NOISE MEASUREMENT SERVICES

Noise Assessment Report
Proposed Childcare Centre
11 Daisy Hill Road
Daisy Hill, QLD 4127
(Lot 36 on RP113835)

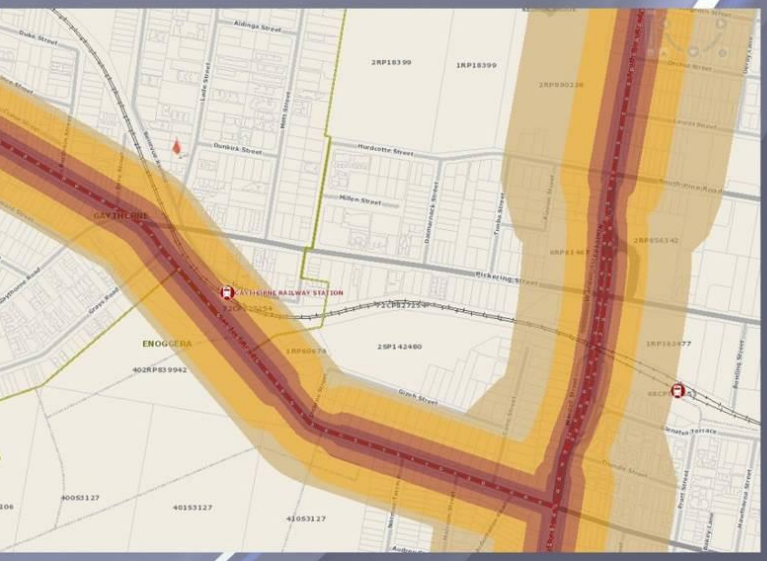
Report No 5530R3 11th December 2020

LOGAN CITY COUNCIL

APPROVED DOCUMENT

This is an approved document for Development Application

MCUI/13/2020



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D0	18/09/2020	Draft Report	JD	MT
D2	23/09/2020	Canopy Design Consideration	JD	MT
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1	17/11/2020	Revision to Council RFI	GR	MT
2	19/11/2020	New Development Plans	GR	
3	11/12/2020	Further Council response	GR	

Copy No(s)	Rev No	Destination
1 pdf	3	Mayhill Planning & Architecture Pty Ltd
2 pdf	3	Jiroma Pty Ltd
3	3	Noise Measurement Services Pty Ltd

REPORT FOR **Mayhill Planning & Architecture** Pty Ltd

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Signed

Max Thorne
(Director)

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Executive Summary

This Report is in response to a request from Mayhill Planning & Architecture for a noise impact assessment of a proposed childcare centre at 11 Daisy Hill Road, Daisy Hill, QLD 4127 (Lot 36 RP113835). The development site is zoned Low Density Residential Suburban, and is adjacent to residential uses.

The purpose of this Report is to assess potential noise impacts from the proposed use onto neighbouring residential dwellings. The following standards and policy documents are referenced:

- *Logan Planning Scheme 2015 (version 7):*
    - Low Density Residential Zone Code;
    - Planning Scheme Policy 3 – Environmental Management 3.2 Emission Standards.
- *Environmental Protection Act 1994 (EPA 1994);*
- *Environmental Protection (Noise) Policy 2019;*
- Education and Child Care National Regulations;
- Australian Standard *AS1055:2018 Acoustics - Description and measurement of environmental noise*
- Australian Standard *AS3671:1989 Acoustics – Road traffic noise intrusion – Building siting and construction*
- *Queensland Development Code Mandatory Part 4.4 – Buildings in a transport noise corridor;*
- *Department of Environment and Science Noise Measurement Manual 2020;*
- *Association of Australasian Acoustical Consultants Guideline for Child Care Centre Acoustic Assessment v3.0.*

Hours of operation are to be determined. The hours of operation for assessment purposes have are:

- 6:30 AM to 6:30 PM Monday to Friday.

Assessment has been made to the boundary.

Conclusions

It is concluded that-

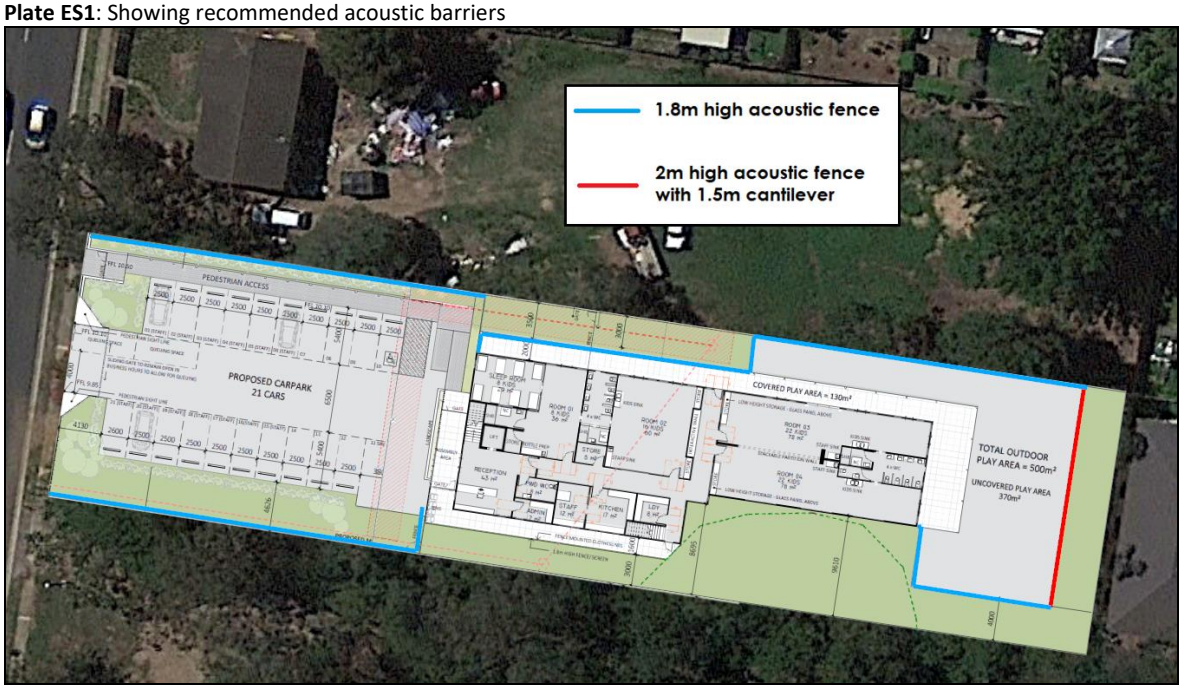
- Subject to the considerations and recommendations as presented in this report, it is the opinion of this consultancy that the proposed development can meet the requirements of the *Logan Planning Scheme 2015*, and be otherwise compliant with relevant regulatory obligations.
- Internal criteria at the childcare component can be met through construction that achieves a Noise Reduction of 30 dB(A) to the designated sleep room, and a Noise Reduction of 25 dB(A) generally.
- The specific type and installation of mechanical plant has not been determined at this stage. Detailed assessment of plant noise can be conducted – if required – at the Building Approval stage once final architectural plans become available. Due to the significant setback distances, it is expected that the required criteria will be readily achievable without any further acoustic treatment.
- Responses to a further Information Request (received 7th December) are provided in **Appendix E**.

Recommendations

It is recommended that:

- Mechanical plant be selected, installed and (if necessary) screened to not exceed 40 dB(A) at neighbouring properties. Due to the significant setback distances, this criterion is expected to be readily achievable without any further acoustic treatment.
- The child care centre be constructed to achieve a Noise Reduction of not less than 30 dB(A) to the designated sleep room, and a noise Reduction of 25 dB(A) generally. Detailed calculations under AS3671 can be conducted at the Building Approval stage, once detailed architectural plans become available. The required Noise Reduction may also be achievable through construction to the QDC MP4.4, corresponding with Noise Categories 2 & 1 respectively.
- Acoustic fencing be provided as shown in **Plate ES1** below, and as discussed in **Section 4.3.3** & **Section 4.3.4**. To effectively function as an acoustic barrier, this screening should be continuous and gap-free, with a density of not less than 12.5 kg/m^2.
- Outdoor play be limited to the hours of 7am to 6pm.

Plate ES1: Showing recommended acoustic barriers



1. Introduction

This Report is in response to a request from Mayhill Planning & Architecture for a noise impact assessment of a proposed childcare centre at 11 Daisy Hill Road, Daisy Hill, QLD 4127 (Lot 36 RP113835). The development site is zoned Low Density Residential - Suburban, and is adjacent to residential uses.

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Hours of operation are to be determined. The hours of operation for assessment purposes have are:

- 6:30 AM to 6:30 PM Monday to Friday.

The maximum proposed capacity is up to 90 children plus staff across six play/education rooms. Assessment has been made to the boundary.

1.1 Description of Site

The locality and development design are presented in the following **plates**. Plans are set out in **Appendix A**; terms and definitions used in this report are found in **Appendix D**.

Plate 1: Showing the development site and locale (source: Google)

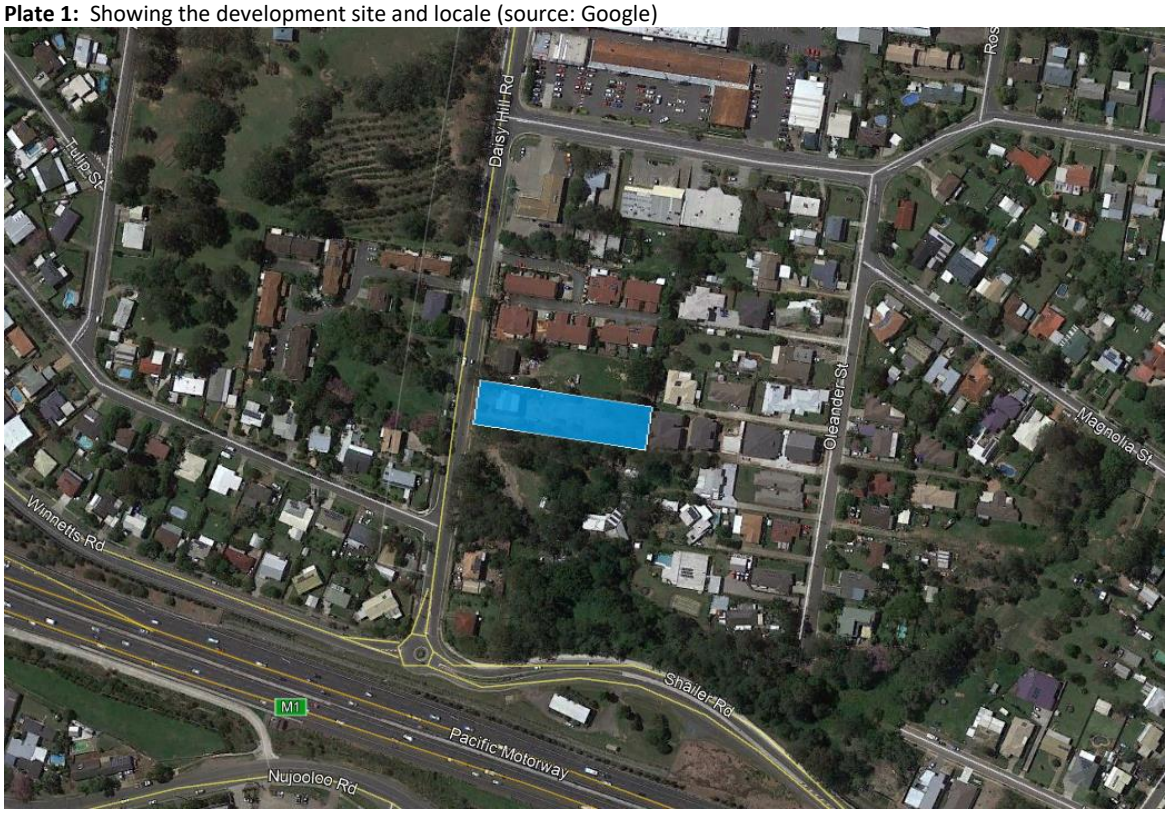


Plate 2: Showing the Council property details. (Source: Logan City Council)

Address:	11 Daisy Hill Road DAISY HILL QLD 4127
Lot/Plan:	Lot 36 RP 113835
Property Key:	184445
Property Size:	2,529 m ^{2} (survey plan area) 2,527.5 m ^{2} (shape area)
Division:	3 Mayor and Councillors
Zone and precinct:	Low Density Residential - Suburban

For further information, please see Part 6 of the Logan Planning Scheme.

Local plan:	N/A
Local plan precinct:	N/A

For further information, please see Part 7 of the Logan Planning Scheme.

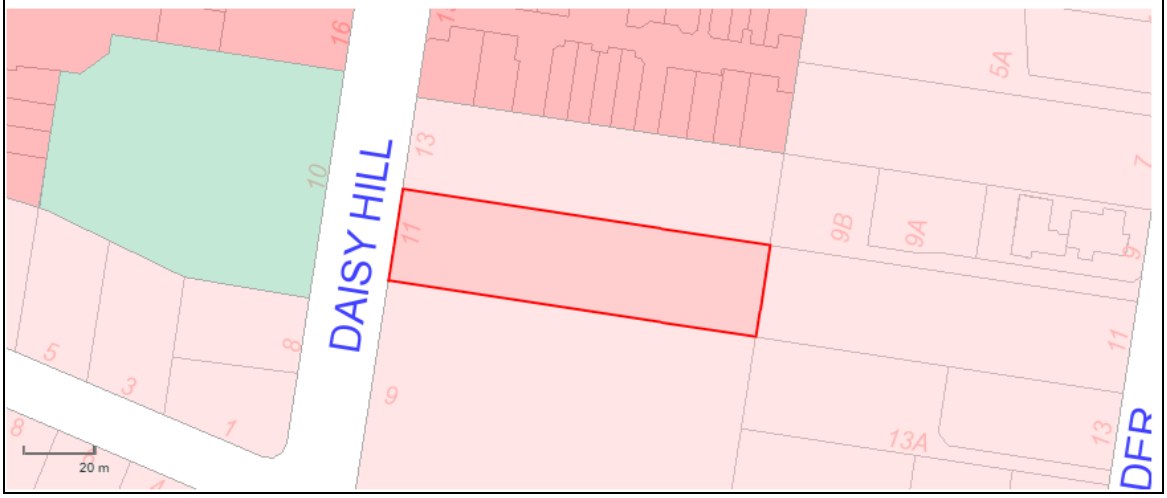
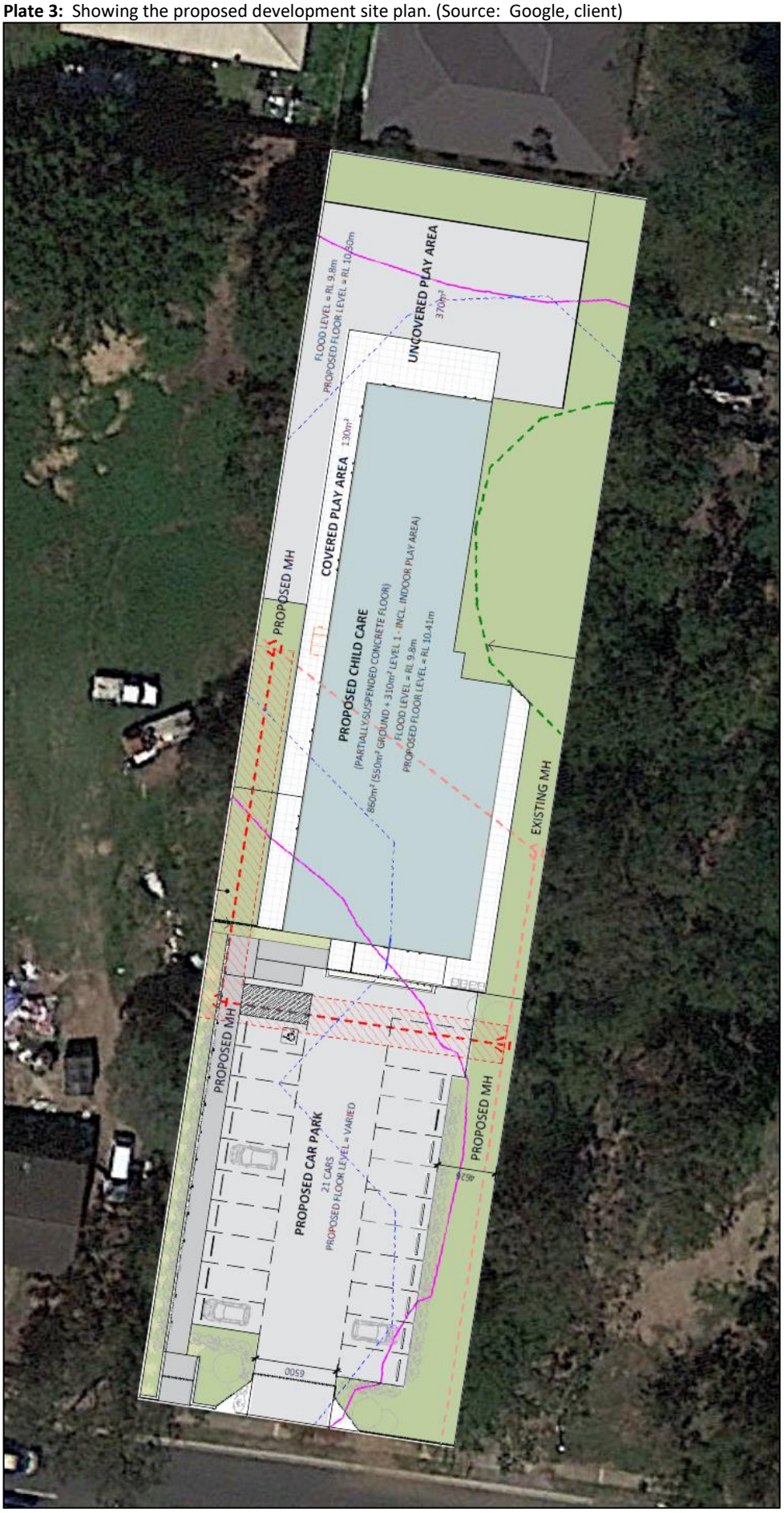


Plate 3: Showing the proposed development site plan. (Source: Google, client)



1.2 Noise Receivers

The development site is adjacent to noise sensitive uses to the north, east and south. This notwithstanding, an Information Requestion received from Council (Document #14156021/RYANJO:ryanjo, dated 20th October 2020) specifically requires assessment at the property boundary. Accordingly, six receivers – referred to as R1 to R6 in this Report – have been assessed, representing the most exposed boundary locations. It is noted that these receivers are not representative of noise impacts at neighbouring sensitive uses. The locations of R1 to R6 are presented below.

Plate 4: Showing receivers R1 to R6, as modelled

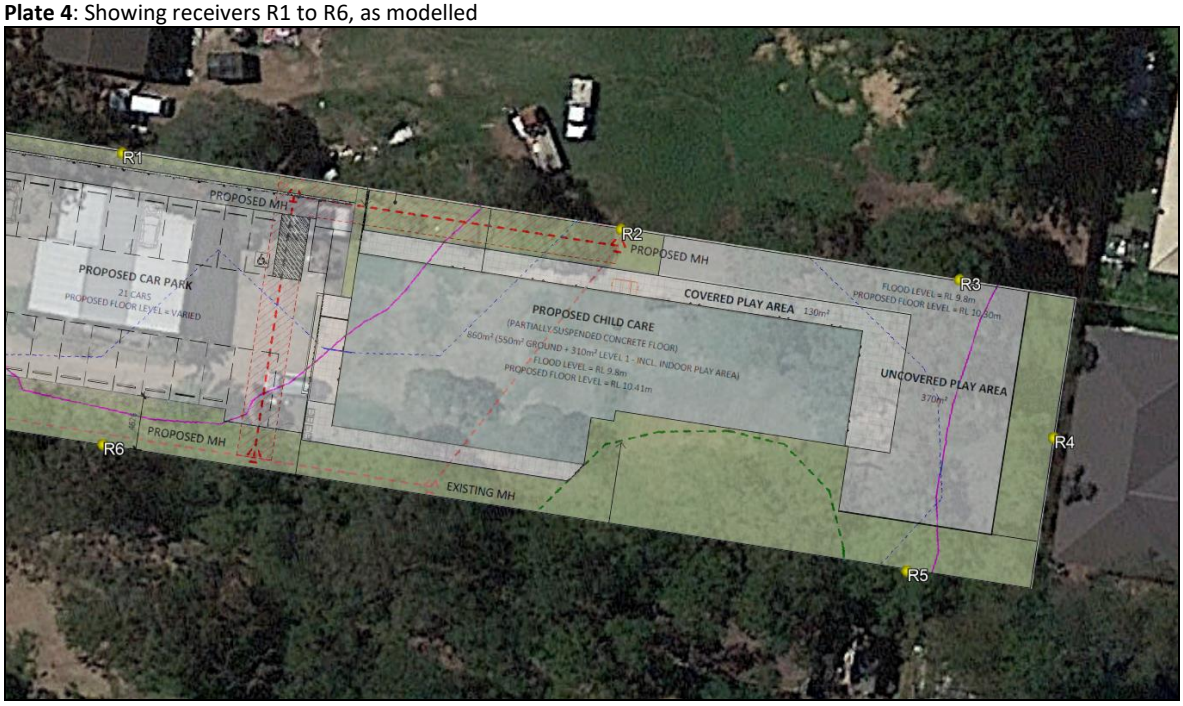


Table 1: Showing receivers R1 to R6, as modelled, by Universal Transverse Mercator (UTM)

Receiver	Boundary Address	Criteria	Receiver Height	UTM Co-ordinates	
				Easting	Southing
R1	13 Daisy Hill Road	Residential amenity	1.5m	515137.61	6942041.21
R2	13 Daisy Hill Road	Residential amenity	1.5m	515174.18	6942035.50
R3	13 Daisy Hill Road	Residential amenity	1.5m	515204.56	6942030.77
R4	9B Oleander Street	Residential amenity	1.5m	515215.72	6942016.18
R5	5-9 Daisy Hill Road	Residential amenity	1.5m	515202.60	6942005.68
R6	5-9 Daisy Hill Road	Residential amenity	1.5m	515131.66	6942016.53

2. Measurement of Existing Ambient Noise Levels

2.1 Measurement Procedures

An ambient noise survey was conducted on-site to establish the existing sound levels in the environment. The environmental noise logger was installed at the rear of the site, near the proposed outdoor play area and near the noise sensitive receivers. Sound levels were measured from the 4th of September to the 11th of September 2020. The environmental noise logger was installed with a microphone height of 1.4 metres above ground in a free field location. Levels measured at this location are considered representative of the existing ambient environment at the residential interface(s). The measurement location is referred to as ML1 in this Report, and is presented in **Plate 5** below.

Plate 5: The measurement location ML1 is marked (source: Google)

Photo 1: Showing measurement location ML1 (source: NMS)

The noise logger was field calibrated before and after each measurement session and found to be within 0.1 dB of the reference signal. All instrumentation used in this assessment hold a current calibration certificate from a certified NATA calibration laboratory. The following instrumentation was used:

- 1 x Larson Davis 831 Class 1 sound level meter;
- 1 x Larson Davis CAL200 Class 1 Calibrator.

2.2 Measurement Results

Ambient sound pressure levels were measured generally in accordance with *Australian Standard AS1055:2018 – Acoustics - Description and measurement of environmental noise*, and with the Department of Environment and Science *Noise Measurement Manual 2020*. Levels are presented graphically in **Figure 1** below, and in tabular format in **Table 1** following.

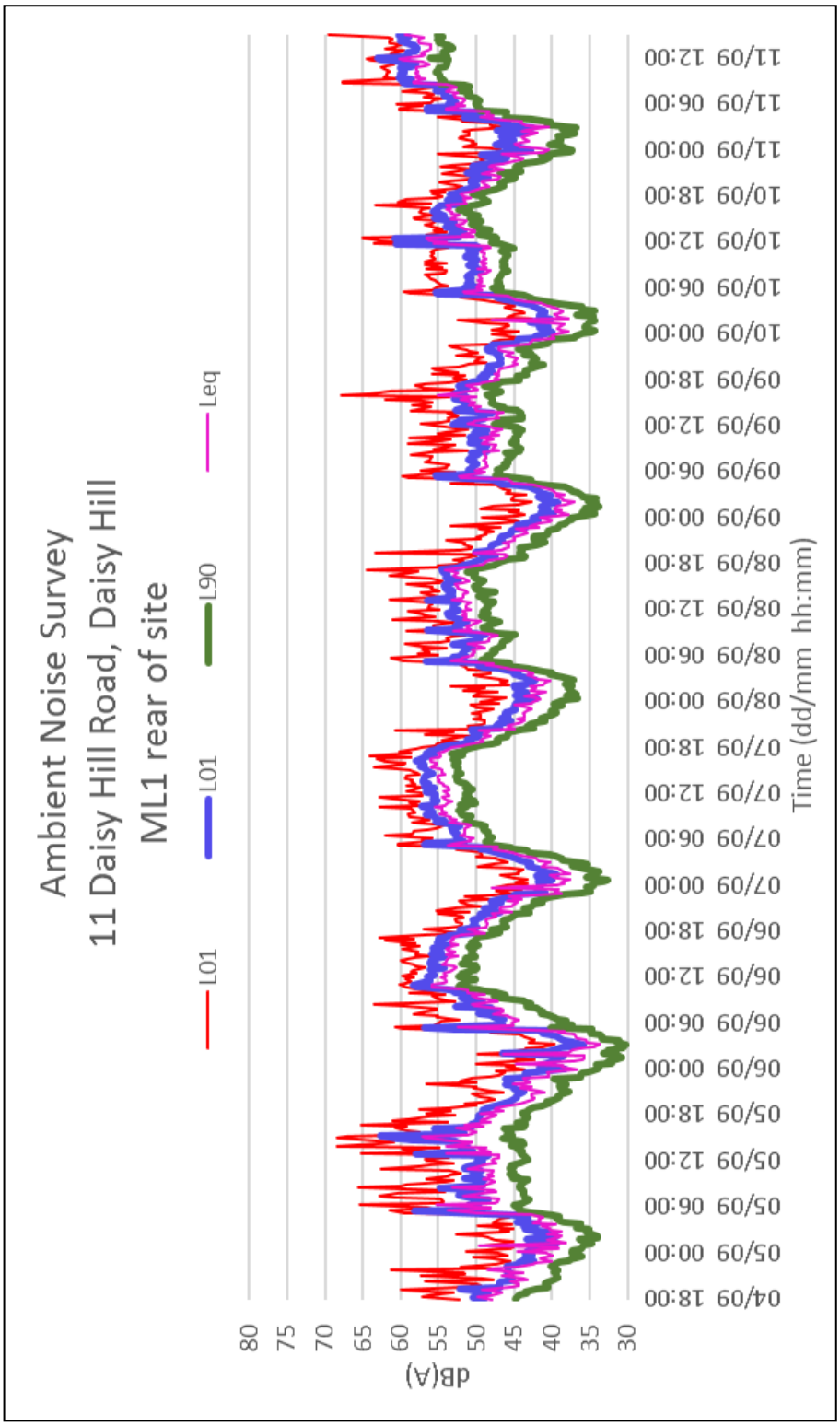


Figure 1: Average measured noise levels at ML1, 4th – 11th September 2020. Levels are in dB(A), free field

Table 2: Averaged measured noise levels at ML1, 4th – 11th September 2020. Levels are in dB(A), free field

Day	Date	Period	L_{01}	L_{10}	L_{90}	L_{eq}
Saturday	5th September	10:00pm – 7:00am	56.2	44.6	38.4	46.0
		7:00am – 6:00pm	65.3	51.5	44.4	50.7
		6:00pm – 10:00pm	55.1	46.3	40.6	45.2
Sunday	6th September	10:00pm – 9:00am	57.7	43.8	36.1	44.4
		9:00am – 6:00pm	60.0	54.7	50.0	53.2
		6:00pm – 10:00pm	55.2	49.3	44.9	48.0
Monday	7th September	7:00am – 6:00pm	57.8	45.6	39.7	46.7
		6:00pm – 10:00pm	62.6	55.8	51.5	54.3
		10:00pm – 7:00am	56.9	49.5	45.3	48.8
Tuesday	8th September	7:00am – 6:00pm	57.5	46.5	41.3	46.6
		6:00pm – 10:00pm	59.4	52.8	48.5	51.4
		10:00pm – 7:00am	53.5	48.1	43.6	46.9
Wednesday	9th September	*7:00am – 6:00pm*	54.6	44.5	39.3	45.1
		6:00pm – 10:00pm	59.0	50.6	46.0	49.6
		10:00pm – 7:00am	55.6	47.9	43.1	46.2
Thursday	10th September	*7:00am – 6:00pm*	55.2	45.0	39.7	45.5
		6:00pm – 10:00pm	60.5	52.9	48.1	51.7
		10:00pm – 7:00am	55.4	50.7	46.6	49.3
Friday	4th and 11th September	7:00am – 6:00pm	56.7	48.3	42.4	47.9
		6:00pm – 10:00pm	67.7	57.5	52.4	56.5
		10:00pm – 7:00am	58.7	47.4	41.4	46.7
		Period	**L_{01}**	**L_{10}**	**L_{90}**	**L_{eq}**
Median		**Day**	**-**	**-**	**48**	**52**
		Evening	**-**	**-**	**44**	**47**
		Night	**-**	**-**	**40**	**46**

The levels presented above include noise measured from all sources in the locale, including road traffic, residential activity, meteorology and wildlife. Measured levels are notably consistent between days, and are considered to be representative of the existing environment at the residential interface.

Meteorological conditions at the nearest Bureau of Meteorology (BOM) station (Logan water treatment plant) show negligible rain and variable wind during the survey period. Meteorological data is presented in **Table 3** below.

Table 3: Showing meteorological data from the nearest BOM station (source: Bureau of Meteorology)

Logan City, Queensland
September 2020 Daily Weather Observations

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
4	Fr	15.4	25.2	0						19.5	78	8	E	2		24.2	44	4	N	7	
5	Sa	13.7	25.8	0						18.8	78	2	SW	4							
6	Su	16.4	23.7	0						21.1	76	3	S	2							
7	Mo	16.8	23.8	0						20.8	61	4	SE	19		22.5	56	4	S	19	
8	Tu	13.0	23.3	0						19.3	71	7	S	6		22.5	54	4	E	15	
9	We	13.9	23.1	0						17.6	74	4	SW	2		22.8	46	4	NNW	19	
10	Th	13.3	20.0	0						18.8	67	7	SW	4		17.1	86	8	ESE	15	
11	Fr	9.6	22.3	4.0						19.8	53	6	SE	19		20.4	48	3	ESE	26	

The primary source of significant (i.e. 3 m/s or greater) wind at the BOM station was from the south-east, which consists of largely vacant, undeveloped land, as shown in **Plate 6** below.

Plate 6: Showing the location of the nearest BOM station

This is not considered representative of land use to the south-east of the development site, which is largely developed and expected to significantly shield receivers at a height of 1.4m. Since measured levels do not show significant 'spikes' in the L_{90} descriptor consistent with atypical meteorological effects, it is concluded that meteorology was a very minor if not negligible source of measured background levels, and that the ambient noise survey constitutes a reasonable and appropriate representation of the existing acoustic environment at the development site.

3. Noise Criteria and Limits

3.1 Logan Planning Scheme 2015

Under the *Logan Planning Scheme 2015*, guidance as to acoustic amenity is contained within the Low Density Residential Zone Code (reproduced in **Table 4** below, in part). The Noise Emissions Standards are presented in **Table 5** following.

Table 4: Logan Planning Scheme 2015 – Low Density Residential Zone Code (in part)

Performance Outcomes	Acceptable Outcomes
Amenity	
General Emissions	
PO5 Development protects the intended amenity for the zone or precinct and an adjoining residential zone category land by having regard to: (a) noise emissions; (b) air emissions; (c) light emission; (d) radiation emissions; (e) vibration emissions.	**AO5** Development complies with the following emissions standard of planning scheme policy 3–Environmental management: a. Table 3.2.1.1–Noise emission standards for the protection of residential amenity where adjoining a residential zone category; b. Table 3.2.1.2–Noise emission standards for the protection of general amenity; c. Table 3.2.2.1–Air emission standards; d. Table 3.2.3.1–Light emission standards; e. Section 3.2.4–Radiation emission standards; f. Table 3.2.5.1–Preferred weighted rms value for continuous and impulsive vibration acceleration (m/s^2) 1/80Hz

Table 5: Logan Planning Scheme 2015 – Noise Emissions Standards Table 3.2.1.1 and 3.2.1.2

Noise level at the boundary of premises			
Noise type	**Time period**	**Monday to Saturday**	**Sunday and public**
Residential Amenity			
Non-steady sound	Day 7:00am – 6:00pm	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A)
	Evening 6:00pm to 10:00pm	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A)
	Night 10:00 – 7:00am	$L_{Aeq,adj,T} \leq L_{A90}$ plus 0 dB(A) and $L_{Amax} \leq$ 60dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 0 dB(A) and $L_{Amax} \leq$ 60dB(A)
Continuous noise	Anytime	$L_{A90,T}$ plus 0dB(A)	$L_{A90,T}$ plus 0dB(A)
General Amenity			
Non-steady sound	Day 7:00am – 6:00pm	$L_{Aeq,adj,T} \leq L_{A90}$ plus 10 dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A)
	Evening 6:00pm to 10:00pm	$L_{Aeq,adj,T} \leq L_{A90}$ plus 10 dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A)
	Night 10:00 – 7:00am	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A) and $L_{Amax} \leq$ 80dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A) and $L_{Amax} \leq$ 80dB(A)
Continuous noise	Anytime	$L_{A90,T}$ plus 5dB(A)	$L_{A90,T}$ plus 5dB(A)

Regarding noise immissions onto noise sensitive uses, Planning Scheme Policy 3 cites the indoor *Acoustic Quality Objectives* as per the *Environmental Protection (Noise) Policy 2008* as assessment criteria. It is noted that this policy has been superseded by the *Environmental Protection (Noise) Policy 2019*, which has been applied as representative of current State policy (and is discussed in **Section 3.2** below). The *Acoustic Quality Objectives* are nonetheless identical between the two revisions.

3.2 Environmental Protection (Noise) Policy 2019

The *Environmental Protection (Noise) Policy 2019* (EPP Noise 2019) establishes acoustic quality objectives to protect or enhance stated environmental values, as shown in **Table 6** below. The environmental values to be enhanced or protected under the policy are the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and the qualities of the acoustic environment that are conducive to human health and well-being, including ensuring a suitable acoustic environment for individual's to sleep, study and learn, to be involved in recreation including relaxation and conversation; and the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

Table 6: Acoustic Quality Objectives from EPP (Noise) 2019 (in part)

Type of Occupancy / Activity	**Recommended Acoustic Quality Objective**		
RESIDENTIAL BUILDINGS	LAeq,adj,1hr	LA10,adj,1hr	LA01,adj,1hr
Dwelling, outdoors, daytime & evening	50	55	65
Dwelling, indoors, daytime & evening	35	40	45
Dwelling, indoors, night-time	30	35	40
CHILD CARE CENTRE			
Indoors, when the children usually sleep	30		
Indoors, other than when the children usually sleep	35		
Outdoors, when the children usually play outside	55		

It is noted that the Acoustic Quality Objectives (AQO) are to be progressively achieved over the long term, to meet the stated purpose of the Noise Policy:

(a) identifying environmental values to be enhanced or protected; and

(b) stating acoustic quality objectives for enhancing or protecting the environmental values; and

(c) providing a framework for making consistent, equitable and informed decisions about the acoustic environment.

Noise management strategies are required to the extent it is reasonable to do so. The AQO are therefore not intended to be necessarily limiting criteria, as reasonableness and equity are fundamental precepts of the policy. The Objectives specifically do not apply to noise from ordinary use of public roads, and are not intended to override Council noise policies, where in force. It is thereby concluded that the intent of EPP Noise 2019 regarding emissions can be met through application of the Noise Emissions Standards (as presented in **Section 3.1** above).

Under Council policy, noise immissions onto new noise sensitive uses – in this case, child care – are to be assessed against the indoor Acoustic Quality Objectives. It is furthermore noted that the current State policy supersedes the *Environmental Protection (Noise) Policy 2008*. The AQO are nonetheless identical between the two revisions, and the 2019 revision has been applied representing current State policy, although this is immaterial to calculations.

3.3 State and Commonwealth Regulations

Regulation 81 of the Education and Child Care National Regulations requires that: "The approved provider of an education and care service must take reasonable steps to ensure that the needs for sleep and rest of children being educated and cared for by the service are met, having regard to the ages, development stages and individual needs of the children."

Under the *Logan Planning Scheme 2015*, the indoor Acoustic Quality Objectives as per the *Environmental Protection (Noise) Policy* are applicable assessment criteria for new noise sensitive uses. The Policy includes a 30 dB(A) $L_{eq,1hr}$ indoor Objective for childcare centre sleeping areas, and it is concluded that meeting this criterion will provide a suitable acoustic environment in accordance with State and Commonwealth Regulations.

3.4 Air Conditioning - Noise Emissions

It is expected that alternative ventilation – such as air conditioning – will be installed, although the precise type and siting of equipment is not known at this stage. State requirements are set out under the *Environmental Protection Act 1994* (EPA 94); in that Act noise from air conditioning must not exceed the following noise levels when measured as the L_{A90} dB(A) level over a period of 15 minutes at an affected building:

- Between 10pm and 7am: 3 dB(A) above the background level;
- From 7am to 10pm: 5 dB(A) above the background level.

It is noted that these limits are less stringent that the noise emission criteria for residential amenity under the *Logan Planning Scheme 2015*. Meeting the residential criteria will therefore also meet the requirements of the Act, although it is recommended that plant be maintained to ensure compliance with EPA 94 criteria at all times as they represent an ongoing legal obligation.

4. Noise Impact Assessment

4.1 Criteria Summary

A summary of applicable criteria is presented in **Table 7** below, calculated (where applicable) with reference to the measured L_{90} during the ambient noise survey and presented in **Section 2.2**.

Table 7: Summary of assessment criteria. Levels are in dB(A)

Noise level at the boundary of premises				
Noise type	**Time period**	**Monday to Saturday**	**Sunday and public**	
Residential Amenity				
Non-steady sound	Day 7:00am – 6:00pm	$L_{Aeq,adj,T}$ ≤ 53 dB(A)	-	
	Evening 6:00pm to 10:00pm	$L_{Aeq,adj,T}$ ≤ 49 dB(A)	-	
	Night 10:00 – 7:00am	$L_{Aeq,adj,T}$ ≤ 40 dB(A) and L_{Amax} ≤ 60dB(A)	-	
Continuous noise	Anytime	$L_{A90,T}$ 48 / 44 / 44 dB(A) (Day/Evening/Night)	-	
Noise Immissions				
Child Care Centre sleeping areas	L_{eq}	30	30	30
Child Care Centre other indoor areas	L_{eq}	35	35	35

4.2 Noise Immissions – Child Care Centre Design

The existing acoustic environment on site – as described in **Section 2.2** – is considered to be consistent with a generally amenable residential locale affected by moderate levels of road traffic noise and residential activity. While road traffic noise from Daisy Hill Road is identified as a significant contributing source of measured levels, the childcare centre will be largely protected from road traffic noise by its setback and building envelopes. It is therefore concluded that noise immissions onto the childcare component will be controlled by local traffic activity. The measured $L_{eq,1hr\ max}$ during the ambient noise survey is considered a reasonable worst-case external noise level into the design horizon, amounting to 60 dB(A) $L_{eq,1hr}$ façade-adjusted.

To meet the internal Acoustic Quality Objectives, a Noise Reduction (NR) of 25 dB(A) is therefore generally required from the building envelope, and a NR of 30 dB(A) is required to the designated Sleep Room. This corresponds with Category 2 and Category 3 construction under Australian Standard *AS3671*:

- *Category 2:* TNR of approximately 25 dB(A) is expected. Standard construction is acceptable, except for some light-weight elements such as fibrous cement or metal cladding or all-glass facades. Windows, doors and other openings must be closed.
- *Category 3:* TNR of approximately 25-35 dB(A) is expected. Special construction is required. Windows, doors and other openings must be closed.

Detailed calculations under AS3671 can be conducted at the Building Approval stage, once final architectural plans become available. It is nonetheless concluded that the required NR will be readily achievable through appropriate material selection and construction.

It is furthermore noted that the *Queensland Development Code Mandatory Part 4.4* (QDC MP4.4) – while not directly applicable to the development – includes 'deemed to satisfy' forms of construction to achieve minimum Noise Reductions. In particular, a minimum Noise Reduction of 25 dB(A) is expected from Category 1 construction, and 30 dB(A) is expected from Category 2 construction. The required Noise Reduction may therefore be achievable through construction in accordance with QDC MP4.4 Category 2 for the Sleep Room, and Category 1 generally.

Recommendations regarding acoustic design and construction are not intended to be prescriptive as to operational management and processes. Childcare centre staff and management are considered the appropriate entities for assessing amenity requirements during operation, and acoustic recommendations are intended to ensure the availability of suitably amenable space.

4.3 Noise Emissions

4.3.1 Noise Sources

The following sources of potentially intrusive noise have been identified from the proposed development:

- Vehicle movements through the car park, represented by the L_{eq} descriptor
- 'Slamming' car doors at the car park, represented by the L_{max} descriptor;
- Children at outdoor play, represented by the L_{eq} descriptor;
- Rubbish collection, represented by the L_{max} descriptor
- Mechanical plant activity, represented by the L_{90} descriptor.

The precise model(s) and installation of mechanical plant has not been determined at this stage. To meet the Noise Emission Standards, it is recommended that plant be selected, installed and (if necessary) screened to not exceed 40 dB(A) at neighbouring uses. Detailed assessment of mechanical plant noise can be conducted – if required – at the Building Approval stage once specifications can be determined. Due to the significant buffer distances, it is nonetheless expected that plant will be readily compliant without any further acoustic treatment.

It is understood that rubbish collection will be through the standard kerbside service. Noise impacts from rubbish collection will therefore be commensurate with typical residential activity in the locale.

Noise emissions from the remaining sources have been calculated to neighbouring properties using the environmental noise model presented in **Appendix B**. Design sound power levels have been sourced from the NMS database, and are presented in **Table 8** below. Design source levels for car door 'slams' have been calculated from measurements previously undertaken by NMS of a 'worst-case' high intensity door closure. Design source levels for vehicle movements and outdoor play have been calculated as per the *Association of Australasian Acoustical Consultants Guideline for Child Care Centre Acoustic Assessment v3.0*.

Table 8: Design sound power levels, as modelled

Noise Source	Descriptor	Sound Power Levels in dB(Z)								Total in dB(A)
		63 Hz	125 Hz	250 Hz	500 Hz	1kHz	2 kHz	4 kHz	8 kHz	
Vehicle movements	L_{eq}	74	81	75	72	75	76	72	69	**81**
Car door 'slam'*	L_{max}	90	94	89	91	94	89	87	85	**97**
8 children ages 0-2	L_{eq}	53	59	65	69	73	70	66	63	**76**
16 children ages 2-3	L_{eq}	63	69	75	81	83	80	76	72	**87**
11 children ages 3-5	L_{eq}	64	70	75	81	83	80	76	72	**87**
22 children ages 3-5	L_{eq}	67	73	78	84	86	83	79	75	**90**
Sound Pressure Levels at 1m										
Vehicle movements	L_{eq}	66	73	67	64	67	69	65	62	**73**
Car door 'slam'*	L_{max}	56	69	71	79	85	80	78	73	**88**
8 children ages 0-2	L_{eq}	45	51	57	61	65	62	58	55	**69**
16 children ages 2-3	L_{eq}	55	61	67	73	75	72	68	64	**79**
11 children ages 3-5	L_{eq}	57	63	68	74	76	73	69	65	**79**
22 children ages 3-5	L_{eq}	60	66	71	77	79	76	72	68	**82**

* Includes a +2 dB(A) adjustment for impulsiveness, as per Australian Standard AS10555

4.3.2 Environmental Noise Calculations – Vehicle Movements

Noise emissions from vehicle movements through the site have been conceptualized as a moving line source, based upon sound power levels as proposed in the *Association of Australasian Acoustical Consultants Guideline for Child Care Centre Acoustic Assessment v3*. Average speeds of 25 km/hr have been assumed, with a source height of 1.5m (representing dominant engine noise at low speeds). Peak hour traffic flows of 36 movements/hr have been calculated as per the *NSW RTA Guide to Traffic Generating Developments* v2.2. As a highly conservative assumption, peak traffic flows have been assumed during the entirety of the assessment periods.

Noise source locations – as modelled – are presented in **Plate 7** below, while results from the environmental noise calculations are presented along with criteria in **Table 9** following.

Plate 7: Showing vehicle moving line source locations, as modelled

Table 9: Noise emissions forecasts, vehicle movements. Levels are in dB(A) $L_{eq,adj,T}$

Receiver	Forecast	Criteria			Assessment
		Day	Evening	Night	
R1	37	53	49	40	Pass
R2	28	53	49	40	Pass
R3	12	53	49	40	Pass
R4	12	53	49	40	Pass
R5	12	53	49	40	Pass
R6	36	53	49	40	Pass

As shown above, vehicle movements are forecast to meet criteria at all receivers during all periods under a highly conservative calculation scenario.

4.4.3 Environmental Noise Calculations – Car Doors

Although the 'slamming' of car doors is not a necessary nor unavoidable consequence of car park activity, such events may sporadically occur. Assessment of car door noise emissions are based upon measurements of a 'reasonable worst-case' slam event previously measured by NMS. In contrast to 'slamming', typical car door closures emit significantly lower levels of noise. As a comparison, a 4 wheel drive door closure – with moderate force – was measured approximately 13 dB(A) lower than assumed in assessment, and typical closures are expected to generate relatively minor noise emissions.

Potential noise impacts have been modelled from all potential parking locations, as presented in **Plate 8** below. Results from the environmental noise calculations are presented along with criteria in **Table 10** following.

Plate 8: Showing car door noise source locations, as modelled

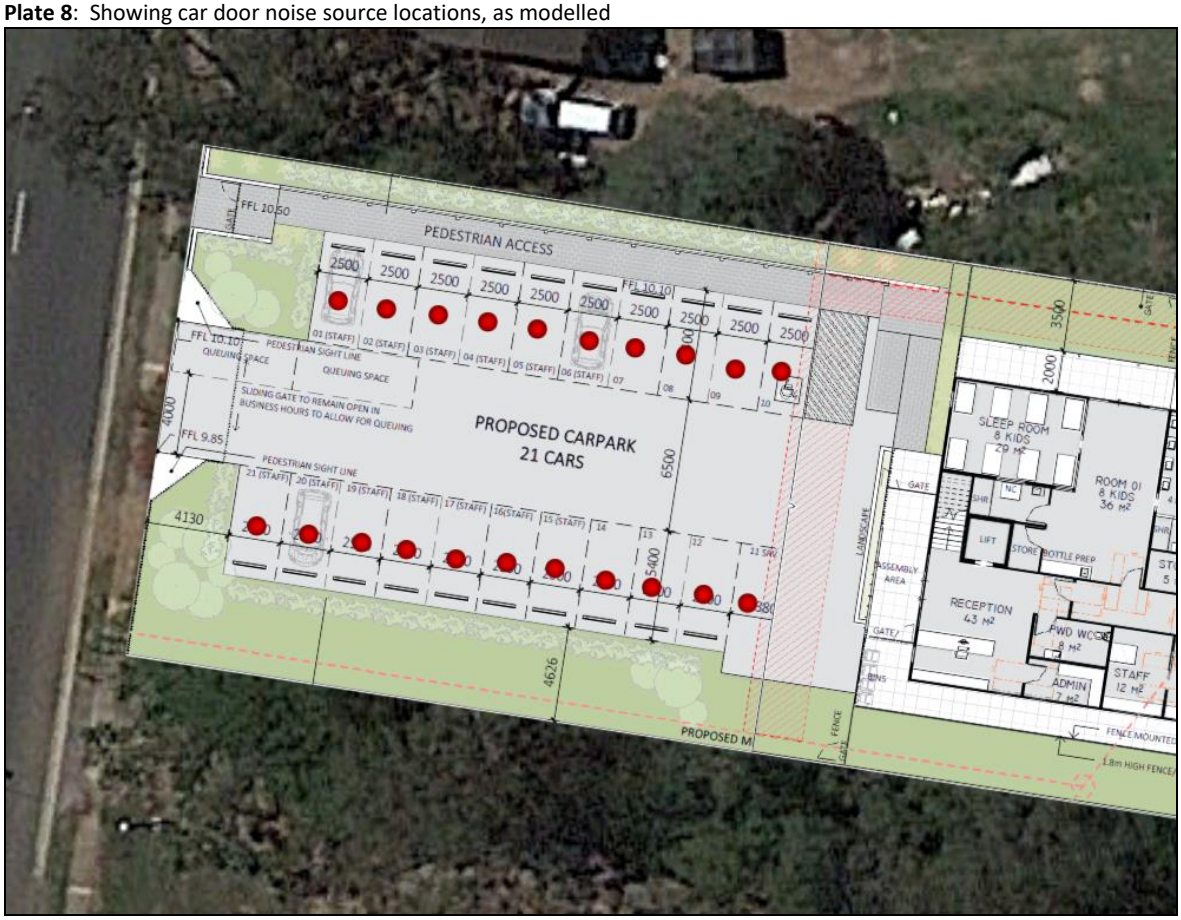


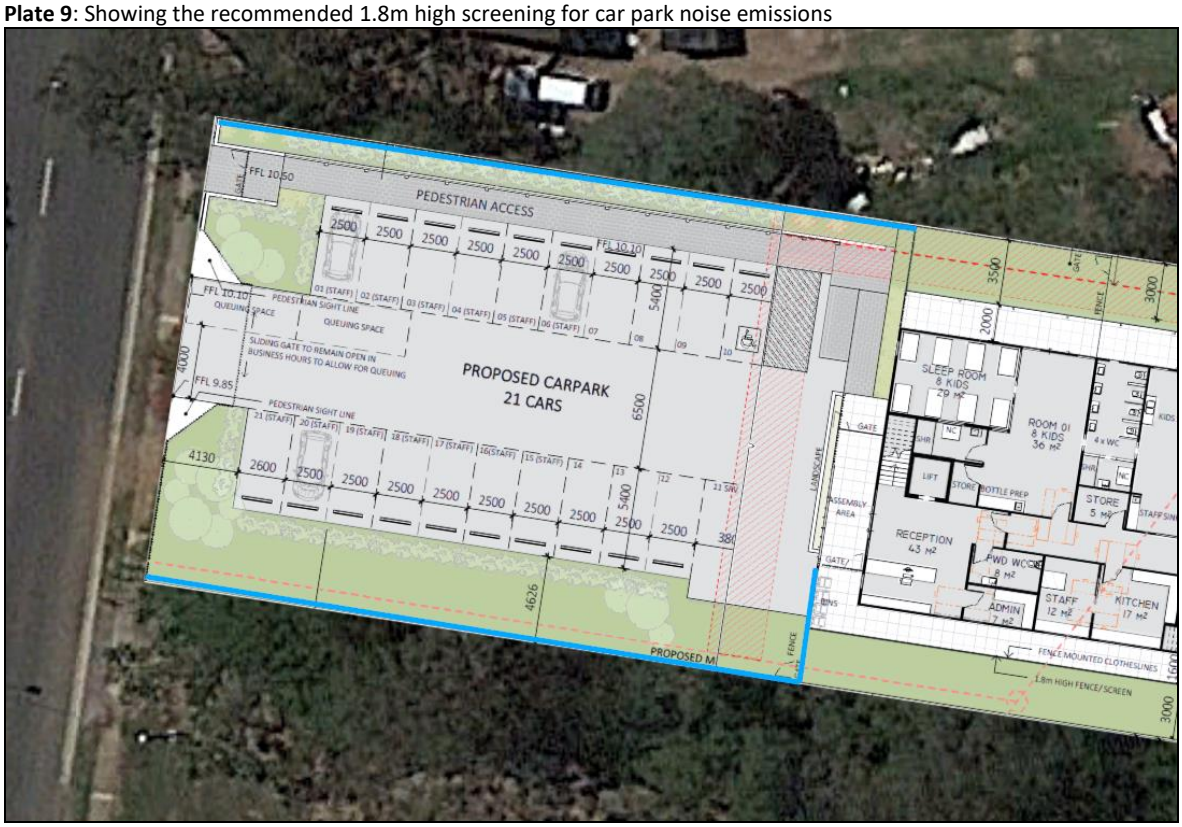
Table 10: Noise emission forecasts and criteria, car doors. Levels are in dB(A) $L_{max.}$ No fence scenario

Receiver	Forecast*	Criteria			Assessment
		Day	Evening	Night	
R1	70	-	-	60	+10
R2	59	-	-	60	Pass
R3	52	-	-	60	Pass
R4	38	-	-	60	Pass
R5	50	-	-	60	Pass
R6	69	-	-	60	+9

* Includes a +2 dB(A) adjustment for impulsiveness as per Australian Standard AS1055

As shown above, noise emissions from worst-case door 'slam' events are forecast to meet criteria at receivers R2 – R5, but to exceed criteria at R1 and R6. To meet criteria, 10 dB(A) of noise reduction is required to the northern boundary, and 9 dB(A) of noise reduction is required to the southern boundary. This can be achieved through the provision of 1.8m high boundary acoustic fencing, as presented in **Plate 9** below.

Plate 9: Showing the recommended 1.8m high screening for car park noise emissions



To effectively function as an acoustic barrier, this fencing should be continuous and gap-free, with a density of not less than 12.5 kg/m^2. Noise emission calculations – including screening from this recommended fencing – are presented in **Table 11** below. Barrier calculations are presented in **Appendix C**.

Table 11: Noise emission forecasts and criteria, car doors. Levels are in dB(A) L_{max}. 1.8m high fence scenario

Receiver	Forecast*	Criteria			Screening Required	Screening Provided	Assessment
		Day	Evening	Night			
R1	70	-	-	60	10	13	Pass
R2	59	-	-	60	0	0	Pass
R3	52	-	-	60	0	0	Pass
R4	38	-	-	60	0	0	Pass
R5	50	-	-	60	0	0	Pass
R6	69	-	-	60	9	13	Pass

* Includes a +2 dB(A) adjustment for impulsiveness as per Australian Standard AS1055

As shown above with the inclusion of screening from the recommended 1.8m high acoustic fencing, noise from car door 'slams' is forecast to meet criteria at all receivers.

4.3.4 Environmental Noise Calculations – Outdoor Play

Potential noise impacts from outdoor play have been assessed assuming full capacity, and all children playing outdoor simultaneously. It is expected and recommended that outdoor play be limited to the hours of 7am to 6pm. It is noted that noise breakout from internal play may occur when windows are fully open. However, passive play activities are expected at 6 dB(A) lower than outdoor play, and a minimum of 5 dB(A) noise reduction can be assumed through transmission loss through a fully open window. Indoor play is therefore calculated to generate noise impacts 11 dB(A) lower than outdoor play, and therefore constitute a very minor if not negligible contribution to overall levels.

Outdoor play activities have been modelled as point sources, representing the central focus of an area of dynamic play, grouped by play rooms. Sound power levels have been calculated as per the *Association of Australasian Acoustical Consultants Guideline for Child Care Centre Acoustic Assessment v3.0*. Power levels per room grouping have been calculated according to the formula as presented in the Guideline:

- Effective Sound Power Level for 'n' children = Effective Sound Power Level for 10 children + 10 log (n/10)

The location of noise point sources – as modelled – are presented in **Plate 10** below. It is understood that outdoor play will be limited to the areas as shown in **Plate 11** below. The distribution of point sources – as modelled – is therefore considered representative of a 'worst-case' one hour scenario of full capacity play. Results of the environmental noise calculations are presented along with criteria in **Table 12** following.

Plate 10: Showing playing children noise point sources, as modelled

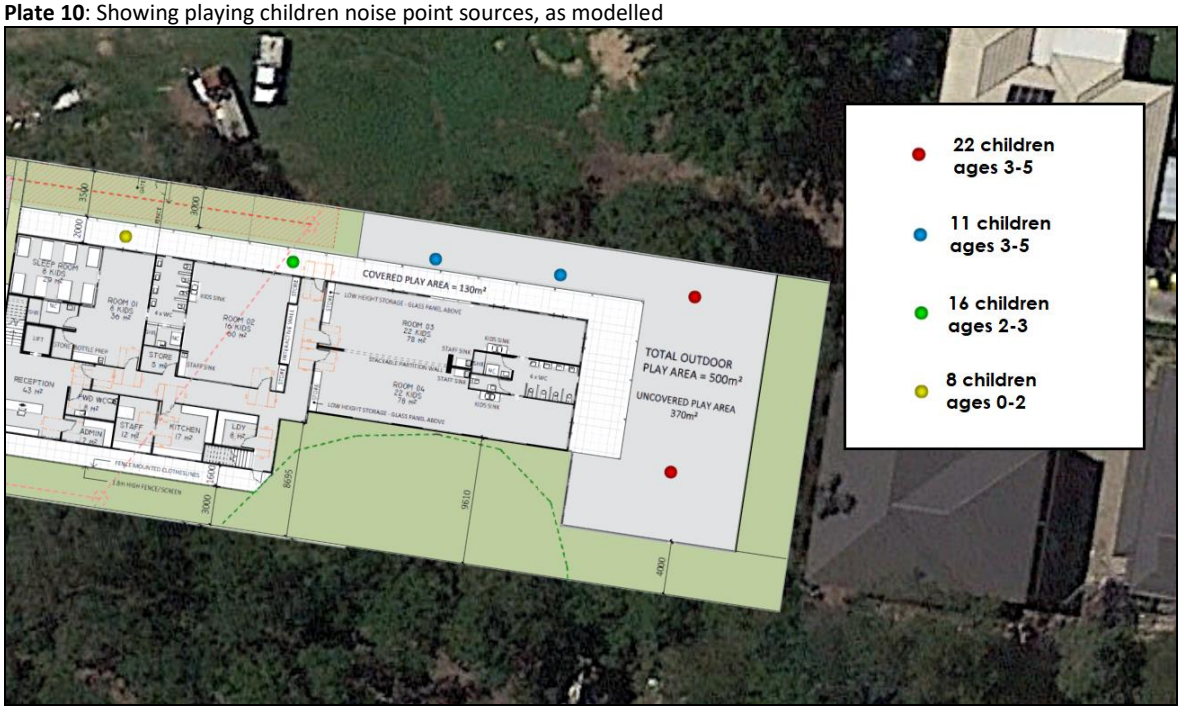


Plate 11: Showing designated outdoor play areas (in blue)

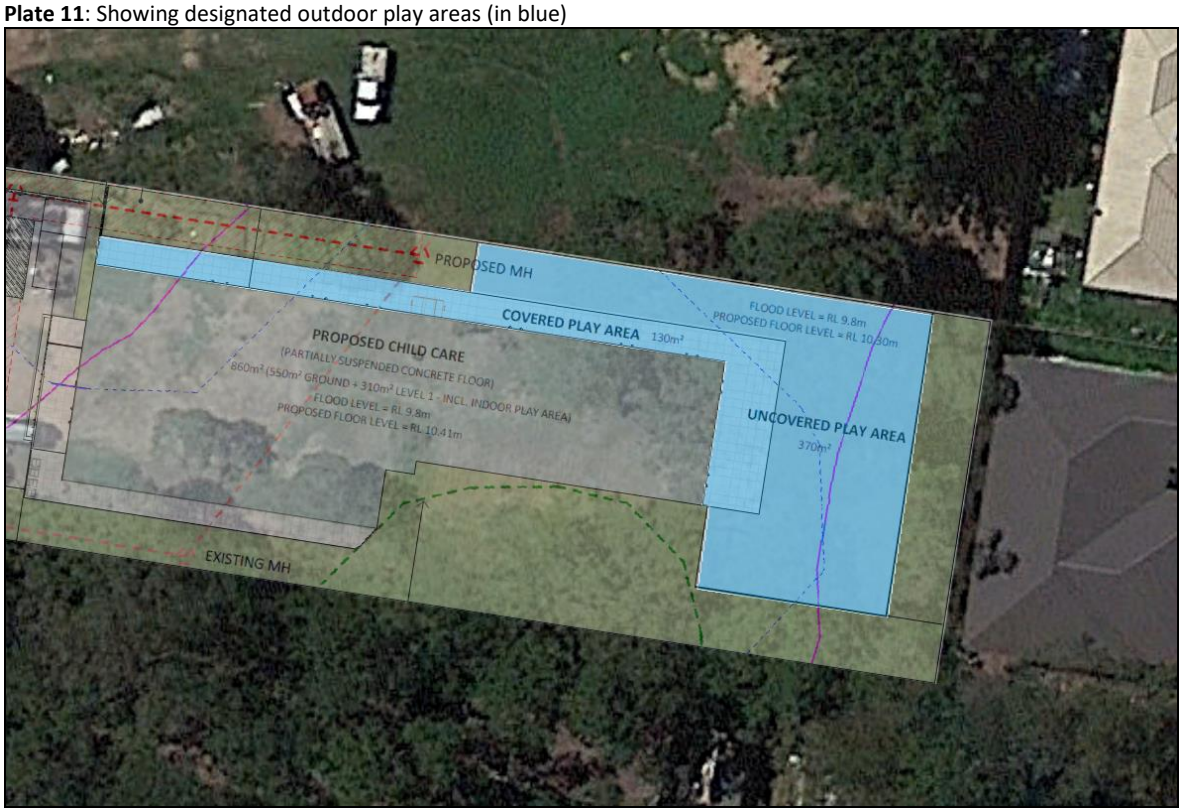


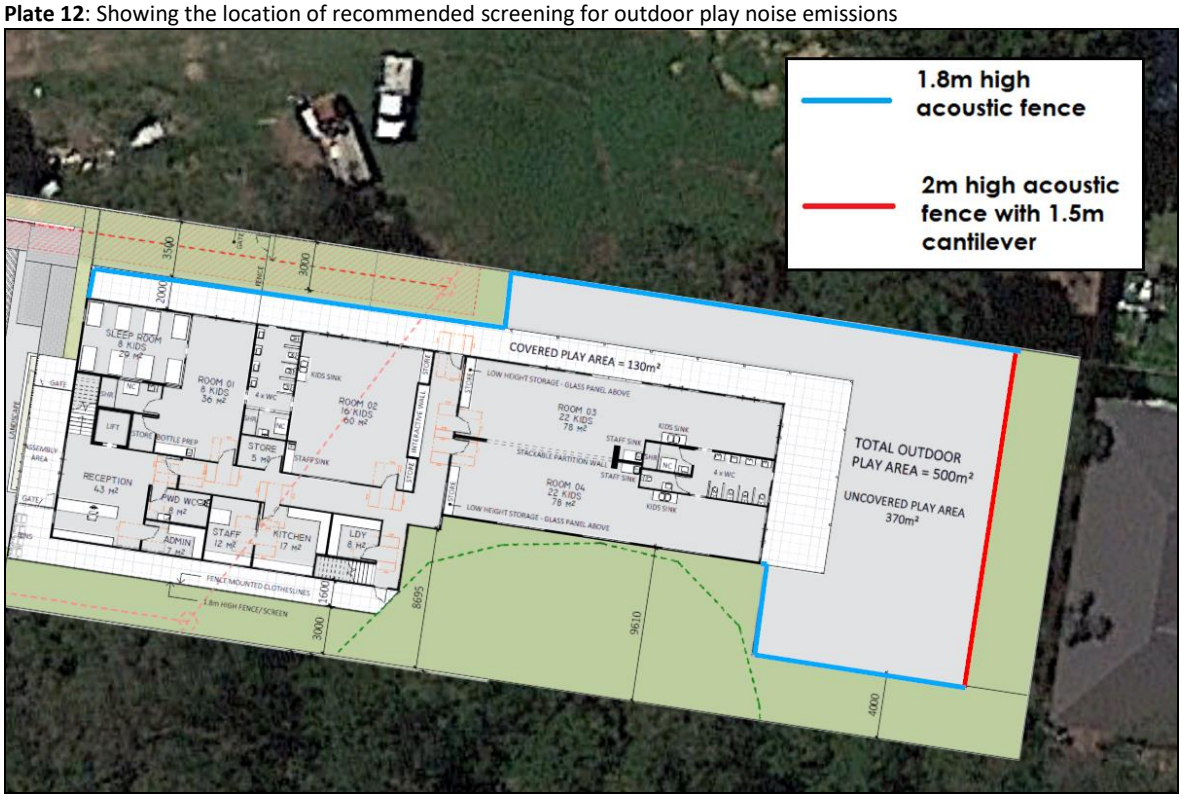
Table 12: Noise emissions forecasts, outdoor play. Levels are in dB(A) $L_{eq,adj,T}$. No fence scenario

Receiver	Forecast	Criteria			Assessment
		Day	Evening	Night	
R1	49	53	-	-	Pass
R2	61	53	-	-	+8
R3	65	53	-	-	+12
R4	62	53	-	-	+9
R5	62	53	-	-	+9
R6	35	53	-	-	Pass

As shown above, emissions are forecast to exceed criteria at R2 – R3 by up to 8 dB(A). To meet criteria, 8 dB(A) of screening is therefore required to the northern boundary, and 4 dB(A) of screening is required to the eastern and southern boundary.

This can be achieved throught the provision of acoustic barriers as presnted in **Plate 12** below.

Plate 12: Showing the location of recommended screening for outdoor play noise emissions



The design for the proposed cantilevered fence on the eastern extent of the play area is shown in **Figure 2** below.

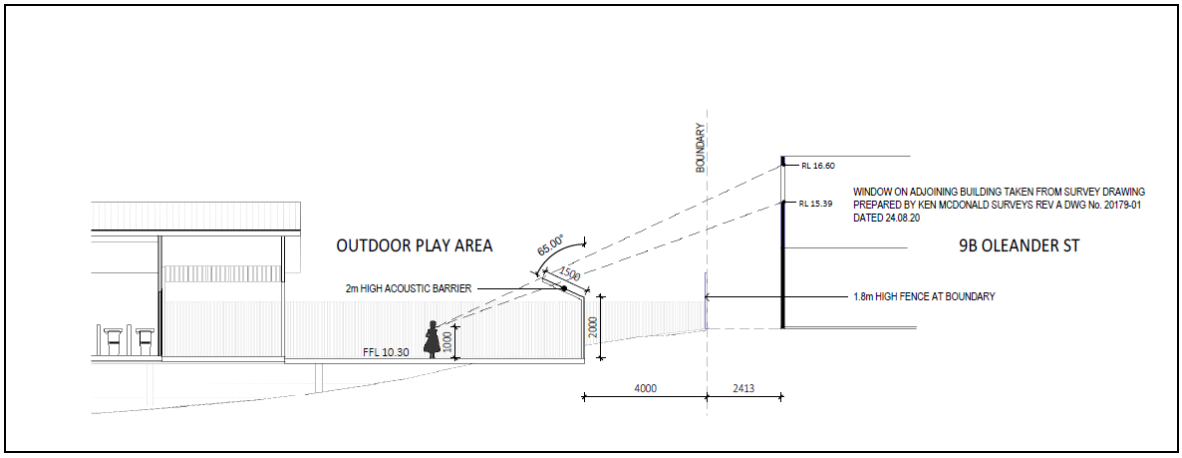


Figure 2: Showing the proposed cantilvered fence design

To effectively function as acoustic barriers, this screening should be continuous and gap-free, with a density of not less than 12.5 kg/m^2. Noise emission calculations – including screening from this recommended fencing – are presented in **Table 13** below. Barrier calculations are presented in **Appendix C**.

Table 13: Noise emission forecasts and criteria, outdoor play. Levels are in dB(A) $L_{eq,adj,T}$. 1.8m high fence scenario

Receiver	Forecast	Criteria			Screening Required	Screening Provided	Assessment
		Day	Evening	Night			
R1	49	53	-	-	0	0	Pass
R2	61	53	-	-	8	14	Pass
R3	65	53	-	-	12	12	Pass
R4	62	53	-	-	9	18	Pass
R5	62	53	-	-	9	9	Pass
R6	35	53	-	-	0	0	Pass

As shown above, with the provision of screening from the recommended acoustic barriers, noise emissions from outdoor play are forecast to meet criteria at all receivers during the daytime period. It is furthermore noted that calculations assuming continuous full capacity outdoor play throughout the entire daytime period. Since no allowance has been made for periods of internal play and rest – which will generate substantively lower noise emissions – this is considered to be a highly conservative assessment scenario.

Appendix A: Development Plans

SITE DETAILS

ADDRESS:	11 DAISY HILL ROAD, DAISY HILL QLD 4127
LOT AND PLAN:	LOT 36 ON RP 113835
SITE AREA:	2529m²
ZONE:	LOW DENSITY RESIDENTIAL (SUBURBAN PRECINCT)
EXISTING USE:	SINGLE DETACHED DWELLING HOUSE
EXISTING PARKING:	2 x CARS

PROPOSED DEVELOPMENT

PROPOSED USE:	CHILD CARE CENTRE (90 PLACES) CATEGORIES: ROOM 01 = 8 PLACES (0 - 24 months) ROOM 02 = 16 PLACES (24 - 36 months) ROOM 03 = 22 PLACES (36 months and over) ROOM 04 = 22 PLACES (36 months and over) ROOM 05 = 11 PLACES (36 months and over) ROOM 06 = 11 PLACES (36 months and over)
PROPOSED SITE COVER:	1150m² (45%)
PROPOSED BUILDING AREA:	860m² (550m² GROUND + 310m² LEVEL 1 - INCL. INDOOR PLAY AREA)
PROPOSED OUTDOOR PLAY AREA:	500m² (INCLUDING VERANDAH)
PROPOSED PARKING:	21 CARS (INCLUDING 1 x PWD & 1 SRV)
PROPOSED BUILDING HEIGHT:	2 STOREY (8.4m MAX. BUILDING HEIGHT ABOVE NGL)

DRAWING LIST

DWG. No.	DRAWING TITLE	REVISION
DA 1.00	COVER PAGE	D
DA 1.01	LOCATION PLAN	D
DA 1.02	EXISTING SITE SURVEY	D
DA 2.01	PROPOSED SITE PLAN	D
DA 2.02	PROPOSED FLOOR PLAN	D
DA 2.03	PROPOSED FLOOR PLAN (cont.)	D
DA 2.04	PROPOSED FLOOR PLAN - LEVEL 1	D
DA 2.05	ROOF PLAN	D
DA 3.01	ELEVATIONS 1	D
DA 3.02	ELEVATIONS 2	D
DA 3.03	ELEVATIONS 3	D
DA 3.04	ELEVATIONS 4	D
DA 4.01	SCHEMATIC SECTIONS	D
DA 4.02	SCHEMATIC SECTION - REAR BOUNDARY	D
DA 5.01	PERSPECTIVE VIEWS	D
DA 5.02	PERSPECTIVE VIEWS	D
DA 5.03	PERSPECTIVE VIEWS	D
DA 5.04	PERSPECTIVE VIEWS	D

DEVELOPMENT APPLICATION

11 DAISY HILL ROAD, DAISY HILL QLD 4127

PROPOSED CHILD CARE CENTRE

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N
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SUBJECT SITE
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VERONICA AVENUE
WINNETTS ROAD
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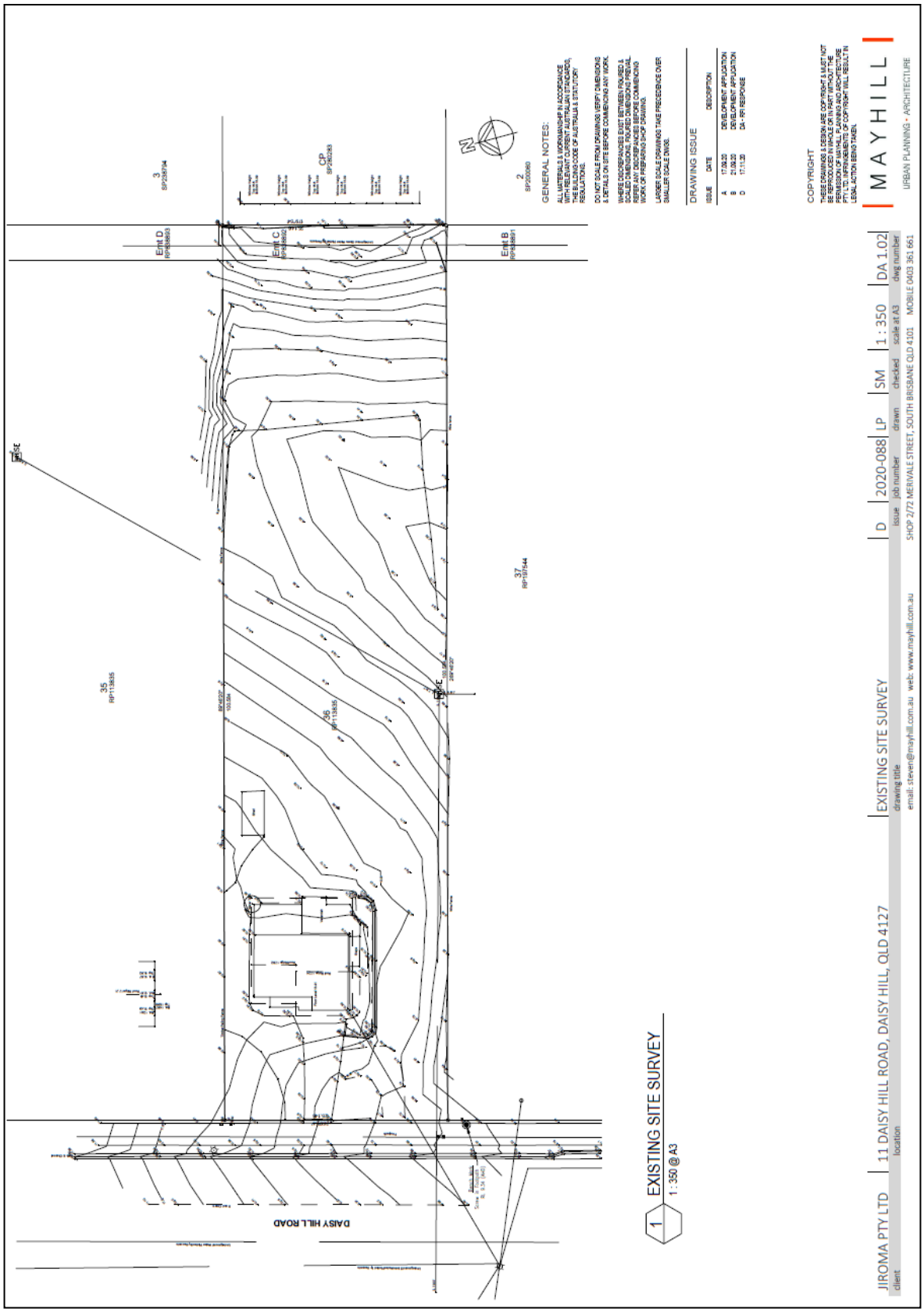
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EXISTING SITE SURVEY
1 : 350 @ A3
DAISY HILL ROAD
Emt D
Emt C
Emt B
CP SP282263
35 RP113835
36 RP113836
37 RP187444
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client
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location
EXISTING SITE SURVEY
drawing title
D
issue
2020-088
job number
LP
drawn
SM
checked
1 : 350
scale at A3
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dwg number
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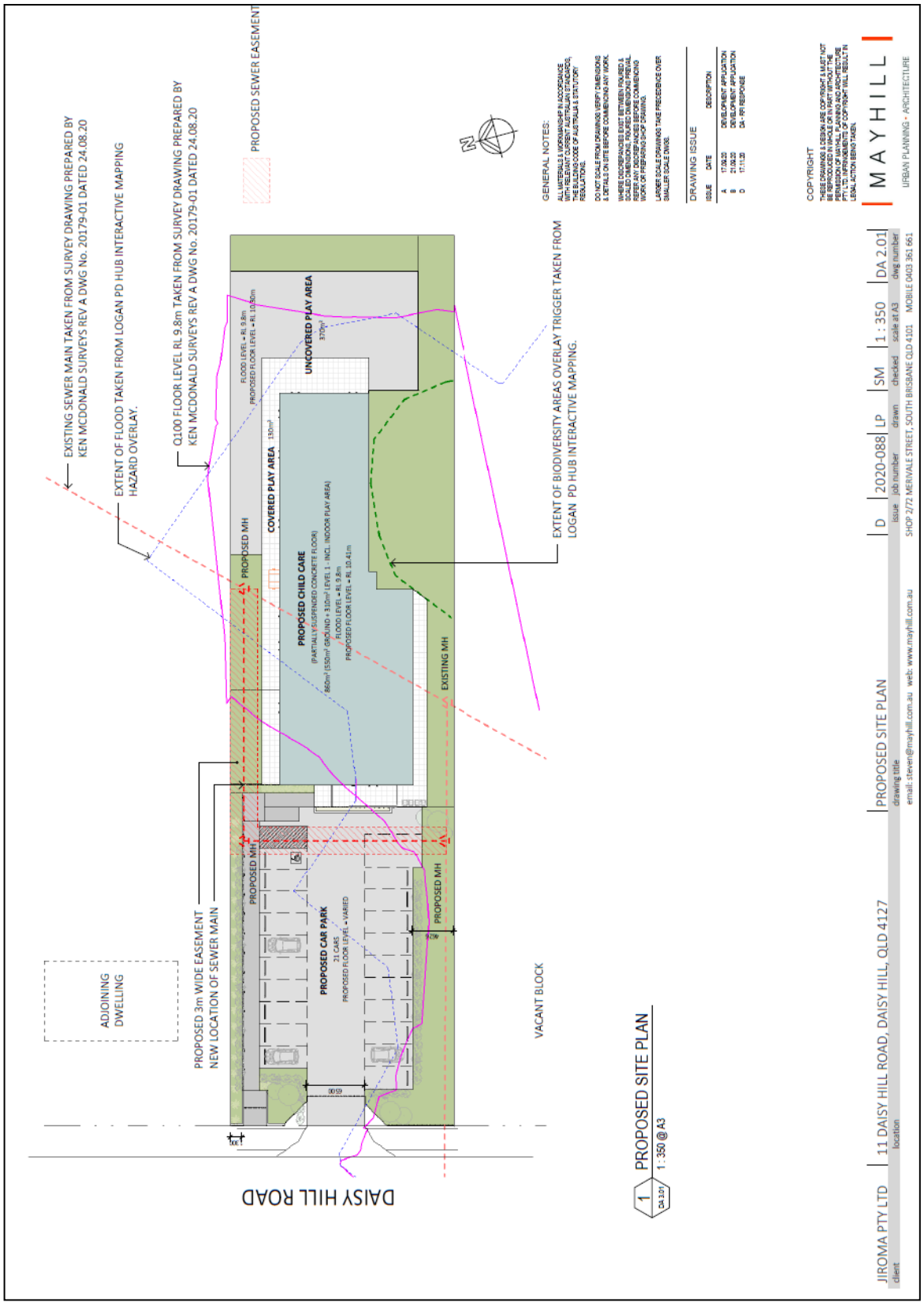
EXISTING SEWER MAIN TAKEN FROM SURVEY DRAWING PREPARED BY KEN MCDONALD SURVEYS REV A DWG No. 20179-01 DATED 24.08.20
EXTENT OF FLOOD TAKEN FROM LOGAN PD HUB INTERACTIVE MAPPING HAZARD OVERLAY.
Q100 FLOOR LEVEL RL 9.8m TAKEN FROM SURVEY DRAWING PREPARED BY KEN MCDONALD SURVEYS REV A DWG No. 20179-01 DATED 24.08.20
PROPOSED SEWER EASEMENT
EXTENT OF BIODIVERSITY AREAS OVERLAY TRIGGER TAKEN FROM LOGAN PD HUB INTERACTIVE MAPPING.
PROPOSED CHILD CARE
UNCOVERED PLAY AREA
COVERED PLAY AREA
PROPOSED CAR PARK
PROPOSED MH
EXISTING MH
ADJOINING DWELLING
PROPOSED 3m WIDE EASEMENT NEW LOCATION OF SEWER MAIN
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PROPOSED SITE PLAN
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PROPOSED SITE PLAN
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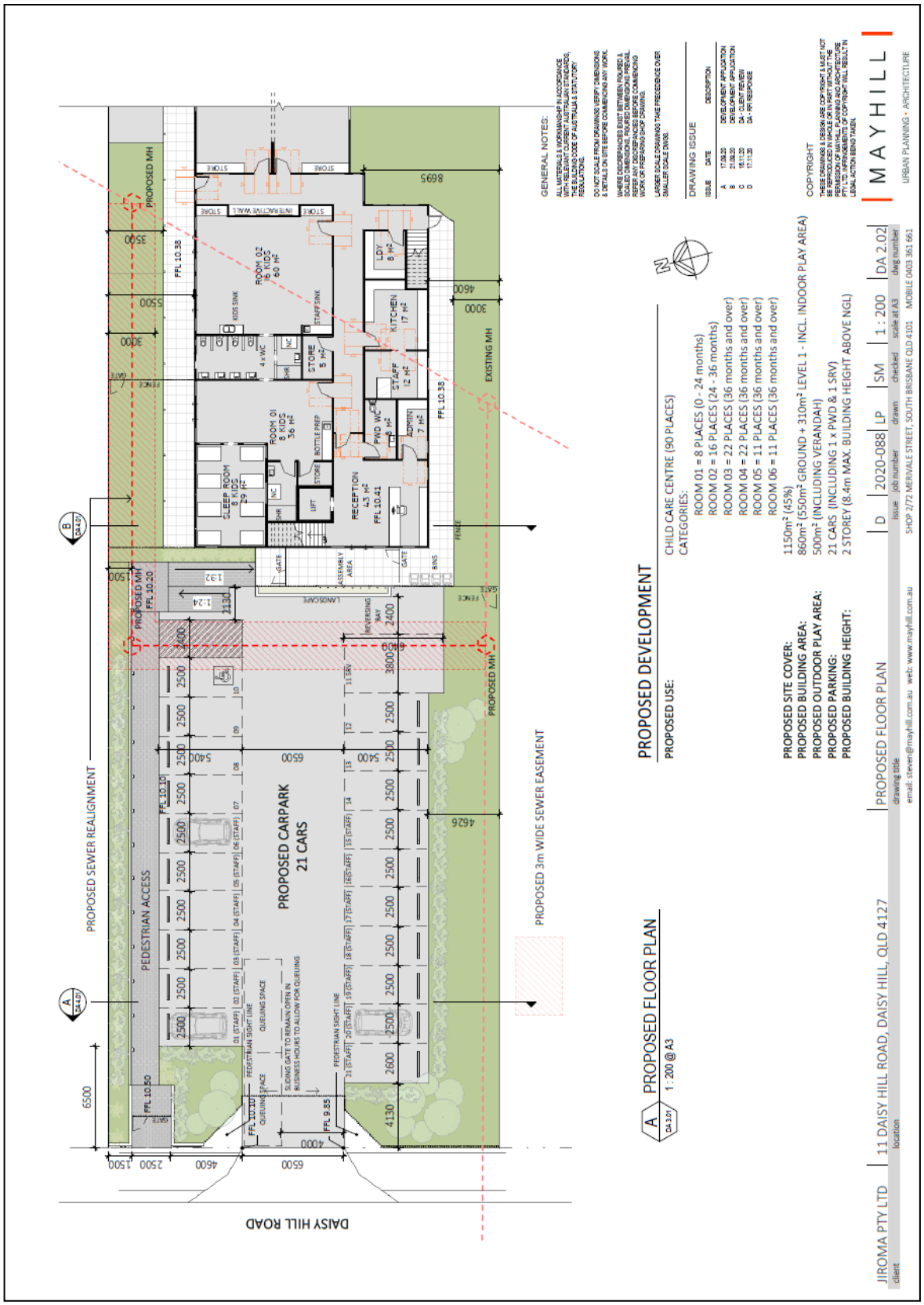
PROPOSED DEVELOPMENT
PROPOSED USE:
CHILD CARE CENTRE (90 PLACES)
CATEGORIES:
ROOM 01 = 8 PLACES (0 - 24 months)
ROOM 02 = 16 PLACES (24 - 36 months)
ROOM 03 = 22 PLACES (36 months and over)
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ROOM 06 = 11 PLACES (36 months and over)
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PROPOSED PARKING: 21 CARS (INCLUDING 1 x PWD & 1 SRV)
PROPOSED BUILDING HEIGHT: 2 STOREY (8.4m MAX. BUILDING HEIGHT ABOVE NGL)
A PROPOSED FLOOR PLAN
1 : 200 @ A3
PROPOSED FLOOR PLAN
D | 2020-088 | LP | SM | 1 : 200 | DA 2.02
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PROPOSED SEWER REALIGNMENT
PROPOSED 3m WIDE SEWER EASEMENT
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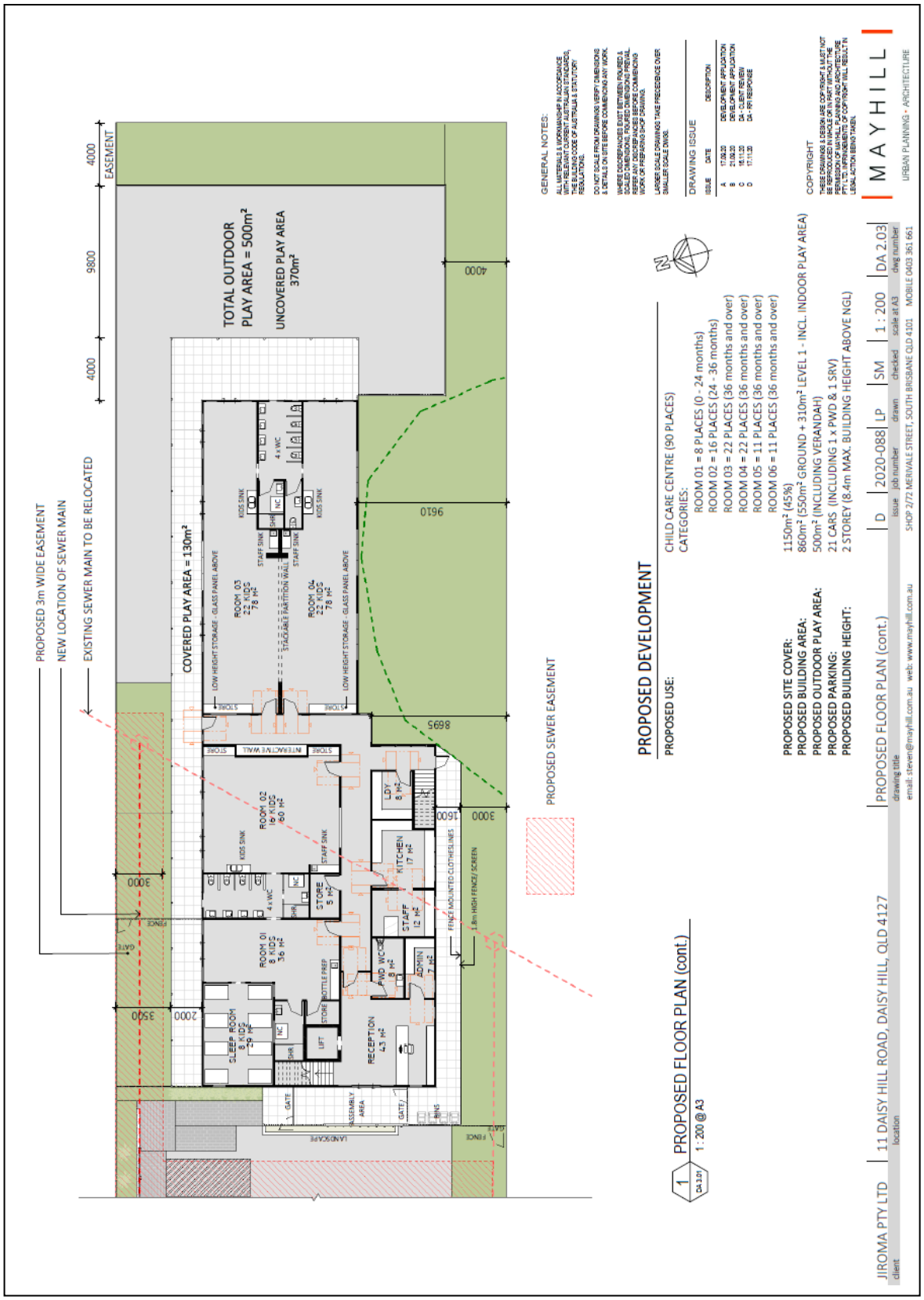

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C	16.11.20	DA - CLIENT REVIEW
D	17.11.20	DA - RFI RESPONSE

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PROPOSED DEVELOPMENT

PROPOSED USE: CHILD CARE CENTRE (90 PLACES)

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PROPOSED PARKING: 21 CARS (INCLUDING 1 x PWD & 1 SRV)
PROPOSED BUILDING HEIGHT: 2 STOREY (8.4m MAX. BUILDING HEIGHT ABOVE NGL)

1 PROPOSED FLOOR PLAN (cont.) — DA 3.01
1 : 200 @ A3

PROPOSED FLOOR PLAN (cont.) | D | 2020-088 | LP | SM | 1 : 200 | DA 2.03
drawing title | issue | job number | drawn | checked | scale at A3 | dwg number

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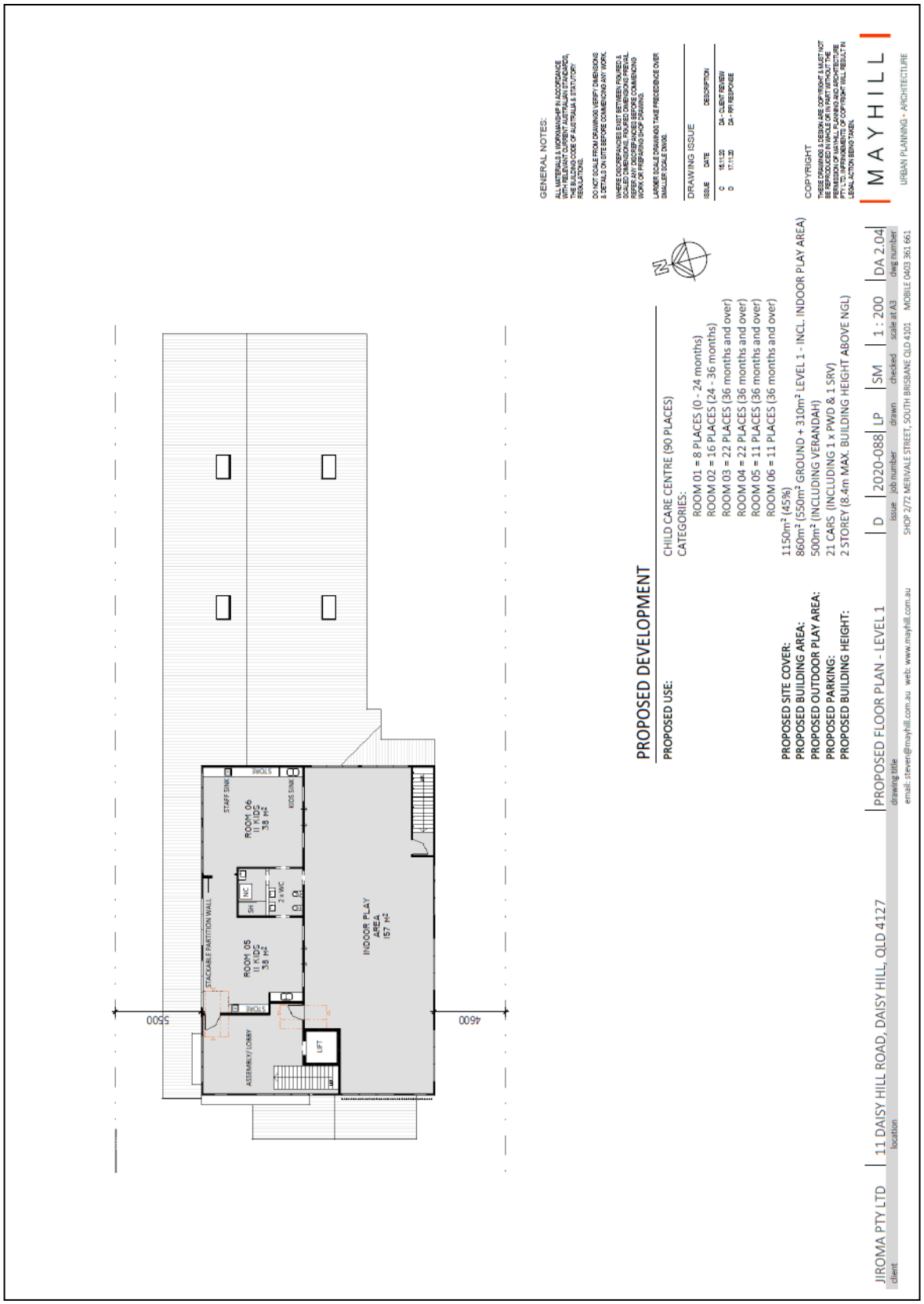
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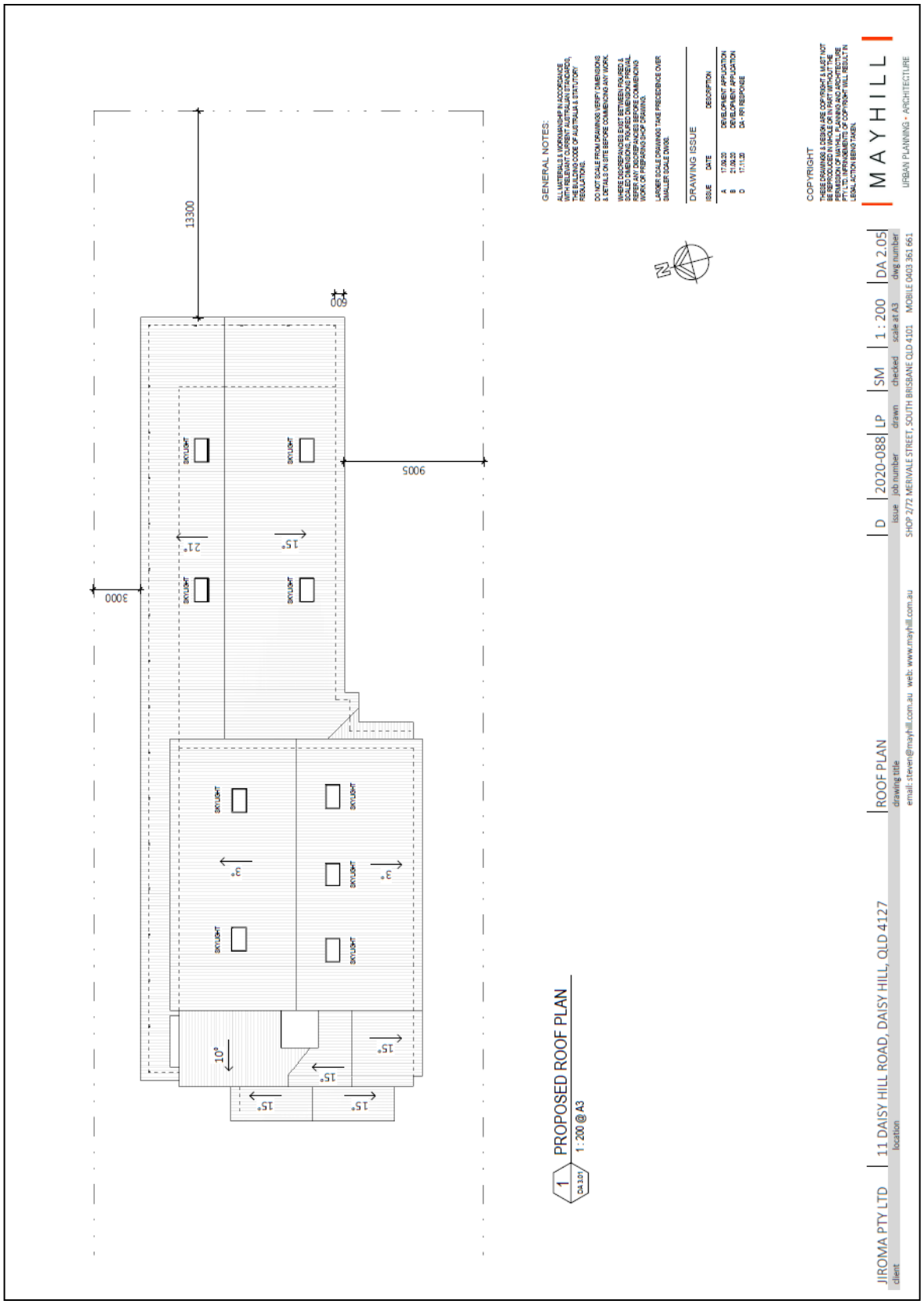
MAYHILL
URBAN PLANNING - ARCHITECTURE
PROPOSED DEVELOPMENT
PROPOSED USE: CHILD CARE CENTRE (90 PLACES)
CATEGORIES:
ROOM 01 = 8 PLACES (0 - 24 months)
ROOM 02 = 16 PLACES (24 - 36 months)
ROOM 03 = 22 PLACES (36 months and over)
ROOM 04 = 22 PLACES (36 months and over)
ROOM 05 = 11 PLACES (36 months and over)
ROOM 06 = 11 PLACES (36 months and over)
PROPOSED SITE COVER: 1150m² (45%)
PROPOSED BUILDING AREA: 860m² (550m² GROUND + 310m² LEVEL 1 - INCL. INDOOR PLAY AREA)
PROPOSED OUTDOOR PLAY AREA: 500m² (INCLUDING VERANDAH)
PROPOSED PARKING: 21 CARS (INCLUDING 1 x PWD & 1 SRV)
PROPOSED BUILDING HEIGHT: 2 STOREY (8.4m MAX. BUILDING HEIGHT ABOVE NGL)
N
5500
4600
ROOM 06
11 KIDS
38 m2
ROOM 05
11 KIDS
38 m2
INDOOR PLAY
AREA
157 m2
STAFF SINK
KIDS SINK
STACKABLE PARTITION WALL
ASSEMBLY / LOBBY
LIFT
2 x WC
JIROMA PTY LTD
client
11 DAISY HILL ROAD, DAISY HILL, QLD 4127
location
PROPOSED FLOOR PLAN - LEVEL 1
drawing title
D
issue
2020-088
job number
LP
drawn
SM
checked
1 : 200
scale at A3
DA 2.04
dwg number
email: steven@mayhill.com.au web: www.mayhill.com.au
SHOP 2/72 MERIVALE STREET, SOUTH BRISBANE QLD 4101
MOBILE 0403 361 661


13300
600
9005
3000
SKYLIGHT
21°
15°
3°
10°
N
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MAYHILL
URBAN PLANNING - ARCHITECTURE
1 PROPOSED ROOF PLAN
DA 2.05
1 : 200 @ A3
JIROMA PTY LTD
client
11 DAISY HILL ROAD, DAISY HILL, QLD 4127
location
ROOF PLAN
drawing title
D
issue
2020-088
job number
LP
drawn
SM
checked
1 : 200
scale at A3
DA 2.05
dwg number
email: steven@mayhill.com.au web: www.mayhill.com.au
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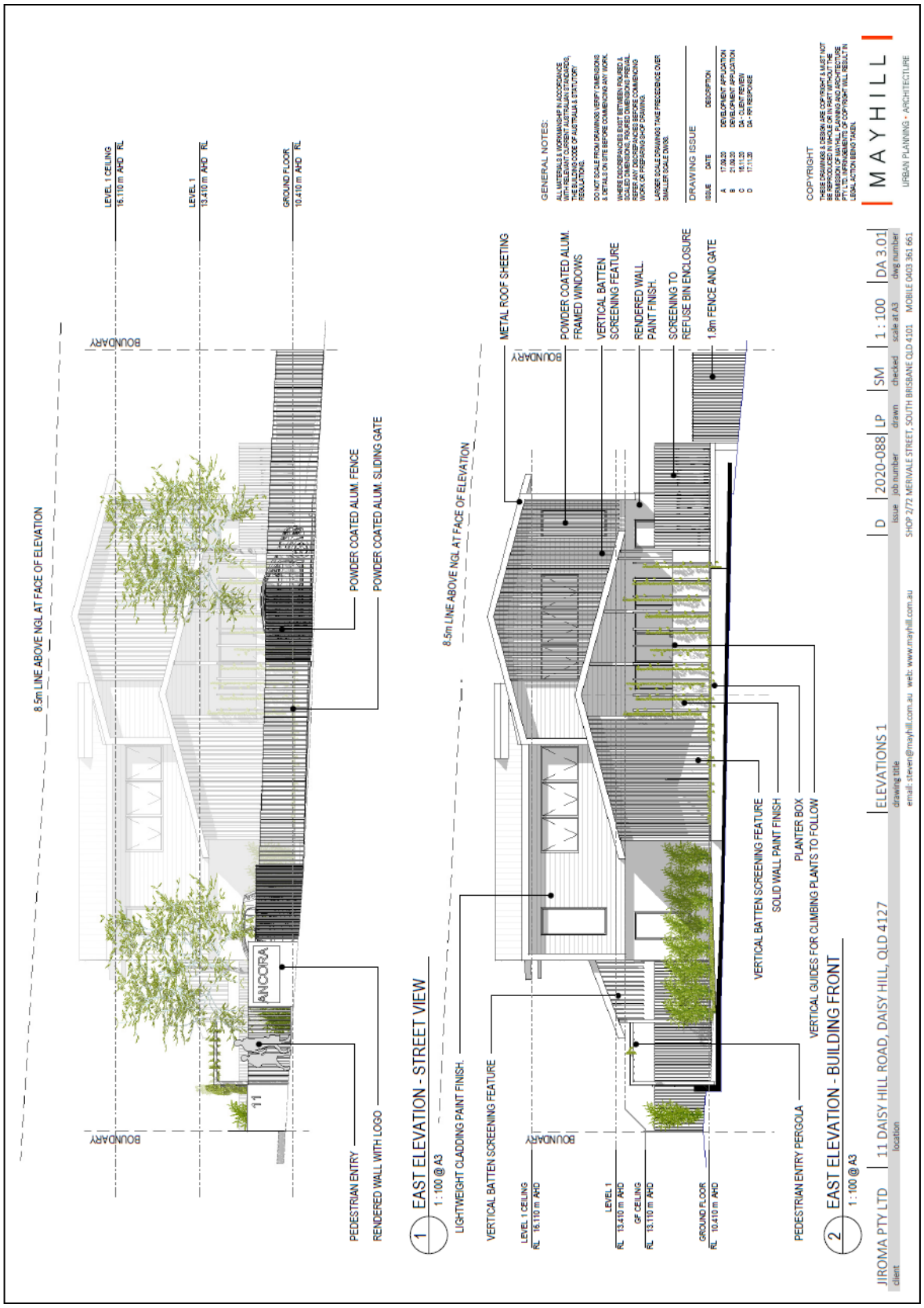
1 EAST ELEVATION - STREET VIEW
1 : 100 @ A3
2 EAST ELEVATION - BUILDING FRONT
1 : 100 @ A3
8.5m LINE ABOVE NGL AT FACE OF ELEVATION
LEVEL 1 CEILING
16.110 m AHD RL
LEVEL 1
13.410 m AHD RL
GROUND FLOOR
10.410 m AHD RL
BOUNDARY
ANCORA
11
POWDER COATED ALUM. FENCE
POWDER COATED ALUM. SLIDING GATE
PEDESTRIAN ENTRY
RENDERED WALL WITH LOGO
LIGHTWEIGHT CLADDING PAINT FINISH.
VERTICAL BATTEN SCREENING FEATURE
METAL ROOF SHEETING
POWDER COATED ALUM. FRAMED WINDOWS
VERTICAL BATTEN SCREENING FEATURE
RENDERED WALL. PAINT FINISH.
SCREENING TO REFUSE BIN ENCLOSURE
1.8m FENCE AND GATE
VERTICAL BATTEN SCREENING FEATURE
SOLID WALL PAINT FINISH
PLANTER BOX
VERTICAL GUIDES FOR CLIMBING PLANTS TO FOLLOW
PEDESTRIAN ENTRY PERGOLA
GENERAL NOTES:
DRAWING ISSUE
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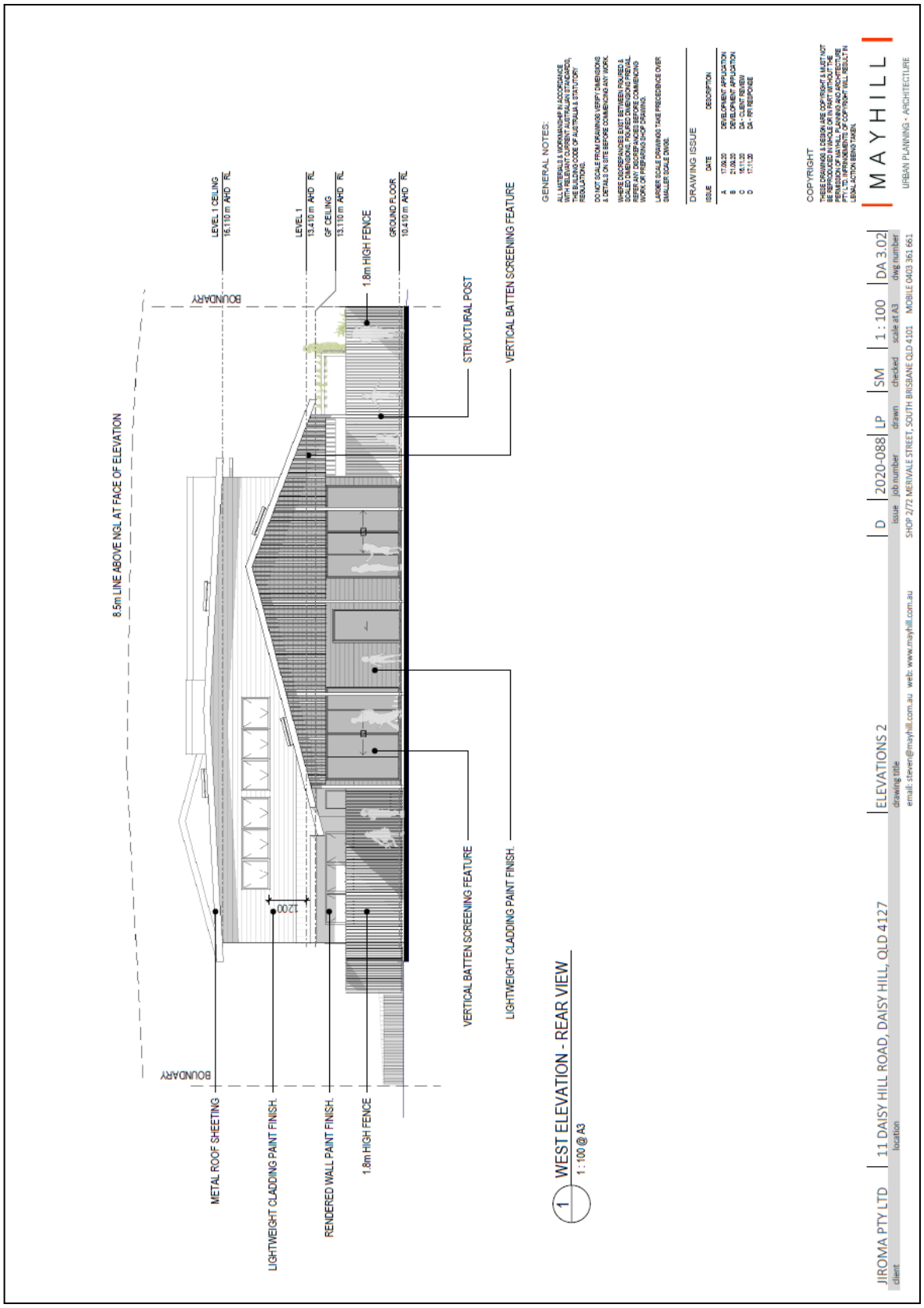
URBAN PLANNING - ARCHITECTURE
JIROMA PTY LTD
11 DAISY HILL ROAD, DAISY HILL, QLD 4127
ELEVATIONS 1
2020-088
DA 3.01
SHOP 2/72 MERIVALE STREET, SOUTH BRISBANE QLD 4101 MOBILE 0403 361 661


LEVEL 1 CEILING
16.110 m AHD RL
LEVEL 1
13.410 m AHD RL
GF CEILING
13.110 m AHD RL
1.8m HIGH FENCE
GROUND FLOOR
10.410 m AHD RL
BOUNDARY
8.5m LINE ABOVE NGL AT FACE OF ELEVATION
STRUCTURAL POST
VERTICAL BATTEN SCREENING FEATURE
VERTICAL BATTEN SCREENING FEATURE
LIGHTWEIGHT CLADDING PAINT FINISH.
1200
METAL ROOF SHEETING
LIGHTWEIGHT CLADDING PAINT FINISH.
RENDERED WALL PAINT FINISH.
1.8m HIGH FENCE
BOUNDARY
1 WEST ELEVATION - REAR VIEW
1 : 100 @ A3
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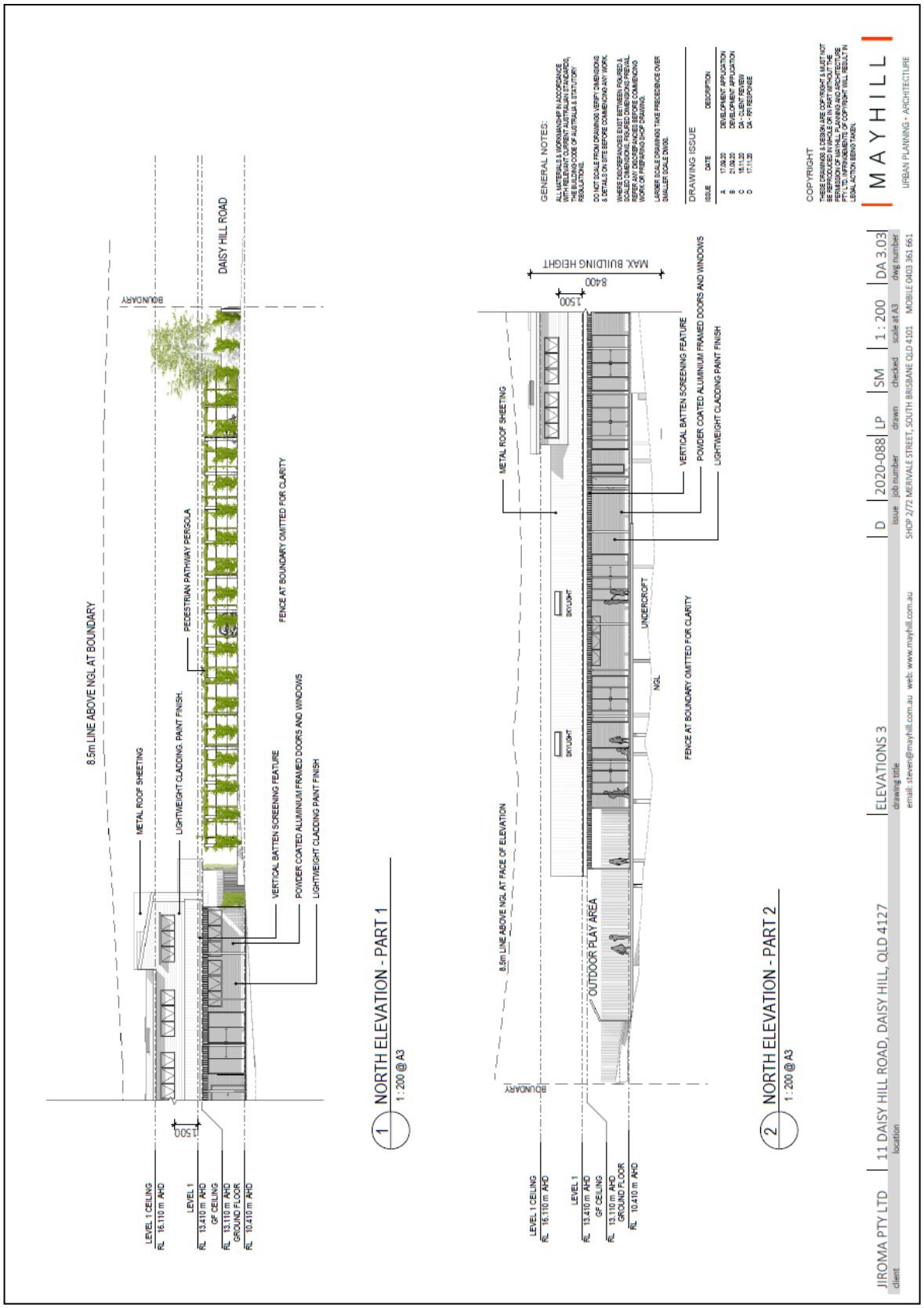
MAYHILL
URBAN PLANNING - ARCHITECTURE
JIROMA PTY LTD
client
11 DAISY HILL ROAD, DAISY HILL, QLD 4127
location
ELEVATIONS 2
drawing title
D
issue
2020-088
job number
LP
drawn
SM
checked
1 : 100
scale at A3
DA 3.02
dwg number
email: steven@mayhill.com.au web: www.mayhill.com.au
SHOP 2/72 MERIVALE STREET, SOUTH BRISBANE QLD 4101 MOBILE 0403 361 661


8.5m LINE ABOVE NGL AT BOUNDARY
METAL ROOF SHEETING
LIGHTWEIGHT CLADDING, PAINT FINISH.
PEDESTRIAN PATHWAY PERGOLA
DAISY HILL ROAD
BOUNDARY
FENCE AT BOUNDARY OMITTED FOR CLARITY
VERTICAL BATTEN SCREENING FEATURE
POWDER COATED ALUMINIUM FRAMED DOORS AND WINDOWS
LIGHTWEIGHT CLADDING PAINT FINISH
1500
LEVEL 1 CEILING
RL 16.110 m AHD
LEVEL 1
RL 13.410 m AHD
GF CEILING
RL 13.110 m AHD
GROUND FLOOR
RL 10.410 m AHD
1 NORTH ELEVATION - PART 1
1 : 200 @ A3
8.5m LINE ABOVE NGL AT FACE OF ELEVATION
METAL ROOF SHEETING
MAX. BUILDING HEIGHT
8400
1500
SKYLIGHT
SKYLIGHT
OUTDOOR PLAY AREA
UNDERCROFT
NGL
VERTICAL BATTEN SCREENING FEATURE
POWDER COATED ALUMINIUM FRAMED DOORS AND WINDOWS
LIGHTWEIGHT CLADDING PAINT FINISH
FENCE AT BOUNDARY OMITTED FOR CLARITY
2 NORTH ELEVATION - PART 2
1 : 200 @ A3
GENERAL NOTES:
DRAWING ISSUE
ISSUE DATE DESCRIPTION
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C 16.11.20 DA - CLIENT REVIEW
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client
11 DAISY HILL ROAD, DAISY HILL, QLD 4127
location
ELEVATIONS 3
drawing title
D
issue
2020-088
job number
LP
drawn
SM
checked
1 : 200
scale at A3
DA 3.03
dwg number
email: steven@mayhill.com.au web: www.mayhill.com.au
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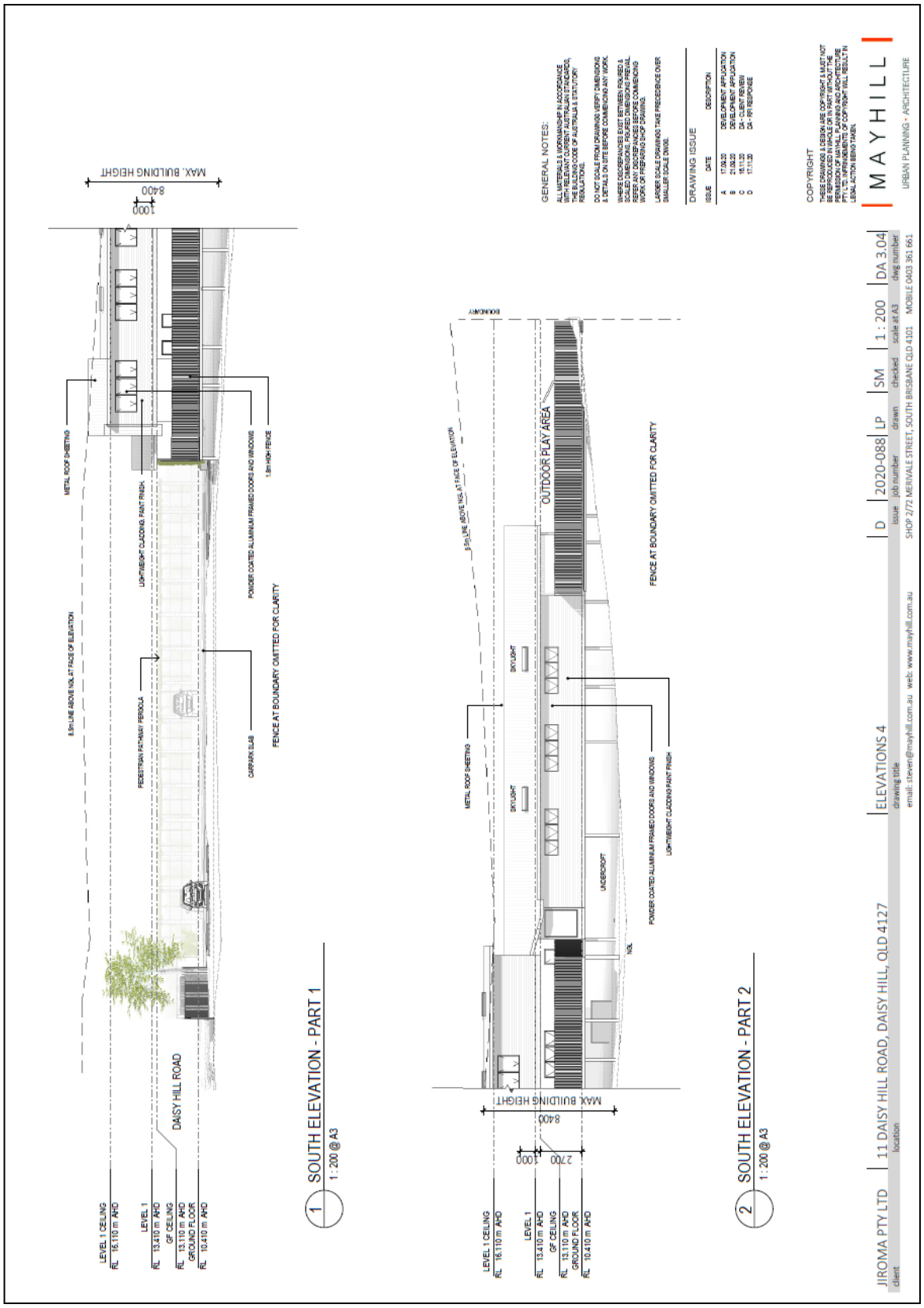
MAYHILL
URBAN PLANNING + ARCHITECTURE


MAX. BUILDING HEIGHT
8400
1000
METAL ROOF SHEETING
8.5m LINE ABOVE NGL AT FACE OF ELEVATION
LIGHTWEIGHT CLADDING PAINT FINISH
POWDER COATED ALUMINIUM FRAMED DOORS AND WINDOWS
1.8m HIGH FENCE
PEDESTRIAN PATHWAY PERGOLA
CARPARK SLAB
FENCE AT BOUNDARY OMITTED FOR CLARITY
LEVEL 1 CEILING
RL 16.110 m AHD
LEVEL 1
RL 13.410 m AHD
GF CEILING
RL 13.110 m AHD
GROUND FLOOR
RL 10.410 m AHD
DAISY HILL ROAD
1 SOUTH ELEVATION - PART 1
1 : 200 @ A3
BOUNDARY
OUTDOOR PLAY AREA
SKYLIGHT
UNDERCROFT
NGL
2700
2 SOUTH ELEVATION - PART 2
1 : 200 @ A3
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JIROMA PTY LTD
client
11 DAISY HILL ROAD, DAISY HILL, QLD 4127
location
ELEVATIONS 4
drawing title
D
issue
2020-088
job number
LP
drawn
SM
checked
1 : 200
scale at A3
DA 3.04
dwg number
email: steven@mayhill.com.au web: www.mayhill.com.au
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URBAN PLANNING - ARCHITECTURE
CARPARK
8.5m LINE ABOVE NGL AT FACE OF SECTION
MAX. BUILDING HEIGHT
8400
A SCHEMATIC SECTION A
1 : 100 @ A3
DA 2.02
LEVEL 1 CEILING
RL 16.110 m AHD
LEVEL 1
RL 13.410 m AHD
GF CEILING
RL 13.110 m AHD
GROUND FLOOR
RL 10.410 m AHD
UNDERCROFT
2700
300
2700
1088
B SCHEMATIC SECTION B
1 : 100 @ A3
DA 2.02
SUSPENDED SLAB OVER THE EXTENT OF FLOOD AREA
3000
2700
2160
2010
C SCHEMATIC SECTION C
1 : 100 @ A3
client
JIROMA PTY LTD
location
11 DAISY HILL ROAD, DAISY HILL, QLD 4127
drawing title
SCHEMATIC SECTIONS
issue
D
job number
2020-088
drawn
LP
checked
SM
scale at A3
1 : 100
dwg number
DA 4.01
email: steven@mayhill.com.au web: www.mayhill.com.au
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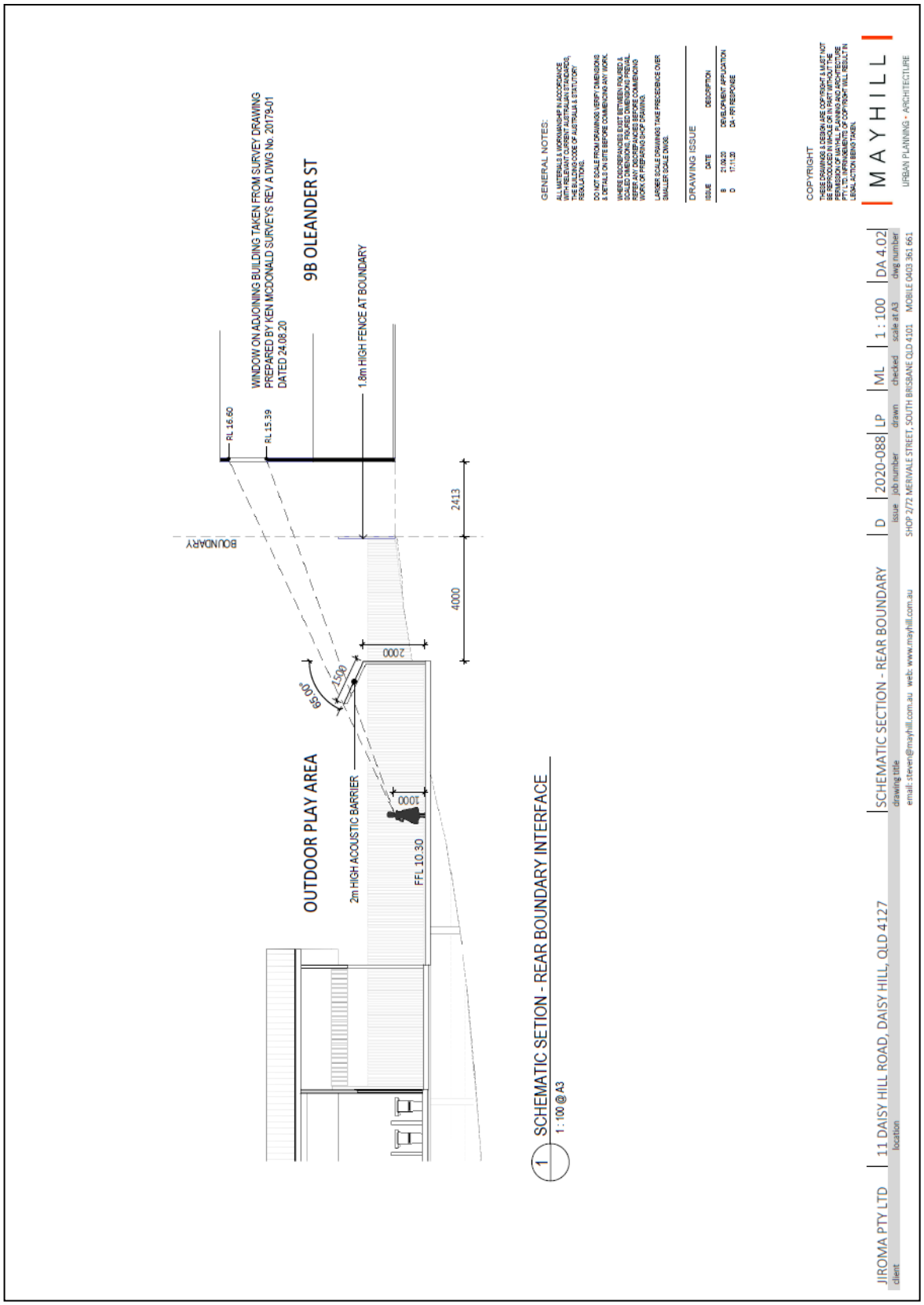
WINDOW ON ADJOINING BUILDING TAKEN FROM SURVEY DRAWING
PREPARED BY KEN MCDONALD SURVEYS REV A DWG No. 20179-01
DATED 24.08.20
9B OLEANDER ST
1.8m HIGH FENCE AT BOUNDARY
RL 16.60
RL 15.39
BOUNDARY
2413
4000
2000
1500
900
1000
OUTDOOR PLAY AREA
2m HIGH ACOUSTIC BARRIER
FFL 10.30
1 SCHEMATIC SETION - REAR BOUNDARY INTERFACE
1 : 100 @ A3
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client
11 DAISY HILL ROAD, DAISY HILL, QLD 4127
location
SCHEMATIC SECTION - REAR BOUNDARY
drawing title
D
issue
2020-088
job number
LP
drawn
ML
checked
1 : 100
scale at A3
DA 4.02
dwg number
email: steven@mayhill.com.au web: www.mayhill.com.au
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MAYHILL
URBAN PLANNING - ARCHITECTURE


STREET VIEW
11
ANCORA
1 EXTERIOR - STREET FRONT
@ A3
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URBAN PLANNING - ARCHITECTURE
JIROMA PTY LTD
client
11 DAISY HILL ROAD, DAISY HILL, QLD 4127
location
PERSPECTIVE VIEWS
drawing title
D
issue
2020-088
job number
LP
drawn
SM
checked
scale at A3
DA 5.01
dwg number
email: steven@mayhill.com.au web: www.mayhill.com.au
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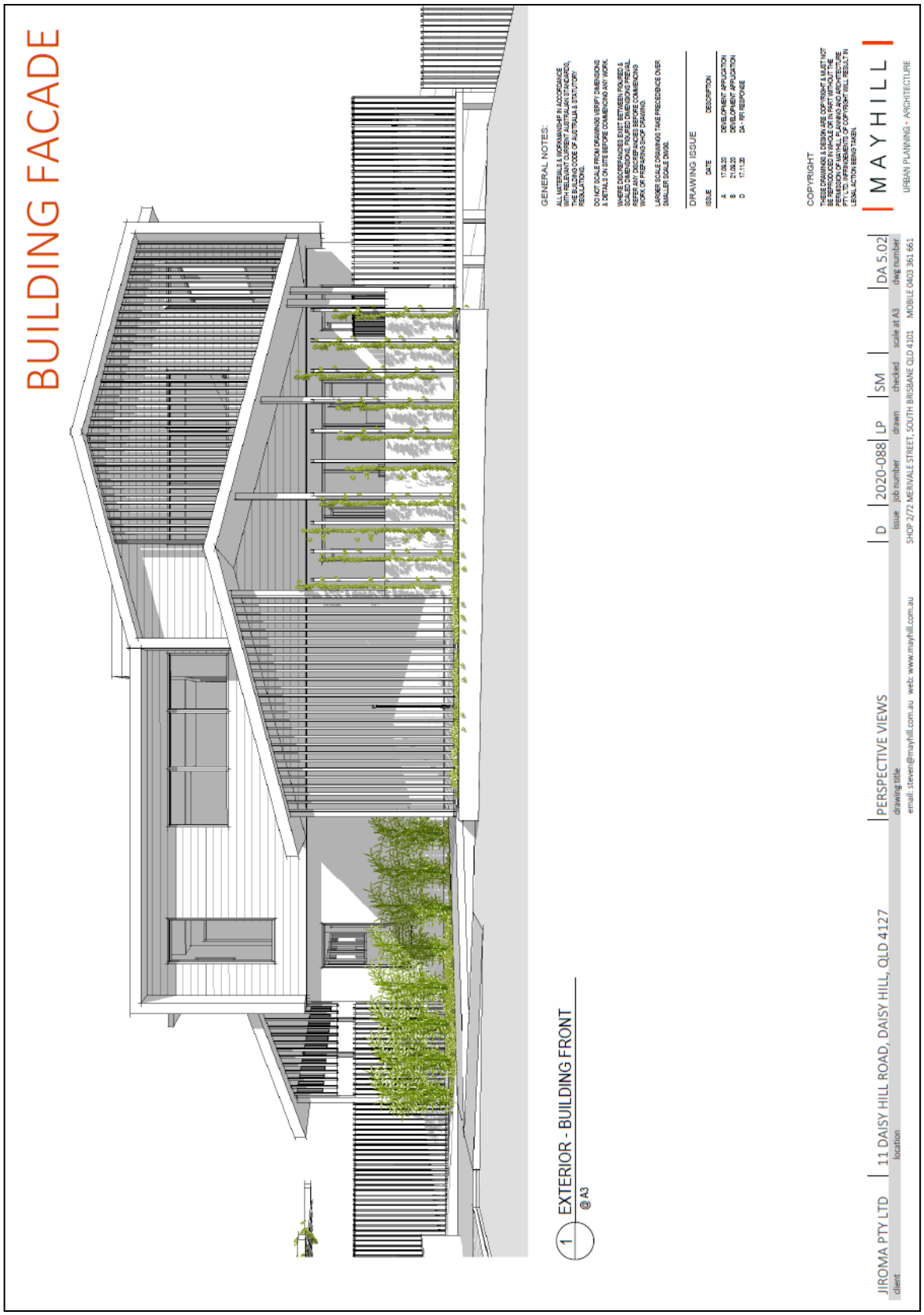
BUILDING FACADE
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1 EXTERIOR - BUILDING FRONT
@ A3
JIROMA PTY LTD client
11 DAISY HILL ROAD, DAISY HILL, QLD 4127 location
PERSPECTIVE VIEWS drawing title
D issue
2020-088 job number
LP drawn
SM checked
DA 5.02 dwg number
scale at A3
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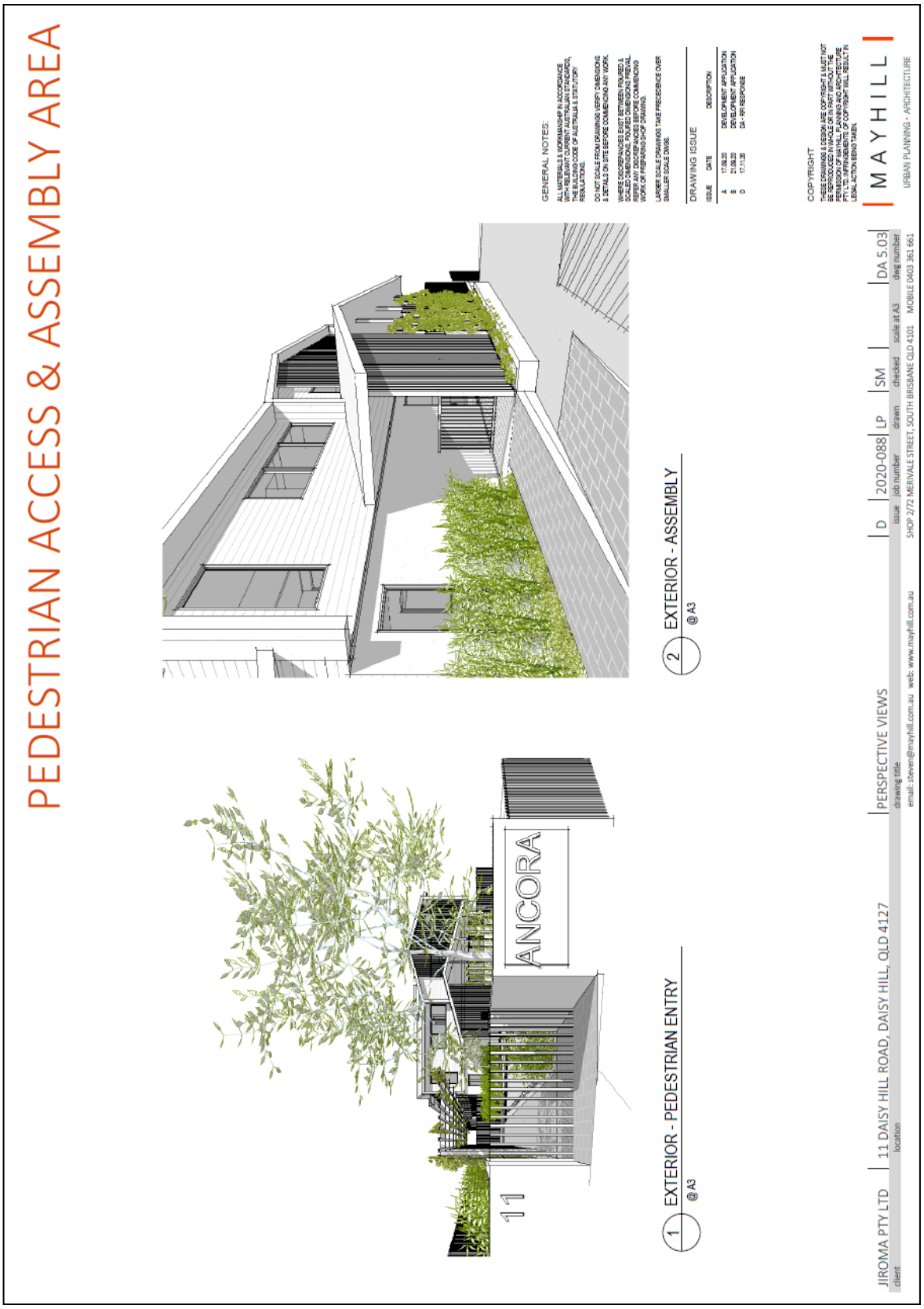
URBAN PLANNING + ARCHITECTURE
email: steven@mayhill.com.au web: www.mayhill.com.au
SHOP 2/72 MERIVALE STREET, SOUTH BRISBANE QLD 4101 MOBILE 0403 361 661


PEDESTRIAN ACCESS & ASSEMBLY AREA
GENERAL NOTES:
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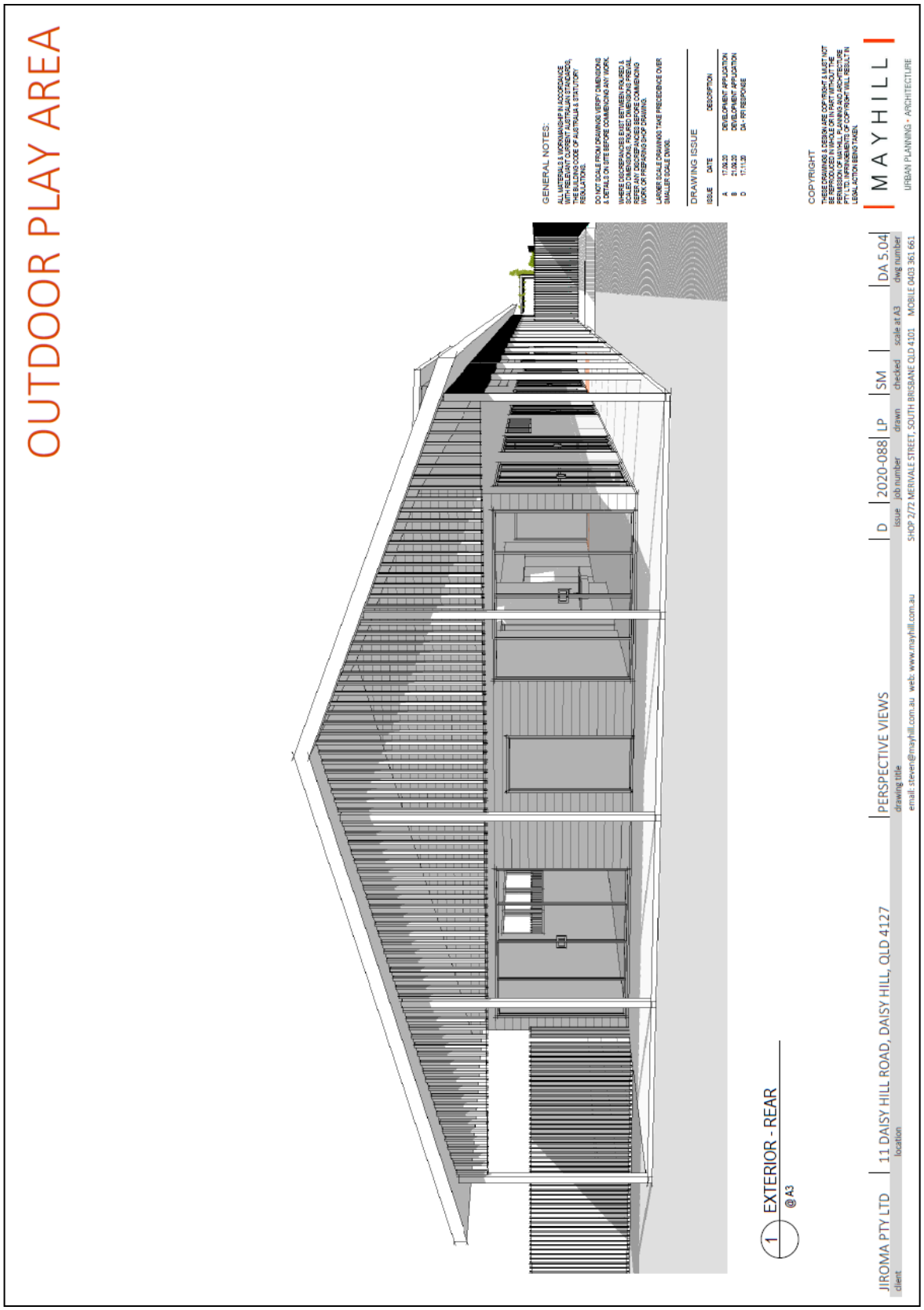
MAYHILL
URBAN PLANNING - ARCHITECTURE
ANCORA
11
1 EXTERIOR - PEDESTRIAN ENTRY @ A3
2 EXTERIOR - ASSEMBLY @ A3
client JIROMA PTY LTD
location 11 DAISY HILL ROAD, DAISY HILL, QLD 4127
drawing title PERSPECTIVE VIEWS
issue D
job number 2020-088
drawn LP
checked SM
scale at A3
dwg number DA 5.03
email: steven@mayhill.com.au web: www.mayhill.com.au
SHOP 2/72 MERIVALE STREET, SOUTH BRISBANE QLD 4101 MOBILE 0403 361 661


OUTDOOR PLAY AREA
GENERAL NOTES:
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B 21.09.20 DEVELOPMENT APPLICATION
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MAYHILL
URBAN PLANNING + ARCHITECTURE
1 EXTERIOR - REAR
@ A3
JIROMA PTY LTD
client
11 DAISY HILL ROAD, DAISY HILL, QLD 4127
location
PERSPECTIVE VIEWS
drawing title
D
issue
2020-088
job number
LP
drawn
SM
checked
DA 5.04
dwg number
scale at A3
email: steven@mayhill.com.au web: www.mayhill.com.au
SHOP 2/72 MERIVALE STREET, SOUTH BRISBANE QLD 4101 MOBILE 0403 361 661

Appendix B: Environmental Noise Model

Forecasts noise emissions from expected activities at the proposed development have been calculated with PEN3D2000, a software program implementing a prediction model based on the method described in Bies & Hansen, *ISO 9613-2 (1996) Acoustics – Attenuation of sound propagation outdoors Part 2: General Method of Calculation* and *CONCAWE*. The basic equation adopted is-

Lp = Lw - 20 log10(r) - 10log10(4π) + AE

Where

- Lp is the sound pressure level at an observer
- Lw is the sound power level of the source
- 20 log10r - 10log10(4PI) is the Distance attenuation (spherical)
- AE is the excess attenuation factors and is determined as the sum of the contributions

All prediction models have limits to their accuracy of prediction. This is due to the inherent nature of the calculation algorithms that go into the design of the models, the assumptions made in the implementation of the model, and the availability of good source sound power data. ISO 9613-2 has an estimated accuracy for broadband noise of ±3 dB at 1000 metres. Neutral atmospheric and meteorological conditions have been assumed.

Noise source design sound power levels (SWL) of activities considered representative of those at the development have been sourced from the NMS database, and are discussed in **Section 4.4.** Topographic data was sourced from Geosciences Australia, extracted in 0.5m contours. Calculations do not include screening from the recommended acoustic barriers, which is presented separately in **Appendix C**. The sound power levels used in the environmental noise model are presented in **Table B1** below. Results from the environmental noise calculations are presented in the **plates** and **tables** following.

Table B1: Design sound power levels, as modelled

Noise Source	Descriptor	Sound Power Levels in dB(Z)								Total in dB(A)
		63 Hz	125 Hz	250 Hz	500 Hz	1kHz	2 kHz	4 kHz	8 kHz	
Vehicle movements	L_{eq}	74	81	75	72	75	76	72	69	**81**
Car door 'slam'*	L_{max}	90	94	89	91	94	89	87	85	**97**
8 children ages 0-2	L_{eq}	53	59	65	69	73	70	66	63	**76**
16 children ages 2-3	L_{eq}	63	69	75	81	83	80	76	72	**87**
11 children ages 3-5	L_{eq}	64	70	75	81	83	80	76	72	**87**
22 children ages 3-5	L_{eq}	67	73	78	84	86	83	79	75	**90**
Sound Pressure Levels at 1m										
Vehicle movements	L_{eq}	66	73	67	64	67	69	65	62	**73**
Car door 'slam'*	L_{max}	56	69	71	79	85	80	78	73	**88**
8 children ages 0-2	L_{eq}	45	51	57	61	65	62	58	55	**69**
16 children ages 2-3	L_{eq}	55	61	67	73	75	72	68	64	**79**
11 children ages 3-5	L_{eq}	57	63	68	74	76	73	69	65	**79**
22 children ages 3-5	L_{eq}	60	66	71	77	79	76	72	68	**82**

* Includes a +2 dB(A) adjustment for impulsiveness, as per Australian Standard AS10555

Table B2: Receiver point calculations, vehicle movements. Levels are in dB(A) $L_{eq,1hr}$

POINT CALCULATIONS

Pen3D2000 V 1.9.32
Project Code: 5530
Project Description: Noise assessment of 11 Daisy Hill Road, Daisy Hill
File:D:\IZ Drive\5530 11 Daisy Hill Road, Daisy Hill - childcare centre\Model\5530 vehicles.PEN
Tuesday 17 Nov, 2020 at 12:57:24

Environmental Calculations (Moving Line Source)

All moving line sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.
Noise level results include the Leq (1 hour) of all noise sources
Meteorology :Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m) Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%)
Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Noise Level (dB(A))
R1	515137.6	6942041.2	1.5	36.6
R2	515174.2	6942035.5	1.5	27.8
R3	515204.6	6942030.8	1.5	12.4
R4	515215.7	6942016.2	1.5	12.4
R5	515202.6	6942005.7	1.5	12.3
R6	515131.7	6942016.5	1.5	36.0

Table B3: Receiver point calculations, car door 'slams'. Levels are in dB(A) L_{max}

POINT CALCULATIONS

Pen3D2000 V 1.9.32
Project Code: 5530
Project Description: Noise assessment of 11 Daisy Hill Road, Daisy Hill
File:D:\IZ Drive\5530 11 Daisy Hill Road, Daisy Hill - childcare centre\Model\5530 car door.PEN
Thursday 19 Nov, 2020 at 16:32:09

Environmental Calculations

All point and line sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.
Noise level results are the maximum of all the noise sources Noise level results incorporate the incoherent ground reflection algorithm
Meteorology :Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m) Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%)
Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Ground (m)	Noise Level (dB(A))
R1	515137.6	6942041.2	1.5	10.9	70.4
R2	515174.2	6942035.5	1.5	9.5	59.2
R3	515204.6	6942030.8	1.5	9.7	52.4
R4	515215.7	6942016.2	1.5	11.3	38.3
R5	515202.6	6942005.7	1.5	9.9	49.5
R6	515131.7	6942016.5	1.5	9.5	69.2

Table B3: Receiver point calculations, outdoor play. Levels are in dB(A) $L_{eq,1hr}$

POINT CALCULATIONS

Pen3D2000 V 1.9.32
Project Code: 5530
Project Description: Noise assessment of 11 Daisy Hill Road, Daisy Hill
File:D:\IZ Drive\5530 11 Daisy Hill Road, Daisy Hill - childcare centre\Model\5530 children.PEN
Thursday 19 Nov, 2020 at 16:33:25

Environmental Calculations

All point and line sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.
Noise level results are the logarithmic addition of all the noise sources Noise level results incorporate the incoherent ground reflection algorithm
Meteorology :Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m) Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%)
Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Ground (m)	Noise Level (dB(A))
R1	515137.6	6942041.2	1.5	10.6	49.3
R2	515174.2	6942035.5	1.5	9.2	60.8
R3	515204.6	6942030.8	1.5	9.7	65.4
R4	515215.7	6942016.2	1.5	11.3	61.8
R5	515202.6	6942005.7	1.5	9.9	61.7
R6	515131.7	6942016.5	1.5	9.5	34.8

Plate B1: Noise contours at 1.5m, vehicle movements. Levels are in dB(A) $L_{eq,1hr}$

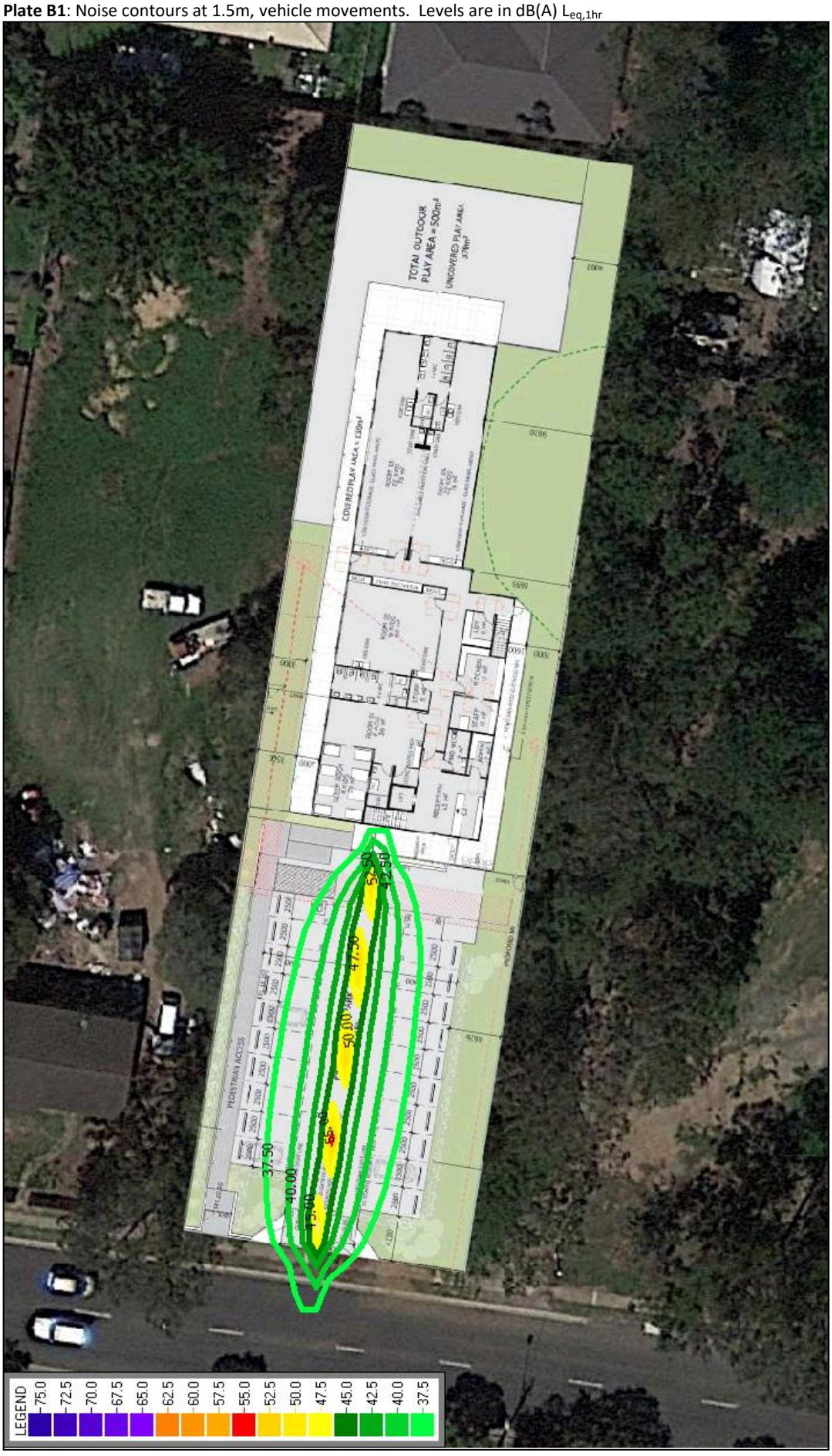


Plate B2: Noise contours at 1.5m, car door 'slams'. Levels are in dB(A) L_{max}

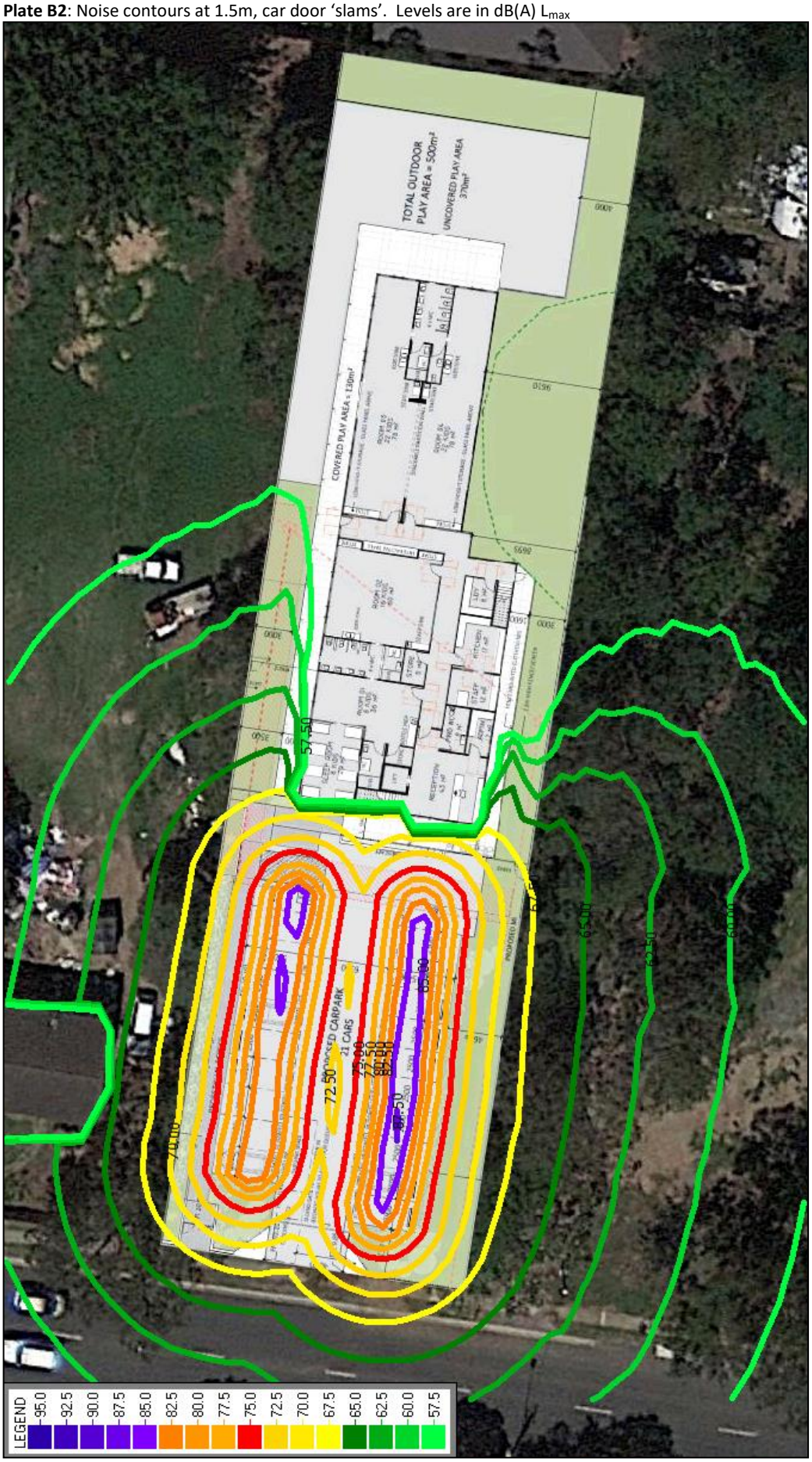
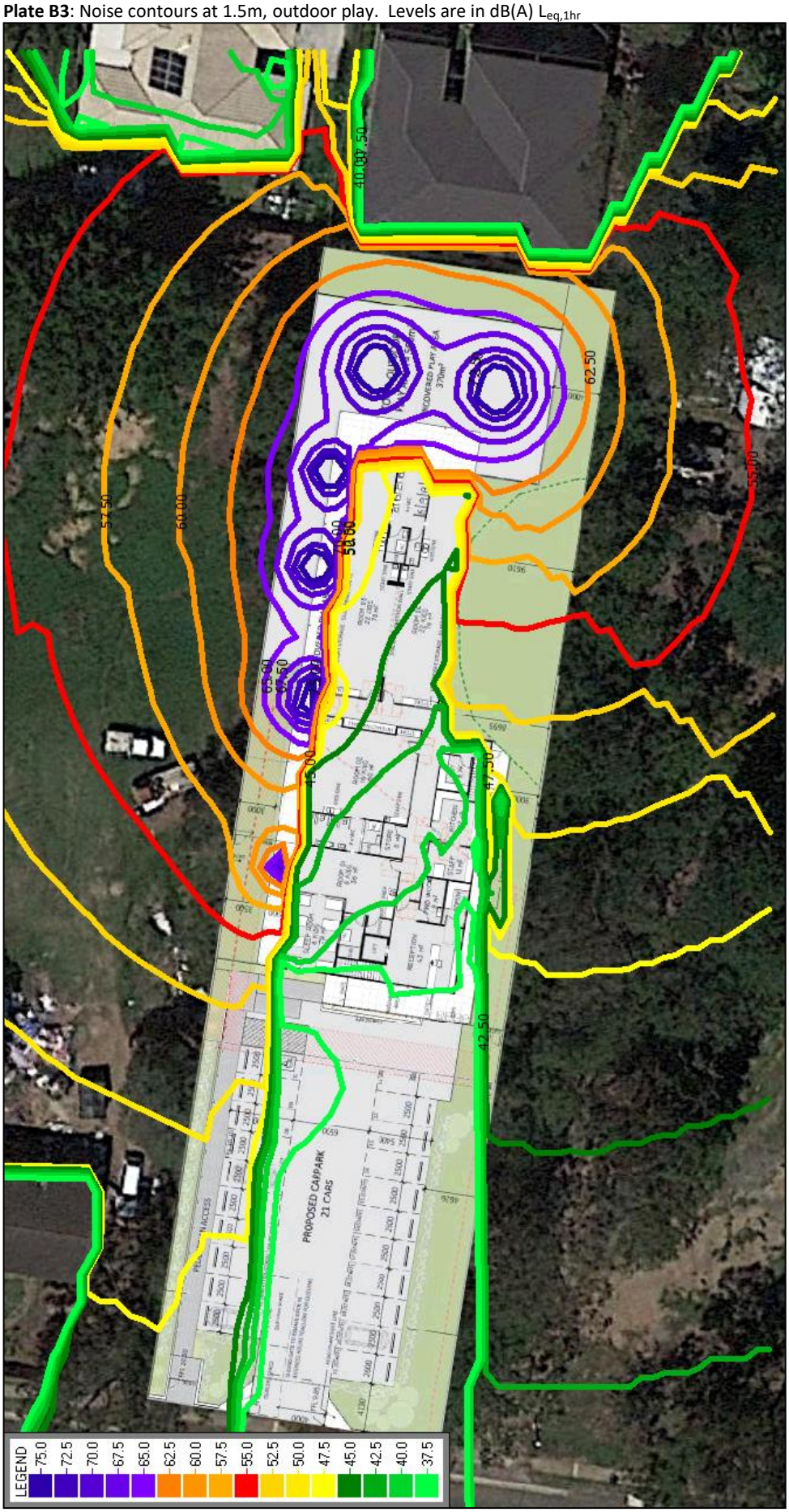
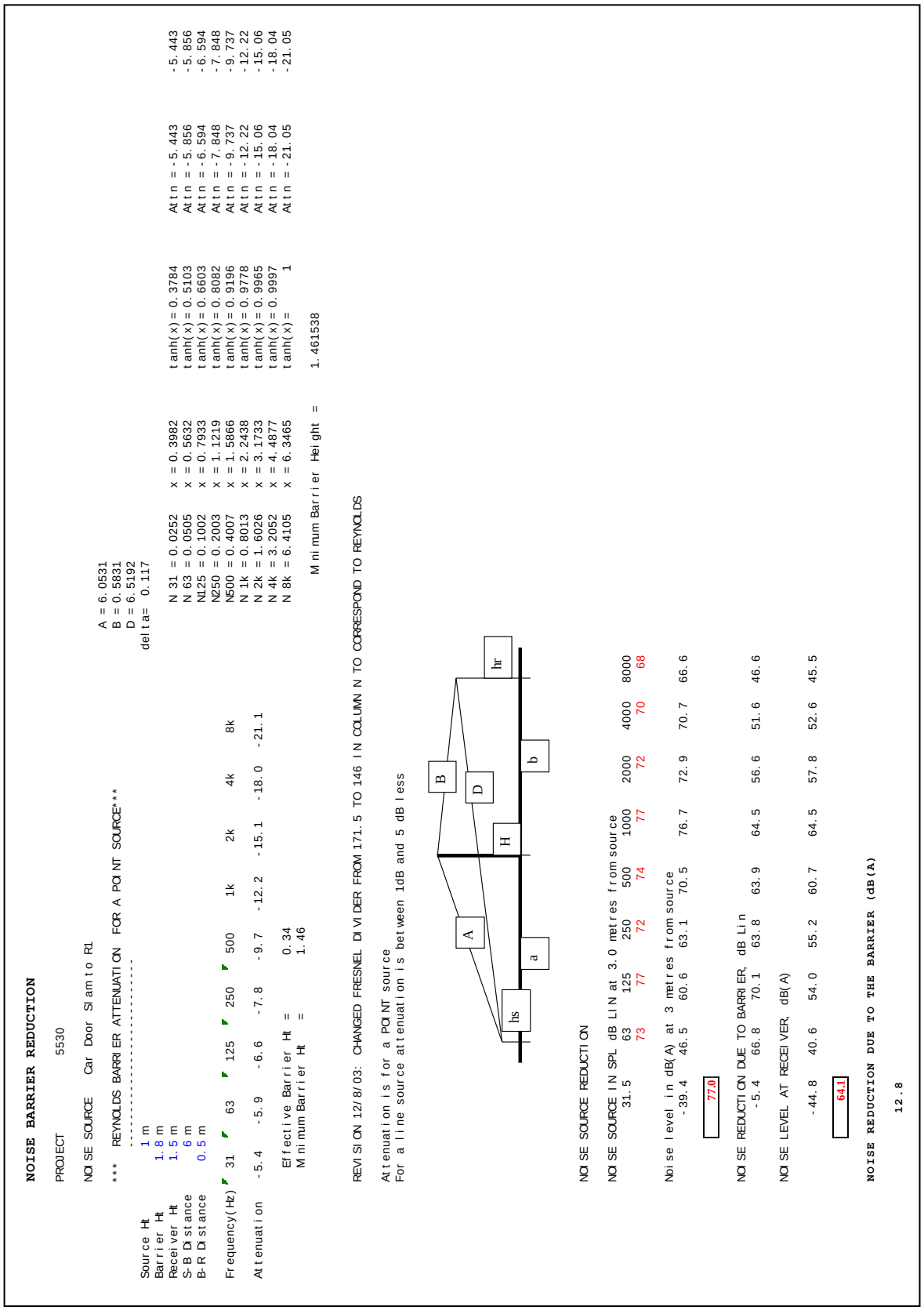


Plate B3: Noise contours at 1.5m, outdoor play. Levels are in dB(A) $L_{eq,1hr}$



Appendix C: Barrier Calculations



```
NOISE BARRIER REDUCTION

PROJECT          5530

NOISE SOURCE   Car Door Slam to R1

***  REYNOLDS BARRIER ATTENUATION  FOR A POINT SOURCE***
     ------------------------------

Source Ht          1 m
Barrier Ht       1.8 m
Receiver Ht      1.5 m
S-B Distance       6 m
B-R Distance     0.5 m

Frequency(Hz)    31     63     125    250    500    1k     2k     4k     8k
Attenuation    -5.4   -5.9   -6.6   -7.8   -9.7  -12.2  -15.1  -18.0  -21.1

   Effective Barrier Ht =        0.34
   Minimum Barrier Ht   =        1.46

A = 6.0531
B = 0.5831
D = 6.5192
delta= 0.117

N 31 = 0.0252   x = 0.3982   tanh(x) = 0.3784   Attn = -5.443
N 63 = 0.0505   x = 0.5632   tanh(x) = 0.5103   Attn = -5.856
N125 = 0.1002   x = 0.7933   tanh(x) = 0.6603   Attn = -6.594
N250 = 0.2003   x = 1.1219   tanh(x) = 0.8082   Attn = -7.848
N500 = 0.4007   x = 1.5866   tanh(x) = 0.9196   Attn = -9.737
N 1k = 0.8013   x = 2.2438   tanh(x) = 0.9778   Attn = -12.22
N 2k = 1.6026   x = 3.1733   tanh(x) = 0.9965   Attn = -15.06
N 4k = 3.2052   x = 4.4877   tanh(x) = 0.9997   Attn = -18.04
N 8k = 6.4105   x = 6.3465   tanh(x) =      1   Attn = -21.05

                Minimum Barrier Height =  1.461538

REVISION 12/8/03:  CHANGED FRESNEL DIVIDER FROM 171.5 TO 146 IN COLUMN N TO CORRESPOND TO REYNOLDS

Attenuation is for a POINT source
For a line source attenuation is between 1dB and 5 dB less

NOISE SOURCE REDUCTION

NOISE SOURCE IN SPL  dB LIN at 3.0 metres from source
        31.5     63     125    250    500    1000   2000   4000   8000
                 73     77     72     74     77     72     70     68

Noise level in dB(A) at 3 metres from source
       -39.4   46.5   60.6   63.1   70.5   76.7   72.9   70.7   66.6

                77.0

NOISE REDUCTION DUE TO BARRIER, dB Lin
        -5.4   66.8   70.1   63.8   63.9   64.5   56.6   51.6   46.6

NOISE LEVEL AT RECEIVER, dB(A)
       -44.8   40.6   54.0   55.2   60.7   64.5   57.8   52.6   45.5

                64.1

NOISE REDUCTION DUE TO THE BARRIER (dB(A)
                12.8
```

NOISE BARRIER REDUCTION

PROJECT 5530

NOISE SOURCE Car Door Slam to R6

*** REYNOLDS BARRIER ATTENUATION FOR A POINT SOURCE***

Source Ht	1 m
Barrier Ht	1.8 m
Receiver Ht	1.5 m
S-B Distance	7.5 m
B-R Distance	0.5 m

Frequency(Hz)	31	63	125	250	500	1k	2k	4k	8k
Attenuation	-5.4	-5.8	-6.5	-7.7	-9.5	-12.0	-14.8	-17.8	-20.8

Effective Barrier Ht = 0.33
Minimum Barrier Ht = 1.47

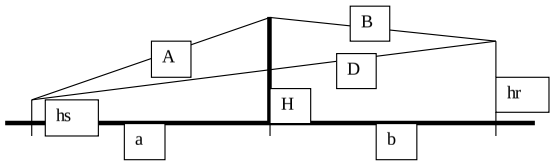
A = 7.5425
B = 0.5831
D = 8.0156
delta= 0.11

N 31 = 0.0237	x = 0.3862	tanh(x) = 0.3681	Attn = -5.417	-5.417
N 63 = 0.0475	x = 0.5462	tanh(x) = 0.4977	Attn = -5.808	-5.808
N125 = 0.0942	x = 0.7694	tanh(x) = 0.6466	Attn = -6.51	-6.51
N250 = 0.1884	x = 1.088	tanh(x) = 0.7962	Attn = -7.713	-7.713
N500 = 0.3768	x = 1.5387	tanh(x) = 0.9119	Attn = -9.544	-9.544
N 1k = 0.7536	x = 2.1761	tanh(x) = 0.9746	Attn = -11.98	-11.98
N 2k = 1.5073	x = 3.0774	tanh(x) = 0.9958	Attn = -14.8	-14.8
N 4k = 3.0146	x = 4.3521	tanh(x) = 0.9997	Attn = -17.78	-17.78
N 8k = 6.0291	x = 6.1548	tanh(x) = 1	Attn = -20.78	-20.78

Minimum Barrier Height = 1.46875

REVISION 12/8/03: CHANGED FRESNEL DIVIDER FROM 171.5 TO 146 IN COLUMN N TO CORRESPOND TO REYNOLDS

Attenuation is for a POINT source
For a line source attenuation is between 1dB and 5 dB less



NOISE SOURCE REDUCTION

NOISE SOURCE IN SPL dB LIN at 3.0 metres from source

31.5	63	125	250	500	1000	2000	4000	8000
	73	77	72	74	77	72	70	68

Noise level in dB(A) at 3 metres from source

-39.4	46.5	60.6	63.1	70.5	76.7	72.9	70.7	66.6

77.0

NOISE REDUCTION DUE TO BARRIER, dB Lin

-5.4	66.9	70.2	64.0	64.1	64.7	56.9	51.9	46.9

NOISE LEVEL AT RECEIVER, dB(A)

-44.8	40.7	54.1	55.4	60.9	64.7	58.1	52.9	45.8

64.3

NOISE REDUCTION DUE TO THE BARRIER (dB(A)

12.6

NOISE BARRIER REDUCTION

PROJECT 5530

NOISE SOURCE Outdoor play to R2

*** REYNOLDS BARRIER ATTENUATION FOR A POINT SOURCE***

Source Ht	1 m
Barrier Ht	1.8 m
Receiver Ht	1.5 m
S-B Distance	1 m
B-R Distance	3.5 m

Frequency(Hz)	31	63	125	250	500	1k	2k	4k	8k
Attenuation	-6.0	-6.8	-8.1	-10.2	-12.7	-15.6	-18.6	-21.6	-24.0

Effective Barrier Ht = 0.69
Minimum Barrier Ht = 1.11

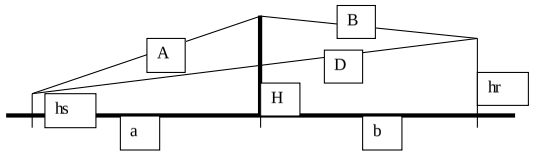
A = 1.2806
B = 3.5128
D = 4.5277
delta= 0.2658

N 31 = 0.0573	x = 0.6002	tanh(x) = 0.5372	Attn = -5.963	-5.963
N 63 = 0.1147	x = 0.8489	tanh(x) = 0.6905	Attn = -6.794	-6.794
N125 = 0.2275	x = 1.1957	tanh(x) = 0.8323	Attn = -8.146	-8.146
N250 = 0.4551	x = 1.691	tanh(x) = 0.9343	Attn = -10.15	-10.15
N500 = 0.9102	x = 2.3914	tanh(x) = 0.9834	Attn = -12.72	-12.72
N 1k = 1.8203	x = 3.3819	tanh(x) = 0.9977	Attn = -15.6	-15.6
N 2k = 3.6406	x = 4.7828	tanh(x) = 0.9999	Attn = -18.59	-18.59
N 4k = 7.2813	x = 6.7638	tanh(x) = 1	Attn = -21.6	-21.6
N 8k = 14.563	x = 9.5655	tanh(x) = 1	Attn = -24.61	-24.61

Minimum Barrier Height = 1.111111

REVISION 12/8/03: CHANGED FRESNEL DIVIDER FROM 171.5 TO 146 IN COLUMN N TO CORRESPOND TO REYNOLDS

Attenuation is for a POINT source
For a line source attenuation is between 1dB and 5 dB less



NOISE SOURCE REDUCTION

NOISE SOURCE IN SPL dB LIN at 3.0 metres from source

31.5	63	125	250	500	1000	2000	4000	8000
	53	58	60	62	62	64	65	67

Noise level in dB(A) at 3 metres from source

-39.4	26.5	41.5	51.5	58.5	62.5	65.5	66.5	65.5

70.9

NOISE REDUCTION DUE TO BARRIER, dB Lin

-6.0	45.9	49.4	49.9	48.9	46.9	45.7	43.9	42.6

NOISE LEVEL AT RECEIVER, dB(A)

-45.4	19.7	33.3	41.3	45.7	46.9	46.9	44.9	41.5

51.7

NOISE REDUCTION DUE TO THE BARRIER (dB(A)

19.2

NOISE REDUCTION DUE TO THE BARRIER (adjusted for area source)

14.2

NOISE BARRIER REDUCTION

PROJECT 5530

NOISE SOURCE Outdoor play to R3

*** REYNOLDS BARRIER ATTENUATION FOR A POINT SOURCE***

Source Ht	1 m
Barrier Ht	1.8 m
Receiver Ht	1.5 m
S-B Distance	5 m
B-R Distance	0.5 m

Frequency(Hz)	31	63	125	250	500	1k	2k	4k	8k
Attenuation	-5.5	-5.9	-6.7	-8.0	-9.9	-12.4	-15.3	-18.3	-21.3

Effective Barrier Ht = 0.35
Minimum Barrier Ht = 1.45

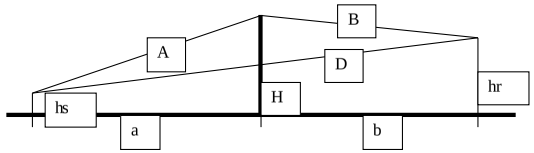
A = 5.0636
B = 0.5831
D = 5.5227
delta= 0.124

N 31 = 0.0268	x = 0.41	tanh(x) = 0.3885	Attn = -5.468	-5.468
N 63 = 0.0535	x = 0.5798	tanh(x) = 0.5226	Attn = -5.904	-5.904
N125 = 0.1062	x = 0.8168	tanh(x) = 0.6733	Attn = -6.678	-6.678
N250 = 0.2123	x = 1.1551	tanh(x) = 0.8194	Attn = -7.982	-7.982
N500 = 0.4247	x = 1.6335	tanh(x) = 0.9266	Attn = -9.925	-9.925
N 1k = 0.8494	x = 2.3102	tanh(x) = 0.9805	Attn = -12.44	-12.44
N 2k = 1.6988	x = 3.2671	tanh(x) = 0.9971	Attn = -15.31	-15.31
N 4k = 3.3975	x = 4.6203	tanh(x) = 0.9998	Attn = -18.3	-18.3
N 8k = 6.7951	x = 6.5341	tanh(x) = 1	Attn = -21.3	-21.3

Minimum Barrier Height = 1.454545

REVISION 12/8/03: CHANGED FRESNEL DIVIDER FROM 171.5 TO 146 IN COLUMN N TO CORRESPOND TO REYNOLDS

Attenuation is for a POINT source
For a line source attenuation is between 1dB and 5 dB less



NOISE SOURCE REDUCTION

NOISE SOURCE IN SPL dB LIN at 3.0 metres from source

31.5	63	125	250	500	1000	2000	4000	8000
	57	52	54	64	67	69	70	70

Noise level in dB(A) at 3 metres from source

-39.4	30.7	35.7	45.7	60.7	66.7	70.7	70.7	68.7

75.0

NOISE REDUCTION DUE TO BARRIER, dB Lin

-5.5	51.0	45.1	46.3	53.9	54.2	54.2	51.4	48.5

NOISE LEVEL AT RECEIVER, dB(A)

-44.9	24.8	29.0	37.7	50.7	54.2	55.4	52.4	47.4

58.4

NOISE REDUCTION DUE TO THE BARRIER (dB(A)

16.6

NOISE REDUCTION DUE TO THE BARRIER (adjusted for area source)

11.6

NOISE BARRIER REDUCTION

PROJECT 5530

NOISE SOURCE Outdoor play to R4

*** REYNOLDS BARRIER ATTENUATION FOR A POINT SOURCE***

Source Ht	1 m
Barrier Ht	3.25 m
Receiver Ht	1.5 m
S-B Distance	5 m
B-R Distance	4 m

Frequency(Hz)	31	63	125	250	500	1k	2k	4k	8k
Attenuation	-7.6	-9.4	-11.8	-14.6	-17.5	-20.6	-23.6	-24.0	-24.0

Effective Barrier Ht = 1.97
Minimum Barrier Ht = 1.28

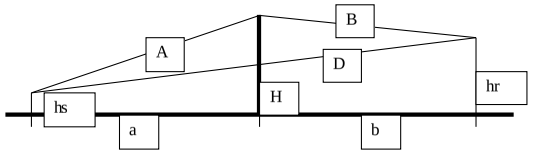
A = 5.4829
B = 4.3661
D = 9.0139
delta= 0.8351

N 31 = 0.1802	x = 1.064	tanh(x)= 0.7872	Attn = -7.617	-7.617
N 63 = 0.3604	x = 1.5047	tanh(x)= 0.906	Attn = -9.407	-9.407
N125 = 0.715	x = 2.1195	tanh(x)= 0.9716	Attn = -11.78	-11.78
N250 = 1.43	x = 2.9975	tanh(x)= 0.995	Attn = -14.58	-14.58
N500 = 2.86	x = 4.2391	tanh(x)= 0.9996	Attn = -17.55	-17.55
N 1k = 5.7199	x = 5.995	tanh(x)= 1	Attn = -20.56	-20.56
N 2k = 11.44	x = 8.4781	tanh(x)= 1	Attn = -23.57	-23.57
N 4k = 22.88	x = 11.99	tanh(x)= 1	Attn = -26.58	-26.58
N 8k = 45.76	x = 16.956	tanh(x)= 1	Attn = -29.59	-29.59

Minimum Barrier Height = 1.277778

REVISION 12/8/03: CHANGED FRESNEL DIVIDER FROM 171.5 TO 146 IN COLUMN N TO CORRESPOND TO REYNOLDS

Attenuation is for a POINT source
For a line source attenuation is between 1dB and 5 dB less



NOISE SOURCE REDUCTION

NOISE SOURCE IN SPL dB LIN at 3.0 metres from source

31.5	63	125	250	500	1000	2000	4000	8000
	57	52	54	64	67	69	70	70

Noise level in dB(A) at 3 metres from source

-39.4	30.7	35.7	45.7	60.7	66.7	70.7	70.7	68.7

75.0

NOISE REDUCTION DUE TO BARRIER, dB Lin

-7.6	47.5	40.0	39.7	46.3	46.1	45.9	45.7	45.8

NOISE LEVEL AT RECEIVER, dB(A)

-47.0	21.3	23.9	31.1	43.1	46.1	47.1	46.7	44.7

51.7

NOISE REDUCTION DUE TO THE BARRIER (dB(A)

23.3

NOISE REDUCTION DUE TO THE BARRIER (adjusted for area source)

18.3

NOISE BARRIER REDUCTION

PROJECT 5530

NOISE SOURCE Outdoor play to R5

*** REYNOLDS BARRIER ATTENUATION FOR A POINT SOURCE***

Source Ht	1 m
Barrier Ht	1.8 m
Receiver Ht	1.5 m
S-B Distance	5 m
B-R Distance	4 m

Frequency(Hz)	31	63	125	250	500	1k	2k	4k	8k
Attenuation	-5.2	-5.5	-5.9	-6.7	-7.9	-9.9	-12.4	-15.2	-18.2

Effective Barrier Ht = 0.52
Minimum Barrier Ht = 1.28

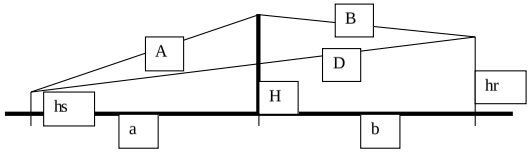
A = 5.0636
B = 4.0112
D = 9.0139
delta= 0.061

N 31 = 0.0132	x = 0.2874	tanh(x) = 0.2798	Attn = -5.235	-5.235
N 63 = 0.0263	x = 0.4065	tanh(x) = 0.3855	Attn = -5.461	-5.461
N125 = 0.0522	x = 0.5726	tanh(x) = 0.5173	Attn = -5.883	-5.883
N250 = 0.1044	x = 0.8098	tanh(x) = 0.6695	Attn = -6.653	-6.653
N500 = 0.2087	x = 1.1452	tanh(x) = 0.8162	Attn = -7.942	-7.942
N 1k = 0.4175	x = 1.6196	tanh(x) = 0.9246	Attn = -9.869	-9.869
N 2k = 0.835	x = 2.2905	tanh(x) = 0.9797	Attn = -12.38	-12.38
N 4k = 1.6699	x = 3.2392	tanh(x) = 0.9969	Attn = -15.24	-15.24
N 8k = 3.3398	x = 4.5809	tanh(x) = 0.9998	Attn = -18.22	-18.22

Minimum Barrier Height = 1.277778

REVISION 12/8/03: CHANGED FRESNEL DIVIDER FROM 171.5 TO 146 IN COLUMN N TO CORRESPOND TO REYNOLDS

Attenuation is for a POINT source
For a line source attenuation is between 1dB and 5 dB less



NOISE SOURCE REDUCTION

NOISE SOURCE IN SPL dB LIN at 3.0 metres from source

31.5	63	125	250	500	1000	2000	4000	8000
	57	52	54	64	67	69	70	70

Noise level in dB(A) at 3 metres from source

-39.4	30.7	35.7	45.7	60.7	66.7	70.7	70.7	68.7

75.0

NOISE REDUCTION DUE TO BARRIER, dB Lin

-5.2	51.4	45.9	47.6	55.9	56.8	57.1	54.4	51.5

NOISE LEVEL AT RECEIVER, dB(A)

-44.6	25.2	29.8	39.0	52.7	56.8	58.3	55.4	50.4

61.2

NOISE REDUCTION DUE TO THE BARRIER (dB(A)

13.8

NOISE REDUCTION DUE TO THE BARRIER (adjusted for area source)

8.8

Appendix D: Glossary

Event maximum sound pressure level (LA%,adj,T), L01

The L01 level is calculated as the noise level equalled and exceeded for 1% of the measurement time, for example 9 seconds in any 15 minute interval. L01 is an appropriate level to characterise single events, such as from train bypass.

In this Report, the measured L01 levels for day/evening/night are not averaged but are arranged from low to high in the relevant day/evening/night interval and the value that is found at the 90th percentile (L10 of L01 sample) in the interval is recorded as its "L01" level.

Average maximum sound pressure level (LA%,adj, T), L10

The "L10" level is an indicator of "steady-state" noise or intrusive noise conditions from traffic, music and other relatively non-impulsive noise sources. The L10 level is calculated as the noise level equalled and exceeded for 10% the measurement time, for example 90 seconds in any 15 minute interval. The measured L10 time-intervals for day/evening/night are arithmetically averaged to present the "average maximum" levels of the environment for day/evening/night. The level can be adjusted for tonality or impulsiveness.

Background sound pressure level (LA90,T), L90

Commonly called the "L90" or "background" level and is an indicator of the quietest times of day, evening or night. The L90 level is calculated as the noise level equalled and exceeded for 90% the measurement time. The measured L90 time-intervals are arithmetically averaged to present the "average background" levels of the environment for day/evening/night. The level is recorded in the absence of any noise under investigation. The level is not adjusted for tonality or impulsiveness.

Equivalent Continuous or time average sound pressure level (LAeq,T), Leq

Commonly called the "Leq" level it is the logarithmic average noise level from all sources far and near. The maximum 1-hour levels within the day/evening/night time intervals are referenced for building design. The level can be adjusted for tonality.

Façade-adjusted level

A sound level that is measured at a distance of 1.0 metre from a wall or facade. The level is nominally 2.5 dB higher than the free-field level.

Free-field level

A sound level that is measured at a distance of more than 3.5 metres from a wall or facade.

Weighted Sound Reduction Index, Rw

A single number value used to compare the sound reduction index of building elements. Similar to the Sound Transmission Class (STC) rating that is still in common use. Rw and STC are not identical though may be considered, for most applications, as being interchangeable. A high Rw indicates high sound reduction.

Appendix E: Response to Further Information Request

This Appendix is provided in response to and clarification of further issues raised by Council (received 7th December), as reproduced below:

" *Acoustic:*

1. *Please provide the relevant reference material that supports a 13dB(A) reduction in noise for a 1.8m high barrier at 12.5kg/m2. Council notes the amended location and height of acoustic barriers to attenuate noise generated within the carpark area of the site. Given that the use proposes to operate from 6:30am it is anticipated that activity within the car park area will occur for a 30minute period within the night period. It is unclear how a 1.8m high acoustic barrier at 12.5kg/m2 can provide approximately 13 dB(A) attenuation. Council would typically expect such a barrier to provide approximately 7-8 dB(A). As such, Council has concerns that activities such as car door slams in the northern car parks may exceed 60dB(A) at the property boundary during the night period.*

2. *The plan of development indicates that SRV space has been provided on the southern side of the parking area. In accordance with the Guideline for Child Care Centre Acoustic assessment Version 2.0 referenced within the Acoustic assessment a van operating in this area is likely to produce emissions of 95dB(A). It is noted that Appendix C does not include a calculation of the barriers for R6 to the south of the car parking area. For this reason the Council has concerns that the lamax of 60dB(A) will not be achieved at the southern property boundary. Council notes that despite the applicant's response to the above request item regarding the attenuation from a 1.8m barrier at 12.5kg/m2, even if the barrier to the southern car park could achieve a 13dB(A) reduction, the lamax of 60dB(A) would still not be achieved at the southern boundary of the car parking area. "*

Responses to these two items are presented below.

1. Calculation of barrier insertion loss has been conducted generally in accordance with the methodology set out in: Reynolds, D *"Engineering principles of acoustics: noise and vibration control",* Allyn and Bacon, 1980. Barrier calculations assume a boundary receiver at minimal setback from the fence line (noting that the receiver cannot be located inside the fence for such calculations), and this calculated insertion loss has subsequently been applied to results from the environmental noise model (which does locate the receiver at the boundary as required for assessment). It is noted that somewhat reduced attenuation can be expected from receivers at further setback from the barrier, and that a 7-8 dB(A) reduction is conceivable for receivers located at the façade of a nominal neighbouring building. However, the additional distance attenuation that can be expected to such receivers (amounting to approximately 6 dB(A) per doubling of distance for a point source) would provide additional noise mitigation, and be broadly commensurate. In any case, assessment has been required at the boundary, and the recommended acoustic fencing is calculated to provide more than the 10 dB(A) of insertion loss required to meet criteria at this location.

2. Revision 2 of this Noise Assessment referenced Version 3.0 of the AAAC Guideline, although previous revisions referenced Version 2.0 of the Guideline, which was superseded as of September 2020. Version 3.0 of the Guideline nominates substantively lower sound power levels for vehicle activity, amounting to 81 dB(A) SWL for cars and 86 dB(A) SWL for delivery vans. This is consistent with observations of an aggregate reduction in vehicle source levels over time, as low-noise vehicle design and construction becomes more common. Calculations nonetheless assume source levels of 97 dB(A) for L_{max} events, which is in any case higher than source levels nominated under either revision of the AAAC Guideline.

   It is furthermore acknowledged that the previous revision of this Report included a minor labelling error in Appendix C, and that while the calculation of screening to R6 from fencing on the southern boundary was included, the calculation was mis-labelled as to R1. The calculations presented in Appendix C of this revision includes the correct labelling, and shows the fencing to provide more than the 9 dB(A) of screening required to meet L_{max} criteria at the southern boundary.