

# WOOLWORTHS MOOREBANK REGIONAL DISTRIBUTION CENTRE, MOOREBANK

## Acoustic Certification of Condition B138 of SSD 7709

20 December 2021

Tactical Group

TL265-10F02 Acoustic Certification of Condition B138 for MoRDC Warehouse (r2)

## Document details

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## Document control

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# 1 Introduction

Renzo Tonin & Associates was engaged to provide acoustic certification for the Woolworths Moorebank Regional Distribution Centre (MoRDC) Warehouse in Moorebank.

This certification is to address the acoustic requirements of Consent Condition B138 of State Significant Development (SSD) 7709 prior to construction of the MoRDC at the Moorebank Intermodal Terminal.

The assessment of the mechanical plant and other noisy equipment at this facility take into account the predicted contribution noise levels presented in the Noise & Vibration Impact Assessment (NVIA) report for the SSDA [ref: TL265-01F04 DA Acoustic Assessment Construction and Operation (r10)] to ensure the cumulative noise levels at the potentially most affected residential receiver locations do not exceed the overall operational noise limits as set out in the Modification Application (MOD).

This acoustic certification report addresses external noise emissions only, as an internal noise assessment is not required by Consent Condition B138.

APPENDIX A contains a glossary of acoustic terms used in this report.

## 2 Acoustic conditions

Consent Condition B138 is as follows:

### Mechanical Plant and Other Noisy Equipment Monitoring

B138. Prior to construction of the freight terminal, freight village and each warehouse, the Applicant must submit to the Secretary a Noise Assessment for Mechanical Plant and other noisy equipment to demonstrate that plant and equipment has been selected to meet the overall noise limits specified in **Table 4**.

The referenced Table 4 above, is presented below which provides operational cumulative noise limits for the entire Moorebank industrial precinct and was updated on 24 December 2020 in the SSD 7709 MOD 1 as follows:

**Table 4: Operational Noise Limits dB(A)**

| Location<br>(residential receivers) | Day<br>L <sub>Aeq</sub> , 15 minute | Evening<br>L <sub>Aeq</sub> , 15 minute | Night<br>L <sub>Aeq</sub> , 15 minute | Night<br>L <sub>A1</sub> , 1 minute |
|-------------------------------------|-------------------------------------|---|---------------------------------------|-------------------------------------|
| Casula                              | 39 dB <b><u>46 dB</u></b>           | 35 dB <b><u>44 dB</u></b>               | 35 dB <b><u>39 dB</u></b>             | 52 dB                               |
| Glenfield                           | 35 dB <b><u>49 dB</u></b>           | 35 dB <b><u>46 dB</u></b>               | 35 dB <b><u>42 dB</u></b>             | 52 dB                               |
| Wattle Grove                        | 36 dB <b><u>44 dB</u></b>           | 35 dB <b><u>42 dB</u></b>               | 35 dB <b><u>42 dB</u></b>             | 52 dB                               |
| <b><u>Wattle Grove North</u></b>    | <b><u>41 dB</u></b>                 | <b><u>41 dB</u></b>                     | <b><u>41 dB</u></b>                   | <b><u>52 dB</u></b>                 |

### 3 Referenced documents

The following documentation is referenced for this report:

- Architectural drawings prepared by BELL Architecture received as a package [ref: MoRDC---Moorebank-Campus-Regional-DC\_-\_Drawings] on 27 September 2021
- Mechanical services drawings prepared by LCI Consultants (Australia) received as a package [ref: MoRDC---Moorebank-Campus-Regional-DC\_-\_Drawings] on 27 September 2021
- Mechanical services specification prepared by LCI Consultants (Australia) [ref: JR-SP-M-00-0000 MECHANICAL SERVICES SPECIFICATION[T2]] dated 18 June 2021
- Acoustic performance data for Fusion FPA180PAC units which consist of the same outdoor hardware as Temperzone OPA2000 as advised by Sam Wissa from Fusion HVAC on 15 October 2021
- Daikin air-cooled chiller with inverter driven screw compressor and R134a refrigerant technical data sheet [ref: Woolworths JR DC - CH-L9-01 - Air-Cooled VSD Screw - EWAD950TZ-PR B2 - 881 kW Cooling]
- Daikin Air Cooled Single Screw Chiller/Heatpump Selection Report [ref: Woolworths JR DC - CH-L9-03 - Air-Sourced Screw Heat Pump - UAY348ST3-FBBEQQDR - 1050 kW Heating]

## 4 Design review

The established cumulative noise criteria for all noise sources from the Moorebank Intermodal Terminal are set out in Table 4 *Operational Noise Limits dB(A)* in SSD 7709 MOD 1.

So as not to add or contribute to the predicted  $L_{Aeq, 15min}$  operational noise levels set out in Table 5.8 of the NVIA, the noise emission from mechanical plant and other noisy equipment has been designed to be significantly below the cumulative noise limits referred to herein.

### 4.1 Mechanical plant and other noisy equipment

To satisfy the requirements of Condition B138 of the Consent, an acoustic review of the proposed items of plant and equipment was conducted. The various items of plant equipment to be associated with MoRDC are presented in Table 1 below.

**Table 1: Plant and equipment sound level data**

| Item                                     | Location   | Brand & model no.              | Sound pressure level, $L_p$ [dB(A)] <sup>1</sup> | Calculated / reported sound power level, $L_w$ [dB(A) re 1pW] <sup>1</sup> |
|--|--|--------------------------------|--|--|
| <b>AIR CONDITIONING CONDENSING UNITS</b> |  |                                |  |  |
| ACC-OA-1                                 | Outdoor units mounted on plant form within Grids CB20-CB21 and LB3-LB4 | Daikin REYQ26TAY1              | 63 @ 1m (Cooling)                                | 84   |
| ACC-OA-2                                 | Outdoor units mounted on plant form within Grids CB20-CB21 and LB3-LB4 | Daikin REYQ8TAY1               | 58 @ 1m (Cooling)                                | 78   |
| ACC-OA-3                                 | Outdoor units mounted on plant form within Grids CB20-CB21 and LB3-LB4 | Daikin REYQ32TAY1              | 67 @ 1m (Cooling)                                | 89   |
| ACC-OA-4                                 | Outdoor units mounted on plant form within Grids CB20-CB21 and LB3-LB4 | Daikin REYQ16TAY1              | 64 @ 1m (Cooling)                                | 86   |
| ACC-OA-5                                 | Not shown on any drawing (TBA)   | Daikin RXYMQ8AY1               | 57 @ 1m (Cooling)<br>58 @ 1m (Heating)           | 75   |
| ACC-GHN-01                               | Along the southern facade of Gate House North                          | Daikin RXYMQ5AV4A <sup>2</sup> | 53 @ 1m (Cooling)<br>54 @ 1m (Heating)           | 71   |
| ACC-GHN-02                               | Along the southern facade of Gate House North                          | Daikin RXYMQ5AV4A <sup>2</sup> | 53 @ 1m (Cooling)<br>54 @ 1m (Heating)           | 71   |
| ACC-GHN-03                               | Not shown on any drawing (TBA)   | TBA                            | TBA  | TBA  |

| Item                         | Location  | Brand & model no.               | Sound pressure level, $L_p$ [dB(A)] <sup>1</sup>   | Calculated / reported sound power level, $L_w$ [dB(A) re 1pW] <sup>1</sup> |
|------------------------------|---|---------------------------------|--|--|
| ACC-RO-1                     | Along the southern facade of Receiving Office   | Daikin RZAC100CV1 <sup>2</sup>  | 52 @ 1m (Cooling)<br>54 @ 1m (Heating)<br>48 @ 1m (Night quiet mode)                           | 71   |
| ACC-RO-2                     | Along the southern facade of Receiving Office   | Daikin RZAC85CV1 <sup>2</sup>   | 51 @ 1m (Cooling)<br>54 @ 1m (Heating)<br>47 @ 1m (Night quiet mode)                           | 70   |
| ACC-DO-1                     | Along the western facade of Dispatch/Dock Office  | Daikin RZAV60CV1 <sup>2</sup>   | 48 @ 1m (Cooling)<br>51 @ 1m (Heating)<br>44 @ 1m (Night quiet mode)                           | 68   |
| ACC-GHS-1                    | Along the eastern facade of Gate House South  | Daikin RXYMQ5AV4A <sup>2</sup>  | 53 @ 1m (Cooling)<br>54 @ 1m (Heating)   | 71   |
| ACC-GHS-2                    | Along the eastern facade of Gate House South  | TBA (not in the Equipment List) | TBA  | TBA  |
| ACC-DR-01<br>(Internal only) | Along the northern facade of the Data Room  | Daikin RXV46UVMA                | 47 @ 1m (Cooling, H)<br>44 @ 1m (Cooling, SL)<br>48 @ 1m (Heating, H)<br>45 @ 1m (Heating, SL) | 59<br>60   |
| ACC-DW-01                    | Not shown on Mechanical Services Drawing No. JR-WD-M-E-26 but nominated as DRIVER WAITING (TBA) | Daikin RZAC35EVM                | 48 @ 1m (Cooling)<br>48 @ 1m (Heating)   | 61   |
| ACC-WS-01                    | Roof above the MHE & MHS Workshop A.G.06  | Daikin RXYQ20AYM                | 65 @ 1m (Cooling)  | 88   |
| ACC-TM-01                    | Along the northern facade of the Truck Maintenance  | Daikin RXYMQ5AV4A <sup>2</sup>  | 53 @ 1m (Cooling)<br>54 @ 1m (Heating)   | 71   |
| ACC-CRAC-1                   | Not shown on any drawing (TBA)  | Vertiv LSF52-R3 <sup>2</sup>    | ≤ 66 @ 1m  | 82   |
| ACC-CRAC-2                   | Not shown on any drawing (TBA)  | Vertiv LSF52-R3 <sup>2</sup>    | ≤ 66 @ 1m  | 82   |
| ACC-CRAC-3                   | Not shown on any drawing (TBA)  | Vertiv LSF52-R3 <sup>2</sup>    | ≤ 66 @ 1m  | 82   |
| ACC-CRAC-4                   | Not shown on any drawing (TBA)  | Vertiv LSF52-R3 <sup>2</sup>    | ≤ 66 @ 1m  | 82   |
| ACC-CRAC-EC1A                | Along the western facade of the Energy Complex  | Vertiv LVC170SE4 <sup>2</sup>   | ≤ 68 @ 1m  | 86   |
| ACC-CRAC-EC1B                | Along the western facade of the Energy Complex  | Vertiv LVC170SE4 <sup>2</sup>   | ≤ 68 @ 1m  | 86   |
| ACC-CRAC-EC1C                | Along the western facade of the Energy Complex  | Vertiv LVC170SE4 <sup>2</sup>   | ≤ 68 @ 1m  | 86   |
| ACC-CRAC-EC2A                | Along the western facade of the Energy Complex  | Vertiv LVC170SE4 <sup>2</sup>   | ≤ 68 @ 1m  | 86   |
| ACC-CRAC-EC2B                | Along the western facade of the Energy Complex  | Vertiv LVC170SE4 <sup>2</sup>   | ≤ 68 @ 1m  | 86   |



| Item                                   | Location                                       | Brand & model no.                    | Sound pressure level, $L_p$ [dB(A)] <sup>1</sup> | Calculated / reported sound power level, $L_w$ [dB(A) re 1pW] <sup>1</sup> |
|--|--|--------------------------------------|--|--|
| ACC-CRAC-EC2C                          | Along the western facade of the Energy Complex | Vertiv LVC170SE4 <sup>2</sup>        | ≤ 68 @ 1m  | 86   |
| ACC-CRAC-EC3A                          | Along the western facade of the Energy Complex | Vertiv LVC170SE4 <sup>2</sup>        | ≤ 68 @ 1m  | 86   |
| ACC-CRAC-EC3B                          | Along the western facade of the Energy Complex | Vertiv LVC170SE4 <sup>2</sup>        | ≤ 68 @ 1m  | 86   |
| ACC-CRAC-EC3C                          | Along the western facade of the Energy Complex | Vertiv LVC170SE4 <sup>2</sup>        | ≤ 68 @ 1m  | 86   |
| <b>PACKAGED AIR CONDITIONING UNITS</b> |  |                                      |  |  |
| PAC-01/<br>PAC-CB-1                    | Roof within Grids CB2-CB3 and CBB-CBC          | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-02/<br>PAC-CB-2                    | Roof within Grids CB4-CB5 and CBA-CBB          | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-03/<br>PAC-CB-3                    | Roof within Grids CB6-CB7 and CBB-CBC          | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-04/<br>PAC-CB-4                    | Roof within Grids CB8-CB9 and CBA-CBB          | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-05/<br>PAC-CB-5                    | Roof within Grids CB10-CB11 and CBB-CBC        | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-06/<br>PAC-CB-6                    | Roof within Grids CB12-CB13 and CBA-CBB        | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-07/<br>PAC-CB-7                    | Roof within Grids CB14-CB15 and CBB-CBC        | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-08/<br>PAC-CB-8                    | Roof within Grids CB16-CB17 and CBA-CBB        | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-09/<br>PAC-CB-9                    | Roof within Grids CB18-CB19 and CBB-CBC        | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-10/<br>PAC-SP-1                    | Roof within Grids CB1-CB2 and CBC-LB1          | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-11/<br>PAC-SP-2                    | Roof within Grids CB2-CB3 and LB4-HBA          | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-12/<br>PAC-SP-3                    | Roof within Grids CB6-CB7 and LB4-HBA          | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-13/<br>PAC-SP-4                    | Roof within Grids CB8-CB9 and CBC-LB1          | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-14/<br>PAC-SP-5                    | Roof within Grids CB10-CB11 and CBC-LB1        | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-15/<br>PAC-SP-6                    | Roof within Grids CB10-CB11 and LB4-HBA        | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-16/<br>PAC-SP-7                    | Roof within Grids CB15-CB16 and LB4-HBA        | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-17/<br>PAC-SP-8                    | Roof within Grids CB18-CB19 and HBA-HBB        | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |
| PAC-18/<br>PAC-SP-9                    | Roof within Grids CB19-CB20 and CBC-LB1        | Fusion FPA180/<br>Temperzone OPA2000 | 62 @ 3m (Outdoor Fan Speed High)                 | 78   |

| Item                      | Location  | Brand & model no.   | Sound pressure level, L <sub>p</sub> [dB(A)] <sup>1</sup> | Calculated / reported sound power level, L <sub>w</sub> [dB(A) re 1pW] <sup>1</sup> |
|---------------------------|---|---|---|---|
| PAC-19/<br>PAC-SP-10      | Roof within Grids CB2-<br>CB3 and LB2-LB3                           | Fusion FPA180/<br>Temperzone OPA2000  | 62 @ 3m (Outdoor Fan<br>Speed High)                       | 78  |
| PAC-20/<br>PAC-SP-11      | Roof within Grids CB4-<br>CB5 and LB2-LB3                           | Fusion FPA180/<br>Temperzone OPA2000  | 62 @ 3m (Outdoor Fan<br>Speed High)                       | 78  |
| PAC-21/<br>PAC-SP-12      | Roof within Grids CB7-<br>CB8 and LB2-LB3                           | Fusion FPA180/<br>Temperzone OPA2000  | 62 @ 3m (Outdoor Fan<br>Speed High)                       | 78  |
| PAC-22/<br>PAC-SP-13      | Roof within Grids CB9-<br>CB10 and LB2-LB3                          | Fusion FPA180/<br>Temperzone OPA2000  | 62 @ 3m (Outdoor Fan<br>Speed High)                       | 78  |
| PAC-23/<br>PAC-SP-14      | Roof within Grids CB12-<br>CB13 and LB2-LB3                         | Fusion FPA180/<br>Temperzone OPA2000  | 62 @ 3m (Outdoor Fan<br>Speed High)                       | 78  |
| PAC-24/<br>PAC-SP-15      | Roof within Grids CB15-<br>CB16 and LB2-LB3                         | Not in the Equipment<br>List but assumed to be<br>Fusion FPA180/<br>Temperzone OPA2000<br>(TBA) | 62 @ 3m (Outdoor Fan<br>Speed High)                       | 78  |
| PAC-25/<br>PAC-SP-16      | Roof within Grids CB18-<br>CB19 and LB2-LB3                         | Not in the Equipment<br>List but assumed to be<br>Fusion FPA180/<br>Temperzone OPA2000<br>(TBA) | 62 @ 3m (Outdoor Fan<br>Speed High)                       | 78  |
| <b>AIR HANDLING UNITS</b> |   |   |   |   |
| AHU-01                    | Not shown on any<br>drawing but likely to be<br>internal only (TBA) | Daikin DM2TB-1015B  | -   | 95  |
| AHU-02                    | Not shown on any<br>drawing but likely to be<br>internal only (TBA) | Daikin DM2TB-1319B  | -   | 98  |
| AHU-03                    | Not shown on any<br>drawing but likely to be<br>internal only (TBA) | Daikin DM2TB-1319B  | -   | 98  |
| AHU-04                    | Not shown on any<br>drawing but likely to be<br>internal only (TBA) | Daikin DM2TB-1319B  | -   | 98  |
| AHU-05                    | Not shown on any<br>drawing but likely to be<br>internal only (TBA) | Daikin DM2TB-1319B  | -   | 98  |
| AHU-06                    | Not shown on any<br>drawing but likely to be<br>internal only (TBA) | Daikin DM2TB-1319B  | -   | 98  |
| AHU-07                    | Not shown on any<br>drawing but likely to be<br>internal only (TBA) | Daikin DM2TB-1015B  | -   | 95  |
| AHU-08                    | Not shown on any<br>drawing but likely to be<br>internal only (TBA) | Daikin DM2TB-1015B  | -   | 95  |
| AHU-09                    | Not shown on any<br>drawing but likely to be<br>internal only (TBA) | Daikin DM2TB-1319B  | -   | 98  |

| Item                              | Location   | Brand & model no.  | Sound pressure level, L <sub>p</sub> [dB(A)] <sup>1</sup> | Calculated / reported sound power level, L <sub>w</sub> [dB(A) re 1pW] <sup>1</sup> |
|-----------------------------------|--|--|---|---|
| AHU-10                            | Not shown on any drawing but likely to be internal only (TBA)              | Daikin DM2TB-1319B   | -   | 98  |
| AHU-11                            | Not shown on any drawing but likely to be internal only (TBA)              | Daikin DM2TB-1319B   | -   | 98  |
| AHU-12                            | Not shown on any drawing but likely to be internal only (TBA)              | Daikin DM2TB-1319B   | -   | 98  |
| AHU-13                            | Not shown on any drawing but likely to be internal only (TBA)              | Daikin DM2TB-1319B   | -   | 98  |
| AHU-14                            | Not shown on any drawing but likely to be internal only (TBA)              | Daikin DM2TB-1015B   | -   | 95  |
| <b>WATER COOLED CHILLERS (CH)</b> |  |  |   |   |
| CH-01                             | Roof of Primary Receiving within Grids LT11-LT12 and HBA-HBC               | Daikin EWAD950TZ-PR B2 (standard unit configuration without options) | 73 @ 1m (full load operation)                             | 95  |
| CH-02                             | Roof of Primary Receiving within Grids LT11-LT12 and HBA-HBC               | Daikin EWAD950TZ-PR B2 (standard unit configuration without options) | 73 @ 1m (full load operation)                             | 95  |
| CH-03                             | Roof of Primary Receiving within Grids LT11-LT12 and HBA-HBC               | Daikin UAY291ST3-FBBEQQDR  | 80 @ 1m (horizontal distance from chiller to receiver)    | 101   |
| <b>EXHAUST FANS</b>               |  |  |   |   |
| TEF-08                            | GROUND LEVEL - MALE / FEMALE WC DETAIL (NORTH OF STAIR 15)                 | TBA (not in the Equipment List)                                      | TBA   | TBA   |
| TEF-OA-1                          | GROUND ADMIN - FEMALE WC   | Fantech CUD504ER   | -   | 65  |
| TEF-OA-2                          | GROUND ADMIN - MALE WC   | Fantech CUD716DD   | -   | 60  |
| TEF-OA-3                          | GROUND ADMIN - WC  | Fantech TD-500/150ECO  | -   | 58  |
| TEF-OA-4                          | LVL 1 ADMIN - CLEANER / WC   | Fantech TD-800/200ECO  | -   | 61  |
| TEF-OA-5                          | DRIVERS' UNISEX  | Fantech TD-500/150ECO  | -   | 58  |
| TEF-OA-6                          | Not shown on any drawing but nominated as LVL 1 ADMIN - CLEANER / WC (TBA) | Fantech CUD504ER   | -   | 65  |
| TEF-OA-07                         | SHWR 3 & SHWR 4  | TBA (not in the Equipment List)                                      | TBA   | TBA   |
| TEF-OA-8                          | LVL 1 ADMIN - WC   | Fantech TD-800/200ECO  | -   | 63  |

| Item                      | Location  | Brand & model no.   | Sound pressure level, $L_p$ [dB(A)] <sup>1</sup> | Calculated / reported sound power level, $L_w$ [dB(A) re 1pW] <sup>1</sup> |
|---------------------------|---|---|--|--|
| TEF-DO-01                 | DISPATCH OFFICE - GROUND  | Fantech TD-500/150ECO   | -  | 60   |
| TEF-DW-01                 | Not shown on Mechanical Services Drawing No. JR-WD-M-E-26 but nominated as DRIVER WAITING (TBA) | Fantech TD-500/150ECO   | -  | 60   |
| TEF-GHS-01                | GATEHOUSE SOUTH - ROOF  | Fantech TD-350/125ECO   | -  | 57   |
| TEF-RO-01                 | RECEIVING OFFICE - GROUND   | Fantech APEC031JP6WS001   | -  | 64   |
| TEF-TM-01                 | TRUCK MAINT - GROUND  | Fantech APEC031JP6WS001   | -  | 65   |
| TEF-TM-02                 | Not shown on any drawing but nominated as TRUCK MAINT - MEZZANINE (TBA)                         | Fantech TD-350/125ECO   | -  | 57   |
| TEF-TW-01                 | TRUCK WASH  | Fantech TD-350/125ECO   | -  | 57   |
| TEF-GHN-01                | GATEHOUSE NORTH - ROOF  | Fantech GUEEC31V  | -  | 65   |
| GEF-EC-1                  | ENERGY CENTRE ROOF  | Fantech CEEC25V   | -  | 69   |
| GEF-EC-2                  | ENERGY CENTRE ROOF  | Fantech CE508V  | -  | 64   |
| GEF-EC-3                  | ENERGY CENTRE ROOF  | Fantech CE508V  | -  | 64   |
| GEF-GHN-1 (Internal only) | GATEHOUSE NORTH   | Fantech RESPF150  | -  | 58   |
| GEF-GHN-2 (Internal only) | GATEHOUSE NORTH   | Fantech RP254   | -  | 61   |
| GEF-GHS-1 (Internal only) | GATEHOUSE SOUTH   | Fantech RP254   | -  | 61   |
| GEF-DO-1 (Internal only)  | DISPATCH OFFICE - GROUND  | Not in the Equipment List but assumed to be Fantech RP254 (TBA) | TBA  | TBA  |
| GEF-RO-1 (Internal only)  | RECEIVING OFFICE - GROUND   | Fantech RP254   | -  | 61   |
| GEF-OA-03/<br>GEF-3       | OFFICE ADMIN ROOF LEVEL   | TBA (not in the Equipment List)                                 | TBA  | TBA  |
| GEF-OA-4                  | OFFICE ADMIN ROOF LEVEL   | TBA (not in the Equipment List)                                 | TBA  | TBA  |
| GEF-SP-4                  | SPINE ROOF LEVEL  | TBA (not in the Equipment List)                                 | TBA  | TBA  |
| EF-1                      | Not shown on any drawing but nominated as PRIMARY CONNECT HUB (TBA)                             | Fantech GUDEC50V  | -  | 79   |

| Item                            | Location  | Brand & model no.               | Sound pressure level, $L_p$ [dB(A)] <sup>1</sup> | Calculated / reported sound power level, $L_w$ [dB(A) re 1pW] <sup>1</sup> |
|---------------------------------|---|---------------------------------|--|--|
| EF-2                            | Not shown on any drawing but nominated as PRIMARY CONNECT HUB (TBA)                             | Fantech GUDEC50V                | -  | 79   |
| EF-3                            | Not shown on any drawing but nominated as PRIMARY CONNECT HUB (TBA)                             | Fantech GUDEC50V                | -  | 79   |
| EF-4                            | Not shown on any drawing but nominated as PRIMARY CONNECT HUB (TBA)                             | Fantech GUDEC50V                | -  | 79   |
| <b>SUPPLY FANS</b>              |   |                                 |  |  |
| OAF-OA-1                        | MHS OFFICE WEST   | Fantech TD-800/200ECO           | -  | 62   |
| OAF-OA-2                        | MHS OFFICE EAST   | Fantech TD-350/125ECO           | -  | 55   |
| OAF-OA-3                        | MHS MEETING ROOM  | Fantech TD-800/200ECO           | -  | 61   |
| OAF-OA-4                        | GROUND ADMIN - LOCKERS  | Fantech CUEEC45                 | -  | 69   |
| OAF-OA-5                        | FIRST AID ROOM  | Fantech TD-500/150ECO           | -  | 61   |
| OAF-OA-6                        | RECEIVING OFFICE - GROUND   | Fantech TD-500/150ECO           | -  | 61   |
| OAF-OA-7                        | WAITING   | Fantech TD-500/150ECO           | -  | 60   |
| OAF-OA-8                        | QUIET ROOM  | Fantech TD-350/125ECO           | -  | 58   |
| OAF-OA-9                        | HOT DESKS   | Fantech TD-350/125ECO           | -  | 58   |
| OAF-OA-10                       | TRAINING ROOM 01  | Fantech TD-2000/315ECO          | -  | 77   |
| OAF-OA-11                       | TRAINING ROOM 02  | Fantech TD-2000/315ECO          | -  | 76   |
| OAF-OA-12                       | IT WORKROOM   | Fantech TD-350/125ECO           | -  | 56   |
| OAF-OA-13                       | MEETING ROOM 5  | Fantech TD-500/150ECO           | -  | 61   |
| OAF-OA-13 STAFF KITCHEN (2-off) | STAFF KITCHEN   | TBA (not in the Equipment List) | TBA  | TBA  |
| OAF-DO-1                        | DISPATCH OFFICE - GROUND  | Fantech TD-350/125ECO           | -  | 58   |
| OAF-DW-1                        | Not shown on Mechanical Services Drawing No. JR-WD-M-E-26 but nominated as DRIVER WAITING (TBA) | Fantech TD-350/125ECO           | -  | 53   |

| Item                      | Location  | Brand & model no.               | Sound pressure level, $L_p$ [dB(A)] <sup>1</sup> | Calculated / reported sound power level, $L_w$ [dB(A) re 1pW] <sup>1</sup> |
|---------------------------|---|---------------------------------|--|--|
| OAF-GHN-1                 | GATEHOUSE NORTH - GROUND  | Fantech TD-350/125ECO           | -  | 58   |
| OAF-GHN-2                 | GATEHOUSE NORTH - GROUND  | TBA (not in the Equipment List) | TBA  | TBA  |
| OAF-GHS-01                | GATEHOUSE SOUTH - ROOF  | Fantech TD-800/200ECO           | -  | 59   |
| OAF-RO-01                 | RECEIVING OFFICE - GROUND   | Fantech TD-800/200ECO           | -  | 62   |
| OAF-TM-01                 | TRUCK MAINT - MEZZANINE   | Fantech TD-350/125ECO           | -  | 57   |
| OAF-TM-02                 | Not shown on any drawing but nominated as MAINT WORKSHOP - GROUND (TBA)   | Fantech TD-800/200ECO           | -  | 63   |
| OAF-TM-03                 | Not shown on any drawing but nominated as RECEIVING OFFICE - GROUND (TBA) | Fantech TD-350/125ECO           | -  | 58   |
| SAF-EC-01                 | ENERGY CENTRE TX ROOM   | Fantech AP0564LP6/31            | -  | 75   |
| SAF-EC-02                 | ENERGY CENTRE TX ROOM   | Fantech AP0564LP6/31            | -  | 75   |
| <b>SMOKE EXHAUST FANS</b> |   |                                 |  |  |
| SEF-CB-01                 | CASE BUFFER SMOKE EXHAUST   | Fantech HC0804CP12/34           | -  | 93   |
| SEF-CB-02                 | CASE BUFFER SMOKE EXHAUST   | Fantech HC0804CP12/34           | -  | 93   |
| SEF-CB-03                 | CASE BUFFER SMOKE EXHAUST   | Fantech HC0804CP12/34           | -  | 93   |
| SEF-13/<br>SEF-HB-1       | HIGH BAY SMOKE EXHAUST  | Fantech RVE0804CP9/31           | -  | 91   |
| SEF-14/<br>SEF-HB-2       | HIGH BAY SMOKE EXHAUST  | Fantech RVE0804CP9/31           | -  | 91   |
| SEF-15/<br>SEF-HB-3       | HIGH BAY SMOKE EXHAUST  | Fantech RVE0804CP9/31           | -  | 91   |
| SEF-16/<br>SEF-HB-4       | HIGH BAY SMOKE EXHAUST  | Fantech RVE0804CP9/31           | -  | 91   |
| SEF-17/<br>SEF-HB-5       | HIGH BAY SMOKE EXHAUST  | Fantech RVE0804CP9/31           | -  | 91   |
| SEF-18/<br>SEF-HB-6       | HIGH BAY SMOKE EXHAUST  | Fantech RVE0804CP9/31           | -  | 91   |
| SEF-19/<br>SEF-HB-7       | HIGH BAY SMOKE EXHAUST  | Fantech RVE0804CP9/31           | -  | 91   |
| SEF-20/<br>SEF-HB-8       | HIGH BAY SMOKE EXHAUST  | Fantech RVE0804CP9/31           | -  | 91   |
| SEF-21/<br>SEF-HB-9       | HIGH BAY SMOKE EXHAUST  | Fantech RVE0804CP9/31           | -  | 91   |

| Item   | Location   | Brand & model no.                | Sound pressure level, $L_p$ [dB(A)] <sup>1</sup> | Calculated / reported sound power level, $L_w$ [dB(A) re 1pW] <sup>1</sup> |
|--|--|----------------------------------|--|--|
| <b>STAIR PRESSURISATION FANS</b>               |  |                                  |  |  |
| SPF-1  | STAIR PRESSURISATION   | Fantech<br>APPM080BP7/30         | -  | 91   |
| SPF-2  | STAIR PRESSURISATION   | Fantech<br>APPM080BP7/30         | -  | 91   |
| SPF-3  | Not shown on any drawing but nominated as STAIR PRESSURISATION (TBA) | Fantech<br>APPM063BP7/31         | -  | 81   |
| SPF-4  | Not shown on any drawing but nominated as STAIR PRESSURISATION (TBA) | Fantech<br>APPM063BP7/31         | -  | 81   |
| SPF-5  | STAIR 15   | TBA (not in the Equipment List)  | TBA  | TBA  |
| <b>CHILLED WATER PUMPS</b>                     |  |                                  |  |  |
| CHWP-RL-1                                      | Roof above PRIMARY RECEIVING   | TBA                              | TBA  | TBA  |
| CHWP-RL-2                                      | Roof above PRIMARY RECEIVING   | TBA                              | TBA  | TBA  |
| CHWP-RL-3                                      | Roof above PRIMARY RECEIVING   | TBA                              | TBA  | TBA  |
| <b>GENERATORS</b>                              |  |                                  |  |  |
| Gen-sets                                       | Generators ENERGY COMPLEX  | CPS Containerized enclosure type | 75 @ 1m <sup>3</sup> (field free)                | 94 <sup>2,3</sup>  |
| <b>COMPRESSOR DESIGN</b>                       |  |                                  |  |  |
| 11kW Compressor #1 (Main Scope)                | Compressor Room  | pilotair PAC 11                  | 69 @ 1m (according to Pneurop/Cagi PN2CPTC2)     | 84   |
| 11kW Compressor #2 (Main Scope) (Standby Unit) | Compressor Room  | pilotair PAC 11                  | 69 @ 1m (according to Pneurop/Cagi PN2CPTC2)     | 84   |
| 22kW Compressor (Future Upgrade)               | Compressor Room  | pilotair PAC 22                  | 68 @ 1m (according to Pneurop/Cagi PN2CPTC2)     | 84   |
| <b>REFRIGERATED AIR DRYERS</b>                 |  |                                  |  |  |
| Dryer #1 for 11kW Compressor #1                | Compressor Room  | pilotair TFD 15                  | < 70 @ 1m (Max noise)                            | 83   |
| Dryer #2 for 11kW Compressor #2 (Standby Unit) | Compressor Room  | pilotair TFD 15                  | < 70 @ 1m (Max noise)                            | 83   |
| Dryer #3 for 22kW Compressor                   | Compressor Room  | pilotair TFD 45                  | < 70 @ 1m (Max noise)                            | 84   |

| Item | Location | Brand & model no. | Sound pressure level,<br>$L_p$ [dB(A)] <sup>1</sup> | Calculated / reported<br>sound power level, $L_w$<br>[dB(A) re 1pW] <sup>1</sup> |
|------|----------|-------------------|---|--|
|------|----------|-------------------|---|--|

- Notes:
1. Noise data obtained or calculated from manufacturers' brochure or technical data sheet;  $L_p$  dB(A) or  $L_w$  dB(A) re 1pW.
  2. No spectral data is available.
  3. No detail is available and therefore, the sound power level has been estimated.

Exact plant and equipment selection and locations are to be confirmed during Approved for Construction (AFC) Stage.

Plant and equipment not listed above and those with TBA have not been assessed.

Contractor or supplier is to use the sound power level data and the associated frequency spectrum for equipment selection.

The following discusses the basis of specific operating assumptions:

- Weatherproof Louvres (WPL) will open in fire mode following the make-up air path, but also as a relief air path when the AHUs are running (ie. open during normal operation)
- Smoke Exhaust Fans (SEF) only operate during fire mode (ie. during emergency situation)
- Stair Pressurisation Fans (SPF), only operate during fire mode (ie. during emergency situation)
- There is no Fire Pump room within the MoRDC site - this is shared with MoNDC
- Generators (Gen-set) only run in a power outage, which is an operational emergency, not a life safety emergency situation. These could run for as long as they need to until power is restored. In a major outage this could be days, although highly unlikely given the information provided on reliability and redundancy of the electrical network supplying the project. Outages are generally rare and short and it is understood that there have been no unplanned outages on the estate in the past 2 years; only outages to do cutovers and bringing online new equipment.
- Equipment to be running during fire/emergency mode is tested annually and this will be done during the daytime period only.
- For the Compressor Room, the design should be as follows:
  - The proposed 2250x1400 acoustic louvre at low level equivalent to Fantech SBL1-14-225 as per mechanical consultant's mechanical ventilation system design shall be adopted.
  - The proposed roof (a framed ceiling with acoustic tiles and insulation above to absorb the noise, and a dust cover [profiled metal sheet]) as per architect's architectural model shall be adopted. Alternatively, the roof/ceiling of the compressor room shall achieve a minimum acoustic rating of  $R_w$  30, which can be achieved with a minimum construction of metal cladding on the outside and a solid layer (plasterboard, FC sheet, etc.) on the inside.
  - The external walls and doors of the compressor room shall achieve a minimum acoustic rating of  $R_w$  30, which can be achieved with a minimum construction of metal cladding on the outside and a solid layer (plasterboard, FC sheet, etc.) on the inside.



- The above recommendations assume that the proposed Exhaust Fans (EFs) serving the compressor room are to be acoustically treated or significantly quieter than the compressors and dryers.
- Details of the AHUs on MoRDC are not yet available; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required).

## 4.2 Acoustic treatments

The following acoustic treatment is for external noise emissions only (internal noise level assessment is not required for the purpose of the acoustic certification with regard to Consent Condition B138) and to be incorporated/documentated into the mechanical services drawings as appropriate:

**Table 2: Plant & Equipment Mitigation Measures**

| Item                                     | Acoustic treatment  | Comment  |
|--|---|--|
| <b>AIR CONDITIONING CONDENSING UNITS</b> |   |  |
| ACC-OA-1                                 | Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on one side (west) of the plant form (encapsulating ACC-OA-1, ACC-OA-2, ACC-OA-3 and ACC-OA-4). The other sides can be open to allow for ventilation. The noise screen height is to be at least 1m above the tallest unit on the plant form. | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| ACC-OA-2                                 |   |  |
| ACC-OA-3                                 |   |  |
| ACC-OA-4                                 |   |  |
| ACC-OA-5                                 | Not shown on any drawing  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| ACC-GHN-01                               | -   | -  |
| ACC-GHN-02                               | -   | -  |
| ACC-GHN-03                               | Not shown on any drawing and no equipment selection   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| ACC-RO-1                                 | -   | -  |
| ACC-RO-2                                 | -   | -  |
| ACC-DO-1                                 | -   | -  |

| Item                      | Acoustic treatment  | Comment  |
|---------------------------|---|--|
| ACC-GHS-1                 | Relocate outdoor condenser unit to the eastern facade of the building in an acoustically shielded position  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| ACC-GHS-2                 | No equipment selection; however, it is to be relocated to the eastern facade of the building in an acoustically shielded position   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| ACC-DR-01 (Internal only) | Internal noise level assessment is not required for the purpose of the acoustic certification with regard to Consent Condition B138   | -  |
| ACC-DW-01                 | Not shown on Mechanical Services Drawing No. JR-WD-M-E-26   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| ACC-WS-01                 | Re-select outdoor condenser unit with an overall noise emission level at least 5dB lower than the current selection. Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit. | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| ACC-TM-01                 | -   | -  |
| ACC-CRAC-1                | Not shown on any drawing  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| ACC-CRAC-2                | Not shown on any drawing  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |

| Item  | Acoustic treatment   | Comment  |
|---|--|--|
| ACC-CRAC-3  | Not shown on any drawing   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| ACC-CRAC-4  | Not shown on any drawing   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| ACC-CRAC-EC1A<br>ACC-CRAC-EC1B<br>ACC-CRAC-EC1C<br>ACC-CRAC-EC2A<br>ACC-CRAC-EC2B<br>ACC-CRAC-EC2C<br>ACC-CRAC-EC3A<br>ACC-CRAC-EC3B<br>ACC-CRAC-EC3C | Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on two sides (north and west) of the ACC-CRAC-EC area (encapsulating ACC-CRAC-EC1A, ACC-CRAC-EC1B, ACC-CRAC-EC1C, ACC-CRAC-EC2A, ACC-CRAC-EC2B, ACC-CRAC-EC2C, ACC-CRAC-EC3A, ACC-CRAC-EC3B and ACC-CRAC-EC3C). The eastern side can be open to allow for ventilation. The noise screen height is to be at least 2m above the tallest unit on the area. | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
|   |  |  |

| Item                                   | Acoustic treatment  | Comment  |
|--|---|--|
| <b>PACKAGED AIR CONDITIONING UNITS</b> |   |  |
| PAC-01/ PAC-CB-1                       | <p>Re-select packaged A/C unit with an overall noise emission level at least 10dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-02/ PAC-CB-2                       | <p>Re-select packaged A/C unit with an overall noise emission level at least 10dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-03/ PAC-CB-3                       | <p>Re-select packaged A/C unit with an overall noise emission level at least 10dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-04/ PAC-CB-4                       | <p>Re-select packaged A/C unit with an overall noise emission level at least 10dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-05/ PAC-CB-5                       | <p>Re-select packaged A/C unit with an overall noise emission level at least 10dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-06/ PAC-CB-6                       | <p>Re-select packaged A/C unit with an overall noise emission level at least 10dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |

| Item             | Acoustic treatment  | Comment  |
|------------------|---|--|
| PAC-07/ PAC-CB-7 | <p>Re-select packaged A/C unit with an overall noise emission level at least 10dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-08/ PAC-CB-8 | <p>Re-select packaged A/C unit with an overall noise emission level at least 10dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-09/ PAC-CB-9 | <p>Re-select packaged A/C unit with an overall noise emission level at least 10dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-10/ PAC-SP-1 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p>  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-11/ PAC-SP-2 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p>  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-12/ PAC-SP-3 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p>  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |

| Item             | Acoustic treatment   | Comment  |
|------------------|--|--|
| PAC-13/ PAC-SP-4 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-14/ PAC-SP-5 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-15/ PAC-SP-6 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-16/ PAC-SP-7 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-17/ PAC-SP-8 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-18/ PAC-SP-9 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |

| Item              | Acoustic treatment   | Comment  |
|-------------------|--|--|
| PAC-19/ PAC-SP-10 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p>   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-20/ PAC-SP-11 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p>   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-21/ PAC-SP-12 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p>   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-22/ PAC-SP-13 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p>   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-23/ PAC-SP-14 | <p>Re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p>   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| PAC-24/ PAC-SP-15 | <p>No equipment selection; however, if as the other PAC-SP selection, then re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |

| Item                      | Acoustic treatment   | Comment  |
|---------------------------|--|--|
| PAC-25/ PAC-SP-16         | <p>No equipment selection; however, if as the other PAC-SP selection, then re-select packaged A/C unit with an overall noise emission level at least 5dB lower than the current selection.</p> <p>Install a noise absorption screen equivalent to ModularWalls AcoustiSorb75 on three sides (north, west and south) of the unit. The eastern side can be open to allow for ventilation. The noise screen height is to be at least 1m above the unit.</p> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| <b>AIR HANDLING UNITS</b> |  |  |
| AHU-01                    | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required.  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| AHU-02                    | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required.  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| AHU-03                    | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required.  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| AHU-04                    | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required.  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| AHU-05                    | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required.  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |



| Item   | Acoustic treatment  | Comment  |
|--------|---|--|
| AHU-06 | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required. | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| AHU-07 | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required. | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| AHU-08 | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required. | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| AHU-09 | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required. | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| AHU-10 | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required. | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| AHU-11 | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required. | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |

| Item                              | Acoustic treatment  | Comment  |
|-----------------------------------|---|--|
| AHU-12                            | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required.         | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| AHU-13                            | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required.         | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| AHU-14                            | Not shown on any drawing; however, it is understood that the air intakes will be facing east (away from the nearest identified residential receiver location and can be acoustically treated as required.         | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| <b>WATER COOLED CHILLERS (CH)</b> |   |  |
| CH-01                             | Re-select chiller with an overall noise emission level at least 5dB lower than the current selection<br>OR<br>Install proprietary acoustic treatment to reduce the overall noise emission level by at least 5dB   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| CH-02                             | Re-select chiller with an overall noise emission level at least 5dB lower than the current selection<br>OR<br>Install proprietary acoustic treatment to reduce the overall noise emission level by at least 5dB   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| CH-03                             | Re-select chiller with an overall noise emission level at least 10dB lower than the current selection<br>OR<br>Install proprietary acoustic treatment to reduce the overall noise emission level by at least 10dB | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |

| Item                | Acoustic treatment  | Comment  |
|---------------------|---|--|
| <b>EXHAUST FANS</b> |   |  |
| TEF-08              | No equipment selection                                    | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| TEF-OA-1            | -   | -  |
| TEF-OA-2            | -   | -  |
| TEF-OA-3            | -   | -  |
| TEF-OA-4            | -   | -  |
| TEF-OA-5            | -   | -  |
| TEF-OA-6            | Not shown on any drawing                                  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| TEF-OA-07           | No equipment selection                                    | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| TEF-OA-8            | -   | -  |
| TEF-DO-01           | -   | -  |
| TEF-DW-01           | Not shown on Mechanical Services Drawing No. JR-WD-M-E-26 | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| TEF-GHS-01          | -   | -  |
| TEF-RO-01           | -   | -  |
| TEF-TM-01           | -   | -  |

| Item                      | Acoustic treatment  | Comment  |
|---------------------------|---|--|
| TEF-TM-02                 | Not shown on any drawing  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| TEF-TW-01                 | -   | -  |
| TEF-GHN-01                | -   | -  |
| GEF-EC-1                  | -   | -  |
| GEF-EC-2                  | -   | -  |
| GEF-EC-3                  | -   | -  |
| GEF-GHN-1 (Internal only) | Internal noise level assessment is not required for the purpose of the acoustic certification with regard to Consent Condition B138 | -  |
| GEF-GHN-2 (Internal only) | Internal noise level assessment is not required for the purpose of the acoustic certification with regard to Consent Condition B138 | -  |
| GEF-GHS-1 (Internal only) | Internal noise level assessment is not required for the purpose of the acoustic certification with regard to Consent Condition B138 | -  |
| GEF-DO-1 (Internal only)  | No equipment selection  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| GEF-RO-1 (Internal only)  | Internal noise level assessment is not required for the purpose of the acoustic certification with regard to Consent Condition B138 | -  |
| GEF-OA-03/ GEF-3          | No equipment selection  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| GEF-OA-4                  | No equipment selection  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |

| Item               | Acoustic treatment       | Comment  |
|--------------------|--------------------------|--|
| GEF-SP-4           | No equipment selection   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| EF-1               | Not shown on any drawing | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| EF-2               | Not shown on any drawing | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| EF-3               | Not shown on any drawing | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| EF-4               | Not shown on any drawing | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| <b>SUPPLY FANS</b> |                          |  |
| OAF-OA-1           | -                        | -  |
| OAF-OA-2           | -                        | -  |
| OAF-OA-3           | -                        | -  |
| OAF-OA-4           | -                        | -  |
| OAF-OA-5           | -                        | -  |
| OAF-OA-6           | -                        | -  |
| OAF-OA-7           | -                        | -  |
| OAF-OA-8           | -                        | -  |

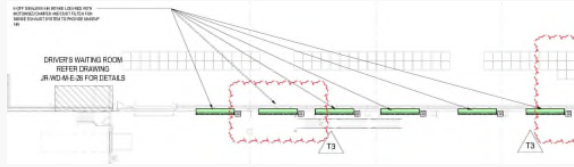
| Item                            | Acoustic treatment  | Comment  |
|---------------------------------|---|--|
| OAF-OA-9                        | -   | -  |
| OAF-OA-10                       | -   | -  |
| OAF-OA-11                       | -   | -  |
| OAF-OA-12                       | -   | -  |
| OAF-OA-13                       | -   | -  |
| OAF-OA-13 STAFF KITCHEN (2-off) | No equipment selection                                    | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| OAF-DO-1                        | -   | -  |
| OAF-DW-1                        | Not shown on Mechanical Services Drawing No. JR-WD-M-E-26 | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| OAF-GHN-1                       | -   | -  |
| OAF-GHN-2                       | No equipment selection                                    | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| OAF-GHS-01                      | -   | -  |
| OAF-RO-01                       | -   | -  |
| OAF-TM-01                       | -   | -  |
| OAF-TM-02                       | Not shown on any drawing                                  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |

| Item                             | Acoustic treatment  | Comment  |
|----------------------------------|---|--|
| OAF-TM-03                        | Not shown on any drawing  | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| SAF-EC-01                        | Internally line intake ductwork with 50mm thick acoustic insulation for a minimum length of 1m from the fan | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| SAF-EC-02                        | Internally line intake ductwork with 50mm thick acoustic insulation for a minimum length of 1m from the fan | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| <b>SMOKE EXHAUST FANS</b>        |   |  |
| SEF-CB-01                        | -   | Fire mode only   |
| SEF-CB-02                        | -   | Fire mode only   |
| SEF-CB-03                        | -   | Fire mode only   |
| SEF-13/ SEF-HB-1                 | -   | Fire mode only   |
| SEF-14/ SEF-HB-2                 | -   | Fire mode only   |
| SEF-15/ SEF-HB-3                 | -   | Fire mode only   |
| SEF-16/ SEF-HB-4                 | -   | Fire mode only   |
| SEF-17/ SEF-HB-5                 | -   | Fire mode only   |
| SEF-18/ SEF-HB-6                 | -   | Fire mode only   |
| SEF-19/ SEF-HB-7                 | -   | Fire mode only   |
| SEF-20/ SEF-HB-8                 | -   | Fire mode only   |
| SEF-21/ SEF-HB-9                 | -   | Fire mode only   |
| <b>STAIR PRESSURISATION FANS</b> |   |  |
| SPF-1                            | -   | Fire mode only   |
| SPF-2                            | -   | Fire mode only   |

| Item                       | Acoustic treatment       | Comment  |
|----------------------------|--------------------------|--|
| SPF-3                      | Not shown on any drawing | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| SPF-4                      | Not shown on any drawing | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| SPF-5                      | No equipment selection   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| <b>CHILLED WATER PUMPS</b> |                          |  |
| CHWP-RL-1                  | No equipment selection   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| CHWP-RL-2                  | No equipment selection   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| CHWP-RL-3                  | No equipment selection   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |



| Item   | Acoustic treatment   | Comment  |
|--|--|--|
| <b>Generators</b>                              |  |  |
| Gen-sets                                       | As the units are containerized enclosure type with special acoustic treatment, no additional acoustic treatment required | -  |
| <b>COMPRESSOR DESIGN</b>                       |  |  |
| 11kW Compressor #1 (Main Scope)                | Refer to architectural recommendations for the design of the Compressor Room in Section 4.1 above                        | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| 11kW Compressor #2 (Main Scope) (Standby Unit) | Refer to architectural recommendations for the design of the Compressor Room in Section 4.1 above                        | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| 22kW Compressor (Future Upgrade)               | Refer to architectural recommendations for the design of the Compressor Room in Section 4.1 above                        | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| <b>REFRIGERATED AIR DRYERS</b>                 |  |  |
| Dryer #1 for 11kW Compressor #1                | Refer to architectural recommendations for the design of the Compressor Room in Section 4.1 above                        | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| Dryer #2 for 11kW Compressor #2 (Standby Unit) | Refer to architectural recommendations for the design of the Compressor Room in Section 4.1 above                        | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |

| Item                                   | Acoustic treatment  | Comment  |
|--|---|--|
| Dryer #3 for 22kW Compressor           | Refer to architectural recommendations for the design of the Compressor Room in Section 4.1 above   | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| <b>WEATHERPROOF LOUVRES</b>            |   |  |
| WPLs on northern facade of Case Buffer | Install acoustic louvres with equivalent acoustic performance as Aambianz AWAZ Series150 Acoustic Louvres<br> | Tactical Group, the builder and mechanical contractor will endeavour to implement the recommendations outlined in this report to an equal or similar method within the mechanical design in order to achieve the desired acoustic outcomes |
| WPL on western facade of Case Buffer   | -   | -  |
| WPLs on northern facade of High Bay    | -   | -  |
| WPLs on southern facade of High Bay    | -   | -  |

Note: Exact plant and equipment selection, and the required acoustic treatments are to be confirmed during AFC Stage.

The selection of all noise control elements outlined herein have been made for acoustic purposes only. The appropriate usage and placement of these materials for non-acoustic purposes (ie. fire) are the responsibility of other appropriate disciplines.

Additional to the descriptions of acoustic treatments presented in the table above, the measures described below also apply.

### 4.2.1 Noise screens

A range of noise screens are proposed as part of the noise mitigation measures incorporated into the design and are recommended in Table 2 above. All noise screens have absorptive facings on the plant/equipment side and will need to extend down to connect with the structure beneath (eg. roof).

The extent and heights of noise screens are nominal. The final extents and quantities of noise screens and materials required, will largely depend on the performance of the preferred materials selected by the designers, any updates or changes to the plant/equipment, and the outcomes of a design review / optimisation process.

The construction of a noise screen can be made from any durable material with sufficient mass to prevent direct noise transmission (eg. steel, fibrous-cement, timber etc) selected to withstand weather elements.

Due to the potential acoustic reflections of these elements, there are range of acoustic absorption elements required to be incorporated into the design that may impact the noise screens, which is further detailed in Section 4.2.2.

In addition to the above, all noise barriers/screens should give regard to the following to maintain acoustic integrity and to perform effectively as noise screens:

- any penetrations through the fabric of the noise screen should be sealed airtight
- all joints and gaps between noise screen panels and adjacent structures should be sealed airtight
- any gaps between the noise screen and the bottom structure (ie. roof) should be filled to ensure that the screen provides appropriate noise attenuation
- any penetrations through the screens (eg. for drainage) are to be designed considering acoustics (ie. long pipes with bends) as these can compromise the performance of the noise screen.

For gaps less than 10 mm, fill all gaps with an approved acoustic mastic sealer. The depth of sealer shall be at least equal to the width of the gap. If the gap is greater than 10mm, fill the cavity with polyester insulation and a backing rod. Seal the gap airtight an approved acoustic mastic sealer. The depth of sealer shall be at least equal to the width of the gap. The gaps between frames shall also be sealed using aluminium angle brackets (approximately 25 mmx 25 mm x 3 mm).

Where acoustic mastic sealant is specified anywhere in this document, the material shall be a flexible non-hardening compound (flexible non-hardening acrylic specific gravity 1.6 or polyurethane specific gravity 1.45). Approved products, from an acoustics perspective are CSR Gyprock Fire Mastic, Promaseal Acrylic Sealant, Hilti CP606 or Bostik Fireban 1 or equivalent.

#### 4.2.2 Acoustic absorption

The minimum acoustic performance for the acoustic absorption to be used to line the plant/equipment sides of the noise screens, is presented in Table 3.

**Table 3: Minimum external acoustic absorption performance**

| Item                         | Acoustic absorption coefficient per octave band, Hz |     |     |      |      |      | NRC        |
|------------------------------|---|-----|-----|------|------|------|------------|
|                              | 125   | 250 | 500 | 1000 | 2000 | 4000 |            |
| External acoustic absorption | 0.3   | 0.7 | 0.9 | 0.9  | 0.8  | 0.8  | <b>0.8</b> |

Example materials that could be used for the external areas are:

- 50mm Pyrotek Reapor.

- Perforated metal sheeting, minimum 20% perforated open area, with 50 mm 32kg/m<sup>3</sup> insulation (minimum 25 kg/m<sup>3</sup>) in the 50mm cavity (such as Stramit Acoustic Panels or AcoustiSorb75).
- Or any other products of equivalent acoustic performance as approved by the project's acoustic consultant in writing.

All selected materials are to have laboratory test data demonstrating that they can achieve the minimum acoustic absorption performance presented in Table 3.

Any exceptions from the presented minimum acoustic absorption performance, are to be justified through predicted noise levels at nearby receiver locations, to demonstrate the noise levels remain consistent with project noise emission objectives.

All products proposed to be used in the final design are to be approved by the project's acoustic consultant and should be reviewed by the designers and contractors for meeting relevant smoke and fire requirements. Similarly, it is recommended that this material should be UV stable insulation suitable for outdoor application.

#### 4.2.3 Vibration isolation of plant / equipment

It is recommended that plant and equipment shall be vibration isolated and balanced in accordance with Australian Standard 2625 *Rotating and Reciprocating Machinery - Mechanical Vibration*.

Fans shall be vibration isolated from any adjoining structure with neoprene mounts with minimum 12mm static deflection (ie. Embelton NRD3, or Mason Mercer ND-C, or acoustically approved alternative). Fans shall also be isolated from ductwork with flexible connections.

All condenser units shall be vibration isolated from the supporting structure with two layers of 10mm thick Embelton Shearflex neoprene pads (with metal shim plate between) or 35mm high Embelton NRD neoprene mounts.

All air conditioning condensing pipes shall be vibration isolated from the supporting structure using waffle pads or rubber mounts.

#### 4.2.4 Structure borne noise and vibration

**Balancing** - All rotating equipment such as fans, pumps, centrifugal compressors etc. complete with pulleys, couplings, belts etc. shall be statically and dynamically balanced so that the out of-balance does not exceed 0.03 mm kg/kg of rotating member, when installed and connected up for normal operation. Test certificates shall be provided for items of equipment listed in the mechanical specification. Rotating equipment shall not operate at speeds in excess of 80% of its critical speed.

**Mountings** - Equipment shall be mounted on rigid bases supported by vibration isolators.

**Inertia Blocks** - Inertia blocks shall be provided for equipment where limiting the amplitude of vibration to practical limit is required, where shown on the drawings or where listed in the mechanical specification.

**Flexible Connections** - Additionally rotating and reciprocating equipment shall be connected to duct work, piping, etc. with flexible connections. All service connections such as electrical, drainage, flues etc., to resiliently mounted equipment shall have a flexible section of approved type installed between the equipment and the nearest support.

### 4.3 Noise predictions

Table 4 summarises the results of the noise assessment incorporating the acoustic treatments listed above along with the most stringent noise criteria listed in Table 4 of SSD 7709 MOD 1 for the Casula receivers, being the nearest and the potentially worst affected receivers relating to this warehouse operation.

**Table 4: Predicted  $L_{Aeq,15min}$  operational noise levels, dB(A)**

| Receiver  | Description            | Overall, dB(A)                                  |
|---|------------------------|---|
| <b>Mitigated design - 8m high noise barriers within the site up to 325m in total length</b> |                        |   |
| R1 - 9 Casula Road, Casula  | Predicted noise levels | Operation (night, adverse) <sup>1,2,3</sup> 37  |
|   |                        | Plant and equipment incl. MoNDC 24              |
|   |                        | TOTAL 37  |
|   | <i>Noise goal</i>      | <i>Night</i> 39                                 |
| R3a - Glenfield Farm, Casula  | Predicted noise levels | Operation (night, adverse) <sup>1,2,3</sup> 29  |
|   |                        | Plant and equipment incl. MoNDC 22              |
|   |                        | TOTAL 30  |
|   | <i>Noise goal</i>      | <i>Night</i> 39                                 |
| R4 - 30 Goodenough Street, Glenfield  | Predicted noise levels | Operation (night, adverse) <sup>1,2,3</sup> <20 |
|   |                        | Plant and equipment incl. MoNDC <20             |
|   |                        | TOTAL <20                                       |
|   | <i>Noise goal</i>      | <i>Night</i> 39                                 |

Noise emissions from the proposed plant and equipment with the acoustic treatments implemented are predicted to be significantly below the  $L_{Aeq, 15min}$  operational noise levels previously predicted during the modification application (ie. below the established overall site operational noise limits). Therefore, the design of mechanical plant and other noisy equipment is deemed suitable for operation.

Any changes to the proposed plant and equipment and/or acoustic treatments set out in this report should be reviewed by the project's acoustic consultant.

Engineering margins and allowances for tolerances have not been included in the noise predictions presented herein to alleviate risk of non-compliance. Consideration of such margins and tolerances would be given during the detailed design and AFC design.

Risk management is an integral part of good management practice. AS/NZS 4360-1999 "Risk Management" has become part of our company's culture and as a consequence it permeates all aspects of the company's work and is actively promoted to our clients.

The risk management process can be applied to any situation where an undesired or unexpected outcome could be significant or where opportunities are identified. Our clients need to know about possible outcomes and the steps that can be taken to control any adverse impact.

There is an opportunity in the design process for the client to actively participate in risk management by providing input into risk reduction strategy. For example, the client may need to know that some aspects of risk reduction could involve passing those risks on to other entities in a better position to treat those risks. Some aspects of risk reduction may involve additional cost or time consequences. On the other hand, there may also be opportunities to avoid or avert risk at no cost to the client by rescheduling processes so that key information becomes available at a critical time.

When the client is properly informed, this supports better decision making by contributing a greater insight into risks and their impacts.

## 5 Conclusion

Based on the documentation reviewed and listed in Section 3 and the design review presented in Section 4, Renzo Tonin & Associates certifies that the acoustic requirements of Consent Condition B138 of State Significant Development (SSD) 7709 prior to construction of the MoRDC at the Moorebank Intermodal Terminal, can be satisfactorily met.

## APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

|                    |   |
|--------------------|---|
| Adverse weather    | Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).   |
| Ambient noise      | The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.  |
| Assessment period  | The period in a day over which assessments are made.  |
| Assessment point   | A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.   |
| Background noise   | Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L <sub>90</sub> noise level (see below).  |
| Decibel [dB]       | The units that sound is measured in. The following are examples of the decibel readings of every day sounds:<br>0dB The faintest sound we can hear<br>30dB A quiet library or in a quiet location in the country<br>45dB Typical office space. Ambience in the city at night<br>60dB CBD mall at lunch time<br>70dB The sound of a car passing on the street<br>80dB Loud music played at home<br>90dB The sound of a truck passing on the street<br>100dB The sound of a rock band<br>115dB Limit of sound permitted in industry<br>120dB Deafening  |
| dB(A)              | A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. |
| dB(C)              | C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.  |
| Frequency          | Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.   |
| Impulsive noise    | Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.  |
| Intermittent noise | The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.  |
| L <sub>Max</sub>   | The maximum sound pressure level measured over a given period.  |
| L <sub>Min</sub>   | The minimum sound pressure level measured over a given period.  |



|                      |  |
|----------------------|--|
| L <sub>1</sub>       | The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.  |
| L <sub>10</sub>      | The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.   |
| L <sub>90</sub>      | The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L <sub>90</sub> noise level expressed in units of dB(A).  |
| L <sub>eq</sub>      | The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.   |
| Reflection           | Sound wave changed in direction of propagation due to a solid object obscuring its path.   |
| SEL                  | Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L <sub>eq</sub> sound levels over any period of time and can be used for predicting noise at various locations. |
| Sound                | A fluctuation of air pressure which is propagated as a wave through air.   |
| Sound absorption     | The ability of a material to absorb sound energy through its conversion into thermal energy.   |
| Sound level meter    | An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.  |
| Sound pressure level | The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.  |
| Sound power level    | Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.   |
| Tonal noise          | Containing a prominent frequency and characterised by a definite pitch.  |