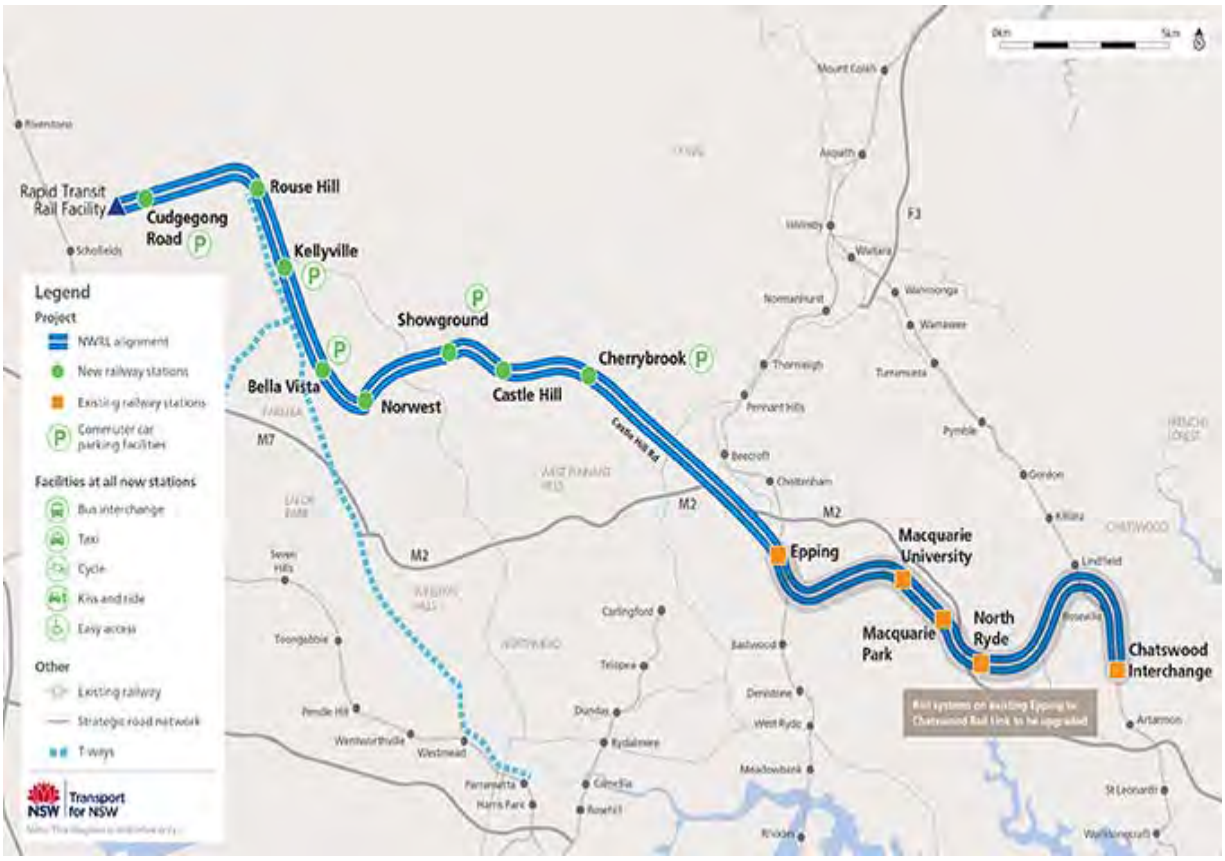

Hills District
Bus Guide
Effective from:
24 January 2015
hillsbus
Rouse Hill Town Centre Local Area
Castle Hill Local Area
Hornsby Area
Parramatta Local Area
Blacktown Local Area
Epping to Lane Cove Area
North Sydney/CBD Area
Map Legend
Glenorie
Arcadia
Berrilee
Galston
Kenthurst
Rouse Hill
Annangrove
Dural
Round Corner
Glenhaven
Cherrybrook
Kellyville
Stanhope Gardens
Acacia Gardens
Parklea
Glenwood
Bella Vista
Kings Langley
Kings Park
Castle Hill
Pennant Hills
West Pennant Hills
Beecroft
Cheltenham
Epping
Baulkham Hills
Blacktown
Lalor Park
Seven Hills
Winston Hills
North Rooks
Carlingford
Mobbs Hill
Northmead
North Parramatta
Toongabbie
Old Toongabbie
Telopea
Oatlands
Westmead
Wentworthville
Pendle Hill
Prospect
Girraween
Parramatta
Mays Hill
Harris Park
Hornsby
Waitara
Normanhurst
Thornleigh
North Epping
Marsfield
Macquarie Park
Eastwood
East Ryde
Chatswood West
Chatswood
Willoughby
Artarmon
Lane Cove West
Lane Cove
St Leonards
Osborne Park
Crows Nest
Northwood
Greenwich
Wollstonecraft
Artarmon
St Leonards
Osborne Park
Crows Nest
Cammeray
North Sydney
Milsons Point
Wynyard
Sydney CBD

A plan of the railway stations on the Sydney Metro Northwest Railway Line is reproduced below.



3. Pedestrians and Cyclists

Pedestrian activity in the area is largely accommodated on footpaths which form part of the road network serving the site. As new development in the area proceeds, additional sections of footpaths will be concreted facilitating pedestrians access through the area.

Designated cycle routes which serve and pass through the area are shown on the Castle Hill On-Road Off-Road Cycleways map reproduced in the following pages. As can be observed, the proposed development site is conveniently located in respect of the designated on-road cycleway which runs along Old Castle Hill Road past the intersections with Garthowen Crescent. That on-road cycleway connects with other on-road and off-road cycleways which serve the area.


Castle Hill on road off road cycleways
Green Rd
President Rd
Wrights Rd
Kings Rd
Victoria Rd
Gilbert Rd
Tuckwell Rd
Glenhaven Rd
Evans Rd
Old Northern Rd
Old Castle Hill Rd
Britannia Rd
Castle St
Showground Rd
Pennant St
Terminus St
Salisbury Rd
Carrington Rd
Gladstone Rd
Victoria Ave
Anella Ave
Norwest Blvd
Barina Downs Rd
Parsonage Rd
Windsor Rd
Merindah Rd
Chapel Ln
Crestwood Dr
Excelsior Ave
Edward St
Off-Road Cycleway
On Road Cycleway
Playground
Toilets
Carpark
N
W
E
S
For more Tracks and Trails information visit www.thehills.nsw.gov.au
THE HILLS
Sydney's Garden Shire

4. Home Travel Plan

The following Home Travel Plan has been prepared in the interests of providing guidance to future residents of the proposed development in order to reduce car trips and encourage the use of sustainable transport.

However, in circumstances where completion of the residential development proposal is some years away at which time specific details of travel options might have changed, the preparation of a detailed Home Travel Plan at this stage is not warranted. The Home Travel Plan and its detail is more appropriately prepared just prior to occupation of the building at a time when current travel arrangements can be specified. Notwithstanding, in order to provide guidance for the preparation of a Home Travel Plan for occupants of the proposed apartment buildings, the following "generic" Home Travel Plan is proposed.

HOME TRAVEL PLAN

Provide Information on Public Transport Services

The proposed development site currently enjoys a high level of public transport accessibility in the form of bus services which stop at the Castle Hill Bus Interchange centered on Old Castle Hill Road (see Figure 2). Completion of the Sydney Metro Northwest Railway Line including the Castle Hill Railway Station in 2019 will provide future residents with access to railway travel. The Home Travel Plan will provide the following information on those public transport services.

Railway Service

- a copy of the Sydney Rail Network map showing the extent of the rail service throughout the Sydney Metropolitan Service, and the location of the Sydney Metro Northwest Railway Line and the Castle Hill Railway Station on that Line
- details of up to date train timetables for Castle Hill Railway Station
- a map showing the shortest and safest pedestrian route between the site and Castle Hill Railway Station.

Bus Services

- details of bus services which stop at the Castle Hill Bus Interchange including:

- service number
- origin/destination
- travel route along streets in the vicinity of the site
- nearest bus stop
- bus service timetables
- a map showing the shortest and safest pedestrian route between the site and the nearest bus stops.

Bicycle and Pedestrian Access

The Home Travel Plan will identify:

- the location of designated bicycle parking facilities for residents and their visitors in the proposed development

- a map showing cycleways conveniently accessible to the site, and demonstrating how those cycleways connect with the regional bicycle network.

The Home Travel Plan will provide information on the most convenient and safest Pedestrian Routes connecting the site with prominent destinations in the vicinity including a map showing the most convenient and safest Pedestrian Route connecting the Site with the Castle Hill Bus Interchange and Railway Station, Castle Towers Shopping Centre, schools in the area, and open space/recreational facilities in the area.

Implementation

Just prior to the initial occupation of the residential apartments, the "generic" Home Travel Plan will be finalised with the inclusion of relevant information such as train and bus timetables, illustrations showing the shortest and most convenient routes between the site and the full range of destinations encompassed by the Plan, etc.

Hard copies of the Home Travel Plan will be produced for distribution to new owners/tenants of the residential apartments.

A website will also be established for the building, and the Home Travel Plan will be included on that website. The Body Corporate of the building will be responsible for updating the Home Travel Plan on, at least, an annual basis.

5. Parking

Table 1 in Clause 2.1 of Part C Section 1 of *The Hills Development Control Plan (DCP) 2012* (the "DCP") specifies the parking requirements for the proposed development. A further guide to the appropriate parking provision to serve the proposed development is provided by the RTA Guidelines[1]. The parking requirement for the proposed development calculated in accordance with those two guides is:

PARKING REQUIREMENTS					
	The Hills DCP			**RTA Guidelines***	
RESIDENTIAL					
Resident					
67 x 1-bedroom	1 space per unit	=	67 spaces	0.6 space per unit	= 40 spaces
174 x 2-bedroom	2 spaces per unit	=	348 spaces	0.9 space per unit	= 157 spaces
27 x 3-bedroom	2 spaces per unit	=	54 spaces	1.40 spaces per unit	= 38 spaces
Sub Total Resident			469 spaces		235 spaces
Visitor	2 spaces per 5 units	=	107 spaces	1 space per 5 units	= 54 spaces
TOTAL RESIDENTIAL			**576 spaces**		**289 spaces**

For the purposes of this table the RTA Guidelines **residential parking requirement is based on the rates specified for Metropolitan Sub-Regional Centres*

As can be observed, the parking requirement for the proposed development calculated in accordance with the DCP is nearly double the requirement calculated in accordance with the RTA Guidelines. A discrepancy of this magnitude demands further examination. In this respect it is noted that:

- it is relevant that the parking requirements specified by the RTA Guidelines for residential flat buildings are derived from surveys of residential flat buildings and located within the Sydney Metropolitan Area. In contrast, the basis for the parking requirements specified by the DCP is not disclosed by the DCP

- the RTA Guidelines specify parking requirements for high density residential flat buildings located in Metropolitan Regional (CBD) Centres and Metropolitan Sub-Regional Centres. Although the proposed development is located immediately adjacent to the northern boundary of the designated Castle Hill Major Centre, the higher parking requirement specified by the Guidelines for high density residential flat buildings in Metropolitan Sub-Regional Centres has been adopted

[1] *RTA "Guide to Traffic Generating Developments. Section 5 – Parking Requirements for Specific Landuses" October 2002*

- while the RTA Guidelines recommend that the minimum number of off-street visitor parking spaces is 1 space for every 5 units, it notes that *"…. Council's may wish to reduce this requirement for buildings located in close proximity to public transport, or where short term unit leasing is expected."* By virtue of its convenient location to public transport services and to the Castle Hill Major Centre, the proposed development could be considered to be in this category. In this respect, it is particularly relevant that the residential visitor parking requirement specified by the DCP is extraordinarily high at 2 spaces per 5 units. It is submitted that this particularly high parking requirement for visitor parking is not warranted in this case, and represents a massive waste of resources

It can be reasonably concluded that the parking requirement specified by the Hills DCP for the proposed development is substantially excessive and therefore inconsistent with established State Government policy which promotes sustainable development, particularly in circumstances where the residential development proposal is high density, the site is conveniently located in respect of the Castle Hill Major Centre, and has convenient access to all public transport services which currently serve the Castle Hill CBD and which are planned to serve the Centre in the future, in particular Castle Hill Railway Station which forms part of the Sydney Metro Northwest Rail Link currently under construction and scheduled for completion in 2019.

Relevantly, Objective 3J-1 of *SEPP 65 – Apartment Design Guide* which came into force on 17th July 2015 states that:

Objective 3J-1

Carparking is provided based on proximity to public transport in Metropolitan Sydney and centres in regional areas.

Design Criteria

1. For development in the following locations:
   - on sites that are within 800m of a railway station or light rail stop in the Sydney Metropolitan Area, or
   - on land zoned, and sites within 400m of land zoned, P3 Commercial Core, B4 Mixed Use or equivalent in a nominated regional centre.

   The minimum carparking requirement for residents and visitors is set out in the Guide to Traffic Generating Developments, or the carparking requirement prescribed by the relevant Council, whichever is less.

   The carparking needs for a development must be provided off-street.

That Objective and the accompanying Design Criteria support the proposition that the parking requirement specified by the RTA Guidelines should be preferred over the higher parking requirement calculated in accordance with Council's DCP.

Further, Clause 30 of SEPP 65 says:

> **30. Standards that cannot be used as grounds to refuse development consent or modification of development consent**
>
> (1) If an application for the modification of a development consent or a development application for carrying out of development to which this Policy applies satisfies the following design criteria, the consent authority must not refuse the application because of those matters:
>
> a) If the carparking for the building will be equal to, or greater than, the recommended minimum amount of carparking specified in Part 3J of the Apartment Design Guide…..

It is therefore recommended that the proposed development should be required to satisfy the parking requirements calculated in accordance with the RTA Guidelines, that is provision of 289 parking spaces to serve the proposed development.

6. Traffic

Existing and Proposed Road Network

The classifications assigned to the road network serving the site by the RMS (Figure 3) identify the following classified State Roads in the vicinity of the site:

State Roads
Old Northern Road
Castle Hill Road
Showground Road

Garthowen Crescent enjoys convenient access to the higher order road network which serves and passes through the area via short sections of Old Castle Hill Road and McMullen Street. Although not included in the RMS classification, Old Castle Hill Road performs an important *collector* road function for the area, while McMullen Street can be considered to perform a *sub-arterial* road function.

The existing traffic and parking controls on the road network in the vicinity of the site are shown on Figure 4. Garthowen Crescent has a sealed carriageway 8m wide.

Existing Traffic Conditions

To provide an indication of existing traffic conditions on the road network serving the site, a count of traffic activity was conducted during the AM and PM peak periods on Wednesday, 16th March 2016 at the following intersections:

Old Castle Hill Road/Pennant Street/McMullen Street
Old Castle Hill Road/Garthowen Crescent (north)
Old Castle Hill Road/Garthowen Crescent (south)

The detailed results of those traffic counts are included in Appendix A to this report, while the weekday AM and PM peak period traffic flows through those intersections are summarised on Figure 5. As shown on Figure 5, the weekday AM peak period is assumed to be between 8.15 – 9.15am, while the weekday PM peak period is assumed to be between 4.45 – 5.45pm.

Because of the relatively close proximity of the Old Castle Hill Road/Garthowen Crescent (south) intersection to the busy Old Castle Hill Road/Pennant Street/McMullen Street intersection, and the likelihood that southbound traffic flows on Old Castle Hill Road queue

back from the Pennant Street/McMullen Street intersection past the Old Castle Hill Road/Garthowen Crescent (south) intersection, gap acceptance and queue length surveys were conducted at the intersections of Old Castle Hill Road with Garthowen Crescent (south) and Garthowen Crescent (north) during the AM and PM peak periods on Thursday 19th May 2016. The results of those surveys are presented as Appendix B to this report.

Projected Traffic Generation Potential

An indication of the traffic generation potential of the proposed development is provided by the typical traffic generation rates specified by the RTA Guidelines[2] for different forms of residential development. For the purposes of calculating the traffic generation potential of the proposed residential development, the weekday peak period traffic generation rates specified by the RTA Guidelines for *high density residential flat buildings in Metropolitan Sub-Regional Centres* were adopted.

The weekday peak period traffic generation potential of the proposed development is therefore:

PROJECTED TRAFFIC GENERATION POTENTIAL							
			TOTAL	AM		PM	
				IN	OUT	IN	OUT
Residential	268 units	0.29 vtph per unit	80	15	65	65	15

That projected traffic generation potential has been assigned to the road network serving the site in accordance with existing traffic flows on the road network. The *additional* traffic demand on the road network serving the site as a consequence of the proposed development is shown on Figure 6.

Traffic Implications – Road Network Capacity

Reference to Figure 6 indicates that the main traffic implications of the proposed development in terms of road network capacity concern the effect of the *additional* traffic demand generated by the proposed development on the operating performance of the following intersections:

Old Castle Hill Road/Pennant Street/McMullen Street
Old Castle Hill Road/Garthowen Crescent (north)
Old Castle Hill Road/Garthowen Crescent (south)

[2] *RTA "Guide to Traffic Generating Developments. Section 3 – Landuse Traffic Generation" Oct 2002*

The operating performance of those intersections under existing and projected future traffic demand during the weekday AM and PM peak periods can be assessed using SIDRA analysis, and criteria for interpreting the results of SIDRA analysis are set out on the schedule reproduced in Appendix C. However, because the operating performance of the Old Castle Hill Road/Garthowen Crescent (south) intersection is affected by southbound traffic on Old Castle Hill Road queueing back from the Old Castle Hill Road/Pennant Street/McMullen Avenue intersection, the SIDRA model for the Garthowen Crescent (south) intersection was calibrated using the results of the traffic queue survey included in Appendix B. The Old Castle Hill Road/Garthowen Crescent (north) intersection was analysed as an isolated intersection as queueing from Old Castle Hill Road/Pennant Street/McMullen Avenue intersection did not reach this intersection. The Old Castle Hill Road/Pennant Street/McMullen Avenue intersection was modelled as a signalised intersection by SIDRA.

The results of the SIDRA analysis of the intersections during the weekday AM and PM peak period under existing and projected future traffic demand are summarised on the table below revealing that:

- the Old Castle Hill Road/Pennant Street/McMullen Avenue intersection operates near capacity under existing and projected post-development traffic demand during both the AM and PM peak periods. Relevantly, the additional traffic demand on the intersection as a consequence of the proposed development had a relatively minor effect on intersection performance

- the intersections of Old Castle Hill Road and Garthowen Crescent (south) and (north) operated satisfactorily under both existing and projected post-development traffic demand during both the weekday AM and PM peak period.

RESULTS OF SIDRA ANALYSIS

	AM Peak Hour		PM Peak Hour	
	Level of Service	Average Delay (sec)	Level of Service	Average Delay (sec)
Existing				
- Pennant Street/Old Castle Hill Road/McMullen Avenue	D	45	D	46
- Old Castle Hill Road/Garthowen Crescent South	A	8	A	5
- Old Castle Hill Road/Garthowen Crescent North	A	12	A	12
Post Development				
- Pennant Street/Old Castle Hill Road/McMullen Avenue	D	46	D	52
- Old Castle Hill Road/Garthowen Crescent South	A	9	A	5
- Old Castle Hill Road/Garthowen Crescent North	A	13	A	13

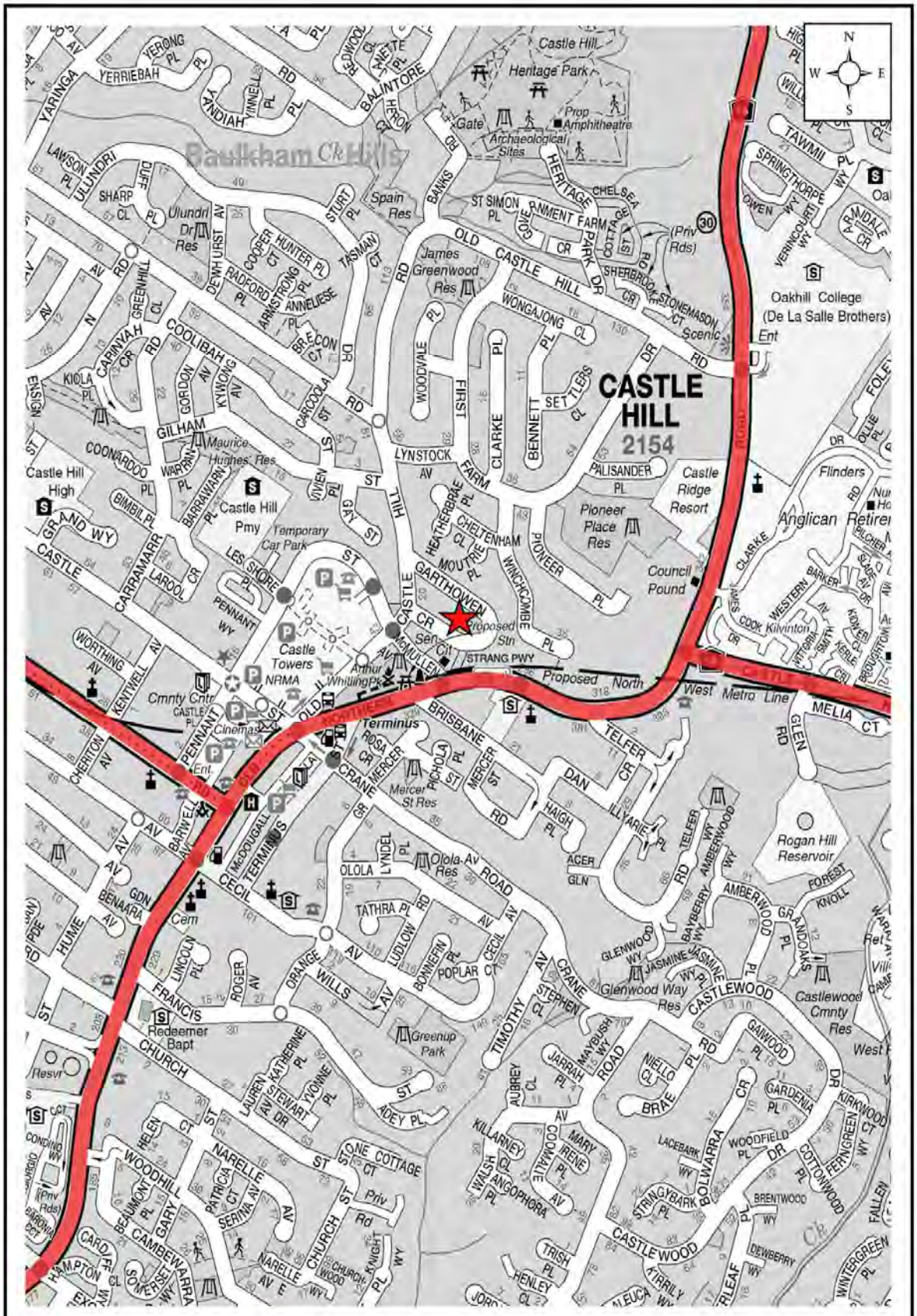
The detailed results of the SIDRA analysis are included as Appendix C to this report.

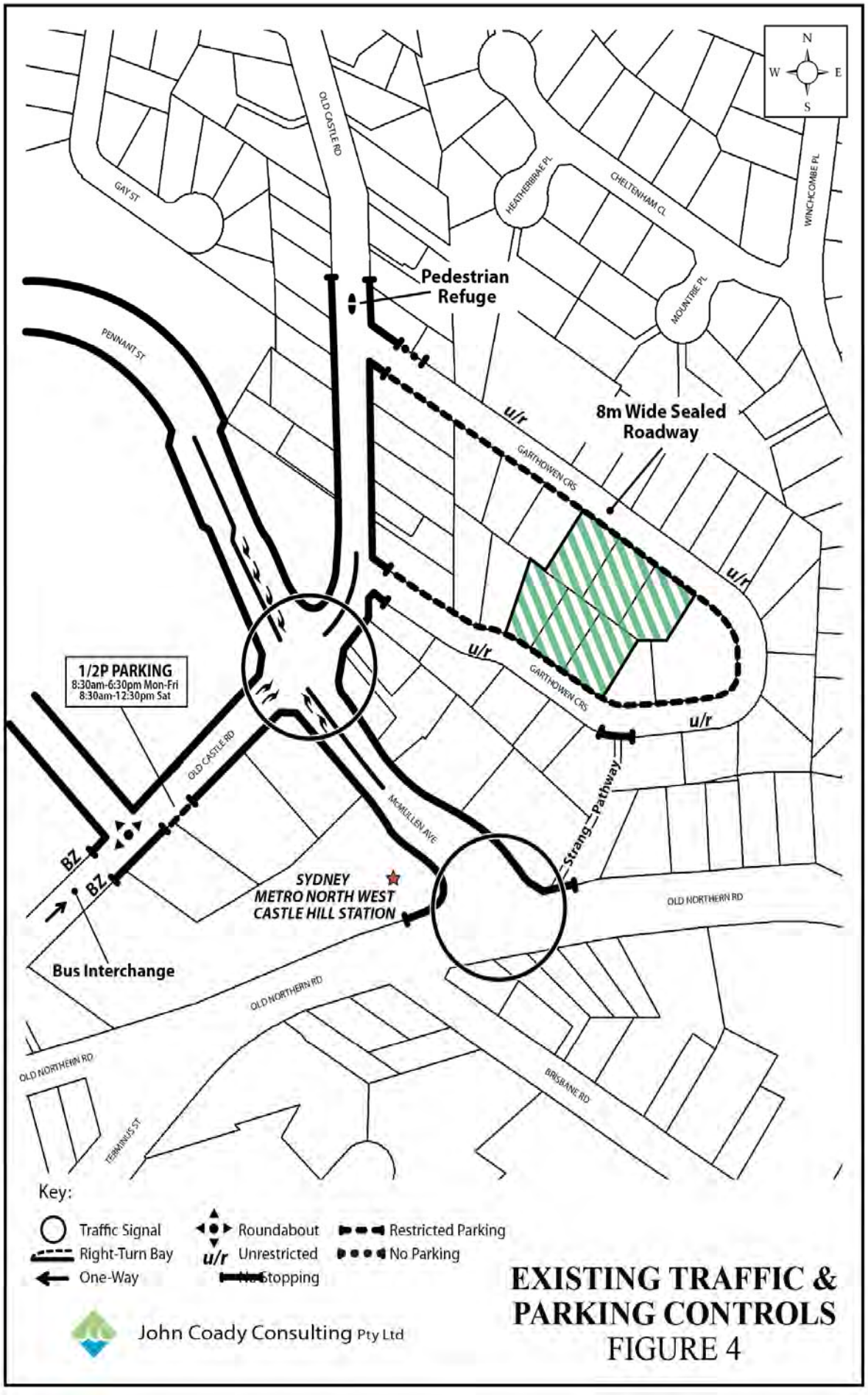
The predicted operating performance of the intersections of Old Castle Hill Road with Garthowen Crescent (south) and Garthowen Crescent (north) is supported by the results of the gap acceptance and traffic queue surveys included in Appendix B to this report. Those survey results indicate that:

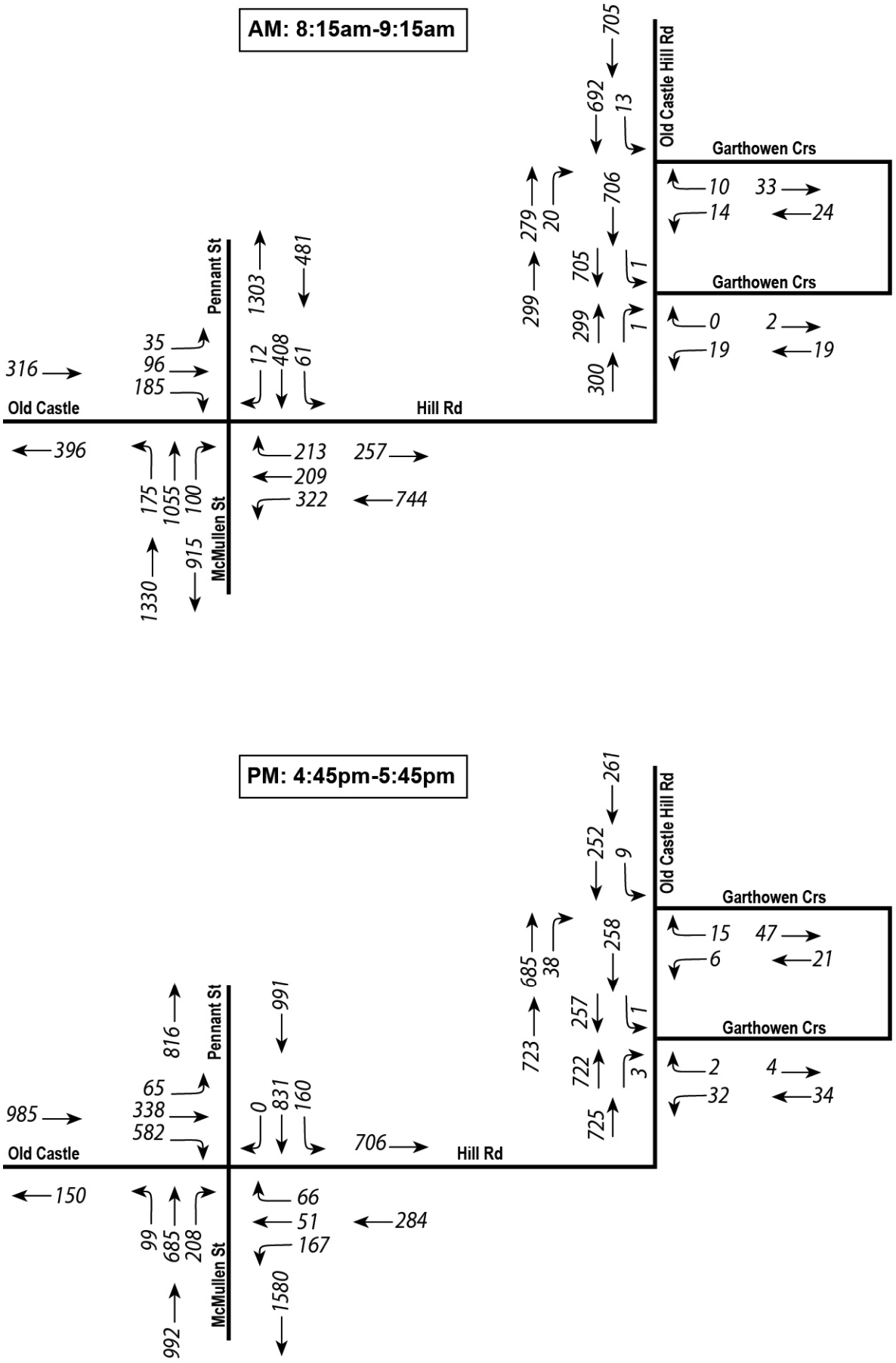
- the amount of gap times of 5 seconds or more recorded for southbound traffic at Garthowen Crescent (south) intersection accounts for 44% (AM) and 67% (PM) of the survey periods
- the amount of gap times of 5 seconds or more recorded for southbound traffic at Garthowen Crescent (north) intersection accounts for 50% (AM) and 70% (PM) of the survey periods
- the amount of gap times of 5 seconds or more recorded for southbound and northbound traffic at Garthowen Crescent (north) intersection accounts for 47% (AM) and 38% (PM) of the survey periods.

In the circumstances, it can be concluded that:

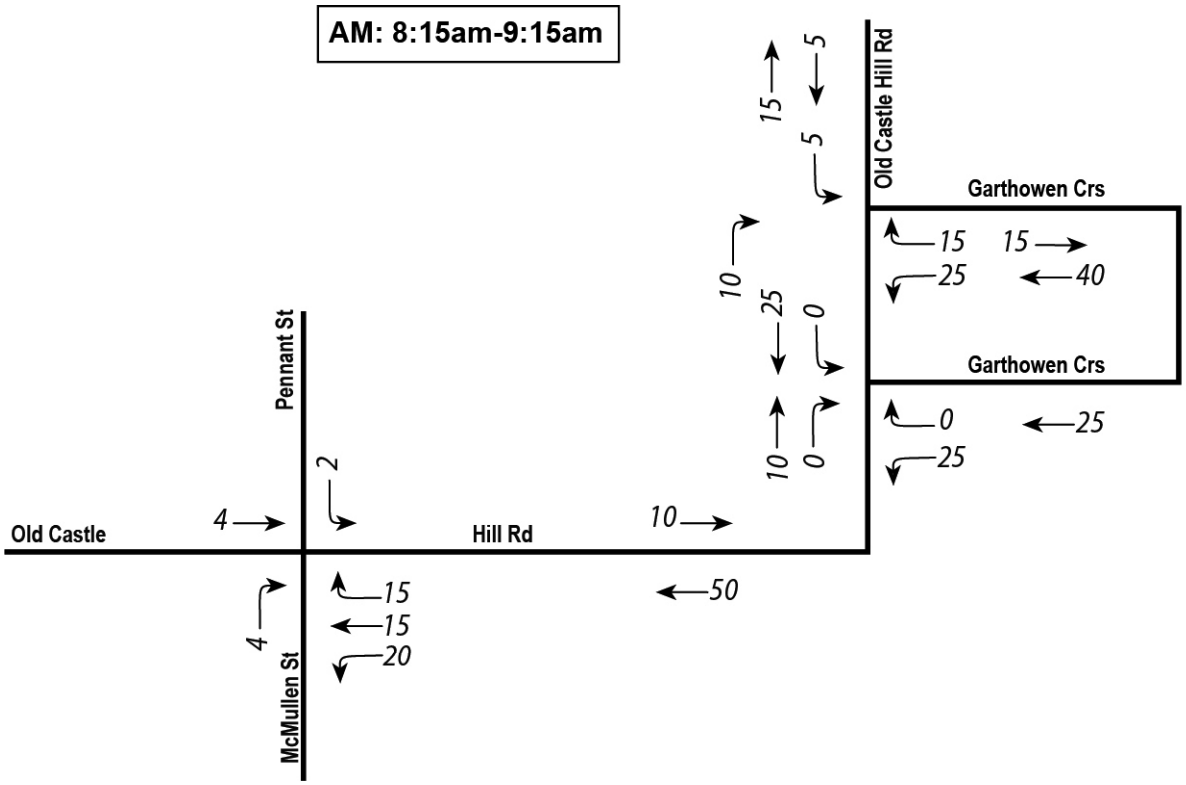
- there is sufficient intersection capacity to accommodate the projected post-development traffic demand for the LT movement, from Garthowen Crescent (south), and from Garthowen Crescent (north), and the RT movement to/from Garthowen Crescent (north)
- in consequence, the proposed development has no unacceptable traffic implications in terms of road network capacity

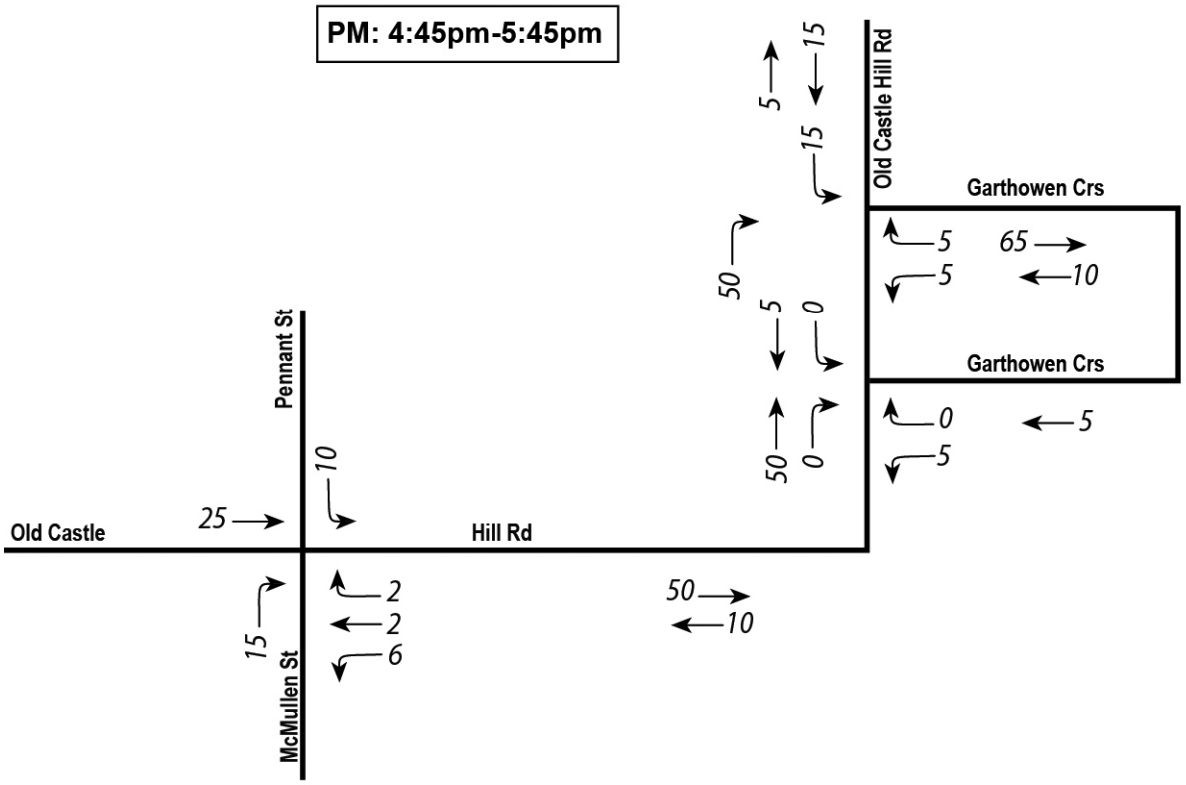

CASTLE HILL
2154
Castle Hill
Heritage Park
Prop Amphitheatre
Archaeological Sites
Gate
Baulkham Ck Hills
Spain Res
James Greenwood Res
Oakhill College (De La Salle Brothers)
Castle Ridge Resort
Pioneer Place Res
Council Pound
Maurice Hughes Res
Castle Hill Pmy
Temporary Car Park
Castle Towers NRMA
Arthur Whiting Pk
Proposed Stn
Proposed North West Metro Line
Terminus
Cmnty Cntr
Cinemas
Redeemer Bapt
Greenup Park
Olola Av Res
Mercer St Res
Rogan Hill Reservoir
Glenwood Way Res
Castlewood Cmnty Res
Castle Hill High
Anglican Retire
Flinders
Key:
State Road
John Coady Consulting Pty Ltd
ROAD HIERARCHY
FIGURE 3


N
W
E
S
OLD CASTLE RD
GAY ST
HEATHERBRAE PL
CHELTENHAM CL
WINCHCOMBE PL
MOUNTRIE PL
Pedestrian Refuge
PENNANT ST
8m Wide Sealed Roadway
u/r
GARTHOWEN CRS
1/2P PARKING
8:30am-6:30pm Mon-Fri
8:30am-12:30pm Sat
OLD CASTLE RD
McMULLEN AVE
Strang Pathway
BZ
BZ
SYDNEY
METRO NORTH WEST
CASTLE HILL STATION
OLD NORTHERN RD
Bus Interchange
BRISBANE RD
TERMINUS ST
Key:
Traffic Signal
Right-Turn Bay
One-Way
Roundabout
Unrestricted
No Stopping
Restricted Parking
No Parking
John Coady Consulting Pty Ltd
EXISTING TRAFFIC & PARKING CONTROLS
FIGURE 4



EXISTING TRAFFIC FLOWS
FIGURE 5





TRAFFIC ASSIGNMENT
FIGURE 6

Appendix A
Traffic Count Data

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

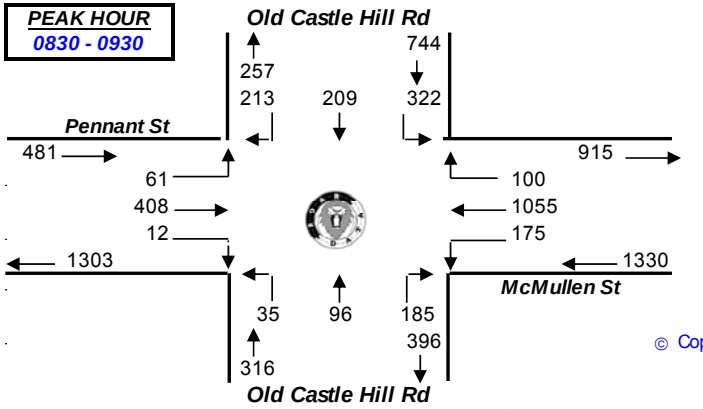
Client : John Coady Consulting
Job No/Name : 5986 CASTLE HILL Old Castle Hill Rd
Day/Date : Wednesday 16th March 2016

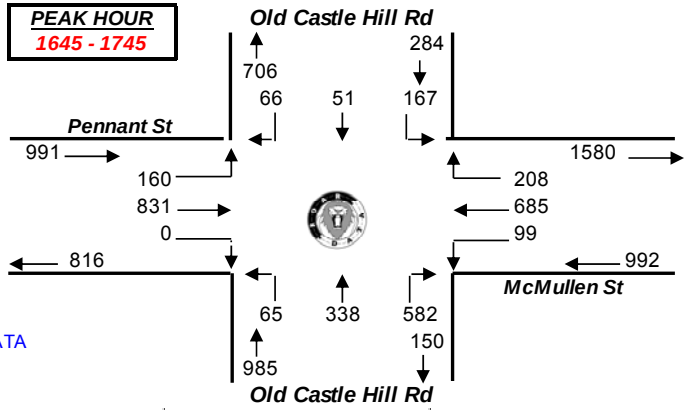
All Vehicles	NORTH Old Castle Hill Rd			WEST Pennant St			SOUTH Old Castle Hill Rd			EAST McMullen St			
Time Per	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0630 - 0645	45	5	2	5	131	0	9	14	19	5	138	5	**378**
0645 - 0700	77	9	7	7	167	0	8	23	23	7	155	16	**499**
0700 - 0715	79	17	14	1	152	1	10	18	32	6	137	12	**479**
0715 - 0730	83	29	19	10	141	1	13	32	36	11	189	19	**583**
0730 - 0745	96	20	24	10	128	2	10	30	38	24	178	8	**568**
0745 - 0800	76	18	23	13	110	1	7	33	42	25	170	10	**528**
0800 - 0815	73	26	23	6	93	1	5	16	37	31	210	22	**543**
0815 - 0830	119	37	36	17	93	1	8	31	45	28	211	36	**662**
0830 - 0845	63	52	42	14	69	2	9	30	31	47	296	35	**690**
0845 - 0900	87	69	63	15	107	5	14	30	44	44	296	25	**799**
0900 - 0915	90	48	45	23	121	2	5	14	38	38	236	22	**682**
0915 - 0930	82	40	63	9	111	3	7	22	72	46	227	18	**700**
Period End	**970**	**370**	**361**	**130**	**1423**	**19**	**105**	**293**	**457**	**312**	**2443**	**228**	**7111**

All Vehicles	NORTH Old Castle Hill Rd			WEST Pennant St			SOUTH Old Castle Hill Rd			EAST McMullen St			
Time Per	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1530 - 1545	45	39	23	25	115	1	16	76	146	26	147	26	**685**
1545 - 1600	33	25	24	29	124	1	23	73	151	30	142	39	**694**
1600 - 1615	25	25	18	31	155	2	20	69	152	28	175	33	**733**
1615 - 1630	34	23	14	30	168	2	18	66	153	26	180	34	**748**
1630 - 1645	42	10	18	29	145	1	20	68	129	20	176	50	**708**
1645 - 1700	34	10	23	30	201	0	13	81	122	30	165	42	**751**
1700 - 1715	47	10	15	55	207	0	17	91	175	22	173	66	**878**
1715 - 1730	45	18	16	38	217	0	15	89	117	13	175	49	**792**
1730 - 1745	41	13	12	37	206	0	20	77	168	34	172	51	**831**
1745 - 1800	36	12	10	22	138	4	10	66	125	13	131	71	**638**
1800 - 1815	32	13	13	21	151	0	11	68	114	19	152	53	**647**
1815 - 1830	39	15	20	31	135	2	12	50	92	11	162	32	**601**
Period End	**453**	**213**	**206**	**378**	**1962**	**13**	**195**	**874**	**1644**	**272**	**1950**	**546**	**8706**

	NORTH Old Castle Hill Rd			WEST Pennant St			SOUTH Old Castle Hill Rd			EAST McMullen St			
Peak Time	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0630 - 0730	284	60	42	23	591	2	40	87	110	29	619	52	**1939**
0645 - 0745	335	75	64	28	588	4	41	103	129	48	659	55	**2129**
0700 - 0800	334	84	80	34	531	5	40	113	148	66	674	49	**2158**
0715 - 0815	328	93	89	39	472	5	35	111	153	91	747	59	**2222**
0730 - 0830	364	101	106	46	424	5	30	110	162	108	769	76	**2301**
0745 - 0845	331	133	124	50	365	5	29	110	155	131	887	103	**2423**
0800 - 0900	342	184	164	52	362	9	36	107	157	150	1013	118	**2694**
0815 - 0915	359	206	186	69	390	10	36	105	158	157	1039	118	**2833**
0830 - 0930	322	209	213	61	408	12	35	96	185	175	1055	100	**2871**
PEAK HOUR	**322**	**209**	**213**	**61**	**408**	**12**	**35**	**96**	**185**	**175**	**1055**	**100**	**2871**

	NORTH Old Castle Hill Rd			WEST Pennant St			SOUTH Old Castle Hill Rd			EAST McMullen St			
Peak Time	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1530 - 1630	137	112	79	115	562	6	77	284	602	110	644	132	**2860**
1545 - 1645	134	83	74	119	592	6	81	276	585	104	673	156	**2883**
1600 - 1700	135	68	73	120	669	5	71	284	556	104	696	159	**2940**
1615 - 1715	157	53	70	144	721	3	68	306	579	98	694	192	**3085**
1630 - 1730	168	48	72	152	770	1	65	329	543	85	689	207	**3129**
1645 - 1745	167	51	66	160	831	0	65	338	582	99	685	208	**3252**
1700 - 1800	169	53	53	152	768	4	62	323	585	82	651	237	**3139**
1715 - 1815	154	56	51	118	712	4	56	300	524	79	630	224	**2908**
1730 - 1830	148	53	55	111	630	6	53	261	499	77	617	207	**2717**
PEAK HOUR	**167**	**51**	**66**	**160**	**831**	**0**	**65**	**338**	**582**	**99**	**685**	**208**	**3252**



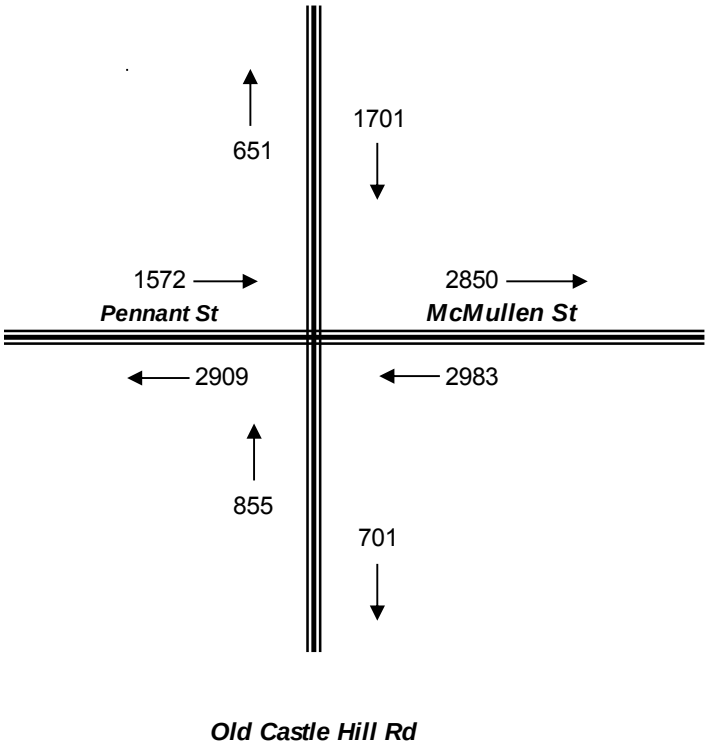


R.O.A.R DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : John Coady Consulting
Job No/Name : 5986 CASTLE HILL Old Castle Hill Rd
Day/Date : Wednesday 16th March 2016

TOTAL VOLUMES FOR COUNT PERIOD

AM



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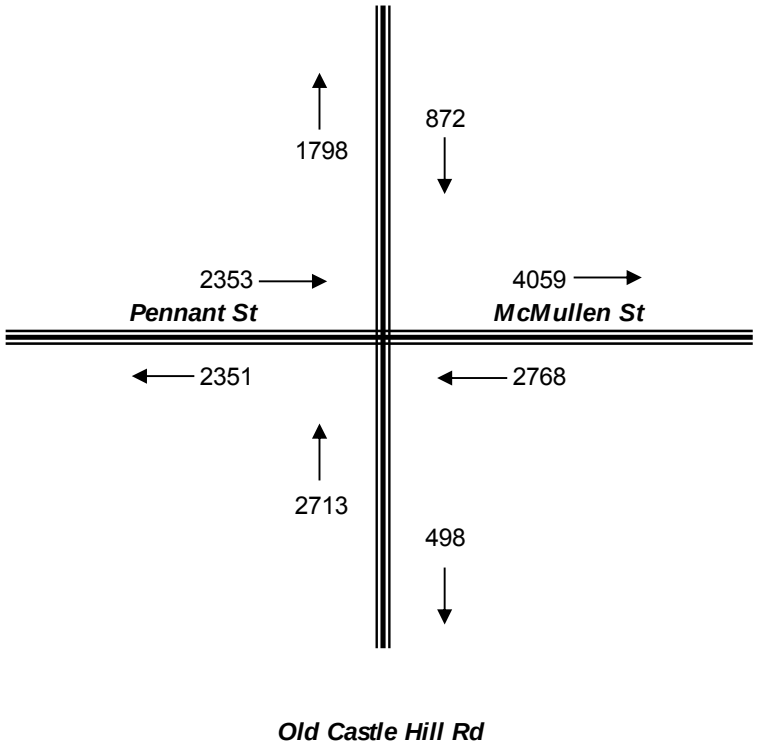


R.O.A.R. DATA

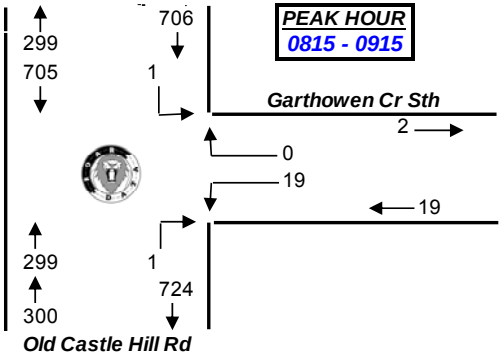
Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

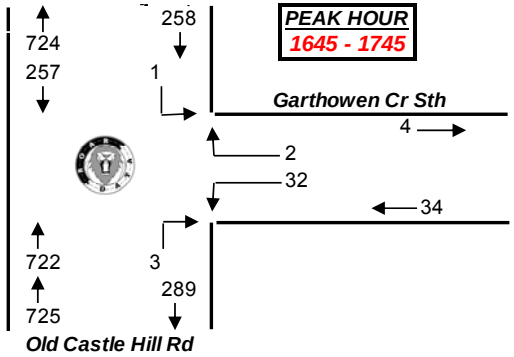
Client : John Coady Consulting
Job No/Name : 5986 CASTLE HILL Old Castle Hill Rd
Day/Date : Wednesday 16th March 2016

All Vehicles	NORTH		EAST		SOUTH		
	Old Castle		*Garthowen*		*Old Castle*		
Time Per	**T**	**L**	**R**	**L**	**R**	**T**	**TOTAL**
0630 - 0645	67	0	0	1	0	22	**90**
0645 - 0700	83	0	1	3	1	43	**131**
0700 - 0715	102	3	1	8	0	47	**161**
0715 - 0730	118	0	1	6	1	50	**176**
0730 - 0745	115	0	0	7	0	49	**171**
0745 - 0800	130	0	0	5	0	61	**196**
0800 - 0815	124	1	0	6	2	48	**181**
0815 - 0830	177	1	0	5	1	83	**267**
0830 - 0845	156	0	0	1	0	88	**245**
0845 - 0900	192	0	0	9	0	62	**263**
0900 - 0915	180	0	0	4	0	66	**250**
0915 - 0930	180	1	0	8	0	54	**243**
Period End	**1624**	**6**	**3**	**63**	**5**	**673**	**2374**

	NORTH		EAST		SOUTH		
	Old Castle		*Garthowen*		*Old Castle*		
Peak Per	**T**	**L**	**R**	**L**	**R**	**T**	**TOTAL**
0630 - 0730	370	3	3	18	2	162	**558**
0645 - 0745	418	3	3	24	2	189	**639**
0700 - 0800	465	3	2	26	1	207	**704**
0715 - 0815	487	1	1	24	3	208	**724**
0730 - 0830	546	2	0	23	3	241	**815**
0745 - 0845	587	2	0	17	3	280	**889**
0800 - 0900	649	2	0	21	3	281	**956**
0815 - 0915	705	1	0	19	1	299	**1025**
0830 - 0930	708	1	0	22	0	270	**1001**
PEAK HR	**705**	**1**	**0**	**19**	**1**	**299**	**1025**



	NORTH		EAST		SOUTH		
	Old Castle		*Garthowen*		*Old Castle*		
Peak Per	**T**	**L**	**R**	**L**	**R**	**T**	**TOTAL**
1530 - 1630	315	1	0	23	0	542	**881**
1545 - 1645	273	2	0	22	0	544	**841**
1600 - 1700	276	1	1	23	1	577	**879**
1615 - 1715	267	1	2	25	2	635	**932**
1630 - 1730	262	1	2	31	2	678	**976**
1645 - 1745	257	1	2	32	3	722	**1017**
1700 - 1800	248	2	1	32	3	713	**999**
1715 - 1815	254	3	0	24	2	670	**953**
1730 - 1830	254	3	0	19	2	619	**897**
PEAK HR	**257**	**1**	**2**	**32**	**3**	**722**	**1017**

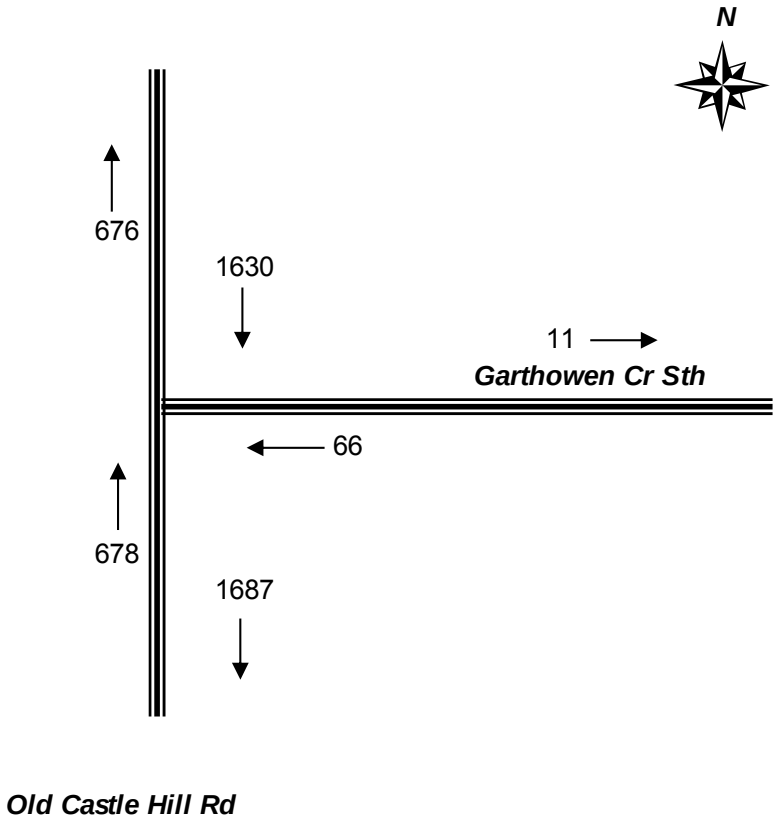


R.O.A.R DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : John Coady Consulting
Job No/Name : 5986 CASTLE HILL Old Castle Hill Rd
Day/Date : Wednesday 16th March 2016

TOTAL VOLUMES FOR PERIOD COUNTED

AM



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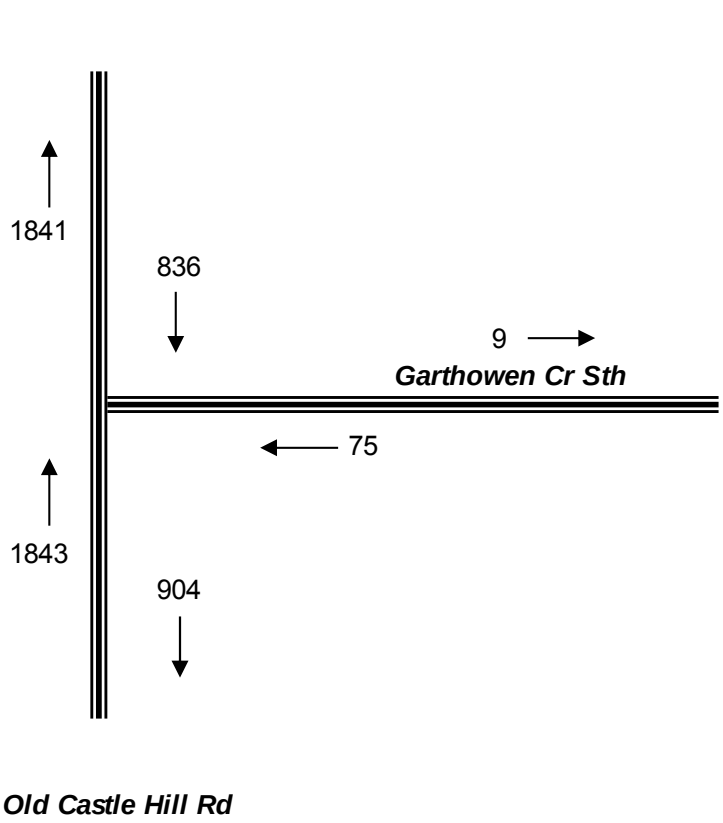


R.O.A.R. DATA

Reliable, Original & Authentic Results

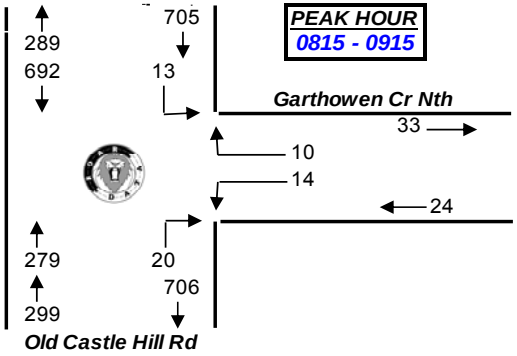
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : John Coady Consulting
Job No/Name : 5986 CASTLE HILL Old Castle Hill Rd
Day/Date : Wednesday 16th March 2016

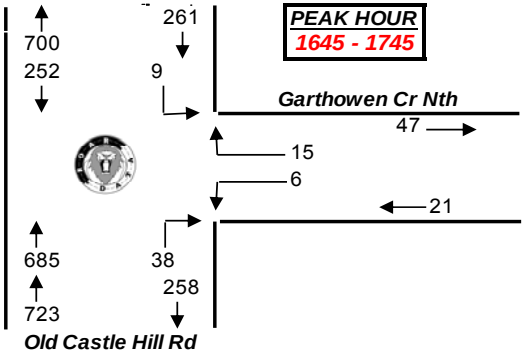
All Vehicles

Time Per	NORTH Old Castle T	NORTH Old Castle L	EAST Garthowen R	EAST Garthowen L	SOUTH Old Castle R	SOUTH Old Castle T	TOTAL
0630 - 0645	67	1	1	0	9	13	**91**
0645 - 0700	83	2	0	0	16	27	**128**
0700 - 0715	105	5	1	0	5	43	**159**
0715 - 0730	116	3	2	2	9	41	**173**
0730 - 0745	110	2	0	5	6	43	**166**
0745 - 0800	128	2	2	2	7	54	**195**
0800 - 0815	121	1	1	4	7	41	**175**
0815 - 0830	173	0	2	5	3	80	**263**
0830 - 0845	156	2	4	0	5	83	**250**
0845 - 0900	187	5	2	5	6	56	**261**
0900 - 0915	176	6	2	4	6	60	**254**
0915 - 0930	181	3	2	0	5	49	**240**
Period End	**1603**	**32**	**19**	**27**	**84**	**590**	**2355**

Peak Per	NORTH Old Castle T	NORTH Old Castle L	EAST Garthowen R	EAST Garthowen L	SOUTH Old Castle R	SOUTH Old Castle T	TOTAL
0630 - 0730	371	11	4	2	39	124	**551**
0645 - 0745	414	12	3	7	36	154	**626**
0700 - 0800	459	12	5	9	27	181	**693**
0715 - 0815	475	8	5	13	29	179	**709**
0730 - 0830	532	5	5	16	23	218	**799**
0745 - 0845	578	5	9	11	22	258	**883**
0800 - 0900	637	8	9	14	21	260	**949**
0815 - 0915	692	13	10	14	20	279	**1028**
0830 - 0930	700	16	10	9	22	248	**1005**
PEAK HR	**692**	**13**	**10**	**14**	**20**	**279**	**1028**



Peak Per	NORTH Old Castle T	NORTH Old Castle L	EAST Garthowen R	EAST Garthowen L	SOUTH Old Castle R	SOUTH Old Castle T	TOTAL
1530 - 1630	314	9	5	1	17	525	**871**
1545 - 1645	272	9	7	3	27	517	**835**
1600 - 1700	271	9	12	6	36	541	**875**
1615 - 1715	261	11	14	7	40	596	**929**
1630 - 1730	257	8	17	6	42	637	**967**
1645 - 1745	252	9	15	6	38	685	**1005**
1700 - 1800	247	4	13	3	31	683	**981**
1715 - 1815	255	4	14	2	26	644	**945**
1730 - 1830	255	6	10	3	23	596	**893**
PEAK HR	**252**	**9**	**15**	**6**	**38**	**685**	**1005**

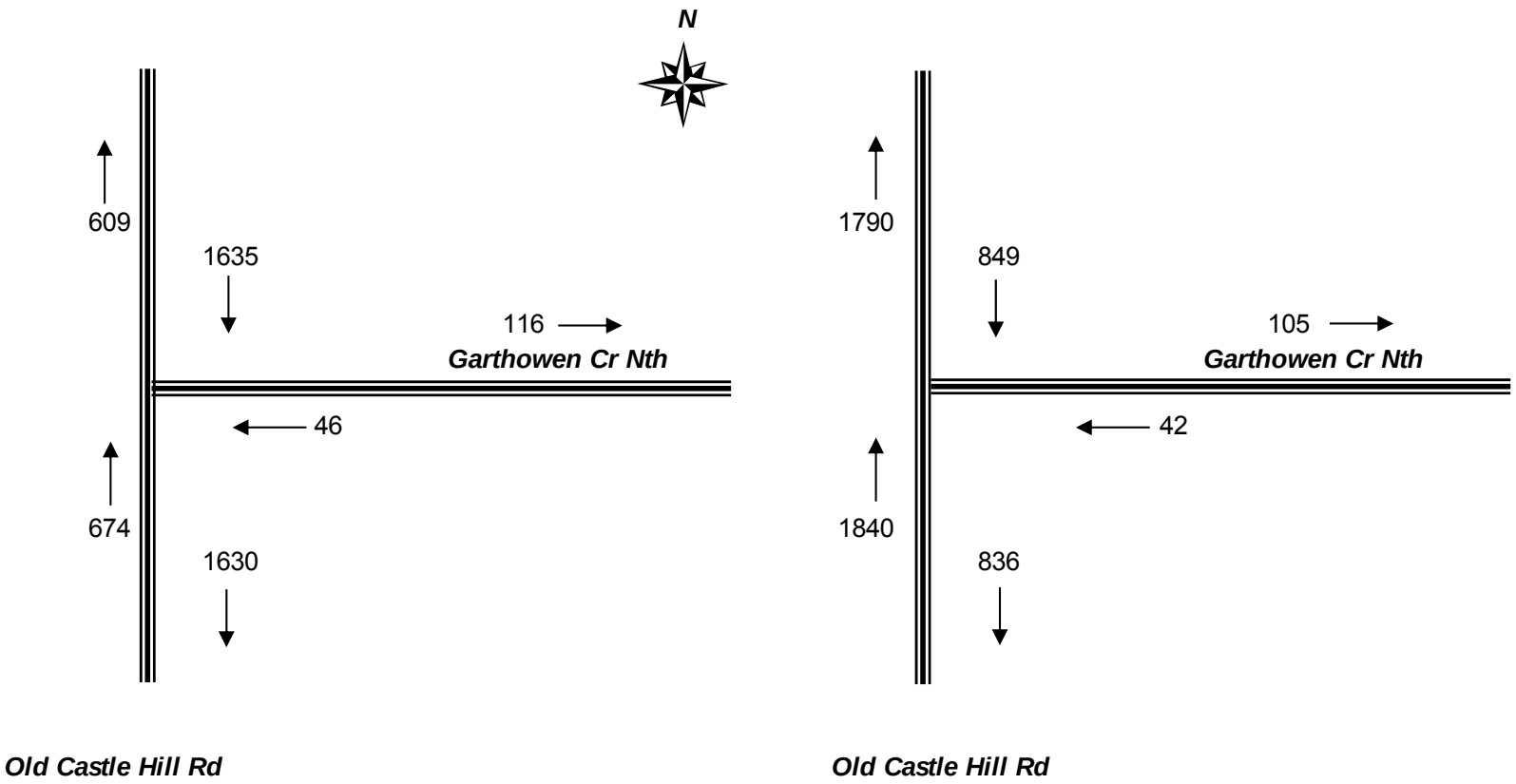


R.O.A.R DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : John Coady Consulting
Job No/Name : 5986 CASTLE HILL Old Castle Hill Rd
Day/Date : Wednesday 16th March 2016

TOTAL VOLUMES FOR PERIOD COUNTED

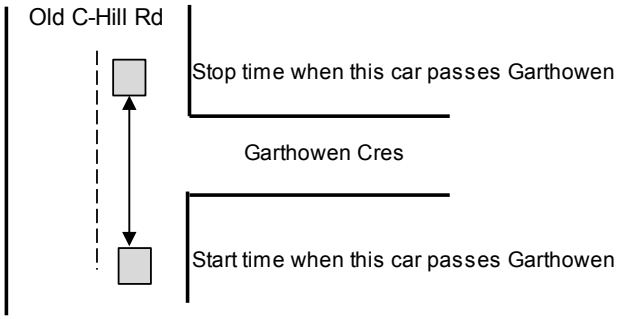
AM ***PM***



Appendix B
Results of Gap Acceptance and Queue Length Surveys

R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : John Coady Consulting
Job No/Name : 6076 CASTLE HILL Garthowen Cres
Day/Date : Thursday 19th May 2016



Record in Seconds

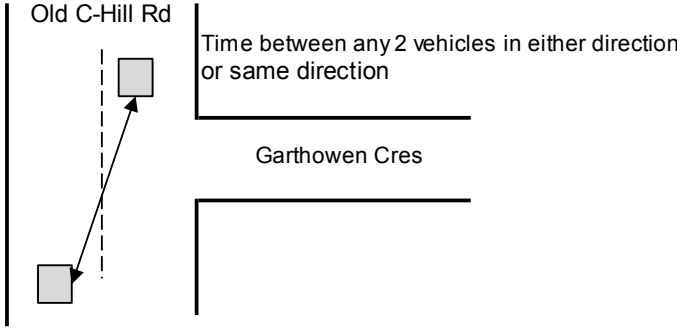
Time Per	***Gap Times 5 Seconds and Over Southbound @ Garthowen Cres South***																	
0800 - 0815	6	5	8	13	12	13	6	13	15	13	14	8	5	14	6	8	13	38
	8	12	8	8	17	21	7	12	7	5	12	10	5	11	10	20	15	11
	5	7	13	7	9	22	9											
0815 - 0830	9	20	13	5	9	7	8	7	10	6	10	5	18	19	7	10	6	6
	7	25	5	7	15	5	5	10	15	13	8	16						
0830 - 0845	9	39	7	5	12	11	9	11	11	7	12	6	10	5	8	15	16	11
	6	8	11	6	7	6	8	6	6	5	21	5	10	6	17	8	14	31
	8	7	5															

Record in Seconds

Time Per	***Gap Times 5 Seconds and Over for Southbound Vehicles @ Garthowen Cres North***																	
0845 - 0900	10	8	14	7	5	8	13	38	5	7	13	13	13	7	8	8	8	7
	11	6	11	13	20	33	8	9	9	14	27	5	6	20	5	6	5	
0900 - 0915	8	9	7	7	14	13	17	14	9	6	21	6	9	10	7	5	8	5
	23	14	17	15	11	6	25	6	11	6	6	14	6	32	5	14	7	13
	47																	
0915 - 0930	18	5	5	8	21	7	7	7	8	10	7	7	16	19	19	7	10	15
	6	8	14	7	11	8	8	8	11	21	5	5	5	6	11	6	14	5
	17	11	17	11	5	6	6	6	10	40								

R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : John Coady Consulting
Job No/Name : 6076 CASTLE HILL Garthowen Cres
Day/Date : Thursday 19th May 2016



Record in Seconds

Time Per	*Gap Times 5 Seconds between Southbound and Northbound Vehicles @ Garthowen Cres North*																	
0845 - 0900	7	14	8	8	7	14	13	12	8	7	5	6	9	10	8	9	9	5
	9	11	6	8	6	19	16	10	7	12	5	7	23	19	8	9		
0900 - 0915	6	9	5	16	14	10	6	17	11	8	6	6	5	6	10	8	5	8
	5	24	7	15	14	17	5	6	8	26	8	8	9	6	7	5	23	9
	6	9	5	8	5	33	10	5	7									
0915 - 0930	5	8	23	9	8	7	11	5	7	8	5	5	20	5	18	8	11	9
	6	7	9	12	5	20	8	6	8	6	13	19	8	5	7	14	6	16
	7	15	6	6	15	11	5	10	6	12	21	16						

R.O.A.R. DATA
Reliable, Original & Authentic Results
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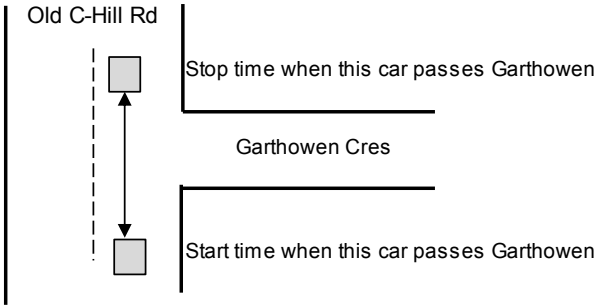
Client : John Coady Consulting
Job No/Name : 6076 CASTLE HILL Garthowen Cres
Day/Date : Thursday 19th May 2016



Record in Seconds

Time Per	*Gap Times 5 Seconds and Over Southbound @ Garthowen Cres South*																	
1630 - 1645	29	27	10	19	6	32	19	5	9	14	6	9	13	45	14	35	26	14
	8	10	29	7	29	13	11	14	6	25	7	7	13	8	9	26	22	6
	18	5	24															
1645 - 1700	12	25	13	10	7	25	8	10	23	10	18	33	13	9	27	25	22	11
	7	12	5	20	1.03	14	6	6	8	18	10	16	21	5	24	28	6	27
	19	24																
1700 - 1715	6	17	40	9	11	5	14	5	7	7	31	7	23	26	15	5	14	6
	12	21	11	18	14	10	5	34	7	11	15	16	26	19	8	24	7	15
	6	45	12	24														

Record in Seconds

Time Per	*Gap Times 5 Seconds and Over for Southbound Vehicles @ Garthowen Cres North*																	
1715 - 1730	8	40	17	7	7	6	12	22	5	6	24	58	13	14	30	34	5	7
	8	8	7	8	7	30	10	8	5	7	20	6	13	46	6	6	6	16
	19	7																
1730 - 1745	21	8	10	16	17	10	30	6	27	11	16	36	14	10	24	11	38	11
	59	10	45	11	7	27	19	7	19	26	17	10	15	41	57	13	53	16
	7	5																
1745 - 1800	20	7	6	8	46	14	16	12	11	5	12	14	7	5	33	20	9	5
	14	7	16	15	31	14	6	11	15	5	12	9	14	8	14	12	6	16
	9	33	5	23														

R.O.A.R. DATA
Reliable, Original & Authentic Results
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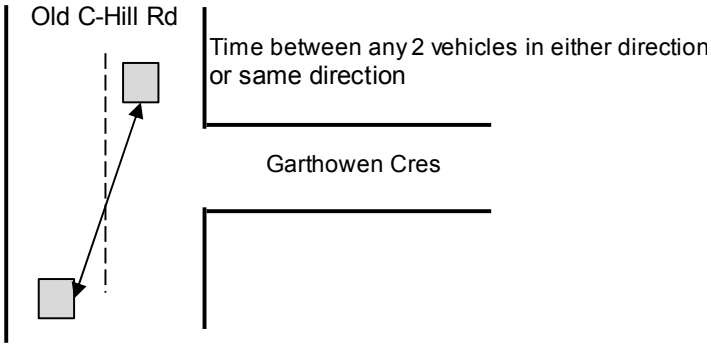
Client : John Coady Consulting
Job No/Name : 6076 CASTLE HILL Garthowen Cres
Day/Date : Thursday 19th May 2016



Record in Seconds

Time Per	*Gap Times 5 Seconds between Southbound and Northbound Vehicles @ Garthowen Cres North*																	
1715 - 1730	7	8	6	11	6	8	25	6	6	5	13	8	11	7	8	7	9	9
	6	6	8	22	7	7	11	7	7	5	9	6	7	8	8	9	7	6
1730 - 1745	19	6	7	8	9	23	7	5	6	20	10	11	9	6	13	11	12	10
	11	13	19	6	7	9	8	16	7	12	11	10	6	20	6			
1745 - 1800	7	7	8	10	6	20	31	16	6	10	8	14	6	14	15	9	10	19
	8	16	12	7	10	9	10	11	6	6	12	21	17					

R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : John Coady Consulting
Job No/Name : 6076 CASTLE HILL Garthowen Cres
Day/Date : Thursday 19th May 2016

0800 - 09.30

Hrs:Mins:Sec				Hrs:Mins:Sec	
Time lights turns GREEN	Number of vehicles in longest queue	Did queue go back to Garthowen Cres	Did queue go past & block Garthowen Cres	Time lights turns RED	Signal phase time
8:00:57	1	N		8:01:18	0:00:21
8:02:53	1	N		8:03:14	0:00:21
8:04:37	2	N		8:05:08	0:00:31
8:06:55	3	N		8:07:23	0:00:28
8:08:47	1	N		8:09:14	0:00:27
8:10:49	1	N		8:11:18	0:00:29
8:12:49	2	N		8:13:13	0:00:24
8:14:44	4	N		8:15:03	0:00:19
8:16:43	4	N		8:17:11	0:00:28
8:18:45	3	N		8:19:10	0:00:25
8:20:50	2	N		8:21:05	0:00:15
8:22:50	5	N		8:23:14	0:00:24
8:24:55	5	N		8:25:17	0:00:22
8:27:03	8		Y	8:27:20	0:00:17
8:29:08	7		Y	8:29:29	0:00:21
8:31:10	3	N		8:31:28	0:00:18
8:33:05	7		Y	8:34:37	0:01:32
8:34:50	2	N		8:35:06	0:00:16
8:36:46	9		Y	8:37:14	0:00:28
8:38:28	4	N		8:39:12	0:00:44
8:40:25	6	N		8:41:14	0:00:49
8:42:39	4	N		8:43:19	0:00:40
8:45:08	6	N		8:45:29	0:00:21
8:46:53	7		Y	8:47:23	0:00:30
8:48:50	2	N		8:49:13	0:00:23
8:50:56	6	Y		8:52:11	0:01:15
8:52:50	14		Y	8:53:10	0:00:20
8:54:41	9		Y	8:55:17	0:00:36
8:56:53	5	N		8:57:14	0:00:21
8:58:45	7		Y	8:59:17	0:00:32
9:00:45	7		Y	9:01:04	0:00:19
9:02:50	8		Y	9:03:15	0:00:25
9:04:55	6	Y		9:05:15	0:00:20
9:06:33	6	Y		9:07:16	0:00:43
9:08:46	5	N		9:09:14	0:00:28
9:10:44	11		Y	9:11:09	0:00:25
9:12:32	6	N		9:12:56	0:00:24
9:14:18	7		Y	9:15:00	0:00:42
9:16:19	4	N		9:16:42	0:00:23
9:18:26	4	N		9:18:48	0:00:22
9:20:23	4	N		9:20:40	0:00:17

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : John Coady Consulting

Job No/Name : 6076 CASTLE HILL Garthowen Cres

Day/Date : Thursday 19th May 2016

0800 - 09.30

Hrs:Mins:Sec Time lights turns GREEN	Number of vehicles in longest queue	Did queue go back to Garthowen Cres	Did queue go past & block Garthowen Cres	Hrs:Mins:Sec Time lights turns RED	Signal phase time
9:22:07	7		Y	9:22:46	0:00:39
9:24:25	6	Y		9:24:50	0:00:25
9:26:25	6	Y		9:26:45	0:00:20
9:28:09	4	N		9:28:32	0:00:23
9:30:15	5	N		9:30:40	0:00:25
					0:00:00
					0:00:00
					0:00:00
					0:00:00
					0:00:00
					0:00:00
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R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : John Coady Consulting
Job No/Name : 6076 CASTLE HILL Garthowen Cres
Day/Date : Thursday 19th May 2016

1630 - 1800

Hrs:Mins:Sec				Hrs:Mins:Sec	
Time lights turns GREEN	Number of vehicles in longest queue	Did queue go back to Garthowen Cres	Did queue go past & block Garthowen Cres	Time lights turns RED	Signal phase time
16:30:53	3	N		16:31:10	0:00:17
16:32:51	3	N		16:33:12	0:00:21
16:34:50	3	N		16:35:15	0:00:25
16:36:54	2	N		16:37:07	0:00:13
16:38:49	3	N		16:39:12	0:00:23
16:40:52	4	N		16:41:13	0:00:21
16:42:50	3	N		16:43:03	0:00:13
16:44:49	6	Y		16:45:10	0:00:21
16:46:45	7		Y	16:47:09	0:00:24
16:49:05	5	N		16:49:39	0:00:34
16:51:10	6	Y		16:51:21	0:00:11
16:53:19	7		Y	16:53:45	0:00:26
16:55:26	2	N		16:55:55	0:00:29
16:57:21	3	N		16:57:51	0:00:30
16:59:15	3	N		16:59:27	0:00:12
17:01:18	5	N		17:01:37	0:00:19
17:03:15	3	N		17:03:39	0:00:24
17:05:14	4	N		17:05:32	0:00:18
17:07:12	4	N		17:07:31	0:00:19
17:09:14	7		Y	17:09:38	0:00:24
17:11:16	6	Y		17:11:39	0:00:23
17:13:18	5	N		17:13:34	0:00:16
17:15:32	5	N		17:15:59	0:00:27
17:17:35	3	N		17:17:59	0:00:24
17:19:27	4	N		17:19:51	0:00:24
17:21:19	3	N		17:21:38	0:00:19
17:23:17	3	N		17:23:39	0:00:22
17:25:12	4	N		17:25:28	0:00:16
17:27:12	8		Y	17:27:35	0:00:23
17:29:05	10		Y	17:29:24	0:00:19
17:31:07	12		Y	17:31:32	0:00:25
17:33:12	10		Y	17:33:36	0:00:24
17:35:14	5	Y		17:35:35	0:00:21
17:37:23	3	N		17:37:39	0:00:16
17:39:20	3	N		17:39:33	0:00:13
17:41:15	3	N		17:41:40	0:00:25
17:43:10	7		Y	17:43:23	0:00:13
17:45:15	4	N		17:45:38	0:00:23
17:47:18	5	N		17:47:42	0:00:24
17:49:25	5	N		17:49:55	0:00:30
17:51:03	2	N		17:51:30	0:00:27

R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : John Coady Consulting
Job No/Name : 6076 CASTLE HILL Garthowen Cres
Day/Date : Thursday 19th May 2016

1630 - 1800

Hrs:Mins:Sec Time lights turns GREEN	Number of vehicles in longest queue	Did queue go back to Garthowen Cres	Did queue go past & block Garthowen Cres	Hrs:Mins:Sec Time lights turns RED	Signal phase time
17:53:01	8		Y	17:53:29	0:00:28
17:55:01	8		Y	17:55:29	0:00:28
17:57:03	6	Y		17:57:21	0:00:18
17:58:55	4	N		17:59:09	0:00:14
18:00:53	2	N		18:01:14	0:00:21
					0:00:00
					0:00:00
					0:00:00
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Appendix C
Results of SIDRA Analysis

Criteria for Interpreting Results of SIDRA Analysis

1. Level of Service (LOS)

LOS	Traffic Signals and Roundabouts	Give Way and Stop Signs
'A'	Good operation.	Good operation.
'B'	Good with acceptable delays and spare capacity.	Acceptable delays and spare capacity.
'C'	Satisfactory.	Satisfactory but accident study required.
'D'	Operating near capacity.	Near capacity and accident study required.
'E'	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode.	At capacity and requires other control mode.
'F'	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode.

2. Average Vehicle Delay (AVD)

The AVD provides a measure of the operational performance of an intersection as indicated on the table below which relates AVD to LOS. The AVD=s listed in the table should be taken as a guide only as longer delays could be tolerated in some locations (ie inner city conditions) and on some roads (ie minor side street intersecting with a major arterial route).

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 14	Good operation.	Good operation.
B	15 to 28	Good with acceptable delays and spare capacity.	Acceptable delays and spare capacity.
C	29 to 42	Satisfactory.	Satisfactory but accident study required.
D	43 to 56	Operating near capacity.	Near capacity and accident study required.
E	57 to 70	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode.	At capacity and requires other control mode.

3. Degree of Saturation (DS)

The DS is another measure of the operational performance of individual intersections.

For intersections controlled by traffic signals[3] both queue length and delay increase rapidly as DS approaches 1, and it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 queues can be anticipated.

For intersections controlled by a roundabout or GIVE WAY or STOP signs, satisfactory intersection operation is indicated by a DS of 0.8 or less.

[3] *The values of DS for intersections under traffic signal control are only valid for cycle length of 120 secs.*

MOVEMENT SUMMARY

▽ Site: 01 [Garthowen Cres Sth_EX AM]

⧓ Network: N101 [Existing AM]

6-10 &16-20 Garthowen Crescent, Castle Hill
Existing AM
Old Castle Hill Rd/Garthowen Cres South
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Old Castle Hill Rd (S)													
2	T1	316	2.0	316	2.0	0.164	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		316	2.0	316	2.0	0.164	0.0	NA	0.0	0.0	0.00	0.00	50.0
East: Garthowen Cres South (E)													
4	L2	20	0.0	20	0.0	0.057	8.2	LOS A	0.1	0.7	0.58	0.76	41.0
Approach		20	0.0	20	0.0	0.057	8.2	LOS A	0.1	0.7	0.58	0.76	41.0
North: Old Castle Hill Rd (N)													
7	L2	1	0.0	1	0.0	0.772	4.6	LOS A	4.8	34.4	0.00	0.00	48.6
8	T1	742	2.0	742	2.0	0.772	0.1	LOS A	4.8	34.4	0.00	0.00	49.2
Approach		743	2.0	743	2.0	0.772	0.1	NA	4.8	34.4	0.00	0.00	49.2
All Vehicles		1079	2.0	1079	2.0	0.772	0.3	NA	4.8	34.4	0.01	0.01	48.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 01 [Garthowen Cres Sth_FU AM]

Network: N101 [Post Development AM]

6-10 &16-20 Garthowen Crescent, Castle Hill
Post Development AM
Old Castle Hill Rd/Garthowen Cres South
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Old Castle Hill Rd (S)													
2	T1	326	2.0	326	2.0	0.170	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		326	2.0	326	2.0	0.170	0.0	NA	0.0	0.0	0.00	0.00	50.0
East: Garthowen Cres South (E)													
4	L2	46	0.0	46	0.0	0.137	8.6	LOS A	0.2	1.7	0.60	0.81	40.6
Approach		46	0.0	46	0.0	0.137	8.6	LOS A	0.2	1.7	0.60	0.81	40.6
North: Old Castle Hill Rd (N)													
7	L2	1	0.0	1	0.0	0.799	4.6	LOS A	8.2	58.7	0.00	0.00	48.5
8	T1	768	2.0	768	2.0	0.799	0.2	LOS A	8.2	58.7	0.00	0.00	49.1
Approach		769	2.0	769	2.0	0.799	0.2	NA	8.2	58.7	0.00	0.00	49.1
All Vehicles		1142	1.9	1142	1.9	0.799	0.5	NA	8.2	58.7	0.02	0.03	48.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 01 [Garthowen Cres Sth_EX PM]

Network: N101 [Existing PM]

6-10 &16-20 Garthowen Crescent, Castle Hill
Existing PM
Old Castle Hill Rd/Garthowen Cres South
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Old Castle Hill Rd (S)													
2	T1	763	2.0	763	2.0	0.396	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
Approach		763	2.0	763	2.0	0.396	0.0	NA	0.0	0.0	0.00	0.00	49.9
East: Garthowen Cres South (E)													
4	L2	36	0.0	36	0.0	0.056	5.4	LOS A	0.1	0.8	0.34	0.56	43.1
Approach		36	0.0	36	0.0	0.056	5.4	LOS A	0.1	0.8	0.34	0.56	43.1
North: Old Castle Hill Rd (N)													
7	L2	1	0.0	1	0.0	0.282	4.6	LOS A	0.6	4.3	0.00	0.00	49.1
8	T1	271	2.0	271	2.0	0.282	0.0	LOS A	0.6	4.3	0.00	0.00	49.8
Approach		272	2.0	272	2.0	0.282	0.0	NA	0.6	4.3	0.00	0.00	49.8
All Vehicles		1071	1.9	1071	1.9	0.396	0.2	NA	0.6	4.3	0.01	0.02	49.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 01 [Garthowen Cres Sth_FU PM]

Network: N101 [Post Development PM]

6-10 &16-20 Garthowen Crescent, Castle Hill
Post Development PM
Old Castle Hill Rd/Garthowen Cres South
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Old Castle Hill Rd (S)													
2	T1	816	2.0	801	2.0	0.416	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
Approach		816	2.0	801[N1]	2.0	0.416	0.0	NA	0.0	0.0	0.00	0.00	49.9
East: Garthowen Cres South (E)													
4	L2	41	0.0	41	0.0	0.064	5.4	LOS A	0.1	0.9	0.34	0.56	43.1
Approach		41	0.0	41	0.0	0.064	5.4	LOS A	0.1	0.9	0.34	0.56	43.1
North: Old Castle Hill Rd (N)													
7	L2	1	0.0	1	0.0	0.287	4.6	LOS A	1.5	10.6	0.00	0.00	49.1
8	T1	276	2.0	276	2.0	0.287	0.0	LOS A	1.5	10.6	0.00	0.00	49.8
Approach		277	2.0	277	2.0	0.287	0.0	NA	1.5	10.6	0.00	0.00	49.8
All Vehicles		1134	1.9	1118[N1]	2.0	0.416	0.2	NA	1.5	10.6	0.01	0.02	49.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

▽ Site: 02 [Garthowen Cres Nth_EX AM]

6-10 &16-20 Garthowen Crescent, Castle Hill
Existing AM
Old Castle Hill Rd/Garthowen Cres North
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Old Castle Hill Rd (S)											
2	T1	294	2.0	0.164	0.0	LOS A	0.0	0.0	0.00	0.04	49.6
3	R2	21	0.0	0.164	4.6	LOS A	0.0	0.0	0.00	0.04	48.1
Approach		315	1.9	0.164	0.3	NA	0.0	0.0	0.00	0.04	49.5
East: Garthowen Cres North (E)											
4	L2	15	0.0	0.049	8.1	LOS A	0.2	1.1	0.64	0.80	40.6
6	R2	11	0.0	0.049	12.3	LOS A	0.2	1.1	0.64	0.80	43.3
Approach		25	0.0	0.049	9.9	LOS A	0.2	1.1	0.64	0.80	42.0
North: Old Castle Hill Rd (N)											
7	L2	14	0.0	0.386	4.6	LOS A	0.0	0.0	0.00	0.01	49.4
8	T1	728	2.0	0.386	0.1	LOS A	0.0	0.0	0.00	0.01	49.8
Approach		742	2.0	0.386	0.1	NA	0.0	0.0	0.00	0.01	49.8
All Vehicles		1082	1.9	0.386	0.4	NA	0.2	1.1	0.02	0.04	49.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 02 [Garthowen Cres Nth_FU AM]

6-10 &16-20 Garthowen Crescent, Castle Hill
Post Development AM
Old Castle Hill Rd/Garthowen Cres North
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Old Castle Hill Rd (S)											
2	T1	294	2.0	0.170	0.0	LOS A	0.0	0.0	0.00	0.06	49.5
3	R2	32	0.0	0.170	4.6	LOS A	0.0	0.0	0.00	0.06	48.0
Approach		325	1.8	0.170	0.4	NA	0.0	0.0	0.00	0.06	49.3
East: Garthowen Cres North (E)											
4	L2	41	0.0	0.129	8.3	LOS A	0.4	3.0	0.66	0.84	40.4
6	R2	26	0.0	0.129	13.0	LOS A	0.4	3.0	0.66	0.84	43.2
Approach		67	0.0	0.129	10.1	LOS A	0.4	3.0	0.66	0.84	41.7
North: Old Castle Hill Rd (N)											
7	L2	19	0.0	0.389	4.6	LOS A	0.0	0.0	0.00	0.01	49.4
8	T1	728	2.0	0.389	0.1	LOS A	0.0	0.0	0.00	0.01	49.8
Approach		747	1.9	0.389	0.2	NA	0.0	0.0	0.00	0.01	49.8
All Vehicles		1140	1.8	0.389	0.8	NA	0.4	3.0	0.04	0.07	49.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 02 [Garthowen Cres Nth_EX PM]

6-10 &16-20 Garthowen Crescent, Castle Hill
Existing PM
Old Castle Hill Rd/Garthowen Cres North
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Old Castle Hill Rd (S)											
2	T1	721	2.0	0.396	0.0	LOS A	0.0	0.0	0.00	0.03	49.7
3	R2	40	0.0	0.396	4.6	LOS A	0.0	0.0	0.00	0.03	48.1
Approach		761	1.9	0.396	0.3	NA	0.0	0.0	0.00	0.03	49.6
East: Garthowen Cres North (E)											
4	L2	6	0.0	0.047	5.4	LOS A	0.1	1.0	0.55	0.73	40.3
6	R2	16	0.0	0.047	12.1	LOS A	0.1	1.0	0.55	0.73	43.1
Approach		22	0.0	0.047	10.2	LOS A	0.1	1.0	0.55	0.73	42.5
North: Old Castle Hill Rd (N)											
7	L2	9	0.0	0.143	4.6	LOS A	0.0	0.0	0.00	0.02	49.4
8	T1	265	2.0	0.143	0.0	LOS A	0.0	0.0	0.00	0.02	49.8
Approach		275	1.9	0.143	0.2	NA	0.0	0.0	0.00	0.02	49.8
All Vehicles		1058	1.9	0.396	0.4	NA	0.1	1.0	0.01	0.04	49.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 02 [Garthowen Cres Nth_FU PM]

6-10 &16-20 Garthowen Crescent, Castle Hill
Post Development PM
Old Castle Hill Rd/Garthowen Cres North
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Old Castle Hill Rd (S)											
2	T1	721	2.0	0.424	0.0	LOS A	0.0	0.0	0.00	0.06	49.3
3	R2	93	0.0	0.424	4.6	LOS A	0.0	0.0	0.00	0.06	47.8
Approach		814	1.8	0.424	0.5	NA	0.0	0.0	0.00	0.06	49.2
East: Garthowen Cres North (E)											
4	L2	12	0.0	0.071	5.4	LOS A	0.2	1.5	0.54	0.72	40.1
6	R2	21	0.0	0.071	13.4	LOS A	0.2	1.5	0.54	0.72	42.9
Approach		33	0.0	0.071	10.5	LOS A	0.2	1.5	0.54	0.72	42.2
North: Old Castle Hill Rd (N)											
7	L2	25	0.0	0.151	4.6	LOS A	0.0	0.0	0.00	0.05	49.2
8	T1	265	2.0	0.151	0.0	LOS A	0.0	0.0	0.00	0.05	49.5
Approach		291	1.8	0.151	0.4	NA	0.0	0.0	0.00	0.05	49.5
All Vehicles		1137	1.7	0.424	0.8	NA	0.2	1.5	0.02	0.08	48.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 00 [Pennant St/Old Castle Hill Rd_EX AM]

Network: N101 [Existing AM]

6-10 &16-20 Garthowen Crescent, Castle Hill
Existing AM
Old Castle Hill Rd Traffic Signal
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: McMullen Ave (S)													
1	L2	184	2.0	184	2.0	0.192	21.5	LOS B	5.6	39.8	0.56	0.72	43.4
2	T1	1111	5.0	1111	5.0	0.978	69.6	LOS E	40.2	293.1	0.90	1.12	28.1
3	R2	105	2.0	105	2.0	0.255	26.9	LOS B	3.7	26.3	0.72	0.73	32.1
Approach		1400	4.4	1400	4.4	0.978	60.0	LOS E	40.2	293.1	0.85	1.04	29.7
East: Old Castle Hill Rd (E)													
4	L2	339	2.0	339	2.0	0.640	18.0	LOS B	9.2	65.3	0.67	0.68	39.5
5	T1	220	2.0	220	2.0	0.640	14.3	LOS A	9.2	65.3	0.67	0.68	40.3
6	R2	224	2.0	224	2.0	0.812	55.6	LOS D	9.2	65.3	0.93	0.86	22.3
Approach		783	2.0	783	2.0	0.812	27.7	LOS B	9.2	65.3	0.74	0.73	32.5
North: Pennant St (N)													
7	L2	64	2.0	64	2.0	0.051	6.9	LOS A	0.5	3.5	0.20	0.60	49.1
8	T1	429	5.0	429	5.0	0.310	26.9	LOS B	7.5	54.8	0.64	0.54	41.7
9	R2	13	2.0	13	2.0	0.064	30.7	LOS C	0.4	2.9	0.86	0.68	39.3
Approach		506	4.5	506	4.5	0.310	24.5	LOS B	7.5	54.8	0.59	0.55	42.1
West: Old Castle Hill Rd (W)													
10	L2	37	2.0	37	2.0	0.425	53.8	LOS D	7.3	52.1	0.94	0.77	32.6
11	T1	101	2.0	101	2.0	0.425	48.3	LOS D	7.3	52.1	0.94	0.77	23.2
12	R2	195	2.0	195	2.0	0.304	52.7	LOS D	5.0	35.9	0.91	0.77	31.9
Approach		333	2.0	333	2.0	0.425	51.5	LOS D	7.3	52.1	0.92	0.77	30.0
All Vehicles		3022	3.5	3022	3.5	0.978	44.8	LOS D	40.2	293.1	0.79	0.85	31.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	50.5	LOS E	0.2	0.2	0.92	0.92
P2	East Full Crossing	53	28.8	LOS C	0.1	0.1	0.69	0.69
P3	North Full Crossing	53	50.5	LOS E	0.2	0.2	0.92	0.92
P4	West Full Crossing	53	32.3	LOS D	0.1	0.1	0.73	0.73
All Pedestrians		211	40.5	LOS E			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 00 [Pennant St/Old Castle Hill Rd_FU AM]

Network: N101 [Post Development AM]

6-10 &16-20 Garthowen Crescent, Castle Hill
Post Development AM
Old Castle Hill Rd Traffic Signal
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: McMullen Ave (S)													
1	L2	184	2.0	184	2.0	0.192	21.5	LOS B	5.6	39.8	0.56	0.72	43.4
2	T1	1111	5.0	1111	5.0	0.981	71.1	LOS F	40.4	294.7	0.90	1.13	27.8
3	R2	109	2.0	109	2.0	0.265	27.0	LOS B	3.9	27.5	0.72	0.73	32.1
Approach		1404	4.4	1404	4.4	0.981	61.1	LOS E	40.4	294.7	0.84	1.05	29.4
East: Old Castle Hill Rd (E)													
4	L2	360	2.0	360	2.0	0.687	18.2	LOS B	9.2	65.3	0.69	0.69	39.4
5	T1	236	2.0	236	2.0	0.687	14.5	LOS B	9.2	65.3	0.69	0.69	40.1
6	R2	240	2.0	240	2.0	0.921	69.5	LOS E	9.2	65.3	0.94	0.98	19.3
Approach		836	2.0	836	2.0	0.921	31.9	LOS C	9.2	65.3	0.76	0.77	30.5
North: Pennant St (N)													
7	L2	66	2.0	66	2.0	0.053	6.9	LOS A	0.5	3.6	0.20	0.60	49.1
8	T1	429	5.0	429	5.0	0.310	26.9	LOS B	7.5	54.8	0.64	0.54	41.7
9	R2	13	2.0	13	2.0	0.064	30.7	LOS C	0.4	2.9	0.86	0.68	39.3
Approach		508	4.5	508	4.5	0.310	24.4	LOS B	7.5	54.8	0.59	0.55	42.1
West: Old Castle Hill Rd (W)													
10	L2	37	2.0	37	2.0	0.436	53.9	LOS D	7.6	53.8	0.94	0.77	32.6
11	T1	105	2.0	105	2.0	0.436	48.4	LOS D	7.6	53.8	0.94	0.77	23.1
12	R2	195	2.0	195	2.0	0.304	52.7	LOS D	5.0	35.9	0.91	0.77	31.9
Approach		337	2.0	337	2.0	0.436	51.5	LOS D	7.6	53.8	0.93	0.77	29.9
All Vehicles		3085	3.5	3085	3.5	0.981	46.1	LOS D	40.4	294.7	0.79	0.86	31.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	50.5	LOS E	0.2	0.2	0.92	0.92
P2	East Full Crossing	53	28.8	LOS C	0.1	0.1	0.69	0.69
P3	North Full Crossing	53	50.5	LOS E	0.2	0.2	0.92	0.92
P4	West Full Crossing	53	32.3	LOS D	0.1	0.1	0.73	0.73
All Pedestrians		211	40.5	LOS E			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 00 [Pennant St/Old Castle Hill Rd_EX PM] — **Network: N101 [Existing PM]**

6-10 &16-20 Garthowen Crescent, Castle Hill
Existing PM
Old Castle Hill Rd Traffic Signal
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: McMullen Ave (S)													
1	L2	104	2.0	104	2.0	0.096	16.7	LOS B	2.6	18.3	0.46	0.68	46.0
2	T1	721	5.0	721	5.0	0.761	38.0	LOS C	19.6	142.9	0.83	0.75	37.0
3	R2	219	2.0	219	2.0	0.982	81.1	LOS F	13.6	96.6	1.00	1.13	16.6
Approach		1044	4.1	1044	4.1	0.982	44.9	LOS D	19.6	142.9	0.83	0.82	32.9
East: Old Castle Hill Rd (E)													
4	L2	176	2.0	176	2.0	0.731	33.8	LOS C	9.2	65.3	0.93	0.92	29.9
5	T1	54	2.0	54	2.0	0.731	30.2	LOS C	9.2	65.3	0.93	0.92	30.4
6	R2	69	2.0	69	2.0	0.217	49.8	LOS D	3.5	25.1	0.90	0.75	23.8
Approach		299	2.0	299	2.0	0.731	36.9	LOS C	9.2	65.3	0.92	0.88	28.3
North: Pennant St (N)													
7	L2	168	2.0	168	2.0	0.177	13.9	LOS A	3.5	24.7	0.52	0.69	41.7
8	T1	875	5.0	875	5.0	0.797	40.7	LOS C	25.1	183.0	0.90	0.83	36.0
9	R2	1	2.0	1	2.0	0.004	29.5	LOS C	0.0	0.3	0.79	0.59	39.8
Approach		1044	4.5	1044	4.5	0.797	36.4	LOS C	25.1	183.0	0.84	0.80	36.5
West: Old Castle Hill Rd (W)													
10	L2	68	2.0	68	2.0	0.951	80.5	LOS F	31.8	226.5	1.00	1.17	26.5
11	T1	356	2.0	356	2.0	0.951	74.9	LOS F	31.8	226.5	1.00	1.17	17.5
12	R2	613	2.0	613	2.0	0.705	45.2	LOS D	15.4	110.0	0.91	0.83	34.2
Approach		1037	2.0	1037	2.0	0.951	57.7	LOS E	31.8	226.5	0.94	0.97	27.9
All Vehicles		3424	3.4	3424	3.4	0.982	45.5	LOS D	31.8	226.5	0.88	0.87	32.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	33.1	LOS D	0.1	0.1	0.74	0.74
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	36.9	LOS D	0.1	0.1	0.79	0.79
All Pedestrians		211	44.6	LOS E			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 00 [Pennant St/Old Castle Hill Rd_FU PM]

Network: N101 [Post Development PM]

6-10 &16-20 Garthowen Crescent, Castle Hill
Post Development PM
Old Castle Hill Rd Traffic Signal
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: McMullen Ave (S)													
1	L2	104	2.0	104	2.0	0.096	16.7	LOS B	2.6	18.3	0.46	0.68	46.0
2	T1	721	5.0	721	5.0	0.643	36.3	LOS C	17.9	130.4	0.83	0.72	37.7
3	R2	235	2.0	235	2.0	1.055	119.7	LOS F	18.6	132.5	1.00	1.22	12.3
Approach		1060	4.0	1060	4.0	1.055	52.8	LOS D	18.6	132.5	0.83	0.83	30.4
East: Old Castle Hill Rd (E)													
4	L2	182	2.0	182	2.0	0.758	36.6	LOS C	9.2	65.3	0.94	0.95	28.8
5	T1	56	2.0	56	2.0	0.758	32.9	LOS C	9.2	65.3	0.94	0.95	29.2
6	R2	72	2.0	72	2.0	0.223	49.9	LOS D	3.6	25.9	0.90	0.75	23.8
Approach		309	2.0	309	2.0	0.758	39.0	LOS C	9.2	65.3	0.93	0.90	27.5
North: Pennant St (N)													
7	L2	179	2.0	179	2.0	0.193	14.8	LOS B	3.9	27.8	0.55	0.70	40.8
8	T1	875	5.0	875	5.0	0.800	40.8	LOS C	25.2	184.3	0.90	0.83	36.0
9	R2	1	2.0	1	2.0	0.004	29.8	LOS C	0.0	0.3	0.80	0.59	39.7
Approach		1055	4.5	1055	4.5	0.800	36.4	LOS C	25.2	184.3	0.84	0.81	36.4
West: Old Castle Hill Rd (W)													
10	L2	68	2.0	68	2.0	1.008	107.4	LOS F	39.5	281.3	1.00	1.33	22.2
11	T1	382	2.0	382	2.0	1.008	101.8	LOS F	39.5	281.3	1.00	1.33	14.0
12	R2	613	2.0	613	2.0	0.705	45.2	LOS D	15.4	110.0	0.91	0.83	34.2
Approach		1063	2.0	1063	2.0	1.008	69.5	LOS E	39.5	281.3	0.95	1.04	25.1
All Vehicles		3487	3.4	3487	3.4	1.055	51.7	LOS D	39.5	281.3	0.88	0.89	30.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	33.1	LOS D	0.1	0.1	0.74	0.74
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	36.9	LOS D	0.1	0.1	0.79	0.79
All Pedestrians		211	44.6	LOS E			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Statement of Heritage Impact

6-10 & 16-20 Garthowen Crescent Castle Hill

for

HCM Building Pty Ltd

"Garthowen"

Prepared by:

Archnex Designs

Wentech Pty Ltd (ABN 310 735 41803) trading as Archnex Designs.

June 2016

Phone: 9716 0541/0425 228176 *14 Winchcombe Ave, Haberfield N S W 2045* *Fax: 9716 6083*

6-10 & 16-20 Garthowen Crescent Castle Hill

(Proposed Residential Development)

Statement of Heritage Impact
Table of Contents

Statement:

Appendix: **Documents**

Archnex Designs

Nominated Architect: Greg Patch (Reg. No. 4820)
Wentech Pty Ltd (ABN 310 735 41803) trading as Archnex Designs.
Architects, Heritage Building Consultants, Interior Designers

STATEMENT OF HERITAGE IMPACT [SoHI]:

Date:	**19 April 2016**
Premises:	**6-10 & 16-20 Garthowen Crescent Castle Hill**
Property Description:	**Lots 23, 24, 25, 28, 29, 30 DP 222257**
Prepared By:	Greg Patch B Sc Arch, B ARCH (Hons), M Herit Cons (Hons), AIA 14 Winchcombe Ave, Haberfield NSW 2045
For:	**HCM Building Pty Ltd**

A. PURPOSE OF STATEMENT

This statement has been prepared to assess potential heritage impacts of a proposed new residential development in relation to a heritage item adjoining.

B. GROUNDS OF STATEMENT

14 Garthowen Crescent ("Garthowen") is listed as a heritage item. This has been established through a search Schedule 5 of The Hills LEP 2012.

C. LIMITS OF STATEMENT

This statement is based on the inventory sheet for Item 51, and an inspection of the site in April 2016.

D. LOCATION

1. Location of subject properties with "Garthowen" highlighted yellow (Source: SIX Maps © NSW Lands 2016) .

E. CONTEXT

E1. DOCUMENTARY

Land Titles

The land is part of a 60 acre grant made to James Duff on 13th January1818.

Part of the grant (44 acres 3 roods 11 perches) was converted to real property under Primary Application 7192 by Robert William Hardie of Sydney, gentleman in 1888, and Certificate of Title Volume 887 Folio 230 [CT887-230]. Hardie sold the property to George Sargent of Sydney, confectioner, in November 1906. Sargent sold the property to John Strang of Penrith, grazier, in December 1920.

John Strang subdivided the property under DP 10761 (endorsed 14 June 1921), and proceeded to sell off land parcels during the course of the early 1920s, including land resumed for the passage of the Rogans Hill railway. CT 3727-140 was issued to him in May 1925, and the endorsements show that he continued to sell off lots into the mid-1930s. CT 5272-44 was issued to him in 1941, and shows that by that time the remnant property was 14 acres, 31 perches or thereabouts. It appears Strang died in early 1942 as the property was transmitted to Hilda Lyle Woodriff of Palmwoods, Queensland, Kathleen Grace Lowe of Penrith, married woman, and Margaret Georgina Taylor of Avalon, widow, in May 1942. It was transferred in 1950 to the same parties, with Mary Strang of Sydney, spinster, added. Part of the property was sold by them to Walter Robilliard Thomas of North Sydney, grazier, in May 1952 and the title cancelled and CT 6662-65 issued to them for the residue (11acres 3 roods and 31 perches). In August 1956, CT 6662-65 was cancelled and CT 7164-179 issued to them for the residue after a transfer of part to Montie [sp?] William Atkin Cullen. By July 1962, James Douglas Hawkins and Gordon Geoffrey Hawkins are the registered proprietors, thereby ending the Strang association with the property. CT 7164-179 was cancelled, CTs 8108-61 & 62 issued to them, subsequently cancelled and CT 9896-130 issued to the Hawkins in December 1964.

DP 222257 was surveyed and endorsed in April 1964. It subdivided the remnant portion of the land into 33 lots, with the land associated with “Garthowen” being Lots 26 & 27.

The property was transferred to Denis Richmond Durham of Castle Hill, founder, in April 1965.

Lots 26 & 27 were re-subdivided under DP 533390 in January 1969.

The property being transferred to John Philip Parkinson of Castle Hill, medical practitioner and Lyn Ann Parkinson, his wife, in May 1979.

The title was converted to Computer Folio in July 1988 as Computer Folio 2/533390. There have been 3 transfers since (1995, 1998 and 2014), and one commercial lease (2015) since.

Historical Aerial Photograph

2. 1943 “From the Skies” series aerial photograph. “Garthowen” (Source: SIX Maps © NSW Lands 2016)

Inventory Sheet

The inventory sheet for Item 51 describes the item as:

> *Large single storey timber house with steep gable roof, "M" formation with jerkin heads, pointed bell-shaped turret. Extensive verandahs, timber posts with cast iron brackets. Interior cornices and ceiling has skilled detailing. Garden is sufficient for its setting. Brick entrance posts, iron gates and fence.*

The historical background is given as:

> *Land was originally granted to James Duff in 1818. The house is believed to have been built by Robert Hardie and was originally known as Craigowan. It was sold to the Sargeants of Sargeants' Pie fame in 1906 who renamed it Garthowen and were responsible for erecting the brick posts with iron gates which used to stand on the Old Northern Road boundary opposite Brisbane Road but are now relocated in Garthowen Crescent. In 1921 the property was auctioned, bought by John Strang and subdivided into 62 lots. During WWII it was used to house displaced children.*

Its significance is stated as:

> *Fine late Victorian residence, originally built on generous site, commanding a premier position near the township. One of the few major houses to survive the post WWI subdivision successfully. Demonstrates the role of Castle Hill as an area of country estates.*

A photograph is provided:

3. Photograph taken 16 March 1994- Extract from the Baulkham Hills Heritage Study 1993-1994

E2. PHYSICAL

The properties and area were inspected in April 2016, when the following photographs were taken:

4. 20 Garthowen Crescent from opposite.

5. North-east portion Garthowen Crescent looking north-west.

6. 18 Garthowen Crescent.

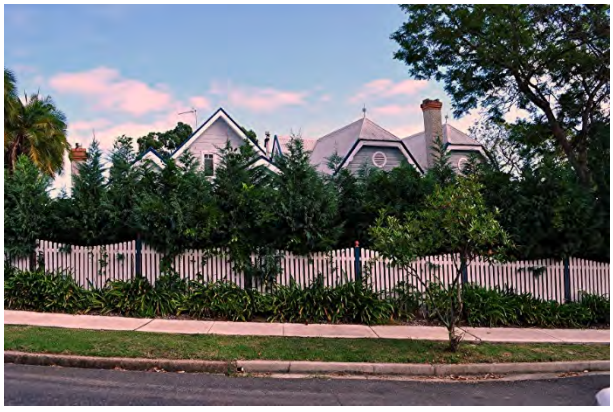
7. 16 Garthowen Crescent

8. Part 16 Garthowen Crescent/ gates to "Garthowen".

9. Gates to "Garthowen".

10. "Garthowen".

11. 9-13 Garthowen Crescent under construction.



12. "Garthowen" from the east.

13. "Garthowen" from the south.

"Garthowen" is currently in use as the "Young Academics Early Learning Centre".

14. "Garthowen" – west wall.

15. Parking area to the west of "Garthowen"

16. 12 Garthowen Crescent.

17. 10 Garthowen Crescent.

17. 8 Garthowen Crescent.

18. 6 Garthowen Crescent.

19. 10 & part 12 Garthowen Crescent.

20. 9-11 Garthowen Crescent.

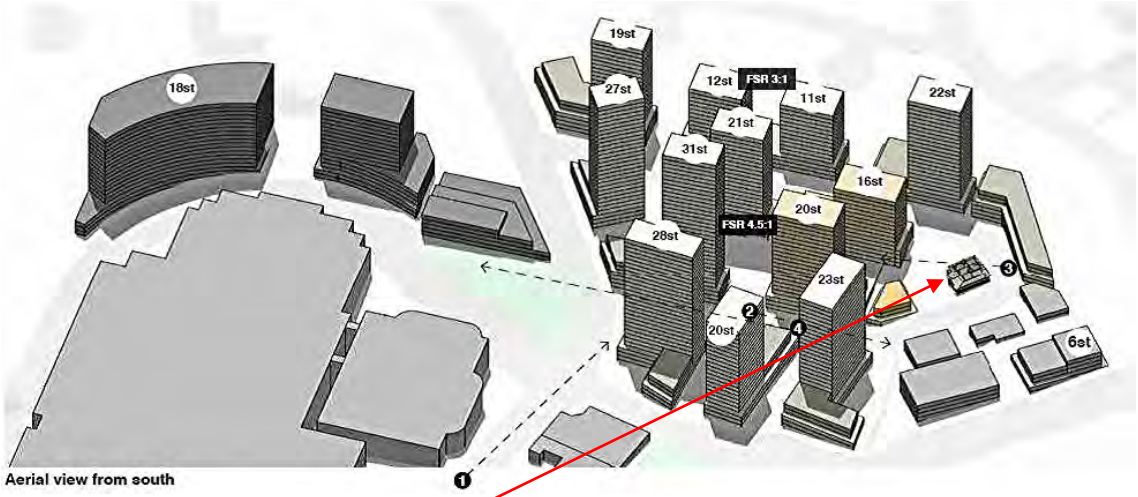
F. PROPOSED DEVELOPMENT

I have read an Urban Design Report prepared by Architectus dated 04 April 2016.

It proposes a development on the subject properties which is summarised at Part 3.3 (p29) of the report:

- *Scenario C (4.5:1 FSR) is considered appropriate for the site as the heights and densities are:*
- *Consistent with Castle Hill Structure Plan (7-20 storeys).*
- *Similar height to Council's Pennant Street Target Site with significantly less visually bulky towers.*
- *Similar to that envisaged under the Draft Hills Strategy for neighbouring sites (compare proposal in Scenario C with buildings on adjacent sites in Scenario A).*
- *Similar to other planning proposals (with Council for review) within the area.*

Part of the analysis in arriving at this conclusion, includes aerial modelling and block modelled views from "Garthowen"



21. As captioned. Location of "Garthowen".

Views from Garthowen Crescent are also included:

22. As captioned. "Garthowen" modelled, proposed towers.

Aerial Photomontage views are also provided:

23. Aerial view from the east. "Garthowen".

24. Aerial view from the north-east. "Garthowen".

G. IMPACT OF THE PROPOSED DEVELOPMENT

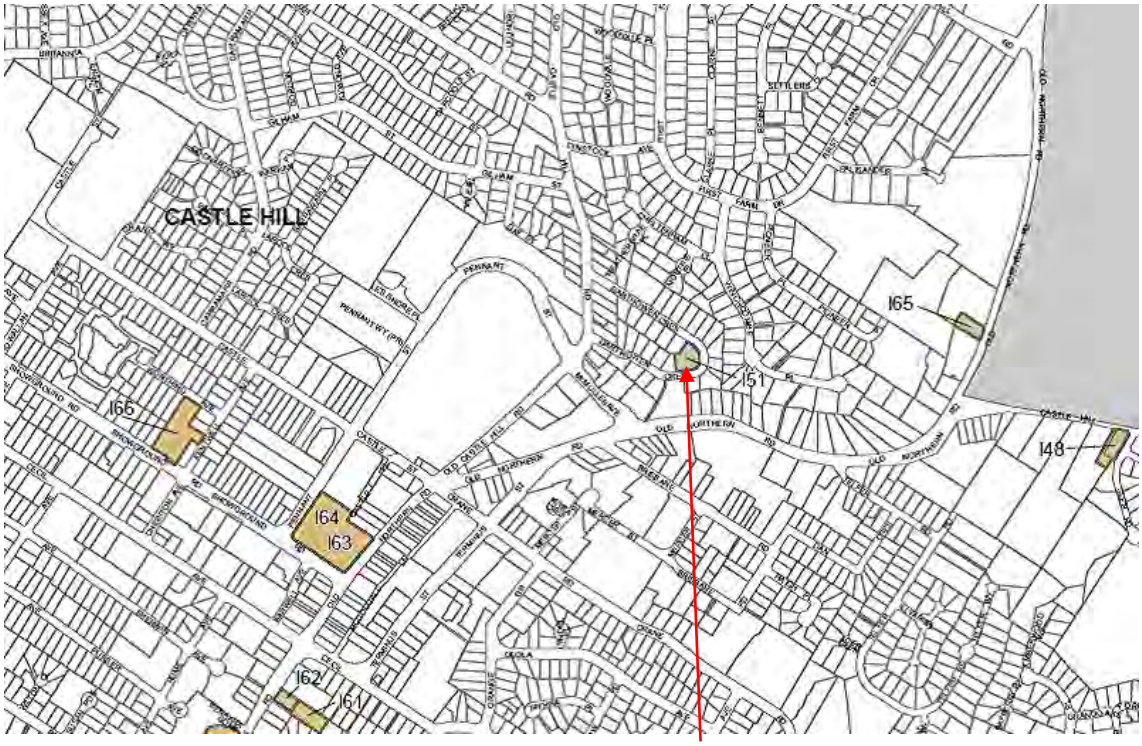
"Garthowen" is listed under The Hills LEP 2012 at:

Schedule 5 Environmental heritage

Part 1 Heritage items

Suburb	*Item name*	*Address*	*Property description*	*Significance*	*Item no*
Castle Hill	*"Garthowen"*	*14 Garthowen Crescent*	*Lot 2, DP 533390*	*Local*	*I51*

It is mapped as:



25. Extract: The Hills LEP Heritage Map _HER_024. Location of "Garthowen".

The relevant provisions of The Hills LEP are:

5.10 Heritage conservation

Note. *Heritage items (if any) are listed and described in Schedule 5. Heritage conservation areas (if any) are shown on the Heritage Map as well as being described in Schedule 5.*

Clause	**Comment**
(1) ***Objectives***	
The objectives of this clause are as follows: *(a) to conserve the environmental heritage of The Hills,* *(b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views,* *(c) to conserve archaeological sites,* *(d) to conserve Aboriginal objects and Aboriginal places of heritage significance.*	
(2) ***Requirement for consent***	
Development consent is required for any of the following: *(a) demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance):* *(i) a heritage item,* *(ii) an Aboriginal object,* *(iii) a building, work, relic or tree within a heritage conservation area,* *(b) altering a heritage item that is a building by making structural changes to its interior or by making changes*	

to anything inside the item that is specified in Schedule 5 in relation to the item, *(c) disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed,* *(d) disturbing or excavating an Aboriginal place of heritage significance,* *(e) erecting a building on land:* *(i) on which a heritage item is located or that is within a heritage conservation area, or* *(ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance,* *(f) subdividing land:* *(i) on which a heritage item is located or that is within a heritage conservation area, or* *(ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance.*	
(3) ***When consent not required***	
However, development consent under this clause is not required if: *(a) the applicant has notified the consent authority of the proposed development and the consent authority has advised the applicant in writing before any work is carried out that it is satisfied that the proposed development:* *(i) is of a minor nature or is for the maintenance of the heritage item, Aboriginal object, Aboriginal place of heritage significance or archaeological site or a building, work, relic, tree or place within the heritage conservation area, and* *(ii) would not adversely affect the heritage significance of the heritage item, Aboriginal object, Aboriginal place, archaeological site or heritage conservation area, or* *(b) the development is in a cemetery or burial ground and the proposed development:* *(i) is the creation of a new grave or monument, or excavation or disturbance of land for the purpose of conserving or repairing monuments or grave markers, and* *(ii) would not cause disturbance to human remains, relics, Aboriginal objects in the form of grave goods, or to an Aboriginal place of heritage significance, or*	Consent is required.

(c) the development is limited to the removal of a tree or other vegetation that the Council is satisfied is a risk to human life or property, or *(d) the development is exempt development.*	
(4) ***Effect of proposed development on heritage significance***	
The consent authority must, before granting consent under this clause in respect of a heritage item or heritage conservation area, consider the effect of the proposed development on the heritage significance of the item or area concerned. This subclause applies regardless of whether a heritage management document is prepared under subclause (5) or a heritage conservation management plan is submitted under subclause (6).	The significance of "Garthowen" is stated as: *Fine late Victorian residence, originally built on generous site, commanding a premier position near the township. One of the few major houses to survive the post WWI subdivision successfully. Demonstrates the role of Castle Hill as an area of country estates.* Discussion in relation to the DCP Controls below.
(5) ***Heritage assessment***	
The consent authority may, before granting consent to any development: *(a) on land on which a heritage item is located, or* *(b) on land that is within a heritage conservation area, or* *(c) on land that is within the vicinity of land referred to in paragraph (a) or (b),* *require a heritage management document to be prepared that assesses the extent to which the carrying out of the proposed development would affect the heritage significance of the heritage item or heritage conservation area concerned.*	The proposed development is to land that is within the vicinity of a heritage item This document has been prepared having general regard to the guideline document "Statements of Heritage Impact" as published by the Heritage Branch of the NSW Office of Environment & Heritage.
(6) ***Heritage conservation management plans***	
The consent authority may require, after considering the heritage significance of a heritage item and the extent of change proposed to it, the submission of a heritage conservation management plan before granting consent under this clause.	
(7) ***Archaeological sites***	
The consent authority must, before granting consent under this clause to the carrying out of development on an archaeological site (other than land listed on the State Heritage Register or to which an interim heritage order under the Heritage Act 1977 applies): *(a) notify the Heritage Council of its intention to grant consent, and* *(b) take into consideration any response received from the Heritage Council within 28 days after the notice is sent.*	The subject site is not identified as being of archaeological significance.
(8) ***Aboriginal places of heritage significance***	
The consent authority must, before granting consent under this clause to the carrying out of development in an Aboriginal place of heritage significance:	The subject site is not identified as being of Aboriginal significance.

(a) consider the effect of the proposed development on the heritage significance of the place and any Aboriginal object known or reasonably likely to be located at the place by means of an adequate investigation and assessment (which may involve consideration of a heritage impact statement), and *(b) notify the local Aboriginal communities, in writing or in such other manner as may be appropriate, about the application and take into consideration any response received within 28 days after the notice is sent.*	
(9) ***Demolition of nominated State heritage items***	
The consent authority must, before granting consent under this clause for the demolition of a nominated State heritage item: *(a) notify the Heritage Council about the application, and* *(b) take into consideration any response received from the Heritage Council within 28 days after the notice is sent.*	The subject site is not identified as being of State significance.
(10) ***Conservation incentives***	
The consent authority may grant consent to development for any purpose of a building that is a heritage item or of the land on which such a building is erected, or for any purpose on an Aboriginal place of heritage significance, even though development for that purpose would otherwise not be allowed by this Plan, if the consent authority is satisfied that: *(a) the conservation of the heritage item or Aboriginal place of heritage significance is facilitated by the granting of consent, and* *(b) the proposed development is in accordance with a heritage management document that has been approved by the consent authority, and* *(c) the consent to the proposed development would require that all necessary conservation work identified in the heritage management document is carried out, and* *(d) the proposed development would not adversely affect the heritage significance of the heritage item, including its setting, or the heritage significance of the Aboriginal place of heritage significance, and* *(e) the proposed development would not have any significant adverse effect on the amenity of the surrounding area.*	Conservation incentives are not sought.

The Hills Development Control Plan

3.5. DEVELOPMENT IN THE VICINITY OF A HERITAGE SITE

For the purposes of this section, 'vicinity' is defined as land adjoining or located within the visual catchment of a heritage site. The visual catchment will vary depending upon the location of the heritage site and the bulk and scale of the proposed development. For example the visual catchment of a heritage site located on a hilltop would cover a larger area than that of an item in a secluded location.

Comment: the proposed development is to land adjoining the heritage item.

OBJECTIVE

(i) To ensure that the development of land in the vicinity of a heritage site is undertaken in a manner that complements the heritage significance of the site.

Comment: the proposed development is to land adjoining the heritage item.

DEVELOPMENT CONTROLS

(a) Development on land within the vicinity of a heritage site is not to detract from the identified significance of the place, its setting, nor obstruct important views to and from the site.

(b) New structures proposed on land adjoining a heritage building should be of similar scale and proportions to the heritage building.

(c) Where development is proposed within the vicinity of a heritage site, the following matters must be taken into consideration:-

- *the character, siting, bulk, height and external appearance of the development;*
- *visual relationship between the proposed development and the heritage site;*
- *potential for overshadowing of the heritage site;*
- *colours and textures of materials proposed to be used in the development;*
- *landscaping and fencing of the proposed development;*
- *location of car parking spaces and access ways into the development;*
- *impact of any proposed advertising signs or structures;*
- *maintenance of the existing streetscape, where the particular streetscape has particular significance to the heritage site;*
- *impact the proposed use would have on the amenity of the heritage site; and*
- *effect the construction phase will have on the well being of a heritage building.*

Comment: the proposed development reflects the strategic planning intentions of the NSW Government "Plan for Growing Sydney" and the site is within an area identified for increased density ("High Density Residential") in the Strategic Centre of Castle Hill. This, according to the Architectus document, entails development of "…an expected height of 7-20 storeys" (p10).

The above Controls appear premissed on the assumption of the context of a heritage item being of a similar land use and scale to the heritage item, which is patently not the case in areas of increased FSR, height and differing building types, as are found opposite on Garthowen Crescent.

SUBMISSION REQUIREMENTS

- *A Heritage Impact Statement which includes consideration of all those matters listed in (c) above.*

Comment: this document has been prepared having general regard to the guidelines of the Office of Environment and Heritage

H. CONCLUSION

"Garthowen" is presumed to have been built by Robert William Hardie, most probably in the late 1880s/ early 1890s. It was seemingly designed and sited to enjoy a prospect of the 44 acres of land to the north-west of it and enjoyed an elevated position in relation to this prospect and the views beyond to the mountains.

Successive subdivisions commenced during the Strang period of ownership (1920-52), with the current subdivision pattern to Garthowen Crescent largely a product of further subdivision by the Hawkins in 1964. The take-up of allotments following this subdivision appears to have occurred in a relatively short period of time, with the housing stock currently seen in Garthowen Crescent reflective of this. Recent higher density development the eastern end of Garthowen Crescent- some still under construction- has heralded the development of higher density housing in the vicinity.

The current use of "Garthowen" as an Early Learning Centre also indicates that the place is now utilised in a more introspective manner, and is reflective of the continuing disconnect of "Garthowen" to its intended curtilage.

The proposed development is a manifestation of growing urban density that is a product of state sponsored strategic planning.

This phenomena is seen in growing centres throughout the wider Sydney metropolitan area, and indeed worldwide.

The resultant admixture of erstwhile semi-rural “estate” houses, and high density development is reflective of increasing urban density, and the heritage impact is a further manifestation of what has been an historical sequence of change.

Prepared by

Greg Patch
Architect/Heritage Consultant

Appendix: Documents

THE HILLS Sydney's Garden Shire

Heritage Inventory Sheet

SHEET

I51

PROPERTY DESCRIPTION

STREET NO & NAME: 14 Garthowen Crescent

TOWN/SUBURB: Castle Hill

REAL PROPERTY DESCRIPTION: Lot 2 DP 533390

COMMON NAME: Garthowen

PREVIOUS NAME: Craigowan

SITE AREA: 1983.006 m²

***CATEGORY:** Building

SUB-CATEGORY: single storey residence

SUPERSEDED REFERENCE NO. 023

***YEAR OF CONSTRUCTION:** 1880s

ARCHITECT/DESIGNER:

BUILDER:

HERITAGE RELATED REPORTS UNDERTAKEN:

(Note: Reference should be made to all Development Applications lodged in relation to the property for details of all (if any) heritage related reports that have been undertaken)

DEVELOPMENT APPLICATION HISTORY

307/1995/GS Alterations and additions to existing Heritage property. Approved 24-Aug-1995

HERITAGE LISTING:

- ○ REGISTER OF THE NATIONAL ESTATE (AHC) – REGISTERED
- ○ REGISTER OF THE NATIONAL ESTATE (HC) – INTERIM
- ○ REGISTER OF THE NATIONAL TRUST (NSW)
- ○ REGISTER OF SIGNIFICANT TWENTIETH CENTURY ARCHITECTURE (RAIA)
- ○ DEPARTMENT OF PUBLIC WORKS HERITAGE AND CONSERVATION REGISTER
- ● STATE HERITAGE INVENTORY
- ○ STATE HERITAGE REGISTER (NSW HERITAGE ACT, 1977)
- ○ CONSERVATION ORDER ( )
- ○ NSW GOVT DEPT HERITAGE REGISTER (S170 HERITAGE ACT)
- ○ NP & WS HISTORIC SITES REGISTER
- ○ NP & WS ABORIGINAL SITES REGISTER (CONTACT SITES)
- ○ INSTITUTION OF ENGINEERS (NSW) HERITAGE REGISTER
- ● NORTH WEST SECTOR STUDY
- ○ REGIONAL ENVIRONMENTAL PLAN 20 HAWKESBURY/NEPEAN RIVER 1990
- ● BAULKHAM HILLS SHIRE-WIDE HERITAGE STUDY
- ● LOCAL ENVIRONMENTAL PLAN 2012 - SCHEDULE 5 – ENVIRONMENTAL HERITAGE

***HISTORICAL PERIOD:**

PERIOD	BUILT	USE
PRE 1800	○	○
1800-1825	○	○
1826-1850	○	○
1851-1875	○	○
1876-1900	●	●
1901-1925	○	●
1926-1950	○	●
1951-1975	○	●
POST 1975	○	●

***EVALUATION CRITERIA**

HISTORIC	RARE	○	REP	●	L
AESTHETIC	RARE	○	REP	○	
SOCIAL	RARE	○	REP	○	
SCIENTIFIC	RARE	○	REP	○	
OTHER	RARE	○	REP	○	

***COMMENTS:**

poor location of swimming pool disturbs the setting of the house

***HISTORY:**

Land was originally granted to James Duff in 1818. The house is believed to have been built by Robert Hardie and was originally known as Craigowan. It was sold to the Sargeants of Sargeants' Pie fame in 1906 who renamed it Garthowen and were responsible for erecting the brick posts with iron gates which used to stand on the Old Northern Road boundary opposite Brisbane Road but are now relocated in Garthowen Crescent. In 1921 the property was auctioned, bought by John Strang and subdivided into 62 lots. During WWII it was used to house displaced children.

***HISTORICAL THEMES**

SHIP: Leisure

LOCAL THEMES: Country retreat

***PHYSICAL CHARACTERISTICS**

ARCHITECTURAL STYLE: Victorian
MATERIALS – EXTERIOR: American Redwood / iron **INTERIOR:**

OTHER DETAILS OF PHYSICAL APPEARANCE

Large single storey timber house with steep gable roof, "M" formation with jerkin heads, pointed bell-shaped turret. Extensive verandahs, timber posts with cast iron brackets. Interior cornices and ceiling has skilled detailing. Garden is sufficient for its setting. Brick entrance posts, iron gates and fence.

MODIFICATIONS: Cast iron frieze now removed.

***INFORMATION SOURCES**

WRITTEN: Baulkham Hills Shire Council files, NWS 1984, HL Woodriff, Hills News 23/02/88

ORAL:
GRAPHIC:

HISTORY OF HERITAGE ASSISTANCE FUND
2001/2002 - $770 re-painting of damager interior surfaces
2002/2003 - $2000 termite control measures and re-painting of verandah
2008/2009 - $2000 repairs to box guttering and downpipes, restoration and replacement of roof materials and water sealing and painting works to the roof

***BRIEF STATEMENT OF SIGNIFICANCE**

Fine late Victorian residence, originally built on generous site, commanding a premier position near the township. One of the few major houses to survive the post WWI subdivision successfully. Demonstrates the role of Castle Hill as an area of country estates.

RELATIONSHIP TO NEAREST ARTERIAL ROAD, LOT SHAPE, SIZE AND RELATIONSHIP TO NEIGHBOURS

Locality Plan: Baulkham Hills Shire Council

PHOTOGRAPHS:
DATE TAKEN: 16 March 1994

*** Extract from Baulkham Hills Heritage Study 1993-1994**

No 7192

New South Wales.

(A.)

APPLICATION TO BRING LANDS UNDER THE PROVISIONS OF THE REAL PROPERTY ACT (26 VICTORIA NO. 9).

Ass. 2. 14. 8
Cert. 1. 0. 0
Adv. 1. 10. 0
Com. 2. 10. 0
£7 : 14 : 8

CAUTION.—Applicants are reminded that by Section 132, the penalties of perjury are attached to a false declaration concerning any matter or procedure under the Act, and that the utmost care is therefore necessary in framing (or reading over, if the form be filled up by an attorney) every particular statement herein.
It is further provided by Section 117, that any applicant procuring a Certificate through any fraud, error, omission, misrepresentation, or misdescription will, notwithstanding the issue of such Certificate, remain liable for damages to any person thereby prejudiced. And any person who fraudulently procures, assists in fraudulently procuring, or is privy to the fraudulent procurement of any Certificate of Title, is declared guilty of a misdemeanour, and liable to a penalty not exceeding £500, or imprisonment not exceeding three years; and any Certificate thereby procured is rendered void as between all parties or privies to the fraud.

FEE SIMPLE.*

* Another form can be obtained for leaseholds.

I,[a] Robert William Hardie of Sydney in the Colony of New South Wales Gentleman do solemnly and sincerely declare, that[b] I am seized for an Estate in fee simple of[c] All that piece or parcel of land containing by admeasurement 13 acres two roods and 31 perches or thereabouts situated in the Parish of Castle Hill County of Cumberland and Colony of New South Wales being Lot No 1 of Subdivision of Metcalfe's Estate also forming part of the Southernmost of two grants of 60 acres each originally granted to J. Cuff commencing at the North West corner of lot No 2 and bounded thence on the South West by a public Road bearing North 9 degrees 23 minutes West 6 chains 41 links and further bearing North 23 degrees 44 minutes West 5 chains 53 links thence on the North East by a line bearing South 64 degrees 23 minutes East 19 chains 74 links thence on the South East by a line dividing it from lot No 3 bearing South 25 degrees West 8 chains 95 links and thence on the South West by a line dividing it from lot No 2 bearing North 65 degrees West 11 chains 75 links to the point of Commencement

Also all that piece or parcel of land containing by admeasurement 32 acres 2 roods and 7 perches or thereabouts situated as aforesaid being lots No 2, 3, and 4, of Subdivision of Metcalfe's Estate also forming part of a Grant of 60 acres originally granted to James Cuff ~~and part of 60 acres originally granted to J. Rogers~~ commencing at the South West corner of lot No 1 and bounded thence on the South West by a public Road bearing South 9 degrees 22 minutes East 4 chains 45 links thence on the North West by that Road bearing South 39 degrees 1 minute West 6 chains 72 links thence again on the South West by a line bearing South 64 degrees 4 minutes East 6 chains 75 links thence on the South East by the North West side of a Public Road leading from Parramatta to Pennant Hills bearing North 68 degrees 42 minutes East 5 chains 87 links thence North 76 degrees 56 minutes East 5 chains 90 links thence South 73 degrees 11 minutes East 5 chains 11 links thence South 56 degrees 43 minutes East 3 chains 31 links thence North 79 degrees 59 minutes East 6 chains 74 links thence North 62 degrees 53 minutes East 2 chains 50 links and thence North 25 degrees 18 minutes East 2 chains 90 links thence on the North East by a line dividing it from the Northernmost of J. Cuff's 60 acres Grants bearing North 64 degrees 21 minutes West 22 chains 81 links thence again on the North West by a line dividing it from lot No 1 bearing South 25 degrees West 8 chains 52 links and thence again on the North East by a line dividing it from lot 1 aforesaid bearing North 65 degrees West 11 chains 75 links to the point of commencement

which land (including all improvements) is of the value of[d] Thirteen hundred and twelve pounds and no more, and is[e] part of[f] Sixty acres originally granted to[g] James Cuff by Crown grant, under the hand of[h] His Excellency Lachlan Macquarie Esquire Governor of the Colony, dated the thirteenth day of January 1818.

And I further declare, that I verily believe there does not exist any lease or agreement for lease of the said land for any term exceeding a tenancy for one year, or from year to year [~~except as follows~~][i]

Also, that there does not exist any mortgage, lien, writ of execution, charge or encumbrance, will or settlement, or any deed or writing, contract, or dealing (other than such lease or tenancy as aforesaid) giving any right, claim, or interest in or to the said land, or any part thereof, to any other person than myself [~~except as follows~~][j]

a Here state Christian and Surname in full with residence and occupation.
b "I am," or "C.D. of ..." (as the case may be).
c Here give description of the property in full.
If the land consists of a Crown Grant, a diagram from the Survey Office must be procured—and on payment of a special fee of 2s. 6d. accompanying the application this will be obtained through the Land Titles Department.
If the land comprise a portion only of a Grant, an accurate plan must accompany the application.
It is always desirable, and in many cases absolutely necessary, that this plan be prepared and certified by one of the Surveyors licensed under the Act.
If there be any rights of way, or other rights or easements affecting the premises, the particulars should be stated.
If the space for description be insufficient, it may be completed by annexure, which must, however, be identified as part of the declaration, by memorandum signed by the declarant and attesting Officer.
d If this valuation be inadequate or doubtful, the applicant will be subjected to the expense of an official valuation, under Section 27.
e State whether "the whole" or "part."
f Insert Allotment with reference to number and section on plan, if any, or if not, number of acres granted.
g Name of Grantee.
h Name of Governor.
i If there be any Lease, here state particulars; if none, strike out the words within brackets.
j If any exception, here state particulars; if none, strike out the words of reference within brackets.

16/5/89

A.L. 19.12.57

188

Certificate of Title issued, Vol. 887 Fol. 230 9.9.88

[Price, 6d.]

k — Insert "unoccupied," or "in the occupation of," adding names and addresses of tenants in full. State also nature of tenancy, if not under some lease before mentioned.

and I further declare, that there is no person in possession or occupation of the said lands adversely to my Estate or interest therein, and that the said land is now[k] unoccupied

l — Here insert names and residences of adjacent owners and occupiers on each side.

and that the owners and occupiers of adjacent lands are as follows[l]:—On the north part of by James Parser of the Old Castle Hill Road, Castle Hill owner and occupier on other part of the North by C. Black of the ... Road Castle Hill owner and occupier On the South by Wright of Castle Hill Road Castle Hill ——— owner and occupier ——— ~~occupier~~;

m — Insert the like particulars as to the other sides of the property.

~~on the[m]~~

n — Here insert "am unmarried," or "was married to my present wife on the day of 18 " as the fact may be.

And I further declare that[n] I was married to my present wife on the or about the year — ... ——— one thousand eight hundred and seventy

And I further declare, that the annexed Schedule, to which my signature is affixed, and which is to be taken as part of this Declaration, contains a full and correct list of all settlements, deeds, documents, or instruments, maps, plans, and papers relating to the land comprised in this application, so far as I have any means of ascertaining the same, distinguishing such as being in my possession or under my control, are herewith lodged, and indicating where or with whom, so far as known to me, any others thereof are deposited: Also, that there does not exist any fact or circumstance whatever material to the title, which is not hereby fully and fairly disclosed to the utmost extent of my knowledge, information, and belief; and that there is not, to my knowledge and belief, any action or suit pending affecting the said land, nor any person who has or claims any estate, right, title, or interest therein, or in any part thereof, otherwise than by virtue and to the extent of some lease or tenancy hereby fully disclosed [~~except as follows~~][o].

o — If any exception, state particulars; if none, strike out the words within brackets.

And I make this solemn Declaration, conscientiously believing the same to be true. ———

DATED at Sydney ——— this 14th day of December ——— 1887.

Made and subscribed by the abovenamed Robert William Hardie this 14th day of December ——— 1887, in the presence of[p] ... King J.P.

Signature of Applicant } Robt W. Hardie

p — The declaration must be attested by the Registrar General or Deputy, or by a Notary Public, or by a Justice of the Peace. If the signature be by mark, the attestation must state that it was read over to the declarant, that he appeared fully to understand the contents. This applies also to the subjoined direction, particularly if a different person be nominated to receive certificate. If to Applicant, say "myself;" if to other person, write name at full length, with address and occupation. If to two or more, state whether as joint tenants or tenants in common. If to an infant, the age should be stated, and verified by Certificate of Baptism, or by Statutory Declaration. If to a married woman the name of the husband, together with his residence and occupation should be stated.

To the Registrar General,—

I, Robert William Hardie ——— the above declarant, do hereby apply to have the land described in the above declaration brought under the provisions of the Real Property Act, and request you to issue the Certificate of Title in the name of[q] myself —

DATED at Sydney in the Colony of New South Wales ——— this fourteenth — day of December ——— 1887.

Witness to Signature —

... King J.P. (*Signature of Applicant*) Robt W. Hardie

N.B.—The annexed Schedule, and the Certificate indorsed should both be also signed.

SCHEDULE REFERRED TO.*

(TO BE SIGNED BY APPLICANT.)

For the particulars which this Schedule must comprise, see concluding part of Declaration, to which particular attention is invited, as any omission or misstatement will render applicant liable to the penalties of false Declaration.

Such of the Deeds and Documents as are in applicant's possession or control, must be deposited with the application.

Counterpart leases must be included, but these will be returned, if required.

If any deposited Deeds relate also to property not brought under the Act, they may be returned after partial cancellation; but of all these, abstracts or copies for retention should be furnished, and the desire for the return of the originals noted.

If the only object be to comply with covenant to produce, parties are reminded that by specially depositing them under the 25th Section of the Act, 22 Vic. No. 1, such covenant will be finally satisfied.

11th March 1884 Conveyance John Mitchell Treves, Frederick Alfred Adolphus Wilson and Edmund Barton of the one part and Edward Hearle Acres of the other part Registered etc 559 Book 254

12th March 1884 Conveyance John Mitchell Treves, Frederick Alfred Adolphus Wilson and Edmund Barton of the first part Edwin James Black of the 2nd part and Edward Hearle Acres of the third part Registered etc 349 Book 253

5th November 1887 Plan and Declaration of Licensed Surveyor John H Fayreed

5th December 1887 Conveyance Edward Hearle Acres to Robert William Registered etc 236 Book 376

1887 Abstract of the Title of Edward Hearle Acres

Witness

F. King J.P.

Robert W. Hardie

* SEE INDORSEMENT OVERLEAF.

N.B.—Section 104 requires that the following Certificate be signed by Applicant or his Solicitor, and renders liable any person falsely or negligently certifying, to a penalty of £50; also, to damages recoverable by parties injured.

I certify that the within application is correct for the purposes of the Real Property Act.*

Robt. W. Hardie

* If by Solicitor insert:—"And that I am the Solicitor of the within-named Applicant," and add his own address to his signature.

FEES.

PAYMENT OF THESE MUST ACCOMPANY THE APPLICATION.

1st.—Where the Applicant is the Original Grantee from the Crown.

Commissioners' Fee	£0 5 0
New Certificate	1 0 0
Sketch (unless furnished)	0 2 6
Add Assurance, ½d. in the pound on declared value	....

2nd.—Where the Applicant is not *the Grantee from the Crown, or being the Grantee, the Property has been dealt with by any Registered Instrument.*

	Commissioners' Fee.	Advertisements.	New Certificate.	Total.
If property is of the value of £200 and under—	£0 10 0	£1 10 0	£1 0 0	£3 0 0
" " 300 "	1 0 0	1 10 0	1 0 0	3 10 0
" " 400 "	1 10 0	1 10 0	1 0 0	4 0 0
" " 500 "	2 0 0	1 10 0	1 0 0	4 10 0
Ditto above " 500 "	2 10 0	1 10 0	1 0 0	5 0 0

In addition to the Assurance Fee of ½d. in the £ on the value; and 2s. 6d. for Sketch, if the whole of a Crown Grant.

☞ State to whom all correspondence relating to this Application should be sent, with address, as under, viz.:—

Name Thomas B. Holme

Occupation Solicitor

Post Town Pitt Street Sydney

00887230

(c.) **New South Wales.** [CERTIFICATE OF TITLE.]

No 1
Application 7192

REGISTER BOOK,
VOL. 887 FOLIO 230

CANCELLED

W

Robert William Hardie of the City of Sydney Gentleman is now the proprietor of an estate in fee simple subject nevertheless to the reservations and conditions if any contained in the Grant hereinafter referred to and also subject to such encumbrances liens and interests as are notified hereon in That Piece of Land situated in the Parish of Castle Hill and County of Cumberland containing Forty four acres three roods eleven perches ... commencing on the north western side of the Castle Hill Road at the southernmost corner of land of E. Black and bounded thence on the South East, on the South, on the South West and again on the South East by that road being lines bearing South Westerly one hundred and ninety one feet four and three quarter inches one hundred and sixty five feet and four hundred and forty four feet ten inches Westerly two hundred and twenty feet five and one half inches South Westerly five hundred and thirty four feet and one half of an inch, and again South Westerly three hundred and eighty seven feet three and three quarter inches and three hundred and eighty seven feet ten inches to land of McKnight, again on the South West by that land bearing North Westerly four hundred and thirty four feet seven inches to the Old Castle Hill Road, on the North West and again on the South West by that road being lines bearing North Easterly four hundred and twenty one feet eleven and a half inches North Westerly three hundred and forty one feet six inches, three hundred and ninety six feet four inches and three hundred and sixty seven feet ten and one half inches to land of James Parser and on the North East by that land and E. Black's land aforesaid being lines bearing South Easterly one thousand nine hundred and thirty eight feet eight and one half inches and eight hundred and fifty four feet and one half of an inch to the point of commencement, as shown on the plan hereon and thereon about lots being lots 1 to 4 inclusive of a Subdivision of Metcalfe's Estate and part of Sixty acres, delineated in the Public Map of the said Parish deposited in the Office of the Surveyor General originally granted to James Duff by Crown Grant dated the thirteenth day of January one thousand eight hundred and eighteen

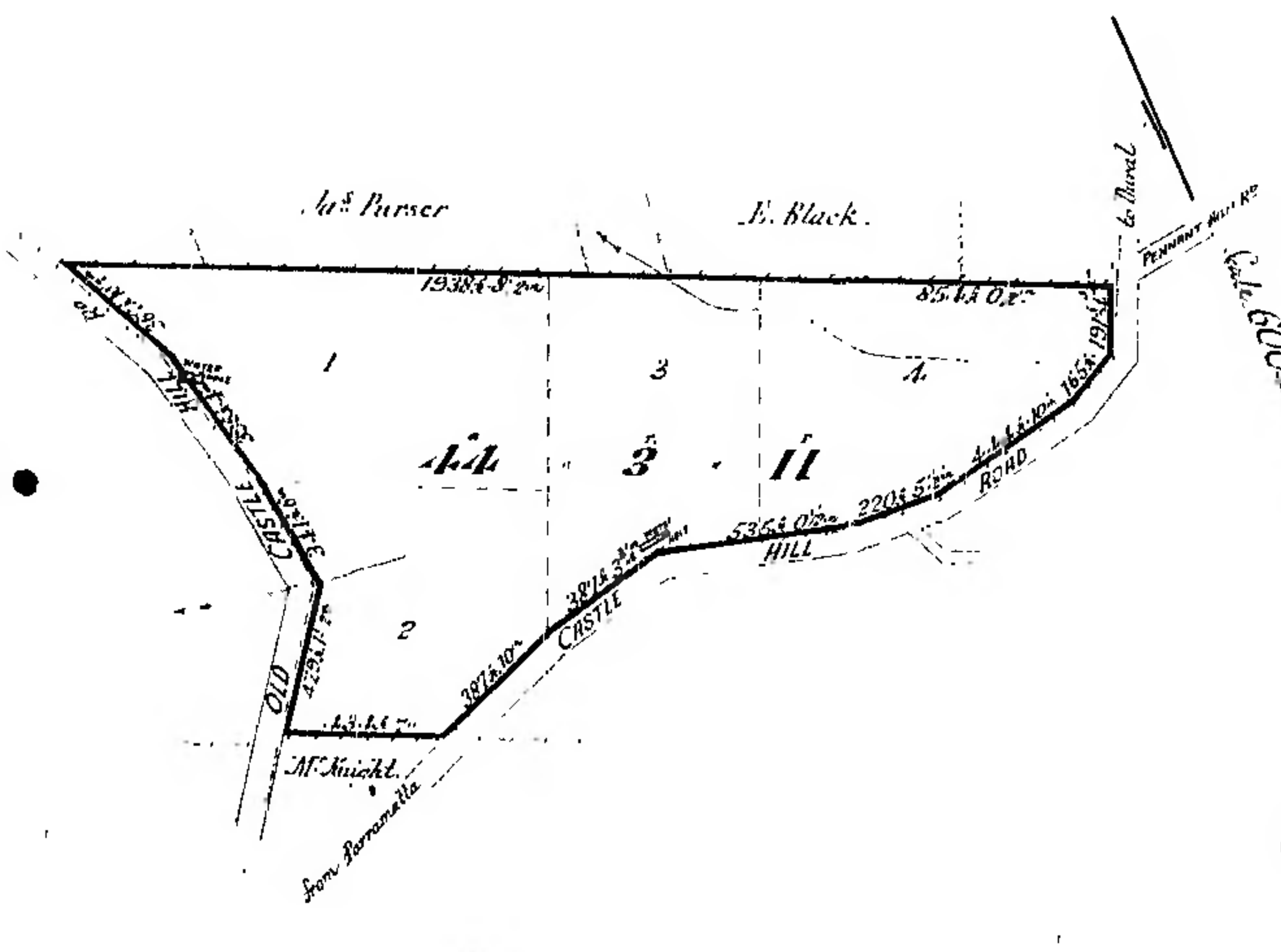
In witness whereof, I have hereunto signed my name and affixed my seal, this ninth day of July One thousand eight hundred and eighty-eight

Signed in the presence of C. M. Wallace
the ninth day of July 1888.

Dep. Registrar General.

REGISTRAR GENERAL NEW SOUTH WALES

No 151978 MORTGAGE DATED 28 May 1889
FROM THE above NAMED Robert William Hardie
TO John Rendall Street, Esquire & James Clegg Taylor, Accountant, both of Sydney
PRODUCED & ENTERED 20 June 1889
AT 26 mts past 11 O'CLOCK IN THE fore NOON
Dep. REGR GENL



No. 180456 *TRANSFER of the above MORTGAGE Number 151978, dated 27th April, 1891, from the within-named JAMES CLEGG TAYLOR, to DAVID WILLIAM ROXBURGH, of Sydney, Solicitor, and the said JAMES CLEGG TAYLOR. PRODUCED and ENTERED 4th June, 1891, at 13 minutes to 2 o'clock in the afternoon.*

Dep. Registrar General.

C.T. PRODUCED 5/10/1921
BY GARLAND, SEABORN & ABBOTT

204490 10th April 93
within Robert William Hardie
Annie Hardie of Sydney
Spinster
12th April 93
22 minutes 4

No. 370442 TRANSFER of the within MORTGAGE No 151978 dated 3rd July 1903, from the said JAMES CLEGG TAYLOR and DAVID WILLIAM ROXBURGH to the said DAVID WILLIAM ROXBURGH and JOHN HUNTER STEPHENSON of Sydney, Accountant. PRODUCED and ENTERED 11th September 1903, at 10 o'clock in the forenoon.

Dep. Registrar General.

DISCHARGE OF within MORTGAGE NO. 151978
DATED 24th November 1906 PRODUCED & ENTERED
30th November 1906 AT 15 mts to 2
O'CLOCK IN THE after NOON.
Deputy Registrar General.

DISCHARGE OF within MORTGAGE NO. 204490
DATED 12th October 1909 PRODUCED & ENTERED
30th November 1909 AT 15 mts to 2
O'CLOCK IN THE after NOON.
Deputy Registrar General.

No. H 47564 TRANSFER DATED 30th November 1909
FROM THE SAID Robert William Hardie
to George Sargent of Sydney
Auctioneer
OF THE LAND within
PRODUCED & ENTERED 30th November
1909 AT 15 mts to 2 O'CLOCK IN THE after NOON.
Deputy Registrar General.

No. A 650223 TRANSFER dated 8th December 1920.
from the said George Sargent to John Strang
of Leeville Grazier
of the land within described.
Produced and entered 11th December 1920
at 11 to 11 o'clock in the fore noon.
REGISTRAR GENERAL

No. A 451661 TRANSFER dated 1st September 1921
from the said John Strang to Martha Eveline Thomas
Lot 22 D.P. 10761 Subject to Covenant
of the land within described.
Produced and entered 2nd November 1921
at 40 mts to 11 o'clock in the after noon.
Cancelled & Certificate of Title issued Vol. 3346 Fol. 213
REGISTRAR GENERAL

No. A 86523 Transfer dated 15th September 1922
from John C. Strang to John Charles
Taylor of Sydney Merchant of Lot 28
D.P. 10761
Produced 25th September 1922 and entered within described
at 10 o'clock in the noon.
Cancelled & Certificate of Title issued Vol. 3373 Fol. 81
REGISTRAR GENERAL

No. A 86320 TRANSFER dated 26th September 1922
from the said John Strang to Andrew
Livingstone of Lot 36 37 and 38
D.P. 10761
11th October 1922 of the land within described
Produced and entered 11th October 1922
at 10 o'clock in the fore noon.
Cancelled & Certificate of Title issued Vol. 3377 Fol. 100
REGISTRAR GENERAL

No A 982516 TRANSFER dated 10th August 1923
from the said John Strang to Bertie Maxwell
Smith of Lot 52 DP 10761
of the land within described
Produced and entered 21st August 1923
at 52 mts pt 10 o'clock in the after noon.
Cancelled & Certificate of Title issued Vol. 3496 Fol. 96
REGISTRAR GENERAL

No. B 120883 TRANSFER dated 18th August 1924
from the said John Strang to Railway Commissioners
for New South Wales of Lot 53 D.P. 10761
of the land within described
Produced and entered 15th October 1924
at 12 o'clock in the noon.
Cancelled & Certificate of Title issued Vol. 3651 Fol. 41
REGISTRAR GENERAL

No. B 174766 TRANSFER dated 29th January 1925
from the said John Strang to Railway Commissioners
for New South Wales of Lot 51 D.P. 10761
of the land within described
Produced and entered 6th February 1925
at 2 o'clock in the after noon.
Cancelling & Certificate of Title issued Fol.
Vol. 3695 Fol. 39
Acting REGISTRAR GENERAL

No. B 174917 TRANSFER dated 5th January 1925
from the said John Strang to Railway
Commissioners for New South Wales of
Lot 39 D.P. 10761
30th January 1925 of the land within described
Produced and entered 9th February 1925
at 12 o'clock in the noon.
Cancelled & Certificate of Title issued Vol. 3695 Fol. 71
Acting REGISTRAR GENERAL

No. B 174917 TRANSFER dated 5th January 1925
from the said John Strang to Railway
Commissioners for New South Wales of
Lot 39 D.P. 10761
26th January 1925 of the land within described
Produced and entered 9th February 1925
at 12 o'clock in the noon.
Cancelled & Certificate of Title issued Vol. 3695 Fol. 71
Acting REGISTRAR GENERAL

This Deed is Cancelled and Certificate of Title issued
Vol. 3727 Fol. 140 for
Residue
B198042. Registrar General.

Appn. No. 7192

Reference to Last Certificate

Vol. 887 Fol. 236.

New South Wales.

[CERTIFICATE OF TITLE.]

Order No B198042

REGISTER BOOK,

VOL. 3727 FOL. 140

CANCELLED R

John Strang of Castle Hill Grazier by virtue of Certificate of Title Volume 887 Folio 236 now surrendered is now the proprietor of an Estate in Fee Simple

subject nevertheless to the reservations and conditions, if any, contained in the Grant hereinafter referred to, and also subject to such encumbrances, liens and interests, as are notified hereon, in Those pieces of land situated in the Shire of Baulkham Hills Parish of Castle Hill, and County of Cumberland containing Twenty eight acres three roods Eighteen perches or thereabouts being Lots 12 to 21 inclusive Lots 23 to 27 inclusive Lots 29 to 32 inclusive Lots 35 and 38. Lots 40 to 47 inclusive Lots 49. 50 and 55 and part of Lots 33 34 and 56 in a plan deposited in the Land Titles Office Sydney. No. 10761 and being also parts of Sixty acres (Portion 136 of Parish) delineated in the public maps of the said Parish in the Department of Lands originally granted to James Duff by Crown Grant dated the thirteenth day of January one thousand eight hundred and eighteen

In witness whereof, I have hereunto signed my name and affixed my Seal, this thirteenth day of May 1925

Signed in the presence of R. Mercy

Registrar General.

Notification referred to

No B 192845 TRANSFER dated 4th March 1925
from the said John Strang to Cecil Edward Futter of Lots 23 & 26 D.P. 10761

20th March 1925 of the land within described
Produced and entered 15th May 1925
at 4 o'clock in the after noon.

Cancelled & Certificate of Title issued Vol. 3732 Fol. 178

REGISTRAR GENERAL.

No B 203639 TRANSFER dated 16th March 1925
from the said John Strang to Arthur Whiting of Lot 56 D.P. 10761 Railway Commissioners for New South Wales of part of Lot 56 D.P. 10761

20th April 1925 of the land within described
Produced and entered 15th May 1925
at 4 o'clock in the after noon.

Cancelled & Certificate of Title issued Vol. 3732 Fol. 180

REGISTRAR GENERAL.

No. B 240569 TRANSFER dated 7th July 1925
from the said John Strang to Railway Commissioners for New South Wales
part

22nd July 1925 of the land within described
Produced and entered 17th September 1925
at 10 o'clock in the fore noon.

Cancelled & Certificate of Title issued Vol. 3777 Fol. 150

REGISTRAR GENERAL.

B192845 A
203639 A

No B 280382 TRANSFER dated 23rd October 1925
from the said John Strang to Hilda Lyle Strang q. Lots 13 DP 10761

of the land within described
Produced and entered 30th October 1925
at 2 mts pt 3 o'clock in the after noon.

Cancelled & Certificate of Title issued Vol. 3797 Fol. 115

REGISTRAR GENERAL.

No. B [illegible] TRANSFER dated 28th January 1924
from the said John Strang to Charles Ernest Woodyatt pt Lot 24

of the land within described
Produced and entered 4th February 1924.
at 59 mts to pt 2 o'clock in the after noon.

Cancelled & Certificate of Title issued Vol. 3968 Fol. 155

REGISTRAR GENERAL.

No. B [illegible] TRANSFER dated 28th January 1924
from the said John Strang to Dewey Alfred Woodyatt pt Lot 25

of the land within described
Produced and entered 4th February 1924.
at 59 mts to pt 2 o'clock in the after noon.

Cancelled & Certificate of Title issued Vol. 3968 Fol. 156.

REGISTRAR GENERAL.

No. B492654 TRANSFER dated 14th April 1927
from the said John Strang to Beryl Alice Edna Pheasant of Lot 25 in DP 10761

of the land within described
Produced 9th April 1927 and entered 9th April 1927
at 39 mts to pt 10 o'clock in the fore noon.

Cancelled & Certificate of Title issued Vol. 3995 Fol. 108

REGISTRAR GENERAL.

No. B 541433 TRANSFER dated 27 July 1927
from the said John Strang To Arthur Edward Hopkins of Lot 32 & part of Lot 33 D.P. 10761
of the land within described
Produced 3rd August 1927 and entered 12th August 1927
at 4 o'clock in the after noon.
Cancelled & Certificate of Title issued Vol 4039 Fol. 218
REGISTRAR GENERAL.

This Deed is Cancelled and Certificate of Title issued
Vol. 4644 Fol. 3 for Lot 1 & 2 of 10
Registrar General.
C 771154

This Deed is Cancelled and Certificate of Title issued
Vol. 4644 Fol. 69 for part
Registrar General.
C 771155

No. B 620224 TRANSFER dated 23rd January 1928.
from the said John Strang to Ellis McMullen of Lot 12 D.P. 18761 (Subject to Covenant)
of the land within described
Produced and entered 8th February 1928.
at 12 o'clock in the noon.
Cancelled & Certificate of Title issued Vol 4111 Fol. 86
Acting REGISTRAR GENERAL.

No. C 329095 TRANSFER dated 4th April 1935.
from the said John Strang To Allan William Britcliff of Lot 30 D.P. 10761.
of the Land within described
Produced 9th April 1935.
entered 23rd April 1935
at 4 o'clock in the after noon.
As to land in this transfer this Certificate is cancelled and new Certificate issued
Vol. 4687 Fol. 75
REGISTRAR GENERAL.

No. B 660158 TRANSFER dated 7th May 1928
from the said John Strang to Alfred James Luckwell of Lots 19 and 20 on D.P. 10761
of the land within described
Produced 10th May 1928 and entered 24th May 1928
at 2 o'clock in the after noon.
Cancelled & Certificate of Title issued Vol 4117 Fol. 206
Acting REGISTRAR GENERAL.

No. C 360819 TRANSFER dated 8th August 1935.
from the said John Strang to Allan William Britcliff of Lot 31 D.P. 10761
of the land within described
Produced 9th August 1935 and
entered 10th August 1935.
at 3 o'clock in the after noon.
As to land in this transfer this Certificate is cancelled and new Certificate issued
Vol. 4708 Fol. 240
REGISTRAR GENERAL.

No. B 888599 TRANSFER dated 1st October 1929
from the said John Strang to Martha Eveline Thomas of Lot 21 D.P. 10761 (Subject to Covenant)
of the land within described
Produced 1st October 1929 and entered 23rd October 1929
at 10 o'clock in the fore noon.
As to land in this transfer this Certificate is cancelled and new Certificate issued
Vol. 4343 Fol. 1
REGISTRAR GENERAL.

No. B 476916 TRANSFER dated 6th February 1930
from the said John Strang to Frank Challoner of Lot 29 D.P. 10761
of the land within described
Produced 10th February 1930 and
entered 28th March 1930
at 4 o'clock in the After noon
As to land in this transfer this Certificate is cancelled and new Certificate issued
Vol. 4411 Fol. 186
REGISTRAR GENERAL.

No. B 998701 TRANSFER dated 8th April 1930
from the said John Strang to Margaret Georgina Taylor of (part of Lot 134 together with right of way)
of the land within described
Produced 8th April 1930 and entered 1st September 1930
at 3 o'clock in the after noon.
As to land in this transfer this Certificate is cancelled and new Certificate issued
Vol 4434 Fol. 23
REGISTRAR GENERAL.

No. C 221153 TRANSFER dated 8th November 1933
from the said John Strang to Horace Harvey John Harkin of part (Subject to covenant).
of the Land within described
Produced 12th December 1933 and
entered 15th February 1934
at 4 o'clock in the after noon.
As to land in this transfer this Certificate is cancelled and new Certificate issued
Vol 4613 Fol. 70
REGISTRAR GENERAL.

B 476916 Lot 29
B 998701 R
C 221153 Lot 134 R
C 329095 Lot 30 R
C 360819 Lot 31 R

Application No. 7192

Reference to last certificates

Vol. 4644 Fol. 69

" 4665 " 203

New South Wales.

85619

[CERTIFICATE OF TITLE.]

REGISTER BOOK.

Vol. 5272 Fol. 44

JOHN STRANG, of Castle Hill, Retired Grazier, Transferee as to part under Instrument of Transfer No. D56677 and as to the other part by virtue of Certificate of Title Volume 4644 Folio 69, now surrendered for consolidation is now the proprietor of an Estate in Fee Simple, subject nevertheless to the reservations and conditions if any contained in the Grant hereinafter referred to and also subject to such encumbrances liens and interests as are notified hereon in That piece of land situated in the Shire of Baulkham Hills Parish of Castle Hill and County of Cumberland containing Fourteen acres thirty one perches or thereabouts as shown in the plan hereon and therein edged red and also shown as to part in plan endorsed on Order No. C271155 and as to the other part in plan annexed to the said Instrument of Transfer No. D56677 being Lot 18 and part of Lots 34, 35 and 55 in Deposited Plan No. 10761 and being also part of 60 acres (Portion 136 of Parish) originally granted to James Duff by Crown Grant dated the 13th day of January 1818.

IN WITNESS whereof I have hereunto signed my name and affixed my Seal, this Fifteenth day of October, 1941.

Signed in the presence of J. H. Ledgard

Registrar General.

NOTIFICATION REFERRED TO

No. B998701 Grant of Right of Way over the piece of land 66 feet wide and variable width coloured brown in plan hereon.

Registrar General.

No. D 1288441 APPLICATION BY TRANSMISSION
Hilda Lyle Woodriff of Palmwoods Queensland, Kathleen Grace Lowe of Penrith, Married Women and Margaret Georgina Taylor of Avalon, Widow, are now the registered Proprietors as joint tenants of the land within described in pursuance of the above Application Produced 12th May 1942 and entered 2nd July 1942 at 12 o'clock in the noon.

REGISTRAR GENERAL

No. D 1288442 CAVEAT dated 12th May 1942 by the Registrar General.
Produced 12th May 1942 and entered 2nd July 1942 at 12 o'clock in the noon.

REGISTRAR GENERAL

No. D 844582 MORTGAGE dated 28th April 1948 from the said Hilda Lyle Woodriff Kathleen Grace Lowe and Margaret Georgina Taylor to The National Bank of Australasia Limited.
Produced 30th June 1948 and entered 28th June 1948 at 2 minutes past 3 o'clock in the after noon.

REGISTRAR GENERAL

No. F 353055 TRANSFER dated 10th October 1950 from the said Hilda Lyle Woodriff Kathleen Grace Lowe and Margaret Georgina Taylor to the said Hilda Lyle Woodriff Kathleen Grace Lowe of Penrith Married Woman Margaret Mary Shang of Sydney Married Woman and Georgina Taylor of Avalon Widow of the land within described
Produced 28th November 1950 and entered 20th March 19[illegible] at 12 o'clock in the noon.

REGISTRAR GENERAL

No. F 659194 DISCHARGE of within mortgage No. D 844582 dated 1st May 1952
Produced and entered 5th May 1952 at 46 minutes past 1 o'clock in the after noon.

REGISTRAR GENERAL

No. F 816011 TRANSFER dated 22nd April 1952 from the said Hilda Lyle Woodriff Kathleen Grace Lowe Margaret Georgina Taylor and Mary Shang to Walter Robilliard Thomas of North Sydney Grazier of part Together with right of carriage way and foot way and together with easement of the land within described
Produced 2nd May 1952 and entered 1st May 1952 at 12 o'clock in the noon.
As to land in this transfer this certificate is cancelled and new Certificate issued Vol. 6662 Fol. 63

REGISTRAR GENERAL

This Deed is Cancelled and Certificate of Title Issued
Vol. 6662 Fol. 65
for residue
F 816011

REGISTRAR GENERAL

D 1288441 2R D 844582 MR CT 7.11.50 F 353055 R F 659194 B/O Withdrawn (Lodged) 6.1.53 F 660335 Lot A (part) Rejected 6.1.53 F 816011 Lot (a) (part) after with Refusal F 821682 O Rel

5272 - 44

056677

Total Area included in Certificate
14a 0r 31p.

All lengths shown hereon are in feet & inches

Scale : 150 feet to one inch.

202

Appn. No. 7192

Reference to last Certificate

Vol. 5272 Fol. 44

New South Wales.

[CERTIFICATE OF TITLE.]

JOINT TENANCY

ORDER NO. F821682

REGISTER BOOK.

VOL. 6662 FOL. 65

CANCELLED

HILDA LYLE WOODRIFF, of Castle Hill, Widow, KATHLEEN GRACE LOWE, of Penrith, Married Woman, MARGARET GEORGINA TAYLOR, of Castle Hill, Widow, and MARY STRANG, of Sydney, Spinster, by virtue of Certificate of Title Volume 5272 Folio 44 now surrendered are now the proprietors of an Estate in Fee Simple as Joint Tenants,

subject nevertheless to the reservations and conditions, if any, contained in the Grant hereinafter referred to, and also subject to such encumbrances, liens, and interests as are notified hereon, in that piece of land situated in the Shire of Baulkham Hills Parish of Castle Hill, and County of Cumberland containing Eleven acres three roods thirty one perches or thereabouts as shown in the plan hereon and therein edged red being part of Lots 34, 35 and 55 in Deposited Plan No.10761 and being also part of 60 acres (Portion 136 of Parish) originally granted to James Duff by Crown Grant dated the 13th day of January 1818.

In witness whereof I have hereunto signed my name and affixed my Seal, this Fourth day of May , 1933

Signed in the presence of R R FitzGerald

J. Wells
Registrar-General.

REGISTRAR GENERAL * NEW SOUTH WALES *

Scale: 150 feet to one inch

F821682

Notification

NOTIFICATION REFERRED TO

No.B998701 Grant of Right of Way over the piece of land 66 feet wide and of variable width coloured blue in the plan hereon.

J. Wells

Registrar General.

No.D128842 Caveat by the Registrar General dated the 12th day of May 1942 Produced the 12th day of May 1942 and entered the 2nd day of July 1942 at 12 o'clock noon.

J. Wells

Registrar General.

No.F816011 Grant of Right of Carriage Way and right of footway over the piece of land coloured blue in plan hereon.

J. Wells

Registrar General.

No.F816011 Grant of Easement affecting the piece of land coloured blue in plan hereon.

J. Wells

Registrar General.

No. G195471 Transfer dated 17th November 1954 from the said Hilda Lyle Woodriff, Margaret Georgina Taylor, Mary Strang and Kathleen Grace Lowe to Lees Brockie of part of the land within described reserving an easement

Produced 19th November 1954 and entered 2nd June 1955 at 12 o'clock noon

As to land in this Transfer this Certificate is cancelled and new Certificate issued Vol. 6984 Fol. 209

J. Wells

Registrar General

By Instrument of Transfer No. G195472 an easement was reserved as appurtenant to the residue of the land within described affecting the land shown by blue colour on the plan on Certificate of Title Vol 6673 Fol. 176

Dated 2nd June, 1955

J. Wells

Registrar General

No. G412659 TRANSFER dated 28th May 1955 1956 from the said Hilda Lyle Woodriff Kathleen Grace Lowe Margaret Georgina Taylor and Mary Strang to Mortgagee William Aitkin Bullen of part of the land within described

Produced 30th November 1955 and entered 4th August 1956 at 12 o'clock noon

As to land in this transfer this Certificate cancelled and new Certificate issued Vol. 7164 Fol. 148.

J. Wells

REGISTRAR GENERAL.

This Deed is Cancelled and Certificate of Title issued Vol. 7164 Fol. 149, for residue.

J. Wells

REGISTRAR GENERAL.

S/o G424078.

202

Primary Appn. No. 7192

Reference to Last Title

Vol. 6662 Fol. 65

New South Wales.

[CERTIFICATE OF TITLE.]

JOINT TENANCY

REGISTER BOOK.

VOL. 7164 FOL. 149

EH Issued on Order No. G424070

HILDA LYLE WOODRIFF, of Castle Hill, Widow, MARGARET GEORGINA TAYLOR, of Avalon, Widow, KATHLEEN GRACE LOWE, of Penrith, Widow and MARY STRANG, of Castle Hill, Spinster, are now the proprietors of an Estate in Fee Simple as Joint Tenants, subject nevertheless to the reservations and conditions, if any, contained in the Grant hereinafter referred to, and also subject to such encumbrances, liens, and interests as are notified hereon, in That piece of land in the Shire of Baulkham Hills Parish of Castle Hill , and County of Cumberland shown in the plan hereon and therein edged red being part of Lots 34, 35 and 55 in Deposited Plan No. 10761 and being also part of Portion 136 granted to James Duff on 13th January 1818.

In witness whereof I have hereunto signed my name and affixed my Seal, this Sixteenth day of August , 1956

Signed in the presence of G. W. Moss

J. Wells

Registrar-General.

NOTIFICATION REFERRED TO

Right of Way affecting the piece of land 66 feet wide and variable width coloured brown in the plan hereon created by Transfer No. B998701.

J. Wells

Registrar General.

No.D128842 Caveat by the Registrar General dated 12th May 1942, Produced 12th May 1942 and entered 2nd July 1942 at 12 o'clock noon.

J. Wells

Registrar General.

Right of Carriage Way and footway affecting the piece of land coloured blue in the plan hereon created by Transfer No. F816011.

35

J. Wells

Registrar General.

Easement affecting the piece of land coloured blue in the plan hereon created by Transfer No. F816011.

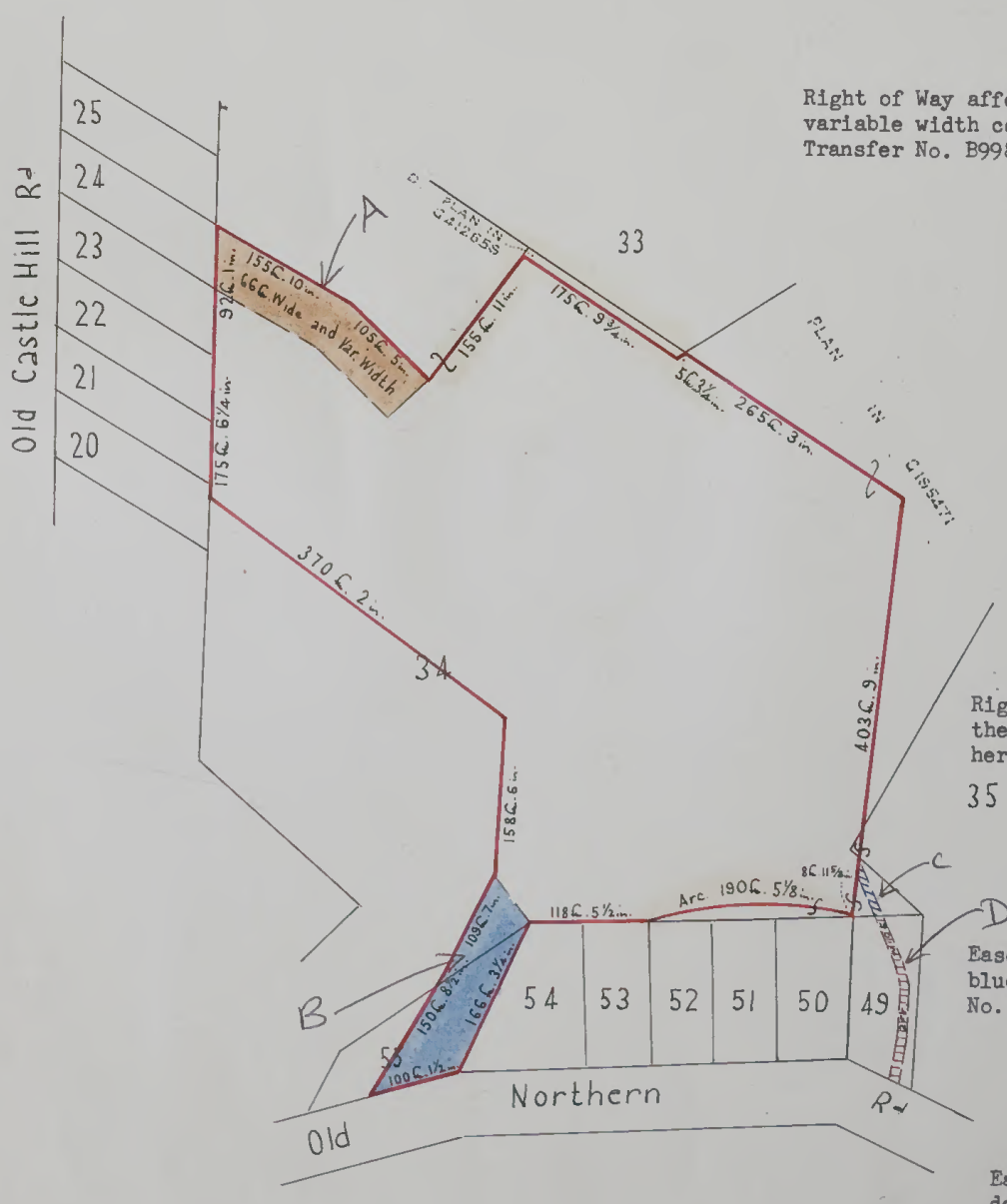
J. Wells

Registrar General.

Easements appurtenant to the land above described affecting the pieces of land 2 feet wide hatched blue and hatched red in the plan hereon created by Transfers Nos. G195471 and G195472 respectively.

J. Wells

Registrar General.



Area: 6 ac. 2 rd. 31¼ per.

Scale: 150 feet to one inch

The land designated "A" is coloured Brown

The land designated "B" is coloured Blue

The land designated "C" is ~~coloured~~ hatched Blue

The land designated "D" is ~~coloured~~ hatched Red

C 424070

15975 5.55 K 2006—1 A. H. PETTIFER, GOVERNMENT PRINTER.

The within Caveat No. D128842 is hereby withdrawn

Dated 22nd August 1957

REGISTRAR GENERAL.

Hilda Lyle Woodruff of Castle Hill Widow, Kathleen Grace Lowe of Penrith Married woman and Mary Strang of Sydney Spinster are now the registered proprietors as joint tenants of the land within described. See Application under Section 12 of the Trustee Act, 1925.

No. G764813 Entered 22nd August 1957.

REGISTRAR GENERAL.

No. G764814 CAVEAT by the Registrar General.

Entered 22nd August 1957.

REGISTRAR GENERAL.

The within Caveat No. G764814 is hereby withdrawn

Dated 3rd September 1962.

REGISTRAR GENERAL

No. J110256 TRANSFER dated 6th July 1962 to James Douglas Hawkins and Thomas Gordon Geoffrey Hawkins as Tenants in common of the land within described

Entered 3rd September 1962

As to land in this transfer this deed is cancelled and new certificate issued Vol 8408 Fol 61/62

REGISTRAR GENERAL

G764814 Sec. 12 - 815 R.G.L.

J110256 W/H

09896130

NEW SOUTH WALES

[redacted]TIFICATE OF TITLE
[redacted]PERTY ACT, 1900, as amended.

Appln. No. 7192
Prior Title Vol. 8408 Fols. 61 and 62

Vol. 9896 Fol. 130

CANCELLED
1st Edition issued 17-12-1964.

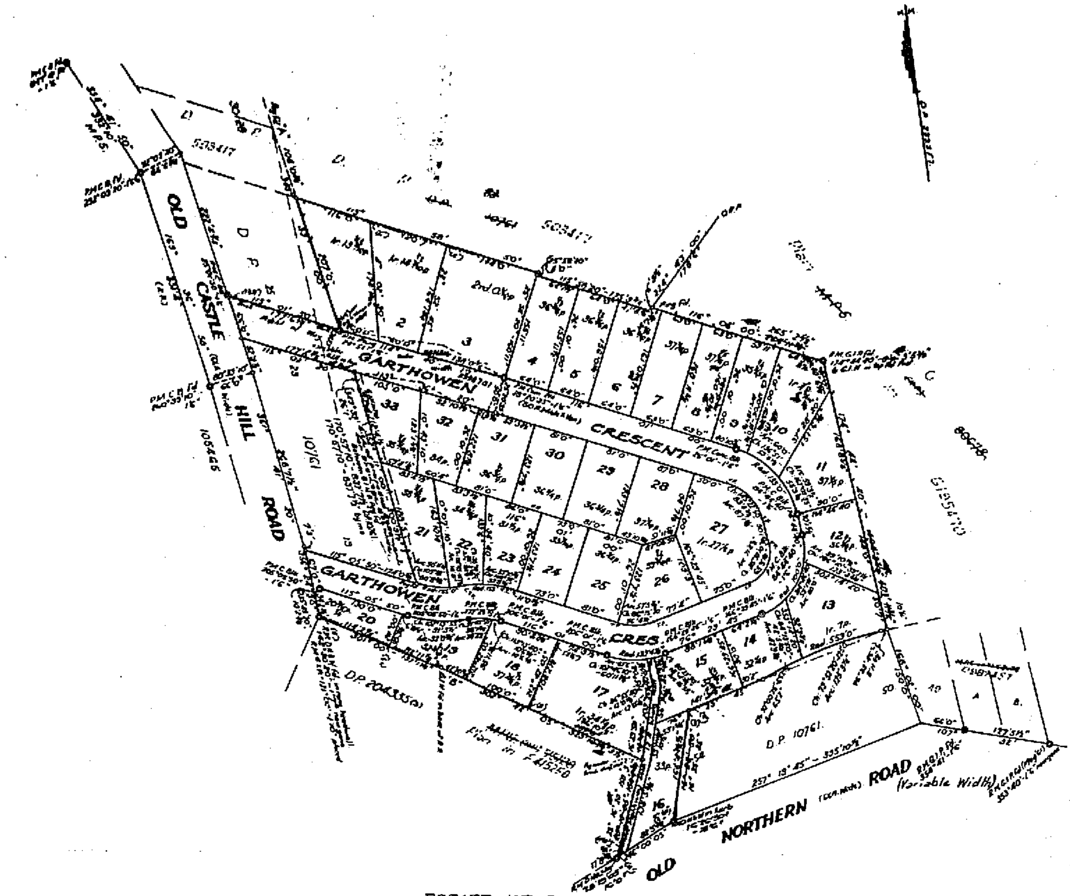
(Page 1) Vol. 9896 Fol. 130

I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

Witness *Abohen*

Registrar General.

PLAN SHOWING LOCATION OF LAND



ESTATE AND LAND REFERRED TO.

Estate in Fee Simple in Lot 27 in Deposited Plan 222257 at Castle Hill in the Shire of Baulkham Hills Parish of Castle Hill and County of Cumberland being part of Portion 136 granted to James Duff on 13-1-1818.

FIRST SCHEDULE (Continued overleaf)

~~JAMES NICOLAS HAWKINS, Builder and THOMAS GORDON GEOFFREY HAWKINS, Accountant, both of Epping, as Tenants in Common.~~

Registrar General.

SECOND SCHEDULE (Continued overleaf)

1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
2. Easements created by Transfers Nos. G195471 and G195472 appurtenant to the part of the land above described formerly comprised in Certificate of Title Volume 8408 Folios 61 and 62 affecting the part of Lot C in Deposited Plan 33333 and the part of Lot 49 in Deposited Plan 10761 respectively shown as Site of Proposed Easement over existing line of water service pipes 2 feet wide in Deposited Plan 33333.

Registrar General.

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE LAND TITLES OFFICE.

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED.

ST 1609 V. C. N. BLIGHT, GOVERNMENT PRINTER

Vol. 9896 Fol 130

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	ENTERED	Signature of Registrar General
Denis Richmond Durham of Castle Hill, Founder	Transfer	J961574	5.4.1965	10.6.1965	[signature]

This deed is cancelled as to whole
New Certificates of Title have issued on 10-3-1969
for lots in Deposited Plan No. 533390 as follows:-
Lots 1 & 2 Vol. 10982 Fol 24-25 respectively.

[signature]
REGISTRAR GENERAL

REGISTRAR GENERAL NEW SOUTH WALES

CT 20/2/1 D.P. 533390 3/2/69 Prog. ... on D.P. 533390 (...)

SECOND SCHEDULE (continued)

INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	PARTICULARS	ENTERED	Signature of Registrar General	CANCELLATION
Mortgage	J961575	5.4.1965	to: Apex Permanent Co-Operative Building Society Limited	10.6.1965	[signature]	

(Page 2 of 2 pages)

FORM No. 62

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

10982025

NEW SOUTH WALES

[redacted]CATE OF TITLE

[redacted]ERTY ACT, 1900, as amended.

Application No. 7192
Prior Titles Volume 9896 Folio 129
Volume 9896 Folio 130

Vol. 10982 Fol. 25

ID

Edition issued 10-2-1969.

CANCELLED

(Page 1) Vol. 10982 Fol. 25

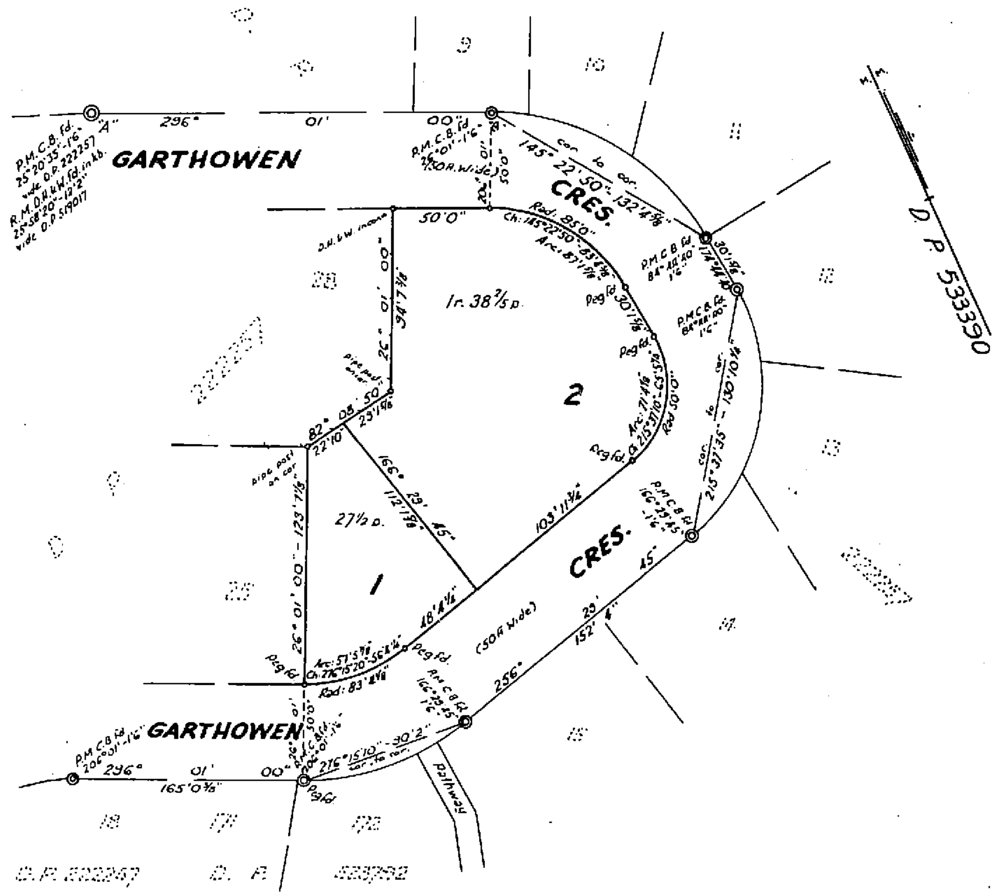
I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

Witness *L. Collins*

SEE AUTO FOLIO

[signature]
Registrar General.

PLAN SHOWING LOCATION OF LAND



S

ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 2 in Deposited Plan 533390 at Castle Hill in the Shire of Baulkham Hills Parish of Castle Hill and County of Cumberland being part of Portion 136 granted to James Duff on 13-1-1818.

FIRST SCHEDULE

~~DENIS RICHMOND DURHAM, of Castle Hill, Founder.~~

GRY

SECOND SCHEDULE

1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
2. ~~Easements created by Transfers Nos.G195471 and G195472 appurtenant to the land above described affecting the part of Lot C in Deposited Plan 33333 and thepart of Lot 49 inDeposited Plan 10761 respectively shown as "Site of Proposed Easement over existing line of water service pipes 2 feet wide" in Deposited Plan 33333.~~ X394048, X394049
3. Covenant created by Transfer No. J951841 affecting part.
4. ~~Mortgage No. J961575 of the part of the land above described formerly comprised in Certificate of Title Volume 9896 Folio 130 to Apex Permanent Co-operative Building Society Limited Entered 10-5-1965.~~ Discharged L365350

CV

[signature]
Registrar General

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE LAND TITLES OFFICE.

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED.

Vol. 10982 Fol 25

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	ENTERED	Signature of Registrar General
John Philip Parkinson of Castle Hill, Medical Practitioner and Lynne Ann Parkinson his wife as joint tenants	Transfer	R194963	———	2-5-1979	[signature]

SECOND SCHEDULE (continued)

INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	PARTICULARS	ENTERED	Signature of Registrar General	CANCELLATION		
~~Mortgage~~	~~L365351~~	~~13-12-1968~~	~~to Apex Permanent Building Society Ltd.~~	~~20-3-1969~~	[signature]	Discharged	P236725	[signature]
M Mortgage	R194964 P	———	to The Commercial Banking Company of Sydney Limited	2-5-1979	[signature]			

CANCELLED

SEE AUTO FOLIO

(Page 2 of 2 pages)

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

L365350 DM 1 M
P236725 D
R194963 Te 64 M 1
X394048 R/R 92 R

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE
19/4/2016 8:45AM

FOLIO: 2/533390

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 10982 FOL 25

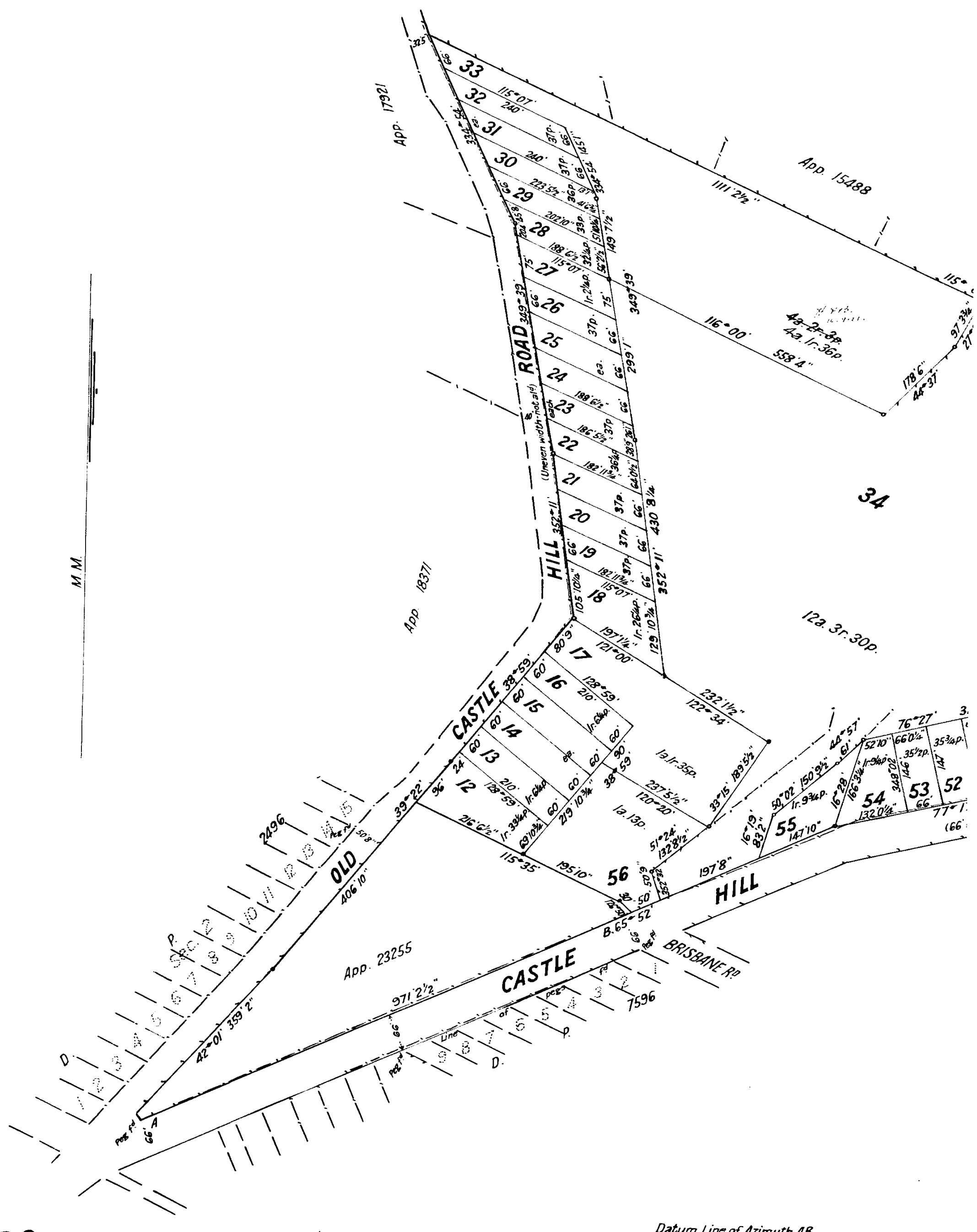
Recorded	Number	Type of Instrument	C.T. Issue
28/3/1988		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
5/7/1988		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
9/8/1995	O443189	DISCHARGE OF MORTGAGE	
9/8/1995	O443190	TRANSFER	
9/8/1995	O443191	MORTGAGE	EDITION 1
12/9/1997	3406464	DISCHARGE OF MORTGAGE	
12/9/1997	3406465	MORTGAGE	EDITION 2
10/11/1998	5382925	DISCHARGE OF MORTGAGE	
10/11/1998	5382926	TRANSFER	
10/11/1998	5382927	MORTGAGE	EDITION 3
16/9/2006	AC604093	MORTGAGE	EDITION 4
18/12/2012	AH446595	CAVEAT	
11/10/2013	AI83474	BANKRUPTCY APPLICATION	EDITION 5
31/1/2014	AI342070	DISCHARGE OF MORTGAGE	
31/1/2014	AI342071	TRANSFER	
31/1/2014	AI342072	MORTGAGE	EDITION 6
24/11/2014	AJ63506	POSITIVE COVENANT	
24/11/2014	AJ63507	RESTRICTION ON USE OF LAND BY/VESTED IN PRESCRIBED AUTHORITY	EDITION 7
30/6/2015	AJ614293	LEASE	EDITION 8

*** END OF SEARCH ***

Archnex Designs PRINTED ON 19/4/2016

Req:R796320 /Doc:DP 0010761 P /Rev:16-Feb-1994 /Sts:OK.OK /Pgs:ALL /Prt:31-May-2016 07:10 /Seq:1 of 3
Ref:Archnex Designs /Src:P

Shire of Baulkham Hills
A.705917 18.6.21



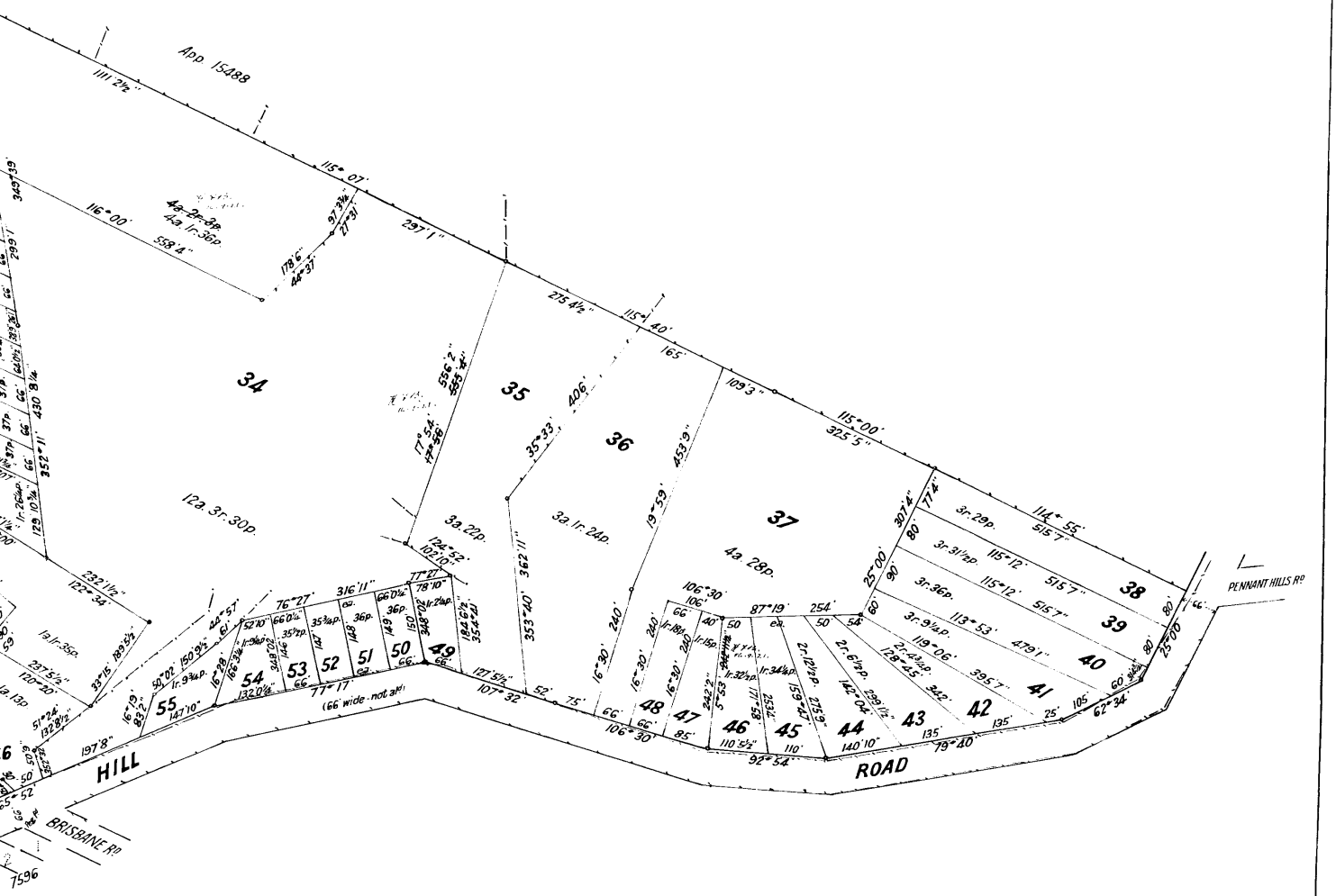
DP 10761

PLAN D.P10761

of subdivision of the land comprised in Cert. of Title Vol 887 fol 230
and part of the land comprised in App. 23255

Parish of Castle Hill . County of Cumberland

Scale 150 feet to an inch



Subscribed and declared before me at Sydney
this 14th day of June A.D. 1921.

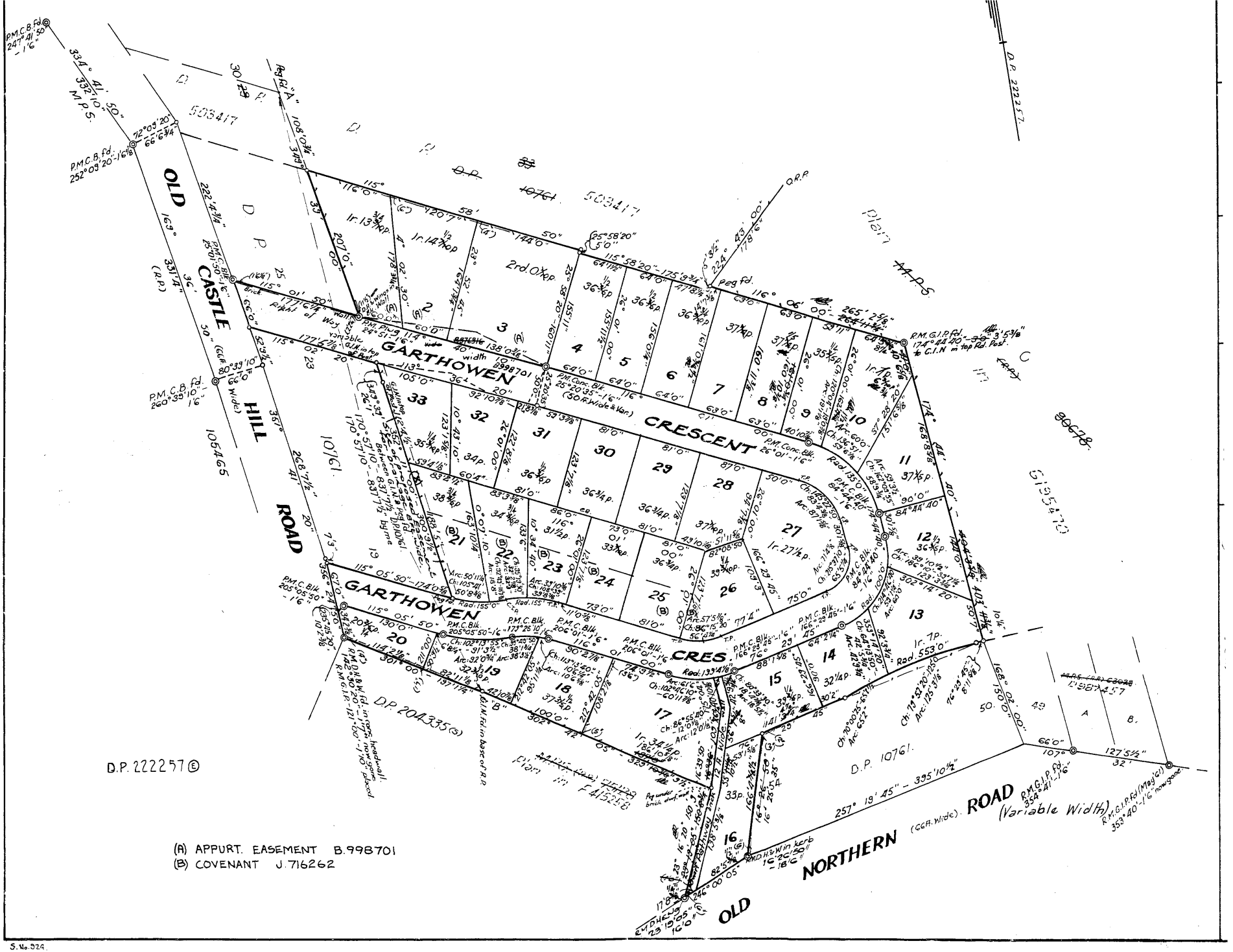
J.P.

I, Harold Frederick Busby of Sydney, Licensed Surveyor, specially licensed under the Real Property Act, do hereby solemnly and sincerely declare that the boundaries and measurements shown in this plan are correct for the purposes of the said Act, and that the survey of the land to which the plan relates has been made under my immediate supervision, and I make this solemn declaration conscientiously believing the same to be true and by virtue of the Oaths Act 1900.

H F Busby

Licensed Surveyor.

Datum Line of Azimuth AB.
Date of Survey April 1921



DP 222257 (E)

Registered: 23.9.1964

C.A.: 2883 of 24.4.1964

Title System: Torrens

Purpose: Subdivision

Ref. Map: Baulkham Hills Sh6

Last Plan: 89769/6 & FB16011 (D.P. 10761) & D.P. 10761

PLAN OF

Subdivision of part of Lots 24, 34, 35 & 55 D.P. 10761 & Lots A & B in B97G016 & Pt. Lot A in FB16011

Scale: 100 Feet to an Inch.

Shire of Baulkham Hills.

Locality Castle Hill.

Parish of Castle Hill

County of Cumberland.

I, Vernon Rupert Clements of 71 George Street, Parramatta.

a surveyor registered under the Surveyors Act, 1929 as amended, hereby certify that the survey represented in this plan is accurate and has been made by me under my immediate supervision in accordance with the Survey Practice Regulations, 1933, and was completed on the 8th April, 1964.

Signature

Surveyor registered under Surveyors Act, 1929 as amended.

Datum Line of Azimuth "A" to "B".

Statements of Dedications and Easements.

(Signatures and Seals to appear in panel provided)

It is intended to dedicate GARTHOWEN CRESCENT & PATHWAY 12 FT. WIDE to the Public

It is intended to create a Drainage Easement 8 feet wide as shewn hereon to vest in Baulkham Hills Shire Council as appurtenant to Garthowen Crescent.

Signatures and Seals Only.

I hereby certify that the requirements of the Local Government Act, 1919 (other than the requirements for registrations of plans) have been complied with by the applicant in relation to the proposed subdivision and new road(s) set out herein.

Subdivision No. 2883 Date: 24.4.64.

Council Clerk.

Approved by Council
The Common Seal of The Council of the Shire of Baulkham Hills.
was hereunto affixed on 27th April 1964 pursuant to a resolution
of Council passed on 21st April 1964

Council Clerk.

Mayor/President

CONVERSION TABLE ADDED IN REGISTRAR GENERAL'S DEPARTMENT

DP 222257

FEET	INCHES	METRES
-	2	0.051
-	3	0.076
-	4	0.102
-	5	0.127
-	6	0.152
-	11 1/2	0.292
-	11 5/8	0.295
1	0 5/8	0.321
1	6	0.457
1	6 1/8	0.460
1	6 1/4	0.464
1	7	0.483
1	10	0.559
2	2 1/4	0.667
3	2 1/2	0.978
3	5 3/8	1.051
3	6	1.067
3	10 1/4	1.175
4	7 3/8	1.407
5	-	1.524
5	3 1/2	1.613
6	8 1/4	2.038
7	3	2.210
8	11 5/8	2.734
10	2 3/8	3.108
10	6 1/4	3.207
10	6 5/8	3.216
11	0 5/8	3.369
12	-	3.658
12	0 1/8	3.661
12	3 1/8	3.737
14	7 3/8	4.455
16	-	4.877
17	8 1/4	5.391
18	2 3/8	5.547
18	4 7/8	5.610
18	5 1/2	5.626
18	6	5.639
18	7 7/8	5.686
18	8	5.690
19	0 7/8	5.813
19	1 1/8	5.820
21	8 3/8	6.614
21	8 5/8	6.620
26	1	7.950
30	1 5/8	9.185
30	2	9.195
32	2 1/8	9.808
32	3	9.830
34	2 3/8	10.424
38	1 3/4	11.627
38	3 1/2	11.671
39	7 1/4	12.071
39	8 7/8	12.113
39	10 3/8	12.151
39	10 1/2	12.154
40	6 5/8	12.360
40	10 7/8	12.468
42	5 3/4	12.948
42	9 3/4	13.049
42	10 7/8	13.078
43	10 1/8	13.364
47	8 1/4	14.535
50	-	15.240
50	7	15.418
50	8 3/8	15.453
50	8 5/8	15.459
50	9 1/2	15.481
50	11 1/4	15.526
51	11 5/8	15.840
52	9 1/2	16.091
53	1 5/8	16.196
55	10 1/2	17.031
56	4 1/4	17.177
56	8	17.272
57	5 7/8	17.523
58	9 3/4	17.926

CONVERSION TABLE ADDED IN REGISTRAR GENERAL'S DEPARTMENT

DP 222257 CONTINUED

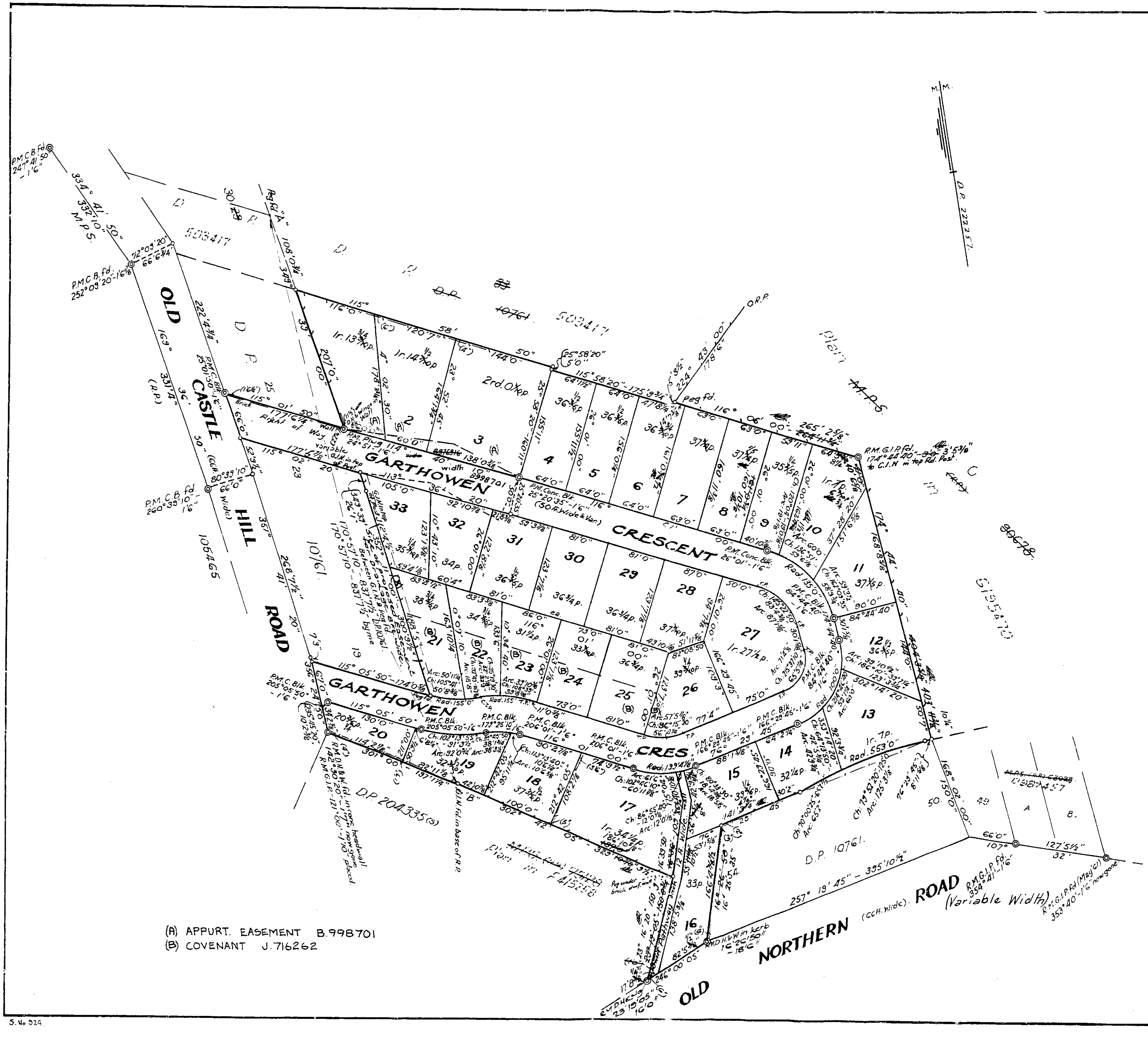
FEET	INCHES	METRES
59	1 1/4	18.015
59	3 1/2	18.072
59	3 7/8	18.082
59	4 1/8	18.088
59	6 1/8	18.139
59	11	18.263
60	-	18.288
60	4	18.390
60	11 7/8	18.590
61	6	18.745
63	-	19.202
64	-	19.507
64	1 1/2	19.545
64	2 1/4	19.564
64	8 1/4	19.717
64	11 1/2	19.799
65	1 1/2	19.850
65	2	19.863
65	5 1/4	19.945
66	-	20.117
66	6 3/4	20.288
67	-	20.422
71	4 1/8	21.746
73	-	22.250
74	9 1/2	22.797
75	-	22.860
77	4	23.571
81	-	24.689
82	5 1/2	25.133
82	11 1/8	25.276
83	2 1/2	25.362
83	3 3/8	25.384
83	4 3/8	25.410
83	4 3/8	25.410
86	-	26.213
87	-	26.518
87	1 5/8	26.559
88	1 5/8	26.864
90	-	27.432
90	2 7/8	27.505
91	3 1/2	27.826
92	0 3/4	28.061
92	3 3/4	28.137
92	10 7/8	28.318
93	3 3/4	28.442
94	7 3/8	28.639
94	7 3/8	28.639
95	10 1/2	29.223
95	11 1/4	29.242
100	-	30.480
105	-	32.004
108	0 3/4	32.937
108	2 1/8	32.972
109	3	33.299
109	6 3/4	33.395
112	4 1/2	34.252
114	2 1/8	34.801
116	-	35.357
120	7	36.754
122	8 1/8	37.392
123	1 5/8	37.532
123	3 3/4	37.586
123	7 1/8	37.671
125	-	38.100
125	3 1/8	38.179
127	5 1/2	38.849
130	-	39.624
133	4 1/8	40.643
133	6	40.691
135	-	41.148
138	0 3/8	42.072
138	5 3/8	42.199
139	4 1/8	42.472
141	4 1/4	43.085
144	-	43.891
150	-	45.720
150	9	45.949

CONVERSION TABLE ADDED IN REGISTRAR GENERAL'S DEPARTMENT

DP 222257 CONTINUED

FEET	INCHES	METRES
151	6 5/8	46.193
155	-	47.244
155	11	47.523
155	11 1/2	47.536
156	0 1/4	47.555
160	11	49.047
160	11 3/8	49.057
160	11 3/4	49.066
161	0 1/2	49.086
162	1 1/2	49.416
163	10 1/4	49.943
164	1 3/4	50.032
166	4 1/2	50.711
168	8 5/8	51.425
174	0 5/8	53.051
175	9 3/4	53.588
177	5 7/8	54.099
177	6 1/4	54.108
177	6 7/8	54.124
178	3 3/4	54.350
178	6	54.407
186	10 5/8	56.963
188	5	57.429
197	1 1/4	60.077
207	-	63.094
222	4 3/4	67.786
265	2 5/8	80.839
265	2 7/8	80.845
268	7 1/2	81.877
300	9 1/2	91.681
329	9 1/2	100.521
331	4	100.990
332	10	101.448
395	10 1/2	120.663
403	10 1/4	123.095
537	7 1/2	163.868
553	-	168.554

AC	RD	P	SQ M
-	-	.2	5.1
-	-	9 1/4	234
-	-	20 1/4	512.2
-	-	31 1/2	796.7
-	-	32 1/4	815.7
-	-	32 1/2	822
-	-	33	834.7
-	-	34	860
-	-	34 3/4	878.9
-	-	35 1/4	891.6
-	-	36 1/2	923.2
-	-	36 3/4	929.5
-	-	37	935.8
-	-	37.2	940.9
-	-	37 1/2	948.5
-	-	38 3/4	980.1
-	-	39 1/4	992.7
-	1	6 3/4	1182
-	1	7	1189
-	1	13 3/4	1359
-	1	14 1/2	1378
-	1	27 1/2	1707
-	1	34 1/4	1878
-	2	-	2023



DP 222257 (E)

Registered: 23.9.1964

C.A. 2883 of 24.4.1964

Title System: Torrens

Purpose: Subdivision

Ref. Map: Baulkham Hills Sh6

Last Plan: B97691 6 & F816011 (DP 10761) & D.P. 10761

PLAN OF

Subdivision of part of Lots 24, 34, 35 & 55 D.P. 10761 & Lots A & B in B976916 & Pt. Lot A in F816011

Scale: 100 feet to an inch.

Shire of Baulkham Hills.
Locality Castle Hill.
Parish of Castle Hill
County of Cumberland.

I, Vernon Rupert Clements of 71 George Street, Parramatta, a surveyor registered under the Surveyors Act, 1929 as amended, hereby certify that the survey represented in this plan is accurate and has been made under my immediate supervision in accordance with the Survey Practice Regulations, 1933, and was completed on the 8th. April, 1964.

Signature [signature]
Surveyor registered under Surveyors Act 1929 as amended.
Datum Line of Azimuth "A" to "B".

Statements of Dedications and Easements.
(Signatures and Seals to appear in panel provided)

It is intended to dedicate GARTHOWEN CRESCENT & PATHWAY 12 FT WIDE to the Public

It is intended to create a Drainage Easement 8 feet wide as shown hereon to vest in Baulkham Hills Shire Council as appurtenant to Garthowen Crescent.

S. No 524

PLAN

of subdivision of lots 26 & 27 D.P. 222257.

Shire of Baulkham Hills

Locality Castle Hill

Parish Castle Hill

County Cumberland.

Scale: 60 feet to an Inch.

D. P. 533390 (E)

Registered. DT. 21-1-1969.

C.A. 3751 of 11-7-1968

Title System Torrens

Purpose Subdivision

Ref. Map Baulkham Hills Sh. 6

Last Plan D. P. 222257 #

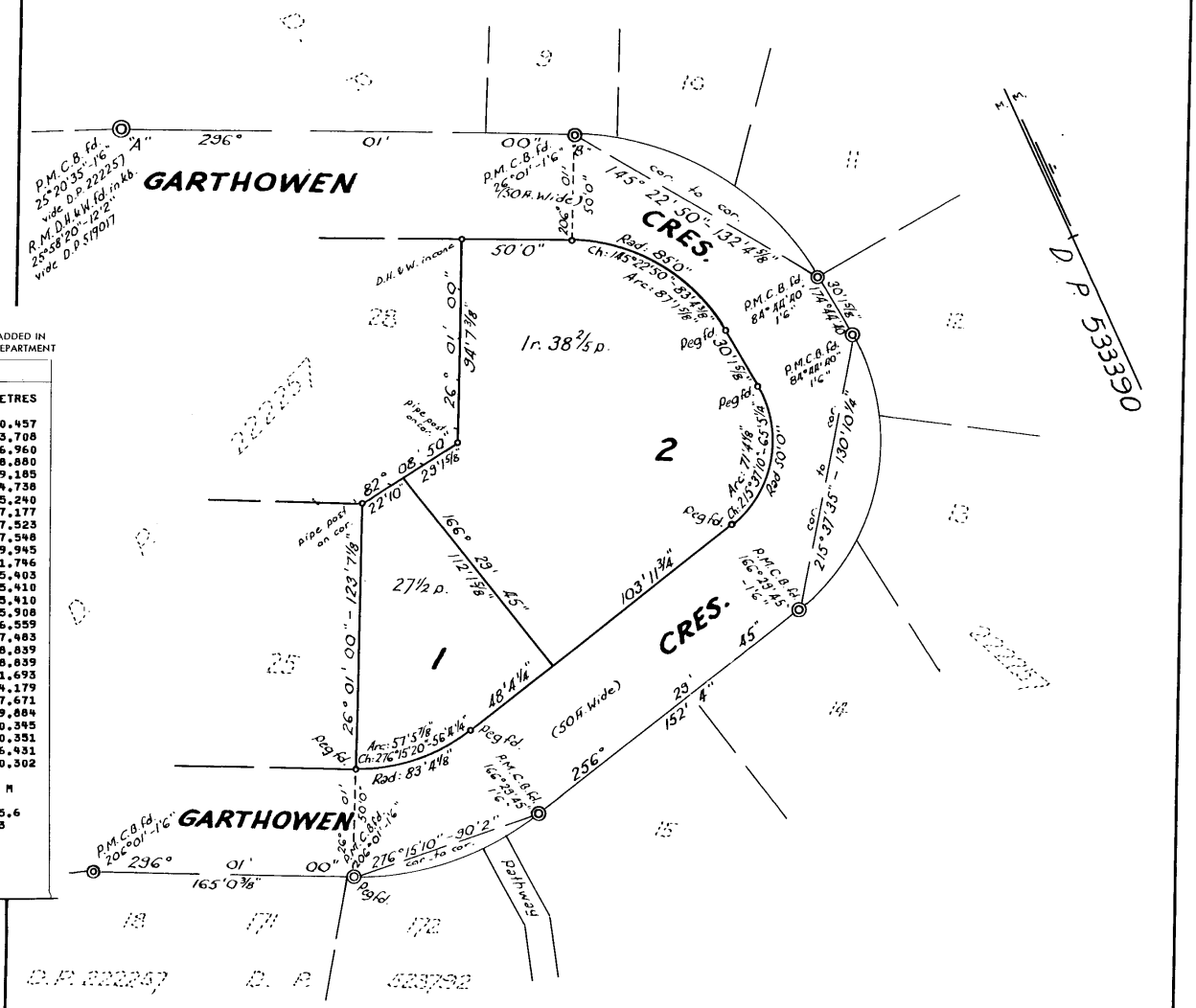
N002A1A

CONVERSION TABLE ADDED IN REGISTRAR GENERAL'S DEPARTMENT

DP 533390

FEET	INCHES	METRES
1	6	0,457
12	2	3,708
22	10	6,960
29	1 5/8	8,880
30	1 5/8	9,185
48	4 1/4	14,738
50	-	15,240
56	4 1/4	17,177
57	5 7/8	17,523
57	6 7/8	17,548
65	5 1/4	19,945
71	4 1/8	21,746
83	4 1/8	25,403
83	4 3/8	25,410
83	4 3/8	25,410
85	-	25,908
87	1 5/8	26,559
90	2	27,483
94	7 3/8	28,839
94	7 3/8	28,839
103	11 3/4	31,693
112	1 5/8	34,179
123	7 1/8	37,671
130	10 1/4	39,884
132	4 3/8	40,345
132	4 5/8	40,351
152	4	46,431
165	0 3/8	50,302

AC	RD	P	SQ M
-	-	27 1/2	695.6
-	1	38.4	1983



Signatures, Seals and Statements of intention to dedicate public roads or public reserves or create drainage reserves, easements, or restrictions as to user.

I Geoffrey Leonard Leggatt, of Suite 1, 30 Old Castle Hill Rd, Castle Hill. 2154 a surveyor registered under the Surveyors Act, 1929 as amended, hereby certify that the survey represented in this plan is accurate and has been made by me in accordance with the Survey Practice Regulations, 1933 and was completed on 4th June 1968.

Datum Line of Azimuth "A" to "B":

Signature G. L. Leggatt

Surveyor registered under Surveyors Act, 1929 as amended.

Council Clerk's Certificate

I hereby certify that:

(a) the requirements of the Local Government Act, 1919 (other than the requirements for the registration of plans) and

(b) the requirements of Section 34B of the Metropolitan Water, Sewerage and Drainage Act, 1924, as amended,

have been complied with by the applicant in relation to the proposed subdivision set out herein.

Subdivision No. 3751

Date 11-7-'69.

Signature

Council Clerk.

M.P.D.

No 1411

REDGUM Horticultural
Arboriculture & Horticulture Consultants

REPORT:

ARBORICULTURAL IMPACT ASSESSMENT

6-10 & 16-20 Garthowen Crescent, Castle Hill NSW

Prepared 16 June 2016
Our Ref: 1697

PH/FAX 8824 8314 PO Box 3687, Rouse Hill NSW 2155 ABN 28116465304 E info@redgumhrt.com.au

Contents

PREFACE

Redgum Horticultural has prepared this report for Caladines Town Planning Pty Ltd *(the planner)* on behalf of Mr John Bouchahine, HCM Building Pty Ltd, P.O. Box 100a, South Strathfield NSW (*the applicant*).

Mr. Neville Shields (*the author*) attended 6-10 & 16-20 Garthowen Crescent, Castle Hill NSW (*the site*), on 11 December 2015, all the trees and their growing environment were examined. The site is subject to a Development Application and this report and any works recommended herein, that require approval from the consenting authority, forms part of that development application.

INTRODUCTION

The land is located in The Hills Shire Council (*the Council)* Local Government Area (*LGA*) and the trees are protected under Clause 5.9 of The Hills Local Environment Plan (THLEP), The Hills Development Control Plan 2012 (DCP). The Council is the consenting authority for development works on the site. This report involves 23 trees (*the trees*), as indicated on Site Plan A - Survey of Subject Trees (Appendix E) and considers the removal of fourteen (14) trees within the property and the retention of nine (9) trees within the property, neighbouring properties and adjacent on the road reserve. The trees will be considered as 1 stand to encompass all trees within and immediately adjacent to the site, where appropriate, as marked on Appendix E, Site Plan A – Survey of Subject Trees. *Tree Protection Zone* fencing or works are marked on the Appendix F, Site Plan B - Trees to be Retained and Tree Protection Zones.

The site is comprised of six residential blocks where the existing structures are to be demolished and are to be replaced with a proposed multi-unit residential development with basement parking, requiring the removal of fourteen (14) existing trees within the site. As part of the Landscape Plan where appropriate, the tree cover on the site will be enhanced by planting with advanced specimens/s of appropriate tree species for the space available above and below ground being soil volumes available and to prevent future conflict between trees and built structures.

The proposed building design and its configuration and infrastructure were arrived at following the undertaking of an arboricultural assessment of the trees on the site to determine their significance by Redgum Horticultural. The plans provided do not show the location of sewer, water or electricity supply to the proposed development.

Setbacks for the new works and associated infrastructure should provide sufficient space to protect the existing growing environments both above and below ground for trees to be retained, and so that trees within the property and on adjoining properties will not be adversely affected.

The proposed design has considered the spatial requirements for the trees to be retained based on the information available or provided at the time of compiling this report, and those areas to be protected will be discussed further. The Summary lists the general condition of trees and a summary of works in Table 1.0. In section 5.0 each individual tree is described in greater detail including protective or remedial works. Tree maintenance works including pruning, removal or transplantation are detailed in section 4.0.

SUMMARY

This report considers 23 trees, 19 trees within the site, 3 trees on a neighbouring property and 1 tree on the adjacent road reserve. The trees to be retained and protected are Trees 1, 6, 8, 9, 12, 13, 14^{x2} & 16 and Trees 2, 3, 4, 5, 7, 10, 11, 15 and 17 to 22 are recommended to be removed. For Tree 1; the alignment of the building is a minor encroachment to this specimen. *The section of the basement within the TPZ of this specimen is to be constructed using a vertical cut with shotcrete and contiguous pilings to reduce any impact on its stability.* Tree 6, 8 & 9; the alignment of the development is sufficiently setback to not affect these specimens. Trees 12, 13 & 14^{x2}; these specimens are sufficiently setback from the development to not be affected. Tree 16; the alignment of the building is a minor encroachment to this specimen. *The section of the basement within the TPZ of this specimen is to be constructed using a vertical cut with shotcrete and contiguous pilings to reduce any impact on its stability.*

There will be no impact to Tree 1, 6, 8, 9, 12, 13 & 14^{x2} with a minor encroachment for Tree 1 & 16 which are to be retained and protected as per AS 4970 (2009) Section 3. Any excavations within the Tree Protection Zone must be supervised and certified by the Project Arborist in accordance with AS4970 (2009).

Table 1.0 General condition of trees and Schedule of works. Trees described in greater detail in section 5.0.

Tree No.	*Genus and species*	Common name	Condition G = Good, F = Fair P = Poor, D = Dead	Description of work to be done
1	*Jacaranda mimosifolia*	Jacaranda	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
2	*Citharexylum spinosum*	Fiddlewood	F	Remove and replace with by new plantings as per Landscape Plan
3	*Nyssa sylvatica*	Black Gum	G	Remove and replace with by new plantings as per Landscape Plan
4	*Liquidambar styraciflua*	Sweet Gum	F	Remove and replace with by new plantings as per Landscape Plan
5	*Ulmus parvifolia*	Chinese Elm	F	Remove and replace with by new plantings as per Landscape Plan
6	*Nyssa sylvatica*	Black Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan. – *Street Tree Specimen*
7	*Nyssa sylvatica*	Black Gum	G	Remove and replace with by new plantings as per Landscape Plan
8	*Jacaranda mimosifolia*	Jacaranda	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan. – *Neighbouring Property Specimen*
9	*Acer buergerianum*	Trident Maple	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan. – *Neighbouring Property Specimen*
10	*Cupressus macrocarpa 'Brunniana'*	Brunnings Cypress	G	Remove and replace with by new plantings as per Landscape Plan
11	*Acer buergerianum*	Trident Maple	G	Remove and replace with by new plantings as per Landscape Plan
12	*Jacaranda mimosifolia*	Jacaranda	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
13	*Cupressus macrocarpa 'Leightons Green'*	Leightons Green Pine	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
14/2	*Cupressus macrocarpa 'Leightons Green' x2*	Leightons Green Pine	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
15	*Brachychiton acerifolius*	Illawarra Flame Tree	F	Remove and replace with by new plantings as per Landscape Plan
16	*Corymbia citriodora*	Lemon Scented Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan. – *Neighbouring Property Specimen*
17	*Liquidambar styraciflua*	Sweet Gum	G	Remove and replace with by new plantings as per Landscape Plan
18	*Liquidambar styraciflua*	Sweet Gum	G	Remove and replace with by new plantings as per Landscape Plan
19	*Liquidambar styraciflua*	Sweet Gum	G	Remove and replace with by new plantings as per Landscape Plan
20	*Liquidambar styraciflua*	Sweet Gum	G	Remove and replace with by new plantings as per Landscape Plan
21	*Syzygium smithii*	Lilly Pilly	G	Remove and replace with by new plantings as per Landscape Plan
22	*Liquidambar styraciflua*	Sweet Gum	G	Remove and replace with by new plantings as per Landscape Plan

Table 2.0

This table only applies to trees being retained. Tree Protection Zone fencing locations as measured from the centre of each tree and the recommended distances for the side closest to the building construction works e.g. excavation (see explanatory notes below). Tree Protection Zone fences and setbacks where applicable are indicated in Appendix F and are to be measured on site.

1. Redgum Tree No. / Redgum Stand No.	2. Structural Root Zone SRZ (DARB) From centre of trunk (COT) Diameter Above Root Buttress AS4970 2009 Section 3, 3.3.5 (see Appendix C) where applicable (Minimum 1.5 metres)	3. Trunk Diameter at Breast Height DBH 1.4m above ground, AS4970 2009, or mm or m above ground where indicated. # = average. g = ground	4. Tree Protection Zone (TPZ) = 12 x DBH From centre of trunk (COT) in metres AS4970 2009Section 3 (see Appendix C) (Minimum 2.0 metres)	5. Distance of fence with TPZ setback (reduced by 10% of area of TPZ) in metres as per AS4970 2009 Section 3, 3.3 (Minimum 2.0 metres)	6. Estimated distance of tree protection fence/works on the side closest to building construction[2], in metres by Redgum Horticultural.
1	2.3	400	4.8	4.3	3.4
6	1.7	200	2.4	2.2	2.4
8	3.3	980 @ g	11.8	10.6	11.8
9	2.1	320 @ g	3.8	3.5	3.8
12	2.4	450	5.4	4.9	5.4
13	2.0	300	3.6	3.2	3.6
14/2	2.0	300	3.6	3.2	3.6
16	2.5	500	6.0	5.4	5.0

Descriptors for modified setbacks in Column 6.

1. Special conditions apply to protect the roots of trees generally, see discussion points.
2. Additional protective fencing information is detailed in discussion points.
3. Acceptable due to the good relative tolerance of the species to development impacts.
4. Range of setbacks for the trees at each end of a linear stand, see discussion points.
5. Acceptable as fence located at a substantial distance beyond dripline, or may also include the location of a smaller tree in proximity to a larger tree to be retained and the smaller tree being protected well within the protective fencing for that larger tree.
6. Acceptable due to additional special protection works, see Section 5.0 for this tree.
7. Acceptable as pre-existing site conditions were conducive to having restricted the development of root growth in this direction.
8. Street tree with protective fencing of minimal width to allow for pedestrian access along road reserve.
9. Acceptable as tree transplanted reducing the area of the root zone.
10. Acceptable as not effected by development works.
11. Young tree not expected to have established a substantially expansive root system and able to re-establish or modify growth to be sustainable due to age and good vigour.
12. Set back prescribed by the consent authority.
13. Acceptable as tree growing on a lean and encroachment on compression wood side where root growth is of reduced structural importance.
14. Acceptable as root mapping has indicated extent of structural woody roots with a diameter of 20 mm or more.
15. Acceptable as a specimen of palm taxa tolerant of encroachment.
16. Acceptable as excavation on down slope or across slope side of tree.
17. Acceptable as encroachment into growing area below ground minor, with one corner of building or excavation works extending to within the radius of the dripline.
18. Acceptable as encroachment by pier, including screw piles, with minimal disturbance.
19. Acceptable as encroachment above grade without excavation or sub-base compaction.
20. Acceptable as located within 0.5 m from edge of dripline.
21. Acceptable as encroachment with gap graded fill that can accommodate gaseous exchange between roots/soil and the atmosphere and ongoing root growth.
22. Minimum setback 2 m, AS4970 (2009) section 3, 3.2.
23. Maximum setback 15 m, AS4970 (2009) section 3, 3.2.
24. Tree is a palm, other monocot, cycad or tree fern TPZ is to be 1 m outside crown projection AS4970 (2009) section 3, 3.2.
25. Minimum Structural Root Zone (SRZ) for trees less than 0.15 m diameter is 1.5 m, AS4970 (2009) section 3, 3.5.

Explanatory notes for Table 2.0.

This table is based upon Australian Standard AS4970 2009 *Protection of trees on development sites*, Section 3 Determining the protection zone of the selected trees (see Appendix B), where the approved building works should be no closer, including excavation, than the dimensions stated above.

"3.3 Variations to the TPZ

3.3.2 Minor Encroachment

If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.

3.3.3 Major Encroachment - If the proposed encroachment is greater than 10% of the area of the TPZ or inside the SRZ the project arborist must demonstrate that the tree(s) would remain viable. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ."

1.0 AIMS

1.1 Detail the condition of the trees on the site, adjoining properties or adjacent road reserve where such trees may be affected by the proposed works, by assessment of individual trees or stands of trees, and indicate protection measures or remedial works for their retention and protection pre, during and post construction. Consider the location and condition of the trees in relation to the proposed building works and recommend retention and protection or removal and replacement where appropriate. The retained specimens are to remain in a safe and healthy condition, not less than at the time of initial inspection for this report, or in a reduced but sustainable condition due to the impact of the development but ameliorated through tree protection measures recommended to be applied.

1.2 Provide as an outcome of the assessment, the following: a description of the trees, observations made, discussion of the effects the location of the proposed building works may have on the trees, and make recommendations required for remedial or other works to the trees, if and where appropriate. *(See section 5 - Tree Assessment.)*

1.3 Determine from the assessment as detailed in 1.2 a description of the works or measures required to ameliorate the impact upon the trees to be retained, by the proposed building works or future impacts the trees may have upon the new building works if and where appropriate, or the benefits of removal and replacement if appropriate for the medium to long term safety and amenity of the site.

2.0 OBJECTIVES

2.1 Assess the condition of the subject trees.

2.2 Determine impact of development on the subject trees.

2.3 Provide recommendations for retention or removal of the subject trees.

3.0 METHODOLOGY
Note: Individual methodologies applied as applicable.

3.1 The method of assessment of tree/s applied is adapted from the principles of visual tree assessment undertaken from the ground, which considers:

1. Tree health and subsequent stability, both long and short term
2. Sustainable Retention Index Value (SRIV) Version 4 (IACA 2010)©
3. Hazard potential to people and property
4. Amenity values
5. Habitat values
6. Significance

3.2 This assessment is undertaken using standard tree assessment criteria for each tree based on the values above and is implemented as a result of at least one comprehensive and detailed site inspection to undertake a visual tree assessment from the ground of each individual tree, or stand of trees, or a representative population sample. Any dimensions recorded as averages, or by approximation are noted accordingly.

3.3 This report adopts Australian Standard AS4970 2009 *Protection of trees on development sites* as a point of reference and guide for the recommended minimum setbacks (Appendix C) from the centre of a tree's trunk to development works and the distances may be increased or decreased by the author in accordance with AS4970 – Section 3.3.4 as a result of other factors providing mitigating circumstances or constraints as indicated by but not restricted to the following:

1. Condition of individual trees,
2. Tolerance of individual species to disturbance,
3. Geology e.g. physical barriers in soil, rock floaters, bedrock to surface
4. Topography e.g. slope, drainage,
5. Soil e.g. depth, drainage, fertility, structure,
6. Microclimate e.g. due to landform, exposure to dominant wind,
7. Engineering e.g. techniques to ameliorate impact on trees such as structural soil, gap graded fill, lateral boring,
8. Construction e.g. techniques to ameliorate impact on trees such as pier and beam, bridge footings, suspended slabs,
9. Root mapping,
10. Physical limitations - existing modifications to the environment and any impact to tree/s by development e.g. property boundaries, built structures, houses, swimming pools, road reserves, utility services easements, previous impact by excavation, or construction in other directions, soil level changes by cutting or filling, existing landscaping works within close proximity, modified drainage patterns,
11. Extraneous factors e.g. potential future impacts from development on adjoining land when the tree is located on or near to a property boundary.

3.4 Trees in groups may be referred to as stands and a stand may exclusively contain specimens to be either retained or removed or a combination of both. A stand may be used to discuss all the trees on a given site to expedite their assessment, or refer to trees growing proximate to one another or within a defined space. Stands may be comprised by mass boundary or screen plantings, to form a group of the same or a mixture of taxa. Each stand is considered as a single unit with each component tree assessed and expressed in tabular form, or indicated by a given percentage as a population sample of each stand. Where it is appropriate for a stand of trees to be retained in full or part, the location and setback of Tree Protection Zone fences or works, are prescribed to provide for the preservation of the stand or selected component trees, in a condition not less than that at the time of initial inspection for its incorporation into the landscape works for the site, or in a reduced but sustainable condition due to the impact of the development but ameliorated through tree protection measures.

3.5 The meanings for terminology used herein are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009. An extract from the IACA Dictionary forms a glossary of terms included as Appendix D.

4.0 PRUNING STANDARDS

4.1 Any pruning recommended in this report is to be to the Australian Standard® AS4373 *Pruning of amenity trees*, and conducted in accordance with the NSW Work Cover Authority Code of Practice, Tree Work, 2007.

4.2 All pruning or removal works are to be in accordance with the appropriate Tree Management Policy where applicable, or Tree Management Order (TMO), or Tree Preservation Order (TPO).

4.3 Tree maintenance work is specialised and in order to be undertaken safely to ensure the works carried out are not detrimental to the survival of a tree being retained, and to assist in the safe removal of any tree, should be undertaken by a qualified arboriculturist with appropriate competencies recognised within the Australian Qualification Framework, with a minimum of 5 years of continual experience within the industry of operational amenity arboriculture, and covered by appropriate and current types of insurance to undertake such works.

5.0 TREE ASSESSMENT – 5.1 - Assessment of a stand of Trees

Tree / Stand No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation R = Radial, or other	Crown Symmetry 1 = symmetrical 2 = asymmetrical / Orientation	Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk **Orientation** other than R = radial, e.g. N/S g = ground	Trunk Lean 1 = Upright-Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / St = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g. R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
1	*Jacaranda mimosifolia*	M	GV	G	MGVG - 10 1	D	8	8x6 N/S	2/N	70 70	400 R	1/R St	1	No	No	G	1 2
	Jacaranda	Comment: Trunk to 1.5 metres, crown deliquescent, orientation N/S, asymmetrical bias to north.															
2	*Citharexylum spinosum*	M	GV	F	MGVF - 9 2	D	8	8 R	1	70 70	500 R	1/R St	1	No	No	G	2 2
	Fiddlewood	Comment: Trunk to 3 metres, crown deliquescent, orientation radial, symmetrical.															
3	*Nyssa sylvatica*	M	GV	G	MGVG - 10 1	D	8	6 R	1	70 70	300 R	1/R St	1	No	No	G	1 2
	Black Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
4	*Liquidambar styraciflua*	M	GV	F	MGVF - 9 1	D	8	9x5 N/S	2/W	70 70	400 R	1/R St	5 5-R	Yes	No	G	2 3
	Sweet Gum	Comment: Trunk erect, straight, gradually tapering & continuous, orientation N/S, asymmetrical bias to east, crown excurrent. Branch tear wound at 2m to north/west, decay evident to wound face.															
5	*Ulmus parvifolia*	M	GV	F	MGVF - 9 2	C	6	6x4 N/S	2/E	70 70	250 R	1/R St	1	No	No	P	2 3
	Chinese Elm	Comment: Trunk to 3 metres, crown deliquescent, orientation N/S, asymmetrical bias to north. 3 branch tear wounds to north.															
6	*Nyssa sylvatica*	M	GV	G	MGVG - 10 1	D	5	5 R	1	70 70	200 R	1/R St	1	No	No	G	1 1
	Black Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
7	*Nyssa sylvatica*	M	GV	G	MGVG - 10 1	D	7	6 R	1	70 70	250 R	1/R St	1	No	No	G	1 2
	Black Gum	Comment: Trunk to 1.5 metres, crown deliquescent, orientation radial, symmetrical.															
8	*Jacaranda mimosifolia*	M	GV	G	MGVG - 10 1	D	12	12x9 NW/SE	2/N	70 70	980 @ g R	5/R St	1	No	No	G	1 1
	Jacaranda	Comment: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation NW/SE, asymmetrical bias to north.															
9	*Acer buergerianum*	M	GV	G	MGVG - 10 1	D	10	6x4 N/S	2/S	70 70	320/R 370 DARB	1/R St	1	No	No	G	1 1
	Trident Maple	Comment: Trunk to 1.8 metres, crown deliquescent, orientation N/S, asymmetrical bias to south.															
10	*Cupressus macrocarpa 'Brunniana'*	M	GV	G	MGVG - 10 1	D	8	3 R	1	70 70	300 @ g R	5/R St	1	No	No	G	2 2
	Brunnings Cypress	Comment: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.															

Tree / Stand No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation R = Radial, or other	Crown Symmetry 1 = symmetrical 2 = asymmetrical / Orientation	Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk **Orientation** other than R = radial, e.g. N/S g = ground	Trunk Lean 1 = Upright-Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g. R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
11	*Acer buergerianum*	M	GV	G	MGVG - 10 1	D	5	2 R	1	70 70	300 R	5/R St	1	No	No	G	2 2
	Trident Maple	Comment: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.															
12	*Jacaranda mimosifolia*	M	GV	F	MGVF - 9 1	C	8	6 R	1	70 70	450 R	1/R St	1	No	No	P	2 3
	Jacaranda	Comment: Trunk to 2 metres, crown deliquescent, orientation radial, symmetrical. Topped at 5m.															
13	*Cupressus macrocarpa 'Leightons Green'*	M	GV	G	MGVG - 10 1	D	6	4 R	1	80 80	300 R	1/R St	1	No	No	G	2 2
	Leightons Green Pine	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
14 /2	*Cupressus macrocarpa 'Leightons Green' x2*	M	GV	G	MGVG - 10 1	C	6	4 R	1	80 80	300 R	1/R St	1	No	No	G	2 2
	Leightons Green Pine	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
15	*Brachychiton acerifolius*	M	GV	F	MGVF - 9 1	C	12	5 R	1	N/A D	500 R	1/R St	1	No	No	G	1 1
	Illawarra Flame Tree	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
16	*Corymbia citriodora*	M	GV	G	MGVG - 10 1	D	18	10 R	1	70 70	500 R	1/R St	1	No	No	G	1 1
	Lemon Scented Gum	Comment: Trunk to 3 metres, crown deliquescent, orientation radial, symmetrical.															
17	*Liquidambar styraciflua*	M	GV	G	MGVG - 10 1	C	10	8 R	1	70 70	400 R	5/R St	1	No	No	G	2 2
	Sweet Gum	Comment: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.															
18	*Liquidambar styraciflua*	M	GV	G	MGVG - 10 1	C	14	6 R	1	70 70	350 R	1/R St	1	No	No	G	1 2
	Sweet Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
19	*Liquidambar styraciflua*	M	GV	G	MGVG - 10 1	C	15	9 R	1	70 70	500 R	1/R St	1	Yes	No	P	1 2
	Sweet Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Lopped for line clearance to street. Mechanical damage.															
20	*Liquidambar styraciflua*	M	GV	G	MGVG - 10 1	C	15	9x7 N/S	2/N	70 70	500 R	1/R St	1	Yes	No	P	1 2
	Sweet Gum	Comment: Trunk erect, straight, gradually tapering & continuous, orientation N/S, asymmetrical bias to north crown excurrent. Lopped for line clearance to street. Mechanical damage															

Tree / Stand No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation R = Radial, or other	Crown Symmetry 1 = symmetrical 2 = asymmetrical / Orientation	Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk **Orientation** other than R = radial, e.g. N/S g = ground	Trunk Lean 1 = Upright-Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g. R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
21	*Syzygium smithii*	M	GV	G	MGVG - 10	C	8	8x4	2/N	80	300	1/R	1	No	No	P	2
					1			E/W		80	R	St					2
	Lilly Pilly	Comment: Trunk to 200mm, crown deliquescent, orientation E/W, asymmetrical bias to north.															
22	*Liquidambar styraciflua*	M	GV	G	MGVG - 10	C	8	8x4	2/S	80	300	1/R	1	No	No	P	2
					1			E/W		80	R	St					2
	Sweet Gum	Comment: Trunk to 1.8 metres, crown deliquescent, orientation E/W, asymmetrical bias to south.															

Observation/Discussion

5.2 The site has a stand of mature, planted, non-locally indigenous or exotic evergreen and deciduous taxa within the current proposal. The proposed design requires the retention and protection of nine (9) specimens within the site, neighbouring properties and adjacent road reserve as they are considered significant for their contribution as landscape elements to the property and the retention of these trees allows them as components of the current curtilage to be transferred to the new proposal, maintaining elements of a continuous landscape, providing a more harmonious integration and transition of the use of the land. The other specimens located within the site were within the proposed building envelope and are not able to be retained. They are recommended for removal and replacement with super advanced specimens in 75 or 100 litre bags size stock within more appropriate positions within the development. Replacement of these specimens needs to be mindful of their spatial requirements to allow them to grow to maturity and not be impeded by the built structure.

Tree Significance

5.3 Significant Trees as established by the Rating System for Tree Significance – IACA Stars (2010), Appendix A.

Significance Scale
1 – High
2 – Medium
3 – Low

Significance Scale	1	2	3
Redgum Tree No.	6, 8*, 9*, 15, 16*	1, 2, 3, 7, 10, 11, 13, 14x2, 17, 18, 19, 20, 21, 22	

Tree Retention Value

5.4 See Appendix A for Retention Value Matrix.

Retention Value
High – Priority for Retention
Medium – Consider for Retention
Low – Consider for Removal
Remove - Priority for Removal
* Trees located within the neighbouring property and should be retained and protected. Consent required from owner if removal required.

Retention Value	High Priority for Retention	Medium Consider for Retention	Low Consider for Removal	Remove Priority for Removal
Redgum Tree No.	6, 8*, 9*, 15, 16*	1, 2, 3, 7, 10, 11, 13, 14x2, 17, 18, 19, 20, 21, 22	4, 5, 12	

5.5 AS4970 (2009) section 3, 3.3.3 requires the Project Arborist to demonstrate that where a retained tree is subject to a major encroachment (>10% of area of TPZ) it can be protected to remain viable

5.6 Tree 1 *Jacaranda mimosifolia* - Jacaranda, this specimen was found in good health & vigour at time of assessment.

- *Trees viability to development; this specimen is impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. This specimen should remain viable beyond completion of development provided recommended installation & protection measures are adhered too.*

- *Development Impacts: AS4970 (2009) section 3 requires a Tree Protection Zone (TPZ) setback of 4.8 metres (m) from centre of trunk (COT), the setback for the proposed basement adjacent to this specimen is estimated at 3.4m from COT, which is a minor encroachment by the proposed development.*

Care will need to be exercised during the demolition of the existing driveway so as to not destabilize this specimen. The section of the basement within the TPZ of this specimen is to be constructed using a vertical cut with shotcrete and contiguous pilings to reduce any impact on its stability.

5.7 Tree 6, 8 7 9 *Nyssa sylvatica* - Black Gum, *Jacaranda mimosifolia* – Jacaranda & *Acer buergerianum* - Trident Maple, these neighbouring and street tree specimens were found in good health & vigour at time of assessment.

- *Trees viability to development; these specimens are not impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. These specimens should remain viable beyond completion of development provided recommended installation & protection measures are adhered too.*

- *Development Impacts: AS4970 (2009) section 3 requires a TPZ setback of 2.4m for Tree (T)6, 11.8 for T8 & 3.8 for T9 from centre of trunk (COT), the setback for the proposed development adjacent to these specimens is estimated at 5.6m, 15.0m & 10m respectively from COT. These specimens are sufficiently setback from the development to not be affected.*

5.8 Tree 12, 13 & 14x2 *Jacaranda mimosifolia* – Jacaranda & *Cupressus macrocarpa 'Leightons Green'* - Leightons Green Pine, these specimens were found in fair & good health & good vigour at time of assessment.

- *Trees viability to development; these specimens are not impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. These specimens should remain viable beyond completion of development provided recommended installation & protection measures are adhered too.*

- *Development Impacts: AS4970 (2009) section 3 requires a TPZ setback of 5.4m for T12 & 3.6m for T13 & T14 from COT, the setback for the proposed development adjacent to these specimens is estimated at 6.0m, 5.0m & 7.0m respectively from COT. These specimens are sufficiently setback from the development to not be affected.*

5.9 Tree 16 *Corymbia citriodora* - Lemon Scented Gum, this specimen was found in good health & vigour at time of assessment.

- *Trees viability to development; this specimen is impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. This specimen should remain viable beyond completion of development provided recommended installation & protection measures are adhered too.*

- *Development Impacts: AS4970 (2009) section 3 requires a TPZ setback of 6.0m from COT, the setback for the proposed development adjacent to this specimen is estimated at 5.0m from COT, which is a minor encroachment. The section of the basement within the TPZ of this specimen is to be constructed using a vertical cut with shotcrete and contiguous pilings to reduce any impact on its stability.*

Where associated infrastructure (pipe works) are to be installed within the Tree Protection Zone of any retained specimen, they are to be installed by hand with non-motorised machinery. If structural roots are found within the trench, they are to be left intact and dug around retaining the specimen's structural integrity. Works are to be undertaken in consultation with the project arborist.

There will be no impact to Tree 1, 6, 8, 9, 12, 13 & 14x2 with a minor encroachment for Tree 1 & 16 which are to be retained and protected as per AS 4970 (2009) Section 3. Any excavations within the Tree Protection Zone must be supervised and certified by the Project Arborist in accordance with AS4970 (2009).

General – Tree Protection works – Prior to Demolition

5.10 *Tree Management Plan* – Prior to demolition works, a site arborist shall be appointed to supervise all tree protection procedures detailed in this specification. The Site Arborist shall have a minimum level 5 AQF qualification in Arboriculture. Milestones are to be adhered to throughout the duration of this development and all relevant documentation is to be submitted to the local authority.

5.11 The Tree Protection Zone for each tree/s is to be incorporated into the construction works for the site and the protection fencing or works to be located as indicated on the Appendix F – Tree Protection Plan. The setbacks from building works on the side closest to each tree are to be carried out as indicated in Table 2.0, and Tree Protection Zones be constructed as described here and detailed in Appendix C. The trees will be sustained within the constraints of the modifications to the site by the proposed development works.

5.12 Trees 1, 6, 8, 9, 12, 13, 14x2 & 16 are to be retained and protected and incorporated into the landscape works for the site, and Tree Protection Zone fencing to be marked accordingly on the Landscape Plan, where appropriate and installed prior to any demolition or construction.

5.13 Ground protection - If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards. These measures may be applied to root zones beyond the TPZ.

5.14 Where applicable, any excavation for the establishment of a batter slope or benching for reasons of safety and to comply with Work Cover Authority safety regulations should be restricted as far as is safely possible near to trees to be retained to prevent root damage. If the excavations cannot be undertaken near to vertical the stability of these trees and their long-term viability may be compromised and their retention in a safe and healthy condition jeopardized and they may need to be revised and possibly removed.

Specific - Tree Protection Works - Prior to Demolition and Tree Removal

5.15 All other trees/shrubs; prior to demolition and tree removal works these tree/s are to be placed within a Tree Protection Zone with protective fencing and maintained and retained until the completion of all building works. Protective fencing is to be installed as shown in Appendix F - Tree Protection Plan.

- The Protective fencing where required may delineate the *Tree Protection Zone* (TPZ) and should be located as determined by the project arborist in accordance with AS4970 Protection of trees on development sites, Section 4, 4.3. "Fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition. Once erected, protective fencing must not be removed or altered without approval by the project arborist. The TPZ must be secured to restrict access. AS4687 Temporary fencing and hoardings specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area. Fence posts and supports should have a diameter greater than 20 mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of the protective fencing" or similar.

- Tree Protection signage is to be attached to each *TPZ* and displayed from within the development site in accordance with AS4970 2009 *Protection of trees on development sites*

- The area of the Tree Protection Zone to be mulched to a depth of 100 mm with organic material being 75% leaf litter and 25% wood, and this being composted material preferably from the same genus and species of tree as that to where the mulch is to be applied, i.e. species specific mulch. The depth of mulch and type as indicated, to be maintained for the duration of the project. Where deep excavation will expose the soil profile to drying out the root plate is to be protected by pegging jute matting across the ground surface 2 m back from the edge of the profile and 2 m down the face of the profile and is to be in one continuous sheet or layers up to 5 mm thick and overlapped 300 mm and pegged. Pegs are to be a minimum length of 200 mm and spaced at 500 mm increments in a grid pattern. Once installed mulch is to be placed on top of the jute matting previously described.

5.16 There is to be no storage of materials, rubbish, soil, equipment, structures or goods of any type to be kept or placed within 5 metres from the trunk or within the dripline of any tree for the duration of the development. This will ensure protection of the tree/s to be retained on or adjacent to site.

5.17 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens prior to demolition to inspect tree protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

Demolition and Tree Removal/s

5.18 Trees 2, 3, 4, 5, 7, 10, 11, 15 and 17 to 22 are to be removed as they are located within the site in a position where they cannot be retained due to the proposed building envelopes and its infrastructure such as excavation of the basement where encroachment will have an adverse impact on its roots and crown for viability and stability. They are recommended for removal and replacement with super advanced specimens in 75 or 100 litre bags size stock within more appropriate positions within the development. Replacement of these specimens needs to be mindful of their spatial requirements to allow them to grow to maturity and not be impeded by the built structure.

- Tree 3, 4, 5 & 7: *Nyssa sylvatica* - Black Gum, *Liquidambar styraciflua* - Sweet Gum & *Ulmus parvifolia* - Chinese Elm; located within the front setback of 16-20 Garthowen Crescent and positioned within the proposed building envelope. These specimens are not able to be retained due to the proposed development.

- Tree 2, 10 & 11: *Citharexylum spinosum* – Fiddlewood, *Cupressus macrocarpa 'Brunniana'* - Brunnings Cypress & *Acer buergerianum* - Trident Maple; located within the middle of the site and positioned within the proposed building envelope. . These specimens are not able to be retained due to the proposed development.

- Tree 15 and 17 to 22: *Brachychiton acerifolius* - Illawarra Flame Tree*, Liquidambar styraciflua* Sweet Gum & *Syzygium smithii* - Lilly Pilly; located within the front setback of 6-10 Garthowen Crescent and positioned within the proposed building envelope. These specimens are not able to be retained due to the proposed development.

5.19 Removal of a tree within 6 m of a tree to be retained should be undertaken only by cutting down such a tree without damaging the trees to be retained, and by grinding out its stump. Where possible the structural roots of 20 mm diameter or greater of the tree to be cut down should not be removed, to minimise soil disturbance and to reduce the impact on the roots of any tree to be retained nearby. Where structural roots are to be removed this should be undertaken manually by the use of non-motorized hand tools after the stump has been ground out when such roots are often easier to locate from the site of the stump from which they have been severed.

5.20 Ground protection in accordance with AS4970 section 4, 4.5.3 may require steel plates to protect the ground surface from compaction to protect roots between the stages of demolition and construction of the new pavement.

Specific - Tree Protection works **–** Post Demolition and Prior to Construction

5.21 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens prior to construction in relation to tree protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

5.22 Location of underground utilities within a Tree Protection Zone of a retained specimen.
Any utility services to be located underground within the TPZ are to be undertaken utilising excavation techniques that prevent or minimise damage to structural roots (roots greater than >20 mm diameter). To prevent soil compaction and root damage these works should be conducted with non-motorised hand tools, air knife or directional drilling.

5.23 Re-grading of site near retained trees; Grading &/or re-grading of sites/slopes within Tree Protection Zones or near retained specimens is to be undertaken only if at all, after consultation with the Project Arborist. This is to protect all structural roots systems from damage or compaction from machinery.

5.24 Placement of relocatable buildings; consideration should be given to tree sensitivity such as the buildings being placed on pier and beam or skids construction as they are to be positioned now on the eastern side of their driplines within the Tree Protection Zone (TPZ). The area of the Tree Protection Zone under the buildings is to be mulched to a depth of 200 mm (*if installed on skids*) with organic material to further reduce compaction. The mulch is to be composted material, i.e. species specific mulch. Alternatively, if installed on a pier & beam construction, piers are to be undertaken manually by using non-motorized hand tools to determine the location of first order and lower order structural roots with a diameter of 20 mm (*structural woody roots*) or greater, without damaging them.

Specific - Tree Protection works **–** During Construction

5.25 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens during construction in relation to tree protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

5.26 Where any structural roots (roots with a diameter of greater than >20 mm) encountered by excavation are to be pruned and it is to be undertaken with clean sharp pruning tools, with a final cut to undamaged wood to prevent infestation by pathogens and assist continued root growth and undertaken in consultation with the Consulting Arboriculturist. Tree Protection Zone fences are to be maintained during these works. Ground protection in accordance with AS4970 section 4, 4.5.3 may require steel plates to protect the ground surface from compaction to protect roots between the stages of demolition and construction of the new pavement.

5.27 All Tree Protection Zones of retained trees are to be monitored for the duration of the construction phase of the development. The three main areas requiring monitoring are; *mulching* - mulch must be maintained to a depth of 50–100 mm using material that complies with AS 4454. Where the existing landscape within the TPZ is to remain unaltered (e.g. garden beds or turf) mulch may not be required, *Watering* - soil moisture levels should be regularly monitored by the project arborist. Temporary irrigation or watering may be required within the TPZ. An above-ground irrigation system could be installed and maintained by a competent individual and *weeding* - weeds should be removed by hand without disturbing soil or should be controlled with weedicide.

5.28 Trees to be removed are to be replaced with advanced specimens being mindful of the space limitations of the new use of the site. The advanced trees should be located in areas along the boundaries of the site. The planting in these locations will provide the maximum benefit to the surrounding properties by screening views to and from the site and the plantings included in the proposed landscape plan. The replacement trees will be located in positions where they may grow to maturity unhindered and will not conflict with built structures or utility services and in greater numbers than the trees removed should provide a net increase in the local amenity.

Specific - Tree Protection works **–** Post Construction

5.29 At completion of construction work the Site/Project Arborist should carry out an assessment of all trees retained &/or affected by works. This assessment is to document and any required on-going remedial care needed to ensure viable retention of trees affected. Documentation is to be submitted to the consenting authority.

6.0 CONCLUSION

Fourteen (14) trees are nominated for removal and replacement with species in accordance with the associated Landscape documentation for the development. The nine (9) trees to be preserved will be retained and protected through the implementation of adequate measures for their integration into the development by the application of appropriate technology as detailed in this report. Where appropriate, the Landscape Plan will include planting with new trees including street tree/s.

It is often a consequence of redevelopment, and subject to the nature of the proposed land use that some or all of the trees present on the site prior to that redevelopment may be required to be removed and replaced with new tree plantings in different locations. This may be dependent upon the type of development and its design constraints and the requirements of the local planning instruments and any Landscape Design Codes if existing. Where tree removal is required for this development, it is considered that those trees identified within this report are not sustainable within the context of the proposed development. Where tree retention has been considered, those trees are expected to survive the redevelopment process and remain stable and viable. The retention and protection of existing trees on site is a significant aspect of the development process, allowing those trees as components of the current curtilage to be transferred to the new development for incorporation into the landscaping works for the site. The retention of some or all of the existing trees contributes to: the preservation of local amenity, screening of views to and from the site, and a balance to the scale and bulk of buildings, while maintaining elements of a continuous landscape, providing a more harmonious integration and transition of the use of the land.

If all the recommendations and procedures detailed herein are adhered to, some or all of the trees the subject of this report will continue, or will be replaced with more appropriate plantings in suitable locations, or enhanced by additional new plantings, and will grow to develop as important landscape components providing elements of long term amenity for the property and its owners or occupants, and the local community.

The recommendations made in this report are subject to approval by the consent authority.

As a renewable and dynamic natural resource the urban tree and the growing environment essential for its survival must be understood and carefully managed to balance its needs with those of people. It is crucial that as required: this resource be planned for, planted, nurtured, protected, maintained and replaced, to ensure appropriateness and suitability of new plantings and trees retained, for safety and viability, so that it remains vital, and is sustainable in continuity.

7.0 RECOMMENDATIONS

7.1 Trees 1, 6, 8, 9, 12, 13, 14x2 & 16 are to be retained in situ within the site and are to be protected as detailed in 5.6 - 5.17 & 5.20 - 5.29. Tree protection fences, or works, to be located in accordance with *Site Plan B - Trees To Be Retained And Tree Protection Zones* (Appendix F).

7.2 Where Tree Protection Zone fences are to be moved or relocated this must be undertaken in consultation with the Consultant Arboriculturist for the project to ensure that tree protection is maintained. If the fences are relocated areas are to be mulched in accordance with 5.15 of this report to reduce compaction to the root system of the retained specimens.

7.3 To minimise damage to retained crowns, all Tree Protection Zones are to be adhered to. This must be undertaken in consultation with the Consultant Arboriculturist for the project to ensure that tree protection is maintained. Minor pruning may be required if damage occurs, work is to be undertaken in accordance with section 4 of this report.

7.4 *Milestones* - Project/Site arborist is to inspect/assess all retained specimens prior to Demolition and Tree Removal, Post Demolition, Prior to Construction during Construction and on completion in relation to trees protected and the protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

7.5 Trees 2, 3, 4, 5, 7, 10, 11, 15 and 17 to 22 are to be removed which is to be undertaken in accordance with section 4.0, parts 4.1 - 4.3.

7.6 Tree removal near retained specimens is to be undertaken in accordance with 5.19 of this report.

7.7 Any work to be undertaken within Tree Protection Zones is to be undertaken in accordance 7.2 of this report.

7.8 There is to be no storage of materials, rubbish, soil, equipment, structures or goods of any type to be kept or placed within 5 metres from the trunk or within the dripline of any tree for the duration of the development. This will ensure protection of the tree/s to be retained on or adjacent to site.

7.9 Each of the replacement are to be a vigorous specimen with a straight trunk, gradually tapering and continuous, crown excurrent, symmetrical, with roots established but not pot bound in a volume container or approved similar and be maintained by an appropriately qualified and experienced landscape contractor for up to one (1) year after planting, or as appropriate.

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3. Standards Australia 2007, *Australian Standard 4373 Pruning of amenity trees*, Standards Australia, Sydney, Australia.
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Appendix A

IACA Significance of a Tree, Assessment Rating System (STARS) © (IACA 2010)©

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High*, *Medium* and *Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined.

Tree Significance - Assessment Criteria

1. High Significance in landscape

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa *in situ* - tree is appropriate to the site conditions.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

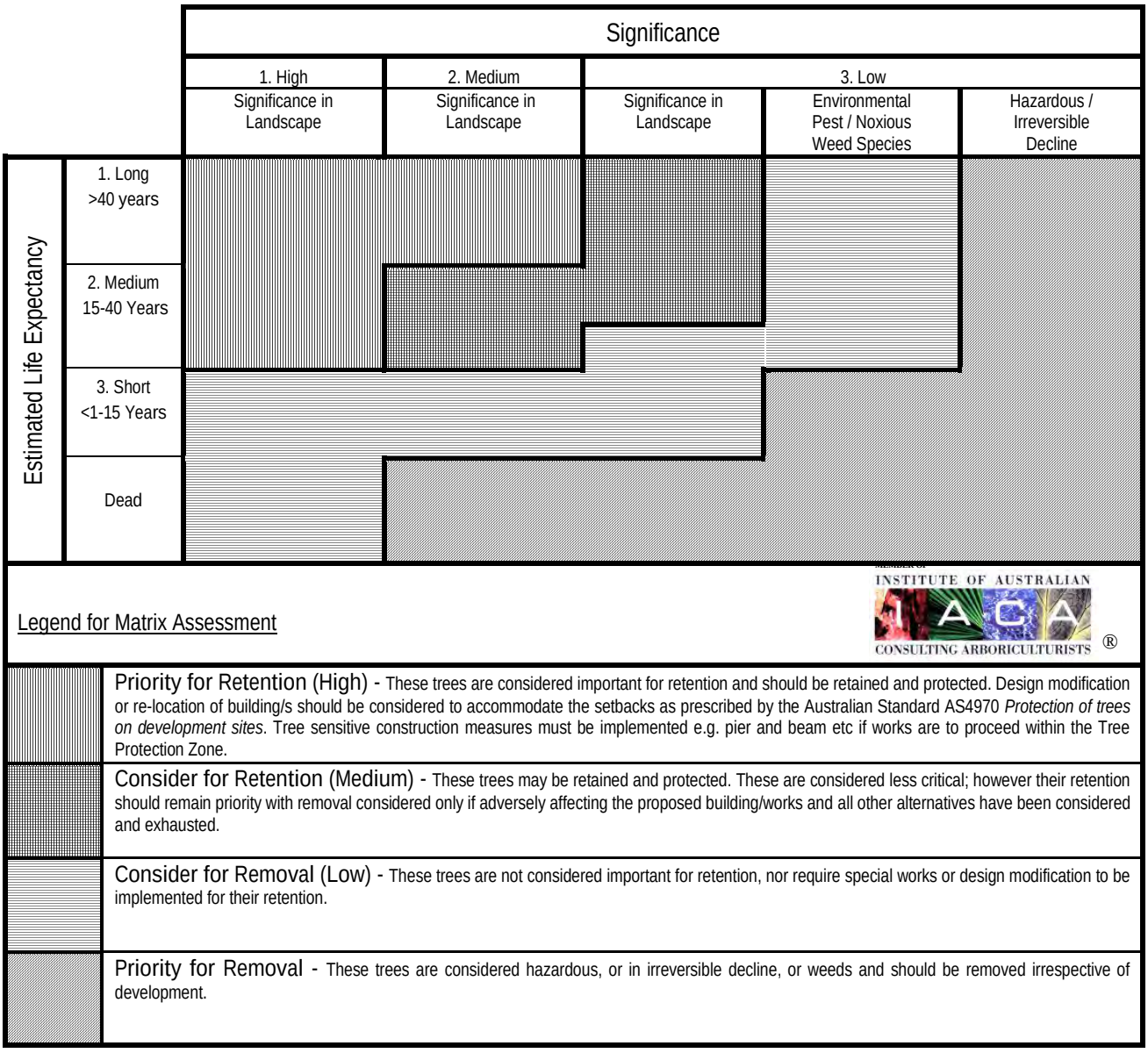
Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g. hedge.

Table 1.0 Tree Retention Value - Priority Matrix.



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Footprint Green Pty Ltd 2001, *Footprint Green Tree Significance & Retention Value Matrix*, Avalon, NSW Australia, www.footprintgreen.com.au

Appendix B

Matrix - Sustainable Retention Index Value (SRIV) ©

Version 4, 2010

Developed by IACA – Institute of Australian Consulting Arboriculturists www.iaca.org.au

The matrix is to be used with the value classes defined in the Glossary for Age / Vigour / Condition.
An index value is given to each category where ten (10) is the highest value.

Age Class	Vigour Class and Condition Class					
	Good Vigour & Good Condition (GVG)	Good Vigour & Fair Condition (GVF)	Good Vigour & Poor Condition (GVP)	Low Vigour & Good Condition (LVG)	Low Vigour & Fair Condition (LVF)	Low Vigour & Poor Condition (LVP)
	Able to be retained if sufficient space available above and below ground for future growth. No remedial work or improvement to growing environment required. May be subject to high vigour. Retention potential - Medium – Long Term.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work may be required or improvement to growing environment may assist. Retention potential - Medium Term. Potential for longer with remediation or favourable environmental conditions.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work unlikely to assist condition, improvement to growing environment may assist. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. No remedial work required, but improvement to growing environment may assist vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment may assist condition and vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	Unlikely to be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment unlikely to assist condition or vigour. Retention potential - Likely to be removed immediately or retained for Short Term. Potential for longer with remediation or favourable environmental conditions.
(Y) Young	YGVG - 9 Index Value 9 Retention potential - Long Term. Likely to provide minimal contribution to local amenity if height <5 m. High potential for future growth and adaptability. Retain, move or replace.	YGVF - 8 Index Value 8 Retention potential - Short – Medium Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium-high potential for future growth and adaptability. Retain, move or replace.	YGVP - 5 Index Value 5 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Low-medium potential for future growth and adaptability. Retain, move or replace.	YLVG - 4 Index Value 4 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium potential for future growth and adaptability. Retain, move or replace.	YLVF - 3 Index Value 3 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Low-medium potential for future growth and adaptability. Retain, move or replace.	YLVP - 1 Index Value 1 Retention potential - Likely to be removed immediately or retained for Short Term. Likely to provide minimal contribution to local amenity if height <5 m. Low potential for future growth and adaptability.
(M) Mature	MGVG - 10 Index Value 10 Retention potential - Medium - Long Term.	MGVF - 9 Index Value 9 Retention potential - Medium Term. Potential for longer with improved growing conditions.	MGVP - 6 Index Value 6 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVG - 5 Index Value 5 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVF - 4 Index Value 4 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVP - 2 Index Value 2 Retention potential - Likely to be removed immediately or retained for Short Term.
(O) Over-mature	OGVG - 6 Index Value 6 Retention potential - Medium - Long Term.	OGVF - 5 Index Value 5 Retention potential - Medium Term.	OGVP - 4 Index Value 4 Retention potential - Short Term.	OLVG - 3 Index Value 3 Retention potential - Short Term. Potential for longer with improved growing conditions.	OLVF - 2 Index Value 2 Retention potential - Short Term.	OLVP - 0 Index Value 0 Retention potential - Likely to be removed immediately or retained for Short Term.

Appendix C

Extract from Australian Standard
AS4970 2009 Protection of trees on development sites

Section 3, Determining the tree protection zones of the selected trees

3.1 Tree protection zone (TPZ)

"The tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.

The TPZ incorporates the structural root zone (SRZ) (refer to Clause 3.3.5)."

3.2 Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

TPZ = DBH x 12

where

DBH = trunk diameter measured at 1.4 m above ground

Radius is measured from the centre of the stem at ground level.

3.3.5 Structural root zone (SRZ)

"The SRZ is the area required for street stability. A larger area is required to maintain a viable tree. The SRZ only needs to be calculated when a major encroachment into a TPZ is proposed. Root investigation may provide more information on the extent of these roots."

Determining the SRZ

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

SRZ radius = $(D \times 50)^{0.42} \times 0.64$

where

D = trunk diameter, in metres, measured above the root buttress.

Note: The SRZ for trees with trunk diameters less than 0.15 m will be 1.5 m (see Figure 1).

The curve can be expressed by the following formula:

$R_{SRZ} = (D \times 50)^{0.42} \times 0.64$

NOTES:

1 R_{SRZ} is the structural root zone radius.
2 D is the stem diameter measured immediately above root buttress.
3 The SRZ for trees less than 0.15 m diameter is 1.5 m.
4 The SRZ formula and graph do not apply to palms, other monocots, cycads and tree ferns.
5 This does not apply to trees with an asymmetrical root plate.

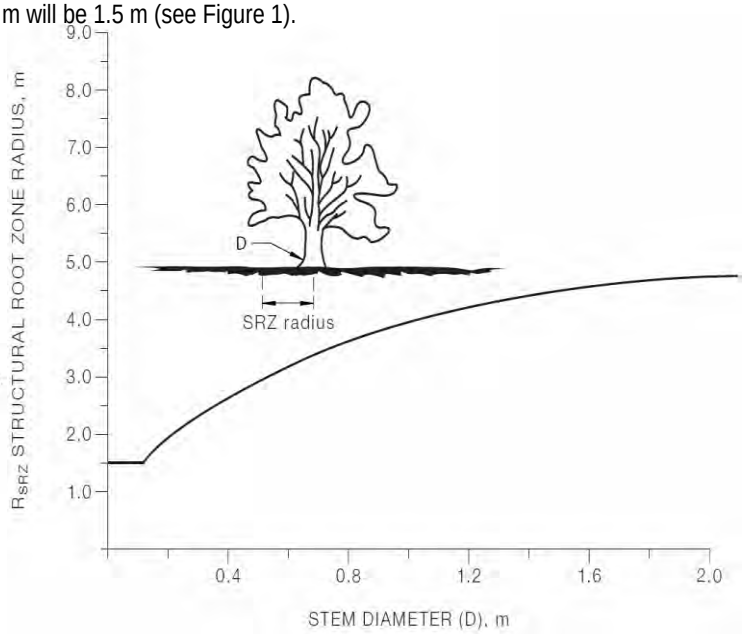


FIGURE 1 STRUCTURAL ROOT ZONE

Appendix D

Glossary

From

Dictionary for Managing Trees in Urban Environments by Draper BD and Richards PA 2009, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Age of Trees

Age Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as *Young*, *Mature* and *Over-mature* (British Standards 1991, p. 13, Harris *et al*, 2004, p. 262).

Young Tree aged less than <20% of life expectancy, *in situ*.

Mature Tree aged 20-80% of life expectancy, *in situ*.

Over-mature Tree aged greater than >80% of life expectancy, *in situ,* or *senescent* with or without reduced *vigour*, and declining gradually or rapidly but irreversibly to death.

Condition of Trees

Condition A tree's *crown form* and growth habit, as modified by its *environment* (aspect, suppression by other trees, soils), the *stability* and *viability* of the *root plate*, trunk and structural branches (first (1st) and possibly second (2nd) order branches), including structural defects such as wounds, cavities or hollows, *crooked* trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with *vigour* and it is possible for a tree to be of *normal vigour* but in *poor condition*. Condition can be categorized as *Good Condition*, *Fair Condition*, *Poor Condition* and *Dead*.

Good Condition Tree is of good habit, with *crown form* not severely restricted for space and light, physically free from the adverse effects of *predation* by pests and diseases, obvious instability or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent from, or contributed to by vigour.

Fair Condition Tree is of good habit or *misshapen*, a form not severely restricted for space and light, has some physical indication of *decline* due to the early effects of *predation* by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the *environment* essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent from, or contributed to by vigour.

Poor Condition Tree is of good habit or *misshapen*, a form that may be severely restricted for space and light, exhibits symptoms of advanced and *irreversible decline* such as fungal, or bacterial infestation, major die-back in the branch and *foliage crown*, *structural deterioration* from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local *environment* that would normally be sufficient to provide for its basic survival if in *good* to *fair* condition. Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and *predation* by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent from, or contributed to by vigour.

Senescent / Moribund Advanced state of decline, dying or nearly dead.

Dead Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms;
Processes
Photosynthesis via its foliage crown (as indicated by the presence of moist, green or other coloured leaves);
Osmosis (the ability of the root system to take up water);
Turgidity (the ability of the plant to sustain moisture pressure in its cells);
Epicormic shoots or *epicormic strands* in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a *lignotuber*);
Symptoms
Permanent leaf loss;
Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots);
Abscission of the *epidermis* (bark desiccates and peels off to the beginning of the sapwood).

Removed No longer present, or tree not able to be located or having been cut down and retained on a site, or having been taken away from a site prior to site inspection.

Branch

Branch An elongated woody structure arising initially from the trunk to support leaves, flowers, fruit and the development of other branches. A branch may itself fork and continue to divide many times as successive *orders of branches* with the length and taper decreasing incrementally to the *outer extremity* of the *crown*. These may develop initially as a gradually tapering continuation of the *trunk* with minimal division as in a *young* tree or a tree of *excurrent habit*, or in a *sapling*, or may arise where the trunk terminates at or some distance from the *root crown*, dividing into *first order branches* to form and support the *foliage crown*. In an *acaulescent* tree, branches arise at or near the *root crown*. Similarly branches may arise from a *sprout mass* from damaged *roots*, *branches* or *trunk*.

Orders of branches The marked divisions between successively smaller branches (James 2003, p. 168) commencing at the initial division where the trunk terminates on a *deliquescent* tree or from *lateral* branches on an *excurrent* tree. Successive branching is generally characterised by a gradual reduction in branch diameters at each division, and each gradation from the trunk can be categorised numerically, e.g. first order, second order, third order etc. (See Figure 21.)

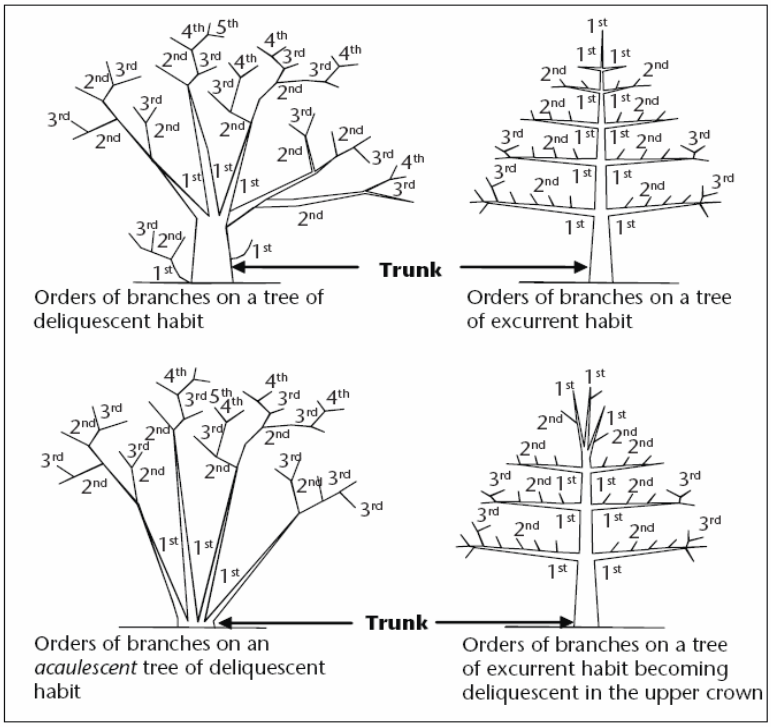


Figure 21 Orders of branches

Crown

Canopy 1. Of multiple trees, the convergence, or merging in full or part, of the crowns of two or more trees due to their proximity, or where competition for light and space available in a forest environment is limited as each tree develops forming a continuous layer of foliage. 2. Used as a plural for crown. 3. Sometimes synonymously used for crown (USA).

Crown Of an individual tree all the parts arising above the trunk where it terminates by its division forming branches, e.g. the branches, leaves, flowers and fruit; or the total amount of foliage supported by the branches. The crown of any tree can be divided vertically into three sections and can be categorised as *lower crown*, *mid crown* and *upper crown* (Figure 8). For a *leaning* tree these can be divided evenly into crown sections of one-third from the *base* to *apex*. The volume of a crown can be categorised as the *inner crown*, *outer crown* and *outer extremity of crown*.

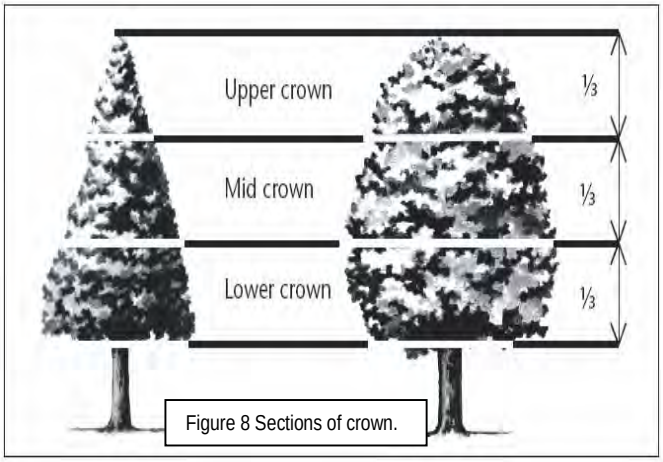


Figure 8 Sections of crown.

Lower crown The *proximal* or lowest section of a crown when divided vertically into one-third (⅓) increments. See also *Crown*, *Mid crown* and *Upper crown*.

Mid crown The middle section of a crown when divided vertically into one-third (⅓) increments. See also *Crown*, *Lower crown* and *Upper crown*.

Upper crown The *distal* or highest section of a crown when divided vertically into one-third (⅓) increments. See also *Crown*, *Mid crown* and *Lower crown*.

Crown Projection (CP) Area within the *dripline* or beneath the lateral extent of the *crown* (Geiger 2004, p. 2). See also *Crown spread* and *Dripline*.

Dripline A line formed around the edge of a tree by the lateral extent of the *crown*. Such a line may be evident on the ground with some trees when exposed soil is displaced by rain shed from the crown. See also *Crown Projection*.

Crown Form of Trees

Crown Form The shape of the crown of a tree as influenced by the availability or restriction of space and light, or other contributing factors within its growing environment. Crown Form may be determined for tree shape and habit generally as *Dominant*, *Codominant*, *Intermediate*, *Emergent*, *Forest* and *Suppressed*. The habit and shape of a *crown* may also be considered qualitatively and can be categorized as *Good Form* or *Poor Form*.

Good Form Tree of *typical* crown shape and habit with proportions representative of the taxa considering constraints such as origin e.g. indigenous or exotic, but does not appear to have been adversely influenced in its development by environmental factors in situ such as *soil water* availability, prevailing wind, or cultural practices such as lopping and competition for space and light.

Poor Form Tree of *atypical* crown shape and habit with proportions not representative of the species considering constraints and appears to have been adversely influenced in its development by environmental factors in situ such as *soil water* availability, prevailing wind, cultural practices such as lopping and competition for space and light; causing it to be *misshapen* or disfigured by disease or vandalism.

Crown Form Codominant Crowns of trees restricted for space and light on one or more sides and receiving light primarily from above e.g. constrained by another tree/s or a building.

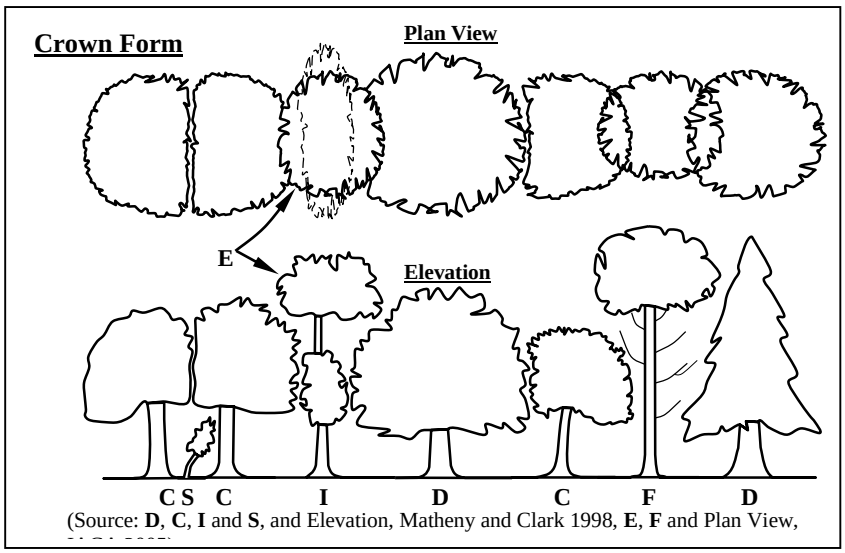
Crown Form Dominant Crowns of trees generally not restricted for space and light receiving light from above and all sides.

Crown Form Emergent Crowns of trees restricted for space on most sides receiving most light from above until the *upper crown* grows to protrude above the canopy in a stand or forest environment. Such trees may be *crown form dominant* or transitional from *crown form intermediate* to *crown form forest* asserting both *apical dominance* and *axillary dominance* once free of constraints for space and light.

Crown Form Forest Crowns of trees restricted for space and light except from above forming tall trees with narrow spreading crowns with foliage restricted generally to the top of the tree. The trunk is usually erect, straight and continuous, tapering gradually, crown often excurrent, with first order branches becoming structural, supporting the live crown concentrated towards the top of the tree, and below this point other first order branches arising radially with each *inferior* and usually temporary, divergent and ranging from horizontal to ascending, often with internodes exaggerated due to competition for space and light in the *lower crown*.

Crown Form Intermediate Crowns of trees restricted for space on most sides with light primarily from above and on some sides only.

Crown Form Suppressed Crowns of trees generally not restricted for space but restricted for light by being *overtopped* by other trees and occupying an understorey position in the canopy and growing slowly.



(Source: **D**, **C**, **I** and **S**, and Elevation, Matheny and Clark 1998, **E**, **F** and Plan View,

Deadwood

Deadwood Dead branches within a tree's crown and considered quantitatively as separate to *crown cover* and can be categorised as *Small Deadwood* and *Large Deadwood* according to diameter, length and subsequent *risk* potential. The amount of dead branches on a tree can be categorized as *Low Volume Deadwood*, *Medium Volume Deadwood* and *High Volume Deadwood*. See also *Dieback.*

Deadwooding Removing of dead branches by *pruning*. Such pruning may assist in the prevention of the spread of *decay* from *dieback* or for reasons of safety near an identifiable target.

Small Deadwood A dead branch up to 10mm diameter and usually <2 metres long, generally considered of low *risk* potential.
Large Deadwood A dead branch >10mm diameter and usually >2 metres long, generally considered of high *risk* potential.
High Volume Deadwood High Volume Deadwood Where >10 dead branches occur that may require *removal*.
Medium Volume Deadwood Where 5-10 dead branches occur that may require *removal*.
Low Volume Deadwood Where <5 dead branches occur that may require *removal*.

Dieback

Dieback The death of some areas of the *crown*. Symptoms are leaf drop, bare twigs, dead branches and tree death, respectively. This can be caused by root damage, root disease, bacterial or fungal canker, severe bark damage, intensive grazing by insects, *abrupt changes* in growth conditions, drought, water-logging or over-maturity. Dieback often implies reduced *resistance, stress* or *decline* which may be temporary. Dieback can be categorized as *Low Volume Dieback*, *Medium Volume Dieback* and *High Volume Dieback*.

High Volume Dieback Where >50% of the *crown cover* has died.
Medium Volume Dieback Where 10-50% of the *crown cover* has died.
Low Volume Dieback Where <10% of the *crown cover* has died. See also *Dieback*, *High Volume Dieback* and *Medium Volume Dieback*.

Epicormic shoots

Epicormic Shoots Juvenile shoots produced at branches or trunk from *epicormic strands* in some Eucalypts (Burrows 2002, pp. 111-131) or sprouts produced from dormant or latent buds concealed beneath the bark in some trees. Production can be triggered by fire, pruning, wounding, or root damage but may also be as a result of *stress* or *decline*. Epicormic shoots can be categorized as *Low Volume Epicormic Shoots*, *Medium Volume Epicormic Shoots* and *High Volume Epicormic Shoots*.

High Volume Epicormic Shoots Where >50% of the *crown cover* is comprised of live *epicormic shoots*.
Medium Volume Epicormic Shoots Where 10-50% of the *crown cover* is comprised of live *epicormic shoots*.
Low Volume Epicormic Shoots Where <10% of the c*rown cover* is comprised of live *epicormic shoots*.

General Terms

Cavity A usually shallow void often localized initiated by a *wound* and subsequent *decay* within the trunk, branches or roots, or beneath bark, and may be enclosed or have one or more opening.

Decay Process of degradation of wood by microorganisms (Australian Standard 2007, p. 6) and fungus.

Hazard The threat of danger to people or property from a tree or tree part resulting from changes in the physical condition, growing environment, or existing physical attributes of the tree, e.g. included bark, soil erosion, or thorns or poisonous parts, respectively.

Included bark 1. The bark on the inner side of the *branch union*, or is within a concave *crotch* that is unable to be lost from the tree and accumulates or is trapped by *acutely divergent* branches forming a *compression fork*. 2. Growth of bark at the interface of two or more branches on the inner side of a branch union or in the crotch where each branch forms a branch collar and the collars roll past one another without forming a graft where no one collar is able to subsume the other. Risk of failure is worsened in some taxa where branching is *acutely divergent* or *acutely convergent* and ascending or erect.

Hollow A large void initiated by a *wound* forming a *cavity* in the trunk, branches or roots and usually increased over time by *decay* or other contributing factors, e.g. fire, or fauna such as birds or insects e.g. ants or termites. A hollow can be categorized as an *Ascending Hollow* or a *Descending Hollow*.

Risk The random or potentially foreseeable possibility of an episode causing harm or damage.

Significant Important, weighty or more than ordinary.

Significant Tree A tree considered important, weighty or more than ordinary. Example: due to prominence of location, or *in situ*, or contribution as a component of the overall landscape for *amenity* or aesthetic qualities, or *curtilage* to structures, or importance due to uniqueness of taxa for species, subspecies, variety, *crown form*, or as an historical or cultural planting, or for age, or substantial dimensions, or habit, or as *remnant vegetation*, or habitat potential, or a rare or threatened species, or uncommon in cultivation, or of aboriginal cultural importance, or is a commemorative planting.

Substantial A tree with large dimensions or proportions in relation to its place in the landscape.

Sustainable Retention Index Value (SRIV) A visual tree assessment method to determine a qualitative and numerical rating for the viability of urban trees for development sites and management purposes, based on general tree and landscape assessment criteria using classes of *age*, *condition* and *vigour*. SRIV is for the professional manager of urban trees to consider the tree *in situ* with an assumed knowledge of the *taxon* and its growing environment. It is based on the physical attributes of the tree and its response to its environment considering its position in a matrix for age class, vigour class, condition class and its sustainable retention with regard to the safety of people or damage to property. This also factors the ability to retain the tree with remedial work or beneficial modifications to its growing environment or removal and replacement. SRIV is supplementary to the decision made by a tree management professional as to whether a tree is retained or removed (IACA - Institute of Australian Consulting Arboriculturists 2005).

Visual Tree Assessment (VTA) A visual inspection of a tree from the ground based on the principle that, when a tree exhibits apparently superfluous material in its shape, this represents repair structures to rectify *defects* or to reinforce weak areas in accordance with the *Axiom of Uniform Stress* (Mattheck & Breloer 1994, pp. 12-13, 145). Such assessments should only be undertaken by suitably competent practitioners.

Leaning Trees

Leaning A tree where the *trunk* grows or moves away from upright. A lean may occur anywhere along the *trunk* influenced by a number of contributing factors e.g. genetically predetermined characteristics, competition for space or light, prevailing winds, aspect, slope, or other factors. A *leaning* tree may maintain a *static lean* or display an increasingly *progressive lean* over time and may be hazardous and prone to *failure* and *collapse*. The degrees of leaning can be categorized as *Slightly Leaning*, *Moderately Leaning*, *Severely Leaning* and *Critically Leaning*.

Slightly Leaning A leaning tree where the trunk is growing at an angle within 0^{O}-15^{O} from upright.
Moderately Leaning A leaning tree where the trunk is growing at an angle within 15^{O}-30^{O} from upright.
Severely Leaning A leaning tree where the trunk is growing at an angle within 30^{O}-45^{O} from upright.
Critically Leaning A leaning tree where the trunk is growing at an angle greater than $>45^{O}$ from upright.
Progressively Leaning A tree where the degree of *leaning* appears to be increasing over time.
Static Leaning A leaning tree whose lean appears to have stabilized over time.

Periods of Time

Periods of Time The life span of a tree in the urban environment may often be reduced by the influences of encroachment and the dynamics of the environment and can be categorized as *Immediate*, *Short Term*, *Medium Term* and *Long Term*.

Immediate An *episode* or occurrence, likely to happen within a twenty-four (24) hour period, e.g. tree failure or collapse in full or part posing an imminent danger.
Short Term A period of time less than <1 – 15 years.
Medium Term A period of time 15 – 40 years.
Long Term A period of time greater than >40 years.

Roots

First Order Roots (FOR) Initial woody roots arising from the *root crown* at the base of the *trunk*, or as an *adventitious root mass* for structural support and *stability*. Woody roots may be buttressed and divided as a marked gradation, gradually tapering and continuous or tapering rapidly at a short distance from the root crown. Depending on soil type these roots may descend initially and not be evident at the root crown, or become buried by changes in soil levels. Trees may develop 4-11 (Perry 1982, pp. 197-221), or more first order roots which may radiate from the trunk with a relatively even distribution, or be prominent on a particular aspect, dependent upon physical characteristics e.g. leaning trunk, *asymmetrical* crown; and constraints within the growing *environment* from topography e.g. slope, soil depth, rocky outcrops, exposure to predominant wind, soil moisture, depth of *water table* etc.

Orders of Roots The marked divisions between woody roots, commencing at the initial division from the base of the trunk, at the *root crown* where successive branching is generally characterised by a gradual reduction in root diameters and each gradation from the trunk and can be categorized numerically, e.g. *first order roots*, second order roots, third order roots etc. Roots may not always be evident at the *root crown* and this may be dependent on species, age class and the growing environment. Palms at maturity may form an adventitious root mass.

Root Plate The entire root system of a tree generally occupying the top 300-600mm of soil including roots at or above ground and may extend laterally for distances exceeding twice the height of the tree (Perry 1982, pp. 197-221). Development and extent is dependent on water availability, soil type, *soil depth* and the physical characteristics of the surrounding landscape.

Root Crown Roots arising at the base of a trunk.

Zone of Rapid Taper The area in the *root plate* where the diameter of *structural roots* reduces substantially over a short distance from the *trunk.* Considered to be the minimum radial distance to provide structural support and *root plate* stability. See also *Structural Root Zone (SRZ)*.

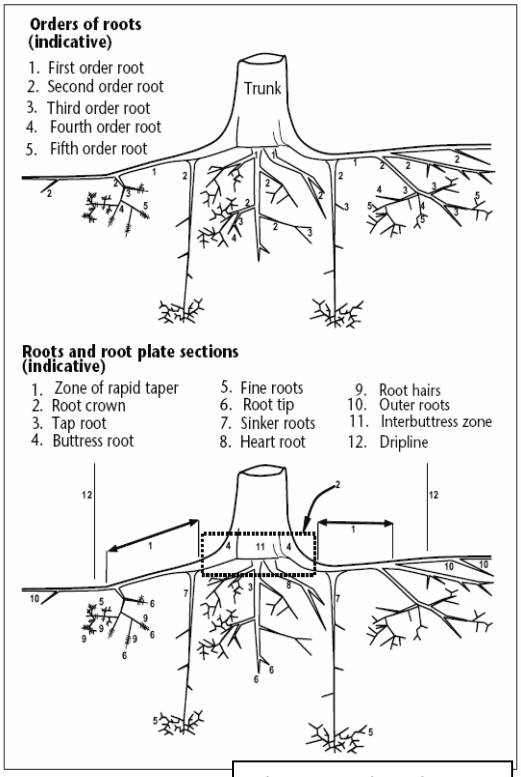


Figure 22 Orders of Roots.

Structural Roots Roots supporting the infrastructure of the *root plate* providing strength and *stability* to the tree. Such roots may taper rapidly at short distances from the *root crown* or become large and woody as with gymnosperms and dicotyledonous angiosperms and are usually 1st and 2nd order roots, or form an *adventitious root mass* in monocotyledonous angiosperms (palms). Such roots may be crossed and grafted and are usually contained within the area of *crown projection* or extend just beyond the *dripline*.

Symmetry

Symmetry Balance within a *crown,* or *root plate,* above or below the *axis* of the trunk of branch and foliage, and root distribution respectively and can be categorized as *Asymmetrical* and *Symmetrical*.

Asymmetrical Imbalance within a crown, where there is an uneven distribution of branches and the foliage *crown* or *root plate* around the vertical *axis* of the trunk. This may be due to *Crown Form Codominant* or *Crown From Suppressed* as a result of natural restrictions e.g. from buildings, or from competition for space and light with other trees, or from exposure to wind, or artificially caused by pruning for clearance of roads, buildings or power lines. An example of an expression of this may be, crown asymmetrical, bias to west.

Symmetrical Balance within a crown, where there is an even distribution of branches and the *foliage crown* around the vertical *axis* of the trunk. This usually applies to trees of *Crown Form Dominant* or *Crown Form Forest*. An example of an expression of this may be crown symmetrical.

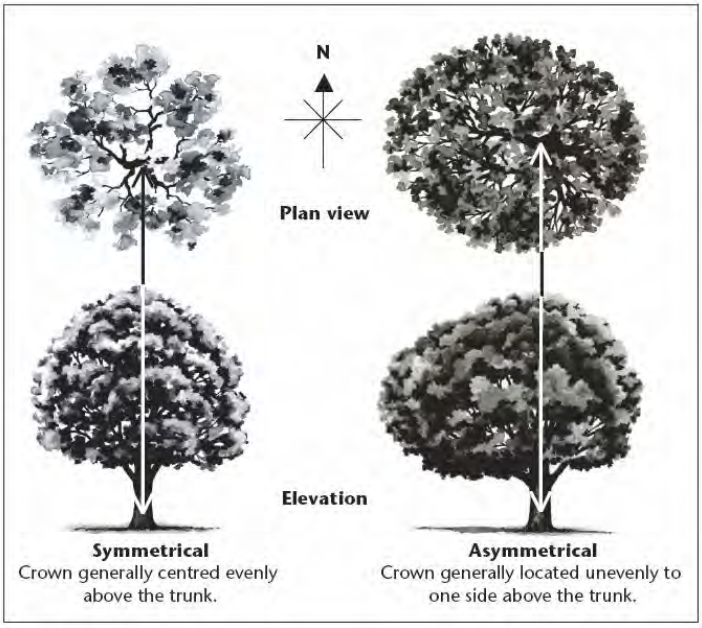


Figure 27 Symmetry within crown

Trunk

Trunk A single stem extending from the *root crown* to support or elevate the *crown*, terminating where it divides into separate *stems* forming *first order branches*. A trunk may be evident at or near ground or be absent in *acaulescent* trees of *deliquescent* habit, or may be continuous in trees of *excurrent* habit. The trunk of any *caulescent* tree can be divided vertically into three (3) sections and can be categorized as *Lower Trunk*, *Mid Trunk* and *Upper Trunk*. For a *leaning* tree these may be divided evenly into sections of one third along the trunk.

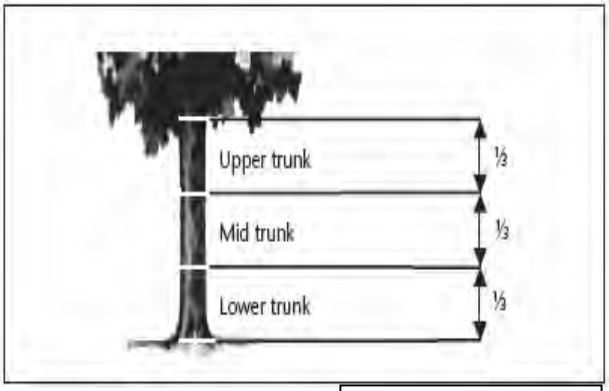


Figure 28 Trunk sections.

Acaulescent A *trunkless* tree or tree growth forming a very short *trunk*. See also *Caulescent.* (See Fig. 21)

Caulescent Tree grows to form a *trunk*. See also *Acaulescent*. (See Fig. 21)

Lower trunk Lowest, or *proximal* section of a trunk when divided into one-third (⅓) increments along its *axis*. See also *Trunk*, *Mid trunk* and *Upper trunk*.

Mid trunk A middle section of a trunk when divided into one-third (⅓) increments along its *axis*. See also *Trunk*, *Lower trunk* and *Upper trunk*.

Upper trunk Highest, or *distal* section of a trunk when divided into one-third (⅓) increments along its *axis*. See also *Trunk*, *Lower trunk* and *Mid trunk*.

Diameter at Breast Height (DBH) Measurement of trunk width calculated at a given distance above ground from the base of the tree often measured at 1.4 m. The trunk of a tree is usually not a circle when viewed in cross section, due to the presence of *reaction wood* or *adaptive wood*, therefore an average diameter is determined with a *diameter tape* or by recording the trunk along its narrowest and widest axes, adding the two dimensions together and dividing them by 2 to record an average and allowing the orientation of the longest axis of the trunk to also be recorded. Where a tree is growing on a lean the distance along the top of the trunk is measured to 1.4m and the diameter then recorded from that point perpendicular to the edge of the trunk. Where a *leaning* trunk is *crooked* a vertical distance of 1.4m is measured from the ground. Where a tree branches from a trunk that is less than 1.4m above ground, the trunk diameter is recorded perpendicular to the length of the *trunk* from the point immediately below the base of the flange of the *branch collar* extending the furthest down the trunk, and the distance of this point above ground recorded as *trunk* length. Where a tree is located on sloping ground the DBH should be measured at half way along the side of the tree to average out the angle of slope. Where a tree is *acaulescent* or *trunkless* branching at or near ground an average diameter is determined by recording the radial extent of the trunk at or near ground and noting where the measurement was recorded e.g. at ground.

Vigour

Vigour Ability of a tree to sustain its life processes. This is independent of the *condition* of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g. *dormant*, deciduous or semi-deciduous trees. Vigour can be categorized as *Normal Vigour, High Vigour*, *Low Vigour* and *Dormant Tree Vigour*.

Normal Vigour Ability of a tree to maintain and sustain its life processes. This may be evident by the *typical* growth of leaves, *crown cover* and *crown density*, branches, roots and trunk and *resistance* to *predation*. This is independent of the *condition* of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

High Vigour *Accelerated growth* of a tree due to incidental or deliberate artificial changes to its growing *environment* that are seemingly beneficial, but may result in *premature aging* or failure if the favourable conditions cease, or promote *prolonged senescence* if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feed lot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or some trees may achieve an extended lifespan from continuous *pollarding* practices over the life of the tree.

Low Vigour Reduced ability of a tree to sustain its life processes. This may be evident by the *atypical* growth of leaves, reduced *crown cover* and reduced *crown density*, branches, roots and trunk, and a deterioration of their functions with reduced *resistance* to *predation*. This is independent of the *condition* of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

Appendices E & F

Appendix E – Survey of Subject Tree/s
Appendix F – Tree Protection Plan

Trees the subject of this report are marked on the plans in the following appendices and are numbered as listed below. This report has relied upon the following plan/s and documents which have been reproduced from electronic transmission and no longer to original scale.

Redgum Tree No.	*Genus and species*	Common name	Recommendation
1	*Jacaranda mimosifolia*	Jacaranda	Retain & protect
2	*Citharexylum spinosum*	Fiddlewood	Remove and replace
3	*Nyssa sylvatica*	Black Gum	Remove and replace
4	*Liquidambar styraciflua*	Sweet Gum	Remove and replace
5	*Ulmus parvifolia*	Chinese Elm	Remove and replace
6	*Nyssa sylvatica*	Black Gum	Retain & protect – Street tree
7	*Nyssa sylvatica*	Black Gum	Remove and replace
8	*Jacaranda mimosifolia*	Jacaranda	Retain & protect – Neighbouring tree
9	*Acer buergerianum*	Trident Maple	Retain & protect – Neighbouring tree
10	*Cupressus macrocarpa 'Brunniana'*	Brunnings Cypress	Remove and replace
11	*Acer buergerianum*	Trident Maple	Remove and replace
12	*Jacaranda mimosifolia*	Jacaranda	Retain & protect
13	*Cupressus macrocarpa 'Leightons Green'*	Leightons Green Pine	Retain & protect
14/2	*Cupressus macrocarpa 'Leightons Green' x2*	Leightons Green Pine	Retain & protect
15	*Brachychiton acerifolius*	Illawarra Flame Tree	Remove and replace
16	*Corymbia citriodora*	Lemon Scented Gum	Retain & protect – Neighbouring tree
17	*Liquidambar styraciflua*	Sweet Gum	Remove and replace
18	*Liquidambar styraciflua*	Sweet Gum	Remove and replace
19	*Liquidambar styraciflua*	Sweet Gum	Remove and replace
20	*Liquidambar styraciflua*	Sweet Gum	Remove and replace
21	*Syzygium smithii*	Lilly Pilly	Remove and replace
22	*Liquidambar styraciflua*	Sweet Gum	Remove and replace

Plan Details

1. *Plan of Detail and Levels over Lots 23-25 & 28-30 in DP 222257, Project No. 41654DT, Sheet 2 of 3, Drawing No:. 210184, Date 06/11/15, Revision C, Ref: 42619, Scale 1:200 @ A1 by LTS Lockley, Locked Bag 5, Gordon NSW 2072. T: 1300 587 000*
2. *The Master Plan, section 4.2 of the proposal supplied on 05.16.2016 by Caladines Town Planning Pty Ltd. M: 0413 597 295 E: caladines@optusnet.com.au*

Appendix E - Site Plan A – Survey of Subject Trees

Plan has been reproduced from electronic transmission and is no longer to original scale.

Legend

- Trees numbered in orange are recommended for retention.
- Trees numbered in blue are recommended for removal.

Note: trees indicated, unnumbered are either shrubs, or trees of species, of dimensions, or condition class not protected by the Tree Preservation Order.

Appendix F - Site Plan B
Survey of Trees to be Retained and Tree Protection Plan

Plan has been reproduced from electronic transmission and is no longer to original scale.
For other tree protection measures see sections 5.0 and 7.0. All Tree Protection Zones are to be measured on site.

Legend

Tree Protection Zone (TPZ), fencing with setbacks as indicated, or other protection measures or works as indicated.

Tree Protection Zone, area of special protection measures or works outside of fenced area.

Tree numbers – trees to be retained only.
Subject trees represented by the approximate location of the trunk.

Indicative location of Tree Protection fencing which is to be measured on site and positioned along the Tree Protection Zone, excavation zone or proposed building footprint and to remain installed for the duration of the development. Installation of boundary fences within rootzone to be of pier and beam construction. Red dotted Tree Protection around trees relates to relocation of fencing when construction is to be undertaken within these areas. All works to be carried out within the blue Tree Protection area after works commences is to be undertaken in consultation with site arboriculturist.