Appendix N

Acoustic Report

WOOD & GRIEVE ENGINEERS

Lot 37 Montario Quarter, Shenton Park

Acoustic Report

Development Application

Prepared for:

IRIS-PW No.1 2017 Pty Ltd

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Executive Summary

Wood and Grieve Engineers (WGE) were commissioned by IRIS-PW No.1 2017 Pty Ltd to undertake an acoustic assessment for the Development Application of the proposed six storey mixed-use development to be located at Lot 37 Montario Quarter, Shenton Park WA. The proposed development site is located within the City of Nedlands. The eastern boundary of the project site is also located on the border of the City of Subiaco.

This acoustic report has been prepared for submission to the City of Nedlands and demonstrates that the project is taking into consideration all acoustic aspects pertinent to the project. Recommendations are provided in this report to address and mitigate any acoustic issues identified.

The following regulations and relevant standards that apply to the development have been addressed in this report:

- WA Environmental Protection (Noise) Regulations 1997 (EPNR);
- Western Australian Planning Commission - State Planning Policy 5.4 (SPP5.4);
- National Construction Code 2016 (NCC 2016), Building Code of Australia; and
- Australian and New Zealand Standard AS/NZS 2107:2016 “Acoustics – Recommended design sound levels and reverberation times for building interiors” (AS 2107).

A preliminary review of traffic noise impact on the façade of the development was carried out. A noise model has been produced using SoundPLAN 8.0 and traffic count numbers obtained from Mainroads WA have been incorporated in order to perform the assessment. Preliminary façade configuration details have been provided in order to achieve adequate indoor noise levels throughout the development, as per the AS2107. The preliminary design recommendations will be reviewed during the design stages of the project.

The predicted noise levels at all external sensitive receivers due to the mechanical equipment were also shown to comply to the L_{A10} criteria at all times of the day for Scenario A. No treatments are required at this stage.

The predicted noise levels for Scenario B at all external sensitive noise receivers were shown to comply to the L_{A10} day time criteria. The predicted noise levels to the internal apartment units exceeded the EPNR L_{A10} criteria by 6 dB. Preliminary acoustic treatments and mitigation strategies have been recommended for compliance to the EPNR.

The noise emission assessment due to the mechanical equipment was carried out for two scenarios:

- Scenario A (excludes smoke exhaust fan):
- Scenario B (includes smoke exhaust fan):

The predicted noise levels at all external sensitive receivers due to the mechanical equipment were also shown to comply to the L_{A10} criteria at all times of the day for Scenario A. There is a 1 dB exceedance at the internal apartment unit located directly above the supermarket condenser plant room louvre. Preliminary acoustic treatments have been recommended for compliance to the EPNR.

The predicted noise levels for Scenario B at all external sensitive noise receivers were shown to comply to the L_{A10} day time criteria. The predicted noise levels to the internal apartment units exceeded the EPNR L_{A10} criteria by 6 dB. Preliminary acoustic treatments and mitigation strategies have been recommended for compliance to the EPNR.

As a result of WGE’s initial acoustic review, the following items have been identified as those that will require ongoing review to achieve compliance with the applicable regulations or acoustic design standards:

- Façade design to ensure compliance to AS2107
- Noise emissions from the development including plant rooms and loading dock are to comply with the assigned noise levels calculated by the method disclosed in the Environmental Protection (Noise) Regulations 1997, at the nearest noise sensitive receiver.
- Noise emissions to the internal apartment units to achieve appropriate internal noise levels as per the AS2107.
- WGE will provide advice during the progression of the design to satisfy and comply with the requirements outlined in the National Construction Code (NCC 2016).

All preliminary treatments recommendations will be updated once the detailed mechanical design and selections have been provided.

1. Introduction

1.1 Overview

Wood and Grieve Engineers (WGE) were commissioned by IRIS-PW No.1 2017 Pty Ltd to undertake the design of a proposed 6 storey mixed use development to be located at Lot 37 Montario Quarter, Shenton Park WA. The proposed development site is located within the City of Nedlands. The eastern boundary of the project site is also located on the border of the City of Subiaco. The completed development will generally consist of the following architectural volumes and layout;

- Lower Ground – Sole occupancy units, fire pump compound, plant room, carpark;
- Ground – Commercial tenancies, sole occupancy units, gymnasium, plant room, loading dock access point, EOT facilities;
- Mezzanine – Loading dock, sole occupancy units, waste collection point, plant room;
- Levels 1 and 2 – Sole occupancy units, carpark;
- Level 3 – Sole occupancy units, communal spaces (indoor and outdoor), swimming pool;
- Levels 4 to 6 – Sole occupancy units; and
- Roof – Mechanical plant and discharge points.

1.2 Study Inputs

Preliminary acoustic assessments have been conducted based on the documentation detailed in Table 1.

Table 1: Received documentation

Date	Detail	Prepared by	Format
26/09/2018	*Development Approval Application DRAFT*	Cameron Chisholm Nicol Architects	.pdf

1.3 Information Sources

The following documentation has been reviewed for acoustic assessment and the preparation of this report:

- WA Environmental Protection (Noise) Regulations 1997 (EPNR);
- Western Australian Planning Commission - State Planning Policy 5.4 (SPP5.4);
- National Construction Code 2016 (NCC 2016), Building Code of Australia; and
- Australian and New Zealand Standard AS/NZS 2107:2016 “Acoustics – Recommended design sound levels and reverberation times for building interiors” (AS 2107).

1.4 Project Location

Areas surrounding the project lot mostly consist of residential zoning. The nearest residential development is located approximately 30 m west of the site (Victoria House on 1A Selby St). Selby St runs along the eastern boundary and is considered as a major road with moderate-high daily traffic. The project location and surrounding areas a detailed in Figure 1.

Figure 1: Project location

Source: Nearmap

1.5 Key Acoustic Considerations

- The proposed development will consist of mixed usage. Noise impacts from mechanical plant servicing commercial tenancies will need to comply with the EPNR criteria, as well as provide a high degree of acoustic amenity to the prospective occupants.
- A loading dock is proposed for the ground floor of the development, with access provided via Selby St. Noise emissions from loading dock areas are also assessable against the EPNR criteria.
- Due to moderate-high traffic volumes along Selby Street, a noise impact on the residential apartments shall be assessed and treatments provided to provide satisfactory internal noise levels.
- Plant rooms that have been proposed on the lower ground, ground, mezzanine levels and the roof will be assessed to determine noise impacts on the nearest noise sensitive receiver.
- The noise emission levels from the mechanical services will need to be evaluated in order for compliance to the EPNR as well as to provide appropriate acoustic comfort to the internal apartment units.
- It is understood that the supermarket smoke exhaust fans located on the roof of the development will only be used during emergencies and during testing periods.
- Mechanical noise emission sources from the apartment facilities including the carpark exhaust fan and bin store exhaust fan are not considered to be part of the noise emission assessment to the apartment units, as they are servicing the apartment units.

2. Acoustic Criteria

2.1 Environmental Noise Emissions

Environmental noise impacts resulting from the development are addressed through the Environmental Protection Act 1986 with the prescribed standards detailed in the Environmental Protection (Noise) Regulations 1997 (EPNR). Compliance to relevant noise limits outlined in the regulation is compulsory. This section discusses the relevant noise criteria at nearest noise sensitive receiver.

The nearest noise sensitive residential receiver has been identified as the following:

- Victoria House directly west (30 metres) of the proposed development;
- 1 Selby St; and
- 8 and 10 Lonnie St.

Noise emissions from the proposed development will be required to comply with EPNR assigned levels at the nearest receiver position.

The regulations are based on maximum allowable noise level received at the boundary of the nearest noise sensitive receiver/s and is termed 'assigned noise level'. To determine the assigned noise levels, the influencing factor (IF) must be determined. This factor considers the amount of industrial and commercial land within a 100 metre radius and a 450 metre radius. In addition, a Transport Factor (TF) is to be determined and included into the calculation of the IF, as described in the EPNR.

The City of Nedland's Town Planning Scheme No.2 and the City of Subiaco's Town Planning Scheme No.4 were both accessed via Intramaps. The town planning schemes were used to identify the amount of commercial and industrial land situated within the 100 metre and 450 metre radius. Traffic data was obtained from Main Roads Western Australia (MRWA), which has identified Selby St as a major road defined under the EPNR. The data from Main Roads has been summarised in Table **2**.

The influencing factor that results from the identifying the required information is 4 dB. This is based on:

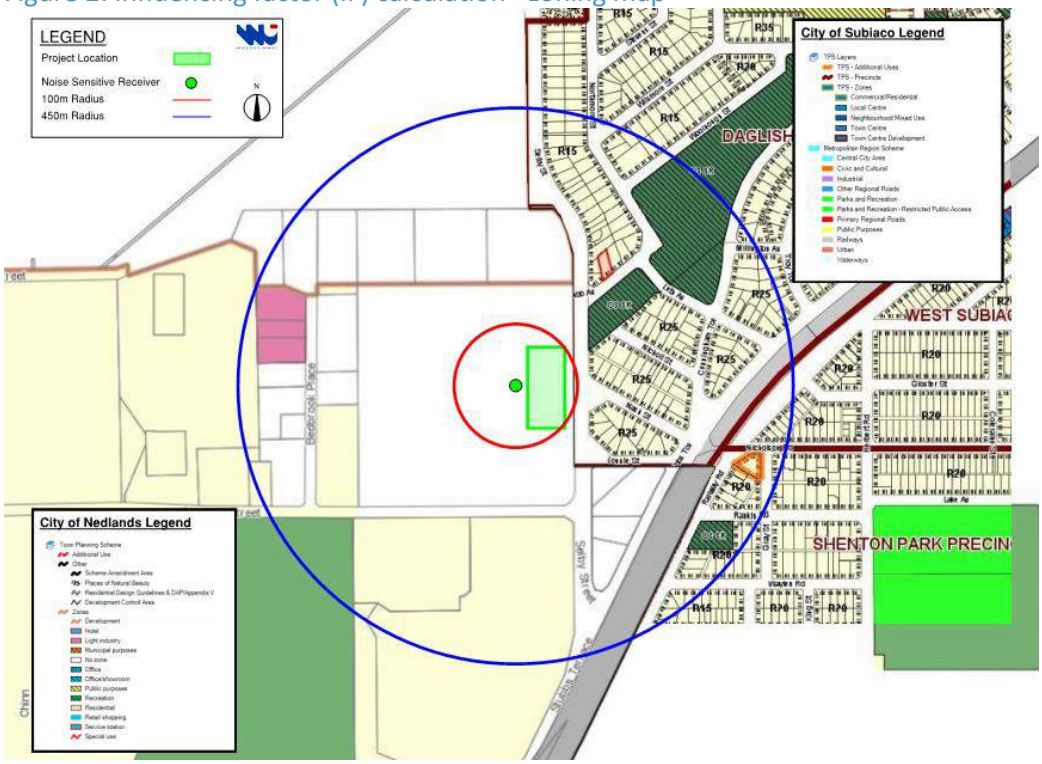
- A maximum transport factor of 4 due to one secondary road (Selby St) in the 100m radius and one major road (Railway Road) in the 450m circle; and
- Industrial Areas — 2% within a 450 m radius.

The area types surrounding the nearest noise sensitive receiver are indicated in Figure 2.

Table 2: Traffic count data (MRWA)

Location	Average Daily Traffic Volume					
	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Selby St (North of Nash St)	18,093	-	19,676	-	19,880	14,161
Raliway Rd (Subiaco Karrakatta - North of Aberdare Rd)	-	-	20,967	23,740	-	22,921

Figure 2: Influencing factor (IF) calculation - zoning map



Source: IntraMaps

2.1.1 Assigned Noise Levels

summarises the resulting assigned noise levels at the nearest noise sensitive receiver. It is required that all noise emissions from the development are kept to a level that is below the assigned noise level for a given period of the day and at the boundary of the receivers.

Table 3: Assigned noise levels

Type of premises receiving noise	Time of day	Assigned Noise Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	49	59	69
	0900 to 1900 hours Sunday & 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 & public holidays	39	49	59
Noise sensitive premises: any area other than highly sensitive area	All Hours	60	75	80
Commercial premises	All Hours	60	75	80
Industrial and utility premises	All Hours	65	80	90

2.1.2 Noise Character Adjustment

The regulation also requires that the noise character must be "free" of annoying characteristics, namely; tonality, modulation and impulsiveness. If these characteristics cannot be reasonably and practicably removed, then a series of adjustments to the measured levels are required, shown in Table 4.

Table 4: Noise character adjustment

Adjustment where noise emission is not music (Cumulative to a maximum of 15 dB)			Adjustment where noise emission is music	
Where tonality is present	Where modulation is present	Where impulsiveness is present	Where impulsiveness is not present	Where impulsiveness is present
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB

The EPNR assigned noise levels only apply to the noise receiving premises and do not apply to noise within the site of the proposed development. It is important that noise emissions from the site have no tonality, modulation or impulsiveness present.

Given the data available from air conditioning unit manufacturers is generally limited to broadband data or in 1/1 octaves, it is not possible to objectively determine tonality as described in the Noise Regulations. One-third octave band data is required and this information is not typically available. Therefore, a 5 dB penalty will be conservatively applied to assigned noise levels in for all assessments.

2.2 Sound Transmission and Insulation – NCC 2016

The acoustic requirements for inter-tenancy walls, floors etc. in residential buildings are outlined in the National Construction Code 2016 Volume 1, Building Code of Australia Class 2, 3 and 9c Buildings (NCC). Requirements based on NCC 2016 are summarised in Table 5.

Table 5: Sound insulation requirements in accordance with NCC 2016

Construction	Condition	Deemed-to-Satisfy Requirements	Verification Requirements
Walls	**Airborne Sound Insulation**		
	Between sole-occupancy units	Minimum $R_w + C_{tr}$ 50	Minimum $D_{nT,w} + C_{tr}$ 45
	Between a sole-occupancy unit and a plant room, lift shaft, stairway corridor, public corridor or the like	Minimum R_w 50	Minimum $D_{nT,w}$ 45
	Impact Sound Insulation		
	Between a laundry, kitchen, bathroom or sanitary compartment in a sole-occupancy unit, and a habitable room in an adjoining unit	Discontinuous construction [1)]	As deemed to satisfy
	Between a sole-occupancy unit and a plant room or lift shaft	Discontinuous construction [1)]	As deemed to satisfy
Floors	**Airborne Sound Insulation**		
	Between sole-occupancy units and between sole occupancy unit and lift shaft, stairway or public corridor	Minimum $R_w + C_{tr}$ 50	Minimum $D_{nT,w} + C_{tr}$ 45
	Impact Sound Insulation		
	Between sole-occupancy units and between sole occupancy unit and lift shaft, stairway or public corridor	Maximum $L_{n,w}$ 62	Maximum $L_{nT,w}$ 62
Services	**Airborne Sound Insulation**		
	Between a habitable room (other than a kitchen) in a sole-occupancy unit and a duct, soil, waste or water supply pipe duct (if the duct or pipe is located in a wall or floor cavity and serves or passes through more than one sole-occupancy unit)	Minimum $R_w + C_{tr}$ 40	N/A

Construction	Condition	Deemed-to-Satisfy Requirements	Verification Requirements
	Between a kitchen or non-habitable room in a sole-occupancy unit and a duct, soil, waste or water supply pipe duct (if the duct or pipe is located in a wall or floor cavity and serves or passes through more than one sole-occupancy unit	Minimum $R_w + C_{tr}$ 25	N/A
	If a storm water pipe passes through a sole-occupancy unit (habitable room other than kitchen)	Minimum $R_w + C_{tr}$ 40	N/A
	If a storm water pipe passes through a sole-occupancy unit (kitchen or non-habitable room)	Minimum $R_w + C_{tr}$ 25	N/A

1) For the purposes of this Part, "discontinuous construction" means a wall having a minimum 20 mm cavity between 2 separate leaves.

- For masonry, where wall ties are required to connect leaves, the ties are of the resilient type; and
- For other than masonry, there is no mechanical linkage between leaves except at the periphery.

2.3 State Planning Policy 5.4

State Planning Policy 5.4 (SPP 5.4) establishes the outdoor noise criteria that apply to a noise sensitive land use due to noise emissions from road and rail transport.

The SPP 5.4 does not apply to this project as the development:

- Is not located within 300m of any major freeway, primary freight road, freight railway or terminal; and
- Is not located within 100m of any passenger railway or secondary road.

The most recent traffic count for Selby St to the east of the project site was obtained from the Mainroads WA website for the year 2015/2016 and show that the number of average cars per day was below 20,000 (14,161), which would not qualify Selby St as a primary road. It is also noted that the proposed development is just in excess of 300m away from Railway Road, which does not trigger the SPP 5.4 assessment. The report from Mainroads WA showing this has been included in APPENDIX B.

2.4 Internal Noise Levels

The criteria recommended in Table 6 are based on the limits presented in the AS/NZS 2107:2016 'Acoustics – Recommended design sound levels and reverberation times for building interiors' (AS2107). The levels stated in AS2107 apply to the combined internal noise levels from building services and external sources.

AS2107 provides recommended internal noise levels (defined as the equivalent continuous A-weighted sound pressure level – $L_{Aeq,t}$) for optimising the acoustic amenity in occupied spaces. The level of noise in an enclosed space typically consists of noise from building services and/or noise intrusion due to external sources (e.g. traffic).

Table 6: Design internal noise level

Type of occupancy/activity	Internal Noise Level, L_{Aeq} dB(A)
Residential	
Sleeping areas (night time)	35 - 40
Living areas	35 – 45
Work areas	35 - 45
Apartment common areas	45 – 50
Commercial	
Enclosed carpark	< 65
Supermarket	< 55
Bars and lounges	45 - 50
Offices	40 - 45
Small retail stores	45 - 50
Specialty shops	<55
Café	45 - 50

Type of occupancy/activity	Internal Noise Level, L_{Aeq} dB(A)
Toilets/Amenities	45 - 55

Rain Noise

The internal noise levels indicated in Table 6 shall not exceed by more than 5 dB above the lower criteria limit outlined in AS2107 due to rainfall. Typically, the assessment is based on a rainfall rate of 15mm/hour, which is considered appropriate assessment method for non-tropical areas of Australia.

2.5 Vibration

Vibration isolation of mechanical plant and equipment must limit vibration levels within buildings to comply with the recommended vibration levels as set out in British Standard BS 6472-1:2008 Guide to evaluation of human exposure to vibrations in buildings, Part 1: Vibration sources other than blasting is applied (BS 6472.1).

The vibration criteria for activities in the gym and outdoor pool shall not exceed curve 1.4 (x, y, z axis) for the residential properties at night time period. The assessment of vibration transfer is as detailed in AS2670-1990 Evaluation of human exposure to whole body vibration – Part 2 Continuous and shock induced vibration in buildings.

Vibration generated in the gym and outdoor pool shall be classified as continuous or intermittent. This includes quasi-stationary vibration caused by repetitive shocks (shock is defined in ISO 2041:1975, clause 3, and is sometimes referred to as transient (impulsive) vibration.

3. Noise Intrusion Assessment

The main sources of noise considered in the noise intrusion assessment for the noise sensitive development on Lot 37 of the Montario Quarters are traffic noise from Selby Street and mechanical plant noise from the development itself. The acceptable internal noise level targets are defined in Table 6.

Once the details of the mechanical schedule and layout are provided at the later stages of the design, WGE will address these accordingly.

For the purpose of this noise intrusion assessment, the effects of noise from Selby Street on the proposed development has been assessed and modelled using the noise modelling software SoundPLAN 8.0.

3.1 Methodology

Noise modelling software SoundPLAN 8.0 was used to ascertain the noise levels at 1 metre from each façade and each floor level of the proposed development.

The noise assessment conducted has been based on the methodology described by the Calculation of Road Traffic Noise algorithm (CoRTN, UK Transport Agency). This algorithm considers a number of factors, including:

- Traffic volume during each period of the day;
- Average traffic speeds;
- Height of each individual noise source (passenger vehicles, heavy vehicles – engine and exhaust)
- Percentage of heavy vehicles; and
- Gradient and surface of road.

3.1.1 Traffic Volumes

Current traffic volumes were obtained from the Main Roads Western Australia (MRWA) to determine the proportion of day/night vehicle volumes, as well as the percentage of heavy vehicles that transit Selby St. Table 7 shows the data obtained from the MRWA traffic count system.

Table 7: Selby Street Traffic Count History

Location	Average Daily Traffic Volumes/Percentage of Heavy Vehicles					
	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Selby St (North of Nash St)	-	-	19,676 (4%)	-	19,880 (4%)	14,161 (4%)

3.1.2 Predicted External Noise Levels

Table 8 summarises the predicted maximum day and night external noise levels at residential units predicted by the noise model for the most recent traffic conditions in Table 7 (2015/2016).

Table 8: Predicted Traffic Noise Levels

Section of Building	Floor	Façade Facing Direction	Highest Predicted Day L_{Aeq} dB(A)	Highest Predicted Night L_{Aeq} dB(A)
Podium	Mezzanine	East	70	63
		North	62	56
		South	62	55
		West	47	47
Tower South	F4	East	68	60
	F4	South	64	57
	F3	North	54	50
	F5	West	46	43
Tower North	F4	East	67	60
	F2	North	64	57

Section of Building	Floor	Façade Facing Direction	Highest Predicted Day L_{Aeq} dB(A)	Highest Predicted Night L_{Aeq} dB(A)
	F4	South (Shielded)	57	48
	F5	West	47	39

3.2 Façade Acoustic Assessment

Noise break-in calculations to residential bedrooms and living areas were undertaken based on the predicted external noise levels for future traffic conditions. Calculations were undertaken following the methodology described in British Standard BS EN 12354:2000 in order to determine suitable glazing, wall, and roof configurations for sensitive spaces at the façade.

The sound spectrum used for the assessment were based on predicted external sound levels from Table 8 as well as the traffic spectrum levels in the ISO 717 guideline.

Based on the composite sound reduction index, the noise intrusion has been calculated for the individual façade elements, which is relative to their surface area. The construction configurations have been designed to achieve the acceptable indoor noise levels of $L_{Aeq(Day)}$ of 40dB(A) in living and work areas and $L_{Aeq(Night)}$ of 35dB(A) in bedrooms.

Day time noise levels from Table 8 were used to perform the assessment for the living rooms and the night time noise levels were used to perform the assessment for bedrooms.

3.2.1 External Glazing (Preliminary)

Preliminary glazing configurations to achieve the required internal noise levels have been provided for all residential units, taking into consideration the predicted external noise levels. This configuration is to achieve acceptable internal noise levels considering road traffic noise only. Assessment of glazing configuration to mitigate noise intrusion from other sources near the project will be undertaken at a later stage of the project.

Table 9 summarises the general requirements for each space. A mark-up is also provided in Appendix C showing the glazing requirements for each area of the development.

Table 9: External glazing requirements (preliminary)

Location	Glazing Option	Glazing Description	$R_W + C_{tr}$	Spectrum Sound Transmission Loss (dB)						
				63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
East Facing Living Room	Single	8.38 mm laminated glass	**31**	18	22	26	31	35	36	44
	Double	6mm glass + 12mm air gap + 6.38mm laminated glass	**33**	22	24	24	35	43	44	49
East Facing Bedroom	Single	8.38 mm laminated glass	**31**	18	22	26	31	35	36	44
	Double	6mm glass + 12mm air gap + 6mm glass	**29**	22	23	19	36	45	41	43
North, South and West Facing Bedroom and Living Room	Single	6.38 mm laminated glass	**29**	15	19	24	29	33	35	41
	Double	6mm glass + 12mm air gap + 6mm glass	**29**	22	23	19	36	45	41	43

Further Design Considerations

A detailed noise survey will be conducted in the later stages of the project and the glazing configurations will be reviewed based on the noise survey results.

3.2.2 External Walls

External walls to residential units are required to achieve $R_W + C_{tr}$ 45 as a minimum to achieve acceptable internal noise levels.

Wall configurations to achieve this performance will be provided when the preferred construction method has been determined.

3.2.3 Roof Construction

Roof construction is required to control external noise intrusion due to rain and traffic noise emissions, in order to meet internal noise level requirements detailed in AS2107. The following roof construction is recommended as a minimum in order to achieve this performance:

- Colorbond roof with 75mm anticon insulation with suspended plasterboard ceiling and 50mm insulation in ceiling space (minimum 14kg/m^3). Plasterboard to be 10mm standard plasterboard.

4. Noise Emissions

Noise emissions assessment was conducted to assess the noise impact from the proposed development at the nearest sensitive receivers. A 3D noise model was developed in the noise modelling software package SoundPLAN 8.0 and used to predict the noise emission levels. Compliance to the EPNR assigned noise levels at Victoria House, 1A Selby St, has been assessed and noise mitigation measures provided.

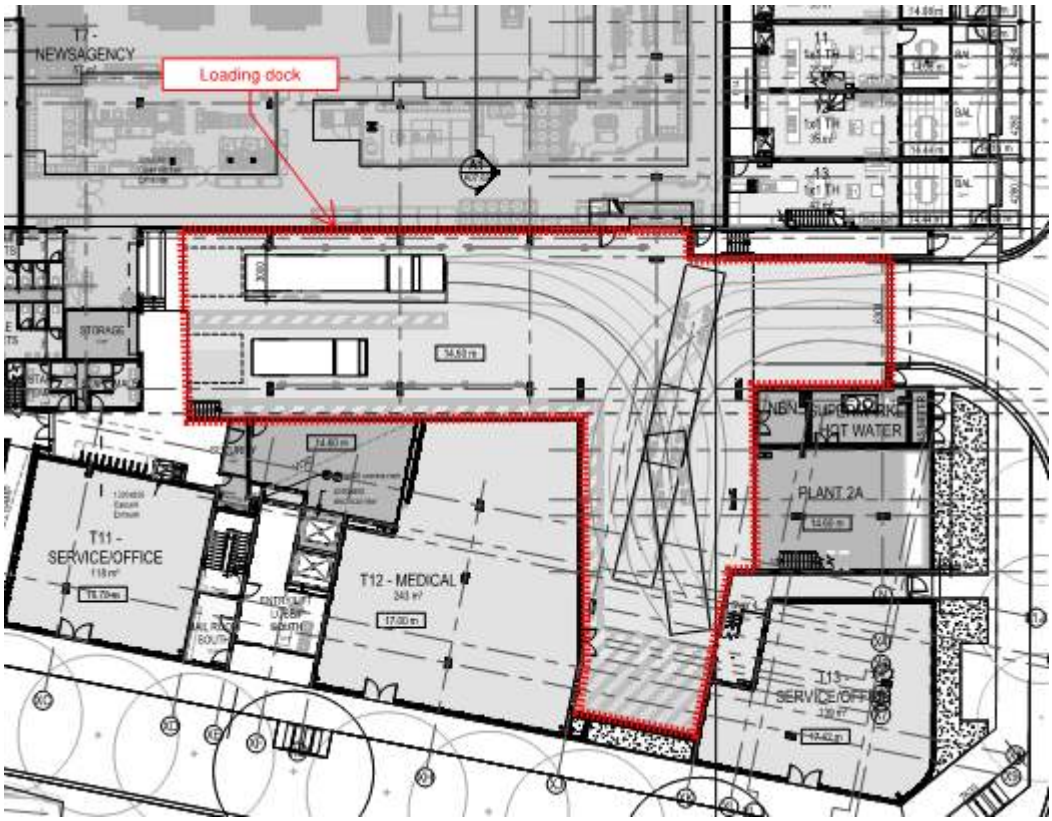
Based on the architectural drawings provided by Cameron Chisholm Nicol (dated 26th September 2018), the expected main sources of noise emission for the project is listed below:

- Plant room (lower ground, ground and mezzanine levels);
- Exposed roof plant;
- Loading dock;
- Common outdoor areas on the podium; and

4.1 Noise Model – Loading Dock

The loading dock is proposed to be located on the south east side of the ground floor, which will be used by the delivery trucks for the supermarket and commercial tenancies with an entry way on Selby St. The layout of the loading dock along with the truck movement paths are shown in Figure 3.

Figure 3: Loading Dock Location



Noise emissions from truck movements and associated operations within these areas are generally formed by a combination of successive and transient, noise events. This typically includes:

- Moving truck (engine noise, acceleration, deceleration, brake squeals, compression release);
- Truck unloading activities (forklifts, pallet jacks, hydraulic lifts); and
- Reversing alarms (beepers).

4.1.1 Noise Model Inputs

The ISO 9613-1:1998 industry noise propagation standard was used for the noise model predictions with a reflection order of 3. The noise model has taken into account noise source levels, distance from the source to receivers, and screening effects due to existing, proposed buildings and ground topology.

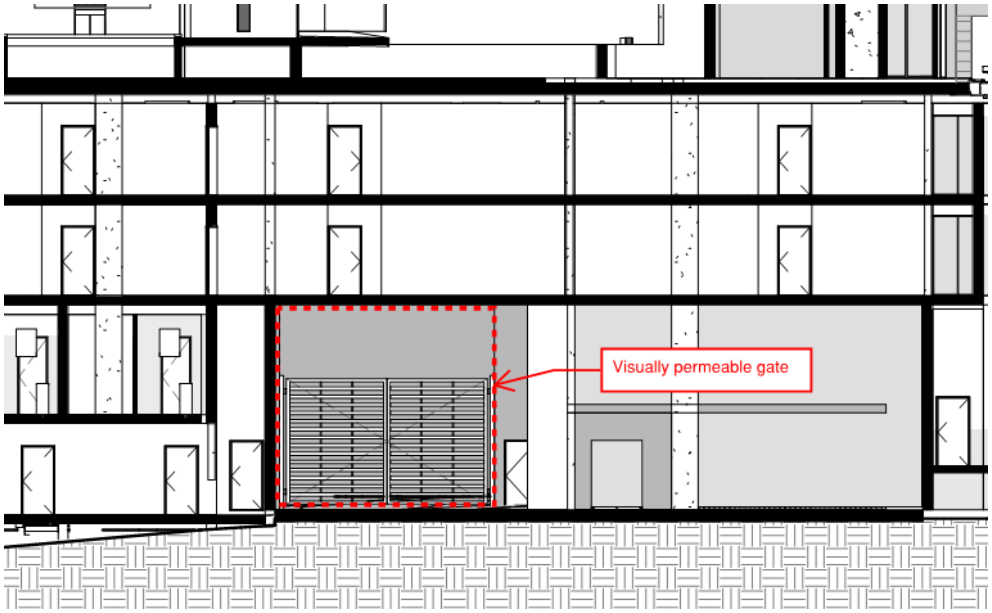
Ground Condition

To suit the current conditions of the project location, a ground condition of 0.6 has been used in the model, which is in between a soft ground condition (1) and a reflective ground condition (0).

Loading Dock Gate

Based on the latest architectural drawings, a visually permeable gate with an opening above has been proposed for the loading dock. This is illustrated in Figure 4.

Figure 4: Loading Dock Gate



As the proposed gate configuration has little to no sound insulation performance, the loading dock has been modelled with an opening and no gate in order to replicate this.

Noise Sources

The noise model has considered one moving truck and one idle truck at any one time as the worst case scenario:

- Moving truck: Entering the loading dock and reversing into the truck parking lot; and
- Idle truck: Truck is parked and being unloaded.

The sound power levels used in the model have been summarised in Table 10.

Table 10: Sound Power Levels of Noise Sources

Noise Source	Loading Dock	Sound Power Level, dB(A)
Large sized trucks driving	Supermarket and commercial	102(1)
Large sized truck unloading activities		95(1)

1. Noise levels obtained from previous measurements of similar noise sources on WGE projects.

Operating Times and Truck Numbers

The following operating times were assumed for each loading dock, based on information provided by the client:

- Monday to Saturday: 0700 AM – 2200 PM;
- Sunday: 0900 AM – 2200 PM.

Table 11 details the number of truck movements simulated for each loading dock.

Table 11: Number of trucks using the loading dock

Loading/Service Bay	Monday to Saturday Day (0700 AM – 1900 PM) & Sunday/PH Day (0900 AM – 1900 PM)	Evening (1900 PM – 2200 PM)	Monday to Saturday Night (2200 PM – 0700 AM) & Sunday/PH Night (2200 PM – 0900 AM)
Supermarket & Commercial	26 (Monday to Saturday) & 20 (Sunday)	1	None

ASSESSMENT PARAMETERS

The application of the assessment criteria is purely dependant on the duration of activity within the representative assessment period. The noise emissions from loading docks are assessed to the L_{A1} criteria of the EPNR due to the short duration of the events. Each truck event has been assumed to be over a period of 2 minutes.

The internal noise sensitive receivers are not required to be compliant to the EPNR criteria but has been included in the assessment achieve acceptable internal noise levels.

4.1.2 Results

The predicted noise levels due to the loading dock at internal and external noise sensitive receivers have been summarized in Table 12. Noise contours have been provided in APPENDIX D.

Table 12: Predicted Loading Dock Noise Emission Levels

Noise Receiver	Predicted Noise Level L_{A1} dB(A)	Period	EPNR Criteria dB(A)	Compliance to EPNR
Internal Receiver – Apartment units on ground floor	43	Day	L_{A10} 49	**Yes**
		Evening and Sunday/PH	L_{A1} 54	**Yes**
10 Lonnie St	47	Day	L_{A10} 49	**Yes**
		Evening and Sunday/PH	L_{A1} 54	**Yes**
8 Lonnie St	43	Day	L_{A10} 49	**Yes**
		Evening and Sunday/PH	L_{A1} 54	**Yes**
1 Selby St	42	Day	L_{A10} 49	**Yes**
		Evening and Sunday/PH	L_{A1} 54	**Yes**
Victoria House	9	Day	L_{A10} 49	**Yes**
		Evening and Sunday/PH	L_{A1} 54	**Yes**

The predicted noise levels at all sensitive receivers including internal apartment units are compliant to the EPNR criteria at all periods of the day. Therefore, no treatments are required.

Noise levels at the façade of the internal apartment units are also compliant to the EPNR criteria at all periods. Furthermore, the glazing configurations have been designed to achieve the recommended internal noise levels due to noise impact from the traffic, which is significantly higher than the noise impacts due to the loading dock.

Should the loading dock be used during night time periods, it is recommended that visually flashing reverse shall be used instead of noise emitting beepers.

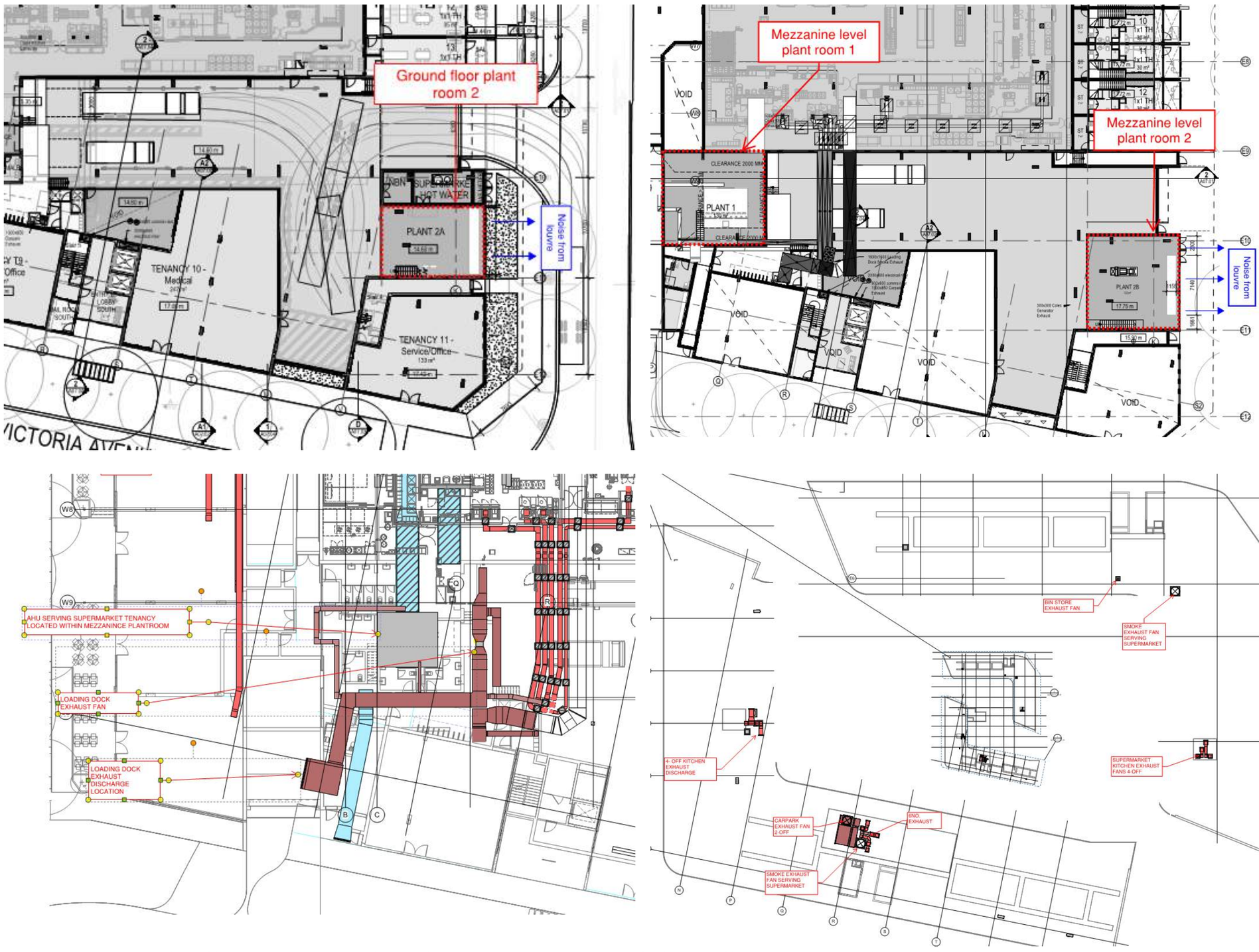
4.2 Noise Model - Mechanical Equipment

According to the latest architectural drawings and information provided by the mechanical engineer working on the project, the following items have been identified as noise emissions sources that are to comply with the EPNR Criteria at the nearest sensitive receiver as well as at the façade of the apartment units:

- AHU intake/discharge to the southern façade of the building on the mezzanine level. The AHU unit itself is housed within Plant room 1, which is located to the rear west of the loading dock on the mezzanine level;
- Supermarket loading dock exhaust fan discharging into the commercial loading dock on level;
- Supermarket refrigeration condensers within Plant room 2, which located on the south east façade of the building on the ground floor, with louvres discharging to Selby St; and
- Exhaust fans on the roof top plant.

The locations of these noise sources have been illustrated in Figure 5.

Figure 5: Noise Emission Source Locations



Note: Ground level drawing (top left), mezzanine level drawing (top right), ground level loading dock exhaust fan (bottom left) and AHU and exhaust fans on roof level (bottom right).

4.2.1 Noise Model Inputs

The ISO 9613-1:1998 industry noise propagation standard was used for the noise model predictions with a reflection order of 3. The noise model has taken into account noise source levels, distance from the source to receivers, and screening effects due to existing, proposed buildings and ground topology.

Noise Sources

The noise levels for the mechanical equipment servicing the development was provided by the mechanical engineer and have been summarised in Table 10.

Table 13: Sound Power Levels of Noise Sources

Location	Noise Source	Sound Power Level, dB(A)
Roof	Carpark exhaust fan	90
	Supermarket loading dock exhaust fan	75
	Supermarket kitchen exhaust fan	70
	Restaurant tenancy kitchen exhaust fan	75
	Bin store exhaust fan	55
	Supermarket smoke exhaust fan	97
Ground floor discharge outlets	Supermarket AHU	91
	Loading dock exhaust fan(1)	85
Ground and mezzanine plant room	Supermarket refrigeration condenser(2)	88

1. No spectrum data available at this stage, only overall sound power level was provided. Spectrum data for similar exhaust fan used in assessment.
2. No sound data provided by the supermarket contractor. Typical supermarket refrigeration condenser sound data used in assessment.

Ground Condition

To suit the current conditions of the project location, a ground condition of 0.6 has been used in the model, which is in between a soft ground condition (1) and a reflective ground condition (0).

Methodology

Multiple scenarios had been considered in the assessment as it is understood that the supermarket smoke exhaust fans will only be used during emergencies and during testing periods. Noise from the apartment facilities including the carpark exhaust fan and bin store exhaust fan were also not considered to be part of the noise emission assessment to the apartment units as they are servicing the apartment units.

As such, two scenarios were considered for the assessment in order to assess the scenario where the smoke exhaust fans are being used separately:

- Scenario A (excludes smoke exhaust fan):
  - Day, evening and Sunday/PH periods - All mechanical equipment excluding the smoke exhaust fans; and
  - Night - All mechanical equipment servicing the apartments and the supermarket refrigeration condenser units.
- Scenario B (includes smoke exhaust fan):
  - Day time only – Smoke exhaust fans & All other mechanical equipment.

ACOUSTIC TREATMENTS

Following acoustic treatments have been allowed for in the noise model based on the preliminary iterations.

- Condenser plant room:
  - Condenser plant room will require the walls to be lined with acoustically absorptive insulation; and
  - Acoustic louvre or acoustic attenuator to be installed in the condenser plant room.
- Roof:
  - Solid noise barrier at least 1 m above the height of the mechanical equipment and a maximum of 0.5m away from the equipment; OR
  - The use of acoustic attenuators.
- Loading dock exhaust fan:
  - 25mm internal acoustic lining to the first run of hard duct including the first elbow bend.

- Smoke Extract fans
  - Routine monthly testing of the SEFs is expected to occur during the daytime period (as defined by the EPNR) and for duration of up to 2 hrs.
  - Where a non-compliant noise emission from a premise is occurring or is expected to occur, for the purpose of meeting a temporary emergency (a period of less than 14 days), the CEO of the Department of Environment and Conservation (DEC) is able to grant an exemption (orally or in writing) of the EPNR for up to 14 days under Section 75 of the Environmental Protection Act 1986 (EPA). The incident should be reported via the Pollution Incident line on 1300 784 782.

4.2.2 Results

SCENARIO A

The predicted noise levels at the sensitive receivers for Scenario A have been summarised in Table 14.

Table 14: Predicted noise levels – Scenario A

Noise Receiver	Predicted Noise Level dB(A)[2]	Period	EPNR Criteria L_{A10} dB(A)	Compliance to EPNR
Internal Receiver – Apartment units[1]	43	Day	49	**Yes**
		Evening and Sunday/PH	44	**Yes**
	38	Night	39	**Yes**
10 Lonnie St	35	Day	49	**Yes**
		Evening and Sunday/PH	44	**Yes**
	34	Night	39	**Yes**
8 Lonnie St	32	Day	49	**Yes**
		Evening and Sunday/PH	44	**Yes**
	30	Night	39	**Yes**
1 Selby St	38	Day	49	**Yes**
		Evening and Sunday/PH	44	**Yes**
	38	Night	39	**Yes**
Victoria House	36	Day	49	**Yes**
		Evening and Sunday/PH	44	**Yes**
	34	Night	39	**Yes**

1. Noise emission assessment for apartment unit does not include noise impacts from the mechanical equipment servicing the apartment itself (carpark exhaust fan and bin store exhaust fan)
2. Includes tonality correction of +5dB.

The predicted noise levels at the nearest sensitive receivers due to the mechanical equipment servicing the development were compliant to the EPNR criteria for all periods . No acoustic treatments are required at this stage.

SCENARIO B

The predicted noise levels at the sensitive receivers for Scenario B have been summarised in Table 15.

Table 15: Predicted noise levels – Scenario B

Noise Receiver	Predicted Noise Level dB(A)[2]	Period	EPNR Criteria L_{A10} dB(A)	Compliance to EPNR
Internal Receiver – Apartment units[1]	55	Day	49	**No (Exceeds by 6 dB)**
10 Lonnie St	38	Day	49	**Yes**
8 Lonnie St	37	Day	49	**Yes**
1 Selby St	41	Day	49	**Yes**
Victoria House	36	Day	49	**Yes**

1. Noise emission assessment for apartment unit does not include noise impacts from the mechanical equipment servicing the apartment itself (carpark exhaust fan and bin store exhaust fan).
2. Includes tonality correction of +5dB.

As shown in Table 15, the predicted noise levels due to all the mechanical exhaust fans including the smoke exhaust fans are compliant to the EPNR criteria at all identified external receivers. A 6 dB exceedance is predicted within the internal apartments.

It is expected that the noise emissions levels will achieve compliance once any of the following mitigation strategies are incorporate, pending detailed information from the mechanical engineer:

- Construction of solid noise barriers around the smoke exhaust fans;
- The use of acoustic attenuators for the supermarket smoke exhaust fan or possibly reselection of quieter equipment; and
- Testing of the smoke exhaust fans shall only be carried out between 0700 AM and 1900 PM on Mondays-Saturdays.

The recommendations provided above are preliminary only and will be reviewed once detailed information regarding the mechanical equipment has been provided by the mechanical engineer. It is expected that once the mitigation strategies and treatment recommendations have been implemented, that the noise emission levels at the nearest sensitive receivers as well as the apartment units will be compliant to the EPNR criteria.

Where equipment details are not available, limiting sound levels will be nominated to the tenant and mechanical engineer for the apartment building.

5. Conclusion

Noise impact on the proposed mixed use development due to Selby St was determined. The software package SoundPLAN 8.0 was used to predict the future noise levels at the façade of the apartment units. The required glazing configurations for living areas and bedrooms of the apartment units within the development were selected in order to meet the criteria stated in the AS2107. It is noted that these are preliminary design recommendations only and will be reviewed at later stages of the project.

Noise emissions due to the loading dock activities and mechanical equipment have been assessed. Noise models have been produced in the software package SoundPLAN 8.0 in order to predict the noise levels at the nearest noise sensitive receiver as well as the internal apartment units.

As a result of the assessment, the predicted noise levels at sensitive receivers due to the loading dock, including the internal apartment units, were shown to comply to the L_{A1} criteria of the EPNR at all times of the day. Hence, no acoustic treatments are required for the loading dock.

The noise emission assessment due to the mechanical equipment was carried out for two scenarios:

- Scenario A (excludes smoke exhaust fan):
- Scenario B (includes smoke exhaust fan):

The predicted noise levels at all external sensitive receivers due to the mechanical equipment were also shown to comply to the L_{A10} criteria at all times of the day for Scenario A. No treatments are required at this stage.

The predicted noise levels for Scenario B at all external sensitive noise receivers were shown to comply to the L_{A10} day time criteria. The predicted noise levels to the internal apartment units exceeded the EPNR L_{A10} criteria by 6 dB. Preliminary acoustic treatments and mitigation strategies have been recommended for compliance to the EPNR.

As a result of WGE's initial acoustic review, the following items have been identified as those that will require ongoing review to achieve compliance with the applicable regulations or acoustic design standards:

- Façade design to ensure compliance to AS2107
- Noise emissions from the development including plant rooms and loading dock are to comply with the assigned noise levels calculated by the method disclosed in the Environmental Protection (Noise) Regulations 1997, at the nearest noise sensitive receiver.
- Noise emissions to the internal apartment units to achieve appropriate internal noise levels as per the AS2107.
- WGE will provide advice during the progression of the design to satisfy and comply with the requirements outlined in the National Construction Code (NCC 2016).

All preliminary treatments recommendations will be updated once the detailed mechanical design and selections have been provided.

APPENDIX A Glossary of Acoustic Terms

Term	Description
A-weighting	A frequency dependent filter applied to an instrument-measured noise. In its simplest form, the filter is designed to replicate the relative sensitivity to loudness perceived by the human ear.
Acoustic Barrier	Solid walls or partitions, solid fences, earth mounds, earth berms, buildings, etc. used to reduce noise.
Ambient Noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Background Noise	A term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed.
C_{tr}	A standard weighting curve which replicates low frequency noise, such as that from traffic. Often added to $D_{nT,W}$ or R_W to characterise airborne sound insulation performance.
dB	The abbreviation for decibel.
dB(A)	A-weighted sound level in decibels.
$D_{nT,W}$	Similar to D_W, $D_{nT,W}$ is the weighted standardised level difference, which also considers reverberation and background noise level of the receiver room.
D_W	A single number value that represents a field measurement of the weighted level difference between two adjacent spaces separated by a partition. $D_W = L_1 - L_2$ where, L_1 is the average sound pressure level in the source room; and L_2 is the average sound pressure level in the receiver room.
Extraneous Noise	Noise resulting from activities that are not typical of the area. Atypical activities include construction, and traffic generated by holidays period and by special events such as concert or sporting events. Normal daily traffic is not considered to be extraneous.
Flanking Path	The transmission of sound from a source room to a receiving room by paths other than through the separating partition i.e. via the ceiling, unsealed gaps and cracks or ineffective door seals etc.
Frequency	Frequency is synonymous to pitch. Frequency or pitch can be measured on a scale in units of Hertz (Hz). Most noise sources typically comprise of a vast, and often complex, range of frequencies.
L_{A1}	The A-weighted sound pressure level exceeded for 1% of the measurement time period.
L_{A10}	The A-weighted sound pressure level exceeded for 10% of the measurement time period.
L_{A90}	The A-weighted sound pressure level exceeded for 90% of the measurement time period. Typically represents the background noise level of an environment.
L_{Aeq}	The equivalent continuous sound pressure level in dB(A). It is often accompanied by an additional suffix "T", which is indicative of the measurement time period. (e.g. $L_{Aeq,15min}$, symbolising the measurement is evaluated over 15-minutes.)
L_{Amax}	The maximum A-weighted sound pressure level recorded over the measurement period.
Noise Logger	A sound level meter situated at a particular point of interest. The instrument is typically for an extended period in order to ascertain typical noise patterns associated with the measurement position.

Term	Description
Reflection	Sound wave changed in direction of propagation due to a solid object met on its path.
Reverberation	The persistence of a sound within a space, which will naturally decay over time. Most apparent once the source signal has ceased emitting. Reverberation may have effects on speech intelligibility if not adequately controlled. Reverberation time, represented in seconds, can vary depending on the volume and surface finishes of the space.
R_W	A single number value which represents the airborne sound insulation performance of a partition or building element that has been determined under laboratory testing conditions.
Sound Level Meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound Absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound Power Level (L_W or SWL)	The total sound energy radiated by a source, expressed in Watts. The sound power level is ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Sound Pressure Level (L_P or SPL)	The measured acoustic wave strength in a given environment and at a particular point of interest where the total sound level expressed is relative to a reference pressure, i.e. the threshold of human hearing. Sound pressure level is typically measured using a standard sound level meter with a microphone, expressed in decibels (dB).
T_{mf}	Describe in AS/NZS 2107:2016 as the arithmetic average of the reverberation time in octave bands at 500 Hz & 1000 Hz.
Tonal Noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B – Selby St 2015/16 Report (Mainroads WA)

mainroads WESTERN AUSTRALIA

SITE 0481

Hourly Volume

Selby St (1270015)

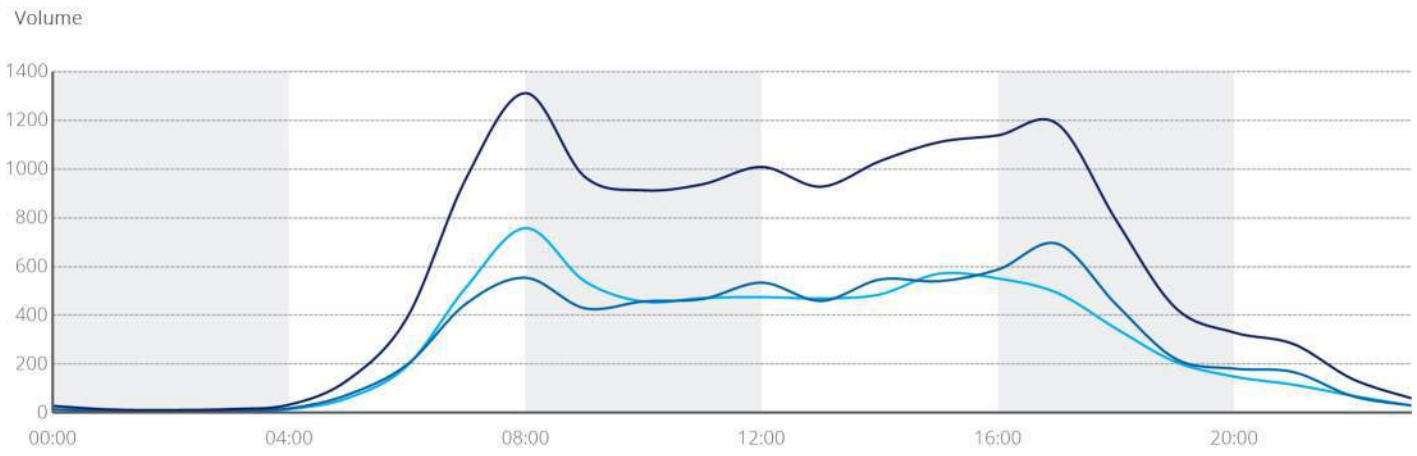
North of Nash St (SLK 0.62)

2015/16
Monday to Friday

	All Vehicles			Heavy Vehicles			
	NB	SB	Both	NB	SB	Both	%
00:00	14	14	28	1	0	1	3.6
01:00	7	6	13	0	0	0	0.0
02:00	4	7	11	1	1	2	18.2
03:00	5	10	15	0	1	1	6.7
04:00	15	18	33	2	2	4	12.1
05:00	61	75	136	3	6	9	6.6
06:00	194	199	393	19	13	32	8.1
07:00	517	449	966	26	23	49	5.1
08:00	758	554	1312	36	26	62	4.7
09:00	540	429	969	27	29	56	5.8
10:00	456	457	913	33	24	57	6.2
11:00	471	467	938	30	22	52	5.5
12:00	475	534	1009	28	18	46	4.6
13:00	469	459	928	25	16	41	4.4
14:00	486	547	1033	28	17	45	4.4
15:00	571	540	1111	30	16	46	4.1
16:00	551	588	1139	21	16	37	3.2
17:00	492	694	1186	19	15	34	2.9
18:00	345	444	789	9	13	22	2.8
19:00	209	222	431	6	4	10	2.3
20:00	148	181	329	2	3	5	1.5
21:00	115	167	282	1	2	3	1.1
22:00	70	68	138	3	1	4	2.9
23:00	29	30	59	1	0	1	1.7
TOTAL	7002	7159	14161	351	268	619	4.4

Peak Statistics

AM	TIME	08:00	07:45	08:00	08:00	09:00	08:00
	VOL	758	562	1312	36	29	62
PM	TIME	15:30	16:45	16:45	15:00	15:45	15:30
	VOL	579	699	1205	30	19	47



DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE 16-Nov-2018

FILE 08-50167-1

SITE 0481

Hourly Volume

Selby St (1270015)

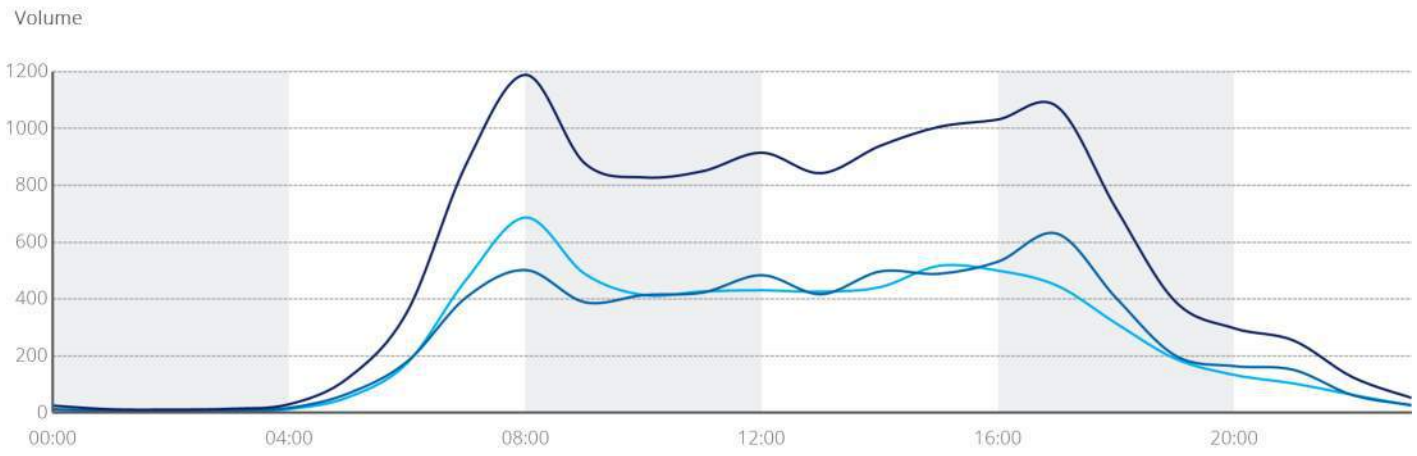
North of Nash St (SLK 0.62)

2015/16
Monday to Sunday

	All Vehicles			Heavy Vehicles			
	NB	SB	Both	NB	SB	Both	%
00:00	13	12	25	1	0	1	4.0
01:00	6	6	12	0	0	0	0.0
02:00	4	7	11	1	1	2	18.2
03:00	5	9	14	0	1	1	7.1
04:00	13	17	30	2	2	4	13.3
05:00	55	68	123	3	5	8	6.5
06:00	176	181	357	17	12	29	8.1
07:00	470	407	877	25	21	46	5.2
08:00	687	502	1189	33	22	55	4.6
09:00	489	389	878	24	27	51	5.8
10:00	414	414	828	30	22	52	6.3
11:00	427	423	850	27	20	47	5.5
12:00	431	484	915	25	16	41	4.5
13:00	426	417	843	23	15	38	4.5
14:00	442	497	939	26	16	42	4.5
15:00	517	489	1006	26	14	40	4.0
16:00	500	532	1032	19	13	32	3.1
17:00	447	630	1077	18	14	32	3.0
18:00	314	403	717	9	12	21	2.9
19:00	190	201	391	6	4	10	2.6
20:00	133	164	297	1	3	4	1.3
21:00	103	151	254	0	2	2	0.8
22:00	63	62	125	2	1	3	2.4
23:00	25	27	52	0	0	0	0.0
TOTAL	6350	6492	12842	318	243	561	4.4

Peak Statistics

AM	TIME	08:00	07:45	08:00	08:00	09:00	08:00
	VOL	687	509	1189	33	27	55
PM	TIME	15:30	16:45	16:45	13:45	17:30	14:00
	VOL	525	634	1094	28	17	42



DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE	FILE
16-Nov-2018	08-50167-1

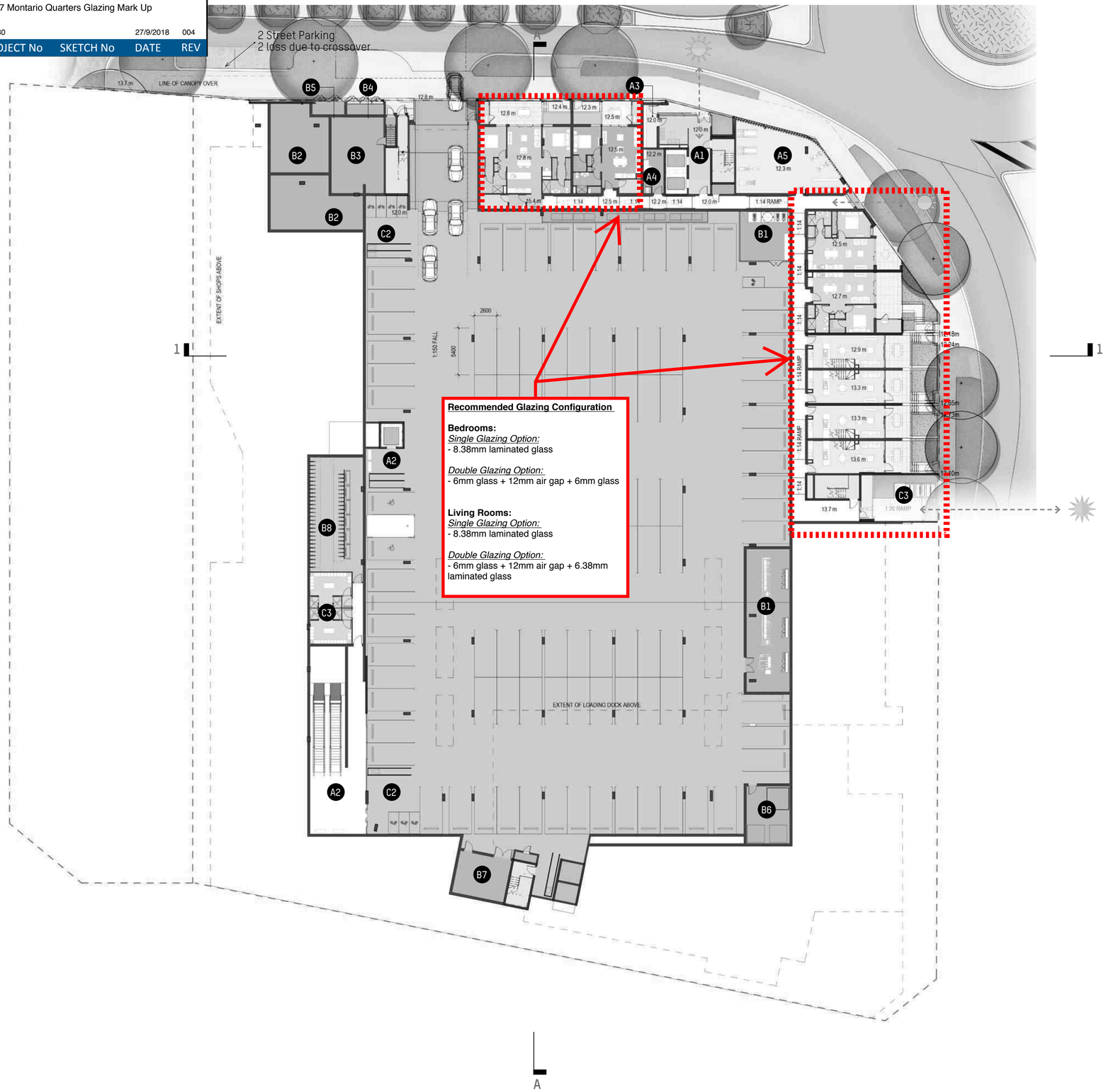
APPENDIX C Glazing Recommendations Mark-up

WOOD & GRIEVE ENGINEERS

SKETCH TITLE BY MXC

Lot 37 Montario Quarters Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
33380		27/9/2018	004



PRIMEWEST | Iris Residential | CAMERON CHISHOLM NICOL

DEPARTMENT OF PLANNING, LANDS AND HERITAGE
DATE 16-Nov-2018
FILE 08-0301G7-1

LEGEND

- 1 x 1 TOWNHOUSE
- 1 x 1 STUDIO APARTMENT
- 2 x 2 APARTMENT
- RESIDENTS FACILITIES
- SERVICES
- STORES
- SUPERMARKET
- RESIDENTS LOBBY

- A1 Residents Lobby
- A2 Commercial Lobby
- A3 Mail Room
- A4 Care Taker Office
- A5 Gym

- B1 Plant Room
- B2 Hydrant/Sprinkler Tanks
- B3 Fire Pump Room
- B4 Fire Booster
- B5 Water Meter
- B6 Portable Water
- B7 Electrical Switchroom
- B8 EOT

- C1 Supermarket Car Parking
- C2 Motorcycle Parking
- C3 Bicycle Parking

2.5 5 10 20 m SCALE (A1)

LOWER GROUND

DEVELOPMENT APPROVAL APPLICATION - **LOT 37 MONTARIO QUARTER**

September26,2018

DA 3

WOOD & GRIEVE ENGINEERS

SKETCH TITLE BY MXC

Lot 37 Montario Quarters Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
33380		27/9/2018	004

2 Street Parking
2 loss due to crossover

SEYMOUR ST

SELBY ST

LANEWAY

VICTORIA AVE

Recommended Glazing Configuration

Bedrooms:
Single Glazing Option:
- 8.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6mm glass

Living Rooms:
Single Glazing Option:
- 8.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6.38mm laminated glass

primewest

Iris Residential

CAMERON CHISHOLM NICOL

DEPARTMENT OF PLANNING, LANDS AND HERITAGE
DATE 16-Nov-2018
FILE 08-0301F-1

LEGEND

- 1 x 1 TOWNHOUSE
- 1 x 1 STUDIO APARTMENT
- 2 x 2 APARTMENT
- RESIDENTS FACILITIES
- COMMERCIAL
- SERVICES
- SUPERMARKET
- RESIDENTS LOBBY
- TREES RETAINED
- TREES NEW
- VEHICULAR ACCESS
- SERVICE ACCESS

- T1 Cafe
- T2 Hairdresser
- T3 Liquor Store
- T4 TBA
- T5 Pharmacy
- T6 Restaurant
- T7 Newsagency
- T8 Restaurant
- T9 Patisserie
- T10 Restaurant
- T11 Service/Office
- T12 Medical
- T13 Service/Office
- T14 Supermarket
- T15 Kiosk

- A1 Resident's Lobby
- A2 Gym
- A3 Alfresco
- A4 Retail Lift Connecting Level 1 & 2

- B1 Loading Dock
- B2 EOT
- B3 Visitors Toilets
- B4 Staff Toilets
- B5 Substation

- C1 Street Parking
- C2 Bicycle Parking

- V Void

2.5 5 10 20 m SCALE (A1)

GROUND

DEVELOPMENT APPROVAL APPLICATION - **LOT 37 MONTARIO QUARTER**

September26,2018

DA 4

WOOD & GRIEVE ENGINEERS

SKETCH TITLE BY MXC

Lot 37 Montario Quarters Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
33380		27/9/2018	004

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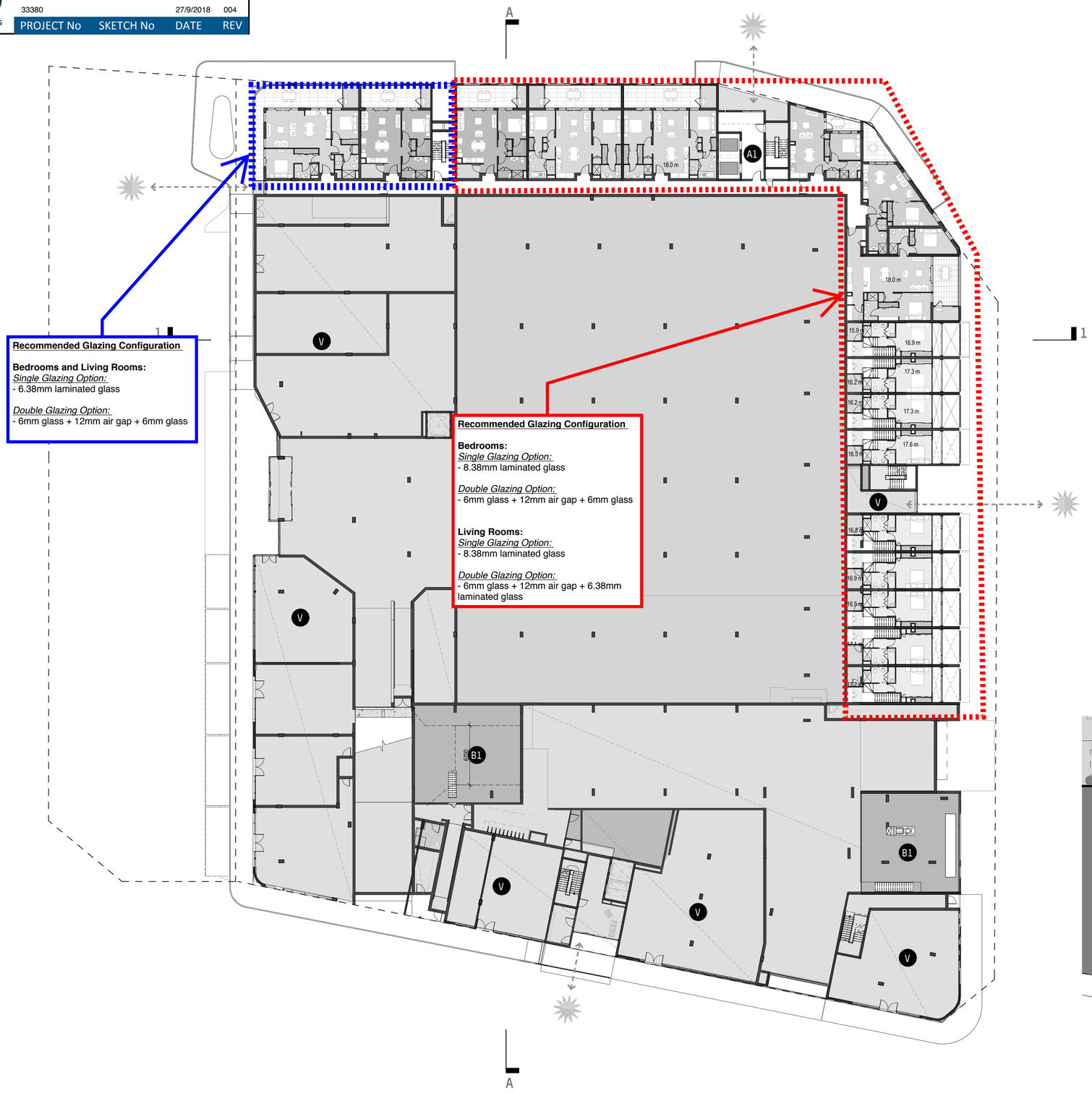
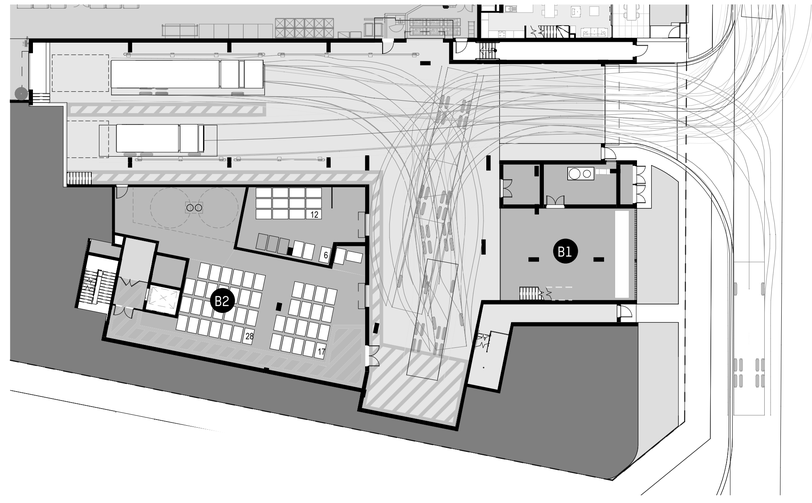
FILE 08-0301F-1
DATE 16-Nov-2018



LEGEND

- STUDIO APARTMENT
- 1 X 1 APARTMENT
- 1 x 1 TOWNHOUSE
- 2 X 1 APARTMENT
- 2 X 2 APARTMENT
- SERVICES
- SUPERMARKET
- STORES

- A1 Residents lobby
- B1 Plantroom
- B2 Bin store
- V Void



2.5 5 10 20 m SCALE (A1)

MEZZANINE + LOADING DOCK

DEVELOPMENT APPROVAL APPLICATION - **LOT 37 MONTARIO QUARTER**

September26,2018

DA 5

WOOD & GRIEVE ENGINEERS

SKETCH TITLE BY MXC

Lot 37 Montario Quarters Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
33380		27/9/2018	004

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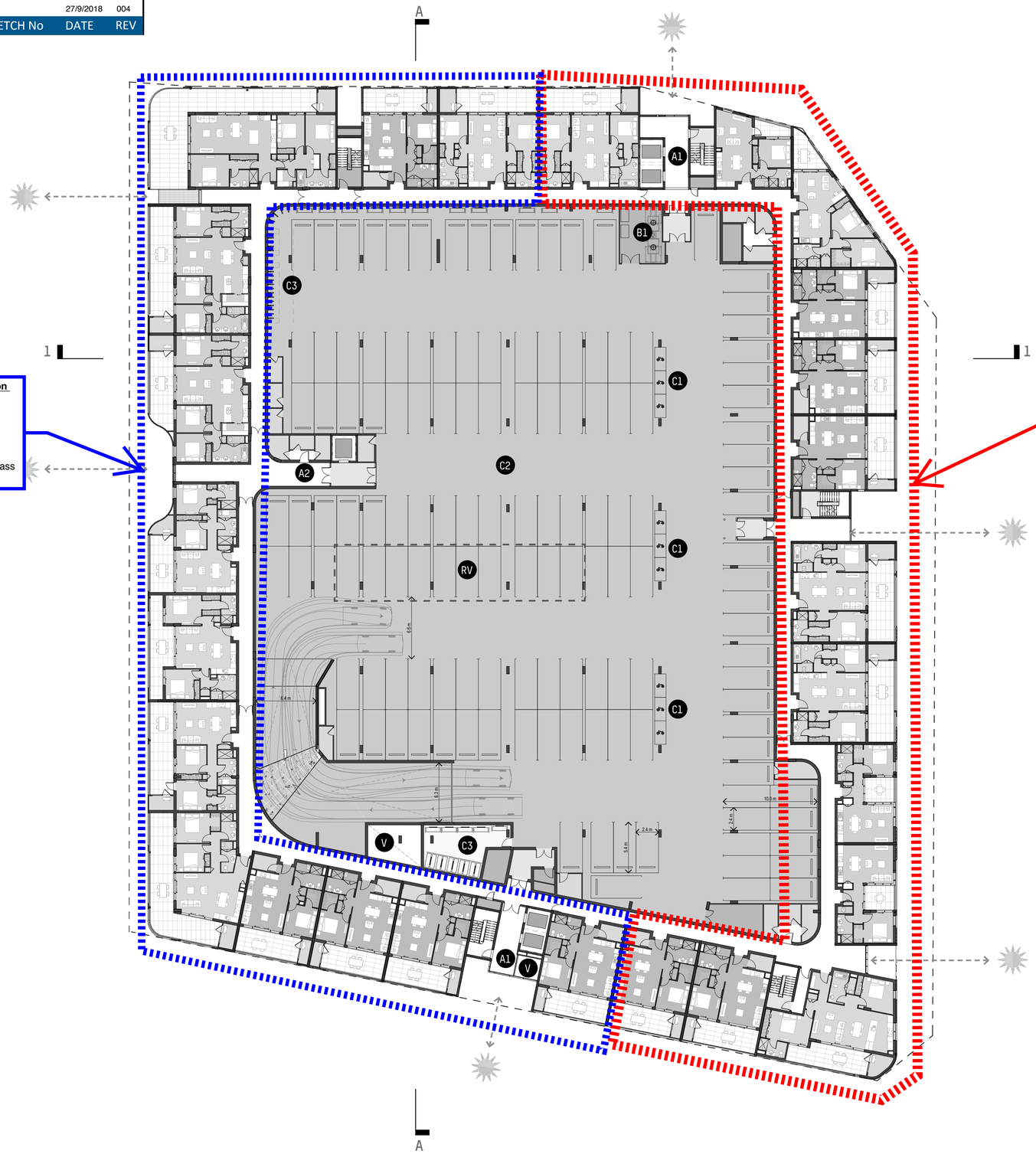
DEPARTMENT OF PLANNING, LANDS AND HERITAGE — DATE 16-Nov-2018 — FILE 08-0341-1



Recommended Glazing Configuration

Bedrooms and Living Rooms:
Single Glazing Option:
- 6.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6mm glass

Recommended Glazing Configuration

Bedrooms:
Single Glazing Option:
- 8.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6mm glass

Living Rooms:
Single Glazing Option:
- 8.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6.38mm laminated glass

LEGEND

- STUDIO APARTMENT
- 1 X 1 APARTMENT
- 2 X 1 APARTMENT
- 2 X 2 APARTMENT
- 3 X 2 APARTMENT
- SERVICES
- RESIDENTS FACILITIES
- STORES

A1 Residents lobby

cting ground floor retail

g room

e parking

car parking

rking

visitor car parking

2.5 5 10 20 m SCALE (A1)

LEVEL 1

DEVELOPMENT APPROVAL APPLICATION - **LOT 37 MONTARIO QUARTER**

September26,2018

DA 8

WOOD & GRIEVE ENGINEERS

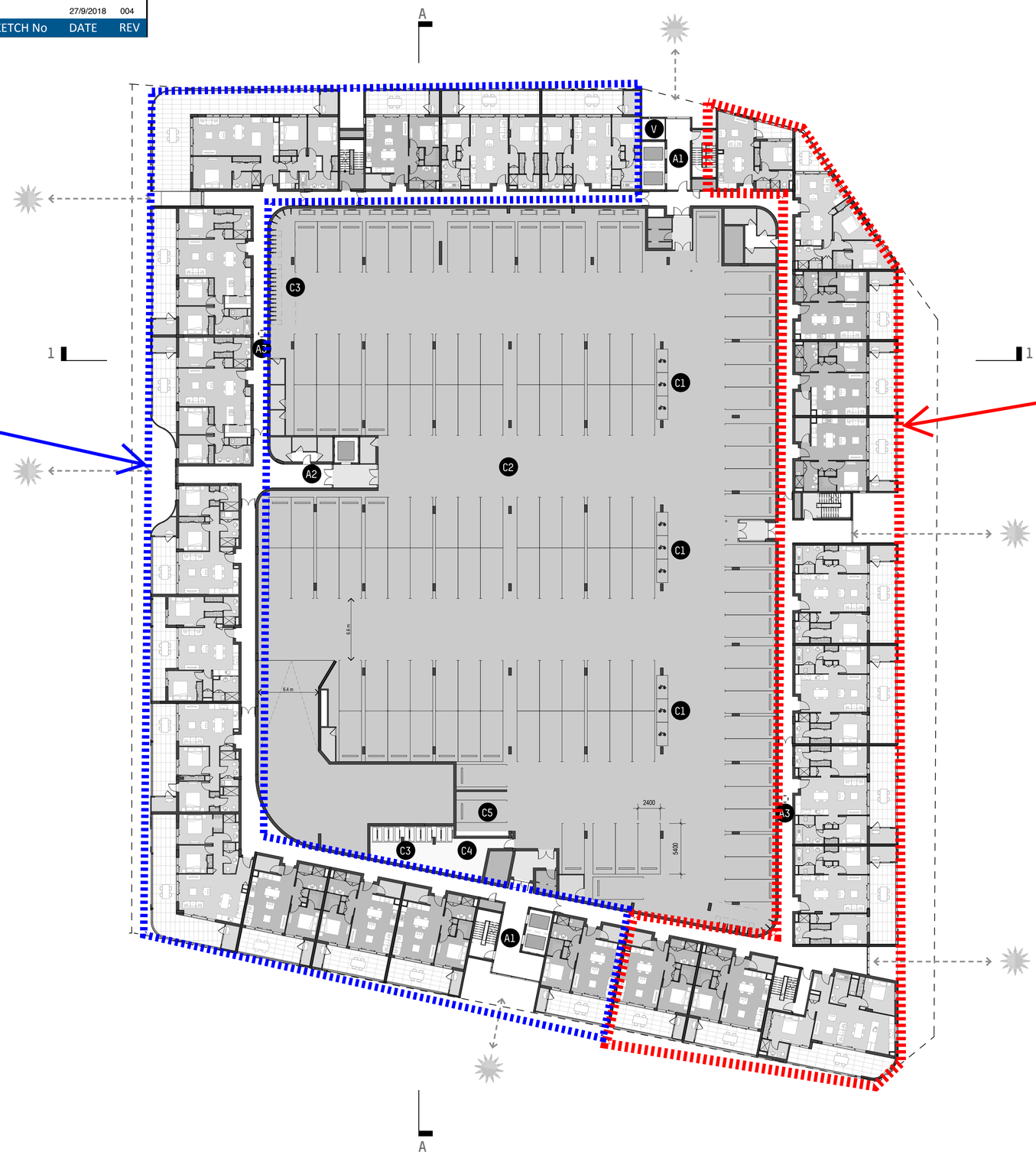
SKETCH TITLE BY MXC

Lot 37 Montario Quarters Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
33380		27/9/2018	004

PRIMEWEST | Iris Residential | CAMERON CHISHOLM NICOL

DEPARTMENT OF PLANNING, LANDS AND HERITAGE
DATE 16-Nov-2018
FILE 08-2018/7-1



Recommended Glazing Configuration

Bedrooms and Living Rooms:
Single Glazing Option:
- 6.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6 mm glass

Recommended Glazing Configuration

Bedrooms:
Single Glazing Option:
- 8.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6mm glass

Living Rooms:
Single Glazing Option:
- 8.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6.38mm laminated glass

LEGEND

- STUDIO APARTMENT
- 1 X 1 APARTMENT
- 2 X 1 APARTMENT
- 2 X 2 APARTMENT
- 3 X 2 APARTMENT
- SERVICES
- RESIDENTS FACILITIES
- STORES

A1 Residents lobby
Lift connecting ground floor retail
Solartube skylight above
Bin store
Motorcycle parking
Residents car parking
Bicycle parking
Bicycle workshop
Carwash bay

2.5 5 10 20 m SCALE (A1)

LEVEL 2

DEVELOPMENT APPROVAL APPLICATION - **LOT 37 MONTARIO QUARTER**

September26,2018

DA 9

WOOD & GRIEVE ENGINEERS

SKETCH TITLE BY MXC

Lot 37 Montario Quarters Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
33380		27/9/2018	004

PRIMEWEST

Iris Residential

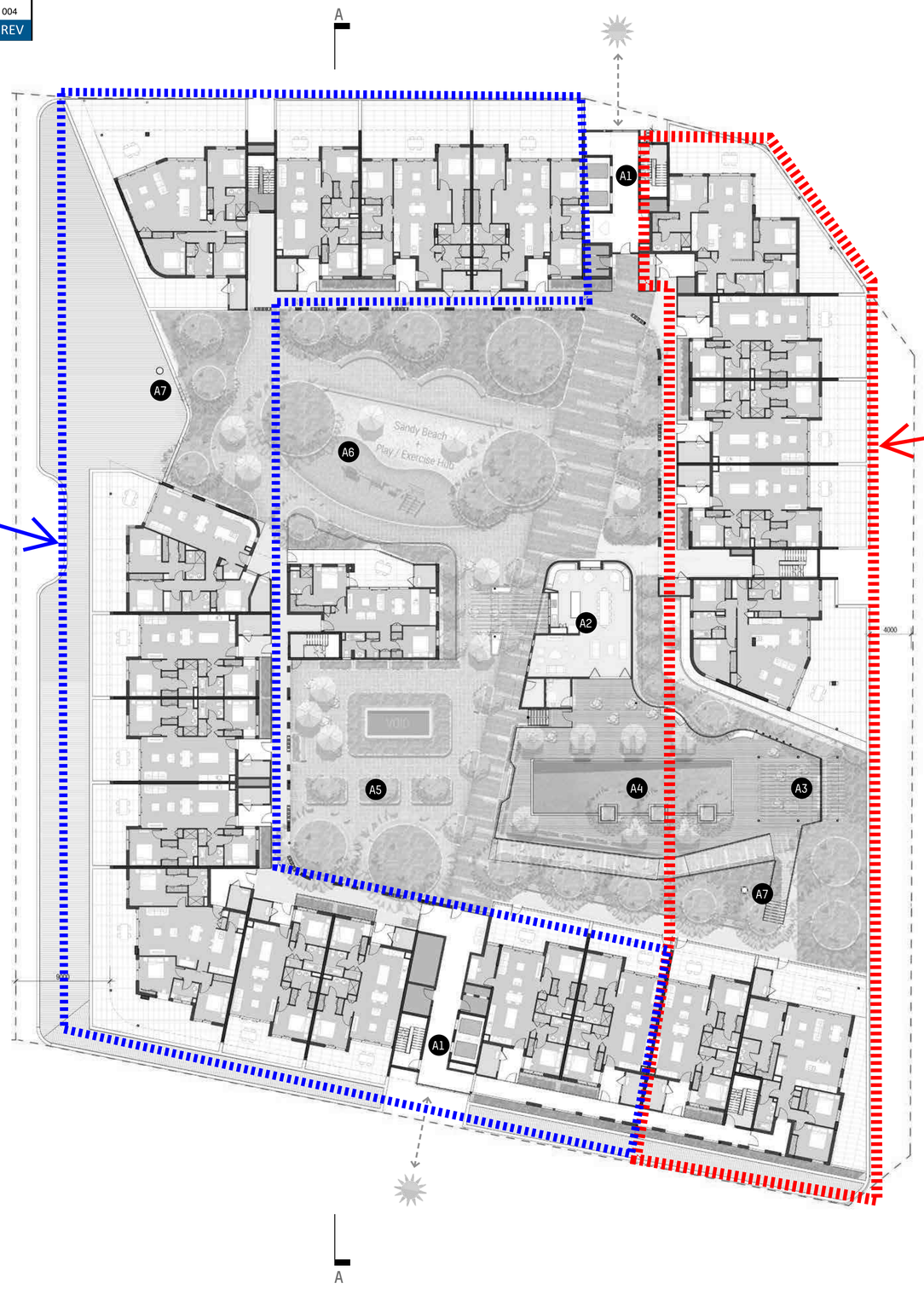
CAMERON CHISHOLM NICOL

DEPARTMENT OF PLANNING, LANDS AND HERITAGE
DATE 16-Nov-2018
FILE 08-0301-1

LEGEND

- 2 X 2 APT
- 3 X 2 APT
- RESIDENTS FACILITIES
- SERVICES
- STORES

- A1 Residents lobby
- A2 Residents dining
- BBQ facilities
- Pool
- Communal vegetable garden
- Children's play area
- Solartube to corridor below



Recommended Glazing Configuration

Bedrooms and Living Rooms:
Single Glazing Option:
- 6.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6mm glass

Recommended Glazing Configuration

Bedrooms:
Single Glazing Option:
- 8.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6mm glass

Living Rooms:
Single Glazing Option:
- 8.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6.38mm laminated glass

2.5 5 10 20 m SCALE (A1)

LEVEL 3 PODIUM

DEVELOPMENT APPROVAL APPLICATION - **LOT 37 MONTARIO QUARTER**

September26,2018

DA 10

WOOD & GRIEVE ENGINEERS

SKETCH TITLE BY MXC

Lot 37 Montario Quarters Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
33380		27/9/2018	004

PRIMEWEST

Iris Residential

CAMERON CHISHOLM NICOL

DEPARTMENT OF PLANNING, LANDS AND HERITAGE
FILE 08-0301-7-1
DATE 16-Nov-2018

LEGEND

- 2 X 2 APT
- 3 X 2 APT
- SERVICES
- STORES

A1 Residents lobby

V Void

Recommended Glazing Configuration

Bedrooms and Living Rooms:
Single Glazing Option:
- 6.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6mm glass

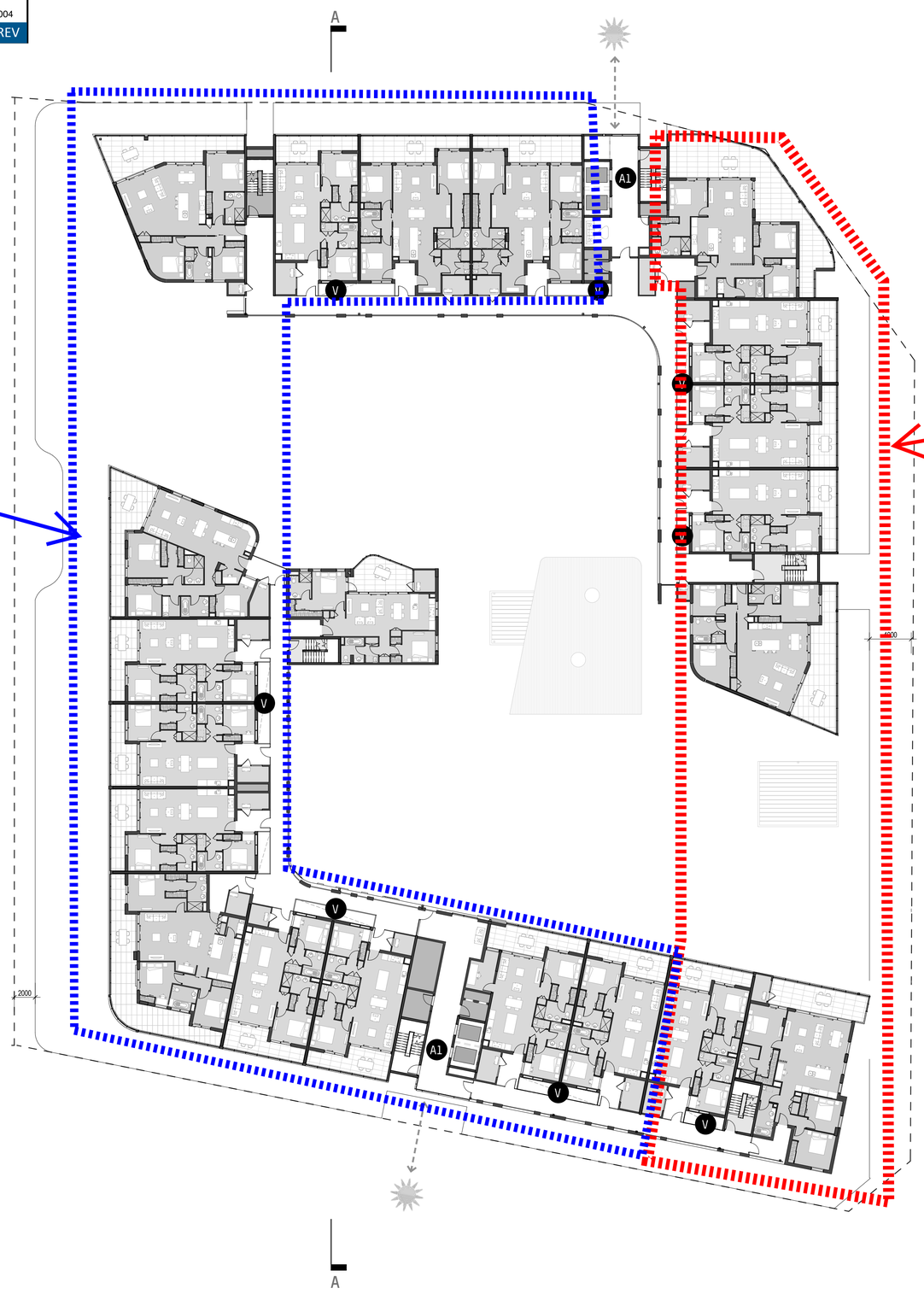
Recommended Glazing Configuration

Bedrooms:
Single Glazing Option:
- 8.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6mm glass

Living Rooms:
Single Glazing Option:
- 8.38mm laminated glass

Double Glazing Option:
- 6mm glass + 12mm air gap + 6.38mm laminated glass



2.5 5 10 20 m SCALE (A1)

LEVEL 4 - 6

DEVELOPMENT APPROVAL APPLICATION - **LOT 37 MONTARIO QUARTER**

September26,2018

DA 11

WOOD & GRIEVE ENGINEERS

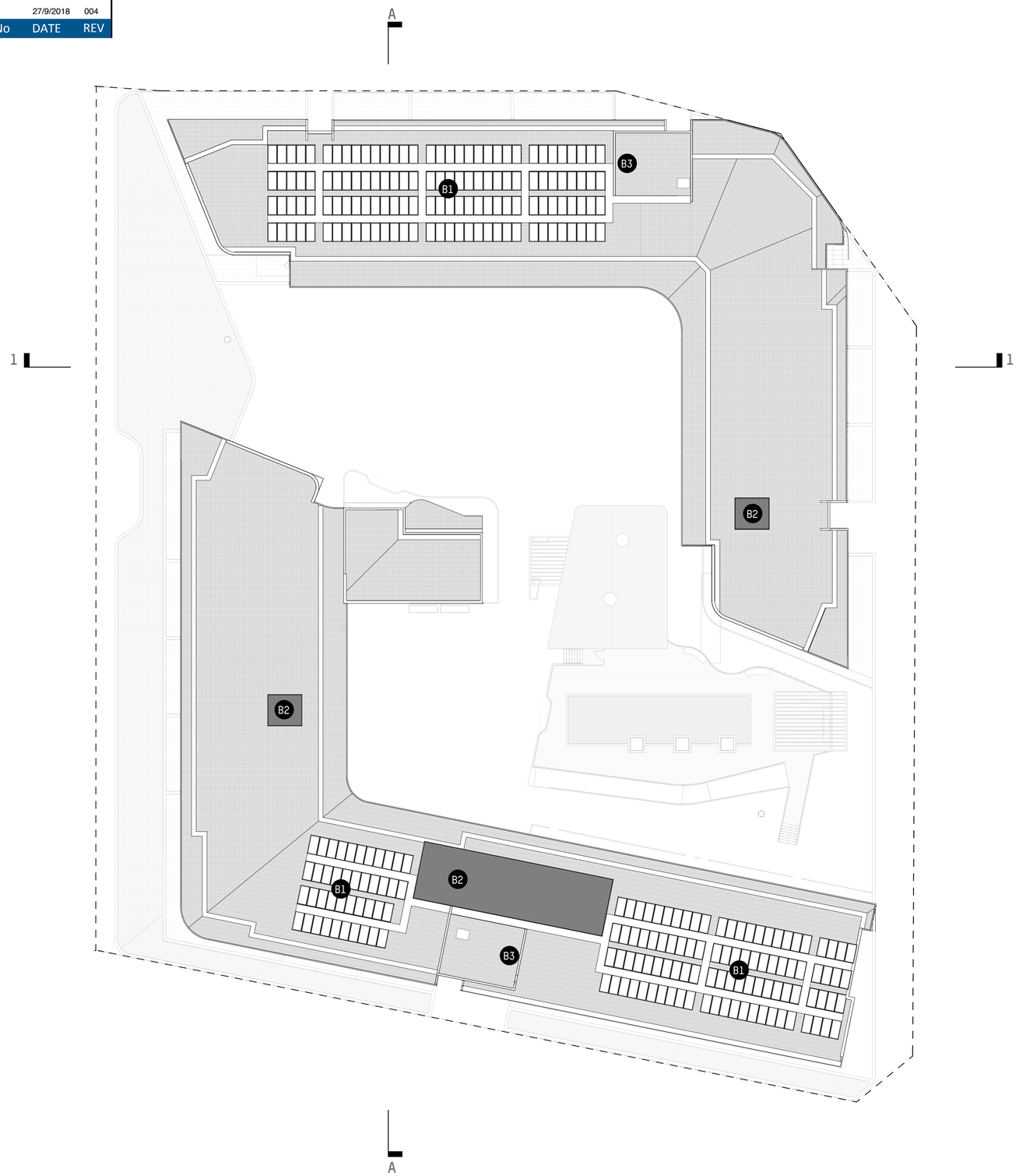
SKETCH TITLE BY MXC

Lot 37 Montario Quarters Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
33380		27/9/2018	004

primewest | Iris Residential | CAMERON CHISHOLM NICOL

DEPARTMENT OF PLANNING, LANDS AND HERITAGE
DATE 16-Nov-2018
FILE 08-0301F-1



LEGEND

- B1 Photovoltaic panels
- B2 Screened rooftop plant
- B3 Stair & Lift overrun

2.5 5 10 20 m SCALE (A1)

ROOF PLAN

DEVELOPMENT APPROVAL APPLICATION - **LOT 37 MONTARIO QUARTER**

September26,2018

DA 12

APPENDIX D Loading Dock Model Noise Contours

DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE	FILE
16-Nov-2018	08-50167-141

Lot 37 Montario Quarter,
Shenton Park

33380
4/10/2018
MXC

Loading Dock Noise Emission

Height: 1.5m

Noise level
in dB(A)

	< 35.0
35.0 <=	< 37.5
37.5 <=	< 40.0
40.0 <=	< 42.5
42.5 <=	< 45.0
45.0 <=	< 47.5
47.5 <=	< 50.0
50.0 <=	< 52.5
52.5 <=	< 55.0
55.0 <=	< 57.5
57.5 <=	< 60.0
60.0 <=	< 62.5
62.5 <=	< 65.0
65.0 <=	< 67.5
67.5 <=	< 70.0

0 5 10 15 20 25 m

WOOD & GRIEVE ENGINEERS

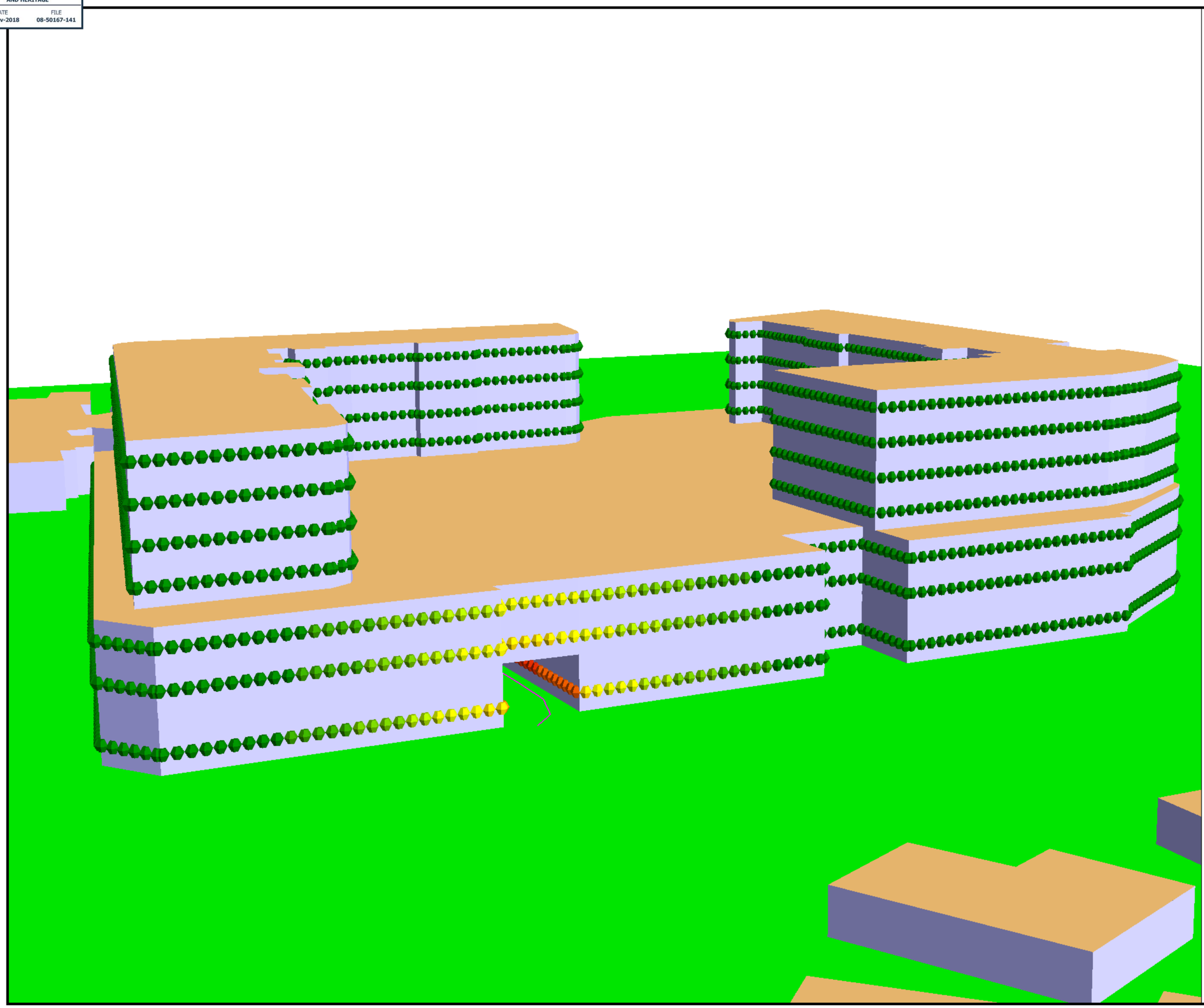
Lot 37 Montario Quarter,
Shenton Park

33380
4/10/2018
MXC

Loading Dock Noise Emission

(Apartment Building Facade)

Height: 1.5m



Noise level
in dB(A)

	< 35.0
35.0 <=	< 37.5
37.5 <=	< 40.0
40.0 <=	< 42.5
42.5 <=	< 45.0
45.0 <=	< 47.5
47.5 <=	< 50.0
50.0 <=	< 52.5
52.5 <=	< 55.0
55.0 <=	< 57.5
57.5 <=	< 60.0
60.0 <=	< 62.5
62.5 <=	< 65.0
65.0 <=	< 67.5
67.5 <=	< 70.0

0 4 8 12 16 20 m

WOOD & GRIEVE ENGINEERS

APPENDIX E Mechanical Equipment Model Noise Contours

DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE	FILE
16-Nov-2018	08-50167-141

Lot 37 Montario Quarter,
Shenton Park

33380
28/09/2018
MXC

Mechanical Equipment
Emission to External
Receivers

Scenario 1 Day

Height: 1.5m

Noise level
in dB(A)

	< 25.0
25.0 <=	< 27.5
27.5 <=	< 30.0
30.0 <=	< 32.5
32.5 <=	< 35.0
35.0 <=	< 37.5
37.5 <=	< 40.0
40.0 <=	< 42.5
42.5 <=	< 45.0
45.0 <=	< 47.5
47.5 <=	< 50.0
50.0 <=	< 52.5
52.5 <=	< 55.0
55.0 <=	< 57.5
57.5 <=	< 60.0

0 5 10 15 20 25 m

WOOD & GRIEVE ENGINEERS

DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE	FILE
16-Nov-2018	08-50167-141

Lot 37 Montario Quarter,
Shenton Park

33380
28/09/2018
MXC

Mechanical Equipment Emission to Apartment Units

Scenario 1 Day

Height: 1.5m

Noise level
in dB(A)

	< 25.0
25.0 <=	< 27.5
27.5 <=	< 30.0
30.0 <=	< 32.5
32.5 <=	< 35.0
35.0 <=	< 37.5
37.5 <=	< 40.0
40.0 <=	< 42.5
42.5 <=	< 45.0
45.0 <=	< 47.5
47.5 <=	< 50.0
50.0 <=	< 52.5
52.5 <=	< 55.0
55.0 <=	< 57.5
57.5 <=	< 60.0

0 5 10 15 20 25 m

WOOD & GRIEVE ENGINEERS

DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE	FILE
16-Nov-2018	08-50167-141

Lot 37 Montario Quarter,
Shenton Park

33380
28/09/2018
MXC

Mechanical Equipment
Emission to External
Receivers

Scenario 1 Night

Height: 1.5m

Noise level
in dB(A)

	< 25.0
25.0 <=	< 27.5
27.5 <=	< 30.0
30.0 <=	< 32.5
32.5 <=	< 35.0
35.0 <=	< 37.5
37.5 <=	< 40.0
40.0 <=	< 42.5
42.5 <=	< 45.0
45.0 <=	< 47.5
47.5 <=	< 50.0
50.0 <=	< 52.5
52.5 <=	< 55.0
55.0 <=	< 57.5
57.5 <=	< 60.0

0 5 10 15 20 25 m

WOOD & GRIEVE ENGINEERS

DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE	FILE
16-Nov-2018	08-50167-141

Lot 37 Montario Quarter,
Shenton Park

33380
28/09/2018
MXC

Mechanical Equipment
Emission to Apartment
Units

Scenario 1 Night

Height: 1.5m

Noise level
in dB(A)

	< 25.0
25.0 <=	< 27.5
27.5 <=	< 30.0
30.0 <=	< 32.5
32.5 <=	< 35.0
35.0 <=	< 37.5
37.5 <=	< 40.0
40.0 <=	< 42.5
42.5 <=	< 45.0
45.0 <=	< 47.5
47.5 <=	< 50.0
50.0 <=	< 52.5
52.5 <=	< 55.0
55.0 <=	< 57.5
57.5 <=	< 60.0

0 5 10 15 20 25 m

WOOD & GRIEVE ENGINEERS

DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE	FILE
16-Nov-2018	08-50167-141

Lot 37 Montario Quarter,
Shenton Park

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28/09/2018
MXC

Mechanical Equipment
Emission to External
Receivers

Scenario 2

Height: 1.5m

Noise level
in dB(A)

	< 25.0
25.0 <=	< 27.5
27.5 <=	< 30.0
30.0 <=	< 32.5
32.5 <=	< 35.0
35.0 <=	< 37.5
37.5 <=	< 40.0
40.0 <=	< 42.5
42.5 <=	< 45.0
45.0 <=	< 47.5
47.5 <=	< 50.0
50.0 <=	< 52.5
52.5 <=	< 55.0
55.0 <=	< 57.5
57.5 <=	< 60.0

0 5 10 15 20 25 m

WOOD & GRIEVE ENGINEERS

DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE	FILE
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Lot 37 Montario Quarter,
Shenton Park

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28/09/2018
MXC

Mechanical Equipment
Emission to Apartment
Units

Scenario 2

Height: 1.5m

Noise level
in dB(A)

	< 25.0
25.0 <=	< 27.5
27.5 <=	< 30.0
30.0 <=	< 32.5
32.5 <=	< 35.0
35.0 <=	< 37.5
37.5 <=	< 40.0
40.0 <=	< 42.5
42.5 <=	< 45.0
45.0 <=	< 47.5
47.5 <=	< 50.0
50.0 <=	< 52.5
52.5 <=	< 55.0
55.0 <=	< 57.5
57.5 <=	< 60.0

0 5 10 15 20 25 m

WOOD & GRIEVE ENGINEERS

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the art and science of place

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