Proposed Muriel Court District Structure Plan (City of Cockburn Development Area 19)

TRAFFIC AND TRANSPORT STUDY

Prepared for
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On behalf of
“THE OWNERS”, and CITY OF COCKBURN

Prepared by
Uloth and Associates
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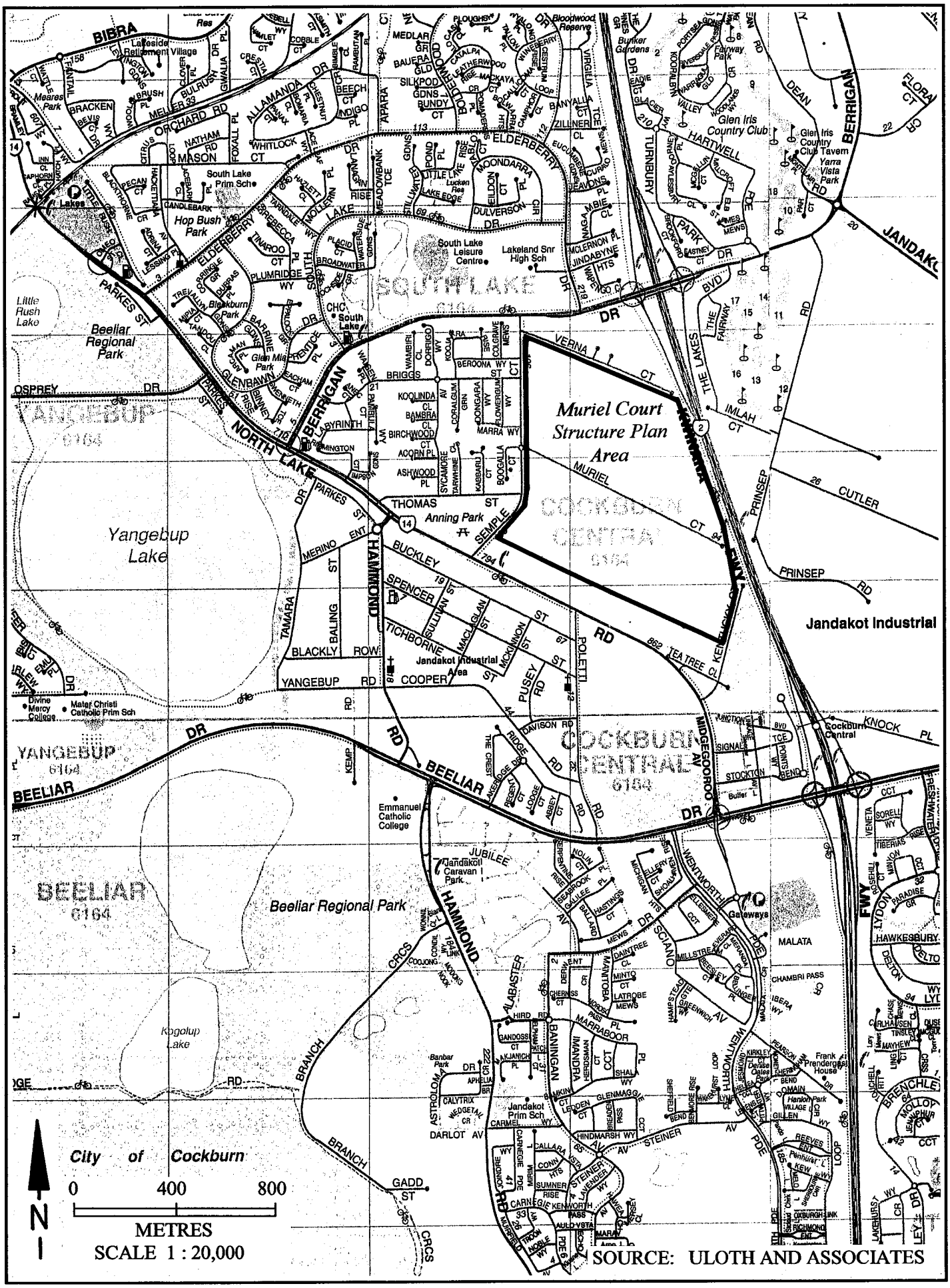
1. INTRODUCTION

Uloth and Associates has been commissioned by the owners of the south east portion of City of Cockburn Development Area 19 to carry out a traffic and transport investigation for the proposed Muriel Court Structure Plan.

The structure plan area is located on the western of side Kwinana Freeway, bounded by Verna Court, Semple Court, North Lake Road and Kentucky Court, as shown in the Locality Plan in Figure 1.

1.1 STUDY OBJECTIVES

The objective of the study is to address all the necessary traffic and transport requirements for the preparation and lodgement of the detailed Muriel Court District Structure Plan.



Locality Plan

MURIEL COURT STRUCTURE PLAN

FIG. 1

2. STUDY FINDINGS AND CONCLUSIONS

The study findings and conclusions are discussed in this chapter. Additional information is provided within the Technical Appendix.

2.1 EXISTING ROADS AND TRAFFIC

- The existing road network in the vicinity of the Muriel Court Structure Plan area is also shown in the Locality Plan in Figure 1.

- It can be seen in Figure 1 that access to the structure plan area is currently provided via Verna Court and Muriel Court, off Semple Court, and via Kentucky Court, off North Lake Road.

- Semple Court is a 2-lane residential street, which would be classified as Neighbourhood Connector B under Liveable Neighbourhoods, suitable for traffic flows up to 3,000 vehicles per day.

- Berrigan Drive is a 4-lane divided road between Kwinana Freeway and Semple Court, and is classified a District Distributor A under the Main Roads WA Metropolitan Functional Road Hierarchy.

- North Lake Road is also a District Distributor A which will ultimately be 4-lanes divided, although it is currently a 2-lane road from just east of Hammond Road through to Midgegooroo Avenue and Beeliar Drive.

- Existing weekday traffic flows were obtained from Main Roads WA and City of Cockburn. However, peak period turning movement counts were also carried out by Uloth and Associates in order to identify more up-to-date traffic flows at various key locations.

- The PM peak hour and daily turning movements at those key locations are shown in Figures A.1 to A.4 in the Technical Appendix, while the existing weekday traffic flows in the vicinity are shown in Figure A.5.

- It can be seen in Figures A.1 to A.5 that Semple Court currently carries 2,950 vehicles per day at its southern end, increasing to 3,400 vehicles per day at Muriel Court and 4,200 vehicles per day south of Berrigan Drive, while Muriel Court carries 480 vehicles per day east of Semple Court. It can also be seen that North Lake Road carries 15,600 vehicles per day west of Semple Court and 17,700 vehicles per day east of Semple Court, while Berrigan Drive carries 19,600 vehicles per day west of Kwinana Freeway, 17,300 vehicles per day west of Elderberry Drive, and 14,200 vehicles per day west of Semple Court.

2.2 EXISTING PUBLIC TRANSPORT AND PEDESTRIAN/CYCLIST FACILITIES

- The Muriel Court Structure Plan area is currently serviced by a single bus route (Route 520 between Fremantle and the new Cockburn Central Train Station), which travels via Elderberry Drive, Berrigan Drive, Semple Court and North Lake Road, as shown in Figure A.6 in the Technical Appendix. It can also be seen in Figure A.6 that buses then travel south along Poletti Road in order to access the station from the west via Beeliar Drive.

- Elderberry Drive, Berrigan Drive, Semple Court and North Lake Road are also identified as part of a ‘Signed Continuous Route’ (with shared paths) within the Perth Bike Network, as shown in Figure A.7 in the Technical Appendix, while a Principal Shared Path is provided along the western side of Kwinana Freeway adjacent to the proposed structure plan area, as also shown in Figure A.7.

2.3 PROPOSED STRUCTURE PLAN AND FUTURE TRAFFIC

2.3.1 Land Use and Traffic Generation

- The proposed Muriel Court Structure Plan is shown in Figure A.8 in the Technical Appendix.

- It is estimated that the plan could accommodate up to 1,820 residential dwellings, as indicated in Table A.1 in the Technical Appendix, in addition to the existing Child Care Centre at the Semple Court - Muriel Court intersection.

- It is estimated that the residential developments could generate 10,720 vehicle trips per day, (based on 8 trips per dwelling for R20 development, 6 trips per unit for R40 development, and 5 trips per unit for R160 development).

2.3.2 Future Local Traffic Forecast

- A future forecast of 'Local' traffic generated by the structure plan development has been prepared, assuming full development of the structure plan area.

- The anticipated external distribution of traffic generated by the Muriel Court Structure Plan area is as follows:

  - Berrigan Drive, east (incl. Elderberry Drive): 27 percent
  - Midgegooroo Avenue, south (and future North Lake Road Bridge, east): 39 percent
  - Hammond Road, south: 9 percent
  - North Lake Road and Berrigan Drive, west: 25 percent

- Future traffic flows generated by the proposed Muriel Court Structure Plan are therefore as shown in Figure A.10 in the Technical Appendix, excluding any external through traffic on North Lake Road, Berrigan Drive or Semple Court.

- It can be seen in Figure A.10 that the new North-South road will carry up to 4,600 vehicles per day of local traffic at its northern end, while Muriel Court will carry up to 3,300 vehicles per day, and Kentucky Court will carry 3,700 vehicles per day. All other roads within the structure plan area will carry less than 3,000 vehicles per day, with most roads carrying less than 1,000 vehicles per day.

2.3.3 Adjacent Areas and External Through Traffic

- On the basis of the existing traffic counts along Semple Court, it is estimated that the existing residential area to the west currently contributes approximately 3,200 vehicles per day onto Semple Court, while an additional 1,950 vehicles per day use Semple Court as a through route.

- By re-assigning this existing traffic onto the modified road network proposed, the anticipated future total traffic flows following full development of the structure plan area have also been identified, as shown in Figure A.11 in the Technical Appendix. (It is important to note that this does not include any additional traffic growth due to other developments; it is simply existing traffic plus structure plan traffic).

- It can be seen in Figure A.11 that future traffic on the new North-South Road will be between 7,300 and 8,800 vehicles per day north of Muriel Court, and between 4,900 and 5,300 vehicles per day south of Muriel Court.

2.3.4 Long Term Traffic Growth

- In addition to the above traffic forecasts, it is also important to take into account additional traffic growth on both North Lake Road and Berrigan Drive in the long term.

- The City of Cockburn District Traffic Study (prepared by Uloth and Associates in May 2006) shows that traffic flows on North Lake Road could increase from the existing 17,680 vehicles per day east of Semple Court to approximately 22,000 vehicles per day by 2016 and then to 33,000 vehicles per day by 2031. The report also shows that North Lake Road at Kentucky Court will increase from the existing 14,630 vehicles per day to 20,000 vehicles per day in 2016 and 33,000 vehicles per day in 2031, while traffic on Berrigan Drive east of Semple Court is expected to increase from the existing 17,250 vehicles per day to 28,000 vehicles per day in 2016 and 29,000 vehicles per day by 2031.

- Taking into account this additional traffic growth, long term peak hour traffic flows for the critical intersections at each end of the new North-South road and at Kentucky Court have been calculated and are shown in Figures A.12 and A.13 in the Technical Appendix.

2.4 PUBLIC TRANSPORT

- As noted above in Section 2.2, there is currently 1 bus route travelling via Elderberry Drive, Berrigan Drive, Semple Court and North Lake Road, which services the existing residential area west of Semple Court. There are also 2 additional routes currently operating along North Lake Road.

- The route along Semple Court will have to be shifted onto the new North-South road to the east of Semple Court under the proposed structure plan, resulting in slightly longer walking distances for some of the existing residents. However, all future residents of the structure plan area will be well-serviced by this route.

- It is suggested that the bus route will continue along the southern part of Semple Court and turn into North Lake Road, in order to provide access to the future Mixed Business developments. However, it is recommended that provision should also be made for buses to travel along Muriel Court and Kentucky Court, in the long term, as part of a possible alternative future bus route to the train station from the north.

- It is also important to note that the south-east portion of the structure plan area is within the accepted 800 metre walking distance of Cockburn Central Train Station, resulting in very good public transport access for this proposed high density residential area.

2.5 PEDESTRIAN/CYCLIST FACILITIES

- As noted above in Section 2.2, there is currently a shared path along the full length of Semple Court, linking to shared paths in Berrigan Drive/Elderberry Drive and North Lake Road.

- With the proposed construction of a new North-South road parallel to Semple Court (and the corresponding realignment of Elderberry Drive), it is recommended to provide shared paths along both sides of the new road, linking to shared paths along both sides of Elderberry Drive.

- It is also recommended to provide a shared path along the northern side of Muriel Court and the eastern side of Kentucky Court, with a possible connection to the Kwinana Freeway Principal Shared Path at their junction.

- Footpaths along other roads within the structure plan area should be provided in accordance with the requirements of Liveable Neighbourhoods.

2.6 FUTURE ROAD HIERARCHY AND INTERSECTION SPACING ALONG NORTH-SOUTH ROAD

- With the new North-South road expected to carry in excess of 7,000 vehicles per day at its northern end, it is recommended that it be classified as an Integrator Arterial B with a cross-section in accordance with Figure 6 in Liveable Neighbourhoods.

- It is therefore also recommended that minimum intersection spacings along the new road should be 60 metres for left/right staggered junctions and 40 metres for right/left staggered junctions, as specified in Table 3 of Liveable Neighbourhoods.

- Several adjustments are therefore required to the proposed plan, as shown in Figure 2 in Chapter 3 Recommendations.

- All other roads within the structure plan should be classified as Access Streets B, C or D, as also shown in Figure 4, with cross-sections generally in accordance with in Figures 10, 11 and 12 of Liveable Neighbourhoods (although City of Cockburn has indicated a preference for a standard 15.0 metre road reserve for both Access Streets C and D).

2.7 INTERSECTION OPERATIONAL EVALUATION

- In order to identify the infrastructure requirements for the adjacent road network resulting from the proposed structure plan, intersection operational analyses have been carried out for the intersections of the new North-South road with both Berrigan Drive and North Lake Road, as well as for the existing junction configuration at North Lake Road - Kentucky Court.

- The analyses show that North Lake Road will need to be widened to 4 lanes divided (with a wide median) in the short to medium term (that is with existing traffic flows on North Lake Road plus full development of the proposed structure plan) in order for the intersection with the new North-South road to operate at an acceptable Level of Service.

- In the longer term, when traffic on North Lake Road reaches 33,000 vehicles per day, traffic signals will be required at the intersection with the new North-South road, with operational characteristics as shown in Table A.3 in Chapter A.5 in the Technical Appendix.

- The analysis also shows that the existing North Lake Road - Kentucky Court junction could operate at an acceptable Level of Service in the short to medium term. The junction could also operate without traffic signals in the long term, as long as North Lake Road/Midgegooroo Avenue was upgraded to 4 lanes divided (with a wide median), as indicated in Table A.4 in the Technical Appendix. However, it is important to note that traffic signals will be installed at Kentucky Court as part of the extension of North Lake Road across Kwinana Freeway and the construction of the resulting 4-way intersection with Midgegooroo Avenue.

- Traffic signals will also be required at the proposed 4-way intersection of Berrigan Drive and Elderberry Drive with the new North-South road, with lane arrangements at the signal as shown in the inset detail in Figure 3 in Chapter 3 Recommendations, and with operational characteristics as shown in Table A.2 in the Technical Appendix.

- It is also important to note that with queues of up to 100 metres anticipated within the new North-South road at the Berrigan Drive signalised intersection, it is recommended that the proposed western junction with Verna Court should be restricted to left-in/left-out movements only, as indicated in Figure 2 in Chapter 3.

2.8 INFRASTRUCTURE COSTS

- In addition to the infrastructure costs within the structure plan area itself, it is also necessary to identify the contribution requirements toward external infrastructure upgrades resulting from the proposed structure plan.
- It is therefore clear that the total costs of modifications to both Semple Court and Elderberry Drive (including traffic signals at Berrigan Drive) should be included as structure plan costs.

- Modifications to North Lake Road, however, are already planned as part of the overall growth of the region, and so an equitable cost contribution from the structure plan development should be determined.

- It is also important to note that since the structure plan area is made up of a large number of small land-holdings, the higher standards of construction for the new North-South road, Muriel Court and Kentucky Court will result in higher costs for some landowners for the shared benefit of the entire structure plan area.

- It is therefore suggested that the ‘increased’ cost of these roads should be shared across all landowners as part of the overall structure plan infrastructure contributions.

3. RECOMMENDATIONS

The following recommendations are made on the basis of the study findings and conclusions discussed above in Chapter 2, and the additional information in the Technical Appendix.

- It is recommended to modify the proposed road network by realigning the 4 northern-most access roads linking to the new North-South road, as indicated in Figure 2, and by restricting access to the first of these roads (Verna Court west) to left-in/left-out movements only, as also shown in Figure 2.

- It is recommended to realign the southern end of Elderberry Drive as indicated in Figure 3, to create a signalised 4-way intersection with the new North-South road, with lane arrangements as also indicated in Figure 3.

- It is recommended that the new North-South road should be classified as an Integrator Arterial B with a road reserve width of 25.2 metres, as indicated in Figure 4, and a cross-section in accordance with Figure 6 in Liveable Neighbourhoods.

- It is recommended that Muriel Court and Kentucky Court should both be classified as Neighbourhood Connector A roads with 24.4 metre road reserves, in accordance with Figure 7 in Liveable Neighbourhoods.

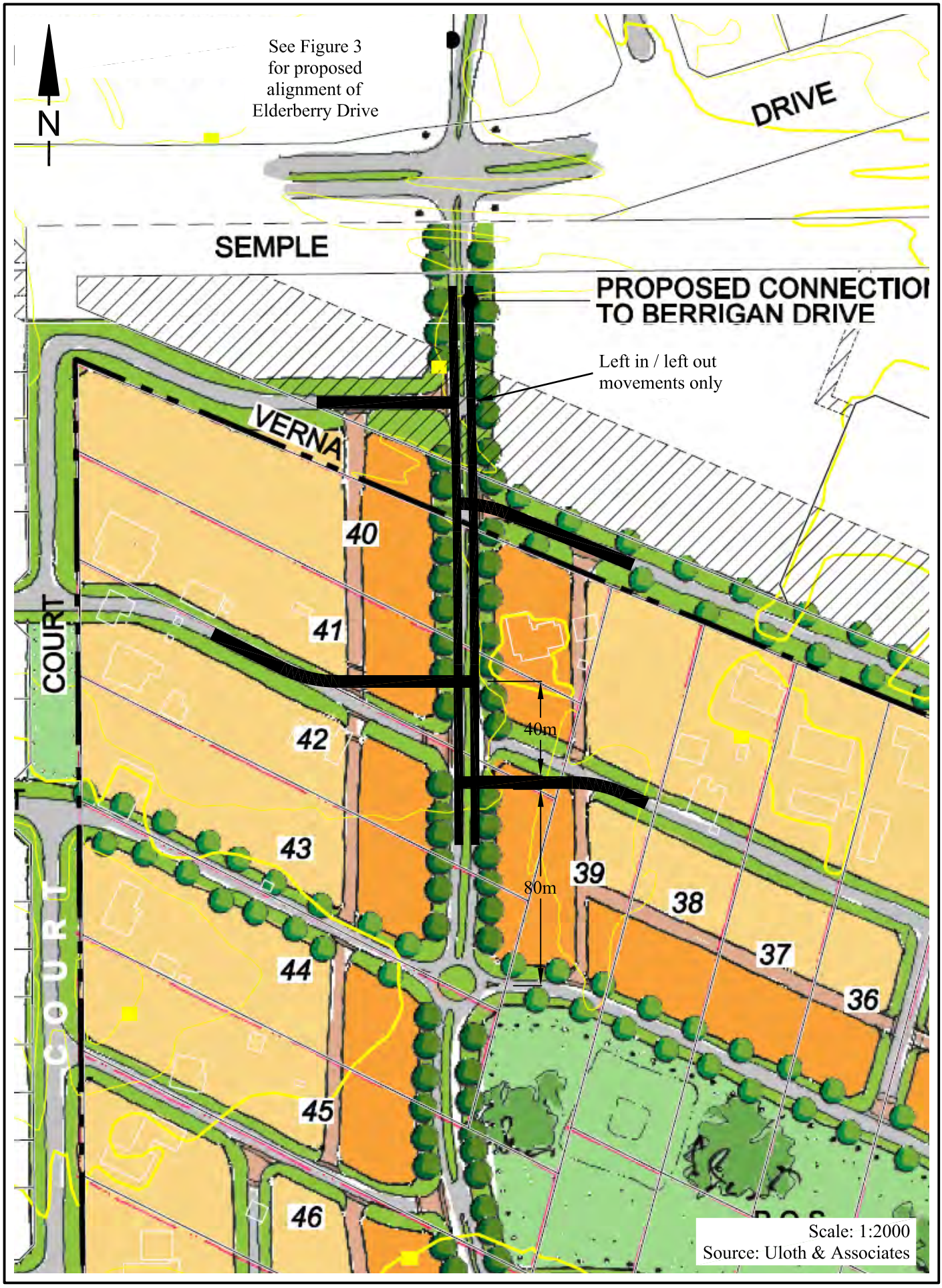
- It is recommended to provide a shared path along the northern side of Muriel Court and the eastern side of Kentucky Court, with a possible connection to the Kwinana Freeway Principal Shared Path at the junction of these 2 roads. A standard footpath should also be provided on the other side of both Muriel Court and Kentucky Court.

- All other roads should be classified as Access Street B, C or D, as shown in Figure 4, with cross-sections generally in accordance with Figures 10, 11 and 12 of Liveable Neighbourhoods, and with standard footpaths as required. However, it is important to note that City of Cockburn Officers have indicated a preference for 15.0 metre road reserves for both Access Streets C and D.

- In identifying the structure plan infrastructure cost contributions, it is recommended that the following items should be included:
  - Realignment of Elderberry Drive and new signalised intersection (including closure of existing Elderberry Drive and Semple Court junctions)
  - Closure of Semple Court between Beroona Way and Briggs Street
  - Closure of Semple Court south of Thomas Street

- It has also been suggested that the ‘increased’ costs due to the higher standard of construction of the new North-South road, Muriel Court and Kentucky Court should be shared between all landowners.

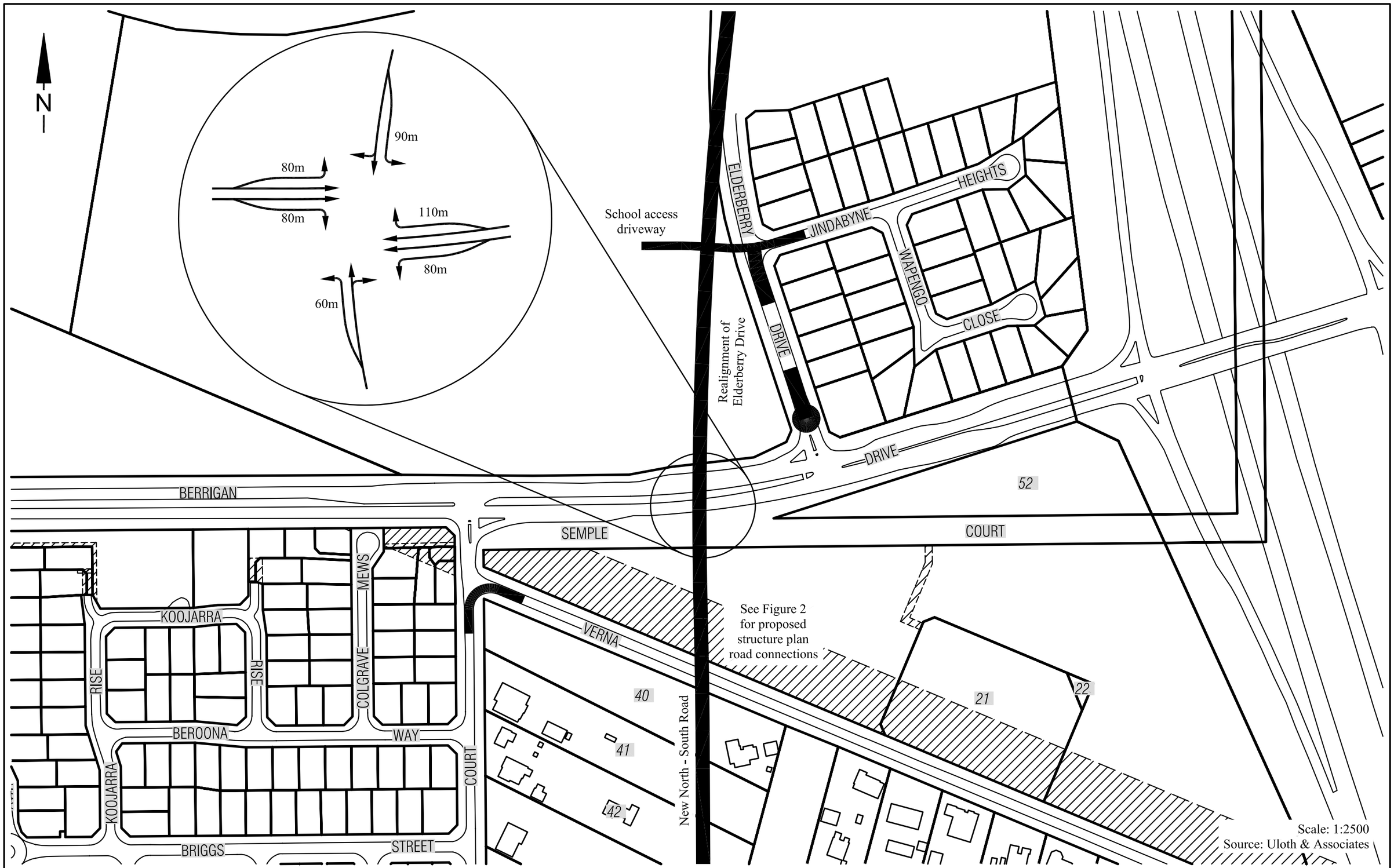
- It is also recommended that equitable cost contributions from the proposed structure plan should be calculated for the following external works:
  - Widening of North Lake Road to 4 lanes divided between Semple Court and Kentucky Court
  - Installation of traffic signals at North Lake Road - Semple Court
  - Installation of traffic signals at North Lake Road - Kentucky Court



Recommended Modifications

PROPOSED MURIEL COURT STRUCTURE PLAN

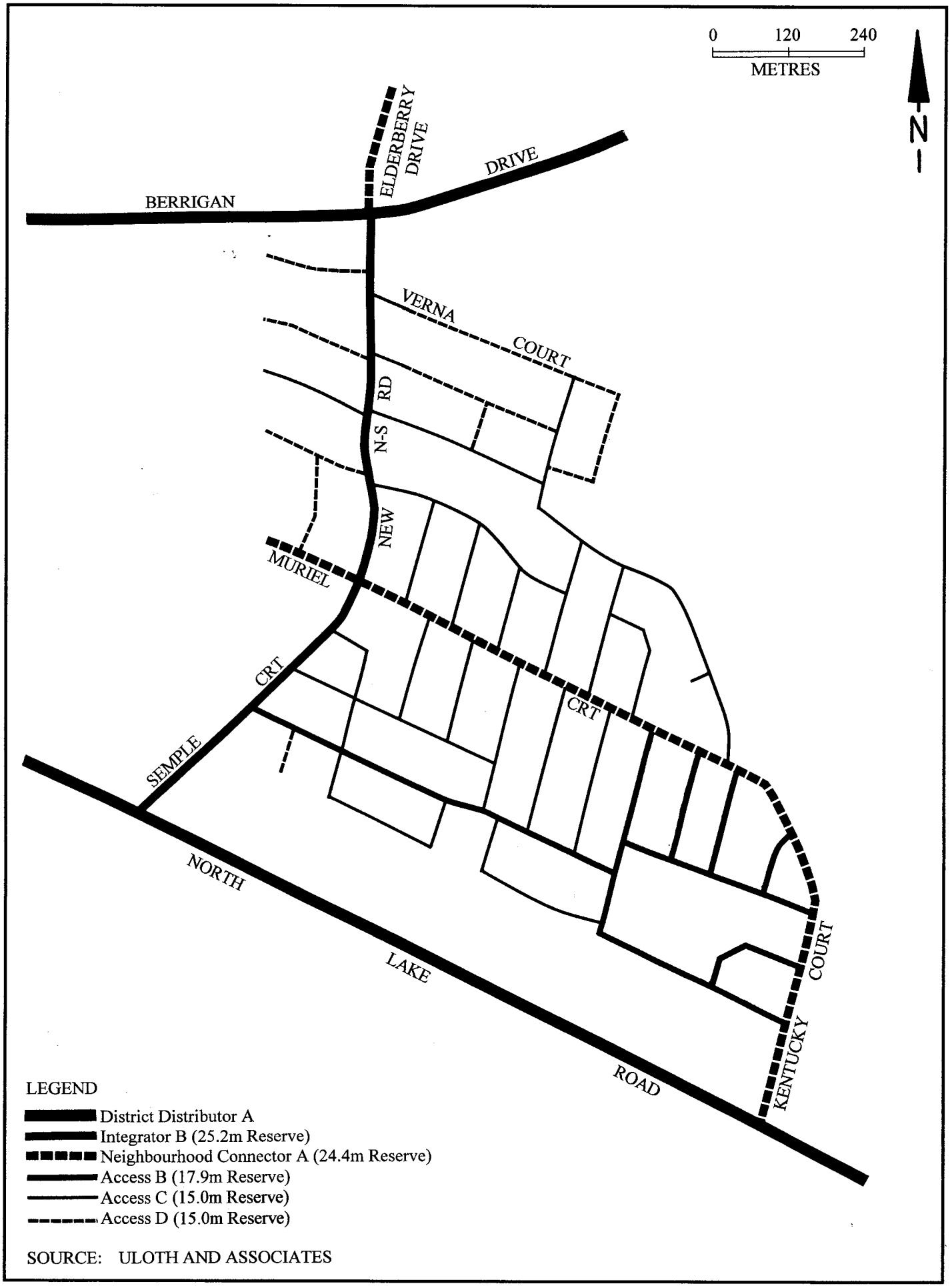
FIG. 2



Recommended Realignment of Elderberry Drive

PROPOSED MURIEL COURT STRUCTURE PLAN

FIG. 3



Recommended Road Hierarchy

PROPOSED MURIEL COURT STRUCTURE PLAN

FIG. 4

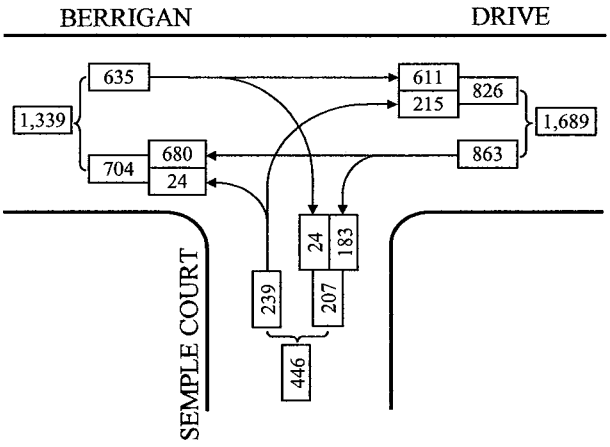
TECHNICAL APPENDIX

The Technical Appendix documents existing traffic flows, proposed future land use data and the corresponding future traffic flows for the Muriel Court structure plan.

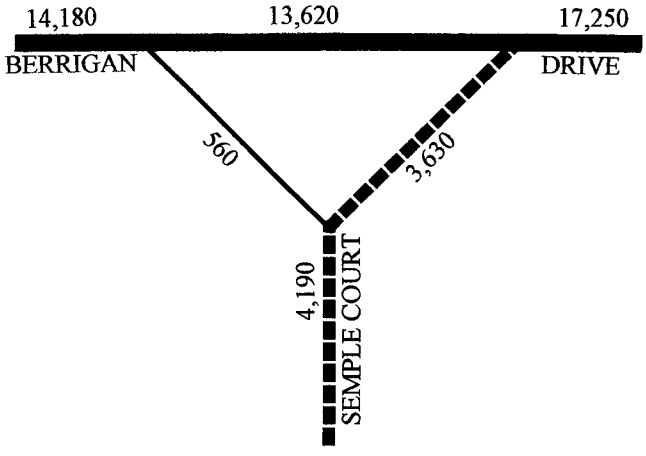
A.1 EXISTING TRAFFIC

In order to identify existing traffic flows in the vicinity of the proposed Muriel Court structure plan, Uloth and Associates carried out PM period traffic counts at several locations on Thursday 1 November 2007 and Thursday 29 November 2007. The surveyed PM peak hour turning movements are shown in the upper part of Figures A.1 to A.4, while the corresponding daily traffic flows are shown in the lower part.

Figure A.5 then shows the overall existing weekday traffic flows in the vicinity of the proposed structure plan, including additional data as surveyed by Main Roads WA and City of Cockburn.



PM PEAK HOUR TRAFFIC (4^{15}- 5^{15}pm)



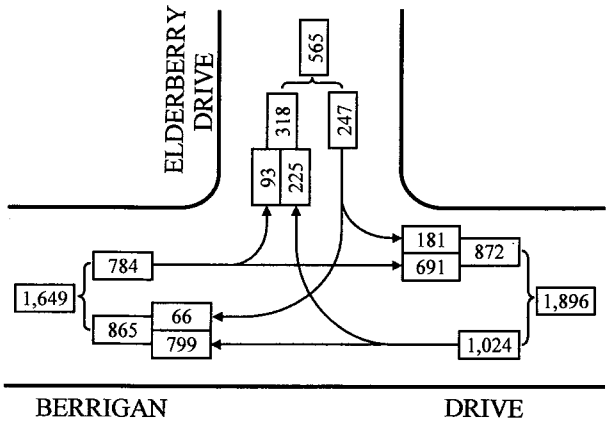
DAILY TRAFFIC

SOURCE: ULOTH AND ASSOCIATES

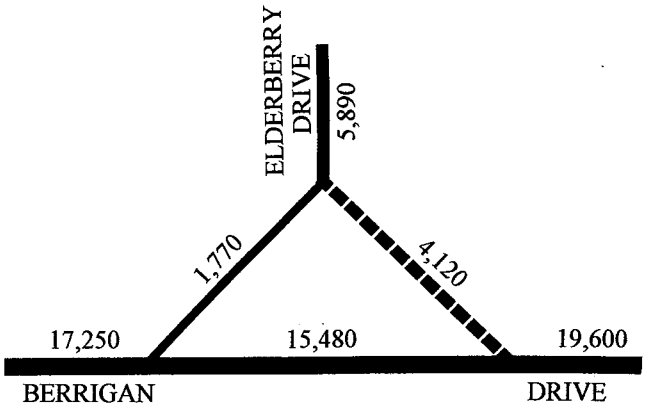
Existing Traffic Flows

BERRIGAN DRIVE - SEMPLE COURT

FIG. A.1



PM PEAK HOUR TRAFFIC (4^{15}- 5^{15}pm)



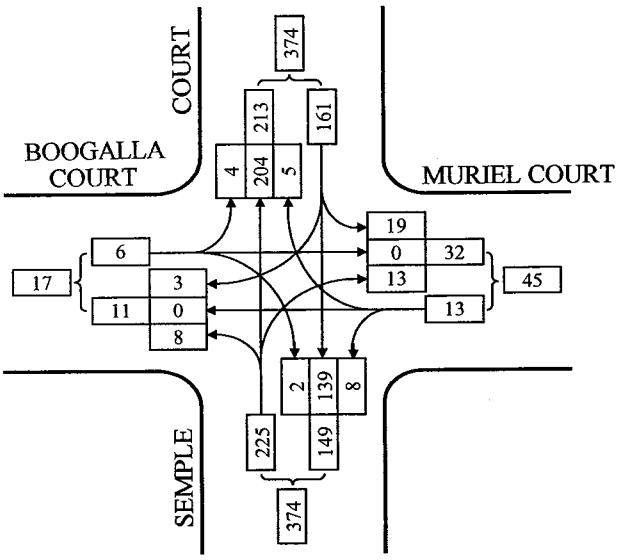
SOURCE: ULOTH AND ASSOCIATES

DAILY TRAFFIC

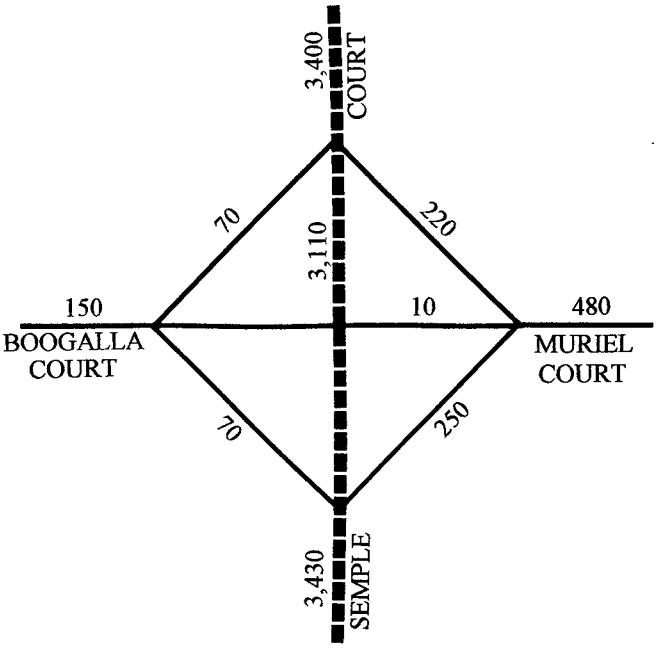
Existing Traffic Flows

BERRIGAN DRIVE - ELDERBERRY DRIVE

FIG. A.2



PM PEAK HOUR TRAFFIC (4^{15}- 5^{15}pm)



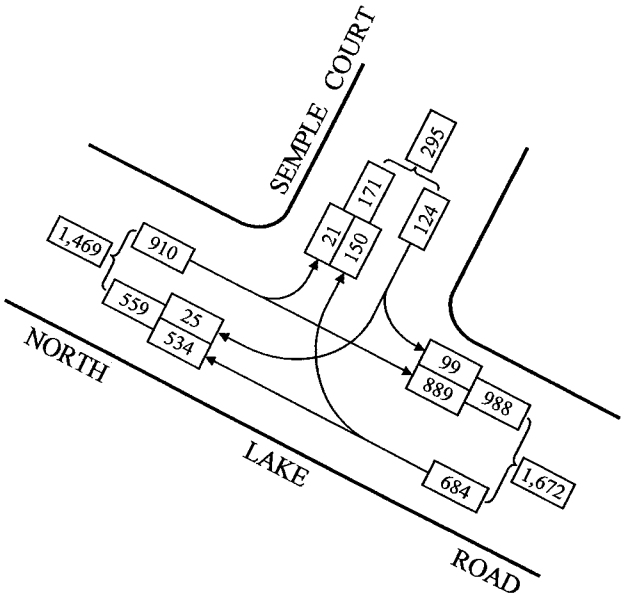
SOURCE: ULOTH AND ASSOCIATES

DAILY TRAFFIC

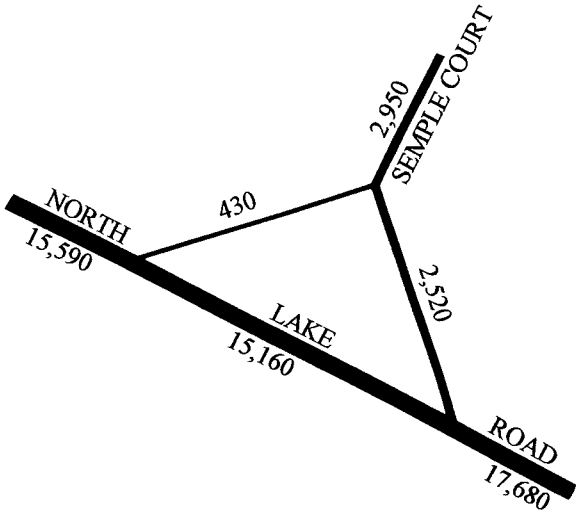
Existing Traffic Flows

SEMPLE COURT - MURIEL COURT

FIG. A.3



PM PEAK HOUR TRAFFIC (4^{30}- 5^{30}pm)



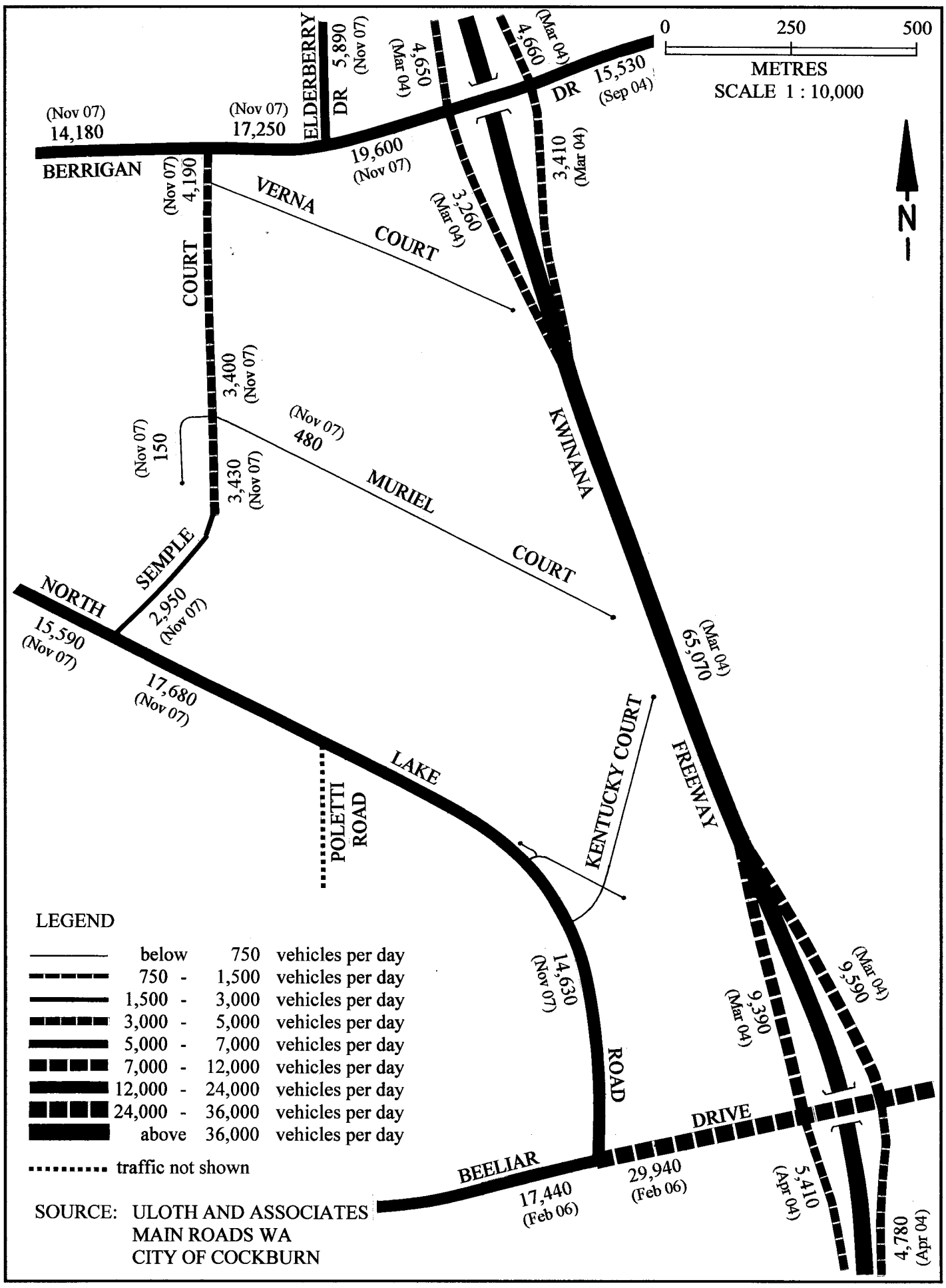
SOURCE: ULOTH AND ASSOCIATES

DAILY TRAFFIC

Existing Traffic Flows

NORTH LAKE ROAD - SEMPLE COURT

FIG.
A.4



Existing Weekday Traffic

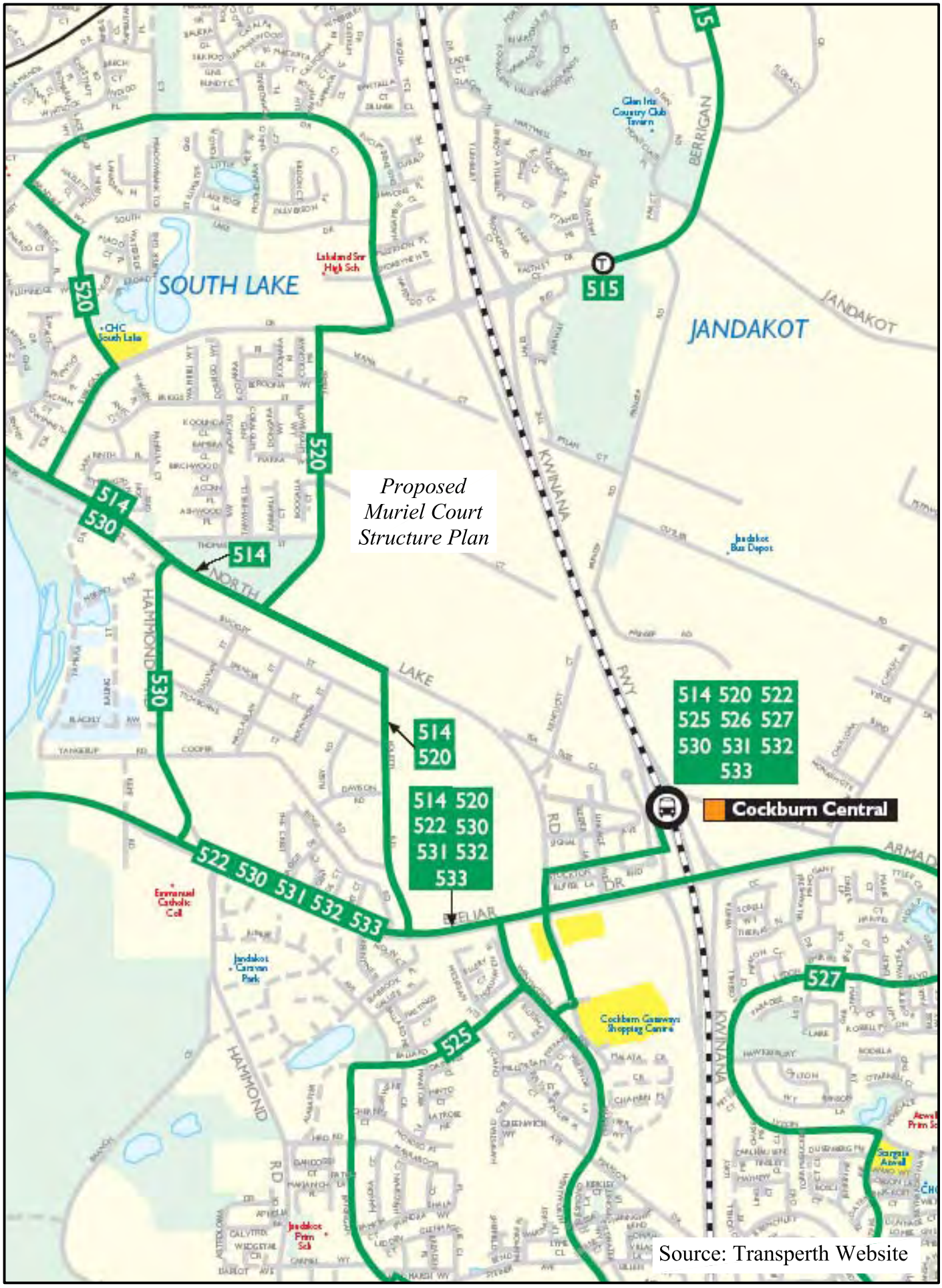
IN THE VICINITY OF PROPOSED STRUCTURE PLAN

FIG. A.5

A.2 PUBLIC TRANSPORT AND PEDESTRIAN/CYCLIST FACILITIES

Figure A.6 shows the existing bus routes in the vicinity of the proposed structure plan, as obtained from the Transperth website.

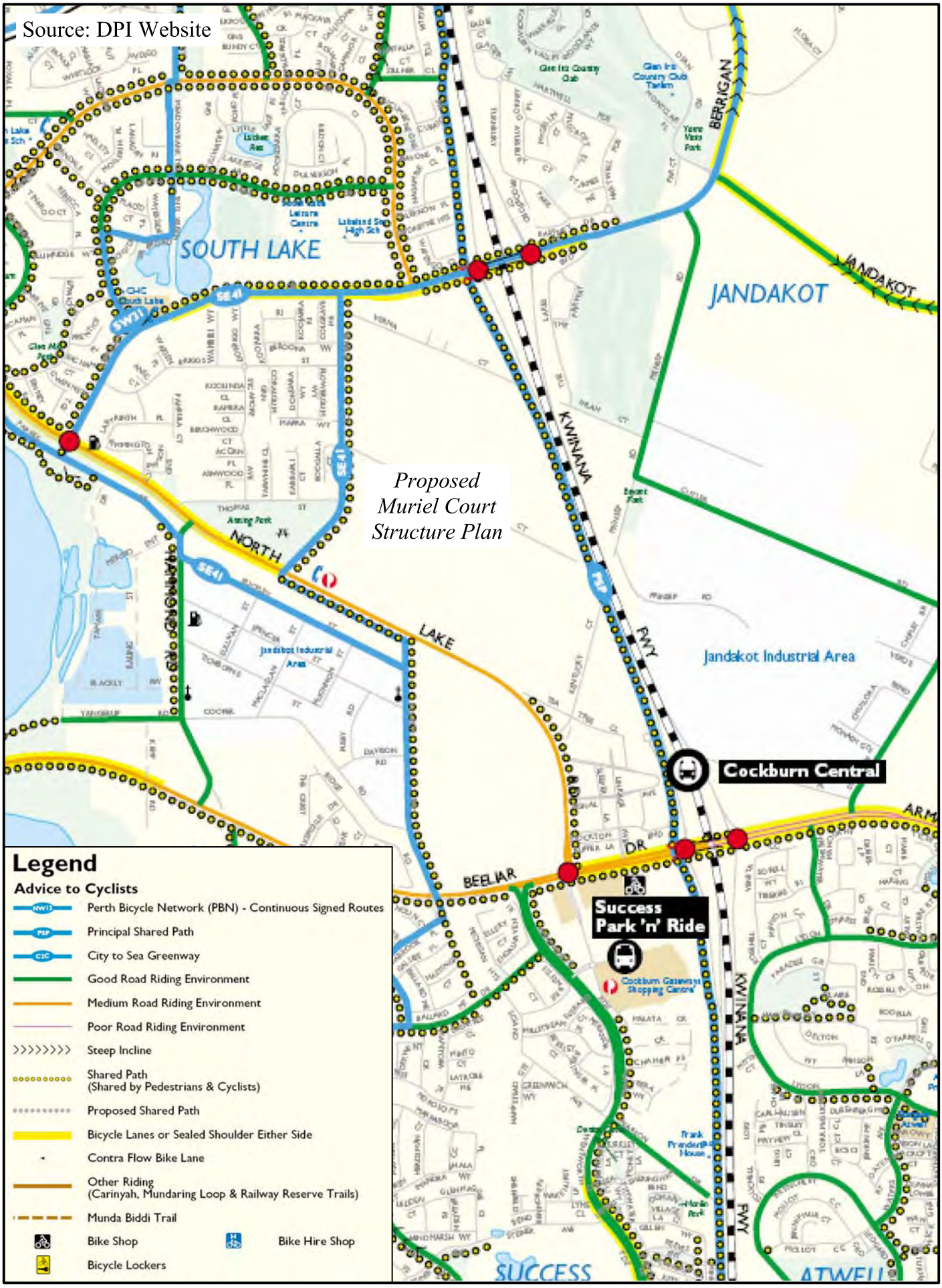
Figure A.7 shows the Perth Bike Network plan for the same area, as obtained from the DPI website.



Existing Bus Routes

IN THE VICINITY OF PROPOSED MURIEL COURT STRUCTURE PLAN

FIG. A.6



Perth Bike Network

IN THE VICINITY OF PROPOSED MURIEL COURT STRUCTURE PLAN

FIG. A.7

A.3 PROPOSED STRUCTURE PLAN

Figure A.8 shows the proposed Muriel Court Structure Plan (City of Cockburn Development Area 19), as prepared by Koltasz Smith.

Table A.1 shows the anticipated future land use for the overall structure plan, together with the estimated traffic generation, on the basis of the Traffic Zones shown in Figure A.9. Traffic generation is based on 8 trips per dwelling per day for R20 development, 6 trips per unit for R40 development, and 5 trips per unit for R160 development.

TABLE A.1
ANTICIPATED LAND USE DATA AND TRAFFIC GENERATION
PROPOSED MURIEL COURT STRUCTURE PLAN

TRAFFIC ZONE	NUMBER OF DWELLINGS				TRAFFIC GENERATION (VPD)
	R20 (Lots)	R40 (Lots)	R160 (Units)	Total	
1	68	64	-	132	930
2	52	44	-	96	680
3	30	18	-	48	350
4	3	223	-	226	1,360
5	17	69	-	86	550
6	70	107	-	177	1,200
7	-	319	-	319	1,910
8	-	45	693	738	3,740
Total	240	889	693	1,822	10,720

Note: Traffic Zones are as shown in Figure A.9.

Source: Uloth and Associates

PROPOSED RE-ALIGNMENT OF ELDERBERRY DRIVE

PROPOSED CONNECTION TO BERRIGAN DRIVE

EXISTING CHILDCARE FACILITY

EXISTING CHURCH

P.O.S

CATCHMENT WALKABLE 800m

CATCHMENT WALKABLE 400m

BERRIGAN DRIVE

SEMPLE COURT

KOOJARRA RISE

COLGRAVE MEWS

BEROONA WAY

VERNA COURT

BRIGGS STREET

DONGARA WAY

FLOWERGUM WAY

MARRA WAY

KABBARLI COURT

BOOGALLA COURT

MURIEL COURT

THOMAS STREET

STREET

THE FAIRWAY

THE LAKES BOULEVARD

IMLAH COURT

FREEWAY

NORTH LAKE ROAD

POLETTI ROAD

TEA TREE ROAD

KENTUCKY STREET

LEGEND

- SITE BOUNDARY
- R40 ZONE
- R160 ZONE
- R20 ZONE
- MIXED BUSINESS
- PUBLIC OPEN SPACE

DISTRICT STRUCTURE PLAN

Development Area 19, COCKBURN CENTRAL

koltasz smith
TOWN PLANNING · PROJECT MANAGEMENT
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City of Cockburn

Hillarys towards

1:2,000@A1 :	SCALE
30 November 2007 :	DATE
2780-5-004 :	PLAN No
- :	REVISION
C.P :	PLANNER
L.W :	DRAWN

METRES 0 50 100 150 200 250

FIG.

A.8

SOURCE: ULOTH AND ASSOCIATES

Future Traffic Zones

PROPOSED MURIEL COURT STRUCTURE PLAN

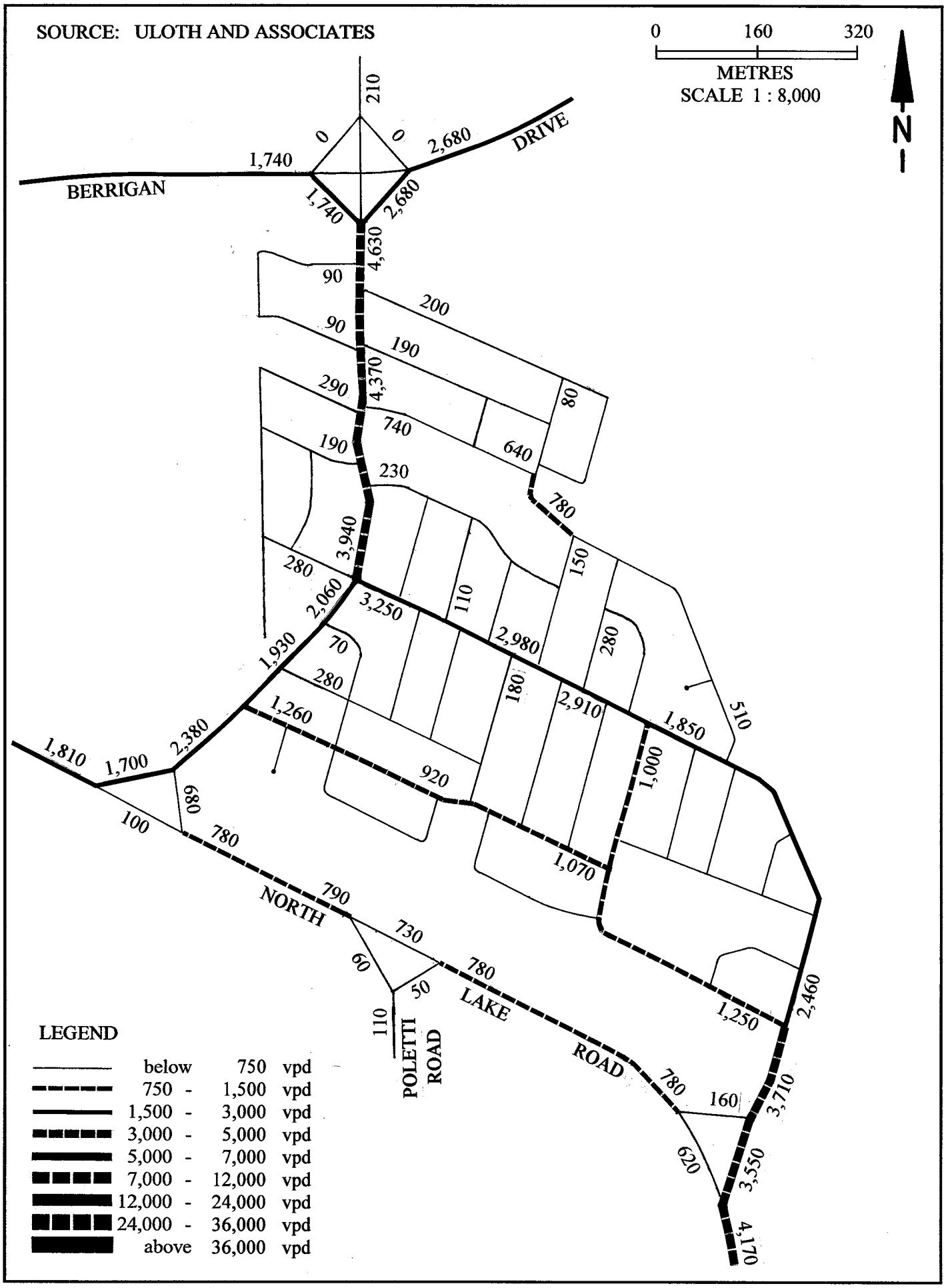
FIG. A.9

A.4 FUTURE TRAFFIC

Figure A.10 shows the assignment of local traffic generated by the proposed structure plan onto the existing and proposed road network.

Figure A.11 shows the resulting future total traffic, comprising existing traffic flows plus the anticipated structure plan traffic flows.

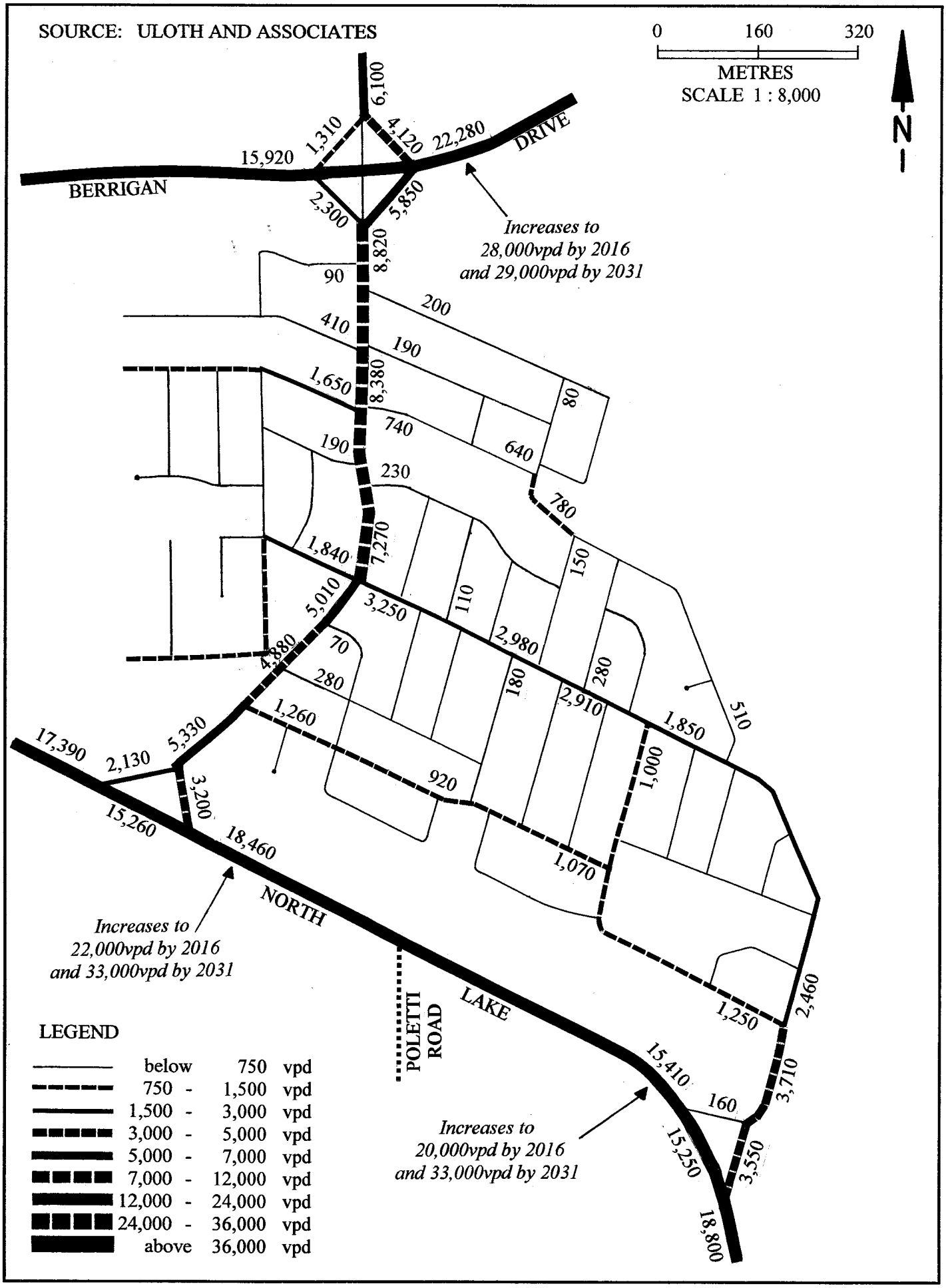
Figures A.12 and A.13 show the long term future PM peak hour turning movements at the Berrigan Drive - Elderberry Drive - New North-South Road intersection, the North Lake Road - Semple Court junction, and the North Lake Road - Kentucky Court junction (under the existing road configuration).



Future Development Traffic Flows

PROPOSED MURIEL COURT STRUCTURE PLAN

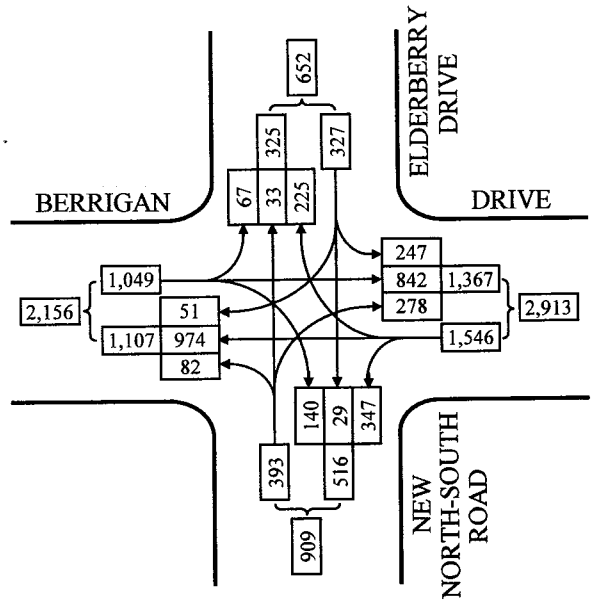
FIG. A.10



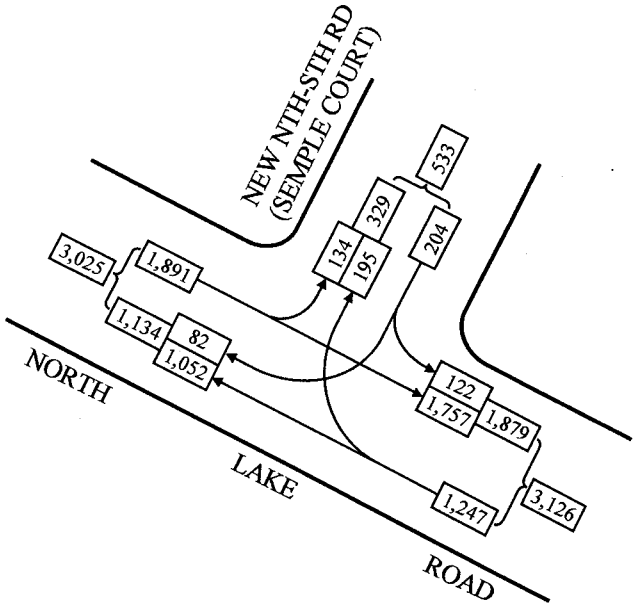
Future Total Traffic Flows

PROPOSED MURIEL COURT STRUCTURE PLAN

FIG.
A.11



NEW NORTH-SOUTH ROAD - BERRIGAN DRIVE



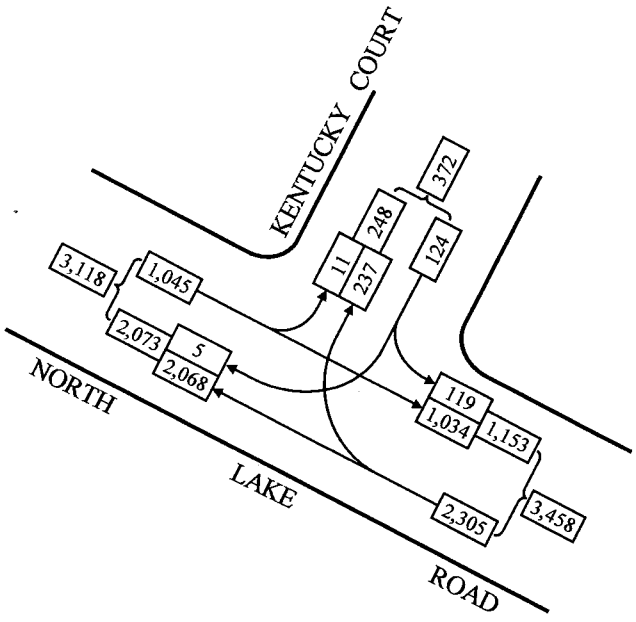
SEMPLE COURT - NORTH LAKE ROAD

SOURCE: ULOTH AND ASSOCIATES

Long Term Pm Peak Hour Traffic

NEW NORTH-SOUTH ROAD - BERRIGAN DRIVE - NORTH LAKE ROAD

FIG. A.12



NORTH LAKE ROAD - KENTUCKY COURT

SOURCE: ULOTH AND ASSOCIATES

Long Term Pm Peak Hour Traffic

NORTH LAKE ROAD - KENTUCKY COURT

FIG. A.13

A.5 INTERSECTION OPERATIONAL ANALYSES

Table A.2 shows the long term PM peak hour intersection operational characteristics for the proposed 4-way intersection at Berrigan Drive - Elderberry Drive, while Table A.3 shows the corresponding operational characteristics at North Lake Road - Semple Court.

Table A.4 shows the long term intersection operational characteristics that would apply at North Lake Road - Kentucky Court, if the existing intersection configuration was retained (and North Lake Road/Midgegooroo Avenue was simply widened to 4 lanes divided on its existing alignment.

TABLE A.2
OPERATIONAL CHARACTERISTICS FOR SIGNALISED BERRIGAN DRIVE - NEW NORTH-SOUTH ROAD INTERSECTION – LONG TERM THURSDAY PM PEAK HOUR

ITEMS	OPERATIONAL CHARACTERISTICS Thursday PM Peak Hour					
No. of Approach Lanes: N E S W	2 4 2 4					
No. of Phases	5					
Cycle Time (sec)	80					
Flow Ratio (Y)	0.596					
Average Delay (sec)	37.3					
Level of Service	D					
Approach	Move-ment	X-Value	Max. Queue Veh.	Max. Queue Metres	Avrge Delay (sec)	Level of Serv.
Elderberry Drive - north	L	0.483	10.1	73.9	32.5	C
	TR	0.624	4.9	35.8	46.9	D
Berrigan Drive - east	L	0.259	3.9	28.6	8.4	A
	T	0.868	23.0	168.1	37.3	D
	T	0.868	23.0	168.1	37.3	D
	R	0.882	12.5	91.2	54.1	D
New North-South Rd - south	L	0.153	2.5	18.0	19.7	B
	TR	0.857	15.8	115.3	47.6	D
Berrigan Drive - west	L	0.056	0.9	6.5	8.8	A
	T	<u>0.893</u>	21.3	155.5	43.1	D
	T	<u>0.893</u>	21.3	155.5	43.1	D
	R	0.818	8.1	59.0	52.1	D

Notes: Level of Service calculations are based on Average Delay and Degree of Saturation.
Underlined X-values denote maximum values.

Source: Uloth and Associates

TABLE A.3
OPERATIONAL CHARACTERISTICS FOR SIGNALISED NORTH LAKE ROAD - SEMPLE COURT JUNCTION – LONG TERM THURSDAY PM PEAK HOUR

ITEMS	OPERATIONAL CHARACTERISTICS Thursday PM Peak Hour					
No. of Approach Lanes: N E S W	2 3 - 3					
No. of Phases	3					
Cycle Time (sec)	85					
Flow Ratio (Y)	0.660					
Average Delay (sec)	17.8					
Level of Service	B					
Approach	Move-ment	X-Value	Max. Queue Veh.	Max. Queue Metres	Avrge Delay (sec)	Level of Serv.
Semple Court - north	L	0.203	4.7	34.3	20.7	C
	R	0.678	5.2	38.2	53.1	D
North Lake Road - east	T	0.372	8.4	61.6	2.9	A
	T	0.372	8.4	61.6	2.9	A
	R	<u>0.866</u>	11.5	83.7	55.8	E
North Lake Road - west	L	0.096	1.2	8.9	8.6	A
	T	0.849	35.5	259.3	21.4	C
	T	0.849	35.5	259.3	21.4	C

Notes: Level of Service calculations are based on Average Delay and Degree of Saturation.
Underlined X-values denote maximum values.

Source: Uloth and Associates

TABLE A.4
OPERATIONAL CHARACTERISTICS FOR UNSIGNALISED NORTH LAKE ROAD - KENTUCKY COURT JUNCTION – LONG TERM THURSDAY PM PEAK HOUR

ITEMS	OPERATIONAL CHARACTERISTICS Thursday PM Peak Hour					
No. of Approach Lanes: N E S W	1 3 - 3					
Approach	Move-ment	X-Value	Max. Queue (veh)	Max. Queue m	Avrge Delay (sec)	Level of Serv.
Kentucky Court - north	LR	0.308	1.3	9.5	14.8	B
North Lake Road - east	T	<u>0.576</u>	0.0	0.0	0.0	A
	T	<u>0.576</u>	0.0	0.0	0.0	A
	R	0.450	3.1	22.3	16.8	C
North Lake Road - west	L	0.007	0.0	0.0	7.6	A
	T	0.288	0.0	0.0	0.0	A
	T	0.288	0.0	0.0	0.0	A

Notes: Level of Service calculations are based on Average Delay and Degree of Saturation.
Underlined X-values denote maximum values.

Source: Uloth and Associates