Mullaloo Shopping Centre

SIte Location Plan

DA Application

17019

1 2 3 4 5 10

TAYLORROBINSON

Rev -
SL01

Mullaloo Shopping Centre
Site Location Plan
Development Application

C
SD1
09 2018

NTS
17019

TAYLOR ROBINSON CHANEY BRODERICK

Mullaloo Shopping Centre
Site Plan
Development Application

D
SD2
09 2018

NTS
17019

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CHANEY
BRODERICK

Legend

- Vehicular Access
- Pedestrian Route
- Mall Entrance

Mullaloo Shopping Centre

Site Plan Access

Development Application

D

SD4

09 2018

NTS

17019

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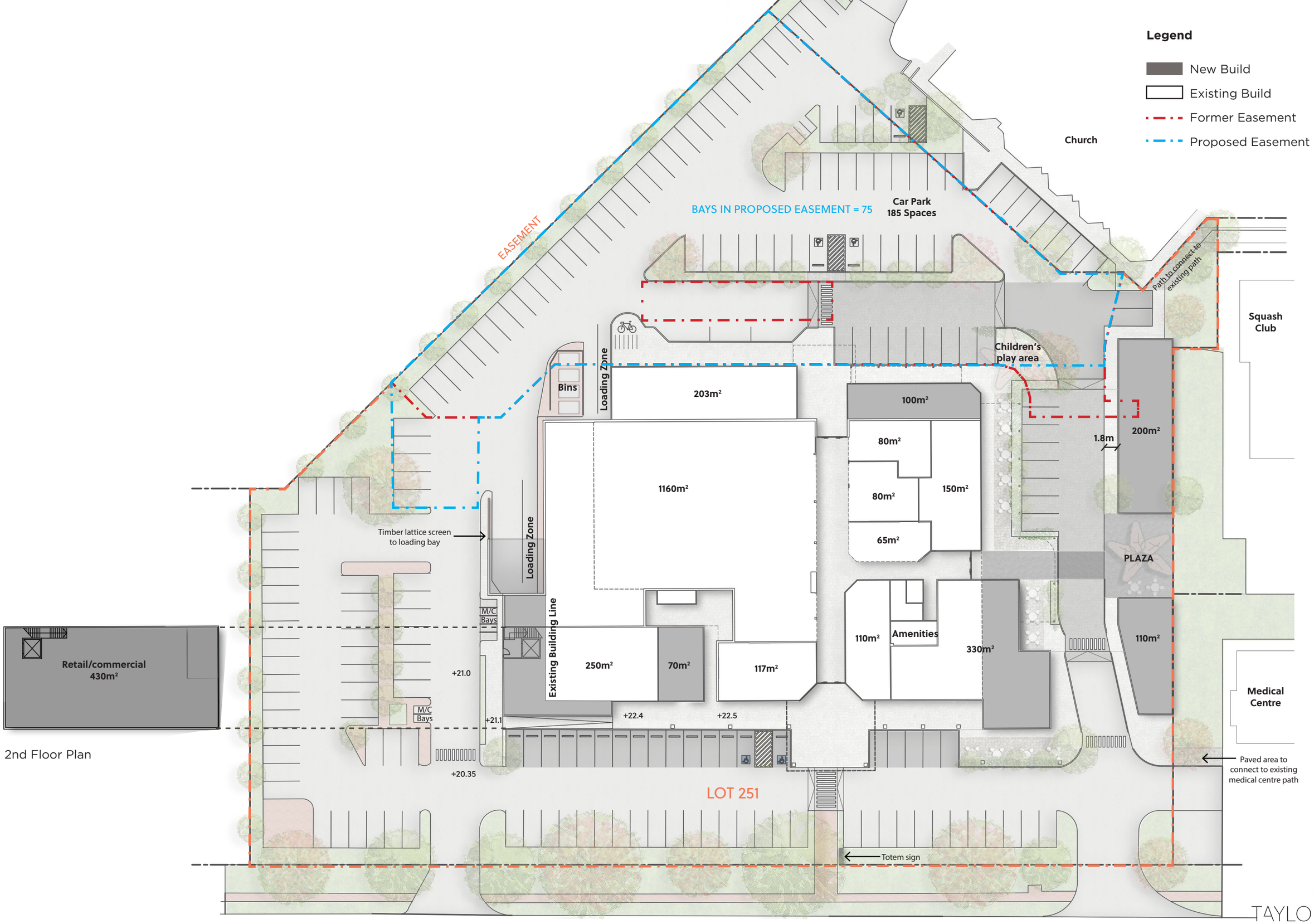

2nd Floor Plan

Mullaloo Shopping Centre

Proposed Easement

Easement Adjustment

A

SD2

09 2018

1:500 @ A3

17019

0 5 10 25

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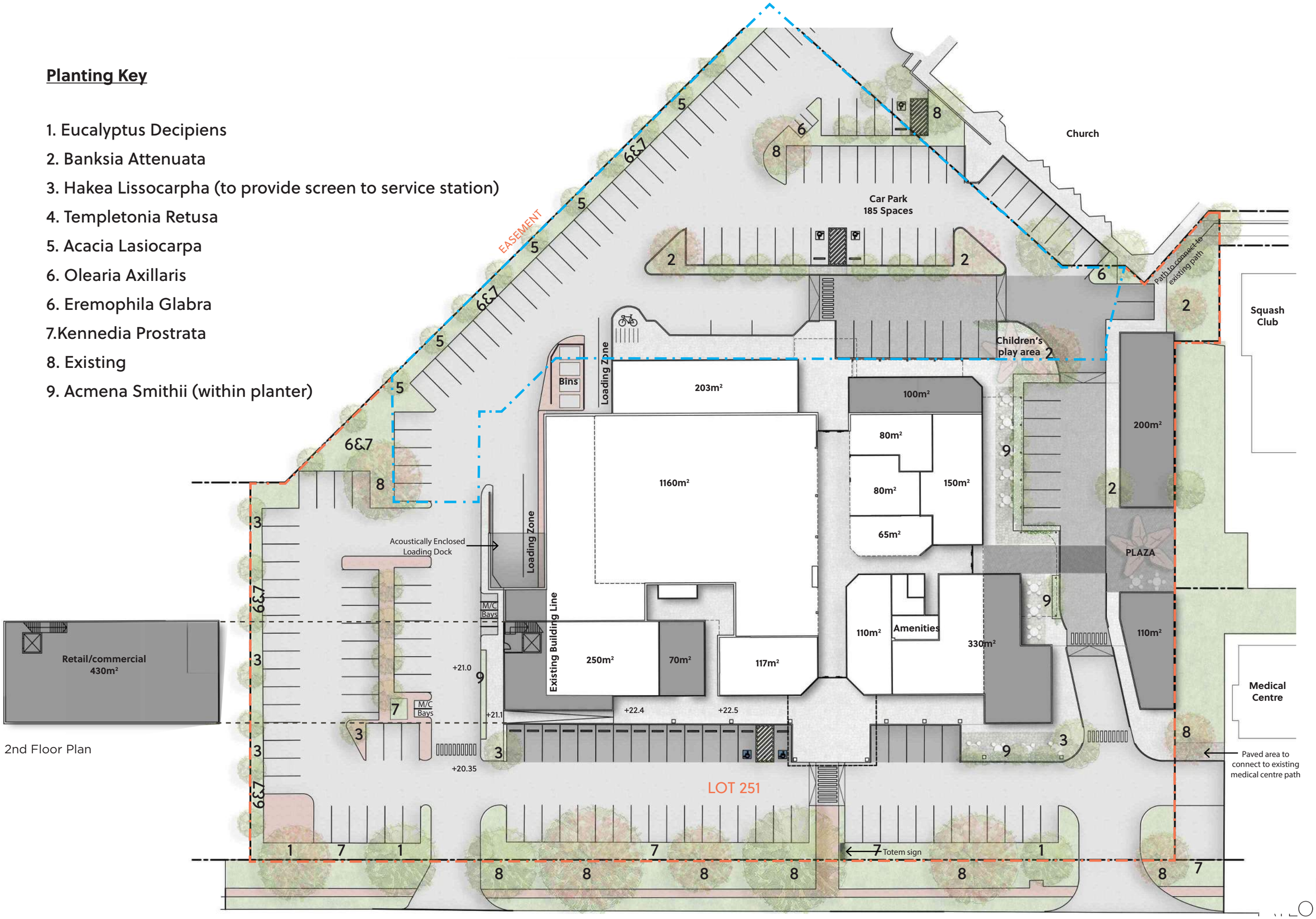
Planting Key

1. Eucalyptus Decipiens
2. Banksia Attenuata
3. Hakea Lissocarpha (to provide screen to service station)
4. Templetonia Retusa
5. Acacia Lasiocarpa
6. Olearia Axillaris
6. Eremophila Glabra
7.Kennedia Prostrata
8. Existing
9. Acmena Smithii (within planter)



2nd Floor Plan

Mullaloo Shopping Centre
Ground Floor Plan
Development Application

D
SD6
09 2018

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17019

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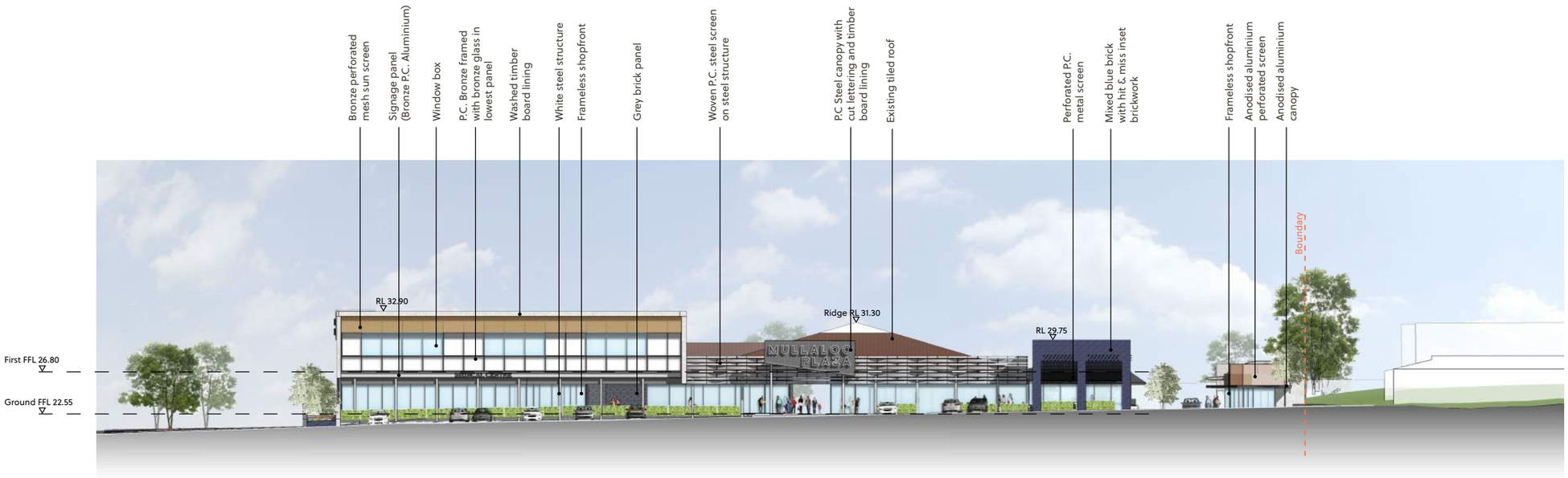
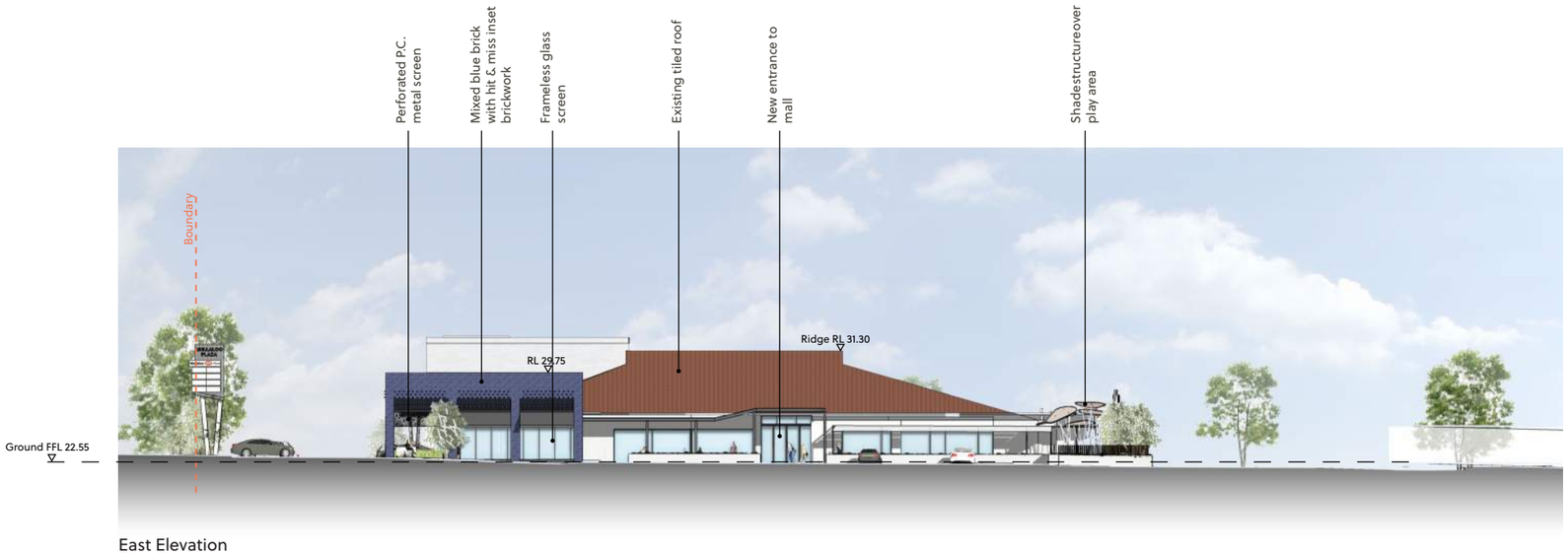
ROBINSON CHANEY BRODERICK



South Elevation



East Elevation

Mullaloo Shopping Centre
Elevations
Development Application

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SD8
09 2018

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17019

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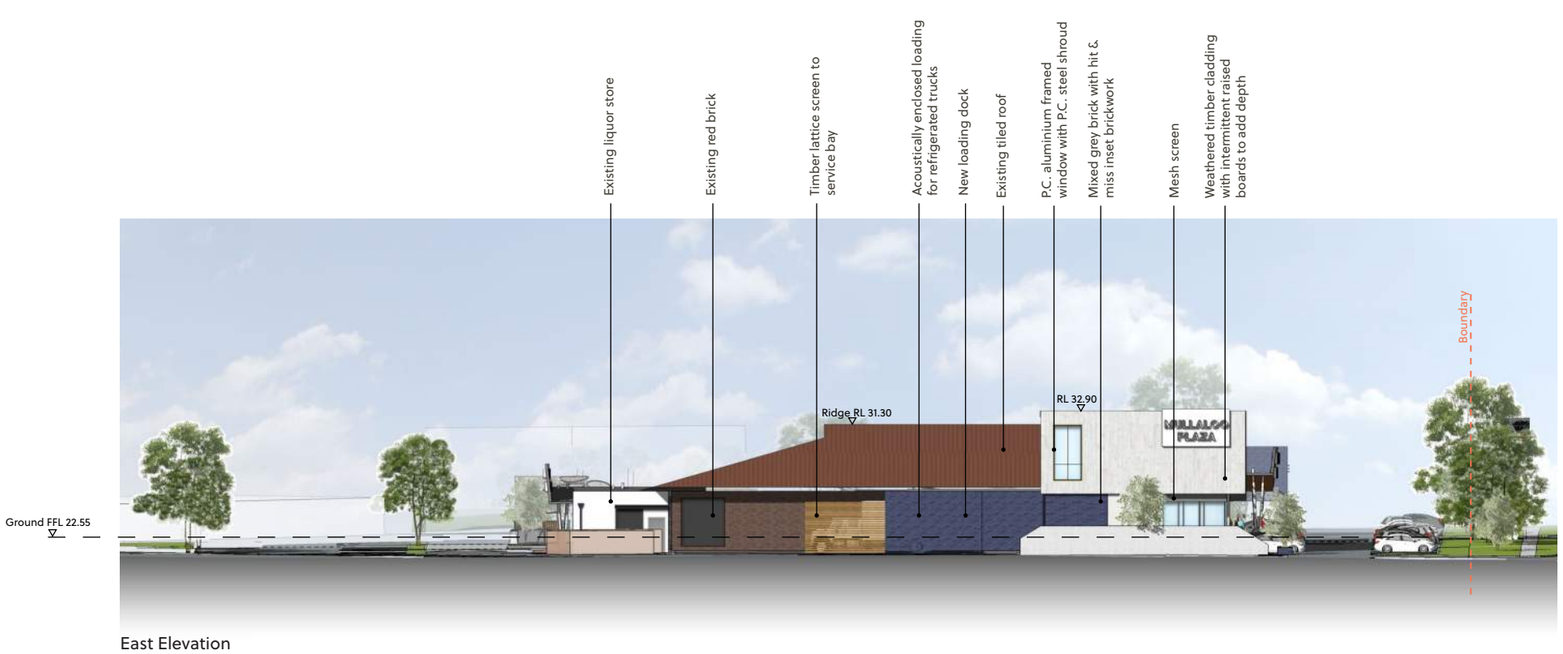
TAYLOR ROBINSON CHANEY BRODERICK

South Elevation



East Elevation

Mullaloo Shopping Centre
Elevations
Development Application

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SD9
09 2018

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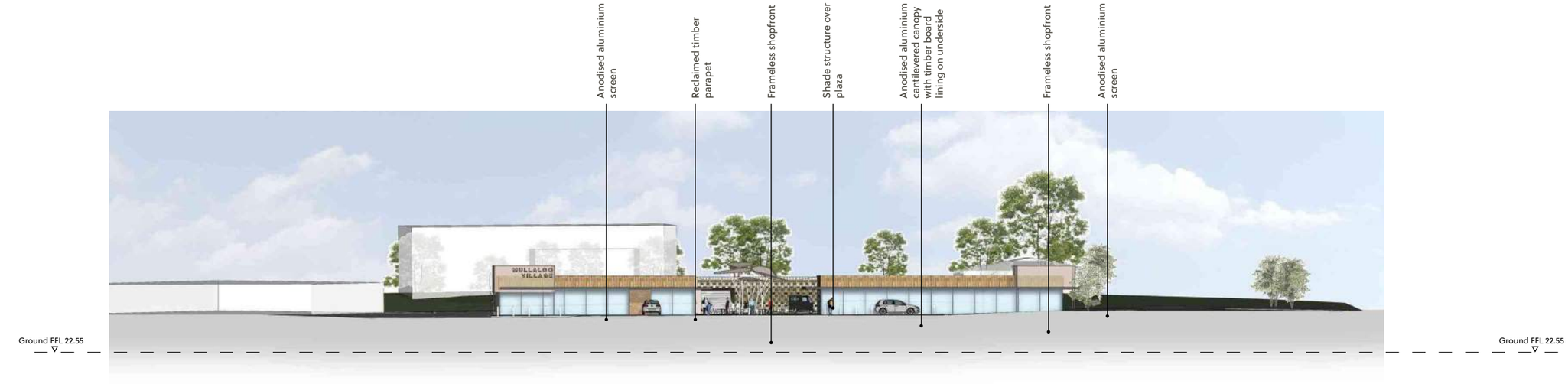
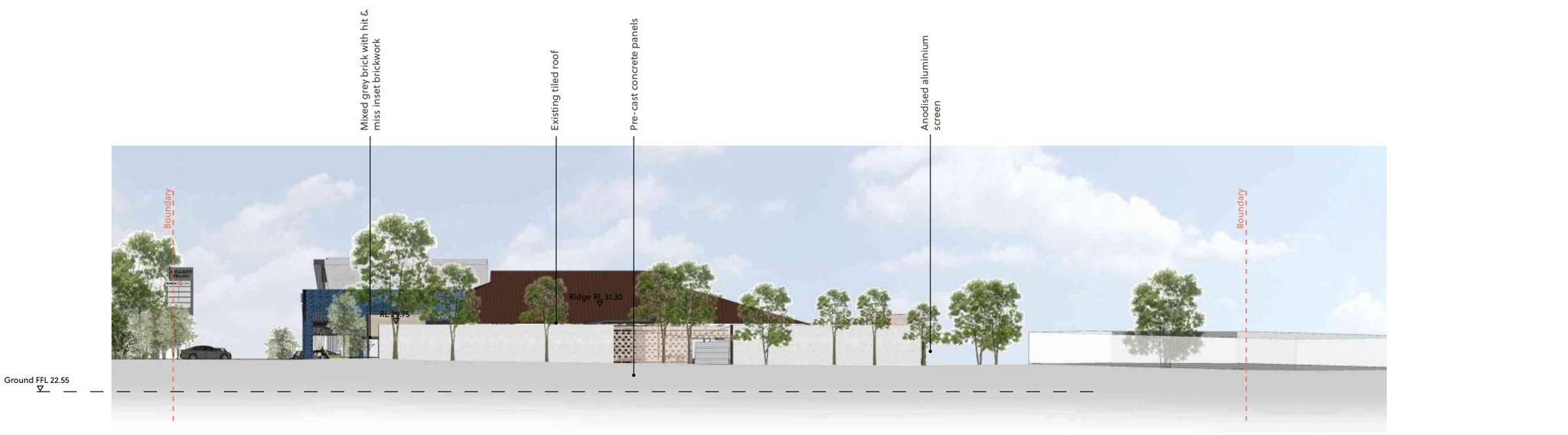
17019

0 5 10 25

TAYLOR ROBINSON CHANEY BRODERICK



West Elevation B



East Elevation B

Mullaloo Shopping Centre
Elevations
Development Application

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SD10
09 2018

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17019

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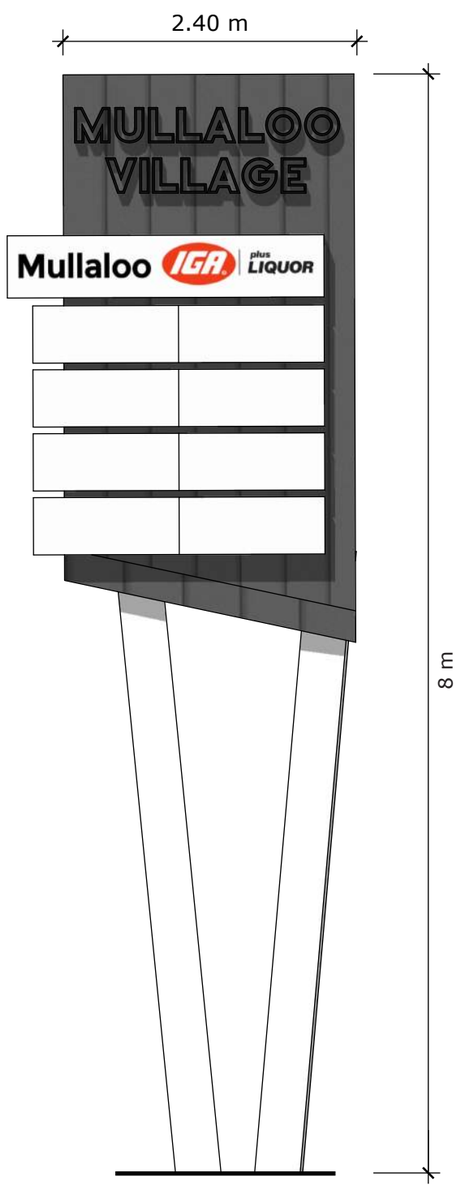
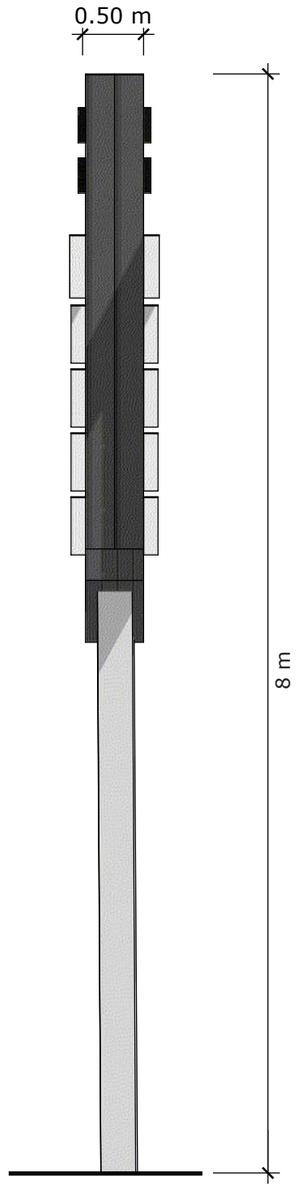
TAYLOR ROBINSON CHANEY BRODERICK





Mullaloo Shopping Centre
Pylon Sign Elevations
Development Application

D
SD15
09 2018

1:50 @ A3
17019

TAYLOR
ROBINSON
CHANEY
BRODERICK

Mullaloo Shopping Centre
Aerial View - Stage Two
Development Application

D
SD7
09 2018

17019

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CHANEY
BRODERICK

Mullaloo Shopping Centre
Plaza - Stage Two
Development Application

D
SD11
09 2018

17019

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MULLALOO
VILLAGE

Mullaloo Shopping Centre
Southeast Perspective
Development Application

D
SD13
09 2018

17019

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CHANEY
BRODERICK

Mullaloo Shopping Centre

Medical Centre Perspective

Development Application

D

SD14

09 2018

17019

TAYLOR ROBINSON CHANEY BRODERICK

1. White washed timber panels
2. Woven aluminium screen
3. Mottled blue brick
4. Mesh screen
5. Recycled timber
6. Perforated aluminium panel

1.

2.

3.

4.

5.

6.

Sealhurst Pty Ltd
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ABN: 86 161 563 551
ACN: 161 563 551

12th DECEMBER 2017

Mark Dorril
Mullaloo Shopping Centre (Client Entity TBA)
C/o - Taylor Robinson Architects
234 Railway Parade
WEST LEEDERVILLE
WA 6007

Mullaloo Shopping Centre Refurbishment & Expansion
Acoustic Assessment - DA Input

Dear Mark,

Further to our preliminary acoustic assessment works regarding the Mullaloo Shopping Centre Refurbishment and Expansion development, Sealhurst have prepared the following letter report to address potential impacts of noise emissions anticipated from the operation of the completed development, as is currently identified in the concept design plans at DA stage. The project includes an existing IGA-brand supermarket and neighbouring specialty retail, medical centre and food & beverage outlets. It is intended that further detailed works will be undertaken post-DA to ensure the project is able to meet its requirements under the statutory design codes (and any Council conditions arising) governing noise and noise emissions to local receivers.

PROJECT APPRECIATION

The existing Mullaloo Shopping Centre is proposed to be refurbished and expanded for the current owners, to form Mullaloo Plaza, concept images shown right. The project site is addressed at corner of Koorana Road and Dampier Avenue, located within the established residential suburb of Mullaloo - the shopping centre in its current format has been operational for a number of years, with IGA supermarket, bottle shop, assorted health and beauty stores, and several food and beverage outlets, including fish and chips, and cafe at the rear.

The refurbishment and expansion project is proposed to occur in stages – Stage 1 shows refurbishment of the existing building and surrounding parking facilities, addition of medical centre and incorporating changes to the existing layout; Stage 2 shows further works most notably to a landscaped outdoor Plaza.

Acoustic design input at this stage, and for this type of shopping centre development relates to controlling anticipated noise sources such as building plant, exhaust fans, and refrigeration package units etc, to maintain compliance with the WA Environmental Protection (Noise) Regulations 1997 (incl. amendments). Logistics, deliveries, opening hours, and waste management considerations must also be addressed in terms of practical noise controls.

An overall Development Approval (DA) submission is currently being prepared for the project, and a preliminary acoustic assessment is required to understand the potential impact of noise emissions from the operation of these premises.

The primary noise sources anticipated as part of the proposed development are expected to include upgraded plant equipment for commercal tenancy air-conditioning, general mechanical exhaust fans, specifc kitchen

exhaust fan system(s) for existing , refurbished and potetnial new food and beverage tenancies, existing and any new refrigeration plant – all anticipated to be located externally at roof level;

At this stage, additional elements of anticipated noise emissions are logistics/deliveries, loading dock operations, customer car parking and waste management as potential sources of noise.

The scope of works for this assessment includes:

- Undertake baseline environmental noise survey to ascertain existing operational noise levels, and ambient background conditions;
- Establish environmental design criteria with reference to the *WA Environmental Protection (Noise) Regulations 1997 (incl. amendments)* as the relevant statutory legislation and standard for noise emissions;
- Estimate noise levels from the development with potential for impact at nearby noise-sensitive receivers – e.g. loading docks, roof mounted plant equipment, noise from customer vehicles etc.;
- Assess compliance with the applicable noise limits and suggest indicative measures to minimise potential impact at noise-sensitive receiver locations;
- Identify acoustic issues for consideration and highlight areas requiring further investigation.

As the project is at Concept Design stage, details and specifics re: building plant equipment selections and locations are not yet determined, as is appropriate for this stage of the development; Post DA, it is anticipated that further acoustic assessment will be undetaken as a required component of the project's Building Licence (BL) approval submission. At this stage, and during Detailed Design, more and better particulars will be reviewed using specific equipment selections and locations, pertaining to the demonstration that the development will be able to comply with the *Environmental Protection (Noise) Regulations 1997 (as amended)* at all times, post completion.

CONCLUSIONS

Our findings at the current stage of the project design are as follows:

1. In terms of noise emissions, the *Environmental Protection (Noise) Regulations 1997 (as amended)* represent the applicable statutory legislation, and the Assigned Noise Level (ANL) limits the objective gauge with which the proposed development must be shown to comply.
2. ANL limits with respect to the Shopping Centre noise emissions have been calculated based upon an Influencing Factor (IF) of **+4** at the nearest of 4x Noise Sensitive Receivers (NSRs), identified as follows:
    a. NSR 1 existing residential premises on Koorana Drive located approximately 55 metres south of the nearest point of the proposed development.;
    b. NSR 2 existing rear residential property boundary(s), Scaphelia Ave located approximately 25 metres north from the nearest point of the proposed development.;
    c. NSR 3 existing rear residential property boundary(s), Scaphelia Ave adjacent to Service Station, located approximately 40 metres west of the nearest point of the proposed development.
    d. NSR 4 under EPA *Regs* Whitfords Church of Christ is also considered as noise sensitive premises; located approximately 30 metres north-east of the nearest point of the proposed development.

    NSRs are identified on calculation mapping – nearest plant locations TBC as Detailed Design is progressed.

3. To provide a responsible and practical context to the applicable Assigned Noise Level (ANL) limits, a detailed noise survey was undertaken at the site, to evaluate and identify the current acoustic climate at the site. In this way, baseline acoustic conditions (from the shopping centre) are determined, hence the project may demonstrate through the detailed design process, that any new noise sources may both comply with the statutory *Regulations*, whilst also generating no increase in local ambient noise levels at completion.

   Ambient noise levels were measured over consecutive 5 minute intervals and logged across 6 day period (06th December – 11th December 2017) to determine a representative sound field at a location on the verge of the existing shopping centre, as identified in this report. Noise levels were arithmetically and energetically averaged (where appropriate) – average LAeq values across the survey period were determined at 61dB(A) during daytime (0700 - 1900 hrs), 59.5dB(A) during evenings (1900 – 2200 hrs) and 53 dB(A) during night time (2200 – 0700 hrs);

   Primary incidental noise sources were identified as car park use by patrons, wind noise, delivery trucks to existing (south facing) loading dock, persistent birdcalls and intermittent interruption activity from car park patrons/pedestrians, with incidental peak sound events recorded from car park patron door slams, and passing motorcycles.

4. In terms of anticipated noise sources, building services equipment locations and noise emission data for roof mounted plant equipment noise levels have been estimated using representative information from empirical and reference sound power level data taken from similar studies conducted by Sealhurst.

   Anticipated noise source data for typical equipment types has been used to derive realistic predictions of noise emission (sound pressure level) values which are able to be compared to the Assigned Noise Level (ANL) limits, as applicable under EPA *Regulations*.

5. Preliminary results indicate that noise emissions from rooftop mechanical plant are generally predicted to comply, with minor exceedances shown during night time operation. Specific advice at this stage is as follows:

6. On the basis of the identified typical/example/assumed plant, plant deck locations and natural screening, NSR 2 is exposed to unscreened refrigeration plant noise and may not comply with the *Regulations* ANL limits after 7 PM; We recommend any refrigeration plant and location(s) be examined during detailed design – options to reduce noise emission to complaint levels would be:

   a. Select refrigeration plant with lower sound power level output, OR run refrigeration plant at reduced fan duty after 7 PM;

   b. Retain example refrigeration plant as max sound power rating limit (for equipment specifier/specialist refrigeration sub-contractor), and apply screening in the form of a solid or louvered plane enclosure/screen, to reduce noise levels as received at NSR 2 after 7 PM;

   c. Relocate assumed refrigeration plant location further away from NSR 2, i.e. closer to centre of shopping centre roof, preferably utilising roof peaks as partial screening – TBC during detailed design;

7. On the basis of the identified typical/example/assumed plant, plant deck locations and screening, NSR 4 is exposed to unscreened Toilet Exhaust Fan (TEF) noise, and unscreened refrigeration plant noise from 2 x separate (assumed) sources, and consequently may not comply after 7 PM; We recommend the project mechanical engineer select reduced sound power level TEF fans limited to 50dB(A) @ 3m or less;

   Also, refrigeration plant and locations to be examined during detailed design – options to reduce noise emission to complaint levels would be:

   a. Select refrigeration plant with lower sound power level output, OR run refrigeration plant at reduced fan duty after 7 PM;

   b. Retain example refrigeration plant as max sound power rating limit (for equipment specifier/specialist refrigeration sub-contractor), and apply screening in the form of a solid or louvered plane enclosure/screen, to reduce noise levels as received at NSR 4 after 7 PM;

c. Move refrigeration plant location further away from NSR 4, i.e. closer to centre of shopping centre roof, preferably utilising roof peaks as partial screening – TBC during detailed design;

8. Eventual locations and equipment selections will determine the necessary treatments required to achieve compliance with night time noise emissions limits.

   Sealhurst recommend further assessment be undertaken as the design progresses and more detailed information becomes available. Comprehensive noise modelling would represent the most useful means to determine acoustic treatments (if any) required to allow cumulative noise sources/noise source emissions to meet *Regulatory*-compliant levels at each of the identified NSRs.

   Octave band sound level data pertinent to specific equipment selections can then be assessed to allow characterisation of "Tonality", (and "Impulsiveness" or "Modulation"), to provide a full assessment under the *Regulations.*

9. Under the current design, the existing shopping centre loading docks (x2) are to be altered, with the south-facing dock to be relocated to alongside the existing west-facing loading dock, to form a 2-bay loading facility. The revised dock has been assessed using sound power level data from refrigerated trucks with engines idling as the highest anticipated noise source. The dock is currently at concept stage, and will be shielded from NSRs 1 and 4, with partial shielding to NSR 2; However, the current concept layout provides no identifiable shielding to residential NSR 3, identified as rear residential boundaries pertaining to properties on Scaphelia Ave near adjacent BP Service Station – a distance of approx. 40m from the main loading dock.

10. Using the L_{A1} parameter, estimated loading dock activity sound pressure levels (based upon source SWL 95 dB(A), see Technical Appendices) are predicted to generate 55.2 dB(A) at NSR 3 rear residential property boundary. On the basis of short term (e.g. 20 min) loading dock operations, NSR 3 is predicted to exceed the *Regulations* ANL limits (L_{A1}) using refrigerated diesel engine truck with engine idling and refrigeration plant running, when assessed against the Assigned Noise Level limit of 54 dB L_{A1} in evening hours, and 49dB L_{A1} at night.

    Under the current format, and concept design layout, our preliminary recommendation is to limit deliveries to between 7 AM and 7 PM, to avoid exceeding the *Regulations.*

    Specific operational procedures may assist in reducing noise emissions such as use of non-tonal reverse beepers; In addition, the NSR property boundary is currently a 1.8m height profile steel fence, which could be extended as part of the shopping centre refurbishment to provide an advertising/signage feature space, which doubles as an acoustically useful (noise) barrier to exposed 1st Floor windows at NSR 2;

    Alternative options could be to enclose the loading dock using barrier wall that eliminates direct line of sight between the loading dock and residential receivers, or a full enclosure, though these means are not recommended at this stage, until more and better particulars are determined during Detailed Design.

11. At this early stage, generic practical recommendations are put forward in terms of managing on site/off site waste compaction, waste/refuse collection times, use of hours of operation for delivery times, and visual alarm alternatives to assist in minimising use of tonal reverse beepers from delivery/logistics trucks.

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ACN: 161 563 551

Overall, the current predicted exceedances at the nearest residential receivers are recommended to be reduced to compliant levels through a combination of acoustic treatments and operations management/scheduling, with exact requirements to be determined via further assessment as the project progresses into the design development phase.

If there are any specific queries relating to our findings, please feel free to contact me direct,

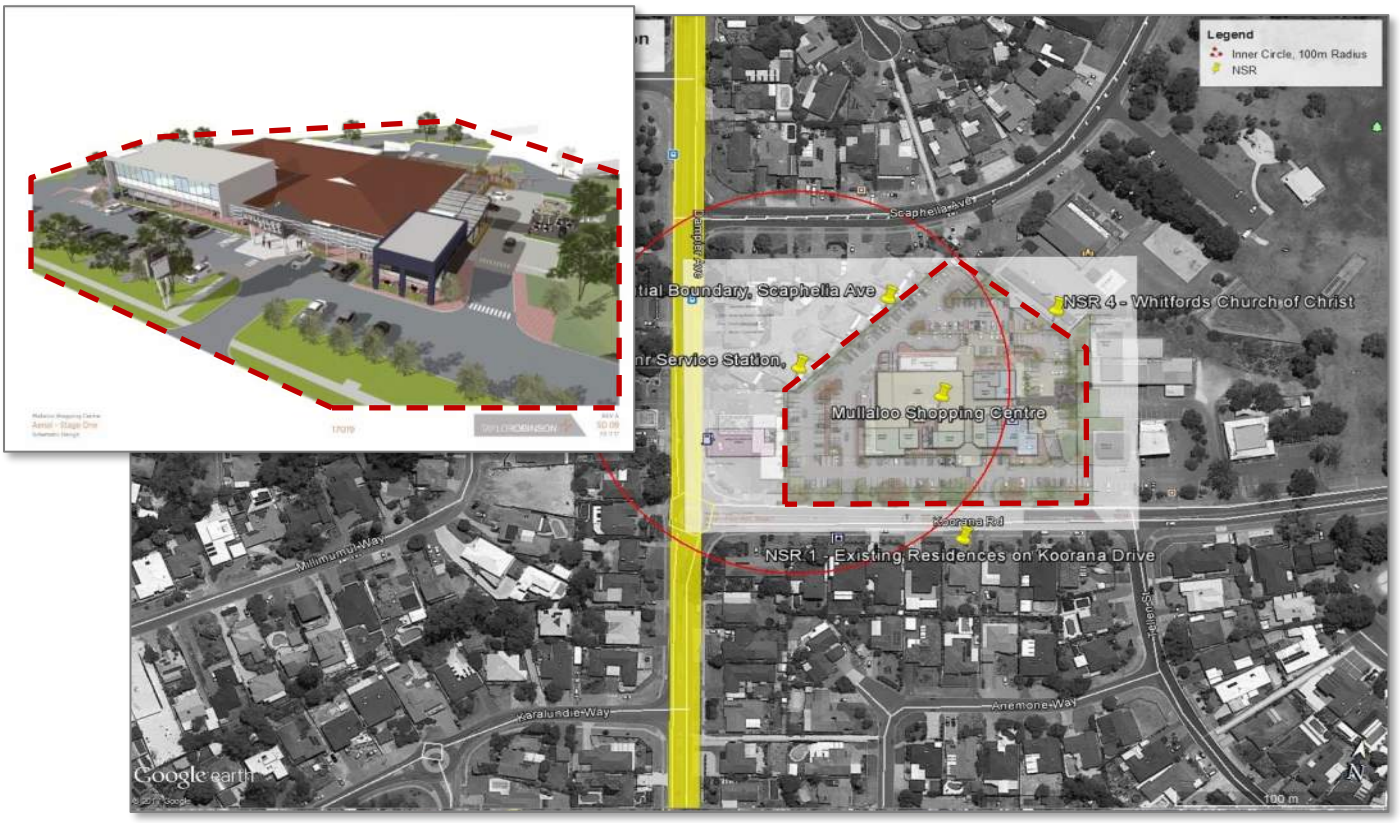
Kind Regards,

Daryl Thompson
Director
Sealhurst Pty Ltd

E: daryl.thompson@sealhurst.com.au
T: +61 (0)8 9306 4481
M: +61 (0)420 364 650

PROJECT APPRECIATION

The proposed expansion and refurbishment plans are overlaid on existing aerial imagery on the composite schematic image below. The refurbishment and expansion project is proposed to occur in stages – Stage 1 shows refurbishment of the existing building and surrounding parking facilities, addition of medical centre and incorporating changes to the existing layout; Stage 2 shows further works most notably to a landscaped outdoor plaza.



As with all new developments, anticipated noise emissions must be demonstrated to be able to comply with the relevant noise emissions limits, as calculated according to the prescribed methodology under the *WA Environmental Protection (Noise) Regulations 1997 (incl. amendments).*

This assessment provides a preliminary investigation into the anticipated noise emissions, which may be generated as a result of the proposed development. As the project is at preliminary/concept design phase, full detailed assessment (i.e. of individual equipment items etc) is not yet appropriate. The aim of a preliminary investigation is to allow the project to understand any potential acoustic issues that require further assessment, as well as identifying potential treatments and/or operational protocols that may be required to facilitate noise emissions compliance with the *Regulations* in the completed building.

Primary factors which will ultimately influence received noise levels at the nearest noise-sensitive receivers include:

- Location of noise sources, such as plant decks, loading docks, refuse storage and the like;
- Sound power level (SWL) ratings of fixed noise sources, including spectral characteristics;
- Application of screening barriers or building shielding upon identified noise source propagation;
- Time, periodic frequency and duration of noise emission events, e.g. 24 hours;

UNDERSTANDING THE APPLICABLE CRITERIA

Environmental Protection (Noise) Regulations 1997 (incl. amendments)

All environmental noise emissions must demonstrate compliance with *Regulation 7* of the *Environmental Protection (Noise) Regulations 1997 (as amended)* represents the applicable legislation governing environmental noise emissions which may be introduced when a new building or development is constructed. The legislation seeks to regulate noise emission by the prescription of noise limits deemed "allowable" and applied at an identified nearest Noise Sensitive Receiver (NSR).

To calculate the applicable limits, two concentric circles with radii of 100m and 450m are superimposed around an identified NSR and the type of land use contained within the circles is identified. Annual Average Weekday Traffic (AAWT) volume is also accounted for in calculating the "Influencing Factor", which is used to derive a set of Assigned Noise Level (ANL) limits applicable to the noise sensitive receiver, when subject to noise emissions.

When the premises receiving noise is used for commercial purposes, the Influencing Factor is not applicable, and fixed ANL limits based upon L_{A10} 60 dB applies during all hours of the day, seven days a week.

Noise Source Character

In addition to the ANL limits, particular noise sources attract additional punitive dB levies based upon the noise source characteristics. *Regulation 7* prescribes that the noise character must be "free" of annoying characteristics - specifically:

(i) tonality (e.g. whining, droning)
(ii) modulation (e.g. cyclical change in character, such as a siren)
(iii) impulsiveness (e.g. banging, thumping)

Penalties apply up to a maximum of +15 dB, for tonality (+5 dB), modulation (+5 dB) and impulsiveness (+10 dB), where the noise source is NOT music.

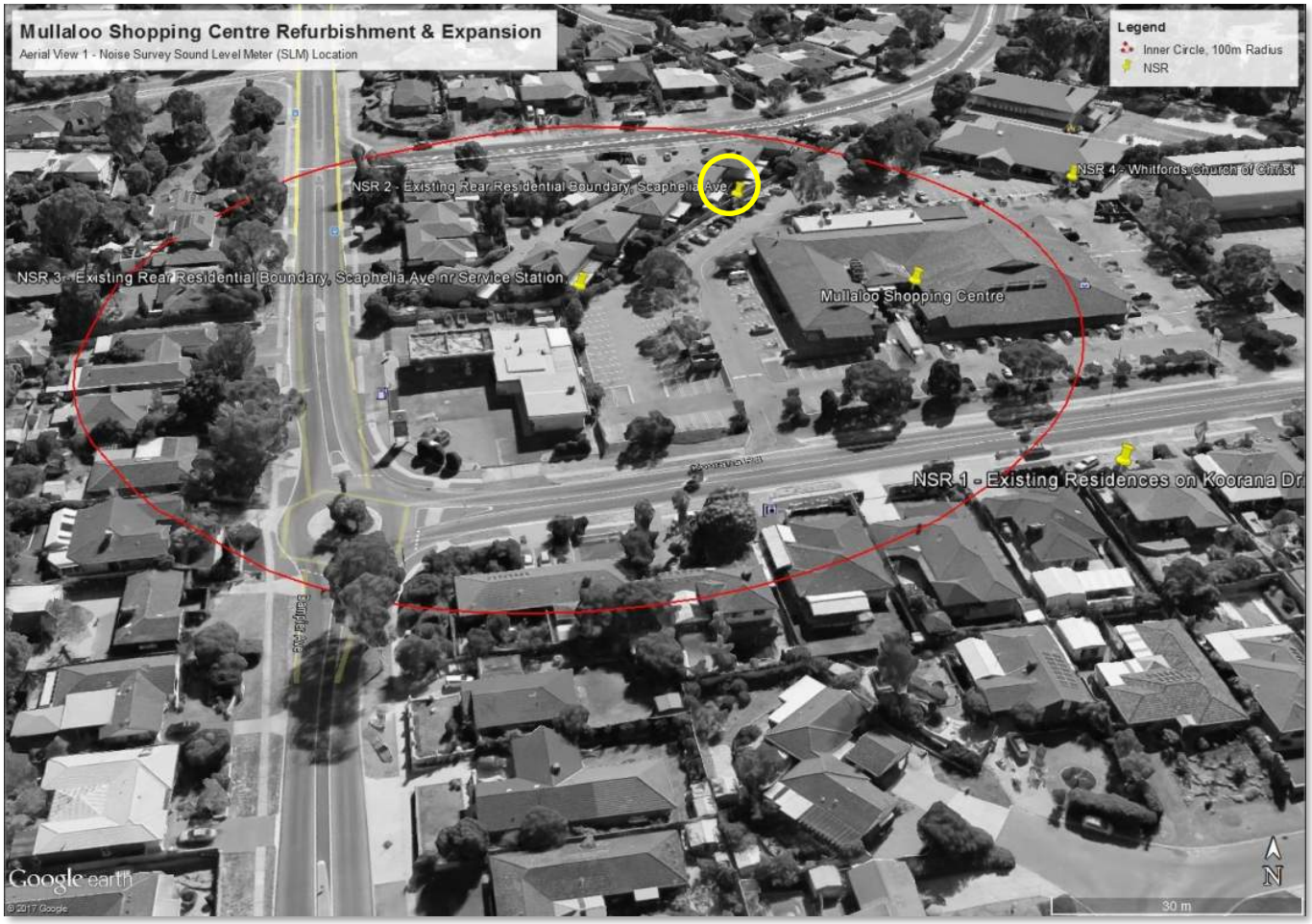
Identification of the Nearest Noise Sensitive Receiver (NSR)

To assess likely noise impacts, the nearest NSR must be identified - *Schedule 1 Part C,* of the *Regulations* prescribes the applicable definitions of noise sensitive premises. Demonstrating compliance with the *Regulations* at these locations typically implies the logic that any receiver(s) further away from the source will also comply.

ANL limits with respect to the Shopping Centre noise emissions have been calculated based upon an Influencing Factor (IF) of **+4** at the nearest of 4x Noise Sensitive Receivers (NSRs), identified as follows:

- NSR 1 existing residential premises on Koorana Drive located approximately 55 metres south of the nearest point of the proposed development.;
- NSR 2 existing rear residential property boundary(s), Scaphelia Ave located approximately 25 metres north from the nearest point of the proposed development.;
- NSR 3 existing rear residential property boundary(s), Scaphelia Ave adjacent to Service Station, located approximately 40 metres west of the nearest point of the proposed development.
- NSR 4 under EPA *Regs* Whitfords Church of Christ is also considered as noise sensitive premises; located approximately 30 metres north-east of the nearest point of the proposed development.

NSRs are identified on the calculation mapping below. At the current stage, locations for mechanical, refrigeration, hydraulic plant are not yet determined, and are expected to be developed as design progresses. The location of the proposed loading docks are identified on the current concept plans, as on the western facade of the shopping centre, facing the BP Service Station and rear property boundaries to Scaphelia Ave. The nearest NSR has been identified as "NSR 2", an existing rear residential property boundary(s), Scaphelia Ave located approximately 25 metres north from the nearest point of the shopping centre building, across car park space, and closest NSR to the proposed loading docks, at a propagation distance of 40m;



Application of Assigned Noise Level Limits

Under the prescribed calculation methodology, the Influencing Factor (IF) has been calculated at **+4**, determined by the presence of commercial and industrial land use surrounding NSR 2, and Dampier Avenue as a "Secondary Road" passing through the inner (100m) calculation radius. The table on the following page presents the resultant calculated Assigned Noise Level (ANL) limits for noise emissions, applicable at the nearest NSR as identified above. L_{A10} limits refer to the noise level limit which cannot be exceeded for more than 10% of a representative measurement period.

Land Use has been calculated using a combination of site observation, geospatial data recognition and planning mapping to determine land area(s) of particular defined uses. Land use mapping, percentage area details and all calculation inputs are presented in Technical Appendices accompanying this report.

Part of Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{AMAX}
Noise sensitive premises at locations within 15m of a building directly associated with a noise sensitive use	0700 to 1900 hours Monday to Saturday	49	59	69
	0900 to 1900 hours Sundays and public holidays	44	54	69
	1900 to 2200 hours all days	44	54	59
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	39	49	59
Noise sensitive premises at locations further than 15m of a building directly associated with a noise sensitive use	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and Utility premises	All hours	65	80	90

Assessment of Loading Dock Activities

Regulations limits are applied in L_{A10}, L_{A1} and L_{AMAX} indices. Whilst L_{AMAX} apply to all noise levels regardless of source, and cannot be exceeded at any time, the L_{A1} and L_{A10} parameters are applied to particular noise event type/durations - pertain to assessment of short-term noise sources, the L_{A1} value in this case has been used as the assessment parameter for loading dock events, noted from site observations during existing noise survey as typically <20 minutes in duration;

Assessment of Building Services Plant

Conversely, the L_{A10} parameter is the most appropriate parameter to assess constant noise sources, such as building services plant. The above distinctions and application of parameter values to specific noise sources have been made in our preliminary assessment.

EVALUATION OF LOCAL ACOUSTIC ENVIRONMENT

EXISTING AMBIENT NOISE SURVEY

Determination of Existing Background Noise

To deliver a building design able to respond to an existing or future-defined acoustic environment, reliable sound level data is crucial information, particularly in relation to noise-sensitive building uses, whereby noise emissions is a design parameter. Noise survey data provides essential project information in terms of existing noise emissions from the development. This is of particular importance where existing background noise levels may be affected by a new development, and serves as a determination of baseline conditions, in order to assess any finished impact or increased audibility of "new" noise sources (e.g. AC condensers, KEF systems).

Measurement Equipment Details

Attended and logged measurements were recorded using a Norsonic Nor140 Type 1 Sound Level Meter. The meter complies with all relevant specification standards for Type 1 integrating sound measurement equipment and was within a valid laboratory-calibration period at the time of survey. The meter also satisfies all relevant and applicable Australian Standards for acoustic measurement devices, including Schedule 4 clauses contained within the *Environmental Protection (Noise) Regulations 1997 (inc. amendments).*

The meter was field-calibrated before and after the measurement series, which consisted of continuous data logging with synchronised measurements stored in 5 minute intervals. All measurements were taken in accordance with the relevant guidance in *AS1055.1-1997: Acoustics – Description and Measurement of Environmental Noise, Part 1: General Procedures*.

Details of the measurement equipment are presented below:

Equipment Type/Model	Serial No.	Calibration Cert. No.	Last Calibration Date
Norsonic Nor140	1406036	473692023	2014-08-14
Norsonic Nor 1251	34172	CAL 022-2014-4735	2014-08-14

Calibration certificates of this equipment are included in the Technical Appendices attached to this letter report.

Noise Survey Details

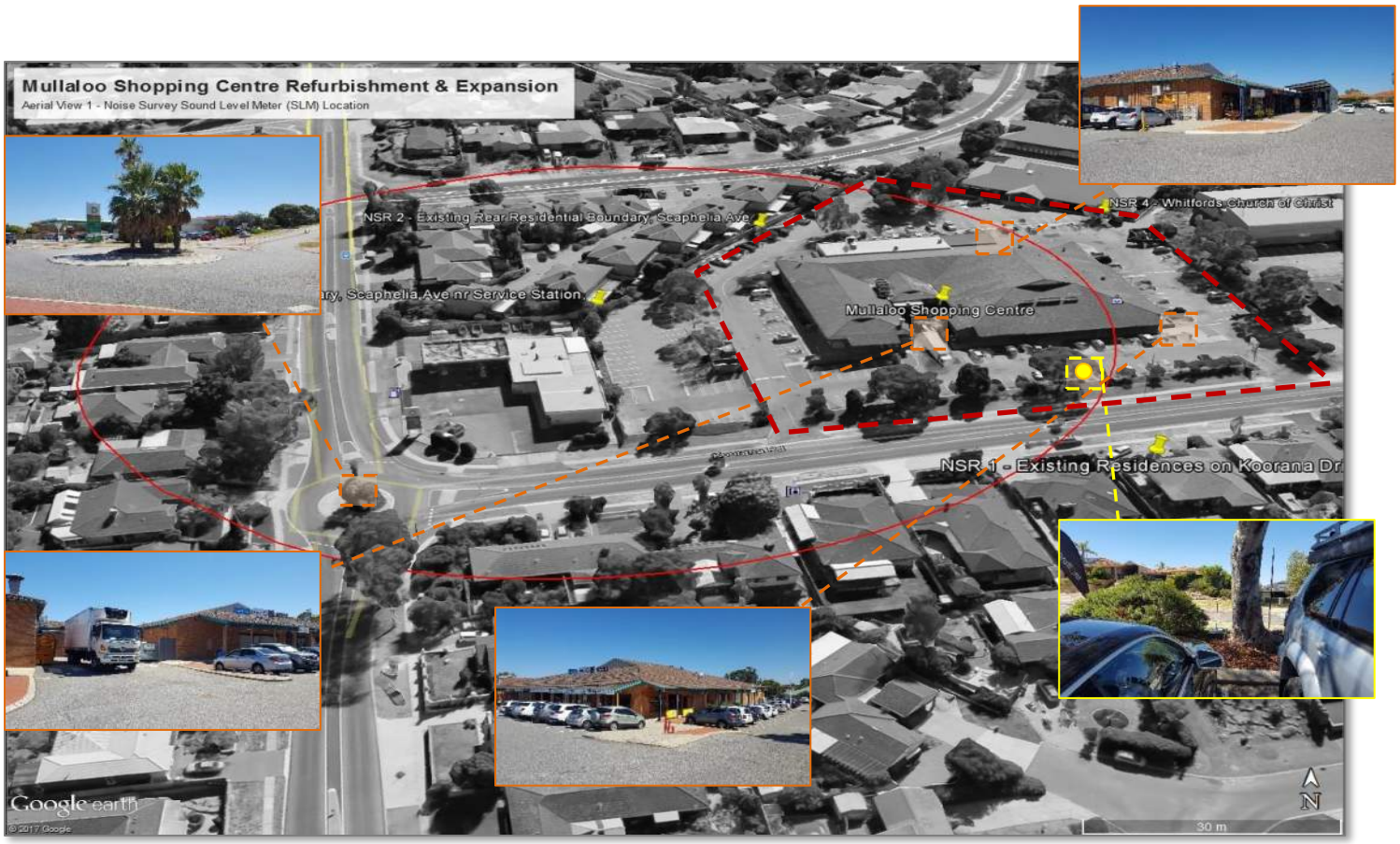
Sealhurst established a noise monitoring position at the development site from 06th – 11th December 2017 to undertake a baseline noise survey analysis via 24-hour continuous data logging. Sound pressure levels and detailed spectral and time resolution data were obtained for consecutive 5 minute periods, complete with audio recordings of significant noise events set to trigger at a sound pressure level of 65 dB(A).

Collected data was then analysed to identify existing features of the current ambient acoustic climate assessment, and determine an objective baseline for noise emissions; At project completion, the baseline data may be referred as proof the proposed building design is able to achieve noise emission requirements, and also to determine any impact against the existing conditions.

Noise Survey - Measurement Locations

The noise monitoring station was established at a height of approx. 1.5m above ground level on the existing verge at Koorana Drive, to the south side of the car parking area at the existing Mullaloo Shopping Centre. This location was deemed to be representative of noise level and character which will ultimately be incident upon the noise sensitive receivers to the south, across Koorana Drive, and be generally representative of loading dock noise form the existing interface.

Data was recorded over day, evening and night time periods as documented in this report. The image below illustrates the measurement location (yellow) relative to the development site outline (red).



Measurement Equipment Details

Attended and logged measurements were recorded using a Norsonic Nor140 Type 1 Sound Level Meter. The meter complies with all relevant specification standards for Type 1 integrating sound measurement equipment and was within a valid laboratory-calibration period at the time of survey. The meter also satisfies all relevant and applicable Australian Standards for acoustic measurement devices, including Schedule 4 clauses contained within the *Environmental Protection (Noise) Regulations 1997 (as amended).*

The meter was field-calibrated before and after the measurement series, which consisted of continuous data logging with synchronised measurements stored in 5 minute intervals. All measurements were taken in accordance with the relevant guidance in *AS1055.1-1997: Acoustics – Description and Measurement of Environmental Noise, Part 1: General Procedures*.

Equipment Type/Model	Serial No.	Calibration Cert. No.	Last Calibration Date
Norsonic Nor 140	1406036	2566J2753	2016-09-06
Nor 1251 Calibrator	34172	449J2753	2016-09-06

Calibration certificates of this equipment are included in the Technical Appendices accompanying this report.

Survey Weather Notes

Meteorological conditions were stable throughout the week, with light (<10km/h) to moderate (10-20km/h) winds during specific periods. Night time conditions were relatively calm. Minor precipitation was recorded on the 9th December.

Day Time Noise Sources (0700 – 1900)

During day time hours, the typical noise environment at the survey location is fairly consistent with expected noise sources from a suburban shopping centre street frontage; Intermittent vehicle movements and car park activity noise, passing motorcycles and trucks, and occasional delivery vehicles provide main features, with typical noise level around 60 dB(A) measured at the Sound Level Meter (SLM) location, rising to 64/65 dB(A) during periods of increased atmospheric wind, causing IGA-branded supermarket flags to flap;

Road traffic is comprised primarily of private cars and utility vehicles, with approximately 6% heavy vehicles. Public bus services also operate on Dampier Drive, with bus stops located on either side of the road, some 80 - 100m north and south of the roundabout .

Supply delivery trucks were observed on several occasions, typically remaining in for up to 20 minutes at a time; Truck engines were left idling and the majority of trucks were "refrigerated" with cab roof mounted condenser units also audible during unloading operations. Typical noise levels at the SLM location during loading activity from the nearest loading dock increased LAeq values to 62 – 64 dB(A) – typified on the graphical noise monitoring data trace as levels of 62 – 64dB(A) accompanied by a raised LA90 for the delivery (idling) period; Note, SLM was at a distance of ~40m from trucks in the front loading dock.

Passing trucks, motorcycle pass-bys and occasional hoons accounted for the highest incidental noise "peaks", followed by car park patron door slams close to the SLM. Specific periods of the morning and afternoon were birdsong and persistent bird calls, causing elevated local sound pressure levels; Similarly, periods of occasional sea breeze caused IGA flags and local low frequency aero noise to occur, causing brief periods of elevated noise.

Evening Time Noise Sources (1900 - 2200)

Vehicle movements on surrounding roads, Koorana Drive car park shopping centre activity, and general pedestrian activity decreased steadily during evening hours, after the closing of the Mullaloo Fish & Chip Shop, resulting in a subsequent decrease in recorded noise levels, typically falling from 60 dB(A) $L_{Aeq, 5min}$ at 1900 hours, to 50 dB(A) $L_{Aeq, 5min}$ at 2200 hours.

Passing trucks, motorcycle pass-bys and occasional hoons accounted for occasional incidental noise "peaks".

Night Time Noise Sources (2200 – 0700)

During night time hours, vehicle traffic on surrounding roads continued to decline. After midnight, several 5min measurement intervals contained no vehicle pass-bys on Yangebup Road, with resultant recorded noise levels typically decreasing from 50-55 dB(A) $L_{Aeq, 5min}$ at 2200 hours, to a minimum of 40-45 dB(A) $L_{Aeq, 5min}$ at 0430 hours.

Traffic, birdsong/bird calls and general activity at the shopping centre began to increase from approximately 0430 hours, increasing typical noise levels from 45 dB(A) $L_{Aeq, 5min}$ at 0430 hours to 60-65 dB(A) $L_{Aeq, 5min}$ at 0600 hours. This onset of morning activity is responsible for the increase in overall averaged sound pressure levels recorded during night time hours (2200 – 0700 hours) to 53 dB(A) $L_{Aeq, 5min}$.

NOISE CONDITIONS TO REAR OF EXISTING SHOPPING CENTRE

It must be noted that the Sound Level Meter (SLM) measurement location provides the existing baseline of representative sound pressure levels for the main street front car park at Koorana Drive only. The site was selected primarily due to the presence of a loading dock, open air café, street frontage and nearby premises across the road on Koorana Drive, as well as for security/practical purposes.

Activity at the rear of the shopping centre was not assessed, though for the purposes of setting the baseline conditions, the sound pressure levels and resultant acoustic environment is assumed to be typically of similar activity levels.

DESIGN SOUND LEVEL DATA

LOGGED MEASUREMENTS

The consecutive logged data periods were recorded over the course of the week, to provide a representative noise climate for assessment of external noise ingress. Technical Appendices attached to this letter report contain detailed graphical representation plots external L_{Aeq}, L_{AMAX} and L_{AMIN} noise levels, providing an overview of the existing noise environment at the proposed development site.

L_{Aeq} (dB) noise levels are used for assessment of internal design criteria, shown blue, representing the equivalent sound energy recorded in each successive period – the L_{Aeq} is a measure of general activity noise level recorded at the building façade location throughout the day. Commentary is annotated onto the graph where specific periods of raised background noise are identified.

L_{AMAX} (dB) noise levels report the loudest sound recorded during each consecutive 5 minute period. The L_{AMAX} trace is shown red, and peaks are attributable to sound pressure from the passing of incidental louder vehicles, car park patron door slams, or other incidental noise sources.

L_{A90} (dB) noise levels report the ambient background noise level noise levels recorded during each measurement period, hence between the three traces we can visualise the typical acoustic environment at the development site. Where the L_{A90} trace closely resembles the L_{Aeq} trace, this indicates a consistent noise environment; Where

the L_{A90} is elevated within the L_{Aeq}, we can derive a change in local background noise level – typically from idling trucks, or, increased atmospheric wind movement noise.

EXTERNAL NOISE – SUMMARY AVERAGE DESIGN SOUND LEVEL DATA

The table below presents continuous measurements taken over the course of the survey period as energy or statistically averaged single figure values (as appropriate) across day, evening and night time periods respectively, to generate reference baseline levels for the completed building. Equivalent (L_{Aeq}), Maximum (L_{Amax}) and Minimum (L_{Amin}) and statistical noise indices L_{A1}, L_{A10} and L_{A90} sound level data is presented to offer an overview of the local acoustic environment.

A summary of this broadband design sound level data is presented below.

Measurement Location	Period	$L_{Aeq,T}$ (dB)	L_{A1} (dB)	L_{A10} (dB)	L_{A90} (dB)	L_{AFmax} (dB)
Mullaloo Shopping Centre, verge, Koorana Drive	Day time (0700-1900 hrs)	61.0	69.7	63.1	50.3	91.3
	Evening Time (1900-2200 hrs)	59.5	65.7	57.1	46.2	91.2
	Night time (2200-0700 hrs)	53.0	59.0	50.7	42.8	87.2

NOTES:

$L_{Aeq,T}$ (dB) is the equivalent noise level that is the summation of noise events and integrated over the measurement period (T).
L_{AF1} (dB) is the statistical index that describes the sound pressure level which was exceeded for 1% of the overall measurement period,
L_{AF10} (dB) is the statistical index that describes the sound pressure level which was exceeded for 10% of the overall measurement period.
L_{AF90} (dB) is the statistical index that describes the sound pressure level which was exceeded for 90% of the overall measurement period,
L_{A90} is also referred to as background or residual noise.
L_{AFMAX} (dB) is the maximum sound pressure level measured during the measurement period.

PRELIMINARY NOISE EMISSIONS MODELLING ASSESSMENT

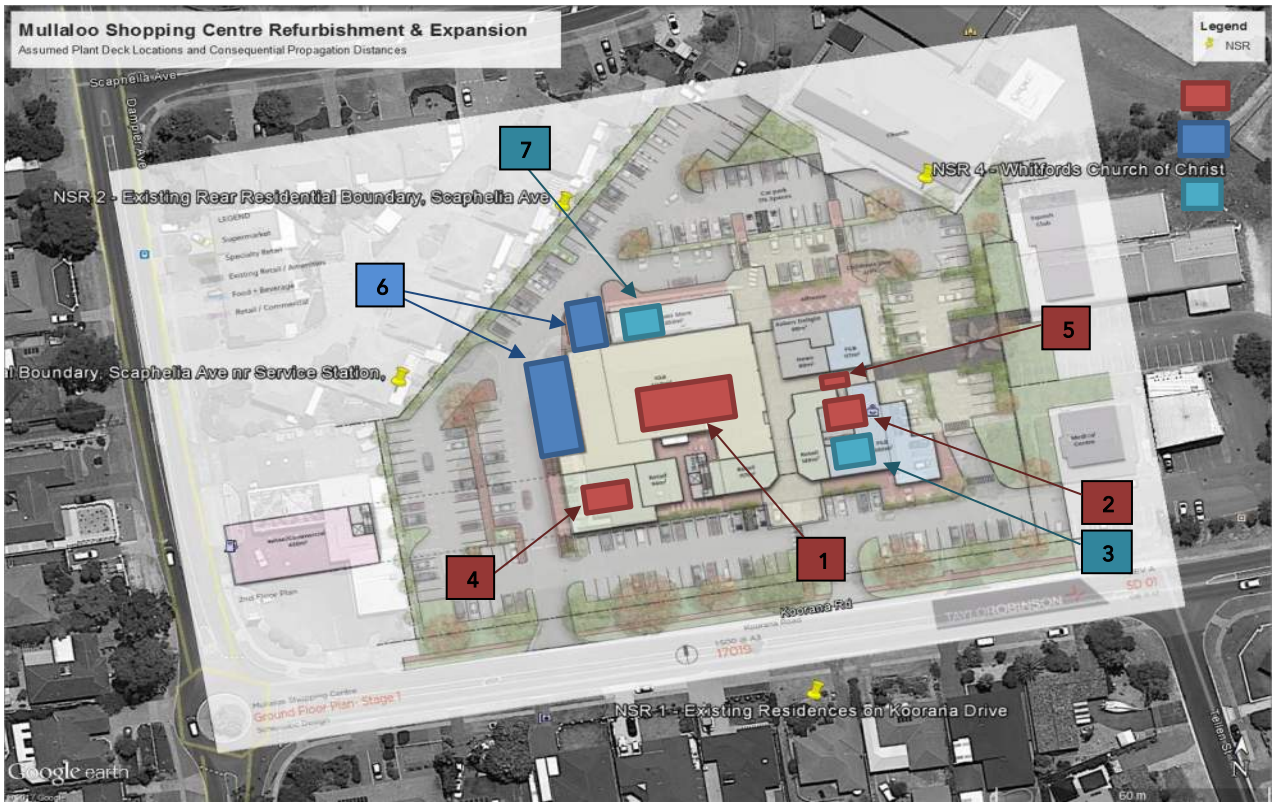
Notwithstanding analysis of recorded environmental noise survey data, all noise emission sources anticipated as part of the development must be demonstrated to comply with the calculated Assigned Noise Level (ANL) limits, as prescribed under the *Regulations* for individual and cumulative noise source(s).

For this assessment, some basic assumptions and locations have been derived, subject to detailed design, in order to provide a realistic compliance scenario. A basic calculation model was constructed and populated with assumed plant locations, to provide preliminary data regarding likely noise levels at the nearest noise-sensitive residences from primary noise sources – assumptions as follows:

1. Multi-unit plant deck housing minimum of 8 x commercial Condenser Units (CUs), located centrally between roof peaks (red), located to maximise distance to NSRs and screening capacity of roof peaks;
2. Minimum of 2 x separate commercial Kitchen Exhaust Fan (KEF) systems, located to the eastern extent, above identified F&B area as part of Stage 1 concept development plans (red);
3. Minimum of 2 x packaged refrigeration equipment, (24hr operations) located in similar position to KEF(s) (turquoise);
4. Minimum of 4 x packaged air handling units (red) – located on "medical centre" 2-storey building roof;
5. Minimum of 2 x Toilet Exhaust Fan (TEF) outlets, over identified amenities area;
6. 2 x Loading Docks (blue) to western side of proposed Shopping centre, using standard refrigerated truck with idling engine sound power levels;
7. 1 x Refrigeration plant to bottle shop, (24hr operation), over existing/retained "liquor store" (turquoise);

Each numbered source is identified as red (plant) or blue (loading dock) area over Concept Stage 1 plan below:

MODELLED SOURCES OF NOISE EMISSIONS – POTENTIAL ROOF PLANT LAYOUT



MODELLED SOURCES OF NOISE EMISSIONS - SOUND POWER LEVEL DATA

	Example Equipment	Sound Pressure Level, (SPL) dB(A),3m	1 x Source Unit, Sound Power Level (SWL) Data, dB							
			Octave Band Centre Frequency (Hz)							
			63	125	250	500	1kHz	2kHz	4kHz	8kHz
1	8 x Commercial Condenser Units (CUs), e.g. DAIKIN RZQ250LY1	1 x CU = 63dB(A),3m **8 x CUs = 72dB(A),3m**	-	-	-	-	-	-	-	-
2	2 x Kitchen Exhaust Fans (KEFs) e.g. GUDEC63V	1 x KEF = 59dB(A),3m **2 x KEFs = 62dB(A),3m**	78	77	79	74	76	72	67	63
3	Refrigeration Package Unit (e.g. Kirby Titan PPH152_MH, 100% Fan Speed	1 x R CU = 61dB(A),3m **2 x R CU = 64dB(A),3m**	-	-	-	-	-	-	-	-
4	2 x Packaged CUs, e.g. Mitsubishi PURY P500	1 x CUs = 63dB(A),3m **2 x CUs = 66dB(A),3m**	-	-	-	-	-	-	-	-
5	2 x TEFs, e.g. Generic	1 x TEF = 55dB(A),3m **2 x TEFs = 58dB(A),3m**	-	-	-	-	-	-	-	-
6	Loading Dock – Refrigerated truck with diesel engine idling, typical sound power levels;	1 x Truck, 77dB(A),3m	-	-	-	-	-	-	-	-
7	Refrigeration Package Unit (e.g. Kirby Titan PPH152_MH, 100% Fan Speed	**1 x R CU = 61dB(A),3m**	-	-	-	-	-	-	-	-

PRELIMINARY NOISE MODELLING RESULTS

The table below contains estimated sound pressure level contributions from each plant item/location, and the cumulative received (single figure) A-Weighted sound pressure level at each NSR, as compared against the Regulations:

Estimated Noise Source ID	NSR 1 Koorana Dv			NSR 2 – Scaphelia Ave,			NSR 3 – Scaphelia Ave, nr Servo			NSR 4 – Whitfords Church of Christ		
	Dist (m)	Screening* (Y/N)	SPL @ NSR dB(A)	Dist (m)	Screening* (Y/N)	SPL @ NSR dB(A)	Dist (m)	Screening* (Y/N)	SPL @ NSR dB(A)	Dist (m)	Screening* (Y/N)	SPL @ NSR dB(A)
1	80	Y	35.5	51	Y	39,4	62	Y	37.7	73	Y	36.3
2	71	Y	26.5	80	Y	25.5	100	Y	23.5	57	N	36.4
3	71	Y	28.5	80	Y	27.5	100	Y	25.5	57	N	38.4
4	68	Y	30.9	67	Y	31.0	52	Y	33.2	100	N	35.5
5	83	Y	29.2	70	Y	30.6	96	Y	27.9	47	N	42.1
6	83	Y	40.6	55	Y	44.2	40	N	55.0	99	Y	39.1
7	100	Y	27.5	35	N	44.7	63	N	39.5	64	N	39.5
CUMULATIVE SPL @ NSR			**42.8 dB(A)**			**48.3 dB(A)**			**55.2 dB(A**	)		**47.2 dB(A)**

* - Screening indicates a conservative allowance for barrier attenuation as anticipated from roof peak screening, building mass screening or visual-type louver screen;

PRELIMINARY COMPLIANCE ASSESSMENT

The table below compares preliminary predicted Sound Pressure Levels **from anticipated fixed building plant only**, as received at NSR locations (with conservative allowance for building screening), against the calculated Assigned Noise Level (ANL) limits. The purpose of omitting the loading dock is that it is not a constant noise source – mechanical services plant represents an anticipated noise source that is typically on/constant. This type of noise source is most appropriately assessed using the L_{A10} parameter;

Daytime and Evening period assessments assume all plant operating at 100% duty; Night time assessment assumes only refrigeration plant is operating after 10 PM – compliance is assessed in each case; Green indicates preliminary compliance, Orange indicates a minor exceedence, red indicates a more significant exceedence:

Period	ANL limits L_{A10}, dB	NSR 1 Predicted SPL, dB(A)	NSR 2 Predicted SPL, dB(A)	NSR 3 Predicted SPL, dB(A)	NSR 4 Predicted SPL, dB(A)
Daytime (0700 – 1900)	**49**	38.6	46.2	42.6	46.5
Evening (1900 – 2200)	**44**	38.6	46.2	42.6	46.5
Night time (2200 – 0700)	**39**	31.1	44.7	39.7	42.0

Loading dock noise is anticipated to be a short term, temporary noise source, hence comparison is more suited to the L_{A1} parameter, for short term intermittent noise sources. Cumulative loading dock and plant noise is compared to the L_{A1} parameter in an equivalent preliminary summary assessment as per table below:

Period	ANL limits L_{A1}, dB	NSR 1 Predicted SPL, dB(A)	NSR 2 Predicted SPL, dB(A)	NSR 3 Predicted SPL, dB(A)	NSR 4 Predicted SPL, dB(A)
Daytime (0700 – 1900)	**59**	42.8	48.3	55.2	47.2
Evening (1900 – 2200)	**54**	42.8	48.3	55.2	47.2
Night time (2200 – 0700)	**49**	41.1	48.4	55.2	47.5

CONCLUSIONS

On the basis of the identified typical/example/assumed plant, plant deck locations and natural screening, NSR 2 is exposed to unscreened refrigeration plant noise and may not comply with the *Regulations* ANL limits after 7 PM; We recommend any refrigeration plant and location(s) be examined during detailed design – options to reduce noise emission to complaint levels would be:

- Select refrigeration plant with lower sound power level output, OR run refrigeration plant at reduced fan duty after 7 PM;
- Retain example refrigeration plant as max sound power rating limit (for equipment specifier/specialist refrigeration sub-contractor), and apply screening in the form of a solid or louvered plane enclosure/screen, to reduce noise levels as received at NSR 2 after 7 PM;

- Relocate assumed refrigeration plant location further away from NSR 2, i.e. closer to centre of shopping centre roof, preferably utilising roof peaks as partial screening – TBC during detailed design;

On the basis of the identified typical/example/assumed plant, plant deck locations and screening, NSR 4 is exposed to unscreened Toilet Exhaust Fan (TEF) noise, and unscreened refrigeration plant noise from 2 x separate (assumed) sources, and consequently may not comply after 7 PM; We recommend the project mechanical engineer select reduced sound power level TEF fans limited to 50dB(A) @ 3m or less;

Also, refrigeration plant and locations to be examined during detailed design – options to reduce noise emission to complaint levels would be:

- Select refrigeration plant with lower sound power level output, OR run refrigeration plant at reduced fan duty after 7 PM;
- Retain example refrigeration plant as max sound power rating limit (for equipment specifier/specialist refrigeration sub-contractor), and apply screening in the form of a solid or louvered plane enclosure/screen, to reduce noise levels as received at NSR 4 after 7 PM;
- Move refrigeration plant location further away from NSR 4, i.e. closer to centre of shopping centre roof, preferably utilising roof peaks as partial screening – TBC during detailed design;

Sealhurst recommend further assessment be undertaken as the design progresses and more detailed information becomes available. Comprehensive noise modelling will then determine the acoustic treatment (if any) required to allow noise emissions to meet compliant levels.

On the basis of short term (e.g. 20 min) loading dock operations, NSR 3 is predicted to exceed when assessed using refrigerated diesel engine truck with engine idling and refrigeration plant running during evening and night time hours.

Under the current format, and concept design layout, our preliminary recommendation is to limit deliveries to between 7 AM and 7 PM, to avoid exceeding the *Regulations.*

<u>Loading Dock Operations</u>

Contributions from loading dock operations include:

- Manoeuvring of delivery truck in and out of loading dock
- Unloading of delivery truck
- Waste disposal

Truck movement noise, pallet movements, forklift operations and general impact-generated sounds form part of the noise emission profile typically associated with the identified loading dock operations. The proposed loading dock servicing the supermarket is unshielded from rear residential property boundaries to Scaphelia Ave, and is separated by an attenuation distance of 40m with preliminary modelling predicting likely exceedance of noise emissions limits during evening and night time hours.

It is inappropriate to apply attenuation requirements on the preliminary assessment of assumed refrigerated truck noise level(s), time and frequency of deliveries, and no adaptation to existing built form whilst the project is at concept design stage; However options are available to modify the concept layout loading docks which should be integrated into the project as design progresses.

We recommend the proposed layout of the loading docks (and any shielding barriers) be modelled as more and better particulars become known, to ascertain whether compliant loading dock operations will be possible outside of daytime hours.

Specific operational procedures may assist in reducing noise emissions such as use of non-tonal reverse beepers; In addition, the NSR property boundary is currently a 1.8m height profile steel fence, which could be extended as part of the shopping centre refurbishment to provide an advertising/signage feature space, which doubles as an acoustically useful (noise) barrier to exposed 1st Floor windows at NSR 2;

Alternative options could be to enclose the loading dock using barrier wall that eliminates direct line of sight between the loading dock and residential receivers, or a full enclosure, though these means are not recommended at this stage, until more and better particulars are determined during Detailed Design.

RECOMMENDATIONS FOR FURTHER ASSESSMENT

Preliminary noise modelling of the primary noise sources anticipated from the operation of the proposed Mullaloo Plaza indicate a likelihood of compliance with daytime noise emissions limits, with potential exceedances predicted during evening and night time periods, under the current layout and assumed noise sources and locations. Further information is required to more accurately assess the magnitude of potential exceedances, and relative contributions to these exceedances from the expected noise sources.

A more detailed modelled environment, in conjunction with likely selections and accurate locations of rooftop plant equipment will allow a more definitive assessment of potential noise impacts. Any requirement for barrier screening or acoustic enclosures surrounding rooftop plant can then be determined. The character of all noise sources will also require investigation to assess whether any additional penalties are applicable, which will affect the requirements of any noise mitigation treatments (if applicable).

The proposed hours of operation and scheduling of deliveries is also a critical component of noise assessment to quantify the impact of the proposed activities with respect to the relevant noise emissions limits. Certain equipment is anticipated to operate continuously (e.g. refrigeration equipment), whilst other equipment may be switched off outside of trading hours, resulting in compliance, for example during periods of non-operation e.g. after 7 PM which is a valid noise control.

PRELIMINARY ADVICE RE: OPERATIONAL REQUIREMENTS

HGV Truck Manoeuvring Noise

The site is compact therefore the likelihood of heavy goods vehicles (HGVs) reversing is anticipated. HGVs can produce engine and exhaust noise levels in excess of 80dB(A) at source and may present a problem in strict compliance with the Regulations. In addition, part of the safety strategy for reversing vehicles in commercial applications can entail reverse beepers which, as an additional noise source can be more likely to cause annoyance and potential complaint, particularly at more noise-sensitive times i.e. evening and night time periods.

Regards engine noise, no attenuation mechanism is recommended – rather, practical controls such as loading/unloading with engines turned off is the most cost effective and useful control.

Regards reverse beepers, there exists a reasonable amount of literature[1] regards alternative safety devices and management principles which can be employed to avoid this precise acoustical issue - as the issue is one of safety (with an acoustical annoyance outcome), by removing the reverse beeper alarm source in place of an alternative (e.g. visual) alarm, the problem can be removed.

Such strategies are employed in existing high noise scenarios, where audio warnings have limited value - for example high noise plant rooms, off shore installations etc where noise levels of warning sirens/signals may not be overheard and/or could approach levels which would otherwise induce hearting damage on order to be heard. Typically staff in such areas may already be wearing ear defenders, therefore the principle is able to be implemented where certain constraints apply.

The use of reversing cameras, visual alarms signals (e.g. specific vehicle reverse lights) and safety management techniques such as the use of spotters should be considered as part of the noise management strategy for the new development.

Timing of Deliveries

To mitigate the extent of the potential exceedences from logistics deliveries, delivery times should be scheduled between the hours of 7am to 7pm ONLY, at which times the ANL noise emission limits are at their least tringent.

On site/Off site Refuse Compaction

As part of refuse management and collection strategy, the presence of an on-site compaction facility is to be considered. Where no on-site waste compactor is proposed, no noise impacts or controls need apply, and the project is directed to Section 5.1.4 re: waste collection. In the event a compactor is used, noise levels must comply with the ANL limits as set out in this report, cumulative to existing compliance results. Equipment selection and location must be considered to minimise noise emission.

As a control measure, times of use of the compactor will be critical, and if possible should be managed to coincide with the noisiest parts of the day identified during the noise survey - nominally morning and evening rush hour periods, to minimise likelihood of complaint.

Waste Collection

In terms of commercial waste management and collection, the EPA (noise) regulations offer specific clause(s) so as not to impose onerous or impractical restrictions on this essential service. Regulation 14A determines that specified works, nominated here as aste collection is NOT subject to the Regulations ANL limits if determined to be class 1 works, that is specified works undertaken between the hours of 07:00 and 19:00 weekdays/Saturdays and 0900-1900 ion Sundays/Public Holidays;

Class 1 works may require the submission and approval of a detailed noise management plan, valid for 3 years;

[1] SAFE WORK AUSTRALIA - Draft guide Traffic Management: Construction Work; ROADING NEW ZEALAND - Guideline for Controlling Reversing Vehicles DEC 2009;

Class 2 works (i.e. outside of those hours) are permitted but only under an approved Noise Management Plan submitted to the DER and approved by the CEO, in accordance with Sub-Regulation (6) as follows:

(6) A noise management plan for class 2 works is to include, but is not limited to —

a. details of vehicle or equipment evaluation and purchase policies adopted to select, on a reasonable and practicable basis, the quietest vehicle or equipment available;

b. measures to be adopted to minimise noise emissions resulting from carrying out the works;

c. justification for carrying out the works during the times of day to which the class relates;

d. a description of the specified works to be carried out during the times of day to which the class relates;

e. operator training programmes;

f. community information on the manner in which the specified works will be carried out; And,

g. a complaints response procedure.

Practical Recommendations

Notwithstanding Noise Management Plans and associated works, the management of impacts of waste collections can be effectively managed by responsible and sensitive approach to the time(s) of refuse collection. Waste collections should be considered as "Class 1 works" (between the hours of 0700-1900) only in the building operational management plan, and scheduled to occur between the hours of 7am and 7pm ONLY, where practicable, to minimise potential exceedences.

Waste collections should be expressly arranged to NEVER coincide with evening and night time periods. Some practical concessions must be considered in this approach however, as rush hour traffic conditions (likely noisiest periods) it may not be appropriate to purposely add additional large heavy vehicles to an already congested road network, particularly when delivery times are can be critical.

Where possible, waste collections should be scheduled to coincide with existing residential refuse collection services.

At this early stage, Sealhurst would recommend that deliveries and waste disposal/collection be scheduled to occur during day time hours only, particularly with regard to the western loading dock(s), which in its current form may exceed both evening (1900 – 2200 hours) and night time noise limits at NSR 3.

TECHNICAL APPENDICES

CALCULATION OF NOISE EMISSIONS LIMITS

Schedule 3 of the *Regulations* prescribes a specific calculation methodology to determine the applicable limits, referred to as the Assigned Noise Level (ANL) limits. An Assigned Noise Level is calculated for each identified noise sensitive receiver using a combination of environmental factors local to the receiver. A standard set of ANL's exist to provide a base level of acoustic amenity, as shown in the Table below. These levels are modified by an Influencing Factor (IF) to reflect noise sensitivity in the specific environment relative to the subject development.

The Influencing Factor (IF) accounts for site-specific circumstances surrounding the NSR(s), identified as part of the calculation process, and is formulated via a detailed appraisal of the percentage Commercial "C" and Industrial "I" land. To calculate the additional Influencing Factor (IF), two concentric circles are drawn around the nearest noise-sensitive reception point; one at 450m radius and one at 100m radius. Percentages are calculated for the amount of land area within the circles used for noise emitting purposes (e.g. industrial or commercial uses) and compared to the total area encompassed by the concentric circles.

A Transport Factor (TF) is also calculated to account for volume of road traffic in (AAWT) within these two zones. The combined calculation attempts to provide a site-specific and practical relevance to noise emissions for each new development, allowing for existing noise sources.

Part of Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises at locations within 15m of a building directly associated with a noise sensitive use	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sundays and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises at locations further than 15m of a building directly associated with a noise sensitive use	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and Utility premises	All hours	65	80	90

CALCULATION OF INFLUENCING FACTOR (IF)

The Influencing Factor (IF) is calculated using the following equation:

Influencing Factor (IF) = I + C + TF

Where;

I = (% of industrial land usage within 100m + % industrial land usage within 450m) x 1 / 10

C = (% of commercial land usage within 100m + % commercial land usage within 450m) x 1 / 20

TF = +6 if there is a major road within 100m of the development
+2 if there is a major road within 450 m of the development
+ 2 if there is a secondary road within 100m of the development

The maximum value the transport factor (TF) can reach is 6;

A "Major" road is defined as having Annual Average Weekday Traffic (AAWT) flows in excess of 15,000 vehicle movements per day. A "Secondary" road is defined as having Annual Average Weekday Traffic (AAWT) flows in excess of 6,000 vehicle movements per day.

SURROUNDING LAND USE

Land use surrounding the nearest identified Noise Sensitive Receiver (NSR 2, Existing rear residential property boundaries on Scaphelia Ave, near Service Station) is a mixture of commercial, industrial and residential, as defined under Schedule 1, Parts A, B and C of the *Regulations*.

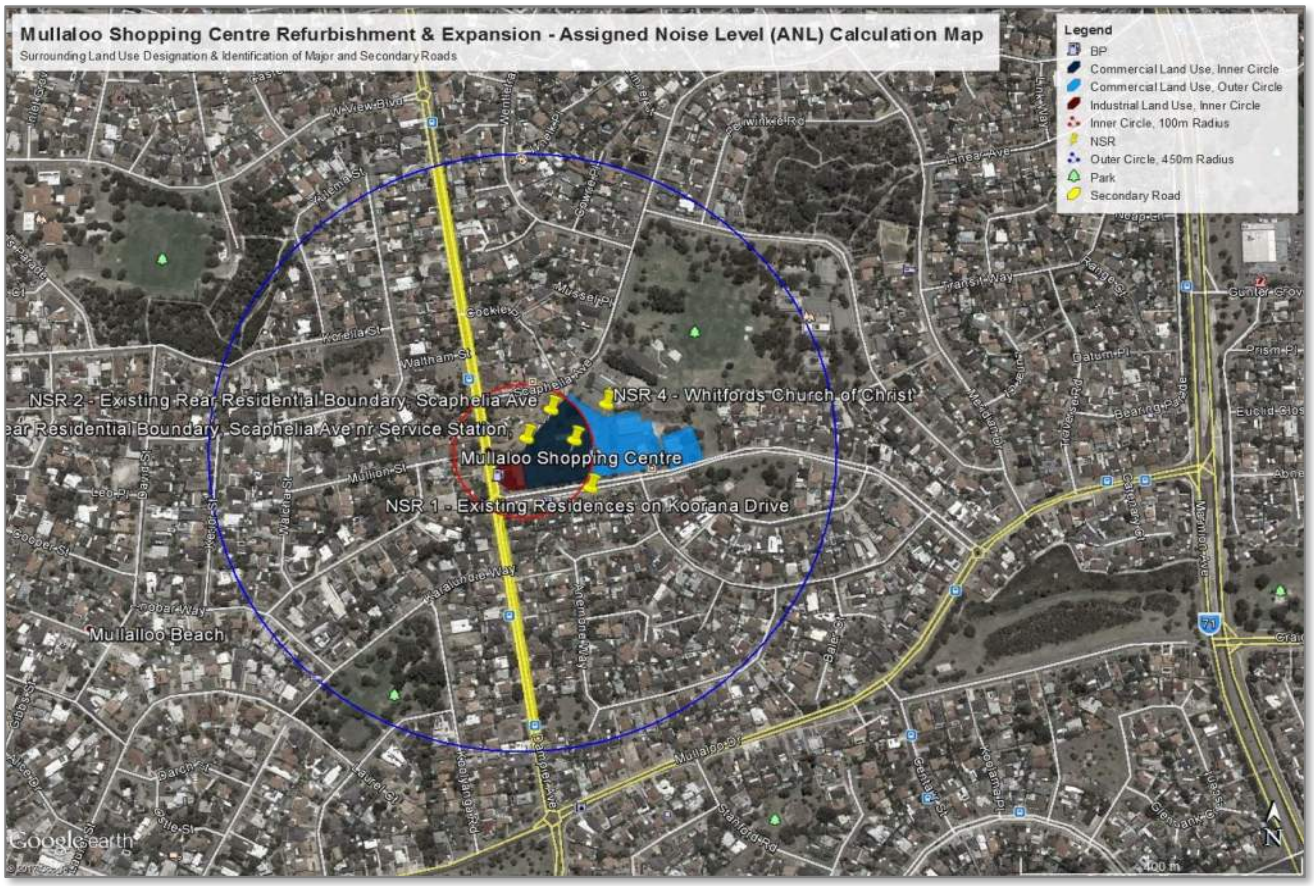
Commercial land use is predominantly the existing shopping centre plaza , though individual properties used for private businesses (commercial use) are located nearby. Industrial land uses are identified as the adjacent BP Service Station, by virtue of the attached vehicle workshop – note Schedule 1, Part B of the *Regulations*.

No Major Road infrastructure is identified within the Inner (100m) or Outer (450m) circle calculation radii. Dampier Avenue has been identified as a Secondary Road, having >6,000 vehicle movements per day within the 100m (Inner Circle) calculation radius.

Note, 2015 traffic data identifies Dampier Avenue with 5,808 Annual Average Weekday Traffic (AAWT) movements per day[2], however this data is historical; Recent developments at Whitfords Shopping Centre and observations on site indicate an increase in vehicular movement to > 6,000 movements per day, hence we have classified Dampier Avenue as a "Secondary" Road, for the purposes of the ANL calculation.

[2] Source: Metropolitan Traffic Digest 2009/15

IDENTIFICATION OF LAND USE



CALCULATION VALUES

Land Use Type & IF Calculation					
Industrial Land Use					"I"
% Area in Inner Circle	6%				+ 0.57
% Area in Outer Circle	0%				
Commercial Land Use					"C"
% Area in Inner Circle	30%				+ 1.58
% Area in Outer Circle	2%				
Roads	**Location**	**Estimated vehicle movements per day**	**Classification**	**Result**	"TF"
Dampier Ave, (N of Mullaloo Drive)	Inner	>6,000	SECONDARY	+2	+2
INFLUENCING FACTOR					+ 4.15

The resultant IF therefore equals **+4**, determining the applicable Assigned Noise Level limits at all times.

NOISE SURVEY & DETAILED MONITORING DATA

24-Hour Design Sound Level Data Logs

Unattended (noise logging) sound measurements were recorded using a Norsonic Nor140 Type 1 Sound Level Meter (SLM), situated 1.5m above local ground level at Koorana Drive verge. The noise monitoring system was used to capture a representative sample of the existing ambient sound field as part of existing shopping centre everyday activity.

Detailed noise data was recorded over consecutive 5min periods logged data periods throughout day, evening and night time periods, starting on 06th December 2017 for a total duration of 6 consecutive days, to provide a representative noise baseline. The following graphical representation plots external LAeq, LAMAX and LA90 noise levels, providing an overview of the existing noise environment at the proposed new building facade.

Notable peaks are identified, annotated as shown, attributable to:

1. Passing motorcycles;
2. V8/"sports" exhausts on private vehicles;
3. Public services e.g. trucks/refuse/street cleaning vehicles;
4. Public transport services, HGVs
5. Periods of rainfall (NB: SPL data not valid for use in façade assessment calculations)
6. Helicopter/aircraft flyover noise events;
7. Police/emergency services sirens;
8. Construction-type noise;
9. Dogs barking, passing pedestrians/car park patrons;
10. Birdsong/Persistent Bird calls

Consecutive logged data periods were recorded over the course of the representative measurement period, to provide a representative noise climate for assessment of external noise ingress. The following graphical representation plots external LAeq, LAMAX and LAMIN noise levels, providing an overview of the existing noise environment at the proposed development site.

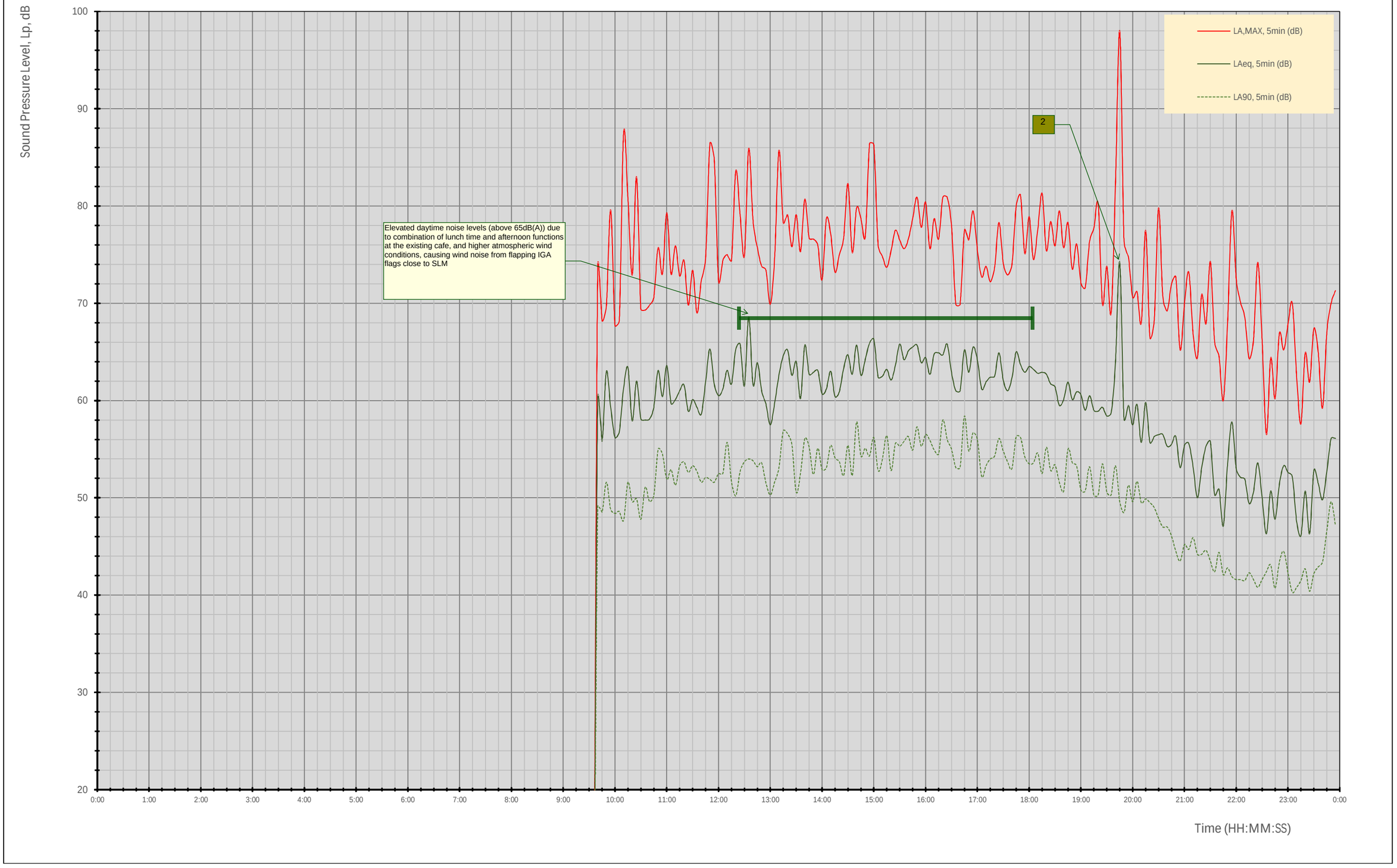
LAeq (dB) noise levels are used for assessment of internal design criteria, shown green, representing the equivalent sound energy recorded in each successive period – the LAeq is a measure of general activity noise level recorded at the building façade location throughout the day.

LAMAX (dB) noise levels report the loudest sound recorded during each consecutive 5 minute period. The LAMAX trace is shown red, and peaks are attributable to sound pressure from the passing of incidental loud motorcycles/vehicles, refuse trucks, occasional pedestrian activity and the like.

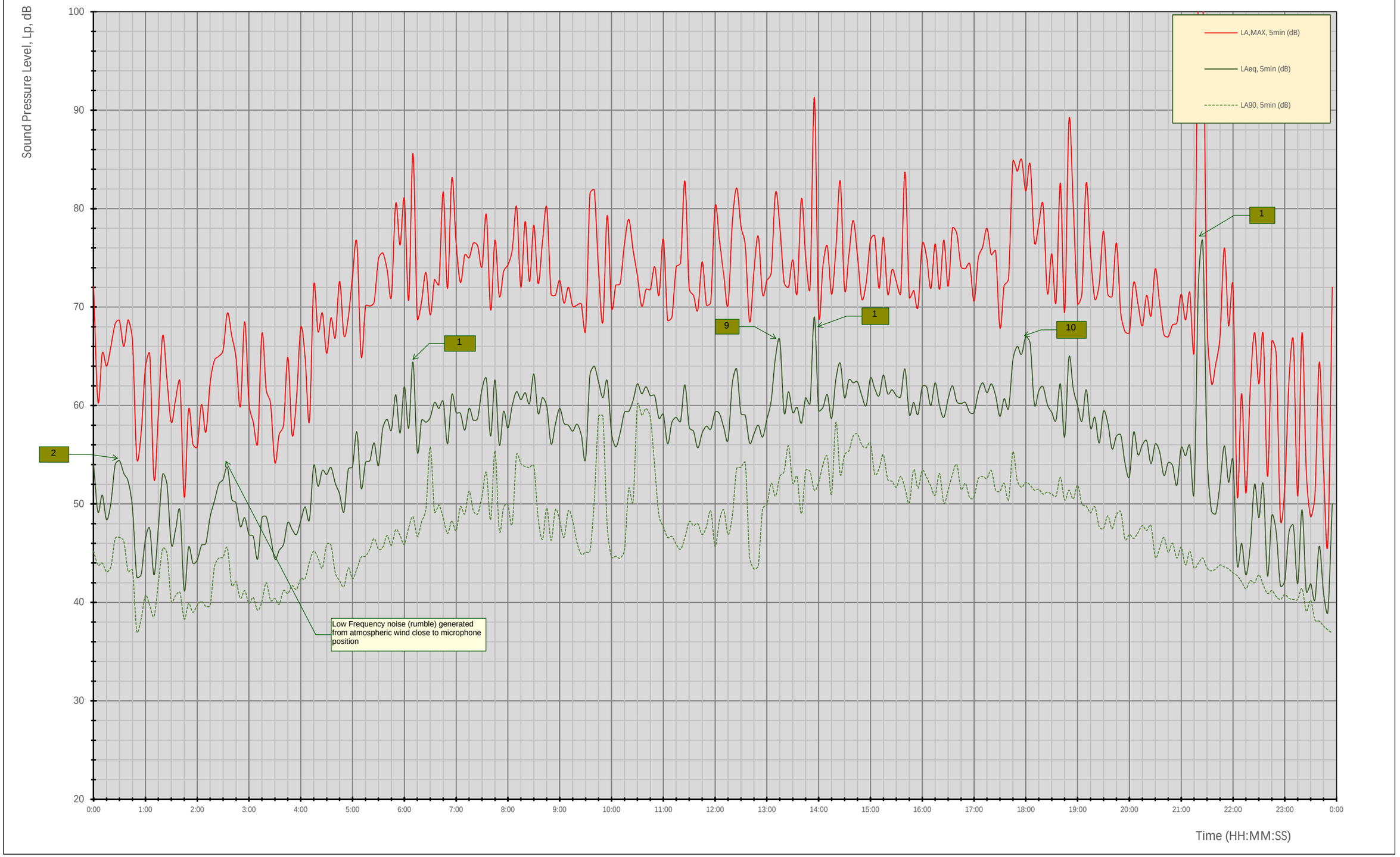
LA90 (dB) noise levels represent the residual background noise (shown green dash), and is referred to as the 90th percentile, or, the level of noise exceeded for >90% of the period. The LA90 gives a good understanding of the consistency and level of background noise, in the absence of all other sources – the greater the difference between LAeq and LA90, the more incidental noise events occurred during a specific period; Where LAeq is

close to LA90, few or no incidental noise events occur, (e.g. overnight) and the noise level is largely driven by environmental factors (e.g. wind) only.

WED 06 DEC 2017 A-Weighted Sound Pressure Level Data - LAeq, LAMAX, LA90



WED 07 DEC 2017 A-Weighted Sound Pressure Level Data - LAeq, LAMAX, LA90



THU 08 DEC 2017 A-Weighted Sound Pressure Level Data - LAeq, LAMAX, LA90

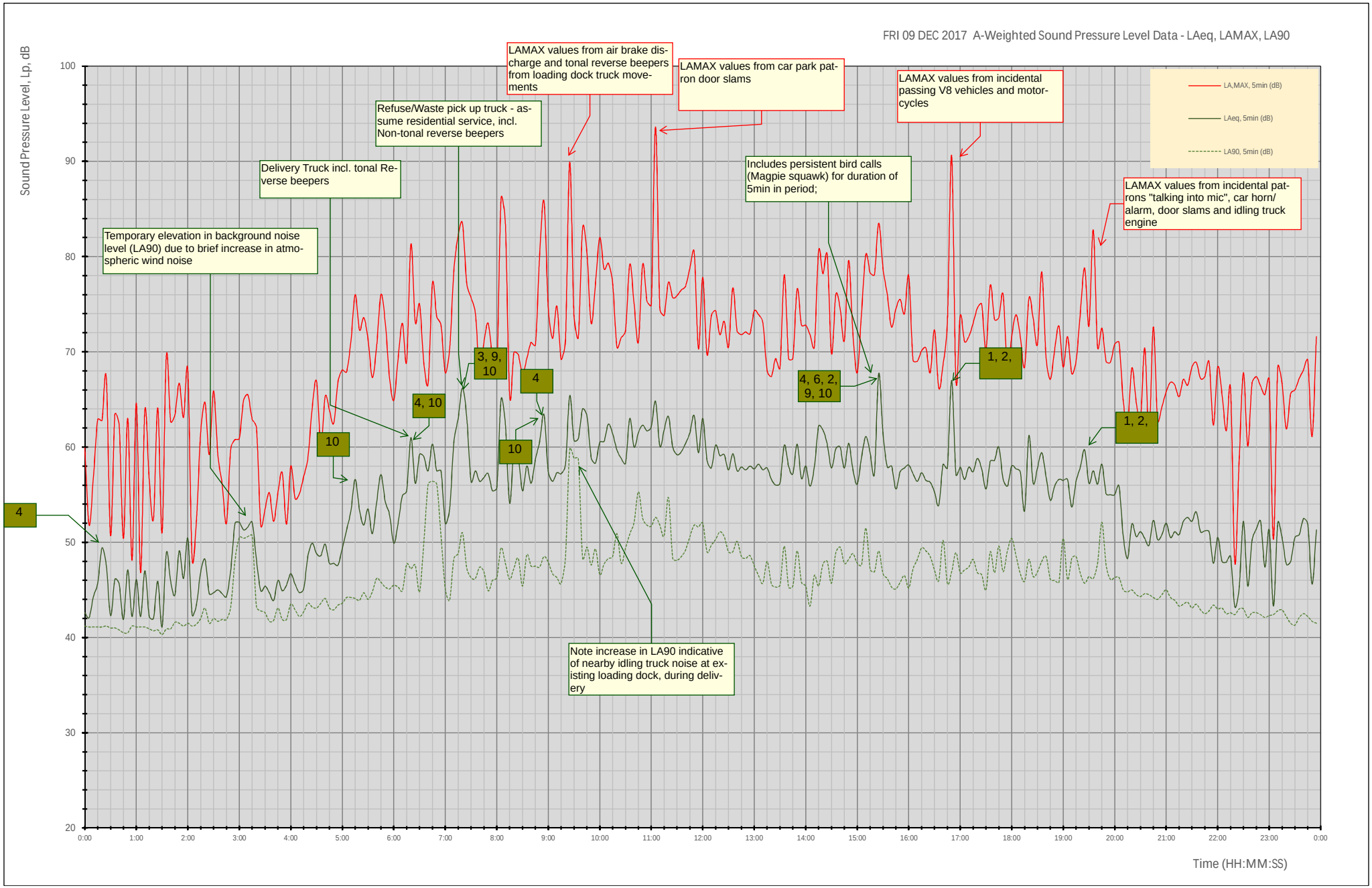
Sound Pressure Level, Lp, dB

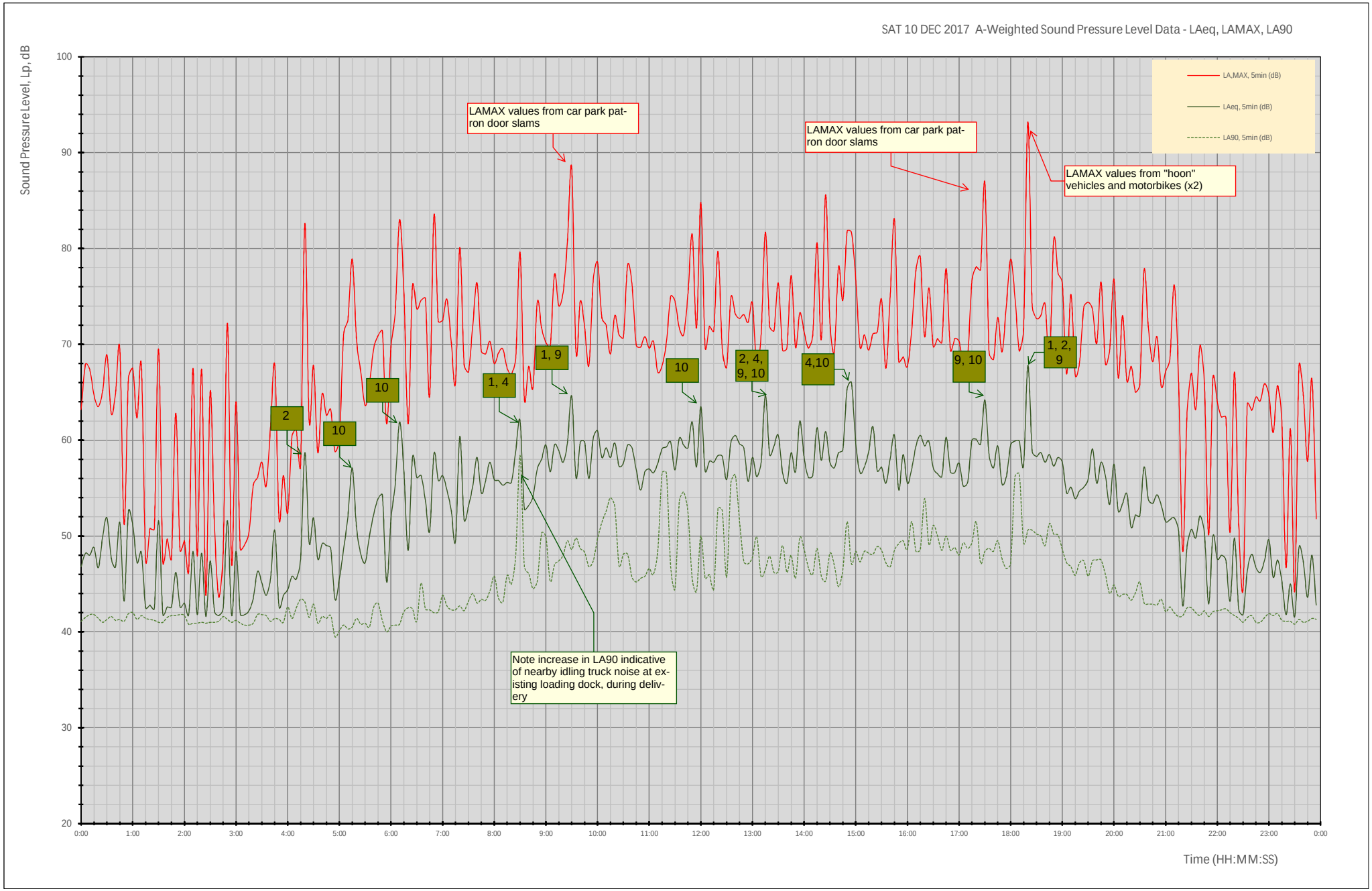
Temporary elevated noise levels due to wind noise from flapping IGA flags close to SLM

LA,MAX, 5min (dB)
LAeq, 5min (dB)
LA90, 5min (dB)

Time (HH:MM:SS)

G:\Projects 2017\SEA-2017-033 Mullalloo Shopping Centre Refurb & Expansion\3 TECH WORK AREA\SEA-2017-033 Monitoring Summary Data DEC 17


FRI 09 DEC 2017 A-Weighted Sound Pressure Level Data - LAeq, LAMAX, LA90
Sound Pressure Level, Lp, dB
Time (HH:MM:SS)
LA,MAX, 5min (dB)
LAeq, 5min (dB)
LA90, 5min (dB)
LAMAX values from air brake discharge and tonal reverse beepers from loading dock truck movements
LAMAX values from car park patron door slams
LAMAX values from incidental passing V8 vehicles and motorcycles
Refuse/Waste pick up truck - assume residential service, incl. Non-tonal reverse beepers
Delivery Truck incl. tonal Reverse beepers
Includes persistent bird calls (Magpie squawk) for duration of 5min in period;
LAMAX values from incidental patrons "talking into mic", car horn/ alarm, door slams and idling truck engine
Temporary elevation in background noise level (LA90) due to brief increase in atmospheric wind noise
Note increase in LA90 indicative of nearby idling truck noise at existing loading dock, during delivery
4
10
4, 10
3, 9, 10
4
10
4, 6, 2, 9, 10
1, 2,
1, 2,


SAT 10 DEC 2017 A-Weighted Sound Pressure Level Data - LAeq, LAMAX, LA90
Sound Pressure Level, Lp, dB
Time (HH:MM:SS)
LA,MAX, 5min (dB)
LAeq, 5min (dB)
LA90, 5min (dB)
LAMAX values from car park patron door slams
LAMAX values from car park patron door slams
LAMAX values from "hoon" vehicles and motorbikes (x2)
Note increase in LA90 indicative of nearby idling truck noise at existing loading dock, during delivery
2
10
10
1, 4
1, 9
10
2, 4, 9, 10
4,10
9, 10
1, 2, 9


SUN 11 DEC 2017 A-Weighted Sound Pressure Level Data - LAeq, LA,MAX, LA90
Sound Pressure Level, Lp, dB
100
90
80
70
60
50
40
30
20
LA,MAX, 5min (dB)
LAeq, 5min (dB)
LA90, 5min (dB)
10, 4
4
2
Temporary elevation in background noise level (LA90) due to brief increase in atmo-spheric wind noise
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time (HH:MM:SS)

EXISTING SITE PHOTOGRAPHS

001	002
	
Existing Loading Dock to bottle shop	Existing Loading Dock to bottle shop
003	**004**
	
Bottle shop wall to loading dock	Rear car park and entrance to Shopping Centre – west extent
005	**006**
	
Rear car park and entrance to Shopping Centre – east extent	Rear property boundaries to Scaphelia Ave properties; **NSR 2**

007	008
	
Existing Mullaloo Fish and Chip Shop rear door	Existing Café at rear car park - east extent
009	**010**
	
Whitfords Church of Christ, rear shopping centre car park	Rear shopping centre car park boundary fence, eastern extent
011	**012**
	
BP Service Station on corner of Dampier Ave/Koorana Drive	BP Service Station on corner of Dampier Ave/Koorana Drive – shows auto body/workshop
013	**014**
	
Rear car park	Bottle shop wall to loading dock

015	016
	
Front (Koorana Drive) car park loading dock w/refrigerated truck activity	BP Service Station, from Dampier Avenue
017	**018**
	
Existing café at eastern extent Koorana Drive entrance	Eastern car park, facing Koorana Drive
019	**020**
	
Koorana Drive, facing east	BP Service Station, from Dampier Ave roundabout
021	**022**
	
Existing squash centre building	Eastern extent entrance on Koorana Drive

023	024
	
Existing Eastern Facade	Western extent entrance, on Koorana Drive
025	**026**
	
Existing Mullaloo Fish & Chip Shop	Existing on-site electrical (Western Power) substation infrastructure
027	**028**
	
Southern carpark, looking east	Western car park facing Koorana Drive
029	**030**
	
Koorana Drive, facing north east	Western extent carp park, facing line of rear residential property boundaries to Scaphelia Ave **NSRs 2 and 3**

031	032
	
Main front car park, looking west	Sound Level Meter noise survey recording location
033	**034**
	
Koorana Drive, looking west towards Dampier Ave	Western car park, facing Koorana Drive
035	**036**
	
Main front car park, looking east towards Whitfords Church of Christ	Dampier Ave/Koorana Drive roundabout
037	**038**
	
View of Eastern extent car park from offsite, on Koorana Drive	Main front car park, looking east

039	040
	
NSR 3, rear property boundaries on Scaphelia Ave	Eastern site boundary to squash centre and Mullaloo Dental Clinic
041	**042**
	
Eastern car park entrance off Koorana Drive	Sound Level Meter noise survey recording location
043	**044**
	
Main shopping centre frontage, from Koorana Drive	Western car park entrance, from Koorana Drive
045	**046**
	
Eastern car park entrance, from Koorana Drive	Main shopping centre frontage, from Koorana Drive

047	048
	
Western car park, looking north towards Whitfords Church of Christ and car park entrance from Scaphelia Ave	Existing Mullaloo Dental Clinic
049	**050**
	
Sound Level Meter noise survey recording location	Eastern car park entrance, from Koorana Drive
051	**052**
	
Boundary to BP Service Station, from western car park area	Boundary to BP Service Station, from western car park area

PRELIMINARY (ASSUMED) TECHNICAL NOISE DATA

HEATCRAFT™
Worldwide Refrigeration

Kirby Titan Outdoor Condensing Unit

With VSD & optional EC fan motors

KIRBY

6.3kW 34kW

Titan Outdoor Condensing Units with VSD and optional EC fan motors
Product Overview

With the increased demand for higher efficiency and improved capacity control, Kirby now offer a range of Titan Outdoor 4 Cylinder Semi-Hermetic Condensing Units configured with a Variable Speed Compressor Drive kit.

Features

- 9 Models / 27 Applications = 9 x R134a Medium Temp. + 9 x R404A Low/Medium Temp. + 9 x R407F Low/Medium Temp.
- Widest capacity range from 6.3kW to 34kW (@-5°C sst / 35°C ambient on R134a)
- High quality, with industry recognised VSD brand
- All standard wiring and controls are factory installed and tested
- Compressor speed envelope from 30 to 65Hz using standard compressors
- Fan speed control fitted as standard (EC fans are available as an option)
- Trax Oil management system installed as part of VSD kit
- More accurate balanced load matching with improved efficiency;
- Auto tuning feature ensures optimum smooth constant suction pressure control that maintains a stable storage temperature with less starts and stops of the compressor
- Heatcraft expect Kirby Titan power consumption to reduce by up to 18%
- Factory pre-configured VSD minimises on-site programming and ensures ease of installation & commissioning
- Soft-start feature of VSD reduces compressor starting current by up to 40%
- Fail safe fixed speed 50Hz mechanical control backup changeover in the event of failed VSD and/or electrical power supply issue

Titan Outdoor Condensing Units - Nomenclature Data

Model Numbering - Standard Kirby Titan Condensing Units

PP	S	152	MH	A1	-	4

PP = Polarpack

Compressor Type
S = Semi Hermetic Reciprocating

Primary Refrigerant Capacity (kW) x 10
at -5°C SST R404A 30ºC SCT 50Hz. MH/LM&LMH" Range
eg. 100 = 10 (kW) x 10

Operating Range for Primary Refrigerant
MH = Medium / High, LM = Low / Medium
LMH = Low / Medium / High

Condenser Type & Variant
A = Air Cooled
Number = Sequential for Different Available Condensers

Release Number & Power Supply to Compressor
Odd Number = Single Phase
Even Number = Three Phase

NOTE: Add respective kit model numbers to quote, selection and orders. (Refer to page 8)

Titan Outdoor Condensing Units with VSD and optional EC fan motors

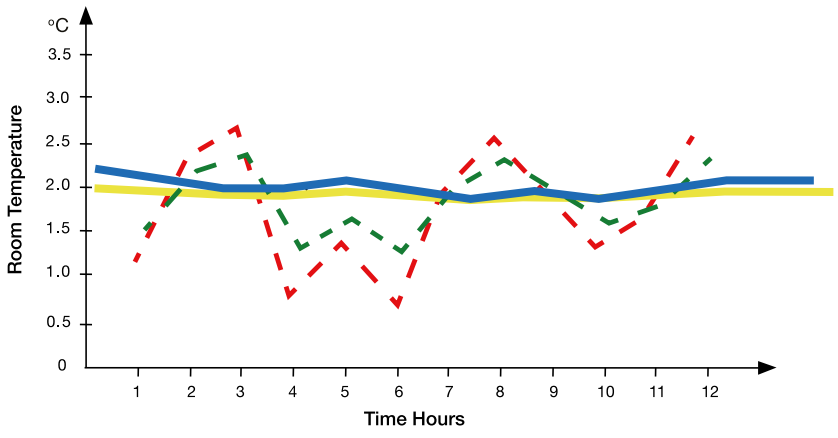
R134a Medium/High Temperature Application

Product Number	Amb. (°C)	MT Capacity (Watts) Evap Temp°C				HT Capacity (Watts) Evap Temp °C		
		-20	-15	-10	-5	0	5	10
SELECTION DATA - R134a CAPACITY VSD OPERATION - INHERENT SUBCOOLING, 20°C RETURN GAS								
PPS152LMHA1-4 Output 65Hz	35		7930	9930	12190	14730	17560	20680
	45		6840	8670	10750	13080	15660	18480
Output 50Hz	35		6210	7800	9600	11660	13960	16510
	45		5370	6810	8460	10340	12450	14760
Output 30Hz	35			4810	5950	7260	8760	10440
	45			4220	5260	6450	7810	9330
PPS178LMHA1-4 Output 65Hz	35		9440	11730	14310	17200	20400	23890
	45		8040	10080	12390	14950	17770	20820
Output 50Hz	35		7400	9220	11300	13640	16260	19150
	45		6310	7920	9760	11840	14160	16690
Output 30Hz	35			5700	7020	8530	10250	12170
	45			4910	6070	7400	8910	10600
PPS205LMHA1-4 Output 65Hz	35		11170	13900	16970	20400	24210	28360
	45		9600	12100	14920	18070	21510	25250
Output 50Hz	35		8770	10940	13420	16210	19330	22770
	45		7540	9510	11770	14320	17160	20260
Output 30Hz	35			6780	8360	10160	12210	14500
	45			5900	7320	8950	10810	12880
PPS242LMA1-4 Output 65Hz	35		13640	16990	20770	24990	29640	34660
	45		11740	14820	18320	22190	26430	
Output 50Hz	35		10720	13400	16450	19890	23710	27880
	45		9240	11670	14480	17640	21140	24930
Output 30Hz	35		6630	8320	10260	12490	15010	17810
	45			7280	9040	11070	13360	15900
PPS289LMHA1-4 Output 65Hz	35		13630	17070	20980	25370	30230	35550
	45		11710	14840	18410	22380	26740	31480
Output 50Hz	35		10680	13410	16540	20090	24070	28460
	45		9190	11650	14480	17710	21310	25230
Output 30Hz	35			8290	10260	12530	15120	18030
	45			7230	8990	11030	13360	15990
PPS328LMA1-4 Output 65Hz	35		17440	21650	26360	31590	37320	43550
	45		14950	18820	23080	27770	32900	38460
Output 50Hz	35		13710	17060	20870	25160	29900	35050
	45		11710	14750	18230	22130	26390	30970
Output 30Hz	35		8480	10600	13030	15810	18950	22430
	45			9200	11380	13880	16710	19840
PPS338LMHA1-4 Output 65Hz	35		17530	21870	26810	32380	38580	45390
	45		15180	19140	23660	28750	34380	40520
Output 50Hz	35		13710	17150	21090	25580	30640	36240
	45		11900	15010	18600	22700	27300	32360

Titan Outdoor Condensing Units with VSD and optional EC fan motors

R134a Medium/High Temperature Application

Product Number	Amb. (°C)	MT Capacity (Watts) Evap Temp°C				HT Capacity (Watts) Evap Temp °C		
		-20	-15	-10	-5	0	5	10
(CONT'D) SELECTION DATA - R134a CAPACITY VSD OPERATION - INHERENT SUBCOOLING, 20°C RETURN GAS								
Output 30Hz	35			10570	13050	15910	19170	22860
	45				11540	14120	17070	20400
PPS370LMA1-4 Output 65Hz	35		20040	24700	29900	35680	42010	48810
	45		17300	21570	26280	31450	37110	
Output 50Hz	35		15760	19500	23750	28500	33720	39400
	45		13550	16960	20840	25150	29840	34880
Output 30Hz	35		9770	12140	14860	17970	21470	25330
	45		8460	10580	13020	15830	18980	22470
PPS411LMA1-4 Output 65Hz	35		22110	27420	33350	39940	47160	54970
	45		18990	23870	29280	35240	41750	48720
Output 50Hz	35		17390	21630	26450	31850	37820	44300
	45		14900	18760	23160	28090	33480	39300
Output 30Hz	35		10770	13450	16540	20060	24020	28410
	45			11700	14470	17640	21230	25190



Kirby Titan = Efficiency

A) EC Fan = up to 5% lower energy
B) VSD Comp = up to 18% lower energy
C) Stability* = up to 4% lower energy
OVERALL ENERGY SAVINGS = up to 27%

- Pressure Curve with VSD
- Temperature Curve with VSD
- Pressure Curve without VSD
- Temperature Curve without VSD

The above chart demonstrates how the VSD optimises both the suction and room temperature curves.
*Reduced energy, less starts = greater reliability, improved product / climate condition.

Titan Outdoor Condensing Units with VSD and optional EC fan motors

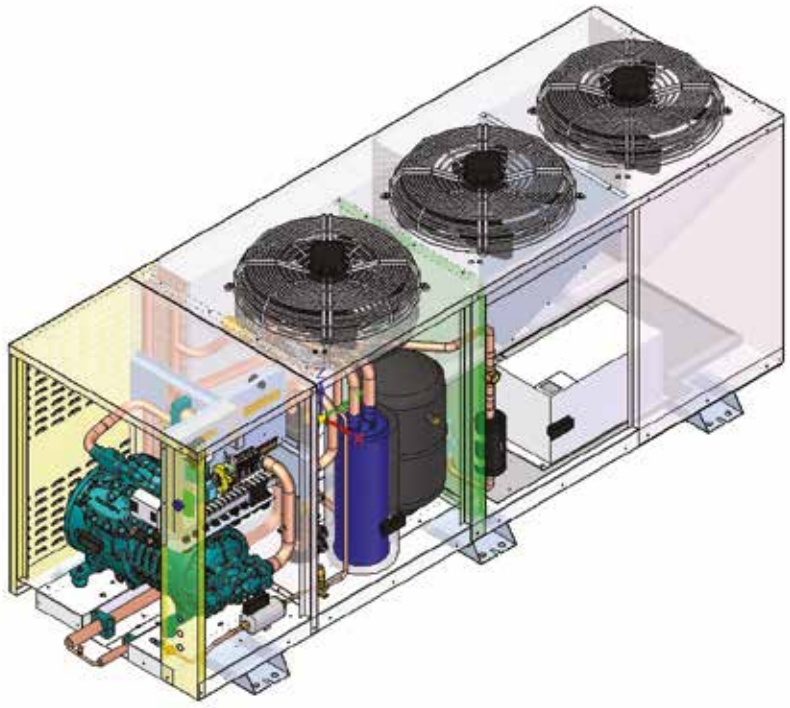
R404A Low/Medium Temperature Application

Product Number	Amb. (°C)	LT Capacity (Watts) Evap Temp °C				MT Capacity (Watts) Evap Temp °C		
		-35	-30	-25	-20	-15	-10	-5
SELECTION DATA - R404A CAPACITY VSD OPERATION - INHERENT SUBCOOLING, 20°C RETURN GAS								
PPS152LMHA1-4 Output 65Hz	35	4820	6280	7980	9950	12210	14750	17500
	45	3770	5000	6420	8090	10010	12160	14440
Output 50Hz	35		4950	6310	7900	9740	11830	14160
	45		3970	5100	6430	7990	9780	11740
Output 30Hz	35			3940	4970	6160	7540	9100
	45				4070	5070	6220	7540
PPS178LMHA1-4 Output 65Hz	35	5930	7650	9620	11890	14490	17370	20480
	45	4630	6080	7750	9690	11900	14320	16870
Output 50Hz	35	4620	6000	7580	9400	11480	13840	16450
	45		4670	5950	7430	9140	11070	13170
Output 30Hz	35			4730	5920	7280	8850	10620
	45				4720	5830	7110	8540
PPS205LMHA1-4 Output 65Hz	35	7120	9210	11590	14300	17360	20710	24310
	45	5590	7360	9370	11680	14270	17070	19980
Output 50Hz	35	5560	7230	9130	11310	13800	16570	19620
	45		5640	7190	8960	10990	13240	15670
Output 30Hz	35			5710	7140	8770	10640	12730
	45				5700	7020	8520	10210
PPS242LMA1-4 Output 65Hz	35	8350	10720	13460	16570	20050	23840	27880
	45	6360	8410	10810	13510	16460	19610	22870
Output 50Hz	35	6610	8490	10670	13190	16050	19230	22710
	45		6740	8560	10690	13140	15870	18790
Output 30Hz	35			6700	8330	10200	12320	14700
	45				6810	8380	10170	12190
PPS289LMHA1-4 Output 65Hz	35	8710	11310	14310	17750	21650	25990	30730
	45	6700	8920	11520	14470	17750	21320	25130
Output 50Hz	35	6860	8940	11330	14100	17280	20870	24840
	45		7140	9120	11440	14130	17160	20480
Output 30Hz	35			7090	8890	10970	13350	16040
	45			7230	7260	8980	10970	13230
PPS328LMA1-4 Output 65Hz	35	11290	14540	18270	22490	27170	32260	37640
	45	8600	11460	14730	18330	22230	26370	
Output 50Hz	35	8940	11530	14520	17940	21810	26090	30750
	45		9140	11630	14540	17840	21460	25310
Output 30Hz	35			9150	11380	13940	16820	20030
	45			7400	9270	11400	13830	16550
PPS338LMHA1-4 Output 65Hz	35	11520	14830	18620	22970	27940	33500	39590
	45	8890	11630	14850	18610	22910	27680	32810
Output 50Hz	35		11710	14760	18270	22300	26880	31980
	45		9260	11800	14760	18220	22180	26570

Titan Outdoor Condensing Units with VSD and optional EC fan motors

R404A Low/Medium Temperature Application

Product Number	Amb. (°C)	LT Capacity (Watts) Evap Temp °C				MT Capacity (Watts) Evap Temp °C		
		-35	-30	-25	-20	-15	-10	-5
(CONT'D) SELECTION DATA - R404A CAPACITY VSD OPERATION - INHERENT SUBCOOLING, 20°C RETURN GAS								
Output 30Hz	35				11490	14130	17140	20560
	45				11490	14130	17140	20560
PPS370LMA1-4 Output 65Hz	35	12910	16630	20860	25590	30790	36380	42190
	45	9940	13260	16970	20980	25270	29780	
Output 50Hz	35	10240	13190	16590	20470	24830	29610	34740
	45	8040	10520	13400	16710	20420	24430	28610
Output 30Hz	35		8260	10470	13010	15910	19170	22780
	45			8520	10650	13090	15840	18910
PPS411LMA1-4 Output 65Hz	35	14240	18340	23020	28300	34140	40440	47050
	45	10930	14530	18620	23150	28050	33240	48720
Output 50Hz	35	11270	14540	18300	22590	27430	32780	38570
	45		11570	14730	18390	22530	27070	31870
Output 30Hz	35			11520	14330	17530	21140	25160
	45			9360	11710	14400	17440	20850



Titan Outdoor Condensing Units with VSD and optional EC fan motors

R407F Low/Medium Temperature Application

Product Number	Amb. (°C)	LT/MT Capacity (Watts) Evap Temp °C						
		-25	-20	-15	-10	-5	0	5
SELECTION DATA - R407F CAPACITY VSD OPERATION - INHERENT SUBCOOLING, 20°C RETURN GAS								
PPS152LMHA1-4 Output 65Hz	35	7637	9724	12123	14851	17905	21267	24905
	45	6599	8370	10456	12924	15776	18949	
Output 50Hz	35	5976	7644	9559	11751	14238	17026	20098
	45	5164	6580	8245	10227	12545	15170	18019
Output 30Hz	35		4717	5938	7353	8975	10813	12862
	45		4060	5122	6399	7908	9634	11532
PPS178LMHA1-4 Output 65Hz	35	8829	11259	14054	17222	20748	24605	28754
	45	7592	9705	12171	15016	18239		
Output 50Hz	35	6921	8853	11071	13603	16460	19648	23159
	45	5989	7624	9546	11807	14399	17283	
Output 30Hz	35		5479	6899	8523	10368	12448	14778
	45		4773	6013	7423	9036	10877	12956
PPS205LMHA1-4 Output 65Hz	35	10145	12942	16151	19778	23806	28209	32951
	45	8729	11152	13975	17228	20908		
Output 50Hz	35	7950	10171	12722	15634	18913	22556	26557
	45	6888	8765	10966	13553	16517	19812	
Output 30Hz	35		6291	7922	9790	11912	14306	16985
	45		5477	6907	8529	10384	12495	14874
PPS242LMA1-4 Output 65Hz	35	11998	15306	19108	23390	28113		
	45	10312	13233	16646	20515			
Output 50Hz	35	9411	12041	15048	18474	22341		
	45	8127	10359	12999	16087	19598		
Output 30Hz	35		7472	9398	11599	14097		
	45		6508	8182	10095	12293		
PPS289LMHA1-4 Output 65Hz	35	14393	18414	22995	28136	33828	40068	46865
	45	12302	15934	20049	24644	29730		
Output 50Hz	35	11298	14454	18082	22218	26874	32050	37752
	45	9773	12446	15586	19266	23475	28158	
Output 30Hz	35		8946	11263	13916	16931	20333	24140
	45		7792	9815	12117	14754	17760	21149

Auxilary Head Cooling Fan Kit Required (Refer to page 8)

Titan Outdoor Condensing Units with VSD and optional EC fan motors

R407F Low/Medium Temperature Application

Product Number	Amb. (°C)	LT/MT Capacity (Watts) Evap Temp °C						
		-25	-20	-15	-10	-5	0	5
SELECTION DATA - R407F CAPACITY VSD OPERATION - INHERENT SUBCOOLING, 20°C RETURN GAS								
PPS328LMA1-4 Output 65Hz	35	16169	20497	25427	30961	37080		
	45	13926	17194	21083	25565			
Output 50Hz	35	9652	12653	16113	20051	24498	29485	
	45		10897	13516	16625	20229	24261	
Output 30Hz	35		9943	12456	15329	18586		
	45		8341	10328	12657	15293		
PPS338LMHA1-4 Output 65Hz	35	16290	20758	25896	31735	38247	45384	53119
	45	14140	17910	22304	27462	33343		
Output 50Hz	35	12747	16318	20421	25111	30414	36334	42868
	45	11064	14078	17588	21729	26514	31883	
Output 30Hz	35		10070	12685	15712	19171	23074	27433
	45		8688	10926	13597	16713	20247	24163
PPS370LMA1-4 Output 65Hz	35	18691	23843	29638	36051	43063		
	45	16122	20776	25962	31687			
Output 50Hz	35	14676	18764	23407	28648	34509		
	45	12634	16154	20292	25041	30326		
Output 30Hz	35	9081	11682	14669	18081	21944	21944	
	45		10168	12763	15744	19154		
PPS411LMA1-4 Output 65Hz	35	20976	26770	33307	40556	48485		
	45	18086	23328	29182	35650			
Output 50Hz	35	16472	21057	26280	32188	38805		
	45	14181	18127	22776	28129	34103		
Output 30Hz	35	10181	13086	16450	20291	24639		
	45		11317	14266	17670	21542		

Auxilary Head Cooling Fan Kit Required

Titan VSD Configuration Order Details

Product Number	ADD Respective VSD kit part number (Factory fitted to Titan)*				
	R134a MT/HT	R404A LT/MT	R407F LT/MT	EC Fan + Orbus Kit	Aux Head Cooling Fan Kit
PPS152LMHA1-4	KP541-23F	KP541-31F	KP541-31F	KP560-10F	KP541-43F
PPS178LMHA1-4	KP541-24F	KP541-32F	KP541-32F	KP560-10F	KP541-43F
PPS205LMHA1-4	KP541-24F	KP541-32F	KP541-32F	KP560-10F	KP541-43F
PPS242LMA1-4	KP541-24F	KP541-32F	KP541-32F	KP560-11F	KP541-43F
PPS289LMHA1-4	KP541-25F	KP541-33F	KP541-33F	KP560-11F	KP541-37F
PPS328LMA1-4	KP541-24F	KP541-33F	KP541-33F	KP560-11F	KP541-37F
PPS338LMHA1-4	KP541-28F	KP541-40F	KP541-40F	KP560-12F	KP541-37F
PPS370LMA1-4	KP541-25F	KP541-40F	KP541-40F	KP560-11F	KP541-37F
PPS411LMA1-4	KP541-28F	KP541-34F	KP541-34F	KP560-12F	KP541-37F

Titan Outdoor Condensing Units with VSD and optional EC fan motors
Sound Data

Product Number	Unit- RLA & Watts for R134a, 50Hz				Unit- RLA & Watts for R404A, 50Hz			
	RLA	MCC	LRA	Input	RLA	MCC	LRA	Input
	(Amps/Ph)			(Watts)	(Amps/Ph)			(Watts)
PPS 152 LMH A1-4	9.8	17.6	66.2	3,960	13.4	17.6	66.2	6,633
PPS 178 LMH A1-4	12.4	22.6	89.1	4,510	15.8	22.6	89.1	7,538
PPS 205 LMH A1-4	13.0	22.6	89.1	5,200	17.6	22.6	89.1	8,850
PPS 242 LM A1-4	15.7	24.2	90.7	6,550	20.1	24.2	90.7	10,990
PPS 289LMH A1-4	17.3	32.7	139.4	7,130	24.1	32.7	139.4	12,050
PPS 328 LM A1-4	17.4	28.7	113.4	8,250	26.2	28.7	113.4	14,070
PPS 338 LMH A1-4	22.1	37.6	174.1	9,360	28.3	37.6	174.1	14,810
PPS 370 LM A1-4	19.9	32.7	139.4	9,180	29.9	32.7	139.4	16,030
PPS 411 LM A1-4	23.8	37.6	174.1	11,000	33.7	37.6	174.1	18,815

* = Unit RLA and Input Watts data are taken at -5°C SST / +45°C SCT with refrigerant as noted. Compressor LRA and MCC data are supplied by compressor manufacturer.

Product Number	Compressor	Data @ 30Hz to Compressor				Data @ 50Hz to Compressor				Data @ 65Hz to Compressor			
		100% Fan Speed		60% Fan Speed		100% Fan Speed		60% Fan Speed		100% Fan Speed		60% Fan Speed	
		LwA	LpA 3m	LwA	LpA 3m	LwA	LpA 3m	LwA	LpA 3m	LwA	LpA 3m	LwA	LpA 3m
PPS 152 LMH A1-4	H551CC	**77.0**	57.0	**70.5**	50.5	**81.0**	61.0	**74.5**	54.5	**84.0**	64.0	**77.5**	57.5
PPS 178 LMH A1-4	H701CC	**77.0**	57.0	**71.0**	51.0	**81.0**	61.0	**75.0**	55.0	**84.0**	64.0	**78.0**	58.0
PPS 205 LMH A1-4	H751CC	**77.5**	57.5	**72.5**	52.5	**81.5**	61.5	**76.5**	56.5	**84.5**	64.5	**79.5**	59.5
PPS 242 LM A1-4	H751CS	**79.0**	59.0	**73.0**	53.0	**83.0**	63.0	**77.0**	57.0	**86.0**	66.0	**80.0**	60.0
PPS 289LMH A1-4	H1001CC	**79.0**	59.0	**73.0**	53.0	**83.0**	63.0	**77.0**	57.0	**86.0**	66.0	**80.0**	60.0
PPS 328 LM A1-4	H1001CS	**78.5**	58.5	**74.0**	54.0	**83.5**	63.5	**79.0**	59.0	**86.5**	66.5	**82.0**	62.0
PPS 338 LMH A1-4	H1501CC	**82.0**	62.0	**74.0**	54.0	**87.0**	67.0	**79.0**	59.0	**90.0**	70.0	**82.0**	62.0
PPS 370 LM A1-4	H1501CS	**78.5**	58.5	**75.0**	55.0	**83.5**	63.5	**80.0**	60.0	**86.5**	66.5	**83.0**	63.0
PPS 411 LM A1-4	H1601CS	**82.5**	62.5	**76.5**	56.5	**87.5**	67.5	**81.5**	61.5	**90.5**	70.5	**84.5**	64.5

Location	1	2	3	4
LwA - LpA (3m)	20	17.5	14.5	11.5

LwA: Sound power level, dB(A)
Lw: Linear Sound Power level, dB
LpA: Sound pressure level, dB(A)

Location 1: Unit located with no hard surfaces to reflect the sound, such as suspended in mid air.
Location 2: Unit located with 1 hard surface to reflect the sound, such as mounted on concrete.
Location 3: Unit located with 2 hard surfaces to reflect the sound, such as mounted on concrete & close to a wall.
Location 4: Unit located with 3 hard surfaces to reflect the sound, such as mounted on concrete & close to 2 walls.

Standard Fan Speed Control Overview

- The controller varies the supply voltage to the fan motor from 45% (1-Ph) or 35% (3-Ph) to at least 95% over the proportional condensing pressure band which is factory fixed at 4 Bar
- The full voltage set point (FVS) is adjustable from 8-28 Bar and is set by Heatcraft at 19 Bar for R404A medium temp. By turning the setting screw clockwise, the pressure setting increases. Turn anti-clockwise to decrease the pressure setting. The set point can be seen on the range setting pointer
- The cut-off point is defined at 45% (1-Ph) or 35% (3-Ph) supply voltage to the fan motor, at factory setting this is 15±1 Bar depending on actual load and / or power supply
- When the condensing pressure reduces to the minimum speed condition, the factory setting of “Min Speed” on the change-over switch ensures that the fans continue to run at this speed regardless of how low the pressure goes below the minimum
- Heatcraft factory set point for R404A is 19 Bar(g) for M/T & 14 Bar(g) for L/T units & 10 Bar(g) for R134a units

Titan Outdoor Condensing Units with VSD and optional EC fan motors

Electrical Data

Optional EC Fans + Orbus Control

EC (Electronically Commutated) fan motors combined with a proprietary fan speed controller called 'Orbus™' is offered as an option on the Heatcraft condensing unit ranges: Polar Pack, Titan and Centurion.

The Orbus controller supplies a 0-10 volt DC signal to any EC fan that can be speed controlled via a 0-10 volt signal. The Orbus supplies this control voltage in a reversed manner to that of conventional controllers, i.e. 0 volts DC is full speed and 10 volts DC is minimum speed or off. This is the fail safe feature of the Orbus in case of loss of the control signal. This means that the Orbus can only be used with EC fans that have been specifically programmed to operate on a reversed logic at the manufacturing stage or in the case of some of the larger EC fans that can be programmed at point of installation.

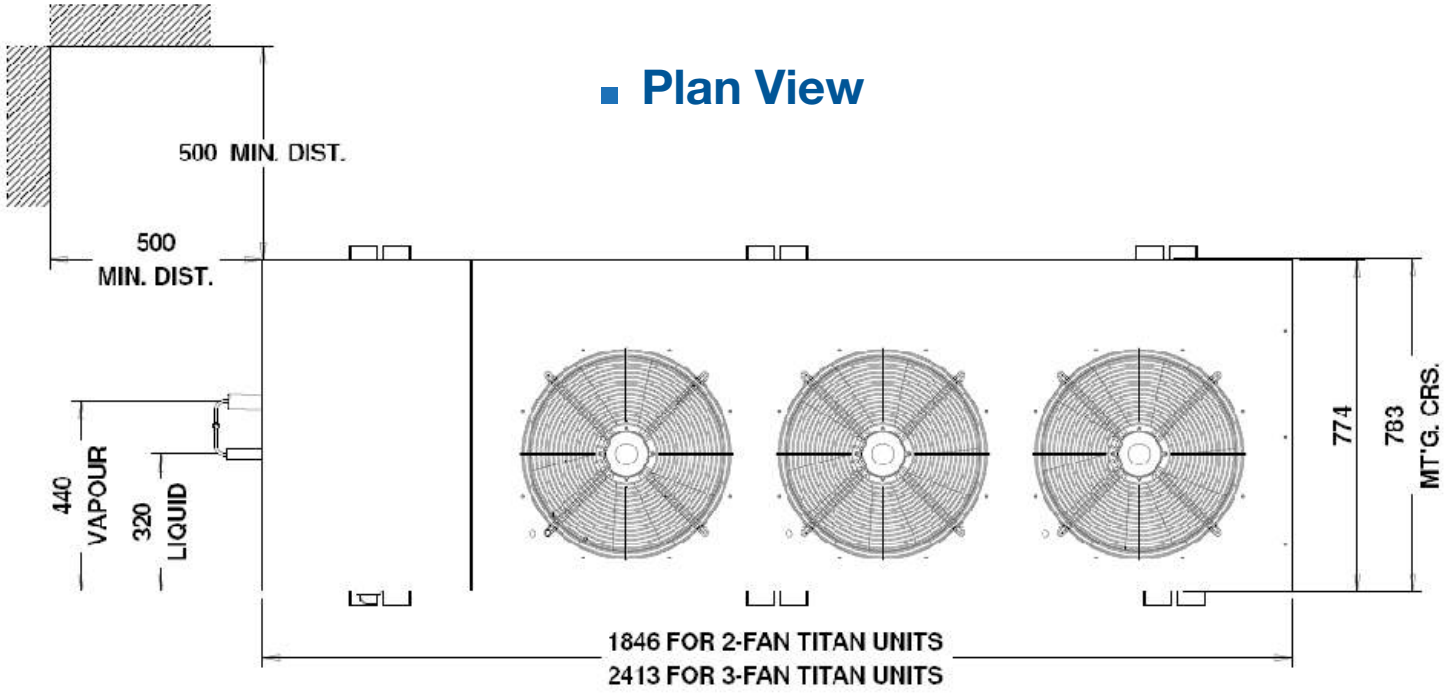
			Unit	Elect Data R404A			Elec Data R134a		
		Displ.	LRA	MCC	RLA*	INPUT	MCC*	RLA	Input
Product Number	Compressor	m3/Hr	Amp/Ph	A/Ph	A/Ph	Watts	A/Ph	A/Ph	Watts
PPS 152 LMH A1-4	H551CC	23.13	66.2	17.6	13.4	6,635	13.3	6.7	3,260
PPS 178 LMH A1-4	H701CC	27.33	89.1	22.6	15.8	7,540	16.0	9.3	3,810
PPS 205 LMH A1-4	H751CC	33.47	89.1	22.6	17.6	8,850	17.9	9.9	4,500
PPS 242 LM A1-4	H751CS	38.06	90.7	24.2	21.8	10,990	19.5	15.7	6,550
PPS 289LMH A1-4	H1001CC	42.81	139.4	32.7	24.0	12,050	23.6	17.3	7,130
PPS 328 LM A1-4	H1001CS	48.82	113.4	28.7	26.2	14,070	22.3	17.4	8,250
PPS 338 LMH A1-4	H1501CC	48.82	174.1	37.6	28.3	14,810	28.3	22.1	9,360
PPS 370 LM A1-4	H1501CS	56.87	139.4	32.7	29.9	16,030	25.9	19.9	9,180
PPS 411 LM A1-4	H1601CS	62.92	174.1	37.6	33.7	18,815	29.6	23.8	11,000

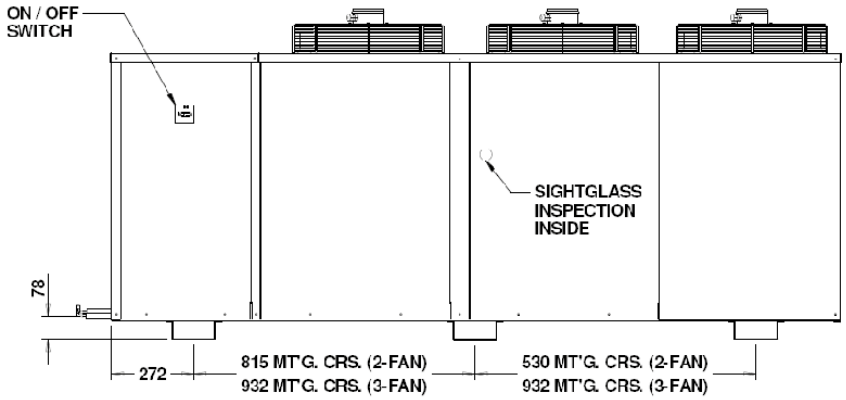
	Condenser		Connections		Rec'r Volume	Nominal Cond. KTD**		
	Fan Ø	Airflow	Suction	Liquid		R134a MT	R404A LT	R407F M/HT
Product Number	x Qty	l/s	mm	mm	LTRS	@ -5°C SST	@ -25°C SST	@ -5°C SST
PPS 152 LMH A1-4	450 x 2	2,630	28.6	15.9	14.5	7.1	5.3	10.1
PPS 178 LMH A1-4	450 x 2	2,490	34.9	15.9	14.5	7.0	5.3	9.9
PPS 205 LMH A1-4	450 x 2	2,240	34.9	15.9	14.5	7.0	5.4	9.7
PPS 242 LM A1-4	450 x 3	3,945	34.9	22.2	24.5	8.0	5.9	10.5
PPS 289LMH A1-4	450 x 3	3,525	34.9	22.2	24.5	7.0	5.4	9.9
PPS 328 LM A1-4	450 x 3	3,525	34.9	22.2	24.5	8.1	6.4	11.0
PPS 338 LMH A1-4	500 x 3	4,285	34.9	22.2	24.5	6.5	5.1	9.2
PPS 370 LM A1-4	450 x 3	3,360	34.9	22.2	24.5	8.7	6.7	11.8
PPS 411 LM A1-4	500 x 3	4,285	34.9	22.2	24.5	8.3	6.4	11.6
						32°C Amb., Comp. @ 50Hz, 100% Fan Speed		

Titan Outdoor Condensing Units with VSD and optional EC fan motors

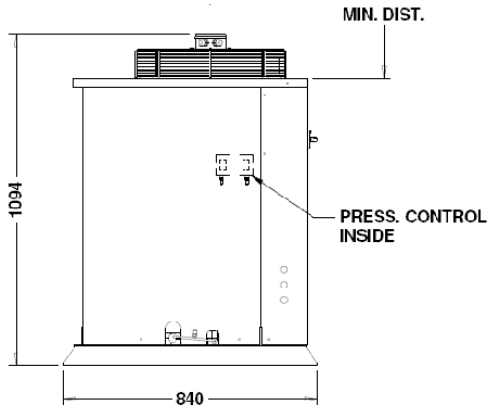
Three Fan Physical Dimensions

Plan View





Side View



End View (right side of unit)

australia **13 23 50**
heatcraft.com.au

new zealand **0800 653 330**
heatcraft.co.nz

Australia Head Office

Heatcraft Australia Pty Ltd, 286 Horsley Road, Milperra NSW 2214 Locked Bag 63, Wetherill Park NSW 1851 (+61) 2 9774 7155

New Zealand Head Office

Heatcraft New Zealand Pty Ltd
12 George Bourke Drive, Mt Wellington PO Box 12371 Penrose, Auckland (+64) 9 276 4888

FIG L

CARRIER TRANSICOLD

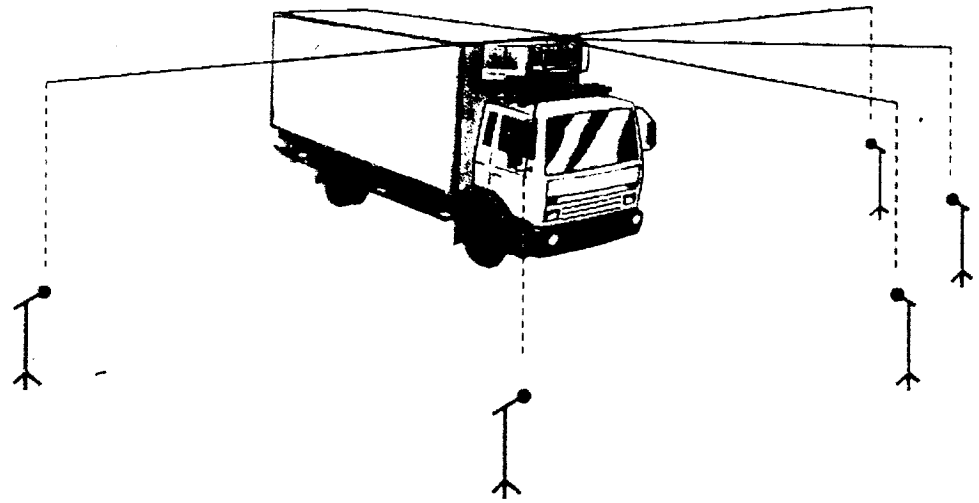
MEASUREMENT OF SOUND PRESSURE

According to DIN 8958.

This standard takes into account sound levels at a height of 1.2 m in front of the vehicle.

Test results

UNIT	TYPE	OPERATION		
		Standby	Diesel	
			low speed	high speed
		dBA	dBA	dBA
SUPRA 422 (CTD Tests)	Standard	60	67	69
	With sound proofing kit	57	62	65
SUPRA 522 (UTAC)	Standard	60,3	67,2	69,9
	With sound proofing kit	57	62,7	65,6
SUPRA 722 (UTAC)	Standard	61	70,4	73,4
	With sound proofing kit	59,6	66,1	69,7
SUPRA 822 (UTAC)	Standard	60	68,7	71,8
	With sound proofing kit	57	64,8	67,3



Measurement methods :

5 measurement points located in front of the vehicle.

- The 5 points were located 1.2 m above ground level within a radius of 7 m.

FRIGIKING FRANCE S.A.
BP 16 - FRANQUEVILLE-SAINT-PIERRE - 76520 BOOS
Tel : 35 79 46 46
Fax : 35 79 46 00
Telex : 172 546 + (FRIKI)

EQUIPMENT CALIBRATION CERTIFCATES

Instrulabs Pty. Ltd.

ACOUSTIC CALIBRATOR CALIBRATION CERTIFICATE

THIS IS TO CERTIFY THAT THE ACOUSTIC CALIBRATOR

MAKE : Norsonic

MODEL : 1251

SERIAL : 34172

OWNED BY : Sealhurst Pty Ltd

Address: 51 Knight Road

Gnangara WA 6077

HAS BEEN CALIBRATED ON : 06-Sep-16

SUMMARY

A sound level meter connected to a digital acquisition system is adjusted to a known reference sound pressure level, then the digital acquisition system records the frequency and sound pressure levels of the acoustic calibrator under test. All instruments used have current NATA endorsed calibration documentation

CALIBRATION INSTRUMENTS USED

Rion NA-28 Sound Level Meter	s/n 01270691	Recalibration due 03-Feb-17
Bruel & Kjaer Acoustic Calibrator Type 4226	s/n 2692340	Recalibration due 23-May-17
NI USB-6221-BNC Multifunction DAQ	s/n 14E9DD2	Recalibration due 09-Aug-17

CERTIFIED QUANTITIES

Frequency - AS IEC 60942-2004 clause B3.5

Limits ± 1%, Uncertainty ± 0.05%, C.F. = 2, C.L. = 95%

Frequency : 1000.1 Hz Pass

THD+N - AS IEC 60942-2004 clause B3.6

Limits ± 3%, Uncertainty ± 0.8%, C.F. = 2, C.L. = 95%

THD+N : 0.49 % Pass

SPL - AS IEC 60942 clause B3.4.3.2

Limits ± 0.4dB, Uncertainty ± 0.2dB, C.F. = 2, C.L. = 95%

Amplitude : 113.87 dB Pass

Signature _____ Signature _____

Calibrated by Jason Dixon

Lab manager, Approved Signatory

Checked by Erik Fry

WA manager, Approved Signatory

LABORATORY ACCREDITATION NUMBER 1943 - Since 1985
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email: info@instrulabs.com.au web : www.instrulabs.com.au

Accredited for compliance with ISO/IEC 17025:2005
Approved for issue by Erik Fry, 28th of January 2012. Document ID number: C010

Issue Date: 6/09/2016

Report# 449J2753

NATA WORLD RECOGNISED ACCREDITATION

Instrulabs Pty. Ltd.

SOUND LEVEL METER CALIBRATION CERTIFICATE

Calibration Date : **Tuesday, 6 September 2016**

Device and Calibration Information

Client : **Sealhurst Pty Ltd**
51 Knight Road
Gnangara
WA 6077

Contact : **Dan Millard, 9306 4481**

Meter : **Norsonic NOR140, S/N: 1406036, Class 1**

Firmware Revision: 3.0.1793

Preamp : **Norsonic, 1209, s/n: 20076**

Microphone : **Norsonic, 1225, s/n: 208154**

Laboratory Reference Equipment Used:

Bruel & Kjaer Acoustic Calibrator Type 4226, S/N: 2692340, Cal Due: 23/05/2017

Fluke8846A Precision Multimeter, S/N: 2479018, Cal Due: 28/07/2017

Test Environment (at start/at end):

24.6 C, 1007.4 hPa, 36.1 %R.H.

24.2 C, 1007.4 hPa, 43.7 %R.H.

Acoustic stimuli for the calibration tests were generated by a Bruel & Kjaer 4226 multifunction acoustic calibrator. Electrical stimuli for the calibration tests were generated by a TTi 1241 Arbitrary Waveform Generator and signal levels were verified using a Fluke 8846A Voltmeter. All reference calibration artefacts have current NATA endorsed calibration documentation.

SUMMARY OF CERTIFIED RESULTS

Pass	IEC61672.3 cl 10 - Indication at the Check Frequenc	N/T	IEC61672.3 cl 17 - Linearity incl. the Range Control
Pass	IEC61672.3 cl 11 - Self Generated Noise	Pass	IEC61672.3 cl 18 - Toneburst Response
Pass	IEC61672.3 cl 12 - Frequency Weighting Acoustic	Pass	IEC61672.3 cl 19 - Peak C Sound Level
Pass	IEC61672.3 cl 13 - Electrical Frequency Weightings	Pass	IEC61672.3 cl 20 - Overload Indication
Pass	IEC61672.3 cl 14 - Frequency & Time Weightings	Pass	IEC61672.3 cl 21 - High-Level Stability
Pass	IEC61672.3 cl 15 - Long-Term Stability	Pass	AS/NZS 4476 cl 4.4 - Relative attenuation, 1/1 Oct
Pass	IEC61672.3 cl 16 - Level Linearity on the Ref. Range	Pass	AS/NZS 4476 cl 4.4 - Relative attenuation, 1/3 Oct

STATEMENT OF CONFORMANCE

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3 Ed. 2.0, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1 Ed. 2.0, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1 Ed. 2.0.

Signature _____ Signature _____

Calibrated by Jason Dixon
Lab manager, Approved Signatory

Checked by Erik Fry
WA manager, Approved Signatory

LABORATORY ACCREDITATION NUMBER 1943 - Since 1985
Mail : PO Box 1211, East Victoria Park WA 6102
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Accredited for compliance with ISO/IEC 17025:2005
Approved for issue by Erik Fry, 7th of April 2016. Document ID number: C013

Issue Date: 6/09/2016
Report# 2566J2753

NATA
WORLD RECOGNISED ACCREDITATION

Instrulabs Pty. Ltd.

SOUND LEVEL METER CALIBRATION REPORT

Calibration Date: **Tuesday, 6 September 2016** Calibration Result: **Pass**

Device and Calibration Information

Client : **Sealhurst Pty Ltd, 51 Knight Road, Gnangara WA 6077**

Contact : **Dan Millard, 9306 4481**

Meter : **Norsonic NOR140, S/N: 1406036**
Firmware Revision: 3.0.1793

Preamp : **Norsonic, 1209, s/n: 20076**

Microphone : **Norsonic, 1225, s/n: 208154**

Laboratory Reference Equipment Used:

Bruel & Kjaer Acoustic Calibrator Type 4226, S/N: 2692340, Cal Due: 23/05/2017

Fluke8846A Precision Multimeter, S/N: 2479018, Cal Due: 28/07/2017

Test Environment:

Start Conditions	End Conditions
24.6 C, 1007.4 hPa, 36.1 %R.H.	24.2 C, 1007.4 hPa, 43.7 %R.H.

Indication at the Calibration Check Frequency - IEC61672.3 Ed. 2.0 clause 10

Test parameters: 1kHz @ 114 dB Uncertainty = ±0.085dB C.F.= 1.97 C.L.= 95%

Initial indication **114.4** dB Final indication **114.0** dB

Self Generated Noise - IEC61672.3 Ed. 2.0 clause 11

	Electrical Tests Dummy microphone used with shorting cap fitted			Acoustic Tests Microphone fitted		
Weighting	Max Permitted (dB)	30 sec LAeq result (dB)	Test result	Max Permitted (dB)	30 sec LAeq result (dB)	Test result
A	13.0	9.3	Pass	18.0	17.6	Pass
C	15.0	10.6	Pass	22.0	17.7	Pass
Z	25.0	18.2	Pass	30.0	22.6	Pass

Frequency & Time Weightings - IEC61672.3 Ed. 2.0 clause 14

Reference SPL (dB) **114.0** Stimulus level (mVAC) **570.6** Uncertainty = ±0.1dB C.F.= 1.97 C.L.= 95%

	Indicated SPL (dB)	Dev. from LAF @ 1kHz	Tolerance	Test Result
LCF	114.0	0.0 dB	± 0.2dB	Pass
LZF	114.0	0.0 dB	± 0.2dB	Pass
LAS	114.0	0.0 dB	± 0.2dB	Pass
LAeq	114.0	0.0 dB	± 0.2dB	Pass

Signature _____

Calibrated by Jason Dixon
Lab manager, Approved Signatory

Signature _____

Checked by Erik Fry
WA manager, Approved Signatory

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Accredited for compliance with ISO/IEC 17025:2005
Approved for issue by Erik Fry, 28th of January 2016. Document ID number: R014

Issue Date: 6/09/2016
Report# 2566J2753

WORLD RECOGNISED ACCREDITATION

ATTACHMENT 4

City of Joondalup

Environmentally Sustainable Design – Checklist

Under the City's planning policy, *Environmentally Sustainable Design in the City of Joondalup*, the City encourages the integration of environmentally sustainable design principles into the construction of all new residential, commercial and mixed-use buildings and redevelopments (excluding single and grouped dwellings, internal fit outs and minor extensions) in the City of Joondalup.

Environmentally sustainable design is an approach that considers each building project from a 'whole-of-life' perspective, from the initial planning to eventual decommissioning. There are five fundamental principles of environmentally sustainable design, including: siting and structure design efficiency; energy efficiency; water efficiency; materials efficiency; and indoor air quality enhancement.

For detailed information on each of the items below, please refer to the *Your Home Technical Manual* at: **www.yourhome.gov.au**, and *Energy Smart Homes* at: **www.clean.energy.wa.gov.au**.

This checklist must be submitted with the planning application for all new residential, commercial and mixed-use buildings and redevelopments (excluding single and grouped dwellings, internal fit outs and minor extensions) in the City of Joondalup.

The City will seek to prioritise the assessment of your planning application and the associated building application if you can demonstrate that the development has been designed and assessed against a national recognised rating tool.

Please tick the boxes below that are applicable to your development.

Siting and structure design efficiency

Environmentally sustainable design seeks to affect siting and structure design efficiency through site selection, and passive solar design.

Does your development retain:

- ☑ existing vegetation; and/or
- ☑ natural landforms and topography

Does your development include:

- ☐ northerly orientation of daytime living/working areas with large windows, and minimal windows to the east and west
- ☑ passive shading of glass
- ☑ sufficient thermal mass in building materials for storing heat
- ☑ insulation and draught sealing
- ☐ floor plan zoning based on water and heating needs and the supply of hot water; and/or
- ☑ advanced glazing solutions

Energy efficiency

Environmentally sustainable design aims to reduce energy use through energy efficiency measures that can include the use of renewable energy and low energy technologies.

Do you intend to incorporate into your development:

- ○ renewable energy technologies (e.g. photo-voltaic cells, wind generator system, etc); and/or
- ☑ low energy technologies (e.g. energy efficient lighting, energy efficient heating and cooling, etc); and/or
- ☑ natural and/or fan forced ventilation

Water efficiency

Environmentally sustainable design aims to reduce water use through effective water conservation measures and water recycling. This can include stormwater management, water reuse, rainwater tanks, and water efficient technologies.

Does your development include:

- ○ water reuse system(s) (e.g. greywater reuse system); and/or
- ○ rainwater tank(s)

Do you intend to incorporate into your development:

- ☑ water efficient technologies (e.g. dual-flush toilets, water efficient showerheads, etc)

Materials efficiency

Environmentally sustainable design aims to use materials efficiently in the construction of a building. Consideration is given to the lifecycle of materials and the processes adopted to extract, process and transport them to the site. Wherever possible, materials should be locally sourced and reused on-site.

Does your development make use of:

- ☑ recycled materials (e.g. recycled timber, recycled metal, etc)
- ○ rapidly renewable materials (e.g. bamboo, cork, linoleum, etc); and/or
- ☑ recyclable materials (e.g. timber, glass, cork, etc)
- ○ natural/living materials such as roof gardens and "green" or planted walls

Indoor air quality enhancement

Environmentally sustainable design aims to enhance the quality of air in buildings, by reducing volatile organic compounds (VOCs) and other air impurities such as microbial contaminants.

Do you intend to incorporate into your development:

- ☑ low-VOC products (e.g. paints, adhesives, carpet, etc)

'Green' Rating

Has your proposed development been designed and assessed against a nationally recognised "green" rating tool?

- ○ Yes
- ☑ No

If yes, please indicate which tool was used and what rating your building will achieve:

If yes, please attach appropriate documentation to demonstrate this assessment.

If you have not incorporated or do not intend to incorporate any of the principles of environmentally sustainable design into your development, can you tell us why:

Is there anything else you wish to tell us about how you will be incorporating the principles of environmentally sustainable design into your development:

The development is an extension of the existing shopping centre and will generally tap into the existing systems. However where feasible low energy systems and good passive energy and ventilation solutions will be utilised. The intention is where the new additions are able materials with a low carbon footprint will be used.

All landscaping areas will be planted with indigenous species that are low water use and tolerant of the local conditions.

When you have checked off your checklist, sign below to verify you have included all the information necessary to determine your application.

Thank you for completing this checklist to ensure your application is processed as quickly as possible.

Applicant's Full Name: Mark Dorril for Alex Nor (Conflexa) **Contact Number:** 9388 6111

Applicant's Signature: Mark Dorril Digitally signed by Mark Dorril DN: C=AU, E=mdorril@trcb.com.au, O=TRCB, CN=Mark Dorril Reason: I am the author of this document Date: 2018.04.27 16:11:17+08'00' **Date Submitted:** 27.04.18

Accepting Officer's Signature: _____

Checklist Issued: March 2011