



Project: **ASHBURTON ART GALLERY**

Prepared for: **Ashburton District Council c/o Logic Group**
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Report No.: **Rp 001 20201147**

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Document Control

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SUMMARY

This report provides an assessment of the potential noise effects arising from the proposed new plant compound at the Ashburton Art Gallery. The compound will contain new mechanical plant and rehouse existing mechanical plant that is currently located on the roof.

We understand that the mechanical plant will potentially operate 24 hours a day and we have predicted noise levels assuming conservative operational scenario against the most stringent applicable District Plan night-time noise limit of 40 dB $L_{Aeq(1\text{ Hour})}$.

Our noise assessment can be summarised as follows:

- The existing night-time noise environment at the nearest dwellings is dominated by existing traffic on State Highway 1 – night-time noise is in the range 47 to 59 dB L_{Aeq}
- The proposed mechanical plant compound is predicted to comply with the most stringent night-time noise limit of 40 dB $L_{Aeq(1\text{ Hour})}$ when applied at the first floor of the closest adjacent dwelling at 130 Wills Street.
- To comply with the District Plan noise limits, the proposed plant will require 4 metre high perimeter noise control barriers to mitigate noise emissions to the adjacent sensitive boundaries.
- Overall, we consider that any potential adverse noise effects will be minimal in the context of the elevated noise levels in the receiving environment and existing residential amenity will be maintained.

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1.0 INTRODUCTION

Marshall Day Acoustics has been engaged by Ashburton District Council to assess the noise effects from proposed re-configuration of the Art Gallery's mechanical plant in the context of the applicable District Plan noise limits and with reference to the existing underlying traffic noise environment.

This report provides:

- An overview of the existing acoustic environment regarding traffic noise from State Highway 1;
- An assessment of compliance with the Ashburton District Plan;
- Results of the noise measurements conducted on site from existing mechanical plant;
- Predicted noise emissions from the proposed new plant compound and remaining plant at rooftop.

A glossary of the terminology used in this report is provided in Appendix A

2.0 SITE AND ACTIVITY DESCRIPTION

2.1 Site locality

The Ashburton Art Gallery is located at 327 West Street, Ashburton. The Art Gallery and the closest neighbouring dwellings are zoned *Residential* under the Ashburton District Plan. Figure 1 shows the mechanical plant locations, and nearest dwellings.

The Art Gallery shares a boundary with two residential dwellings at 127 Cameron Street and 130 Wills Street. Both dwellings are two storeys.

Figure 1: Aerial view of site, existing plant rooms and proposed new plant compound location



2.2 Project description

The Art Gallery wish to relocate several items of existing roof mounted mechanical plant to a new plant compound located at ground level on the northern part of the site as indicated in Figure 1. The proposed plant compound will also house some new mechanical plant. The mechanical plant is proposed to operate 24 hours a day.

We understand the proposed mechanical plant changes are as set out in Table 1.

Table 1: Proposed changes for the Art Gallery's mechanical plant

Quantity	Description
3	Two existing heat pump units (Carrier and Thermocold) and one new Carrier unit to be located in proposed plant compound
6	Air handling units (Airpak) to remain on the roof 4 at Plant Area 1 and 2 and Plant Area 2
3	Condenser units (Mitsubishi) to remain on the roof

3.0 APPLICABLE NOISE STANDARDS

The site and surrounding properties are zoned *Residential* in the Ashburton District Plan. Applicable noise limits for adjacent residential dwellings are summarised in Table 2.

Table 2: Ashburton District Plan noise limits

Zone	Daytime (0700-2200 inclusive)		Night-time (All other times)	
	L _{Aeq} (1hr)	L _{AF} , L _{max}	L _{Aeq} (1hr)	L _{AF} , L _{max}
Residential A, B, C and D	50 dB	75 dB	40 dB	65 dB

Notes:

- Where there are buildings close to or on a site boundary, compliance with the noise limits shall be assessed 1 metre from any accessible façade of those buildings.
- Where a fence or other noise control structure is erected on a site boundary, compliance assessment shall consider the effect of such a structure
- When applying the notional boundary provision, the notional boundary is a line 20 metres from any residential unit on any neighbouring site, as defined in NZS6802:2008 Acoustics Environmental Noise.
- The daytime noise limits are intended to provide amenity for outdoor activities. Night-time noise limits are intended to allow for sleep amenity
- The noise rule that is applicable to a site is based on the zoning of the site receiving the noise and not the site that is generating the noise

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4.0 EXISTING NOISE ENVIRONMENT

On 5 June 2024, we installed noise logging instrumentation in order to measure the existing traffic noise environment at a representative position adjacent to the dwelling at 130 Wills Street. The position was aligned with the dwelling façade and the measurement microphone was at approximately 4 metres high.

Supplementary attended noise measurements were carried out at MP1 as shown in Figure 2. Measurement position 1 (MP1) is approximately 50 metres from the centreline of the State Highway 1 and was chosen as being representative of the noise received by the dwellings at 130 Wills Street and 127 Cameron Street.

Figure 2: Ambient noise survey measurement positions



All noise measurements were taken in accordance with New Zealand Standards NZS 6801: 2008 “Acoustics- Measurement of Sound”. The measurement duration was generally 15 minutes.

Figure 3: Variation in noise level with time at the property boundary of 130 Wills Street

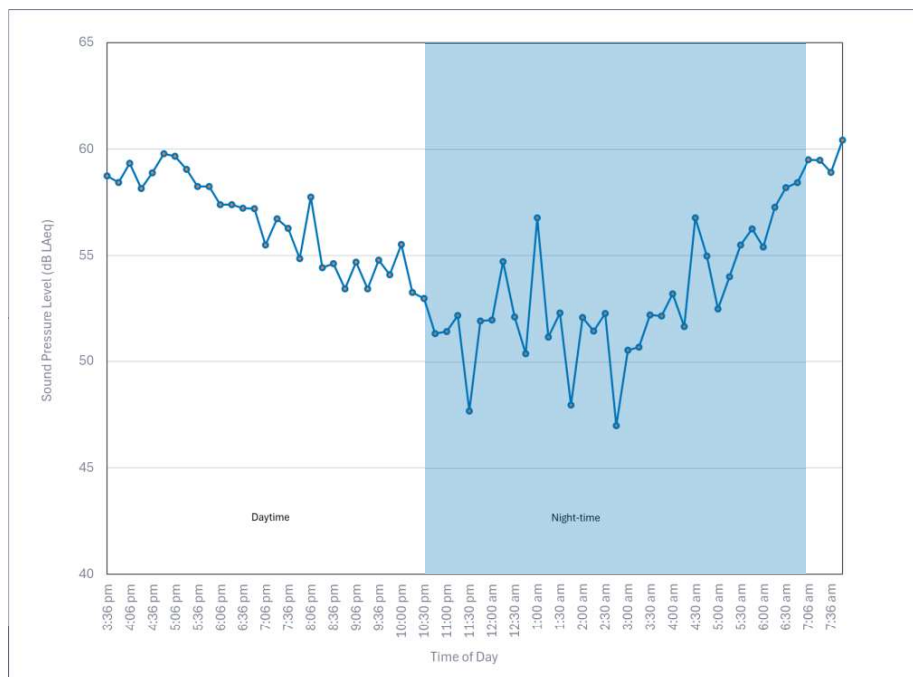


Table 3: Night-time attended noise measurements

Measurement position	Start time (hr:mn)	Noise level, dB L _{Aeq}
MP1	22:11	56
	22:36	54

Measured noise levels indicate that the existing traffic noise levels are greater than both the daytime and night-time District Plan permitted activity noise limits of 50 and 40dB L_{Aeq} respectively. During the critical night-time period, existing levels are in the range 47 to 59 dB L_{Aeq} with the quietest period being at approximately 0245hrs in the morning.

5.0 PREDICTED NOISE LEVELS

This section describes our methodology for assessing likely future noise emissions from the proposed plant compound.

5.1 Noise source data

The proposed plant compound will house both new and relocated mechanical plant. To assist with our assessment, we have measured noise emissions from the existing mechanical plant and reviewed manufacturer sound power levels for the proposed heat pump units - these are presented in Appendix D. Our measurements indicate that the manufacturer's data underestimate the equipment noise emissions and require some adjustment. The sound level data used on our analysis is presented in Table 4.

Table : Noise data proposed mechanical plant

Item	Description	Noise levels	Noise data source
New plant compound			
HP1	Heat pump model 30RQS 090	83 dB L _{WA}	Manufacturer data
HP2	Heat pump model 30RQS 078	84 dB L _{WA}	Measured by MDA
HP3	Heat pump unit model Quattro Prozone	87 dB L _{WA}	Measured by MDA
Remaining plant on roof			
MC	Mitsubishi condenser units	82 dB L _{WA}	Measured by MDA
FA	Fresh air unit	65 dB L _{WA}	Measured by MDA
AHU	Air Handling units (Airpak)	78 dB L _{WA}	Measured by MDA

5.2 Predicted noise levels

We predicted noise levels using the sound power levels provided in Table 2. As the mechanical plant is expected to operate both day and night to meet cooling or heating demands, we assessed the predicted noise levels against the most stringent applicable night-time noise limit of 40 dB $L_{Aeq}(1 \text{ hour})$.

Our noise modelling calculations were undertaken using the SoundPLAN v9.0 suite of software. This software implements calculation procedures described in International Standard ISO 9613-2:1996 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation" and accounts for a range of factors affecting sound propagation, such as ground and atmospheric attenuation, meteorological effects and the presence of obstacles or barriers.

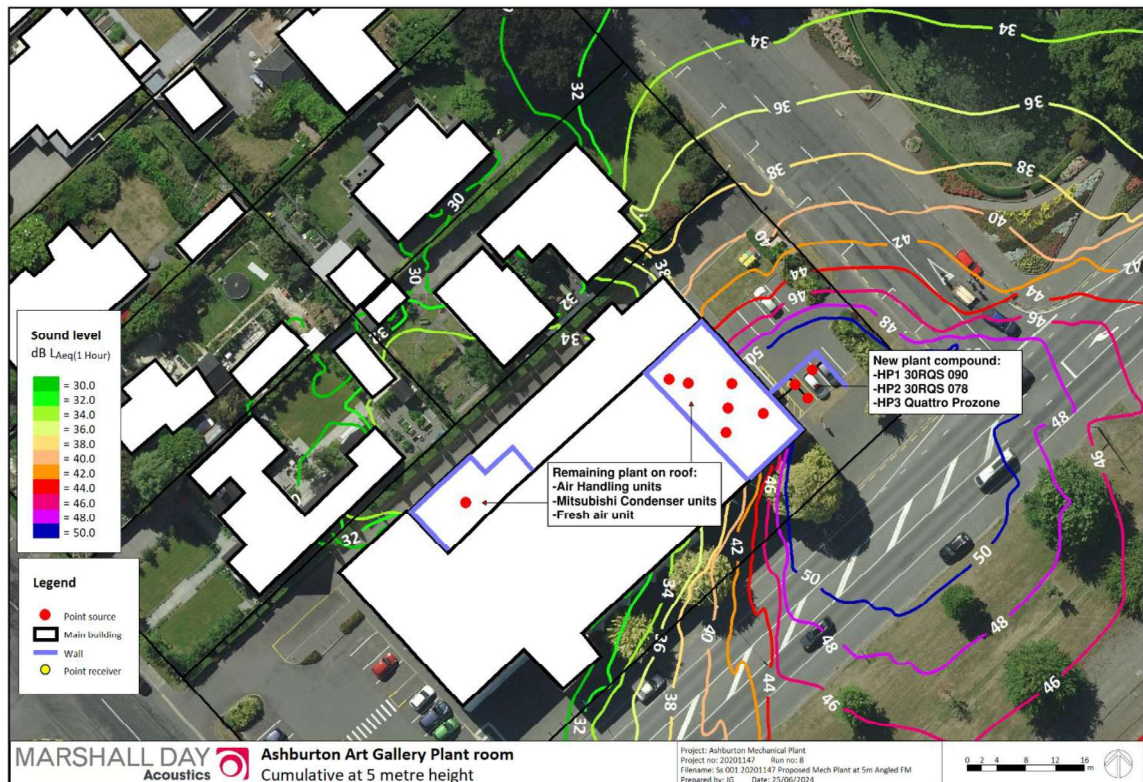
This assessment focuses on the noise received at the residential site boundary, specifically at a height of 5 metres that is representative of the first-floor bedrooms. The calculations are of the cumulative noise from both the existing and proposed mechanical plant, and include the reduction provided by a 4-metre-high noise control fence to the north and west of the proposed plant compound. This approach ensures that the night-time noise limits, designed to protect sleep amenity, are met.

Table 3 shows the calculated noise levels along the residential boundary. Noise contour plots are provided in Figure 4.

Table 3: Predicted noise levels from the mechanical plant at adjacent receivers at 5 metres height

Assessment position	Predicted noise level dB $L_{Aeq}(1 \text{ hour})$	Night-time noise limit dB $L_{Aeq}(1 \text{ hour})$	Complies? Yes/No
130 Wills Street	38	40	Yes
127 Cameron Street	36	40	Yes

Figure 4: Noise contours from the mechanical plant at adjacent receivers at 5 metres height



6.0 ASSESSMENT OF NOISE EFFECTS

Our assessment shows that the total noise from both the proposed plant compound and existing roof-mounted mechanical plant can operate and comply with the applicable District Plan permitted activity noise limit of 40 dB L_{Aeq} . Noise emissions will provide appropriate residential amenity for the protection of sleep.

Furthermore, existing traffic noise levels at the adjacent residences are elevated at night to levels of 47 to 58 dB L_{Aeq} which is substantially above the permitted activity noise environment of 40 dB L_{Aeq} .

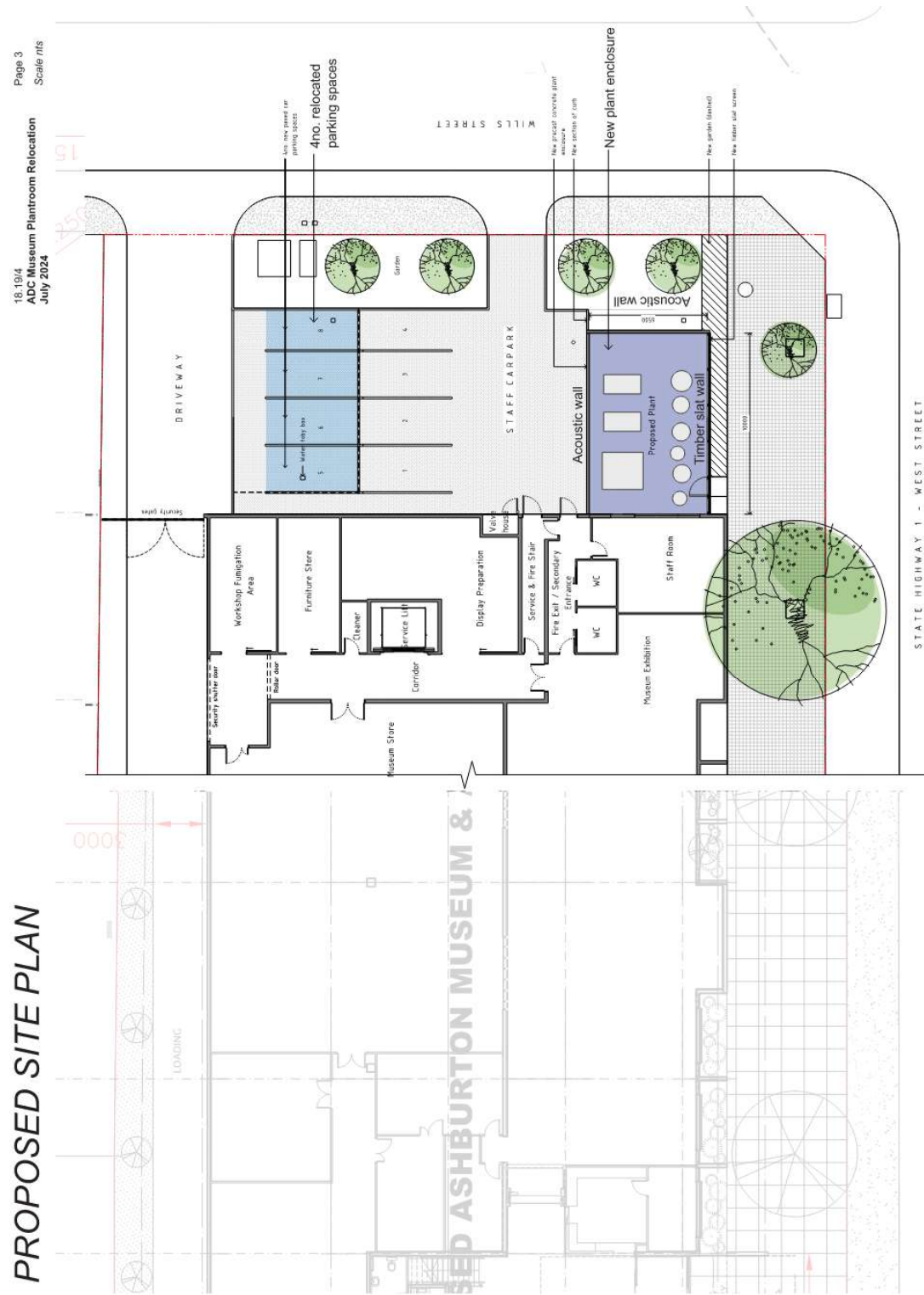
Therefore, we consider the proposed relocation of the heat pumps to the new plant compound at the ground floor with noise mitigation in place, will result in a decrease in noise levels received by the nearest dwelling at 130 Wills Street.

Overall, we consider that any potential adverse noise effects will be minimal, given the elevated noise levels in the receiving environment. As a result, the existing residential amenity will not be substantially altered by the proposed changes.

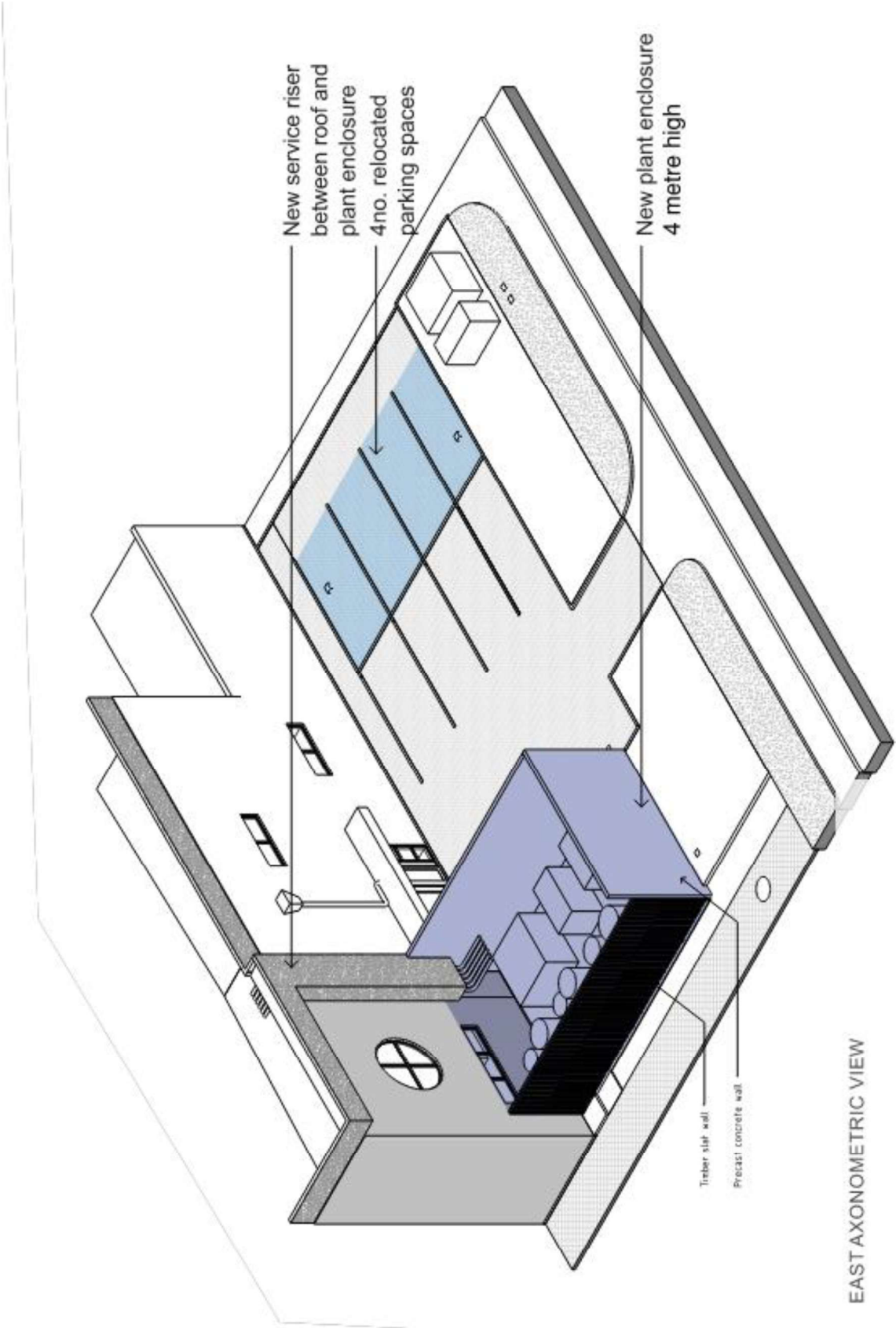
APPENDIX A GLOSSARY OF TERMINOLOGY

Noise	A sound that is unwanted by, or distracting to, the receiver.
dB	Decibel (dB) is the unit of sound level. Expressed as a logarithmic ratio of sound pressure (P) relative to a reference pressure (Pr), where $dB = 20 \times \log(P/Pr)$.
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) to more closely approximate the frequency bias of the human ear. A-weighting is used in airborne acoustics.
L_{Aeq} (t)	The equivalent continuous (time-averaged) A-weighted sound level commonly referred to as the average level. The suffix (t) represents the period, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{AFmax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.

APPENDIX B PROPOSED SITE PLAN





APPENDIX C PROPOSED NEW PLANT ENCLOSURE



APPENDIX D TECHINCAL SPECIFICATIONS

HP1 Carrier 30RQS090

Acoustics Report

Date: 1/24/2020 11:48 AM

Prepared By: Dennis Jackson

Acoustic Information									
Octave Band Center Frequency	Hz	125	250	500	1K	2K	4K	8K	Total
Sound Power at Chiller Acoustic Center	dB	80	82	81	78	73	66	-	87
A-Weighted Sound Power	dBA	64	73	78	78	74	67	-	83
Sound pressure at specified distance in a free field	dB	57	59	58	54	50	43	-	64
A-Weighted Sound Pressure Level	dBA	41	50	55	54	51	44	-	59

HP2 Carrier 30RQS78

 		Acoustics Report							
Date: 1/24/2020 11:42 AM		Prepared By: Dennis Jackson							

Acoustic Information									
Octave Band Center Frequency	Hz	125	250	500	1K	2K	4K	8K	Total
Sound Power at Chiller Acoustic Center	dB	77	79	78	75	71	64	-	84
A-Weighted Sound Power	dBA	61	70	75	75	72	65	-	80
Sound pressure at specified distance in a free field	dB	54	56	56	52	48	42	-	61
A-Weighted Sound Pressure Level	dBA	38	48	53	52	49	43	-	57

Quattro Prozone 265Z MA SL -R410A

QUATTRO PROZONE 265 Z MA SL - R410A

ACOUSTIC DATA	Sound level pressure at 20 m (ISO 3744)							[db]	41
	Sound level pressure at 10 m (ISO 3744)							[db]	46
	Sound level pressure 5 m (ISO 3744)							[db]	51
	Sound level pressure 1 m (ISO 3744)							[db]	61
	Sound power level (ISO 3744)							[db]	78
	Hz	63	125	250	500	1000	2000	4000	8000
	[db]	56	52	47	43	40	38	32	27
DIMENSIONS	Length	[mm]	2300	Height	[mm]	1550			
	Width	[mm]	1350	Weight	[kg]	705			