BASIX® Certificate

Building Sustainability Index www.basix.nsw.gov.au

Multi Dwelling

Certificate number: 512213M_02

This certificate confirms that the proposed development will meet the NSW government's requirements for sustainability, if it is built in accordance with the commitments set out below. Terms used in this certificate, or in the commitments, have the meaning given by the document entitled "BASIX Definitions" dated 29/06/2009 published by Planning & Infrastructure. This document is available at www.basix.nsw.gov.au

This certificate is a revision of certificate number 512213M lodged with the consent authority or certifier on 20 December 2013 with application DA2013/1519.

It is the responsibility of the applicant to verify with the consent authority that the original, or any revised certificate, complies with the requirements of Schedule 1 Clause 2A, 4A or 6A of the Environmental Planning and Assessment Regulation 2000

Director-General
Date of issue: Thursday, 28 August 2014
To be valid, this certificate must be lodged within 3 months of the date of issue.

NSW GOVERNMENT Planning & Infrastructure

Project summary	
Project name	18-22 Sturdee Pde & 27-29 Pacific Pde_02
Street address	18-22 Sturdee Parade Dee Why 2099
Local Government Area	Warringah Council
Plan type and plan number	deposited 8270
Lot no.	23-25
Section no.	-
No. of residential flat buildings	2
No. of units in residential flat buildings	201
No. of multi-dwelling houses	0
No. of single dwelling houses	0

Project score		
Water	✔ 40	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 23	Target 20

Certificate Prepared by
Name / Company Name: AGA Consultants
ABN (if applicable): 37 159 342 711

Description of project

Project address	
Project name	18-22 Sturdee Pde & 27-29 Pacific Pde_02
Street address	18-22 Sturdee Parade Dee Why 2099
Local Government Area	Warringah Council
Plan type and plan number	deposited 8270
Lot no.	23-25
Section no.	-
Project type	
No. of residential flat buildings	2
No. of units in residential flat buildings	201
No. of multi-dwelling houses	0
No. of single dwelling houses	0
Site details	
Site area (m²)	5463
Roof area (m²)	880
Non-residential floor area (m²)	0
Residential car spaces	291
Non-residential car spaces	0

Common area landscape		
Common area lawn (m²)	1161	
Common area garden (m²)	364	
Area of indigenous or low water use species (m²)	0	
Assessor details		
Assessor number	BDAV/12/1457	
Certificate number	14570047	
Climate zone	56	
Project score		
Water	✔ 40	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 23	Target 20

Description of project

The tables below describe the dwellings and common areas within the project

Residential flat buildings - Sturdee Pde Block, 98 dwellings, 6 storeys above ground

Dwelling no.	No. of bedrooms	Conditioned floor area (m^2)	Unconditioned floor area (m^2)	Area of garden & lawn (m^2)	Indigenous species (min area m^2)
101	1	66.0	0.0	0	0
105	1	50.0	0.0	0	0
109	1	51.0	0.0	0	0
113	1	50.0	0.0	0	0
117	1	66.0	0.0	0	0
202	1	53.0	0.0	0	0
206	1	50.0	0.0	0	0
210	1	65.0	0.0	0	0
214	1	50.0	0.0	0	0
218	1	53.0	0.0	0	0
303	1	50.0	0.0	0	0
307	1	65.0	0.0	0	0
311	1	53.0	0.0	0	0
315	2	79.0	0.0	0	0
402	1	49.0	4.0	0	0
406	1	50.0	0.0	0	0
410	1	59.0	0.0	0	0
501	2	73.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m^2)	Unconditioned floor area (m^2)	Area of garden & lawn (m^2)	Indigenous species (min area m^2)
102	1	53.0	0.0	0	0
106	1	50.0	0.0	0	0
110	1	65.0	0.0	0	0
114	1	50.0	0.0	0	0
118	1	53.0	0.0	0	0
203	1	50.0	0.0	0	0
207	1	65.0	0.0	0	0
211	1	65.0	0.0	0	0
215	1	50.0	0.0	0	0
219	1	53.0	0.0	0	0
304	1	50.0	0.0	0	0
308	2	74.0	0.0	0	0
312	1	61.0	0.0	0	0
316	1	53.0	0.0	0	0
403	1	49.0	4.0	0	0
407	1	50.0	0.0	0	0
411	1	50.0	0.0	0	0
502	1	53.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m^2)	Unconditioned floor area (m^2)	Area of garden & lawn (m^2)	Indigenous species (min area m^2)
103	1	50.0	0.0	0	0
107	1	65.0	0.0	0	0
111	1	65.0	0.0	0	0
115	1	50.0	0.0	0	0
119	1	53.0	0.0	0	0
204	1	50.0	0.0	0	0
208	2	74.0	0.0	0	0
212	1	50.0	0.0	0	0
216	1	53.0	0.0	0	0
301	1	57.0	0.0	0	0
305	1	50.0	0.0	0	0
309	1	51.0	0.0	0	0
313	2	68.0	4.0	0	0
317	1	53.0	0.0	0	0
404	1	49.0	4.0	0	0
408	2	74.0	0.0	0	0
412	2	72.0	0.0	0	0
503	2	81.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m^2)	Unconditioned floor area (m^2)	Area of garden & lawn (m^2)	Indigenous species (min area m^2)
104	1	50.0	0.0	0	0
108	2	74.0	0.0	0	0
112	1	50.0	0.0	0	0
116	1	53.0	0.0	0	0
201	1	66.0	0.0	0	0
205	1	50.0	0.0	0	0
209	1	51.0	0.0	0	0
213	1	50.0	0.0	0	0
217	1	66.0	0.0	0	0
302	1	50.0	0.0	0	0
306	1	50.0	0.0	0	0
310	1	60.0	0.0	0	0
314	2	68.0	4.0	0	0
401	2	74.0	0.0	0	0
405	2	69.0	3.0	0	0
409	1	59.0	0.0	0	0
413	1	63.0	0.0	0	0
504	2	78.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
505	2	78.0	0.0	0	0
509	2	70.0	0.0	0	0
604	2	74.0	0.0	0	0
G03	1	74.0	0.0	25	0
G07	2	74.0	0.0	63	0
G11	1	50.0	0.0	0	0
G15	1	50.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
506	1	52.0	0.0	0	0
601	2	84.0	0.0	0	0
605	2	83.0	0.0	0	0
G04	2	74.0	0.0	28	0
G08	1	51.0	0.0	18	0
G12	1	50.0	0.0	0	0
G16	2	70.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
507	2	74.0	0.0	0	0
602	1	59.0	0.0	0	0
G01	1	66.0	0.0	26	0
G05	2	74.0	0.0	28	0
G09	1	66.0	0.0	0	0
G13	1	50.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
508	1	50.0	0.0	0	0
603	2	77.0	0.0	0	0
G02	1	66.0	0.0	25	0
G06	1	66.0	0.0	25	0
G10	1	50.0	0.0	0	0
G14	1	50.0	0.0	0	0

Residential flat buildings - Pacific Pde Block, 103 dwellings, 7 storeys above ground

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
101	1	66.0	0.0	0	0
105	1	51.0	0.0	0	0
109	1	51.0	0.0	0	0
113	1	51.0	0.0	0	0
117	1	66.0	0.0	0	0
202	1	54.0	0.0	0	0
206	1	51.0	0.0	0	0
210	2	74.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
102	1	54.0	0.0	0	0
106	1	51.0	0.0	0	0
110	2	74.0	0.0	0	0
114	1	51.0	0.0	0	0
118	1	52.0	0.0	0	0
203	1	51.0	0.0	0	0
207	1	65.0	0.0	0	0
211	1	65.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
103	1	51.0	0.0	0	0
107	1	65.0	0.0	0	0
111	1	65.0	0.0	0	0
115	1	51.0	0.0	0	0
119	1	52.0	0.0	0	0
204	1	51.0	0.0	0	0
208	1	66.0	0.0	0	0
212	1	51.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
104	1	51.0	0.0	0	0
108	1	66.0	0.0	0	0
112	1	51.0	0.0	0	0
116	1	54.0	0.0	0	0
201	1	66.0	0.0	0	0
205	1	51.0	0.0	0	0
209	1	51.0	0.0	0	0
213	1	51.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m^2)	Unconditioned floor area (m^2)	Area of garden & lawn (m^2)	Indigenous species (min area m^2)
214	1	51.0	0.0	0	0
218	1	52.0	0.0	0	0
303	1	51.0	0.0	0	0
307	1	65.0	0.0	0	0
311	1	65.0	0.0	0	0
315	1	51.0	0.0	0	0
319	1	52.0	0.0	0	0
404	1	68.0	0.0	0	0
408	1	69.0	0.0	0	0
412	1	58.0	0.0	0	0
501	2	73.0	5.0	0	0
505	2	80.0	0.0	0	0
509	2	78.0	0.0	0	0
604	2	80.0	0.0	0	0
G01	2	74.0	0.0	21	0
G05	1	66.0	0.0	18	0
G09	1	51.0	0.0	17	0
G13	1	67.0	0.0	24	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m^2)	Unconditioned floor area (m^2)	Area of garden & lawn (m^2)	Indigenous species (min area m^2)
215	1	51.0	0.0	0	0
219	1	52.0	0.0	0	0
304	1	51.0	0.0	0	0
308	1	66.0	0.0	0	0
312	1	51.0	0.0	0	0
316	1	50.0	0.0	0	0
401	2	72.0	0.0	0	0
405	1	53.0	0.0	0	0
409	1	53.0	0.0	0	0
413	2	74.0	0.0	0	0
502	1	64.0	5.0	0	0
506	2	79.0	0.0	0	0
601	2	76.0	0.0	0	0
605	2	79.0	0.0	0	0
G02	1	52.0	0.0	13	0
G06	1	66.0	0.0	18	0
G10	1	67.0	0.0	24	0
G14	1	67.0	0.0	24	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m^2)	Unconditioned floor area (m^2)	Area of garden & lawn (m^2)	Indigenous species (min area m^2)
216	1	54.0	0.0	0	0
301	1	67.0	0.0	0	0
305	1	51.0	0.0	0	0
309	1	51.0	0.0	0	0
313	1	51.0	0.0	0	0
317	1	57.0	0.0	0	0
402	1	57.0	0.0	0	0
406	1	60.0	0.0	0	0
410	2	70.0	0.0	0	0
414	1	44.0	0.0	0	0
503	2	75.0	0.0	0	0
507	2	81.0	0.0	0	0
602	2	75.0	0.0	0	0
606	2	81.0	0.0	0	0
G03	1	66.0	0.0	18	0
G07	1	66.0	0.0	18	0
G11	1	67.0	0.0	24	0
G15	1	52.0	0.0	19	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m^2)	Unconditioned floor area (m^2)	Area of garden & lawn (m^2)	Indigenous species (min area m^2)
217	1	66.0	0.0	0	0
302	1	54.0	0.0	0	0
306	1	51.0	0.0	0	0
310	2	74.0	0.0	0	0
314	1	51.0	0.0	0	0
318	1	52.0	0.0	0	0
403	1	68.0	0.0	0	0
407	1	51.0	0.0	0	0
411	2	70.0	0.0	0	0
415	1	44.0	0.0	0	0
504	1	52.0	0.0	0	0
508	2	70.0	4.0	0	0
603	1	52.0	0.0	0	0
607	2	81.0	0.0	0	0
G04	1	66.0	0.0	18	0
G08	1	63.0	0.0	50	0
G12	1	67.0	0.0	24	0

Description of project

The tables below describe the dwellings and common areas within the project

Common areas of unit building - Sturdee Pde Block

Common area	Floor area (m²)
Lift car (No. 1)	-

Common area	Floor area (m²)
Lift car (No. 2)	-

Common areas of unit building - Pacific Pde Block

Common area	Floor area (m²)
Lift car (No. 3)	-

Common area	Floor area (m²)
Lift car (No. 4)	-

Common areas of the development (non-building specific)

Common area	Floor area (m²)
Basement 1	3720
Switch rooms	10
Other internal, storage	8

Common area	Floor area (m²)
Basement 2	3780
Garbage rooms	119
Ground floor lobby types	65

Common area	Floor area (m²)
Basement 3	1580
Plant or service rooms	119

Schedule of BASIX commitments

1. Commitments for Residential flat buildings - Sturdee Pde Block
    - (a) Dwellings
        - (i) Water
        - (ii) Energy
        - (iii) Thermal Comfort
    - (b) Common areas and central systems/facilities
        - (i) Water
        - (ii) Energy

2. Commitments for Residential flat buildings - Pacific Pde Block
    - (a) Dwellings
        - (i) Water
        - (ii) Energy
        - (iii) Thermal Comfort
    - (b) Common areas and central systems/facilities
        - (i) Water
        - (ii) Energy

3. Commitments for multi-dwelling houses

4. Commitments for single dwelling houses

5. Commitments for common areas and central systems/facilities for the development (non-building specific)
    - (i) Water
    - (ii) Energy

Schedule of BASIX commitments

The commitments set out below regulate how the proposed development is to be carried out. It is a condition of any development consent granted, or complying development certificate issued, for the proposed development, that BASIX commitments be complied with.

1. Commitments for Residential flat buildings - Sturdee Pde Block

(a) Dwellings

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must plant indigenous or low water use species of vegetation throughout the area of land specified for the dwelling in the "Indigenous species" column of the table below, as private landscaping for that dwelling. (This area of indigenous vegetation is to be contained within the "Area of garden and lawn" for the dwelling specified in the "Description of Project" table).	✔	✔	
(c) If a rating is specified in the table below for a fixture or appliance to be installed in the dwelling, the applicant must ensure that each such fixture and appliance meets the rating specified for it.		✔	✔
(d) The applicant must install an on demand hot water recirculation system which regulates all hot water use throughout the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below.		✔	✔
(e) The applicant must install: (aa) a hot water diversion system to all showers, kitchen sinks and all basins in the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below; and (bb) a separate diversion tank (or tanks) connected to the hot water diversion systems of at least 100 litres. The applicant must connect the hot water diversion tank to all toilets in the dwelling.		✔ ✔	✔ ✔
(e) The applicant must not install a private swimming pool or spa for the dwelling, with a volume exceeding that specified for it in the table below.	✔	✔	
(f) If specified in the table, that pool or spa (or both) must have a pool cover or shading (or both).		✔	
(g) The pool or spa must be located as specified in the table.	✔	✔	
(h) The applicant must install, for the dwelling, each alternative water supply system, with the specified size, listed for that dwelling in the table below. Each system must be configured to collect run-off from the areas specified (excluding any area which supplies any other alternative water supply system), and to divert overflow as specified. Each system must be connected as specified.	✔	✔	✔

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
507, 508, 509, 601, 602, 603, 604, 605	3 star (> 4.5 but <= 6 L/min)	3 star	3 star	4 star	no	-	3 star	-	-	-	-	-	-	-

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 301, 302,	3 star (> 4.5 but <= 6 L/min)	3 star	3 star	4 star	no	-	3 star	-	-	-	-	-	-	-

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 501, 502, 503, 504, 505, 506, G01, G02, G03, G04, G05, G06,														

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
G07, G08, G09, G10, G11, G12, G13, G14, G15, G16														

	Alternative water source							
Dwelling no.	Alternative water supply systems	Size	Configuration	Landscape connection	Toilet connection (s)	Laundry connection	Pool top-up	Spa top-up
G01, G02, G03, G04, G05, G06, G07, G08	central water tank (no. 1)	See central systems	See central systems	yes	-	-	-	-

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must install each hot water system specified for the dwelling in the table below, so that the dwelling's hot water is supplied by that system. If the table specifies a central hot water system for the dwelling, then the applicant must connect that central system to the dwelling, so that the dwelling's hot water is supplied by that central system.	✔	✔	✔
(c) The applicant must install, in each bathroom, kitchen and laundry of the dwelling, the ventilation system specified for that room in the table below. Each such ventilation system must have the operation control specified for it in the table.		✔	✔

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(d) The applicant must install the cooling and heating system/s specified for the dwelling under the "Living areas" and "Bedroom areas" headings of the "Cooling" and "Heating" columns in the table below, in/for at least 1 living/bedroom area of the dwelling. If no cooling or heating system is specified in the table for "Living areas" or "Bedroom areas", then no systems may be installed in any such areas. If the term "zoned" is specified beside an air conditioning system, then the system must provide for day/night zoning between living areas and bedrooms.		✔	✔
(e) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Artificial lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that the "primary type of artificial lighting" for each such room in the dwelling is fluorescent lighting or light emitting diode (LED) lighting. If the term "dedicated" is specified for a particular room or area, then the light fittings in that room or area must only be capable of being used for fluorescent lighting or light emitting diode (LED) lighting.		✔	✔
(f) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Natural lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that each such room or area is fitted with a window and/or skylight.	✔	✔	✔
(g) This commitment applies if the applicant installs a water heating system for the dwelling's pool or spa. The applicant must: (aa) install the system specified for the pool in the "Individual Pool" column of the table below (or alternatively must not install any system for the pool). If specified, the applicant must install a timer, to control the pool's pump; and (bb) install the system specified for the spa in the "Individual Spa" column of the table below (or alternatively must not install any system for the spa). If specified, the applicant must install a timer to control the spa's pump.		✔ ✔	
(h) The applicant must install in the dwelling: (aa) the kitchen cook-top and oven specified for that dwelling in the "Appliances & other efficiency measures" column of the table below; (bb) each appliance for which a rating is specified for that dwelling in the "Appliances & other efficiency measures" column of the table, and ensure that the appliance has that minimum rating; and (cc) any clothes drying line specified for the dwelling in the "Appliances & other efficiency measures" column of the table.		✔ ✔ ✔	✔
(i) If specified in the table, the applicant must carry out the development so that each refrigerator space in the dwelling is "well ventilated".		✔	

	Hot water	Bathroom ventilation system		Kitchen ventilation system		Laundry ventilation system	
Dwelling no.	Hot water system	Each bathroom	Operation control	Each kitchen	Operation control	Each laundry	Operation control
All dwellings	central hot water system 1	individual fan, ducted to façade or roof	interlocked to light	individual fan, ducted to façade or roof	manual switch on/off	individual fan, ducted to façade or roof	interlocked to light

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
All dwellings	1-phase airconditioning 2 Star (new rating)	1-phase airconditioning 2 Star (new rating)	1-phase airconditioning 2 Star (new rating)	1-phase airconditioning 2 Star (new rating)	1	2	yes	yes	yes	yes	0	no

	Individual pool		Individual spa		Appliances & other efficiency measures							
Dwelling no.	Pool heating system	Timer	Spa heating system	Timer	Kitchen cooktop/oven	Refrigerator	Well ventilated fridge space	Dishwasher	Clothes washer	Clothes dryer	Indoor or sheltered clothes drying line	Private outdoor or unsheltered clothes drying line
All dwellings	-	-	-	-	gas cooktop & electric oven	-	no	2.5 star	-	-	no	no

(iii) Thermal Comfort	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must attach the certificate referred to under "Assessor details" on the front page of this BASIX certificate (the "Assessor Certificate") to the development application and construction certificate application for the proposed development (or, if the applicant is applying for a complying development certificate for the proposed development, to that application). The applicant must also attach the Assessor Certificate to the application for a final occupation certificate for the proposed development.			
(b) The Assessor Certificate must have been issued by an Accredited Assessor in accordance with the Thermal Comfort Protocol.			
(c) The details of the proposed development on the Assessor Certificate must be consistent with the details shown in this BASIX Certificate, including the details shown in the "Thermal Loads" table below.			
(d) The applicant must show on the plans accompanying the development application for the proposed development, all matters which the Thermal Comfort Protocol requires to be shown on those plans. Those plans must bear a stamp of endorsement from the Accredited Assessor, to certify that this is the case.			
(e) The applicant must show on the plans accompanying the application for a construction certificate (or complying development certificate, if applicable), all thermal performance specifications set out in the Assessor Certificate, and all aspects of the proposed development which were used to calculate those specifications.			

(iii) Thermal Comfort	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(f) The applicant must construct the development in accordance with all thermal performance specifications set out in the Assessor Certificate, and in accordance with those aspects of the development application or application for a complying development certificate which were used to calculate those specifications.		✔	✔
(g) Where there is an in-slab heating or cooling system, the applicant must: (aa) Install insulation with an R-value of not less than 1.0 around the vertical edges of the perimeter of the slab; or (bb) On a suspended floor, install insulation with an R-value of not less than 1.0 underneath the slab and around the vertical edges of the perimeter of the slab.	✔	✔	✔
(h) The applicant must construct the floors and walls of the development in accordance with the specifications listed in the table below.	✔	✔	✔

	Thermal loads	
Dwelling no.	Area adjusted heating load (in mJ/m²/yr)	Area adjusted cooling load (in mJ/m²/yr)
101	41.6	22.0
102	50.0	3.5
103	1.2	5.8
104	0.9	3.2
106	0.9	3.0
107	0.9	28.4
108	0.9	17.2
109	1.0	16.1
110	10.5	29.5
111	6.4	4.6
114	0.5	4.1
115	8.1	3.8
117	18.5	24.7
118	11.3	8.4
119	28.4	8.5

	Thermal loads	
Dwelling no.	**Area adjusted heating load (in mJ/m²/yr)**	**Area adjusted cooling load (in mJ/m²/yr)**
201	19.9	26.0
202	1.9	4.0
203	1.5	5.5
207	0.9	27.9
208	1.0	17.0
209	1.1	15.5
210	11.0	29.5
211	8.9	5.6
214	0.7	3.9
215	8.4	3.8
217	18.7	24.8
218	3.7	8.7
219	3.7	8.8
301	39.7	27.4
302	60.0	13.3
303	54.4	15.6
304	54.0	12.7
305	15.0	4.3
306	15.0	4.2
307	8.0	22.1
308	7.9	18.2
309	1.2	15.4
310	37.3	26.8
311	17.7	11.4
312	42.2	13.2
313	31.5	12.2
314	32.7	12.2

	Thermal loads	
Dwelling no.	**Area adjusted heating load (in mJ/m²/yr)**	**Area adjusted cooling load (in mJ/m²/yr)**
315	22.4	17.3
401	64.1	18.2
402	65.9	14.7
405	66.0	19.5
406	6.5	21.7
407	8.0	21.2
408	0.1	10.2
409	0.7	11.2
410	0.8	10.0
411	0.9	9.4
412	31.3	36.4
413	55.3	23.9
501	62.7	16.9
502	4.1	16.5
503	5.5	10.8
504	10.7	29.9
505	23.7	13.2
506	0.5	9.3
507	19.2	33.0
508	3.2	8.8
509	62.9	12.8
601	65.0	12.0
602	60.3	18.9
603	60.0	34.0
604	64.6	18.0
605	57.7	23.5
G01	49.5	57.9

	Thermal loads	
Dwelling no.	**Area adjusted heating load (in mJ/m²/yr)**	**Area adjusted cooling load (in mJ/m²/yr)**
G02	59.7	18.1
G03	46.3	14.1
G04	47.7	9.4
G05	64.5	9.3
G06	42.6	8.8
G07	62.1	17.0
G08	56.6	49.5
G09	43.7	13.2
G10	19.4	4.0
G11	20.1	3.8
G14	19.5	3.6
G15	19.7	3.7
G16	25.3	5.2
105, 206	1.0	3.0
112, 113	0.8	4.1
116, 216	0.9	5.0
204, 205	1.1	3.0
212, 213	0.9	4.0
316, 317	7.1	9.5
403, 404	65.1	14.9
All other dwellings	20.4	3.8

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	3 star	3 star	no common laundry facility

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

	Common area ventilation system		Common area lighting		
Common area	**Ventilation system type**	**Ventilation efficiency measure**	**Primary type of artificial lighting**	**Lighting efficiency measure**	**Lighting control system/BMS**
Lift car (No. 1)	-	-	compact fluorescent	connected to lift call button	No
Lift car (No. 2)	-	-	compact fluorescent	connected to lift call button	No

Central energy systems	Type	Specification
Lift (No. 1)	gearless traction with V V V F motor	Number of levels (including basement): 10
Lift (No. 2)	gearless traction with V V V F motor	Number of levels (including basement): 10

2. Commitments for Residential flat buildings - Pacific Pde Block

(a) Dwellings

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must plant indigenous or low water use species of vegetation throughout the area of land specified for the dwelling in the "Indigenous species" column of the table below, as private landscaping for that dwelling. (This area of indigenous vegetation is to be contained within the "Area of garden and lawn" for the dwelling specified in the "Description of Project" table).	✔	✔	
(c) If a rating is specified in the table below for a fixture or appliance to be installed in the dwelling, the applicant must ensure that each such fixture and appliance meets the rating specified for it.		✔	✔
(d) The applicant must install an on demand hot water recirculation system which regulates all hot water use throughout the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below.		✔	✔
(e) The applicant must install: (aa) a hot water diversion system to all showers, kitchen sinks and all basins in the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below; and (bb) a separate diversion tank (or tanks) connected to the hot water diversion systems of at least 100 litres. The applicant must connect the hot water diversion tank to all toilets in the dwelling.		✔ ✔	✔ ✔
(e) The applicant must not install a private swimming pool or spa for the dwelling, with a volume exceeding that specified for it in the table below.	✔	✔	
(f) If specified in the table, that pool or spa (or both) must have a pool cover or shading (or both).		✔	
(g) The pool or spa must be located as specified in the table.	✔	✔	
(h) The applicant must install, for the dwelling, each alternative water supply system, with the specified size, listed for that dwelling in the table below. Each system must be configured to collect run-off from the areas specified (excluding any area which supplies any other alternative water supply system), and to divert overflow as specified. Each system must be connected as specified.	✔	✔	✔

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
G13, G14, G15	3 star (> 4.5 but <= 6 L/min)	3 star	3 star	4 star	no	-	3 star	-	-	-	-	-	-	-

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 301, 302,	3 star (> 4.5 but <= 6 L/min)	3 star	3 star	4 star	no	-	3 star	-	-	-	-	-	-	-

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 501, 502, 503, 504, 505, 506, 507, 508,														

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
509, 601, 602, 603, 604, 605, 606, 607, G01, G02, G03, G04, G05, G06, G07, G08, G09, G10, G11, G12														

	Alternative water source							
Dwelling no.	Alternative water supply systems	Size	Configuration	Landscape connection	Toilet connection (s)	Laundry connection	Pool top-up	Spa top-up
G01, G02, G03, G04, G05, G06, G07, G08, G09, G10, G11, G12, G13, G14, G15	central water tank (no. 1)	See central systems	See central systems	yes	-	-	-	-

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must install each hot water system specified for the dwelling in the table below, so that the dwelling's hot water is supplied by that system. If the table specifies a central hot water system for the dwelling, then the applicant must connect that central system to the dwelling, so that the dwelling's hot water is supplied by that central system.	✔	✔	✔
(c) The applicant must install, in each bathroom, kitchen and laundry of the dwelling, the ventilation system specified for that room in the table below. Each such ventilation system must have the operation control specified for it in the table.		✔	✔
(d) The applicant must install the cooling and heating system/s specified for the dwelling under the "Living areas" and "Bedroom areas" headings of the "Cooling" and "Heating" columns in the table below, in/for at least 1 living/bedroom area of the dwelling. If no cooling or heating system is specified in the table for "Living areas" or "Bedroom areas", then no systems may be installed in any such areas. If the term "zoned" is specified beside an air conditioning system, then the system must provide for day/night zoning between living areas and bedrooms.		✔	✔
(e) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Artificial lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that the "primary type of artificial lighting" for each such room in the dwelling is fluorescent lighting or light emitting diode (LED) lighting. If the term "dedicated" is specified for a particular room or area, then the light fittings in that room or area must only be capable of being used for fluorescent lighting or light emitting diode (LED) lighting.		✔	✔
(f) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Natural lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that each such room or area is fitted with a window and/or skylight.	✔	✔	✔
(g) This commitment applies if the applicant installs a water heating system for the dwelling's pool or spa. The applicant must: (aa) install the system specified for the pool in the "Individual Pool" column of the table below (or alternatively must not install any system for the pool). If specified, the applicant must install a timer, to control the pool's pump; and (bb) install the system specified for the spa in the "Individual Spa" column of the table below (or alternatively must not install any system for the spa). If specified, the applicant must install a timer to control the spa's pump.		✔ ✔	
(h) The applicant must install in the dwelling: (aa) the kitchen cook-top and oven specified for that dwelling in the "Appliances & other efficiency measures" column of the table below; (bb) each appliance for which a rating is specified for that dwelling in the "Appliances & other efficiency measures" column of the table, and ensure that the appliance has that minimum rating; and (cc) any clothes drying line specified for the dwelling in the "Appliances & other efficiency measures" column of the table.		✔ ✔ ✔	✔
(i) If specified in the table, the applicant must carry out the development so that each refrigerator space in the dwelling is "well ventilated".		✔	

	Hot water	Bathroom ventilation system		Kitchen ventilation system		Laundry ventilation system	
Dwelling no.	Hot water system	Each bathroom	Operation control	Each kitchen	Operation control	Each laundry	Operation control
All dwellings	central hot water system 1	individual fan, ducted to façade or roof	interlocked to light	individual fan, ducted to façade or roof	manual switch on/off	individual fan, ducted to façade or roof	interlocked to light

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
All dwellings	1-phase airconditioning 2 Star (new rating)	1-phase airconditioning 2 Star (new rating)	1-phase airconditioning 2 Star (new rating)	1-phase airconditioning 2 Star (new rating)	1	2	yes	yes	yes	yes	0	no

	Individual pool		Individual spa		Appliances & other efficiency measures							
Dwelling no.	Pool heating system	Timer	Spa heating system	Timer	Kitchen cooktop/oven	Refrigerator	Well ventilated fridge space	Dishwasher	Clothes washer	Clothes dryer	Indoor or sheltered clothes drying line	Private outdoor or unsheltered clothes drying line
All dwellings	-	-	-	-	gas cooktop & electric oven	-	no	2.5 star	-	-	no	no

(iii) Thermal Comfort	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must attach the certificate referred to under "Assessor details" on the front page of this BASIX certificate (the "Assessor Certificate") to the development application and construction certificate application for the proposed development (or, if the applicant is applying for a complying development certificate for the proposed development, to that application). The applicant must also attach the Assessor Certificate to the application for a final occupation certificate for the proposed development.			
(b) The Assessor Certificate must have been issued by an Accredited Assessor in accordance with the Thermal Comfort Protocol.			

(iii) Thermal Comfort	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(c) The details of the proposed development on the Assessor Certificate must be consistent with the details shown in this BASIX Certificate, including the details shown in the "Thermal Loads" table below.			
(d) The applicant must show on the plans accompanying the development application for the proposed development, all matters which the Thermal Comfort Protocol requires to be shown on those plans. Those plans must bear a stamp of endorsement from the Accredited Assessor, to certify that this is the case.			
(e) The applicant must show on the plans accompanying the application for a construction certificate (or complying development certificate, if applicable), all thermal performance specifications set out in the Assessor Certificate, and all aspects of the proposed development which were used to calculate those specifications.			
(f) The applicant must construct the development in accordance with all thermal performance specifications set out in the Assessor Certificate, and in accordance with those aspects of the development application or application for a complying development certificate which were used to calculate those specifications.		✔	✔
(g) Where there is an in-slab heating or cooling system, the applicant must: (aa) Install insulation with an R-value of not less than 1.0 around the vertical edges of the perimeter of the slab; or (bb) On a suspended floor, install insulation with an R-value of not less than 1.0 underneath the slab and around the vertical edges of the perimeter of the slab.	✔	✔	✔
(h) The applicant must construct the floors and walls of the development in accordance with the specifications listed in the table below.	✔	✔	✔

	Thermal loads	
Dwelling no.	**Area adjusted heating load (in mJ/m²/yr)**	**Area adjusted cooling load (in mJ/m²/yr)**
101	17.7	25.7
102	0.1	3.7
103	1.1	6.0
104	0.8	3.3
105	0.9	3.0
106	0.8	3.0
107	6.8	3.9
108	8.8	35.1
109	0.9	16.1

	Thermal loads	
Dwelling no.	**Area adjusted heating load (in mJ/m²/yr)**	**Area adjusted cooling load (in mJ/m²/yr)**
110	0.8	12.4
111	3.5	5.2
112	0.3	4.2
115	6.9	4.0
117	17.6	26.8
201	18.0	25.7
202	0.1	3.6
203	1.3	5.5
204	1.0	3.1
207	7.0	3.6
208	9.1	35.2
209	1.0	15.7
210	0.9	12.7
211	3.6	5.2
215	7.2	4.1
217	17.8	26.4
301	34.3	30.1
302	6.0	5.1
303	3.6	6.0
304	3.4	3.4
305	3.4	3.3
306	3.3	3.3
307	12.8	4.5
308	11.5	32.5
309	1.2	15.4
310	2.8	12.8
311	4.9	5.2

	Thermal loads	
Dwelling no.	**Area adjusted heating load (in mJ/m²/yr)**	**Area adjusted cooling load (in mJ/m²/yr)**
312	3.5	4.8
313	3.4	4.8
314	29.6	12.9
315	29.8	12.8
316	18.8	13.2
317	43.5	33.7
401	62.0	14.5
402	52.9	11.8
403	49.6	10.7
404	50.8	10.6
405	43.4	26.1
406	53.8	38.0
407	14.0	43.2
408	43.8	50.1
409	47.0	13.3
410	61.6	14.2
411	30.6	11.6
412	47.4	12.4
413	65.8	17.9
414	37.9	15.7
415	38.0	15.7
501	58.1	24.5
502	8.3	24.1
503	6.6	11.9
504	2.9	6.1
505	20.9	14.3
506	24.3	12.5

	Thermal loads	
Dwelling no.	**Area adjusted heating load (in mJ/m²/yr)**	**Area adjusted cooling load (in mJ/m²/yr)**
507	3.7	6.6
508	9.6	18.5
509	62.0	20.0
601	21.8	48.3
602	24.9	29.1
603	32.8	15.7
604	37.1	19.5
605	39.5	17.8
606	12.9	8.9
607	22.3	53.2
G01	65.0	11.1
G02	48.1	12.2
G03	52.1	14.2
G04	51.8	14.2
G05	52.0	14.2
G06	52.9	14.2
G07	52.5	14.2
G08	53.2	15.6
G09	56.9	57.2
G10	13.0	41.2
G11	23.2	38.4
G12	22.9	38.6
G15	28.9	27.0
113, 114	0.3	4.3
116, 216	0.9	5.8
118, 119	11.1	8.8
205, 206	1.0	3.0

	Thermal loads	
Dwelling no.	**Area adjusted heating load (in mJ/m²/yr)**	**Area adjusted cooling load (in mJ/m²/yr)**
218, 219	11.5	8.7
318, 319	15.7	9.3
G13, G14	22.7	31.2
All other dwellings	0.4	4.1

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	3 star	3 star	no common laundry facility

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

	Common area ventilation system		Common area lighting		
Common area	**Ventilation system type**	**Ventilation efficiency measure**	**Primary type of artificial lighting**	**Lighting efficiency measure**	**Lighting control system/BMS**
Lift car (No. 3)	-	-	compact fluorescent	connected to lift call button	No
Lift car (No. 4)	-	-	compact fluorescent	connected to lift call button	No

Central energy systems	Type	Specification
Lift (No. 3)	gearless traction with V V V F motor	Number of levels (including basement): 10
Lift (No. 4)	gearless traction with V V V F motor	Number of levels (including basement): 10

5. Commitments for common areas and central systems/facilities for the development (non-building specific)

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	3 star	3 star	no common laundry facility

Central systems	Size	Configuration	Connection (to allow for...)
Central water tank - rainwater or stormwater (No. 1)	30000	To collect run-off from at least: - 700 square metres of roof area of buildings in the development - 0 square metres of impervious area in the development - 0 square metres of garden/lawn area in the development - 0 square metres of planter box area in the development (excluding, in each case, any area which drains to, or supplies, any other alternative water supply system).	- irrigation of 1256 square metres of common landscaped area on the site - car washing in 0 car washing bays on the site
Fire sprinkler system (No. 1)	-	-	-

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

	Common area ventilation system		Common area lighting		
Common area	Ventilation system type	Ventilation efficiency measure	Primary type of artificial lighting	Lighting efficiency measure	Lighting control system/BMS
Basement 1	ventilation (supply + exhaust)	carbon monoxide monitor + VSD fan	fluorescent	time clock and motion sensors	No
Basement 2	ventilation (supply + exhaust)	carbon monoxide monitor + VSD fan	fluorescent	time clock and motion sensors	No
Basement 3	ventilation (supply + exhaust)	carbon monoxide monitor + VSD fan	fluorescent	time clock and motion sensors	No
Switch rooms	ventilation exhaust only	thermostatically controlled	fluorescent	motion sensors	No
Garbage rooms	ventilation exhaust only	-	fluorescent	motion sensors	No
Plant or service rooms	ventilation exhaust only	thermostatically controlled	fluorescent	motion sensors	No
Other internal, storage	no mechanical ventilation	-	fluorescent	motion sensors	No
Ground floor lobby types	no mechanical ventilation	-	compact fluorescent	time clocks	No

Central energy systems	Type	Specification
Central hot water system (No. 1)	gas-fired storage (manifolded)	Piping insulation (ringmain & supply risers): (a) Piping external to building: R0.6 (~25 mm); (b) Piping internal to building: R0.6 (~25 mm)

Notes

1. In these commitments, "applicant" means the person carrying out the development.
2. The applicant must identify each dwelling, building and common area listed in this certificate, on the plans accompanying any development application, and on the plans and specifications accompanying the application for a construction certificate / complying development certificate, for the proposed development, using the same identifying letter or reference as is given to that dwelling, building or common area in this certificate.
3. This note applies if the proposed development involves the erection of a building for both residential and non-residential purposes (or the change of use of a building for both residential and non-residential purposes). Commitments in this certificate which are specified to apply to a "common area" of a building or the development, apply only to that part of the building or development to be used for residential purposes.
4. If this certificate lists a central system as a commitment for a dwelling or building, and that system will also service any other dwelling or building within the development, then that system need only be installed once (even if it is separately listed as a commitment for that other dwelling or building).
5. If a star or other rating is specified in a commitment, this is a minimum rating.
6. All alternative water systems to be installed under these commitments (if any), must be installed in accordance with the requirements of all applicable regulatory authorities. NOTE: NSW Health does not recommend that stormwater, recycled water or private dam water be used to irrigate edible plants which are consumed raw, or that rainwater be used for human consumption in areas with potable water supply.

Legend

1. Commitments identified with a "✔" in the "Show on DA plans" column must be shown on the plans accompanying the development application for the proposed development (if a development application is to be lodged for the proposed development).
2. Commitments identified with a "✔" in the "Show on CC/CDC plans and specs" column must be shown in the plans and specifications accompanying the application for a construction certificate / complying development certificate for the proposed development.
3. Commitments identified with a "✔" in the "Certifier check" column must be certified by a certifying authority as having been fulfilled. (Note: a certifying authority must not issue an occupation certificate (either interim or final) for a building listed in this certificate, or for any part of such a building, unless it is satisfied that each of the commitments whose fulfilment it is required to monitor in relation to the building or part, has been fulfilled).

MANAGING DIRECTORS
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BEN WHITE

23-29 Pacific Parade, Dee Why

DA Acoustic Assessment - Stage 2

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DOCUMENT CONTROL REGISTER

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TABLE OF CONTENTS

1 INTRODUCTION

This report presents an acoustic assessment to accompany the stage 2 development application of the proposed residential apartment development located at 23-29 Pacific Parade, Dee Why.

In this report we have:

- Identified environmental noise sources (primarily traffic noise) which may have impact on the site and recommended acoustic treatments to ensure a reasonable level of amenity is achieved for future occupants.
- Setup criteria for environmental noise emissions from the operation of the development (mechanical plant items and carpark)
- Conduct initial noise emission assessment for the proposed carpark.

External noise impacts onto the site have been assessed in accordance with Warringah Council requirements, NSW State Environment Planning Policy Infrastructure (2007) and Australian Standard 2107.

Mechanical plant noise emission criteria have been determined in accordance with NSW EPA Industrial Noise Policy.

The assessment is based on the architectural drawings provided by Marchese Partners dated August 2014.

2 SITE DESCRIPTION

The proposed stage 2 development includes a six level residential apartment building with two basement carpark levels.

The site is bounded by Sturdee Parade to the south and Pacific Parade to the north. Both roads carry low to medium traffic levels. To the north and east of the site are existing residential apartment buildings, to the west is Dee Why Grand which has commercial tenants on lower levels and residential apartments on higher levels.

Figure 1 shows the site map and measurement locations conducted as part of the stage 1 DA application in September 2013.

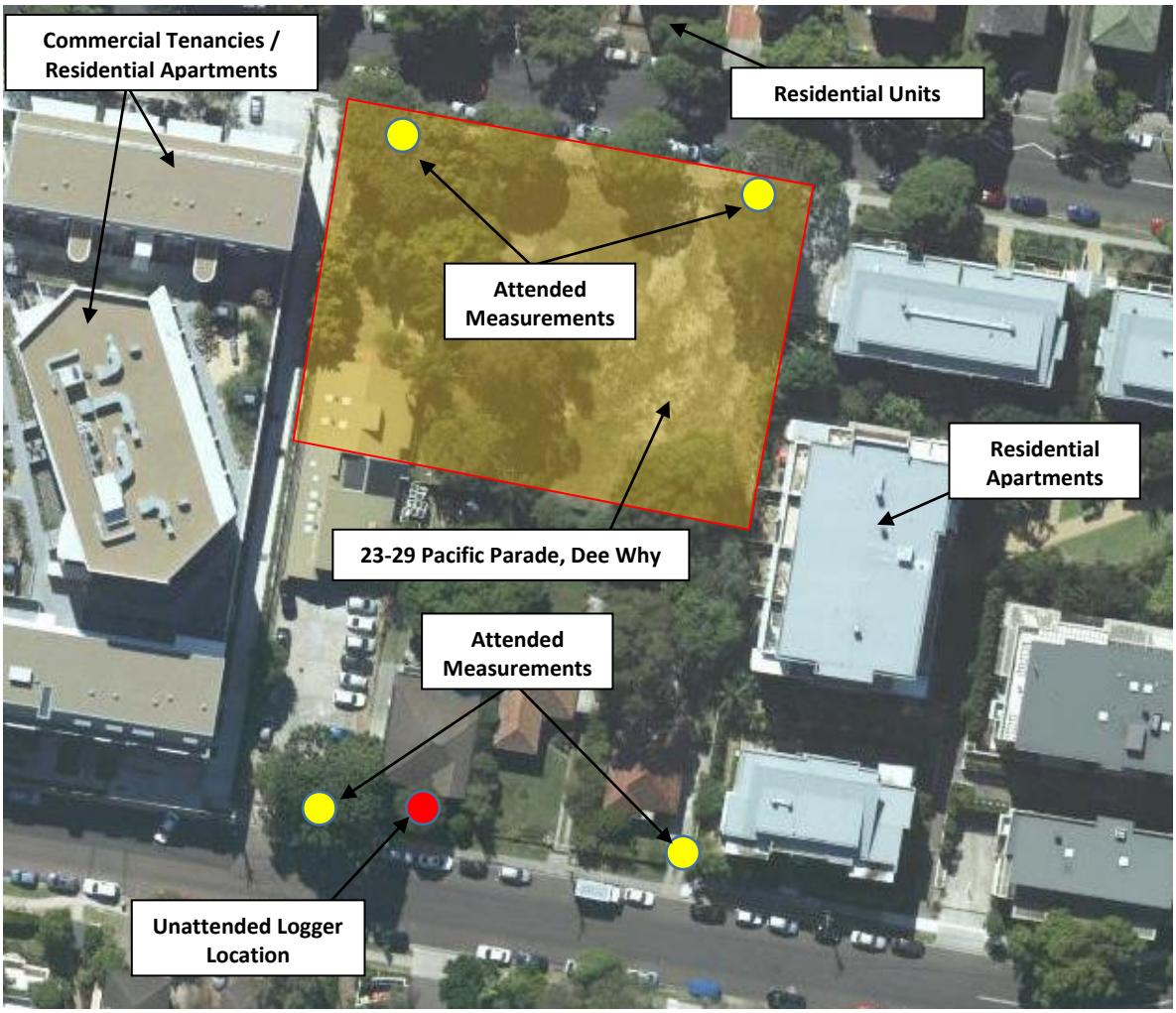


Figure 1: Site Map and Measurement Locations

3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise three principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement interval.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4 EXTERNAL NOISE INTRUSION ASSESSMENT

The main environmental noise sources affecting the site is from road traffic travelling along Pacific Parade and to a lesser extent, road traffic along Sturdee Parade.

4.1 PROJECT CRITERIA

Warringah Council does not specify any specific requirement for internal noise levels for residential development. Therefore, the NSW State Environmental Planning Policy Infrastructure (2007) and Australian Standard 2107:2000 will be used to determine the internal noise criteria.

4.1.1 State Environmental Planning Policy

The NSW Department of Planning's policy, Development Near Rail Corridors And Busy Roads – Interim Guideline, sets out internal noise level criteria adapted from the State Environmental Planning Policy (Infrastructure) 2007 (the 'Infrastructure SEPP') for developments with the potential to be impacted by traffic or rail noise and vibration.

The Infrastructure SEPP defines busy roads that are subject to an acoustic assessment as:

"Clause 102: development for any of the following purposes that is on land in or adjacent to a road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data available on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:

- *building for residential use*
- *a place of public worship*
- *a hospital*
- *an educational establishment or childcare."*

The Infrastructure SEPP sets out the following criteria for internal noise levels from airborne traffic noise:

> *"For Clauses 87 (Rail) and 102 (Road):*
> *"If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:*
> *in any bedroom in the building : 35dB(A) at any time 10pm–7am*
> *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."*

Internal requirements are for residential spaces and are measured internally with windows closed.

4.1.2 Australian Standard 2107:2000

Australian Standard 2107:2000 "Recommended design sound level and reverberation times for building interiors" also specifies the recommended internal noise levels for residential receivers, detailed below.

Type of occupancy/activity	Recommended design sound level, $L_{Aeq(1hour)}$, dB(A)
Living Areas	40
Sleeping Areas	35

4.1.3 Resultant Criteria

Given that both Sturdee Parade and Pacific Parade do not have more than 20,000 AADTV. The Australian Standard 2107 criteria will be adopted by this project.

Table 1 - Internal Traffic Noise Criteria

Space/Activity Type	Noise Level
Living Area (24 hours)	40 dB(A) $L_{eq\ (1\ hour)}$
Bedroom (10pm-7am)	35 dB(A) $L_{eq\ (1hour)}$

4.2 TRAFFIC NOISE MEASUREMENTS

Traffic noise measurements were conducted using both unattended long-term noise monitor and attended measurements. Measurements were performed generally in accordance with the Australian Standard AS1055 – "Description and measurement of environmental noise – General Procedures".

The measurements were conducted in September 2013 as part of the stage 1 development application at the same site.

4.2.1 Measurement Location

The long-term unattended noise monitor was setup near the southern boundary of the site, approximately 5m from the Sturdee Parade. The monitor had an unrestricted view of the road.

Supplementary attended measurements were taken along Sturdee Parade and Pacific Highway, as indicated in Figure 1.

4.2.2 Measurement Period

The long-term monitoring was conducted from 6th September 2013 to 12th September 2013.

The attended measurements were taken on the 5th September 2013 between 4pm and 5pm.

4.2.3 Measurement Equipment

The long term monitoring was conducted using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted.

Attended measurements were undertaken using a Norsonic 140 sound level analyser, set to A-weighted fast response. The sound level analyser was calibrated before and after the measurements, no significant drift was noted.

4.2.4 Measurement Results

The traffic noise levels listed in table 2 were determined based on the logging data and manned measurements conducted at the site. In determination of acoustic treatments at the façade of the stage 2 development at 23-29 Pacific Parade, Dee Why; the measured level is adjusted for distance and orientation.

Table 2 – External Noise Level (Traffic Noise)

Location	Time Period	Traffic Noise Level
Future Southern Façade	Day (7am – 10pm)	59 dB(A)$L_{Aeq\ (1hr)}$
	Night (10pm – 7am)	55 dB(A)$L_{Aeq\ (1hr)}$
Future Northern Façade	Day (7am – 10pm)	62 dB(A)$L_{Aeq\ (1hr)}$
	Night (10pm – 7am)	58 dB(A)$L_{Aeq\ (1hr)}$

4.3 EVALUATION OF NOISE INTRUSION

Internal noise levels will primarily be as a result of noise transfer through the windows and doors and roof, as these are relatively light building elements that offer less resistance to the transmission of sound.

The predicted noise levels through the windows, doors and roof are discussed below. The predicted noise levels have been based on the measured level and spectral characteristics of the external noise, the area of building elements exposed to aircraft, traffic and train noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

Calculations were performed taking into account the orientation of windows, barrier effects (where applicable), the total area of glazing, facade transmission loss and the likely room sound absorption characteristics. In this way the likely interior noise levels can be predicted.

4.3.1 Recommended Glazing

The recommended glazing assemblies are indicated in table 3 below. The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement.

Table 3 –Glazing Requirements

Building	Space	Façade	Glazing Thickness	Acoustic Seals
Pacific Parade Building	Bedroom	North	6.38mm laminated	Yes
		East & West	6mm float	Yes
		South	4mm float	Yes
	Living Area	North	6.38mm laminated	Yes
		East & West	6mm float	Yes
		South	4mm float	Yes

In addition to complying with the minimum scheduled glazing thickness, the STC/R_w rating of the glazing fitted into operable frames and fixed into the building opening should not be lower than the values listed in table 4 below.

Where nominated, this will require the use of acoustic seals equal to Schlegel Q-lon series *(acoustic bulb seal)* around the full perimeter of operable frames. The frame will need to be sealed into the building opening using a flexible 100% polyurethane sealant equal to Selleys Proseries Fireblock. **Note that mohair seals and/or mohair/plastic fin combination seals in windows and doors are not acceptable where acoustic seals are required.**

It is recommended that only window systems have test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

Table 4 – Minimum STC/R_w of Glazing Requirements

Glazing Assembly	Acoustic Seals	Minimum STC/R_w of Installed Window
4mm float	Yes	27
6mm float	Yes	29
6.38mm laminated	Yes	31

4.3.2 Roof/Ceiling Construction

The roof is proposed to be constructed of concrete slab. This is acoustically satisfactory does not require any upgrades.

4.3.3 External Walls

External walls of masonry construction are acoustically satisfactory and do not require any upgrade.

4.3.4 Mechanical Ventilation

It is recommended by NSW Road Noise Policy that alternative outside air source be installed to units that internal noise levels cannot be achieved with windows open. However, this is not a mandatory requirement and the following recommendations are optional.

In this project, units with windows not facing Sturdee Parade or Pacific Parade can be open and still achieve the required internal noise levels. No mechanical ventilation is required.

However, in case any mechanical ventilation system that may be installed should be designed such that the acoustic performance of the recommended constructions (presented above) are not reduced by any dust or pipe penetrating the wall/ceiling/roof. Noise emitted to the property boundaries by any ventilation system shall comply with EPA and Council requirements.

5 NOISE EMISSION ASSESSMENT

The main noise sources from the development will be those from mechanical plant serving the site and the tenants using the proposed underground carpark.

Detailed mechanical equipment selection and layouts are not available at this stage. The external noise emission criteria are set up in this section of the report to ensure that the acoustic amenity of nearby residents is not adversely affected.

The potentially affected residential receivers are the apartment buildings adjacent to the site to east and west.

5.1 BACKGROUND NOISE MONITORING

The same unattended noise monitor was used for background noise monitoring as well. The measured background noise levels are presented in table 5 below.

Table 5 – Measured Background Noise Levels

Location	Period/Time	Assessment Background Noise Level dB(A) L_{90}
Pacific Parade, Dee Why	Day (7am-6pm)	45
	Evening(6pm-10pm)	42
	Night(10pm-7am)	37

5.2 ACOUSTIC OBJECTIVES

The following documents were used to determine the project criteria for noise emission:

- Warringah Council DCP
- NSW EPA Industrial Noise Policy
- Protection of the Environmental Operation Act Regulation 2000

5.2.1 Warringah Council DCP

Warringah Council DCP has the following control over noise emission.

"Part D Design
D3 Noise

Requirements
1. Noise from combined operation of all mechanical plant and equipment must not generate noise levels that exceed the ambient background noise by more than 5dB(A) when measured in accordance with the NSW Industrial Noise Policy at the receiving boundary of residential and other noise sensitive land uses."

5.2.2 EPA Industrial Noise Policy

The EPA Industrial Noise Policy, has two criteria which need to be satisfied namely Intrusiveness and Amenity.

The EPA Industrial Noise Policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface. Under the policy the nearest residence would be assessed against the urban criteria.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

5.2.2.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 4.1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

5.2.2.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA's Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface. This site is categorised by the residential receivers as suburban.

For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

Table 6 – EPA Amenity Noise Levels

Type of Receiver	**Time of day**	**Recommended Noise Level dB(A)$L_{eq(period)}$**	
		Recommended	Maximum
Residential - Suburban	Day	55	60
	Evening	45	50
	Night	40	45

5.2.2.3 Sleep Arousal

To minimise the potential for sleep arousal the $L_{1\ (1\ minute)}$ noise level of any specific noise source does not exceed the background noise level *(L_{90})* by more than 15 dB(A) outside a resident's bedroom window between the hours of 10pm and 7am.

The L_1 noise level is the level exceeded for 1 per cent of the time and approximates the typical maximum noise level from a particular source. Where the typical repeatable existing L_1 levels exceed the above requirement then the existing L_1 levels form the basis for, sleep disturbance criteria.

5.2.3 Protection of the Environmental Operation Act Regulation

Protection of the Environmental Operations regulation limits the noise levels associated within the operation of domestic air conditioning criteria during night time periods which is presented below:

Protection of the Environmental Operations (Noise Control) Regulation 2000-Sect 52

52 Air Conditioners

(1) A person must not cause or permit an air conditioner to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless of weather any door or window to that room is open):

(a) before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or
(b) before 7 am or after 10 pm on any other day.

5.2.4 Noise Emission Objectives

Based on the requirements stated in the sections above, Table 7 provides a summary of the assessment criteria applicable to the future residential development at the project site. The assessment criteria are also based on the ambient noise monitoring conducted at the site.

Table 7 – Environmental Noise Emission Criteria

Time Period	Assessment Background Noise Level dB(A)L_{90}	Amenity Criteria dB(A) L_{eq}	Intrusiveness Criteria Background + 5 dB(A) $L_{eq(15min)}$	EPA Criteria for Residential Condensers	EPA Criteria for Sleep Disturbance dB(A) $L_{1(1minute)}$
Day	45	55	50	N/A	N/A
Evening	42	45	47	N/A	N/A
Night	37	40	42	Inaudible within neighbouring premises	52

5.3 CARPARK NOISE ASSESSMENT

The proposed carpark as part of the stage 2 DA includes two levels of basement parking containing approximately 150 spaces for the Pacific Parade building. The entrance to the Pacific Parade carpark is located along the eastern boundary of the site and has the potential to impact the residential apartment building to the east.

The vehicle noise from the proposed carpark has been predicted to the nearest receivers. The prediction is based on the assumptions below:

- We assume that peak hour will occur during the day time and during peak hours, the usage of the carpark will be approximately 50% of its capacity.
- During night time, the carpark will be less frequently used, we assume a maximum usage of 10% of the capacity.
- Vehicles move at 10km/hour speed with typical sound power level 85 dB(A) (noise data from other projects conducted by this office).

Predicted noise levels are presented below:

Table 8 – Predicted Noise Levels from Carpark Movements

Location	Time of Day	Predicted Level dB(A)L_{eq}	Noise Objective dB(A)$L_{eq(15min)}$	Complies
Apartment to the East	Day	44	50	Yes
	Night	37	40	Yes
Apartment to the north across Pacific Parade	Day	39	50	Yes
	Night	32	40	Yes

5.4 GARBAGE TRUCK NOISE ASSESSMENT

The garbage loading area is located near the eastern boundary of site on Pacific Parade, it will have the greatest impact on the residential apartment building to the east.

The prediction is based on the assumptions listed below:

- Garbage collection will only happen once a week and typically during day time.
- Truck move at 10km/hour speed with typical sound power level 100 dB(A) (Noise data from other projects conducted by this office).

Table 9 – Predicted Noise Levels from Carpark Movements

Location	Time of Day	Predicted Level dB(A)L_{eq}	Noise Objective dB(A)$L_{eq(15min)}$	Complies
Apartment to the East	Day	45	50	Yes
Apartment to the north across Pacific Parade	Day	35	50	Yes

5.5 MECHANICAL PLANT

Detailed plant selection has not been undertaken at this stage, as plant selections have not been determined. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels. Satisfactory levels will be achievable through appropriate plant selection and location and, if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.

Noise emissions from all services plant to the closest residential receiver should comply with the noise emission criteria in Section 5.2.

6 CONCLUSION

This report presents our acoustic assessment for the Stage 2 residential apartment development located at 23-29 Pacific Parade, Dee Why.

Noise intrusion impact from traffic noise onto the future occupants of the development has been assessed in accordance with Australian Standard 2107:2000 and NSW State Environmental Planning Policy Infrastructure (2007). The acoustic treatments in principle necessary to achieve these guidelines have been set out in Section 4.3.

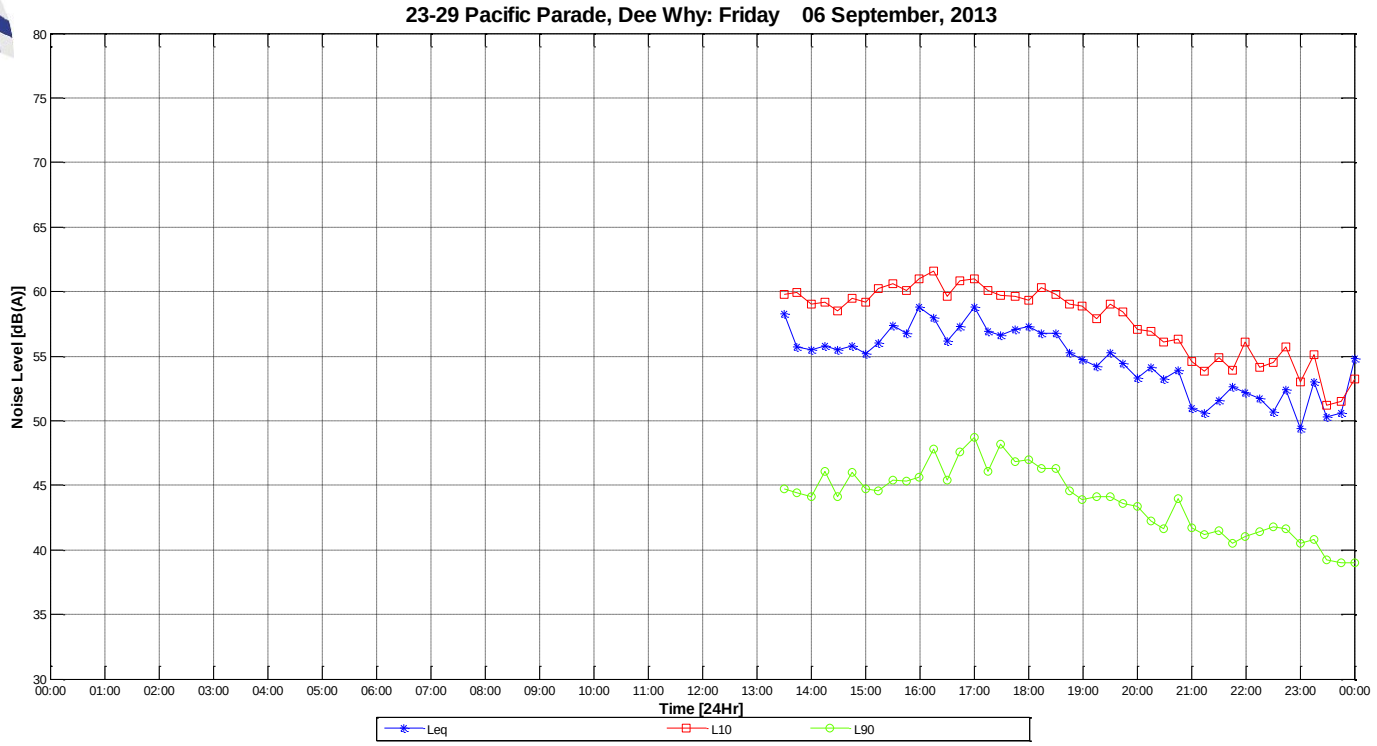
Noise emission criteria for the site have been determined based on the on-site noise logging, Warringah Council DCP, EPA NSW Industrial Noise Policy and Protection of the Environmental Operation Act Regulation. These have been presented in Section 5.

Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Jeff Robinson

APPENDIX A: NOISE LOGGING DATA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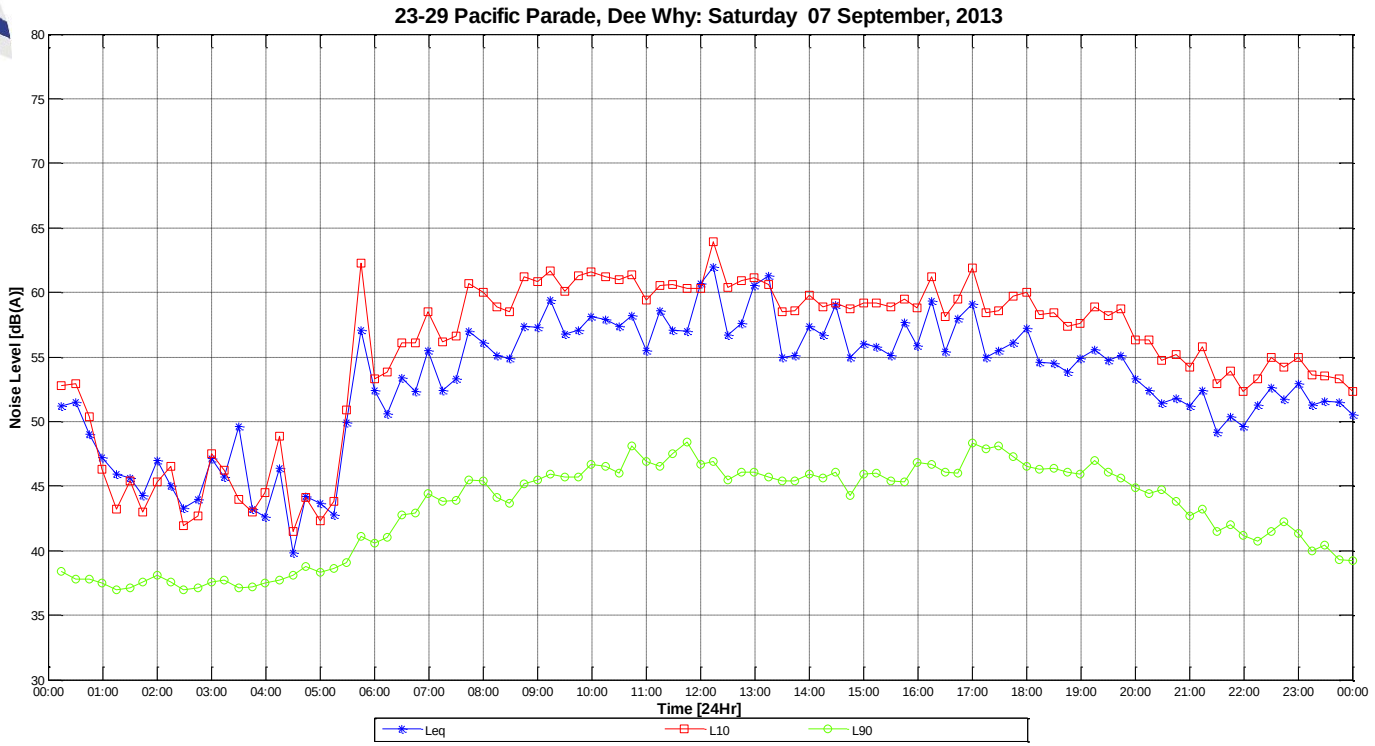
Leq
L10
L90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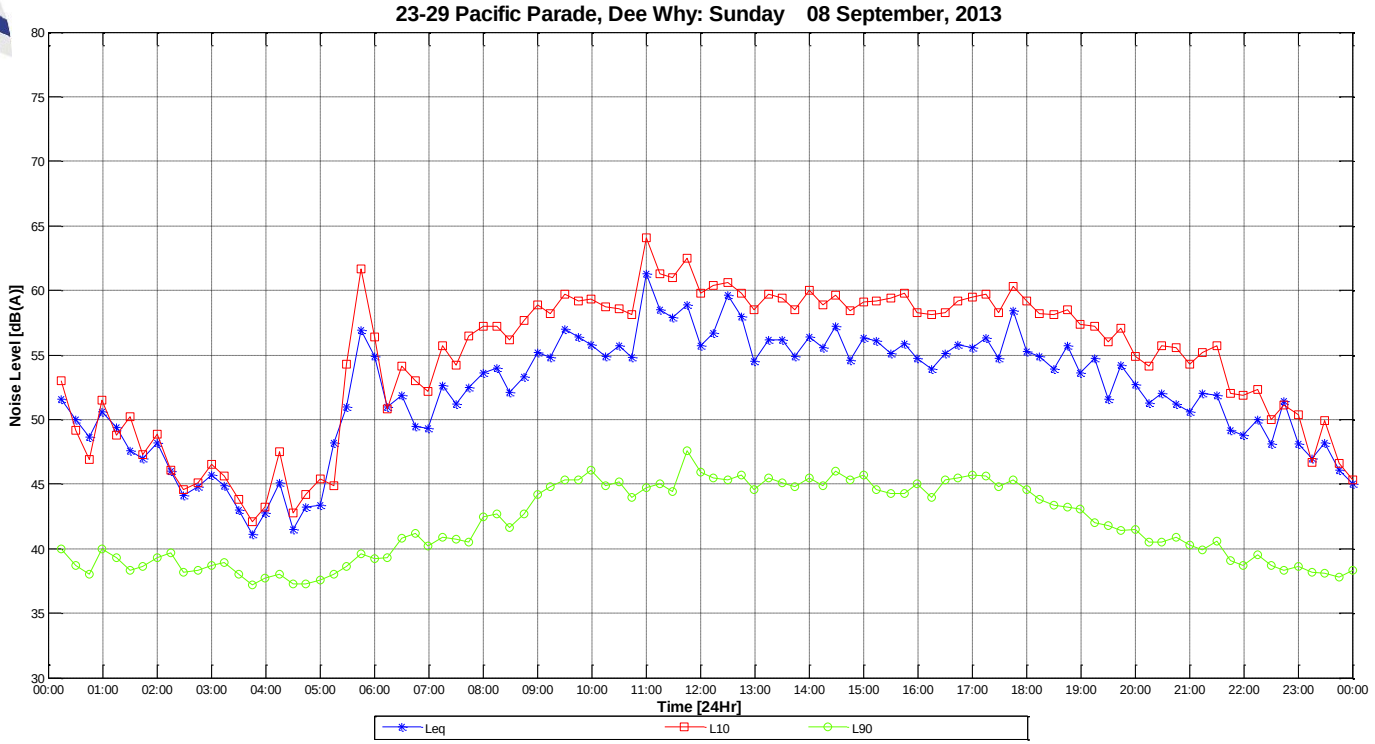
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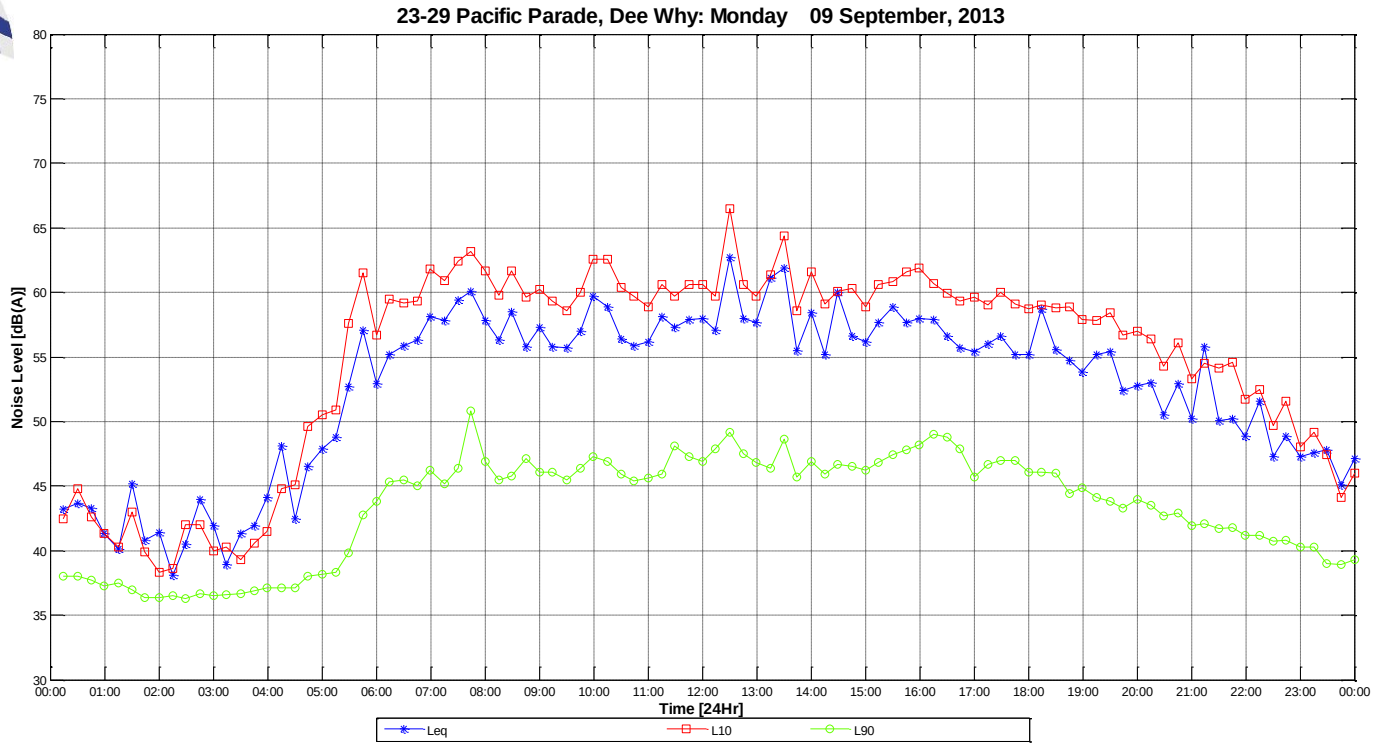
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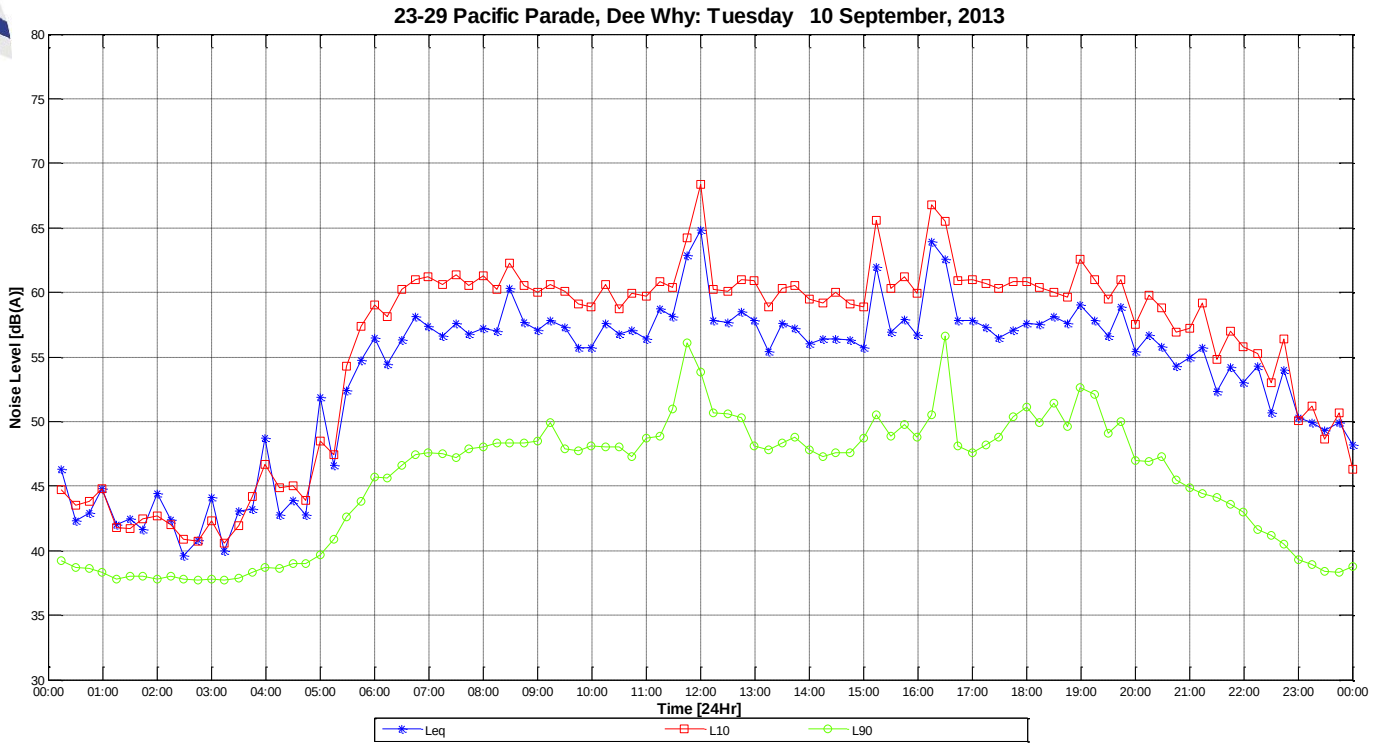
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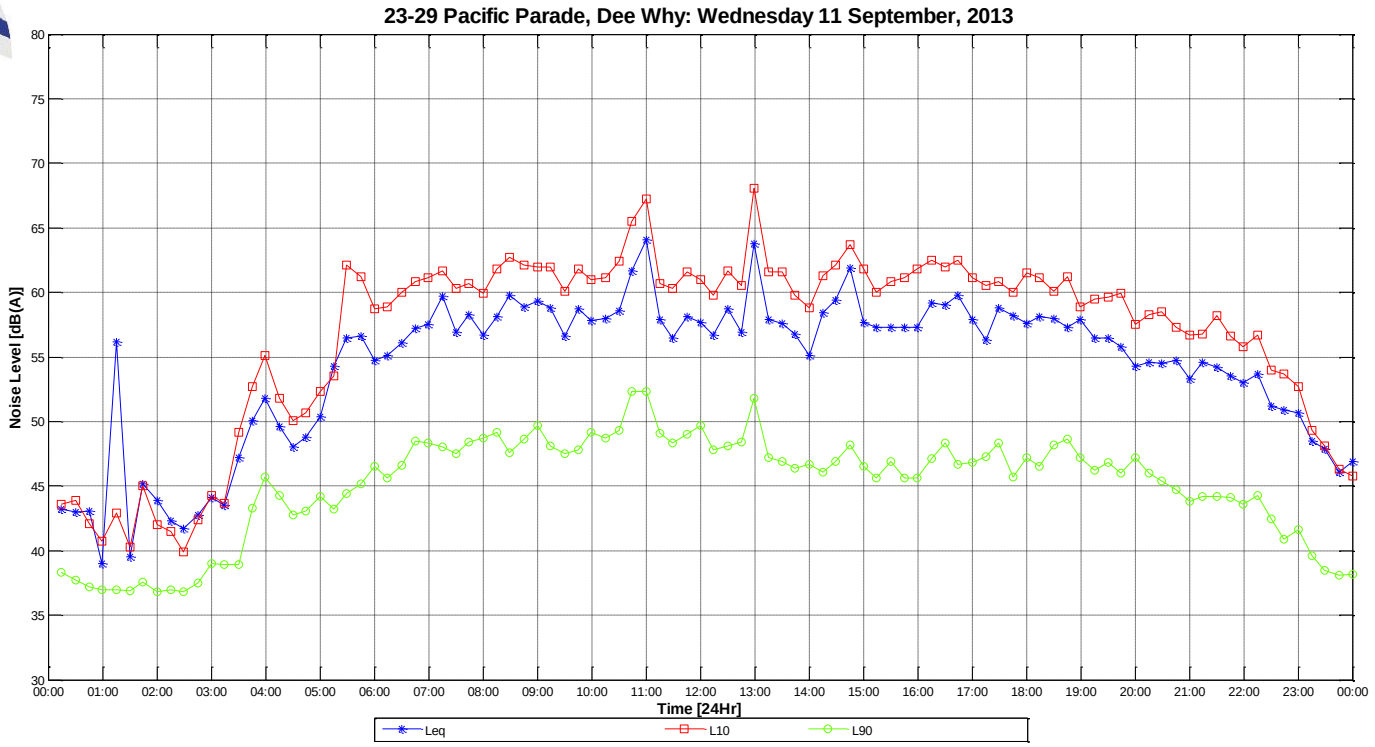
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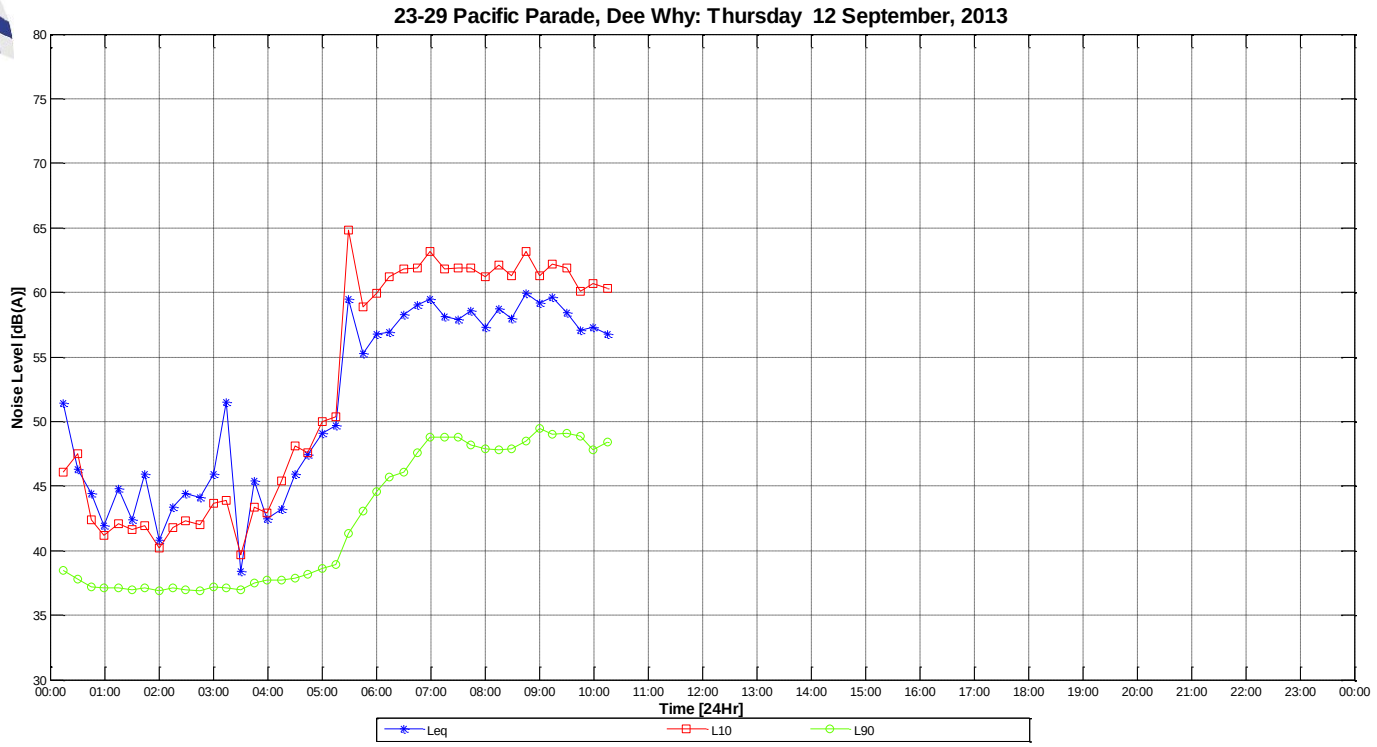
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ACCESS REPORT

DEVELOPMENT APPLICATION

STAGE 2 - 23-29 PACIFIC PARADE
(STAGE 1 – 18-22 STURDEE PARADE)
DEE WHY

MULTI-UNIT RESIDENTIAL DEVELOPMENT

Prepared By Mark Relf
16th September 2014

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CONTENTS

Introduction

This report has been prepared to provide an Access Report for a proposed multi-unit residential development at Stage 2 of the "Dee Why Apartments" development 18-22 Sturdee Parade and in particular the site at 23-29 Pacific Parade, Dee Why.

Stage 2 shall consist of.

- 103 residential apartments including 2 adaptable apartments representing 2% of the total;
- 143 basement parking spaces with lift access to all levels including a minimum of 2 resident accessible spaces.

The purpose of this report is to provide an accessibility review of the subject development to ascertain whether the development is consistent with part D3 of the BCA for the common area accessibility of the development and SEPP 65 requirements pertaining to accessibility of common domain areas and adaptability of at least 2% of apartments to Class C adaptability within the multi-unit residential development.

Assessment Criteria

This assessment considers the following legislation, planning instruments and standards pertaining to access for people with disabilities:

(1) Parts D3, E3.6, F2.4 of the Building Code of Australia (BCA 2014)

(2) DDA Premises Standards / Access Code.

(3) SEPP 65 – Design Quality of Residential Flat Development.

(4) SEPP 65 – Residential Flat Building Design Code (SEPP 65 Design Code).

(5) Warringah DCP 2011 : Section 16 – *Accessibility which references AS1428.2 (1992), although this standard has been generally superseded by AS1428.1 (2009) and the DDA Premises Standards and BCA 2012.*

(6) Australian Standard AS1428.1 (2009) – Design for Access and Mobility – general requirements.

(7) Australian Standard AS1428.4.1 (2009) – Tactile Indicators.

(8) Australian Standard AS4299 (1995) – Adaptable Housing.

(9) Australian Standard AS2890.6 (2009) – Off-Street Parking.

Report Format

The report provides the following Parts to reflect the various elements:

- **Part A – Common Area:** provides a general assessment of the proposed retail areas against the relevant Australian Standards AS1428 (Parts 1, 2 and 4.1) and AS2890.6 in accordance with Parts D3, E3.6 and F2.4 of the BCA, DDA Access Code and Council's DCP *Accessibility* requirements.
- **Part B – SEPP 65 Assessment:** provides a review of the residential component of the development against the accessibility and adaptability requirements of SEPP 65 and the Adaptable Housing standard AS4299.

Development Application Plans

The plans relied upon for this accessibility assessment include the following:

Drawing No.	Issue	Description
10002 – DA 0.01	B	Cover Sheet
10002 – DA 0.02	A	Site Analysis
10002 – DA 0.03	A	Demolition Plan
10002 – DA 0.04	A	Landscape Open Space Plan
10002 – DA 1.01	B	Site Plan
10002 – DA 1.02	D	Basement Level B1 Plan
10002 – DA 1.03	E	Basement Level B2 Plan
10002 – DA 1.05	B	Ground Floor Plan
10002 – DA 1.06	B	Level 01-02 Floor Plan
10002 – DA 1.07	B	Level 03 Floor Plan
10002 – DA 1.08	B	Level 04 Floor Plan
10002 – DA 1.09	B	Level 05 Floor Plan
10002 – DA 1.10	B	Level 06 Floor Plan
10002 – DA 1.11	B	Level 07 Floor Plan
10002 – DA 1.12	B	Roof Plan
10002 – DA 1.13	A	Pre & Post Adaptation Unit Plans
10002 – DA 2.01	B	Elevation North & South
10002 – DA 2.02	B	Elevation East & West
10002 – DA 3.01	B	Section Through Car Park Ramp
10002 – DA 3.02	B	Section Through Communal Open Space
10002 – DA 3.03	B	Pacific Parade Ramp Detail

Part A – Common Areas

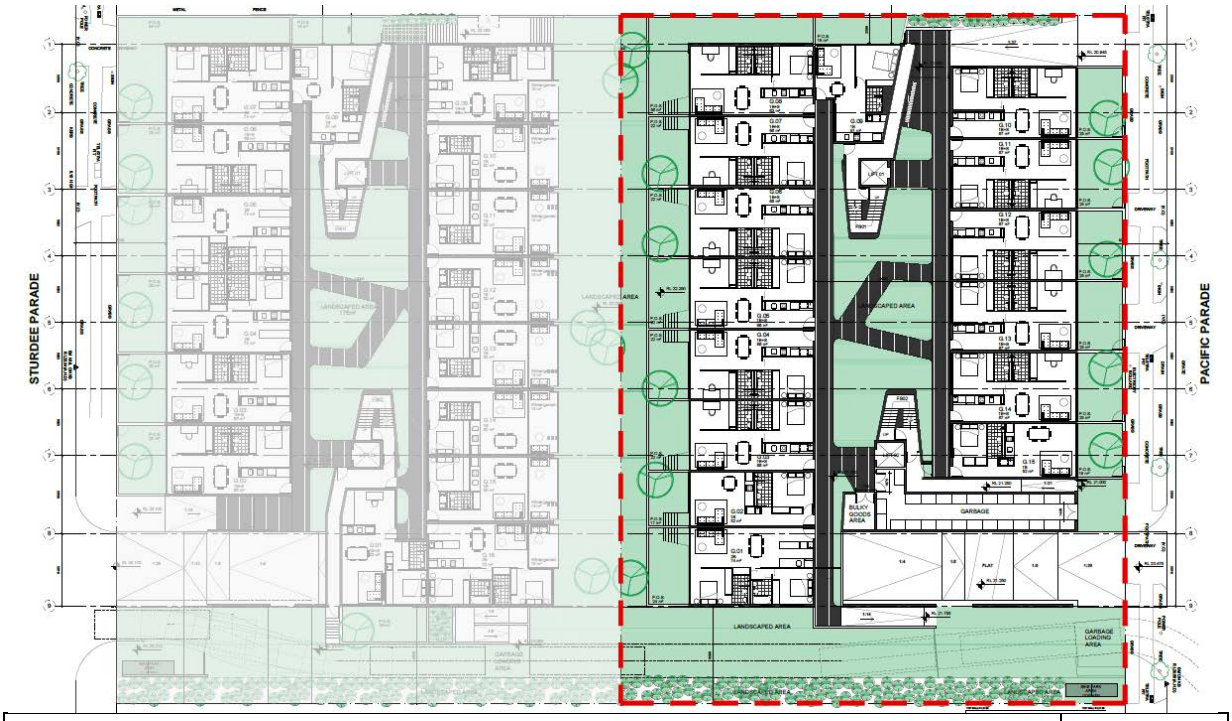
Accessibility Assessment

Assessment Methodology

Part A of the review considers the accessibility requirements of the Building Code of Australia as expressed by Parts D3, E3.6 and F2.4, DDA Access Code and the various referenced standards AS1428.1–Design for Access and Mobility, AS2890.6-Off-Street Parking and AS1735.12–Lifts. With regard to retail areas of the development the requirements of Council's DCP Accessibility requirements are incorporated within the review comments.

The comments do not cover detail issues pertaining to construction documentation such as internal design of accessible toilet facilities, lift specification, door schedule, tactile ground surface indicators, signage and the like, which will be confirmed at construction certificate stage.

External Pathway Links and Building Entrances (Parts D3.2 & D3.3 of the BCA)



BCA / DDA Compliance	Complies
1. **Sturdee Parade Street Frontage / Building Entrance** – The plans show the development providing a single principal entrance from the Sturdee Parade approach that proposes a 1:14 ramped access from the street frontage @RL24.600 to the ground floor courtyard @RL25.400 which facilitates level accessways to all apartment entrance doorways and the lifts in accordance with AS1428.1 in accordance with AS1428.1 to satisfy Part D3.2 of the BCA.	**YES**
2. The plans indicate the ramp is recessed from the property boundary by at least 900mm in accordance with AS1428.1 to satisfy Part D3.2 of the BCA.	**YES**
3. **Pacific Parade Street Frontage / Building Entrance** – The plans show the development providing a single principal entrance from the Pacific Parade approach that proposes a 1:37 ramped access from the street frontage	**YES**

BCA / DDA Compliance		Complies
@RL20.950 to the ground floor courtyard @RL21.250 which facilitates level accessways to all apartment entrance doorways and the lifts in accordance with AS1428.1 in accordance with AS1428.1 to satisfy Part D3.2 of the BCA.		
4. The construction documentation shall ensure that entry gates/doorways within the common area shall incorporate level internal landings and thresholds while details of door schedule and door hardware shall confirm 850mm clear opening widths with lever and D-pull handles to comply with AS1428.1 and satisfy Parts D3.2 and D3.3 of the BCA. **5.** Where the ramped entry is steeper than 1:20, the detailing shall incorporate handrails and kerbs/kerbrails in accordance with AS1428.1 and tactile indicators in accordance with AS1428.4.1. **6. Timberdeck walkways through the Courtyards** shall ensure accessways to apartment entrances and lifts are in accordance with AS1428.1 to satisfy Part D3.2 of the BCA in terms of 1550mm width Turning Areas at dead-end accessways and 1800mm width for Passing Bays.		**YES at CC stage** **YES at CC stage** **YES at CC stage**

Accessibility of Common Domain Areas (Table D3.1, Parts D3.2 & D3.3 of the BCA)

BCA / DDA Compliance	Complies
7. In accordance with Table D3.1 of the BCA a development is required for Class 2 Areas of a development (residential flat buildings); • *To provide a pedestrian entrance to be accessible to at least one (1) floor containing sole occupancy units and to the entrance doorway of each sole occupancy unit located on that level, and*	

BCA / DDA Compliance	Complies
• *To and within not less than one (1) of each type of room or space for use in common by the residents, including a cooking facility, sauna, gymnasium, swimming pool, common laundry, games room, individual shop, eating area, or the like.* • *Where a ramp complying with AS 1428.1 or a passenger lift is installed —* *a) to the entrance doorway of each sole-occupancy unit; and* *b) to and within rooms or spaces for use in common by the residents, located on the levels served by the lift or ramp.*	
8. **Overview of Apartment Access** - As indicated on the ground floor the development will provide a common entry to a courtyard with direct access to all apartments on the ground floor and lifts, which enables equitable access to all levels within the development and ultimately continue along corridors to approach the entry doorways of all **103 apartments** to satisfy Table D3.1 of the BCA.	**YES**
9. **Lifts -**The plans indicate the Residential lift cars will be at least 1400mm X 2000mm as specified by Part E3.6 of the BCA and AS1735.12 – *Lifts For People With Disabilities.*	**YES**
10. **Stairways -** In accordance with part D3.3(a)(ii) of the BCA the common area stairways (excluding fire-isolated stairs) such as the basement car park stairs will be detailed at construction certificate stage with handrails on both sides to the requirements of AS1428.1, luminance contrasting step nosings, closed risers and tactile ground surface indictors to satisfy Parts D3.3(a)(ii) and D3.8 of the BCA.	**YES at CC stage**
11. **Letter boxes** shall be installed at the Sturdee Parade & Pacific Parade entries where access can be achieved to enable access for people with disabilities consistent with AS1428.1 to satisfy Table D3.1 of the BCA.	**YES**

Car Parking

12. There is no accessible parking requirement within Table D3.5 of the BCA or the DDA Premises standards relating to class 2 residential apartment buildings.

Internal Accessways (Part D3.3 of the BCA)

Having regard to the requirements of Part D3.3 of the BCA the assessments considers the on-site accessibility between the entry level, vertical access to parking levels, retail tenancies and the internal circulation spaces and amenities.

BCA / DDA Compliance	Complies
Ground Floor Level 00	
13. At the ground floor level the plans show level access from the site entries of both Stages 1 and 2 along boardwalk areas to apartment entry doorways across a single level with no inherent barriers to comply with AS1428.1 and satisfy D3.3 of the BCA and DDA Premises Standards.	**YES**
14. With respect to the spatial areas of the accessways the landscape plan indicates a 1550 minimum width accessway from the site entries, that continue through to the	**YES**

BCA / DDA Compliance	Complies
apartments entrance doorways and lifts which enable Turning Areas at any location to comply with AS1428.1 and satisfy Part D3.3 of the BCA. 15. The T-junctions and 1800mm width lift landings enable Passing Areas at various locations to comply with AS1428.1 and satisfy Part D3.3 of the BCA.	**YES**
Levels 1 to 2 (3 and 4 similar) 	
16. On levels 1 to 4 the plans show level access from the 4200mm X 5700mm lift landings to 1550mm minimum width accessways that enable appropriate access to the adjacent apartments and facilitates Turning Areas at the dead-end corridors to comply with AS1428.1 and satisfy Part D3.3 of the BCA. 17. The plans show 1800mm x 2000mm Passing Areas adjacent to the lifts to comply with AS1428.1 and generally satisfy Part D3.3 of the BCA.	**YES** **YES**
Level 5 	

BCA / DDA Compliance	Complies
18. The Level 5 plans show lift landings providing 1800mm X 2000mm minimum areas with 1550mm minimum width accessways to apartment entrance doorways which facilitate Turning and Passing Areas to comply with AS1428.1 and satisfy D3.3 of the BCA.	**YES**
Level 6 	
19. The Level 6 plan shows two lift landing layouts with providing 1800mm X 2000mm minimum areas with 1550mm minimum width accessways to apartment entrance doorways which facilitate Turning and Passing Areas to comply with AS1428.1 and satisfy D3.3 of the BCA.	**YES**
20. **Doors & Door Hardware –** Details of doors and door hardware to common areas will detailed at construction certificate stage to comply with AS1428.1 and satisfy Part D3.3 of the BCA.	**YES**

Lifts (Part E3.6 of the BCA)

BCA / DCP Compliance	Complies
21. While the development provides lifts that comply with Part D3.3 BCA in enabling vertical access to various details of internal floor car areas, controls, handrails and the like will be provided at construction documentation stage to confirm compliance with Part E3.6 of the BCA.	**YES**
22. In accordance with Part E3.6 of the BCA the lift car shall provide a 1400 X 2000 minimum area for lifts travelling more than 12 metres and an ***effective height*** exceeding 12 metres.	**YES at CC stage**

Accessible Sanitary Facilities (Part F2.4 of the BCA)

BCA / DCP Compliance	Complies
23. None provided within common areas.	**N/a**

Tactile ground surface indicators (Part D3.8 of the BCA)

BCA / DCP Compliance	Complies
24. Details concerning the provision of tactile ground surface indicators (TGSI's) as required by Part D3.8 of the BCA will be provided at construction certificate stage for stairways (excluding fire-isolated stairs) and ramps within common areas.	**YES**

Part B – SEPP 65 Accessibility

To determine whether the proposed development will be consistent with the objectives of SEPP 65, which reference Australian Standards AS1428 / AS4299, the review provides the following functional definitions of "visitability", "adaptability" that enable the following outcomes;

Barrier Free / Visitable Access – To provide wheelchair accessible entry to a single level apartment or a level of a multi-level unit that provides access to a "living area" and a "visitable toilet".

Adaptable – To provide wheelchair accessible entry to a single level apartment or a level of a multi-level residential unit that provides a "living/dining area", "kitchen", "main bedroom", "bathroom" and other areas that can be accessible from the outset or modified at minimal expense to satisfy the performance objectives of AS4299 – Adaptable Housing to Category C.

SEPP 65 Design Code

The following is provided to demonstrate compliance or otherwise with the relevant visitability and adaptability requirements of the SEPP 65 Design Code.

SEPP 65 Design Code – Accessibility, Visitability and Adaptability design requirements	**ASSESSMENT FINDINGS**
Site Configuration Landscape Design (p 47) ***Improve the amenity of open space with landscape design which: by*** *Providing accessible routes through the open spaces and between buildings.* **Site Access** Pedestrian Access (p 64) ***To ensure that residents, including users of strollers and wheelchairs and people with bicycles, are able to reach and enter their apartment and use communal areas via minimum grade ramps, paths, accessways or lifts.*** *Provide high quality accessible routes to public and semi-public areas of the building and the site, including major entries, lobbies, communal open space, site facilities, parking areas, public streets and internal roads.* ***Maximize** number of accessible, visitable, adaptable apartments in the building. (References AS1428,*	The plans show an accessible site entrances at the ground level that enables access to the ground floor apartments and lifts, which facilitates direct access to all upper floor levels including the designated adaptable apartments. Overall I am satisfied that the principal building entrances and access to lifts will provide appropriate access for people with disabilities in accordance with AS1428.1 / AS4299 to satisfy SEPP 65. **Visitable Housing** The development provides visitable access to the entry of all 103 residential apartments which are single level and represent 100% to readily satisfy the SEPP 65 *"Rule of Thumb"* regarding 20% minimum visitability. **Adaptable Housing** With respect to the provision of "Adaptable" apartments please refer to the following Adaptability assessment criteria of; • 2 X 1 Bedroom Apartments 1.09, 209 in both buildings. Consistent with SEPP 65 the development proposes a minimum of 2 apartments or 2% of the 102 dwellings will be designed as "adaptable housing".

SEPP 65 Design Code – Accessibility, Visitability and Adaptability design requirements	**ASSESSMENT FINDINGS**
AS4299, BCA and Access to Premises).	
Building Configuration Apartment Mix (p 70) *Locate a mix of one, two and three bedroom apartments on the **ground level** where **accessibility** is more easily achieved for **disabled**, elderly people or families with children.* ***Optimise** the number of **accessible** and **adaptable** apartments to cater for a wider range of occupants (Australian Standards are only a minimum).*	The overall apartment mix of the 103 apartments comprises; 0 studio single level apartments, 77 X 1 bedroom single level apartments, 26 X 2 bedroom single level apartments. There is a total of 103 single level apartments that enjoy wheelchair accessible entry and internal access to the living areas, which include a toilet, thereby representing 100% access to the doorway entrances and interior visitability.
Building Configuration Flexibility (p 75) *Provide accessibility and adaptability by ensuring:* ▪ *The number of **accessible** and **visitable** apartments is **optimized**.* ▪ *Adequate pedestrian mobility and access is provided.*	With regard to "adaptability" the development provides a floor plan layout of a 1 bedroom layout. Providing a satisfactory level of adaptability and flexibility in terms of access for people with disabilities, which is consistent with the objectives of SEPP 65. The following section provides a detailed review of the apartment floor plans and associated resident parking for the designated adaptable apartments.
Building Configuration Ground Floor Units (p 77-78) *Promote housing choice by: Maximizing the number of **accessible** and **visitable** apartments on the **ground floor**.*	There are 19 residential apartments on ground/street level which are all visitable to satisfy SEPP 65.

Adaptability Assessment

The following provides an assessment of the designated "adaptable" apartments in accordance with Category C of the Adaptable Housing Standard – AS4299.

Consistent with SEPP 65 at least 2% of the 103 apartments, that being a minimum of 2 apartments shall be adaptable and shall comply with AS4299 to Class C.

The apartment types and quantities include the following:

- 2 X 1 Bedroom Apartments 1.09 and 2.09 buildings.

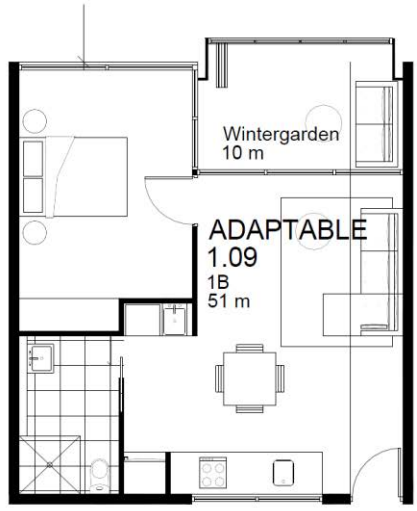
The following provides an overview of the common domain building elements.

Clause	Adaptability Assessment – Common Domain areas	Compliance
AS4299 Clauses 3.3 and 3.5	**Building Entrances** The plans show an accessible Common entrance at the ground level with direct access to the ground floor units and the lifts to access all levels including the basement car park and upper floor levels to access the designated adaptable apartments. Overall I am satisfied that the principal building entrance and access to lifts will provide appropriate access for people with disabilities in accordance with AS1428.1 / AS4299.	
AS4299 Clause 3.8	**Letterboxes** The development will provide the letter boxes at the ground floor level entries on Pacific Parade will provide at least 1550mm X 1550mm level landing areas in front of all letter boxes for circulation and access to comply with AS4299.	**YES**
AS4299 Cls 3.3.3	**Lift Landings –** The 1800mm minimum width lift landings on all levels where adaptable apartments are provided will facilitate appropriate access in accordance with AS1428.1 it is apparent that these common facilities will be accessible to residents and thereby comply with parts D3.2/D3.3, AS4299 and SEPP 65.	**YES**
AS4299 Cls 3.3.3, 3.7 & AS2890.5	**Car Parking** The development proposes 143 car spaces within a basement car park that includes 2 accessible resident parking spaces of at least 2400mm width adjoining 2400mm width Shared Areas for the adaptable apartment to facilitate access for side-loading ramps and hoists which complies with AS4299.	**YES**
	The accessible 2200mm minimum height clearances and 2500mm height over the accessible spaces will readily comply with AS4299.	**YES**
	The accessible parking will be situated on generally level pavement no steeper than 1:40 to comply with AS2890.6 and conveniently located near the lift.	**YES**
AS1735.12	**Lift Access** The plans indicate the lift cars will be approximately 1400mm X 2000mm which will comply with the minimum specified by Part E3.6 of the BCA – *Lifts For People With Disabilities.*	**YES**

Clause	Adaptability Assessments - Apartment Layouts	Complies

The apartment types and quantities include the following:

- 2 X 1 Bedroom Apartments 1.09 and 2.09 in both buildings.



1 PRE-ADADPTION UNITS 1.09 & 2.09
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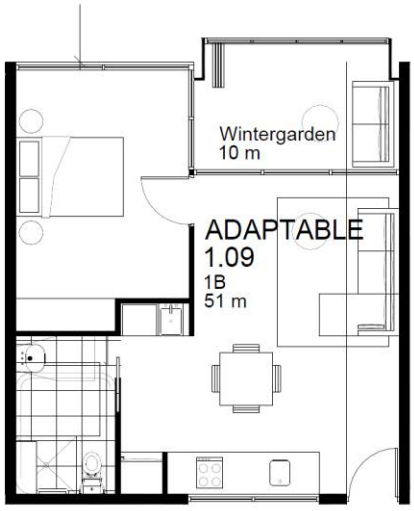


2 POST-ADADPTION UNITS 1.09 & 2.09
1 : 50

AS4299 Clauses 4.3.1, 4.3.2 and 4.3.3	**Accessible entry** – The front entrance to these units provide at least 1550mm X 1550mm externally in the common corridors and internally with 530mm minimum latch side clearance with a 920mm min entry door, which complies with the spatial requirements of AS4299.	**YES**
AS4299 Cls 4.3.7	**Interior**: **general** – The pre adaptation plans provide open plan living areas with direct access to the bedroom doorways and bathroom providing appropriate doorway circulation space in accordance with AS1428.1/4299.	**YES**
	Doors and Door Hardware While the plans do not indicate 920mm door widths and lever handles these details should be provided at construction drawing stage to confirm compliance.	**YES**
AS4299 Clause 4.7	**Living and Dining rooms** – The plans show combined living and dining area on a single level with sufficient area to provide a 2250mm diameter turning area to comply with this clause.	**YES**
AS4299 Clause 4.5	**Kitchen** – The kitchens are generally single galley design, which provide 1550mm clearance adjacent to the benches and appliances to comply with AS4299 requirements.	**YES**
	With regard to the "adaptability" of the kitchen the pre-adaptation plans provide an appropriate layout of a sink, fridge, wall oven, cooktop while the post adaptation plan proposes a height adjustable workbench that is readily adaptable and satisfies the "ease of adaptation" guidelines outlined in section 2 – Performance Objectives of AS4299.	**YES**
	Therefore, subject to confirmation of the installation of kitchen cupboards, appliances and the like at the construction documentation	

Clause	Adaptability Assessments - Apartment Layouts	Complies
	stage it is apparent that the kitchen will comply with AS4299.	
AS4299 Clause 4.6	**Main bedroom** – The plans show the main bedroom for these Units will be at least 4100mm X 3250mm clear of the robes thereby providing 1540mm X 2070mm circulation space adjacent to a queen bed while providing a 1000-1250mm minimum on side or foot of the queen sized bed and appropriate doorway circulation spaces to enter/exit the room and access robe areas to satisfy AS4299/1428.	**YES**
AS4299 Clause 4.7	**Bathroom** – The plans show the post adapted bathrooms will be at least 1900mm X 3000mm with a layout of sanitary facilities that is adaptable and consistent with the intent of AS1428/4299. I am also satisfied that the location of the WC pan, washbasin and shower/bath in pre and post adaptation satisfy the performance requirements of AS4299.	**YES**
AS4299 Cls 4.4.3	**Toilet** – With respect to the provision of visitable toilets the plans indicate the size and layout of the bathrooms that enables the toilet to comply with AS4299 by providing 1250mm X 900mm in front of the WC pan and comply with AS4299.	**YES**
AS4299 Clause 4.8	**Laundry** – The laundry facilities provide adequate space for a washing machine/drier while the adjacent area facilitates the required minimum 1550mm X 1550mm clear circulation space in front of the appliances to comply with AS4299.	**YES**
AS4299 Cls 3.5(b)	**Outdoor Private Open Space –** The plans show outdoor balcony terrace areas adjacent to the living area for each of these units with sliding doors for convenient access and an approximate, which provide one area of at least 2200 X 4000 which is adequate to perform a 180 degree wheelchair manoeuvre. While the plans do not indicate thresholds the construction drawings will confirm a 35mm maximum with the capability for threshold ramps to comply with AS1428/4299.	**YES**

In summary, I conclude that these apartments and associated common domain facilities will comply with fundamental spatial design criteria of AS4299 and consequently the SEPP 65 Design Code.

Conclusion

In summary this assessment confirms the following outcomes;

- The common domain accessways to the residential lobby areas on the ground floor of the development will provide appropriate access for people with disabilities in accordance with Part D3 of the BCA and the DDA Premises Standards; and
- The lifts provide access to the basement parking, all upper levels in a manner that will satisfy Part D3.3 of the BCA and the DDA Premises Standards; and
- The two (2) accessible parking spaces of 2400mm width car space adjoining 2400mm width shared areas for the adaptable apartments facilitate appropriate access for vehicles with side-loading ramps and hoists which complies with AS2890.6 and the intent of AS4299; and
- The 103 apartments shall provide 100% visitability in terms of wheelchair access to the entry doorways of all apartments, which satisfies Table D3.1 of the BCA and is consistent with SEPP 65 and SEPP 65 Design Code, and
- There will be at least 2% of apartments – two (2) that will be adaptable in accordance with AS4299, which is consistent with SEPP 65 and SEPP 65 Design Code.

The access and adaptability review of the development demonstrates compliance with the accessibility requirements of the BCA 2014, DDA Premises Standards/DDA Access Code and relevant objectives and design code requirements of SEPP 65 for multi-unit residential developments incorporating adaptable housing which also satisfies the Warringah DCP 2011 : Section 16 – *Accessibility*.

Mark Relf
Access Consultant (ACAA)

Appendix A – Statement of Expertise

accessibility solutions (NSW) PTY LTD

CONSULTANCY PROFILE & STATEMENT OF EXPERTISE

Accessibility Solutions consultancy offers a range to services to provide advice for clients to develop new and modify existing buildings, facilities and services to be accessible to people with disabilities to comply with legislation and regulations relevant to people with disabilities.

Relevant legislation and regulations that underpins advice includes the Disability Discrimination Act (DDA) Building Code of Australia, Australian Standards 1428, DDA Premises Standards, DDA Transport Standard, State Environment Planning Policy Housing for Seniors or People With a Disability (SEPP HS) / Seniors Living Policy, SEPP 65 – Residential Flat Buildings Design Code and various local government DCP's.

The scope of services provided by Accessibility Solutions includes:

- Plan Appraisals and design advice
- Access Reports for development applications and construction certificates
- Expert Reports for Court evidence
- Access Auditing of existing buildings, facilities, transport conveyances and infrastructure
- Policy and document reviews and development of Disability Action Plans
- Staff training in access auditing

The services consider issues concerning people with all types of disability including; physical; vision; hearing, intellectual and other cognitive impairments that may affect access for people with a disability consistent with the Disability Discrimination Act.

As principle consultant Mark Relf has considerable experience and expertise in a wide range of access related projects and is a recognised Access Adviser approved by the NSW Ageing and Disability Department and has attained accreditation with the Association of Consultants in Access Australia for the purposes of providing advice concerning access to the built environment and services for people with disabilities.

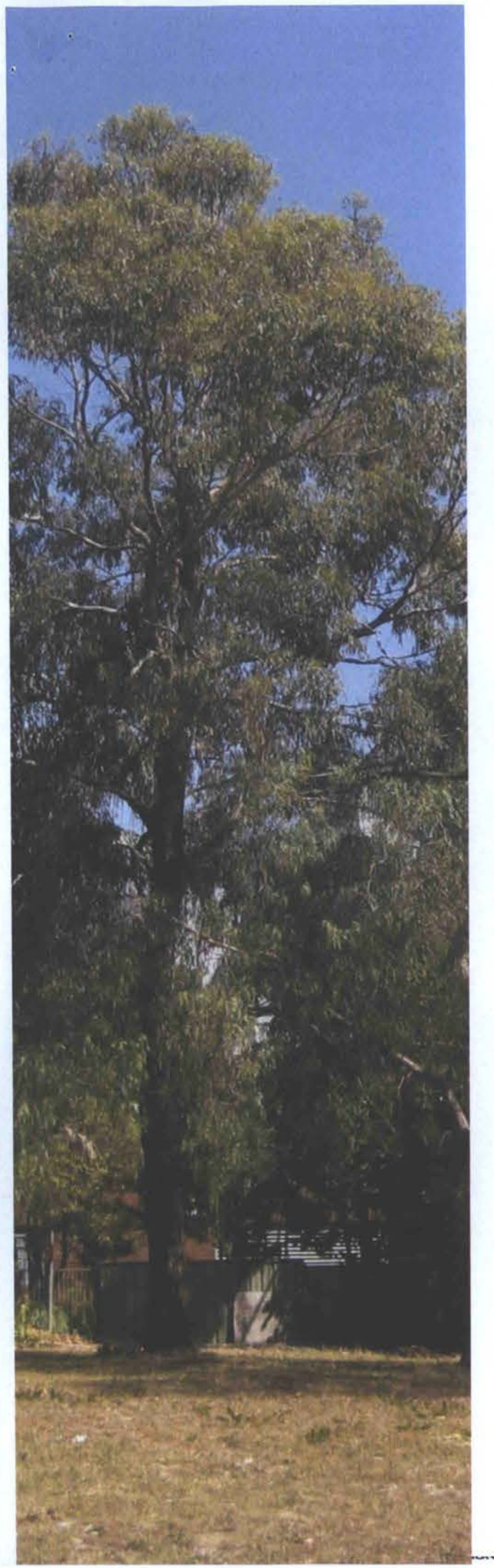
His expertise has been gained over 20 years working in management and advocacy roles within the disability sector and since 1994 providing advice to clients on access issues. Mark also participates on various key committees concerning access for people with disabilities. His qualifications and affiliations are:

- Accredited Member of the Association of Consultants in Access Australia.
- Member, Standards Australia ME/64 Committee responsible for the AS1428 suite and AS4299 – Adaptable Housing.
- Member, NSW Heritage Office's – Fire, Access and Services Advisory Panel.


ACA AUSTRALIA

CERTIFICATE OF MEMBERSHIP

THIS IS TO CERTIFY THAT
Mark P Relf
WAS ADMITTED AS AN
Accredited Member
OF THE ASSOCIATION OF CONSULTANTS IN ACCESS, AUSTRALIA INC.
ON THE Tenth DAY OF October, 2000
PRESIDENT
SECRETARY
MEMBERSHIP NO. 74



arboricultural impact assessment, stage 2 - 23-29 pacific parade, dee why

17th September 2014

prepared by Melanie Howden - Ass. Dip. Hort. (Haw. Ag. C.), SoA. Arb. MAIH, MIACA

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Executive Summary

This report has been prepared to assess the condition and significance of a number of trees on and adjacent the allotments known as 23-29 Pacific Parade, Dee Why and assess the potential impact of the proposed development on the identified trees.

The report has been commissioned by Dee Why Properties Pty Ltd and site instructions have been provided by Marchese & Partners Architects. Site inspections and field work were initially conducted on the 04/12/12 with additional site inspections conducted on the 25/10/13. For the purposes of this report the properties known as 23-29 Pacific Parade, Dee Why will be referred to as the site.

The terminology in this report and development impact assessments are based upon the Australian Standard, Protection of Trees on Development Sites AS 4970-2009 and the definition of a tree in this report is consistent with Warringah Development Control Plan (2011) being "*a palm or woody perennial plant greater than five (5) metres in height or seven (7) metres in canopy width*"

The site is currently developed and contains the rear portion of a child care facility and 2 vacant lots. The trees on the site are a mix of indigenous, non-indigenous and exotic species. The proposed development involves demolition of the existing built structures and construction of multi storey apartments with basement car parking (Marchese, 2014).

There are **46** trees on and adjacent the Stage 2 proposal that have been considered in this report of which 41 trees are on the site, 1 tree is located on the adjoining allotment and 4 trees are located within the road reserves. Of the 46 trees identified in this report:

- **5** trees are to be retained (3 trees on site, 1 on adjacent allotments, 1 tree within the road reserve), and

- **41** trees are proposed to be removed (38 trees on site, 3 trees within the road reserve).

Contents

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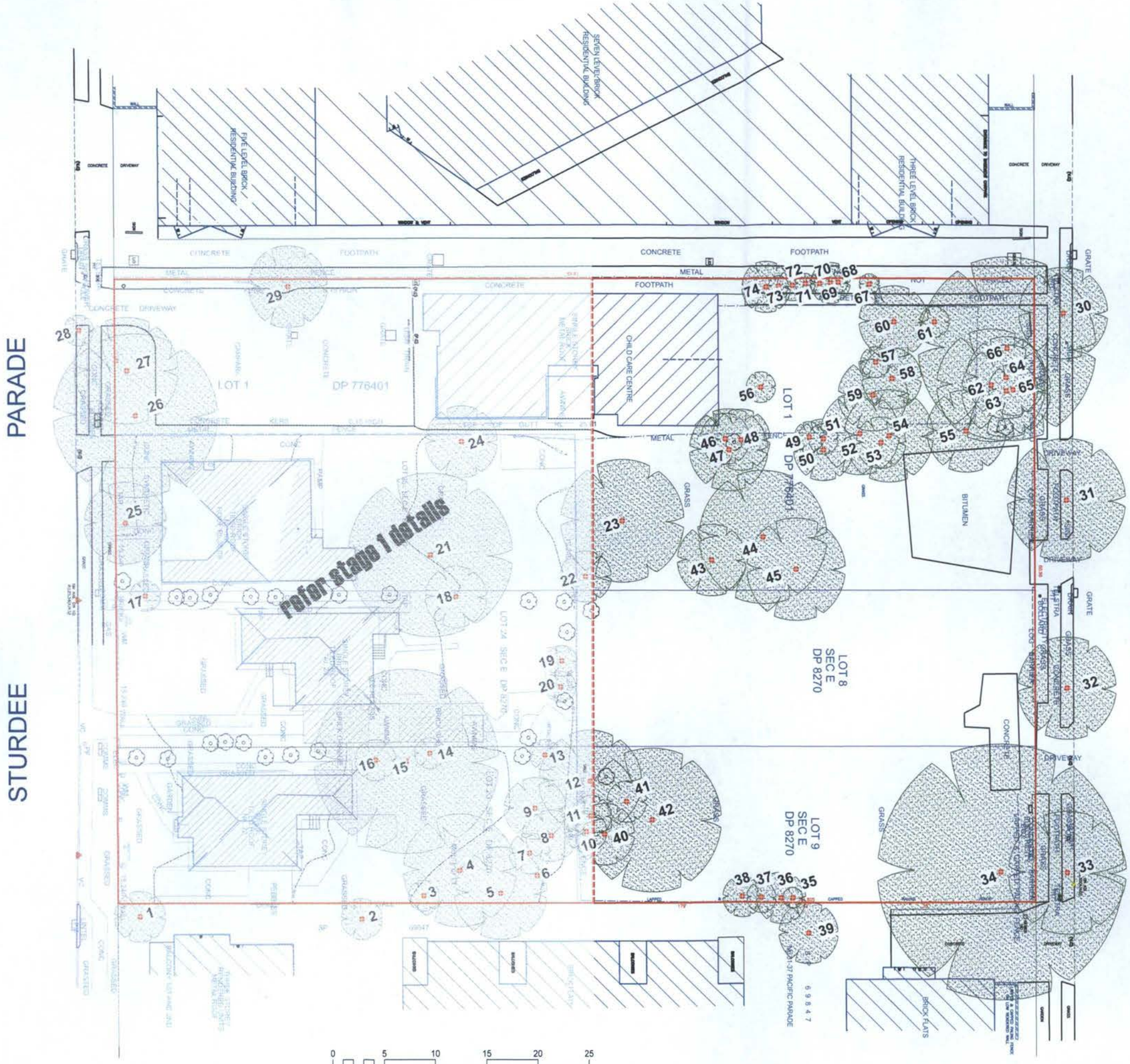

tree legend

99 trees considered in this report

trees / shrubs not considered in this report as they are of a size/dimension not covered by the Council's Development Control Plan (2011) and currently can be removed without consent.

This plan is based upon:

Plan Showing Detail & Levels Over Lots 23, 24 & 25, Sec C, DP 8270 18, 20 & 22 Sturdee Pde, Dee Why, Ref. 2328, Dated 20/08/2012 (C&A Registered Surveyors, Greystanes NSW)

Plan Showing Selected Detail & Levels Over No.23-29 Pacific Parade Dee Why, Ref No. 38530, dated 22/03/13, (Higgins Surveyors, Nth Sydney, NSW)

Whilst a number of trees and shrubs were identified on the survey, only the trees with dimensions covered by Warringah Council's DCP (2011) have been considered in this report. Other smaller trees and shrubs are not protected and can currently be removed without consent.

In addition to the trees shown on the survey, Tree No's 39 & 53 have been added to this plan, and their locations, whilst based upon surveyed featured, are approximate.

Tree No. 8 has recently failed at the base and lies on the ground.

The tree canopies on this plan have been adjusted to better reflect the actual canopy spreads however they remain as indicative graphics.

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tree significance

significance in the environment

Trees need to be considered in the overall environment and are subject to specific legislation such as:

- Threatened Species Conservation Act (NSW) 1995, and
- Noxious Weeds Act (NSW) 1993.

Threatened Species Conservation Act (NSW) 1995
The Threatened Species Conservation Act lists in its schedules a number of species, populations or ecological communities that are either endangered or vulnerable. The Act requires the preparation of a species impact statement if an activity or development is going to have a significant effect on species, populations or endangered ecological communities listed in the schedules of the Act. Where identified on or adjacent the site, threatened tree species are considered in this report, however no attempt is made to identify threatened ecological communities or populations.

Noxious Weeds Act (NSW) 1993
The Noxious Weeds Act provides the Minister with the powers to issue an Order declaring a plant noxious and these plants can be either agricultural or significant environmental pest species. The Minister's declaration may specify a plant to be noxious in part or all of the State and the Minister also may specify the level of noxious weed control required for that species.

Environmental Pest Species
There are a number of environmental pest species that commonly cause problems in developed urban areas or readily spread into natural bushland areas. In urban areas these species can have aggressive root systems and cause damage to built structures or services. Alternatively some species can be problematic in natural bushland areas degrading habitats and reducing natural biodiversity.

Many of these are not considered noxious but are recognised by Councils as pest species and are exempt from protection under Tree Preservation Orders or Development Control Plans.

significance in the landscape

Assessment of a tree's significance in the landscape is generally categorised as either:

- Very High Landscape Significance- prominent from a broad landscape perspective;
- High Landscape Significance - prominent from a neighbourhood perspective;
- Moderate Landscape Significance - prominent from adjacent areas surrounding the site, and
- Low Landscape Significance - prominent from a site perspective only.

tree condition & life expectancy

condition

The assessment of the trees condition is undertaken by visual inspection of the trees themselves, surrounding vegetation and the site conditions.

An assessment of each tree is undertaken taking into account the condition of the tree's roots, trunk, branches, foliage, previous pruning works, pests and disease, nesting hollows, fauna scratchings and the surrounding environment that may influence the condition of the tree.

Safe Useful Life Expectancy (SULE)

The condition information is used to determine the Safe Useful Life Expectancy (SULE) of each tree and takes into account the age of the tree, the life span of the species, local environment conditions, estimated life expectancy, the location of the tree and safety aspects.

The SULE method takes into account whether a tree can be retained with an acceptable level of risk based on the information available at the time of inspection. A SULE assessment is not static as it relates to the tree's health and the surrounding conditions. Whilst it is recognised that changes to the tree's condition will effect the assessment, changes to the surrounding environment may result in changes to the SULE assessment.

Table 1 Safe Useful Life Expectancy (SULE), (Barrell, 2001)

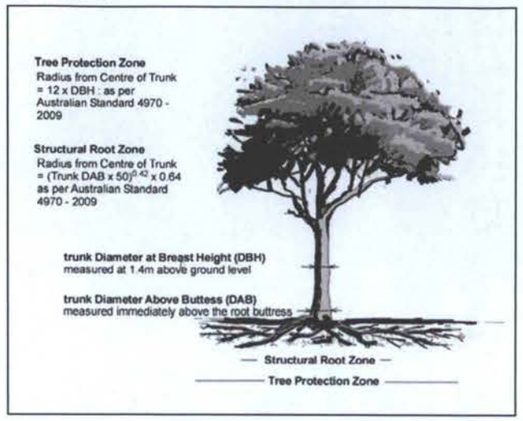
Category	Description
1	Long -Life span greater than 40 years
2	Medium - Life span from 15 to 40 years
3	Short - Life span from 5 to 15 years
4	Should be removed within 5 years
5	Small, Young or Regularly Pruned, Trees that can readily be moved or replaced.
In addition to the categories listed above, trees that show signs of imminent structural failure are listed as 'Unstable'.	
Unstable	Unstable in the ground or have significant trunk damage rendering them structurally hazardous.

development planning & general impacts on trees

tree protection zones

Where trees are intended to be retained, development footprints should be located away from trees so as to provide adequate clearances for a tree protection zone.
Disturbance within Tree Protection Zones can be detrimental to the tree's root system and in turn affect the stability, health and condition of the tree. In many cases damage to the root systems is the major cause of tree decline in urban areas.

Figure 3.1 Typical diagram of a Tree Protection Zone & Structural Root Zone of a tree based upon AS 4970 – 2009.



Where trees are multi-trunk specimens assessment needs to be made based upon the number of trunks and the diameter of each trunk. Based upon the Australian Standard for Protection of Trees on Development Sites, AS 4970 – 2009, the DBH of multi-trunk trees is calculated by:

$$DBH = \sqrt{(DBH_1)^2 + (DBH_2)^2 + (DBH_3)^2}$$

development design & Tree Protection Zones

Where trees are intended to be retained, proposed developments must provide an adequate Tree Protection Zone around trees. This Tree Protection Zone is set aside for the tree's root zone and it is essential for the stability and longevity of the tree. Existing soil levels should be retained within the Tree Protection Zone.

Based upon the Australian Standard for Protection of Trees on Development Sites, AS 4970 – 2009, the radius of the Tree Protection Zone (TPZ) is calculated as: TPZ = 12 x DBH with a minimum 2.0m radius and a maximum 15m radius.

developments within the Tree Protection Zone

Minor encroachments into Tree Protection Zones
Based upon AS 4970 – 2009 some development activity can occur within the vicinity of trees and minor encroachments can occur within the calculated Tree Protection Zone provided that:

- no more that 10% of the area (m2) of the Tree Protection Zone is removed (0.7 x TPZ radius on 1 side only);
- the encroachment does not extend into the Structural Root Zone, and
- the area (m2) to be removed is compensated for by increasing the distance of the Tree Protection Zone in other directions so that there is no net loss in area (m2) of the Tree Protection Zone

Major encroachments into Tree Protection Zones
Where the proposed development activity is greater than that described as a minor encroachment (refer above); the activity is considered to be a major encroachment into the Tree Protection Zone.

Where major encroachments are to occur within the Tree Protection Zone of trees intended to be retained, it must be demonstrated that the works or activities will not have a significant impact on the health and condition of the tree. To demonstrate this detailed root mapping investigation by non invasive methods may be necessary; and other factors such as the age class, health & vigour, trunk lean, disturbance tolerance of the species, and building design may need to be taken into account in the arboricultural assessment.

Where major encroachments are proposed to occur into the Tree Protection Zone the tree's Structural Root Zone should also be taken into account.

developments within the tree's Structural Root Zone

The Structural Root Zone is the area surrounding the tree where the severance of roots and excavation is likely to affect the structural stability of the tree and is likely to have a significant detrimental impact on the health & condition of the tree.
Based upon AS 4970 – 2009 the radius of a tree's Structural Root Zone (SRZ) is determined by measuring the diameter of the trunk immediately above the root buttress (DAB) and calculated by: SRZ = (DAB x 50) 0.42 x 0.64.

Developments should not encroach into the tree's Structural Root Zone and existing soil levels must remain unchanged. Excavation should not occur within this area unless a detailed arboricultural assessment is undertaken and Specific Tree Protection measures will be required.

Tree No	Genus Species	Common Name	Height (m)	Canopy Spread (m)	DBH (mm)	DAB (mm)	Description	Environmental / Landscape Significance	Condition	Foliage Condition	% Canopy Dead Wood	Evidence of Pests, Disease, Cavity, Bracket Fungi	SULE	On / off site	TPZ Radius (m)	Area of TPZ (m2)
23	*Angophora bakeri*	Narrow-leaved Apple	16	14	650	850	Mature twin trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. No evidence of significant branch pruning.	High L/scape Sig.	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	15%	None evident	2	On site	7.8	191.2
30	*Lophostemon confertus*	Brushbox	13	9	460	620	Mature single trunk tree with an upright spreading form; an upright trunk/s and majority of canopy and branch development is towards the north west. Lower limbs of the tree have been pruned to 4m.	Moderate L/scape Sig.	The tree displays some signs of instability and its branch attachment appears fair. The tree is considered to be in moderate health and displays fair vigour.	Good	20%	The tree appears to be suppressed by the adjacent vegetation. There is evidence of limb failure on the eastern side and decay in the main trunk from 0.3m - 1.8m.	4	Within road reserve	5.5	95.8
31	*Lophostemon confertus*	Brushbox	12	12	880	950	Mature multi trunk tree with an upright spreading form; an upright trunk/s and balanced canopy and branch development. Lower limbs of the tree have been pruned to 5m and the central leaders appear to have been pruned in the past at 2.5m.	Moderate L/scape Sig.	The tree stability is suspect and its branch attachment appears fair. The tree is considered to be in moderate health and displays fair vigour.	Good	15%	The tree has a trunk wound from 0.7m - 1.3m with decay present. The northern leader has failed at 1m, the western leader has decay present and small fungal growths are present on the western branches with decay present.	Unstable	Within road reserve	10.6	350.5
32	*Lophostemon confertus*	Brushbox	12	10	550	900	Mature multi trunk (at 2m) tree with an upright spreading form; an upright trunk/s and balanced canopy and branch development. Lower limbs of the tree have been pruned to 4m and the central leaders appear to have been pruned in the past at 2.5m.	Moderate L/scape Sig.	The tree appears stable and its branch attachment appears fair. The tree is considered to be in moderate health and displays fair vigour.	Fair	20%	The tree is carrying sections of dead wood.	2	Within road reserve	6.6	136.9
33	*Lophostemon confertus*	Brushbox	11	12	700	950	Mature multi trunk tree with an upright spreading form; an upright trunk/s and balanced canopy and branch development. Lower limbs of the tree have been pruned to 3m and the central leaders appear to have been pruned in the past at 2.5m.	Moderate L/scape Sig.	The tree appears stable and its branch attachment appears fair. The tree is considered to be in moderate health and displays fair vigour.	Fair	10%	The tree has a sparse canopy.	2	Within road reserve	8.4	221.8
34	*Cinnamomum camphora*	Camphor Laurel	22	25	1950	1800	Over mature multi trunk tree with a tall spreading form; an upright trunk/s and balanced canopy and branch development. Lower limbs of the tree have been pruned to 5m and the central leaders appear to have been pruned in the past at 2m.	Env. Pest Species - Exempt from Council's DCP	The tree appears stable and its branch attachment appears fair. The tree is considered to be in moderate health and displays fair vigour.	Fair	15%	The 2 eastern leaders have significant bark cracking at 5-7m and the northern leader has dieback. The eastern leader has epicormic growth and the tree has a sparse canopy.	2	On site	15	707.1

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arboricultural impact assessment, stage 2, 23-29 pacific pde, dee why

drawing title
arboricultural assessment – tree data sheet

Tree No	Genus Species	Common Name	Height (m)	Canopy Spread (m)	DBH (mm)	DAB (mm)	Description	Environmental / Landscape Significance	Condition	Foliage Condition	% Canopy Dead Wood	Evidence of Pests, Disease, Cavity, Bracket Fungi	SULE	On / off site	TPZ Radius (m)	Area of TPZ (m2)
35	*Syagrus romanzoffianum*	Cocos Palm	3	2	110	180	Immature single trunk tree with an elevated spreading form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council s DCP	The tree appears stable and its branch attachment appears fair The tree is considered to be in moderate health and displays fair vigour	Fair	10%	None evident	4	On site	0 75	1 8
36	*Syagrus romanzoffianum*	Cocos Palm	10	5	300	650	Mature single trunk tree with an elevated spreading form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council's DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Good	5%	None evident	2	On site	2	12 6
37	*Syagrus romanzoffianum*	Cocos Palm	6	3	160	350	Semi-mature single trunk tree with an elevated spreading form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council s DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in moderate health and displays fair vigour	Fair	10%	None evident	2	On site	1 2	4 5
38	*Syagrus romanzoffianum*	Cocos Palm	8	4	200	250	Semi-mature single trunk tree with an elevated spreading form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council s DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in moderate health and displays fair vigour	Fair	5%	None evident	2	On site	1 2	4 5
39	*Jacaranda mimosifolia*	Jacaranda	10	6	260	320	Semi-mature single trunk tree with a broad spreading form a slight trunk lean to the north and balanced canopy and branch development No evidence of significant branch pruning	Moderate L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Good	5%	None evident	2	On adjacent allotment	3 1	30 6
40	*Callistemon salignus*	Willow Bottlebrush	11	6	300	500	Semi-mature single trunk tree with an upright elliptical form an upright trunk/s and majority of canopy and branch development is towards the east Lower limbs of the tree have been pruned to 2m	Moderate L/scape Sig	The tree appears stable and its branch attachment appears fair The tree is considered to be in moderate health and displays fair vigour	Fair	20%	None evident	4	On site	3 6	40 7
41	*Howea forsteriana*	Kentia Palm	5	4	220	380	Semi-mature single trunk tree with an elevated spreading form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Low L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	<5%	None evident	2	On site	1	3 1
42	*Schinus areira*	Peppercorn Tree	17	14	500	750	Mature single trunk tree with an upright spreading form an upright trunk/s and majority of canopy and branch development is towards the north east Lower limbs of the tree have been pruned to 8m and the western limb has been pruned at 4m	High L/scape Sig	The tree displays some signs of instability and its branch attachment appears fair The tree is considered to be in moderate health and displays fair vigour	Fair	25%	The tree has sparse thinning foliage and has a trunk cavity at 2 2m on the northern side where decay is evident	3	On site	6	113 1
43	*Schinus areira*	Peppercorn Tree	8	7	1*250 1*300	650	Mature twin trunk tree with a broad spreading form an upright trunk/s and balanced canopy and branch development Lower limbs of the tree have been pruned to 3m	Moderate L/scape Sig	The tree displays some signs of instability and its branch attachment appears fair The tree is considered to be in poor health and displays poor vigour	Fair	35%	The tree has a hollow in the southern trunk	3	On site	4 8	71 3
44	*Eucalyptus sp*	Ironbark	17	13	460	700	Mature single trunk tree with an upright forest form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	High L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	<5%	None evident	1	On site	5 5	95 8
45	*Schinus areira*	Peppercorn Tree	10	10	460	700	Mature single trunk tree with a broad spreading form an upright trunk/s and balanced canopy and branch development Lower limbs of the tree have been pruned to 4m	High L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in moderate health and displays fair vigour	Good	10%	None evident	1	On site	5 5	95 8
46	*Syagrus romanzoffianum*	Cocos Palm	11	5	240	250	Mature single trunk tree with an elevated d form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council's DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Good	<5%	None evident	2	On site	1 6	8
47	*Syagrus romanzoffianum*	Cocos Palm	15	8	290	550	Mature single trunk tree with an elevated rounded form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council's DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	<5%	None evident	2	On site	2 4	18 1
48	*Syagrus romanzoffianum*	Cocos Palm	12	6	320	400	Mature single trunk tree with an elevated rounded form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council's DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	5%	None evident	2	On site	1 9	11 3
49	*Schefflera actinophylla*	Umbrella Tree	5	3	200	220	Mature single trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council's DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Good	5%	The tree appears to be suppressed by the adjacent vegetation	2	On site	2 4	18 1
50	*Syagrus romanzoffianum*	Cocos Palm	13	6	320	500	Mature single trunk tree with an elevated rounded form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council's DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	5%	None evident	2	On site	2 1	13 9
51	*Syagrus romanzoffianum*	Cocos Palm	8	3	260	400	Semi-mature single trunk tree with an elevated spreading form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council's DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in moderate health and displays fair vigour	Fair	5%	The tree appears to be suppressed by the adjacent vegetation	2	On site	1 4	6 2
52	*Cinnamomum camphora*	Camphor Laurel	9	8	350	480	Semi-mature twin trunk (at 1 8m) tree with a broad spreading form a slight trunk lean to the south east and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council's DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Good	10%	None evident	1	On site	4 2	55 4
53	*Cinnamomum camphora*	Camphor Laurel	9	5	22	300	Semi-mature single trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council s DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	5%	The tree appears to be suppressed by the adjacent vegetation	1	On site	2	12 6
54	*Jacaranda mimosifolia*	Jacaranda	11	9	1*400 2*200 1*300	750	Mature multi trunk tree with an upright spreading form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Moderate L/scape Sig	The tree stability is suspect and its branch attachment appears poor The tree is considered to be in moderate health and displays fair vigour	Fair	15%	The tree has decay and inclusions in the lower main trunk with decay present in other sections	Unstable	On site	6 9	149 3
55	*Pittosporum undulatum*	Sweet Pittosporum	11	8	1*160 1*180	400	Mature twin trunk tree with an upright elliptical form a slight trunk lean to the east and majority of canopy and branch development is towards the east No evidence of significant branch pruning	Low L/scape Sig	The tree displays some signs of instability and its branch attachment appears fair The tree is considered to be in poor health and displays poor vigour	Poor	50%	There is cracking and decay in the western trunk	4	On site	2 9	26 2
56	*Elaeocarpus reticulatus*	Blueberry Ash	5	3	350	380	Mature single trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Low L/scape Sig	The tree stability is suspect and its branch attachment appears poor The tree is considered to be in poor health and displays poor vigour	Fair	15%	The central leader shows signs of decay and extensive decay is present in the lower trunk on the southern side	Unstable	On site	4 2	55 4
57	*Pittosporum undulatum*	Sweet Pittosporum	6	3	220	380	Semi-mature single trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Low L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in moderate health and displays fair vigour	Fair	20%	The tree appears to be suppressed by the adjacent vegetation	3	On site	2 6	21 9
58	*Pittosporum undulatum*	Sweet Pittosporum	8	6	260	400	Mature twin trunk tree with an upright elliptical form a slight trunk lean to the north and majority of canopy and branch development is towards the north Lower limbs of the tree have been pruned to 3m	Low L/scape Sig	The tree appears stable and its branch attachment appears fair The tree is considered to be in moderate health and displays fair vigour	Fair	25%	The tree appears to be suppressed by the adjacent vegetation	3	On site	3 1	30 6

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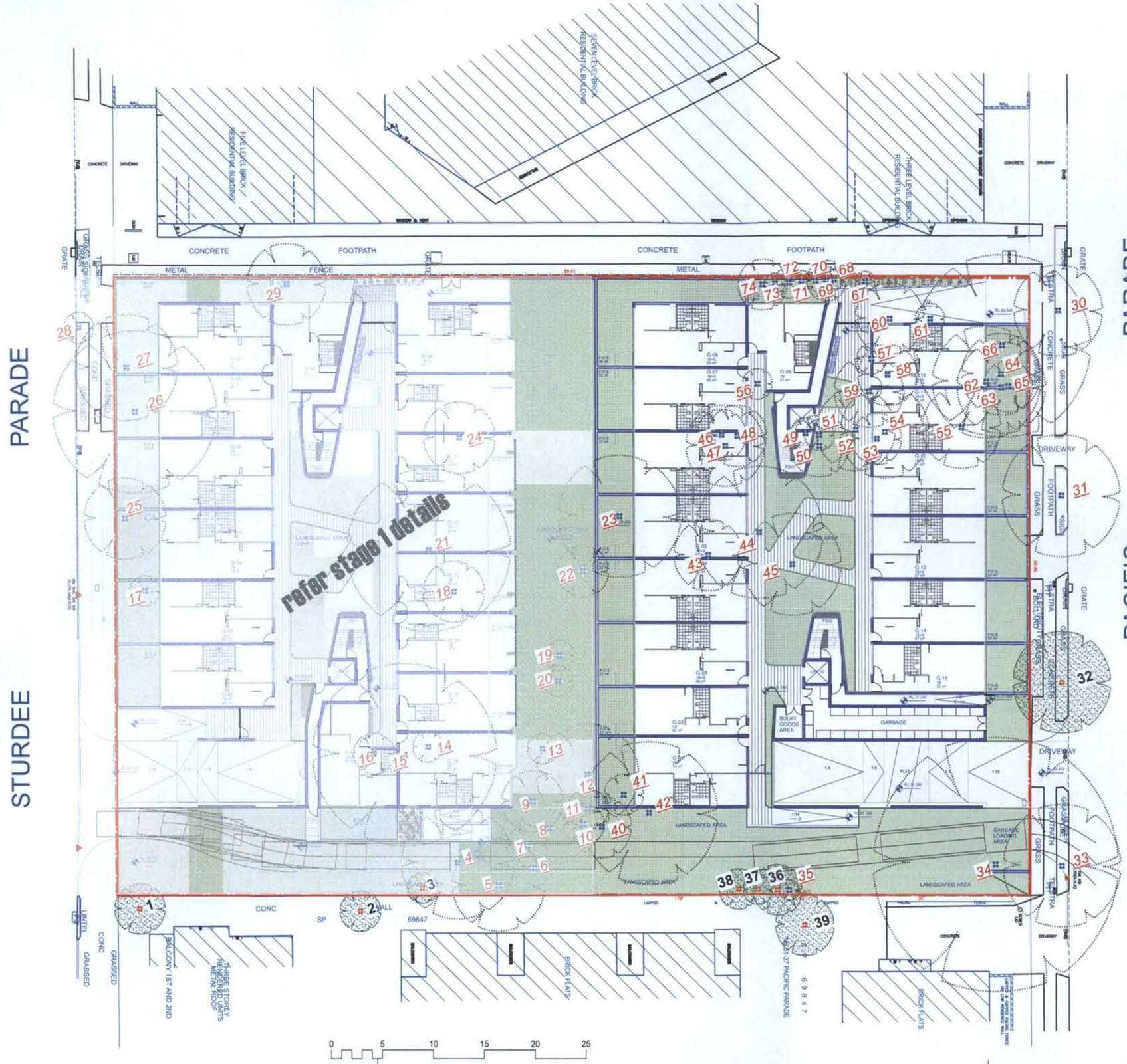
project: **arboricultural impact assessment, stage 2, 23-29 pacific pde, dee why**

drawing title: **arboricultural assessment – tree data sheet**

Tree No	Genus Species	Common Name	Height (m)	Canopy Spread (m)	DBH (mm)	DAB (mm)	Description	Environmental / Landscape Significance	Condition	Foliage Condition	% Canopy Dead Wood	Evidence of Pests, Disease, Cavity, Bracket Fungi	SULE	On / off site	TPZ Radius (m)	Area of TPZ (m2)
59	*Glochidion ferdinandi*	Cheese Tree	10	7	260	550	Mature single trunk tree with a broad spreading form an upright trunk/s and majority of canopy and branch development is towards the south No evidence of significant branch pruning	Moderate L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Good	10%	None evident	2	On site	3 1	30 6
60	*Pittosporum undulatum*	Sweet Pittosporum	8	7	320	420	Mature single trunk tree with an upright spreading form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Low L/scape Sig	The tree appears stable and its branch attachment appears fair The tree is considered to be in moderate health and displays fair vigour	Fair	40%	None evident	4	On site	3 8	46 3
61	*Syzygium smithii*	Lilly Pilly	5	3	1*20 3*30, 1*40	800	Reshooting stump resulting in multi trunk tree with a broad spreading form an upright trunk/s and balanced canopy and branch development The tree appears to have been previously removed to ground level	Low L/scape Sig	The tree stability is suspect and its branch attachment appears poor The tree is considered to be in moderate health and displays fair vigour	Good	<5%	The tree consists of epicormic shoots from a stump	Unstable	On site	2	12 6
62	*Endiandra sieberi*	Hard Corkwood	14	11	320	540	Mature single trunk tree with an upright spreading form an upright trunk/s and balanced canopy and branch development Lower limbs of the tree have been pruned to 4m	High L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	<5%	None evident	1	On site	3 8	46 3
63	*Endiandra sieberi*	Hard Corkwood	10	9	280	480	Mature single trunk tree with an upright spreading form a slight trunk lean to the north east and majority of canopy and branch development is towards the north east Lower limbs of the tree have been pruned to 4m	Moderate L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Good	10%	The tree appears to be suppressed by the adjacent vegetation	1	On site	3 4	35 5
64	*Endiandra sieberi*	Hard Corkwood	10	8	300	400	Mature single trunk tree with an upright elliptical form an upright trunk/s and majority of canopy and branch development is towards the north Lower limbs of the tree have been pruned to 4m	Moderate L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Good	10%	The tree appears to be suppressed by the adjacent vegetation and minor decay is present on dead limbs	1	On site	3 6	40 7
65	*Brachychiton acerifolius*	Illawarra Flame Tree	13	5	240	320	Mature single trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Env Pest Species - Exempt from Council's DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Excellent	<5%	None evident	1	On site	2 9	26 1
66	*Cinnamomum camphora*	Camphor Laurel	15	18	1*460 1*560	1100	Mature twin trunk tree with a broad spreading form an upright trunk/s and balanced canopy and branch development Lower limbs of the tree have been pruned to 5m	Env Pest Species - Exempt from Council's DCP	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	10%	None evident	1	On site	8 7	237 7
67	*Syzygium luehmannii*	Small-leafed Lillypilly	7	2	1*120 1*100	250	Semi-mature twin trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development Lower limbs of the tree have been pruned to 3m	Low L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	<5%	None evident	2	On site	2	12 6
68	*Syzygium luehmannii*	Small-leafed Lillypilly	5	1	60	120	Immature single trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development Appears that the central leader has been previously pruned/removed	Low L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Fair	<5%	None evident	2	On site	2	12 6
69	*Syzygium luehmannii*	Small-leafed Lillypilly	8	4	1*120 1*240	420	Semi-mature twin trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development Lower limbs of the tree have been pruned to 3m	Low L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	<5%	None evident	2	On site	3 2	32 6
70	*Syzygium luehmannii*	Small-leafed Lillypilly	5	1	2*60	100	Immature twin trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Low L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Fair	<5%	The tree appears to be suppressed by the adjacent vegetation	2	On site	2	12 6
71	*Syzygium luehmannii*	Small-leafed Lillypilly	5	2	3*100	200	Semi-mature multi trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Low L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Fair	<5%	None evident	2	On site	2	12 6
72	*Syzygium luehmannii*	Small-leafed Lillypilly	7	3	1*120, 1*100	300	Semi-mature multi trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development Lower limbs of the tree have been pruned to 3m	Low L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	5%	None evident	2	On site	2	12 6
73	*Syzygium luehmannii*	Small-leafed Lillypilly	6	2	2*100	140	Semi-mature twin trunk tree with an upright elliptical form, an upright trunk/s and balanced canopy and branch development Lower limbs of the tree have been pruned to 3m	Low L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Good	5%	None evident	2	On site	2	12 6
74	*Syzygium luehmannii*	Small-leafed Lillypilly	8	5	2*200	460	Mature twin trunk tree with an upright elliptical form an upright trunk/s and balanced canopy and branch development No evidence of significant branch pruning	Low L/scape Sig	The tree appears stable and its branch attachment appears sound The tree is considered to be in good health and displays good vigour	Very Good	5%	None evident	2	On site	3 4	36 2



tree legend

99 trees to be retained

99 trees to be removed

This plan is based upon:

Plan Showing Detail & Levels Over Lots 23, 24 & 25, Sec C, DP 8270 18, 20 & 22 Sturdee Pde, Dee Why, Ref. 2328, Dated 20/08/2012 (C&A Registered Surveyors, Greystanes NSW)

Plan Showing Selected Detail & Levels Over No.23-29 Pacific Parade Dee Why, Ref No. 38530, dated 22/03/13, (Higgins Surveyors, Nth Sydney, NSW)

Ground Floor Plan, Dwg No. DA 1.05, Rev. B, Dated 28/08/14 (Marchese Partners International, Nth Sydney, NSW)

In addition to the trees shown on the survey, Tree No's 39 & 53 have been added to this plan, and their locations, whilst based upon surveyed featured, are approximate.

The tree canopies on this plan have been adjusted from those shown on the survey to better reflect the actual canopy spreads however they remain as indicative graphics.

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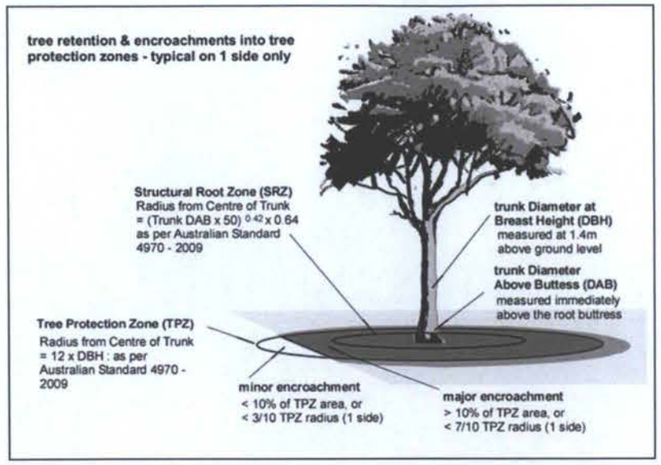
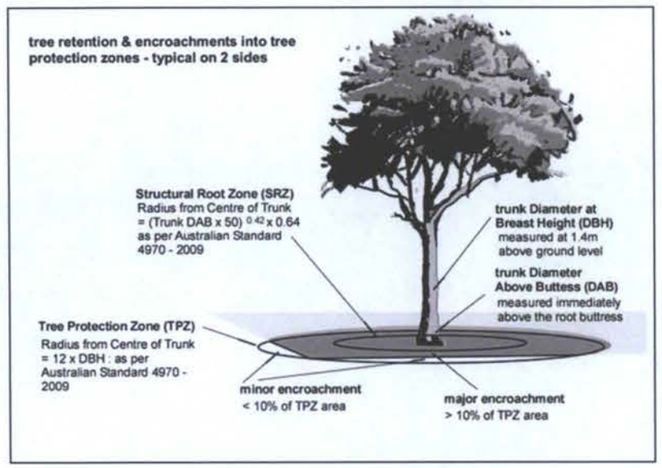
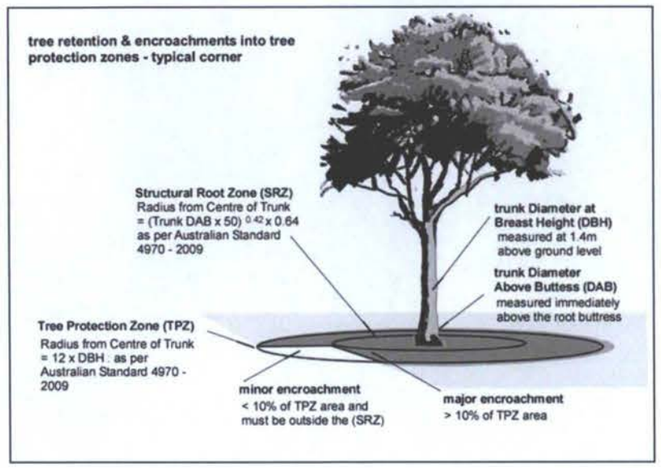
project
arboricultural impact assessment, stage 2, 23-29 pacific pde, dee why

drawing title
proposed development tree retention & removal

typical application of Australian Standard 4970-2009 - Protection of Trees on Development Sites







Tree No	Genus Species	DBH (mm)	DAB (mm)	SULE	Env./ L/scape Sig.	TPZ Radius (m)	Area of TPZ (m2)	Radius of 90% of TPZ (7/10)	SRZ Radius (m)	Adjacent Works	Influence on Tree	Plan Status	On / off site
23	*Angophora bakeri*	650	850	2	High L/scape Sig.	7.8	191.2	5.5	3.1	The proposed basement car park spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
30	*Lophostemon confertus*	460	620	4	Moderate L/scape Sig.	5.5	95.8	3.9	2.7	The proposed vehicle crossover spatially conflicts with the location of the tree.	Not applicable	To be Removed	Within road reserve
31	*Lophostemon confertus*	880	950	Unstable	Moderate L/scape Sig.	10.6	350.5	7.4	3.2	The proposed front boundary wall is within 3.1m (south) of the tree.	No significant impact however the tree is unstable.	To be Removed.	Within road reserve
32	*Lophostemon confertus*	550	900	2	Moderate L/scape Sig.	6.6	136.9	4.6	3.2	The proposed front boundary wall is within 3.1m (south) of the tree.	No significant impact with appropriate Tree Protection Measures.	Retained with Specific Tree Protection Measures	Within road reserve
33	*Lophostemon confertus*	700	950	2	Moderate L/scape Sig.	8.4	221.8	5.9	3.2	The proposed garbage trunk crossover spatially conflicts with the location of the tree.	Not applicable	To be Removed	Within road reserve
34	*Cinnamomum camphora*	1950	1800	2	Env. Pest Species - Exempt from Council's DCP	15	707.1	10.5	4.2	The proposed excavated driveway is within 5.4m (west) of the tree. The proposed garbage trunk access is within 1.1m (west) of the tree.	Excavation for the driveway is likely to involve severance of significant tree roots resulting in the decline of the tree.	To be Removed	On site
35	*Syagrus romanzoffianum*	110	180	4	Env. Pest Species - Exempt from Council's DCP	0.75	1.8	0.5	0.5	The proposed garbage trunk access is within 1.9m (west) of the palm.	No significant impact however, the tree is considered to be in poor condition.	To be Removed	On site
36	*Syagrus romanzoffianum*	300	650	2	Env. Pest Species - Exempt from Council's DCP	2	12.6	1.4	1.4	The proposed garbage trunk access is within 1.8m (west) of the palm.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	On site
37	*Syagrus romanzoffianum*	160	350	2	Env. Pest Species - Exempt from Council's DCP	1.2	4.5	0.8	0.8	The proposed garbage trunk access is within 1.7m (west) of the palm.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	On site
38	*Syagrus romanzoffianum*	200	250	2	Env. Pest Species - Exempt from Council's DCP	1.2	4.5	0.8	0.8	The proposed garbage trunk access is within 1.7m (west) of the palm.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	On site
39	*Jacaranda mimosifolia*	260	320	2	Moderate L/scape Sig.	3.1	30.6	2.2	2.1	No proposed works within 2.9m (west) of the tree.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	On adjacent allotment
40	*Callistemon salignus*	300	500	4	Moderate L/scape Sig.	3.6	40.7	2.5	2.5	The proposed basement car park is within 1.8m (west) of the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site
41	*Howea forsteriana*	220	380	2	Low L/scape Sig.	1	3.1	0.7	0.7	The proposed basement car park spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site

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Tree No	Genus Species	DBH (mm)	DAB (mm)	SULE	Env./ L/scape Sig.	TPZ Radius (m)	Area of TPZ (m2)	Radius of 90% of TPZ (7/10)	SRZ Radius (m)	Adjacent Works	Influence on Tree	Plan Status	On / off site
42	*Schinus areira*	500	750	3	High L/scape Sig.	6	113.1	4.2	2.9	The proposed building footprint and basement car park is within 0.4m (west) of the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site
43	*Schinus areira*	1*250, 1*300	650	3	Moderate L/scape Sig.	4.8	71.3	3.3	2.8	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
44	*Eucalyptus sp.*	460	700	1	High L/scape Sig.	5.5	95.8	3.9	2.8	The proposed basement car park spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
45	*Schinus areira*	460	700	1	High L/scape Sig.	5.5	95.8	3.9	2.8	The proposed basement car park spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
46	*Syagrus romanzoffianum*	240	250	2	Env. Pest Species - Exempt from Council's DCP	1.6	8	1.1	1.1	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
47	*Syagrus romanzoffianum*	290	550	2	Env. Pest Species - Exempt from Council's DCP	2.4	18.1	1.7	1.7	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
48	*Syagrus romanzoffianum*	320	400	2	Env. Pest Species - Exempt from Council's DCP	1.9	11.3	1.3	1.3	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
49	*Schefflera actinophylla*	200	220	2	Env. Pest Species - Exempt from Council's DCP	2.4	18.1	1.7	1.8	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
50	*Syagrus romanzoffianum*	320	500	2	Env. Pest Species - Exempt from Council's DCP	2.1	13.9	1.5	1.5	The proposed basement car park spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
51	*Syagrus romanzoffianum*	260	400	2	Env. Pest Species - Exempt from Council's DCP	1.4	6.2	1	1	The proposed basement car park spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
52	*Cinnamomum camphora*	350	480	1	Env. Pest Species - Exempt from Council's DCP	4.2	55.4	2.9	2.4	The proposed basement car park spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
53	*Cinnamomum camphora*	22	300	1	Env. Pest Species - Exempt from Council's DCP	2	12.6	1.4	2	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
54	*Jacaranda mimosifolia*	1*400, 2*200, 1*300	750	Unstable	Moderate L/scape Sig.	6.9	149.3	4.8	2.9	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
55	*Pittosporum undulatum*	1*160, 1*180	400	4	Low L/scape Sig.	2.9	26.2	2	2.3	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
56	*Elaeocarpus reticulatus*	350	380	Unstable	Low L/scape Sig.	4.2	55.4	2.9	2.2	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
57	*Pittosporum undulatum*	220	380	3	Low L/scape Sig.	2.6	21.9	1.8	2.2	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
58	*Pittosporum undulatum*	260	400	3	Low L/scape Sig.	3.1	30.6	2.2	2.3	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
59	*Glochidion ferdinandi*	260	550	2	Moderate L/scape Sig.	3.1	30.6	2.2	2.6	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
60	*Pittosporum undulatum*	320	420	4	Low L/scape Sig.	3.8	46.3	2.7	2.3	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
61	*Syzygium smithii*	1*20, 3*30, 1*40	800	Unstable	Low L/scape Sig.	2	12.6	1.4	3	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
62	*Endiandra sieberi*	320	540	1	High L/scape Sig.	3.8	46.3	2.7	2.6	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
63	*Endiandra sieberi*	280	480	1	Moderate L/scape Sig.	3.4	35.5	2.4	2.4	The proposed basement car park is within 1.5m (south) of the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site
64	*Endiandra sieberi*	300	400	1	Moderate L/scape Sig.	3.6	40.7	2.5	2.3	The proposed basement car park is within 1.4m (south) of the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site
65	*Brachychiton acerifolius*	240	320	1	Env. Pest Species - Exempt from Council's DCP	2.9	26.1	2	2.1	The proposed basement car park is within 2.1m (south) of the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree.	To be Removed	On site
66	*Cinnamomum camphora*	1*460, 1*560	1100	1	Env. Pest Species - Exempt from Council's DCP	8.7	237.7	6.1	3.4	The proposed basement car park is within 1.5m (south) of the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site
67	*Syzygium luehmannii*	1*120, 1*100	250	2	Low L/scape Sig.	2	12.6	1.4	1.8	The proposed basement car park is within 0.6m (east) of the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site
68	*Syzygium luehmannii*	60	120	2	Low L/scape Sig.	2	12.6	1.4	1.4	The proposed basement car park is within 0.8m (east) of the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site
69	*Syzygium luehmannii*	1*120, 1*240	420	2	Low L/scape Sig.	3.2	32.6	2.3	2.3	The proposed basement car park is within 0.8m (east) of the tree. External landscape levels are to be lowered around the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site

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melanie howden	nts	17/09/14	aiasi 2.01	0.3	8 10

project: **arboricultural impact assessment, stage 2, 23-29 pacific pde, dee why**

drawing title: **impact of development on individual trees**

Tree No	Genus Species	DBH (mm)	DAB (mm)	SULE	Env./ L/scape Sig.	TPZ Radius (m)	Area of TPZ (m2)	Radius of 90% of TPZ (7/10)	SRZ Radius (m)	Adjacent Works	Influence on Tree	Plan Status	On / off site
70	*Syzygium luehmannii*	2*60	100	2	Low L/scape Sig.	2	12.6	1.4	1.3	The proposed basement car park is within 0.7m (east) of the tree. External landscape levels are to be lowered around the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site
71	*Syzygium luehmannii*	3*100	200	2	Low L/scape Sig.	2	12.6	1.4	1.7	The proposed basement car park is within 1.2m (east) of the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site
72	*Syzygium luehmannii*	1*120, 1*100	300	2	Low L/scape Sig.	2	12.6	1.4	2	The proposed basement car park is within 1.2m (east) of the tree. External landscape levels are to be lowered around the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site
73	*Syzygium luehmannii*	2*100	140	2	Low L/scape Sig.	2	12.6	1.4	1.4	External landscape levels are to be lowered around the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site
74	*Syzygium luehmannii*	2*200	460	2	Low L/scape Sig.	3.4	36.2	2.4	2.4	The proposed basement car park is within 1.7m (east) of the tree. External landscape levels are to be lowered around the tree.	Excavation is likely to involve severance of significant tree roots resulting in the decline of the tree and/or rendering it unstable.	To be Removed	On site

Figure 11.1 Tree No.31 showing poor structural branch attachment with decay.

Figure 11.2 South eastern corner of the Lot 9 with Tree No's 45, 44 & 43 (left-right) on Lot 1 in the foreground.

Figure 11.3 North eastern corner of the site with frontage on Pacific Parade

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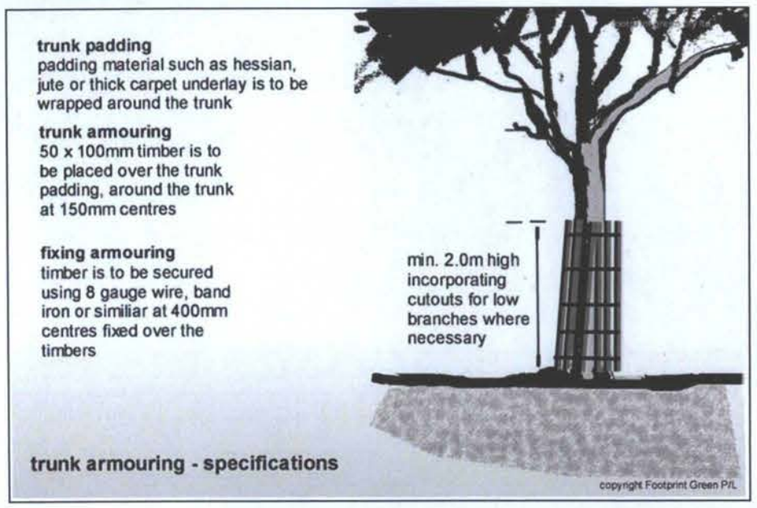
tree protection measures

specific tree protection during construction.

Tree No. 32 is located within the road reserve adjacent the site. To minimise damage to the trunks of the trees whilst maintaining public access trunk armouring will need to be installed around Tree No. 32 in accordance with the specifications below.



general tree protection during construction.

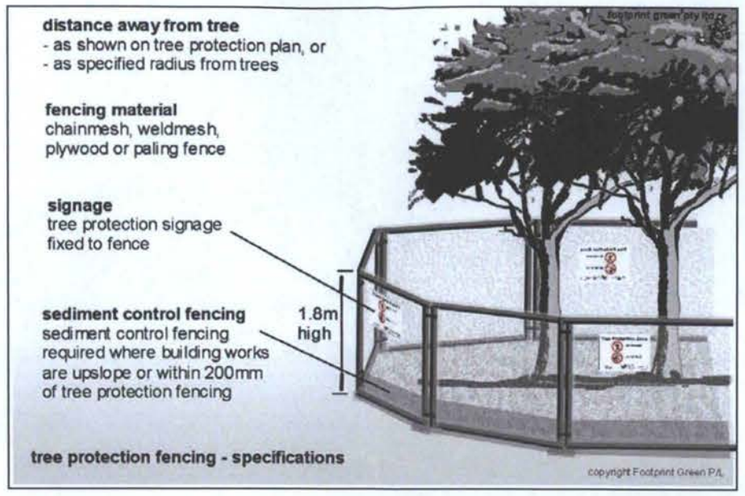
Prior to earthworks or construction activities, the removal of the identified trees should be undertaken with particular attention given to ensure that no damage occurs to the canopy foliage and branch structure of the trees to be retained.

Prior to demolition or construction, secure protective fencing is to be erected around individual trees or groups of trees identified as being retained and should be located no closer than the Tree Protection Zone (refer sheet 5).

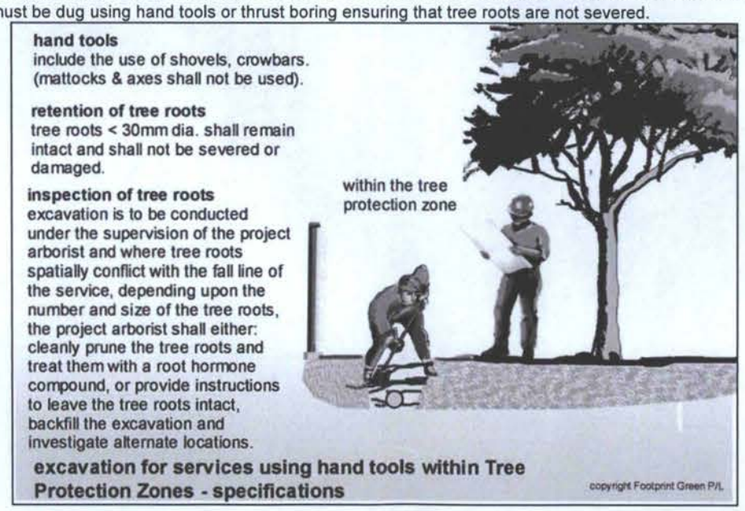
The building contractor shall ensure that at all times during site works no activities, stock piles, storage or disposal of materials shall take place within the fenced off areas and that all Protective Fences remain secure throughout the development work period.

All access within the tree protection fencing for temporary and permanent works must be carried out under the instructions of an experienced and qualified project arborist and protective fencing shall remain in functional condition for the duration of building works

Outside the approved building footprints or retaining walls, landscape works in the vicinity of the trees must be sympathetic to tree retention and existing ground levels within the Tree Protection Zones (refer sheet 5) must remain unchanged.



Specific excavation for services that require critical fall (eg. sewer, stormwater) may be undertaken within the fenced off areas only under the direct supervision of the project arborist and the trenching must be dug using hand tools or thrust boring ensuring that tree roots are not severed.



Any damage that occurs to trees or tree roots during site works is to be treated by an experienced and qualified arborist. Where branch pruning works are required, all pruning works including the removal of deadwood are to be undertaken in accordance with Australian Standard AS 4373-2007 Pruning of Amenity Trees and the work is to be undertaken by an experienced and qualified arborist.

tree report summary

conclusion

This report has been prepared to assess the condition and significance of a number of trees on and adjacent the allotments known as 23-29 Pacific Parade, Dee Why and assess the potential impact of the proposed development on the identified trees.

The report has been commissioned by Dee Why Properties Pty Ltd and site instructions have been provided by Marchese & Partners Architects. Site inspections and field work were initially conducted on the 04/12/12 with additional site inspections conducted on the 25/10/13. For the purposes of this report the properties known as 23-29 Pacific Parade, Dee Why will be referred to as the site.

The terminology in this report and development impact assessments are based upon the Australian Standard, Protection of Trees on Development Sites AS 4970-2009 and the definition of a tree in this report is consistent with Warringah Development Control Plan (2011) being *"a palm or woody perennial plant greater than five (5) metres in height or seven (7) metres in canopy width"*

The site is currently developed and contains the rear portion of a child care facility and 2 vacant lots. The trees on the site are a mix of indigenous, non-indigenous and exotic species. The proposed development involves demolition of the existing built structures and construction of multi storey apartments with basement car parking (Marchese, 2014).

There are 46 trees on and adjacent the Stage 2 proposal that have been considered in this report of which 41 trees are on the site, 1 tree is located on adjoining allotment and 4 trees are located within the road reserves. Of the 46 trees identified in this report:

- 5 trees are to be retained (3 trees on site, 1 on the adjacent allotment, 1 tree within the road reserve), and
- 41 trees are proposed to be removed (38 trees on site, 3 trees within the road reserve).

Details of the 5 Trees to be Retained (number of trees)						
Condition	Environmental / Landscape Significance					
	Noxious	Env. Pest (Exempt from DCP)	Low L/scape Sig.	Moderate L/scape Sig.	High L/scape Sig.	Very High L/scape Sig.
SULE - 1						
SULE - 2		3		2		
SULE - 3						
SULE - 4						
Unstable						

Details of the 41 Trees to be Removed (number of trees)						
Condition	Environmental / Landscape Significance					
	Noxious	Env. Pest (Exempt from DCP)	Low L/scape Sig.	Moderate L/scape Sig.	High L/scape Sig.	Very High L/scape Sig.
SULE - 1		4		2	3	
SULE - 2		7	9	2	1	
SULE - 3		2		1	1	
SULE - 4		1	2	2		
Unstable			2	2		

Provided that the specific and general tree protection measures (refer opposite this sheet) are implemented and works are undertaken in a sensitive manner, it is considered that the proposed development will not have a significant impact on the long-term health of the trees identified as being retained.

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melanie howden	nts	17/09/14	aiacp 2.01	0.3	10	10

project: **arboricultural impact assessment, stage 2, 23-29 pacific pde, dee why**

drawing title: **tree protection measures & report summary**

marchesepartners

16 September 2014

ARCHITECTURAL DESIGN STATEMENT

Prepared to accompany a DA application to Warringah Council

PROPOSED RESIDENTIAL DEVELOPMENT AT 23-29 PACIFIC PARADE, DEE WHY

MAJOR DESIGN PARAMETERS AND GOALS

In conceptualising the Sturdee Parade Apartments the following issues have been identified as important design parameters and goals and have been carefully considered;

1. Adhering to the Warringah Council LEP Guidelines for residential development.
2. Understanding the proposed built form and land use of the adjacent properties and developments to arrive at a solution that provides a good contextual fit with high quality architecture.
3. Mitigate privacy of both the existing developments and the proposed development.

THE PROPOSAL

The proposal is to create a high quality medium density development of 103 residential units for individuals, couples, and families who desire to live in the area. The dwellings are a mixture of one, and two bedroom units. There are two levels of parking below ground that serves both residents and visitors.

The proposal provides an elegant contemporary building and landscape that will add to and reflect the positive elements of the neighborhood.

AESTHETICS

A limited palette of materials has been carefully selected and implemented creating a warm tactile contemporary building.

The units wrap around an open central courtyard garden creating a protected entry that is connected to nature. The facades are articulated to break up the form and massing achieving a humanistic scale. The subtly articulated building offers a delicate façade to the road and surrounding buildings in keeping with the current pattern along the street.

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Daniel Mulcahy
MJ Neal FAIA

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Blair Keenan

The overall design of both the building and garden will achieve a contemporary aesthetic through a selected palette of materials, shapes, textures, and colours while maintaining an appropriate scale to the adjacent surrounding developments and neighbourhood.

STEVE ZAPPIA
Marchese Partners International
Principal
Reg.NSW 6535

PLANNING
BUILDING
HERITAGE
URBAN DESIGN

CITY PLAN SERVICES

BUILDING CODE OF AUSTRALIA ASSESSMENT REPORT

Project: 23-29 Pacific Parade, Dee Why (Stage 2)

Client: Dee Why Properties Pty Ltd
Report: 132312.3
Date: 17 September 2014

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CITY PLAN HERITAGE PTY LTD ABN 46 103 185 413

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Report Revision History
Report No: RE 132312.3

Revision	Date Issued	Comment	Prepared By	Verified By
00	28.10.13	Draft issue for comment	Alison Domenici 	Brendan Bennett 
1	10.12.13	Final issue to client	Alison Domenici 	Brendan Bennett 
2	10.12.13	Minor amendments for final issue to Client	Alison Domenici 	Brendan Bennett 
3	17.09.14	Remove 16-22 Sturdee Parade site + upper level + update to BCA14	Brendan Bennett 	Brendan Bennett 

EXECUTIVE SUMMARY

The development, the subject of this report, is for the construction of a multi-storey residential building facing 23-29 Pacific Parade, Dee Why consisting of seven residential storeys and two storeys of basement carparking. The proposed building will be used for residential purposes only.

This report has been prepared, on behalf of our client Dee Why Properties Pty Ltd, to establish compliance to the Building Code of Australia 2014 and relevant Acts and Regulations for the proposed works.

The design as proposed is capable of complying with the Building Code of Australia, and will be subject to construction documentation that will provide appropriate details to demonstrate compliance. This report has identified areas of the plans which will be amended to show compliance with the deemed-to-satisfy provisions of the BCA.

1.0 INTRODUCTION

1.1 General

The development, the subject of this report, is for the construction of a multi-storey residential building facing 23-29 Pacific Parade, Dee Why consisting of seven residential storeys and two storeys of basement carparking.

The subject property is located within the local government area of Warringah Council. The consent authority for a development application is Warringah Council.

1.2 Purpose of the Report

This report has been prepared, on behalf of Dee Why Properties Pty Ltd, to establish compliance with the Building Code of Australia, for the purpose of a planning development application.

1.3 Report Basis

This report is based on:

i. Preliminary architectural plans prepared by the Marchese Partners as detailed in Appendix 1.

ii. The Building Code of Australia 2014 Volume one, inclusive of NSW variations (See Note 1).

Note 1: The Building Code of Australia 2014 was adopted on 01 May 2014 in New South Wales (NSW). The amendment of the BCA in force at the date of lodgement of the Building Application is the version called up for building design. Consideration must be given to the requirements of the Building Code of Australia (BCA) 2014 to ensure compliance of all proposed works. Below is a list of items that need to be addressed to ensure compliance is achieved.

1.4 Exclusions & Limitations

i. Structural design, and
ii. The Disability Discrimination Act 1992 (access for people with disabilities has been assessed in accordance with Part D3 of the BCA, however additional measures may be required to be provided subject to the Disability Discrimination Act 1992), and
iii. Disability (Access to Premises – Building) Standards 2010, and
iv. No liability is accepted for the accuracy of the documents prepared by others which form the basis of this analysis, and
v. No liability is accepted for the use of the findings of this report outside the set design criteria or by any third party, and
vi. Changes to the development in the future may invalidate the findings of this report. Therefore if the design changes this report will need to be updated.

2.0 BUILDING CODE OF AUSTRALIA ASSESSMENT

2.1 Classification (A3.2)

The proposed building consists of;

Basement B1 – B2 – Class 7a Carparking
Ground - Level 06 – Class 2 Residential sole-occupancy units

2.2 Effective Height (A1.1)

The proposed building will have an effective height of less than 25 m.

2.3 Rise in Storeys (C1.2)

The proposed building will consist of a rise in storeys of eight (7).

2.4 Type of Construction (C1.1)

Type A construction in accordance with Specification C1.1 of the BCA, is the applicable type of construction for the building.

3.0 BUILDING CODE OF AUSTRALIA ASSESSMENT

3.1 Structure (BCA Section B)

BCA Clause	Title	Assessment and Comment	Status
B1.1	Resistance to actions	The resistance of the building must be greater than the most critical action effects resulting from different combinations of actions. The construction documentation is to demonstrate compliance with this requirement.	Note
B1.2	Determination of individual actions	The building is to be designed and constructed to accommodate the magnitude of individual actions generally covering; (a) Permanent actions (b) Imposed actions (c) Wind, snow and ice and earthquake actions (d) Other specified actions A structural engineer is to provide design certification at the Construction Certificate stage that the building has been designed to the relevant structural standards and maintain appropriate supervision during construction to certify that the structure has been constructed in accordance with the design. Attention should be given to providing suitable crash barriers to the carparking levels adjacent to vehicle ramps/changes in levels.	The proposed building is capable of complying
B1.4	Determination of structural resistance of materials & forms of construction	The structural resistance of the following materials and forms of construction must be determined; (a) Masonry (b) Concrete construction (c) Steel construction (d) Composite steel and concrete (e) Aluminium construction (f) Timber construction (g) Piling (h) Glazing assemblies (i) Termite risk management (j) Roof construction (k) Particleboard structural flooring A structural engineer is to provide design certification at the Construction Certificate stage that the building has been designed to the relevant structural standards and maintain appropriate supervision during construction to certify that the structure has been constructed in accordance with the design.	The proposed building is capable of complying

3.2 Fire Resistance (BCA Section C)

BCA Clause	Title	Assessment and Comment	Status
C1.1	Type of construction required	The type of fire resisting construction applicable is Type A construction. Type A construction is the highest of the fire resistant types of construction. (Refer to Item 3.3 of this report – Specification C1.1 Fire-resisting Construction)	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
C1.8	Lightweight construction	If lightweight construction is to be specified for a wall system or for the fire-resisting covering of a steel column, it shall be designed and installed to comply with the provisions of Specification C1.8 and satisfy the relevant tests.	The proposed building is capable of complying
C1.10	Fire hazard properties	Proposed floor materials, floor coverings, wall and ceiling lining materials are to be selected to comply with the required fire hazard properties of Specification C1.10. Evidence of compliance (test certificates) shall be obtained from the supplier or manufacturer.	The proposed building is capable of complying
C1.11	Performance of external walls in fire	Concrete external walls that could collapse as complete panels (e.g. tilt-up and pre-cast concrete) must comply with Specification C1.11.	N/A
C1.12	Non-combustible materials	Materials identified in this clause, though combustible or containing combustible fibres, may be used wherever a non-combustible material is required	The proposed building is capable of complying
C2.2	General floor area & volume limitations	Limitations not applicable to class 2 building and the basement storey would comply with the limitations	The building design complies
C2.6	Vertical separation of openings in external walls	In a building of Type A construction, any part of a window or other opening in an external wall is above another opening in the storey next below and its vertical projection falls not further than 450 mm outside the lower opening (measured horizontally), the openings must be separated by- (i) A sprandrel which:- (A) is not less than 900mm height; and (B) Extends not less than 600mm above the upper surface of the intervening floor; and (C) is of non-combustible material having an FRL of not less than 60/60/60; or (ii) Part of a curtain wall that complies with (i) (iii) Construction that complies with (i) behind a curtain wall, and has any gaps packed with a non-combustible material that will withstand thermal expansion, and structural movement of the walling without the loss of seal against fire and smoke; or (iv) A slab or other horizontal construction that- (A) Projects outwards from the external face of the walls not less than 1100mm; and (B) Extends along the wall not less than 450mm beyond the openings concerned; and (C) Is non-combustible and has an FRL of not less than 60/60/60 The residential portions of the development is not proposed to be provided with a sprinkler system and therefore spandrel protections are required for vertical separation. Of particular note is protection required to where full height windows/doors are used above the floor below where there is no slab or horizontal construction that projects outwards. Furthermore special attention would be required to spandrel design and construction to where large openings in the carpark are situated below the floor above, and panels walls are depicted under openings. The construction documentation is to demonstrate compliance with this clause.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
C2.7	Separation by firewalls	The proposed building is to be separeated by fire walls complying with (b) of this clause. The roof of the carpark to be be 120/120/120 construction and no openings exist within 3metres of the roof.	The proposed building is capable of complying
C2.8	Separation of classifications in the same storey	Not applicable.	N/A
C2.9	Separation of classifications in different storeys	The building can achieve separation between the residential storeys and the basement carparking by relying on the reinforced concrete floor construction. The construction documentation is to identify the FRL of floor slabs to demonstrate compliance.	The proposed building is capable of complying
C2.10	Separation of lift shafts	The construction documentation is to identify the relevant FRL of the lift shafts in accordance with this provision and Table 3 of Specification C1.1.	The proposed building is capable of complying
C2.11	Stairways and lifts in one shaft	The lift & stair shafts are separated.	The proposed building complies
C2.12	Separation of equipment	The following equipment is to be fire separated from the remainder of the building by 120/120/120 FRL construction: • Lift motor rooms and lift control panels. • Emergency generators; • Central smoke control plant; • Boilers; • Batteries; The construction documentation is to identify compliance with this requirement.	The proposed building is capable of complying
C2.13	Electricity supply system	The following equipment, if installed in the building, is required to be fire separated from the remainder of the building by 120/120/120 FRL construction: • An electricity substation • A main switchboard • Electrical conductors supplying either of the above Doorways in that construction must be protected with a self-closing fire door having an FRL of at least -/120/30. In all switchboards, non-emergency switchgear must be separated from emergency switchgear by metal partitions designed to minimise the spread of a fault from the non-emergency switchgear.	The proposed building is capable of complying
C2.14	Public corridors in Class 2 building	Levels 1 to 4 of the building does not have enclosed public corridors. It is the design intent that the corridors servicing these levels are to form an “open” corridor.	The proposed building is capable of complying
NSW C3.2	Protection of openings in external walls	Openings in an external wall that is required to have an FRL that are exposed to relevant fire-source features should be protected. Generally the West, North and South walls have openings exposed within 3 metres of the West boundary. Openings should be protected in accordance with C3.4 and if wall-wetting sprinklers are used they are to be located externally. Particular attention is drawn to where natural ventilation requirements for habitable rooms may cause conflict with compliance with C3.4.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
C3.3	Separation of external walls and associated openings in different fire compartments	There are no different fire compartments exposed to each other.	N/A
C3.4	Acceptable methods of protection	Where protection is required, doorways, windows and other openings must be protected as follows: • Doorways I. Internal or external wall-wetting sprinklers to self closing or automatic closing doors. II. -/60/30 self closing or automatic closing doors. • Windows III. Internal or external (as appropriate) wall-wetting sprinklers that are automatic or permanently fixed in the closed position. IV. -/60/- fire windows. V. -/60/- automatic fire shutters. • Other openings VI. Internal or external wall-wetting sprinklers as appropriate. VII. Construction having FRL not less than -/60/-.	Note
C3.5	Doorways in fire walls	There are no doorways proposed in the firewall at basement levels. Not applicable.	N/A
C3.6	Sliding fire doors	Sliding fire doors are not proposed. These may be provided to reduce the fire compartment size in the carpark to under 40 carpark spaces and therefore this clause may become applicable. The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying
C3.8	Openings in fire isolated exits	Fire doors opening into required fire-isolated stairs are to be -/60/30 fire doors as required by this clause.	The proposed building is capable of complying
C3.9	Service penetrations in fire isolated exits	Only services permitted by this clause are to penetrate through fire isolated exits.	The proposed building is capable of complying
C3.10	Fire isolated lift shafts	Lift doors are to be -/60/- fire doors and comply with this provision. The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying
NSW C3.11	Bounding construction	The bounding corridor to the units should meet the requirements laid out in C1.1 for FRL required. All entrance doorways to residential sole occupancy units are to be -/60/30 self closing fire doors. Any other door in the bounding corridor if it provides access from a room not within a sole-occupancy unit to the public corridor must also be protected by -/60/30 fire doors. Protection is also required to be provided where a path of travel to an exit does not provide a person seeking egress with a choice of travel in different directions to alternative exits and is along an open balcony, landing or the like, and passes an external wall of another sole-occupancy unit and a room not within a sole-occupancy unit. Within the subject development the path of travel on the ground floor has to pass by other residential units via open	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
		landing before they have access to the fire stairs. These units are as follows and should be protected as discussed below: Ground level: • G.15, passes by G.14 before it is exposed to alternatives. Also G.08, G.09, G.07, all pass each other before they are exposed to an alternative; Furthermore upper levels have units set back which have to initially pass by other units on an intended open balcony before they are exposed to alternative exits: Levels 1 & 2 • 1.01, 1.02, 1.03, 1.17, 1.15 have to pass by each other before they are exposed to alternatives; Levels 3 • 3.03, 3.02, 3.01 and 3.15, have to pass by each other before they are exposed to alternatives; Level 5; • All units have to pass by others before they can seek access to a single exit. It also may be that the corridor to this part of the building is not an "open corridor/balcony" which will be clarified during design documentation and therefore bounding construction FRLs may just be applicable; Level 6 • All units have to pass by others before they can seek access to a single exit. It also may be that the corridor to this part of the building is not an "open corridor/balcony" which will be clarified during design documentation and therefore bounding construction FRLs may just be applicable; The protection to be provided is as follows:- The external wall must:- (i) Be constructed of concrete or masonry, or be lined internally with a fire-protective covering; and (ii) Have any doorway fitted with a self-closing, tight-fitting solid core door not less than 35 mm thick; and (iii) Have any windows or other openings- (A) Protected internally in accordance with C3.4 of the BCA; or (B) Located at least 1.5m above the floor of the balcony, landing or the like/ The construction documentation is to demonstrate compliance with this requirement.	
C3.12	Openings in floors and ceilings for services.	Services passing through floors required to have an FRL and ceilings required to have a resistance to the incipient spread of fire must be protected by a shaft that will not reduce the fire performance of the building element it penetrates, or protected in accordance with Clause C3.15.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
C3.15	Openings for service installations	Services that penetrate a building element that is required to have an FRL must be protected utilising one of the options listed under this clause. Where polybutyelene (plastic) pipes are proposed for domestic water supply, or UPVC pipes and fire collars for mechanical sub-ducts, they must be supported by the appropriate test data from a registered laboratory demonstrating compliance with C3.15 (a).	The proposed building is capable of complying
C3.16	Construction joints	Construction joints, spaces and the like in and between building elements required to be fire-resisting with respect to integrity and insulation must be protected in a manner identical with a prototype tested in accordance with AS 1530.4 to achieve the required FRL.	The proposed building is capable of complying

3.3 Fire-Resisting Construction (Specification C1.1)

BCA Clause	Title	Assessment and Comment	Status
2.1	Exposure to fire source features	The subject building is exposed to boundaries as fire source features.	Note
2.2	Fire protection for support of another part	Elements which have an FRL and rely upon the direct vertical or lateral support from another element to maintain its FRL, the supporting part must have the same fire resistance. The building is to be designed to comply with this provision.	The proposed building is capable of complying
2.3	Lintels	Lintels are required to have an FRL where required. The building is to be designed to comply with this provision.	The proposed building is capable of complying
2.4	Attachments not to impair fire resistance	Any attachments such as louvres over windows, external wall cladding to the façade or any type of combustible material must comply with this requirement and not be installed directly above or near an exit, so that it will not constitute a risk of fire spread via the façade and must comply with C1.10 above. Glass louvers and other non-combustible external materials are proposed.	The proposed building is capable of complying
2.5	General concessions	A requirement for an external wall to have an FRL does not apply to a curtain wall or panel wall which is of non-combustible construction and fully protected by automatic external wall-wetting sprinklers. A balcony, verandah or the like and any incorporated supporting part, which is attached to or forms part of a building need not comply with FRL requirements listed under Table 3 as they do not form part of the only path of travel to a required exit from the building but only where they are situated not more than 2 storeys above the lowest storey providing direct egress to the road, any supporting columns are of non-combustible construction. The other concessions would generally not apply to this building.	Note
2.7	Enclosure of shafts	The building is to be designed to comply. The construction documentation is to demonstrate compliance with this requirement.	

BCA Clause	Title	Assessment and Comment	Status
3.1	Fire resistance of building elements	The proposed new building work is required to be designed to comply with the required fire resistance levels applicable to Type A construction. A building element & any columns or beam incorporated in it must achieve the FRL specified in Table 3. Any internal wall required to have an FRL with respect to integrity and insulation must extend to- (i) The underside of the floor next above; or (ii) the underside of the roof complying with Table 3; (iii) roof subject to Clause C3.5, the wall should extend to the underside of the non-combustible roof covering and except for roof battens with dimensions of 75 mm x 50 mm or less or sarking-type material, must not be crossed by timber or other combustible building elements; or (iv) a ceiling that is immediately below the roof and has a resistance to the incipient spread of fire to the roof space between the ceiling and the roof of not less than 60 minutes; External walls, common walls and the flooring and floor framing of lift pits must be non-combustible. A loadbearing internal wall and a loadbearing fire wall (including those that are part of a loadbearing shaft) must be of concrete or masonry. A non-loadbearing internal wall required to be fire-resisting and shafts such as lift, ventilating, pipe, garbage or similar, must be non-combustible construction. The FRLs specified in Table 3 for an external column apply also to those parts of an internal column that face and are within 1.5m of a window and are exposed through that window to a fire-source feature.	The proposed building is capable of complying
Table 3	FRL of Building Elements	• External load-bearing walls 3 m or more from a FSF 90/60/30 (Class 2), and 120/60/30 (Class 7a) • External columns 3 m or more from a FSF -/-/- for both the carparking and residential parts • Common walls & fire walls 90/90/90 (Class 2) and 120/120/120 (Class 7a) • Internal Walls bounding a public corridor, public lobbies and the like, between SOU's, must have an FRL of 90/90/90 (Class 2) 120/-/- (Class 7a), or if non loadbearing -/60/60 (Class 2) -/-/- (Class 7a) • Fire-resisting stair and lift shafts 90/90/90 (Class 2) and 120/120/120 (Class 7a) and if non-loadbearing -/90/90 (Class 2) and -/120/120 • Ventilating, pipe, garbage and the like shafts not used for the discharge of hot products of combustion-loadbearing 90/90/90 (Class 2), 120/90/90 Class 7a), non-loadbearing -/ 90/ 90 (Class 2 and 7a) • Other load-bearing internal walls, internal beams, internal trusses or internal columns 90/-/-(Class 2), 120/-/- (Class 7a) • Floors 90/90/90 (Class 2) 120/120/120 (Class 7a) • Roofs 90/60/30 (Class 2)	The proposed building is capable of complying
3.5	Roof: Concession	A roof need not comply with Table 3 if its covering is non-combustible and the building is of Class 2.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
3.7	Internal columns and walls; concession	For a building with an effective height of not more than 25m and having a roof without an FRL in accordance with Clause 3.5, in the storey immediately below that roof, internal columns other than fire walls and shaft walls may have in a Class 2 building FRL 60/60/60.	The proposed building is capable of complying
3.9	Carparks	A carpark may comply with Table 3.9 if it is provided with a sprinkler system complying with Specification E1.5 of the BCA and is located below another classification and the floor separating the classifications complies with C2.9. • External wall 3m or more from a FSF -/-/- • Internal wall loadbearing 60/-/- • Non-loadbearing -/-/- • Fire wall; from the direction used as a carpark 60/60/60 and from the direction not used as a carpark as required by Table 3 • Steel column that does not support a part of a building that is not used as a carpark 60/-/- or 26m2/tonne or any other column 60/-/- • Steel floor beam in continuous contact with a concrete floor slab 60/-/- or 30m2/tonne or any other beam 60/-/- • Fire resisting lift and stair shaft (within the carpark only) 60/60/60 • Floor slab and vehicle ramp 60/60/60	The proposed building is capable of complying

3.4 Access & Egress (BCA Section D)

BCA Clause	Title	Assessment and Comment	Status
D1.2	Number of exits required	The building generally is required to be provided with a minimum of one exit from each storey. In respect to the basement carparks not less than 2 exits should be provided from an storey if egress from that storey involves a vertical rise within the building of not more than 1.5m. The building complies.	The building complies
D1.3	When fire isolated exits are required	Every required exit serving a building must be fire isolated if the exit stair connects and/or pass through more than 3 consecutive storeys of Class 2 residential and for the Class 7a part where it connects and/or passes through more than 2 consecutive storeys. The proposed stairs are required to be fire-isolated in the building.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
D1.4	Exit travel distances	The entrance doorway of any sole-occupancy unit must be not be more than 6m from an exit or from a point from which travel in different directions is available or 20m from a single exit serving the storey at the level of egress to a road or open space. Ground level: Egress has access to alternative exits. Level 1, 2, 3 and 4: Egress complies Level 5: Units 5.02, 5.03, 5.04, 5.05 and 5.09 have more than 6m to an exit (8.1m worst case) Level 6: Units 6.01, 6.02, 6.03, 6.04 have more than 6m to an exit (8.3m worst case) It is proposed to justify these extended travel distances to Levels 5 - 6 under an alternative solution by a suitably qualified fire engineer. The basement carpark levels should have no point of the floor more than 20m from an exit, or a point from which travel in different directions to 2 exits is available, in which case the maximum distance to one of those exits must not exceed 40m. Basement levels comply.	The building complies **An alternative solution is proposed** The building complies
D1.5	Distance between exits	Alternative exits to the residential and basement carpark levels where provided are within the allowable limits of this clause.	The building complies
D1.6	Dimensions of exits and paths of travel to exits	A required exit or path of travel to an exit are required to be a minimum unobstructed height of not less than 2m and minimum width of 1m.	The building complies
D1.7	Travel via Fire-isolated exits	Each fire-isolated stair must discharge directly, or by way of its own fire-isolated passageway:- (i) to a road or open space; or (ii) to a point- (A) in a storey or space, within the confines of the building, that is used only for pedestrian movement, car parking or the like and is open for at least 2/3 of its perimeter; and (B) from which an unimpeded path of travel, not further than 20 m, is available to a road or open space; or (iii) into a covered area that- (A) adjoins a road or open space; and (B) is open for at least 1/3 of its perimeter; and (C) has an unobstructed clear height throughout, including the perimeter openings, of not less than 3m; and	

BCA Clause	Title	Assessment and Comment	Status
		(D) provides an unimpeded path of travel from the point of discharge to the road or open space of no more than 6m The building complies. Where a path of travel from the point of discharge of a fire-isolated exit necessitates passing within 6m of any part of an external wall of the same building, measured horizontally at right angles to the path of travel, that part of the wall must have- (i) an FRL of not less than 60/60/60; and (ii) any openings protected internally in accordance with C3.4, for a distance of 3 m above or below, as appropriate, the level of the path of travel, or for the height of the wall, whichever is the lesser. Pacific Parade; FS01 discharges to the West side of the building to concrete footpath which discharges people egressing to Pacific Parade but the path of travel is within 6m of the building and therefore protection is required. Alternatively a fire engineered solution may be provided to justify alternative means of complying with protecting discharge for people egressing the building. Design documentation to be provided at Construction Certificate stage.	The building complies **An alternative solution is proposed**
D1.8	External Stairs or ramps in lieu of Fire-isolated exits	No external open stairs are acting in lieu of fire–isolated stairs.	N/A
D1.9	Travel by non fire isolated stairways or ramps	There are no proposed required non-fire isolated stairs.	N/A
D1.10	Discharge from exits	The path of travel from exits to the road from the building must have an unobstructed width of not less than 1 metre. The path of travel to the road must be by a ramp or other incline having a gradient not steeper than 1:8 at any part. Access to the stairs in the basement levels of the building may be affected by cars. It is recommended that bollards are provided to restrict access to stair issues. The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying
D1.13	Number of persons accommodated	Populations have been assessed in accordance with Table D1.13 in accordance with the proposed uses.	Note

BCA Clause	Title	Assessment and Comment	Status
D1.16	Plant rooms and lift machine rooms and electricity network substations: Concession	The BCA allows concessions for plant rooms with floor areas less than 100m^2 and areas less than 200 m^2. Within these limitations plant rooms can be serviced by a ladder in lieu of a stairway and a stair and ladder in combination. Details are to be provided with the construction documentation.	The proposed building is capable of complying
D1.17	Access to lift pits	Access to lift pits must- (a) Where the pit depth is not more than 3 m, be through the lowest landing doors; or (b) Where the pit depth is more than 3 m, be provided with a access doorway complying with this clause. Details are to be provided with the construction documentation.	The proposed building is capable of complying
D2.1	Application of part	The stairways and any ramps are to comply with this provision.	Note
D2.2	Fire-isolated stairways and ramps	The proposed fire exit stairs are to be designed to comply with the requirements of this clause.	The proposed building is capable of complying
D2.3	Non-fire isolated stairs and ramps	There are no required non-fire isolated stairs in the building.	N/A
D2.4	Separation of rising and descending stair flights	The proposed fire-isolated stairs should have their rising and descending stairs separated (between basements and upper levels at the level of egress). The construction separating or common to the rising and descending flights must be non-combustible and smoke proof in accordance with Clause 2 of Specification C2.5. Details are to be provided with the construction documentation.	The proposed building is capable of complying
D2.7	Installation in exits and paths of travel	Proposed services or equipment comprising electricity meters, distribution boards, central telecommunication distribution boards / equipment, electrical motors or other motors serving equipment in the building, can be installed in corridors or the like leading to a required exit if the services or equipment are enclosed with non-combustible construction or appropriate fire-protective covering and doorways suitably sealed against smoke spread from the enclosure. Gas or other fuel services are not permitted in a required exit. NB: The internal part of a SOU is excluded from this provision	The proposed building is capable of complying
D2.8	Enclosure of space under stairs and ramps	Enclosure of space under stairs is not proposed.	The building complies
D2.9	Width of stairways	The required width of the stairways must be measured clear of all obstructions such as handrails, projecting parts of balustrades or other barriers and the like and extend to a height, without interruption, of 2 metres vertically above a line along the nosings of the treads or the floor of the landing.	The proposed building is capable of complying
D2.10	Pedestrian ramps	No pedestrian ramps are proposed within the fire isolated exits.	N/A
D2.11	Fire-isolated passageways	The enclosing construction of a fire-isolated passageway must have an FRL when tested for a fire outside the passageway in another part of the building of the same rating as the fire stair to which it is attached.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
D2.13	Goings & risers	Goings and risers are to be designed to comply with this clause, including opening sizes, going and riser dimensions and non-slip finish or non-skid nosing. Construction documentation should demonstrate compliance.	The proposed building is capable of complying
D2.14	Landings	Landings are to be designed in accordance with this clause. The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying
NSW D2.15	Thresholds	Thresholds are to be designed to comply. The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying
NSW D2.16	Balustrades and other barriers	Balustrades are to be designed to comply with this clause. The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying
D2.17	Handrails	Handrails are to be designed to comply with this clause. The current documentation does not contain this level of detail. The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying
D2.18	Fixed platforms, walkways, stairways & ladders	Fixed platforms within plant rooms are to be designed to comply with AS1657. The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying
NSW D2.19	Doorways and doors	Hinge doors are proposed for all exit doors.	The building complies
D2.20	Swinging doors	Exit doors, or doors forming part of the exit, are required to swing in the direction of egress. Egress doors indicated swing in the direction of egress.	The proposed building complies
NSW D2.21	Operation of latch	All the doors in the required exits must be readily openable without a key from the side that faces a person seeking egress, by a single hand downward or pushing action on a single device which is located between 900mm and 1.1m from the floor except if it is a sole-occupancy unit in a Class 2 building. The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying
D2.22	Re-entry from fire isolated exits	Not applicable.	N/A
D2.23	Signs on doors	Statutory signage is to fire isolated exit doors.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
D2.24	Protection of openable windows	A window must be provided with protection if the floor below the window is 2m or more above the surface of a bedroom in a Class 2 building. Where the lowest level of the window opening is less than 1.7m above the floor, the openable portion of the window must be protected with A) a device to restrict the window opening or B) a screen with secure fittings. A device or screen on the applicable windows must; A) Not permit a 125mm sphere to pass through the window opening or screen B) Resist an outward horizontal action of 250N against the- (aa) window restrained advice or (bb) Screen protecting the opening and C) Have a child resistant release mechanism if the screen /device is capable to be removed. This item also requires a barrier not less than 865mm above the floor and satisfying the design requirements of a barrier under this clause. For any openable windows less than 865mm situated 4m or more above the surface beneath, a barrier is required as designed by this clause. Construction details to show measurements of compliance or protection methods to satisfy this latest requirement of BCA 2013.	The proposed building is capable of complying
D3.1	General building access requirements	Access for people with a disability must be provided from a pedestrian entrance to at least 1 floor containing sole-occupancy units and to the entrance doorway of each sole-occupancy unit located on that level. Access must also be provided to common rooms and areas in accordance with this clause. Access must be provided, where a ramp complying with AS1428.1 or a passenger lift is installed to the entrance doorway of each sole-occupancy unit and to and within rooms or spaces for use in common by the residents located on the levels served by the lift or ramp. Access generally appears able to comply. The construction documentation is to demonstrate full compliance with this requirement.	The proposed building is capable of complying
D3.2	Access to building	An accessway must be provided to the building from the principal entries through the common areas at all levels. The entries to the building is proposed to comply. The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
D3.3	Parts of building to be accessible	The building is required to be accessible for peoples with disabilities and the following measures are required:- (a) Every passenger lift must comply with E3.6; (c) Accessways must have- (i) passing spaces complying with AS1428.1-2009 at maximum 20 m intervals on those parts of an accessway where a direct line of sight is not available; and (ii) turning spaces complying with AS1428.1-2009 (A) within 2 m of the end of accessways where it is not possible to continue travelling along the accessway; and (B) at maximum 20 m intervals along the accessway; The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying
D3.4	Exemptions	Areas identified by this clause are not required to be accessible.	Note
D3.5	Accessible carparking	No accessible carparking spaces are required under the BCA. Please note that Council's Access Code may have requirements for adaptable units and associated carparks separate to BCA requirements.	Note
D3.6	Signage	This clause does not apply to the subject development	N/A
D3.7	Hearing augmentation	This clause does not apply to the subject development	N/A
D3.8	Tactile indicators	Tactile ground surface indicators complying with AS/NZS 1428.4.1-2009 are to provided to warn people who are blind or have vision impairment that they are approaching a stairway (but not a fire-isolated stair) or ramp.	The proposed building is capable of complying
D3.11	Ramps	Series of connected ramps must not have a combined vertical rise of more than 3.6m and a landing for a step ramp must not overlap a landing for another step ramp or ramp.	The proposed building is capable of complying
D3.12	Glazing on an accessway	On a accessway, all frameless or fully glazed doors, sidelights and any glazing capable of being mistaken for a doorway or opening must be clearly marked in accordance with AS 1428.1-2009. No frameless or fully glazed doors are proposed on the accessway.	N/A

3.5 Services & Equipment (BCA Section E)

BCA Clause	Title	Assessment and Comment	Status
E1.3	Fire hydrants	The building is required to be served by a fire hydrant system complying with this clause. The construction documentation is to demonstrate compliance with this requirement. The booster location, as yet not indicated, should be located within sight of the main entrance and where within 10 m of the building should be protected in accordance with clause 7.3(c) of AS2419.1. The pump room is proposed to be located at basement level but has door with direct connection to the fire-isolated stair and is therefore able to comply.	The proposed building is capable of complying
E1.4	Fire hose reels	The building is required to be served by a fire hose reel system complying with this clause. The construction documentation is to demonstrate compliance with this requirement.	The proposed building is capable of complying
E1.5	Sprinklers	The basement carpark is required to be served by a sprinkler system as more than 40 vehicles are accommodated. The carpark levels may be fire-separated at each level so that each carpark level contains less than 40 vehicles and no sprinkler protection is required. An alternative fire engineered solution meeting the performance provisions of the BCA may be required should any proposed fire shutter not meet the requirements of a fire wall and openings within it. The sprinkler valve room is proposed to be located at basement level but is required to be located in a secure room which has direct access to a road or open space under Specification E1.5 of the BCA. It may be suitable to justify to the location of the valve room through a alternative solution by a suitably qualified fire engineer.	The proposed building is capable of complying An alternative solution is proposed
E1.6	Portable fire extinguishers	Portable fire extinguishers are to comply with this provision and must be selected, located and distributed in accordance with Sections 1, 2, 3 and 4 of AS2444.	The proposed building is capable of complying
E1.9	Fire precautions during construction	As the building is under construction, not less than one fire extinguisher to suit Class A, B and C fires and electrical fires must be provided at all times on each storey adjacent to each required exit or temporary stairway or exit.	The proposed building is capable of complying
E1.10	Provision for special hazards	Suitable additional provision must be made if special problems of fighting fire could arise because of the nature or quantity of materials stored, displayed or used in a building or on the allotment, or the location of the building in relation to water supply for fire fighting purposes.	N/A

BCA Clause	Title	Assessment and Comment	Status
E2.2	General requirements	The following smoke hazard systems are required; • Automatic shutdown of air-handling system. The construction documentation is to demonstrate compliance with this requirement. • Automatic smoke detection and alarm system to all parts of the residential storeys in accordance with Specification E2.2a. The construction documentation is to demonstrate compliance with this requirement. • Where a required fire-isolated stairway serves both the Class 2 parts and the 7a carpark, the carpark must be provided with- (A) Automatic air pressurisation system for fire-isolated exits in accordance with AS/NZS 1668.1; or (B) An automatic smoke detection and alarm system complying with Specification E2.2a; or (C) A sprinkler system complying with Specification E1.5; • Mechanical ventilation to carpark in accordance with AS 1668.2 & Clause 5.5 of AS 1668.1. The construction documentation is to demonstrate compliance with this requirement. • Fire-isolated exit stairs serving more than 2 below ground storeys, including any associated fire-isolated passageways, must be provided with an automatic air pressurisation system for fire-isolated exits in accordance with AS/NZS 1668.	The proposed building is capable of complying
E3.2	Stretcher facility in lifts	Stretcher lifts are required to be provided to building with an effective height of more than 12m. The lift should be able to accommodate a clear space of not less than 600 mm wide x 2000mm long x 1400 mm high above the floor level. The proposed lifts are capable of complying.	The proposed building is capable of complying
E3.3	Warning against use of lifts in fire	Warning signage for the passenger lifts is to be provided in accordance with this clause. The construction documentation is required to demonstrate compliance with this requirement.	The proposed building is capable of complying
E3.4	Emergency Lifts	Not applicable.	N/A
E3.5	Landings	Access and egress from the lift well landing complies with this provision.	Complies
E3.6	Passenger lifts	The lifts are to be designed to comply with the appropriate Australian standard specified in Table E3.6a, have accessible features in accordance with Table E3.6b and not rely on a constant pressure device for its operation if the lift car is fully enclosed. The construction documentation is required to demonstrate compliance with this requirement.	The proposed building is capable of complying
E3.7	Fire service controls	The lift is to be provided with fire services controls in accordance with this provision. The construction documentation is required to demonstrate compliance with this requirement.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
E3.9	Fire service recall operation switch	Fire service recall control switch required by E3.7 to comply with the details of this clause. The construction documentation is required to demonstrate compliance with this requirement.	The proposed building is capable of complying
E3.10	Lift car fire service drive control switch	The lift car fire service drive control switch required by E3.7 to comply with the details of this clause. The construction documentation is required to demonstrate compliance with this requirement.	The proposed building is capable of complying
E4.2	Emergency lighting requirements	Emergency lighting is to be provided in accordance with this clause.	The proposed building is capable of complying
E4.4	Design and operation of emergency lighting	The required emergency lighting system must comply with AS2293.1	The proposed building is capable of complying
E4.5	Exit signs	Exit signs are to be provided in accordance with this clause. The construction documentation should indicate compliance with this requirement.	The proposed building is capable of complying
NSW E4.6	Directional exit signs	Directional exit signage system is to be provided in accordance with this clause. The construction documentation should indicate compliance with this requirement.	The proposed building is capable of complying
E4.7	Class 2 and 3 building and Class 4 parts: Exemptions	E4.5 does not to- (a) A Class 2 building in which every door referred to is clearly and legibly labelled on the side remote from the exit or balcony- (i) with the word “EXIT” in capital letters 25 mm high in a colour contrasting with that of the background; or (ii) by some other suitable method; and (b) an entrance door of a sole-occupancy unit in a Class 2 building	The proposed building is capable of complying
E4.8	Design and operation of exit signs	All exit signs must comply with AS2293.1-2005 and be clearly visible at all times.	The proposed building is capable of complying

3.6 Health & Amenity (BCA Section F)

BCA Clause	Title	Assessment and Comment	Status
F1.0	Deem to satisfy provisions	Performance requirement FP1.4, for the prevention of the penetration of water through external walls, is required to be complied with. Details are to be provided with construction documentation.	The proposed building is capable of complying
F1.1	Stormwater drainage	Stormwater drainage is required to be designed to comply with AS/NZS3500.3. Particular attention is to be paid to any specific requirement of Council. Construction documentation should demonstrate compliance.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
F1.4	External above ground membranes	Waterproofing membranes for external above ground use must comply with AS4654 Parts 1 and 2.	The proposed building is capable of complying
F1.5	Roof coverings	The roof covering is to provide weatherproofing in accordance with this provision. The construction documentation should indicate compliance with this requirement.	The proposed building is capable of complying
F1.6	Sarking	Sarking-type materials used for weatherproofing of roofs and walls are required to comply with AS/NZS 4200 Parts 1 and 2. Construction documentation should demonstrate compliance.	The proposed building is capable of complying
F1.7	Waterproofing of wet areas in building	In a Class 2 building, building elements in wet areas must be water resistant or waterproof in accordance with Table F1.7 and comply with AS3740. Construction documentation should demonstrate compliance.	The proposed building is capable of complying
F1.9	Damp-proofing	Damp proof course is required to be provided to walls to comply with this clause. Construction documentation should demonstrate compliance.	The proposed building is capable of complying
F1.10	Damp-proofing of floor on ground	Moisture from the ground must be prevented from reaching the upper surface of the floor and adjacent walls by the insertion of a vapour barrier in accordance with AS2870 for all floors of rooms laid out on the ground.	The proposed building is capable of complying
F1.11	Provision of floor wastes	The floor of each bathroom and laundry located at any level above a sole-occupancy unit must be graded to permit drainage to a floor waste. Construction documentation should demonstrate compliance.	The proposed building is capable of complying
F1.12	Sub-floor ventilation	The sub-floor space between a suspended floor of a building and the ground must be installed in accordance with this clause.	The proposed building is capable of complying
F1.13	Glazed assemblies	Glazed assemblies to comply with AS 2047 as applicable, other than those not located in an external wall.	The proposed building is capable of complying
F2.1	Facilities in residential building	Each sole occupancy unit (SOU) is to be provided with the minimum facilities for a Class 2 building. Each SOU should contain a kitchen sink, food preparation area, a bath or shower, a closet pan and washbasin, clothes washing facilities including at least one washtub and space for a washing machine and space for clothes drying facilities. The plans do not indicate this level of detail. Construction documentation should demonstrate compliance. As the building contains more than 10 SOU's in total, a closet pan and washbasin must be provided in a compartment or room at or near ground level, accessible to all employees, without entering a SOU. This is proposed in the basement level. Construction documentation should demonstrate compliance.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
F2.5	Construction of sanitary compartments	Sanitary compartments are to comply with this provision. Particular attention is required to bathrooms that have less than 1.2m clearance from the pan to the door opening.	The proposed building is capable of complying
F3.1	Height of rooms and other spaces	The floor to ceiling heights are required as follow; • Kitchen & laundry – 2.1m. • Corridor & passageway – 2.1m. • Habitable room – 2.4m. • Carpark – 2.4m. Construction documentation should demonstrate compliance.	The proposed building is capable of complying
F4.1	Provision of natural light	Natural lighting must be provided to all habitable rooms, including kitchens.	The proposed building is capable of complying
F4.2	Methods and extent of natural lighting	Required natural lighting must be provided by windows that have an aggregate light transmitting area measured exclusive of framing members, glazing bars or other obstructions of not less than 10% of the floor area of the room and are open to the sky or face a court or other space open to the sky or open verandah, carport or the like. Natural light in some instances is proposed to be borrowed from an adjacent area (see F4.3). The elevation drawings will be fully detailed through design documentation to show compliance. Construction documentation should demonstrate compliance.	The proposed building is capable of complying
F4.3	Natural light borrowed from adjoining room	Natural light may come through a glazed panel or opening from an adjoining room if- (i) Both rooms are within the same SOU; and (ii) The glazed panel or opening has an area of not less than 10% of the floor area of the room to which it provides light; and (iii) The adjoining room has windows that have an aggregate light transmitting area of not less than 10% of the combined floor areas of both rooms. The windows should also have an area open to the sky or face a court or other space open to the sky or an open verandah. Some habitable rooms propose to borrow light from adjacent rooms or the winter gardens. The plans are not of sufficient detail to clarify the level of provision provided. Construction Certificate documentation should demonstrate compliance.	The proposed building is capable of complying
F4.4	Artificial lighting	The building is to comply with the requirements of this clause. Lighting to all rooms that are frequently occupied, all spaces required to be accessible, all corridors, lobbies, internal stairways, other circulation spaces and paths of egress. Artificial lighting is to be provided in accordance with AS/NZS1680.0. Construction documentation should demonstrate compliance.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
F4.5	Ventilation of rooms	All habitable rooms, bathrooms, laundries and any other room occupied by a person for any purpose must have natural ventilation complying with F4.6 or a mechanical ventilation or air-conditioning system complying with AS1668.2 and AS/NZS3666.1. Construction documentation should demonstrate compliance.	The proposed building is capable of complying
F4.6	Natural ventilation	Natural ventilation provided in accordance with F4.5(a) must consist of permanent openings, windows, doors or other devices that can be opened, with an aggregate opening or openable size not less than 5% of the floor area of the room required to be ventilated and open to a suitable sized court or open space to the sky, or an open verandah, carport or the like, or an adjoining room in accordance with F4.7. Some habitable rooms propose to borrow ventilation from adjacent rooms or the winter gardens. The elevation drawings will be fully detailed through design documentation to show compliance. Construction documentation should demonstrate compliance.	The proposed building is capable of complying
F4.7	Ventilation borrowed from an adjoining room	Natural ventilation to a room may come through a window, opening, ventilating door or other device from an adjoining room if both rooms are within the same SOU and the room to be ventilated is not a sanitary compartment. The window, opening, door or other device must have a ventilating area of not less than 5% of the floor area of the room to be ventilated and the adjoining room window, opening, door or other device with a ventilating area of not less than 5% of the combined floor areas of both rooms.	Note
F5.2	Determination of airborne sound insulation ratings	A form of construction required to have an airborne sound insulation rating must i. Have a required value determined in accordance with AS/NZS 1276.1 or ISO 717 using results from laboratory measurements; or ii. An acceptable form of construction under Spec F5.2.	The proposed building is capable of complying
F5.3	Determination of impact sound insulation ratings	Floors in the building are required to have an impact sound insulation rating and must have the required value for weighted normalised impact sound pressure level with spectrum adaptation term ($L_{n,w} + C_I$) determined in accordance with AS/ISO 717.2 using results from laboratory measurements, or comply with Specification F5.2. Any walls in the building required to have an impact sound rating must be of discontinuous construction having a minimum 20mm cavity between 2 separate leaves and, for masonry, where wall ties are required to connect leaves, the ties are of the resilient type, and for other than masonry, have no mechanical linkage between leaves except at the periphery.	Note
F5.4	Sound insulation rating of floor	Floors between sole-occupancies and between sole-occupancy units and plant room, lift shaft, stairway, public corridors, public lobby or the like or parts of a different classification in the building, the floors must have an $R_w + C_{tr}$ (airborne) not less than 50 and an $L_{n,w} + C_I$ (impact) not more than 62.	The proposed building is capable of complying
F5.5	Sound insulation of walls	A wall in a Class 2 building must; i. have an $R_w + C_{tr}$ (airborne) not less than 50 if it separates SOU's; and ii. have an R_w (airborne) not less than 50 if it separates	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
		a SOU from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification; and iii. have complying discontinuous construction if it separates a bathroom, sanitary compartment, laundry or kitchen in one SOU from a habitable room (other than a kitchen) in another, or a SOU from a plant room/lift shaft. A door may be incorporated in a wall that separates a SOU from a stairway, public corridor, public lobby or the like, provided the door has an R_w not less than 30. Where a wall required to have sound insulation has a floor above, the wall must extend to the underside of the floor above, roof above, or a ceiling that provides the sound insulation required for the wall. Where a wall required to have sound insulation has a roof above, the wall must extend to the underside of the roof above, or a ceiling that provides the sound insulation required for the wall. Construction documentation should demonstrate compliance.	
F5.6	Sound insulation rating of services	Duct, soil, waste or water supply pipes, including a duct or pipe that is located in a wall or floor cavity, that serves or passes through more than one SOU, must be separated from the rooms of any SOU by construction with an $R_w + C_{tr}$ (airborne) not less than 40 if the adjacent room is a habitable room (other than a kitchen) or 25 if the adjacent room is a kitchen or non-habitable room. If a stormwater pipe passes through a SOU it must be separated in accordance with the above ratings.	The proposed building is capable of complying
F5.7	Sound isolation of pumps	A flexible coupling must be installed at the point of connection between service pipes in a building and any circulating or other pump.	The proposed building is capable of complying

3.7 Ancillary Provisions – (NSW Variation (BCA Section G))

BCA Clause	Title	Assessment and Comment	Status
NSW G1.01	Provision for cleaning windows	A building must provide for a safe manner of cleaning any windows located 3 or more storeys above ground level, A building satisfies this requirement where the windows can be cleaned wholly from within the building or provision is made for the cleaning of the windows by a method complying with the Occupational Health and Safety Act 2000 and regulations made under that Act. Details are to be provided with construction documentation.	The proposed building is capable of complying

3.8 Energy Efficiency – (NSW Variation (Section J(A) – Class 2 & 4 buildings)

The provisions of this Section J(A) are designed to complement the requirements of BASIX which are implemented via a Development Consent or Complying Development as applicable. BASIX is a web-based planning tool design to assess the potential performance of certain residential buildings against a range of sustainability indices.

The assessment is based on a building located within Climate Zone 5.

3.8.1 Building fabric (NSW Part J(A)1

BCA Clause	Title	Assessment and Comment	Status
NSW J(A)1.1	Application of part	The Deemed-to-Satisfy Provisions of this part only apply to thermal insulation in a Class 2 building where a development consent specifies that the insulation is to be provided as part of the development.	Note
NSW J(A)1.2	Compliance with BCA provisions	The building must comply with the national BCA provisions of J0.2(b) to (e) except that the reference to "Where required" in J1.2 is deemed to refer to "Where a development consent specifies that insulation is to be provided as part of the development." In addition, a thermal break is required to be provided between external cladding and framing in accordance with J1.3(e) and J1.5(f) as appropriate (national provision). Details are to be provided with the construction documentation submitted with the construction certificate.	The proposed building is capable of complying

3.8.2 Building Sealing NSW Part J(A)2

BCA Clause	Title	Assessment and Comment	Status
NSW J(A)2.1	Application of part	The Deemed-to-Satisfy Provisions of this part apply to a Class 2 building except for a building ventilation opening that is necessary for the safe operation of a gas appliance and parts of buildings that cannot be fully enclosed.	Note
NSW J(A)2.2	Compliance with BCA provisions	Building works are to comply with national BCA clauses J3.2 for flues, J3.4 external doors and windows, J3.5 for exhaust fans, J3.6 for construction of roofs, walls and floors and J3.7 for evaporative coolers.	The proposed building is capable of complying

3.8.3 Air-conditioning and ventilating systems NSW Part J(A)3

BCA Clause	Title	Assessment and Comment	Status
NSW J(A)3.1	Application of part	The Deemed-to-Satisfy Provisions of this part apply to the Class 2 parts of the buildings.	Note
NSW J(A)3.2	Compliance with BCA provisions	Air-conditioning and ventilating systems, time switches, heating and cooling systems and ancillary exhaust systems are to comply with national BCA clauses J5.2, J5.3. J5.4 and J5.5.	The proposed building is capable of complying

BCA Clause	Title	Assessment and Comment	Status
J3.3	Roof lights	Roof lights are required to be sealed or capable of being sealed, where serving a conditioned space or a habitable room in climate zones 4, 6, 7 & 8. Details are to be provided with the construction documentation submitted with the construction certificate.	The proposed building is capable of complying
J3.4	External doors and windows	External windows and doors are required to be sealed to restrict air infiltration. The requirements of this provision do not apply where external windows and doors are designed in accordance with AS2047, to fire doors or louvered windows or doors. Details are to be provided with the construction documentation submitted with the construction certificate.	The proposed building is capable of complying
J3.5	Exhaust fans	An exhaust fan must be fitted with a sealing device to prevent air infiltration in a conditioned space and in climate zones 4, 6, 7 and 8. Details are to be provided with the construction documentation submitted with the construction certificate.	The proposed building is capable of complying
J3.6	Construction of roofs, walls and floors	Roofs, external walls, external floors and any openings are required to be designed and constructed to minimise air leakage. Details are to be provided with the construction documentation submitted with the construction certificate.	The proposed building is capable of complying

3.8.4 Air-conditioning and ventilating systems NSW Part J(A)3

BCA Clause	Title	Assessment and Comment	Status
NSW J(A)3.1	Application of part	The Deemed-to-Satisfy Provisions of this part apply to a Class 2 building.	Note
NSW J(A)3.2	Compliance with BCA provisions	Air-conditioning and ventilating systems, time switches, heating and cooling systems and ancillary exhaust systems are to comply with national BCA clauses J5.2, J5.3. J5.4 and J5.5.	The proposed building is capable of complying

3.8.5 Hot Water Supply NSW Part J(A)4

BCA Clause	Title	Assessment and Comment	Status
NSW J(A)4.1	Application of part	The Deemed-to-Satisfy Provisions of this part apply to a Class 2 building.	Note
NSW J(A)4.2	Compliance with BCA provisions	J7.2 - Hot water supply system for food preparation and sanitary purposes must be designed and installed in accordance with Section 8 of AS/NZS 3500.4-2003.	The proposed building is capable of complying

3.8.6 Access for maintenance and facilities for monitoring NSW Part J(A)5

BCA Clause	Title	Assessment and Comment	Status
NSW J(A)5.1	Application of part	The Deemed-to-Satisfy Provisions of this part apply to Class 2 buildings except within a sole-occupancy unit.	Note
NSW J(A)5.2	Access for maintenance	Access for maintenance must be provided to- (a) All services and their components, including- (i) Time switches and motion detectors; and (j) Room temperature thermostats; and (k) Plant thermostats such as on boilers or refrigeration units; and (l) Outside air dampers; and (m) Reflectors, lenses and diffusers of light fittings; and (n) Heat transfer equipment; and (b) Adjustable or motorized shading devices.	The proposed building is capable of complying
J5.2	Air conditioning and ventilation systems	The mechanical design would be required to be designed in accordance with the requirements of this provision. Details are to be provided with the construction documentation submitted with the construction certificate.	The proposed building is capable of complying
J5.3	Time switch	The mechanical design would be required to be designed in accordance with the requirements of this provision. Details are to be provided with the construction documentation submitted with the construction certificate.	The proposed building is capable of complying
J5.4	Heating and cooling systems	The mechanical design would be required to be designed in accordance with the requirements of this provision. Details are to be provided with the construction documentation submitted with the construction certificate.	The proposed building is capable of complying
J5.5	Ancillary exhaust systems	The mechanical design would be required to be designed in accordance with the requirements of this provision. Details are to be provided with the construction documentation submitted with the construction certificate.	The proposed building is capable of complying

4.0 FIRE SAFETY SCHEDULE

The following table is a list of the required fire safety measures for this development. This list is to be treated as a guide as to what the building is considered to require.

Access Panels, doors and hoppers to fire resisting shaft	BCA C3.13 & AS1905.1-2005
Automatic fail safe devices	BCA Part C3 & D2.21
Automatic fire detection and alarm system	BCA E2.2, Spec E2.2a & AS 1670.1-2004 & AS 3786-1993
Automatic fire suppression system (sprinkler)	BCA E1.5, Spec E1.5 & AS2118.1-1999
Emergency lighting	BCA E4.2, E4.4 & AS/NZS 2293.1-2005
Building Occupant Warning System	BCA E2.2, Spec E2.2a & AS1670.1 - 2004
Exit signs	BCA E4.5, E4.6, E4.8 & AS/NZS 2293.1-2005
Fire dampers	BCA C3.12 & C3.15, AS/NZS1668.1-1998, AS 1668.2-1991
Fire doors	BCA Spec.C3.4 & AS1905.1-2005
Fire windows	BCA Spec C3.4
Fire shutters	BCA C3.4 & Spec C3.4
Fire hydrant systems	BCA E1.3 & AS2419.1-2005
Fire seals (protecting openings in fire resisting components of the building)	BCA C3.12, C3.15, Spec. C3.15
Hose reel system	BCA E1.4 & AS2441-2005
Lightweight construction	Spec C1.8
Mechanical air handling systems	BCA E2.2, Spec E2.2b & AS/NZS 1668.1-1998
Portable fire extinguishers	BCA E1.6 & AS2444-2001
Wall wetting sprinkler and drencher systems	BCA C3.4
Warning and operational signs	EPA Regulation (reg 183), BCA E3.3 (lifts), BCA C3.6 sliding doors D2.23 Signs on exit doors
Fire engineered solution	TBC

5.0 CONCLUSION

In determining a development application to which Clause 98 of the Environmental Planning & Assessment Regulation (2000) applies, the Regulation stipulates that the work must be carried out in accordance with the requirements of the Building Code of Australia. This report has identified areas of non-compliance with the deemed-to-satisfy provisions that are intended to be addressed by Alternative Solution. Whilst these performance based solutions are to be design developed, it is our view that the solutions will not impact on the current design.

The design as proposed is capable of complying with the Building Code of Australia, and will be subject to construction documentation that will provide appropriate details to demonstrate compliance.

Brendan Bennett
For and on behalf of City Plan Services Pty Ltd

APPENDIX 1 - Assessed plans prepared by Marchese Partners International Pty Ltd

Plan Title	Drawing No.	Issue	Date
Cover Sheet	DA 0.01	B	28/08/14
Site Analysis	DA 0.02	B	28/08/14
Demolition Plan	DA 0.03	A	04/12/13
Landscape Open Space Plan	DA 0.04	A	19/11/13
Site Plan	DA 1.01	B	28/08/14
Level B1 Plan	DA 1.02	D	05/05/14
Level B2 Plan	DA 1.03	E	05/05/14
Ground Floor Plan	DA 1.05	B	28/08/14
Levels 1 & 2 Floor Plan	DA 1.06	B	28/08/14
Level 3 Floor Plan	DA 1.07	B	28/08/14
Level 4 Floor Plan	DA 1.08	B	28/08/14
Level 5 Floor Plan	DA 1.09	B	28/08/14
Level 6 Floor Plan	DA 1.10	B	28/08/14
Roof Plan	DA 1.12	B	28/08/14
Pre & Post Adaptable Unit	DA 1.13	A	19/11/13
North & South Elevations	DA 2.01	B	28/08/14
East and West Elevations	DA 2.02	B	28/08/14
Section Thru Carpark Ramp	DA 3.01	B	28/08/14
Section Thru Communal Open Space	DA 3.02	B	28/08/14
Pacific Parade Ramp Detail	DA 3.03	A	19/11/13
Shadow Diagram	DA 4.04	C	28/08/14
Shadow Diagram	DA 4.05	C	28/08/14
Shadow Diagram	DA 4.06	C	28/08/14
Exterior Material Finishes	DA 5.01	B	28/08/14

APPENDIX 2 - Type A fire-resisting construction table

Table 3 TYPE A CONSTRUCTION: FRL OF BUILDING ELEMENTS **Building element**	**Class of building — FRL: (in minutes)**			
	Structural adequacy/Integrity/Insulation			
	2, 3 or 4 part	**5, 7a or 9**	**6**	**7b or 8**
EXTERNAL WALL (including any column and other building element incorporated therein) or other external building element, where the distance from any *fire-source feature* to which it is exposed is—				
For *loadbearing* parts—				
less than 1.5 m	90/ 90/ 90	120/120/120	180/180/180	240/240/240
1.5 to less than 3 m	90/ 60/ 60	120/ 90/ 90	180/180/120	240/240/180
3 m or more	90/ 60/ 30	120/ 60/ 30	180/120/ 90	240/180/ 90
For non-*loadbearing* parts—				
less than 1.5 m	–/ 90/ 90	–/120/120	–/180/180	–/240/240
1.5 to less than 3 m	–/ 60/ 60	–/ 90/ 90	–/180/120	–/240/180
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
EXTERNAL COLUMN not incorporated in an *external wall*, where the distance from any *fire-source feature* to which it is exposed is—				
less than 3 m	90/–/–	120/–/–	180/–/–	240/–/–
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
COMMON WALLS and FIRE WALLS—	90/ 90/ 90	120/120/120	180/180/180	240/240/240
INTERNAL WALLS—				
Fire-resisting lift and stair *shafts*—				
Loadbearing	90/ 90/ 90	120/120/120	180/120/120	240/120/120
Non-*loadbearing*	–/ 90/ 90	–/120/120	–/120/120	–/120/120
Bounding *public corridors*, public lobbies and the like—				
Loadbearing	90/ 90/ 90	120/–/–	180/–/–	240/–/–
Non-*loadbearing*	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Between or bounding *sole-occupancy units*—				
Loadbearing	90/ 90/ 90	120/–/–	180/–/–	240/–/–
Non-*loadbearing*	–/ 60/ 60	–/–/–	–/–/–	–/–/–

Ventilating, pipe, garbage, and like *shafts* not used for the discharge of hot products of combustion—				
Loadbearing	90/ 90/ 90	120/ 90/ 90	180/120/120	240/120/120
Non-*loadbearing*	–/ 90/ 90	–/ 90/ 90	–/120/120	–/120/120
OTHER LOADBEARING INTERNAL WALLS, INTERNAL BEAMS, TRUSSES				
and COLUMNS—	90/–/–	120/–/–	180/–/–	240/–/–
FLOORS	90/ 90/ 90	120/120/120	180/180/180	240/240/240
ROOFS	90/ 60/ 30	120/ 60/ 30	180/ 60/ 30	240/ 90/ 60

REPORT

TO
ALLPRO BUILDING SERVICES

ON
GEOTECHNICAL INVESTIGATION

FOR
PROPOSED DA STAGE 2
MULTI-STOREY RESIDENTIAL DEVELOPMENT

AT
23-29 PACIFIC PARADE
DEE WHY, NSW

16 September 2014
Ref: 25498SM1rpt Rev3

JK Geotechnics
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

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Date: 16 September 2014
Report No: 25498SM1rpt
Revision No: 3

Report prepared by:

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Principal

For and on behalf of
JK GEOTECHNICS
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TABLE OF CONTENTS

1 INTRODUCTION

This factual report presents the results of additional geotechnical investigation for a multi-storey development which has expanded to include 23-29 Pacific Parade (DA Stage 2), since the original geotechnical investigation report for 18-22 Sturdee Parade (DA Stage 1), Ref. 25498SMrpt Rev 1, dated 17 April 2012.

Based on the DA 'Stage 2' architectural drawings prepared by Marchese Partners International Pty Ltd, including;

- DA1.03 Rev E dated 5/5/14 'Level B2 Plan'
- DA1.06 Rev B dated 28/8/14 'Level B2 Plan', and
- DA3.02 Rev B dated 28/8/14 'Section Thru Communal Open Space'

provided to us on 10 September 2014, we understand the development comprises two levels of stepped basement car parking, with above-ground stories comprising Ground Level plus Levels 1 to 6 (for DA Stage 2). The lower basement level of the DA Stage 2 basement will have FFL of 14.9m and extend to about 2.5m from the western boundary, about 4m from the northern boundary with Pacific Parade and about 8.5m from the western boundary.

The purpose of the investigation was to obtain factual geotechnical information on the upper subsurface soil conditions and groundwater.

2 INVESTIGATION PROCEDURE

In 2012 the original geotechnical investigation for the Sturdee Parade properties comprised two deep cored boreholes with SPT testing (BH1 &BH2), and two Electric Friction Cone Penetration (EFCP) tests (EFCP3 and EFCP4). Standpipes were installed in the boreholes to facilitate groundwater monitoring. Reference should be made to our Report 25498SMrpt Rev 1, dated 17 April 2012 for further details of the above investigation procedure, and results, although the borehole logs, colour core photographs, Point Load Strength Index Test Report, and EFCP test results are presented in Appendix A.

The fieldwork for the additional investigation was completed on 25 October 2013 and comprised the drilling of three boreholes (BH101, BH 102 and BH103) each to 9.0m depth below existing surface levels. The boreholes were auger drilled using our JK305 tracked rig with regular SPT tests. Class 18 PVC standpipes were installed upon completion in each of the boreholes to facilitate groundwater monitoring and sampling.

Prior to commencement of the fieldwork, the test locations were electromagnetically scanned for buried services by a specialist sub-contractor.

The borehole (and EFCP test) locations, as shown on Figure 1, were set out by taped measurements from existing surface features and inferred site boundaries. The approximate surface levels of the test locations were estimated by interpolation between spot heights shown on the supplied survey plan, Ref 38530 Sheets 1 to 4 Rev A dated 19-4-13 prepared by Higgins Surveyors. The datum is the Australian Height Datum (AHD). Note that levels for BH1 and BH2 were estimated as being 0.5m lower than the nearest spot levels, on Sturdee Parade, and therefore these RLs should be considered very approximate.

The apparent compaction of the fill and strength of the subsurface soils was assessed with reference to Standard Penetration Test (SPT) 'N' values, augmented by hand penetrometer test results on cohesive samples returned by the SPT split tube sampler (and also from the outputs of the EFCP testing.)

Groundwater levels were taped measured in the boreholes at the end of the day's fieldwork and on a subsequent complementary site visit. The groundwater monitoring information is presented in the table in, Section 3.2. We note that during the recent fieldwork access could not be gained to BH1 and BH2.

Our geotechnical engineer set out the borehole locations, nominated the sampling and testing locations, prepared logs of the strata encountered and directed the installation of standpipes. The borehole logs, which include field test results and groundwater observations, are attached to this report together with a set of explanatory notes, which describe the investigation techniques, and their limitations, and define the logging terms and symbols used.

No laboratory testing of site soils or water was carried out.

3 RESULTS OF INVESTIGATION

3.1 Site Description

The site is located at the toe of a northwards facing hillside. Site slopes were in the order of 3° to 4°.

The properties were unchanged from 2012, except for the presence of temporary fencing around No 16 and No 18 Sturdee Parade.

The proposed development site comprises all of the properties between Sturdee Parade and Pacific Parade, and between the Dee Why Grand' multi-storey development and the blocks of residential units 31-37 Pacific Parade.

No 18 to 22 Sturdee Parade (Lot 23, 24 and 25 of DP8270) comprised three residential properties each with single storey brick houses and rear gardens. They had concrete driveways sloping down to front gardens which were about 0.5m lower than the road verge. BH1 is located in the driveway of No 22 while BH2 is located in the front garden of No 18.

Nos. 20 and 22 both had grassed gardens to the north and south of the buildings, whereas No. 18 had a layer of artificial grass in the front and rear gardens. A number of mature trees were present in the gardens in the northern part of the site varying from 10m to 15m in height. All three of the houses appeared to be in fair condition based on cursory observations during the fieldwork. BH1 is located in the driveway of No 22 while BH2 is located in the front garden of No 18.

No 23-29 Pacific Parade contained a single storey brick building (former child care centre, Lot 1 DP776401) with a concrete surfaced carpark off Sturdee Parade, and a vacant property (Lots 8 and 9 DP8270). The vacant property had a street frontage with Pacific Parade, was rectangular in plan and grass covered with several large trees close to the boundaries.

Sturdee and Pacific Parades were asphalt surfaced and appeared in reasonable condition. There are numerous three-to-five storey high residential units across the streets. There were four moderate to large trees in the roadside verge of Pacific Parade.

To the east of the site were three residential unit blocks of three and five above ground stories. The buildings which were cement rendered, appeared to be in good condition and were set back about 2m to 3m from the common boundary fence. We were informed by a resident that there were three basement parking levels. The side wall of the basement appeared to comprise a shotcreted secant or contiguous pile wall within about a metre of the boundary.

To the west of the site is the Dee Why Grand multistorey development with three-to-four basement parking levels. The main building line is set back 5m from the subject site boundary.

Between the main building and the boundary is a concrete footpath, narrow landscape strips and a series of stormwater pits believed to connect to a large stormwater culvert.

Slopes and surface levels appeared to be similar across the site boundaries except adjacent to the northern end of the eastern boundary where there was ramped access down to the basement parking of 31-37 Pacific Parade.

3.2 Subsurface Conditions

The Sydney 1:100,000 geological map indicates the site is underlain by Hawkesbury Sandstone but close to an alluvial channel of Quaternary period sands, silt and clay.

In summary, the boreholes and EFCP tests from both stages of investigation, encountered shallow sandy and gravelly fill covering alluvial soils, mostly consisting of clayey or silty sands with sandy clay bands, overlying sandstone bedrock at depth. Groundwater readings ranged from 6.65m to 9.5m depth. Further comments on the subsurface conditions encountered are provided below. A graphical summary of all the new borehole information is presented as Figure 2. A graphical summary of the previous borehole and EFCP information is attached in the appendix. Reference should be made to the borehole logs for detailed descriptions of the subsurface conditions encountered.

Fill

Concrete 90mm thick was encountered in BH1. 40mm of asphaltic concrete was encountered at BH101 and was underlain by igneous gravelly sand to 0.4m depth. Sandy and gravelly fill was encountered in BH1 and BH102 to respective depths of 1.0m and 0.8m, and was assessed to be poorly compacted. The EFCP results indicate fill to be present to depths of 0.7m to 0.6m at locations 3 and 4 respectively. Fill was not encountered in BH2 or BH103.

Alluvial Soils

Alluvial soils were encountered in all of the boreholes and comprised various layers of silty sand, clayey sand, silty clay and sandy clay. The EFCP results present more detailed information showing predominantly sand with clay bands ranging from 0.2m to 3.9m thickness. The thicker clay bands generally occurred at depth.

The sand layers were assessed to range from very loose to dense but were predominantly medium dense from 3m to 4.5m depth but with a loose band identified in BH1 at the 7.5m depth SPT. There were and a few loose bands of sand at depth in EFCP4.

The clay encountered in the boreholes was generally assessed to be of low plasticity and ranged in strength from very stiff to hard. Sandy clay and clayey sand was present in BH2 from about 2.4m to 7.2m depth, similarly, clayey sand and then sandy clay was also present in BH1 from 3.8m to 10.5m depth. At the lower end of site, the clays interpreted in EFCP3 and EFCP4 were thinner bands.

Sandstone Bedrock

Sandstone bedrock was encountered at depths ranging from 17.85m (BH2) to an inferred depth of 32.95 (EFCP 4). In the boreholes the rock was initially distinctly weathered and ranged from very low to medium strength. However, after 0.3m into rock in BH1 and 0.9m into rock in BH2, the majority of the material drilled was represented by zones of core loss up to 1.77m thick and residual soil. Core loss indicates soft or weak material washed away during the coring process, typically expected to be extremely weathered seams or clay seams. Fresh 'competent' sandstone of medium to high strength was encountered from a depth of 21.95m in BH1 and 24.5m in BH2.

The sandstone encountered within each borehole has been classified in the following table in general accordance with the classification system detailed in Pells et al, "Foundations on Sandstone and Shale in the Sydney Region", Australian Geomechanics, December 1998. Reference should be made to Pells et al for definitions of the rock classifications.

The classifications were made based on representative sections of the rock, typically about 2m thick and should be used for indicative purposes only.

Location	**SANDSTONE Depth (m)**	
	CLASS V (Interbedded with residual soil)	**CLASS II**
BH1	18.35	21.95
BH2	17.85	24.5
EFCP3	30.35*	Unknown
EFCP4	32.95*	Unknown

* Indicates inferred sandstone depth. Note, for proof of rock at these locations and to determine the depth of higher classes of rock, cored boreholes would be required.

Groundwater

Groundwater was encountered in all of the boreholes. Groundwater monitoring standpipes were installed in all the boreholes and the water level was monitored over several weeks in 2012 and over a couple of weeks following the additional investigation in 2013. The groundwater depths and approximate reduced levels are presented in the table below.

A water measurement was obtained at BH1 on 25/10/13 (at 1m depth) but this is not believed to be groundwater and therefore 2013 readings have not been included in this table for BH1.

Location	*Surface RL(m)***	**Groundwater Depth (m)** *And RL(m)*							
		30/01/ 2012	**15/02/ 2012**	**10/02/ 2012**	**27/02/ 2012**	**8/03/ 2012**	**25/10/ 2013**	**7/11/ 2013**	**12/11/ 2013**
BH1		9.5***	8.7	8.7	8.4	8.5			
	25	15.5	16.3	16.3	16.6	16.5			
BH2			9***		9.5	9.5			10.15
	25		*16*		*15.5*	*15.5*			*14.95*
EFCP3			-						
	22.2								
EFCP4			8.0*						
	23		*15*						
BH101							6.5	6.6	6.65
	21.1						*14.6*	*14.5*	*14.45*
BH102							8	8.05	8.1
	22.6						*14.6*	*14.55*	*14.5*
BH103							7	7.1	7.1
	21.6						14.6	14.5	14.5

**The reading in EFCP4 was taken upon completion of the test, however, the test hole collapsed at 4m depth in EFCP3 preventing observations.*

***Approximate Surface reduced levels have been estimated as explained in Section 2.*

****These water levels are not thought to have stabilised to true groundwater levels in the short time between adding water during the drilling process and the reading upon completion of standpipe installation.*

We note the groundwater level in BH2 was 0.55m higher in March 2012 than in November 2013.

4 GENERAL COMMENTS

Occasionally, the subsurface conditions between the completed boreholes may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact this office.

A waste classification will need to be assigned to any soil excavated from the site prior to offsite disposal. Subject to the appropriate testing, material can be classified as Virgin Excavated Natural Material (VENM), General Solid, Restricted Solid or Hazardous Waste. If the natural soil has been stockpiled, classification of this soil as Excavated Natural Material (ENM) can also be undertaken, if requested. However, the criteria for ENM are more stringent and the cost associated with attempting to meet these criteria may be significant. Analysis takes seven to 10 working days to complete, therefore, an adequate allowance should be included in the construction program unless testing is completed prior to construction. If contamination is encountered, then substantial further testing (and associated delays) should be expected. We strongly recommend that this issue is addressed prior to the commencement of excavation on site.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. If there is any change in the proposed development described in this report then all recommendations should be reviewed. Copyright in this report is the property of JK Geotechnics. We have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report. The report shall not be reproduced except in full.

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 101 1/2

Client: ALLPRO BUILDING SERVICES

Project: PROPOSED MULTISTOREY RESIDENTIAL DEVELOPMENT

Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM1 **Method:** SPIRAL AUGER JK305 **R.L. Surface:** ≈ 21.1m

Date: 25-10-13 **Datum:** AHD

Logged/Checked by: D.A.F./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0		-	ASPHALTIC CONCRETE: 40mm.t FILL: Gravelly silty sand, fine to medium grained, brown, fine to medium grained igneous gravel.	M			
					N = 29 9,13,16			SM	FILL: Silty sand, fine to medium grained, light brown. SILTY SAND: fine to medium grained, light grey and grey.	M	MD		ALLUVIAL
					N = 18 10,10,8	1			as above, but brown and dark brown, trace of fine grained quartz gravel.				
					N = 16 6,7,9	2		SC	CLAYEY SAND: fine to medium grained, orange brown, grey, light grey and orange brown.			>600 >600 >600	
					N = 15 6,7,8	3							
						4		SM	SILTY SAND: fine to medium grained, brown and light grey, trace of clay.				
ON COMPLET-ION & AFTER 3 HRS ▼					N = 6 2,3,3	5							
						6		SC	CLAYEY SAND: fine to medium grained, light grey, with silt.		L	170 180 180	
						7							

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 101
2/2

Client: ALLPRO BUILDING SERVICES

Project: PROPOSED MULTISTOREY RESIDENTIAL DEVELOPMENT

Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM1
Date: 25-10-13

Method: SPIRAL AUGER
JK305

R.L. Surface: ≈ 21.1m
Datum: AHD

Logged/Checked by: D.A.F./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								CL	SANDY CLAY: low plasticity, light grey, with silt.	MC>PL	St- VSt		
				■	N = 14 5,6,8	8						190 200 200	
						9			END OF BOREHOLE AT 9.0m				MACHINE SLOTTED PVC STANDPIPE INSTALLED TO 8.8m DEPTH. SLOTTED PIPE 2.8m TO 8.8m. CASING FROM 0.0m TO 2.8m, BACKFILLED WITH 2mm FILTER SAND FROM 1m TO 8.8m. BENTONITE CLAY 0.2m TO 1.0m, CONCRETE 0.0m TO 0.2m, CAST IRON GATIC COVER AT SURFACE
						10							
						11							
						12							
						13							
						14							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. **102** 1/2

Client: ALLPRO BUILDING SERVICES

Project: PROPOSED MULTISTOREY RESIDENTIAL DEVELOPMENT

Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM1 **Method:** SPIRAL AUGER JK305 **R.L. Surface:** ≈ 22.6m

Date: 25-10-13 **Datum:** AHD

Logged/Checked by: D.A.F./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0		-	FILL: Silty sandy gravel, fine to coarse grained igneous, brown, fine to medium grained sand.	D			GRASS COVER APPEARS POORLY COMPACTED
						1		SM	SILTY SAND: fine to medium grained, dark brown and grey, trace of fine to coarse grained sandstone and igneous gravel.	M	L		POSSIBLY FILL
				■	N = 6 3,3,3	2			SILTY SAND: fine to medium grained, light grey.	M			ALLUVIAL
								SC	CLAYEY SAND: fine to medium grained, orange brown and brown, with silt.		L-MD		
				■	N = 10 4,5,5	3			as above, but light grey.			320 360 400	
								CL	SANDY CLAY: low plasticity, orange brown and dark brown, with silt, trace of fine grained quartz.	MC≈PL	H		
						4			as above, but orange brown and light brown.				
				■	N = 12 8,6,6	5						500 500 450	
				■	N = 11 3,4,7	6			as above, but light grey and orange brown.		VSt	270 230 320	
						7							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. **102** 2/2

Client: ALLPRO BUILDING SERVICES

Project: PROPOSED MULTISTOREY RESIDENTIAL DEVELOPMENT

Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM1 **Method:** SPIRAL AUGER JK305 **R.L. Surface:** ≈ 22.6m

Date: 25-10-13 **Datum:** AHD

Logged/Checked by: D.A.F./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
▼ ON COMPLET-ION & AFTER 2 HRS ▼					N = 18 7,8,10	8		CL	SANDY CLAY: low plasticity, orange brown and brown, with silt and silty sand bands.	MC≈PL	VSt -H	460 480 550	
						9			END OF BOREHOLE AT 9.0m				MACHINE SLOTTED PVC STANDPIPE INSTALLED TO 8.9m DEPTH. SLOTTED PIPE 2.8m TO 8.9m. CASING FROM 0.0m TO 2.8m, BACKFILLED WITH 2mm FILTER SAND FROM 1m TO 8.9m. BENTONITE CLAY 0.2m TO 1.0m, CONCRETE 0.0m TO 0.2m, CAST IRON GATIC COVER AT SURFACE
						10							
						11							
						12							
						13							
						14							

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BOREHOLE LOG

Borehole No. **103** 1/2

Client: ALLPRO BUILDING SERVICES

Project: PROPOSED MULTISTOREY RESIDENTIAL DEVELOPMENT

Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM1 **Method:** SPIRAL AUGER JK305 **R.L. Surface:** ≈ 21.6m

Date: 25-10-13 **Datum:** AHD

Logged/Checked by: D.A.F./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0		SM	SILTY SAND: fine to medium grained, dark brown and light grey.	M	MD		CRUSHED CONCRETE COVER
					N = 15 9,8,7	1							ALLUVIAL
									as above, but dark brown.		L		
					N = 8 3,3,5	2							
									as above, but light brown and brown, trace of clay.		MD		
					N = 25 7,9,16	3		SM	SILTY SAND: fine to medium grained, light grey and light brown, trace of fine grained quartz gravel.				
						4			SILTY SAND: fine to medium grained, orange brown and red brown, with clay.				
					N = 19 9,9,10								
						5			SILTY SAND: fine to medium grained, light grey and brown, trace of clay.		L		
					N = 7 3,3,4	6							
						7							

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BOREHOLE LOG

Borehole No. **103** 2/2

Client: ALLPRO BUILDING SERVICES

Project: PROPOSED MULTISTOREY RESIDENTIAL DEVELOPMENT

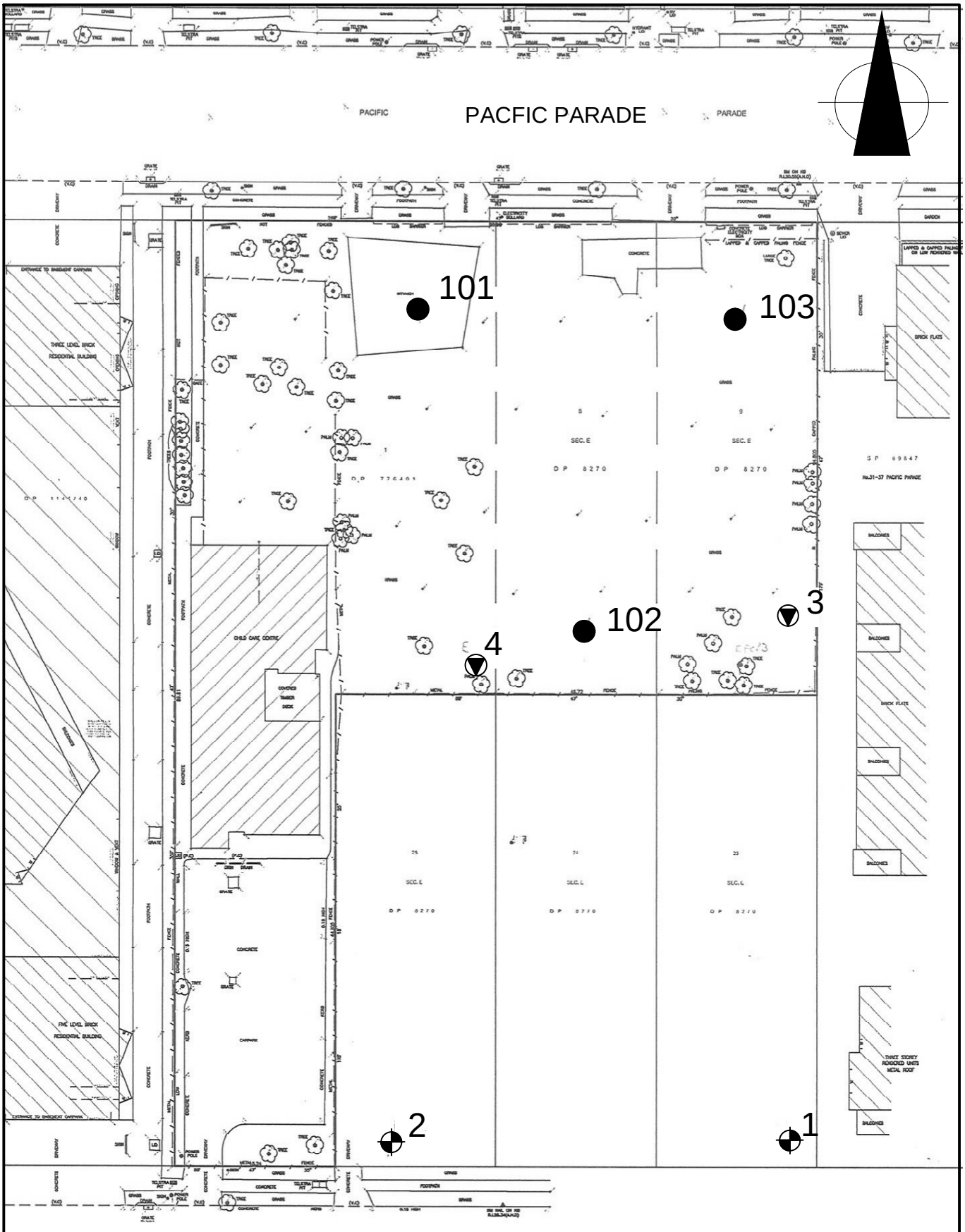
Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM1 **Method:** SPIRAL AUGER JK305 **R.L. Surface:** ≈ 21.6m

Date: 25-10-13 **Datum:** AHD

Logged/Checked by: D.A.F./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
ON COMPLET-ION								SC	CLAYEY SAND: fine to medium grained, light grey, with silt.	M	L		
				■	N = 9 3,3,6			CL	SANDY CLAY: low plasticity, light grey, with silt.	MC>PL	St-VSt	170 190 250	
						8							
						9			END OF BOREHOLE AT 9.0m				MACHINE SLOTTED PVC STANDPIPE INSTALLED TO 9.0m DEPTH. SLOTTED PIPE 2. 8m TO 9.0m. CASING FROM 0.0m TO 2.8m, BACKFILLED WITH 2mm FILTER SAND FROM 1m TO 9.0m. BENTONITE CLAY 0.2m TO 1.0m, CONCRETE 0.0m TO 0.2m, CAST IRON GATIC COVER AT SURFACE
						10							
						11							
						12							
						13							
						14							



SCALE (m)

0 25

LEGEND

- **BOREHOLE (new)**
- **CORED BOREHOLE (from previous 2012 investigation)**
- **EFCP TEST (from previous 2012 investigation)**

INVESTIGATION LOCATION PLAN

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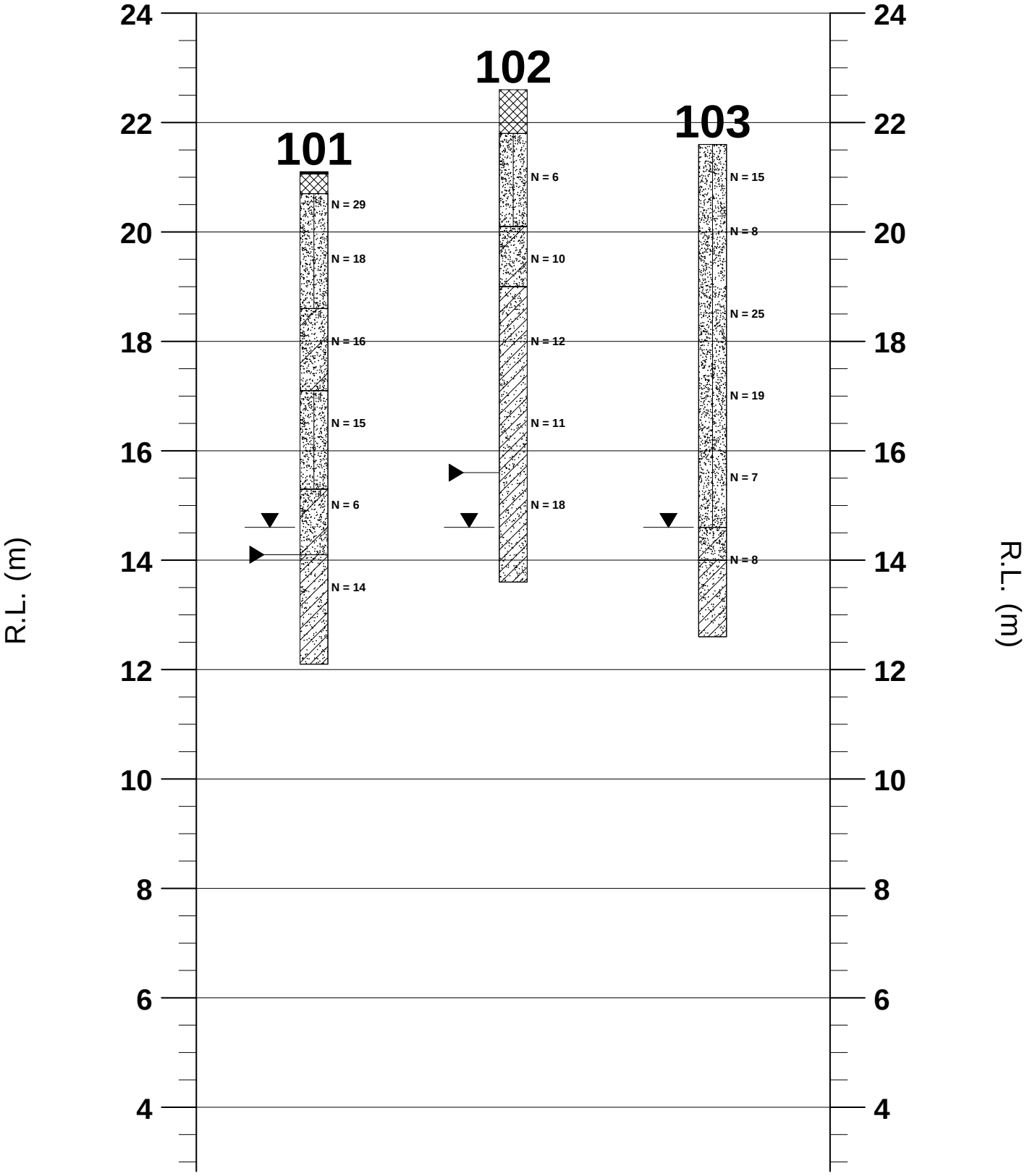
Report No. 25498SM1 Figure No. 1

GRAPHICAL BOREHOLE SUMMARY



Asphaltic/ Bituminous Paving or Coal

Fill

Silty Sand

Clayey Sand

Sandy Clay

Observed water level

Groundwater seepage level

N SPT "N" VALUE

Nc SOLID CONE BLOW COUNTS PER 150mm

Scale 1 : 100 (vert) ; NTS (horiz)

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Job No.: 25498SM1 Figure No.: 3

REPORT EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the geotechnical report in regard to classification methods, field procedures and certain matters relating to the Comments and Recommendations section. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, the SAA Site Investigation Code. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the grading of other particles present (e.g. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	less than 0.002mm
Silt	0.002 to 0.075mm
Sand	0.075 to 2mm
Gravel	2 to 60mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose	less than 4
Loose	4 – 10
Medium dense	10 – 30
Dense	30 – 50
Very Dense	greater than 50

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength kPa
Very Soft	less than 25
Soft	25 – 50
Firm	50 – 100
Stiff	100 – 200
Very Stiff	200 – 400
Hard	Greater than 400
Friable	Strength not attainable – soil crumbles

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'Shale' is used to describe thinly bedded to laminated siltstone.

SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon the degree of disturbance, some information on strength and structure. Bulk samples are similar but of greater volume required for some test procedures.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All except test pits, hand auger drilling and portable dynamic cone penetrometers require the use of a mechanical drilling rig which is commonly mounted on a truck chassis.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Premature refusal of the hand augers can occur on a variety of materials such as hard clay, gravel or ironstone, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock fragments. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel, which gives a core of about 50mm diameter, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses are determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the top end of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" – Test F3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as

  N = 13
  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N>30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, the test results are shown on the borehole logs in brackets.

A modification to the SPT test is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as "N_c" on the borehole logs, together with the number of blows per 150mm penetration.

Static Cone Penetrometer Testing and Interpretation: Cone penetrometer testing (sometimes referred to as a Dutch Cone) described in this report has been carried out using an Electronic Friction Cone Penetrometer (EFCP). The test is described in Australian Standard 1289, Test F5.1.

In the tests, a 35mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the frictional resistance on a separate 134mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are electrically connected by wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output as incremental digital records every 10mm. The results given in this report have been plotted from the digital data.

The information provided on the charts comprise:

- Cone resistance – the actual end bearing force divided by the cross sectional area of the cone – expressed in MPa.
- Sleeve friction – the frictional force on the sleeve divided by the surface area – expressed in kPa.
- Friction ratio – the ratio of sleeve friction to cone resistance, expressed as a percentage.

  The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and occasionally very soft clays, rising to 4% to 10% in stiff clays and peats. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Correlations between EFCP and SPT values can be developed for both sands and clays but may be site specific.

Interpretation of EFCP values can be made to empirically derive modulus or compressibility values to allow calculation of foundation settlements.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive. The test method provides a continuous profile of engineering properties but, where precise information on soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometers: Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a sliding hammer and counting the blows for successive 100mm increments of penetration.

Two relatively similar tests are used:

- Cone penetrometer (commonly known as the Scala Penetrometer) – a 16mm rod with a 20mm diameter cone end is driven with a 9kg hammer dropping 510mm (AS1289, Test F3.2). The test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various Road Authorities.
- Perth sand penetrometer – a 16mm diameter flat ended rod is driven with a 9kg hammer, dropping 600mm (AS1289, Test F3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the sub-surface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than “straight line” variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole or ‘reverted’ chemically if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after stabilising at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg bricks, steel etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 *'Methods of Testing Soil for Engineering Purposes'*. Details of the test procedure used are given on the individual report forms.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building) the information and interpretation may not be relevant if the design proposal is changed (eg to a twenty storey building). If this happens, the company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions – the potential for this will be partially dependent on borehole spacing and sampling frequency as well as investigation technique.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of persons or contractors responding to commercial pressures.

If these occur, the company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed that at some later stage, well after the event.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document *'Guidelines for the Provision of Geotechnical Information in Tender Documents'*, published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Copyright in all documents (such as drawings, borehole or test pit logs, reports and specifications) provided by the Company shall remain the property of Jeffery and Katauskas Pty Ltd. Subject to the payment of all fees due, the Client alone shall have a licence to use the documents provided for the sole purpose of completing the project to which they relate. License to use the documents may be revoked without notice if the Client is in breach of any objection to make a payment to us.

REVIEW OF DESIGN

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer.

SITE INSPECTION

The company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

Requirements could range from:

i) a site visit to confirm that conditions exposed are no worse than those interpreted, to

ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, or

iii) full time engineering presence on site.

GRAPHIC LOG SYMBOLS FOR SOILS AND ROCKS

SOIL


FILL


TOPSOIL


CLAY (CL, CH)


SILT (ML, MH)


SAND (SP, SW)


GRAVEL (GP, GW)


SANDY CLAY (CL, CH)


SILTY CLAY (CL, CH)


CLAYEY SAND (SC)


SILTY SAND (SM)


GRAVELLY CLAY (CL, CH)


CLAYEY GRAVEL (GC)


SANDY SILT (ML)


PEAT AND ORGANIC SOILS

ROCK


CONGLOMERATE


SANDSTONE


SHALE


SILTSTONE, MUDSTONE, CLAYSTONE


LIMESTONE


PHYLLITE, SCHIST


TUFF


GRANITE, GABBRO


DOLERITE, DIORITE


BASALT, ANDESITE


QUARTZITE

DEFECTS AND INCLUSIONS


CLAY SEAM


SHEARED OR CRUSHED SEAM


BRECCIATED OR SHATTERED SEAM/ZONE


IRONSTONE GRAVEL


ORGANIC MATERIAL

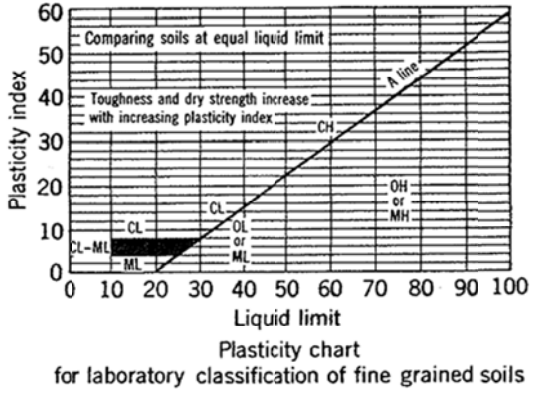
OTHER MATERIALS


CONCRETE


BITUMINOUS CONCRETE, COAL


COLLUVIUM

Field Identification Procedures (Excluding particles larger than 75 μm and basing fractions on estimated weights)				Group Symbols [a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils More than half of material is *larger* than 75 μm sieve size[b] (The smallest particle visible to naked eye)	Gravels More than half of coarse fraction is larger than 4 mm sieve size	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	*GW*	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand*, gravelly; about 20% hard, angular gravel particles 12 mm maximum size; rounded and subangular sand grains coarse to fine, about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (*SM*)	Use grain size curve in identifying the fractions as given under field identification Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than 75 μm sieve size) coarse grained soils are classified as follows: Less than 5% *GW, GP, SW, SP* More than 12% *GM, GC, SM, SC* 5% to 12% *Borderline* cases requiring use of dual symbols $C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *GW* Atterberg limits below "A" line, or *PI* less than 4 / Atterberg limits above "A" line, with *PI* greater than 7 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols $C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *SW* Atterberg limits below "A" line or *PI* less than 5 / Atterberg limits below "A" line with *PI* greater than 7 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
		Gravels with fines (appreciable amount of fines)	Predominantly one size or a range of sizes with some intermediate sizes missing	*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines		
			Nonplastic fines (for identification procedures see *ML* below)	*GM*	Silty gravels, poorly graded gravel-sand-silt mixtures		
			Plastic fines (for identification procedures, see *CL* below)	*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures		
	Sands More than half of coarse fraction is smaller than 4 mm sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	*SW*	Well graded sands, gravelly sands, little or no fines		
			Predominantly one size or a range of sizes with some intermediate sizes missing	*SP*	Poorly graded sands, gravelly sands, little or no fines		
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)	*SM*	Silty sands, poorly graded sand-silt mixtures		
			Plastic fines (for identification procedures, see *CL* below)	*SC*	Clayey sands, poorly graded sand-clay mixtures		
Fine-grained soils More than half of material is *smaller* than 75 μm sieve size (The 75 μm sieve size is about the smallest particle visible to naked eye)	Identification Procedures on Fraction Smaller than 380 μm Sieve Size						
	Silts and clays liquid limit less than 50	Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)			
		None to slight	Quick to slow	None	*ML*	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: *Clayey silt*, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (*ML*)	
		Medium to high	None to very slow	Medium	*CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		Slight to medium	Slow	Slight	*OL*	Organic silts and organic silt-clays of low plasticity	
	Silts and clays liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	*MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		High to very high	None	High	*CH*	Inorganic clays of high plasticity, fat clays	
		Medium to high	None to very slow	Slight to medium	*OH*	Organic clays of medium to high plasticity	
Highly Organic Soils		Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*	Peat and other highly organic soils	



Plasticity chart
for laboratory classification of fine grained soils

Note: 1 Soils possessing characteristics of two groups are designated by combinations of group symbols (eg. GW-GC, well graded gravel-sand mixture with clay fines).
2 Soils with liquid limits of the order of 35 to 50 may be visually classified as being of medium plasticity.

LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION
Groundwater Record	▼	Standing water level. Time delay following completion of drilling may be shown.
	C	Extent of borehole collapse shortly after drilling.
	▶	Groundwater seepage into borehole or excavation noted during drilling or excavation.
Samples	ES	Soil sample taken over depth indicated, for environmental analysis.
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.
	DB	Bulk disturbed sample taken over depth indicated.
	DS	Small disturbed bag sample taken over depth indicated.
	ASB	Soil sample taken over depth indicated, for asbestos screening.
	ASS	Soil sample taken over depth indicated, for acid sulfate soil analysis.
	SAL	Soil sample taken over depth indicated, for salinity analysis.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'R' as noted below.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60 degree solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25	Vane shear reading in kPa of Undrained Shear Strength.
	PID = 100	Photoionisation detector reading in ppm (Soil sample headspace test).
Moisture Condition (Cohesive Soils)	MC>PL	Moisture content estimated to be greater than plastic limit.
	MC≈PL	Moisture content estimated to be approximately equal to plastic limit.
	MC<PL	Moisture content estimated to be less than plastic limit.
(Cohesionless Soils)	D	DRY – Runs freely through fingers.
	M	MOIST – Does not run freely but no free water visible on soil surface.
	W	WET – Free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS	VERY SOFT – Unconfined compressive strength less than 25kPa
	S	SOFT – Unconfined compressive strength 25-50kPa
	F	FIRM – Unconfined compressive strength 50-100kPa
	St	STIFF – Unconfined compressive strength 100-200kPa
	VSt	VERY STIFF – Unconfined compressive strength 200-400kPa
	H	HARD – Unconfined compressive strength greater than 400kPa
	( )	Bracketed symbol indicates estimated consistency based on tactile examination or other tests.
Density Index/ Relative Density (Cohesionless Soils)		**Density Index (I_D) Range (%)** / **SPT 'N' Value Range (Blows/300mm)**
	VL	Very Loose 0-15 / 0-4
	L	Loose 15-35 / 4-10
	MD	Medium Dense 35-65 / 10-30
	D	Dense 65-85 / 30-50
	VD	Very Dense >85 / >50
	( )	Bracketed symbol indicates estimated density based on ease of drilling or other tests.
Hand Penetrometer Readings	300 250	Numbers indicate individual test results in kPa on representative undisturbed material unless noted otherwise.
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Tungsten carbide wing bit.
	T 60	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.

LOG SYMBOLS continued

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely weathered rock	XW	Rock is weathered to such an extent that it has "soil" properties, ie it either disintegrates or can be remoulded, in water.
Distinctly weathered rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly weathered rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh rock	FR	Rock shows no sign of decomposition or staining.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Journal of Rock Mechanics, Mining, Science and Geomechanics. Abstract Volume 22, No 2, 1985.

TERM	SYMBOL	Is (50) MPa	FIELD GUIDE
Extremely Low:	EL		Easily remoulded by hand to a material with soil properties.
----------	----------	0.03	
Very Low:	VL		May be crumbled in the hand. Sandstone is "sugary" and friable.
----------	----------	0.1	
Low:	L		A piece of core 150mm long x 50mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.
----------	----------	0.3	
Medium Strength:	M		A piece of core 150mm long x 50mm dia. can be broken by hand with difficulty. Readily scored with knife.
----------	----------	1	
High:	H		A piece of core 150mm long x 50mm dia. core cannot be broken by hand, can be slightly scratched or scored with knife; rock rings under hammer.
----------	----------	3	
Very High:	VH		A piece of core 150mm long x 50mm dia. may be broken with hand-held pick after more than one blow. Cannot be scratched with pen knife; rock rings under hammer.
----------	----------	10	
Extremely High:	EH		A piece of core 150mm long x 50mm dia. is very difficult to break with hand-held hammer. Rings when struck with a hammer.

ABBREVIATIONS USED IN DEFECT DESCRIPTION

ABBREVIATION	DESCRIPTION	NOTES
Be	Bedding Plane Parting	Defect orientations measured relative to the normal to the long core axis (ie relative to horizontal for vertical holes)
CS	Clay Seam	
J	Joint	
P	Planar	
Un	Undulating	
S	Smooth	
R	Rough	
IS	Ironstained	
XWS	Extremely Weathered Seam	
Cr	Crushed Seam	
60t	Thickness of defect in millimetres	

APPENDIX A

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, BC 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

ABN 43 002 145 173

TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	Jeffery & Katauskas Pty Ltd	**Ref No:**	25498SM
Project:	Proposed Development	**Report:**	A
Location:	18-22 Sturdee Parade, Dee Why	**Report Date:**	29/02/2012
		Page 1 of 1	

BOREHOLE NUMBER	DEPTH m	$I_{S(50)}$ MPa	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)
1	18.44-18.47	0.5	10
	18.77-18.81	0.6	12
	19.53-19.57	0.1	2
	20.80-20.85	0.1	2
	21.96-21.99	1.1	22
	22.10-22.13	1.5	30
	22.74-22.78	1.4	28
	23.23-23.26	1.0	20
	23.76-23.81	1.2	24
2	18.11-18.14	0.5	10
	18.65-18.69	0.3	6
	19.75-19.77	0.3	6
	20.22-20.26	1.0	20
	20.68-20.71	0.5	10
	22.54-22.57	0.2	4
	24.61-24.64	1.3	26
	25.08-25.11	0.7	14
	25.61-25.65	0.8	16
	26.08-26.12	1.4	28
	26.64-26.67	0.9	18

NOTES:

1. In the above table testing was completed in the Axial direction.
2. The above strength tests were completed at the 'as received' moisture content.
3. Test Method: RTA T223.
4. The Estimated Unconfined Compressive Strength was calculated from the point load Strength Index by the following approximate relationship and rounded off to the nearest whole number :
   U.C.S. = 20 $I_{S(50)}$

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 69523

Client:
Jeffery & Katauskas Pty Ltd
PO Box 976
North Ryde BC
NSW 1670

Attention: M Pearce

Sample log in details:

Your Reference:	**25498SM, Dee Why**
No. of samples:	3 soils
Date samples received / completed instructions received	23/02/12 / 23/02/12

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	2/03/12 / 2/03/12
Date of Preliminary Report:	Not issued

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Nick Sarlamis
Inorganics Supervisor

Miscellaneous Inorg - soil				
Our Reference:	UNITS	69523-1	69523-2	69523-3
Your Reference	----------	1	1	2
Depth	----------	4.5-4.95	9.0-9.45	7.5-7.95
Date Sampled		30/01/2012	30/01/2012	15/02/2012
Type of sample		soil	soil	soil
Date prepared	-	29/02/2012	29/02/2012	29/02/2012
Date analysed	-	29/02/2012	29/02/2012	29/02/2012
pH 1:5 soil:water	pH Units	4.8	4.7	5.0
Chloride, Cl 1:5 soil:water	mg/kg	10	11	4
Sulphate, SO4 1:5 soil:water	mg/kg	54	46	29

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 21st ED, 4110 -B.

Client Reference: 25498SM, Dee Why

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			29/02/2012	[NT]	[NT]	LCS-1	29/02/2012
Date analysed	-			29/02/2012	[NT]	[NT]	LCS-1	29/02/2012
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	LCS-1	101%
Chloride, Cl 1:5 soil:water	mg/kg	2	Inorg-081	<2	[NT]	[NT]	LCS-1	92%
Sulphate, SO4 1:5 soil:water	mg/kg	2	Inorg-081	<2	[NT]	[NT]	LCS-1	92%

Report Comments:

Asbestos ID was analysed by Approved Identifier: Not applicable for this job
Asbestos ID was authorised by Approved Signatory: Not applicable for this job

INS: Insufficient sample for this test
NA: Test not required
<: Less than

PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than

NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 1 1/4

Client:

Project: PROPOSED DEVEOPMENT

Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 30-1-12 **Datum:**

Logged/Checked by: I.S./ MP

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			CONCRETE: 90mm.t				5mm DIA. REINFORCEMENT, 20mm TOP COVER
					N = 2 1,1,1			-	FILL: Silty sand, fine to medium grained, dark grey brown, trace of fine grained sandstone gravel.	M	-	-	APPEARS POORLY COMPACTED
						1		SM	SILTY SAND: medium grained, brown and dark brown, trace of fine grained rounded quartz gravel.	M	L	-	POSSIBLY FILL TO 2m DEPTH
					N = 6 5,2,4								
						2							
									as above, but light brown, with clay fines.		MD		ALLUVIAL
					N = 13 4,6,7	3							
								SC	CLAYEY SAND: medium grained, red brown mottled yellow brown.				
					N = 12 4,5,7	4							
						5							
									as above, but light grey mottled orange brown.				50mm DIA. PVC STANDPIPE INSTALLED TO 12m, HAND SLOTTED BETWEEN 6m AND 12m, BENTONITE SEAL FROM 4m TO SURFACE AND CONCRETED AT SURFACE
					N = 18 6,9,9	6							
						7							

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Borehole No. 1 2/4

BOREHOLE LOG

Client:
Project: PROPOSED DEVEOPMENT
Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM **Method:** SPIRAL AUGER **R.L. Surface:** N/A
Date: 30-1-12 **Datum:**
Logged/Checked by: I.S./MP

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SC	CLAYEY SAND: medium grained, light grey mottled orange brown.		MD		
					N = 8 5,4,4	8					L		
▶					N = 15 6,7,8	9		CL	SANDY CLAY: low plasticity, orange brown mottled light grey.	MC>PL	VSt	210 270 250	POSSIBLY CLAYEY SAND
▼ ON COMPLETION OF AUGERING						10							
					N = 13 3,6,7	11		SM	SILTY SAND: medium grained, light brown, with clay fines.	W	MD		
					N = 12 5,6,6	12		SC	CLAYEY SAND: medium grained, brown, with light grey sandy clay bands.				
						13							
					N = 19 3,8,11	14		SM	SILTY SAND: medium grained, light grey brown, with clay, trace of fine grained sub rounded quartz gravel.				

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Borehole No. 1 3/4

BOREHOLE LOG

Client:
Project: PROPOSED DEVEOPMENT
Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM **Method:** SPIRAL AUGER **R.L. Surface:** N/A
Date: 30-1-12 **Datum:**
Logged/Checked by: I.S./ MP

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SM	SILTY SAND: medium grained, light grey brown, with clay, brick fragments and fine grained sub rounded quartz gravel.	W	MD		
					N = 13 4,6,7	15							COMMENCED WASHBORING
						16							
					N = 14 6,7,7				as above, but light orange brown, with light grey clay bands.				
						17							
					SPT 5/5mm REFUSAL	18			REFER TO CORED BOREHOLE LOG				
						19							
						20							

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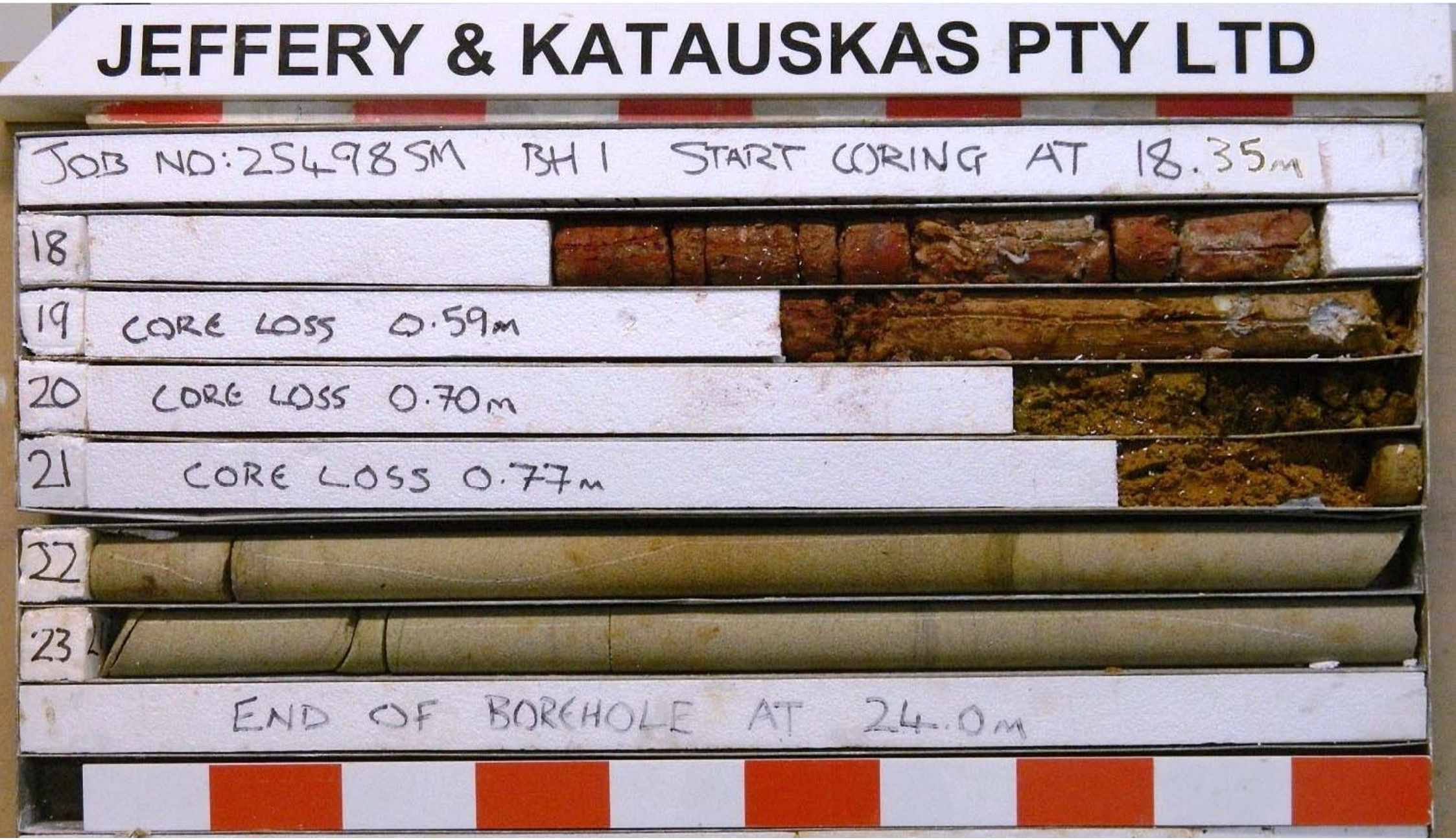

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Borehole No. 1 4/4

CORED BOREHOLE LOG

Client:
Project: PROPOSED DEVEOPMENT
Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM **Core Size:** NMLC **R.L. Surface:** N/A
Date: 30-1-12 **Inclination:** VERTICAL **Datum:**
Drill Type: JK300 **Bearing:** - **Logged/Checked by:** I.S./MP

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT SPACING (mm) 600 300 100 60 30 10	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific	General
		18		START CORING AT 18.35m						
				SANDSTONE: fine to medium grained, red and purple brown.	DW	M-H			- Be, 0°, Un, R - Be, 2°, P, R - Be, 0°, P, R	
				SANDY CLAY: low plasticity, red brown mottled light grey,	RS	St			- Be, 0-5°, Un, R - Be, 0°, P, R HP 150,130,120	
		19		with fine to medium grained sandstone band a t 18.75m CORE LOSS 610mm					- Be, 0°, P, R HP 130,210,200	
				SANDSTONE: fine grained, purple brown.	DW	L				
				SANDY CLAY: purple brown banded light grey.	RS	VSt-H			HP 400,600,430 HP 300,350,360	
		20		CORE LOSS 700mm						
				CLAYEY SAND: fine to medium grained, light brown mottled red brown.	RS DW	VL			- XWS, 0°, 150mm.t	
		21		SANDSTONE: medium grained, brown and dark brown. CORE LOSS 770mm						
				SAND: medium to coarse grained, brown.	RS					
		22		SANDSTONE: fine to medium grained, light grey, with occasional dark grey laminae, bebbed at 40°.	FR	H				
		23							- J, 40°, P, R	
		24		END OF BOREHOLE AT 24.0m						

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Borehole No. 2 1/5

BOREHOLE LOG

Client:
Project: PROPOSED DEVEOPMENT
Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM **Method:** SPIRAL AUGER JK300 **R.L. Surface:** N/A
Date: 15-2-12 **Datum:**
Logged/Checked by: P.C./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0		SM	SILTY SAND: fine to medium grained, dark grey.	M			
					N = 3 1,1,2	1			SILTY SAND: fine to medium grained, light grey.		VL		ALLUVIAL
						2			SILTY SAND: fine to medium grained, brown.				
						3		CL	SANDY CLAY: low plasticity, red brown, fine to medium grained sand.	MC>PL	(VSt)		
						4			as above, but light grey.				
						5			as above, but brown mottled orange brown.		H		
						6			as above, but brown mottled light grey.			>600 >600 >600	50mm DIA. PVC STANDPIPE INSTALLED TO 11.7m, HAND SLOTTED BETWEEN 7m AND 11.7m DEPTH, BENTONITE SEAL FROM 0.3m TO 0.7m DEPTH, AND CONCRETED AT SURFACE
					N = 17 3,6,11	7							

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Borehole No. 2 2/5

BOREHOLE LOG

Client:
Project: PROPOSED DEVEOPMENT
Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM **Method:** SPIRAL AUGER JK300 **R.L. Surface:** N/A
Date: 15-2-12 **Datum:**
Logged/Checked by: P.C./mp

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								CL	SANDY CLAY: low plasticity, brown mottled light grey.	MC>PL	H		
								SC	CLAYEY SAND: fine to medium grained, light brown.	M	MD		
					N = 17 8,8,9	8						(300 250)	
▼								SM	SILTY SAND: fine to medium grained, light brown mottled brown, with clay, trace of fine grained quartz gravel.				
					N = 12 5,6,6	9				W			
					N = 20 5,8,12	10							
						11							
					N = 20 5,9,11	12							
						13							
					N = 11 7,5,6			CL	SILTY CLAY: as below.	MC>PL	VSt	250	
						14							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

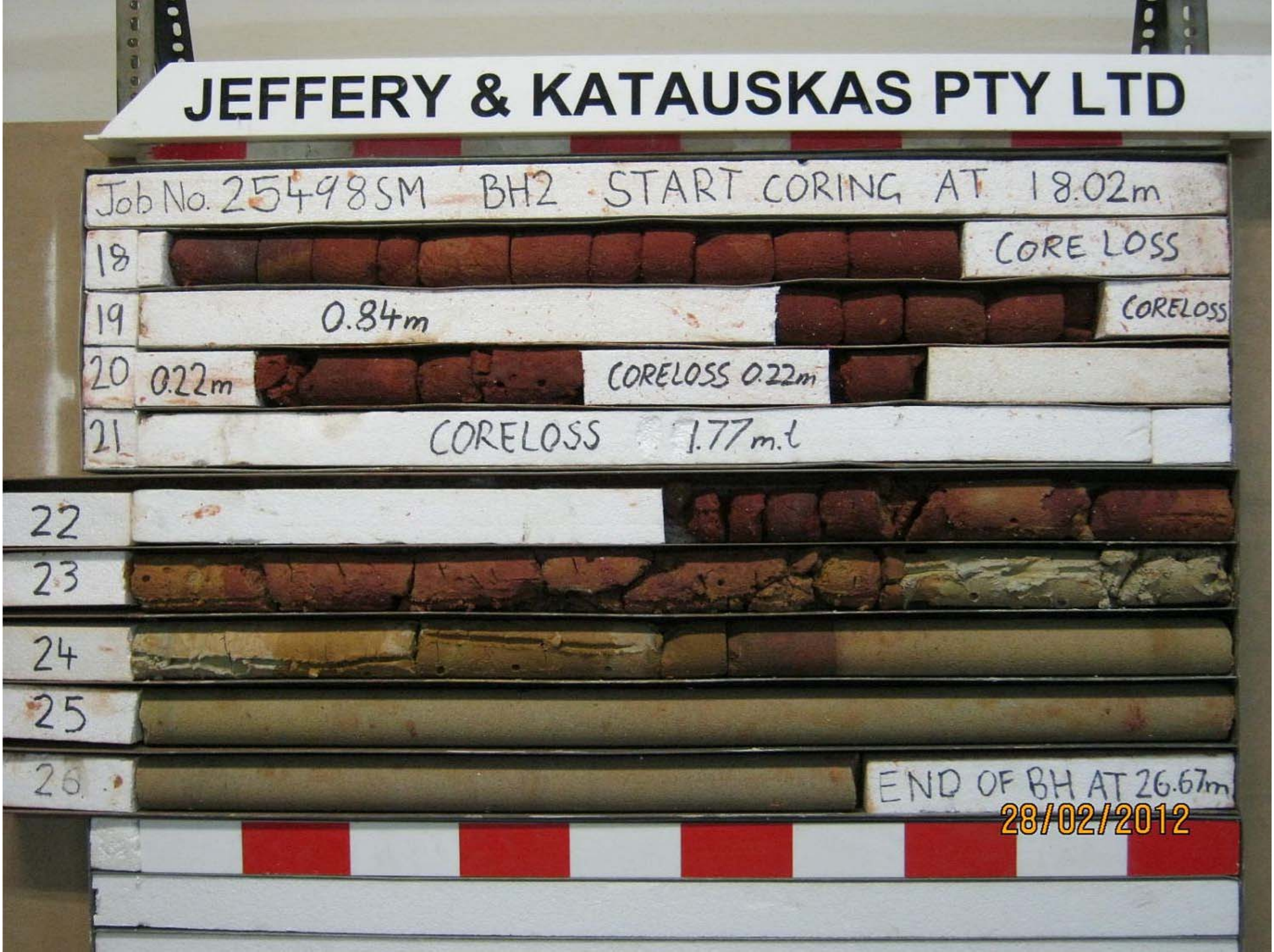
Borehole No. 2 3/5

BOREHOLE LOG

Client:
Project: PROPOSED DEVEOPMENT
Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM **Method:** SPIRAL AUGER JK300 **R.L. Surface:** N/A
Date: 15-2-12 **Datum:**
Logged/Checked by: P.C./MP

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								CL	SILTY CLAY: low plasticity, brown and red brown, with fine to medium grained sand, trace of fine to medium grained quartz gravel.	MC>PL	VSt		
					N = 14 3,6,8	15						250 300 300	
						16					H		
					N = 21 7,10,11							>600 >600 >600	
						17							
						18		-	SANDSTONE: fine to coarse grained, red brown. REFER TO CORED BOREHOLE LOG	XW	(L-M)	-	VERY LOW TO LOW 'TC' BIT RESISTANCE
						19							
						20							


JEFFERY & KATAUSKAS PTY LTD
Job No. 25498SM BH2 START CORING AT 18.02m
18
CORE LOSS
19
0.84m
CORELOSS
20
0.22m
CORELOSS 0.22m
21
CORELOSS 1.77m.t
22
23
24
25
26
END OF BH AT 26.67m
28/02/2012

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 2 4/5

CORED BOREHOLE LOG

Client:
Project: PROPOSED DEVEOPMENT
Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM **Core Size:** NMLC **R.L. Surface:** N/A
Date: 15-2-12 **Inclination:** VERTICAL **Datum:**
Drill Type: JK300 **Bearing:** - **Logged/Checked by:** P.C./ MP

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ (EL VL L M H VH EH)	DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		17							
				START CORING AT 18.02m					
		18		SANDSTONE: fine to coarse grained, red brown, trace of fine to medium grained gravel sized quartz inclusions.	DW	H / L-M	× ×		
50% RET-URN		19		CORE LOSS 0.84m					
				SANDSTONE: fine to coarse grained, red brown, trace of fine to coarse grained gravel sized quartz inclusions.	DW	M	×		
		20		CORE LOSS 0.22m	DW	M	×		- XWS, 0°, 40mm.t - CS, 0°, 80mm.t, HP = 210,250kPa
				SANDSTONE: fine to coarse grained, red brown.					
				CORE LOSS 0.22m	DW	M	×		
				SANDSTONE: fine to coarse grained, red brown.					
		21		CORE LOSS 1.77m					
70% RET-URN		22							
				SANDSTONE: fine to coarse grained, red brown.	DW	L	×		
				as above, but orange brown.	XW	EL			
		23							HP = 220,300kPa
				SILTY CLAY: high plasticity, light grey, trace of coarse	MC>PL	VSt			HP = 230,310kPa

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Borehole No. **2** 5/5

CORED BOREHOLE LOG

Client:
Project: PROPOSED DEVEOPMENT
Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No. 25498SM **Core Size:** NMLC **R.L. Surface:** N/A
Date: 15-2-12 **Inclination:** VERTICAL **Datum:**
Drill Type: JK300 **Bearing:** - **Logged/Checked by:** P.C./ MP

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
FULL RET-URN		25		grained sand. SANDY CLAY: low plasticity, light grey, fine to medium grained sand.	MC>PL	St-VSt			HP = 230,210kPa
				as above, but brown. SANDSTONE: fine to medium grained, brown and dark brown.	SW FR	M-H			
		26		SANDSTONE: fine to medium grained, light grey.					
				END OF BOREHOLE AT 26.76m					
		27							
		28							
		29							
		30							

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

EFCP No. 3

1 / 4

ELECTRICAL FRICTION CONE PENETROMETER TEST RESULTS

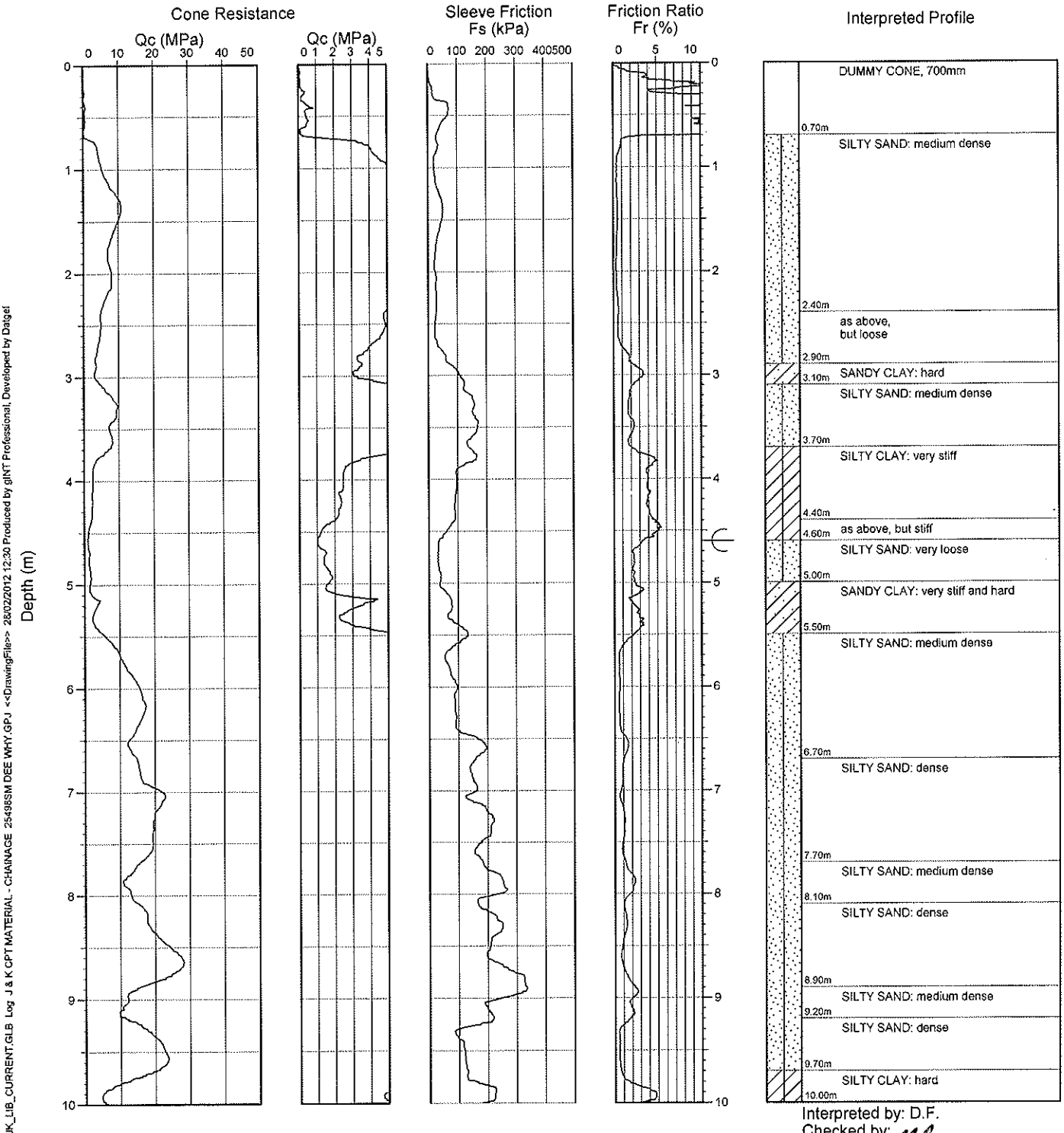
Client:

Project: PROPOSED DEVELOPMENT

Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No.: 25498SM **R.L. Surface:** N/A **Data File:** 25498SM_1.GEF

Date: 13/2/12 **Datum:** **Operator:** D.F.



Interpreted by: D.F.

Checked by: MP

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Jeffery and Katauskas Pty Ltd

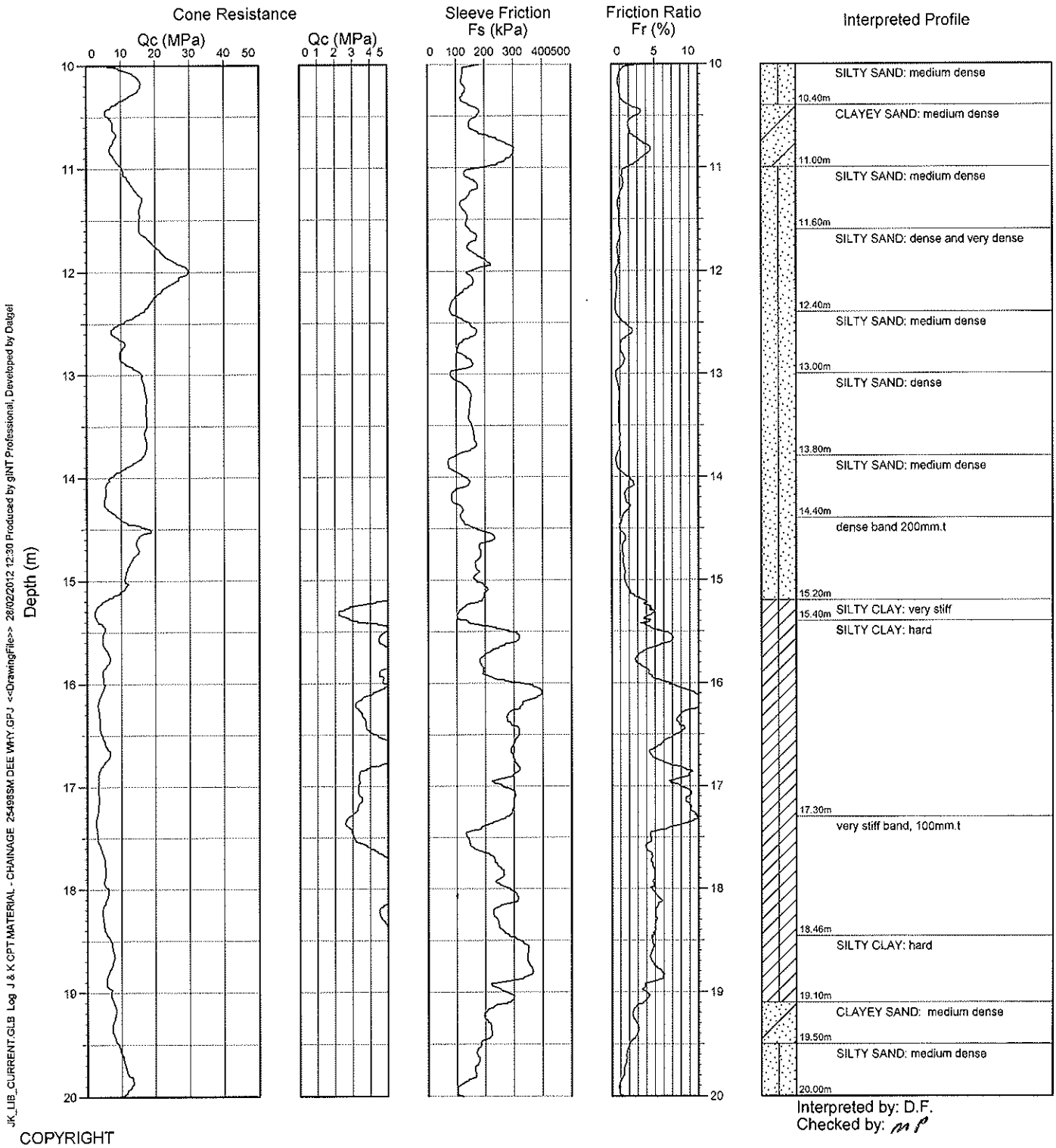
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

EFCP No. 3

2 / 4

ELECTRICAL FRICTION CONE PENETROMETER TEST RESULTS

Client:		
Project:	PROPOSED DEVELOPMENT	
Location:	18-22 STURDEE PARADE, DEE WHY, NSW	
Job No.: 25498SM	**R.L. Surface:** N/A	**Data File:** 25498SM_1.GEF
Date: 13/2/12	**Datum:**	**Operator:** D.F.



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Checked by: MP

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Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

EFCP No. 3

3 / 4

ELECTRICAL FRICTION CONE PENETROMETER TEST RESULTS

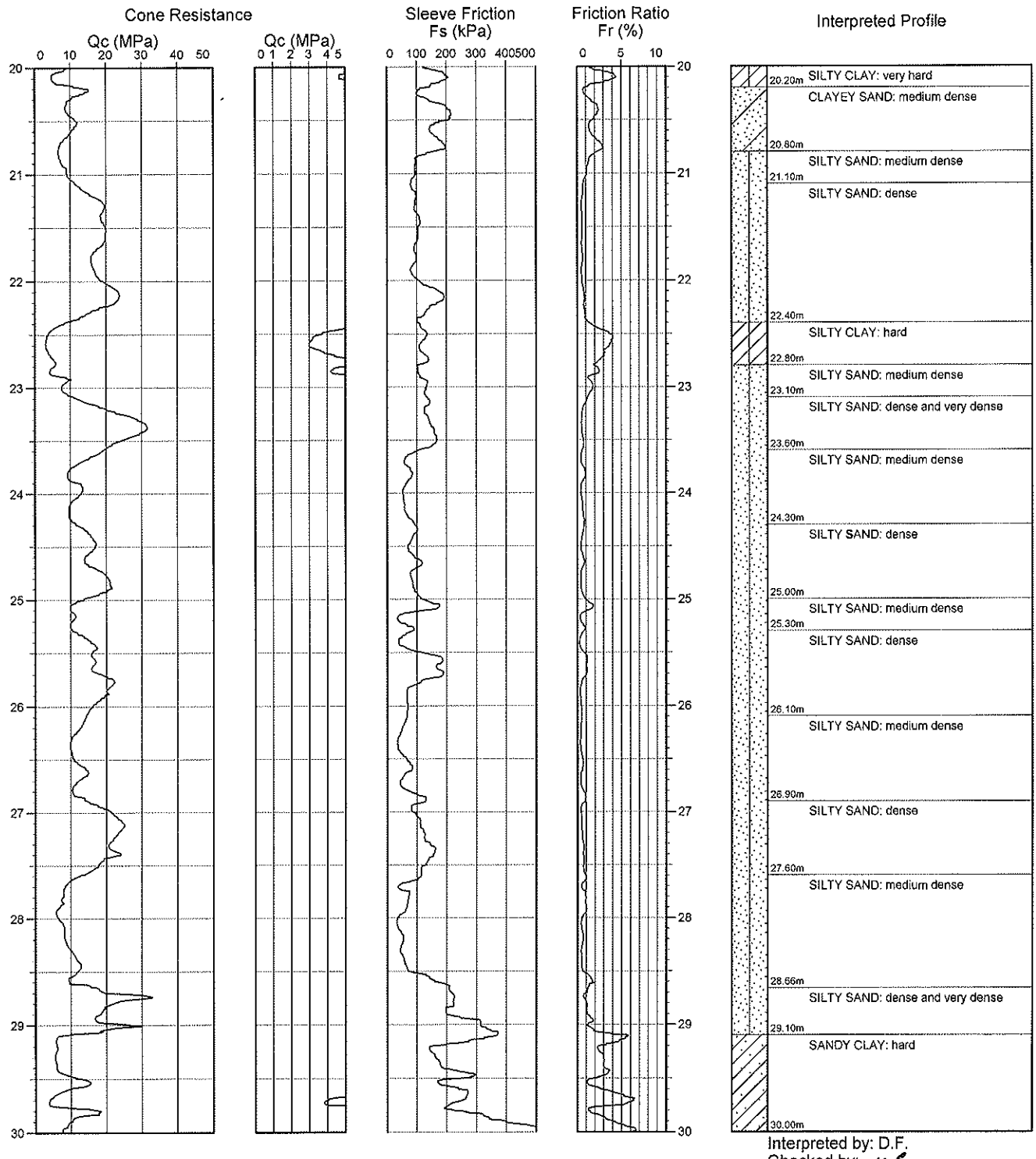
Client:

Project: PROPOSED DEVELOPMENT

Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No.: 25498SM **R.L. Surface:** N/A **Data File:** 25498SM_1.GEF

Date: 13/2/12 **Datum:** **Operator:** D.F.



Interpreted by: D.F.

Checked by: MF

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Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

EFCP No. 3 4 / 4

ELECTRICAL FRICTION CONE PENETROMETER TEST RESULTS

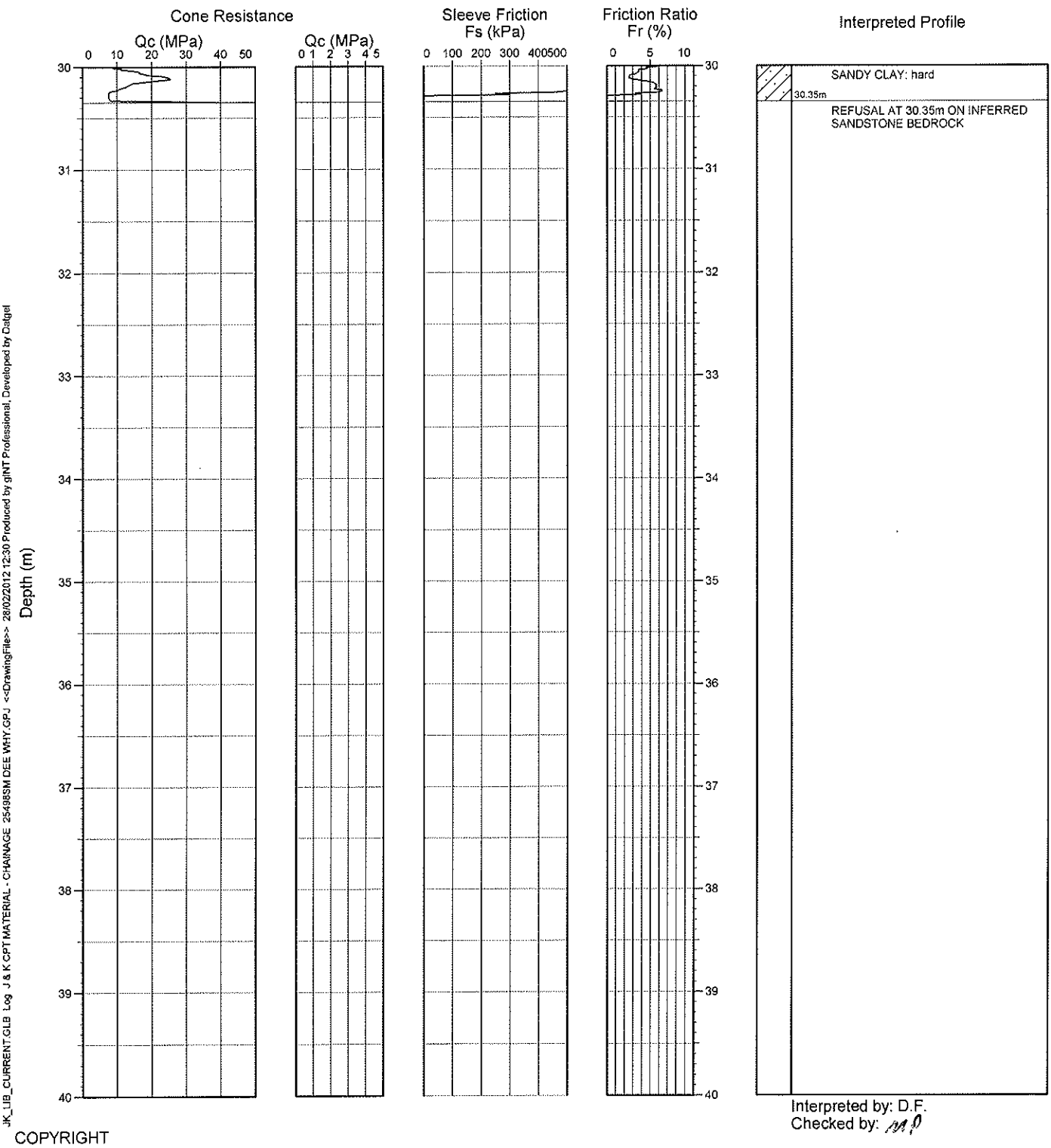
Client:

Project: PROPOSED DEVELOPMENT

Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No.: 25498SM **R.L. Surface:** N/A **Data File:** 25498SM_1.GEF

Date: 13/2/12 **Datum:** **Operator:** D.F.



Interpreted by: D.F.

Checked by: MP

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Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

EFCP No. 4 1 / 4

ELECTRICAL FRICTION CONE PENETROMETER TEST RESULTS

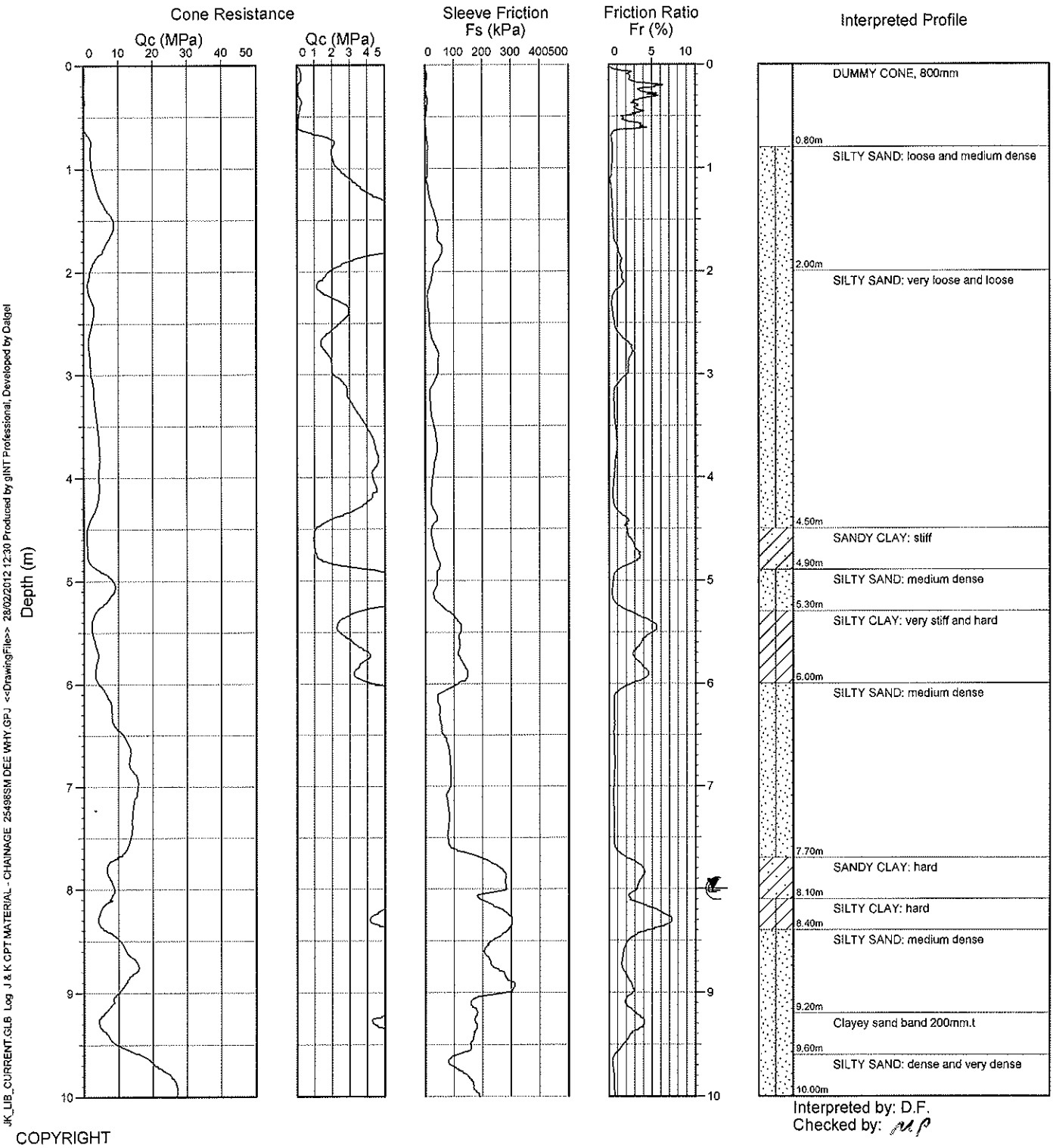
Client:

Project: PROPOSED DEVELOPMENT

Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No.: 25498SM **R.L. Surface:** N/A **Data File:** 25498SM_2.GEF

Date: 13/2/12 **Datum:** **Operator:** D.F.



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Checked by: MP

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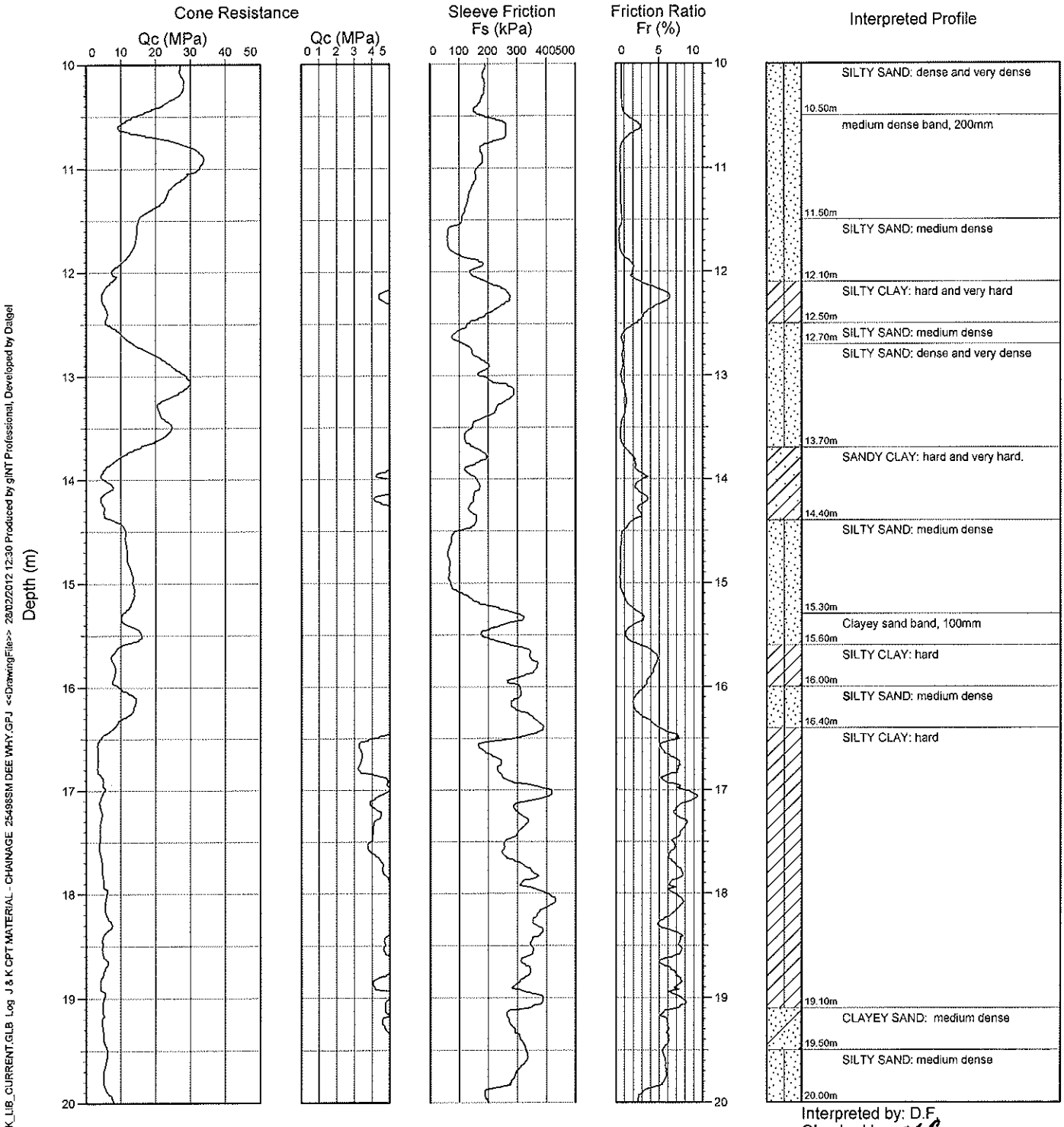
Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

EFCP No. 4 2 / 4

ELECTRICAL FRICTION CONE PENETROMETER TEST RESULTS

Client:		
Project:	PROPOSED DEVELOPMENT	
Location:	18-22 STURDEE PARADE, DEE WHY, NSW	
Job No.: 25498SM	**R.L. Surface:** N/A	**Data File:** 25498SM_2.GEF
Date: 13/2/12	**Datum:**	**Operator:** D.F.



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Checked by: [illegible]

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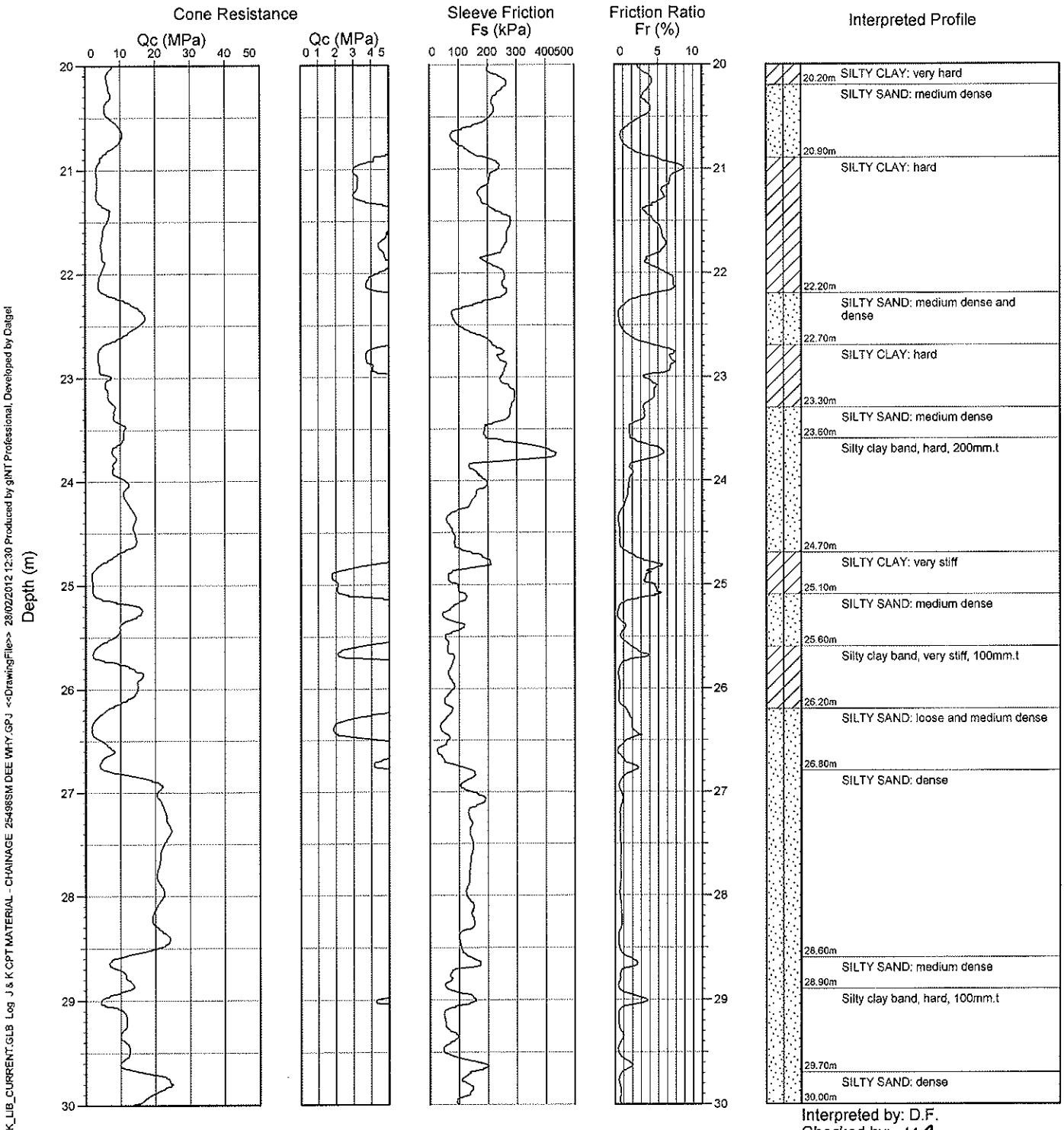
Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

EFCP No. 4 3 / 4

ELECTRICAL FRICTION CONE PENETROMETER TEST RESULTS

Client:		
Project:	PROPOSED DEVELOPMENT	
Location:	18-22 STURDEE PARADE, DEE WHY, NSW	
Job No.: 25498SM	**R.L. Surface:** N/A	**Data File:** 25498SM_2.GEF
Date: 13/2/12	**Datum:**	**Operator:** D.F.



Interpreted by: D.F.
Checked by: MP

JK_LIB_CURRENT.GLB Log J & K CPT MATERIAL - CHAINAGE 25498SM DEE WHY.GPJ <<DrawingFile>> 28/02/2012 12:30 Produced by gINT Professional, Developed by Datgel

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

EFCP No. 4 4 / 4

ELECTRICAL FRICTION CONE PENETROMETER TEST RESULTS

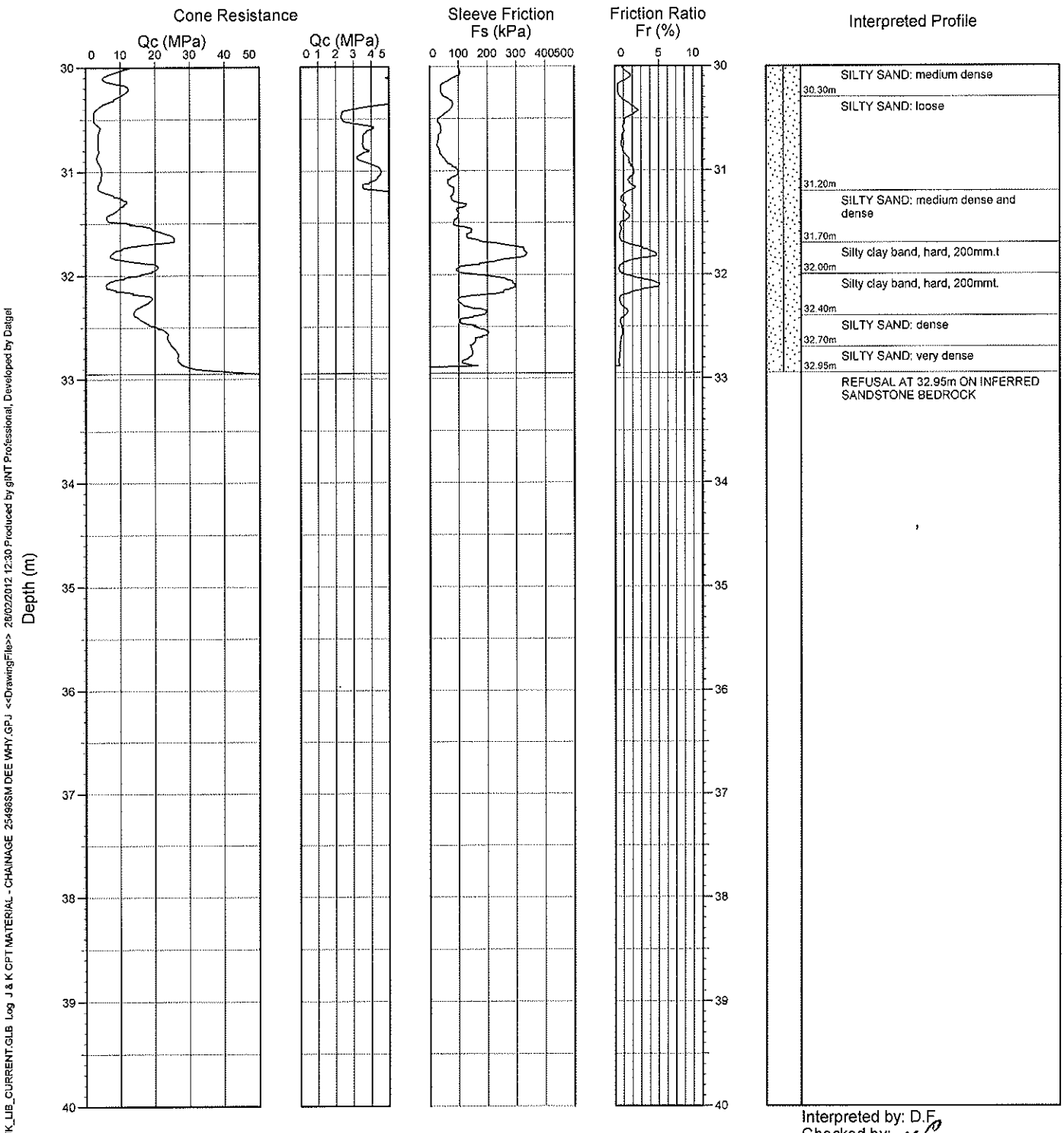
Client:

Project: PROPOSED DEVELOPMENT

Location: 18-22 STURDEE PARADE, DEE WHY, NSW

Job No.: 25498SM **R.L. Surface:** N/A **Data File:** 25498SM_2.GEF

Date: 13/2/12 **Datum:** **Operator:** D.F.



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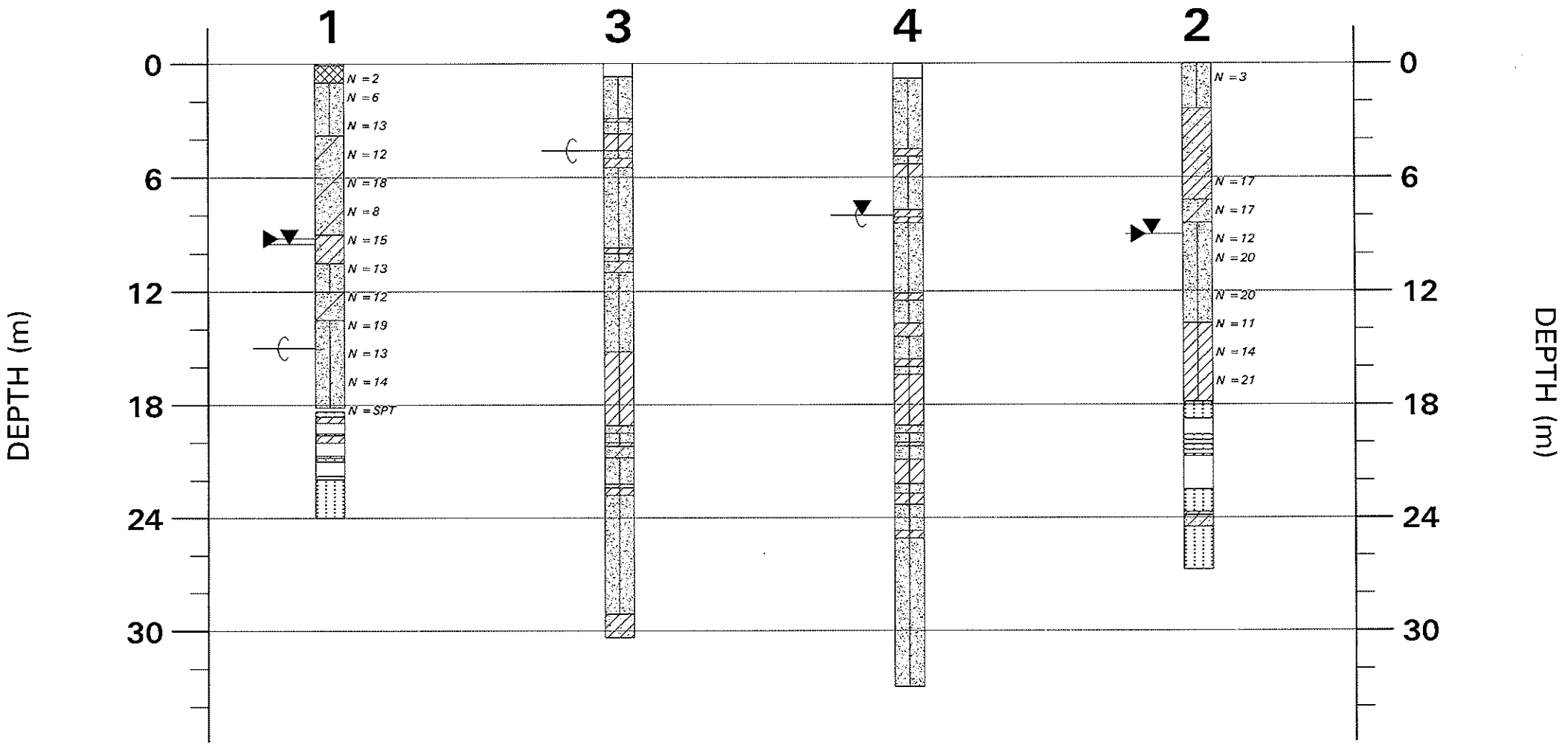
Checked by: MP

JK_LIB_CURRENT.GLB Log J & K CPT MATERIAL - CHAINAGE 25498SM DEE WHY.GPJ <<DrawingFile>> 28/02/2012 12:30 Produced by gINT Professional, Developed by Datgel

GRAPHICAL SUBSURFACE SUMMARY



Concrete
Fill
Silty Sand
Clayey Sand
Sandy Clay
Sandstone/ Greywacke
Core Loss/ Empty
Sand
Silty Clay
Observed water level
Borehole Collapse Depth
Groundwater seepage level
N SPT "N" VALUE
Nc SOLID CONE BLOW COUNTS PER 150mm

NOTE: REFER TO BOREHOLE LOGS

Scale: 1 : 300 (vert) ; NTS (horiz)

Jeffery and Katauskas Pty Ltd

Job No.: 25498SM

Figure No.: 2

INSYNC SERVICES
PTY LTD

Hydraulic Services

Development Application Report

Residential Development

Stage 2

16-22 Sturdee Parade & 23-29 Pacific Parade, Dee Why

Client:

Pinnacle Construction Group Pty Ltd

Architect:

Marchese + Partners Pty Ltd
Level 1, 53 Walker Street
North Sydney SNW 2060
(T) 02 9922 4375
(F) 02 9929 5786

Hydraulic Services Consultant:

Insync Services Pty Ltd
Suite 6.02, Level 6, 89 York Street
Sydney NSW 2000
(T) 02 9262 3400
(F) 02 9262 3422

16 September 2014

File: 20120065 Hydraulic Services Development Application Report.docx

Review and Approval Record:

Rev	Date	Description of Release	Prepared By	Reviewed By	Approved By
A	29/11/13	Development Application	BL	RW	BL
B	16/09/14	Development Application	BL	RW	BL

Contents

1 Introduction

1.1 Background

Pinnacle Construction Group Pty Ltd (the Client), have commissioned Insync Services Pty Ltd (the Hydraulic Services Consultant) to prepare a Development Application (DA) report for the proposed residential development at 16-22 Sturdee Parade & 23-29 Pacific Parade Dee Why.

This report has been prepared to outline the hydraulic services issues associated with the development site outlined above. We would like to note that the documentation has been submitted as a Staged DA as follows:

- Stage 1 - Sturdee Parade Building
- Stage 2 - Pacific Parade Building

This report, the DRAINS calculations and the associated drawings have been submitted for the Staged DA previously. We confirm that approval of Stage 1 (Sturdee Parade Building) has been granted and that Stage 2 required some minor modification.

This report and the associated drawings address the changes to the Stage 2 (Pacific Parade) development for resubmission to Council for their assessment. Please note that there have not been any changes to the DRAINS calculations that were previously submitted.

1.2 Aims

The aim of this report is to provide an outline of the proposed hydraulic services issues associated with the Development Application, specifically including the following;

- Authority Stormwater Drainage Infrastructure
- Site Stormwater Drainage Concept

1.3 Location

The proposed residential development is located across two existing sites described as follows;

The 16-22 Sturdee Parade, Dee Why, site is bounded by existing buildings to the north, east and west, with Sturdee Parade frontage to the south. The site has an overall area of approximately 2,733m^2, and all existing buildings on the site will be demolished to make way for the proposed development.

The 23-29 Pacific Parade, Dee Why, site is bounded by existing buildings to the east, south and west, with Pacific Parade frontage to the north. The site has an overall area of approximately 2,733m^2, and all existing buildings on the site will be demolished to make way for the proposed development.

1.4 Proposed Development

The proposed development incorporates two new multi-storey apartment buildings with three levels of basement car parking. The development will include a total of 199 apartments in accordance with the following apartment type mix;

Apartment Type	16-22 Sturdee Parade, Dee Why	23-29 Pacific Parade, Dee Why	Totals
Studio	0	2	**2**
1 Bedroom	74	80	**154**
2 Bedroom	24	21	**43**
Totals	**98**	**103**	**199**

1.5 Briefing Documents

The hydraulic services engineering elements considered within this report have taken into account the following preliminary documentation and investigations;

- Authority main diagrams.
- Warringah Council On-Site Stormwater Detention Technical Specification
- Architectural documentation prepared by Marchese + Partners Pty Ltd.

2 Stormwater Drainage Infrastructure

2.1 Local Authorities

Warringah Council are the local Authority responsible for the provision of stormwater drainage infrastructure within the development area.

2.2 Existing Stormwater Drainage Infrastructure

Warringah Council are the Authority who provide stormwater drainage infrastructure in the locality of the development site. Currently, there are several existing stormwater mains located within close proximity to the sites, described as follows;

- **Sturdee Parade** – Sturdee Parade does not have any suitable stormwater drainage infrastructure within the vicinity of the development site.

- **Pacific Parade** – an existing kerb entry pit is located midway along the sites street frontage to the southern side of Pacific Parade. This pit is connected by a 375mm pipe into the existing 1800mm x 1200mm stormwater drainage culvert located on the northern side of Pacific Parade.

A copy of the Warringah Council stormwater mains diagram has been included for reference within the Appendix of this report.

2.3 Stormwater Drainage Requirements

The proposed Sturdee & Pacific Parade Development will provide residential facilities over a total site area in the order of 5,466m^2.

Based upon a 100 year storm event with a rainfall intensity of 266mm/h and a 20 year storm event with a rainfall intensity of 206mm/h, we have calculated the respective peak stormwater discharge rates from each site to be as follows;

Variable	Sturdee Parade	Pacific Parade
20 Year Flow Rate	148.57L/s	148.57L/s
100 Year Flow Rate	191.84L/s	191.84L/s

Notwithstanding the fact that strategies such as on-site stormwater detention are required to be employed to reduce the peak site stormwater discharge rate, a piped connection provision for the full 20 year storm event will be required for each site. We have calculated the respective site stormwater connections as follows;

Variable	Sturdee Parade	Pacific Parade
Site Stormwater Connection	375mm	375mm

In addition to the piped drainage connection, full overflow provisions will be required for storm events exceeding the 20 year storm, up to and including the 100 year storm. In this case we have estimated that the full 100 year storm overflow discharge rates for each site as described in the table above. Provision for this overflow will be via overland flow following the natural contours of the site towards Pacific Parade.

2.4 Anticipated Connection Works

The proposed development will require creation of a new inter-allotment stormwater drainage system through the Pacific Parade site for the benefit of the Sturdee Parade site.

A summary of the anticipated stormwater main works required to facilitate the proposed developments is as follows;

- **Sturdee Parade** – the site will require a connection for stormwater drainage to be provided via the creation of a 375mm inter-allotment stormwater drain with associated easement running parallel to the eastern boundary of the Pacific Parade site for its entire length. The inter-allotment stormwater main will then extend in a westerly direction below the southern kerb of Pacific Parade until such point that a road crossing can be made to the north to intercept and connect into the existing 1800mm x 1200mm stormwater drainage culvert located on the northern side of Pacific Parade.

- **Pacific Parade** – the site will be connected into the new 375mm inter-allotment stormwater drain described above for Sturdee Parade.

All inter-allotment stormwater main works are required to be designed to Warringah Council standards, and will require detailed design after approval in principle has been obtained via the Development Approval process.

3 Site Stormwater Drainage Proposal

3.1 Overland Flow

We confirm that the site does not receive any overland flow from existing adjoining developments.

3.2 Council Drainage Connection

As described previously a connection for the site stormwater drainage from this proposed development will be made via a new connection into the existing Council stormwater drainage infrastructure within Pacific Parade.

3.3 Stormwater Detention Design Parameters

In accordance with the On-Site Stormwater Detention Technical Specification as provided by Warringah Council, on-site stormwater drainage will be required for this development.

In accordance with Clause 4.3 of the Technical Specification, an on-site stormwater detention system shall be designed to limit stormwater run-off from the post-developed site for all storms up to and including the 100 year for all storms, to the level of run-off from the pre-developed site assuming that the pre-developed site is 100% impervious. (state of nature)

Computer modelling of the site stormwater system will be used to determine the Permissible Site Discharge (PSD) rates and Site Stormwater Requirements (SSR) required to achieve the above mentioned outcomes.

Specifically the DRAINS model has been utilised with key configuration parameters set as follows;

- Model Type ILSAX
- Paved Area Depression Storage 1mm
- Supplementary Area Depression Storage 5mm
- Grassed Area Depression Storage 5mm
- Soil Type 2.5
- Antecedent Moisture Condition 3
- 2 Year 1 Hour Storm 39.66
- 2 Year 12 Hour Storm 8.95
- 2 Year 72 Hour Storm 2.66
- 50 Year 1 Hour Storm 83.95
- 50 Year 12 Hour Storm 17.84
- 50 Year 72 Hour Storm 5.81
- G Factor 0.00
- F2 Factor 4.30
- F50 Factor 15.87

Catchment data for each of the two sites considered has been determined as follows;

16-22 Sturdee Parade, Dee Why	Paved Area	Supplementary Area	Grassed Area
Percentage Of Area (%)	0	0	100
Additional Time (min)	0	0	0
Flow Path Length (m)	0	0	98.3
Flow Path Slope (%)	0	0	5.5
Flow Path Roughness	0.012	0.33	0.33

23-29 Pacific Parade, Dee Why	Paved Area	Supplementary Area	Grassed Area
Percentage Of Area (%)	0	0	100
Additional Time (min)	0	0	0
Flow Path Length (m)	0	0	57.4
Flow Path Slope (%)	0	0	5.2
Flow Path Roughness	0.012	0.33	0.33

3.4 Detention Tank Details

An independent on-site stormwater detention tank will be provided for each site. The tanks will be constructed from in-situ cast concrete, with the tank located within and accessible from the common landscape area adjacent to the eastern site boundary.

The tanks will be constructed in three sections, incorporating an overflow shaft, a high early discharge chamber, and the general tank storage area. Each section of the tank shall be accessible via access grates located within the tank roof. Step irons will be provided within each section of the tank to provide safe access in accordance with Occupational Health & Safety Guidelines.

Overflow from the on-site detention tank will be via an internal weir between the high early discharge chamber and the overflow chamber. The overflow weir, and outlet pipe from the overflow chamber have been sized to allow for the full 100 year storm capacity.

Permissible site discharge (PSD) will be controlled within the tank via a sharp edged orifice plate installed within the high early discharge chamber. The orifice plate itself being protected by a Maximesh trash screen.

Key details with regard to the on-site stormwater detention tanks are as follows;

16-22 Sturdee Parade, Dee Why	Tank Data
Tank Base Area	99.265
Tank Base RL	19.67 – 19.92
Tank Roof RL (soffit)	21.32
Outlet Control	High Early Discharge
HED Weir Height	20.82
HED Weir Length	3.95
Orifice Diameter	120
Orifice Height	19.67
Overflow Control	Weir
Weir Height	21.02
Weir Length	1.8
Outlet Pipe Diameter	300
Outlet Pipe Invert Level	19.37

23-29 Pacific Parade, Dee Why	Tank Data
Tank Base Area	99.265
Tank Base RL	19.37 – 19.62
Tank Roof RL (soffit)	21.02
Outlet Control	High Early Discharge
HED Weir Height	20.52
HED Weir Length	3.95
Orifice Diameter	120
Orifice Height	19.37
Overflow Control	Weir
Weir Height	20.72
Weir Length	1.8
Outlet Pipe Diameter	300
Outlet Pipe Invert Level	19.07

A summary of the stormwater detention system performance is as follows;

16-22 Sturdee Parade, Dee Why	Pre-Developed Peak Catchment Inflow (L/s)	Post-Developed Peak Catchment Inflow (L/s)	Peak OSD Discharge (L/s)	Peak OSD Overflow (L/s)	Total Site Discharge (L/s)
5 Year ARI Storms	35	106	34	0	34
20 Year ARI Storms	65	143	35	0	35
100 year ARI Storms	99	178	35	0	35

23-29 Pacific Parade, Dee Why	Pre-Developed Peak Catchment Inflow (L/s)	Post-Developed Peak Catchment Inflow (L/s)	Peak OSD Discharge (L/s)	Peak OSD Overflow (L/s)	Total Site Discharge (L/s)
5 Year ARI Storms	44	111	35	0	35
20 Year ARI Storms	76	147	35	0	35
100 year ARI Storms	116	183	35	0	35

3.5 Basement Drainage

A basement drainage system will be required for this development to cater for carpark areas of the development, sub-soil drainage provisions required for the below ground basement, and general water ingress from vehicular driveways into basement levels.

The basement drainage system will be separated from roof water drainage systems to allow for pollution control measures to be incorporated into the site stormwater drainage proposal.

All stormwater discharged from the carpark areas will first pass through a pollution control device, to be located upstream of the sub-soil pump station.

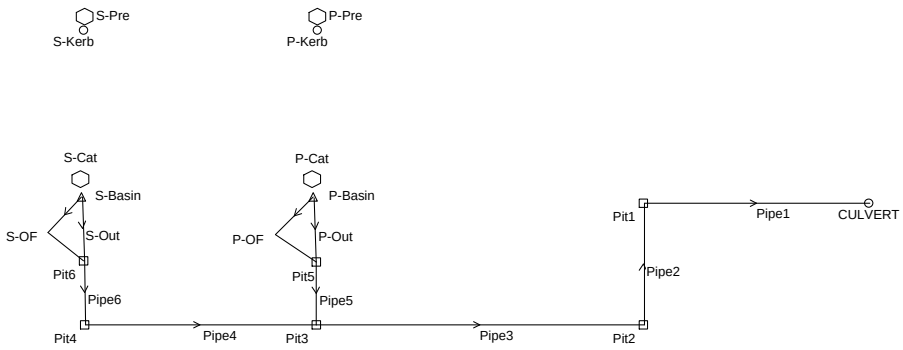
Generally, the type of pollution control device shall be a proprietary device, similar in function to the Ecosol RSF 4300.

4 APPENDIX

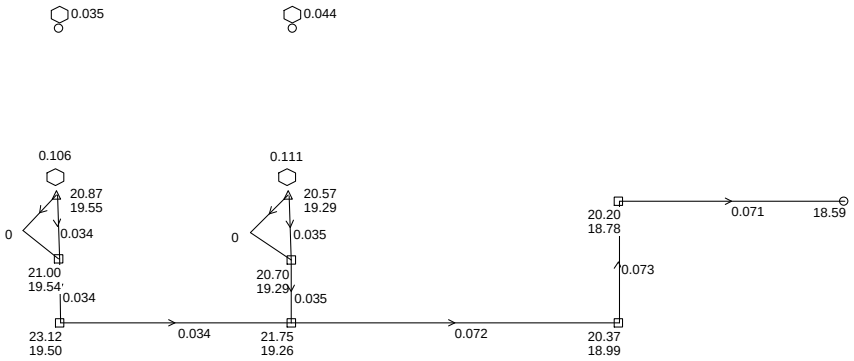
4.1 Stormwater Main Diagram

4.2 Drains Calculations

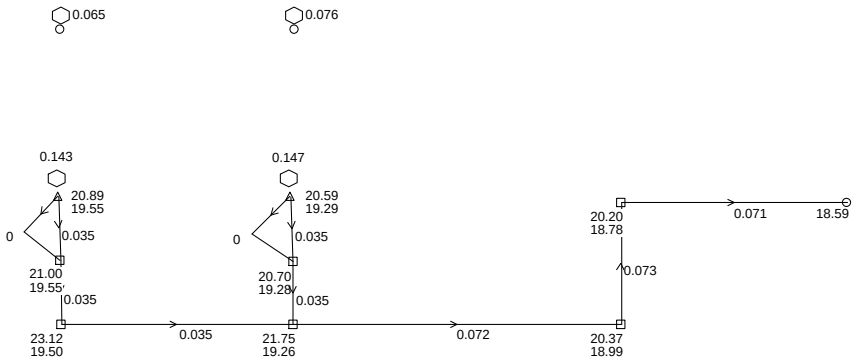

14
16
18
20
22
23
25
Dee Why Lagoon
DEE WHY
Dee Why Lagoon South
PACIFIC PARADE
SPP17264
SP000348
SPP16831
SPP14733
SPP17265
SPP14099
SPP16830
SPP16829
SPP14732



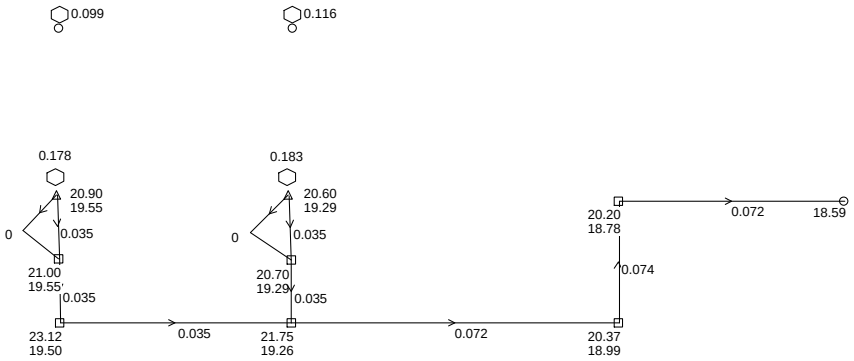
DESIGN DATA
RESIDENTIAL DEVELOPMENT
16-22 STURDEE PARADE, DEE WHY



5 YEAR ARI STORMS
RESIDENTIAL DEVELOPMENT
16-22 STURDEE PARADE, DEE WHY



20 YEAR ARI STORMS
RESIDENTIAL DEVELOPMENT
16-22 STURDEE PARADE, DEE WHY



100 YEAR ARI STORMS
RESIDENTIAL DEVELOPMENT
16-22 STURDEE PARADE, DEE WHY

Project: 16-22 Sturdee parade & 23-29 Pacific Parade, Dee Why
Project Number: 20120065
Date: 29/11/2013
Engineer: Brett Lipscombe

DESIGN DATA

PIT / NODE DETAILS

Name	Type	Family	Version 12 Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss	Inflow Hydrograph	Pit is
S-Kerb	Node					20.1		0		2102.753	-1406.31		33			
Pit6	Sag	Sutherland grated sag pit (sags only)	Sutherland GP 0.9 m x 0.45 m	0.5	1.5	21	0.15	0	0	2103.088	-1512.472	No	51	1 x Ku	No	New
Pit4	Sag	Sutherland grated sag pit (sags only)	Sutherland GP 0.9 m x 0.45 m	0.5	1.5	23.12	0.15	0	0	2103.356	-1541.81	No	25	1 x Ku	No	New
Pit3	Sag	Sutherland grated sag pit (sags only)	Sutherland GP 0.9 m x 0.45 m	0.5	1.5	21.75	0.15	0	0	2209.854	-1541.81	No	9	1 x Ku	No	New
Pit2	Sag	Sutherland grated sag pit (sags only)	Sutherland GP 0.9 m x 0.45 m	0.5	1.5	20.37	0.15	0	0	2360.558	-1541.81	No	8	1 x Ku	No	New
Pit1	Sag	Sutherland grated sag pit (sags only)	Sutherland GP 0.9 m x 0.45 m	0.5	1.5	20.2	0.15	0	0	2360.558	-1485.949	No	7	1 x Ku	No	New
CULVERT	Node					20.16		0		2464.242	-1485.949		6			
Pit5	Sag	Sutherland grated sag pit (sags only)	Sutherland GP 0.9 m x 0.45 m	0.5	1.5	20.7	0.15	0	0	2209.921	-1512.807	No	52	1 x Ku	No	New
P-Kerb	Node					20.1		0		2210.59	-1406.31		1			

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol. (cu.m)	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length(m)	id
S-Basin		19.37	3.465	0 Orifice			120	19.67		2102.083	-1483.001	Yes	20.82	3.95	47
		19.67	3.465												
		19.72	19.265												
		19.77	39.265												
		19.82	59.265												
		19.87	79.265												
		19.92	99.265												
		21.02	99.265												
P-Basin		19.07	3.465	0 Orifice			120	19.37		2208.581	-1483.336	Yes	20.52	3.95	48
		19.37	3.465												
		19.42	19.265												
		19.47	39.265												
		19.52	59.265												
		19.57	79.265												
		19.62	99.265												
		20.72	99.265												

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
S-Pre	S-Kerb	0.2733	0	100	0	0	0	0	0	98.3	0	0	5.5	0	0.012	0.33	0.33	0				1
S-Cat	S-Basin	0.2733	79.6	20.4	0	5	15	0										0				1
P-Cat	P-Basin	0.2733	84.8	15.2	0	5	15	0										0				1
P-Pre	P-Kerb	0.2733	0	100	0	0	0	0	0	57.4	0	0	5.2	0	0.012	0.33	0.33	0				1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)	RL (m)	etc (m)
S-Out	S-Basin	Pit6	1	19.37	19.36	1	uPVC, not under roads, AS/NZS 3500.3 minimum slope	300	303	0.03	NewFixed	1	S-Basin		0				
Pipe6	Pit6	Pit4	1	19.36	19.35	1	uPVC, not under roads, AS/NZS 3500.3 minimum slope	300	303	0.03	NewFixed	1	Pit6		0				
Pipe4	Pit4	Pit3	26.3	19.35	19.08	1.03	FRC Class 2	375	380	0.3	NewFixed	1	Pit4		0				
Pipe3	Pit3	Pit2	21.6	19.05	18.83	1.02	FRC Class 2	375	380	0.3	NewFixed	1	Pit3		0				
Pipe2	Pit2	Pit1	20.6	18.8	18.59	1.02	FRC Class 2	375	380	0.3	NewFixed	1	Pit2		0				
Pipe1	Pit1	CULVERT	11.5	18.56	18.44	1.04	FRC Class 2	375	380	0.3	NewFixed	1	Pit1		0				
P-Out	P-Basin	Pit5	1	19.07	19.06	1	uPVC, not under roads, AS/NZS 3500.3 minimum slope	300	303	0.03	NewFixed	1	P-Basin		0				
Pipe5	Pit5	Pit3	1	19.06	19.05	1	uPVC, not under roads, AS/NZS 3500.3 minimum slope	300	303	0.03	NewFixed	1	Pit5		0				

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of Service (m)	Chg (m)	Bottom Elev (m)	Height of Service (m)	Chg (m)	Bottom Elev (m)	Height of Service (m)	etc etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storms (m)	SafeDepth Minor Storms (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id
S-OF	S-Basin	Pit6	0.1	21.02	1.8	1.45	1.8m OSD WEIR	0.15	0.15	0.6	0.01	0	70
P-OF	P-Basin	Pit5	0.1	20.72	1.8	1.45	1.8m OSD WEIR	0.15	0.15	0.6	0.01	0	74

Project: 16-22 Sturdee parade & 23-29 Pacific Parade, Dee Why
Project Number: 20120065
Date: 29/11/2013
Engineer: Brett Lipscombe

5 YEAR STORM RESULTS

DRAINS results prepared

PIT / NODE DETAILS Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constrain
Pit6	19.54		21	0	1.46		None
Pit4	19.5		23.12	0	3.62		None
Pit3	19.26		21.75	0	2.49		None
Pit2	18.99		20.37	0	1.38		None
Pit1	18.78	20.2		0	1.42		None
CULVERT	18.59			0			
Pit5	19.29	**20.70**		0	1.41		None

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
S-Pre	0.0	0	0.035	0.00	27.3	0	AR&R 5 year, 1 hour storm, average 53.0 mm/h, Zone 1
S-Cat	0.106	0.098	0.009	5	15	0	AR&R 5 year, 25 minutes storm, average 83.0 mm/h, Zone 1
P-Cat	0.111	0.104	0.007	5	15	0	AR&R 5 year, 25 minutes storm, average 83.0 mm/h, Zone 1
P-Pre	0.044	0	0.044	0	20.1	0	AR&R 5 year, 1 hour storm, average 53.0 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.45 impervious + 0.64 pervious = 1.09 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 5 year, 10 minutes st	227.75	123.19 (54.1%)	89.11 (95.2%)	34.08 (25.4%)
AR&R 5 year, 15 minutes st	286.96	168.47 (58.7%)	113.45 (96.2%)	55.02 (32.6%)
AR&R 5 year, 20 minutes st	335.25	204.22 (60.9%)	133.29 (96.7%)	70.92 (35.9%)
AR&R 5 year, 25 minutes st	378.07	236.07 (62.4%)	150.89 (97.1%)	85.18 (38.3%)
AR&R 5 year, 30 minutes st	415.42	258.70 (62.3%)	166.24 (97.4%)	92.46 (37.8%)
AR&R 5 year, 45 minutes st	500.13	316.03 (63.2%)	201.06 (97.8%)	114.97 (39.0%)
AR&R 5 year, 1 hour storm,	579.4	373.15 (64.4%)	233.64 (98.1%)	139.51 (40.9%)
AR&R 5 year, 1.5 hours sto	678.89	431.19 (63.5%)	274.53 (98.4%)	156.66 (39.2%)
AR&R 5 year, 2 hours storm	760.86	480.11 (63.1%)	308.22 (98.6%)	171.89 (38.4%)
AR&R 5 year, 3 hours storm	888.8	557.57 (62.7%)	360.81 (98.8%)	196.76 (37.6%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
S-Out	0.034	0.79	19.546	19.545	AR&R 5 year, 25 minutes storm, average 83.0 mm/h, Zone 1
Pipe6	0.034	1.03	19.502	19.501	AR&R 5 year, 25 minutes storm, average 83.0 mm/h, Zone 1
Pipe4	0.034	1.44	19.45	19.257	AR&R 5 year, 25 minutes storm, average 83.0 mm/h, Zone 1
Pipe3	0.072	2.19	19.176	18.994	AR&R 5 year, 1 hour storm, average 53.0 mm/h, Zone 1
Pipe2	0.073	2.75	18.908	18.776	AR&R 5 year, 10 minutes storm, average 125 mm/h, Zone 1
Pipe1	0.071	1.97	18.695	18.586	AR&R 5 year, 2 hours storm, average 34.8 mm/h, Zone 1
P-Out	0.035	0.63	19.287	19.285	AR&R 5 year, 25 minutes storm, average 83.0 mm/h, Zone 1
Pipe5	0.035	0.69	19.259	19.257	AR&R 5 year, 25 minutes storm, average 83.0 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
S-OF	0	0	0	0	0	0	0	
P-OF	0	0	0	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
S-Basin	20.87	107.7	0.034	0.034	0
P-Basin	20.57	107.9	0.035	0.035	0

CONTINUITY CHECK for AR&R 5 year, 1 hour storm, average 53.0 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
S-Kerb	58.78	58.78	0	0
S-Basin	125.31	121.85	0	2.8
Pit6	121.85	121.81	0	0
Pit4	121.81	121.67	0	0.1
Pit3	247.35	247.05	0	0.1
Pit2	247.05	247.09	0	0
Pit1	247.09	245.96	0	0.5
CULVERT	245.96	245.96	0	0
P-Basin	129.6	125.63	0	3.1
Pit5	125.63	125.68	0	0
P-Kerb	59.46	59.46	0	0

Run Log for 20120065 Drains.drn run at 11:09:38 on 2/12/2013

No water upwelling from any pit. Freeboard was adequate at all pits.
Flows were safe in all overflow routes.

Project: 16-22 Sturdee parade & 23-29 Pacific Parade, Dee Why
Project Number: 20120065
Date: 29/11/2013
Engineer: Brett Lipscombe

20 YEAR STORM RESULTS

DRAINS results prepared 02 December, 2013 from Version 2013.13

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit6	19.55	21	0	0	1.45		None
Pit4	19.5	23.12	0	0	3.62		None
Pit3	19.26	21.75	0	0	2.49		None
Pit2	18.99	20.37	0	0	1.38		None
Pit1	18.78	20.2	0	0	1.42		None
CULVERT	18.59		0				
Pit5	19.28	20.7	0	0	1.42		None

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)		Due to Storm
S-Pre	0.065	0	0.065	0	24.29		0	AR&R 20 year, 1 hour storm, average 71.0 mm/h, Zone 1
S-Cat	0.143	0.128	0.015	5	15		0	AR&R 20 year, 25 minutes storm, average 109 mm/h, Zone 1
P-Cat	0.147	0.137	0.011	5	15		0	AR&R 20 year, 25 minutes storm, average 109 mm/h, Zone 1
P-Pre	0.076	0	0.076	0	17.89		0	AR&R 20 year, 1 hour storm, average 71.0 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.45 impervious + 0.64 pervious = 1.09 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 20 year, 10 minutes storm, average 162 mm/h, Zone 1	295.16	190.06 (64.4%)	116.82 (96.3%)	73.24 (42.1%)
AR&R 20 year, 15 minutes storm, average 137 mm/h, Zone 1	374.42	255.30 (68.2%)	149.39 (97.1%)	105.90 (48.0%)
AR&R 20 year, 20 minutes storm, average 121 mm/h, Zone 1	440.92	309.18 (70.1%)	176.73 (97.5%)	132.45 (51.0%)
AR&R 20 year, 25 minutes storm, average 109 mm/h, Zone 1	496.49	352.36 (71.0%)	199.57 (97.8%)	152.79 (52.2%)
AR&R 20 year, 30 minutes storm, average 100 mm/h, Zone 1	546.6	387.36 (70.9%)	220.16 (98.0%)	167.21 (51.9%)
AR&R 20 year, 45 minutes storm, average 82.0 mm/h, Zone 1	672.32	483.88 (72.0%)	271.83 (98.4%)	212.05 (53.5%)
AR&R 20 year, 1 hour storm, average 71.0 mm/h, Zone 1	776.17	564.86 (72.8%)	314.51 (98.6%)	250.34 (54.8%)
AR&R 20 year, 1.5 hours storm, average 55.0 mm/h, Zone 1	901.89	649.49 (72.0%)	366.18 (98.8%)	283.30 (53.3%)
AR&R 20 year, 2 hours storm, average 46.3 mm/h, Zone 1	1012.32	725.03 (71.6%)	411.57 (98.9%)	313.46 (52.6%)
AR&R 20 year, 3 hours storm, average 36.0 mm/h, Zone 1	1180.66	841.89 (71.3%)	480.76 (99.1%)	361.13 (51.9%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
S-Out	0.035	0.79	19.547	19.545	AR&R 20 year, 25 minutes storm, average 109 mm/h, Zone 1
Pipe6	0.035	1.03	19.503	19.502	AR&R 20 year, 25 minutes storm, average 109 mm/h, Zone 1
Pipe4	0.035	1.44	19.45	19.257	AR&R 20 year, 25 minutes storm, average 109 mm/h, Zone 1
Pipe3	0.072	2.21	19.175	18.994	AR&R 20 year, 30 minutes storm, average 100 mm/h, Zone 1
Pipe2	0.073	2.74	18.908	18.777	AR&R 20 year, 30 minutes storm, average 100 mm/h, Zone 1
Pipe1	0.071	1.96	18.695	18.587	AR&R 20 year, 15 minutes storm, average 137 mm/h, Zone 1
P-Out	0.035	0.64	19.286	19.285	AR&R 20 year, 1.5 hours storm, average 55.0 mm/h, Zone 1
Pipe5	0.035	0.69	19.258	19.257	AR&R 20 year, 30 minutes storm, average 100 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
S-OF	0	0	0	0	0	0	0	0
P-OF	0	0	0	0	0	0	0	0

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
S-Basin	20.89	109.3	0.035	0.035	0
P-Basin	20.59	109.4	0.035	0.035	0

CONTINUITY CHECK for AR&R 20 year, 1 hour storm, average 71.0 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
S-Kerb	105.79	105.79	0	0
S-Basin	174.07	172.78	0	0.7
Pit6	172.78	172.73	0	0
Pit4	172.73	172.59	0	0.1
Pit3	349.41	348.87	0	0.2
Pit2	348.87	349.32	0	-0.1
Pit1	349.32	347.81	0	0.4
CULVERT	347.81	347.81	0	0
P-Basin	178.47	176.86	0	0.9
Pit5	176.86	176.82	0	0
P-Kerb	106.53	106.53	0	0

Run Log for 20120065 Drains.drn run at 11:12:30 on 2/12/2013

No water upwelling from any pit. Freeboard was adequate at all pits.
Flows were safe in all overflow routes.

Project: 16-22 Sturdee parade & 23-29 Pacific Parade, Dee Why
Project Number: 20120065
Date: 29/11/2013
Engineer: Brett Lipscombe

100 YEAR STORM RESULTS

DRAINS results prepared 02 December, 2013 from Version 2013.13

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit6	19.55	21		0	0	1.45	None
Pit4	19.5	23.12		0	0	3.62	None
Pit3	19.26	21.75		0	0	2.49	None
Pit2	18.99	20.37		0	0	1.38	None
Pit1	18.78	20.2		0	0	1.42	None
CULVERT	18.59			0			
Pit5	19.29	20.7		0	0	1.41	None

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)		Due to Storm
S-Pre	0.099	0	0.099	0		21.71	0	AR&R 100 year, 1 hour storm, average 94.0 mm/h, Zone 1
S-Cat	0.178	0.157	0.021	5		15	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
P-Cat	0.183	0.167	0.016	5		15	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
P-Pre	0.116	0	0.116	0		12.96	0	AR&R 100 year, 20 minutes storm, average 159 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.45 impervious + 0.64 pervious = 1.09 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 10 minutes storm, average 210 mm/h, Zone 1	382.62	277.33 (72.5%)	152.76 (97.1%)	124.57 (55.3%)
AR&R 100 year, 15 minutes storm, average 179 mm/h, Zone 1	489.21	368.55 (75.3%)	196.57 (97.8%)	171.98 (59.7%)
AR&R 100 year, 20 minutes storm, average 159 mm/h, Zone 1	579.4	445.72 (76.9%)	233.64 (98.1%)	212.08 (62.1%)
AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1	655.92	506.23 (77.2%)	265.09 (98.3%)	241.14 (62.4%)
AR&R 100 year, 30 minutes storm, average 132 mm/h, Zone 1	721.51	559.06 (77.5%)	292.05 (98.5%)	267.01 (62.8%)
AR&R 100 year, 45 minutes storm, average 109 mm/h, Zone 1	893.69	700.53 (78.4%)	362.81 (98.8%)	337.71 (64.2%)
AR&R 100 year, 1 hour storm, average 94.0 mm/h, Zone 1	1027.61	810.25 (78.8%)	417.85 (98.9%)	392.40 (64.8%)
AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1	1213.45	955.84 (78.8%)	494.24 (99.1%)	461.60 (64.6%)
AR&R 100 year, 2 hours storm, average 62.0 mm/h, Zone 1	1355.55	1063.83 (78.5%)	552.64 (99.2%)	511.20 (64.0%)
AR&R 100 year, 3 hours storm, average 47.7 mm/h, Zone 1	1564.4	1215.92 (77.7%)	638.49 (99.3%)	577.43 (62.7%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
S-Out	0.035	0.79	19.547	19.546	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Pipe6	0.035	1.04	19.503	19.502	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Pipe4	0.035	1.45	19.451	19.257	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Pipe3	0.072	2.27	19.173	18.994	AR&R 100 year, 20 minutes storm, average 159 mm/h, Zone 1
Pipe2	0.074	2.73	18.909	18.779	AR&R 100 year, 30 minutes storm, average 132 mm/h, Zone 1
Pipe1	0.072	1.96	18.696	18.587	AR&R 100 year, 20 minutes storm, average 159 mm/h, Zone 1
P-Out	0.035	0.64	19.287	19.286	AR&R 100 year, 15 minutes storm, average 179 mm/h, Zone 1
Pipe5	0.035	0.7	19.258	19.257	AR&R 100 year, 20 minutes storm, average 159 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
S-OF	0	0	0	0	0	0	0	0
P-OF	0	0	0	0	0	0	0	0

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level	
S-Basin	20.9	110.6	0.035	0.035		0
P-Basin	20.6	110.8	0.035	0.035		0

CONTINUITY CHECK for AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
S-Kerb	195.49	195.49	0	0
S-Basin	279.38	280.21	0	-0.3
Pit6	280.21	280.17	0	0
Pit4	280.17	280.07	0	0
Pit3	565.33	564.99	0	0.1
Pit2	564.99	564.28	0	0.1
Pit1	564.28	562.73	0	0.3
CULVERT	562.73	562.73	0	0
P-Basin	284.79	285.28	0	-0.2
Pit5	285.28	285.26	0	0
P-Kerb	196.17	196.17	0	0

Run Log for 20120065 Drains.drn run at 11:10:03 on 2/12/2013

No water upwelling from any pit. Freeboard was adequate at all pits.
Flows were safe in all overflow routes.

28 May 2013

CPM ENGINEERING
Civil & Structural Consulting Engineers
ABN 56 210 806 383

Joe Bechara
Allpro Building Services
10/56 Buffalo Road
GLADESVILLE NSW 2111

Our Ref: 12155

PRELIMINARY FLOOD REPORT

27 – 29 PACIFIC PARADE, DEE WHY

At your request, we are currently completing a full Flood Study for this property, studying the known flooding point in Pacific Parade which is nearby to the property frontage. Our full Hydrological and basic Hydraulic Computer models are complete, with the remaining work being to refine the Hydraulic model with further site investigations and preparation of the full report.

This preliminary report identifies the approximate 100 year Flood and Flood Planning Levels (FPL's), for you to consider with the options for the site and development discussions with council.

The Pacific Parade frontage is subject to flooding. The 100 year Flood Level is approximately RL: 20.75 and the Flood Planning Level is approximately FPL: 21.25.

All finished floor levels and crests in basement ramps will need to be at or above the flood planning level.

Considering this, the site is partially affected, to a very minor extent. The RL:21 contour passes through the front of the site at an approximate setback of 5m, see the attached survey.

Should you have any queries regarding this matter, please do not hesitate to contact the undersigned.

Yours Sincerely,
CPM Engineering

Chris Morris
BE(Hons) MIEAust CPEng NPER RPEQ
Accredited Certifier BPB No. 0278

Principal:
CHRIS MORRIS
BE (Hons) MIE Aust CPEng NPER
Accredited Certifier
C:\Old D Drive\Projects\12155deew\12155L01.doc

PO Box 1050
SUTHERLAND NSW 1499
M: 0412 401 282
P/F: (02) 9525 5567
E: cpmeng@optusnet.com.au

NOTES:

1) TITLE BEARINGS AND DIMENSIONS ARE SHOWN.
   BOUNDARY REDEFINITION HAS NOT BEEN UNDERTAKEN.
2) ORIGIN OF LEVELS: SSM 40977 R.L 20.13 (A.H.D.) (L.I.C 2013)
3) SITE COMPRISES LOTS 8 & 9 SEC. E D.P. 8270
   LOT 1 D.P. 776401
4) SITE AREA 3414.2m^2 BY TITLE DIMENSIONS.
5) UNDERGROUND SERVICES HAVE NOT BEEN INVESTIGATED.
6) (G) DENOTES GUTTER LEVEL.
7) TREE NAMES SHOWN CONSTITUTE OUR OPINION ONLY. IF TREE SPECIES IDENTIFICATION IS IMPORTANT FOR DESIGN OR HERITAGE REASONS THEY SHOULD BE DETERMINED BY A QUALIFIED ARBORIST.
8) CAUTION: SHOULD ANY DEVELOPMENT OR CONSTRUCTION BE PLANNED ON OR NEAR THE BOUNDARIES, THE BOUNDARIES SHOULD BE CLEARLY MARKED ON SITE

NO INVESTIGATION OF UNDERGROUND SERVICES HAVE BEEN MADE. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE

DEVELOPERS & EXCAVATORS MAY BE HELD FINANCIALLY RESPONSIBLE BY THE ASSET OWNER SHOULD THEY DAMAGE UNDERGROUND NETWORKS

CARELESS DIGGING CAN:
- CAUSE DEATH OR SERIOUS INJURY TO WORKERS & THE GENERAL PUBLIC
- INCONVENIENCE USERS OF ELECTRICITY, GAS, WATER & COMMUNICATIONS
- LEAD TO CRIMINAL PROSECUTION & DAMAGES CLAIMS
- CAUSE EXPENSIVE FINANCIAL LOSSES TO BUSINESS
- CUT OFF EMERGENCY SERVICES
- DELAY PROJECT COMPLETION TIMES WHILE THE DAMAGE IS REPAIRED

MINIMISE YOUR RISK & DIAL BEFORE YOU DIG
TELEPHONE: 1100

ISSUE	DATE	AMENDMENT
A	19-4-13	ADDITIONAL INFORMATION ADDED FOR PACIFIC PARADE

TITLE: PLAN SHOWING SELECTED DETAIL & LEVELS OVER No. 23-29 PACIFIC PARADE, DEE WHY

LGA: WARRINGAH | REFERENCE: 38530

CLIENT : - | DATE: 22-03-13 | SHEET 4

SCALE (AT A0) 1:200 | DATUM : AHD | SURVEYOR: RH

Higgins Surveyors
PROPERTY & DEVELOPMENTS CONSULTANTS
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STATEMENT OF ENVIRONMENTAL EFFECTS

Residential Flat Building
(Stage 2 Development)

16 – 22 Sturdee & 23-29 Pacific Parade
DEE WHY

Statement of Environmental Effects

RESIDENTIAL FLAT BUILDING

23-29 Pacific Parade DEE WHY

prepared under instructions from

Dee Why Properties Pty Ltd &

Marchese + Partners Architects Pty Ltd

by

Ross Fleming
B Urb & Reg Plan (UNE)

Boston Blyth Fleming Pty Ltd
Town Planners

Suite 1/9 Narabang Way
Belrose NSW 2085
Tel: (02) 99862535

Oct. 2014

TABLE OF CONTENTS

ANNEXURES

1.0 INTRODUCTION

The Joint Regional Planning Panel dealt with DA2013/1519 (JRPP No.2014SYE004) on the 17th July 2014 and granted consent to a staged development application that provided for:

STAGE 1 - the consolidation of Lots 8, 9, 23, 24 & 25, Section E, DP 8270 and lot 1 DP 778401 No's 18-22 Sturdee Parade and 23-29 Pacific Parade Dee Why and the re-subdivision of that land to form two equal sized 2731m^2 lots with frontages to Sturdee Parade and Pacific Parade respectively and permitting:

- the redevelopment of the proposed Sturdee Parade lot including the demolition of the existing structures and tree removal to facilitate the construction of a residential flat building over 7 storey's plus basements incorporating 98 residential apartments.

STAGE 2 - condition (2) of the consent requires a subsequent development application to permit the redevelopment of the proposed Pacific Parade lot as a residential flat building and condition 1(b) of that consent requires Pacific Parade building (as per the staged DA consent drawings) to be modified to delete the proposed level 7 and for the building to conform to a maximum height of 21m.

This statement addresses the details of the application for Stage 2 having regard to:

- The Environmental Planning and Assessment Act, 1979 as amended ("The Act").
- The Environmental Planning and Assessment Regulation ("The Regulation").
- SEPP 55 (Remediation of Land)
- SEPP (Infrastructure) 2007
- SEPP (Building Sustainability Index – BASIX) 2004
- SEPP 65 – Design Quality of Residential Flat Development
- Warringah Local Environmental Plan 2011 ("The LEP").
- Warringah Development Control Plan ("The DCP").

The development application is accompanied by a range of documents:

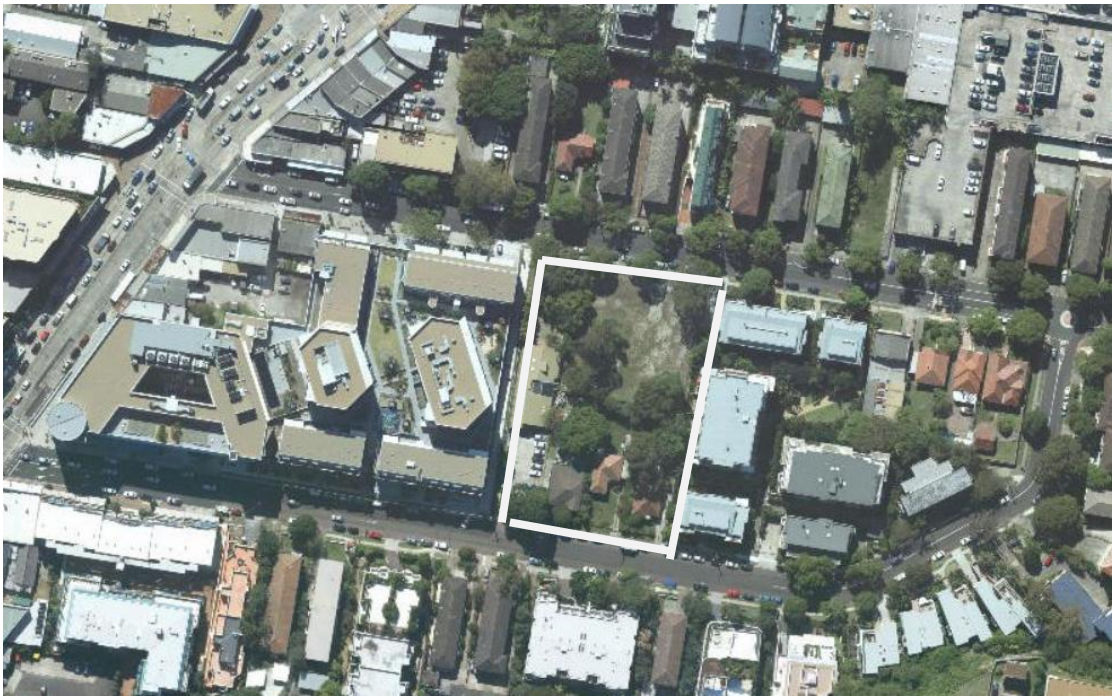
- Level and Detail Site Survey (ref.38530 sheets 1 -4) prepared by Higgins Surveyors and 2328 sheets 1-3 prepared by C & A Registered Surveyors.
- Architectural drawings DA 0.01 – 0.04 (preliminaries), DA 1.01 – 1.10 and 1.12 & 1.13 inclusive (floor plans), DA 2.01 & 2.01 (elevations), 3.01 -3.03 (sections), 5.01 (external materials finishes) and including shadow diagrams (4.04 – 4.06) and certification by Marchese + Partners architects
- Landscape details (sheets 1-5) prepared by 360^o Landscape Architecture

- Acoustic report (stage 2) prepared by Acoustic Logic
- Arboriculture Impact Statement by Footprint Green Pty Ltd dated 17th September 2014
- SEPP 65 design verification statement prepared by Marchese + Partners Architects dated 16th September 2014
- Stage 2 Assessment of traffic and parking prepared by Varga Traffic Planning Pty Ltd date 16th September 2014
- Revised Waste Management Plan by Elephants Foot Recycling Solutions dated September 2014
- BCA Assessment (stage 2) by City Plan Services dated 17th September 2014
- Preliminary flood report dated 28th May 2013 by CPM Engineering
- Stormwater drawings SW 000 -016 inclusive and certification by CPM Engineering dated 16th September 2014
- Stage 2 Hydraulic Services Plans by Insync Services Pty Ltd dated 16th September 2014
- BASIX certification dated 28th August 2014
- Stage 2 Geotechnical Investigation by Jeffery & Katauskas Pty Ltd dated 16th September 2014
- Access Report (Stage 2) by Accessibility Solutions dated 16th September 2014
- Traffic Management (Construction) – Pinnacle Construction Group
- Visual Impact & View Sharing Assessment - RLA dated 22nd September 2014
- Quantity Surveyors Report

The proposed works are permissible with consent and consistent with the intent of the zoning and built form controls as they are reasonably applied to the site and with the staged consent as approved by the JRPP on the 17th July 2014. The proposal succeeds when assessed against the Heads of Consideration pursuant to s79C of the Environmental Planning and Assessment Act, 1979 as amended. It is considered that the application, the subject of this document, succeeds on merit and is appropriate for the granting of consent.

2.0 SITE DESCRIPTION AND LOCATION

The stage 1 and 2 sites comprises Lots 8 & 9, 23 - 25, Section E, DP 8207, No's 16 -22 Sturdee Parade Dee Why and 23 -29 Pacific Parade and Lot 1, DP 776401. The combined sites have an area of 5463m^2.The land falls gently away from the road frontage at a grade along its western boundary of 4%.



Aerial Photo and site indication – Six Maps

Stage 2 works are confined to that portion of the site having frontage to Pacific Parade (as described in the Introduction to this Statement) and having a frontage of 60.96m and a depth of 44.805m.

The works involve the removal of the current site improvements. The arboriculture assessment addresses 46 specimens on or adjacent to the site. The locality within the immediate vicinity of the site is developed including the Dee Why Grand development involving mixed use retail/commercial and residential development as an extension of the Dee Why commercial centre. Land immediately to the east and south of the site in Sturdee Parade is within a medium density locality featuring buildings ranging between 3 – 5 storeys. The site adjoins the Dee Why Grand mixed use development immediately to the west of the site.

The land being of moderate grade and without any hazard indications as per the Council planning maps (including acid sulphate soil or flooding) is appropriate for the use contemplated by this application and is consistent with the land use outcome and intention of the Warringah Local Environmental Plan 2011. The flood study accompanying the DA has been commissioned as a consequence of comments provided at the pre DA meeting by Council and makes recommendations in relation to a minimum floor level/free board. The development application has been prepared consistent with that advice. A detailed site investigation prepared by J & K makes recommendations associated with the detail of the subsurface works, piling and slab design and dilapidation of neighbouring properties and includes the possibility of dewatering the site in certain circumstances. The boreholes as per that report indicate that the water table is encountered between RL 14.45 and RL 14.95 and that these levels are generally below the basement level of the proposed building (RL 14.90). As such it is not envisaged that dewatering or a license to pump ground water will be required.

3.0 DEVELOPMENT PROPOSAL

The application proposes the following elements:

- Demolition of the current site improvements and site clearing consistent with the arborist details as per Footprint Green assessment 17/09/14.

- Stage 2 residential flat building development as per the drawing accompanying the DA submission prepared by Marchese + Partners.

- Site landscaping as per 360^0 Landscape plan drawings

Drawings DA0.01 provide a schedule of individual unit floor areas and Private Open Space areas together with solar access indicators and cross ventilation indicators.

This application provides for the construction of a residential flat building comprising 2 studio apartments, 80 one bedroom apartments and 21 two bedroom apartments (being a reduction of 4 apartments from the original DA submission and arising as a consequence of condition 1(b) involving the deletion of Level 7 –ref. Section drawing DA3.02). The building form and relationship to neighbouring buildings is not changed other than the deletion of level 7.

4.0 STATUTORY PLANNING FRAMEWORK

4.1 General

The following section of the report will assess the proposed development having regard to the statutory planning framework and matters for consideration pursuant to Section 79C of the Environmental Planning & Assessment Act, 1979 as amended. Those matters which are required to be addressed are outlined, and any steps to mitigate against any potential adverse environmental impacts are discussed below.

SEPP 55 – Remediation of Land

The land is/has been developed for residential purposes and a children's care facility. There is no reason to expect any former use of the land which might render the site as contaminated or unsuitable for the development as proposed. The J&K site investigation submitted with the DA does not include a contamination assessment but does not encounter materials that would indicate an issue of concern particularly associated with the borehole testing as undertaken.

SEPP 65 – Design Quality for Residential Flat Development

The development is defined as a 'residential flat building' and is to be assessed having regard to the design quality principles pursuant to clause 9 -18 of this SEPP. The application is accompanied by a design verification statement and assessment report prepared by Marchese + Partners architects addressing the principles and outcome anticipated by the detail of the design.

SEPP (Building Sustainability Index: BASIX) 2004

A BASIX certificate accompanies the DA.

SEPP (Infrastructure) 2007

The site is connected to all reticulated services.

With regard to the requirements of clause 104(2)(b) and Column 3 of the SEPP the development does not have direct access to a classified road nor does the development connect to a road that is within 90m of a classified road and accordingly the provision of 104(2)(b) do not apply. The application is accompanied by an acoustic assessment report prepared by Acoustic Logic which makes recommendations in relation to the treatment of building details at Part 4.3 concerning noise attenuation and the objectives of AS21107:2000.

4.2 Warringah Local Environmental Plan 2011

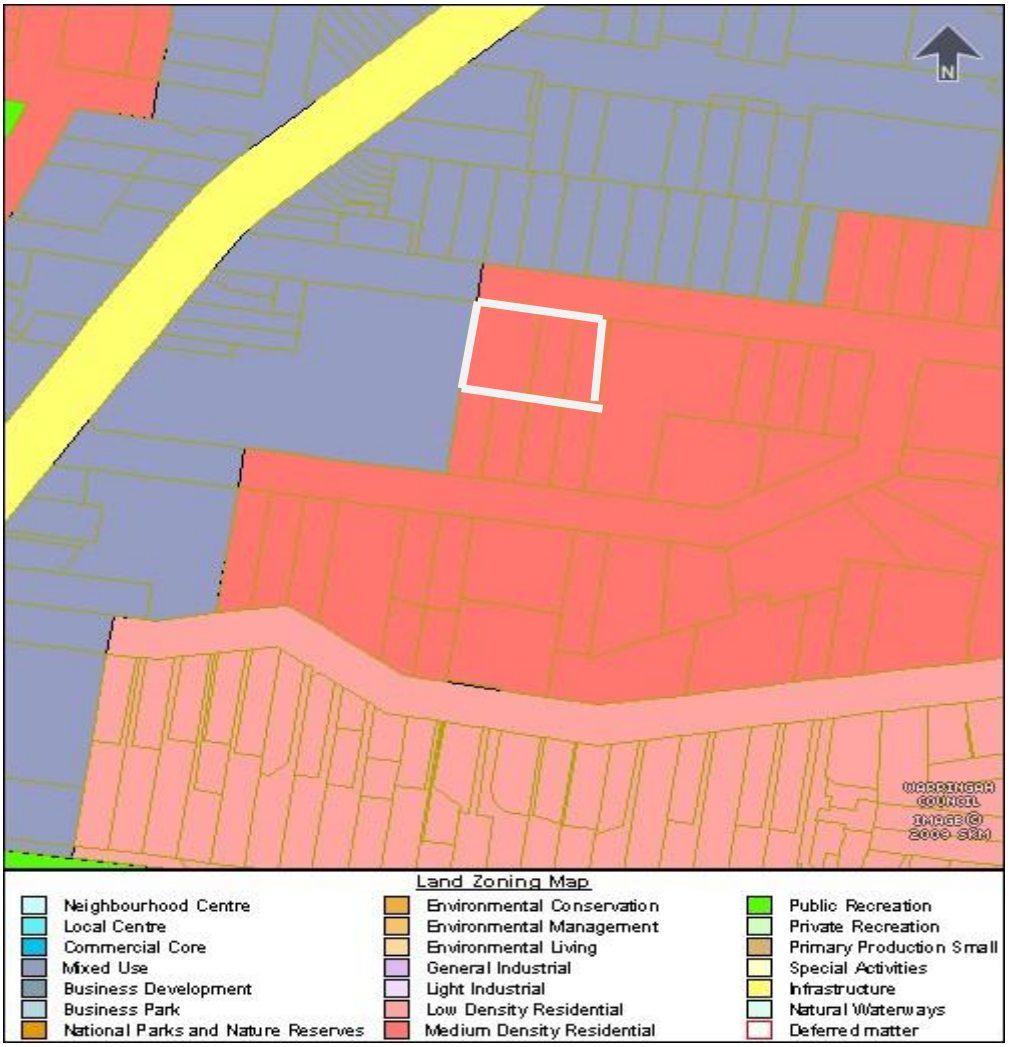
4.2.1 Zone and Zone Objectives

The subject property is zoned R3 medium density residential zone pursuant to the provisions of the Warringah Local Environmental Plan 2011 (WLEP). Residential Flat Buildings are permitted with consent in the zone.

The stated zone objectives are as follows:

- *To provide for the housing needs of the community within a medium density residential environment.*
- *To provide a variety of housing types within a medium density residential environment.*
- *To enable other land uses that provide facilities or services to meet the day to day needs of residents.*
- *To ensure that medium density residential environments are characterised by landscaped settings that are in harmony with the natural environment of Warringah.*
- *To ensure that medium density residential environments are of a high visual quality in their presentation to public streets and spaces.*

The built form and the land use function provided for by this application are consistent with the objectives of the zone and as anticipated by the zoning. The site is not a nominated heritage item and is not within the vicinity of a heritage item.



Zoning Extract

The detail of the design is above the standing water levels as detailed by the J&K site investigation and in those circumstances it is not considered the development requires referral to the NSW Office of Water pursuant to the Water Management Act 2000.

4.2.2 Height of Buildings

Pursuant to clause 4.3 WLEP the height of any building on the land shall not exceed 21 metres above existing ground level as detailed on the heights of building map. The stated objectives of this clause are as follows:

(a) to ensure that buildings are compatible with the height and scale of surrounding and nearby development,

(b) to minimise visual impact, disruption of views, loss of privacy and loss of solar access,

(c) to minimise any adverse impact of development on the scenic quality of Warringah's coastal and bush environments,

(d) to manage the visual impact of development when viewed from public places such as parks and reserves, roads and community facilities.

The dictionary to the LEP defines building height to mean:

***building height** (or **height of building**) means the vertical distance between ground level (existing) and the highest point of the building, including plant and lift overruns, but excluding communication devices, antennae, satellite dishes, masts, flagpoles, chimneys, flues and the like*

Section drawings accompanying the application detail the height of the building relative to the existing ground level. The building conforms to the height standard as per the LEP and the condition of the staged approval for the height relating to Stage 2.

4.3 Warringah Development Control Plan

The subject site is within the area of Part G Special Area Controls and to which the specific provisions of Part G2 of the DCP apply. The objectives of this area are:

Objectives

- To create a visual and spatial transition from the mixed use land adjacent to Pittwater Road to the residential area east of Sturdee Parade.
- To retain significant public and private views.
- To provide a suite of controls that will enable development options and encourage design innovation.
- To encourage lot consolidation and sustainability over the land.
- To ensure shops and dwellings enjoy good access to natural light and buildings address the street.

The objective relating to site consolidation is achieved by the staged development application as approved and the consolidation of the entirety of the remnant undeveloped land in this locality into a two lot redevelopment.

The design of the building has been developed to stage the height of the building away from the street consistent with the building envelop control; to provide for an effective spatial separation between buildings associated with stage 1 and 2; to provide for an increased separation to the existing residential development to the east (SP 69847) and to provide a solution to the Council loading access requirements associated with garbage collection and loading access generally to the site and to provide an effective transition in height at the streetscape elevation from the podium height established by the Dee Why Grand building and the streetscape height of SP 69847 to the east (refer drawing DA 2.01). As such it is considered the proposal exhibits innovation in design consistent with the objectives of the controls. This outcome is complemented by the details of the design, particularly the articulation of the building from the street as height increases, the detailing of the POS treatments and fenestration details of the building materials and the spatial separation between buildings and the effective integration of landscaping into these spaces.

4.3.1 Requirements

The following specific requirements are cited for the locality.

1. The area will remain primarily a medium density residential area. The scale of development at the street frontage is not to be overbearing, and is to be consistent with the scale of existing nearby residential

The development provides for medium density residential development within the siting and setback standards cited by the particular controls for this locality. The building accords with the envelop controls for the site and provides for an effective transition in building height to neighbouring buildings.

2. Within the central part of the block, the height of buildings may be greater.

The maximum building height for the locality is 21m. The building accords with this control.

3. The design and arrangement of buildings are to recognise and preserve existing significant public views (from parks, streets, etc) and significant views from private properties.

The application accords to the height standard prescribed for the locality and provides a building form and scale that is in keeping with its neighbouring The requirements arising from condition 1(b) to consent DA2013/1519 arose specifically in relation to the conservation of views from units within the Dee Why Grand building and this application accords with that requirement.

4. Buildings are to be articulated and modulated to reduce the apparent building mass and reflect the existing pattern of development in the street. The streetscape and public domain shall incorporate consistent building setbacks being free of any structures, vehicle parking areas or site facilities other than driveways, letterboxes and fences.

The block plan details and elevation drawings address this objective. The building is effectively modulated by the incorporation of framed balcony elements into the facades and the staging of the development as the height of the building increases, consistent with the intent of the applicable controls. The staging of the building heights provides for a 12m separation through the centre of the site to level 3 increasing to 18m above level 4. Similarly the height of the building from the street is staged in line with the adjacent buildings at ground floor to the lower floors and increasing to a 14m at level 4 and staging consistent with the envelope control above this floor. These comments are to be read in conjunction with the architects design statement and the assessment of the proposal against the design principles established by SEPP 65 submitted as elements of this DA.

5. Future development will address public streets, create visual interest and enable the establishment of substantial landscaping in the spaces between buildings.

The development satisfies the site landscape area requirement required by G2 par 15. The detailed landscape submission prepared by 360^0 design provides for an effective landscape presentation of the site to the street and

the internal public spaces and is consistent with the outcomes of similar scale development in the vicinity of the site.

6. Development is to be designed to enclose and define mid-block open spaces connected by open space linkages both within the block and to and from the surrounding public street system.

The overall development accords with the site landscape area objective of 40% and provides an effective landscape treatment in accordance with the objectives of the control in both the provision of an appropriate landscape presentation to the street and the incorporation of a an effective 12m wide mid block communal space between the proposed buildings and a pedestrian linkage into the mid block public walkway linkage between streets adjacent to the Dee Why Grand development.

7. Site amalgamation will be encouraged to facilitate new development and car parking is to be provided below ground, using shared driveways where possible. The upgrading of existing buildings will be encouraged to give them a more contemporary and attractive appearance.

The development achieves the particular objectives of the control.

8. Building height is to fall within an envelope defined by a sight line taken from 1.5 metres above ground level at the footpath on the opposite side of the street, intersecting with the maximum street frontage height and on to where that line intersects with the maximum allowable height.

Refer to section drawings. The proposal accords with the control.

9. Buildings at the street frontage are not to exceed 3 storeys.

The building proposes 4 storeys to the street but stages the building by the incorporation of ground floor courtyard units to the street with a combination of first floor wintergardens and open balconies from level 3 to 50% of the building. Above level 3 the building stages away from the street consistent with objective 8 of the control. This arrangement is considered to be both a reasonable and practical outcome in providing a transition in apparent height of the building reflecting the heights of the adjacent buildings. The outcome is to complement the transition in height on the north -south axis as per the envelope control as well as a visual distinction in the streetscape presentation to the east - west axis.

10. Lightweight structures that do not add to the visual mass of the building, such as pergolas and balconies, may penetrate the building envelope.

The external material details are as per drawing DA 5.01. The use of glass louver detailing to winter garden spaces meets the objectives of this built form control.

11. The minimum floor to ceiling height for all storeys is 2.7 metres.

The floor to floor clearances are nominated at 2.95m permitting 250mm structure for compliance with this standard.

12. All buildings are to be setback 8 metres from the street kerb.

Refer block plan drawing DA1.05. The building complies with this standard.

13. Minor variations to this setback will be considered to allow buildings to be articulated with strong vertical and horizontal elements to reduce building mass and add visual interest.

The building satisfies both the numerical and design outcome of the standard. The building provides for a strong horizontal podium at level 4 with the upper floors setback in accordance with the building height plane control. The balcony details set within the facade and articulated set into the building exterior provide for visual interest consistent with the control.

14. Where sites are not being consolidated, the side boundary setback is 4.5 metres.

The development provides for the consolidation of the sites consistent with the objectives of the control. The side boundary controls have been varied to site the proposed building further west on the site. A minimum side boundary setback of 2.5m is proposed to the western boundary, off-set by a 8.5m setback to the eastern side boundary. The justification for this variation as proposed is as follows:

- The control itself permits a variation as a mechanism to assist in the consolidation of sites thereby facilitating the objective of a consolidated significant mid block open space zone. The application satisfies these objectives.

- The adjacent building to the east (SP 69847) does not conform to the minimum setback standard of the DCP and the offset in the boundary setbacks permits an 8.5m separation to the buildings at SP 69847 and a 7.735 separation at Dee Why Grand utilising the 5m public pathway intervening the sites. The outcome permits an effective separation of structures adjacent to the common side boundaries

- The setback to the east common boundary permits the creation of a ROW benefitting both stages of the proposed scheme and the provision of an effective Council access arrangement for garbage collection on site as well as an off street loading access for the buildings. The treatment of the ROW path is to be a structural turf cell with concrete loading areas for garbage trucks and delivery vehicles augmented with a landscape screen edge to the site. The frequency of use of the access way will be restricted to the Council weekly collection cycle with access restricted to a keyed bollard controlled by Council contractors and the site management for other vehicles.

These outcomes have been established by the consent to the staged development application.

15. The minimum amount of landscaped open space on the land is 40% of the site.

40.15% site landscaping is provided for the whole of the development (Stages 1 and 2)

16. Build-to lines have been established to ensure future development defines the streets and public spaces (DCP Map Build To Lines and Central Courts), They are as follows:

- **Where a proposed building, or part of a proposed building, adjoins a 100% build-to line the whole of the relevant building facade is to be built on this line.**
- **Where a proposed building, or part of a proposed building, adjoins a 40- 60% build-to line, between 40-60% of the relevant building facade is to be built on this line.**

The development site has a mixed standard. The building satisfies the 40 - 60% standard in that the buildings proposed are built to the 8m setback from the a kerb line consistent with the setbacks established by the adjacent residential development

17. Light weight structures that do not add to the visual mass of the building, such as pergolas and balconies, may also penetrate the build to line.

The winter garden elements to levels 1 – 3 encroach the build to line by 450mm consistent with the approach adopted by this control adding a visual modulation of the facade and visual interest to the streetscape presentation by framing these elements in those elevations.

18. Outside the 40-60% component of the building, buildings are to be set back at least 9 metres from the kerb.

Not applicable

19. The 100% build-to line is 5 metres from the kerb. The 40-60% build-to line is 8 metres from the kerb. illustrates controls in relation to building massing, buildable area within the central portion of the block and the locations where side setbacks and cross block links are envisaged.

The following controls are to apply:

- **The preferred built form for the block is a perimeter block where buildings are oriented toward the street, enclosing semi-private spaces within the interior.**

- **The building wall addressing the street is to be articulated and fragmented into a module which is reflective of the nearby residential context**

The building form as proposed satisfies the 40% - 60% build to line and setback control and provides for a building set around an internal courtyard and mid block landscape space. The elevation and landscape treatment is reflective of the neighbouring residential development.

20. In cases where sites are amalgamated, interior portions of the block may be built upon subject to the following provisions:

- **A distance of at least 9 metres is required between the rear façade of any building fronting a street and the façade of any building located within the central portion of the block.**

- **The siting of individual buildings within the buildable area in the central portion on the block must be guided by the controls applying to open space and access. Under no circumstances may development within the central portion of the block be comprised by a single tower**

This control is not applicable to the building form as proposed

21. Development proposals need to provide a practical pedestrian/cycle circulation system through the central portions of the site/s, as well as to and from the surrounding streets and the Dee Why Hotel.

Exceptions

Variations of up to 300mm may be permitted to add visual interest and allow articulation of building facades.

The objective of a cycle pedestrian rout through the central portion of the site is not practical given the change in grade to the Sturdee/Pacific pedestrian link adjacent to the site and the absence any effective linkage to sites to the east. Nonetheless the consolidated site provides for an effective midblock landscape space with convenient pedestrian linkages from within the site to the public pathway, Dee Why Grand and the Dee Why hotel site.

On merit it is considered the proposal generally satisfies the specific provisions of the G2 standards of the DCP.

4.3.2 Design Standards

The following general principles of the DCP are applicable to the form of development proposed by the subject application:

D2 Private Open Space

The schedule of areas DA0.01 provides a table of the areas associated with the individual units. All units satisfy the minimum area standard of the Council DCP and the NSW RFDC standard. All units will have access to the communal open space areas within the central portion of the site and adjacent to the ROW linkage along the eastern boundary.

D3 Noise

Refer to Wilkinson Murray assessment report.

D4 Electromagnetic Radiation

There are no generating facilities within the immediate vicinity of the site.

D5 Orientation and energy efficiency

A BASIX rating certificate accompanies the application. The orientation of the individual apartments and access to sunlight and natural ventilation is discussed in D6. The details of the individual apartments layout is to address the street (where appropriate) and in conjunction with the detail of the landscape design to ensure the relationship of the apartments to neighbouring dwellings and the provision of an effective spatial separation to the site boundaries is satisfactory and consistent with the objectives of the control.

D6 Access to Sunlight

Drawings DA0.01 provide a summary of units achieving 2 hours sunlight at mid winter. 75% of units in stage 2 achieve two hours and this is considered a reasonable standard in this instance. The outcome is consistent with the NSW RFDC rule of thumb (p.85) as the site is within a dense urban environment particularly given the adjacent mixed use locality, the north south axis of the site and the expectation of the controls that development should address the street.

D7 Views

Refer to comments in G2 objective 3 above.

D8 Privacy

It is considered the spatial separation between dwellings across the boundary coupled with the staging of the building height provides an effective response to the privacy of the neighbouring dwellings.

D18 Accessibility

Refer to drawing DA4.01 for details of the adaptation of individual apartments and the access report by Accessibility Solutions.

D 21 Provision and Location of Utility Services

The site has access to all reticulated services.

4.5 Matters for Consideration Pursuant to Section 79C(1) of the Environmental Planning and Assessment Act 1979 as amended

The following matters are to be taken into consideration when assessing an application pursuant to section 79C of the Environmental Planning and Assessment Act 1979(as amended). Guidelines (***in italic***) to help identify the

issues to be considered have been prepared by the Department of Urban Affairs and Planning. The relevant issues are:

4.5.1 The provision of any planning instrument, draft environmental planning instrument, development control plan or regulations.

The proposed works are permissible and consistent with the intent of the built form controls as they are reasonably applied to the proposed works.

4.5.2 The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economical impacts in the locality.

Context and Setting

i) What is the relationship to the region and local context on terms of:

- *the scenic qualities and features of the landscape?*
- *the character and amenity of the locality and streetscape?*
- *the scale, bulk, height, mass, form, character, density and design of development in the locality?*
- *the previous and existing land uses and activities in the locality?*

These matters are addressed by the detail presentation of the architectural drawings and from montages included with the DA and by the Design Verification Statement and the Design Statement presented with the DA. This SOEE address particular compliance with the development standards of the Council LEP and objectives of the DCP. It is considered the proposal satisfies the reasonable consideration and application of the standards and controls that are applicable to the development as proposed.

ii) What are the potential impacts on adjacent properties in terms of:

- *relationship and compatibility of adjacent land uses?*
- *sunlight access (overshadowing)?*
- *visual and acoustic privacy?*
- *views and vistas?*
- *edge conditions such as boundary treatments and fencing?*

These matters have been discussed in detail earlier in this report. The works have been designed such that potential impacts are within the scope of the built form controls and the outcomes and objectives of those controls.

Access, transport and traffic

Would the development provide accessibility and transport management measures for vehicles, pedestrians, bicycles and the disabled within the development and locality, and what impacts would occur on:

- *travel demand?*

- *dependency on motor vehicles?*
- *traffic generation and the capacity of the local and arterial road network?*
- *public transport availability and use (including freight rail where relevant)?*
- *conflicts within and between transport modes?*
- *traffic management schemes?*
- *vehicular parking spaces?*

A detailed traffic, parking and traffic access report accompanies the DA prepared by Varga Traffic Consultants. The proposal satisfies the particular parking provision required by Appendix 1 to WDCP.

Public domain

The proposed development will have no adverse impact on the public domain and represents an improvement on the present circumstance of the site in terms of the plethora of vehicle crossings and absence of streetscape presence represented by the current site improvements.

Utilities

Existing utility services will adequately service the development.

Flora and fauna

The proposal does not require the removal of any flora or fauna.

Waste collection

Normal domestic and commercial waste collection applies to development as proposed. Appropriate refuse storage areas for residential units are provided within the basement level 1.

Natural hazards

The site is within a landslip category A locality, but otherwise is not a mapped site. A detailed geotechnical site assessment accompanies the DA. A local flood investigation/study accompanies the DA and the recommended design floor levels adopted. A hydraulic detail accompanies the DA with details for the collection and disposal of stormwater.

Economic impact in the locality

The proposed provides for a development outcome anticipated by the zoning of the land. To that extent the development is consistent with and reinforces the aim of the LEP

Site design and internal design

i) Is the development design sensitive to environmental conditions and site attributes including:

- *size, shape and design of allotments?*
- *the proportion of site covered by buildings?*
- *the position of buildings?*
- *the size (bulk, height, mass), form, appearance and design of buildings?*
- *the amount, location, design, use and management of private and communal open space?*
- *landscaping?*

These matters have been discussed in detail earlier in this report. The potential impacts are considered to be minimal and within the scope of the built form controls.

ii) How would the development affect the health and safety of the occupants in terms of:

- *lighting, ventilation and insulation?*
- *building fire risk – prevention and suppression/*
- *building materials and finishes?*
- *a common wall structure and design?*
- *access and facilities for the disabled?*
- *likely compliance with the Building Code of Australia?*

A preliminary BCA report accompanies the DA. The proposal complies with the relevant standards pertaining to health and safety and will not have any detrimental effect on the occupants.

Construction

i) What would be the impacts of construction activities in terms of:

- *the environmental planning issues listed above?*
- *site safety?*

A construction management plan accompanies the DA. Normal site safety measures and procedures will ensure that no site safety or environmental impacts will arise during construction.

4.5.3 The suitability of the site for the development.

Does the proposal fit in the locality?

- *are the constraints posed by adjacent developments prohibitive?*
- *would development lead to unmanageable transport demands and are there adequate transport facilities in the area?*

- *are utilities and services available to the site adequate for the development?*

The development as proposed is consistent with the zoning for the land and is generally consistent with the controls of the applicable DCP. To that extent the development is an infill development between established developments of similar building form and land use outcomes. The adjacent development does not impose any unusual or impossible development constraints to the site or the development as proposed. The site is well located with regards to public transport and utility services. The development will not cause excessive or unmanageable levels of transport demand.

Are the site attributes conducive to development?

The site being of moderate grade, adequate area, and having no special physical or engineering constraints is suitable for the proposed development.

4.5.4 Any submissions received in accordance with this Act or the regulations.

It is envisaged that Council will appropriately consider any submissions received.

4.5.5 The public interest.

The proposed works are permissible and consistent with the intent of the built form controls as they are reasonably applied to the proposed works given the constraints imposed by the sites corner location and the established built form circumstance.

The development would not be contrary to the public interest.

5.0 CONCLUSION

The proposed works are permissible and consistent with the intent of the zoning of the land and with the built form controls as they are reasonably applied to the proposed works. The building has been modified to accord with the conditions of consent associated with the staged consent as applicable to the land.Having given due consideration to the matters pursuant to Section 79C of the Environmental Planning and assessment Act, 1979 as amended, it is considered that there are no matters which would prevent Council from granting consent to this proposal in this instance.

Boston Blyth Fleming Pty Ltd
Ross Fleming
B Urb & Reg Plan (UNE) MPIA
Director

ANNEXURE 1

Residential Flat Design Code Compliance Table

Note: The following guidelines must be read in conjunction with detailed text and 'rule of thumb' guidelines contained in the Design Code.

Part 1 Primary Development Controls

Objectives	Comments	Compliance
Height		
▪ To ensure future development responds to the desired scale and character of the street and local area.	The building height accords to the standards of the LEP and the conditions pertaining to Staged development consent 2013/1519	Yes
▪ To allow reasonable daylight access to all developments and the public domain.	Shadow details and sun angle indicators are provided with the DA submission and confirm the detail achieves 2 hours sunlight to 78% of the units in mid winter in the performance criteria of the RFDC for high density localities.	Yes
Building Depth		
▪ To ensure that the bulk of the development is in scale with the existing or desired future context.	The scale of the proposed building is consistent with the operable built form standards in the DCP in terms of setback and building height and maximises solar access and residential amenity. The architectural details provide an individual unit assessment in term of the sunlight indicators to all of the units.	Yes
▪ To provide adequate amenity for building occupants in terms of sun access and natural ventilation. ▪ To provide for dual aspect apartments.	The majority of apartments are dual aspect apartments that have a depth of 12m or less. The units provide for flow through ventilation openings onto common area with 99% of the units conforming to the standard – considerably in excess of the performance target of 60%.	Yes

Objectives	Comments	Compliance
Building Separation		
▪ To ensure that new development is scaled to support the desired area character with appropriate massing and spaces between buildings.	The SOEE accompanying the DA addresses the storey control of the DCP to the street, the height standard in terms of the LEP control. Appropriate spatial separation between residential buildings is maintained. See comment in SOEE	Yes Yes
▪ To provide visual and acoustic privacy for existing and new residents.	Shadow and acoustic analysis is provided with the DA. Private open space and communal recreation areas are provided in accordance with Council requirements.	Yes
▪ To control overshadowing of adjacent properties and private or shared open space.	A Landscape Plan is provided in the DA application. The landscape design provided for reasonable areas of deep soil plantings, communal areas of open space and is consistent with the objectives of the DCP.	Yes
▪ To allow for the provision of open space with appropriate size and proportion for recreational activities for building occupants.	The proposal provides a mid block communal open space area consistent with the objectives of the DCP	Yes
▪ To provide deep soil zones for stormwater management and tree planting, where contextual and side conditions allow.	A detailed stormwater management and detention plan has been prepared and submitted with the application	Yes
Street Setbacks		
▪ To establish the desired spatial proportions of the street and define the street edge.	The buildings are designed to address the street as per the DCP objective.	Yes
▪ To create a clear threshold by providing a transition between public and private space. ▪ To assist in achieving	A distinct residential entry is provided. The building is designed to achieve visual privacy while providing surveillance to residential entries. Lobbies are clearly delineated and are of good quality and dimensions.	Yes

Objectives	Comments	Compliance
visual privacy to apartments from the street. ▪ To create good quality entry space to lobbies, foyers or individual dwelling entrances. ▪ To allow an outlook to and surveillance of the street. ▪ To allow for street landscape character.	Passive surveillance is achieved from units orientated to the street frontages and via a single security controlled lobby providing entry to a communal courtyard and to all units.	Yes
Floor Space Ratio		
▪ To ensure that development is in keeping with the optimum capacity of the site and the local area. ▪ To allow definable development density for generic building types. ▪ To provide opportunities for modulation and depth of external walls within the allowable FSR. ▪ To promote thin cross-section buildings, which maximise daylight access and natural ventilation. ▪ To allow generous habitable balconies.	There is no maximum FSR for the site. The building is designed to maximise daylight access and natural ventilation. All apartments provide for unit floor areas in excess of the minimum standards. All units provide functional private recreation spaces that meet the minimum dimensions of the NSW RFDC and the Council DCP. These private spaces are augmented by the communal landscape and courtyard space. All development achieves the outcomes of the RFDC of 70% receiving 2 hours sunlight in mid winter in higher density localities and 60% of units having natural cross flow ventilation.	Yes Yes Yes Yes

Part 2 Site Configuration

Objectives	Comments	Compliance
Site Analysis		
	A site analysis is completed as a component of the design of the building and the submitted SOEE with the DA.	Yes
Deep Soil Zones		
▪ To assist with management of the water table.	The application addresses stormwater and geotechnical issues pertinent to the site.	Yes
▪ To assist with the management of water quality.	Issues of site landscaping are addressed in the details of the landscape documentation accompanying the application.	Yes
▪ To improve the amenity of developments through the retention and/or planting of large and medium size trees.		
▪ Minimum of 25% of the open space area of the site.	40.15% proposed to the staged development	Yes
Fences and Walls		
▪ To define the edges between public and private land.	Details of boundary fencing are provided. Durable and attractive façade elements are utilised for the coastal apartment style in accordance with the Pattern Book general objectives.	Yes Yes
▪ To define the boundaries between areas within the development having different functions or owners.	The landscape detail identifies retaining and fencing to the streetscape	Yes
▪ To provide privacy and security.		
To contribute positively to the public domain.		

Objectives	Comments	Compliance
Landscape Design		
▪ To add value to residents' quality of life within the development in the forms of privacy, outlook and views. ▪ To provide habitat for native indigenous plants and animals. ▪ To improve stormwater quality and reduce quantity. ▪ To improve the microclimate and solar performance within the development. ▪ To improve urban air quality. ▪ To contribute to bio-diversity.	A Landscape Plan has been prepared for the DA. Indigenous and native species are incorporated into the landscape design and in keeping with its coastal location. Stormwater and siltation management has been considered and the required detention has been provided. The application addresses the arboricultural issues associated with the site and its surrounds	Yes Yes
Open Space		
▪ To provide residents with passive and active recreational opportunities. ▪ To provide an area on site that enables soft landscaping and deep soil planting. ▪ To ensure that communal open space is consolidated, configured and designed to be useable and attractive. ▪ To provide a pleasant outlook.	Private open space is provided to all units (refer DA0.01) The provision of recreation spaces and communal space is augmented to the ground floor units provides a function for the edge treatment of the site that would otherwise be difficult to traverse given the particular site circumstances.	Yes Yes
Orientation		
▪ To optimise solar access to residential apartments within the development	Refer DA0.01 and 4.01.	Yes

Objectives	Comments	Compliance
and adjacent development. ▪ To contribute positively to desired streetscape character. ▪ To support landscape design of consolidated open space areas. ▪ To protect the amenity of existing development. ▪ To improve the thermal efficiency of new buildings.	The architectural detail provides an individual assessment for each residential unit.	Yes
Position and orientate buildings to maximise north facing walls (within 30 degrees east and 20 degrees west of north) where possible.	The design addresses the objectives of the DCP outcome that buildings address the street and provide a communal landscape open space mid block.	Yes
Planting on Structures		
▪ To contribute to the quality and amenity of communal open space on roof tops, podiums and internal courtyards. ▪ To encourage the establishment and healthy growth of trees in urban areas.	The Landscape Plan provided demonstrates compliance with these objectives.	Yes
Stormwater Management		
▪ To minimise the impact of residential flat development and associated infrastructure on the health and amenity of natural waterways. ▪ To preserve existing soil and natural features, including watercourses and wetlands.	Refer to the hydraulic design report. Appropriate on site detention is proposed in keeping with Council requirements. No natural features existing. Detailed arboriculture report provided Council conditions will be met during construction. A site management/construction plan is included with the DA application.	Yes Yes Yes

Objectives	Comments	Compliance
▪ To minimise the discharge of sediment and other pollutants to the urban stormwater drainage system during construction activity.		

Site Amenity

Objectives	Comments	Compliance
Safety		
▪ To ensure residential flat developments are safe and secure for residents and visitors. ▪ To contribute to the safety of the public domain.	Building is designed and orientated to maximise visual privacy between units while enabling the passive surveillance of spaces within and surrounding the site.	Yes
Visual Privacy		
▪ To provide reasonable levels of visual privacy externally and internally, during the day and at night.	Buildings have been designed to prevent direct overlooking of rooms and private open spaces with appropriate detail to adjacent dwellings in terms of spatial separation, landscape and window screening.	Yes
▪ To maximise outlook and views from principal rooms and private open space without compromising visual privacy.	The site has limited outlooks to the immediate street or the rear of the site with more expansive opportunities from upper floors.	Yes
Building Entry		
▪ To create entrances which provide a desirable residential identity for the development. ▪ To orient the visitor. ▪ To contribute positively to the streetscape and building façade design.	The entry is designed as a clearly identifiable element of the proposed buildings in the street.	Yes

Objectives	Comments	Compliance
Parking		
▪ To minimise car dependency for commuting and recreational transport use and to promote alternative means of transport – public transport, bicycling and walking. ▪ To provide adequate car parking for the building's users and visitors, depending on building type and proximity to public transport. ▪ To integrate the location and design of car parking with the design of the site and the building.	Details concerning provision of parking are provided. Parking is provided to satisfy the standard of Schedule 1 of the DCP. The site is convenient to the major transport bus link along Pittwater Road and to a range of shopping, employment and recreation facilities. Car parking is underground.	Yes Yes
Pedestrian Access		
▪ To promote residential flat development that is well connected to the street and contributes to the accessibility of the public domain. ▪ To ensure that residents, including users of strollers and wheelchairs and people with bicycles, are able to reach and enter their apartment and use communal areas via minimum grade ramps, paths, access ways or lifts.	Accessible and disabled access routes have been provided to the public domain, entries, lobbies and parking areas	Yes
Vehicle Access		
▪ To integrate adequate car parking and services access without compromising street character, landscape or pedestrian amenity and safety. ▪ To encourage the active use of street frontages.	Car vehicle access routes are confined to a single driveway entry from Sturdee Parade. Streetscape is appropriately dealt with as a residential facade behind a landscape seatback.	Yes Yes

Part 3 Building Configuration

Objectives	Comments	Compliance
Apartment Layout		
▪ To ensure the spatial arrangement of apartments is functional and well organised.	Apartments are functional and provide for a variety of size and internal configuration. All units satisfy the minimum area standards of the Code	Yes
▪ To ensure that apartment layouts provide high standards of residential amenity.	A BASIX certificate accompanies the application.	Yes
▪ To maximise the environmental performance of apartments.	A range of unit size and configurations is provided for.	Yes
▪ To accommodate a variety of household activities and occupants' needs.		
Apartment Mix		
▪ To provide a diversity of apartment types, which cater for different household requirements now and in the future.	A mix of units is provided in a variety of configurations and sizes.	Yes Yes
▪ To maintain equitable access to new housing by cultural and socio-economic groups.	There is no reason why this should not be achieved in this development. The locality is convenient to the established recreation areas and to established retail and restaurant services. Closeness to public transport, shops and facilities, means a reliance on car ownership is not a prerequisite. Accessible units and ground floor access to units would be appropriate for the elderly. Lift access is provided.	
Balconies		
▪ To provide all apartments with private open space.	All apartment balconies have been designed to exceed the Council's LEP built form standard and provide sufficient private open space. All primary balconies have minimum depths of at least 2.5 metres to ensure enjoyment, functionality and useability.	Yes
▪ To ensure balconies are functional and responsive to the environment thereby promoting the enjoyment of outdoor living for apartment residents.	Balconies/POS areas are located adjacent to living areas. Balconies are an integral part of the design, both unit design and façade design, and utilise open and screening elements as appropriate.	Yes Yes

Objectives	Comments	Compliance
▪ To ensure that balconies are integrated into the overall architectural form and detail of residential flat buildings. ▪ To contribute to the safety and liveliness of the street by allowing for casual overlooking and address.	This is achieved to all road frontages.	
Minimum depth of private balconies 2 metres.	This has been provided to all balconies.	Yes
Ceiling Heights		
▪ To increase the sense of space in apartments and provide well proportioned rooms. ▪ To promote the penetration of daylight into the depths of the apartment. ▪ To contribute to flexibility of use. ▪ To achieve quality interior spaces while considering the external building form requirements.	Residential units are 2.7m. As envisaged by the Design Code, the rule of thumb standards may be varied by ensuring that apartments will receive sufficient daylight – this is the case for the majority of units, which have dual aspects and/or shallow depths with large glazed areas.	Yes Yes
Flexibility		
▪ To encourage housing designs which meet the broadest range of the occupants' needs possible. ▪ To promote 'long life loose fit' buildings, that can accommodate whole or partial changes of use. ▪ To encourage adaptive re-use. ▪ To save the embodied energy expended in building demolition.	A variety of unit designs anticipate a broad range of occupants needs. Many apartments can accommodate changing needs of occupants with the option adaptability in terms of disabled occupants With the proposed structure, it would be possible to combine units into bigger spaces in the future.	Yes Yes -

Objectives	Comments	Compliance
Ground Floor Apartments		
▪ To contribute to the desired streetscape of an area and to create active safe streets. ▪ To increase the housing and lifestyle choices available in apartment buildings.	Ground floor apartments utilise the adjacent landscape setback as adjunct to their POS.	
Internal Circulation		
▪ To create safe and pleasant spaces for the circulation of people and their personal possessions. ▪ To facilitate quality apartment layouts, such as dual aspect apartments. ▪ To contribute positively to the form and articulation of the building façade and its relationship to the urban environment. ▪ To encourage interaction and recognition between residents to contribute to a sense of community and improve perceptions of safety.	Simple and clear circulation is provided in a safe environment. Units have secure access and perimeter surveillance of access to the building is achieved. Dual aspect apartments have been maximised The unit layout and the building design reflect the principles outlined in the Residential Flat Design Pattern book. The building's design encourages interaction between residents, while maintaining appropriate levels of privacy.	Yes Yes Yes Yes

Objectives	Comments	Compliance
Storage		
▪ To provide adequate storage for everyday household items within easy access of the apartment. ▪ To provide storage for sporting, leisure, fitness and hobby equipment.	Basement storage facilities have been provided to all units.	Yes
Acoustic Privacy		
▪ To ensure a high level of amenity by protecting the privacy of residents within residential flat buildings both within the apartments and in private open spaces.	The units achieve appropriate spatial separation and orientations.	Yes
Daylight Access		
▪ To ensure that daylight access is provided to all habitable rooms and encouraged in all other areas of residential flat development. ▪ To provide adequate ambient lighting and minimise the need for artificial lighting within daylight hours. ▪ To provide residents with the ability to adjust the quantity of daylight to suit their needs.	Buildings have been designed and orientated to ensure that adequate daylight access is provided to habitable rooms within dwellings. Good solar orientation is achieved, by orientating the units to the northerly aspects. External screening devices have been incorporated into the design for many of the units.	Yes Yes
Rules of Thumb ▪ Living rooms and private open spaces for at least 70 percent of apartments in a development should receive a minimum of three hours direct sunlight between 9 am and 3 pm in mid winter. In	Refer to architectural detail of individual units. Apartment layouts are designed to maximise the daylight utilisation.	Yes Yes

Objectives	Comments	Compliance
dense urban areas a minimum of two hours may be acceptable. ▪ Limit the number of single-aspect apartments with a southerly aspect (SW-SE) to a maximum of 10 percent of the total units proposed. Developments which seek to vary from the minimum standards must demonstrate how site constraints and orientation prohibit the achievement of these standards and how energy efficiency is addressed (see Orientation and Energy Efficiency). ▪ See Apartment Layout for additional rules of thumb.		
Natural Ventilation		
▪ To ensure that apartments are designed to provide all habitable rooms with direct access to fresh air and to assist in promoting thermal comfort for occupants. ▪ To provide natural ventilation in non-habitable rooms, where possible. ▪ To reduce energy consumption by minimising the use of mechanical ventilation, particularly air-conditioning.	Natural flow through ventilation is provided to the majority of units Underground car parking will be provided with appropriate Mechanical ventilation.	Yes Yes
Rules of Thumb ▪ Building depths which support natural ventilation typically range from 8 to 15 metres. ▪ Sixty percent (60%) of residential units should be	All kitchens have access to natural ventilation within 8m to windows and through open planning within living areas. All habitable rooms have access to good natural ventilation.	Yes Yes

Objectives	Comments	Compliance
naturally cross ventilated. ▪ Twenty five percent (25%) of kitchens within a development should have access to natural ventilation. ▪ Developments which seek to vary from the minimum standards must demonstrate how natural ventilation can be satisfactorily achieved, particularly in relation to habitable rooms.		Yes
Facades		
▪ To promote high architectural quality in residential flat buildings. ▪ To ensure that new developments have facades which define and enhance the public domain and desired street character. ▪ To ensure that building elements are integrated into the overall building form and façade design.	Architectural design quality is of a high standard and complies with the Residential Design Pattern Book language for coastal locations. In particular these details are associated with the colour palate and material selections proposed for the external facades of the building. . All elements have been integrated into an overall design.	Yes Yes
Roof Design		
▪ To provide quality roof designs which contribute to the overall design and performance of residential flat buildings. ▪ To integrate the design of the roof into the overall façade, building composition and desired contextual response. ▪ To increase the longevity of the building through weather protection.	Roof is an integrated component of the building composition. Good weather protection is achieved, together with materials with high longevity.	Yes Yes
Energy Efficiency		
▪ To reduce the necessity for mechanical heating and cooling.	Passive environmental design elements and planning layouts are utilised.	Yes

Objectives	Comments	Compliance
▪ To reduce reliance on fossil fuels. ▪ To minimise greenhouse gas emissions. ▪ To support and promote renewable energy initiatives.	See BASIX certificate. Energy efficient appliances and light sources to be incorporated as appropriate.	Yes
Maintenance		
▪ To ensure long life and ease of maintenance for the development.	Selection of material promotes longevity. Common space landscaping is appropriate, durable and automatically irrigated.	Yes
Waste Management		
▪ To avoid the generation of waste through design, material selection and building practices. ▪ To plan for the types, amount and disposal of waste to be generated during demolition, excavation and construction of the development. ▪ To encourage waste minimisation, including source separation, reuse and recycling. ▪ To ensure efficient storage and collection of waste and quality design of facilities.	Appropriate Waste Management receptacle and recycling area is provided in accordance with the Council policy guidelines. Appropriate construction and site management plan can be developed. Site is of adequate dimension to enable construction to be effectively managed.	Yes
Water Conservation		
▪ To reduce mains consumption of portable water. ▪ To reduce the quantity of urban stormwater runoff.	Site stormwater detention and water quality planning is provided as a component of the DA.	Yes

Proposed Residential Development – Stage 2

18-22 Sturdee Parade & 23-29 Pacific Parade, Dee Why

TRAFFIC AND PARKING ASSESSMENT REPORT

16 September 2014

Ref 13120

VARGA TRAFFIC PLANNING Pty Ltd
Transport, Traffic and Parking Consultants

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Ph: 9904 3224 Fax: 9904 3228

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LIST OF ILLUSTRATIONS

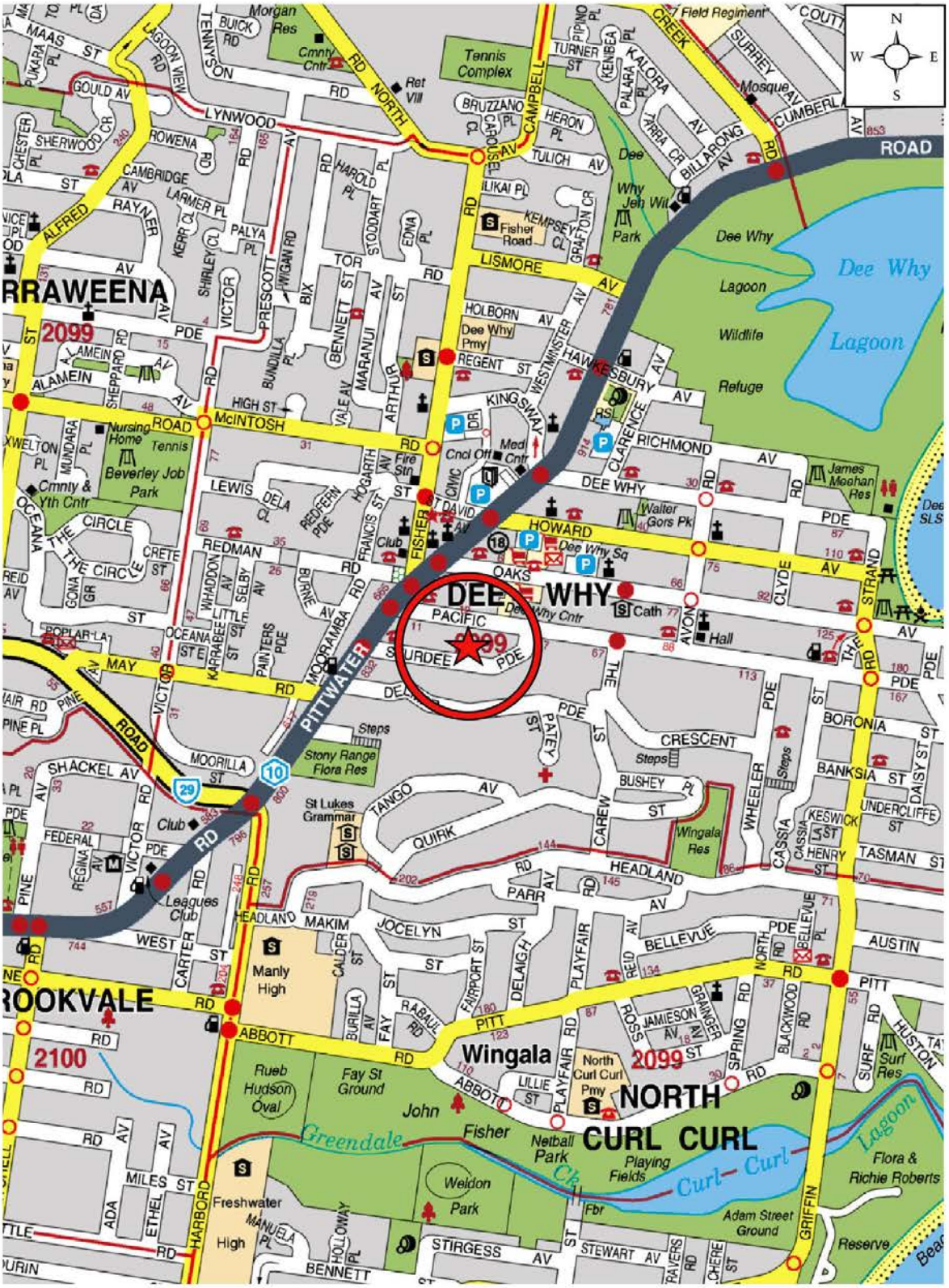
1. INTRODUCTION

This report has been prepared to accompany a Development Application to Warringah Council for a residential development proposal to be located at 18-22 Sturdee Parade and 23-29 Pacific Parade, Dee Why (Figures 1 and 2).

The proposed development will involve the demolition of the existing dwelling houses on the site to facilitate the staged construction of a new residential apartment development, comprising two buildings fronting the two respective street frontages. Car parking is to be provided in two independent basement car parking areas underneath the respective buildings, in accordance with Council's requirements.

The purpose of this report is to assess the traffic and parking implications of the development proposal and to that end this report:

- describes the site and provides details of the development proposal
- reviews the road network in the vicinity of the site
- estimates the traffic generation potential of the development proposal
- assesses the traffic implications of the development proposal in terms of road network capacity
- reviews the geometric design features of the proposed car parking facilities for compliance with the relevant codes and standards
- assesses the adequacy and suitability of the quantum of off-street car parking provided on the site.

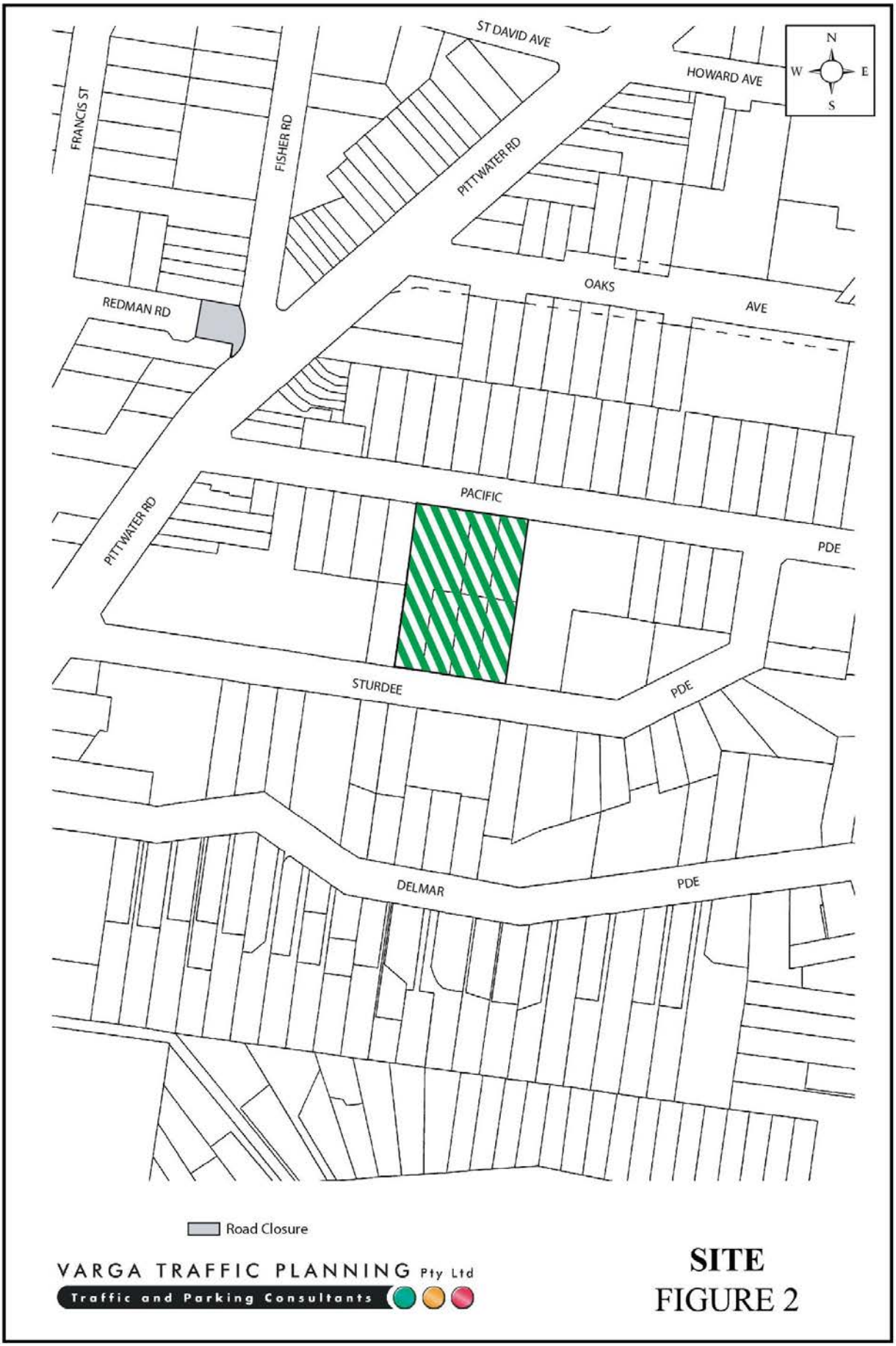


VARGA TRAFFIC PLANNING Pty Ltd

Transport, Traffic and Parking Consultants

LOCATION

FIGURE 1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Road Closure
VARGA TRAFFIC PLANNING Pty Ltd
Traffic and Parking Consultants
SITE
FIGURE 2

2. PROPOSED DEVELOPMENT

Site

The subject site is located on the northern side of Sturdee Parade and extends through to Pacific Parade. The site has a street frontage approximately 61 metres in length to both Sturdee Parade and also Pacific Parade and occupies an area of approximately 5,490m^2.

The southern portion of the subject site fronting Sturdee Parade is currently occupied by three single-storey dwelling houses with off-street parking. Vehicular access is provided via respective driveways out onto Sturdee Parade.

The northern portion of the subject site fronting Pacific Parade is currently vacant however was likely previously occupied by three dwelling houses as well, as suggested by the three separate driveways out onto Pacific Parade.

Proposed Development

The proposed development will involve the demolition of the existing dwelling houses on the site to facilitate the staged construction of two new residential apartment buildings fronting the two respective street frontages.

A total of 201 residential apartments are proposed in the two new buildings as follows:

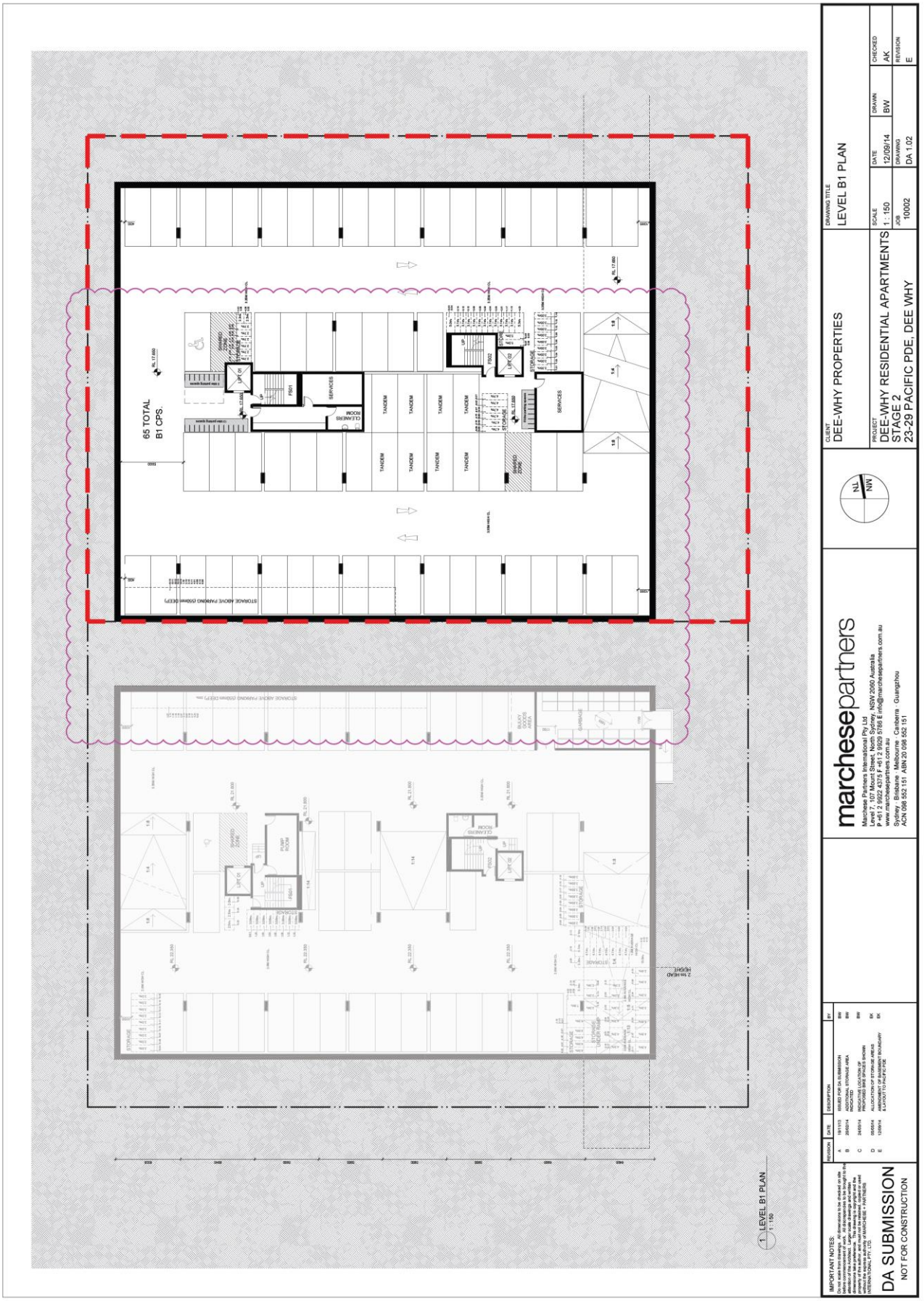
	Stage 1	**Stage 2**	
	Sturdee Pde	**Pacific Pde**	**TOTAL**
Studio apartments:	0	2	2
1 bedroom apartments:	74	80	154
2 bedroom apartments:	24	21	45
TOTAL APARTMENTS:	**98**	**103**	**201**

Off-street car parking is proposed for a total of 282 cars in two independent basement car parking areas beneath the respective buildings, in accordance with Council's requirements. The Pacific Parade basement car parking area comprises a total of 134 spaces across two levels (including 9 tandem spaces), with vehicular access provided via a new entry/exit

driveway located towards the eastern end of the Pacific Parade site frontage. The Sturdee Parade basement car parking area comprises a total of 148 spaces across three levels, with vehicular access provided via a new entry/exit driveway located towards the eastern end of the Sturdee Parade site frontage.

Garbage collection for the proposed development is expected to be undertaken by Council's 10.2m rigid garbage truck. The truck is to enter the site via the Sturdee Parade driveway and onto a new landscaped internal service road which runs along the eastern boundary. The internal service road is to comprise two separate garbage loading areas outside the respective buildings. Once loaded, the garbage truck will exit the site via the Pacific Parade driveway.

Plans of the proposed development have been prepared by *Marchese Partners* and are reproduced in the following pages.


65 TOTAL
B1 CPS.
TANDEM
SERVICES
CLEANERS ROOM
STORAGE
STORAGE ABOVE PARKING BEYOND
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ACN 098 552 151 ABN 20 098 552 151
CLIENT
DEE-WHY PROPERTIES
DRAWING TITLE
LEVEL B1 PLAN
PROJECT
DEE-WHY RESIDENTIAL APARTMENTS
STAGE 2
23-29 PACIFIC PDE, DEE WHY
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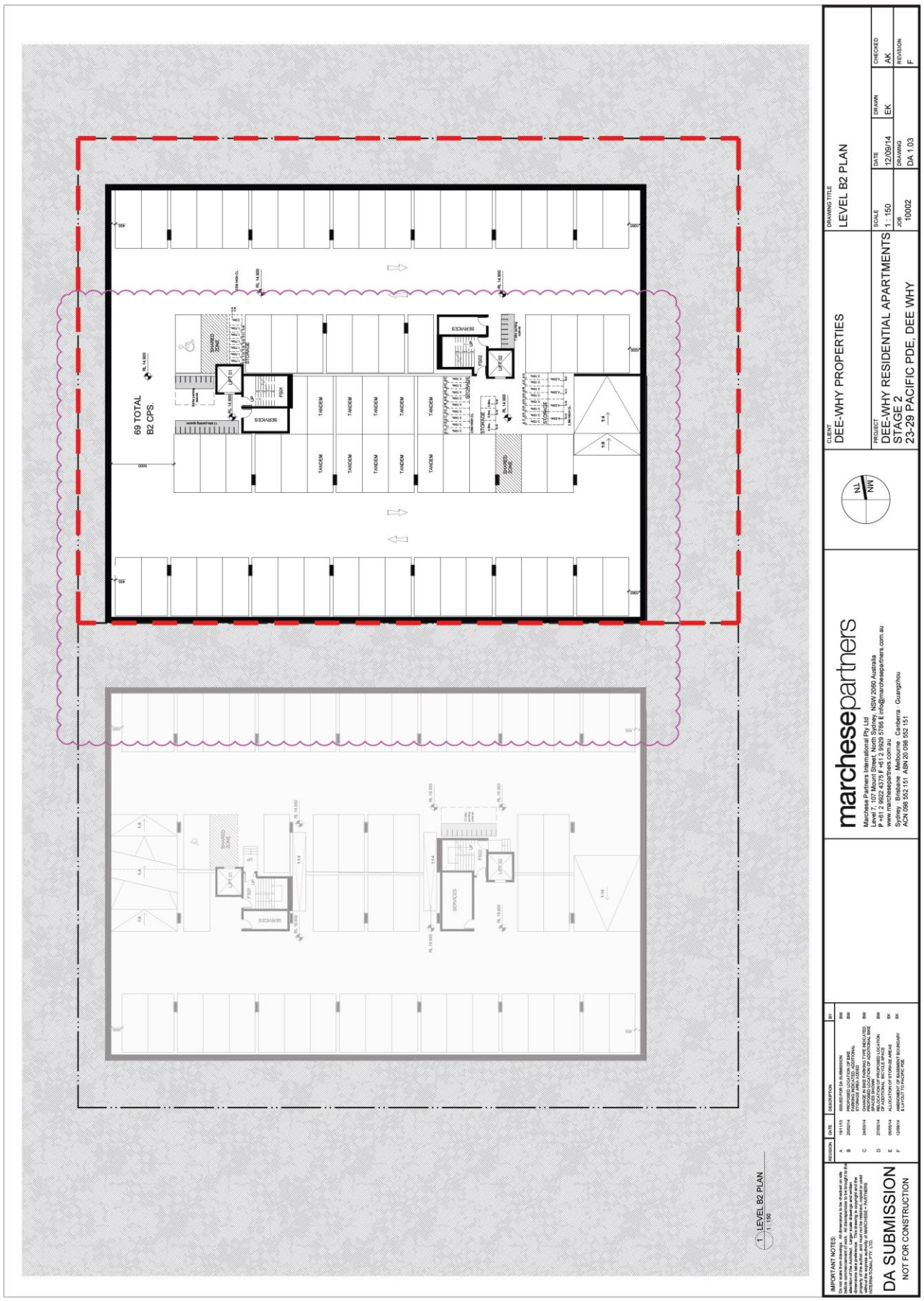
69 TOTAL
B2 CPS.
TANDEM
SERVICES
STORAGE
SHARED ZONE
LIFT 01
LIFT 02
1 LEVEL B2 PLAN
1 : 150
IMPORTANT NOTES:
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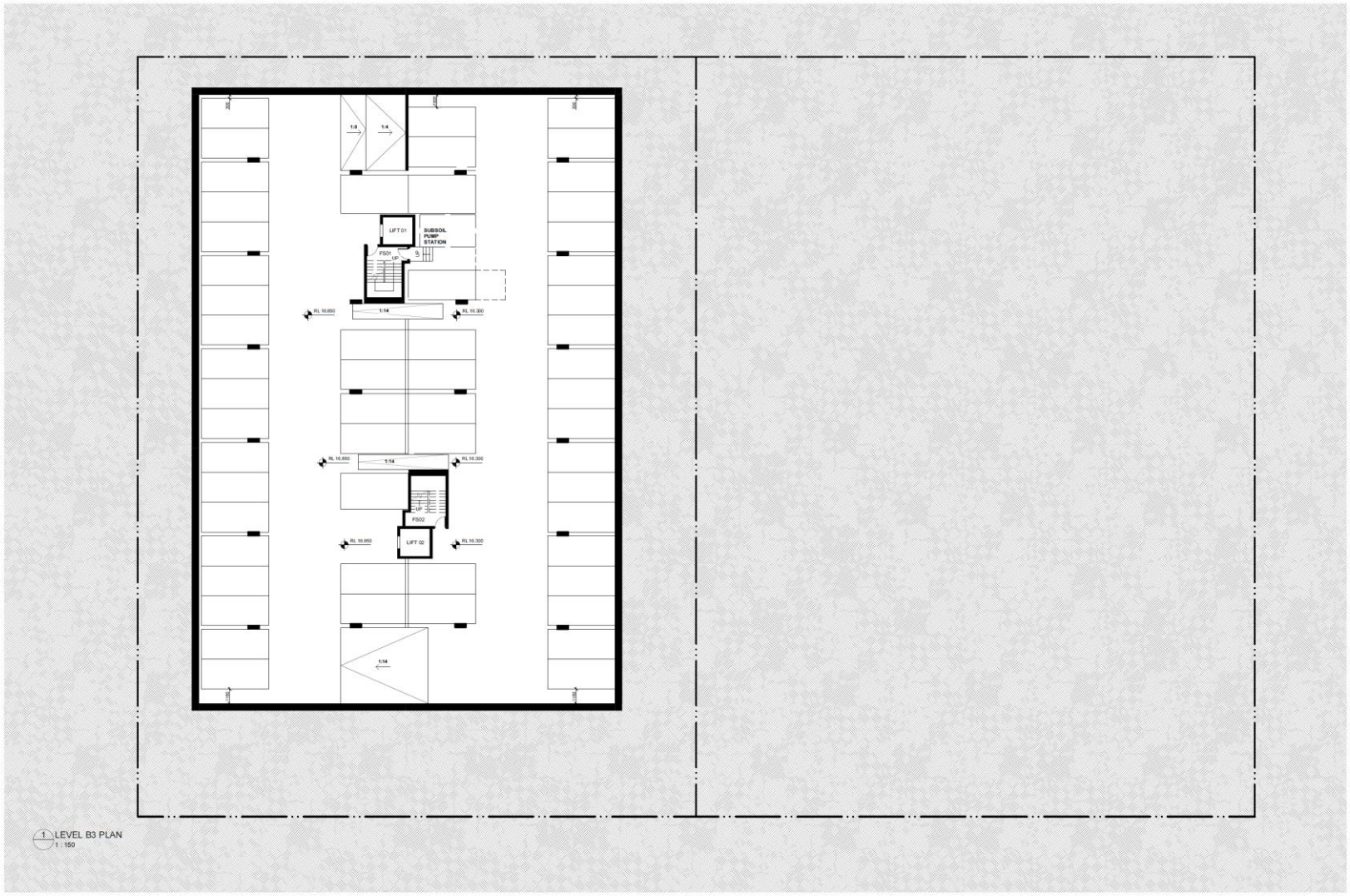

1 LEVEL B3 PLAN
1 : 150

IMPORTANT NOTES:
Do not scale from drawings. All dimensions to be checked on site before commencement of work. All discrepancies to be brought to the attention of the Architect. Larger scale drawings and written dimensions take preference. This drawing is copyright and the property of the author, and must not be retained, copied or used without the express authority of MARCHESE + PARTNERS INTERNATIONAL PTY. LTD.

DA SUBMISSION
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www.marchesepartners.com.au
Sydney · Brisbane · Melbourne · Canberra · Guangzhou
ACN 098 552 151 ABN 20 098 552 151

CLIENT
DEE-WHY PROPERTIES

PROJECT
DEE-WHY RESIDENTIAL APARTMENTS
18-22 STURDEE PDE &
27-29 PACIFIC PDE, DEE WHY

DRAWING TITLE
LEVEL B3 PLAN

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PACIFIC PARADE
STURDEE PARADE
1 LEVEL GROUND FLOOR PLAN
1 : 150
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PROJECT
DEE-WHY RESIDENTIAL APARTMENTS
18-22 STURDEE PDE &
27-29 PACIFIC PDE, DEE WHY
DRAWING TITLE
GROUND FLOOR PLAN
SCALE
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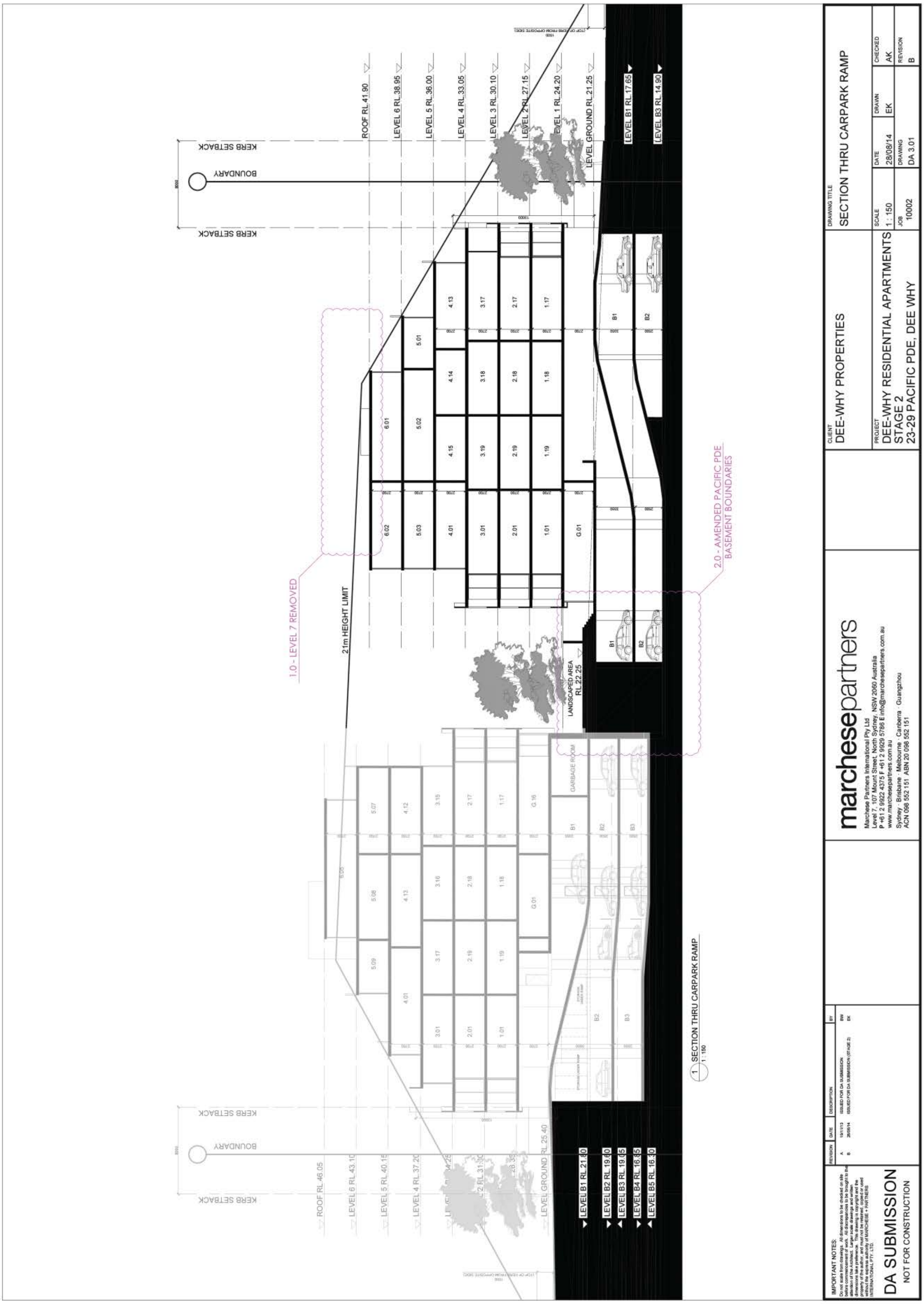
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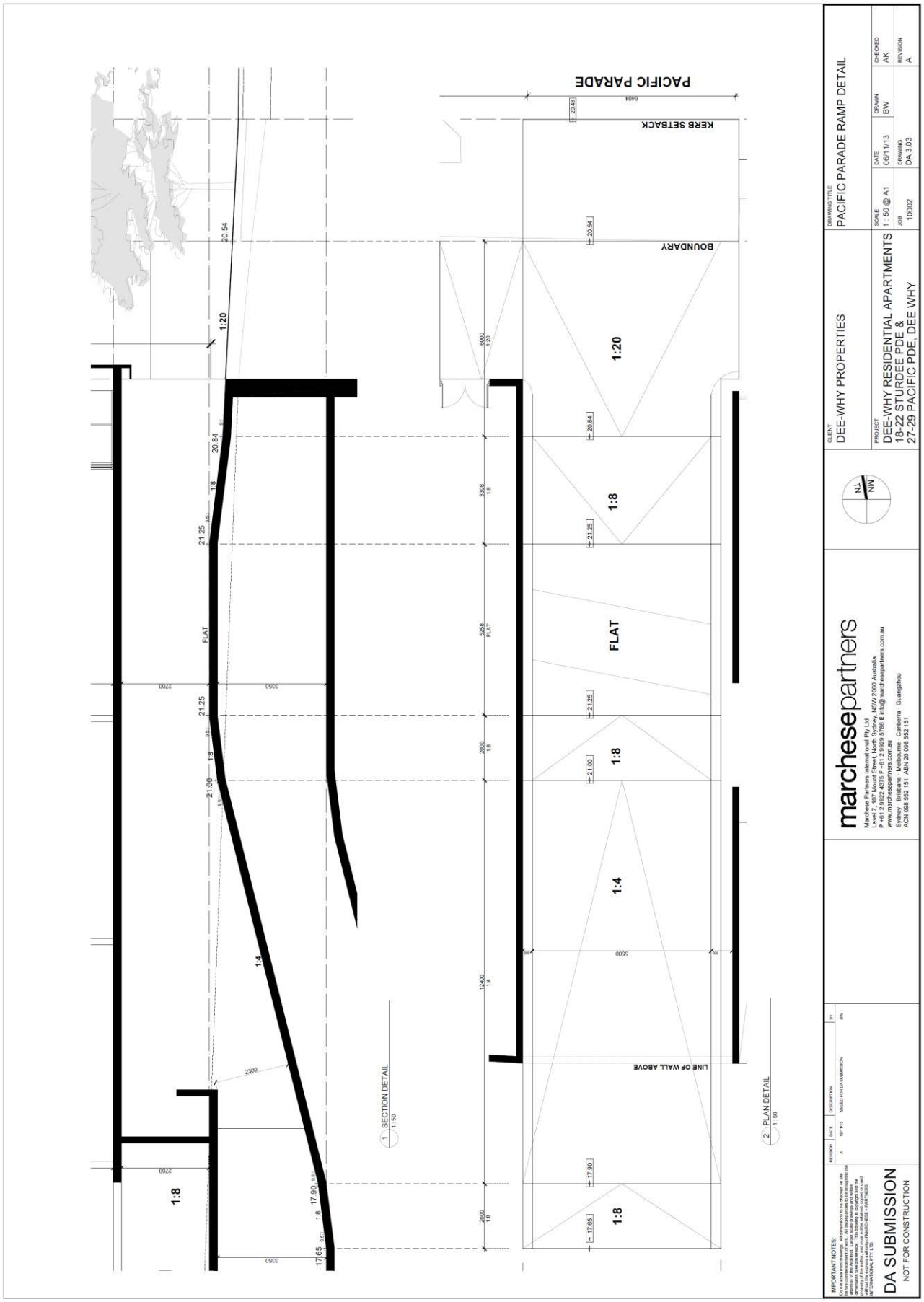
DEE-WHY RESIDENTIAL APARTMENTS
STAGE 2
23-29 PACIFIC PDE, DEE WHY
marchesepartners
1.0 - LEVEL 7 REMOVED
2.0 - AMENDED PACIFIC PDE BASEMENT BOUNDARIES
21m HEIGHT LIMIT
LANDSCAPED AREA RL 22.25
ROOF RL 41.90
LEVEL 6 RL 38.95
LEVEL 5 RL 36.00
LEVEL 4 RL 33.05
LEVEL 3 RL 30.10
LEVEL 2 RL 27.15
LEVEL 1 RL 24.20
LEVEL GROUND RL 21.25
LEVEL B1 RL 17.65
LEVEL B3 RL 14.90
KERB SETBACK
BOUNDARY
DA SUBMISSION
NOT FOR CONSTRUCTION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KERB SETBACK
BOUNDARY
LINE OF WALL ABOVE
FLAT
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1:8
1:4
1 : SECTION DETAIL
1 : 50
2 : PLAN DETAIL
1 : 50
IMPORTANT NOTES:
DA SUBMISSION
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DEE-WHY PROPERTIES
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DEE-WHY RESIDENTIAL APARTMENTS
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27-29 PACIFIC PDE, DEE WHY
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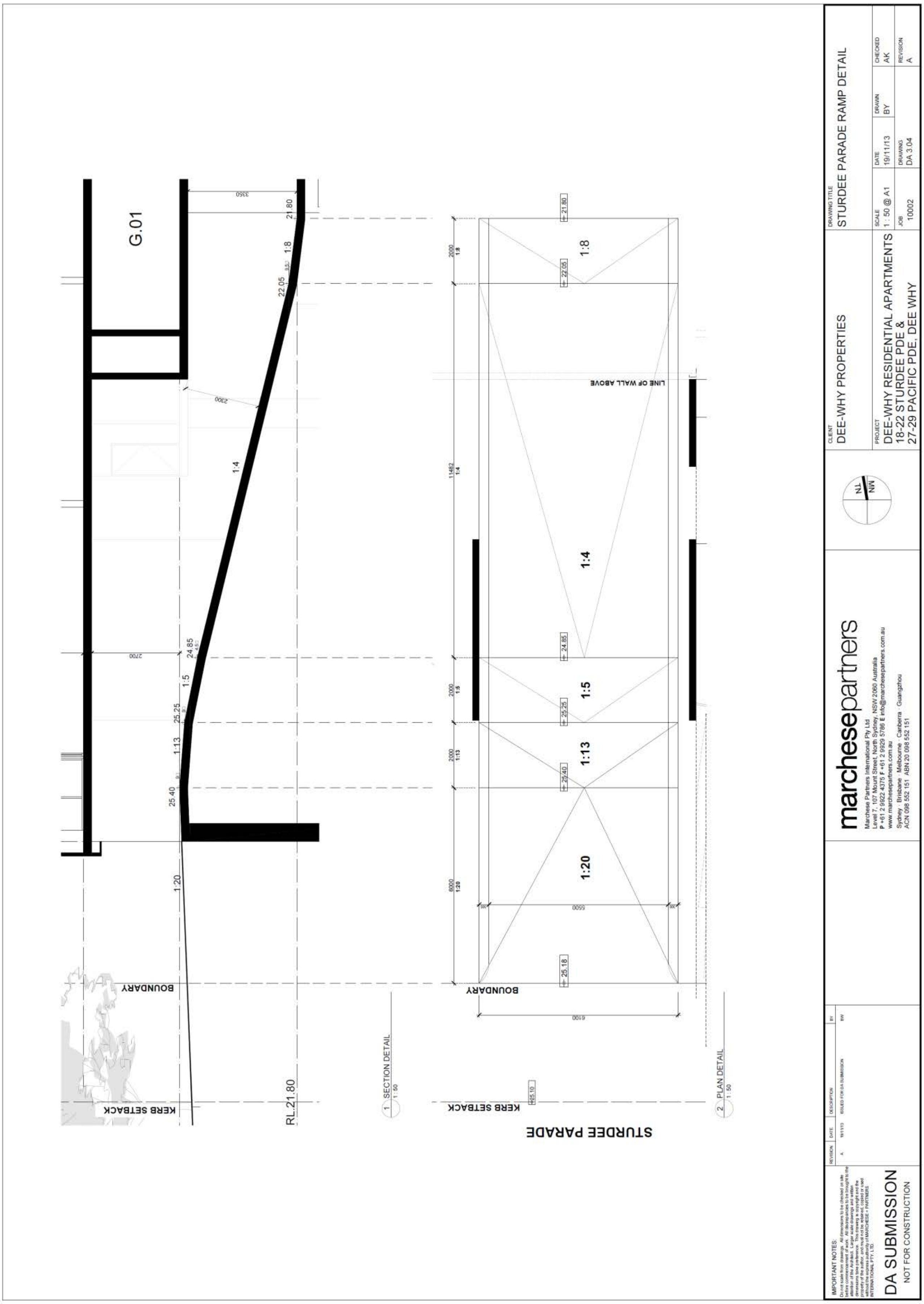
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marchesepartners
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IMPORTANT NOTES:
1 SECTION DETAIL
2 PLAN DETAIL
STURDEE PARADE
KERB SETBACK
BOUNDARY
LINE OF WALL ABOVE
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G.01
1:8
1:4
1:5
1:13
1:20
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22.05
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25.25
25.40
25.18
25.10

3. TRAFFIC ASSESSMENT

Road Hierarchy

The road hierarchy allocated to the road network in the vicinity of the site by the Roads and Maritime Services is illustrated on Figure 3.

Pittwater Road is classified by the RMS as a *State Road* and provides the key north-south road link in the area, linking Manly to Church Point. It typically carries three traffic lanes in each direction in the vicinity of the site, with opposing traffic flows separated by a centre median island. Clearway/Bus Lane restrictions apply during commuter peak periods.

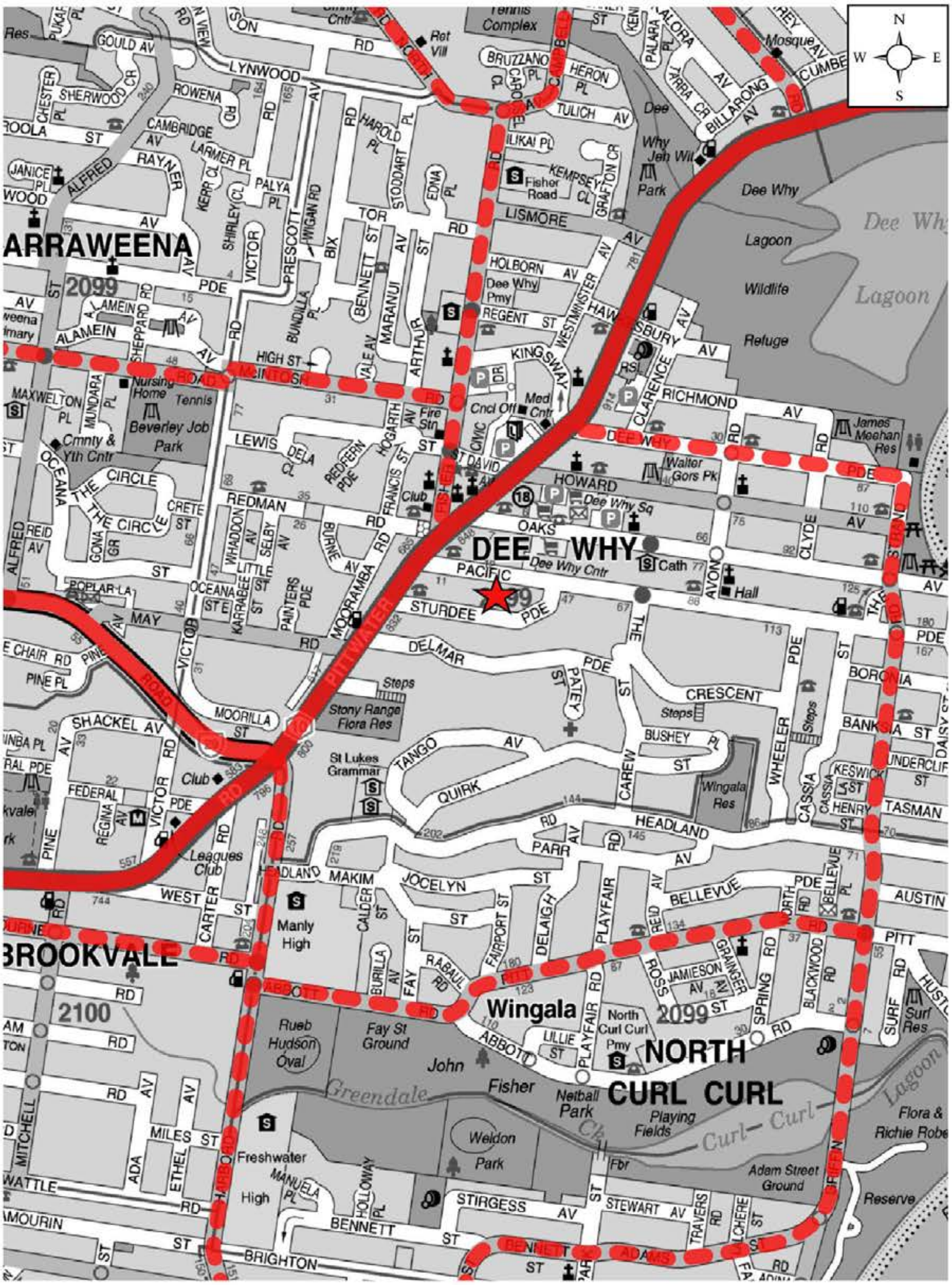
Warringah Road is also classified by the RMS as a *State Road* and provides the key east-west road link in the area, linking Roseville Chase to Brookvale. It typically carries three traffic lanes in each direction in the vicinity of the site with turning bays provided at key locations.

Pacific Parade and Sturdee Parade are local, unclassified roads which are primarily used to provide vehicular and pedestrian access to frontage properties. Kerbside parking is generally permitted on both sides of both roads.

Existing Traffic Controls

The existing traffic controls which apply to the road network in the vicinity of the site are illustrated on Figure 4. Key features of those traffic controls are:

- a 60 km/h SPEED LIMIT which applies to Pittwater Road
- a 50 km/h SPEED LIMIT which applies to Pacific Parade, Sturdee Parade and all other local roads in the area
- TRAFFIC SIGNALS in Pittwater Road where it intersects with Sturdee Parade, Pacific Parade, Fisher Road, Oaks Avenue and also Howard Avenue



Key:

State Road

Regional Road

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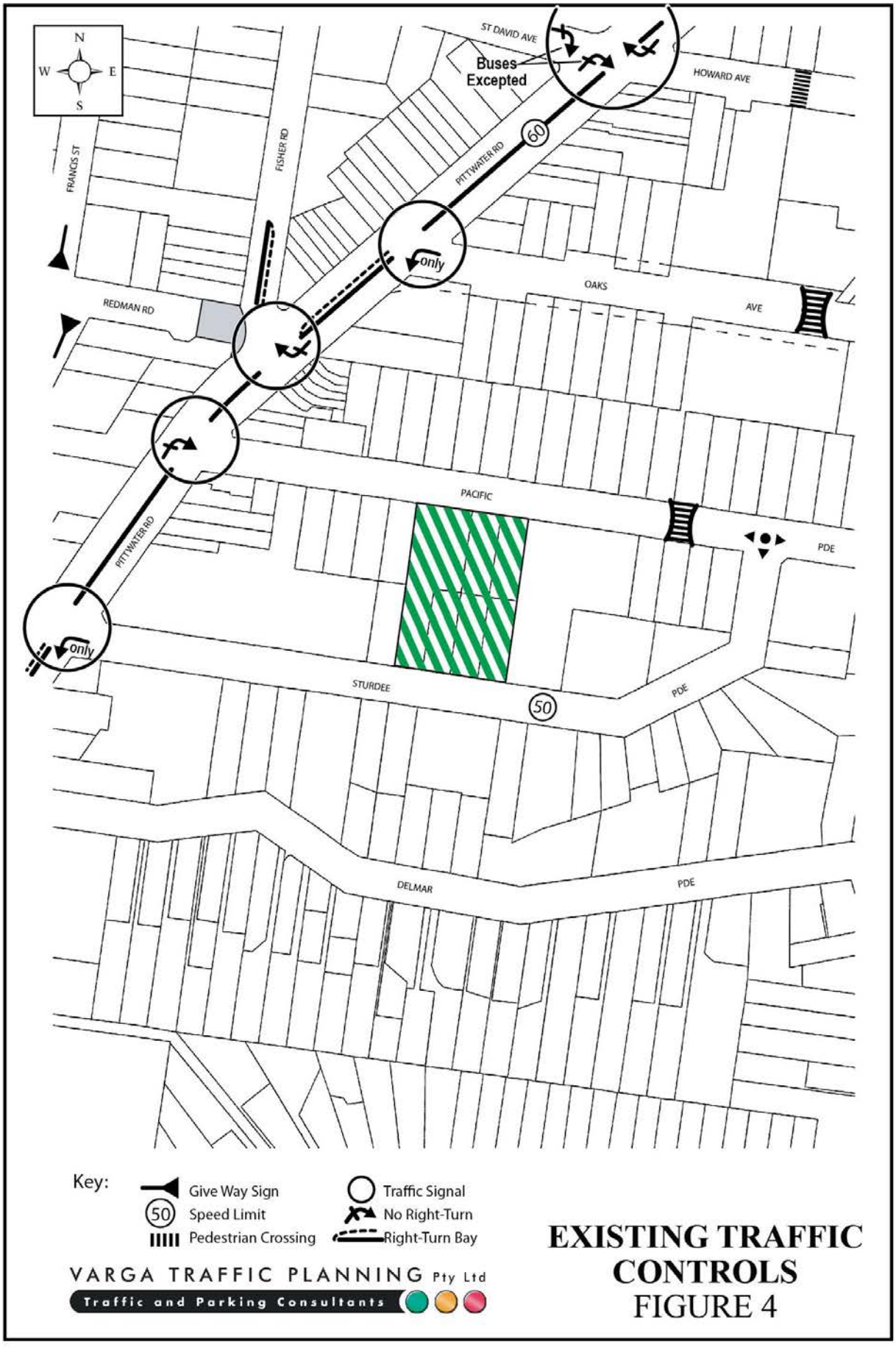
Transport, Traffic and Parking Consultants

ROAD HIERARCHY

FIGURE 3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REDMAN RD
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PACIFIC
PDE
PITTWATER RD
only
STURDEE
50
PDE
DELMAR
PDE
Key:
Give Way Sign
Speed Limit
Pedestrian Crossing
Traffic Signal
No Right-Turn
Right-Turn Bay
VARGA TRAFFIC PLANNING Pty Ltd
Traffic and Parking Consultants
EXISTING TRAFFIC CONTROLS
FIGURE 4

- a northbound RIGHT TURN HOLDING BAY in Pittwater Road turning onto Sturdee Parade

- a LEFT TURN ONLY restriction in Sturdee Parade turning onto Pittwater Road

- a NO RIGHT TURN northbound restriction in Pittwater Road turning onto Pacific Parade

- a ROUNDABOUT in Pacific Parade where it intersects with Sturdee Parade.

Projected Traffic Generation

An indication of the traffic generation potential of the development proposal is provided by reference to the former Roads and Traffic Authority's publication *Guide to Traffic Generating Developments, Section 3 - Landuse Traffic Generation (October 2002).*

The RTA *Guidelines* are based on extensive surveys of a wide range of land uses and nominates the following traffic generation rates which are applicable to the development proposal:

> **High Density Residential Flat Buildings in Sub-Regional Centres**
> 0.29 peak hour vehicle trips per dwelling

The RTA Guidelines also make the following observation in respect of high density residential flat buildings:

> **Definition**
> A *high density residential flat building* refers to a building containing 20 or more dwellings. This does not include aged or disabled persons housing. *High density residential flat buildings* are usually more than 5 levels, have basement level carparking and are located in close proximity to public transport services. The building may contain a component of commercial use.
>
> **Factors**
> The above rates include visitors, staff, service/delivery and on-street movements such as taxis and pick-up/set-down activities.

Application of the above traffic generation rates to the 201 residential apartments outlined in the development proposal yields a traffic generation potential of approximately 58 vehicle trips per hour during commuter peak periods.

When distributed across two sites and two site frontages, that projected increase in traffic activity as a consequence of the development proposal is relatively minimal and will not have any unacceptable traffic implications in terms of road network capacity.

4. PARKING IMPLICATIONS

Existing Kerbside Parking Restrictions

The existing kerbside parking restrictions which apply to the road network in the vicinity of the site are illustrated on Figure 5 and comprise:

- NO PARKING restrictions along the northern side of Pacific Parade early on Wednesday mornings to facilitate kerbside garbage collection

- ½ HOUR PARKING restrictions along the southern side of Pacific Parade including along the entire site frontage

- 5 MINUTE PARKING restrictions along a small section of the Sturdee Parade site frontage

- UNRESTRICTED kerbside parking along the remainder of the Sturdee Parade site frontage and also the southern side of Sturdee Parade.

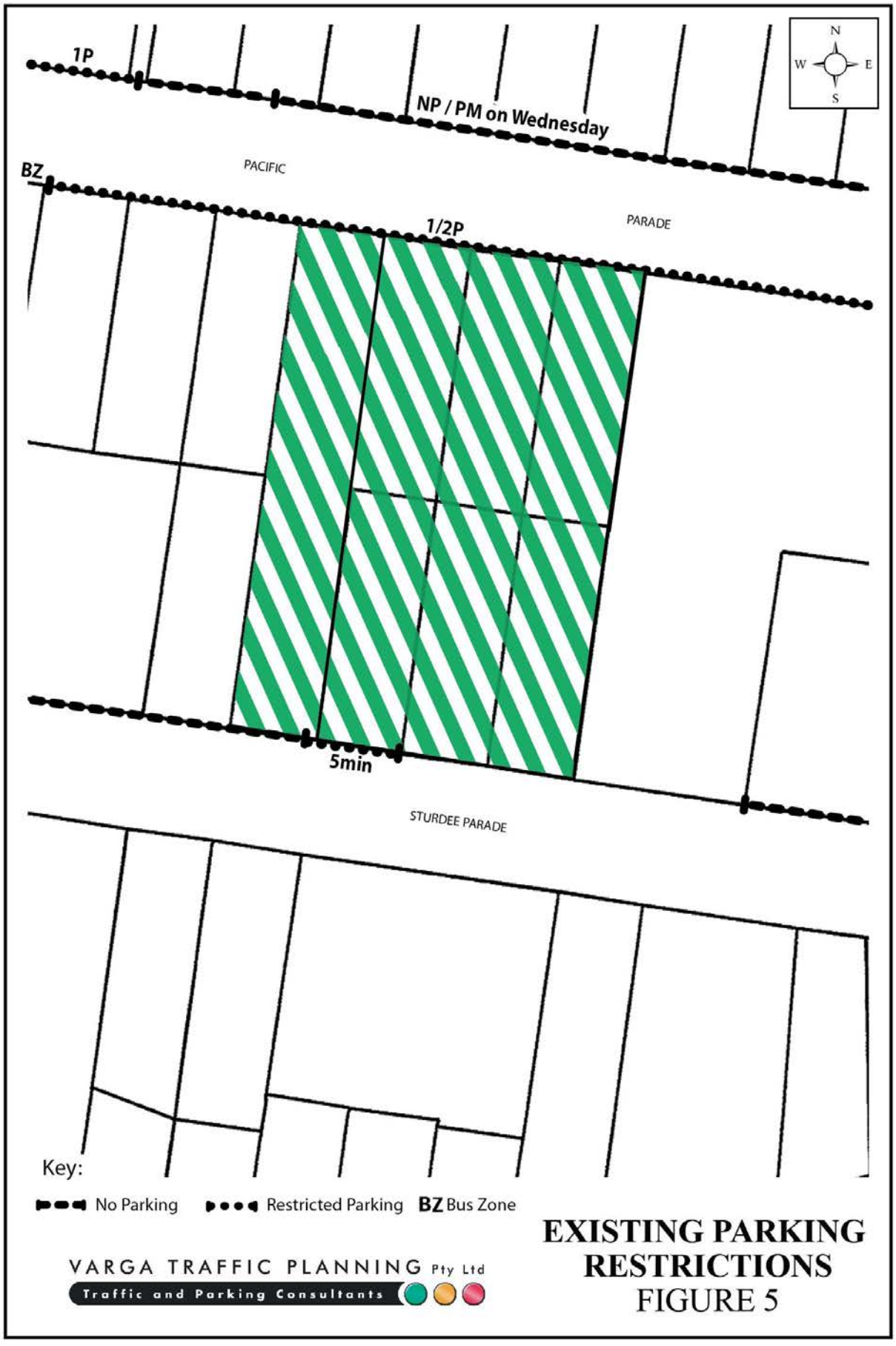
- BUS ZONES located at regular intervals along both sides of Pittwater Road and also Pacific Parade.

Off-Street Parking Provisions

The off-street parking requirements applicable to the development proposal are specified in Warringah Council's *Development Control Plan 2011 – Part H Appendices, Appendix 1: Car Parking Requirements* document in the following terms:

Residential Flat Building

One-bedroom apartment:	1.0 spaces per dwelling
Two-bedroom apartment:	1.2 spaces per dwelling
Visitors:	1.0 space per 5 dwellings


1P
NP / PM on Wednesday
N
W
E
S
BZ
PACIFIC
1/2P
PARADE
5min
STURDEE PARADE
Key:
No Parking
Restricted Parking
BZ Bus Zone
VARGA TRAFFIC PLANNING Pty Ltd
Traffic and Parking Consultants
EXISTING PARKING RESTRICTIONS
FIGURE 5

Application of the above parking requirements to the 201 residential apartments outlined in the development proposal yields an off-street parking requirement of 256 parking spaces as set out below:

	Stage 1 Sturdee Pde	**Stage 2 Pacific Pde**	**TOTAL**
Residents:	102.8 spaces	107.2 spaces	214.8 spaces
Visitors:	19.6 spaces	21.4 spaces	41.0 spaces
TOTAL:	**122.4 spaces**	**128.6 spaces**	**255.8 spaces**

The proposed development makes provision for a total of 282 off-street parking spaces, comprising 134 spaces within the Pacific Parade basement car parking area and 148 spaces within the Sturdee Parade car parking area, thereby satisfying Council's Parking Code requirements.

The geometric design layout of the proposed car parking facilities have been designed to comply with the relevant requirements specified in the Standards Australia publication *Parking Facilities Part 1 - Off-Street Car Parking AS2890.1* in respect of parking bay dimensions, ramp gradients and aisle widths.

In summary, the proposed parking facilities satisfy the relevant requirements specified in both Council's Parking Code as well as the Australian Standards and it is therefore concluded that the proposed development will not have any unacceptable parking implications.

richard lamb & associates

22 September, 2014

The General Manager
Warringah Council Civic Centre
725 Pittwater Road
Dee Why NSW 2099

By email council@warringah nsw gov au

Dear Sir,

Visual Impact and View Sharing Assessment

Stage 2 DA 2013/1519, 16-22 Sturdee Parade and 23-29 Pacific Parade, Dee Why

Applicant Dee Why Properties Pty Ltd

1 Purpose of this report

This report has been commissioned from Richard Lamb and Associates (RLA) by Oracle Estates Pty Ltd, the project managers for the development of the subject property at Dee Why RLA prepared a view loss assessment which accompanied the original DA Level 7 of original proposal

This report addresses the Stage 2 DA for 23-29 Pacific Parade which has been amended to comply with the conditions of approval of the Sydney East Region JRPP on 30 July, 2014, specifically Condition 1(b) that requires the plans be amended to delete Level 7 of the proposed Stage 2 (Pacific Parade) building and ensure compliance of the lift overrun with the 21m height limit above existing ground level

The aim of the condition was to ensure that the environment impact of development are minimised In that regard the condition is intended to result in minimising view loss from some apartments in Building 3 of the Dee Why Grand

Relevant plans

The plans that show the amendments that are relevant to the condition with regard to view sharing are shown in the table below

1/134 Military Road, Neutral Bay NSW 2089 PO Box 1727 Neutral Bay, NSW 2089
T 02 99530922 F 0299538911 M 0418248810 E info@richardlamb com au www richardlamb com au

Drawing Number and Revision	Drawing Name
DA 0 02 Rev B	Site Analysis
DA 1 01 Rev B	Site Plan
DA 1 12 Rev B	Roof Plan
DA 2 10 Rev B	North and South Elevations
DA 2 02 Rev B	East and West Elevations
DA 3 01 Rev B	Section thru carpark ramp
DA 3 02 Rev B	Section thru communal open space
DA 4 04-4 06 Rev C	Shadow diagrams (Level 7 omitted)
DA 5 01 Rev B	External Materials and Finishes

3 Comment

The plans above show that the building has been amended to comply with Condition 1 (b) The reason for the condition was that there was some view loss to apartments in Building 3 of the Dee Why Grand caused by the proposed building at 23-29 Pacific Parade as a result of non-compliance of Level 7 and the lift overrun of the building with the 21m height limit for its site

The roof level of the building as amended fully complies with the 21m height control It also complies with the envelope control for Pacific Parade The maximum height of the lift overrun also complies with the height control as required by Condition 1 (b)

In my opinion the amendments fully comply with Condition 1 (b) and this results in minimisation of the environmental impacts of the building with regard to view sharing, as was the aim of the Condition imposed by the JRPP

Please do not hesitate to contact me if there are any questions of if you require clarification of any points

Dr Richard Lamb

Richard Lamb & Associates

WASTE MANAGEMENT PLAN

PREPARED FOR
MARCHESE PARTNERS

MIXED DEVELOPMENT
PACIFIC PARADE
DEE WHY NSW

REVISED SEPTEMBER 2014

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Offices in Victoria & Queensland - Toll Free 1800 025 073

ABOUT ELEPHANTS FOOT

Elephants Foot Recycling Solutions is a family owned Australian company whose philosophy is providing quality recycling and waste solutions through product innovation. We are Australia's leading supplier of garbage, recycling and laundry chute systems.

Our team of experts has been proudly assisting architects, builders and developers with advice on how best to solve waste management and odour issues in dwellings since 1976. We have a long history of completed projects within the Australian building environment.

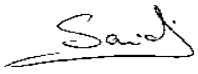
If you require any further information please do not hesitate to call me on 02 9780 3500.

Regards

Eddy Saidi
Director
Elephants Foot Recycling Solutions

REVISIONS

Revision	Copy No.	Date	Prepared by	Reviewed by	Approved by	Remarks
A	1	12/11/2013	N Beattie	E Saidi	E Saidi	Planning
B	1	13/11/2013	N Beattie	E Saidi	E Saidi	Planning
C	1	25/08/2014	N Beattie	E Saidi	E Saidi	Amendment
D	1	15/09/2014	N Beattie	E Saidi	E Saidi	Amendment

Authorised By: 
Date: 25 August 2014

DISTRIBUTION LIST

Recipient Name	Company	Revision	Copy No.
Eddy Saidi	Elephants Foot Recycling Solutions	D	1
Alex Klein	Marchese Partners	D	2
Elias Khamis	Marchese Partners	D	3

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CONTENTS

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EXECUTIVE SUMMARY

Elephants Foot Recycling Solutions was commissioned by Marchese Partners to prepare a waste and recycling plan associated with the proposed development located at Pacific Parade, Dee Why NSW.

Waste audit and management strategies are recommended for new developments to provide support for the building design and promote strong sustainability outcomes for the building. All recommended waste management plans will comply with council codes and any statutory requirements. The waste management plan has three key objectives:

i. ***Ensure waste is managed to reduce the amount of waste and recyclables to land fill*** by assisting residents to segregate appropriate materials that can be recycled; displaying signage to remind and encouraging recycling practices; and through placement of recycling and waste bins in the retail precinct to reinforce these messages.

ii. ***Recover, reuse and recycle*** generated waste wherever possible.

iii. ***Compliance*** with all relevant codes and policies.

The residential waste and recycling will be guided by the services and acceptance criteria of the Warringah Council. The residential waste and recycling will be collected by council.

To assist in the provision of well-segregated material, it is essential that this waste management plan is integral to the overall management of the development and clearly communicated to all residents, occupants and tenants of the buildings.

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INTRODUCTION

The following waste management plan pertains to the complete residential development located at Pacific Parade, Dee Why, NSW. This waste management plan is an operational waste management plan and will address the phases of the completed development.

The plan outlines measures to achieve the following objectives:

- avoid the generation of unnecessary waste;
- minimise the quantities of wastes generated ending up as landfill;
- recover, reuse and recycle waste generated onsite where possible; and
- aim to achieve Federal and State Government waste minimisation targets in accordance with regional waste plans.

For the purpose of this report the proposed development will consist of:

- Two multi-level buildings known as Pacific and Sturdee
- 201 residential units in total – 98 for Sturdee and 103 for Pacific

Each section of this development has been examined individually within this report however; the waste management process must be effectively coordinated between all sections for the system to work.

All figures and calculations are based on area schedules as advised by our client and shown on architectural drawings.

All waste facilities and equipment are to be designed and constructed to be in compliance with the Warringah Council DCP 2011 – *Part H Appendix 13 Councils Allocated number of Waste and Recycling bins, Council contact,* Australian Standards and statutory requirements.

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GENERATED WASTE VOLUMES

This assessment of waste volumes is an estimate only and will be influenced by the development's management and occupants' attitude to waste disposal and recycling.

CONSTRUCTION AND DEVELOPMENT WASTE

The head contractor will be responsible for removing all construction-related waste offsite in a manner that meets all authority requirements. Please refer to the separate waste management plan submitted for construction waste as part of the Development Application.

WASTE DEFINITION

Garbage:	all domestic waste (except recyclables and green waste)
Recycling:	glass bottles and jars – PET, HDPE and PVC plastics; aluminium, aerosol and steel cans; milk and just cartons; soft drink, milk and shampoo containers; paper, cardboard, junk mail, newspapers and magazines.
Green:	garden organics such as small branches, leaves and grass clippings, tree and shrub prunings, plants and flowers, and weeds.

BUILDING MANAGER/ WASTE CARETAKER

All equipment movements in the room are managed by the building manager/ cleaners at all times. No tenants will be allowed to transport waste or recyclables from the waste room; tenants will only transport their waste to the room allocated.

The building manager/ cleaner duties include, but are not limited to, the following:

- Organising, maintaining and cleaning the general and recycled waste holding areas (Frequency will depend on waste generation and will be determined based upon building operation)
- Transporting of bins as required
- Organising both garbage and recycled waste pick-ups as required
- Cleaning and exchanging all bins
- Ensure site safety for residents, children, visitors, staff and contractors
- Abide by all relevant OH&S legislation, regulations, and guidelines
- Assess any manual handling risks and prepare a manual handling control plan for waste and bin transfers
- Provide to staff/contractors equipment manuals, training, health and safety procedures, risk assessments, and PPE to control hazards associated with all waste management activities.

NOTE: It is the responsibility of the building manager to monitor the number of bins required for the development. As waste volumes may change according to the development's management and occupants' attitudes to waste disposal and recycling, bin numbers and sizes may need to be altered to suit the building operation.

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REPORTING

It is recommended that building management ensure that all waste service providers submit monthly reports on all equipment movements and weights of any waste and recycling products removed from the development. Regular reviews of servicing should take place to ensure operational and economic best practise and to assist with sustainability reporting.

EDUCATION

Educational material encouraging correct separation of garbage and recycling items must be provided to each resident to ensure correct use of the waste system and to ensure an understanding of using bins correctly. This should include the correct disposal process for bulky goods (old furniture, large discarded items etc.). It is recommended that information is provided in multiple languages to support correct practises and minimise contamination in the collection MGB.

It is also recommended that the development's website (if available) contain information for residents to refer to regarding use of the waste bins. Information should include:

- recycling and garbage descriptions (Council provides comprehensive information);
- how to dispose of bulky goods and any other items that are not garbage or recycling;
- residents' obligations to WHS and building management

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RESIDENTIAL WASTE

Using council's waste generation rates, the total waste generated by the development can be calculated as follows:

Waste: 80 litres (L) per unit/week
Recycling: 40 litres (L) per unit/week (Paper products and mixed containers)

Sturdee (98 units)
Garbage: 7840L generated requires 33 x 240L MGB
Recycling: 3920L generated requires 17 x 240L MGB

Pacific (103 units)
Garbage: 8240L generated requires 34 x 240L MGB
Recycling: 3920L generated requires 17 x 240L MGB

TOTAL BINS – STURDEE & PACIFIC

Waste: 67 x 240L MGB collected weekly for both buildings
Recycling: 34 x 240L MGB – paper products fortnightly/mixed containers alternate fortnight

BIN SUMMARY
Total number of bins required for collection: 101 x 240L MGB

NOTE: It is the responsibility of the building manager to monitor the number of bins required for the development. As waste volumes may change according to the development's management and occupants' attitude to waste disposal and recycling, bin numbers and sizes may require altering to suit the building operation.

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RESIDENTIAL WASTE MANAGEMENT SYSTEM

All residents will be supplied with a collection area in each unit (generally in the kitchen, under bench) to deposit waste and collect recyclable material suitable for one days storage. Residents should wrap or bag their waste.

Cardboard is to be flattened where possible, and placed in the paper recycling bins.

Recycling must not be bagged. It is recommend that residents use a crate or dedicated bin for collecting recyclables within the allocated residential space provided to ensure correct separation before depositing in the collection bin. It is expected that residents will place clean and empty recycling items into the bins.

Once putrescible and recyclable waste streams are separated, the resident will carry these to the buildings waste room and deposit bagged waste and sorted recyclables into the appropriate collection bins.

Residents of Pacific Parade building will transport waste and recycling to the bin room at ground level; residents of Sturdee Parade will transport their waste streams to the bin room on basement 1 level.

All waste rooms are required to contain clear signage so bins are easily identified by residents. Garbage bins and recycling bins should be kept separate so the opportunity for contamination is reduced.

Council requires maximum storage area for each waste service compartment and doors are required to open outwards.

COMPOSTING

Council suggests that space should also be made available for a home unit worm farm or compost bin, to allow residents to compost their own food scraps however this is considered impractical for this development. Residents, however, may choose to install small home worm farms where practical or use apartment style compost units and self-manage these systems. *(See Appendix 2 – Waste Equipment)*

GREEN WASTE

There will be moderate amount green waste generated by the building's landscaped areas and winter gardens. Any green waste will be collected and removed from site by the maintenance contractor.

OTHER WASTE STREAMS

A space is required for residents to temporarily store unwanted bulky items (such as furniture or white goods), while awaiting disposal. This is important in guarding against residents illegally

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dumping this material on the footpath, thus detracting significantly from the quality and appearance of the development.

Three bulky goods storage areas are allocated for bulky waste (*See Appendix 4 – Bulky Goods Store)* and the temporary storage of bulky household items. As bulky goods collections are usually made via heavy rigid vehicles, correct access will need to be provided for collection. The waste caretaker will liaise with residents regarding collections.

Disposal or recycling of hard, electronic, liquid waste and home detox (paint/chemicals) etc shall be organised with the assistance of the building caretaker. Chemical CleanOuts via the NSW EPA are held annually – Council should be contacted for date.

Recyclable electronic goods include batteries, equipment containing printed circuit boards, computers, televisions, fluorescent tubes and smoke detectors. Up to 15 items may be taken by individual residents to the Belrose recovery Centre, Crozier Road. Individual residents may also take up to 5 items can be taken to Officeworks at Dee Why for recycling.

It is also recommended that donations to charitable organisations be encouraged. Clean, sound furniture and household goods etc. are highly sought after to provide for the disadvantaged. Donations will be arranged with the assistance of the building manager/caretaker. (*See Useful Contacts)*

WASTE ROOM AREA

Each garbage room will need to hold all the waste bins generated weekly, and allow enough room to clean and manoeuvre bins. The waste room will also store empty bins. *(See Appendix 5 – Waste Room Areas)*

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WASTE MANAGEMENT

GARBAGE WASTE & RECYCLABLE

Bins will have to be managed by the caretaker by rotating the bins around and ensuring empty ones are readily available for waste collection. Council provides an optional towbar like device which can be fitted onto the bins at an additional cost. A bin tow device will be required to assist in bring the bins up to the holding bays at ground level from the basement via the ramp.

Transfer of waste and all bin movements require minimal manual handling therefore the operator must assess manual handling risks and provide any relevant documentation to building management. Any manual handling equipment should be provided at the recommendation of the appropriate equipment provider who will assess the correct equipment for supply. (*See useful Contacts*).

COLLECTION OF WASTE

It will be the caretaker's responsibility to have the correct bins ready and placed for quick collection according to council's collection schedule.

Collection of bins will be from the access and egress vehicle pathway accessed off Pacific Parade and egress onto Sturdee Parade. Bin collection area is allocated for each building. *(See Appendix 5 – Collection Area)* Building management will transport full bins to this area according to council's collection schedule and remove empty bins to the waste room after collection.

Note: Garbage and recycling collections may take place at different times depending on the service provider; therefore access should not be restricted at any time.

The collection from the rubbish room must comply with all Council height restrictions; the bin transfer gradient must not exceed 1:14 and steps are not suitable.

Please note that Council require the trucks to service the bins off street and on the property. Council collection vehicles are required to access and egress in a forward motion only. The dimensions of the trucks are approx. 10M (long) x 2.5M (wide) x 3.5M (high) and the full turning circle is approx. 20M. Council will require a clearance height of approx. 4.2M into the building.

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WASTE AREAS

GARBAGE ROOMS CONSTRUCTION REQUIREMENTS

The garbage room will be required to contain the following facilities to minimise odours, protect surrounding areas, and make it a user-friendly and safe area:

- Waste room floor to be sealed with a two pack epoxy
- Waste room floor surface is flat and even
- All corners coved and sealed 100mm up, this is to eliminate build-up of dirt
- A hot and cold water facility provided for washing the bins
- Tap height of 1.6m
- Drain to sewer
- Storm water access preventatives (grate)
- All walls painted with light colour and washable paint
- Equipment electric outlets to be installed 1700mm above floor levels
- The room must be mechanically ventilated
- Light switch installed at height of 1.6m
- Waste rooms must be well lit (sensor lighting recommended)
- Optional automatic odour and pest control system installed to eliminate all pest types. This process generally takes place at building handover – building management make the decision to install. Please note that odour systems spraying product directly onto galvanised steel surfaces may cause corrosion. *(See Useful Contacts)*
- All personnel doors are hinged and self-closing and suitable for 1100L MGB movements
- Appropriate signage prominently displayed on walls and above all bins clearly stating what type of waste or recyclable is to be placed in the bin underneath
- Building management/caretaker is responsible for waste room signage and further education after building handover
- Waste collection area must hold all bins – bin movements should be with ease of access
- All chute doors on all levels will be labelled with signs encouraging occupants to recycle and minimise their waste
- Signage directing chute operations regarding waste and recycling will be posted on each chute door
- All personnel doors are hinged and self-closing
- Waste collection area must hold all bins – bin movements should be with ease of access
- Conform to the Building Code of Australia, Australian Standards and local laws
- Childproofing and public/operator safety shall be assessed and ensured

PREVENTION OF STORMWATER POLLUTION AND LITTER REDUCTION

Building management shall be responsible for the following to minimise dispersion of site litter and prevent stormwater pollution to avoid impact to the environment and local amenity:

- Promoting adequate waste disposal into the bins
- Securing all bin rooms (whilst affording access to staff/contractors)
- Prevent overfilling of bins, keep all bin lids closed and bungs leak-free

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- Taking action to prevent dumping or unauthorised use of waste areas
- Require collection contractor/s to clean-up any spillage that may occur when clearing bins

ADDITIONAL INFORMATION

Transfer of waste and all bin movements require minimal manual handling therefore the operator must assess manual handling risks and provide any relevant documentation to building management. If required, a bin-tug, trailer or tractor consultant should be contacted to provide equipment recommendations. Hitches may require installation to move multiple bins to the collection area. Council must be informed of any hitch attachments required to be installed on bins.

LIMITATIONS

The purpose of this report is to document a Waste Management Plan as part of a development application and is supplied with the following conditions:

- Drawings and information supplied by the project architect
- The figures presented in the report are an estimate only. The actual amount of waste generated will be dependent on the occupancy rate of the building/s and waste generation intensity as well as the building managements approach to waste management.
- The building manager will make adjustments as required based on actual waste volumes (if waste is greater than estimated) and increase the number of bins and collections accordingly.
- The report will not be used to determine or forecast operational costs or prepare any feasibility study or to document any safety or operational procedures.
- Any manual handling equipment should be provided at the recommendation of the appropriate equipment provider who will assess the correct equipment for supply.

SIGNAGE

The building manager/caretaker is responsible for all waste room signage including safety signs. Appropriate signage must be prominently displayed on walls and above all bins, clearly stating what type of waste or recyclables is to be placed in the bin underneath to prevent contamination of recycling bins.

VENTILATION

Waste and recycling rooms must have their own exhaust ventilation system either;

- Mechanically - exhausting at a rate of 5L/m² floor area, with a minimum rate of 100L/s minimum, or
- Naturally - permanent, unobstructed, and opening direct to the external air, not less than one-twentieth (1/20) of the floor area.

Mechanical exhaust systems shall comply with AS1668.2-2002 and not cause any inconvenience, noise or odour problem.

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USEFUL CONTACTS

Warringah Council
Customer Service: 02 9942 2111 - 24/7

National Association of Charitable Recycling Organisations Inc. (NACRO)
Phone: 03 9429 9884
Email: information@nacro.org.au

Purifying Solutions (odour control)
Phone: 1300 636 877 (1300 ODOURS)
sales@purifyingsolutions.com.au

Closed Loop (Apartment compost bins)
Phone: 02 9339 9800
Info@closedloop.com.au

ELECTRODRIVE (Bin tug/tow)
Freecall: 1800 333 002
Fax: 1800 031 057
Email: nsw@electrodrive.com.au

Note: Elephants Foot Recycling Solutions does not warrant or make representation for goods or services provided by suppliers.

Elephants Foot Recycling Solutions (Chutes, compactor and eDiverter systems)
44 – 46 Gibson Avenue
Padstow NSW 2211
Free call: 1800 025 073
Email: natalie@elephantsfoot.com.au

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APPENDIX 1 – STANDARD SIGNAGE FOR WASTE AND RECYCLING BINS

Signs for garbage, recycling and organics bins should comply with the standard signs promoted by the Department of Environment and Heritage.

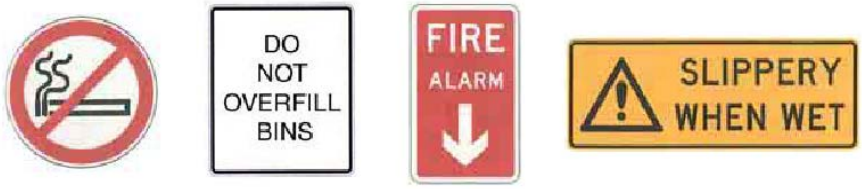
Example wall posters

Example bin lid stickers

SAFETY SIGNS

The design and use of safety sigs for waste rooms and enclosures should comply with AS1319 Safety Signs for Occupational Environment. Safety signs should be used to regulate and control safety related to behaviour, warn of hazards and provide emergency information, including fire protection information. Below are some examples. Each development will need to decide which signs are relevant for its set of circumstances and service provided.

Examples of Australian Standards:



Australian Standards are available from the SAI Global Limited website (www.saiglobal.com).

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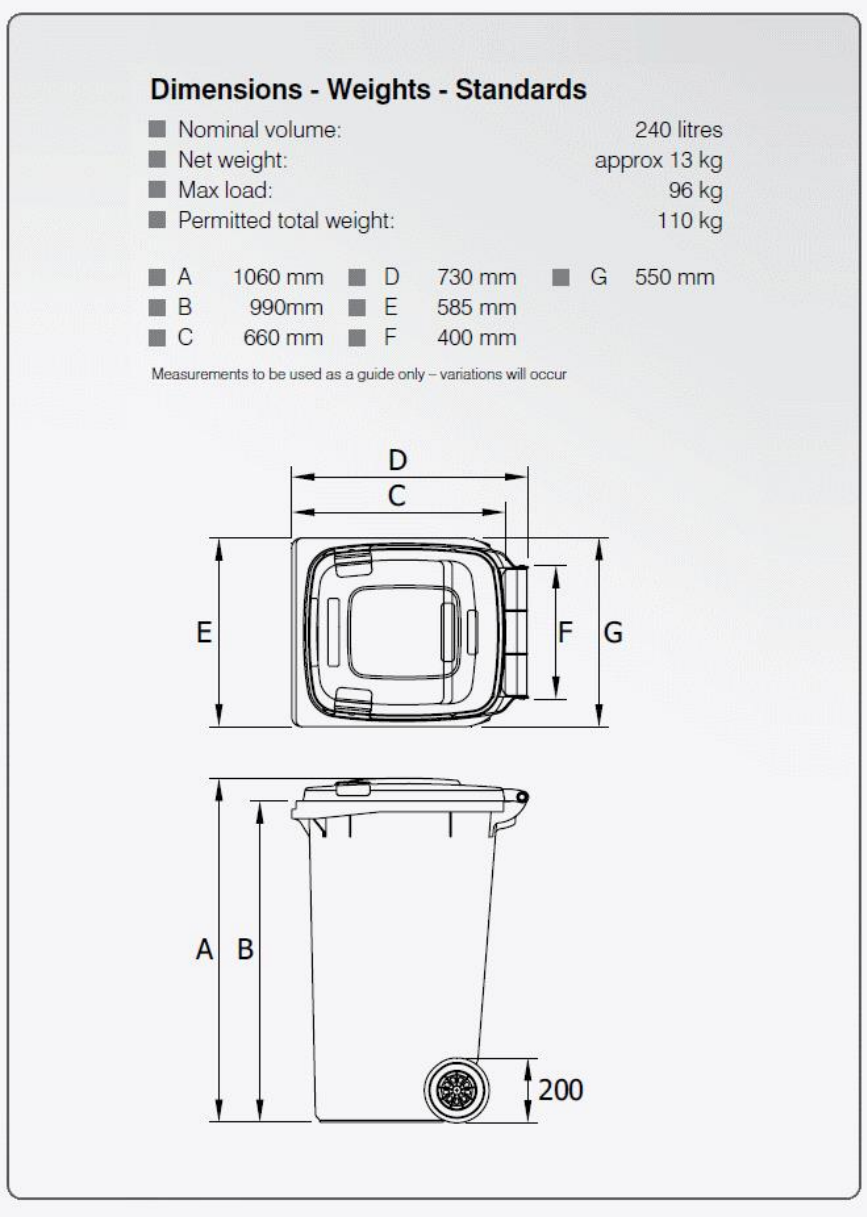
APPENDIX 2 – WASTE MANAGEMENT EQUIPMENT

The below is inserted for information only.



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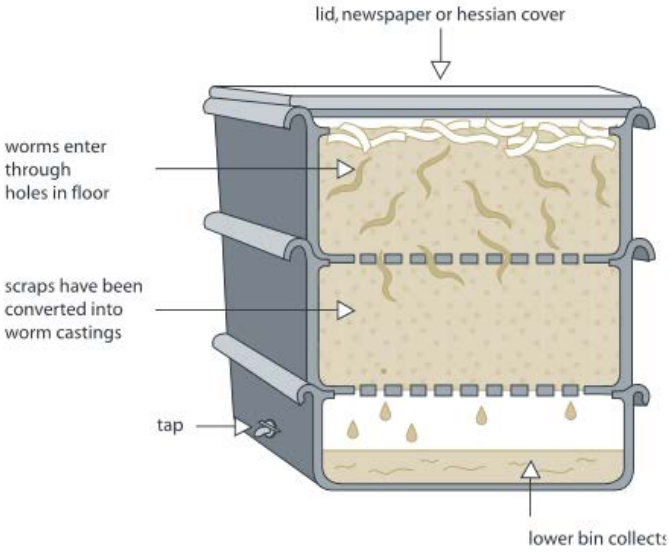
Worm farms



Space requirements for a typical worm farm for an average household:

Height – 300mm per level

Width – 600mm

Length – 900mm

There are many worm farm arrangements. The above dimensions are indicative only.

Source: Department of Environment and Climate Change NSW 2008, *Better Practice Guide for Waste Management in Multi-Unit Dwellings*

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Apartment Style Compost bin – available from hardware stores

Suitable for:

- Vegetables
- Coffee grounds and filters
- Tea and tea bags
- Crushed eggshells (but not eggs)
- Nutshells
- Houseplants
- Leaves
- Cardboard rolls, cereal
- Boxes, brown paper bags
- Clean paper
- Shredded newspaper
- Fireplace ashes
- Wood chips, sawdust,
- Toothpicks, burnt matches
- Cotton and wool rags
- Dryer and vacuum cleaner lint
- Hair and fur
- Hay and straw

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Decomposition Method	Aerobic fermentation by microorganisms
Decomposition Capacity	2 metric tonnes per year** (4 kg per day**)
Rating	220–240 V 50/60 Hz – 1.1 A
Decomposition Time	24 hrs
Operating Temperature	0ºC and 40ºC***
Deodorisation Method	Nano-Filter system
Maximum Power	210 W
Weight	21 kgs
External Dimensions	w 400 mm d 400 mm h 780 mm

* Excludes scallop and oysters shells and large bones.
** Food Waste Handling Capacity – based on an optimal operating environment.
***Ambient temperature range of area where unit may be installed.

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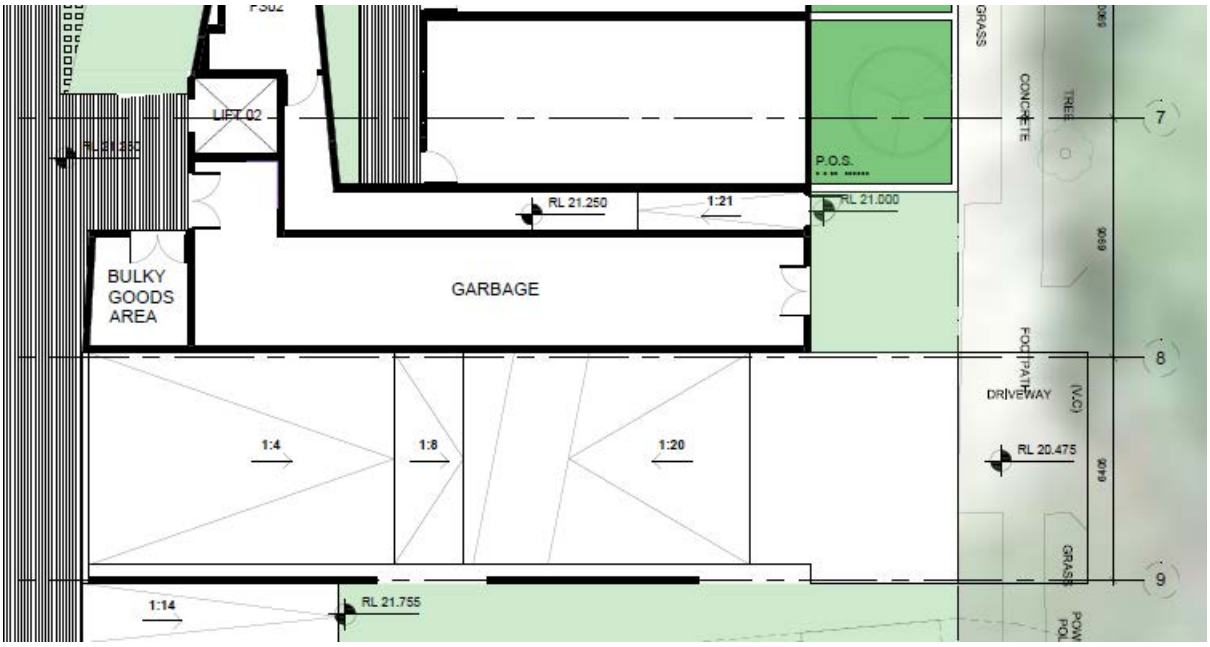
APPENDIX 4 – BULKY GOODS & GARBAGE STORE

Pacific – Level Ground



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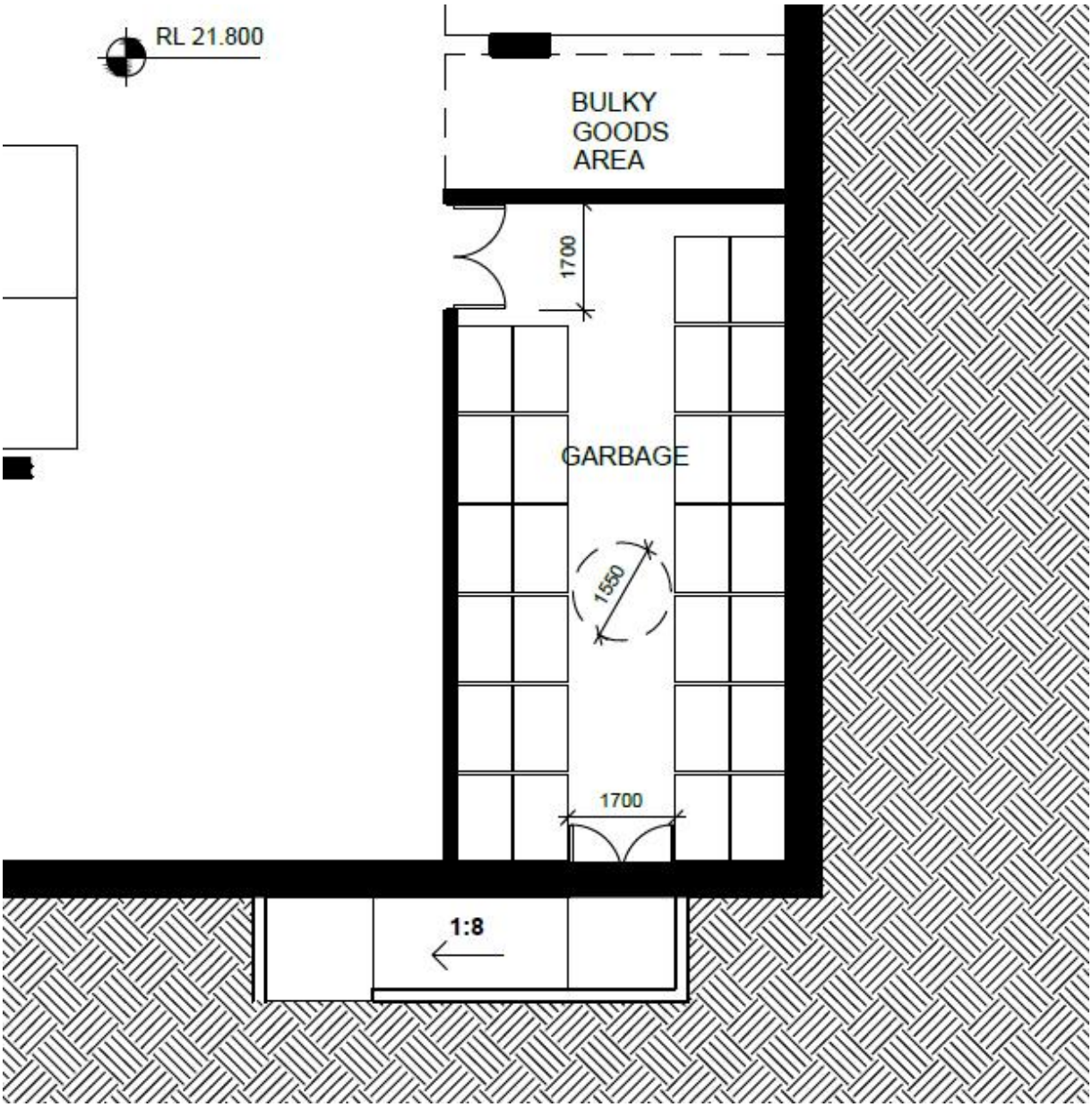
Sturdee – Level B1



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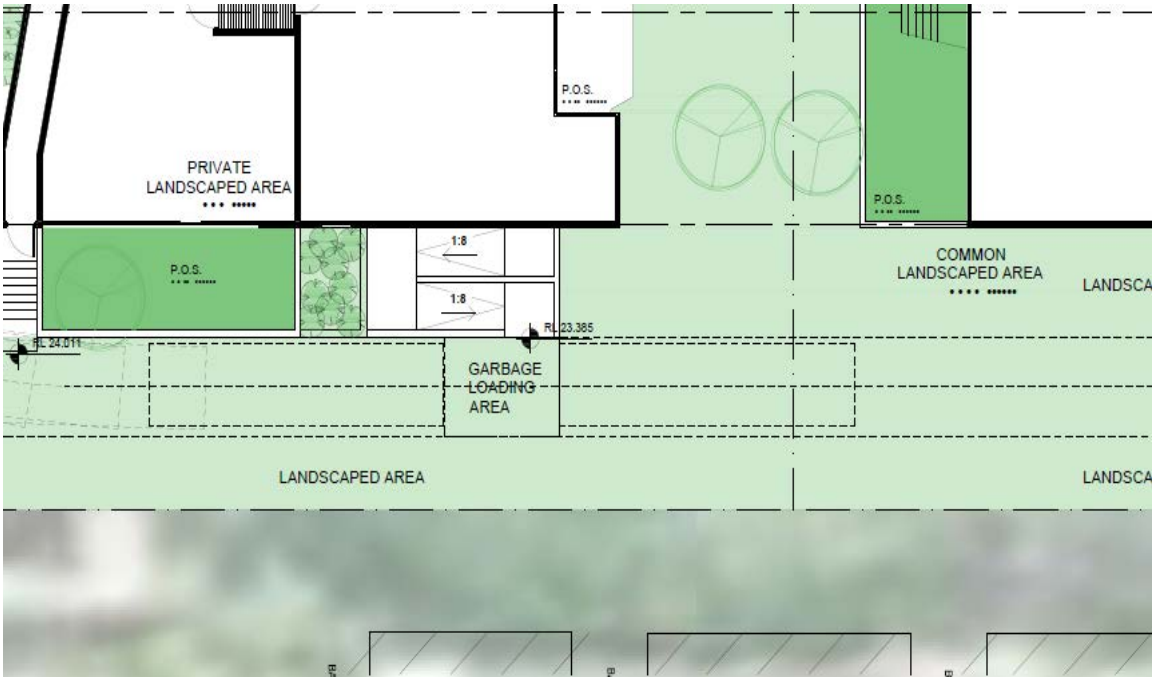
APPENDIX 5 – COLLECTION AREAS

Sturdee – ground level



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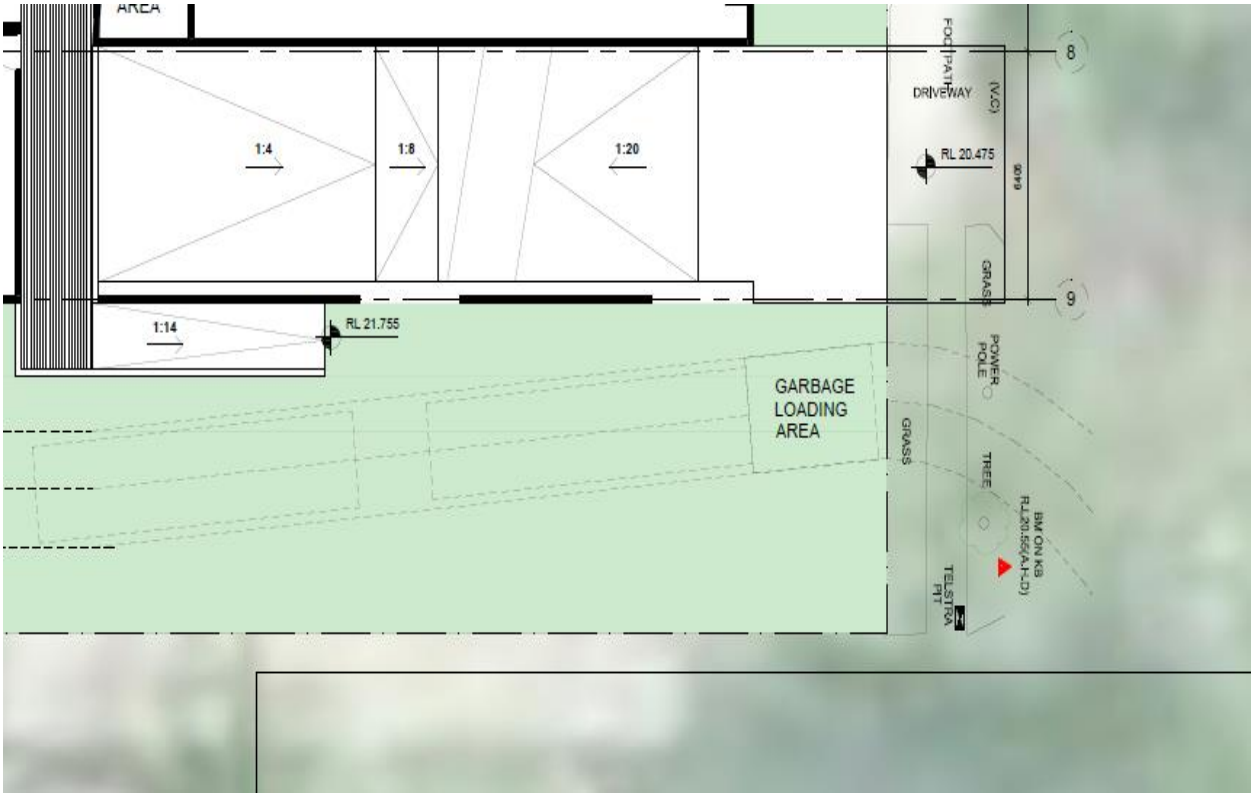
Pacific – ground level



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CPM ENGINEERING
Civil & Structural Consulting Engineers
ABN 55 156 273 755

16 September 2014

Warringah Council
Civic Centre
725 Pittwater Road
DEE WHY NSW 2099

Our Ref: 13078
Council Ref: DA2013/1519

STORMWATER ENGINEERING DESIGN COMPLIANCE CERTIFICATION

PROPOSED RESIDENTIAL DEVELOMENT
27 – 29 PACIFIC PARADE, DEE WHY

Pursuant to the provisions of Clause A2.2 of the Building Code of Australia, I hereby certify that the above design is in accordance with normal Engineering practice and meets the requirements of the Building Code of Australia, Part 7 of the Environmental Planning and Assessment Regulations, relevant Australian Standards and relevant conditions of the Development Consent. In particular the design is in accordance with the following:
The stormwater drainage design for the above project has been designed in accordance with:

- Australian Rainfall & Runoff (1987),
- Australian Standard AS3500.3.2:1998 'National Plumbing and Drainage Standard',
- Warringah Councils' 'On-site Stormwater Detention Technical Specification'

I am an appropriately qualified and competent person in this area and being listed in the National Professional Engineers Register (NPER) and as such can certify that the design and performance of the design systems comply with the above and which are detailed on the following drawings:

- Stormwater Services Plans, Insync Services Pty Ltd, Ref: 20120065, Rev C 16/9/14 has been designed in accordance with the above standards and policy

Should you have any queries regarding this matter, please do not hesitate to contact the undersigned.

Yours Sincerely,

CPM Engineering

Chris Morris
BE(Hons) MIEAust CPEng NPER
Accredited Certifier

Principal:
Chris Morris
BE(Hons) MIEAust CPEng NPER RPEQ
Accredited Certifier BPB No. 0278

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