Appendix 7

Traffic Assessment

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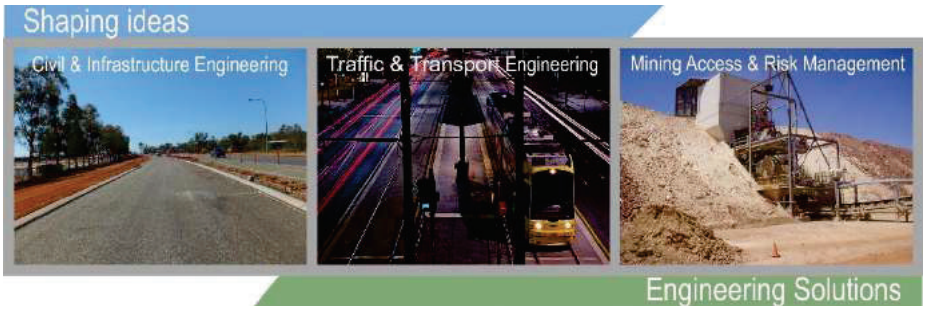
CONSULTING CIVIL & TRAFFIC ENGINEERS, RISK MANAGERS.



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FIGURES

TABLES

1. Summary

TPG Town Planning has developed a Subdivision Concept Plan on behalf of Defence Housing Australia for 16 McDonald Road, Baldivis. The subject site is located in the City of Rockingham, approximately 7.5 kilometres south-east from the Rockingham Town Centre, and 40 kilometres south of the Perth CBD.

This Transport Assessment has been prepared by Shawmac Pty Ltd to support the Subdivision Concept Plan and outlines the likely impact of the proposed subdivision on network traffic flows, safe access, pedestrian and cycle facilities and local amenity.

The eastern section of subject site is currently zoned "Development" under the City of Rockingham *Town Planning Scheme No 2 (TPS 2).* The subdivision proposes 29 single dwellings with a series of local access roads servicing the properties. The western section of the site is zoned "Rural" under TPS 2 and will accommodate an access road and remain a surplus lot.

McDonald Road forms the eastern boundary to the site, with future urban development to the north, east and south, and rural or bush land to the west. A 4 metre road-reservation widening is proposed for McDonald Road adjacent to the southern section of the subdivision and the ultimate development of the site to the north will include an extension of McDonald Road to Kerosene Lane.

There are currently concrete paths on the eastern side of McDonald Road and on the northern side of Fifty Road, east of McDonald Road. The site is currently serviced by Transperth Route 568, with the nearest stop 800m from the site on Fifty Road. The Baldivis (North) District Structure Plan suggests a bus route between Kerosene Lane and Fifty Road to Baldivis via McDonald Road.

A trip generation and distribution exercise was completed and determined that the proposed subdivision would generate 240 vehicular trips per day. The majority of the trips would permeate through the local road network to McDonald Road north to Kerosene Lane and south to Fifty Road. A future road connection via the eastern access road to the northern subdivision will also permeate through the road network.

The traffic generated was not large enough to warrant any intersection analysis, under the Table 6.1 of Austroads Guide to Traffic Management Part 3 - Traffic Studies and Analysis, and there are no safety or operational issues expected.

A footpath is currently provided on the eastern side of McDonald Street and should be provided on at least one side of each of the internal local roads.

A review of the overall transport proposal for the site did not identify any specific issues that present unacceptable risks to the road user or that cannot be managed through appropriate design protocols.

The proposed development is not likely to generate any traffic noise or result in any vibration issues

2. Introduction and Background

2.1. General

This Transport Assessment has been prepared by Shawmac Pty Ltd, on behalf of Defence Housing Australia to support a Subdivision Concept Plan for 16 McDonald Road, Baldivis, in the City of Rockingham.

2.2. Transport Statement Objective

This Transport Assessment outlines the likely impact of the proposed subdivision on network traffic flows, safe access, pedestrian and cycle facilities and local amenity. As part of the assessment, Shawmac considered the likely traffic demand that would be generated through the proposed development.

The assessment considers aspects associated with:

- Generation of traffic including impacts on roads;
- Integration with the surrounding land uses;
- Use of public and other transport modes such as walking and cycling; and
- Safety and access issues.

2.3. Site Location

The subject site is located approximately 44 kilometres south of the Perth CBD and 7.5km south-east of the Rockingham Town Centre. **Figure 1** below shows the broad location of the site.

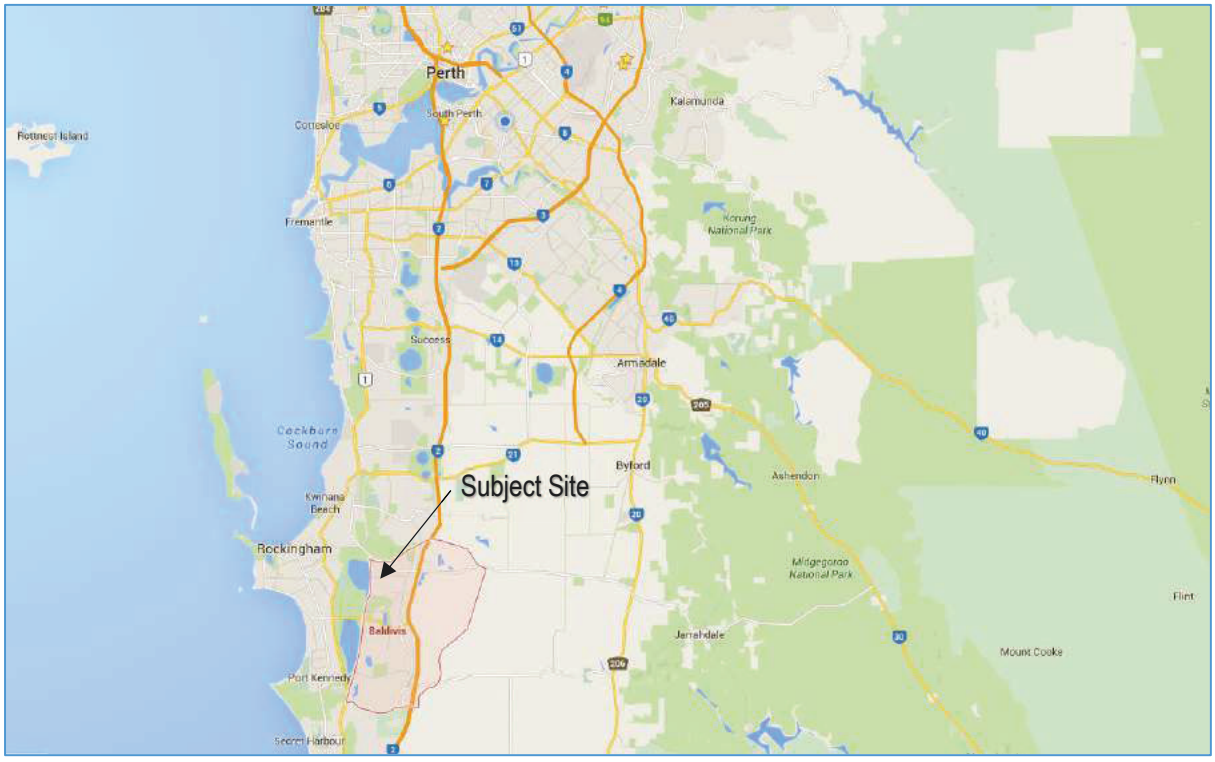

Figure 1 - Regional Context

The subject site is located on the western side of McDonald Road, approximately 100m north of Fifty Road.

There are rural properties to the north and south, undeveloped bush land to the west and existing and future urban development to the east.

Figure 2 shows the location of the site in the context of the local area.

Figure 2 - Local Context

2.4. Surrounding Major Attractors and Generators

The main attractors and generators expected to influence traffic flows to and from the site include:

- Baldivis Primary School
- Rockingham Town Centre
- Kwinana and surrounding Industrial Areas
- Kwinana Freeway via Mundijong Road
- Local shops and community facilities

Figure 3 shows the location of these attractors and generators with respect to the site.

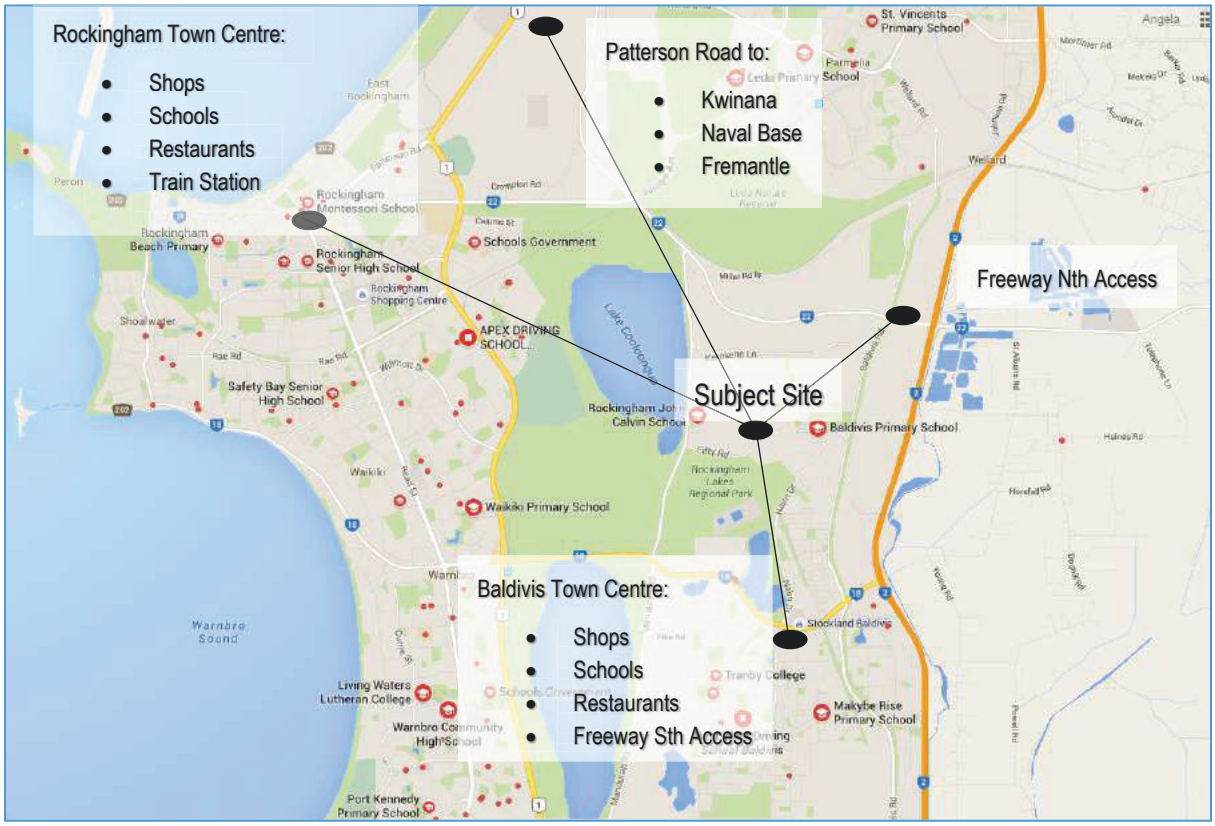

Figure 3 - Attractors and Generators

3. Existing Situation

3.1. Land Use

The subject site is semi-rural, with a single dwelling and swimming pool, a water tank and three sheds on the western side of the lot. There is cleared land to the west and north of the site with bushland broadly to the west and south beyond the cleared land. New residential development is to the broader east and south of the site.

3.2. Zoning

The subject site is currently zoned "Development" under the City of Rockingham *Town Planning Scheme No 2 (TPS 2)*. A portion of the site is zoned "Rural" under the TPS2 as shown in the extract from the planning scheme in **Figure 4.**

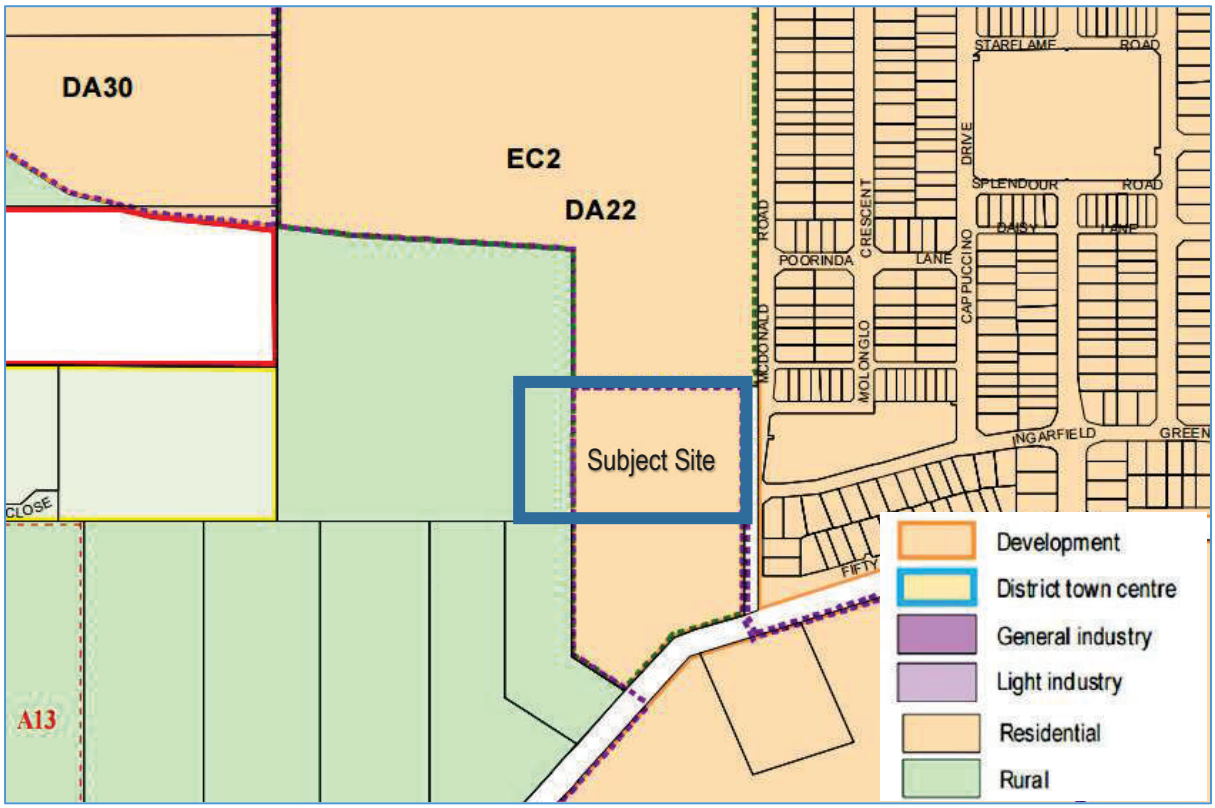

Figure 4 - Extract of City of Rockingham TPS 2

3.3. Existing Road Network

McDonald Road forms the eastern boundary to the site and provides an access to the existing rural properties and the new subdivisions north of Fifty Road. McDonald Road is classified as an *Access Road* under the MRWA regional hierarchy and has a speed limit of 50 km/hr. In the vicinity of the subject site, McDonald Road is described

as a single undivided carriageway with a 7 metre wide seal and 4 metre wide verges. There is a 2.5 metre wide concrete footpath on the eastern side of the road.

McDonald Road connects with Fifty Road, 85m south of the site with a priority controlled T-intersection.

The road classification for the road network surrounding the proposed development site is shown on **Figure 5**.

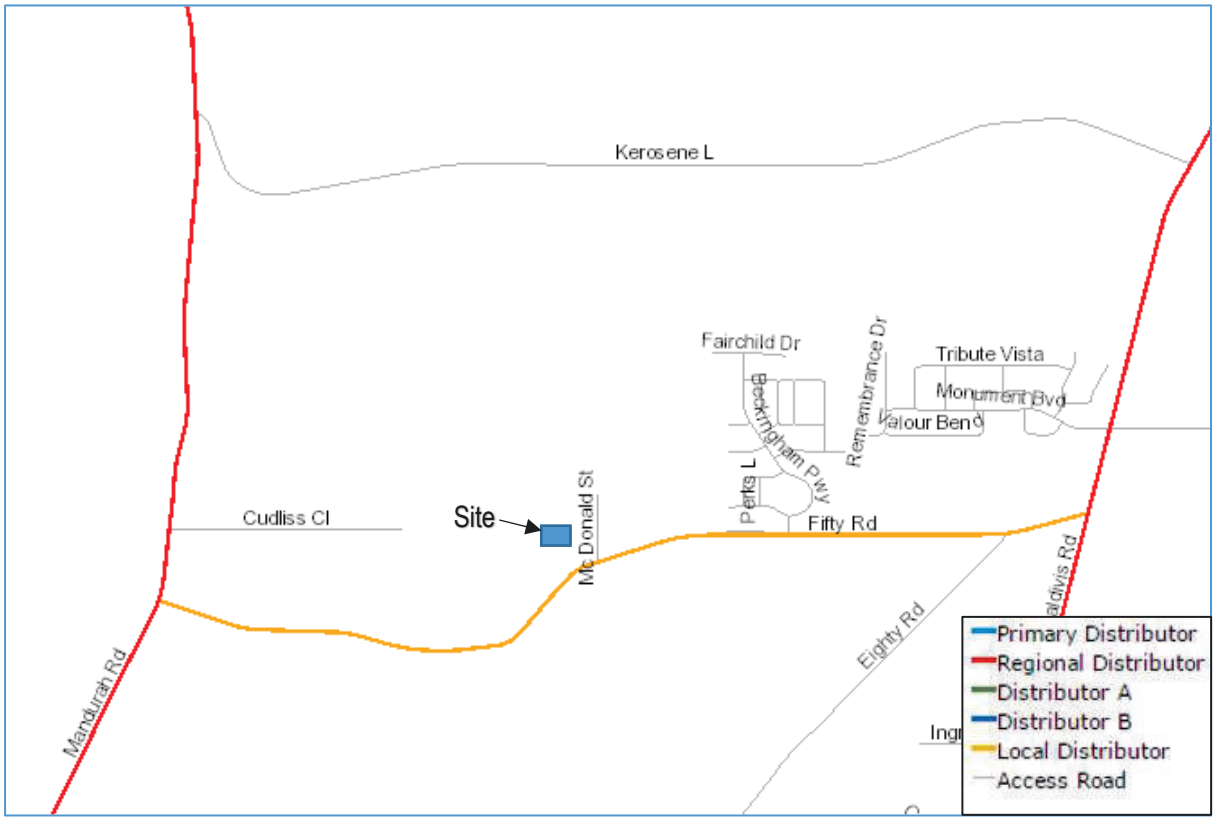

Figure 5 - Road Hierarchy (Source: MRWA Road Information Mapping)

3.4. Road Hierarchy vs Actual Flows

Traffic count data was unavailable for McDonald Road. Based on the lot yield from the ultimate development of the surrounding area, the traffic volume on McDonald Road, adjacent to the site was estimated to be 2,500 vpd.

The current traffic volumes are predicted as less than 500 vpd.

3.5. Public Transport Facilities

There are currently no public transport facilities within a 400m walkable catchment of the subject site. The nearest bus service is the Transperth Route 568 which operates between Wanbro Train Station and Baldivis. The closest bus stop is located on Fifty Road, approximately 800 metres from the subject site and is the terminus for the service, which operates through Baldivis south to Warnbro Train Station.

3.6. Existing Pedestrian and Cycling Network

Figure 6 illustrates the existing pedestrian and cycling network in the vicinity of the subject site. Fifty Road is shown on the *Perth Bicycle Network Map* extract as providing a good road riding environment.

There is a 2.5m wide concrete path on the eastern side of McDonald Road and on the northern side of Fifty Road, between McDonald Road and Baldivis Road.

Figure 6 - Cycling network

4. Development Proposal

4.1. Subdivision Proposal

The proposed subdivision concept plan is attached in **Appendix A** and an extract is shown in **Figure 7.**

Figure 7 - Proposed Subdivision Concept Plan

4.2. Proposed Land Use

The proposed subdivision as shown in **Figure 7** consists of 29 dwellings and a rural lot (Lot 30). The proposed subdivision is R20 with lot sizes range from 303m^2 to 490m^2 with an average lot size of 408m^2, excluding Lot 30.

4.3. Changes to External Transport Networks

McDonald Road will be extended north to Kerosene Lane as other subdivisions to the north of the site are constructed.

The Metropolitan Region Scheme (MRS) depicts Nairn Drive as a blue road, or other regional road. Nairn Drive is approximately 650m to the east of McDonald Road and will ultimately run north-south between Kerosene Lane and Paganoni Road in Karnup.

5. Transport Assessment

5.1. Assessment Period

The time periods for assessment were chosen based on the full development of the proposed subdivision.

5.2. Traffic Generation

Trip Generation rates were applied using the Institute of Transportation Engineers (ITE) *Trip Generation Manual 8th Edition.*

Assessed generation is shown on **Table 1** and is based on Traffic Assessment Zones (TAZ's) shown in **Figure 8**.

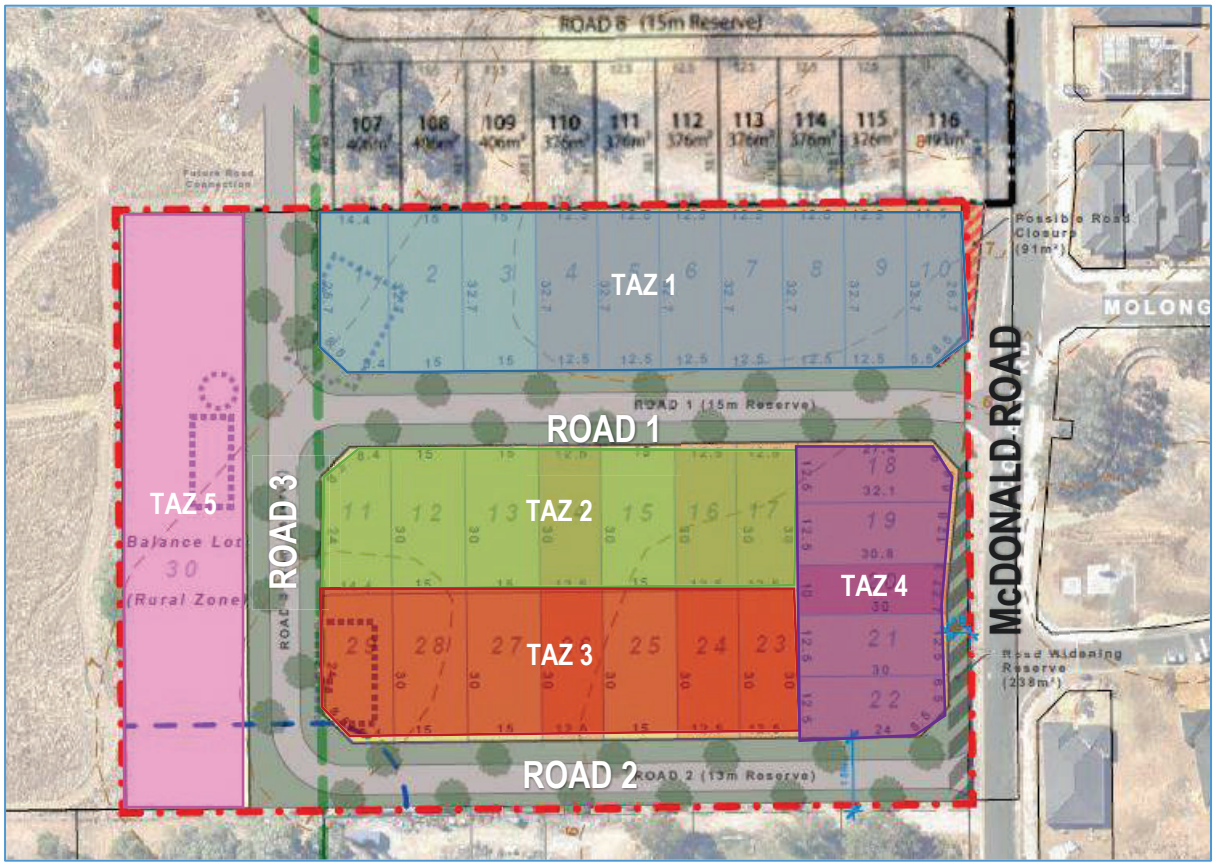

Figure 8 - Traffic Assessment Zones (TAZ's)

Table 1 - Trip Generation

Trip Assessment Zone	Land Use	Dwellings	trips per dwelling	Daily Trips
TAZ 1	R25	10	8	80
TAZ 2	R25	7	8	56
TAZ 3	R25	7	8	56
TAZ 4	R25	5	8	40
TAZ 5	Rural	1	8	8
TOTAL		**30**		**240**

5.3. Traffic Distribution

Based on the location and connectivity of the surrounding network and the major attractors / generators discussed in Section 2.4, the following assumptions have been made for the distribution of the site-generated traffic:

- 30% will enter and exit from the north:
  - 27.5% to and from the north via McDonald Road; and
  - 2.5% to and from the north via the new internal road connection to the west of the site.
- 70 % will enter and exit from the south via McDonald Road:
  - 45% to the west via Kerosene Lane towards the Freeway or Baldivis Town Centre; and
  - 25% to the east via Kerosene Lane towards Rockingham or Baldivis Town Centre.

5.4. Design Traffic Flows

The traffic flows of the network were modelled using QRS II software as shown in **Figure 9. Table 2** lists the predicted traffic flows for the internal road network.

in **Figure 8**.

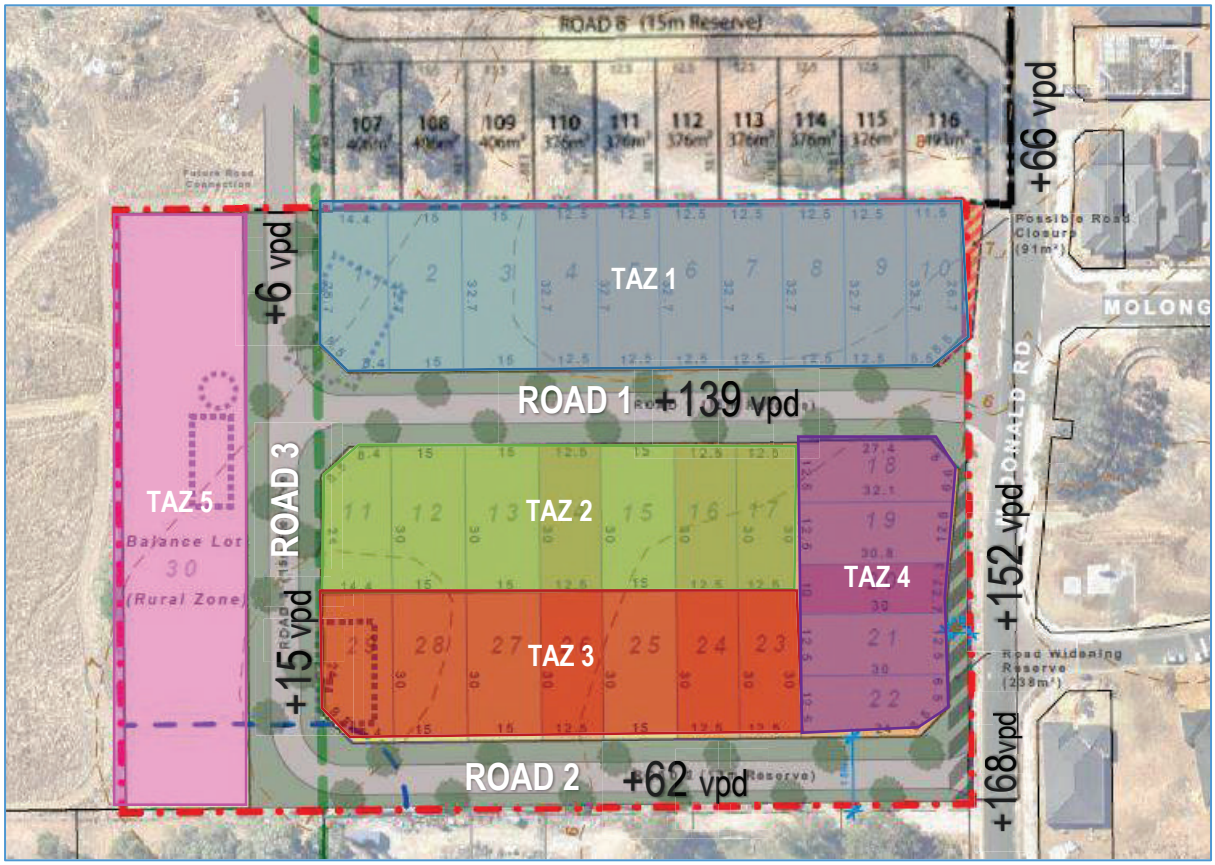

Figure 9 - Future Daily Traffic Volumes

Table 2 - Internal Roads - Future Daily Traffic Volumes

Road Name.	Predicted Traffic Volumes (vpd)
Road 1	139
Road 2	62
Road 3	15
McDonald Road	+168

5.5. External Traffic Flows

The predicted subdivision traffic flows were added to the estimated volumes of traffic for McDonald Road upon the ultimate development of the surrounding site. This is shown in **Table 3** below.

McDonald Road may require upgrading to a Local Distributor or Neighbourhood Connector when it is extended through to Kerosene Lane.

Table 3 - Existing Road Network - Predicted Flows

Road Name.	Desirable Max. Traffic Volume. (vpd)	Current / Predicted external Traffic Volumes (vpd)	Predicted Traffic Volumes (vpd)	Change in Traffic
McDonald Road	3,000	2,500	2,668	+ 168 vpd
Fifty Road	3,000	2,200	2,368	+ 168 vpd

6. Roads and Intersections

6.1. Proposed Internal Transport Networks

Figure 10 indicates the proposed internal transport routes which have been developed based on the predicted traffic volumes.

Figure 10 - Proposed Transport Network

The intersections of Road 1-McDonald Road; Road 2-McDonald Road; Road 1-Road 3 are recommended as priority-controlled T-intersections. Road 3 is proposed to connect to the future subdivision north of the site. Details regarding signage and design of intersections should be developed during the detailed design phases in consultation with the City of Rockingham.

6.2. Road Hierarchy and Reserves

The road cross section requirements have been based on recommendations contained within Liveable Neighborhoods and the Austroads Guide to Traffic Engineering Practice which is attached in **Appendix C.**

Table 4 - Proposed Road Hierarchy and Road Reservations

Road Name.	Predicted Traffic Volumes (vpd)	Proposed Road Reservation (metres)	Liveable Neighbourhoods Road Classification	Indicative Carriageway Width
Road 1	139	15	Access Street D	7.2 (7.0 – 7.5) metre lane.
Road 2	62	15	Access Street D	5.5 – 6.0 metre lane
Road 3	15	15	Access Street D	7.2 (7.0 – 7.5) metre lane.
McDonald Road	2,668	18	Neighbourhood Connector B	11.2 metres including parking plus shared path on one verge.

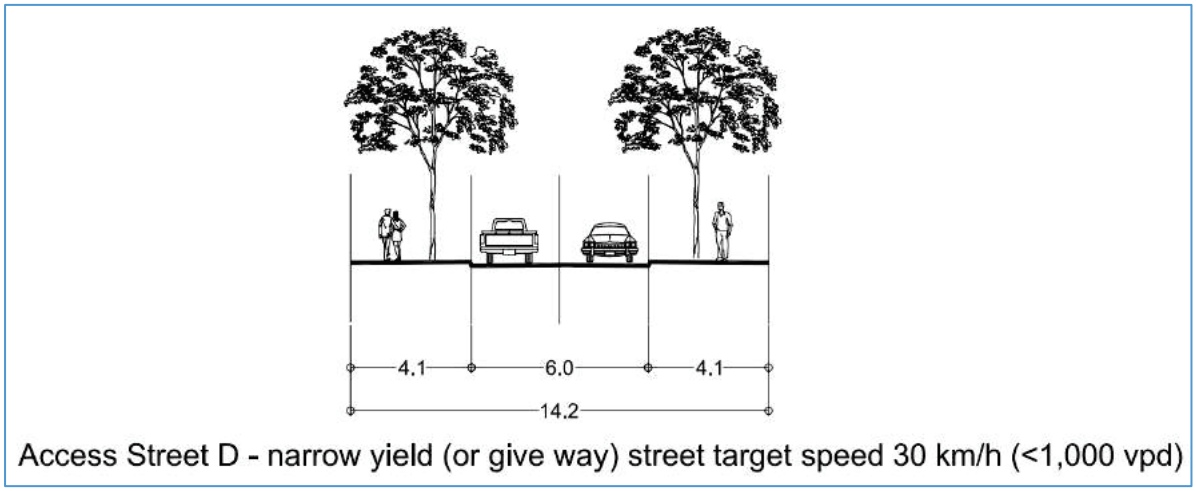

Figure 11 - Access Street D indicative cross section.

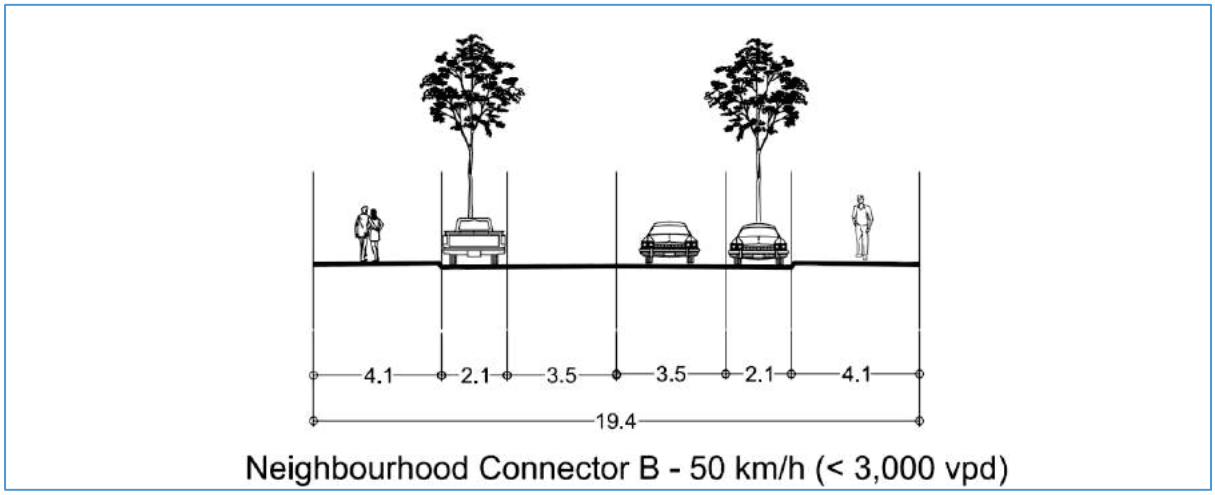

Figure 12 - Neighbourhood Connector B indicative cross section

6.2.1. Intersection Analysis

Internal peak hour traffic volumes within the development are generally small and as such negligible impacts are predicted. Warrants for analysis for each intersection as shown in Table 6.1 of Austroads Guide to Traffic

Management Part 3, Traffic Studies and Analysis, shown below as **Table 5**, were applied and determined that no intersections required capacity analysis. Peak hour traffic volumes were assumed to be approximately 10% of predicted daily traffic.

Table 5 - Intersection Analysis Warrants

Intersection	Hourly volume major road	Hourly volume minor road	Comment.
Warrants as per Table 6.1 of Austroads Guide to Traffic Management Part 3, Traffic Studies and Analysis - Two Lane Major Road Cross Road	400 vph 500 vph 650 vph	250 vph 200 vph 100 vph	Table details flows that initiate intersection analysis. As major flows increase, there is reduced capacity to accept minor flows.
Fifty Road - McDonald Road	220	130	3 way intersection - Analysis not required
McDonald Road - Road 1	260	128	3 way intersection – Analysis not required.
McDonald Road - Road 2	260	<100	3 way intersection – Analysis not required.
All other intersections	<100	<100	Analysis not required.

6.3. Pedestrian/ Cyclist Access

Footpaths should be provided on at least one side of each of the internal local roads with connections to the established pedestrian and cycling network external to the area as well as to future urban development north and east of the subject site. It is recommended that all footpaths are constructed with a minimum width of 1.5 metres.

Due to the low volumes of traffic and the low speed environment on the internal access roads, on-road cycle lanes are not required and cyclists are able to safely share the roadway with motorised vehicles.

Fifty Road is described as a good road riding environment under the Department of Transport *Cycling Maps.* There is a 2.5m concrete path on the north side of the road, east of McDonald Road however there are no formal facilities from McDonald Road to Mandurah Road in the west for cyclists or pedestrians.

6.4. Public Transport Access

As discussed in Section 3.5, there are limited public transport services in the area. As shown in **Figure 13**, a bus route travelling along McDonald Road was identified in the Baldivis (North) District Structure Plan. It is recommended that the Public Transport Authority review the requirements for this area as urban development progresses.

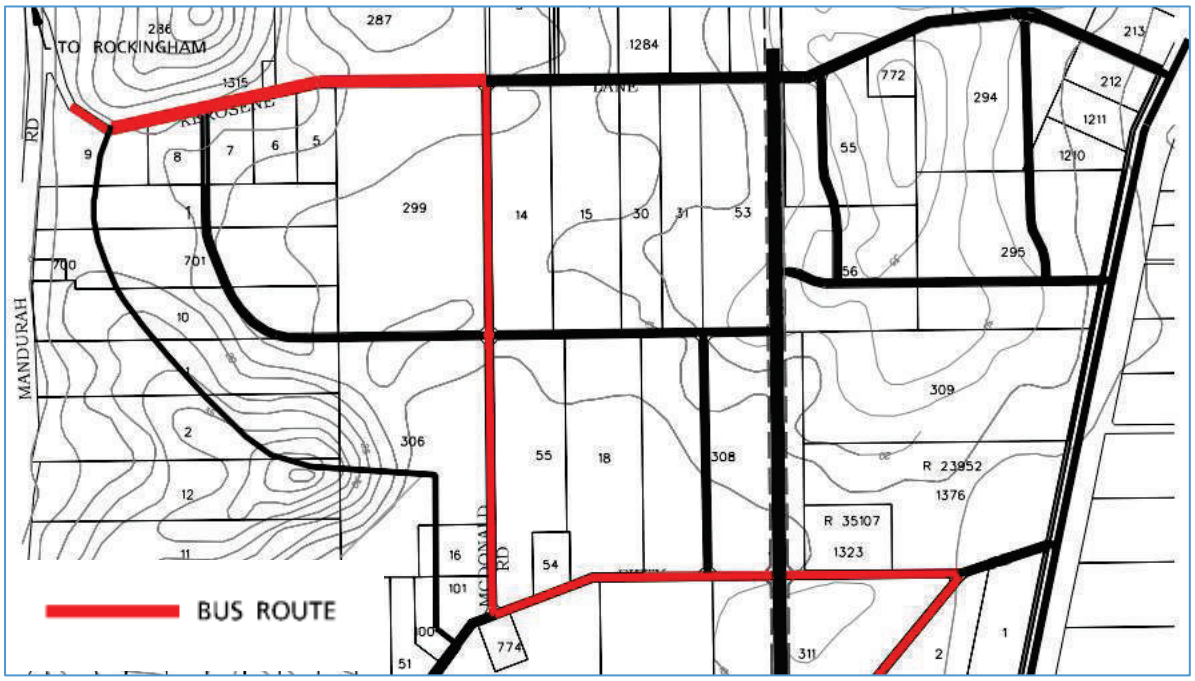

Figure 13 - Suggested Bus Route (Extract from City of Rockingham *Baldivis (North) District Structure Plan*)

6.5. Safety issues

A review of the overall transport proposal for the site did not identify any specific issues that present unacceptable risks to the road user or that cannot be managed through appropriate design protocols.

Road hazards are typically present at intersections and may occur due inadequate sight distance, inappropriate geometry or substandard capacity that promotes undesirable and potentially hazardous movements.

For the new roads, the allocation of adequate road reservation width and truncation of corners will generally allow sight distance requirements to be accommodated in the detailed design phase of the project. Geometric standards prescribed by Austroads and Main Roads WA guidelines will ensure that no unacceptable risk is introduced into the road environment. Assessment of the operational performance of intersections undertaken in this study prescribes appropriate geometry and lane allocation to minimise delay and optimise performance.

Detailed design undertaken as part of the Development Application process would need to define at least the following elements:

- Road cross sections including lane widths, on-road cycle lanes, path widths and provisions for people with disabilities;
- Intersection geometries; and
- Pedestrian and cycle facilities (cross sections, crossing requirements and ramps).

6.6. Noise

The proposed development is not likely to generate any traffic noise or result in any vibration issues.

7. Conclusions

With respect to the proposed Subdivision Concept Plan area, the following is concluded;

- Under the ultimate development of the subdivision, the subdivision will yield 29 dwellings with the capacity for an additional dwelling on the rural balance lot;
- The predicted traffic flows are predicted to be 240 vehicles per day;
- Due to low predicted daily traffic, the intersections did not meet the warrants for analysis and are expected to operate satisfactorily;
- All roads within the subdivision area will be constructed as *Access Roads* with cross section details, line marking, intersection control and local area traffic management measures to be addressed during the detailed subdivision design stages;
- Pedestrian and cyclist facilities should be provided within the subdivision and along McDonald Road; and
- Public Transport services should be considered for the area as it becomes increasingly urbanised.

Appendix A – Subdivision Concept Plan

Appendix B - Fifty Road Traffic Counts

Weekly Vehicle Counts

WeeklyVehicle-1136
Site: SITE-29.0.0EW
Description: **Fifty Rd - west of McDonald Rd**
Filter time: **16:53 Monday, 15 September 2014 => 14:07 Tuesday, 30 September 2014**
Scheme: Vehicle classification (ARX)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	15 Sep	16 Sep	17 Sep	18 Sep	19 Sep	20 Sep	21 Sep	1 - 5	1 - 7
Hour									
0000-0100	*	5	2	2	6	13	9	3.8	6.2
0100-0200	*	1	4	2	4	13	10	2.8	5.7
0200-0300	*	2	3	5	9	3	9	4.8	5.2
0300-0400	*	6	9	6	5	6	11	6.5	7.2
0400-0500	*	13	17	10	9	6	4	12.3	9.8
0500-0600	*	50	54	57	51	24	4	53.0	40.0
0600-0700	*	94	105	98	107	44	15	101.0	77.2
0700-0800	*	140	136	126	123	65	17	131.3	101.2
0800-0900	*	**216<**	**213<**	**202<**	**238<**	111	63	**217.3<**	**173.8<**
0900-1000	*	145	126	143	124	135	71	134.5	124.0
1000-1100	*	120	135	143	145	153	78	135.8	129.0
1100-1200	*	149	157	152	146	**166<**	**110<**	151.0	146.7
1200-1300	*	125	105	145	142	**149<**	87	129.3	125.5
1300-1400	*	109	107	107	139	133	95	115.5	115.0
1400-1500	*	150	168	159	167	93	87	161.0	137.3
1500-1600	*	215	**243<**	213	196	114	**107<**	**216.8<**	**181.3<**
1600-1700	31	**221<**	210	**230<**	**213<**	123	71	181.0	157.0
1700-1800	170	199	181	207	186	140	67	188.6	164.3
1800-1900	76	102	111	107	129	95	50	105.0	95.7
1900-2000	48	49	50	67	72	58	23	57.2	52.4
2000-2100	28	39	51	42	43	39	18	40.6	37.1
2100-2200	20	20	23	34	33	23	16	26.0	24.1
2200-2300	10	10	11	12	19	22	7	12.4	13.0
2300-2400	4	10	3	4	16	15	8	7.4	8.6
Totals									
0700-1900	*	1891	1892	1934	1948	1477	903	1866.8	1650.8
0600-2200	*	2093	2121	2175	2203	1641	975	2091.7	1841.7
0600-0000	*	2113	2135	2191	2238	1678	990	2111.5	1863.3
0000-0000	*	2190	2224	2273	2322	1743	1037	2194.4	1937.3
AM Peak	*	0800	0800	0800	0800	1100	1100		
	*	216	213	202	238	166	110		
PM Peak	*	1600	1500	1600	1600	1200	1500		
	*	221	243	230	213	149	107		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-1136
Site: SITE-29.0.0EW
Description: **Fifty Rd - west of McDonald Rd**
Filter time: **16:53 Monday, 15 September 2014 => 14:07 Tuesday, 30 September 2014**
Scheme: Vehicle classification (ARX)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	22 Sep	23 Sep	24 Sep	25 Sep	26 Sep	27 Sep	28 Sep	1 - 5	1 - 7
Hour									
0000-0100	6	4	4	5	4	9	7	4.6	5.6
0100-0200	1	2	4	6	5	7	9	3.6	4.9
0200-0300	3	4	1	4	1	8	5	2.6	3.7
0300-0400	5	3	10	6	7	5	7	6.2	6.1
0400-0500	12	15	11	11	10	6	3	11.8	9.7
0500-0600	58	56	60	56	59	13	11	57.8	44.7
0600-0700	100	110	92	109	98	27	11	101.8	78.1
0700-0800	110	130	130	112	125	48	15	121.4	95.7
0800-0900	**232<**	**206<**	**209<**	**202<**	**204<**	75	55	**210.6<**	**169.0<**
0900-1000	99	120	97	137	126	101	81	115.8	108.7
1000-1100	101	130	113	124	124	120	92	118.4	114.9
1100-1200	126	136	92	144	160	**132<**	**102<**	131.6	127.4
1200-1300	120	132	123	138	143	**112<**	**103<**	131.2	124.4
1300-1400	118	114	124	119	124	71	78	119.8	106.9
1400-1500	145	177	148	160	196	70	79	165.2	139.3
1500-1600	**223<**	189	**214<**	203	**211<**	89	83	**208.0<**	**173.1<**
1600-1700	221	**189<**	205	202	192	87	89	201.8	169.3
1700-1800	195	187	213	**228<**	190	77	77	202.6	166.7
1800-1900	86	77	115	130	110	57	40	103.6	87.9
1900-2000	104	51	58	56	51	38	42	64.0	57.1
2000-2100	205	30	47	46	47	37	22	75.0	62.0
2100-2200	70	26	28	24	40	18	24	37.6	32.9
2200-2300	9	17	22	23	20	16	22	18.2	18.4
2300-2400	3	4	8	11	14	17	9	8.0	9.4
Totals									
0700-1900	1776	1787	1783	1899	1905	1039	894	1830.0	1583.3
0600-2200	2255	2004	2008	2134	2141	1159	993	2108.4	1813.4
0600-0000	2267	2025	2038	2168	2175	1192	1024	2134.6	1841.3
0000-0000	2352	2109	2128	2256	2261	1240	1066	2221.2	1916.0
AM Peak	0800	0800	0800	0800	0800	1100	1100		
	232	206	209	202	204	132	102		
PM Peak	1500	1600	1500	1700	1500	1200	1200		
	223	189	214	228	211	112	103		

*** - No data.**

Appendix C - Road Hierarchy Criteria

Indicative volume.	Liveable Neighbourhoods Classification	MRWA equivalent classification	Indicative Reserve Width.	Indicative Carriageway Width.
50,000.	Primary Distributor.	Primary Distributor		Determined by Main Roads WA
35,000.	Primary Distributor.	Primary Distributor		Determined by Main Roads WA
15,000 to 35,000.	Integrator Arterial A (District Distributor A).	Primary Distributor/ District Distributor A	50.6 – 52.6 metres.	2 x 8.2 metre carriageways including bike lane and 2 x 5.5 metre service roads containing parking.
<25,000	Integrator Arterial A (District Distributor A).	District Distributor A	35.6 metres.	2 x 10.7 metre carriageways including combined on street parking and bike lane.
7,000 to 15,000.	Integrator Arterial B (District Distributor B).	District Distributor A/ District Distributor B	29.2 metres.	2 x 7.5 metre carriageways with on street parking and bike lane.
15,000.	Integrator Arterial B (District Distributor B).	District Distributor B	25.2 metres.	2 x 7.5 metre carriageways with on street parking.
7,000.	Neighborhood Connector A.	Local Distributor	24.4 metres	2 x 7.1 metres including parking, on street bike lane, median plus shared path on one verge.
3,000.	Neighborhood Connector B.	Local Distributor	19.4 metres	11.2 metres including parking plus shared path on one verge.
3,000.	Access Street A (Avenue).	Local Distributor/ Access Road	20 - 24 metres.	2 x 3.5 metre lanes plus indented parking.
3,000.	Access Street B (Wider street).	Local Distributor/ Access Road	16.5 - 18 metres.	9.7 metre lane.
3,000.	Access Street C (Yield or give way street).	Access Road	15.4 - 16 metres.	7.2 (7.0 – 7.5) metre lane.
1,000.	Access Street D (Narrow yield or give way street).	Access Road	14.2 metres.	5.5 – 6.0 metre lane.
150	Access Street D (Narrow yield or give way street).	Access Road	14.2 metres.	3.5 metre lane plus parking indents.
3,000.	Access Street D (Wider street).	Access Road	16.5 - 18 metres.	9.7 metre lane.