DUBBO TRANSPORTATION STRATEGY

2020

Prepared for Dubbo Regional Council

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CONTENTS

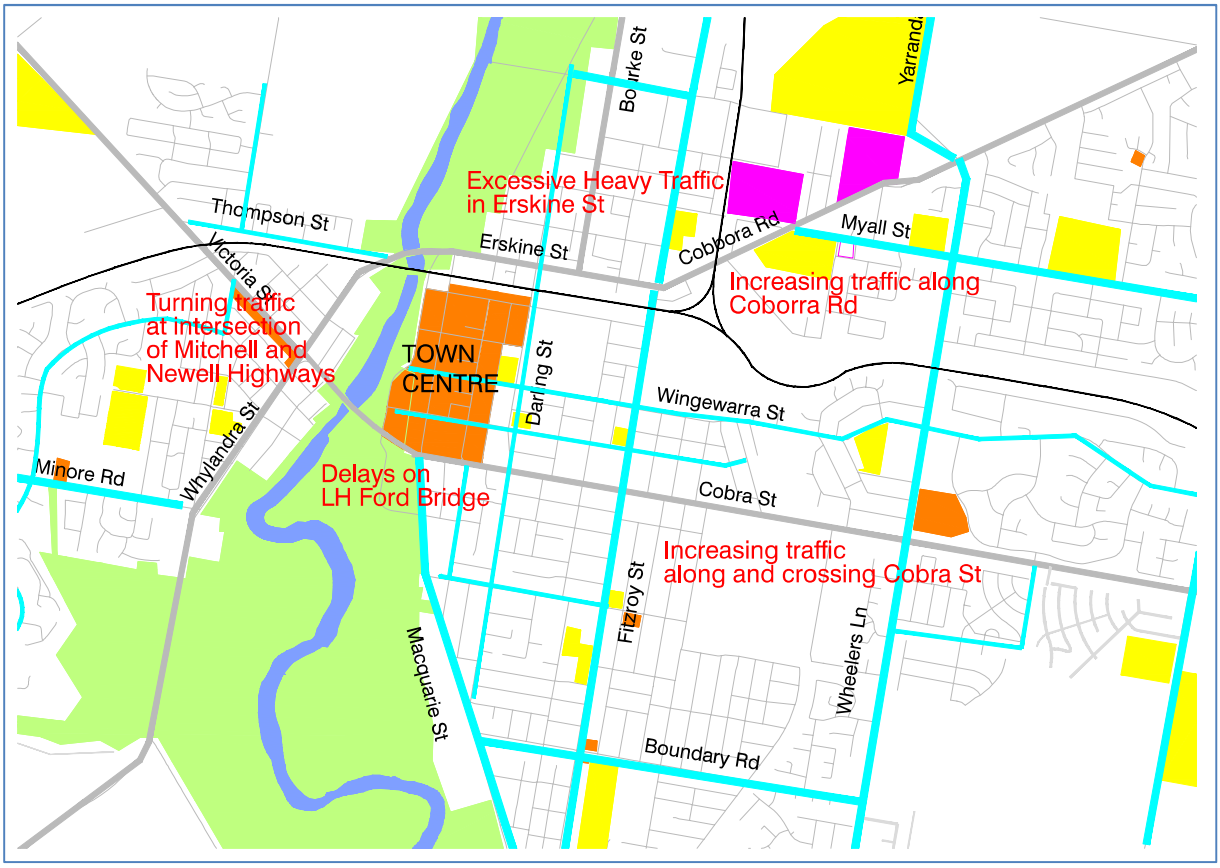
1. SCOPE OF WORK

1.1. Goals

1.1.1. Resolving Current Transport Issues

Dubbo is losing its ten-minute City feel where most trips can be made in under ten minutes. Just a few delays can make the journey feel much longer. Whilst the rapidly growing changes in traffic conditions are observed throughout Dubbo, including say crossing Cobra St from Dubbo South or entering the Emile Serisier Bridge from Thompson St the main Issues are associated with the Highways.

Figure 1.1 Current Transport Issues



The major current transport issues are:

- Overcrowding on the LH Ford Bridge
- Excessive heavy vehicle movement in Erskine St
- Turning of heavy vehicles and all traffic at the intersection of Mitchell Hwy and Newell Hwy in West Dubbo
- Increasing traffic in Cobra St

1.1.2. Responding to State Investment for North Bridge

The State Government is funding the construction of a second high level bridge, partly in response to the growing level of delays in Dubbo, more specifically to improving trucks manoeuvring through the town streets and as a State policy to upgrade the Newell Hwy for operations during flood events, at least until for the 10 year flood occurrence (that is expected to increase in frequency). Council has the opportunity to benefit from this investment. This bridge is referred to as North Bridge.

1.1.3. Optimising Public and Private Investment

Development in Dubbo has always been encouraged and supported by Council. This included Council having a robust developer contribution system that is both fair and equitable. There is an opportunity to direct these funds to facilitate current and future development in an efficient manner.

1.1.4. Maintain Quality of Life for 20,000 New Residents

The population of Dubbo has been increasing consistently over many years; this analysis is based on this increase continuing.

One of the primary attractions to Dubbo is its lifestyle, everything available at short notice using a high quality public realm. This is attracting younger people who grew up in Dubbo to return to the quality of life they remember. One element is the quality of the town centre both in the facilities provided and in the public realm. Part of this is a general lack of intrusive traffic; for, whilst the Highways are busy, they have been generally free from congestion and therefore less pollution and Macquarie St has its own relaxed pace.

New transport infrastructure must support growth without decreasing amenity.

1.1.5. Maintain Dubbo as a Competitive Community

Another major attraction to Dubbo is job opportunities. Commercial investment is encouraged by a cohesive approach to location, amenity, accessibility and cost. This has been recognised by the development of Enterprise Zones. The East Dubbo area also has access to the Blueridge Business Plan and bulky goods retailing.

The transport infrastructure needs to enhance commercial development.

1.2. Scale of Development

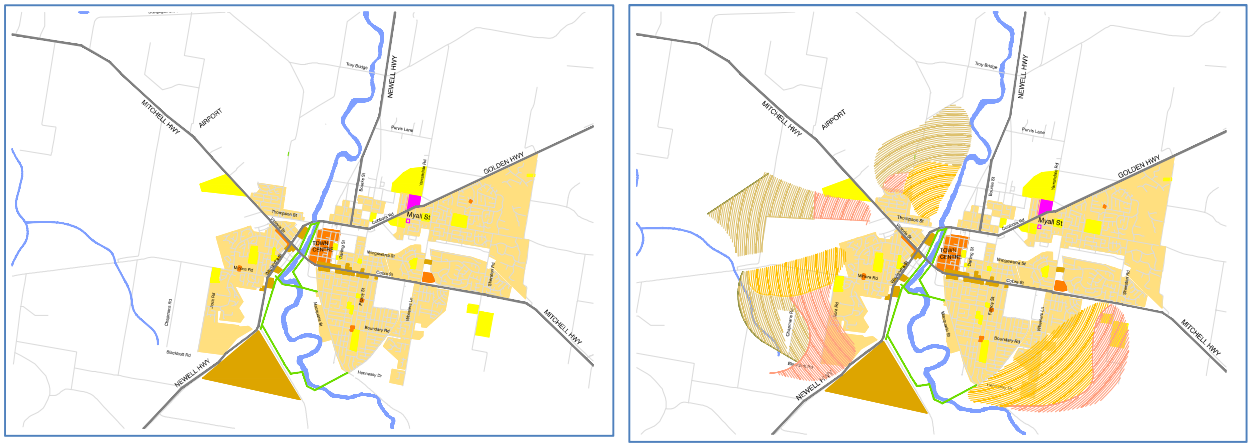
The growth in population is a fixed input to this study. Residential development will occur in four Sectors.

The footprint for existing development is located predominantly on the east side of the Macquarie River. The eastern side will be fully built out in the next 10 to 20 years (Excluding rural residential). Land is available for development to the west that is close to the City centre. This will continue to deliver the efficient 10-minute City. Further details of the staging of development are discussed in Chapter 2.

The analysis of transport infrastructure is generally based on a detailed 10 year plan, when most variables can be estimated accurately; a 20 year plan that supports the continuing trends in population and employment; and a 35 year horizon with the main purpose being to measure the ongoing role of Projects built in the first 20 years. This is relevant to major infrastructure. For example; a new bridge should accommodate the projected flow for 35 years either by additional traffic lanes that are built on at the time, or plans to provide a second bridge during this period. This optimises public investment.

Figure 1.2 Existing and Future Footprint

Existing Footprint **Projected Footprint 2055**



1.3. Information Gathered – Outline of Work Conducted

The analysis of future transport infrastructure starts with an analysis of existing issues and data for future population and employment. The construction of new roads encourages development and hence the order of construction tends to lead to further development. Prospective new links are considered and then evaluated using the transport model. The model estimates trip generation from the residential and employment land uses, predicts a demand between areas, and assigns the journeys to the shortest time through the network. The process for modelling, including how it is calibrated to local conditions, is

described further in Chapter 6. The model has the advantage of providing a logic to the initial concepts and placing them in priority with other potential projects. The patterns of movement are discussed in Chapter 3 and indicate when links will be required. The type of roads required impacts on cost; these are described in Chapter 4. Different scenarios are considered for each time period, these and the conclusions are discussed in Chapter 5.

Firstly, in Chapter 2 below, is a discussion on how the goals can be directed to shape the expansion of Dubbo. These topics have been guided by a number of internal workshops where different skills have been applied to direct the value of the study.

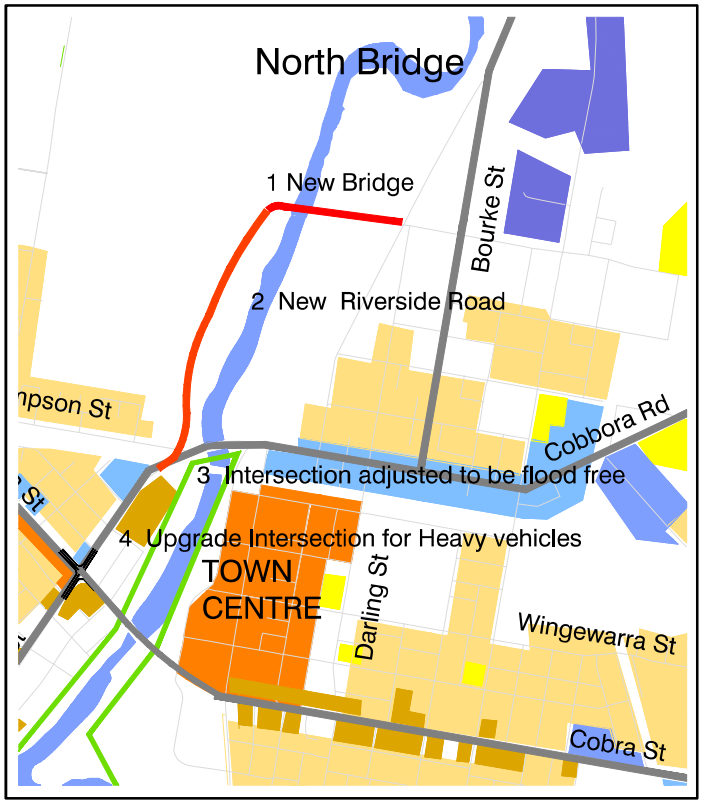
2. DIRECTIONS

2.1. Priority for North Bridge

The construction of North Bridge and its associated infrastructure is a priority for the State Government. The works include (See Figure 1)

1. A new high-level bridge in the alignment of River St.
2. A flood free Riverside connection road on the western bank of the Macquarie River.
3. Realignment of the intersection of Emile Serisier Bridge with Whylandra St to provide flood free access to the new bridge (details not provided by the RMS).
4. Reconfiguration of intersection of Mitchell Hwy and Newell Hwy in West Dubbo to facilitate turning of Trucks in all directions and to accommodate future demand.

Figure 2.1 North Bridge and Highway Works



2.1.1 Flood Free Route

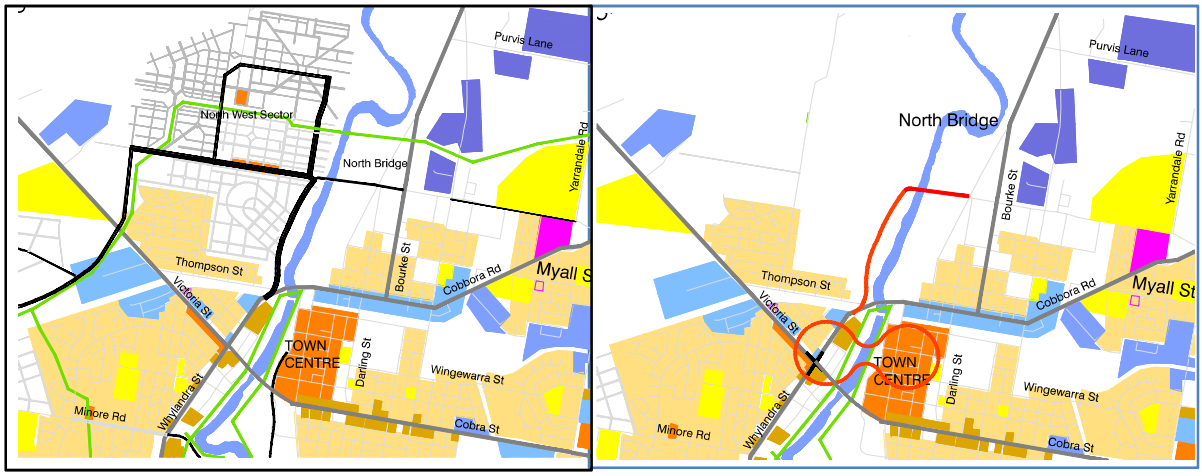
The primary purpose of the North Bridge for the State of NSW is the provision of a second high-level bridge operating during flood events. Recent flood events have resulted in chaos and extensive delays on the LH Ford Bridge. Unfortunately the Newell Hwy north of River St (e.g. Bourke St) and Fitzroy St are flood affected. Therefore, whilst a second bridge will reduce congestion during flood events (when just 2 of 3 bridges will be operating), without further changes to the network traffic, the Newell Hwy will be forced to return to Erskine St and thence use Yarrandale Rd to access the north at Troy Crossing. This issue has been considered and it is proposed to open River St through to Yarrandale Rd during flood events; this is discussed further in 5.2.4.

2.1.2 Integration with Prime Development Area

Another major issue to address is that the western side of North Bridge lands into the centre of the primary riverside development area of the City. This area has been identified for development for over 20 years. Figure 2.2 (a) illustrates an indicative road network for the Northwest Sector drawn up in the 2007 Structure Plan. The diversion of the Newell Hwy from Erskine St will also continue to pass directly (Figure 2.2 (b) through West Dubbo which were also identified in the 2007 Structure Plan as the next stage of development of the City Centre, required as the Western Parts of Dubbo expand.

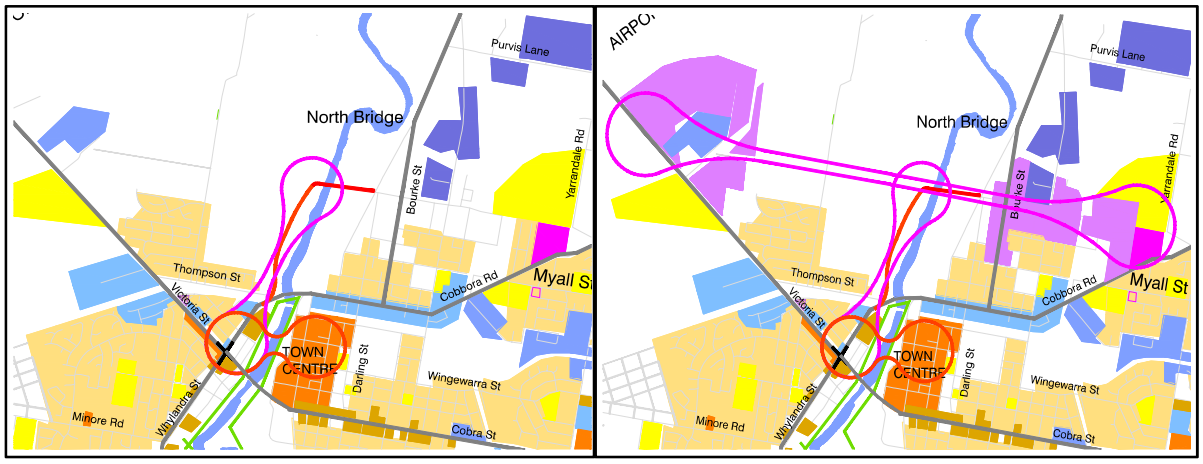
Figure 2.2 Opportunity for Prime Development (2007)

a) Indicative Development of Northwest Sector **b) Indicative Twin Development of City Centre**



The 2007 Structure Plan also identified (Figure 2.2 (c)) as a prime development corridor of the "Riverside Boulevard". This was identified to accommodate prime commercial development, which could include; hotels, accommodation, high end offices and health care; all set in front of residential estates with River St West as a local centre. This was planned on the premise that highway traffic would, at some point be diverted to a Northern Bypass from Troy Crossing connecting to a Western Bypass at the Mitchell Hwy and then continuing south to re-join the Newell Hwy south of the Zoo. This was the 2007 plan and has been amended during the preparation of this strategy in response to the consequences of the North Bridge proposal.

c) 2007 Riverside Commercial Opportunity **d) 2018 Twin Enterprise Zones**



The most recent incentive for attracting employment to Dubbo has been the twin Enterprise Zones near the Dubbo City Regional Airport and the Dubbo Base Hospital that will also impact on the RMS/State plan for a Highway connection using North Bridge. This is discussed further in 2.3.3.

2.1.3 Need for Long Term Resolution of Traffic Intrusion

The relocation of the Newell Hwy to the proposed route still leaves the question of how to reduce the impact of the City traffic on highway traffic in the long term.

2.2. Future Population

2.2.1 Development Trends and Population

The basic predictor for this study has been the ongoing increase in the number of houses built in Dubbo.

TABLE 2.1 HOUSEHOLDS AND POPULATION PROJECTION

		Projected Development	Households	Persons per household	Population
Recent Trend	2015 - 2020	(1250)	14796	2.56	37878
10 Year Contribution Plan	2020 - 2025	1250	16046	2.53	40667
	2025 - 2030	1250	17296	2.51	43397
20 Year Rollling Plan	2030 - 2040	2500	19796	2.46	48676
35 Year Project Life	2040 - 2055	3050	22846	2.41	55052

It has been assumed that the rate of 250 new households per year will be maintained into the future. This is not further discussed here. There is an underlying statistic (ABS) that household size is decreasing in Dubbo and throughout Australia, brought on by factors including an ageing population and more single parents. This statistic is relevant to the number of employees and therefore the journey to work. (See 2.3).

2.2.2 Distribution of Future Residential Development

The precise location of new development is not required for modelling because it will be served by only a few roads. Hence although the exact areas of each new estate have been identified they are shown in Figure 2.3 as hatching per decade.

Figure 2.3 Residential Staging (By Decade/Colours)

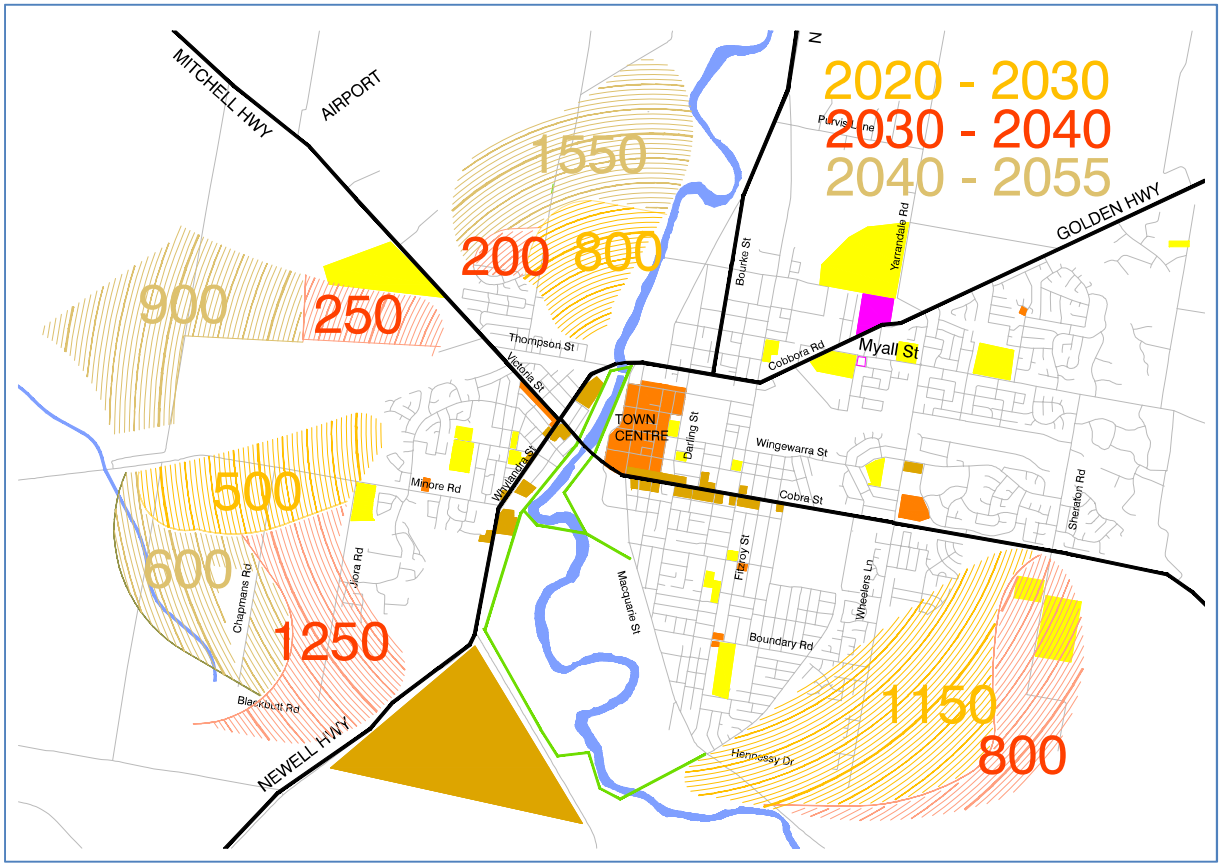


Table 2.2 summarises the information in Figure 2.3.

Development is expected to continue to be concentrated in the SE Sector in the next five years with 60% of new housing, and 20% in the SW and NW Sector. In the following five years the completion of North Bridge is expected to concentrate 44% of new housing in the NW Sector, whilst still maintaining 36% in the SE Sector. No development is expected in the SW Sector in the next 10 years with only the Delroy West Estate being completed adjacent to Minore Rd in addition to some rural residential estates. The total development for 2020 is 1200 in the SE Sector that 800 in the NW Sector, and 500 in the SW Sector that will be subject to a new roads Section 7.11 (formerly Section 94).

TABLE 2.2 PROPOSED DISTRIBUTION OF NEW DWELLINGS					
		SECTORS			
		SE	NW	SW	CWc
Recent Trend					
2015 - 2020	1250	750	50	450	0
		60%	4%	36%	0%
	Total Households	Proposed Distribution			
PROJECTION					
2020 - 2025	1250	750	250	250	0
		60%	20%	20%	0%
2025 - 2030	1250	450	550	250	0
		36%	44%	20%	0%
2030 - 2040	2500	800	200	1250	250
		32%	8%	50%	10%
2040 - 2055	3050	0	1550	600	900
		0%	51%	20%	30%

The capacity of the SE Sector is expected to be complete with 800 dwellings built in the period 2030 – 2040. The concentration of development during this period is expected to be in the SW Sector, mostly along Joira Rd and Chapmans Rd. The SW Sector will accommodate its first estates.

Development is expected to be contained mostly within a 5km radius of the City Centre during the next 15 years until 2055. The majority of new housing, 51%, occurring in NW Sector, and a further 30% in the CW Sector, possibly low density lifestyle development. Only 3050 new houses have been allocated into the sectors in the 2040 – 2055 period, this is 700 short of the 250 new households per year used in this analysis. The reason for this is an assumption that increased density of housing in existing areas will have become a trend by this stage, due in part to the smaller household size and retirement housing. Funding for transport upgrades in existing areas is considered separately.

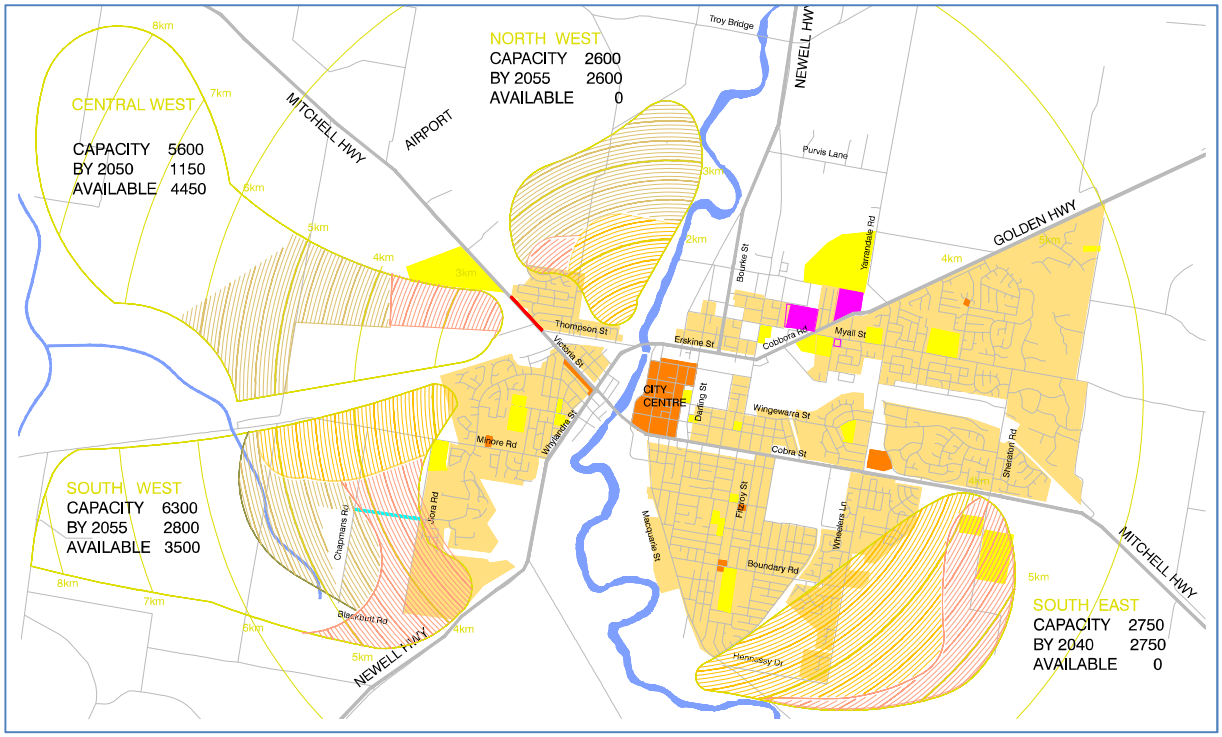
2.2.3 Capacity of Sectors

The physical limitations to development are a factor in the direction of development, as is connectivity.

It is anticipated that the SE Sector and the NW Sector will be built out within the next 35 years with 2750 new dwellings in the SE Sector and 2600 in the NW Sector.

Suitable land is available to expand Dubbo West in the CW and the SW Sectors . An arbitrary boundary has been drawn at the Whylandra Creek. Taking out land that would most likely be assessed as natural open space, the capacity of these sectors is between 5500 to 6500 dwellings, the difference being the density of housing. For the purposes of examining the transport infrastructure needs (in the modelling) 1150 dwellings have been allocated to the CW Sector from 2030 to 2055, all served by new roads and 1850 in the SW most served by existing roads (upgraded). This perhaps illustrates how development tends to follow the least line of resistance, and how good planning can "direct" efficient outcomes.

Figure 2.4 Capacity of Each Sector



2.3 Future Employment

2.3.1 Changes in Employment

As previously discussed, household size is changing as is the number of employees per household. These trends (ABS) determine the future number of employees per household.

Table 2.3 shows the combined impact of both trends with 8050 new households increasing the population by 17,174 from 2.56 persons per household to 2.41. But the workforce is expected to increasing by only 6,413 the rate of employment decreasing from 1.18 to 1.04 employed persons per household.

These factors drive the location of employment and therefore traffic movement.

TABLE 2.3 POPULATION AND EMPLOYMENT TRENDS

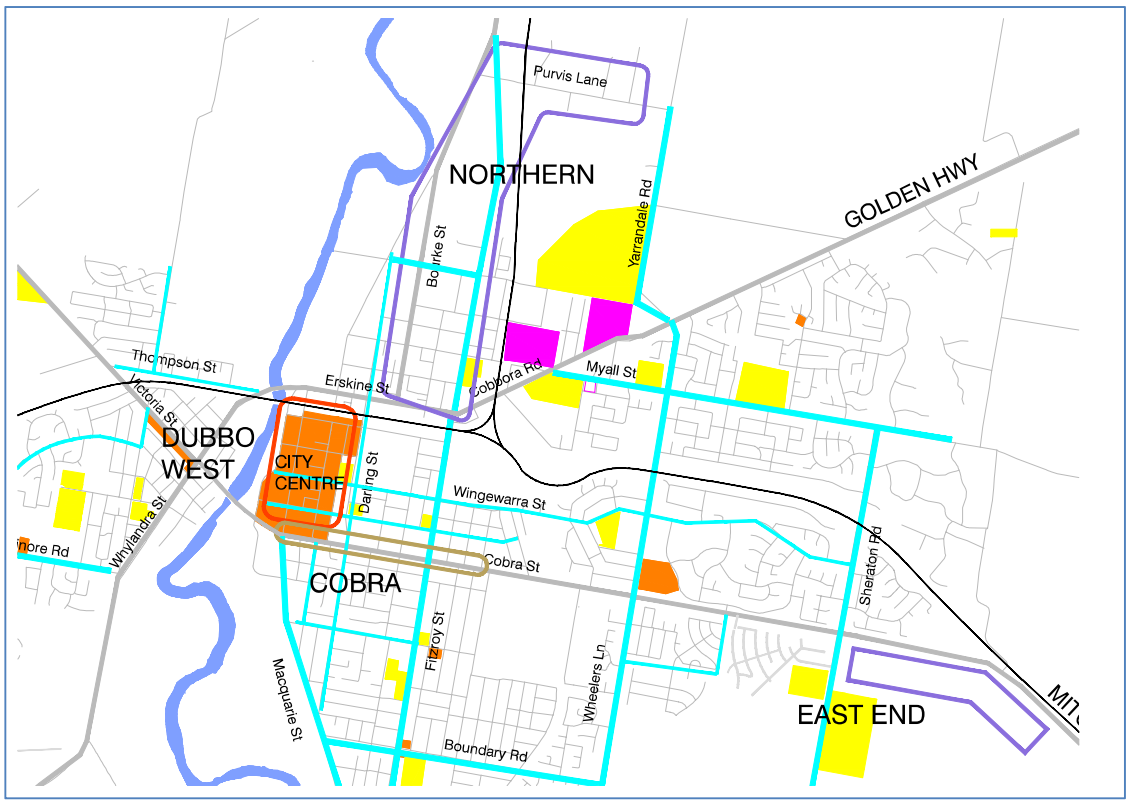
	2020 Verified		2025		2030		2040		2055	CHANGE 2020- 2050
HOUSEHOLDS	14796	1250	16046	1250	17296	2500	19796	3050	22846	8050
Trend in Pop/hh	2.56		2.53		2.51		2.46		2.41	2.13
POPULATION	37878	2789	40667	2730	43397	5279	48676	6376	55052	17174
Trend in % in Work	0.46		0.46		0.45		0.44		0.43	
EMPLOYMENT	17424	1096	18520	1045	19565	1941	21506	2331	23837	6413
Employee/hh	1.18		1.15		1.13		1.09		1.04	

2.3.2 Existing Hubs

Currently 55% of all employment takes place is in the existing Hubs; the City Centre, the Northern Manufacturing Area, West Dubbo, the Cobra Accommodation Strip, plus the East End (Table 3.1). A further 22% of employment is located in Developing Hubs including 18% in the Health and Education Hub near the Base Hospital.

These currently focus traffic movement.

Figure 2.5 Employment Hubs



Employment is changing and this impacts on the growth of Hubs. Many categories used in ABS data, have different trip generation characteristics. Retailing generates a high daily demand per employee/area; finance trends to be based in the city centre, community is spread throughout the town including homework and heath, manufacturing is generally located in zones but also has a proportion spread throughout the town, and "other" is also multi-located.

Table 2.4 summarises the changes in employment projected to occur in Dubbo and this corresponds to the total employment (including external commuters). (Source Council)

TABLE 2.4 TREND IN TYPE OF EMPLOYMENT

		Ret	Fin	Com	Man	Other	Total	
2019		3088	1802	8875	2681	3378	20011	
	% Total	15%	9%	44%	13%	17%		
2025		3210	1931	9893	2976	3406	21615	108%
	% Total	15%	9%	46%	14%	16%		
	increase	122	129	1018	295	28	1604	
2030		3241	2051	10771	3128	3503	22993	106%
	% Total	14%	9%	47%	14%	15%		
	increase	153	249	1896	447	125	2982	
2040		3270	2249	12100	3635	3542	25196	110%
	% Total	13%	9%	48%	14%	14%		
	increase	182	447	3225	954	164	5185	
2055		3319	2481	13627	4033	3967	27927	111%
	% Total	12%	9%	49%	14%	14%		
	increase	231	679	4752	1352	589	7916	
Overall Change		7%	38%	54%	50%	17%	40%	140%

Whilst the proportion of retail employment is projected to decrease from 15% to 12% there is still a small increase in the total number employed in retail (7%), thanks to the increased population. Hence the vitality of the City Centre will be retained. In addition, financial services are expected to increase by 38% in line with the population. Employment in community services and manufacturing are predicted to have the greatest increases of 54% (4752 employees) and 50% (1352) employees respectively.

These factors will change the patterns of demand and have a strong bearing on how to plan the future.

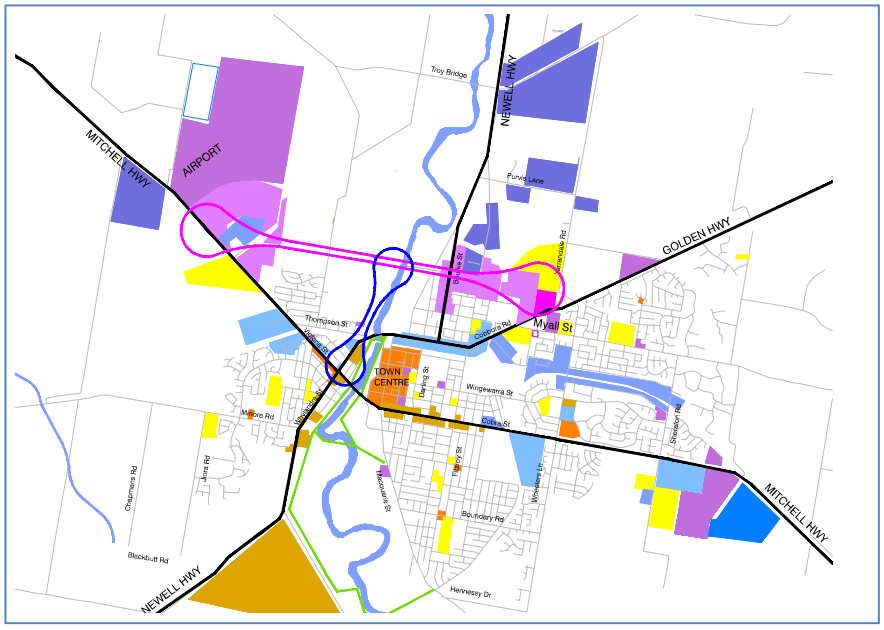
2.3.3 The Enterprise Axis

Referring to the statistic above, in anticipation of changes to future employment Council has been actively planning for two Enterprise Zones, the Health and Education Precinct is currently the subject of a Master Plan. The Airport Precinct is also the subject of detailed future planning.

The shear strength of these two expanding Hubs suggests an Enterprise Axis. This conveniently follows River St and the new river crossing.

This east-west axis strengthens the earlier Riverside Boulevard (2.1.2) as the confluence of two highly strategic employment initiatives. This focuses on the intersection at the western side of North Bridge and the Riverside Boulevard.

Figure 2.6 The Enterprise Axis



This mutual attraction is perfect for development but not so easy to reconcile with the RMS objective for a free flowing Newell Hwy sharing part of the East-west axis and the Riverside Boulevard. Council cannot afford to lose the opportunity to coordinate with the RMS in designing the public realm for the mutual benefit of employment for the City and ease of passage for the Highway. This can be achieved.

2.4 Strategic Roads

The design of roads suitable for their future role in the transport network efficiently is a key objective of the study, and in particular the development of a new Developer Contributions Plan for Roads.

Four fundamental directions dictate the design of strategic roads for Dubbo, as below:

2.4.1 Maintain Flexibility of Movement

The secret of success in Dubbo for the, until recently, lack of congestion has been the flexibility offered by the Grid Network of roads that serve Dubbo. This provides intuitive flexibility, some choosing their traditional route from A to B, others thinking of avoiding a short delay.

2.4.2 Maintain Amenity

The Grid Network, with a few notable exceptions, provides roads with a maximum flow of 600 vehicles per hour or less (Many less). This is a threshold to amenity; relatively easy to cross; relatively easy to be polite and let the slow cross at ease; relatively but not perfectly quiet. Many of course choose to live in the even quieter local streets and only need to travel a short distance to join the Grid Network.

2.4.3 Enhance Quality Of Life

The ease of movement allows residents to maintain a high quality of life, there is very little thought given to can I get there on time or easily. This is an ideal condition for transport that is recognised by many of the returning residents.

2.4.4 Provide an Efficient Transport Network

It could be said that most strategic road are initially under-designed and then regretted a few years later. However the Dubbo Grid has kept on delivering convenient movement with little need for upgrades.

The challenge for the upgraded street designs (Chapter 4) is to continue this legacy and anticipate future trends.

2.5 Natural Assets

2.5.1 Macquarie River

Dubbo was settled along the Macquarie River and the flood plain provides the settling for recreational open space. The proposed Riverside Boulevard extends this opportunity. Unfortunately Macquarie St does not address the open space riverfront through the City.

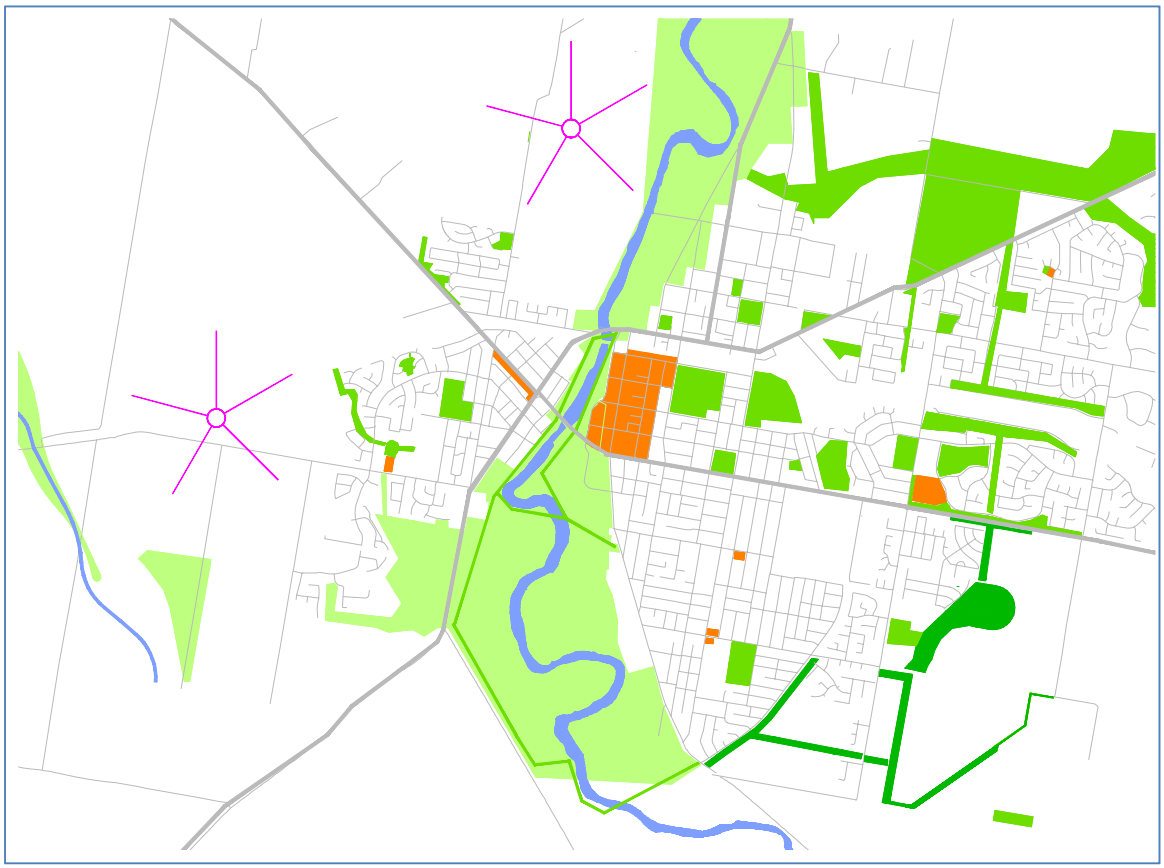
2.5.2 Vistas/ Lookouts

Less well known are the vistas from the ridge to the west of the Macquarie River – shown in Figure 2.7 - These can lead urban development as lookouts or other community focus points and are utilised in the Active Transport Plan (2.6.1). A third potential Lookout has also been identified at the Drive-in Cinema in West Dubbo and this features later in the discussion.

2.5.3 Connectivity of Open Space

The existing urban area contains many areas of recreational open space. The previous Strategic Plan identified some existing linear connections in eastern parts of Dubbo and adopted plans to extend this as a continuous ring around Dubbo (Figure 2.8). This network is suitable for Active Transport.

Figure 2.7 Natural Features



2.6 Future Transport Modes

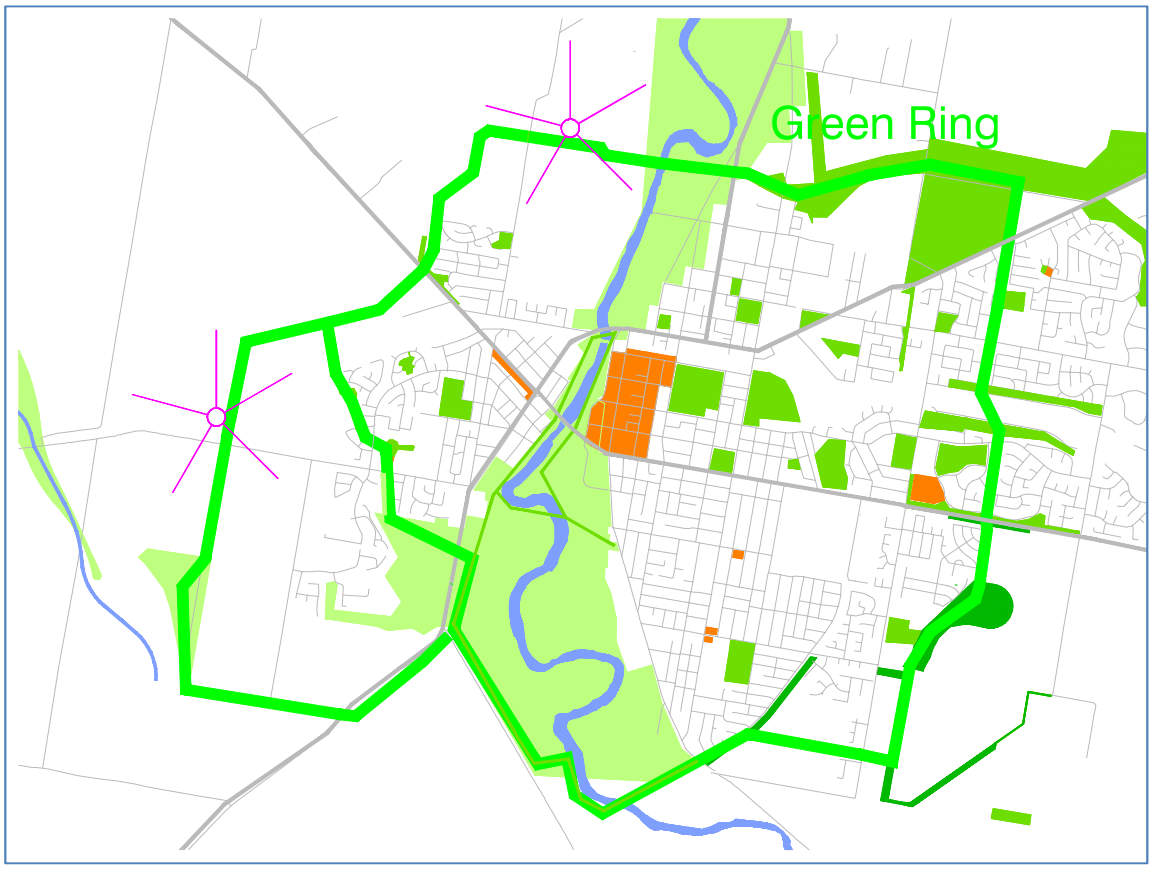
2.6.1 Active Transport

Active Transport networks are being developed in Dubbo. (Refer to Council documents including Cycleways in Dubbo). With the exception of paths along the Macquarie River these are predominantly on road facilities following bike lanes or quiet streets.

Recent developments of electric power have lead to an upsurge of new micro vehicles ranging from electric assisted bikes to boards and scooters. Mobility scooters are also undergoing changes in range and capability and are seen as a transport mode for deliveries and car replacements.

These vehicles are permitted to use Cycleways and will become part of the mainstream movement. This will alter the balance and priority given to the Green Ring and the extension of the Green Ring. Works on this network have been included in this Strategic Transport Plan. This follows on from the previous 2007 Transport Strategy.

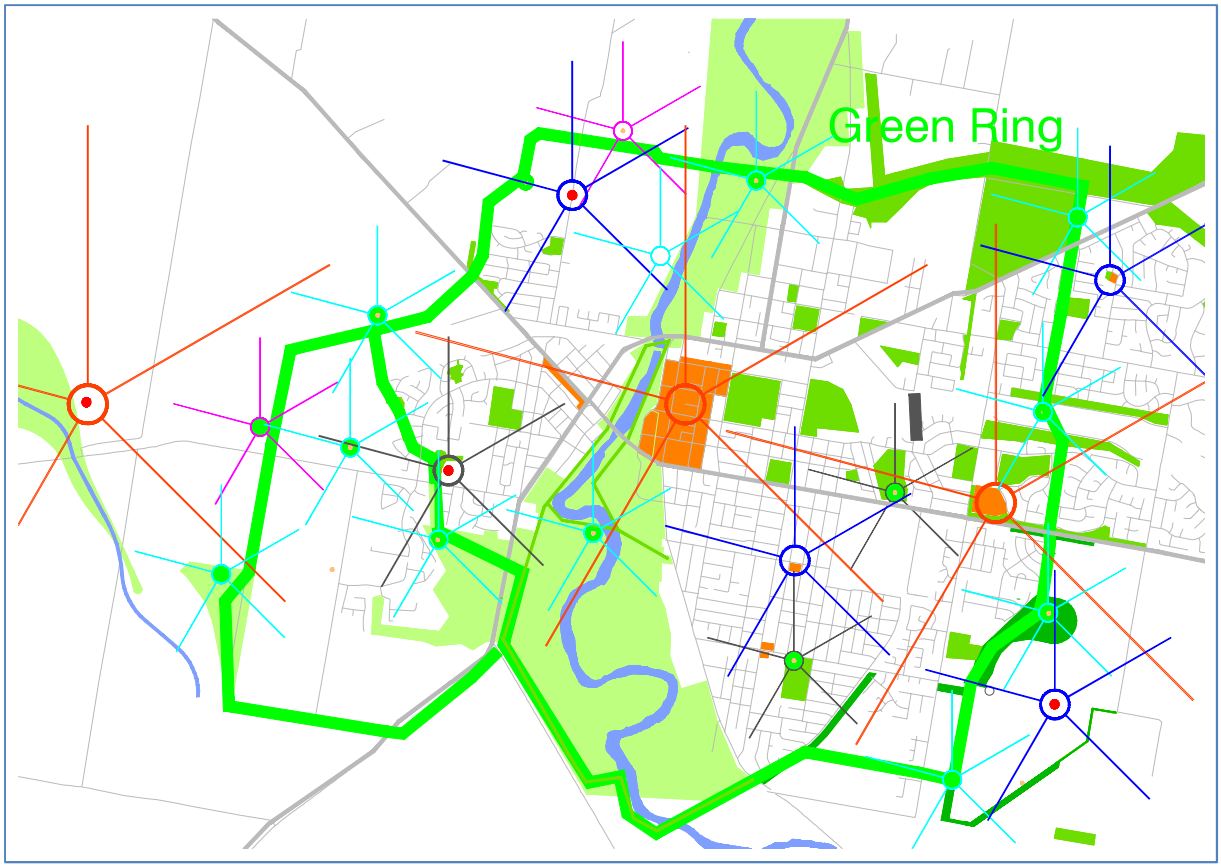
Figure 2.8 Green Ring



These electric powered vehicles are also using footpaths to the detriment of more vulnerable pedestrians including the mobility limited and parents with small children.

Figure 2.9 illustrates the need for local connectivity. This intrusion is not the subject of this report but needs to be addressed as part of a future "hierarchy" of integrated networks.

Figure 2.9 Active Transport Connectivity



2.6.2 Autonomous Vehicles

The introduction of larger electric powered vehicles is also on the agenda. All new vehicles have some form of driver assistance and are becoming to some degree "autonomous". This will have no impact on traffic operations in Dubbo in the short term. Driver advisories for congestion are already assisting in rural highways in Europe and the US but again will have no impact in Dubbo.

The next generation of AV's are aiming to have surveillance to protect pedestrians as well create efficient traffic platoons. This application will not be in general operation for at least 20 years although some truck operations may become more Autonomous earlier.

Nevertheless the Strategic Transport Strategy can address the possibilities for AV operations in new areas and this has been considered in Chapter 4.

2.6.3 Public Transport

Public transport will continue to provide a service to bring residents from the residential areas into the City Centre, Schools, and to work and recreation throughout Dubbo. The route system is efficiently designed for this role with all services focusing on Macquarie St and providing the opportunity to transfer to every other service and thereby move throughout Dubbo.

A detailed review of the existing function of public transport is not required for this study.

Given the time lag for the introduction of AVs public transport will continue its important role in accessibility.

All Street styles are capable of accommodating bus services.

2.6.4 Electric Vehicles and Noise

One goal is the reduction of noise and the intrusion of Highway traffic in Dubbo and hopes for a Bypass to the west of the City.

During the course of this work it has become apparent that further State investment on a Bypass is unlikely to be justified even in the long term (35 years plus).

The introduction of electric powered heavy vehicles – to start with in towns – will reduce noise (as well as pollution) and this will achieve some of the goals to remediate intrusion. This is further discussed in Chapter 4.

3. TRANSPORT PATTERNS

The modelling calculates the three shortest routes through an average of ten road sections between each of the 280 zone pairs, (2.3m digits of information). The intention of this Chapter is to illustrate how traffic is manipulated through the existing and future roads. Firstly to disperse current congestion and secondly to spread traffic throughout the network and in particular to show how new links contribute to the dispersal of traffic. This is summarised numerically in Chapter 6.

3.1. Current Patterns

3.1.1. Traffic Conditions

Results from the Modelling include diagrams that measure sections of road under "stress". This is calculated by measuring the "Level of Service" of street sections and intersections. This is a standard measure of traffic congestion, progressing from excellent to complete stand still.

The diagrams are colour coded. Circles (there are none in Figure 3.1) indicate where an Intersection may require attention, and bars indicate where the street "link" itself may require attention. The links are less critical than the Intersections because the measure is an indication of the lack of opportunity to pass that is more suited to rural conditions than urban streets. It could be argued that some "Bars"/congestion in streets busy with pedestrian activity are a sign of good traffic management.

The output from the modelling is an indicator of the urgency of creating the alternative, with emphasis on alternative rather than necessarily upgrading the location in stress. For example; in traditional engineering a blocked high street can sometimes be resolved by a new Bypass.

The diagrams of "stress" are used in the analysis for future networks, in Chapter 5, and need to be considered in that light.

Referring to the formal Level of Service [LoS] terminology and its impact on travel in Dubbo.

- Green, LoS D warns of the need for attention in the near future.
- Blue LoS E, requires an alternative to be designed.
- Orange LoS F, should not be reached because the alternative should be in place.

Many Dubbo residents are intolerant to delays and indeed the free flow traffic conditions are an attraction to living in the 10 minute City of Dubbo. A lower tolerance is more applicable in Dubbo where LoS C (that is not illustrated in the diagrams) is a sign that some Dubbo drivers are finding conditions unacceptable and might seek an alternative way to avoid the intersection.

This analysis consistently shows Cobra St with green sections and not moving to Blue, this is because the strategy consistently aims to marginally reduce traffic on Cobra St. The question of how much time difference is summarised in Chapter 6 with measurements of the time taken to move along Cobra St from near Wheelers Ln to near Macquarie St and is in the order of 5 to 7 seconds on a 6 minute trip. This is considered within a tolerable range of changing conditions.

Figure 3.1A shows the working analysis of existing conditions and indicates stressed conditions on the LH Ford Bridge, in Coborra Rd – at the railway – both being difficult to avoid and along short sections of Cobra St. (It is considered that the LH Ford Bridge experiences unacceptable queuing for a short period in the morning peak. Because this occurs for a short time this is not reflected in this analysis but is recognised in the Strategy).

The same delays occur if nothing was done in 2025 (Figure 3.1.B) with Coborra Rd moving to unacceptable delays requiring an alternative and LH Ford is stressed in both directions during the morning peak. (This by the way with the intersection of Whylanda St and Victoria St upgraded. (Those with keen eyes will note that Fig 3.1 B has some other new local links added (in the SE Sector and others that are not being used at this time).

Figure 3.1. a) 2019 Level of Service b) 2025 No Minimum Level of Service

As a planning tool this representation shows how efforts must be made to move a small proportion of existing traffic off Cobra St. And confirms that conditions on the LH Ford Bridge are deteriorating fast.

3.2. Patterns Of Growth

3.2.1. Employment

The main attractors for all journeys are the employment Hub. The future proportion of travel to each Hub will change as employment changes (Ref 2.3.2). At first the net result does not appear to be substantial. For example, whilst the existing Hubs are expected to have an overall increase of 26% (Table 3.1) the proportion of total employment in the existing Hubs is expected to reduce from 55% in 2020 (Table 3.1) to 50% by 2050. This is relevant to the City Centre where the total number of employees is projected to grow by 26%, but the proportion of the total employment reduces from 22% to 20%.

These changes in the existing hubs are small and manageable, however the new Hubs have an estimated increase of 75% in employment.

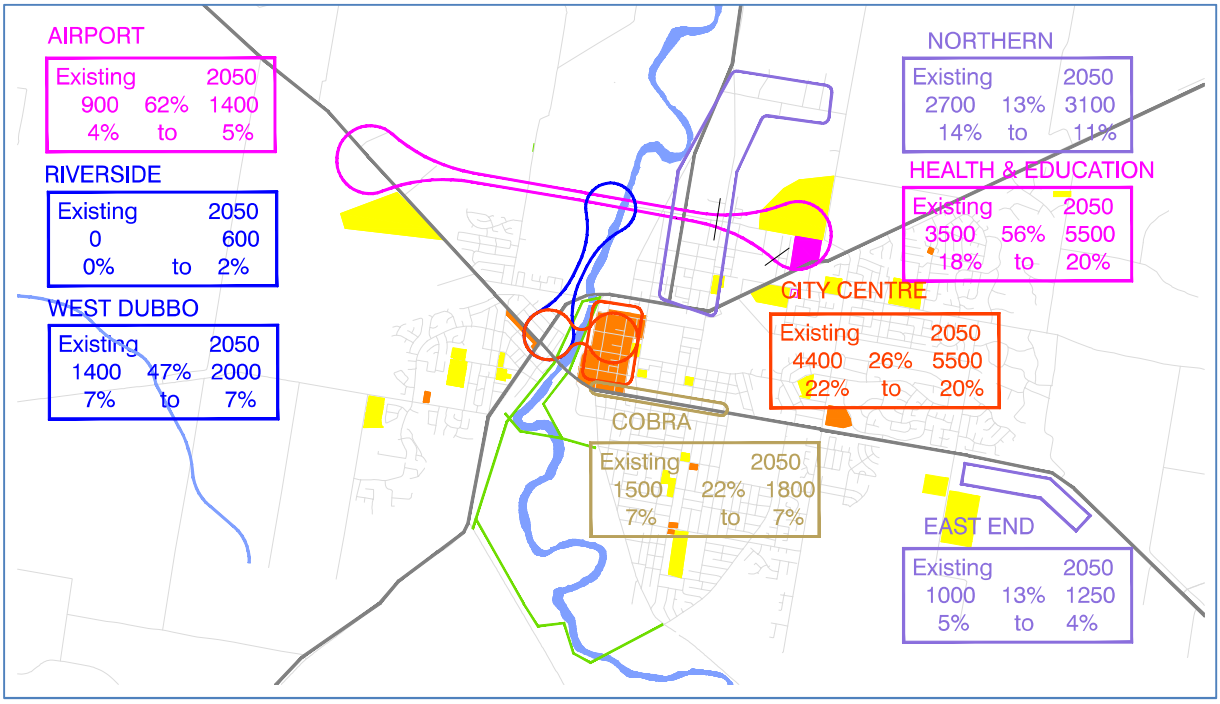
Considering the pattern of journeys, 2000 additional trips need to be accommodated to the Hospital and Education Precinct, nearly half as much as the current employment in the City Centre. The Airport Precinct will have 1000 additional trips, the same as the CBD, with a further 1000 to Cobra and West Dubbo combined. (See Table 3.1 for concise estimates and Figure 3.2 for shape).

TABLE 3.1 EMPLOYMENT BY HUB

	2019 (Calibration)	% Tot	2025	% Tot	2030	% Tot	2040	% Tot	2050	% Tot	Change 2020 - 2050
EXISTING HUBS											
1 City Centre	4399	22%	4689	22%	4945	22%	5291	21%	5635	20%	128%
2 Dubbo West	1363	7%	1614	7%	1736	8%	1952	8%	2041	7%	150%
3 Cobra	1477	7%	1544	7%	1624	7%	1718	7%	1836	7%	124%
4 North	2706	14%	2734	13%	2811	12%	2909	12%	3121	11%	115%
5 East End	1083	5%	1136	5%	1168	5%	1198	5%	1234	4%	114%
	11028	55%	11717	54%	12284	53%	13067	52%	13866	50%	126%
NEW HUBS											
6 Heath & Education Precinct	3509	18%	4133	19%	4536	20%	5037	20%	5617	20%	160%
7 Riverside Precinct	0	0%	27	0%	37	0%	245	1%	609	2%	
8 Airport Precinct	885	4%	930	4%	1071	5%	1267	5%	1457	5%	165%
	4395	22%	5091	24%	5644	25%	6549	26%	7683	28%	175%
SUBURBAN	4588	23%	4808	22%	5065	22%	5579	22%	6378	23%	139%
Total	20011		21615		22993		25196		27927		140%

This pattern shows how the River Street Axis will accommodate the same numeric change as the Central Areas, a clear need for more accessibility to the northern parts of Dubbo. But also the additional employment in the City Centre and Cobra St will attract more demand to the LH Ford Bridge and some other demands need to be dispersed. (2055 projections are used in the modelling and are not illustrated here).

Figure 3.2 Employment Hubs



3.2.2. New Residents

Figure 3 A to D illustrates the directional split of journey to work from each Residential Sector, the light green bars showing demand using new facilities, the base colour showing demand on existing roads.

This "pre analysis" before the modelling continues to indicate the usefulness of new strategic infrastructure; in particular North Bridge and South Bridge but also crossing the railway line at Chapmans Rd (referred to below as Western Railway). This summary was then used to make first calculations of the potential scale of demand on new facilities to indicate the number of new links required.

Demand from the NW Sector will concentrate on the Riverside to Emile Serisior Bridge with a proportion using North Bridge and practically no traffic on the LH Ford Bridge.

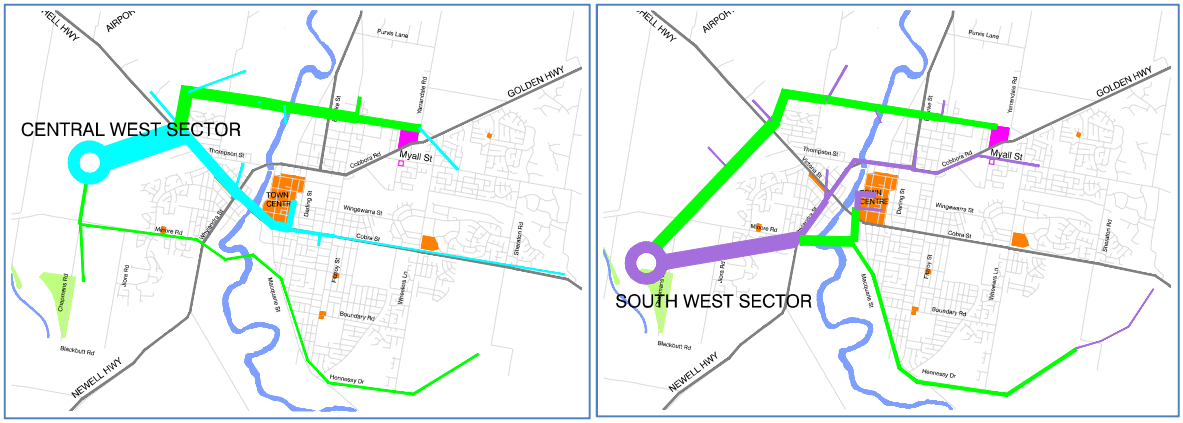
Demand from the SE Sector primarily uses existing roads (for journey to work). The scale of this additional traffic needs to be considered at this Stage. For example; Figure 3.1 B indicates a strong demand using Hennessy Rd and the southern part of Macquarie St. This represents 261 peak hour trips in 2030 from the SE Sector, (Table 3.3 A) with (a surprising) 180 peak hour trips as contraflow from other new development. Cumulatively this is less than 600 vehicles per hour, and therefore within the environmental goal for the Neighbourhood Grid. Demand increases later (Table 3.3.B) to a maximum of 10,000 vehicles per day in 2055.

Figure 3. A) Demand from NW Sector b) Demand from SE Sector

Conclusion; the connection to South Bridge via Macquarie St south is suitable in the foreseeable future and no other option, such as the Southern Bypass (Ref Figure 5.6.1) needs be considered for 10 years.

As a point of clarification, whilst there may be concern over the accuracy figures estimated for 20 or 35 years hence the strategy will be reviewed regularly and other options will be considered at the time. This analysis gives a sense of direction.

Figure 3. c) Demand from CW Sector d) Demand from SW Sector



Demand from the CW Sector concentrates on North Bridge and LH Ford Bridge indicating that some existing traffic must be diverted from this access and hence South Bridge is required.

Demand form the SW Sector concentrates on South Bridge. Further, a new bridge over the railway at Chapmans Rd will spread traffic across the west and onto North Bridge. When combined these will successfully reduce impacts on Cobra St and through West Dubbo. Traffic from the existing parts of the SW will predominantly use South Bridge, this is not reflected in these figures.

Again before starting the modelling it is apparent that North Bridge will be well used by Dubbo traffic by 2030. The figure of 6000 Vehicles per day [vpd] (Referring to Table 3.2A) is higher than the demand from new development for South Bridge ~ 4000 vpd. (See Chapter 6 for modelled results).

TABLE 3.2A 2030 INDICATIVE USE OF NEW MAJOR INFRASTRUCTURE
DEMAND FOR 2030 BY NEW DEVELOPMENT ONLY; EXISTING TRAFFIC WILL ALSO DIVERT TO NEW FACILITIES

MAJOR NEW INFRASTRUCTURE	PEAK TRAFFIC GENERATION								TOTAL DAILY TRAFFIC 0.1
	NW Sector		SE Sector		CW Sector		SWSector		
	Total Gen Estimated % using	800 Additional Traffic	Total Gen Estimated % using	1450 Additional Traffic	Total Gen Estimated % using	0 Additional Traffic	Total Gen Estimated % using	700 Additional Traffic	
North Bridge	40%	320	0%	0	40%	0	40%	280	6000
South Bridge	0%	0	8%	116	12%	0	41%	287	4030
Bligh St	0%	0	10%	145	0%	0	22%	154	2990
Hennessy	10%	80	18%	261	15%	0	15%	105	4460
Western Railway	2%	16	2%	29	3%	0	2%	14	590

Taking these initial estimates to 2055 indicates that North Bridge will be stressed (18000 vpd similar to current flows on LH Ford), South Bridge will be relatively small from newly generated traffic (4000 vpd), Hennessey Rd, as mentioned above will be close to capacity for a Residential Grid Road, and a bridge over the Railway in the SW should be working well (15,000 vpd).

TABLE 3.2B 2055 INDICATIVE USE OF NEW MAJOR INFRASTRUCTURE
DEMAND FOR 2055 BY NEW DEVELOPMENT ONLY; EXISTING TRAFFIC WILL ALSO DIVERT TO NEW FACILITIES

MAJOR NEW INFRASTRUCTURE	PEAK TRAFFIC GENERATION								TOTAL DAILY TRAFFIC
	NW Sector		SE Sector		CW Sector		SWSector		
	Estimated % using	Cumulative Additional	Estimated % using	Cumulative Additional	Estimated % using	Cumulative Additional	Estimated % using	Cumulative Additional	
North Bridge	36%	702	0%	0	31%	357	31%	760	18180
South Bridge	0%	0	15%	338	8%	92	32%	784	12135
Bligh St	0%	0	10%	225	0%	0	10%	245	4700
Hennessy	5%	98	25%	563	8%	92	11%	270	10215
Western Railway	8%	156	7%	158	16%	184	41%	1005	15020

These patterns will form from residential development.

3.2.3.

3.2.4. Scale of External Traffic and Heavy Vehicles

The third pattern of movement is external traffic. This often dominates discussion but is a small proportion of total movement in Dubbo. However, is essential to the economy as Dubbo is the regional centre for 120,000 residents.

Through traffic forms approximately 20% of external traffic (Table 3.3). Regional traffic is considered in two types, Commuters and other regional traffic. Currently of the total regional traffic 50% is journey to work commuter traffic and 50% are regional visitors; shopping, business, school recreation etc.

TABLE 3.3 COMPOSITION OF EXTERNAL TRAFFIC (Two way traffic)

	2019 Survey	Applied Annual Increase	2025		2030		2040		2055	
Through traffic	2460	103%	1.16	2852	1.16	3306	1.34	4443	1.56	6922
Commuter	5174	Varies	1.13	5847	1.1	6431	1.08	6946	1.07	7432
Regional Movement	5271	101%	1.03	5404	1.03	5540	1.05	5824	1.08	6276
TOTAL EXTERNAL	12905			14103		15278		17213		20631
				109%		118%		133%		160%

Through traffic is expected to increase on the existing trend of 3% per year. Regional movement is expected to increase in line with the anticipated small increase in population, generally 1% per year.

Commuting from rural areas has increased over the last decade and is expected to continue in line with changing types of employment in Dubbo.

Considering the total increase in employment, the resident employees in the Dubbo Study area (ABS) is currently made up of 87% internal residents and 13% regional commuters. This is not expected to vary in the future.

TABLE 3.4 EXTERNAL COMMUTERS

ORIGIN OF EMPLOYEES	2020	2025	2030	2040	2055
Internal Resident	17424 87%	18520 86%	19565 86%	21506 86%	23837 87%
External Commuters	2587 13%	2923 14%	3216 14%	3473 14%	3716 13%
Total	20011	21443	22781	24979	27553

External traffic will increase faster than internal traffic (60% and 40% respectively). This will not have an impact on traffic in Dubbo in the foreseeable future.

In conclusion to this Chapter, the Transport Strategy has been a response to the current pattern that centralises demand, the movement of employment more to the north and the centroid of population moving more to the west and little change in the proportion of external traffic.

4. ROADS FOR THE FUTURE

The purpose of this Chapter is to establish suitable Sections for new transport infrastructure that can be costed for use in the Developer Contributions Plan and to make estimates of future infrastructure programs.

The actual traffic requirements, traffic lanes, parking, footpaths and landscape are based on typical Arterial Roads. The traditional Dubbo Suburban Road is included as a comparison for costing and amenity. The design originated with the need to accommodate trucks and turning traffic and evolved to accommodate pedestrian amenity with central refuges, streets include Cobra St, Fitzroy St and tended to spread to most older Grid Roads.

Unit-Cost Prices have been provided by Council. They include the cost (Table 4.2) for m^2 of, pavement, parking lanes, footpaths, bridges, for m length of footpaths, and m^3 for earthworks - earthworks are only estimated for flood plains. Acquisition costs are not included.

Based on these costs the typical existing Dubbo Suburban Road with 14m of heavy-duty pavement and 4.2m of parking pavement cost in the order of $4,000 per-metre length.

Five situations have been considered.

1 **Residential Grid** - a typical Grid Road within a neighbourhood.

Many new links will have similar characteristics to the existing layout of the Grid Roads in Dubbo; frontage housing and low volumes of predominantly local traffic. Whilst the traditional streets are very attractive, and part of the Dubbo identity, more recent Suburban Roads, such as, Boundary Road have been built to the standards of more typical metropolitan streets with 6m of payment plus two parking lanes. (Table 4.1 Costing Infrastructure)

The reserve width is reduced to 15m.

These are primarily internal Suburban Streets and cost $2000 per m length; half of the traditional street style.

2 **Urban Edge** – located at the edge of residential development and requiring one residential service road and a separate carriageway for other traffic (note, not through traffic but simply other local traffic). The per-metre cost of this profile is still a moderate $2800.

The reserve width is maintained at 22m.

The use of Urban Edge Streets is recommended at a number of locations, either at the edge of development or where there is a strong linear barrier to development. For example; Hennessey Rd could eventually (and not in the 35 year horizon) become part of the Southern Link Rd and is situated on the edge of the flood plane. (Hennessey Rd is already designed using the profile).

TABLE 4.1 COSTING OF INFRASTRUCTURE

UNIT PRICES		Unit Price
Pavement/drainage	$/m2	$220
Parking Pavement	$/m2	$120
Kerbs	$/m	$75
Footpaths Width	$/m2	$90
Bridge Water	$/m2	$6,000
Bridge Land	$/m2	$4,800
Earthworks	$/m3	$2,106

OPTIONS FOR ROAD SECTIONS

		Width	Pavement	Light Pavement	Footpath	Kerbs	TOTAL Per m
EXISTING ARTERIALS		m	m	m	m	m	
Central turning	Quantity	22	14	4	3	2	
and pedestrian refuge	$		$3,080	$480	$270	$150	$3,980
1 RESIDENTIAL GRID							
No Regional Traffic	Quantity	15	6	4	0	2	
or wider footpaths/verges	$		$1,320	$480	$0	$150	$1,950
2 URBAN EDGE							
Local and passing traffic	Quantity	22	10.5	2	0	3	
	$		$2,310	$240	$0	$225	$2,775
3 SEGREGATED ARTERIAL							
Limited pedestrian access	Quantity	19	13	0	0	2	
	$		$2,860	$0	$0	$150	$3,010
4 COMMERCIAL INTEGRATOR							
Three carriageways	Quantity	33	17	4	0	4	
	$		$3,740	$480	$0	$300	$4,520
5 RESIDENTIAL INTEGRATOR							
5.1 Stage 1 Single carriageway	Quantity	33	5.5	0	1.5	2	
	$		$1,210	$0	$135	$150	$1,495
5.2 Stage 2 Two Carriageways	Quantity	33	5.5	0	1.5	2	
	$		1210	0	135	150	$1,495
5.3 Three Carriageways	Quantity	30	8	10	3	2	
	$		1760	1200	270	150	$3,380

3 **Segregated Arterial** – crossing flood plains or permanently outside the Urban Expansion (e.g. under airport flight path)

A number of links are built across flood planes or outside the future urban areas, operating at a higher speed they require larger carriageways. Given the higher speed – and given that a Greenway network is included in the costing of Infrastructure – it is desirable to segregate pedestrians from these roads and hence there are no footpaths. The per-metre cost reflects the wider carriageway at $3000.

4 **Commercial Integrator** – passing through mixed development requiring service roads accommodating heavy vehicles and a central carriageway for passing traffic.

This situation was identified in the previous Strategic Transport Plan, (River St West). This is the most flexible means of bringing high volumes of traffic through a commercial area. The 33m width (Table 4.2 Road Design Options) allows for landscaping and therefore provides an attractive street environment.

The per-metre cost of $4500 reflects the stronger carriageways.

5 **Residential Integrator** – Also with the potential for three carriageways but passing through residential development where Service Roads can, be used to accommodate local traffic and not requiring heavy-duty use. (Southern part of Wheelers Lane).

The Residential Integrator can be staged to suit development. This provides the ultimate in flexibility, particularly of the future role of the link is not settled, as is the case for the 20 to 35 year plan.

Stage 1; Residential development on one-side of the reserve requiring one Service Road. At a cost of $1500 per-metre length this is the least cost for a Strategic Road. But because this style is built in stages the Service Road is built for heavy-duty use (and 5.5m in width).

Stage 2; Residential development on the second side of the reserve requiring a second Service Road. Suitable when there is still no certainly on the future use of the Central Carriageway

Stage 3; Build the three carriageways concurrently with two light duty Service Roads. The per-metre cost of $3400 is less than adding the central carriageway to two heavy duty service roads and less than the Commercial Integrator ($4520).

Also note the specification requires space for an 8m central carriageway not the 7m for a Commercial Integrator this is interchangeable. Also Light Duty Service roads can always be upgraded if the need arises in the future. (8m probably ideal for advanced AV vehicles)

In conclusion, using a series of Sections that offer flexibility for future transport demands can make substantial saving to the alternative of simply adopting to continue to use the current Grid Road Section. And furthermore provide a more sustainable long-term transport network; a fact established in the 2007 Transport Strategy.

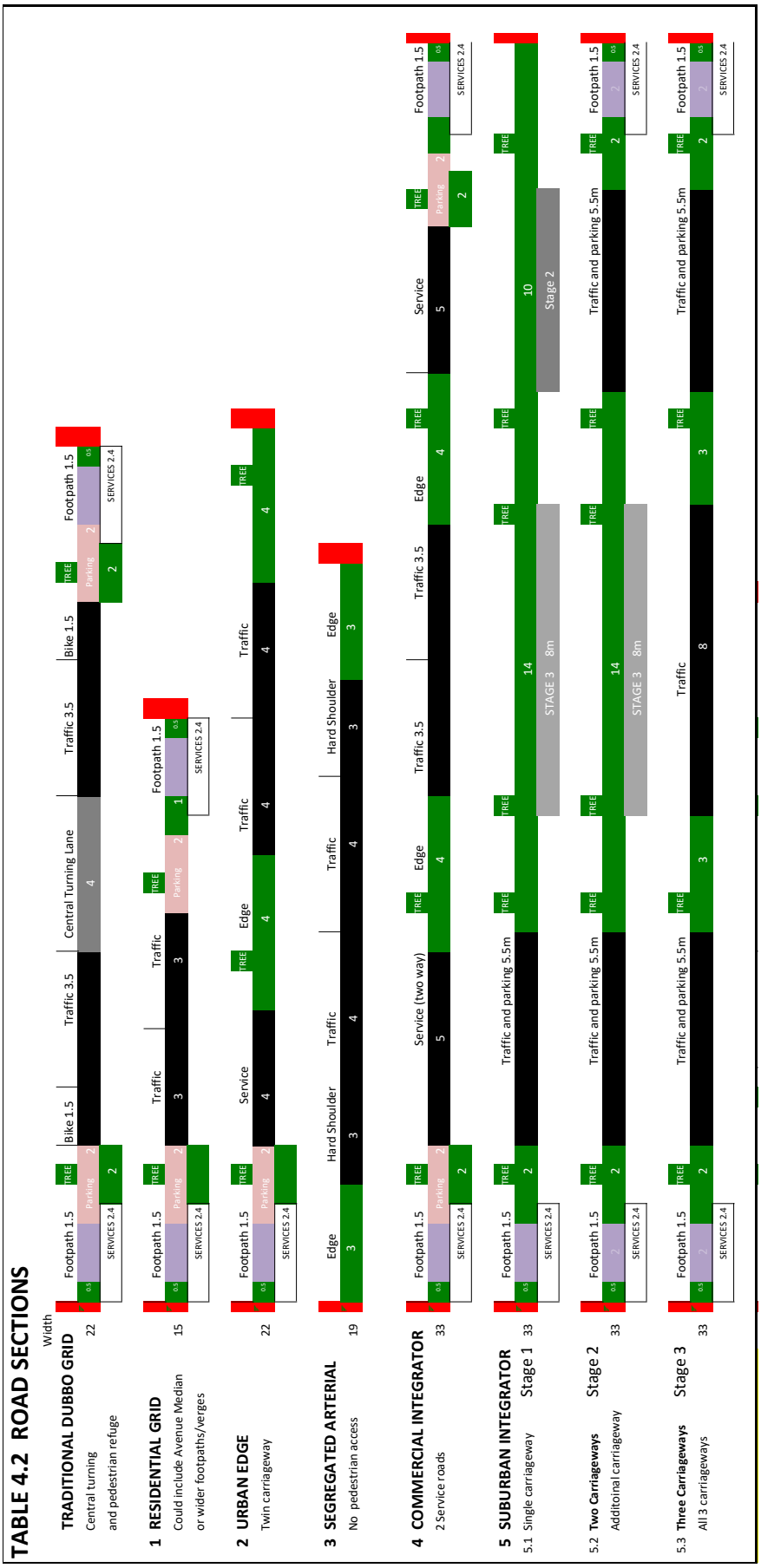


TABLE 4.2 ROAD SECTIONS
Width
TRADITIONAL DUBBO GRID 22
Central turning and pedestrian refuge
Footpath 1.5 TREE Parking Bike 1.5 Traffic 3.5 Central Turning Lane Traffic 3.5 Bike 1.5 Parking TREE Footpath 1.5
0.5 2 2 4 2 2 0.5
SERVICES 2.4 SERVICES 2.4
1 RESIDENTIAL GRID 15
Could include Avenue Median or wider footpaths/verges
Footpath 1.5 TREE Parking Traffic Traffic Parking TREE Footpath 1.5
0.5 2 3 3 2 1 0.5
SERVICES 2.4 SERVICES 2.4
2 URBAN EDGE 22
Twin carriageway
Footpath 1.5 TREE Parking Service Edge Traffic Traffic TREE
0.5 2 4 4 4 4 4
SERVICES 2.4
3 SEGREGATED ARTERIAL 19
No pedestrian access
Edge Hard Shoulder Traffic Traffic Hard Shoulder Edge
3 3 4 4 3 3
4 COMMERCIAL INTEGRATOR 33
2 Service roads
Footpath 1.5 TREE Parking Service (two way) TREE Edge Traffic 3.5 Traffic 3.5 Edge TREE Service TREE Parking Footpath 1.5
0.5 2 5 4 4 5 2 2 0.5
SERVICES 2.4 SERVICES 2.4
5 SUBURBAN INTEGRATOR
5.1 Single carriageway Stage 1 33
Footpath 1.5 TREE Traffic and parking 5.5m TREE TREE TREE TREE
0.5 2 2 14 10
STAGE 3 8m Stage 2
SERVICES 2.4
5.2 Two Carriageways Stage 2 33
Additoinal carriageway
Footpath 1.5 TREE Traffic and parking 5.5m TREE TREE TREE Traffic and parking 5.5m TREE Footpath 1.5
0.5 2 2 14 2 2 0.5
STAGE 3 8m
SERVICES 2.4 SERVICES 2.4
5.3 Three Carriageways Stage 3 33
All 3 carriageways
Footpath 1.5 TREE Traffic and parking 5.5m TREE Traffic TREE Traffic and parking 5.5m TREE Footpath 1.5
0.5 2 2 3 8 3 2 2 0.5
SERVICES 2.4 SERVICES 2.4

5. CONCLUSIONS

It should be noted that the conclusions are based on an assumed location of development; this is known with some accuracy in the short term but becomes progressively less certain as the timeline expands. The location of the Residential Grid will normally only occur when development is underway. The order might change but the intent is the same, i.e. the network is connected and must be maintained.

5.1. Reference to Modelling.

The conclusions reached in this study are assisted by the modelling of journeys predicted to be made in the future from varying employment and population. A more thorough list of network performance is given in Chapter 6.

This Chapter concentrates on conclusions of the future physical form of Dubbo.

5.2. 2020 - 2030 - 10 Year Investment Program

5.2.1. Program

Table 5.2.1 list the projects that are required to accommodate traffic by 2030. This is displayed in three parts, Current Commitments mostly concerning North Bridge, a 0-to-5 year list, requiring immediate action, and 5 to 10 year projects some requiring major design.

Entries in Blue and Green are the list requiring approval for the purposes of calculating developer contributions, Black is either the RMS or Council funding, Orange is an estimate for the upgrade of existing streets. The style of road is described in 4.1, See Figure 5.2.1 for the location of these projects.

Selecting some projects for further analysis:

PJ 1A Riverside Boulevard is currently being designed without input from the Council. This must be designed to accommodate the prime commercial opportunity for the Boulevard. The total cost of the Commercial Integrator has been ascribed to the RMS. This negotiation might require that Council fund Service Lanes but they need access to the central carriageway.

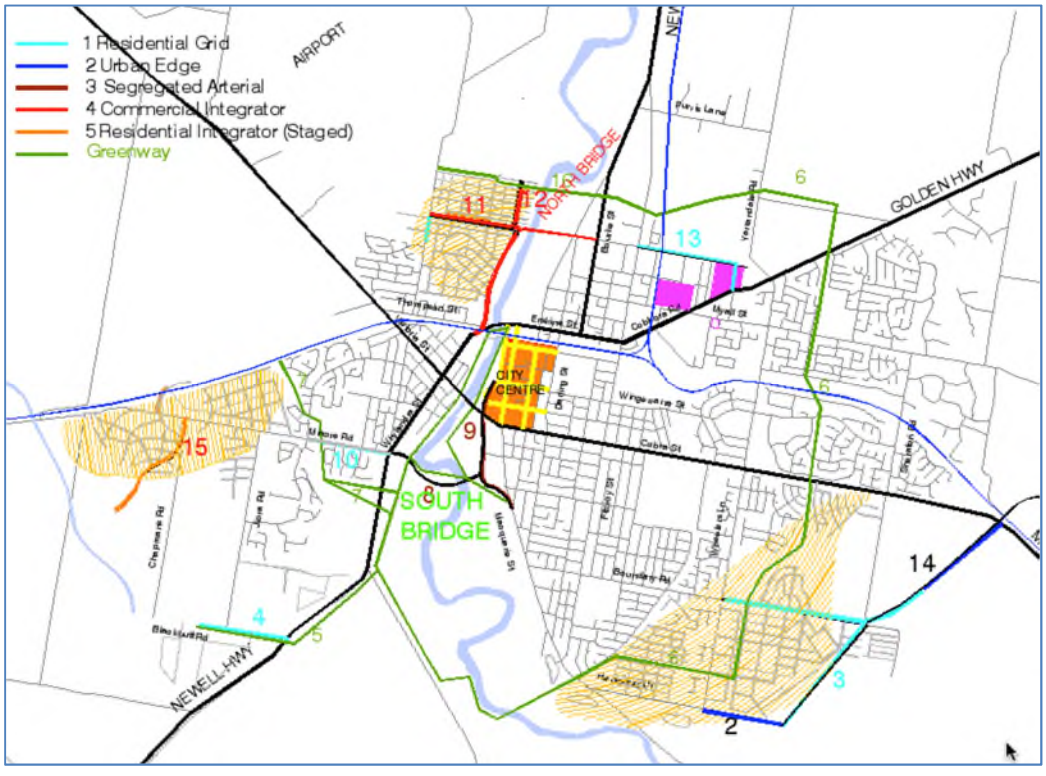
TABLE 5.2.1 0 - 10 YEAR (2020 - 2030) TRANSPORT INFRASTRUCTURE PROGRAM

CURRENT COMMITMENTS

Ref	Project	Purpose	Design	Style		Comment	
1C	North Bridge	Strategic Network	3	80k	Segregated Arterial	RMS funded	
1A	Riverside Boulevard Stage 1	Strategic Network	4	60k	Commercial Integrator	Passes thro prime River Front (RMS)	
1B	Whylandra/Victoria Int	Strategic Network	Upg		Intersection	RMS funded	
UP1	Extn Boundary Rd	Residential Grid	1	50k	Only Local Traffic	Under construction (Excl earth works)	

0 to 5 YEARS 2020 - 2025							100,000s
Ref	**Project**	**Purpose**	**Design**	**Style**		**Comment**	**Est Cost**
2	Hennessy Macquarie St Upgrade	Future Strategic Option	2	60k	Urban Edge	Minor Upgrade Macquarie St	$2,969
3	Sheraton Link	Residential Grid	1	50k	Only Local Traffic		$4,298
4	Blackbutt Rd Stage 1	Residential Grid	1	60k	No Access		$1,950
UP2	Existing Street Upgrades					Item Cost Potential - Bligh St Circulatn	$2,000
5	Greenway to Blackbutt					Start of Budden Creek Loop	$322
6	Greenway S E Loop					Required for SE Sector (over 10 years)	$2,689
7	Greenway Delroy Loop					Required for SW Sector	$663
5 - 10 YEARS 2025 - 2030							
8	South Bridge (low Level)	Strategic Network	3	80k	Segregated Arterial	No Footpaths use existing bridge	$17,930
9	Bligh St Link	Strategic Network	3	70k	Segregated Arterial	Footpaths within Playing Fields	$5,076
10	Minore Rd	Existing Street Upgrade	Upg	50k	Special case	Access to existing properties	$1,950
11	River Street West	Strategic Network	4	60k	Commercial Integrator	Passes through Commercial	$5,005
12	Riverside Boulevard Stage 2	Strategic Network	4	60k	Commercial Integrator	Passes through Commercial	$2,189
13	River St East	Residential Grid	1	50k/40k	Also Flood Management	Passes through Active Area (Campus)	$2,340
14	Blueridge Link Rd	Residential Grid	1	50k/40k	Part with access part not		$3,900
15	Chapmans Rd Diversion	Future Strategic Option	5.1	60k	Residential Integrator St 1	Option for 3 carriageways as Type 4	$1,271
UP3	Existing Street Upgrades					Essential Coborra St Rail Crossing	$2,000
16	Greenway North West St 1					River Crossing	$835

Figure 5.2.1 2030 - 10 Year Infrastructure



PJ2 Hennessey Drive - Macquarie St – are minor works for traffic management in Macquarie St and Urban Edge in Hennessey.

PJ3 Sheraton Rd extension to Hennessey Drive – a perfect example of cooperation to achieve the best connectivity involving the developer, with payment from Developer Contributions.

PJ4 Blackbutt Rd Stage 1 Illustrates how if the link is not built at the time of development it will become impossible in the future. Lost opportunities have included a Gangewood connection to the Newell Hwy that could have located the Southern Bypass to the north of the Zoo and relieved demand on Minore Rd. Together with Stage 2 this forms a part of the SW grid.

PJ 8 South Bridge has been held in the 2020 – 2030 construction program because of the deterioration of traffic amenity even with North Bridge completed, see 5.3.

PL9 Strengthening of Bligh St to distribute traffic to the main Town Centre car parks has been in plans for many years with a number of iterations. The conclusion to connect Bligh St to South Bridge and thence to Macquarie St South if fundamental to creating a stable traffic network that can accommodate traffic until at least 2055. (See Wingewarra crossing Table 5.6.1)

PL10 Upgrading Minore Rd for two through lanes per direction is also as a result of the lack of east-west connection from the SW Sector to the Newell Hwy. Baird Dr has taken much of the additional traffic over the last 15 years (Delory/Grangewood) and this has less capacity and is reaching its design capacity. The loss of amenity in Minore Rd has been slowly growing as traffic has increased, this is the result.

PL11 River St West and PL12 Riverside Boulevard Stage 2 emphasise the manner in which the NW Sector will develop quickly and connect with North Bridge. River St West is also an expensive Commercial Integrator but its role grows in the next few decades. This intersection is identified as the Next Step in the strategic planning process. (Section 5.8)

PL13 River St East also has long-term strategic impacts. (It fails in 2055!). At this time it is required to give access to the Health and Education Precinct. It is designed to have high pedestrian amenity and therefore low traffic capacity, particularly the link though the precinct to Cobbora Rd.

PL14 Blueridge is currently only served by Mitchell Hwy and access form Sheraton Rd (Schools) is inappropriate. The 2007 Strategy relied on the expensive Southern Distributor (See PJ 43 Table 5.6.1). The lack of growth of external traffic precluded tis option in the foreseeable future but there are local demands that will be relieved by this link, plus it will be beneficial to the development of this employment Hub. Requires immediate negotiation.

PL15 Chapmans Rd was previously identified as part of the "Western Bypass". Environmental constraints have required that the alignment in the south be relocated to the west. This needs to be established with development south of Minore Rd (assumed to occur in this period). This forms part of a strategic road linking the SW and the CW.

The estimate for upgrading existing Streets ($4m excluding River St East PJ 13) include works at the railway crossing in Cobbora St. Other works have not been identified and will tend to follow developments. It is noted that the upgrade of Bligh St as part of South Bridge (and already included in budgeting) will probably trigger the opportunity to make changes to circulation in the City Centre.

5.2.2. Greenways

As discussed (2.5.3) in 2007 Council adopted the construction of a Green Ring for active transport that circled the Town Centre (Figure 2.8). Active Transport Networks also can be by small electric powered micro vehicles and in effect are becoming more viable as a transport network. The 2007 Transport Strategy concentrated on the Green Ring passing through the SE Sector and Delroy. The Greenways are an extension to the Green Ring bringing Active Transport close to all new residents.

The cost of this network, be it a community cost or a transport mode, is included in this analysis.

Projects for the period 2020 to 2030 include:

PJ 5 Extension to Blackbutt Rd. This is the first of the projects that add to the Greenways as development occurs, in the same manner as the Residential Grid, in this case Blackbutt Rd PJ 4. This section of the Greenway extending from the front of the Zoo follows roads, something generally avoided but in this case the most efficient way to bring these and future residents to the west into the main network. This is the start of the Buddens Creek Loop.

PJ 6 The South Eastern Loop was intended (in 2007) to become an attraction for new residents in the SE and to bring the benefits of Active Transport through the existing areas of eastern Dubbo. PL6 includes the entire construction of the Green Ring through the SE Sector and up to Troy Creek.

PJ16 Takes the Green Ring over the Macquarie River near Devils Hole and into the development of the NW.

PL7 The Delroy Loop is also part of the original Green Ring linking development at the top of Minore Rd back to the River. This involves negotiation with the Dubbo Golf Course to use the northern edge of the course from the existing path to Yuille Court.

5.2.3. Costing for S94 and Upgrading Existing Networks

TABLE 5.2.2 0 - 10 YEAR TRANSPORT INFRASTRUCTURE COST			
2020 - 2030			
0 - 5 Years 2020 - 2025		100,000's	
	Road Infrastructure in new areas	$9,217	
	Dubbo Greenway Infrastructure	$2,330	
	Existing Network Upgrades	$2,000	
5 - 10 Years 2025 - 2030			
	Road Infrastructure in new areas	$11,094	
	Dubbo Greenway Infrastructure	$2,180	
	Existing Network Upgrades	$4,340	
	Internal Funding	$24,956	
Total 2020 - 2030	Road Infrastructure in new areas	$20,311	
	Dubbo Greenway Infrastructure	$4,509	
2500 Dwellings	Cost Per dwelling (For S94)		$9,928
	Existing Network Upgrades	$6,340	
	Internal Funding	$24,956	

The total cost of Roads (Blue text) and Greenways (Green text) in new areas in the period 2020 to 2030 is estimated at $24,840,400. This cost has been derived from the additional movement generated by 2500 new houses. The cost per dwelling in new areas is $9,928. (Table 5.2.2.) This is applicable to S94.

In addition it is expected that $6.34m will be required to upgrade existing roads; and $25.0m will be required for South Bridge and its approaches.

5.2.4. Flood Management.

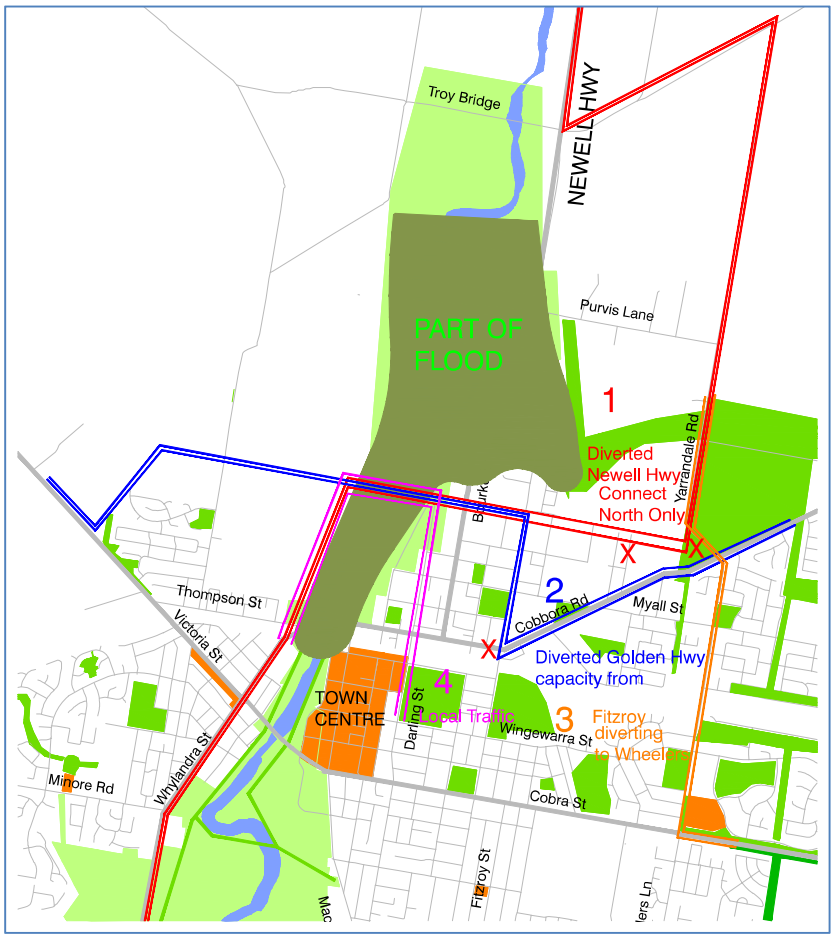
In respect of the proposed North Bridge, The northern parts of Bourke St, Darling St and Fitzroy St are flood affected in a 50 year event.

Three "groups" of traffic will use North Bridge during a flood event a 4th will relocate to Yarrandale Rd.

1 Highway Traffic from the North must use Yarrandale Rd and can be given some priority by having a right turn access into River St, available only during flood events. The Left turn from Yarrandale Rd would be prohibited to give advantage to Highway traffic. Similarly a left turn into Yarrandale Rd but not a right turn.

2 This would limit intrusion into the Campus, albeit heavy vehicles. Further limitation would be extended but prohibiting movement between River St and Caroline St thereby requiring that Cobbora Rd traffic comes down to Fitzroy St – which does not continue north. Hence, Cobbora Rd would access River St from Fitzroy St and with access via River St West could access the Mitchell Hwy.

Figure 5.2.2 Indicative Traffic Management during Flood.



3 In the meantime traffic normally using Fitzroy St to travel north could be advised to divert to Wheelers Lane crossing Cobbora Rd in what should be a congestion free intersection.

4 Town Traffic normally using Emile Serisior Bridge – inundated by flood water – would seek to avoid the congestion at LH Ford Bridge by continuing to North Bridge and then returning into North Dubbo via Bourke St or Darling St and possibly to avoid queuing on North Bridge not Brisbane St. The Cobbora Rd traffic would be encouraged to continue to Fitzroy St by limiting access into Erskine St thereby simplifying the right turn from Cobbora Rd. It may also be necessary to limit access from Fitzroy St south into Cobbora Rd.

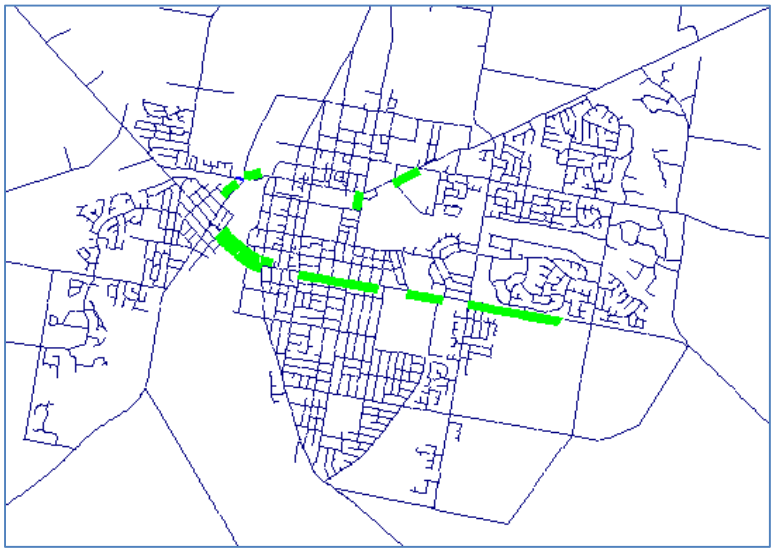
5.3. 2025 – The 5 Year Priority

5.3.1. South Bridge as a 5 Year Priority

The existing 2018 traffic conditions (Fig 3.1) indicate Cobra St, the LH Ford Bridge and Cobbora Rd being under stress.

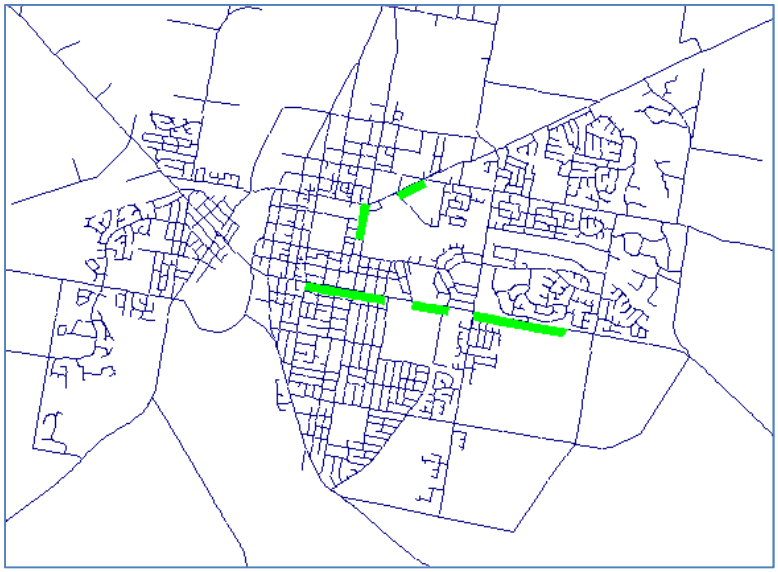
Without any action development between 2020 and 2025 (1250 Dwelling in New Areas) would deteriorate traffic conditions to stress both directions of traffic on the LH Ford Bridge, and Cobbora Rd would reach unacceptable delays. (Fig 3.1). An alternative is required.

Figure 5.3.1 Stressed Traffic Conditions - 2025 AM Peak North Bridge Only



The traffic conditions are not improved by the completion of North Bridge (Figure 5.3.1). A reduction in demand on Cobbora Rd (diversion to River St) bring some relief, but new stress at Thompson St even with a generously designed intersection, and similar conditions on Cobra St and for both directions of the LH Ford Bridge.

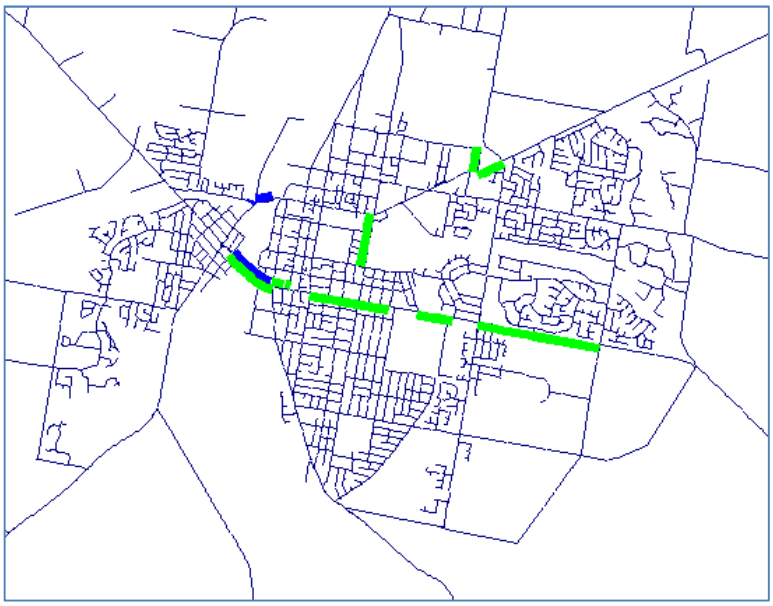
Figure 5.3.2 Stressed Traffic Conditions - 2025 AM Peak Both Bridges



With North Bridge and South Bridge completed in 2025 the Stressed Sections of Cobra St, Fitzroy St and Cobbora Rd settle down and are not experience any further stress in the long term. (Fig 5.4.2 and Fig 5.5.2)

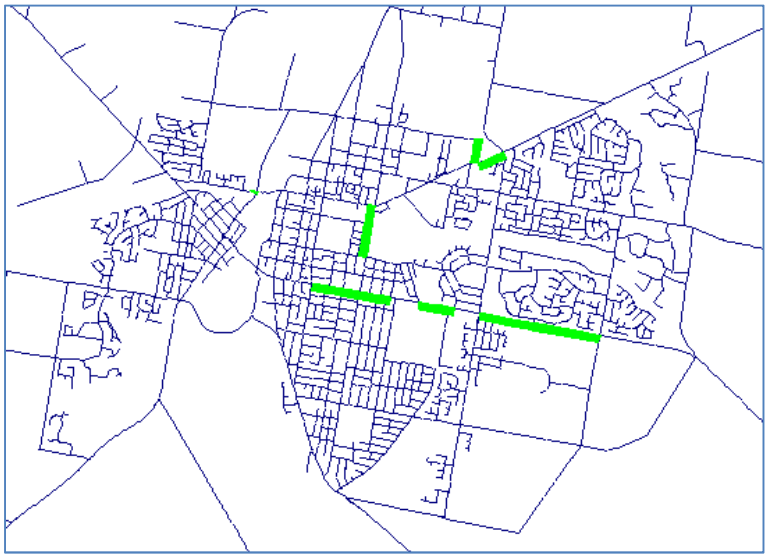
But it is the Costs and Savings achieved, 5.4 and 5.5; and how this expenditure provides for the future 5.6 that justify expenditure and explains the logic. Before the hard economic facts the 'perception" of traffic conditions is view through "Stressed Conditions" continues below.

Figure 5.3.3 Stressed Traffic Conditions - 2030 AM Base No Improvements



Just in case we needed any justification for building a new crossing urgently Figure 5.3.3 illustrates Stressed Streets in 2030. With the eastbound direction of LH Ford and Emile Serisior Bridge both requiring action to be taken.

Figure 5.3.4 Stressed Traffic Conditions - 2030 AM Peak Both Bridges



Whereas with both Bridges built the 2030 conditions show similar conditions to 2025 with pressure building in the Health and Education Precinct (Cobbora Rd)

This is addressed for 2040 (See 5.4.2 but returns as an issue in 2050 (See 5.4.2).

5.4. 2030 - 2040 20 Year Investment Program

New residential growth is expected to occur mostly in SW (1250) and SE (800) with small developments in the CW (250) and NW (200). Infrastructure for the SE is complete and 10 to 20 year program of works concentrate mostly on a Strategic Link in the Central West (PJ 22, PJ 23) and Residential Grid roads in new development. The Strategic Link successfully spreads the newly generated traffic away from LH Ford and across to North Bridge.

TABLE 5.4.1 10 - 20 YEAR (2030 - 2040) TRANSPORT INFRASTRUCTURE PROGRAM

	Ref	Project	Purpose		Speed	Design Style	Comment	100,000s Est Cost
10 - 15 YEARS 2030 - 2035								
	17	Grangewood Extn Stage 1	Residential Grid	1	50k	Only Local Traffic		$1,658
	UP4	Existing Street Upgrades					Item Cost Potential City Circulation	$2,000
	18	Greenway Chapman Park					Opening Forest	$550
15 - 20 YEARS 2035 - 2040								
	20	River St West Extn	Strategic Network	4	60k	Commercial Integrator	Could have access to School	$4,140
	21	Mitchell Hyway Upgrade	Strategic Network	Upg		Existing	Could be earlier	$3,000
	22	Central West Spine Rd Stage 1	Future Strategic Option	2	60k	Urban Edge		$6,132
	23	Extn to River St	Future Strategic Option	2	60k	Urban Edge	Draw to North Bridge	$2,414
	24	Central West Link Rd Stage 1	Residential Grid	1	50k	Only Local Traffic		$2,438
	25	Keswick Collectors	Residential Grid	1	50k	Only Local Traffic		$3,900
	UP5	Existing Street Upgrades					Item Cost ? Golden Hwy Yarrandale	$2,000
	26	Greenway CW Stage 1					Chapmans Creek Loop Complete	$844
	27	Greenway Rail Crossing					Delroy Loop Complete	$280

Table 5.4.1 list the projects that are required to accommodate traffic by 2040. This is displayed in two parts, a 10-to-15 year list, requiring budgeting in the next few years, and 15 to 20 year projects where no action if required – unless of course if development occurs ahead of the schedule used in this analysis, this particularly refers to the Residential Grid.

Entries in Blue and Green are the list are potential for a future S94 plan, Orange is an estimate for the upgrade of existing streets. The Style of Street is described in 4.1, See Figure 5.4.1 for the location of these projects.

Selecting some projects for more comment:

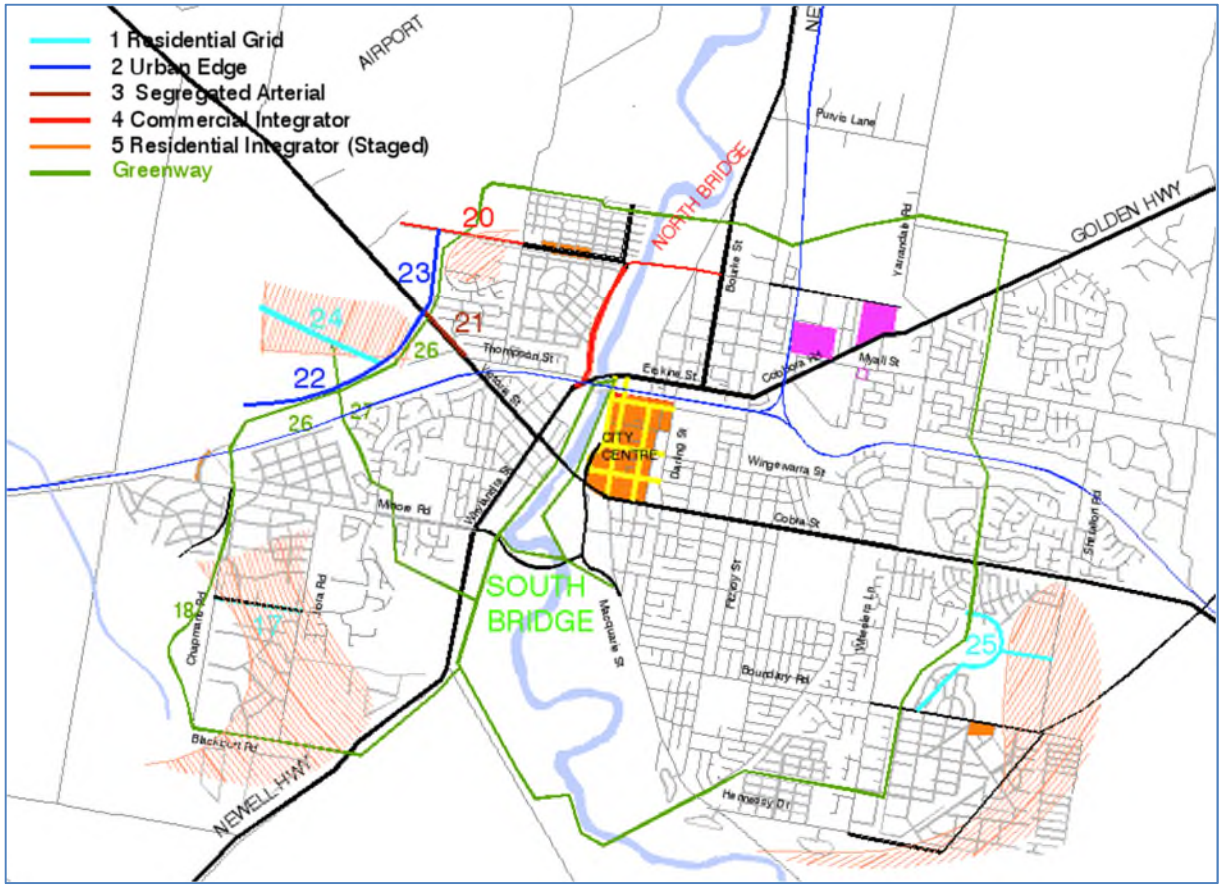
PJ 17 The extension of Grangewood Rd is part of the Residential Grid and not expected to increase traffic on the existing road. This route is expected to serve a future school but not in this stage of construction.

PJ 18 Also in the same area this extension of the Greenway needs to be planned and will open up the remnant forest be to set aside near Chapmans Rd.

PJ 19 A link of Chapmans Rd over the Rail line to the CW Sector (and PJ 22) has been delayed until after 2040, mostly as a cost saving but also because it did not carry sufficient traffic to impact on West Dubbo. Nevertheless it would advantageous to "set" the travel pattern between the SW and River St.

PJ 20 The extension of River St is required to access the Central West Spine Road PJ 22 and PJ23. It is likely to serve a future school.

Figure 5.4.1 2040 10 - 20 Year Infrastructure



PJ 21 Upgrading of the Mitchell Hwy has been allocated to New Residential Development (Item cost $3m). This could perhaps be allocated to non-residential development with the cost saving going towards PJ 19 ($4.8m). As can be seen from this discussion there will be alternative to discuss in 5 years.

PJ 22 The Central West Spine Road is a Strategic Road. This section through the CW from the Mitchell Hwy to Rosedale Rd has been "located" so that it is paralleled with the Greenway PJ 26. Master Planning could indicate other more environmentally sensitive options. Also the alignment may not actually be contained within the development assumed to be occurring in this area. Hence PJ 24 is possibly longer than will be required at the time.

PJ 23 A separate project extending the Central West Spine Road to River St. This could be the subject of a detailed land use plan including the intersection at the Mitchell Hwy and the potential "Lookout" at the Drive-In cinema.

PJ 24 Is Stage 1 of the Central West Link Rd and illustrates how the Residential Grid themselves form a connective network in the same way as the existing Residential Grid in Dubbo.

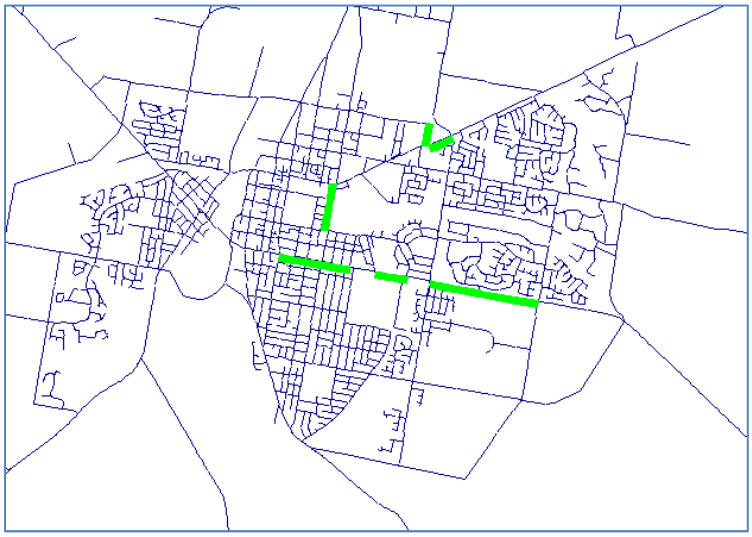
PJ 25 The Keswick Collectors have been 'on the plan' for about 20 years and are strategically orientated to disperse traffic from Keswick without putting pressure on any one of the access roads.

PJ 26 Is the afore mentioned Green Ring almost completed (PJ 32)

PJ 27 Is the last Greenway connection for the Delroy Loop.

The upgrading of Existing Streets are again not specifically identified, it could be anticipated that circulation is again subject to change as the benefits of Bligh St are recognised throughout the town. And the growing employment in the Heath and Education Precinct plus some levels of stress could trigger a circulation plan for this area.

Figure 5.4.2 Stressed Traffic Conditions 2040 AM Peak



The measures taken to move traffic north south across the new western areas has taken pressure off the three river crossings.

Meanwhile the slow growth in demand from the SE and E maintains the levels of stress in Cobra St and Fitzroy St but does not overload these links indicating that previous infrastructure has set up a long term solution. Stress around the Base Hospital continues.

TABLE 5.4.2 10 - 20 YEAR TRANSPORT INFRASTRUCTURE COST 2030 - 2040

		100,000's	
	Road Infrastructure in new areas	$23,681	
	Dubbo Greenway Infrastructure	$1,674	
2500 Dwellings	Cost Per Dwelling		$10,142
	Existing Network Upgrades	$4,000	

The estimated cost for all works attributed to dwellings in new areas for this decade is $25,355,000, or $10,142 per dwelling.

Costs for upgrading existing streets, possibly in the City and Heath and Education Precinct are not known but nominated as $4m. Interestingly the existing intersections throughout town are not reporting an additional delays; this may not be the case for individual developments.

5.5. 2040 – 2055 35 Year Investment Horizon

The pattern for new development between 2040 and 2055 (20 to 35 years) is entirely to the West and it is assumed that development will keep as close as possible to the City Centre. Hence; the NW is built out with 1550 new dwellings; the first major expansion occurs in the CW (900 Dwls); and a slow continuation in the SW (600 Dwls).

New links are orientated to continue the dispersal of traffic after 2055 years and start to concentrate demand on new employment/activity hubs possibly a linear extension of River St. This of course will be reviewed in, say, 2025 when 2055 on will be the new 20-year plan.

The program includes:

PJ 19 The Chapmans rail crossing, reallocated from the 2030 2040 projects.

PJ 37 The second western rail crossing between the SW and CW Sectors.

PJ 28 and PJ 35 Further extensions of Grangewood Rd and Blackbutt Rd

PJ 29 Continuation of the Central West Link Rd.

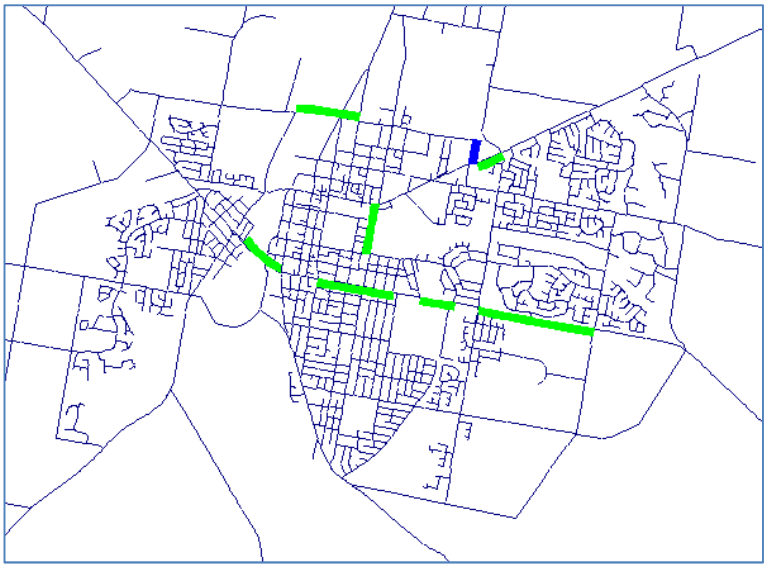
PJ 30 and PJ 31 in the NW Sector

PJ 36 and PJ 38 creating a continuous connection between Blackbutt St and the Central West Link Road.

TABLE 5.5.1 20 - 35 YEAR (2040 - 2055) INDICATIVE TRANSPORT INFRASTRUCTURE PROGRAM

20 - 25 YEARS 2040 - 2045							100,000s
Ref	Project	Purpose		Speed	Design Style	Comment	Est Cost
19	Chapmans Rail Crossing Stage 1	Future Strategic Option	5.1	60k	Residential Integrator St 2	One rail bridge	$4,764
28	SW Extn of Grangewood Rd	Residential Grid	1	50k	Only Local Traffic		$1,950
29	Central West Link Rd Stage 2	Future Strategic Option	5.1	60k	Residential Integrator St 1	Option for 3 carriageways as Type 4	$2,243
30	Northern City Access	Residential Grid	1	50k	Only Local Traffic		$3,900
31	Riverside Boulevard Stage 3	Future Strategic Option	2	60k	Urban Edge		$5,106
UP5	Internal Street Upgrades					Item Cost Not Identified	$2,000
32	Greenway NW					Green Ring Complete	$238
33	Greenway NW Loop						$550
34	Greenway NW-Rail Loop						$544
25 - 35 YEARS 2045 - 2055							
35	SW Extn of Blackbutt	Residential Grid	1	50k	Only Local Traffic	Draw away from Minore	$975
36	Southern Link Rd Stage 1	Future Strategic Option	5.1	60k	Residential Integrator St 1	Option for 3 carriageways as Type 4	$1,944
37	Southern Link Rd Stage 2	Future Strategic Option	5.1	60k	Residential Integrator St 1	Increases significance after 2050	$2,990
38	Northern Link Rd Stage 1	Future Strategic Option	5.1	60k	Residential Integrator St 1	Increases significance after 2050	$4,186
UP5	Internal Street Upgrades					Item Cost Not Identified	$4,000
39	Buddens Creek					Buddens Creek Loop Complete	$669

Figure 5.5.2 Stressed Traffic Conditions 2055 AM Peak



The modelling reports Stress in the usual places on Cobra St, and a critical situation in Caroline St (Heath and Education Precinct).

Stress also returns to LH ford and occurs for the first time on North Bridge.

These two signs indicate a 5th Crossing will be required on or around 2055; 30 years after South Bridge and Bryon Bay have been built.

Figure 5.5.1 2055 - 35 Year Infrastructure

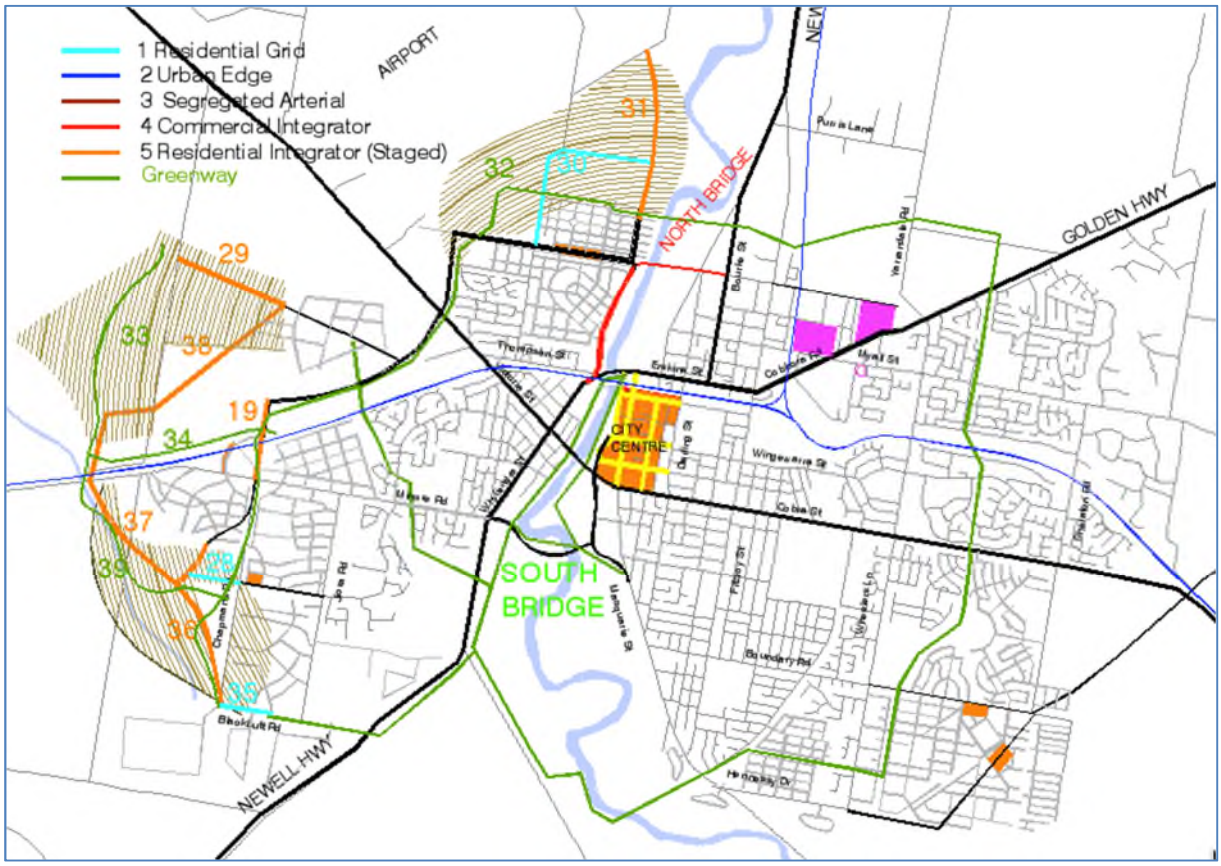


TABLE 5.5.2 20 - 35 YEAR TRANSPORT INFRASTRUCTURE COST 2040 - 2055			
		100,000's	
	Road Infrastructure in new areas	$28,056	
	Dubbo Greenway Infrastructure	$2,001	
3050 Dwellings	Cost Per Dwelling		$9,855
	Existing Network Upgrades	Not Known	

These figures include Greenway costs.

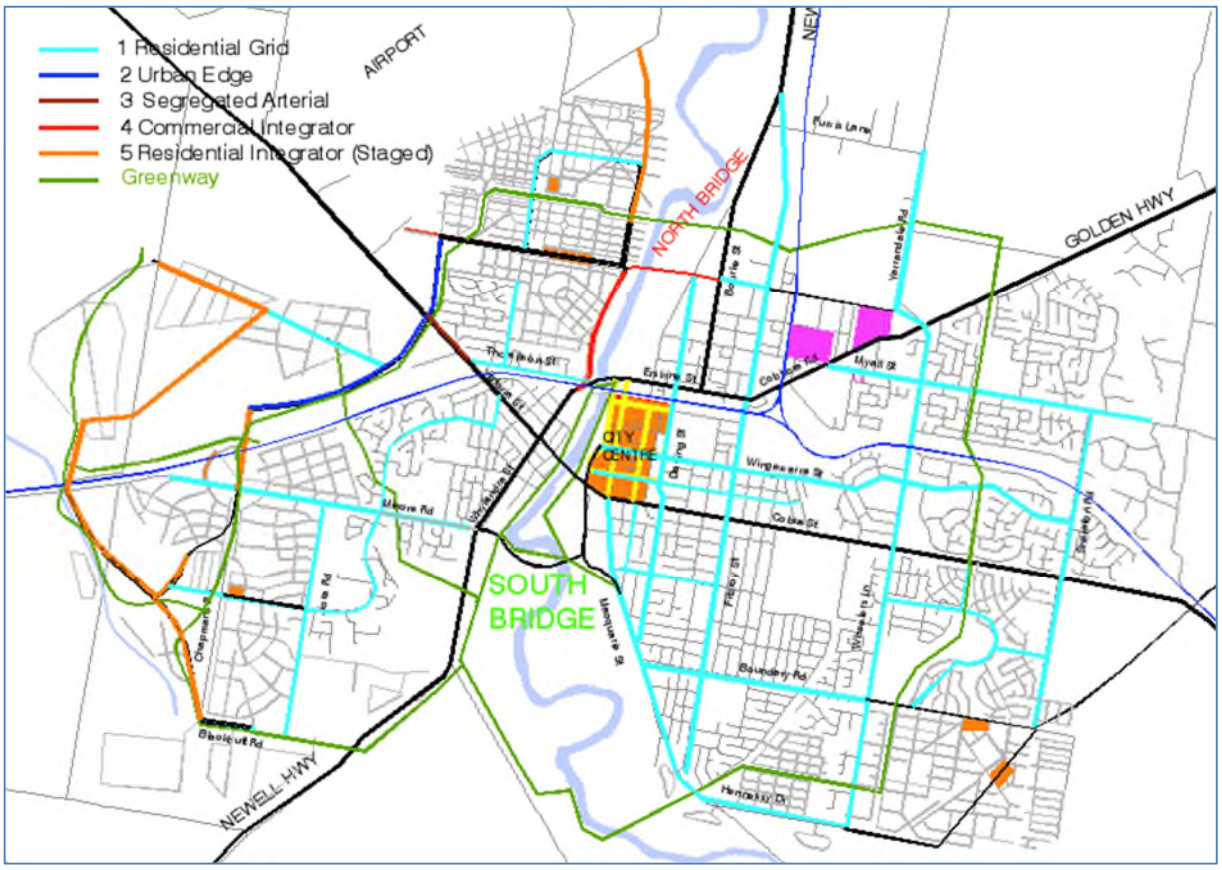
The estimated cost per new dwelling in the 20 to 35 year period (Table 5.5.2), indicates a level of investment per dwelling, $9,855, almost exactly the same as the 2020 – 2030 estimate.

We can confidently conclude that the modelling has confirmed the rate of new infrastructure required by time period over the next 35 years, subject to changes in the scale of development or possibly the location of development. For example; additional development in the SE might force consideration of a new, highly costly Southern Bypass that has not been considered for this or the previous Strategic Transport Plan.

This development scenario concludes with a Road Hierarchy (Fig 5.5.2) that look similar to the existing road hierarchy, consisting of extensive new Residential Grid Road and an expanding Strategic Network.

This scenario is extended to long-term development (5.7).

Figure 5.5.3 The 2055 Road Hierarchy



The second reality check is to summaries the Infrastructure Costs per time period (Table 5.5.3). They are balanced.

TABLE 5.5.3 INFRASTRUCTURE COSTS BY TIME PERIOD

	Total Cost of Infrastructure	RMS Funded	Existing Rd Upgrades	Council Funding	Construction in new Areas		Houses built	Cost per New Dwelling
					Greenways	Roads		
2020 - 2030	$124,807,280	$68,690,880	$6,340,000	$24,956,000	$4,509,000	$20,311,400	2500	$9,928
2030 - 2040	$29,355,000	0	$4,000,000	0	$1,674,400	$23,680,600	2500	$10,142
2040 - 2055	$36,056,600	0	$6,000,000	0	$2,000,500	$28,056,100	3050	$9,855
CW and SW	$102,301,500	Potential	$16,395,500	$0	$5,754,000	$80,152,000	8050	$10,672

(The CW and SW Figures are derived later in 5.6)

5.6. Goals Achieved

The report started by setting out the aims of the transport network.

In response these proposals:

Allow for the population to increase by 17000 new residents whilst:

- Maintaining the 10 minute City.
- Resolving current issues on the LH Ford.
- Continuing to provide the high level of amenity for access throughout Dubbo.
- Providing the flexibility for movement without concentrating traffic.
- Providing new residents with the same level of amenity as the existing areas.
- Avoiding increasing the capacity of Cobra St to maintain it as a mixed commercial residential street.
- Keeping the cost of new infrastructure to within $10,000 per new dwelling.

5.7. Towards 100,000

The final question is how the 2055 proposals will fit into the continuing extension of the residential areas. Figure 2.4 shows how development in the next 35 years will fill the SE and NW Sectors to capacity and there will be capacity for a further 8000 dwellings at the current density of development in the SW and CW . Estimates get a bit open ended in this time frame certainly not suitable for conclusive modelling. The more important planning question is; will the form of infrastructure accommodate additional population after 2055?

This following exercise looks at urban form and, as a reality check, costs the infrastructure and the indicative the cost per new dwelling in the same manner as the analysis to 2055.

Continuity defines how roads are used. In a perfect grid everyone tries to go by the shortest route but tend also to avoid make turns – particularly right turns. A grid network tends to concentrate demand at the centre of the network. The concept for Dubbo is to create two series of roads that offer direct no-turn paths over long distances. One is the traditional grid system serving the Town Centre and a second series of roads are orientated to draw demand away from the Town centre. Figure 5.7.1 illustrates these.

The traditional grid for the City Centre includes

1 The southern edge of the Mitchell Hwy.
2 The northern edge from Thompson St to Cobbora Road.
3 The eastern edge of Fitzroy St to the Mitchell Hwy.
4 The western edge of Whylandra St.

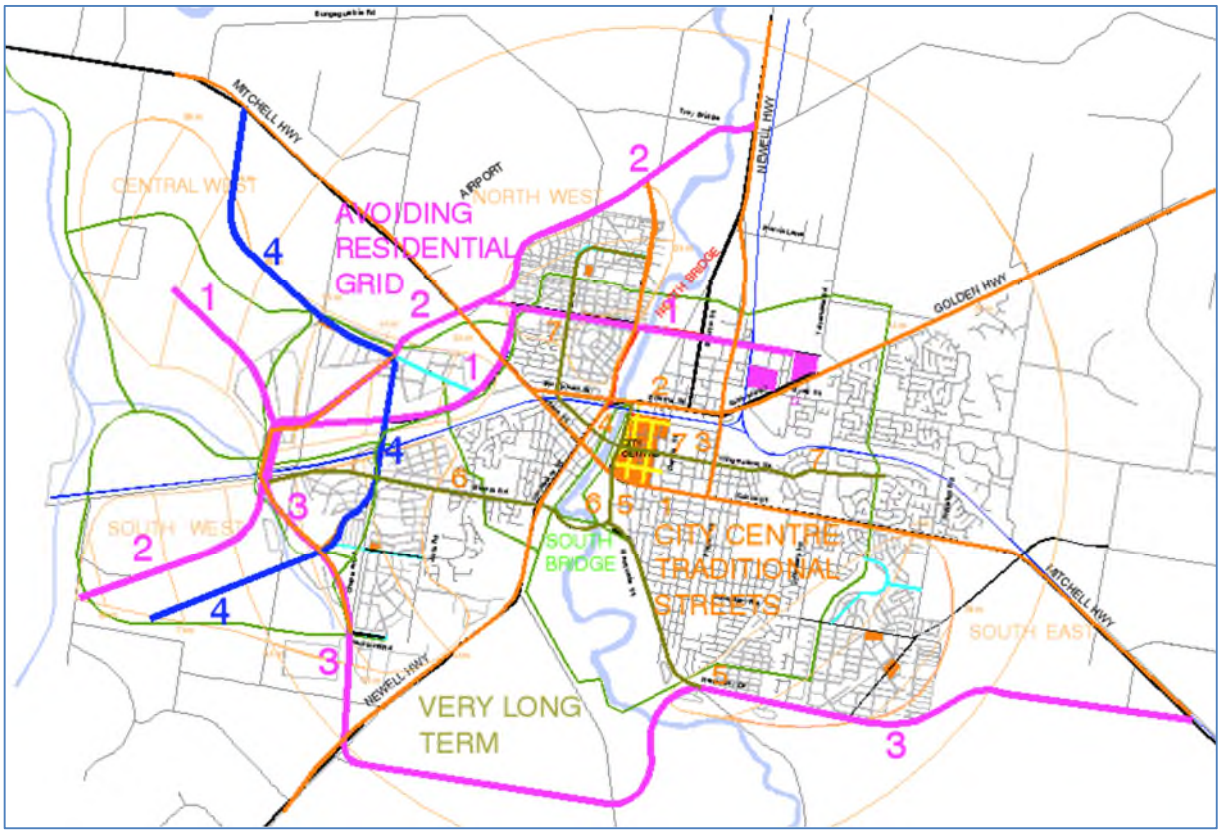
Using any of these streets leads to the opportunity to make one turn into the circulation road in the City Centre.

Three additional roads have been added to increase the capacity of access to the City Centre

1 Bligh Street with direct no-turn access from the SE.
2 South Bridge with direct no-turn access from Minore Rd and the SW.
3 And or around 2055 a bridge at Wingewarra Rd providing a secondary direct link from Wingewarra Rd east possibly through West Dubbo and via Bumblegumbie Rd to the NW.

Conclusion – The City Access network provides a substantial increased capacity, well beyond that needed for the growth of the City. This relieves some capacity on the existing roads for other additional trips.

Figure 5.7.1 Long term Strategy



The second series of long roads all originate in the western development areas. Four long streets, preferably designed with different identities, aim to draw traffic away from the Residential Grid.

These new continuous roads are:

1 The River St axis with a change of orientation to the SW and without a turn.

2 The Northern Link Road, orientated to the north and continues north possibly onto the Northern Bypass.

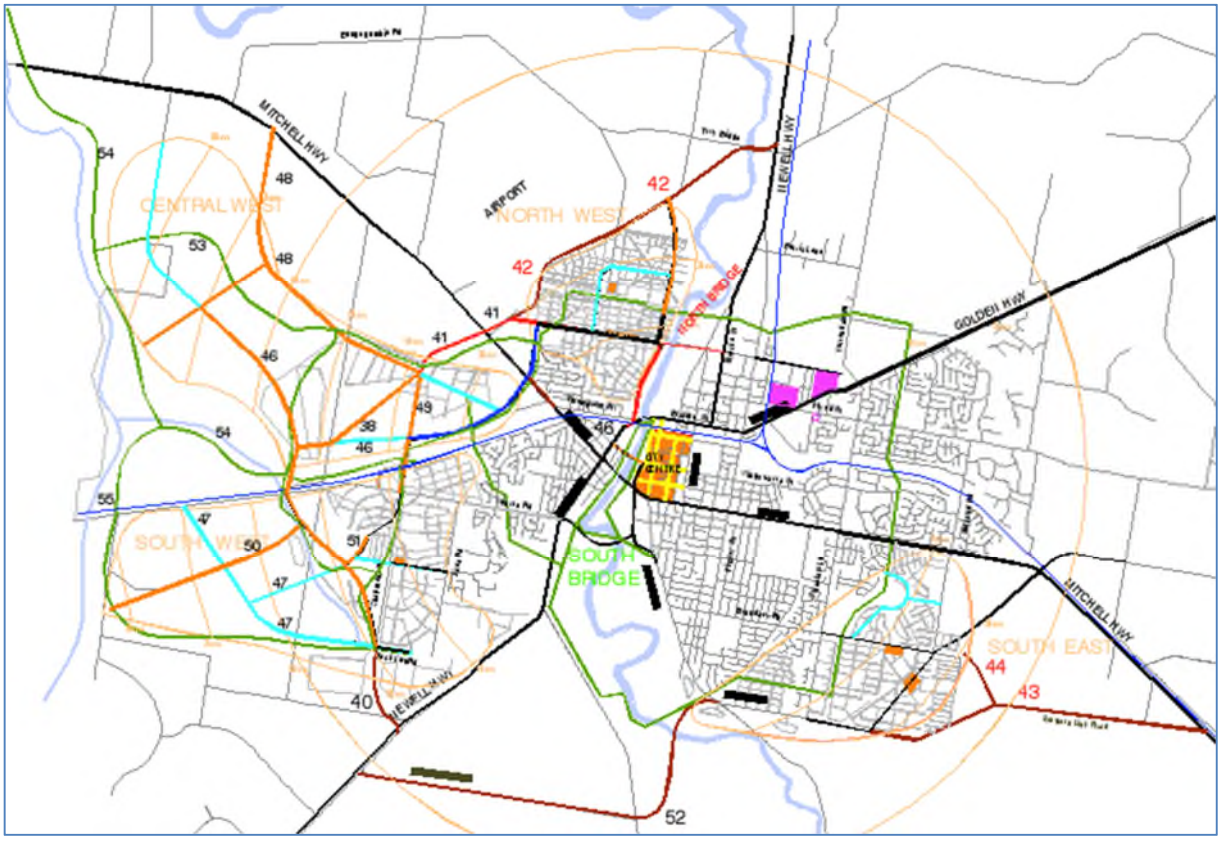
3 The Southern Link Road orientates to the south at the Newell Hwy and possibly onto the Southern Bypass.

These three roads have been focused on the western rail crossing between the CW and SW Sectors. This could vary but it indicates how a powerful position could be created for a future Activity Centre.

4 The Chapmans Loop a continuous street between the CW and the SW providing legibility and accessing 1, 2 and 3 along the way.

This is only an exercise but in the final part of this analysis this concept was costed using the same road styles as earlier work (Fig 5.7.2)

Figure 5.7.2 Indicative Long Term Projects



The 2055 demand indicate that the "Bypasses", PJ 42, PJ 43 and PJ 52 may only have a marginal benefit and are not viable. Whereas some of the 3rd carriageway of already constructed Integrators in the SW and CW [PJ 56], might be required.

TABLE 5.7.1 TRANSPORT INFRASTRUCTURE FOR COMPLETION OF CENTRAL WEST AND SOUTH WEST

Towards 77000 suburban (100,000 with densification)

Ref	Project	Purpose	Design	Style		Comment	100,000s Est Cost
37 38	Expansion of Link Roads	Future Strategic Option	5.2	60k	Residential Integrator St 2	Option for central carriageway	$7,176
40	Southern Link Rd Stage 3	Strategic Network	3	80k	Segregated Arterial	Connecting to Southern Bypass	$4,324
41	Northern Link Rd Stage 2	Future Strategic Option	5.2	60k	Residential Integrator St 2	2nd Connection to River St	$2,392
42	Northern Link Rd Stage 3	Strategic Network	HOLD	100k	Segregated Arterial	Option for Newell Hwy	$30,217
43	Southern Link Rd Stage 4	Strategic Network	HOLD	100k	Segregated Arterial	Option for Mitchell Hwy	$9,750
44	Boundary St Extension	Residential Grid	HOLD	50k	Segregated Arterial	Alternative to Blue Ridge	$1,658
45	Wingewarra Crossing	Strategic Network		40k	Slow Street in City	Could reduce traffic on Cobra St	$16,396
46	Central West Spine Rd Stage 2	Future Strategic Option	5.2	60k	Residential Integrator St 2	Option for central carriageway	$11,063
47	SW Residential Grid	Residential Grid	1	50k	Only Local Traffic		$7,020
48	Central West Link Rd Stage 3	Future Strategic Option	5.2	60k	Residential Integrator St 2	Option for central carriageway	$10,764
49	Chapmans Rd North	Residential Grid	1	50k	Only Local Traffic	2nd rail Bridge	$4,020
50	Northern Link Rd Stage 4	Residential Grid	1	50k	Only Local Traffic		$8,580
51	Chapmans Rd South	Future Strategic Option	5.1	60k	Residential Integrator St 2	Option for central carriageway	$748
52	Southern Bypass	Strategic Network	HOLD	100k	Segregated Arterial	Alternative to Mitchell Hwy	$51,605
56	SW and CW Integrators	Strategic Network	5.3	80k	Add 3rd carriageway	Selection in SW and CW Sectors	$24,066
53	Greenway CW Spine					Cross Rivers Connection Complete	$1,910
54	Greenway Whylandra Ck St 1					CW Sector Loop Complete	$2,344
55	Greenway Whylandra Ck St 2					SW Sector Loop Complete	$1,500

Whilst the analysis is of no consequence for the conclusions reached for 2055 it is reassuring to note that the cost per new dwelling remains around $10,000 indicating a viable extension of the investment until 2055 (Figure 5.7.2). And a project such as the Wingewarra Crossing would cost a further $2000 per dwelling. Of course this will be attributed to upgrading the existing areas and not new development (Figure 5.7.3)

Conclusion - South Bridge provides stable network that can grow without further intervention until 2055.

TABLE 5.7.2	INDICATIVE FUTURE INFRASTRUCTURE COSTS 2055 Plus		
		100,000's	
	Road Infrastructure in new areas	$80,152	
	Dubbo Greenway Infrastructure	$5,754	
8050 Dwellings	Cost Per Dwelling		$10,672
	Strategic Network (See HOLD)	$43,535	$5,408

TABLE 5.6.3 FLEXIBILITY FOR ADDITIONAL PROJECTS 2055 Plus			
		100,000's	
8050	Dwelling Completed		
A			
Include Wingewarra Crossing 2040 - Ultimate (More likely to be internal)			
	Wingewarra	$16,396	
	Additional Cost per Dwelling		$2,037
	Current Plan		$10,672
	Total		$12,708
	Additional		19%

5.8. Next Steps.

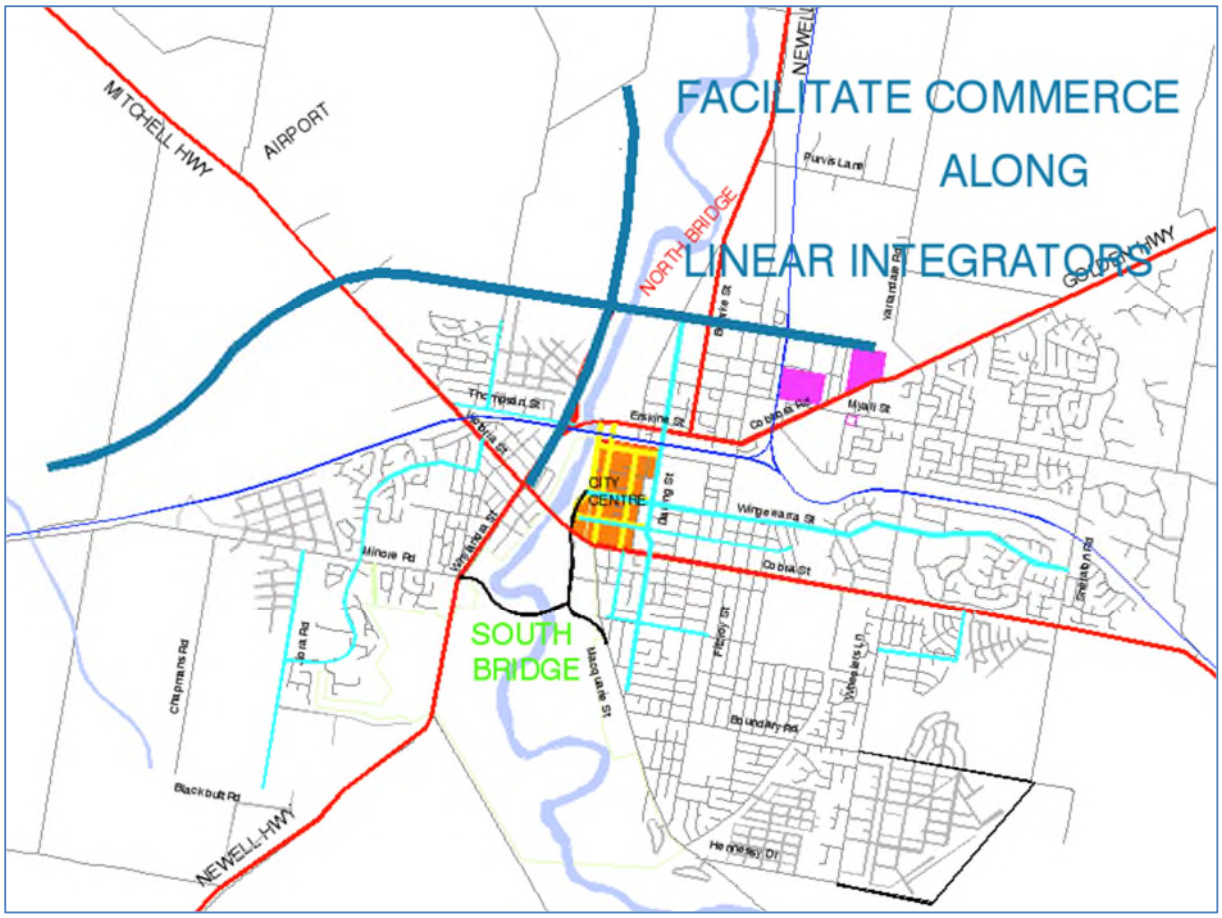
The short term conclusion from the long term form for Dubbo is that the decision to build North Bridge has strengthened three Enterprise Zones. The Heath and Education Precinct, the Airport Precinct and the Riverside Precinct. These need to be enhanced by legible, purpose built, uniquely identifiable, road connections.

The River St Commercial Axis will inevitably extend across the Mitchell Hwy,

The next step is to identify how this axis will work in the short term whilst North Bridge is being constructed; in the medium term as the NW Sector develops and the Axis becomes a Commercial Integrator; and in the long term as it extends it will become a recognisable commercial focus.

Conclusion – This alignment needs to be protected now. As does the Riverside Boulevard?

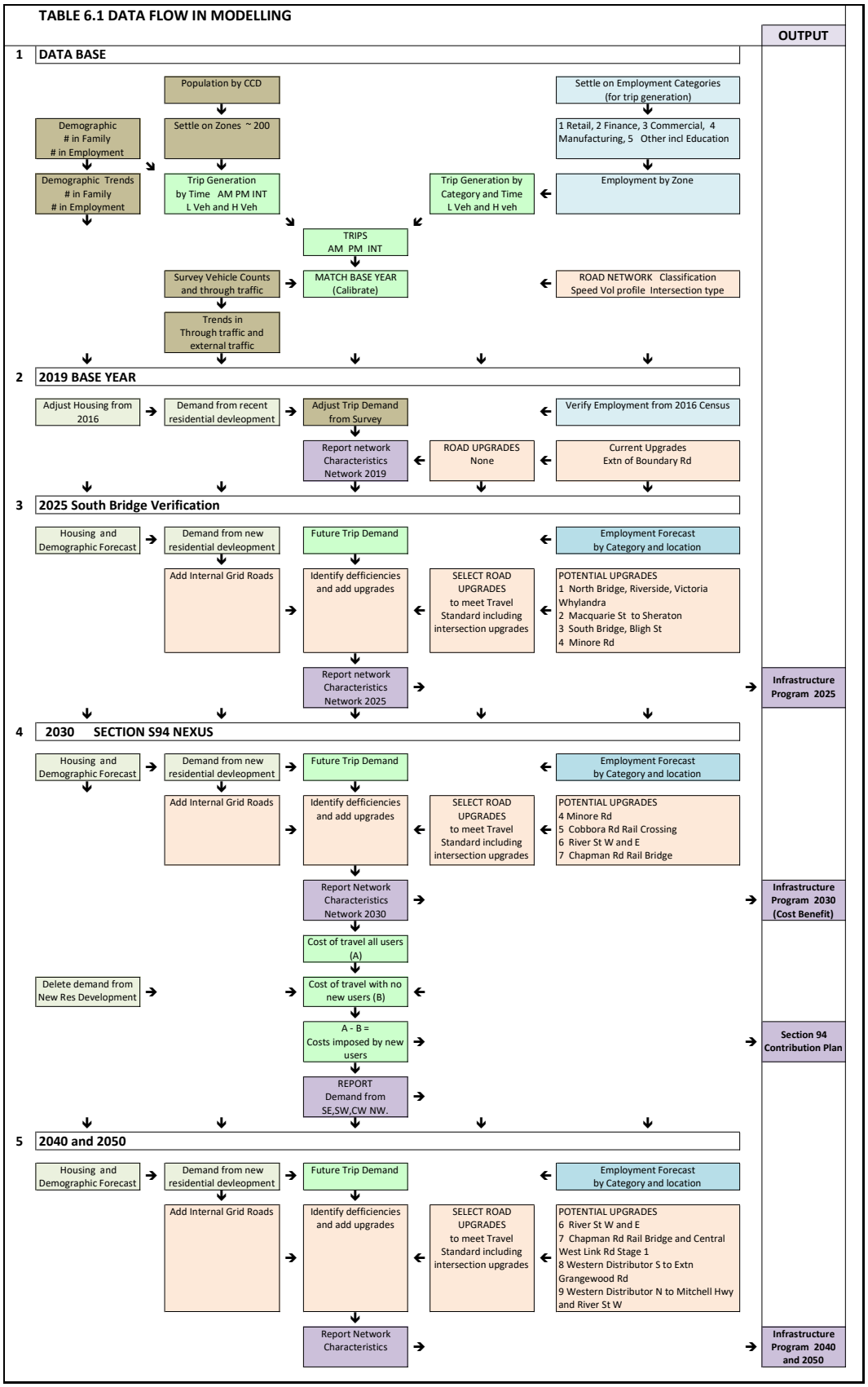
Figure 5.8 Key links to protect



6. DATA ANALYSIS

6.1. Modelling Process

TABLE 6.1 DATA FLOW IN MODELLING



6.2. Transport Task

In the following tables Reference Letters have been attached to each Networks; for example, D/C means results from D divided by results from C. The recommended Network for each time period is in red text.

Selected results are listed in Tables 6.2, 6.3, 6.4 and 6.5. how the transport task will change is described below and summarised in Table 6.2.

TABLE 6.2 TRANSPORT TASK

NETWORK	Ref	VEHICLE TRIPS DAILY Trips	TRIPS per PERSON	AM Peak Trips	TOTAL DISTANCE ALL TRIPS DAILY Veh Kms	AM PEAK Veh Kms	DISTANCE per TRIP km	TOTAL TIME ALL TRIPS DAILY Veh Mins	AM PEAK Veh Mins
2018 Base	A	177,999	4.79	18,657	810,330	89,337	4.91	1,086,495	119,444
2025 Do Minimum	B	194,014	4.77	20,961	950,960	106,646	4.90	1,292,071	146,467
		109%	99.6%	112%	117%	119%	100%	119%	123%
2025 Base - No Bridges ,	C	194,014 .		20,961	949,688	106,383	4.89	1,289,163	145,817
					117%	119%	100%	119%	122%
2025 North Bridge only	**D**	**194,014**		**20,961**	**946,272**	**106,137**	**4.88**	**1,286,166**	**144,904**
					117%	**119%**	**99%**	**118%**	**121%**
2025 Both Bridges ,	E	194,014 .		20,961	945,713	106,023	4.87	1,268,503	142,513
					117%	119%	99%	117%	119%
2030 Base - No Bridges	F	205,758	4.74	22,452	1,015,400	114,477	4.93	1,382,881	157,134
		116%	99.0%	120%	125%	128%	101%	127%	132%
2030 North Bridge only	G	205,758		22,452	1,012,111	113,900	4.92	1,377,087	155,908
					125%	127%		127%	131%
2030 Both Bridges	**H**	**205,758**		**22,452**	**1,014,462**	**115,684**	**4.93**	**1,362,291**	**155,974**
					125%	**129%**	**100%**	**125%**	**131%**
2040 Both Bridges	**I**	**221,363**	**4.55**	**24,569**	**1,128,163**	**128,595**	**5.10**	**1,521,805**	**174,824**
		124%	**94.9%**	**132%**	**139%**	**144%**	**104%**	**140%**	**146%**
2055 Both Bridges	**J**	**244,075**	**4.43**	**27,246**	**1,260,177**	**145,172**	**5.16**	**1,716,290**	**200,731**
		137%	**92.6%**	**146%**	**156%**	**162%**	**105%**	**158%**	**168%**

6.2.1. Daily and Peak Hour Trips

Currently on average each person in Dubbo makes 4.79 trips per day; a total of 165,000 trips by residents per day in Dubbo. A further 12,900 trips are made in and through Dubbo by external traffic (Table 6.7) (Note the figures used in the Text are rounded for ease of reading, the actual results from the model are contained in the tables.) Of these 18,600 trips are made in the peak hour.

The number of trips made per person is reducing due to demographics and therefore the number of trips to be handled by the transport network does not rise in direct proportion to population. Daily trips are expected to rise by 37% to 244,000 trips per day in 2055. The varying proportions in the type of employment are altering the proportion of trip made in the morning peak hour. Demand in the peak period is expected to rise by 46% to 27,200 trips per hour.

6.2.2. Distance travelled on Network,

The gradual increasing size of Dubbo is increasing the distance travel per trip; it is currently 4.91 km per trip and is expected to rise to 5.16 km per trip by 2055. Hence the total vehicle kilometres will rise by 56% in the period to 2055 and by 62% in the peak period.

This is the basic input to the model.

6.2.3. Time Spent on Network,

Output from the model finds that the number of minutes travelled per day will increase from 1.1million minutes to 1.7m minutes, a 58% increase in time. The rise is consistent through the years. Morning Peak hour travel will increase by 68%. This is due to more trips to accommodate and not as a result of congestion.

6.3. Network Performance

A selection of Performance Indicators are described below and listed in Table 6.3.

6.3.1. Minutes per Trip

Dubbo is described as the 10-minute City and the current average trip time is 6.58 minutes. Thinking of a distribution of trips the majority of journeys are indeed less than 10 minutes.

This is an ideal performance indicator for the future networks.

The output from the Model shows the average time hardly varying through to 2030 as demand increases by 25%. The average time increases (by a mere) 18 seconds (4%) by 2040; mostly as a result of the greater area of development. The same applies to 2055 when most development is occurring 5 to 6 km west of the City Centre and the average time increases 7% to 7.03 minutes.

Conclusions – the Land Use and Transport Strategy is successful.

NETWORK	Ref	TABLE 6.3 NETWORK PERFORMANCE MINUTES per TRIP Min	Difference from 2018 Sec	COBRA St Time Min	Difference from 2018 Sec	AVERAGE SPEED AM Peak kmph	Day Period kmph	PM Peak kmph
2018 Base	A	6.58		6.93		44.9	44.7	44.7
2025 Do Minimum	B	6.66 101%	4.7	7.08 102%	9	43.7 97%	44.3 99%	44.1 99%
2025 Base - No Bridges ,	C	6.64	3.8	7.00 101%	4.2	43.8	44.3	44.1
2025 North Bridge only	**D**	**6.63**	**2.9**	**7.01 101%**	**4.8**	**43.9**	**44.3**	**43.8**
2025 Both Bridges ,	E	6.54 99%	-2.6	6.98 101%	3	44.6 99%	44.8 100%	44.7 100%
2030 Base - No Bridges	F	6.72	8.4	7.06 102%	7.8	43.7	44.2	44.0
2030 North Bridge only	G	6.69	6.7	7.03 101%	6	43.8	44.2	44.0
2030 Both Bridges	**H**	**6.62 101%**	**2.4**	**7.03 101%**	**6**	**44.5 99%**	**44.7 100%**	**44.7 100%**
2040 Both Bridges	**I**	**6.87 104%**	**17.6**	**7.05 102%**	**7.2**	**44.1 98%**	**44.6 100%**	**44.3 99%**
2055 Both Bridges	**J**	**7.03 107%**	**27.0**	**7.13 103%**	**12**	**43.4 97%**	**44.3 99%**	**43.9 98%**

6.3.2. Time on Cobra St

Of more local concern to some would be the "Green Bars" seen consistently along Cobra St. A specific measurement was taken from a point near Wheelers Ln along Cobra St to a point near Macquarie St. (This includes some time getting to and from Cobra St). The current time during the morning peak is 6.93 minutes. Without further action but with the increased population the time would increase by 2% by 2030 but with both bridges in operation the time increases by 1% or 6 seconds. This shows the sensitively of the model to very small changes in traffic conditions, as reported in the "Stressed Sections" diagrams.

And even when many parts of the road network will be operating with some difficulty in 2055 the increase in time along Cobra St is only expected to be 3% or 12 seconds, well below the average increase time throughout Dubbo (17 seconds).

Conclusion – The Strategy to draw a little traffic away from Cobra St is successful.

6.3.3. Average Operating Speed

On a broader scale the average speed of trips indicates the overall condition of travel in Dubbo. Currently is it 44.9 km/h in the morning peak and 44.7 km/h in the afternoon peak and during the day. This is a very comfortable average speed that would be envied by most small towns let alone large Metropolitan Areas. The little to no difference between peak and off-peak average speed is also a selling point to the amenity of Dubbo.

And these average speeds are not expected to vary by more than 1% to 3 %, an almost immeasurable difference that could be attributed to minor causes.

Conclusion – The amenity to move about Dubbo easily is not being compromised by development.

6.4. Costs and Savings

TABLE 6.4 INVESTMENT PERFORMANCE

NETWORK	Ref	COST Annual Cost Vehicle $	Time $	Total $	SAVING From	Annual $
2018 Base	A	$73,150,000	$128,160,000	$201,310,000		
2025 Do Minimum	B	$85,840,000	$152,410,000	$238,250,000 118%	Base 2025	
2025 Base - No Bridges	C	$85,730,000	$152,070,000	$237,800,000 118%	No Bridges B - C	$450,000
2025 North Bridge only	**D**	**$85,420,000**	**$151,720,000**	**$237,140,000 118%**	North Bridge Only **D - C**	**$660,000**
2025 Both Bridges	E	$85,370,000	$149,630,000	$235,000,000 117%	Addition for South Bridge E - D	$2,140,000
2030 Base - No Bridges	F	$91,660,000	$163,120,000	$254,780,000 127%	Base 2030	
2030 North Bridge only	G	$91,360,000	$162,440,000	$253,800,000 126%	North Bridge Only F - G	$980,000
2030 Both Bridges	**H**	**$91,580,000**	**$160,700,000**	**$252,280,000 125%**	**Addition for South Bridge H - G**	**$1,520,000**
2040 Both Bridges	**I**	**$101,840,000**	**$179,510,000**	**$281,350,000 140%**		
2055 Both Bridges	**J**	**$113,760,000**	**$202,450,000**	**$316,210,000 157%**		

6.4.1. Vehicle Costs and Time Costs

The cost estimates use 2016 ABS data of 30.09 cents/km for vehicle operating costs and 39.22 cents per minute for the value of time when travelling. These are average figures that should be equally applicable in Dubbo.

Due to the stability of the length of travel time and the distance travelled the cost of travel in Dubbo will increase at near to the same rate as the number of trips increases. (This is somewhat different to a typical cost/benefit discussion for Metropolitan infrastructure where travel time-saving are usually dominant).

The travel cost savings are calculated from the small time savings between schemes (networks). Hence for 2025 the costs of [C] The No Bridges network that does have all other Grid Road against [B] the do minimum where traffic is simply loaded onto the existing network show a saving of $450,000/annum.

Conclusion – The Residential Grid Roads have an economic benefit and are not uni-functional local distributor roads.

6.4.2. Return on Investment

The addition of South Bridge to the 2030 Network [H] shows a saving of $1,520,000 per annum over [G] Network with only North Bridge Built. The estimated cost for South Bridge is $25m. The simple division of $25m by 1.52m indicates a ratio of 16. A full economic calculation is far more complex taking into account changes in traffic etc, this is a comparative indicator.

Conclusion – The first year's savings from South Bridge are 1/16th of the cost of the construction.

Comparing this with the construction of North Bridge ($68m for similar works and not including the intersection at Thompson St) and the time saving of $980,000. The first year's savings are 1/70th of construction cost.

There are many further details, for both schemes, South Bridge looks to be an extremely beneficial project for Council. And the benefits of North Bridge are enhanced by accommodating City traffic and indirectly giving priority to new – Enterprise - employment and residential development.

Conclusion – North Bridge will become a viable project by carrying Dubbo City Traffic.

6.5. Traffic Flows

The model reports the hourly and daily flows between each intersection for every street in the Networks (Fig 3.1 indicates the density of streets included in the Model). Those streets that help explain the analysis are listed in Table 6.5 and are more simply described in the text below. Existing residential streets that are not listed when that generally following a pattern of little or no change or changes in flows of streets in new areas that are simply proportional to new development.

Table 6.5 contains highlights

Green	Identified in the Stress Diagrams (described earlier)
Light Orange	Warning conditions could be coming critical and action is needed
Darker Orange	Double warning
Olive green	Flow decreased
Blue	Large increase in time period.
Red Text	Recommended scheme.

Five groups of results have been selected for their relationship to each other.

6.5.1. Traffic Crossing Macquarie River

The demand for crossing the Macquarie River sets the timing for new crossings. But the location of a new crossing needs to attract demand from the crossings that are congested.

Currently 36,800 vehicles per day [VpD] cross the Macquarie River; 19,500 53% using the LH Ford Bridge; and 17,300 using the Emile Serisior Bridge.

The completion of North Bridge by 2025 will only attract 10% of crossing traffic, mostly from Emile Serisior Bridge (down to 38%) with only a 1% difference at LH Ford.

South Bridge on the other hand would attract 18% of crossing traffic in 2025 and 2030 reducing demand on LH Ford to 40%. Daily traffic in the LH Ford would reduce to 17,700 VpD and stress free in 2030 (Net H).

By 2040 the road configuration in the west, combined with additional employment along the Enterprise Axis, has drawn 15% of demand to North Bridge and 24% to South Bridge. The total demand has lifted from 36,800 VpD existing to 57,800 VpD that is conveniently spread over the 4 crossings. LH Ford is operating at the same demand as currently and therefore starting to experience stress (even though this is not showing up in the statistics) (Fig 5.4.2).

The further concentration of development in the CW and NW through to 2055 will increase the proportion of crossing on North Bridge to 18% and a reduction in the proportion elsewhere (LH Ford from 34% to 31%, Emile Serisior Bridge 28% to 27% and South Bridge 24% to 23%. Both the LH Ford (21,000 VpD) and North Bridge (12,500 VpD) are under stress (Fig 5.5.2). But with LH Ford having slightly less demand than 2025 without South Bridge.

Conclusion – The Strategy maximises the use of new infrastructure.

It is also evident from these figures that a new crossing in the central part of the City, a continuation of Wingewarra Rd, would reduce traffic on the LH Ford and Cobra St around 2055. And, combined with a link through West Dubbo to the NW Sector (Figure 5.7.1) could possibly take just enough pressure off River St at Cobbora Rd to ease demand on North Bridge.

Other features of the stats are that if nothing were to be done by 2030 then the LH Ford Bridge would be operating at High Stress requiring immediate attention. Whereas with North Bridge and South Bridge the LH Ford will be carrying 9% less traffic than today.

6.5.2. South End

The South End Group addresses the sensitivity of traffic intrusion into South Dubbo.

The intention of the new connectivity is to draw a small part of the demand generated in the SE Sector from Boundary Rd into Hennessey Rd and thence the southern part of Macquarie St, the historic entry into Dubbo.

Boundary St is currently carrying more than twice the demand on Hennessey Rd (Counted in Survey).

Between 2018 and 2030 traffic is expected to double on Hennessey Rd (107%) – close to the current flow in Boundary St and traffic in Boundary St is expected to grow by 42%.

Conclusion - The orientation of streets in the SE to Hennessey Rd shows that the upgrade of Bligh St to Macquarie St south will be successful.

Traffic on Bligh St, without the traffic from South Bridge is expected to grow by over 100 %. (Net G) The addition of South Bridge will add a further 100% of current traffic, all located away from residential areas.

Referring to the recommended network for 2030 (Net H) traffic is expected to increase in the next 12 years by 108% on Hennessey Rd and 45% on Boundary St both remaining well within their environment and carrying capacity. The demand will increase gradually after 2030 on these two streets.

Demand on Bligh St will continue to absorb the increase in traffic between the SW and the City Centre, 29% between 2030 and 2040 and 12% thereafter.

The figures in Network E and Network D illustrate the proportion of movements between South Bridge, Macquarie St south, Bligh St and South Dubbo – that will continue to have access south of Tamworth St.

Looking in more depth to explain how traffic flows interact in this Scenario (Net D and Net E).

Without South Bridge 780 vph are using Boundary St to enter South Dubbo and 495 are using Hennessey. Of these 450 are using Bligh St some from both origins some from South Dubbo itself.

With the addition of South Bridge the volumes on Boundary St hardly change (810 vph from 780 vph) and do not change in Hennessey Rd hardly (495 vph). The demand on Bligh St increases by 380 to 830 vph. One additional piece of information, the traffic on the link between South Bridge and Macquarie St south, 715 vph. This comprises traffic accessing South Bridge or Bligh St by residents in South Dubbo, and traffic from Hennessey Rd and Boundary St.

With a maximum of 495 vph from Hennessey and a change of only 25 vph in Boundary the conclusion is that 715 – 495 – 25 = 185 trips accessing South Bridge originate in South Dubbo. Some, maybe half, may originate north of Cobra St and north of Fitzroy St. This is balanced by the outgoing flows indicating some locals would find Cobra St easier for some destinations not used today.

In summary; currently South Dubbo accommodates (Net A) some 800 though trips per hour; with the development of the SE this will increase to 1300 vph **without** the construction of South Bridge and increase by as little as a further 100 with South Bridge built and connected as proposed.

Conclusion – South Dubbo will gain more convenient access via South Bridge than it will experience from additional through traffic.

6.5.3. West End

The West End group in Table 6.5 indicates how the roads in West Dubbo will perform.

The intent of the Strategy was to draw traffic generated in the three western sectors away from this area thereby allow commercial development to occur. There are two elements to this area, the Mitchell Hwy and south along the Newell Hwy.

The manner in which traffic has been drawn away from key congestion is demonstrably noted on the Mitchell Hwy where the increase at West Dubbo is consistently less than the increase in total demand.

This dispersal of traffic is also achieved on the Mitchell Hwy at Thompson St where the need to widened the section from Thompson St to Westview St is averted until 2040. This is in spite of a spike in growth West of Westview St (31% by 2030 and a further 18% by 2040) due to the development of the Airport Enterprise Zone. Traffic is dispersed to River St and North Bridge.

Demand for the Riverside Boulevard north of Thompson St starts at some 4,700 VpD in 2025, mostly generated by development in the NW and grows in proportion to this Sector, 16% in the decade 2030 to 2040 and 30% following, still well within the capacity of this road.

Conclusion - If it were not for its use by Highway traffic the design of the Riverside Boulevard could be moderated to one more suited to the riverside.

Predictions of traffic on the Newell Hwy will vary greatly depending on the construction of Strategic Infrastructure. Without South Bridge demand south Victoria Rd will increase 28% in the next few years, responding to development in the SW. With the addition of South Bridge demand in 2030 will drop by 16% from 14,800 VpD to 12,400 VpD, without South Bridge 19,000 VpD. This will grow back in 2040 to 15,400 and possibly 17,200 in 2055 all very doable for 4 lanes albeit possibly carrying highway traffic through an Active Commercial area.

Further south beyond Minore Rd the Newell Hwy is the only route serving development from the southern parts of the SW to access South Bridge or any other parts of Dubbo hence demand will grow in line with development.

The key contributor in accommodating the growth of the SW is Minore Rd. This is the only access suitable for east west movement south of Victoria Road and the rail line. Traffic is expected to increase by 55% in the next 12 years (2030).

The 2030 demand of 9,100 VpD can hardly be handled by two lanes.

Minore Rd will provide direct access to South Bridge and hence will experience an increase of 71% in the decade 2030 to 2040 the highest increase on any road and a further 23% before 2055. By this time the demand is expected to be 19,100 VpD (Currently 5,900 VpD) a similar demand currently in Cobbora St. It can carry this demand in 4 lanes but amenity will be seriously affected.

Conclusion – Minore Rd is the only route to serve the expansion and the increase in demand requires it to be 4 lanes. This move has been avoided for all other existing streets in Dubbo.

Conclusion – The design of the upgrade must address pedestrian movement particularly to school.

Minore Rd will also serve development west of Chapmans Rd and this can be handled with a lower key Residential Grid Road, with other links taking the bulk of the load.

6.5.4. North End

There is less certainty and more opportunity in the North End where the Heath and Education Precinct will provide a focus for additional employment attracting trips from all directions.

The impact of North Bridge and extension of River St is indicated by the 60% increase in 2025 (Net D) and also reflected by the decreases in Cobbora Rd, Bourke St and Fitzroy St north of Erskine; a transfer of 2700 VpD. Bourke St and Fitzroy St are two streets that are predicted to carry less traffic in 2055 than in 2018. At the same time demand on River St continues to increase until the Link to Cobbora Rd (Caroline St) exceeds capacity in 2055 (not shown in Table 6.5) and River St is also stressed (9,800 VpD 2055). (Triggers for capacity vary with the style of street; 9,000 VpD is on the edge for an active retail street.)

This also explains why the intersection of Fitzroy St and Erskine St does not have as ongoing issue, and why the volume in Fitzroy St south of Erskine St can increase slightly without further issues.

Conclusion - Further management options should be available in and around North End and will become essential in the long term. Perhaps a short-term solution could solve long term issues.

6.5.5. East End

Finally East End describes how the existing grid changes.

Wingewarra St is a "second level" Residential Grid carrying a respectable 10,000 VpD that parallels and is complementary to Cobra St offering a direct line into the City Centre for its local residents. Increases are gradual and below average indicating a balanced existing network, (and no growth in the locality).

Cobra St has similar growth which; given that it is the most direct path serving the expansion of the SE ; indicates that newly generated traffic is successfully dispersed (Hennessey in South End). Nevertheless Cobra St will experience a slower speed than most other streets in Dubbo, (Table 6.3). The actual increase in the peak hour volume is small currently 1852 (two – way) to 2027 in 2025 an additional 180 vehicles per hour does not trigger an increase in Stress. A further increase of 100 vehicles per hour between 2030 and 2040 also has no impact. You might think the model is assuming driving will become more tolerant or skilled or autonomous but the same measure of stress has been applied for the future. The peak hour flow for 2055 is predicted as 2219 vph, 20% greater than today. The reason there is no change is that the time (Table 6.3) is only 3% greater than today, or an increase of 12 seconds. This does not register as a failure but is a reminder that travel conditions do not change in direct proportion to demand.

The same small changes are predicted in Fitzroy St south of Erskine St that also reports a los level of Stress through to 2055. The demand changes between 2025 and 2030 (1698 to1834 vph) but is stable thereafter.

A lesson that leaving something alone that just works is often the answer. This rule has been the approach for the Dubbo Transport Strategy; optimise the network, don't over spend and don't concentrate only on traffic flow but also amenity.

Conclusion – Assuming travel modes are similar to today residents moving around in 35 years time will be experiencing similar conditions to today's easy ways. A fine legacy for Transport Planning.

TABLE 6.5 SUMMARY OF TRAFFIC FLOWS

Group	Section of Street	Network A 2018 Existing		Network C 2025 Base		Network D		2025 North Bridge	Network E 2025 Four Crossings		Network F 2030 Min No new bridges		Network G		2030 North Bridge	Network H		2030 Four Crossings	Network I		2040 Four Crossings	Network J		2055 Four Crossings
		Daily	AM Peak	Daily	AM Peak	Daily	D/A	AM Peak	Daily	AM Peak	Daily	AM Peak	Daily	G/A	AM Peak	Daily	H/A	AM Peak	Daily	I/H	AM Peak	Daily	J/I	AM Peak
RIVER CROSSING																								
	LH Ford Bridge	19510	1948	21787	2119	22610	116%	2278	17662	1693	23718	2320	22980	118%	2218	17690	91%	1641	19701	111%	1955	20975	106%	2104
	Emile Serisior Bridge	17283	1898	21683	2452	16589	96%	1726	13908	1524	19870	2128	15990	93%	1651	13135	76%	1408	15898	121%	1755	18619	117%	2048
	North Bridge					4332		574	4291	569			5296		679	5322		681	8446	159%	1080	12464	148%	1686
	South Bridge								7679	799						8115		820	13762	170%	1484	15705	114%	1630
	Total Crossing River	36793	3846	43470	4571	43531		4578	43540	4585	43588	4448	44266		4548	44262		4550	57807		6274	67763		7468
SOUTH END																								
	Hennessey East of Margaret	2269	285	4137	494	4110	181%	496	4109	494	4470	541	4705	207%	564	4711	208%	563	5043	107%	616	5800	115%	695
	Boundary East of Margaret	4938	529	7191	818	6952	141%	785	7109	811	7163	805	6992	142%	781	7163	145%	799	7545	105%	842	7510	100%	849
	South Bridge at Macquarie St								7253	715						7619		744	9530	125%	1005	10140	106%	1051
	Bligh St south of Bultje St	2697	149	5700	450	5694	211%	451	9647	826	5979	486	6049	224%	495	10313	382%	893	13259	129%	1206	14877	112%	1319
WEST END																								
	Mitchell Hwy west of Whylandra St	13100	1381	14656	1266	15142	116%	1483	14481	1387	15311	1475	14885		1405	13957	107%	1294	15388	110%	1528	16361	106%	1683
	Mitchell Hwy west of Thomson St	13906	1518	16039	1796	16113	116%	1806	16130	1812	16295	1841	15650		1758	15678	113%	1763	16575	106%	1956	17444	105%	2115
	Mitchell Hwy west of Westview St	8311	1003	9706	1211	9729	117%	1209	9743	1215	10580	1322	10847		1357	10868	131%	1360	12868	118%	1607	14054	109%	1791
	Riverside North of Thompson					4688		625	4643	620	1830	218	4812		559	4979		566	5754	116%	686	7471	130%	864
	Newell Hwy south of Victoria	14784	1593	19394	2200	18964	128%	2117	12288	1452	18932	2075	18975	128%	2084	12411	84%	1413	15483	125%	1808	17212	111%	2012
	Newell Hwy south of Minore	5751	629	6969	765	6969	121%	765	6969	765	7727	813	7727		813	7727	134%	813	8864	115%	942	9318	105%	999
	Minore Rd	5874	672	7259	827	7252	123%	828	8286	932	7673	888	7673	131%	888	9125	155%	1043	15571	171%	1810	19100	123%	2148
NORTH END																								
	Cobbora Rd south of White St	19730	2208	22748	2549	19220	97%	2123	19186	2122	20374	2326	20297		2287	20265	103%	2281	21307	105%	2398	22741	107%	2562
	River St East of Fitzroy	4579	430	5103	498	7332	160%	871	7330	871	6887	780	6729		808	6723	147%	809	8288	123%	996	9829	119%	1208
	Bourke North of Erskine	4810	470	5557	622	2387	50%	238	2390	238	3498	365	3172		298	3116	65%	296	3247	104%	314	3926	121%	367
	Fitzroy St North of Erskine	8166	904	10109	1139	5580	68%	661	5582	661	5818	711	6572		783	6560	80%	782	6840	104%	808	7271	106%	847
EAST END																								
	Cobra St east of Fitzroy	19046	1852	20873	2063	20642	108%	2047	20430	2011	21137	2086	21099		2082	20925	110%	2057	21685	104%	2153	22488	104%	2219
	Mitchell Hwy east of Sheraton Rd	8937	852	9124	886	9231	103%	893	9229	893	10575	1075	10572		1074	10572	118%	1074	10028	95%	1019	11056	110%	1131
	Wingewarra east of Fitzroy	10075	826	12159	1067	10326	102%	887	10277	877	10830	946	11151		961	11081	110%	949	11358	102%	1006	11842	104%	1064
	Fitzroy South of Erskine	16894	1703	18655	1890	16500	98%	1698	16524	1700	17295	1815	17811		1836	17764	105%	1834	17737	100%	1823	18182	103%	1852

6.6. Surveys

The study commenced with a large survey of existing traffic required to estimate external traffic and to calibrate the model of internal traffic. The proportion of through traffic was surveys using Number Plate recognition at entry/exit points to the Study Area.

The survey separated traffic into Heavy Vehicles, multiple axles, and Light Vehicles.

Full results of this survey have been lodged with Council.

Table 6.6 summarises the results of the Number Plate Recognition Survey for through traffic. The Newell Hwy south has the highest proportion of through traffic, 23%. This was matched with 13% of through traffic at the northern entry of the Newell Hwy (13%) The difference in through traffic reflects the proportion of regional residents living north and south of Dubbo. The proportion of through traffic on other Highways also reflect the importance of regional access, only 4% of traffic on the Golden Hwy is through traffic, 5% on the Mitchell Hwy to the west and 7% on the Mitchell Hwy to the east. These figures are consistent with regional population.

TABLE 6.6 EXTERNAL TRAFFIC - FROM SURVEY

EXTERNAL ROAD		TOTAL TRAFFIC				THROUGH TRAFFIC (1) Heavy Vehicles					(2) Light Vehicles				(3) TOTAL	
		Total Daily Traffic	Peak AM	PM		Heavy Vehicles	% Thru Daily Survey	Night Total	% Night	Heavy daily Through	Light Vehicles	Small Trucks	% Thru Daily Survey	Light Daily Through	Total Daily Though	% Daily Total
1	Mitchell Hwy Bumblegumbie W	2881	384	219		172	10%	19	11%	34	2424	285	4%	100	134	5%
2	Newell Hwy Troy Crossing	3201	183	307		455	33%	117	26%	227	2505	241	7%	195	422	13%
3	Golden Highway Mayfield Rd	1427	91	147		93	17%	18	19%	31	1205	129	2%	25	55	4%
4	Mitchell Hwy Eulomoga	3818	525	270	4pm	195	11%	60	31%	75	3366	257	5%	183	257	7%
5	Newell Hwy Camp St	1578	111	83	3pm	359	49%	100	28%	227	1087	132	11%	135	361	23%
			1294	1026		1274		314		593	10587	1044		637	1230	
		12905	10%	8%		10%		2%		5%	82%	8%			10%	
						681	To from Dubbo		%	48%	10994	To from Dubbo		52%		
						53%	% Non Through		Total Thru Trips		95%	% Non Through		Total Thru Trips		

INDEX