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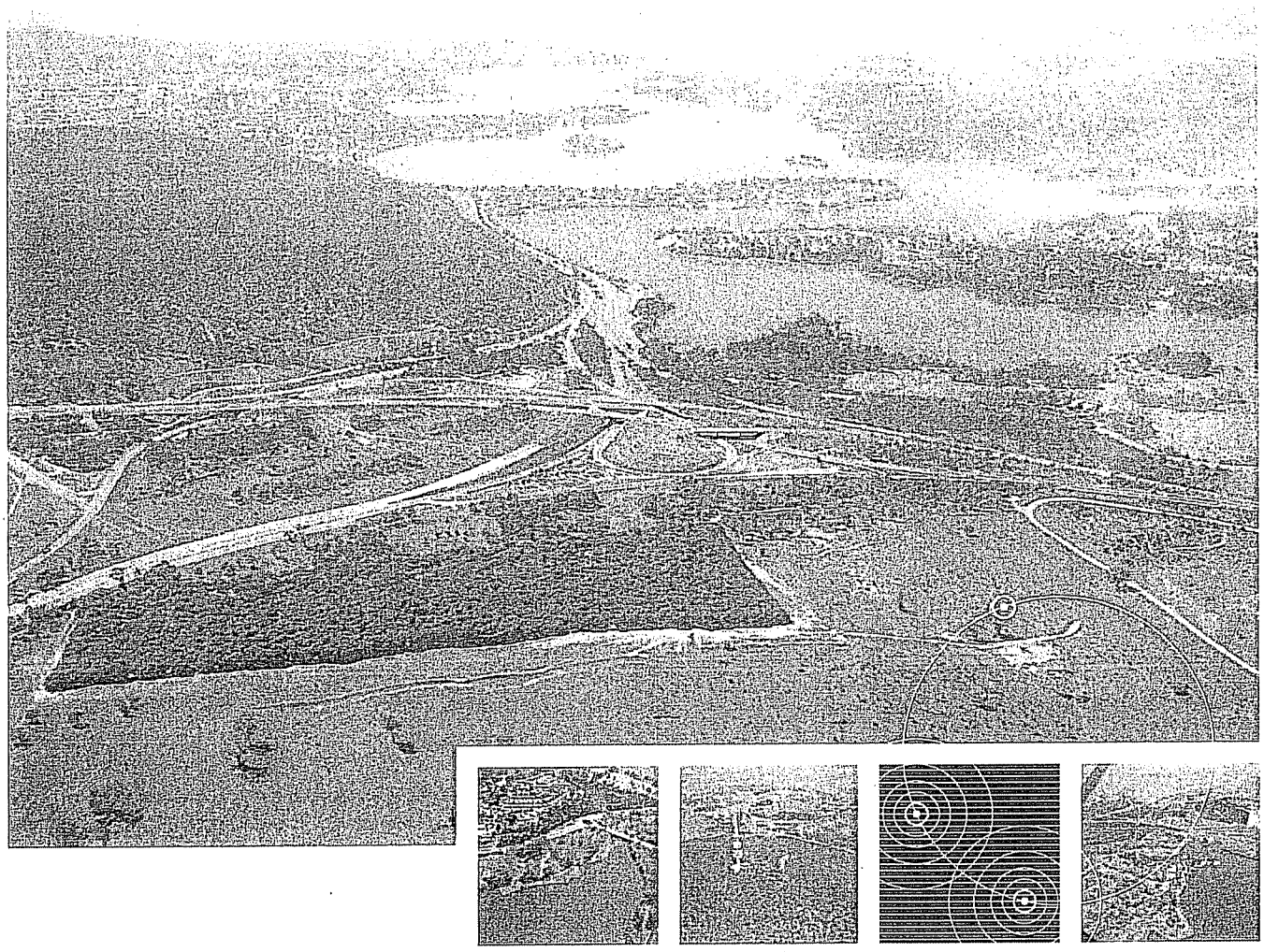

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East West Corridor Infrastructure Study

Final Report

Territory and Municipal Services

10 November 2009

East West Corridor Infrastructure Study

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Prepared for

Territory and Municipal Services

Prepared by

AECOM Australia Pty Ltd
Level 2, 60 Marcus Clarke Street, Canberra ACT 2600, Australia
T +61 2 6201 3000 F +61 2 6201 3099 www.aecom.com
ABN 20 093 846 925

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Quality Information

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0	22/05/2009	First draft report for comment	Rod Williams AECOM ACT Infrastructure Manager	
1	09/07/2009	Final Draft Report	Rod Williams AECOM ACT Infrastructure Manager	
2	10/11/2009	Final Report	Rod Williams AECOM ACT Infrastructure Manager	

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Executive Summary

Background

Over the next twenty years there are several developments either planned or under discussion that will increase the demand on the Canberra road network. A significant proportion of these developments are located close to the centre of the Canberra metropolitan area and will impact on the current major transport corridor that extends from the proposed district of Molonglo to the Canberra Airport/NSW border in a broadly east –west orientation – "The EW Corridor".

The primary purpose of the study is to determine future infrastructure needs and priorities for capital works in the corridor. Figure 1 shows the primary and secondary areas of focus in this study.

There have been several 'specialised, specific, narrow, or isolated' studies of localised infrastructure needs along this corridor over the past few years. This project draws these past studies together into a wider context, so as to identify priorities for the future capital works program.

A review of a number of background strategic planning documents of Canberra highlighted the importance of the EW corridor and in particular the need to develop Parkes Way-Morshead Drive-Pialligo Avenue to a high standard parkway connection. This need has been amplified by land-use decisions embodied in the Canberra Spatial Plan and development around the airport.

The future public transport network recently recommended by McCormick Rankine McCagney (MRC) will not directly affect decisions regarding road improvements in the EW corridor for at least 20 years. MRC propose that, some buses from Molonglo to City will be redirected to Parkes Way in 20 years time. These buses will still comprise a small component of the traffic and Parkes Way and the main consideration will be efficient flow for all traffic on Parkes Way.

Traffic Flows and Growth

Key roads in the EW corridor are some of the busiest roads in Canberra. The high volumes through Glenloch Interchange are most notable. The proposed GDE Stage 2 works will improve traffic flows through here.

Traffic volumes are also high where Parkes Way intersects with Commonwealth Avenue. This also coincides to a location with major design deficiencies and capacity problems. No immediate works are proposed here, but it needs urgent attention.

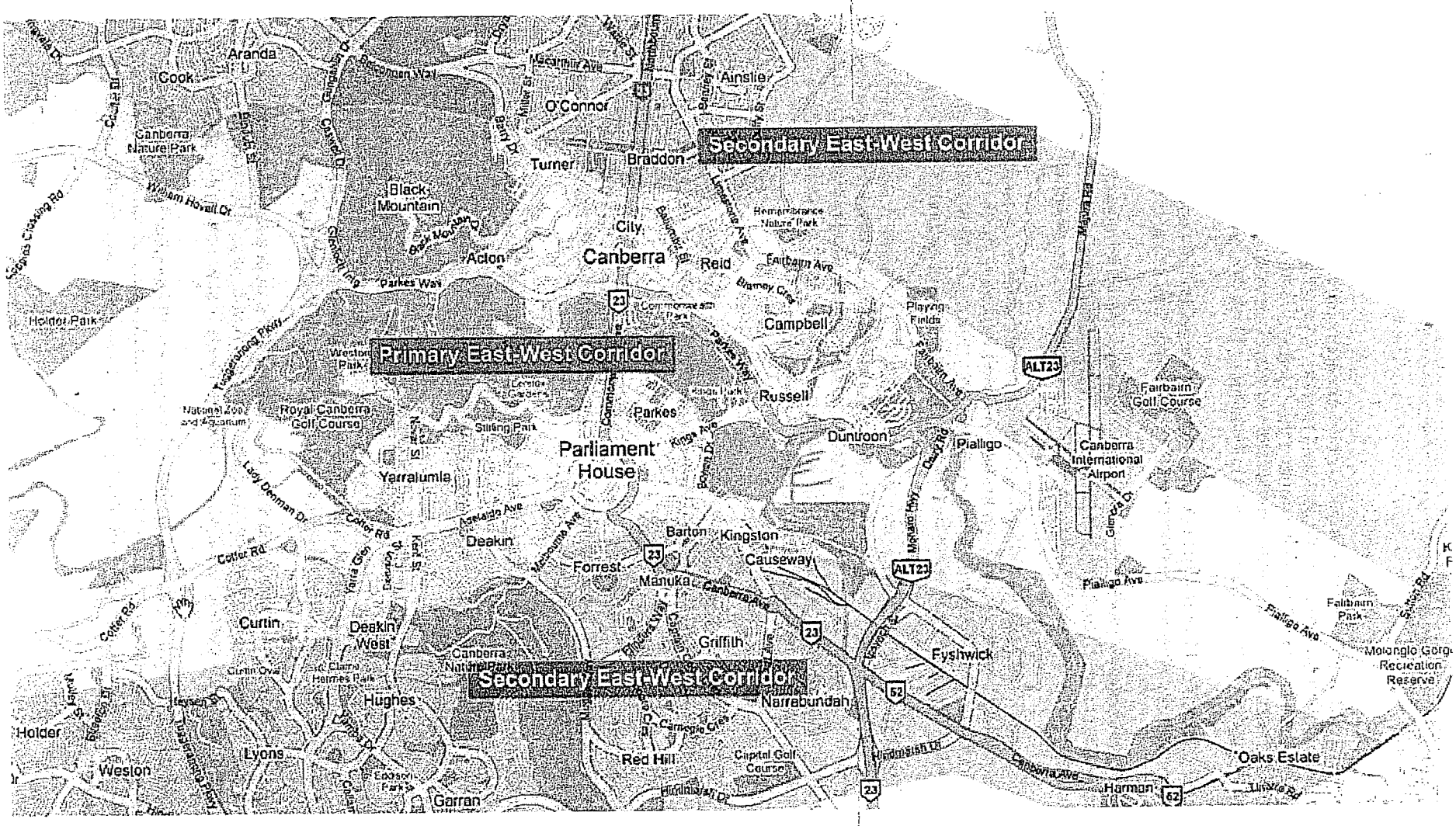
The other location with high volumes is Pialligo Avenue, Morshead Drive and Monaro Highway. The Stage 1 works are progressing here and funding for the proposed Stage 2 works has been approved. These works together with the improved access arrangements at the airport will greatly improve traffic movements in this area.

The results of the traffic modelling showed consistent growth in traffic on Parkes Way, Morshead Drive, Pialligo Avenue, Monaro Highway-Majura Road corridor and Cotter Road west of Tuggeranong Parkway. This growth will generally be higher than growth elsewhere in Canberra and is predicted to remain relatively high for the next 10 years, then it is predicted to flatten off.

The highest growth in the next 10 years will be roads near the airport and Molonglo. The new development in Molonglo is predicted to generate about 40,000 vehicle per day in the Cotter Road and Tuggeranong Parkway corridors, via two new arterial roads that will be built to service Molonglo.

The construction of Majura Parkway and new development in Gungahlin, the Majura Valley and in Queanbeyan will generate significant additional traffic on Monaro Highway, Morshead Drive and Pialligo Avenue. There would also be some growth on Fairbairn Avenue, although this is restricted by its limited capacity.

Figure 1: The East-West Corridor



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Existing Deficiencies

Road Safety Deficiencies

There are a number of locations in the EW road corridor that have relatively high crash rates[1], including:

- The Kings Avenue/Parkes Way roundabout – crashes will be reduced by the construction of the proposed single-point interchange here
- Coranderrk Street/Parkes Way roundabout
- Parkes Way adjacent to Black Mountain
- Lady Denman Drive intersection near Lakeside Interchange – traffic signals recently installed
- Anzac Parade/ Parkes Way roundabout
- Tuggeranong Parkway between Cotter Road and Lakeside Interchange

Physical Freeway Ramp Deficiencies

An examination of the existing road network in the EW corridor identified a number of deficient road elements. An assessment of ramp spacings identified the following sections to be deficient:

- Entry/exit ramps between Novar Street/ Kent Street and Hopetoun Circuit (both directions)
- Eastbound entry ramp from Hopetoun Circuit and the Empire Circuit intersection
- Westbound entry ramp from State Circle and exit ramp to Hopetoun Circuit
- The westbound exit ramp to Kent Street and the exit ramp to Cotter Road
- Lakeside interchange ramps and Glenloch interchange ramps
- Successive entry/exit ramps eastbound on Parkes Way between Edinburgh Avenue and Commonwealth Avenue
- Westbound entry ramp from Commonwealth Avenue to Parkes Way and the Lawson Crescent exit

In addition, the following ramps are considered to have inadequate length or have sight distance restraints:

- Eastbound entry ramp from Cotter Road to Adelaide Avenue
- The entry and exit ramps to/from Novar Street, Kent Street and Hopetoun Circuit
- Northbound entry ramp from Cotter Road onto Tuggeranong Parkway
- The Lakeside interchange ramps
- The entry and exit ramps to/from Commonwealth Avenue, Edinburgh Avenue and Lawson Crescent
- The proposed entry/exit ramps on Morshead Drive at the future Kings Avenue interchange and the Morshead Drive/Russell Drive roundabout

Freeway Ramp Capacity Deficiencies

The capacity of the road system is largely controlled by the capacity of intersections and interchanges and improvements to these can defer the need for road duplication or widening.

The results of the AM peak hour ramp analyses indicated that the following ramps are in most need of attention in future:

- Southbound merge from GDE to Parkes Way
- Northbound from Tuggeranong Parkway to Parkes Way
- Eastbound from Clunies Ross Street to Parkes Way

[1] Locations with high accident occurrence in ACT in the 7 year period from 2001 to 2007 - amongst the highest 100 intersections and highest 50 mid-block locations in ACT (TAMS 2008).

- Northbound from Cotter Road to Tuggeranong Parkway
- Eastbound from Cotter Road to Adelaide Avenue
- Eastbound from Novar Street to Adelaide Avenue
- Southbound from Parkes Way/London Circuit to Commonwealth Avenue

An analysis of weaving movements indicated that weaving movements greatly affect the operation of Parkes Way between Clunies Ross Street and Coranderrk Street. This section should be a priority for improvements.

Mid-block Road Capacity Deficiencies

An analysis of midblock capacities and level of service indicated that most of the roads in the EW corridor are and will continue to be congested in peak hours. Key observations from the results of these analyses are:

- New arterial roads accessing Molonglo from Cotter Road and Tuggeranong Parkway are likely to ultimately require a 4-lane divided cross-section
- Cotter Road should desirably be widened to a 4-lane divided cross-section in future, between the proposed new access to Molonglo and Yarra Glen interchange
- Tuggeranong Parkway may need to be widened to 6 lanes between Cotter Road and Parkes Way in future
- Pialligo Avenue should desirably be widened to a 4-lane divided cross-section in future, between the airport access and the NSW border
- Fairbairn Avenue will need to be upgraded east of Northcott Drive and desirably duplicated through to Treloar Crescent
- The capacity of Parkes Way and Morshead Drive needs to be increased, possibly by widening these roads or improving intersection/interchange operation
- The roads around Russell will require additional capacity

Intersection Capacity Deficiencies

The analyses of key intersection in the EW corridor identified the need for the following works:

- Morshead Drive/Russell Drive – reconstruction of the existing roundabout as a signalised intersection should be considered within the next 5 years, with restricted (left-in/left-out) access into Minindee Drive in future when an alternative access is provided via Kings Avenue
- Parkes Way/Anzac Parade – Parkes Way will need to be tunnelled under the existing roundabout and ramp connections provided to the roundabout within the next 10 years
- Anzac Parade/Constitution Avenue – the box turn arrangement at this intersection has limited capacity and affects road safety, but there are limited options for improvements here so increases in traffic demand through this intersection need to be restricted by providing alternative routes to new development along Constitution Avenue
- Parkes Way/Coranderrk Street – reconstruction of the existing roundabout as a signalised intersection should be considered within the next 5 to 10 years, with provision in the design for Parkes Way to flyover this intersection in the longer-term future; in the short-term, an investigation of the implementation of signal metering of right turns from Parkes Way East to Coranderrk Street should be investigated
- Constitution Avenue/Coranderrk Street – an upgrade of the capacity of this intersection is required as soon as possible to reduce the likelihood of queueing back into the Parkes Way roundabout
- Cotter Road/Streeton Drive – a major upgrade in capacity within the next 5 to 10 years to accommodate traffic from Molonglo
- Cotter Road/McCulloch Street – extra capacity in the next 5 years by extending the length of the eastbound through lane

- Bindubi Street/William Hovell Drive – extra capacity within the next 5 years and should be grade-separated when the Molonglo distributor road connection is built here
- Cotter Road/Lady Denman Drive – reconstruction of the existing roundabout as a signalised intersection within the next 5 to 10 years
- Cotter Road/Kirkpatrick Street – reconstruction of the existing roundabout as a signalised intersection when access via a fourth leg is needed to North Weston

Trunk Cycling and Walking Path Deficiencies

There are a number of gaps in the trunk cycling and walking path network. A recent study by CBRE identified priorities for improvements to the Trunk Cycling and Walking Network. Key works worthy of consideration as part of proposed roadworks in the corridor include:

- Cotter Road 1 – Streeton Drive to Yarralumla Creek ($310k)
- Cotter Road 2 ($350k)
- Cotter Road 3 ($730k)
- Constitution Ave
- Russell Drive

Some of these works on Cotter Road have recently been progressed.

Bridge Deficiencies

A report on the ACT Bridges Strengthening program provided significant data on ACT bridges. The strength, width and vertical clearance of bridges are key elements that affect vehicle access on the major road network.

Bridges requiring strengthening in the EW corridor include:

- Cotter Road bridge over Weston Creek
- Cotter Road bridge over Tuggeranong Parkway
- Tuggeranong Parkway bridge over Molonglo River
- Adelaide Avenue bridges over Hopetoun Circuit
- Parkes Way bridges over Clunies Ross Street
- Commonwealth Avenue bridges over Parkes Way

Key bridges with width or vertical clearance deficiencies include:

- Cotter Road bridge over Weston Creek
- Cotter Road bridge over Tuggeranong Parkway
- Tuggeranong Parkway bridge over Molonglo River
- Kent Street bridge over Adelaide Avenue
- Adelaide Avenue bridges over Hopetoun Circuit
- Parkes Way bridges over Clunies Ross Street
- Edinburgh Avenue bridge over Parkes Way
- Commonwealth Avenue bridges over Parkes Way
- Pedestrian footbridges over Parkes Way near City (vertical clearance)
- Parkes Way bridges over Wendouree Drive
- Pialligo Avenue over Woolshed Creek

Road Infrastructure Improvement Packages

A Description of the Packages

Three generic infrastructure packages that include a range of projects for consideration in the short- to long-term were developed and evaluated. They represented strategies with different geographic focii. In summary, the packages were:

1. Parkes Way West Widening – includes an additional lane in the median of Parkes Way between Glenloch Interchange and Acton Tunnel, duplication of parts of Constitution Avenue and key intersection improvements
2. Cotter Road Duplication – includes the duplication of Cotter Road between Tuggeranong Parkway and Adelaide Avenue, new ramps at the Yarra Glen interchange, widening of Adelaide Avenue between Yarra Glen and State Circle, a single point interchange at Commonwealth Avenue/ Parkes Way, duplication of parts of Constitution Avenue and key intersection improvements
3. Fairbairn-Northcott-Constitution Duplication – includes the duplication of Fairbairn Avenue between Morshead Drive and Northcott Drive, duplication of Northcott Drive, duplication of Constitution Avenue, new ramps at the Clunies Ross Street Interchange, duplication of Clunies Ross Street, a single point interchange at Commonwealth Avenue/ Parkes Way, the extension of Minindee Drive to Kings Avenue and key intersection improvements

Costs and Benefits of the Packages

A summary of the probable capital costs and economic return of each of the packages is summarised in Table 1, based on an assessment of the transport benefits of each project. It shows that each of the packages is economically feasible. The Parkes Way West package will provide the best economic return in terms of an economic assessment of transport benefits. However, elements of packages 2 and 3 include other benefits that cannot be quantified in this project (eg., return on land sales from land currently constrained by road infrastructure, increased). Hence, a preferred package should include elements of all works packages and this is reflected in the recommended program of work in Table 3.

Table 1: Economic Costs and Benefits of Packages

Package	Cost	Net Present Value	Benefit Cost Ratio
1. Parkes Way West Widening	$36.0M	$276.8M	8.7
2. Cotter Road Duplication	$154.3M	$163.5M	2.1
3. Fairbairn-Northcott-Constitution Duplication	$145.4M	$58.2M	1.4

Note: Based on a 7% discount rate, a 20 year evaluation period and constant 2009 prices

In terms of external costs, delivery of these works packages will involve some construction disruption costs. In terms of other benefits, there will be associated savings in vehicle externalities (emissions, accidents etc), as well as improved access / utility of parklands and lake. These are not quantified in the analysis.

Traffic Impacts of the Packages

An overall summary of the network impacts of the various packages, in terms of changes in the amount of travel and average travel speeds in the AM peak, is given in Table 2. It shows marginal overall improvements for each package, but they add up in terms of economic benefits over a 20 year or more period.

Table 2: Changes in the Amount of Travel for the Packages

Package	Year	Vehicle Km (Millions)		Vehicle Hours (Thousands)		Average Speed (km/h)	
		Do Nothing	Project	Do Nothing	Project	Do Nothing	Project
Parkes Way West Widening	2011	1.690	1.689	32.3	31.7	52.4	53.2
	2021	1.931	1.937	44.8	44.3	43.1	43.7
	2031	2.065	2.074	56.9	56.7	36.3	36.6
Cotter Road Duplication	2011	1.690	1.689	32.3	32.1	52.4	52.6
	2021	1.931	1.935	44.8	44.3	43.1	43.7
	2031	2.065	2.071	56.9	56.5	36.3	36.7
Fairbairn-Northcott-Constitution Duplication	2011	1.690	1.690	32.3	32.1	52.4	52.6
	2021	1.931	1.932	44.8	44.6	43.1	43.3
	2031	2.065	2.068	56.9	56.7	36.3	36.5

Note: Based on EMME model predictions for the AM peak period

More specific benefits in terms of changes in the performance of elements of the road system are evident when specific locations where improvements are proposed are examined. A good example is the widening of Parkes Way between Glenloch Interchange and Acton Tunnel; the primary works element in package one. Outputs from simulation modelling of Glenloch Interchange show marked benefits of building the extra lanes (see Figure 2). This is additional to the current improvement works at Glenloch Interchange.

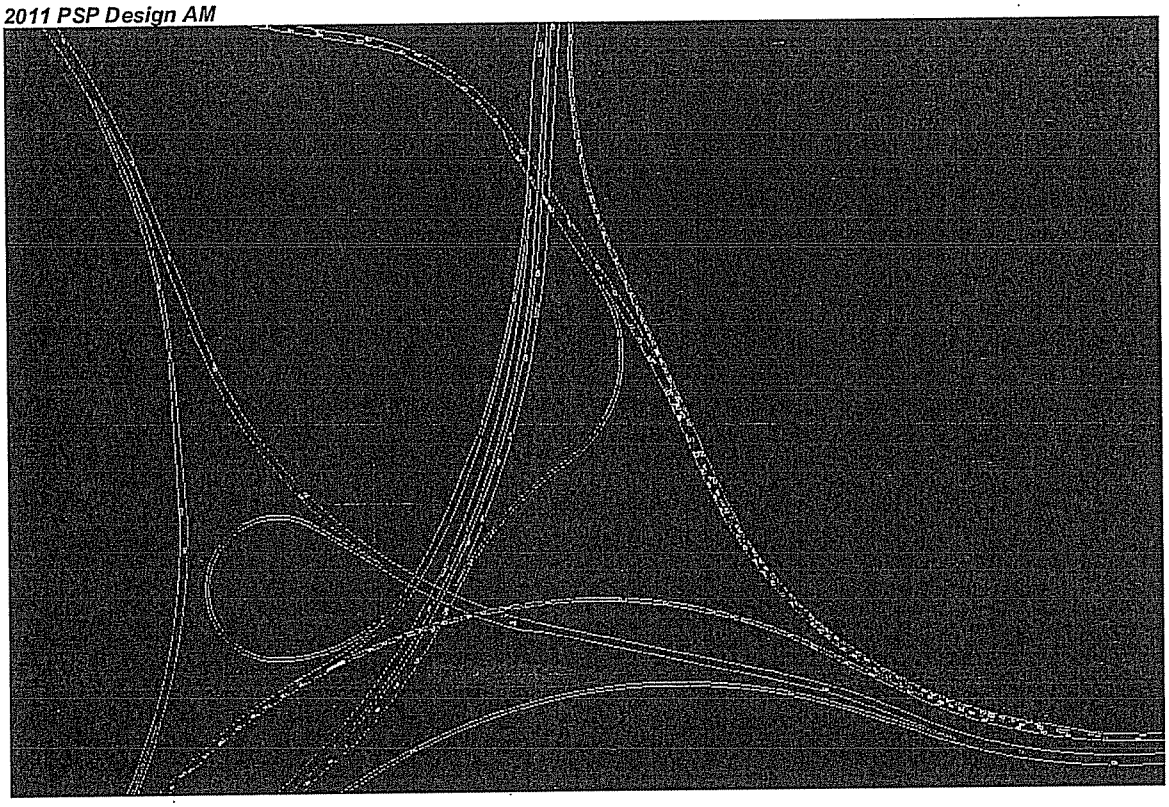
However, there are concerns that widening Parkes Way would put considerable added pressures on the ramps leading to Parkes Way at Glenloch Interchange and at Clunies Ross Street. These ramps are already at capacity and the widening of Parkes Way would make them worse, as well as increasing pressures on Tuggeranong Parkway north of Cotter Road and the Acton Tunnel.

It was found that additional west-facing ramps at Clunies Ross Street/Parkes Way would have little benefit to traffic movements and may adversely impact on adjoining land-uses. Thus, these ramps are not worth further consideration.

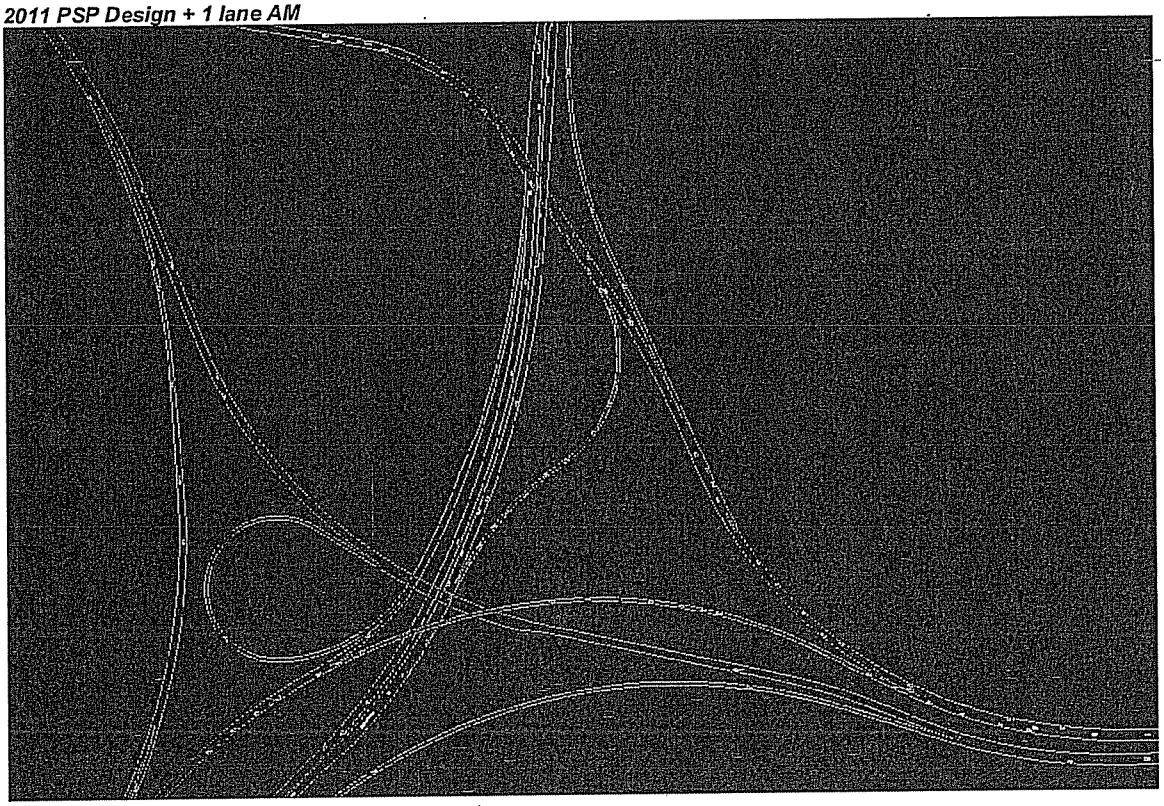
Another high priority work that could be beneficial from a traffic perspective is the reconstruction of the Morshead Drive/Russell Drive junction as a signalised intersection. This would greatly reduce AM peak queues and delays at this intersection (from 119s/veh to 25s/veh) and would encourage City-bound traffic to use Parkes Way rather than Russell Drive, reducing pedestrian/vehicle conflicts in Russell. A feasibility study should also be instigated to investigate the extension of Minindee Drive to Kings Avenue, so that access at Morshead Drive can be restricted to left-in/left-out in future to extend the life of a signalised intersection at this location.

Figure 2: Microsimulation Modelling Outputs Showing the Effect of Widening Parkes Way

2011 PSP Design AM



2011 PSP Design + 1 lane AM



Source: AECOM AM peak Paramics model of Glenloch Interchange

Other Future Works and Investigations

There are strong reasons to examine more closely improvements to Parkes Way between Edinburgh Avenue and Anzac Parade, as this section of road is possibly the most congested in the EW corridor. A feasibility study should be instigated to examine the engineering options and economic impacts of the reconstruction of the Commonwealth Avenue/Parkes Way interchange as a single-point interchange. This interchange will be difficult to build under traffic, but it will provide significant benefits to traffic movements on Parkes Way and would open up opportunities to develop the land adjacent to the interchange (eg., the land currently occupied by freeway ramps). Its construction will require the demolition of the east-facing ramps at Edinburgh Avenue, bringing forward consideration of a land bridge to West Basin and associated benefits of improved accessibility with City West and additional land sales opportunities to offset the cost of the road works. It would also mean careful consideration of how it would connect with Coranderrk Street and what works would be needed at Coranderrk Street /Parkes Way.

Other possible improvements on Parkes Way that are worth more detailed consideration for implementation in the short-term are:

- Reconstruction of the Coranderrk Street/Parkes Way intersection as signals. This should be built in conjunction with capacity improvements to the Coranderrk Street/Constitution Avenue intersection.
- New traffic signals to control the movements of vehicles and queueing on the Parkes Way exit ramp to Commonwealth Avenue and conflicts with traffic from London Circuit. This would need to ensure that bus movement delays are minimised via transponders in buses influencing signal green times.
- Extending the west-bound off-ramp from Parkes Way to Commonwealth Avenue to form an add lane, so that traffic can merge at speed.

Furthermore capacity improvements to key intersections along Cotter Road, Constitution Avenue and at Morshead Drive/Russell Drive identified in this report should be investigated in more detail. In particular, studies should be instigated to develop PSP designs for improvements at these locations. GHD have already developed a PSP design for the Streeton Drive/Cotter Road intersection, using recommendations from this study.

The eastern end of the corridor has already seen significant road improvement activity and this will continue with the announcement of funds for the first stage works of Majura Parkway. However, issues still remain in this part of the corridor that will need to be addressed to cater for increased traffic from continued growth around the airport, Queanbeyan, Majura Valley and Kowen in future. The main problems that will remain to be addressed in the eastern part of the corridor are:

- At-grade intersections and local accesses on Morshead Drive and on Pialligo Avenue east of the new airport access;
- The tight alignment of Morshead Drive near Duntroon and Pialligo Avenue near the north-south (NS) runway;
- The future alignment of the Very High Speed Train;
- The future extension of the NS runway; and
- The development of a future parallel NS runway and possible new roads and terminal.

There are no easy solutions. A study needs to be instigated to examine long-term options for major road improvements in the eastern part of the corridor, including future connections to Kowen and the proposed Queanbeyan Northern Bypass.

Works Priorities

An assessment of existing conditions and potential works packages identified a list of priorities for future investigations, design and construction in the EW corridor. These are shown in Table 3 and they largely include works from Package 1 but also other works considered important from other packages or investigations. In summary, the probable costs[2] for the works identified in the EW corridor are as follows:

- 2009-2011: $0.5M
- 2011-2014: $21.4M
- 2014-2019: $52.5M
- 2019+: $20.0M
- Total $94.3M

Table 3: EW Corridor Works Priorities

Item	Location	Description of Works	Cost ($k)	Timing (years)
1	Commonwealth Ave bridges over Parkes Way	Investigation study	50	0-2
2	Constitution Ave - London Cct to Blamey Cres	Study & PSP design of duplication	200	0-2
3	EB Parkes Way exit ramp to Commonwealth Ave	Study & PSP design for ramp metering signals	50	0-2
4	NB on Tuggeranong Pwy between Cotter Rd and Glenloch interchange	Study to investigate potential road widening	100	0-2
5	Parkes Way bridges over Clunies Ross St	Investigation study	50	0-2
6	Parkes Way EB between Clunies Ross Street and Edinburgh Ave	Investigation study	50	0-2
7	Widening of Parkes Way - Acton Tunnel to Kings Ave	Feasibility study	250	0-2
8	Yarra Glen and Adelaide Avenue between Carruthers St and Coronation Dr	Study to investigate interchange capacity improvement strategy	100	2-5
9	Anzac Pde/Constitution Ave	Redesign and capacity upgrade	250	2-5
10	Constitution Ave/Coranderrk St	Redesign and capacity upgrade	1000	2-5
11	Cotter Rd - McCulloch St to Yarra Glen	Road widening and upgrade	1800*	2-5
12	Cotter Rd - Streeton Dr to Yarra Glen	On-road cycle paths	310	2-5
13	Cotter Rd/Kirkpatrick St	Reconstruct existing roundabout as signals	4000	2-5

[2] In 2009 dollars

Item	Location	Description of Works	Cost ($k)	Timing (years)
14	Cotter Rd/Lady Denman Dr	Reconstruct existing roundabout as signals	800	2-5
15	Cotter Rd/McCulloch St	Redesign and capacity upgrade	250	2-5
16	Cotter Rd/Streeton Dr	Redesign and capacity upgrade	6100	2-5
17	Dixon Dr/Streeton Dr	Construct 2-lane roundabout	3600	2-5
18	East-West Arterial link from Tuggeranong Parkway to Lady Denman Dr	Feasibility study for new road	100	2-5
19	Fairbairn Ave between Majura Rd and Northcott Dr	Road widening and upgrade	9300	2-5
20	Kings Ave (CBRE)	On-road cycle paths	200	2-5
21	Morshead Dr and Pialligo Ave between Kings Ave and the NSW border	Study to investigate alternative route and upgrading options	150	2-5
22	Minindee Dr link to Kings Av	Design investigation study	50	2-5
23	Morshead Dr/Russell Dr	Design and reconstruct existing roundabout as signals	800	2-5
24	Northcott Dr	Study to investigate road widening and safety upgrade	50	2-5
25	Widening of Parkes Way - Glenloch interchange to Acton Tunnel	Design study to investigate adding another lane	100	2-5
26	Parkes Way/Anzac Pde	Grade separation of Parkes Way under Anzac Pde roundabout	40000	5-10
27	Parkes Way/Coranderrk St	Design and reconstruct existing roundabout as signals	2000+	5-10
28	Russell Dr (CBRE)	On-road cycle paths	250	5-10
29	Bindubi St/William Hovell Dr	Grade separation with addition of new road from Molonglo	20000	10-20

* Approximate, as some works are currently being done on Cotter Road
\+ Includes an allowance of $1M for a new pond/GPT

Note: More details of the proposed works are given in the body of this report

1.0 Introduction

1.1 Background

Over the next twenty years there are several developments either planned or under discussion that will increase the demand on the Canberra road network. A significant proportion of these developments are located close to the centre of the Canberra metropolitan area and will impact on the current major transport corridor that extends from the proposed district of Molonglo to the Canberra Airport/NSW border in a broadly east –west orientation – "The EW Corridor". A map indicating the extent of the EW corridor is shown in Figure 1.

The East-West (EW) corridor is a key artery in ACT's transport network comprising Cotter Road, Tuggeranong Parkway, Parkes Way, Morshead Drive and Pialligo Avenue. There are limited east-west transport connections in Canberra – only Hindmarsh Drive and this route are continuous - and this EW corridor is the busiest, serving the proposed development of Molonglo, City Centre, Parliamentary Triangle and airport. The design of this corridor limits the capacity and free movement of traffic.

Significant growth is expected to occur in the EW corridor due to developments in Central Canberra, Molonglo, the Airport, Queanbeyan and in future Kowen. This will result in the need for major improvements in capacity in this corridor. Any improvements will need to be cognizant of future needs for public transport priority.

The focus of the study is to determine future infrastructure needs and priorities for capital works in the corridor. There have been several 'specialised, specific, narrow, or isolated' studies of localised infrastructure needs along this corridor over the past few years. This project draws these past studies together into a wider context, so as to identify priorities for the future capital works program.

Traffic modelling was undertaken to enable capacity analyses and the determination of the needs and priorities for infrastructure improvements in the corridor. However, modelling does not form a major component of the project. The modelling was used to provide input into the assessment of the infrastructure needs of the corridor as a whole by assisting in the identification of "hot spots" and to determine values of travel time and travel distance savings that will arise from the improvements for the economic evaluation.

The load bearing capacity of bridges could also be an issue – although most bridges have been strengthened to meet the current vehicle load limits. The ACT Asset register was used to review current capacities of all the bridges in the corridor and to highlight where there may be issues.

An order of construction cost and travel savings was provided for recommended infrastructure upgrades in the corridor and a broad economic justification of the package of works for the whole corridor. Some broad social and environmental benefits were included in the justification.

1.2 Project Objectives

The objective of this project is to assess the growth in traffic demand on the EW corridor over the coming twenty years and deduce from this assessment the infrastructure development needs to meet this growth at acceptable levels of service. The study outputs are to include an overall program of infrastructure works covering functional needs and scope of works required, broad engineering and environmental issues and constraints, a planning or strategic program cost and broad economic justifications relative to a "do nothing " base case. Individual project assessments are not required.

1.3 Scope of Work

The work required to serve the objectives of this project included:

(1) An outline of the planning context for works to be recommended in the corridor
This was based on a review of recent reports and current policy documents and is provided in Chapter 2.

(2) An assessment of existing conditions in the corridor
This was based on a review and analysis of existing traffic and road infrastructure data in the corridor and is provided in Chapter 3.

(3) Strategic transport modelling of future traffic demands
This was undertaken using the existing EMME model of Canberra, for a base year (2006) and three future years (2011, 2021 and 2031). The assumptions and outcomes of this modelling are given in Chapter 4.

(4) An assessment of future traffic conditions and road improvement needs
This included capacity analyses of midblock, intersection, freeway ramps and weaving sections using traffic forecasts from EMME. The outcomes of this analysis are included in Chapter 5.

(5) The identification of infrastructure works packages for the EW corridor
Three broad improvements packages covering a range of improvement options were developed in discussion with TAMS. These are described in Chapter 6, together with an indication of probable capital costs.

(6) An assessment of the infrastructure works packages
The improvement packages were assessed against a range of physical, economic and environmental criteria in Chapter 7. This included commentary on the impact on public transport, freight, cycling and walking needs in the EW corridor as a result of the different development scenarios.

(8) Identify a program of road infrastructure works and future design investigations
A program of road transport infrastructure improvements and future design investigations for the EW corridor was created and is provided in Chapter 8. It brings together the various conclusions supporting the program of works in a concise summary.

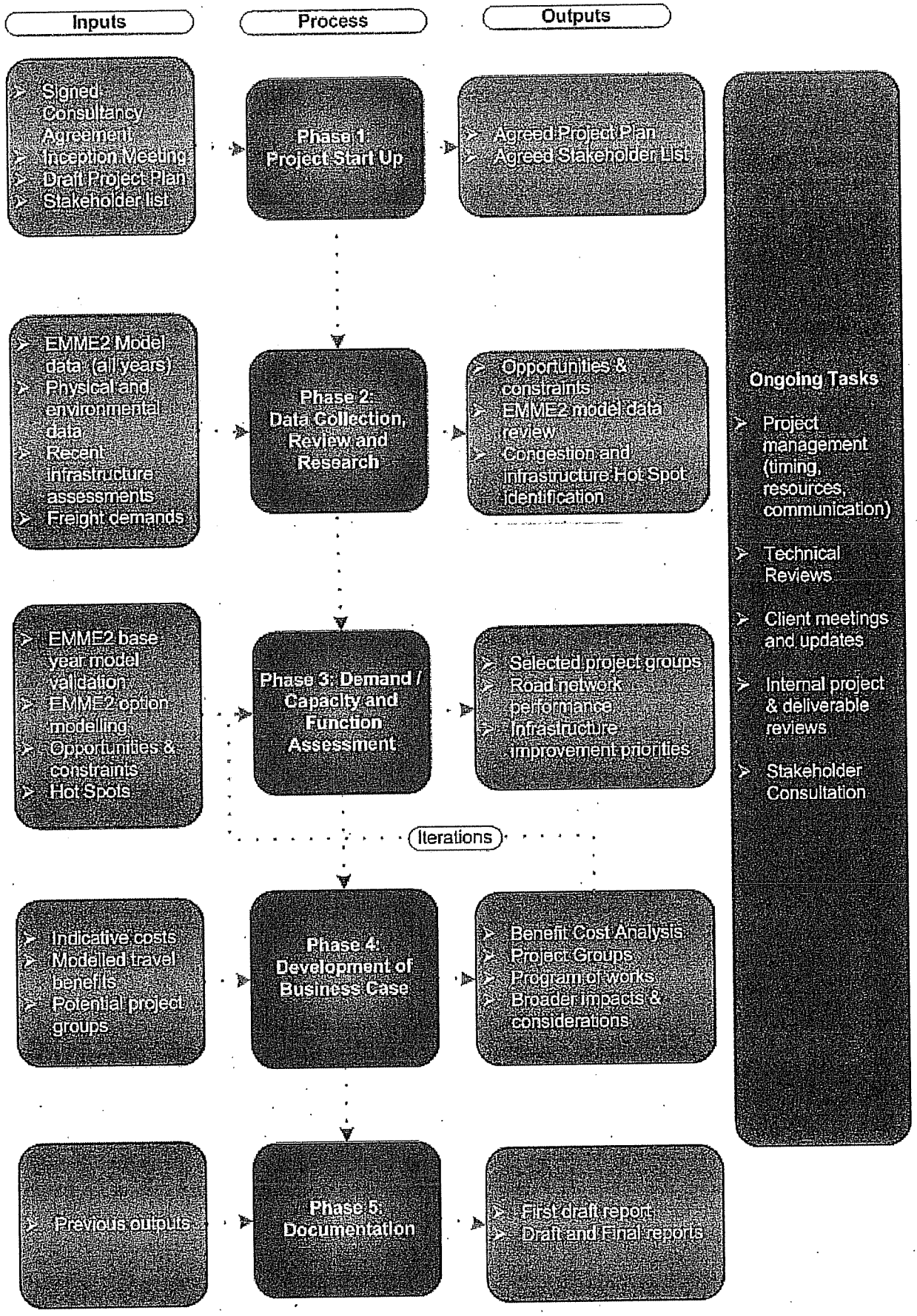
1.4 Project Scope

An outline of the key inputs, outputs and processes undertaken in this project are given in Figure 3. Key elements of the project include:

- A review of previous relevant reports produced in the corridor, including studies of Molonglo, Cotter Road, Glenloch interchange, City, Russell, Pialligo Ave, Majura Pwy and Canberra Airport.
- The identification of accident black spots.
- The identification of major road network deficiencies.
- Strategic road network modelling using Canberra's EMME2 model, for the base year validation (2006) and three future years (2011, 2021 and 2031).
- Capacity analyses of roads in the EW corridor using traffic forecasts from EMME2.
- Estimation of costs and potential benefits of three road infrastructure improvement packages.

A Paramics model of AM peak traffic operations in the corridor was later developed for 2006, 2011 and 2021 to confirm the effectiveness of the proposed improvement works. An outline of this model is included in Appendix A.

Figure 3: Key Project Inputs, Outputs and Processes

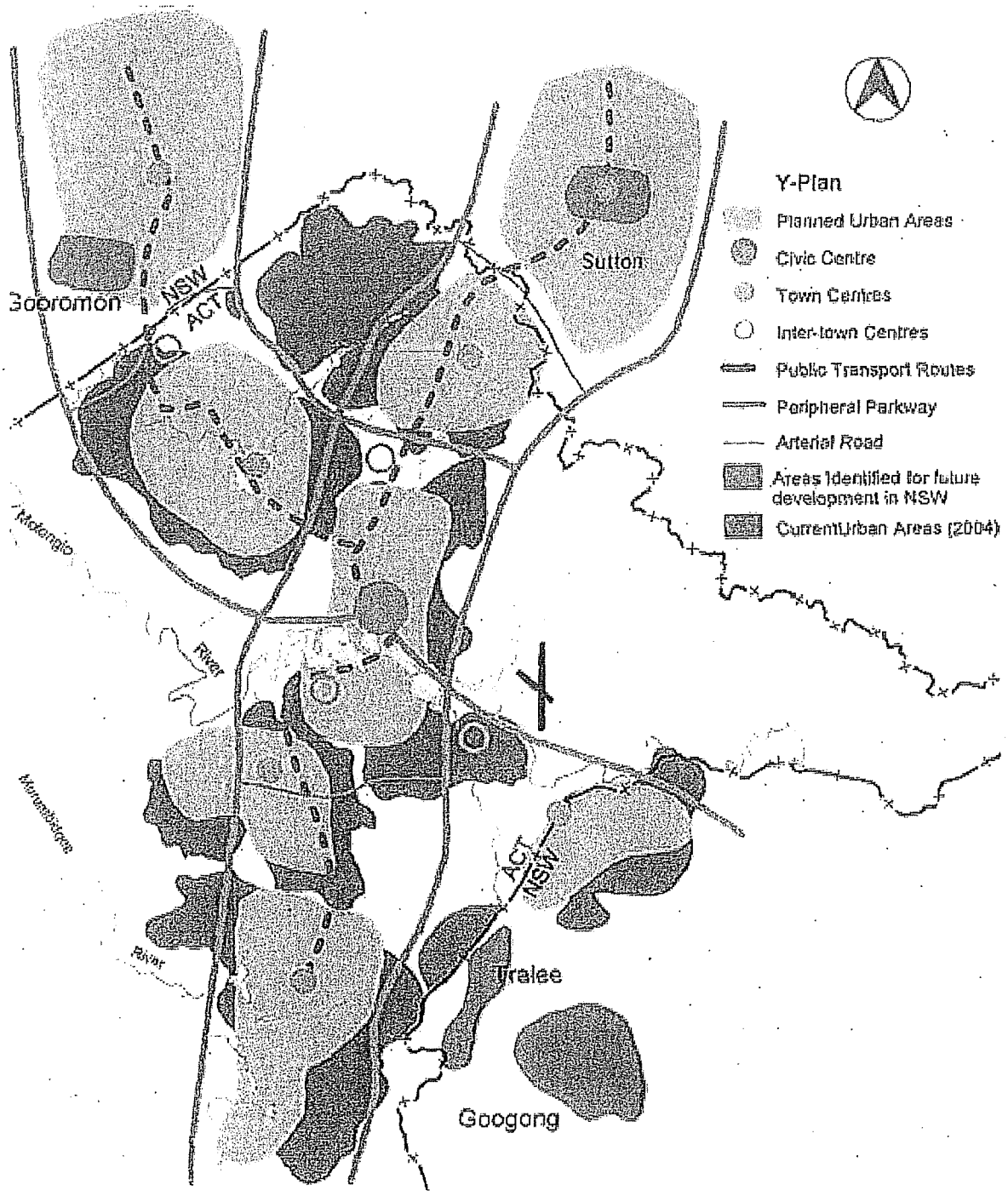


2.0 Planning Context

2.1 The Y-Plan

The 1967 Y-Plan largely had a north-south orientation, but it did recognise Parkes Way and Pialligo Avenue as a crucial cog Canberra's road infrastructure plan. It was recognised as a peripheral parkway, like GDE/Tuggeranong Parkway and Majura Parkway.

Figure 4: The 1967 Y-Plan

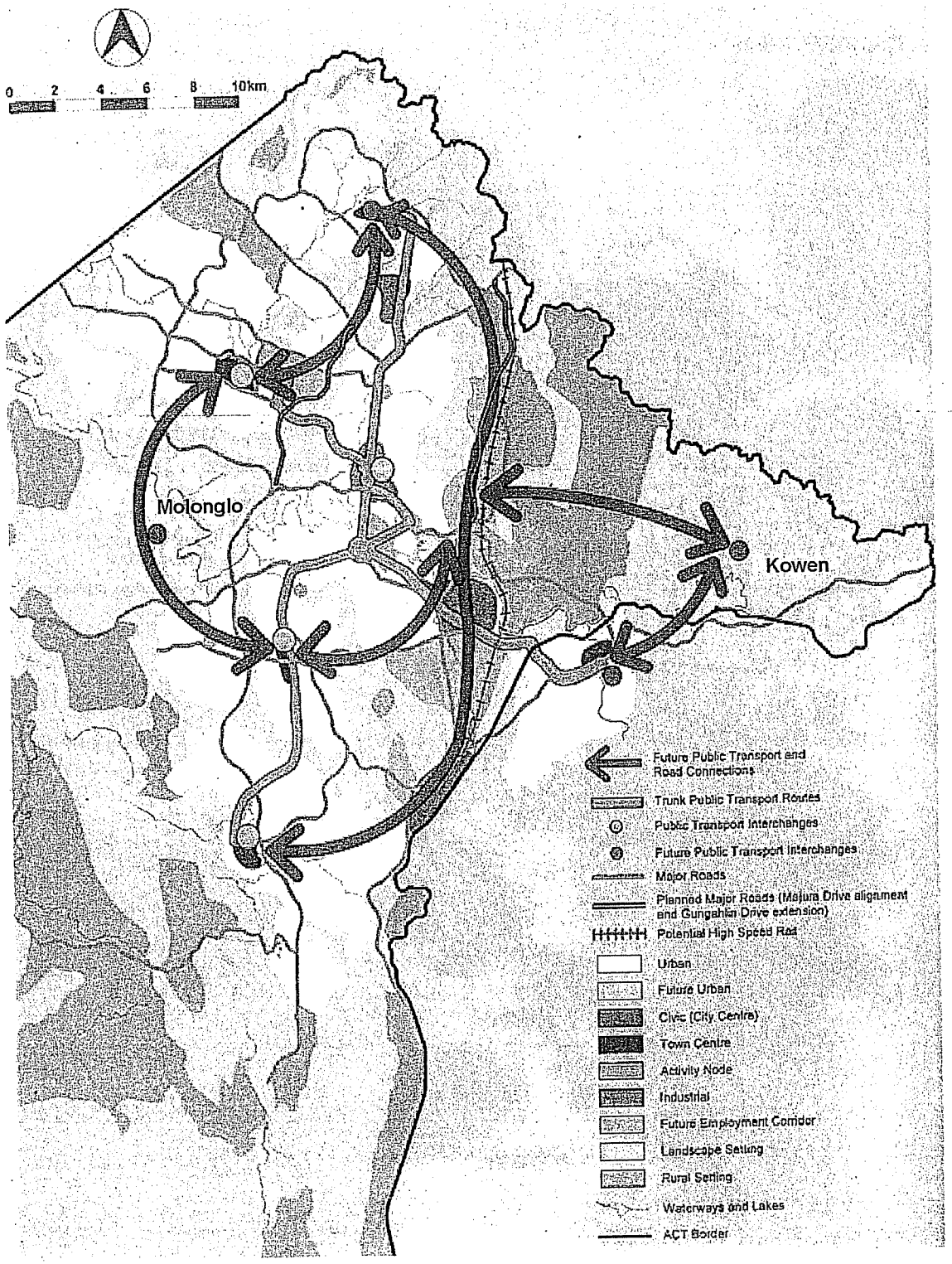


Source: ACT Government (2004)

2.2 Spatial Plan

The Canberra Spatial Plan changed the planning of Canberra to include two new towns – Kowen and Molonglo. It also proposed to intensify urban development in Central Canberra and to create a new employment corridor in Majura Valley (see Figure 5), whilst ignoring significant development to occur in Queanbeyan.

Figure 5: ACT Regional Transport Structure



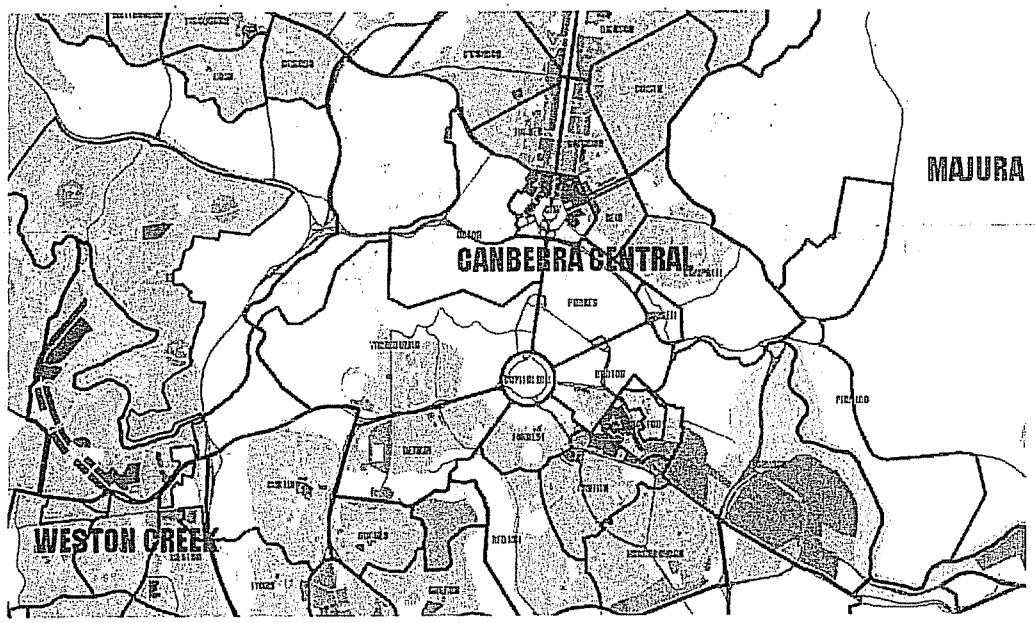
Source: ACT Government (2004)

The Canberra Spatial Plan provides strategic directions for the development of Canberra over the next 30 years. It is the Territory's key strategic planning document for directing and managing urban growth and change. The Plan intensifies development in the EW corridor, yet downplays the importance of road infrastructure in the corridor. Figure 5 highlights the proposed ACT regional transport structure. This Plan underscores the importance of direct peripheral connections as well as Hindmarsh Drive and a future connection to Kowen, with the objective of minimising traffic accessibility through Central Canberra.

2.3 Territory Plan

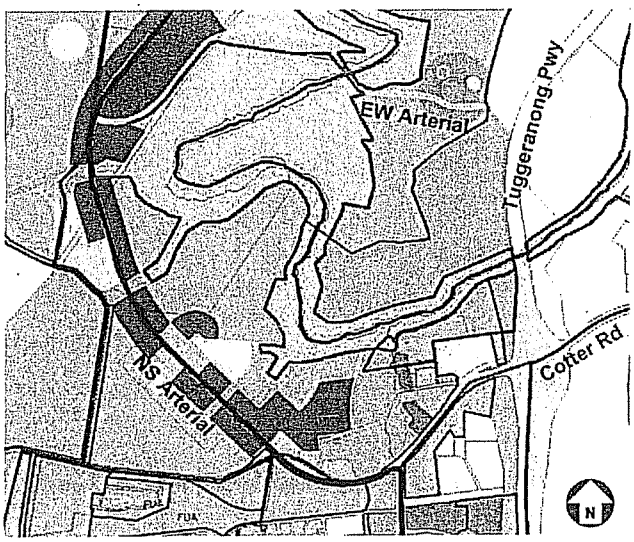
The Territory Plan shows the planning framework for the new town of Molonglo and highlights the fact that much of the EW corridor falls under the National Capital Plan (ie., the grey 'Designated' areas in Figure 6). The Plan shows the general location of major new arterials in Molonglo and how they will connect into the EW corridor - see Figure 7.

Figure 6: Excerpt of Territory Plan for the EW Corridor



Source: ACTMapi (2009)

Figure 7: Key Molonglo Roads Shown in Territory Plan

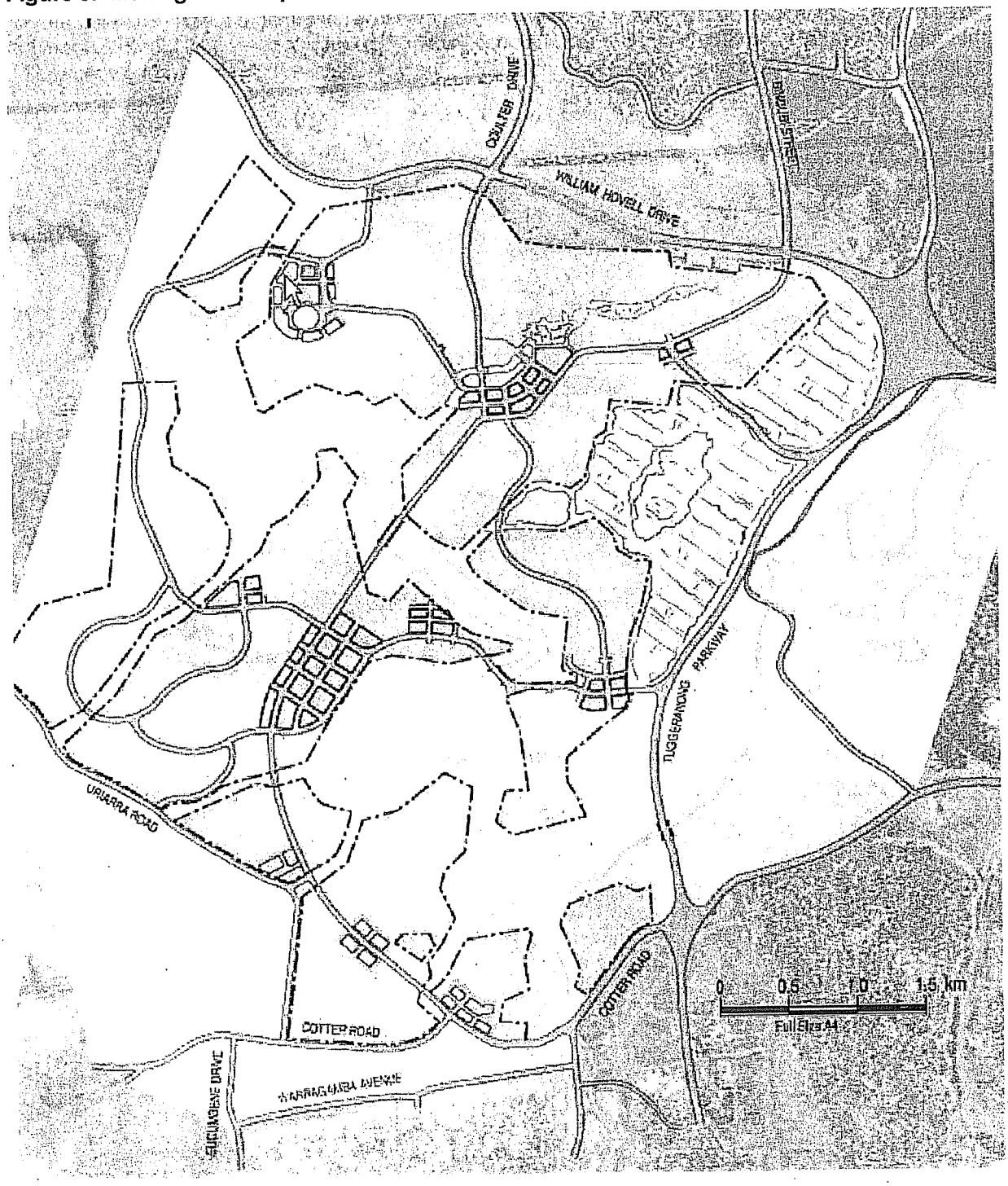


Source: ACTMapi (2009)

A clearer indication of the network of key roads proposed for Molonglo is shown in Figure 8. It includes:

- a new road connection to Cotter Road between Uriarra Road and Streeton Drive
- a future interchange with Tuggeranong Parkway north of Cotter Road
- the creation of new 4-way intersections with Bindubi Street and Coulter Drive

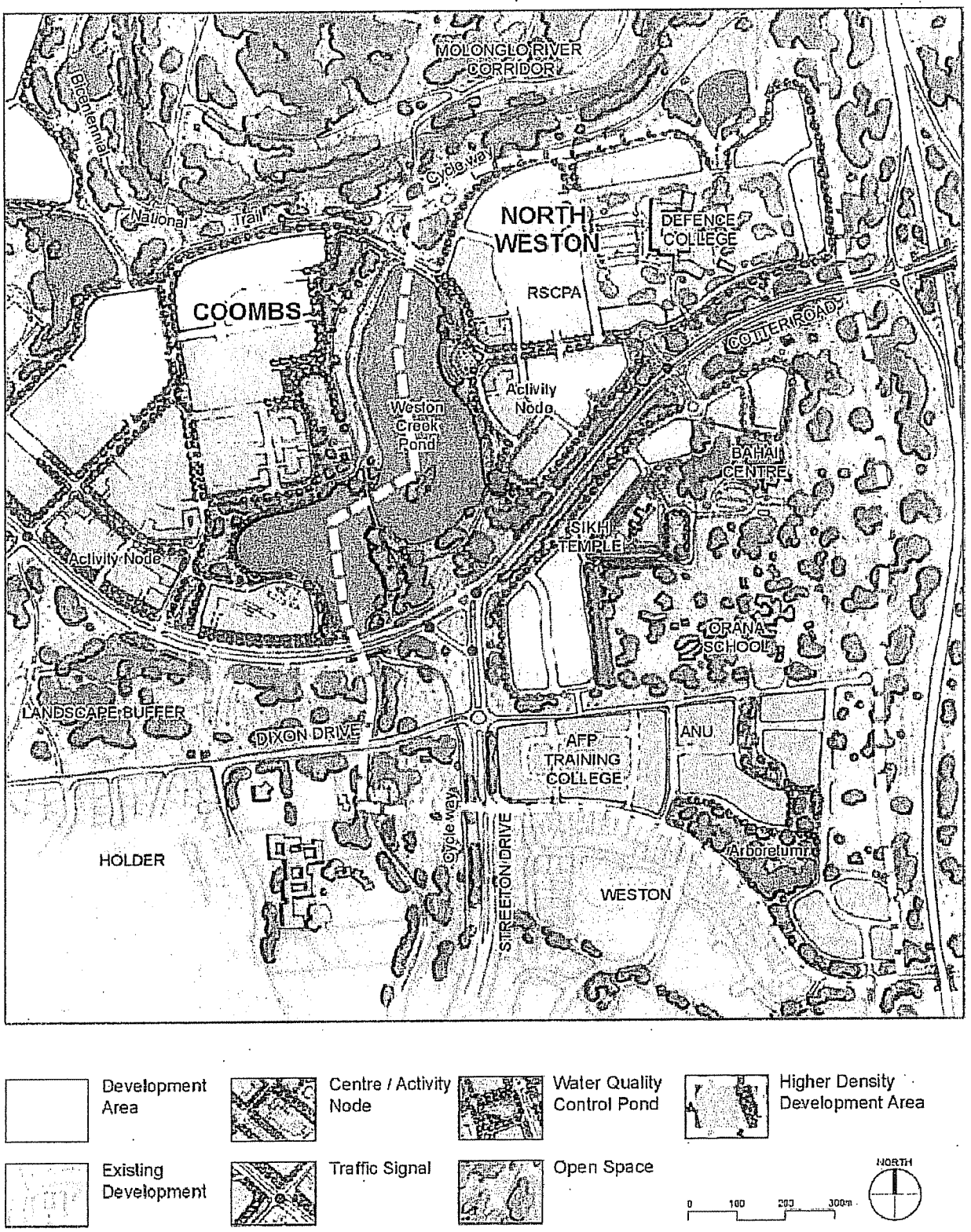
Figure 8: Molonglo Concept Plan



Source: MRC(2008)

Planning for North Weston is more advanced. A recent plan for North Weston is shown in Figure 9. It shows a new signalised intersection on Cotter Road that will provide the major access to North Weston. This is located approximately 120m to the west of the existing roundabout, so as to enable reasonable spacing between the new intersection and a proposed roundabout on Kirkpatrick Street.

Figure 9: North Weston Concept Plan



Source: ACT Government (2008)

2.4 National Capital Plan

In accordance with section 10 of the *Australian Capital Territory (Planning and Land Management) Act 1988* (the Act), the National Capital Plan sets out the planning principles and policies for Canberra and the Territory, and detailed conditions of planning, design and development for designated areas because of their particular importance to the special character of the national capital. Planning and approval of development within designated areas is the responsibility of the National Capital Authority (NCA).

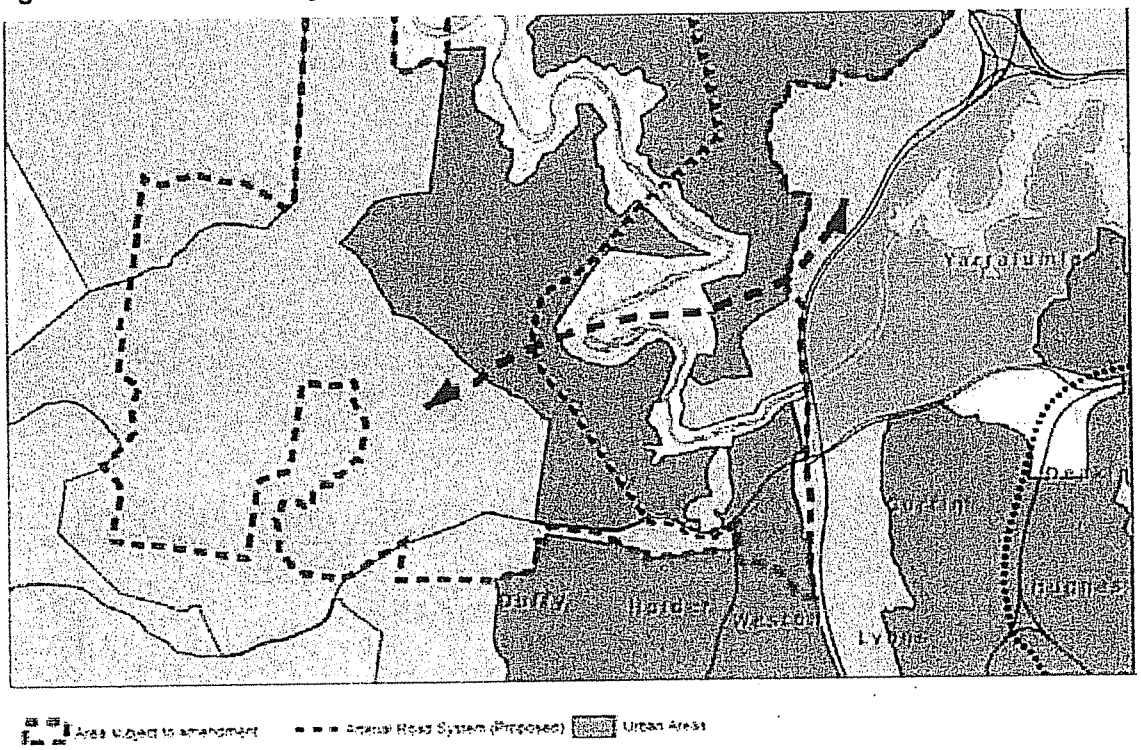
Elements of the Plan that directly influence the planning of the EW corridor include the following amendments:

- Amendment 63 – Molonglo and North Weston (NCA 2008)
- Amendment 61 – West Basin (NCA 2006a)
- Amendment 60 – Constitution Avenue (NCA 2006b)
- Amendment 59 – City Hill Precinct (NCA 2006c)
- Amendment 56 – The Griffin Legacy Principles and Policies (NCA 2006d)
- Amendment 30 – Canberra Airport (NCA 2000)
- Amendment 12 – Russell (NCA 1996)

An outline of key aspects of these amendments that affect the EW corridor follows.

Figure 10 shows an extract from the plan for Molonglo and North Weston (NCA Amendment 63). It shows a North South Arterial road and an east west open space connection between the Canberra International Arboretum and Mount Stromlo, but no East West Arterial road connection. The NCA does not support an arterial road connection to Tuggeranong Parkway through the Arboretum, nor would they be likely to support a major road traversing land identified as being within the Hills, Ridges and Buffer Spaces land use policy of the Plan. Thus, the feasibility and potential alignment of the East West Arterial road shown in Figure 8 needs to be reviewed.

Figure 10: General Policy Plan for Molonglo and North Weston

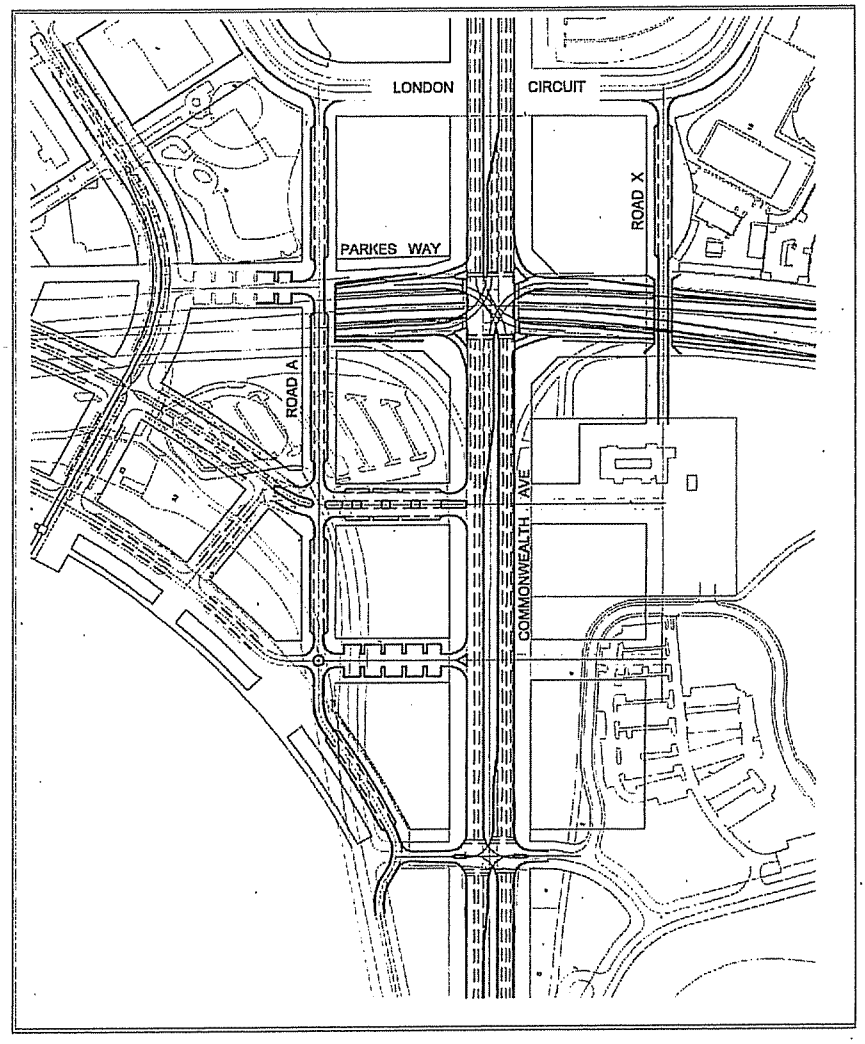


Source: NCA (2008)

The proposed development of West Basin (Amendment 61) includes the creation of a land bridge over Parkes Way near City, as shown in Figure 11. The main features of particular relevance to this study are:

- The expansion of City across Parkes Way, involving major future development in the West Basin Precinct;
- The creation of a "single point interchange" between Parkes Way and Commonwealth Avenue.
- Two new roads, Road A and Road X linking London Circuit across Parkes Way to West Basin or Commonwealth Gardens.

Figure 11: Proposed West Basin Road Works



Source: NCA (2006a)

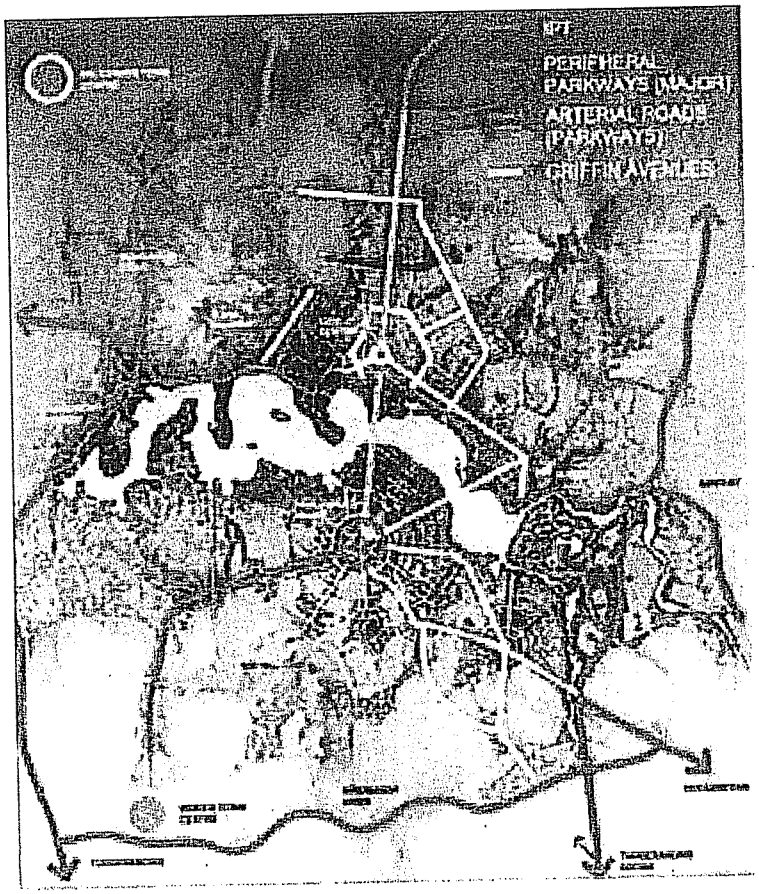
Constitution Avenue runs parallel to Parkes Way and provides additional east west road capacity in Central Canberra. Amendment 60 (NCA 2006b) proposes that Constitution Avenue will become an elegant and vibrant mixed use grand boulevard linking London Circuit to Russell. It will be supported by an integrated transport system, broad tree-lined footpaths and outdoor dining and street parking. This will change the nature of Constitution Avenue and strengthen the importance of Parkes Way for carrying east west traffic, whilst Constitution Avenue will be an important link in the public transport system and will have significant pedestrian and parking activity.

Amendment 59 (NCA 2006c) recommends significant changes to roads around City Hill, including:

- The extension of Constitution and Edinburgh Avenues from London Circuit to Vernon Circle
- Removing the ramps and creating an at-grade intersection between Commonwealth Avenue and London Circuit
- Changes to the character and nature of Vernon Circle and the role of London Circuit in the City road network

In achieving this vision, it recognised the need of extending and reinforcing Canberra's peripheral parkway road system, as illustrated in Figure 12. It is noteworthy that this emphasises the importance of Parkes Way – Pialligo Avenue as a parkway.

Figure 12: Canberra's Peripheral Parkways



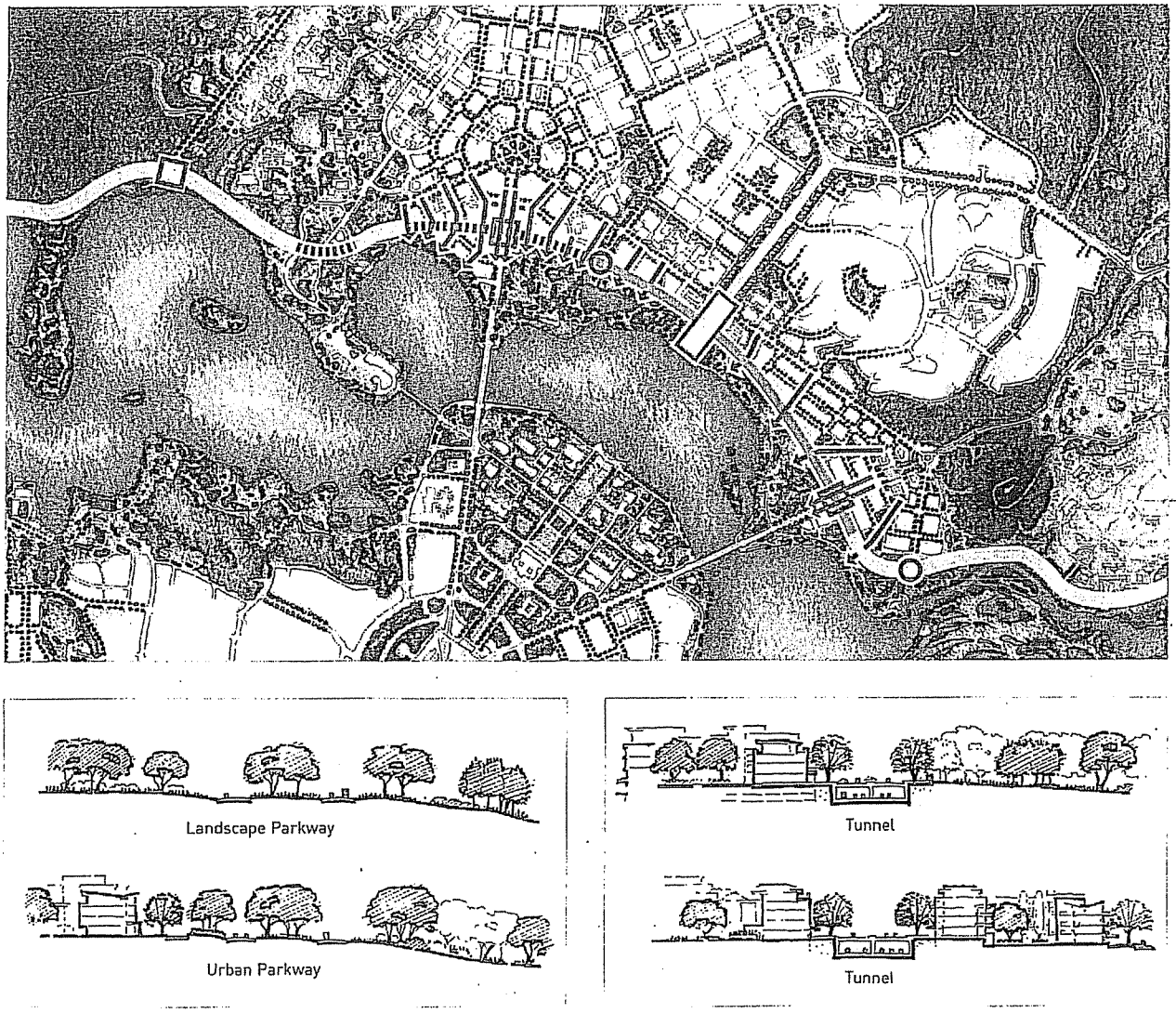
Source: NCA (2006c)

The Griffin Legacy (Amendment 56, NCA 2006d) forms a basis for planning and urban design decisions in the Central National Area. Key transportation principles incorporated in this amendment include:

- extending the City to the lake by developing a variety of waterfront activities on Lake Burley Griffin and enhancing vehicular and pedestrian linkages
- reinforce the main avenues by realising the identified main avenues of Constitution, Northbourne, Commonwealth, Kings, University, Sydney, Brisbane, and part of Canberra and Wentworth Avenues as multi-use boulevards providing corridors of higher-density mixed-use development, public transport, broad tree-lined footpaths with potential for outdoor dining and street parking

It includes initiatives to reduce the barrier that Parkes Way creates between Russell, Civic and the lake foreshores, as well as recognising the growing importance of Parkes Way for carrying increased amounts of traffic more efficiently. NCA's future vision for Parkes Way is shown in Figure 13.

Figure 13: The Griffin Legacy – Parkes Way Initiatives



Source: NCA (2006d)

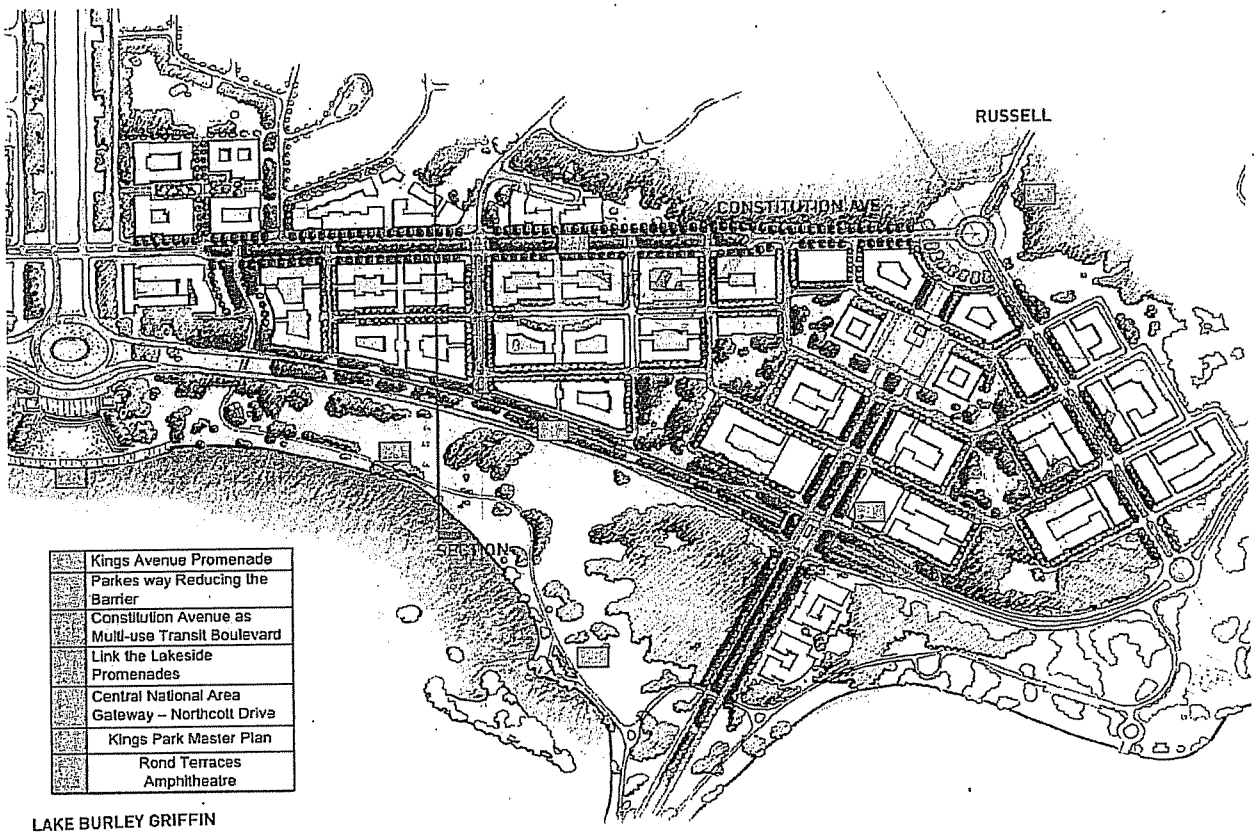
Amendment 30 (Canberra Airport, NCA 2000) enabled a broader range of land uses to be permitted at the Airport, including office and retail uses. This has created increased commercial development around the airport and increased traffic in the EW corridor.

Amendment 12 (NCA 1996) incorporates the Russell master plan which details Conditions of Planning, Design and Development, and includes a statement of Land Use Policy for Russell. The amendment responds to proposals by the Department of Defence to redevelop parts of Russell.

The master plan is shown in Figure 14. Key elements of the plan affecting the EW corridor include:

- significant new development and parking in the precinct, resulting in increased traffic in the EW corridor
- the extension of Blamey Cres to Parkes Way, forming an important access for enabling future development in Russell
- the extension of Sellheim Ave to Morshead Drive
- the extension of Minindee Cres to Kings Ave, enabling an alternative access to the Hospice precinct

Figure 14: Russell Master Plan



Source: NCA (1996)

2.5 Sustainable Transport Plan

The ACT Government is committed to providing Canberran's with an accessible, affordable, reliable and sustainable public transport system. A key element of this commitment is an acceptance of the broad thrust of the *Sustainable Transport Plan* (ACTPLA, 2004). A number of recent land use and transport studies have identified directions that have been encapsulated in the *Sustainable Transport Plan.*

Key issues identified in the Sustainable Transport Plan (STP) include:

- Canberra's low population densities dispersed over a wide area make it difficult for public transport to serve travel needs – this indicates a need to focus on efficient public transport systems, networks and routes

- reducing travel time will be a powerful incentive in attracting public transport patronage
- the Intertown Public Transport (IPT) corridors offer the opportunity to establish bus-based public transport with exclusive rights of way and interchanges/stations that can later be used by light rail
- the targets for increased usage of walking, cycling and public transport for the journey to work are an important outcome of the STP and are shown in Table 4

Table 4: Sustainable Transport Plan Journey to Work Targets

MODE	2001	2011	2026
Walking	4.1%	6%	7%
Cycling	2.3%	5%	7%
Public Transport	6.7%	9%	16%
Total	**13.1%**	**20%**	**30%**

These targets represent a more than doubling of the current proportion of trips used by environmentally-friendly modes. City will attract the most growth in these modes, because of it's continual growing attraction for job opportunities and it's importance as a focal point in Canberra's road and public transport system.

2.6 Public Transport Network Plan

The *ACT Public Transport Strategic Network Plan*, defines steps that will need to be taken over the next two decades to achieve the ACT Government's sustainable transport goals, and to ensure competitive sustainable mobility for Canberrans into the future. Figure 15 shows the recommended Frequent Public Transport Network for 2031. The Frequent Network consists of those services that run every 15 minutes or better all day. These services are frequent enough that they can serve you whenever you want to travel, rather than expecting you to plan your day around their schedules.

Key strategic infrastructure needs and possibilities to support the development of the Frequent Network are shown in Figure 16. Four new or relocated interchanges are recommended by this plan. MRC indicate that these should be completed in the next five years.

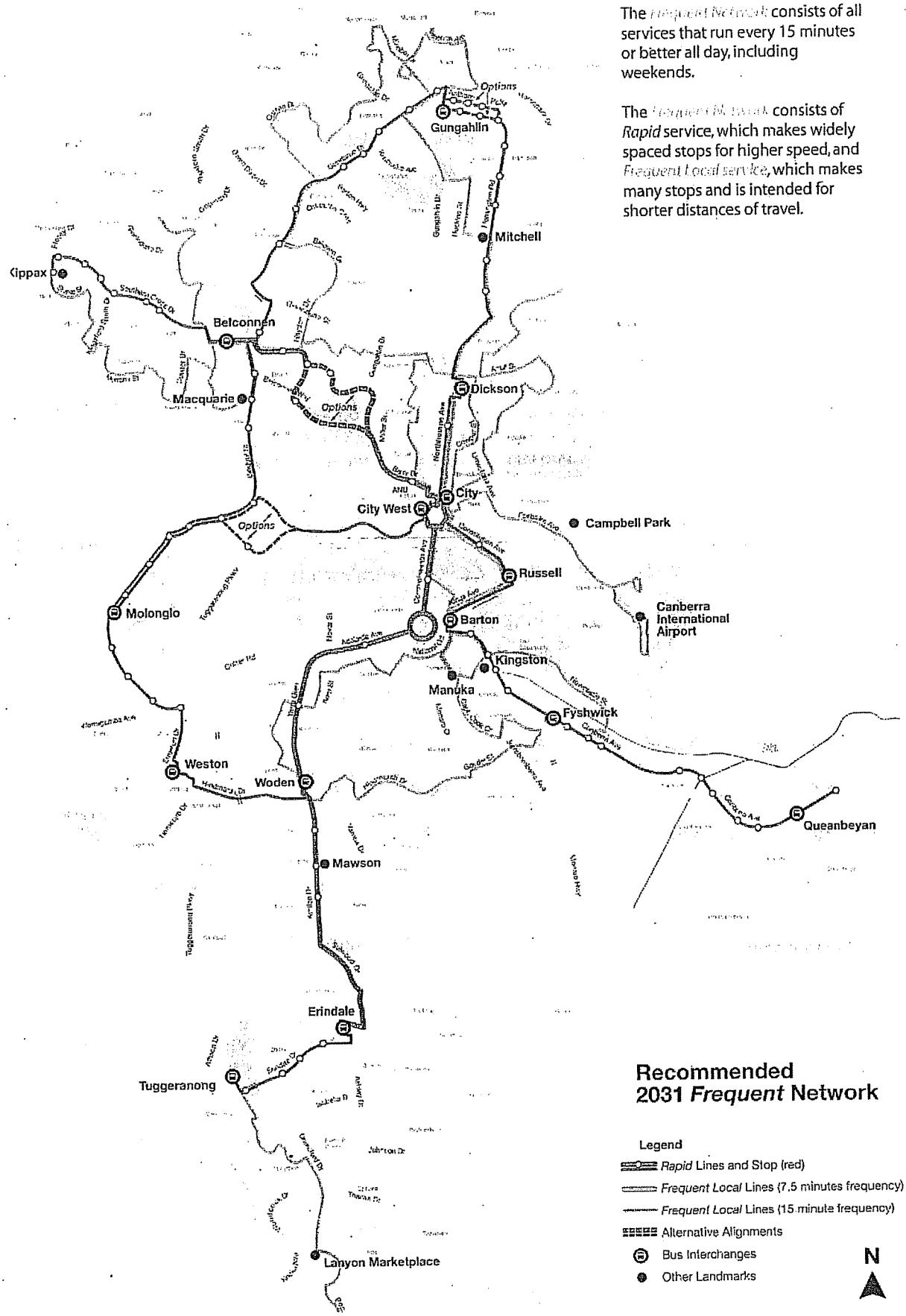
Other long-term infrastructure needs include:

- A Major Stops program, to provide a civilised waiting experience and to support the branding of the Rapid and Frequent Local networks.
- New Rapid stops along Adelaide Avenue and Yarra Glen to provide access to adjacent activity centres.

Road planning should consider the Government's interest in maintaining the speed and reliability of the Frequent Network. MRC (2008) propose operating speed targets for each part of the Frequent Network. In the future, these targets may imply the need for speed protection facilities, such as bus lanes, queue jumps or preferential signals.

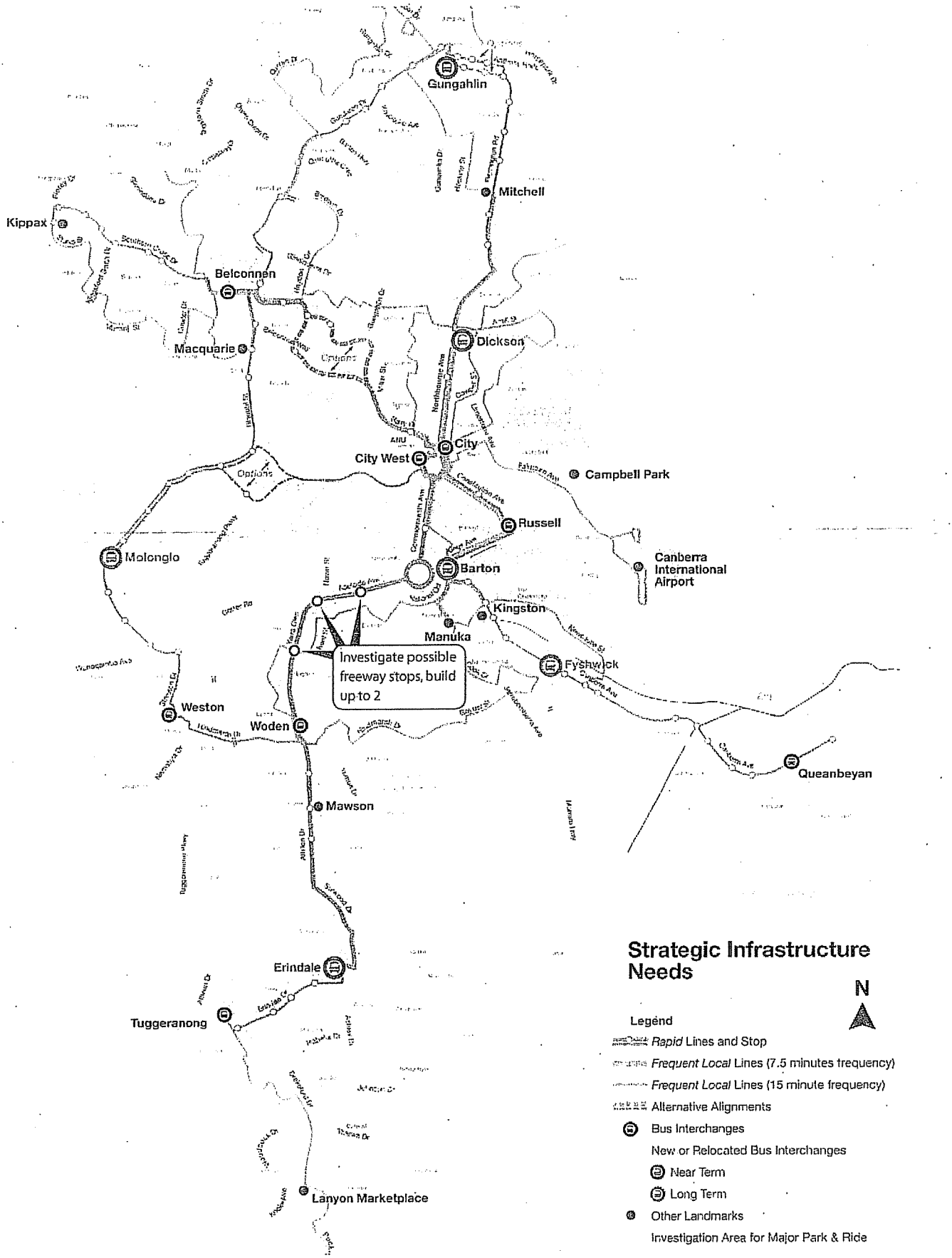
In addition, the pedestrian environment in the vicinity of Frequent Network stops has a crucial impact on the success of public transport in Canberra. High standards for pedestrian environment should be established and maintained in these areas. For example, wherever there are transit stops on both sides of a street, it must be possible for a pedestrian to cross the street safely, as customers will typically arrive one on one side of the street but depart from the other.

Figure 15: 2031 Frequent Bus Network



Source: MRC (2008)

Figure 16: Strategic Public Transport Infrastructure Needs



Source: MRC (2008)

The main infrastructure proposals that could directly affect the EW corridor are proposals for major stops or future park and ride facilities on Adelaide Avenue and near William Hovell Drive. These proposals together with the proposed routes for the Frequent Network shown in Figure 15 need to be taken into account when developing road infrastructure improvement options in the EW corridor.

New public transport infrastructure will be gradually implemented for Molonglo, to achieve the overall plan shown in Figure 17. Only local services and some peak express services will operate up until 2022. A rapid service between Woden, Molonglo and Belconnen would be introduced in the mid 2020's, then a rapid service to City via Parkes Way in about 2030.

2.7 Integrated Transport Framework

The Integrated Transport Framework sets out a commitment to providing Canberrans with an efficient, accessible, sustainable, reliable and integrated transport system. It includes an Action Plan that details key capital works, planning priorities and future initiatives in road infrastructure, parking, public transport, cycling and walking, and emerging transport issues.

The Integrated Transport Framework has a number of integrated transport principles that provide a structure in which the Government can consider the transport system into the future. The Framework also includes an Action Plan, which outlines how the Government will align future transport decision-making and investment with the transport principles.

The Action Plan has been designed to enable the Government to improve the efficiency of Canberra's transport system, address traffic congestion, reduce transport emissions and provide better transport options for the ACT community. These outcomes will be achieved through the provision of adequate infrastructure and by encouraging greater public transport use.

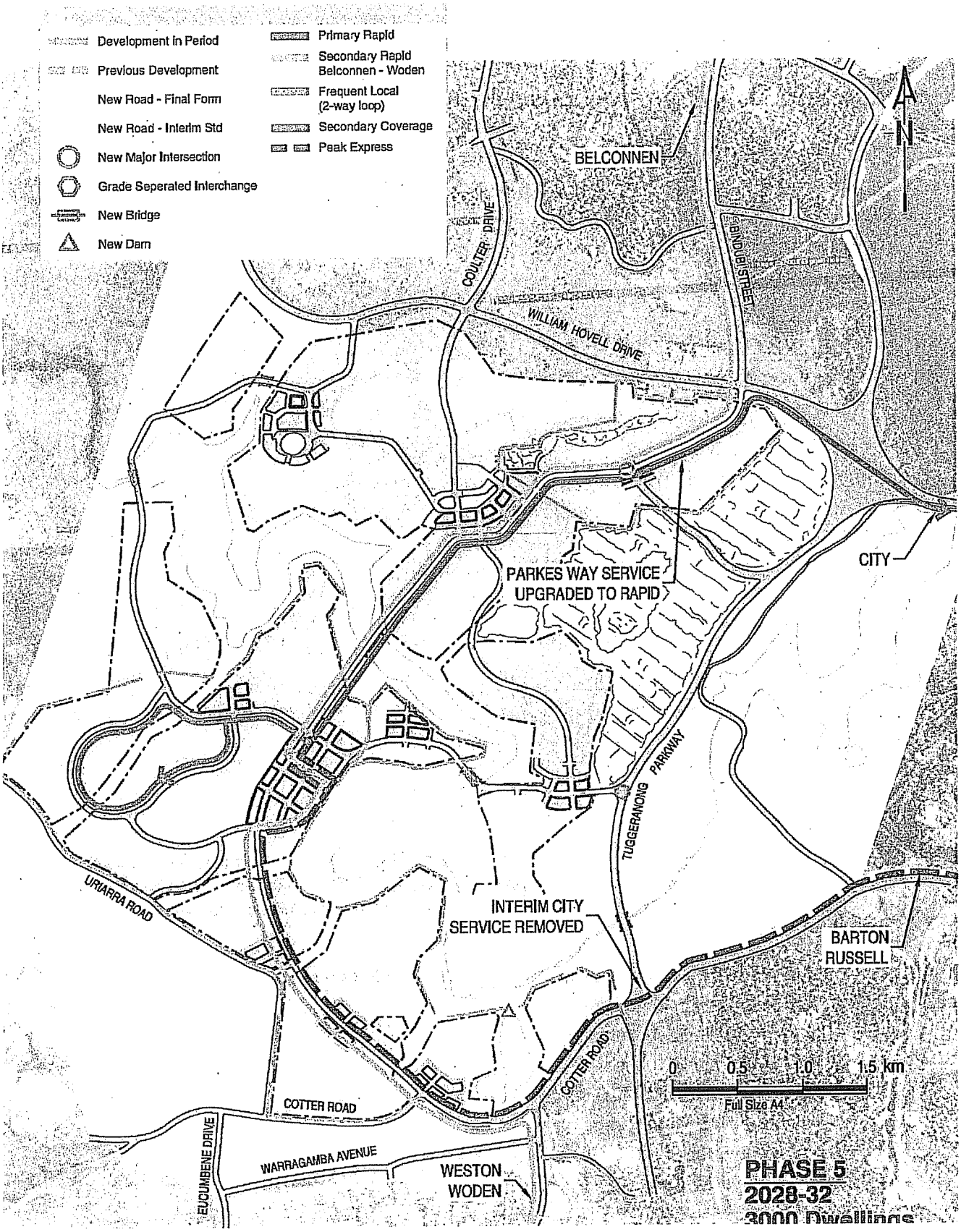
The Plan also involves engaging more actively with the Commonwealth, other States, Territories and infrastructure providers to investigate and promote better connectivity between Canberra and the national transport network.

Key elements of the Plan that will directly impact the EW corridor include:

- Upgrade of Airport roads stage 2 and Horse Park Drive extension *$15 million*
- Rehabilitation of Cotter Road
- Support Commonwealth to upgrade Coranderrk Street / Parkes Way intersection Morshead Drive/ Russell Drive intersections.
- Molonglo Arterial Road *$11 million*
- Duplication of Gungahlin Drive Extension and forward planning for Majura Parkway and Parkes Way *$83 million.*
- Improving Cotter Road on-road cycle connections *$2.338 million*
- Forward design of Majura Road rehabilitation *$0.13 million*
- Off-ramp from Parkes Way to Clunies Ross Street and duplication of Clunies Ross Street
- Northbourne Avenue/ London Circuit and Barry Drive/ Clunies Ross Street intersection upgrades
- Reserve inter-town public transport corridors for Belconnen, Gungahlin and Molonglo connections
- Construction of Majura Parkway, including connection with Northcott Drive[3]
- Complete duplication of Gungahlin Drive Extension
- Improving and managing roads and intersections in Canberra Central, including Northbourne Avenue, Barry Drive, Clunies Ross Street, London Circuit, Constitution Ave and Vernon Circle
- Provide an East – West arterial road connection to Molonglo development
- Finalise an agreed ACT / NSW infrastructure Master Plan and funding mechanisms (accounting for demands placed on roads and other infrastructure by NSW developments / settlement)

[3] A connection to Northcott Drive is now unlikely

Figure 17: Molonglo Public Transport Network Plan

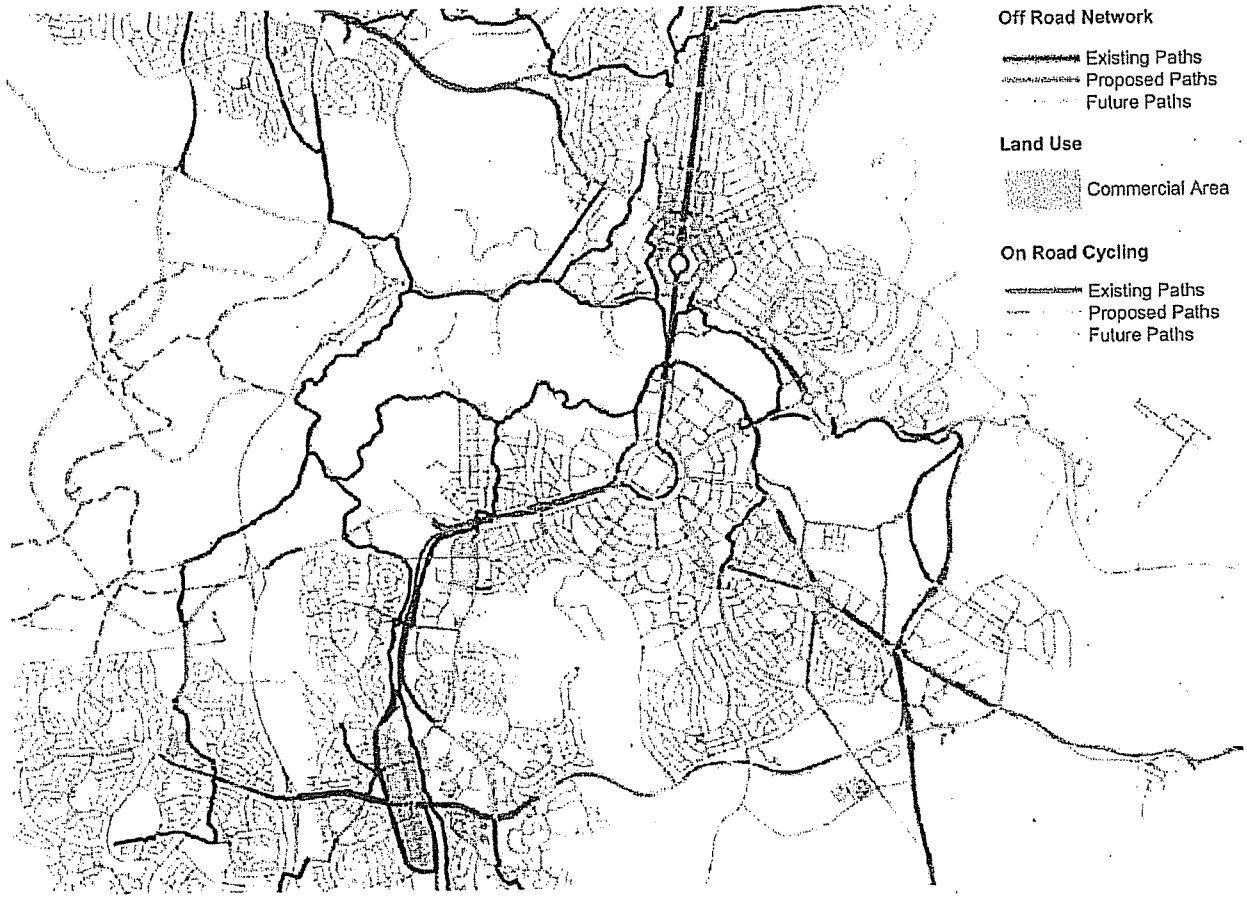


Source: MRC (2008)

2.8 Trunk Cycling and Walking Paths

The latest plan for trunk cycling and walking paths in the EW corridor are illustrated in Figure 18. CBRE (2007) produced this plan for ACT Government.

Figure 18: Trunk Cycling and Walking Master Plan



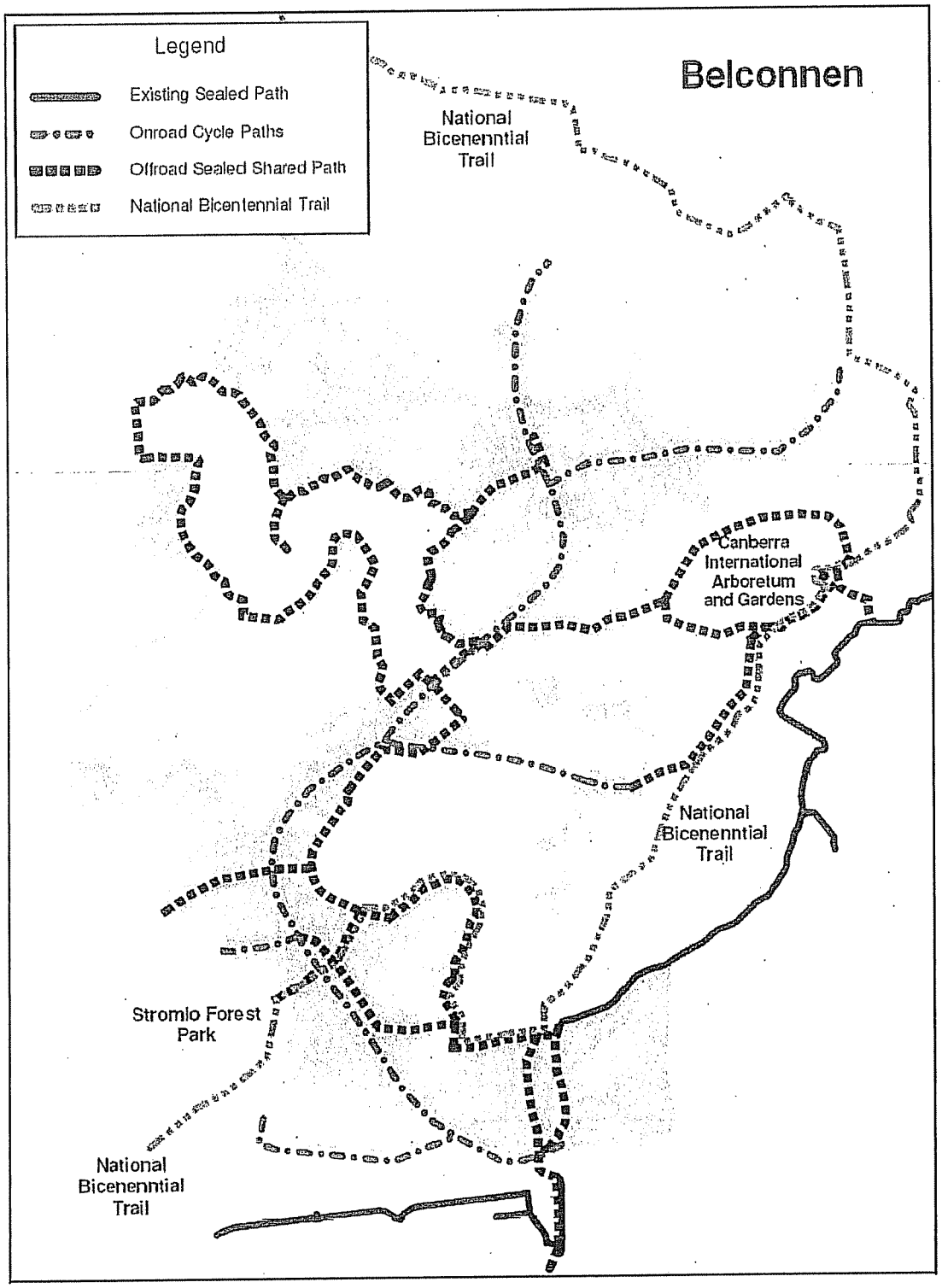
Source: CBRE (2007)

The primary purpose of CBRE's work was to identify a series of projects that would improve the Trunk Commuter Cycling network to encourage modal change, and to allow Roads ACT to begin to design projects in anticipation of budget allocation. Projects identified with highest priority that fall within the EW corridor are:

- Cotter Road 1 – Streeton Drive to Yarralumla Creek ($310k), ranked 4
- Airport Shared Path, ranked 8
- Cotter Road 2 ($350k), ranked 9
- Cotter Road 3 ($730k), ranked 15
- Russell Underpass ($2,480k), ranked 16
- Constitution Ave, ranked 19
- Kings Avenue, ranked 25
- Stromlo Forest Park Link, ranked 37
- Russell Drive, ranked 40

The National Bicentennial Trail passes through the western portion of the EW corridor. The Bicentennial Trial, over 5,000 kilometres from Healesville in Victoria to Cooktown in Queensland, is the longest marked route of its kind in the world. It has been highlighted in the recently produced trunk cycle and pathway plan for Molonglo, shown in Figure 19.

Figure 19: Trunk Cycling and Walking Master Plan for Molonglo



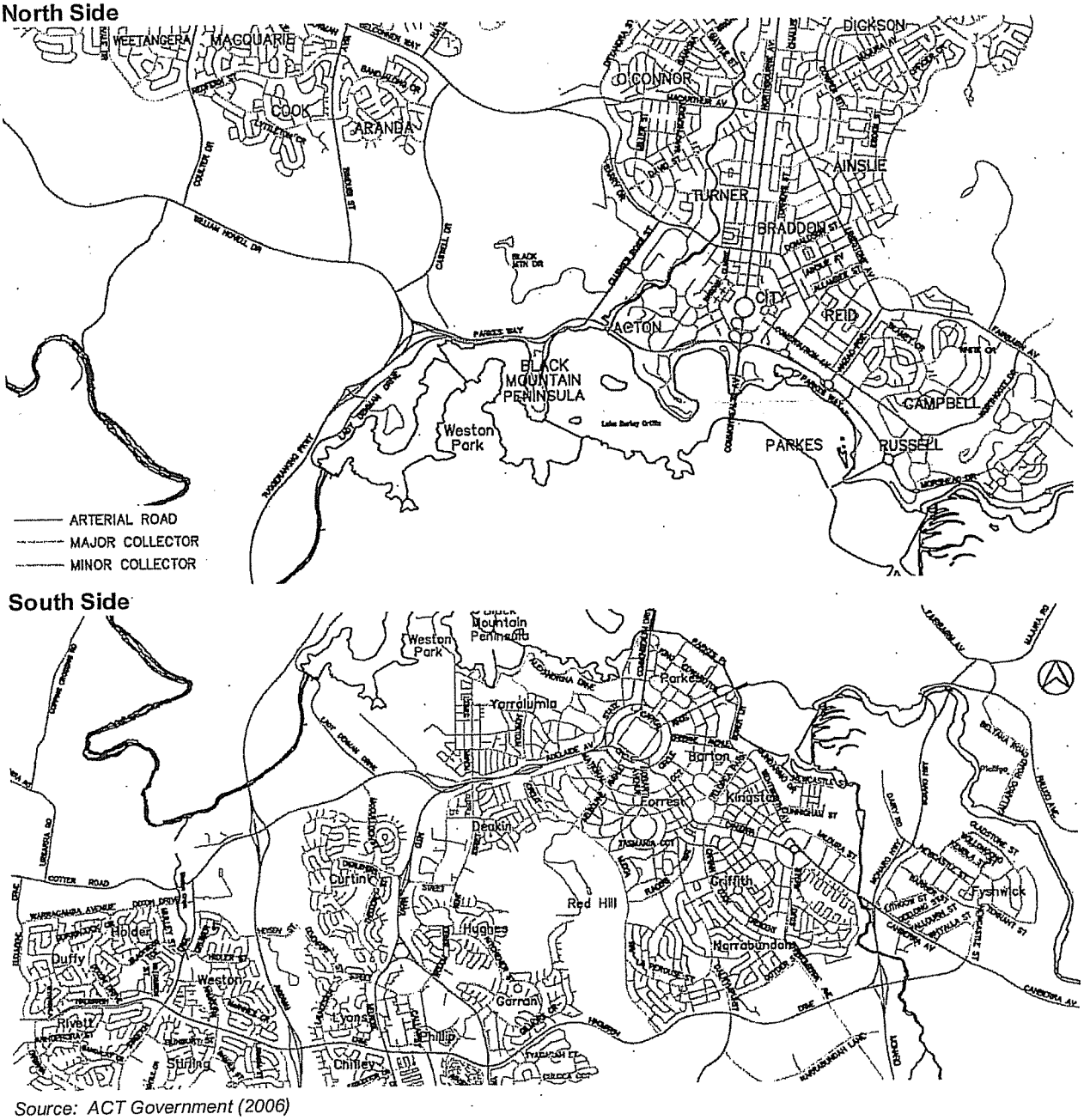
Source: ACT Government (2008)

3.0 Existing Conditions

3.1 Road Hierarchy

The current road hierarchy in the corridor is shown in Figure 20. Three types of road are identified – arterial, major collector and minor collector. Other roads are for local access.

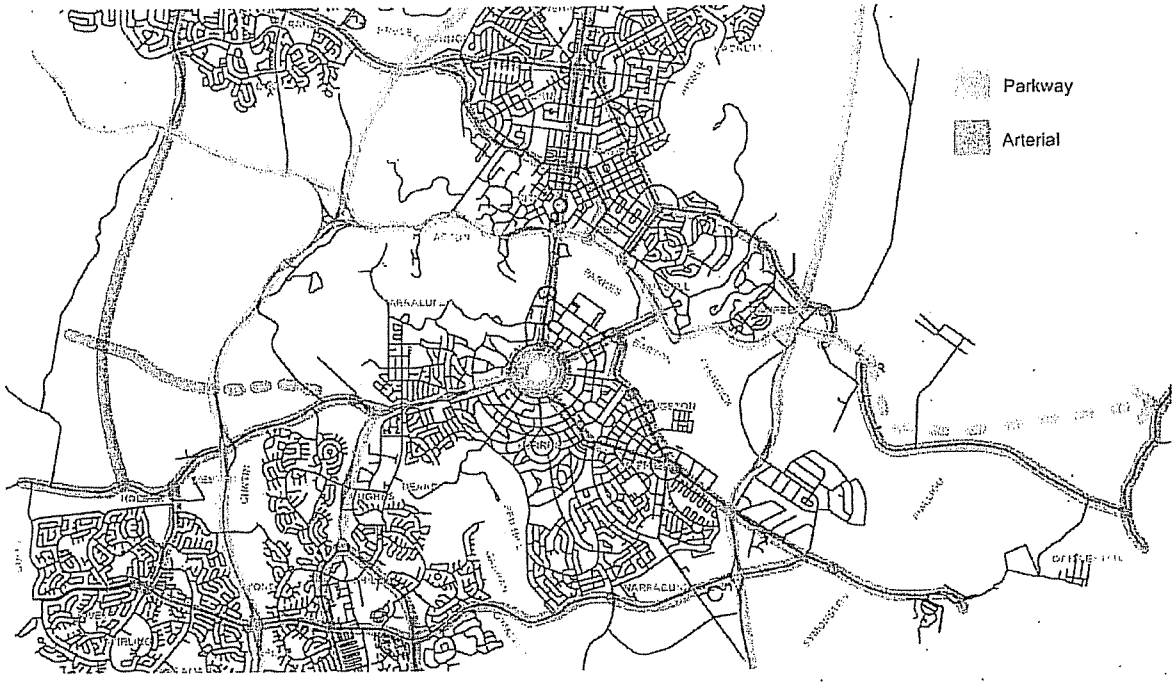
Figure 20: Existing Road Hierarchy



Source: ACT Government (2006)

The information presented in Chapter 2 suggests that roads such as Tuggeranong Parkway, Parkes Way, Morshead Drive, Pialligo Avenue, Majura Parkway and Monaro Highway should be categorised as parkways. That is, to define two types of arterial roads – parkways being earmarked for freeway design standards. The suggested road hierarchy is shown in Figure 21.

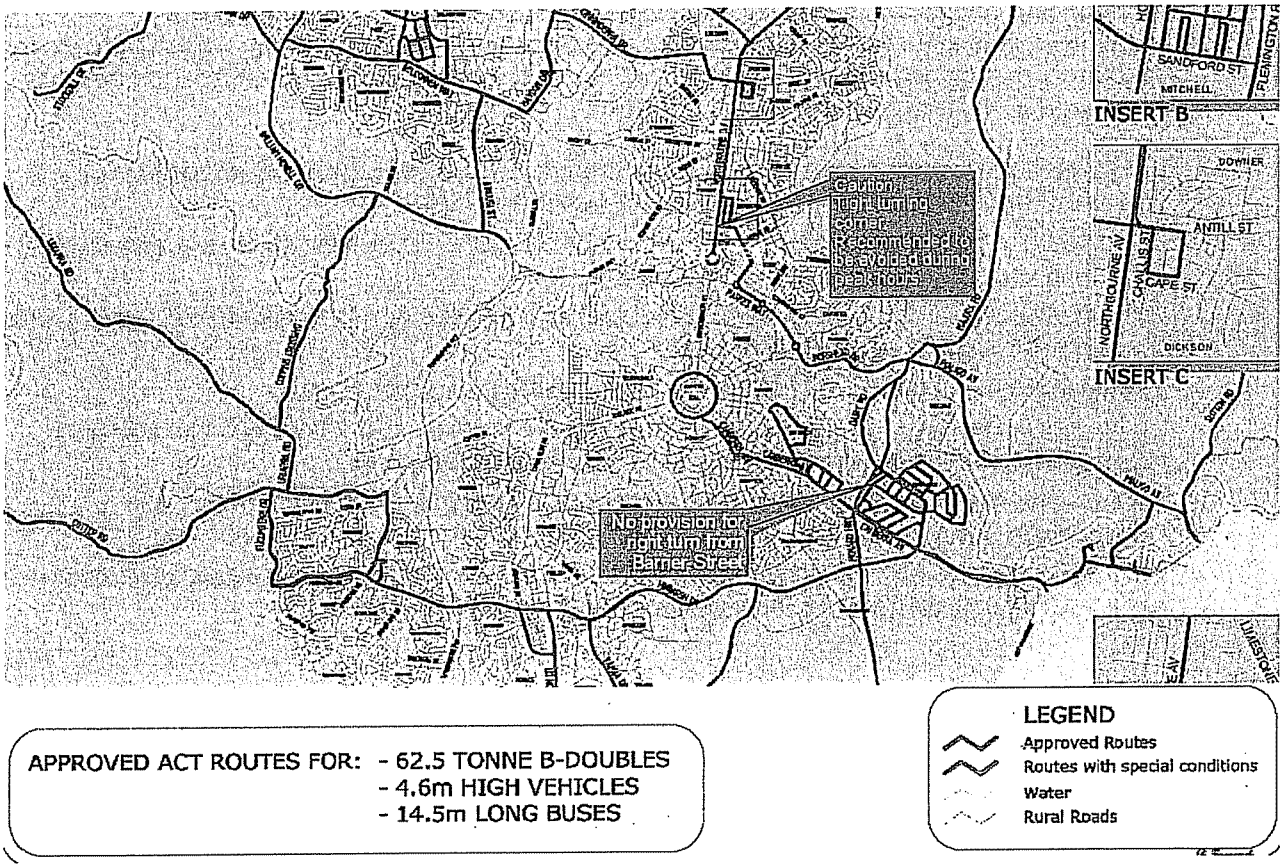
Figure 21: Alternative Road Hierarchy for Major Roads



3.2 Heavy Vehicle Routes

Approved heavy vehicle routes in the EW corridor are shown in Figure 22. These are suitable to carry B Doubles. Note that much of Parkes Way and Tuggeranong Parkway are not suited for B Doubles.

Figure 22: Heavy Vehicle Routes



Source: ACT Government (2006)

There are also over-dimensional routes that pass through the eastern part of the corridor. Defined over dimensional routes include Majura Road, Monaro Highway and Pialligo Avenue. These are suitable for vehicles up to 3.5m in width and prime mover/semi-trailer combinations up to 42.5 tonnes and 25m in length.

3.3 Deficient Road Elements

3.3.1 Bridges and Tunnels

A report on the ACT Bridges Strengthening program provided significant data on ACT bridges. The strength, width and vertical clearance of bridges are key elements that affect vehicle access on the major road network.

Figure 23 shows bridges with load deficiencies in the EW corridor. It also highlights bridges that are considered suitable for B Doubles. The bridges with an HS 2044 load rating are not suitable for general traffic and require strengthening, based on AS 5100.7. The T44 and T54 bridges are suitable for general traffic but usually not suitable for B Doubles. The bridges with an SM 1600 load rating are strongest and are suitable for most heavy vehicles.

Width and vertical clearance deficiencies are highlighted in Figure 24. The width of roadway available for traffic was considered deficient if there is inadequate shoulder width for vehicle breakdowns and/or inadequate space for on-road cycling (at locations identified for future on-road cycling). The locations with deficiencies were identified using the ACT bridge database and AustRoads design standards.

Bridges highlighted as having a very narrow shoulder in Figure 24 have insufficient space for vehicle breakdowns or on-road cycling. Those highlighted with a narrow shoulder have insufficient space for on-road cycling.

3.3.2 Parkway Ramps

The spacing and length of ramps on the parkway sections of arterial roads is an important consideration for safe and efficient flow of traffic. An assessment of ramp spacings in the EW corridor identified the following deficiencies. Austroads recommends an absolute minimum spacing between successive urban freeway interchanges of 1.5-2.0km[4].

- Entry/exit ramps between Novar Street/ Kent Street and Hopetoun Circuit (both directions) – approximately 250m spacing but should be at least 650m apart
- Eastbound entry ramp from Hopetoun Circuit and the Empire Circuit intersection – approximately 170m spacing but should be at least 650m apart
- Westbound entry ramp from State Circle and exit ramp to Hopetoun Circuit – approximately 490m spacing but should be at least 650m apart
- The westbound exit ramp to Kent Street and the exit ramp to Cotter Road
- Lakeside interchange ramps and Glenloch interchange ramps – approximately 270m spacing northbound and 380m southbound but should be at least 650m apart[5]
- Successive entry/exit ramps eastbound on Parkes Way between Edinburgh Avenue and Commonwealth Avenue – spacings of 140m to 200m but should be at least 500m apart
- Westbound entry ramp from Commonwealth Avenue to Parkes Way and the Lawson Crescent exit – approximately 160m spacing but should be at least 450m apart

[4] Guide to Traffic Management Part 6 (Austroads 2007).
[5] Being addressed somewhat by the latest design recommendations for GDE Stage 2 (AECOM 2009)

Figure 23: Bridge Load Deficiencies

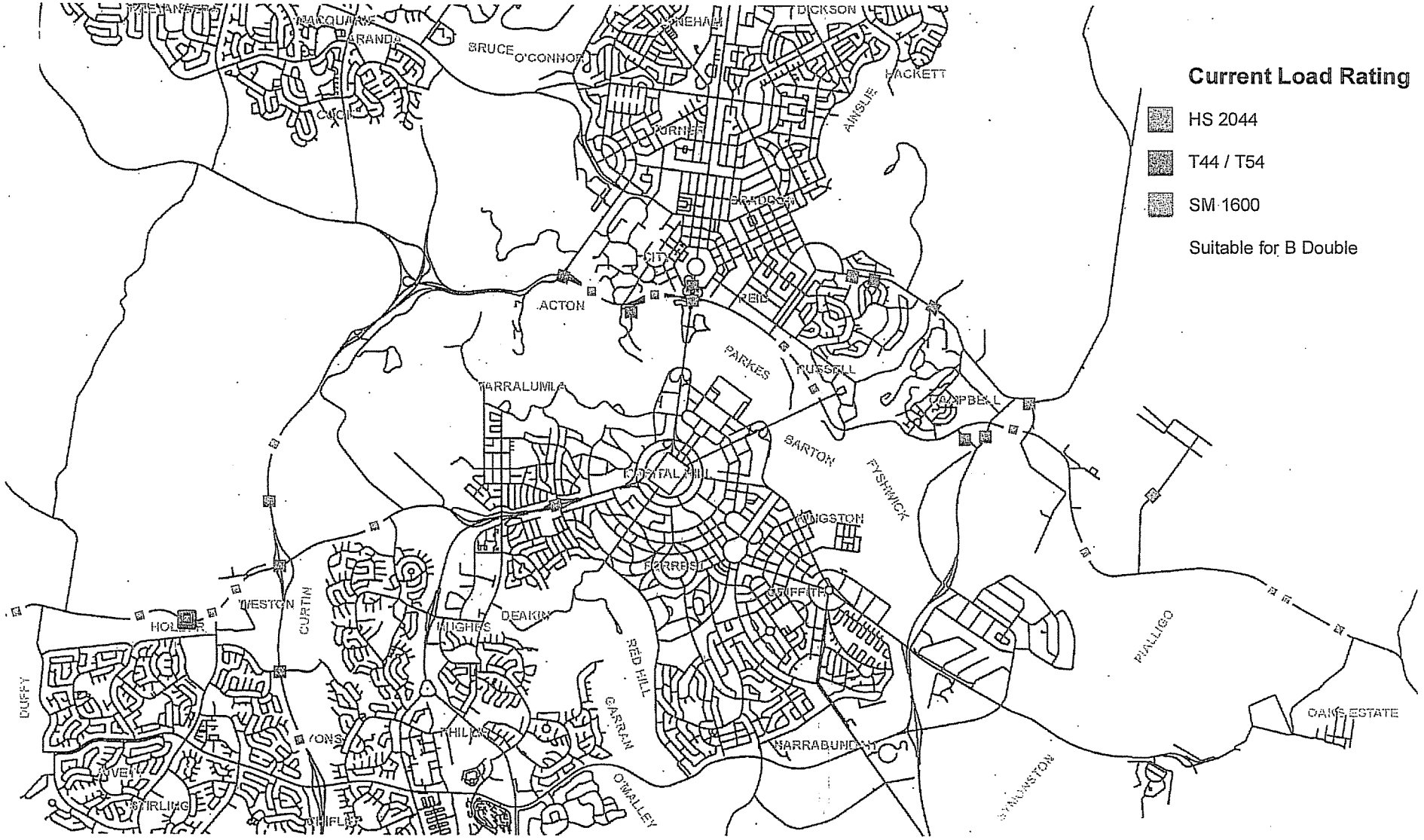


Figure 24: Bridge and Tunnel Width and Clearance Deficiencies