Moreton Bay Regional Council

Caboolture West Transport Modelling

Study Report

Issue | 30 January 2014

Job number 229906

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1 Introduction

1.1 Background

Moreton Bay Regional Council (MBRC) appointed Arup to assist in the planning and development of a Structure Plan for the Caboolture West Master Plan Area. Arup's scope was to undertake strategic transport modelling to assess the likely transport impacts and provide transport planning advice regarding the form of the internal transport network and transport connections to the external network.

Caboolture West is located to the west of Caboolture and Morayfield, bounded to the north by the D'Aguilar Highway and to the south by the Caboolture River Road. The site is predominantly rural in nature and is traversed by several local roads including Old North Road and Bellmere Road. Provisionally, the proposed development could allow for approximately 68,000 residents and employment of 15,000 full time equivalent jobs, with development of the area occurring over the next 30 to 40 years.

MBRC appointed a range of consultants, including urban design, environmental economics and transport modelling to provide specialist input to the structure plan for the proposed Caboolture West development. MBRC with stakeholders set objectives for the form of the development and how it would integrate with the rest of Caboolture.

The purpose of the Arup's commission was to undertake transport modelling to identify the challenges faced accommodating Caboolture West on the wider transport network, to inform land use and transport scenario development and identify the transport infrastructure that would be required to accommodate the development.

1.2 Study Process

The study phases are outlined as follows:

- Phase 1: Travel demand assessment: to identify challenges and issues to provide access to Caboolture West. This involved an assessment of the potential demand characteristics and desire lines
- Phase 2: Scenario Testing: to investigate a range of alternative land use and transport scenarios for Caboolture West that meet the objectives set for the development
- Phase 3: Assessment of Preferred Scenario: to analyse and identify the required transport measures to adequately accommodate travel demand to, from and within Caboolture West as part of Moreton Bay's overall transport goals.

1.3 This report

This report summarises the outcomes of our transport modelling investigations, referring to various appendices that document in more detail the analysis that supports the outcomes:

- Section 2 outlines the study background including the regional planning context and the Caboolture West development
- Section 3 outlines the methodology used and assumptions made to assess the transport impacts of the Caboolture West development on the Caboolture network
- Section 4 describes the impact of the full development on the transport network
- Section 5 outlines intersection road network upgrades required as a result of the development
- Section 6 summarises the staging requirements of transport improvements to accommodate Caboolture West
- Section 7 outlines the preliminary cost estimates for the road infrastructure to be provided.

The following appendices are provided:

- Appendix A: Details the desire line analysis that was used to identify key travel characteristics to inform the transport challenges for Caboolture West
- Appendix B: Contains the working paper produced to assess the impacts of alternative transport and land use scenarios
- Appendix C: Outlines the public transport network assessment
- Appendix D: Details the assessment of required road transport infrastructure
- Appendix E: Details the assessment of staging requirements for transport infrastructure
- Appendix F: Outlines the preliminary costing undertaken for the identified internal and external road network upgrades.

2 Study Background

2.1 Regional context

The Moreton Bay Region is one of the fastest developing places in Australia. Situated between Brisbane and the Sunshine Coast, it is the third largest municipality in Australia. It has a current population in the order of 350,000 and is forecast to grow to over 500,000 by 2031. **Figure 1** shows the Moreton Bay region. Caboolture is a principal activity centre located at the northern extent of the urban footprint from Brisbane. Caboolture is the only principal activity centre between Brisbane and the Sunshine Coast. Other major centres in Moreton Bay are Strathpine and North Lakes located to the south along the Bruce Highway and Redcliffe to the east. The Bruce Highway transport corridor is an important corridor of national importance, servicing the Sunshine Coast and other areas in South East Queensland and is experiencing a significant growth in demand. As growth occurs in this corridor and Moreton Bay increasing pressure is being placed on the transport network in Moreton Bay.

2.2 Caboolture/ Morayfield

The Caboolture/ Morayfield area currently has a population of about 80,000 people, is located on the Bruce Highway and is a key activity centre between Brisbane and the Sunshine Coast. Significant growth is forecast in Caboolture/ Morayfield area where the population is expected to grow to over 200,000 by 2051. This is a substantial change for the current situation and hence requires some consideration on how to provide good and efficient transport connection to accommodate that growth. Whilst development will be a combination of infill and greenfields, there are limited sites to accommodate greenfields development in Caboolture. The Caboolture West site provides the opportunity to the greenfields component of growth.

It is important to note that whilst we are considering the transport network requirements for the Caboolture West Master Plan Area (MPA) the development is being considered as part of the overall Caboolture/Morayfield growth plan.

2.3 Caboolture West

Caboolture West is located to the west of the Caboolture town centre and Morayfield, bounded to the north by the D'Aguilar Highway and to the south by the Caboolture River Road as shown in **Figure 2**. The site is predominantly rural in nature and is traversed by several local roads including Old North Road and Bellmere Road. The proposed development could allow for up to 68,000 residents and employment of 15,000 full time equivalent jobs leading to a potential population in Caboolture of around 200,000.

The proposed development at Caboolture West would retain natural bushland and wildlife habitats in the area as well as many parks and open space areas. There would be a range of homes that people can afford that reflect the needs of all residents from families with children to retirees, singles and extended families. The area will have a "sense of place" with views to the range, river and mountains. Good accessibility will be provided with many choices in how you

can travel. The development plan encourages people walk or cycle to local destinations such as shops, schools and other services that are easily accessed by dedicated pathways. Many of the required services and shops are in the Caboolture West area to encourage trip containment within the area, and minimise unnecessary travel outside Caboolture. Strong transport corridors including public transport/bus services are proposed to connect Caboolture West to external activity centres.

Figure 3 shows the proposed structure plan for Caboolture West. The key features to note include the centrally located town centre and six neighbourhood centres. An enterprise and employment area is located to the north of the area adjacent to the D'Aguilar Highway. A series of major roads permeate the site and link the town and neighbourhood centres to the external road network. The neighbourhoods are quite distinct and are separated by green space.

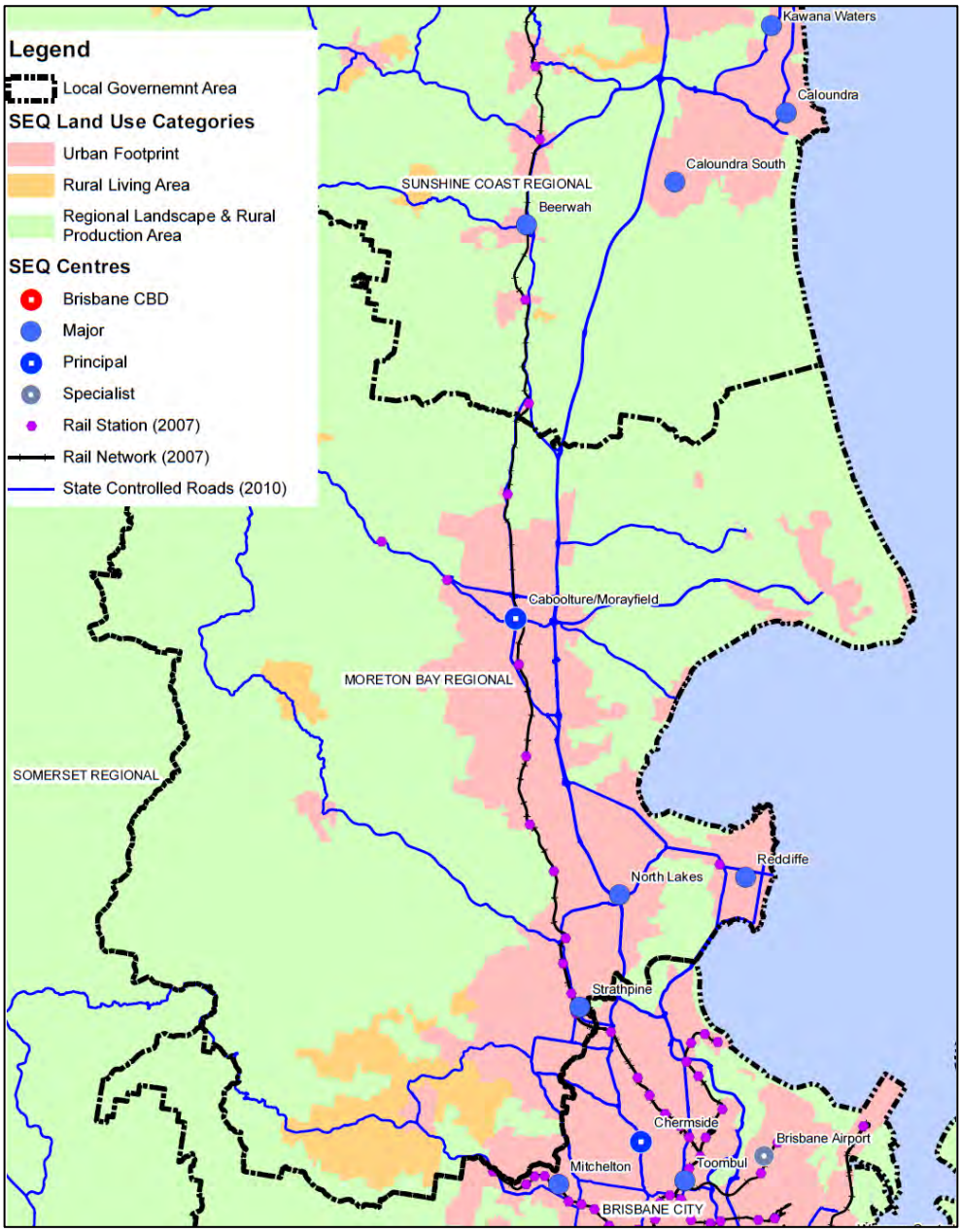

Figure 1: Regional context

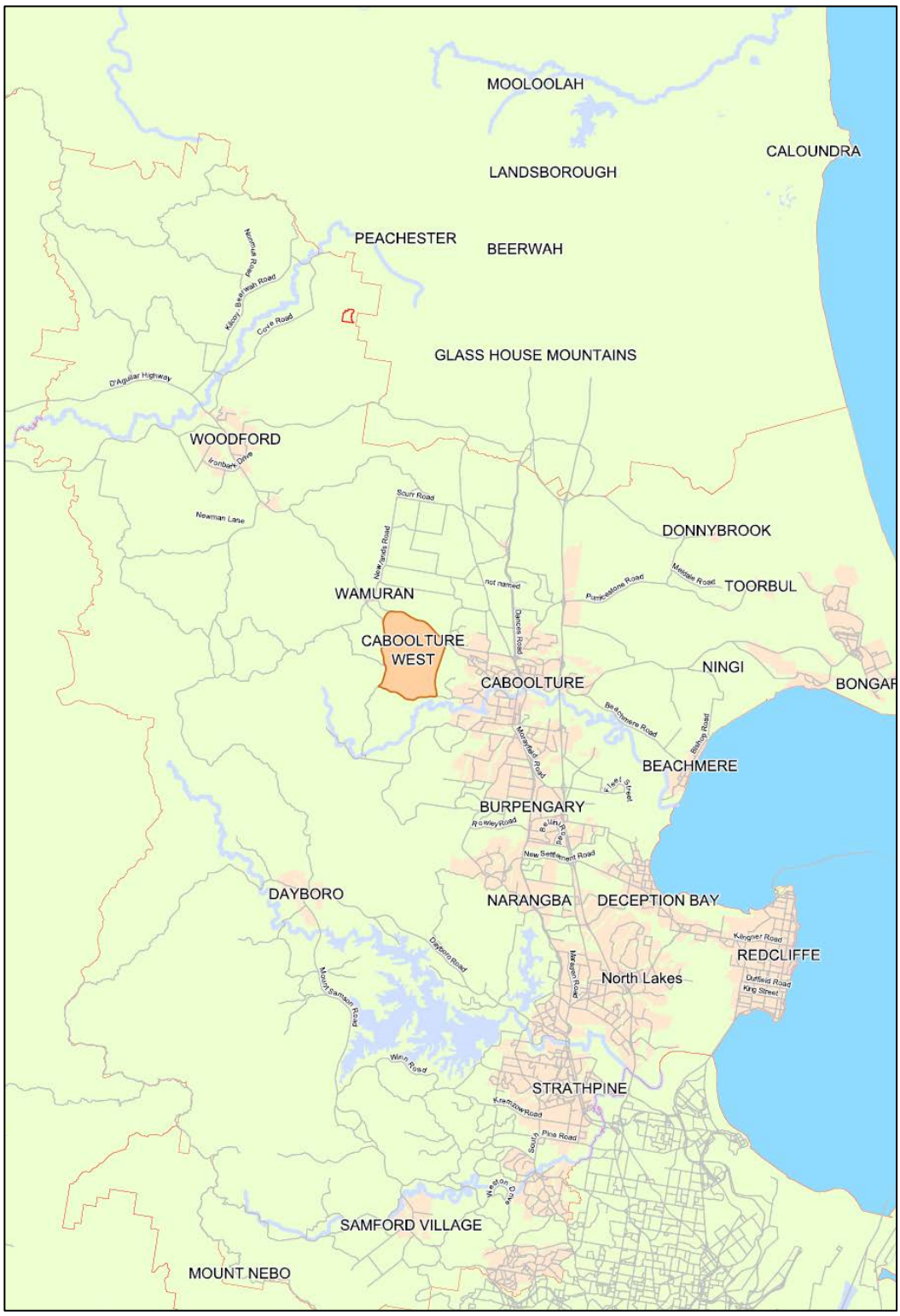

Figure 2: Caboolture West location

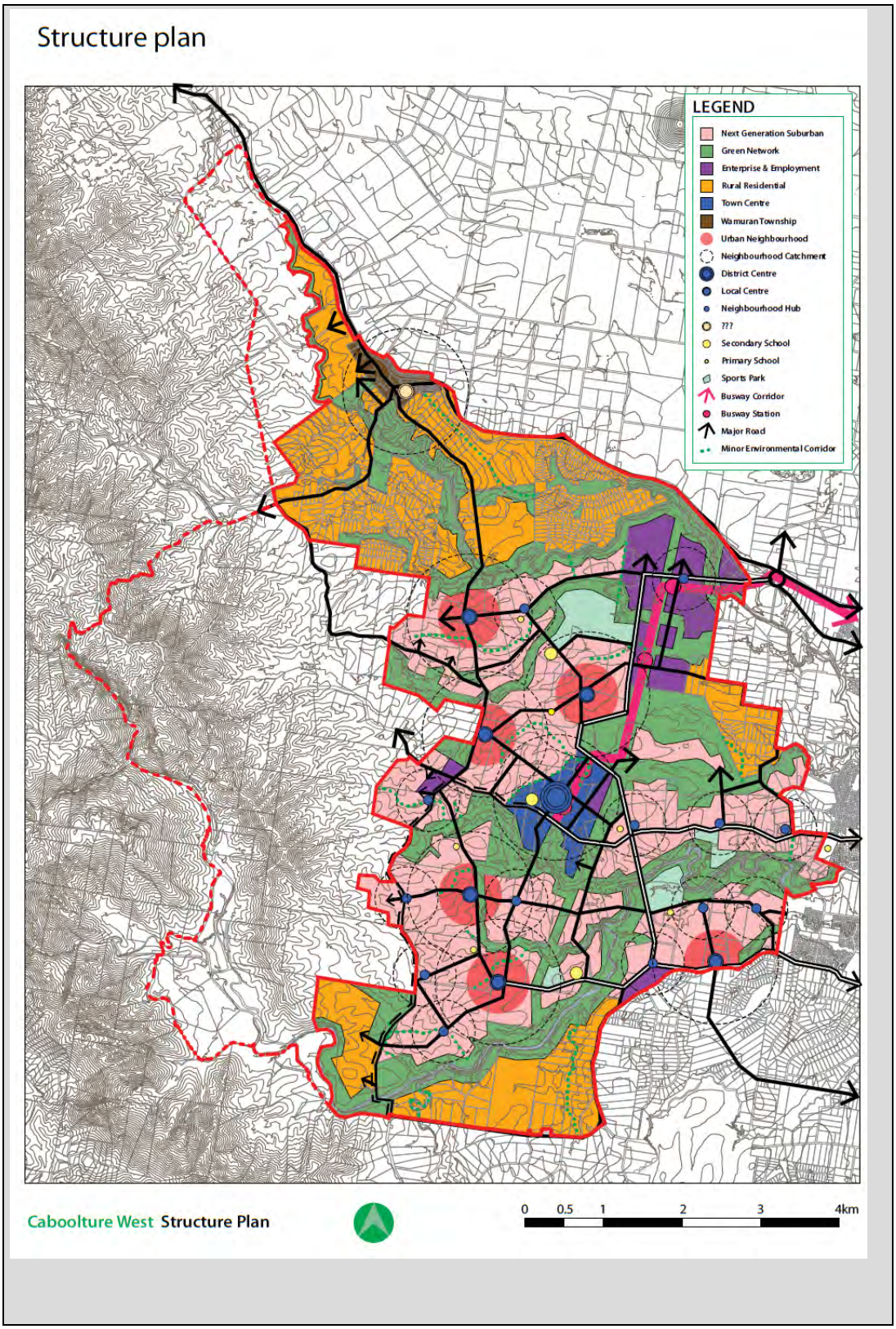

Figure 3: Caboolture West Structure Plan

2.4 Transport Policy and Strategy

2.4.1 State Context

There are two key interrelated State Government strategic planning and policy documents that guide the development and implementation of road network improvements in Queensland. These are:

- *South East Queensland Regional Plan 2009 to 2031*.
- *Connecting SEQ 2031: An integrated regional transport plan for South East Queensland*.

Due to the recent change in government, it is anticipated that a number of these documents will change to represent the current governments' strategies. In the absence of new policy documents the most recent government policy documents available have been reviewed.

The *South East Queensland Regional Plan* sets the overarching policy and planning framework for managing growth in South East Queensland region. The strategic directions outlined in the plan establish the broad policy framework for achieving the regional vision set out in *Toward Q2* and intended growth management outcomes.

The vision is delivered by a series of desired regional outcomes, principles, policies and programs to address growth and management of the region. The most important desired regional outcome for Moreton Bay and Caboolture West is the one for integrated transport.

Connecting SEQ 2031 has been developed as the guiding transport planning and policy document to support the desired outcomes of *South East Queensland Regional Plan 2009 to 2031*. It is one of the programmed activities under the integrated transport desired regional outcome within the regional plan.

To deliver the 2031 transport vision, *Connecting SEQ 2031* has established nine key transport policy goals. These support the government's strategic directions as conveyed in *Toward Q2*, the *Transport Coordination Plan* and the *South East Queensland Regional Plan*. Achieving these goals by 2031 would meet future travel and economic development needs while supporting the desired lifestyle of South East Queensland residents.

To support these key strategic documents are a number of other regional State Government strategic planning and policy documents.

The Moreton Bay Integrated Transport Study (MITS) was undertaken by TMR in 2011 to develop a high level strategy to address Moreton Bay's current and future transport challenges. The strategy drew on the overarching objectives outlined in Connecting SEQ and identified a range of potential actions to achieve those goals. Many of the assumptions for future transport initiatives in this project are based on either Connecting SEQ or MITS assumptions.

2.4.2 Local context

MBRC is currently developing a new Planning Scheme which will be based on the next generation planning 'Place Types' concept. As this will be the first Planning Scheme developed by MBRC as a combined entity, this provided MBRC with the opportunity to provide a fresh direction with regards to the long-term urban development patterns and transport requirements for the region.

To inform their planning scheme MBRC developed a Transport Network and Corridor Strategy (TNCS) and Priority Infrastructure Plan in 2013.The purpose of the TNCS was to provide a strategic framework and analysis by which to evaluate the current and future operation of the primary transport networks and corridors for all transport modes. The strategy aimed to have a focus on those transport assets within the control of MBRC. The desired outcomes from the overall study built upon the following principles for sustainable transport corridors:

1. Creation of a corridor network which is safe and efficient;
2. Creation of a corridor network which supports communities and places;
3. Creation of a corridor network that sustains and attracts economic activity;
4. Maximisation of transport choice;
5. Integration of the corridor network with the natural environment at all scales;
6. Respect of existing natural and built environments;
7. Emphasis of walking as the fundamental unit of the corridor network; and
8. Creation of harmony and integration with other transport networks.

3 Transport Assessment Methodology

3.1 Overview

This section broadly outlines the transport assessment methodology and the assumptions. Our analysis of future strategic travel on the wider transport network uses the Moreton Bay Regional Strategic Transport Model. In summary the assessment methodology includes the following steps:

- Assessment of challenges and issues;
- Assessment of alternative land use and transport scenarios for Caboolture West;
- A multi-criteria assessment workshop with key stakeholders to choose preferred scenario;
- A refinement of preferred scenario following the workshop;
- Detailed analysis of preferred scenario to identify the transport impacts of the development and the required internal and external transport network to support the development;
- Identification of required intersection upgrades required to accommodate Caboolture West traffic demand using SIDRA, based on the traffic flows forecast by MBRSTM;
- A staging assessment of when road and intersection infrastructure needs to be implemented; and
- Development of indicative costing and staging of required transport improvements.

3.2 The model

MBRC's strategic transport model, the Moreton Bay Regional Strategic Transport Model (MBRSTM), has been used to assess the future travel demand impacts of the Caboolture West MPA on the wider transport network and inform the transport network, measures and infrastructure required to accommodate the activity generated by the development.

MBRSTM is a detailed 4 step transport model that uses demographic forecasts to predict travel demand across the MBRC's transport network for all modes for current and future years. It is a strategic model that does not include detailed operational parameters such as the representation of intersection delay or allow for capacity constraints on public transport due to crowding. Other models are developed for this purpose.

The model has been recently been revalidated to 2010 traffic levels to inform future transport network requirements for MBRC's Transport and Corridor Network Strategy and Priority Infrastructure Plan.

The modelling assumes the following:

- The trend based model process has been used. That is the calibrated model has been used without policy intervention.

- The 2031 model has been used to assess the impact of all stages of Caboolture West.
- The highway networks and public transport networks developed for the policy based model were adopted as the base case without Caboolture West.

3.3 Assessment of transport issues

Initially the MBRSTM was used to assess existing travel characteristics and the potential travel demand impacts generated by Caboolture West to broadly identify accessibility and capacity issues. The version of the MBRSTM for this assessment represented Caboolture West MPA with a transport zone definition which was relatively coarse. The results of this assessment were documented in a technical working paper attached as Appendix A. The outcome of the analysis was to identify some potential transport scenarios to align with the land use scenarios.

3.4 Land use and transport scenario assessment

A range of development and transport scenarios was assessed using the MBRSTM to inform the development of the Caboolture West Structure Plan. The scenarios include variation of size and mix of development, the road network connections and the level of public transport provision.

The scenarios include testing of the following:

- Two land use options;
- Three public transport options; and
- Two options for a southern connection (i.e. the West Moreton Corridor).

The key outcomes of the scenario tests are summarised as follows:

- Travel demand: The analysis suggested that a high proportion of trips to and from Caboolture West would generally be contained within Caboolture and Morayfield and most within the Moreton Bay Region;
- Public transport: Frequent bus services would be required to connect the various centres within Caboolture West to key activity nodes within Caboolture and Morayfield. Strong demand for park and ride at Burpengary was forecast;
- Rapid transit: The analysis suggests that the provision of a high quality public transport service between the Town Centre and Caboolture that provides competitive travel times compared to the private vehicle would be attractive to travellers; and
- Road network: The analysis highlighted potentially high demand for Caboolture West traffic to access Morayfield Road to either travel south to the Bruce Highway or access local employment zones. There was also strong demand forecast to Caboolture Town Centre and industrial areas to the north of Caboolture. The analysis highlighted potential external road upgrades would be required to accommodate the additional demand, which is documented in Section 5 of this report.

The scenario testing is documented in detail in Appendix B.

3.5 Preferred scenario selection

A preferred scenario was selected by MBRC following a multi criteria assessment and a workshop with key stakeholders. The preferred scenario selected, termed the "Sustainable Town" was refined both from a land use and planning and transport perspective to account for comments and further analysis following the scenario workshop. The following sections document the key assumptions and analysis of the preferred option.

3.6 Preferred scenario assumptions

3.6.1 Land Use

The modelling was based on the current 2031 land use forecasts for South East Queensland with the addition of the proposed development for Caboolture West. The transport zone definition for MBRSTM within Caboolture West was refined from 28 to 130 zones to represent the proposed development more accurately. Demographic forecasts for Caboolture West have been produced by MBRC for every 5 years to 2051. **Table 1** shows the percentage of the full development for population, housing, school enrolments and jobs in Caboolture West at each five year interval.

Table 1: Caboolture West Development Assumptions

	Population	Dwellings	Enrolment	Jobs
2016	8%	8%	7%	4%
2021	19%	18%	33%	11%
2026	37%	36%	41%	17%
2031	56%	55%	47%	26%
2036	70%	70%	51%	55%
2041	85%	86%	87%	77%
2046	94%	94%	93%	87%
2051	100%	100%	100%	97%
2056	100%	100%	100%	100%

Table 2 outlines in more detail the demographic assumptions in the transport model for the Caboolture West MPA, whilst the assumed demographics are shown spatially in **Figure 4**. Caboolture West is assumed to have an ultimate population of 68,761 and, employment of 15,148 which incorporates a high proportion of retail employment primarily in the town centre and to a lesser extent in the neighbourhood centres. The other concentration of employment is planned to be in the enterprise employment area at the north end of the site. The 16,882 enrolments are mostly for primary and secondary education.

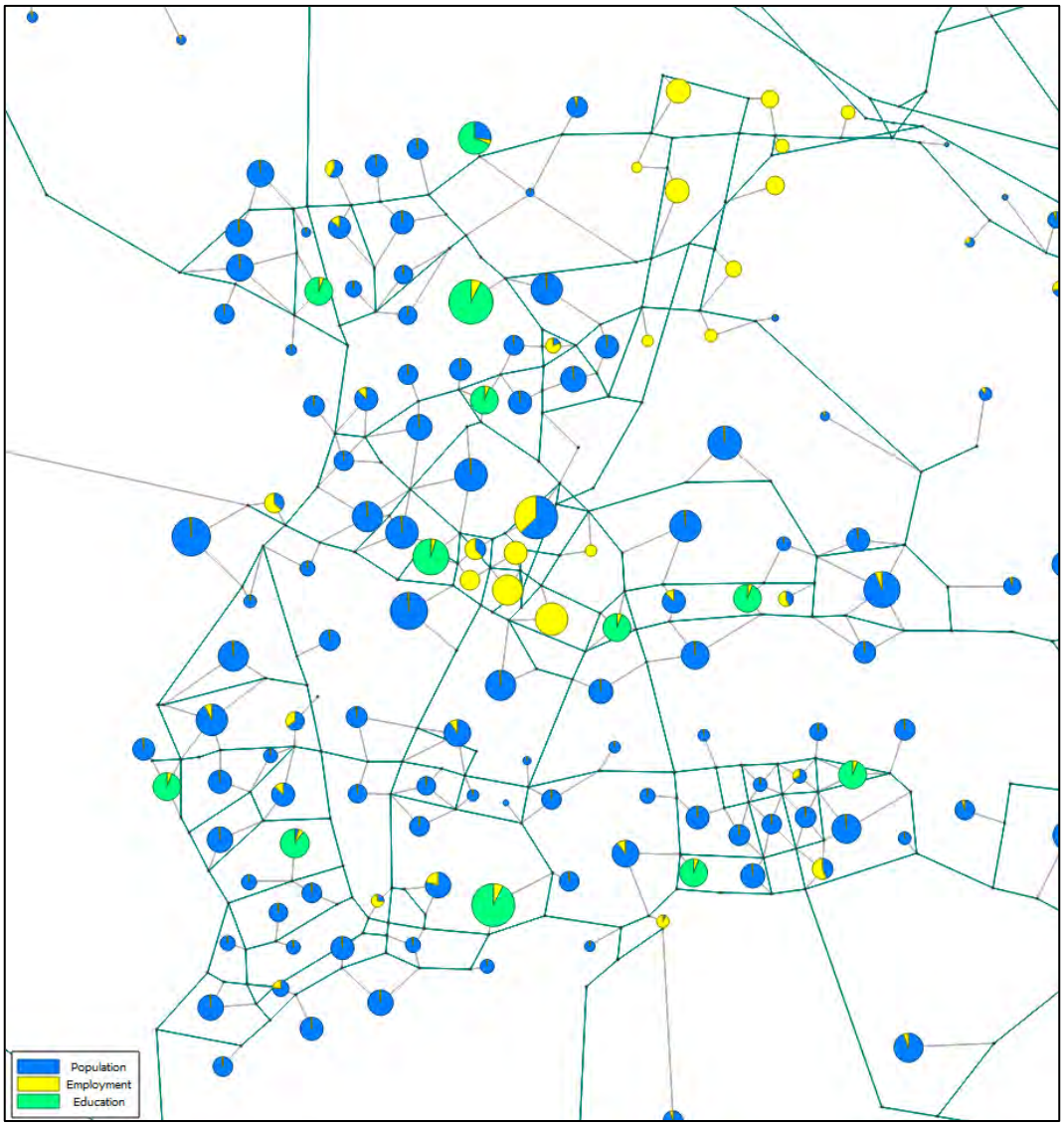

Figure 4 Demographics - population, employment, education

Table 2 Caboolture West demographic assumptions

Demographic Input	Caboolture West Ultimate
Population	**68,761**
Dwellings	**26,956**
Average Occupancy	**2.6**
Employment	**15,148**
Professional	3,689
Service	1,749
Construction & Industry	3,109
Retail	6,542
Other	59
Enrolments	**16,882**
Primary	9,882
Secondary	5,200
Tertiary	1,800

3.6.2 Transport projects

The model assumes the transport projects identified for the MBRC's PIP for 2031 as a basis for the base case network to assess the impact of Caboolture West development. The transport projects were identified using the policy based version of MBRSTM which makes adjustments to the model's forecasting process to reflect MBRC's mode split policy targets. The base case transport network also draws on road improvements and public transport service and infrastructure improvements identified in Connecting SEQ and the Moreton Bay Integrated Transport Study (MITS).

Table 3 and **Table 4** identify the most relevant projects included in the 2031 base case transport scenario. The model outcomes presented in this report are dependent on the assumed future transport network presented in these tables and the results of the modelling may change if these assumptions are altered.

Table 3: Assumed public transport improvements

Future Public Transport Project	2031 Cab West
Moreton Bay Rail Line feeder bus services	✓
North West Transport Corridor (NWTC)	✓
Caboolture North Rail Station (incl. park'n'ride)	✓
CSEQ bus routes (extracted from MITS model)	✓
Northern Busway (Chermside to Bald Hills)	✓
Kippa-Ring to Redcliffe High Frequency bus route	✓
MITS recommended bus routes	✓

Table 4: Selection of road improvements most relevant to Caboolture West

Year	Location	Description	2031 Cab West
2016	2016 Park'n'Ride modifications	Modifications to park'n'ride nodes including updates to car parking spaces	✓
2016	Francis Road Overpass	New overpass connecting into Gympie Road	✓
2016	Kerr Road Overpass	New overpass across Bruce Highway	✓
2016	Station Road, Burpengary (Joyce Road to Progress Road)	Upgrade to 4 lanes divided	✓
2021	Deception Bay Road (Bruce Highway to Lipscombe Road)	Upgrade to 4 lanes divided	✓
2021	2021 Park'n'Ride modifications	Modifications to park'n'ride nodes including updates to car parking spaces	✓
2021	Brown Street Pedestrian Path (Elof Road to Brown Street)	1.5 km walking/cycling route	✓
2021	Moreton Bay Greenfill Sites Network	Road network changes around greenfield sites (North Lakes and Caboolture). North Lakes in preparation for North South Urban Arterial	✓

Year	Location	Description	2031 Cab West
2021	Inner City Rail Stage 1 (Fairfield-Exhibition Loop to Bowen Hills_	New rail	✓
2021	South Pine Road (Queens Road to Lily Street)	Upgrade to 4 lanes undivided	✓
2021	Buchanan Road (entire length)	Upgrade to 4 lanes divided	✓
2021	Caboolture River Road (Grant Road to Morayfield Road)	Upgrade to 4 lanes divided	✓
2021	South Pine Road (Queens Road to Camelia Avenue)	Upgrade to 4 lanes undivided	✓
2026	South Pine Road (Plucks Road to Bunya Road)	Upgrade to 4 lanes undivided	✓
2026	2026 Park'n'Ride modifications	Modifications to park'n'ride nodes including updates to car parking spaces	✓
2031	Caboolture North Rail Station	New rail station at Caboolture North	✓
2031	Caboolture to Wamuran Green Corridor	New green corridor (bus, pedestrian and cycle) from the existing Caboolture Rail Station to Wamuran	✓
2031	Caboolture	Extension of Pettigrew Street to Pumicestone Road	✓
2031	Caboolture South	Cundoot Creek – New link from Buchanan Road to Lower King Street	✓
2031	Morayfield	Continuation of Buchanan Road to Morayfield Road with grade separation at railway crossing.	✓
2031	Morayfield	Upgrade of Morayfield Road/Uhlmann Road to 4 lanes from Graham Road to the Bruce Highway	✓

3.6.3 Caboolture West internal road network

The proposed internal road network (see **Figure 5**) for Caboolture West consists of three main arterial routes, two east-west connections; Caboolture River Road, and Bellmere Road, and a new north-south connection that would be an extension of Williams Road from King Street to Caboolture River Road, connecting the town centre and key employment areas.

Old North Road runs on the western side of the site and will be upgrade to a sub-arterial connection between Wamuran and Rocksberg, intersecting with various sub-arterial and collector roads to access Caboolture West.

The town centre, neighbourhood centres will be connected via a network of new sub-arterial routes, supported by collector and local streets.

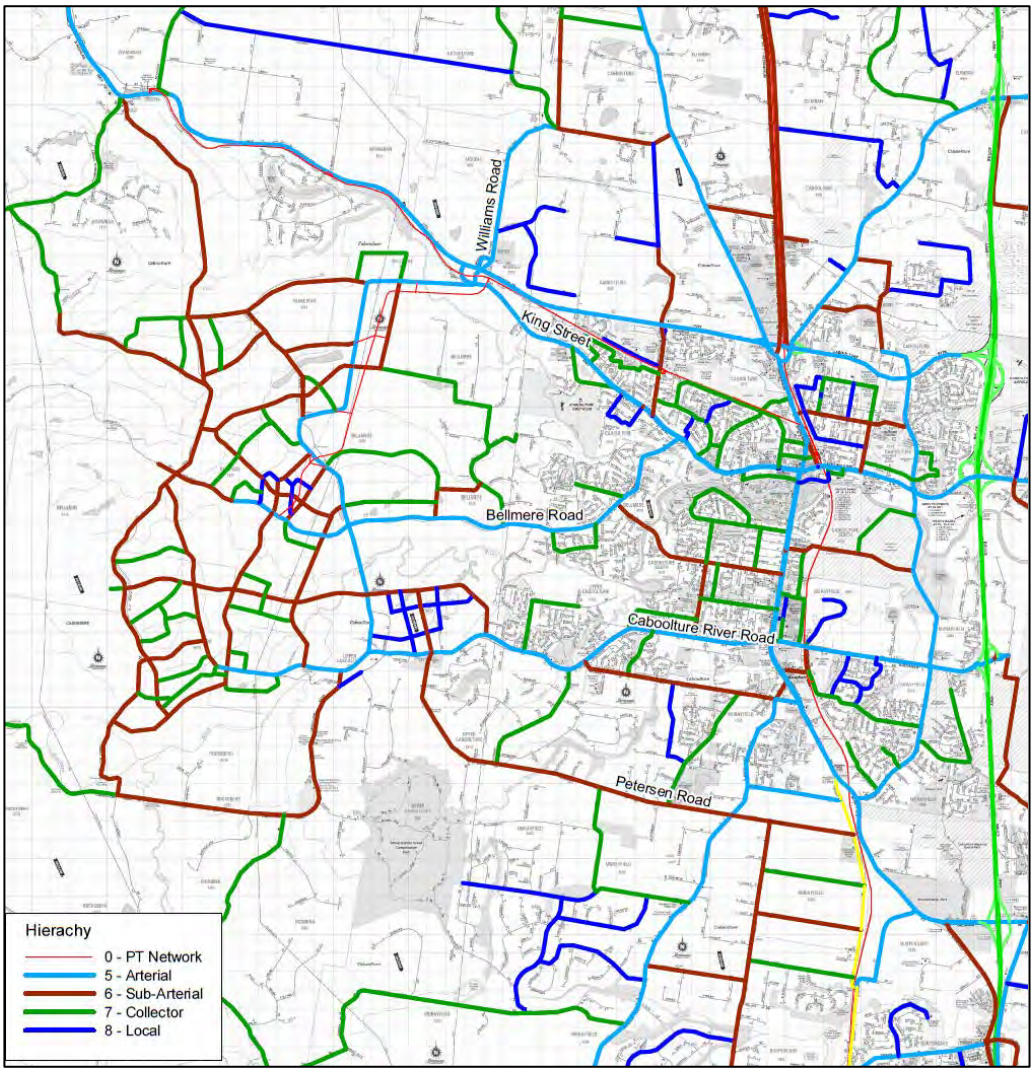

Figure 5 Caboolture West Road hierarchy

3.6.4 Caboolture West external road connections

Analysis of the impact of the Caboolture West development was undertaken based on the transport network assumptions outlined in Section 3.6.2.

External road connections servicing Caboolture West were assessed and a number of upgrades were identified to accommodate the forecast traffic demand. The assessment identified, as illustrated in **Figure 6**, the following existing roads will need to be widened or extended:

- Bellmere Road- widened from 2 to 4 lanes from Caboolture West to King Street;
- Caboolture River Road – widened from 2 to 4 lanes from Caboolture West to Morayfield Road;
- Peterson Road – 2 lane extension connecting Petersen Road to Clark Road; and
- Morayfield Road – widened from 4 to 6 lanes between Buchanan Road and Lindsay Road.

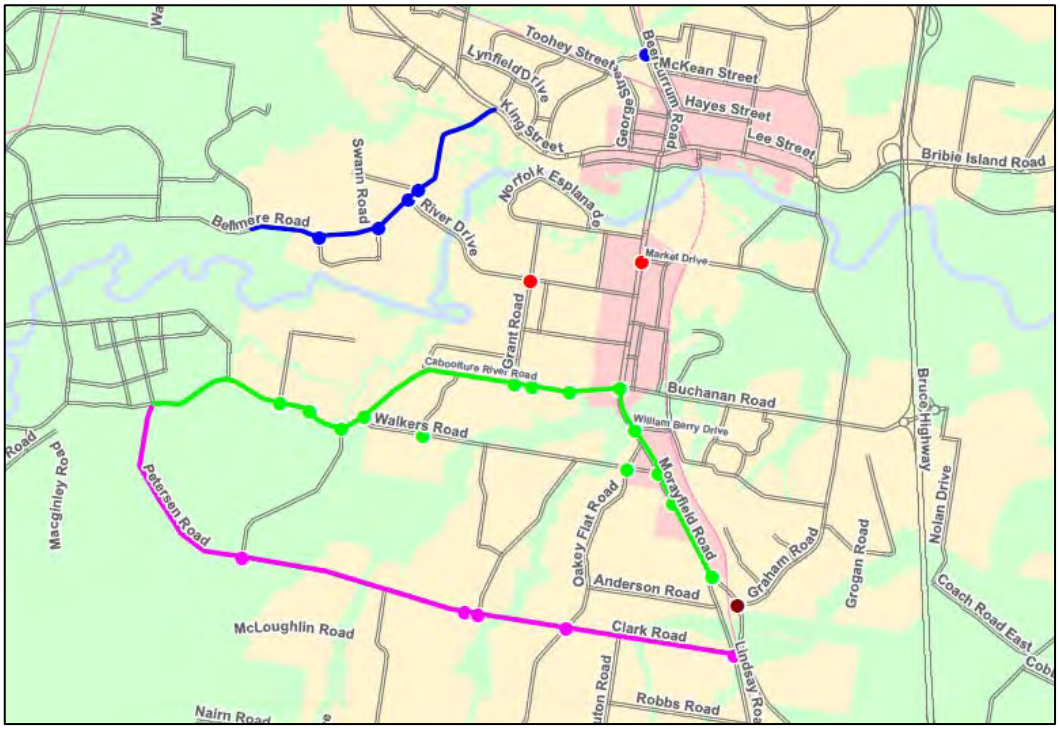

Figure 6 External road upgrades

Our assessment with Caboolture West assumed that increased road capacity was provided in the West Moreton Corridor. A study is currently being undertaken by the state to identify a preferred alignment for a West Moreton Corridor. For the purpose of this study the West Moreton Corridor was assumed to consist of improved traffic operations to/from Narangba along the route of Lindsay Road, O'Brien Road, Station Road, Burpengary Road and Boundary Road (see **Figure 7**). The upgraded route assumes:

- Four lanes with a posted speed of 70km/hr;
- Improved crossing of the rail line at Lindsay Road; and
- Improved crossing of the rail line at Boundary Road to provide a high capacity connection to Narangba Road.

The required intersection improvements on the external road network are discussed in Section 5.

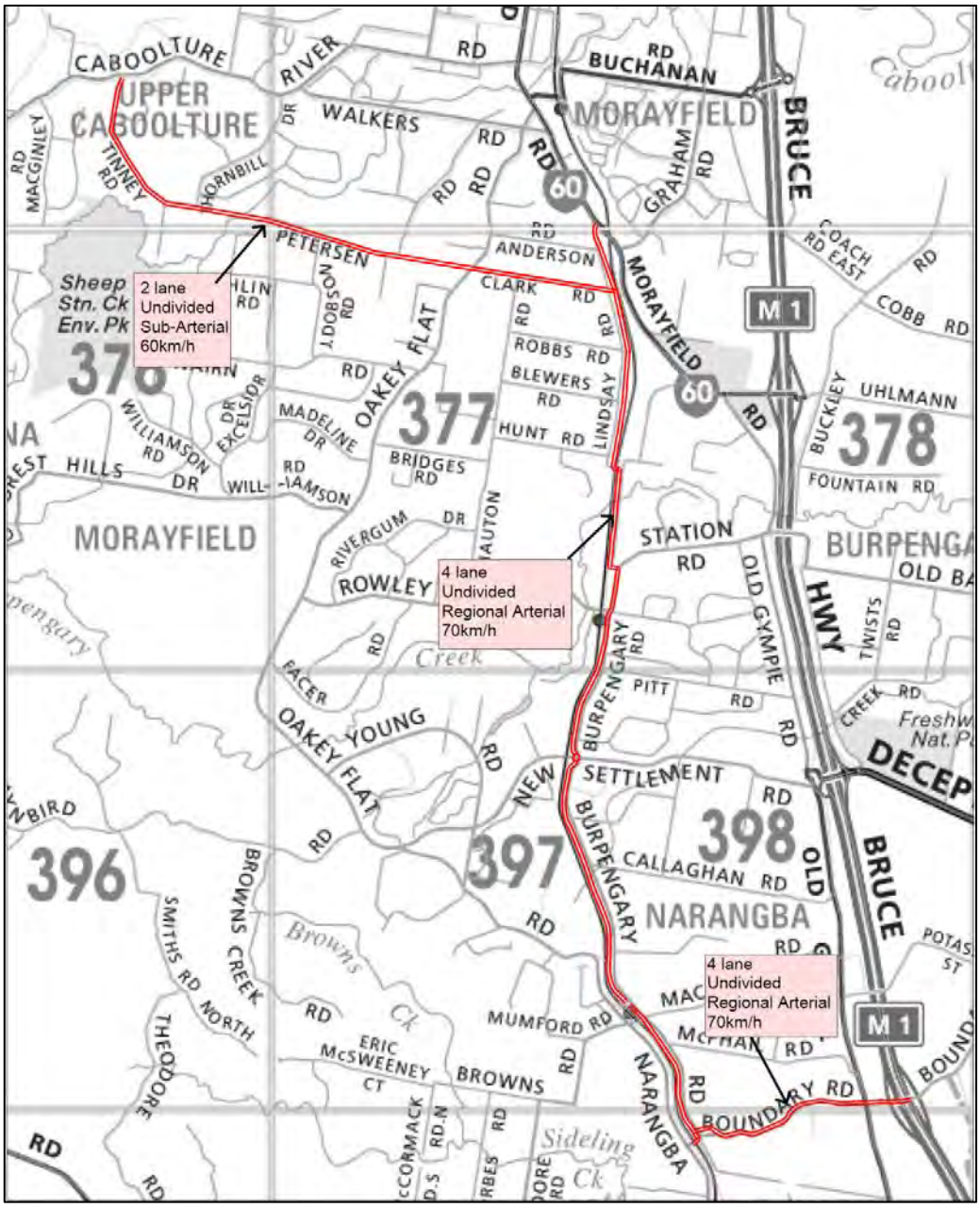

Figure 7 Assumed West Moreton Corridor

3.6.5 Public Transport

The planning for Caboolture West was centred on providing good public transport connections locally, to Caboolture and Morayfield and other regional centres. The transport modelling identified the need for strong public transport provision to service the Caboolture town centre and the Railway Station. The preliminary assessment identified that providing a dedicated rapid transit corridor to connect the Caboolture West town centre to the Caboolture town centre would provide significant patronage uplift compared to on-road systems. The modelling did not assess the relative merits of alternative modes for rapid transit. The assumption for the purposes of the analysis was that the rapid transit corridor would be a segregated bus corridor known as C-Bahn as shown in **Figure 8**. The C-Bahn would accommodate three trunk services that would provide convenient access to

the neighbourhood centres. A further extension from the Caboolture Railway Station to Morayfield was also assumed. This is shown in the figure below as an on-road connection along Morayfield Road, though there are a number of alternatives that could be provided which would need further investigation in the future.

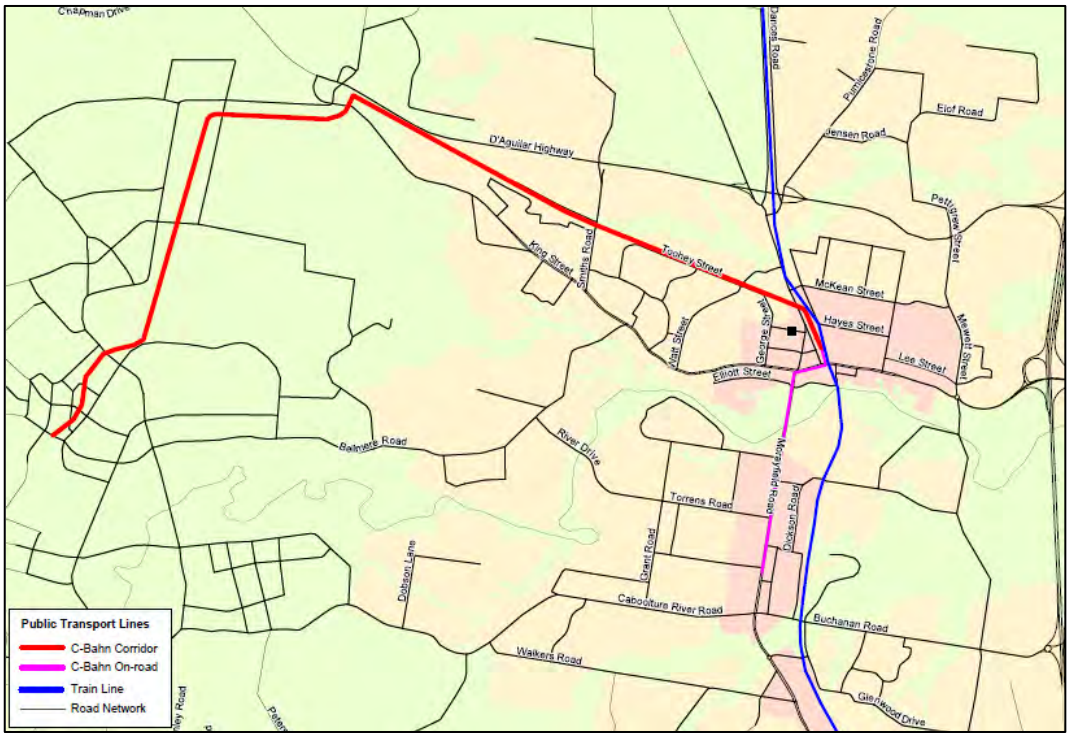

Figure 8 C-Bahn corridor

Within Caboolture West, two levels of C-Bahn services were assumed:

- Three through routes would collect passengers in Caboolture West and continue directly onto the C-Bahn. These would be at 7.5 minute headways during peak periods, providing services on the C-Bahn at 2.5 minute average headways.
- Several additional feeder services would collect passengers throughout Caboolture West, connecting to the C-Bahn at the town centre. Passengers would then need to transfer to travel further, but the high frequency of through service on the C-Bahn means the transfer penalty would be minimised.

The public transport network modelled is highlighted in the figures below. Individual service lines are shown in different colours **Figure 9** and the service frequencies are shown in **Figure 10**. The network included additional route refinements in the areas surrounding Caboolture West to service Caboolture West and other local growth areas. The public transport route refinements are discussed in further detail in Appendix C.

The assumed bus services to Caboolture West would extend current or proposed local services from Caboolture and Morayfield into Caboolture West. The transport analysis indicated the importance of maintaining strong linkages between Morayfield and Caboolture West as well as providing rapid transit to the Caboolture town centre.

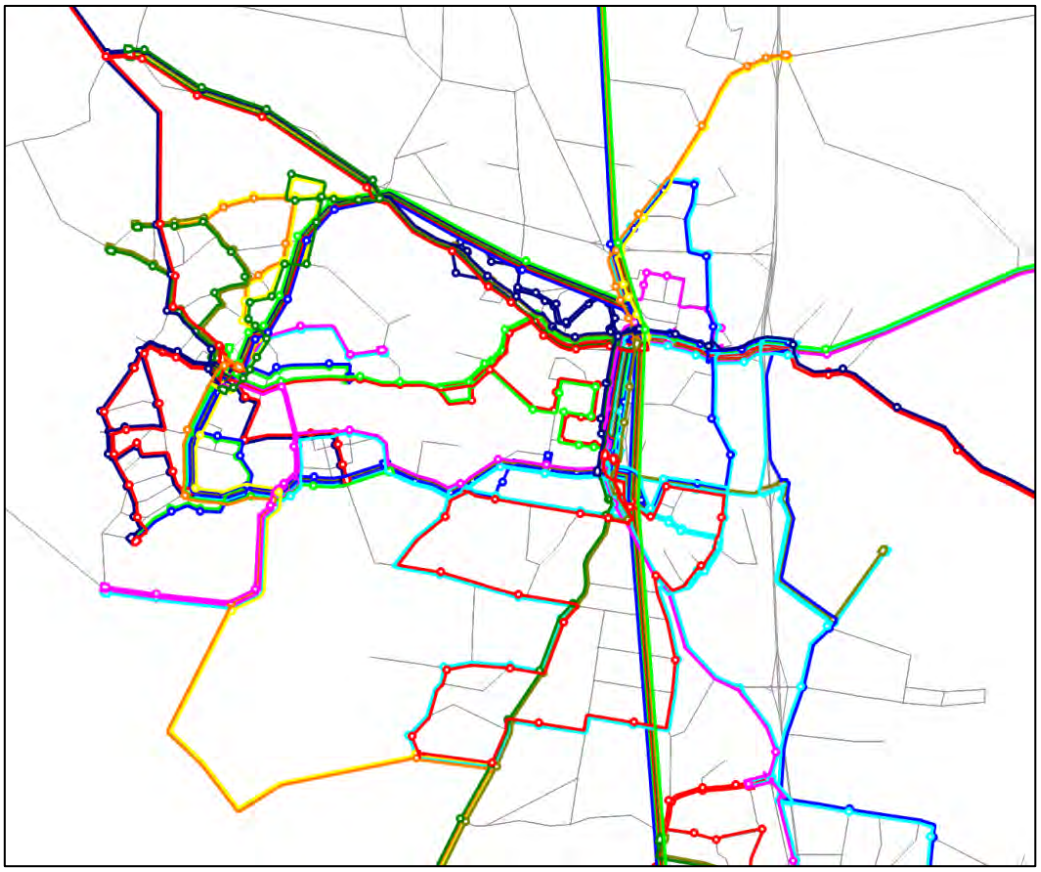

Figure 9 Proposed public transport network and services (2031)

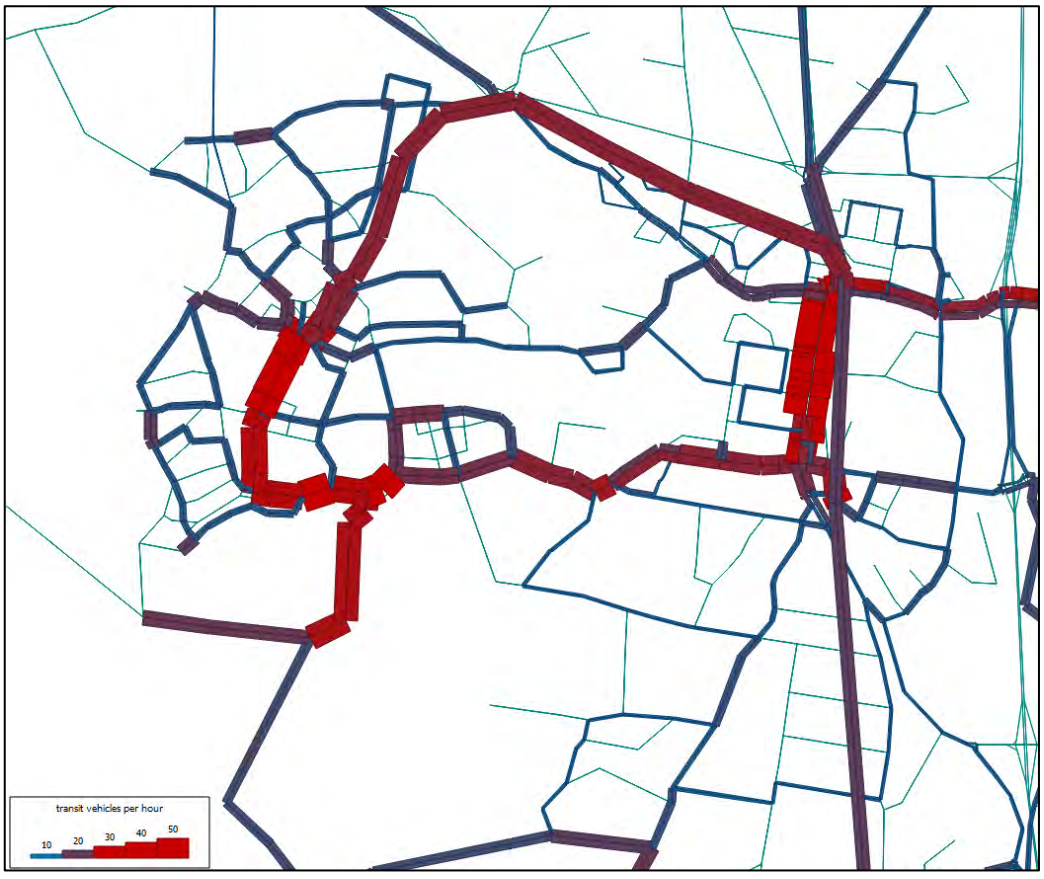

Figure 10 Modelled public transport frequency, AM Peak Hour 2031

4 Ultimate Scenario Assessment

4.1 Introduction

This section outlines the predicted travel demand characteristics as forecast using the MBRSTM for the ultimate Caboolture West development based on the assumptions outlined in Section 3.

4.2 Travel demand

A summary of the forecast daily trip making characteristics of Caboolture West is outlined in **Table 5** showing the MPA is forecast to generate over 218,000 trips during a typical weekday. The high provision of public transport, including C-Bahn, is forecast to result in a relatively high public transport mode split of 12.9% over the day.

Table 5 Trip generation by trip persons

Travel Mode	Daily Trips	Mode Split
Private vehicle	163,277	74.8%
Public transport	28,075	12.9%
Active transport (walking, cycling)	26,804	12.3%
Total	**218,156**	**100%**

Travel demand in the MBRSTM is disaggregated into eight trip purposes with the proportion of daily travel from Caboolture West outlined in **Table 6**. The majority of trips are categorised as “other non-home based” trips, this category is associated with trips that are not connected with a home based journey, such as a work to retail trip.

Table 6: Trips by trip purpose (daily trips)

Purpose	Proportion
Other Non-home-based	25%
Home-based Work (white-collar)	20%
Home-based Other	18%
Home-based Education (Primary and Secondary)	15%
Home-based Shopping	15%
Home-based Work (blue-collar)	4%
Work- based work	2%
Home-based Education (Tertiary)	1%

Figure 11 outlines the forecast trip length profile of trips from Caboolture West for the AM Peak. The average trip length is predicted to be 12 km.

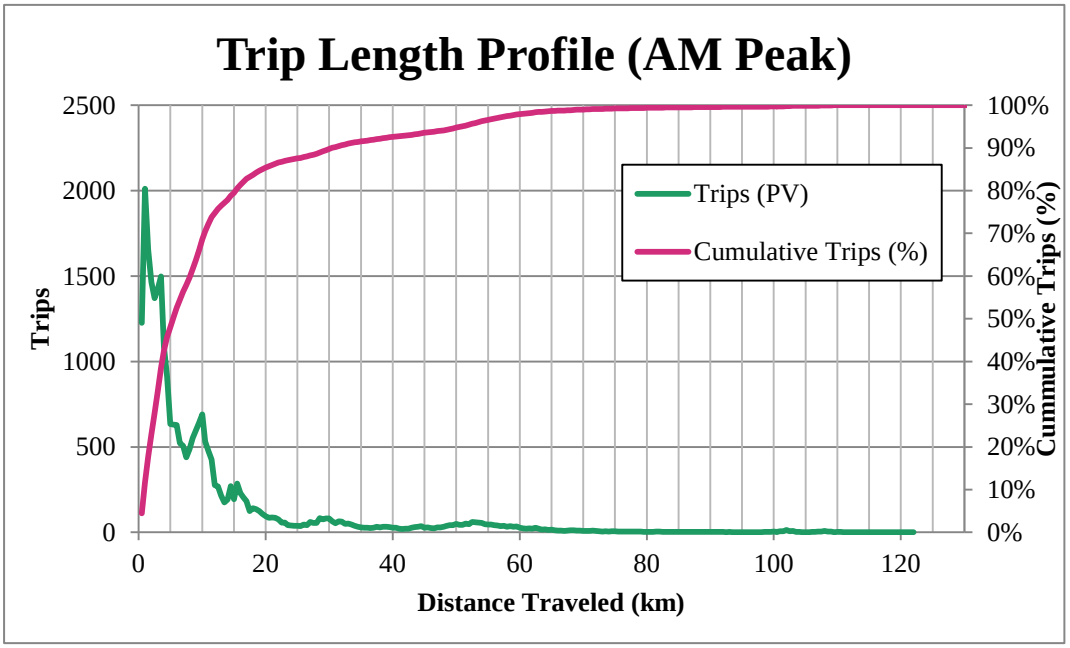

Figure 11: Trip length profile for vehicle trips from Caboolture West

4.3 Trip distribution

Analysis of the trips produced as part of the Caboolture West MPA showed that a large proportion of the trips are forecast to be contained within Caboolture West and Caboolture as reported in **Table 7** for all modes. The locality boundaries used in this analysis are shown in **Figure 12**.

The forecast containment of trips generated by the Caboolture West development within Caboolture West itself is 50% for all modes, whereas for trips contained in the wider Caboolture and Morayfield area this increases to 79%. The majority of trips from Caboolture West, 90%, are forecast to travel to localities within the Moreton Bay region. Of those that would travel to localities outside the region a significant proportion would use public transport (about 40%), reflecting the strong road connection between Moreton Bay and Brisbane.

Table 7 Proportion of Caboolture West trips contained within localities based on trip ends

Locality	Trips	PV	PT	Active	Total
Caboolture West	External	111,326	23,023	901	135,250
	Internal	101,024	10,272	26,342	137,638
	% internal	48%	31%	97%	50%
Inc. Caboolture	External	69,727	17,256	376	87,358
	Internal	142,624	16,039	26,868	185,530
	% internal	67%	48%	99%	68%
Inc. Morayfield	External	42,264	13,647	88	55,998
	Internal	170,087	19,648	27,156	216,890
	% internal	80%	59%	100%	79%
MBRC	External	16,569	11,118	3	27,690
	Internal	195,781	22,176	27,240	245,198
	% internal	92%	67%	100%	90%

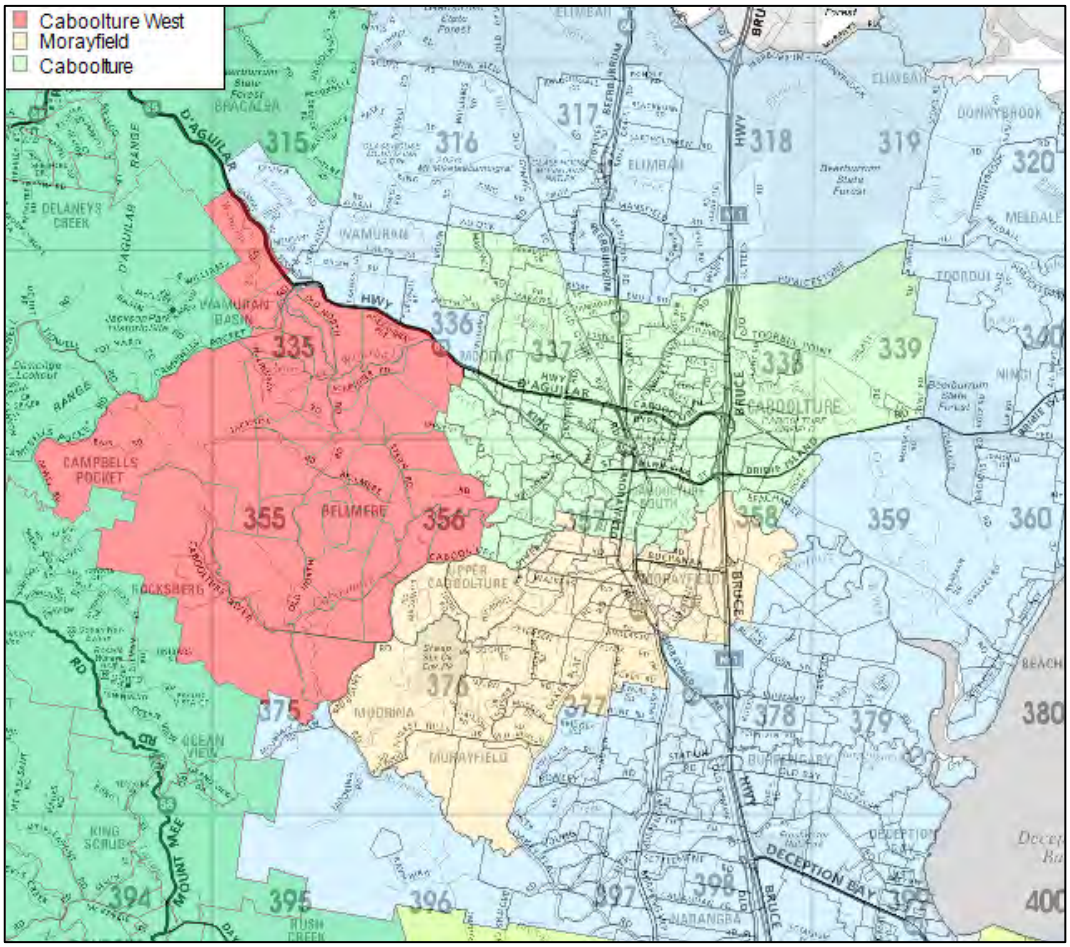

Figure 12: Locality definitions for containment analysis

The distribution of traffic from Caboolture West is shown in **Figure 13**. It shows that the a high proportion (81%) of trips would travel to destinations locally within the Caboolture/ Morayfield area and only 10% of trips travelling to the Brisbane area and the remainder would be distributed North, East and West.

The assigned distribution of traffic from Caboolture West is shown in **Figure 14** for the AM Peak. It shows that the majority of vehicle trips from Caboolture West would travel east towards Caboolture onto Morayfield Road to destinations in Morayfield and to access the Bruce Highway to travel south. There were a large number of trips terminating at the Burpengary Park n' Ride train station as can be observed by the sudden drop along Lindsay Road

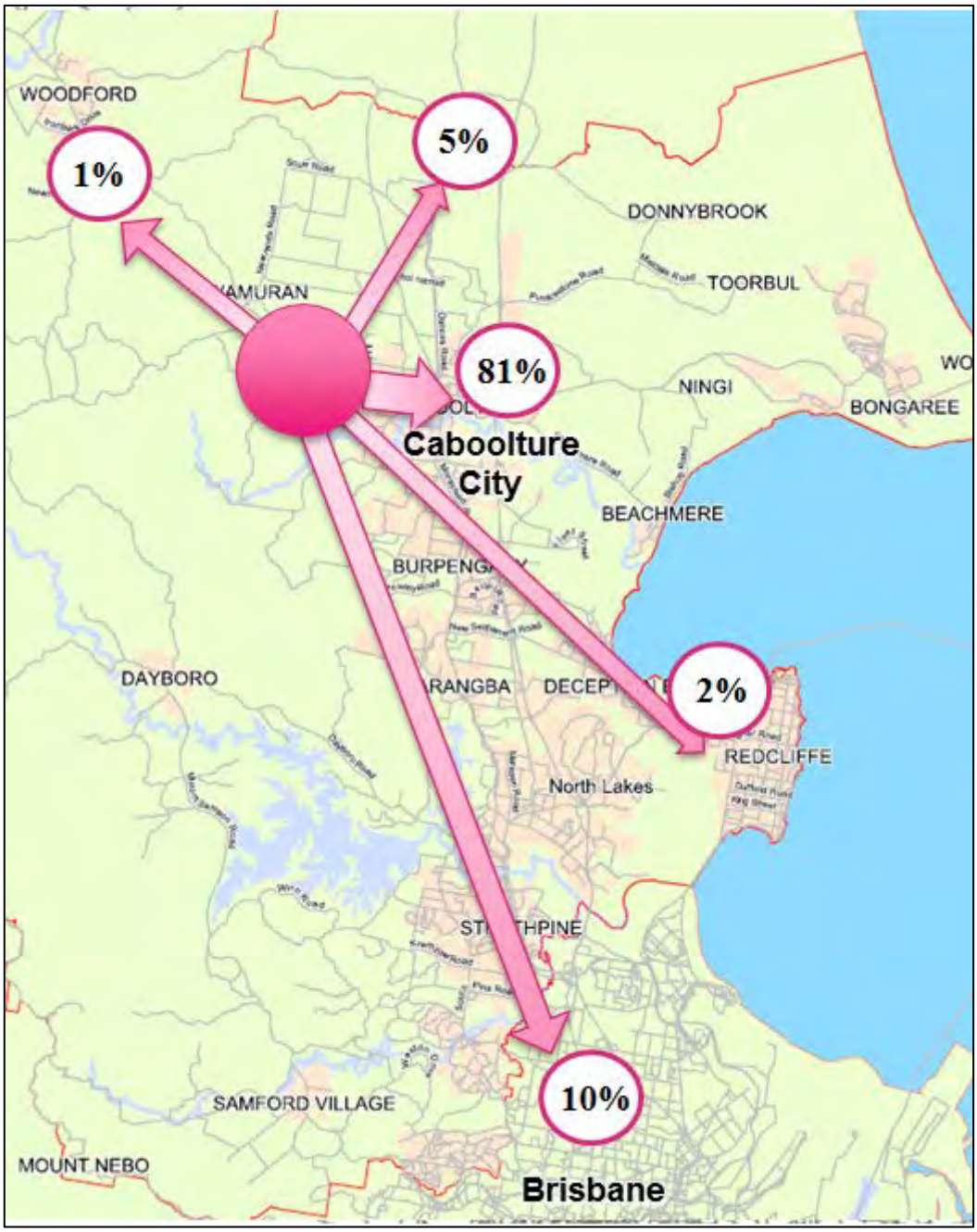

Figure 13 Forecast vehicle trip distribution from Caboolture West 2031

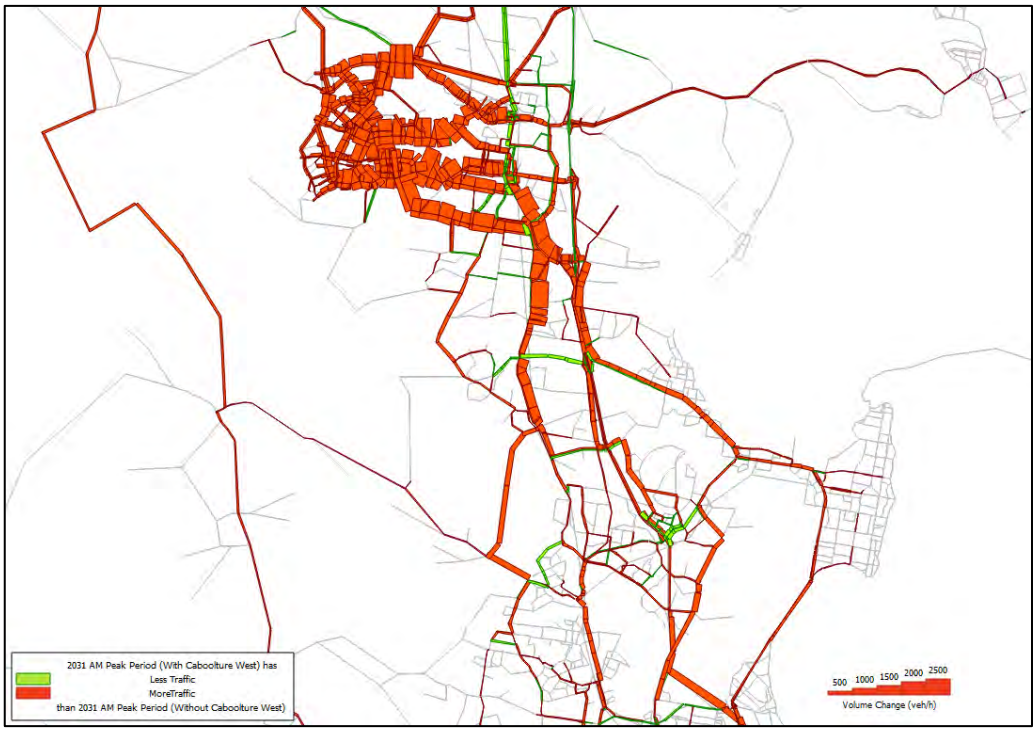

Figure 14 Assigned vehicle trip distribution from Caboolture West (AM Peak)

4.4 Mode split

Table 8 shows the mode share as predicted by 2031 MBRSTM for the entire model and separately for Caboolture West. It can be seen that the model forecasts a high mode share for public and active transport in Caboolture West. It also shows that the forecast mode share for Caboolture West exceeds MBRC's current policy target for public transport. This reflects that a high level of public transport service is assumed to Caboolture West in 2031, including rapid transit that can compete with car travel times.

Table 8 Mode share based on region of origin

Area	Private Vehicle	Public Transport	Active Transport
Moreton Bay Region	82.8%	9.3%	8.0%
Caboolture West	74.5%	13.0%	12.5%
MBRC Policy Targets	75.6%	10.8%	13.6%

4.5 Public transport

The forecast public transport volumes and volume to capacity ratios are shown in **Figure 15** and **Figure 16** respectively for the morning and evening peak period. The bandwidths in the plots represent the relative magnitude of trips whilst the colours denote the volume and capacity (V/C) ratios as per **Table 9**. The plot

indicates that there was a high demand for the C-Bahn service between Caboolture West and Caboolture. It also illustrates that the wider public transport network was underutilised and there is spare capacity.

Table 9: PT volume to capacity ratio colour scale

Colour	V/C Range
Green	< 0.50
Yellow	0.50 – 0.75
Orange	0.75 - 0.85
Light red	0.85 – 1.00
Dark red	> 1.00

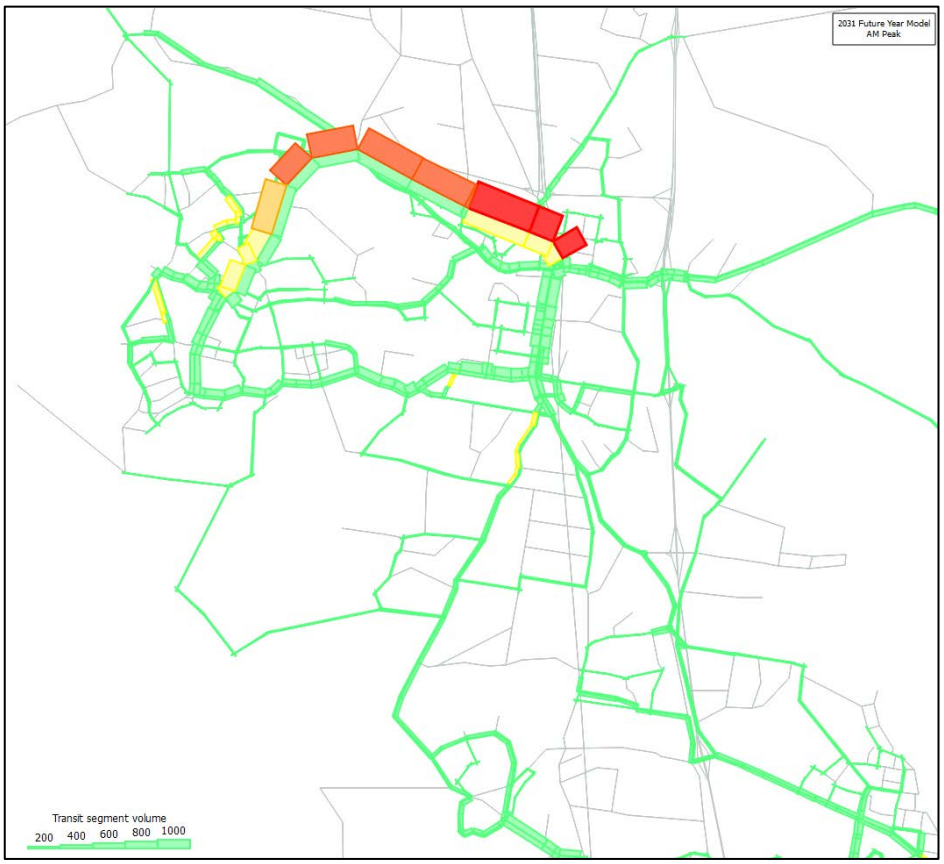

Figure 15: PT volume and volume to capacity ratios, AM peak (excluding rail)

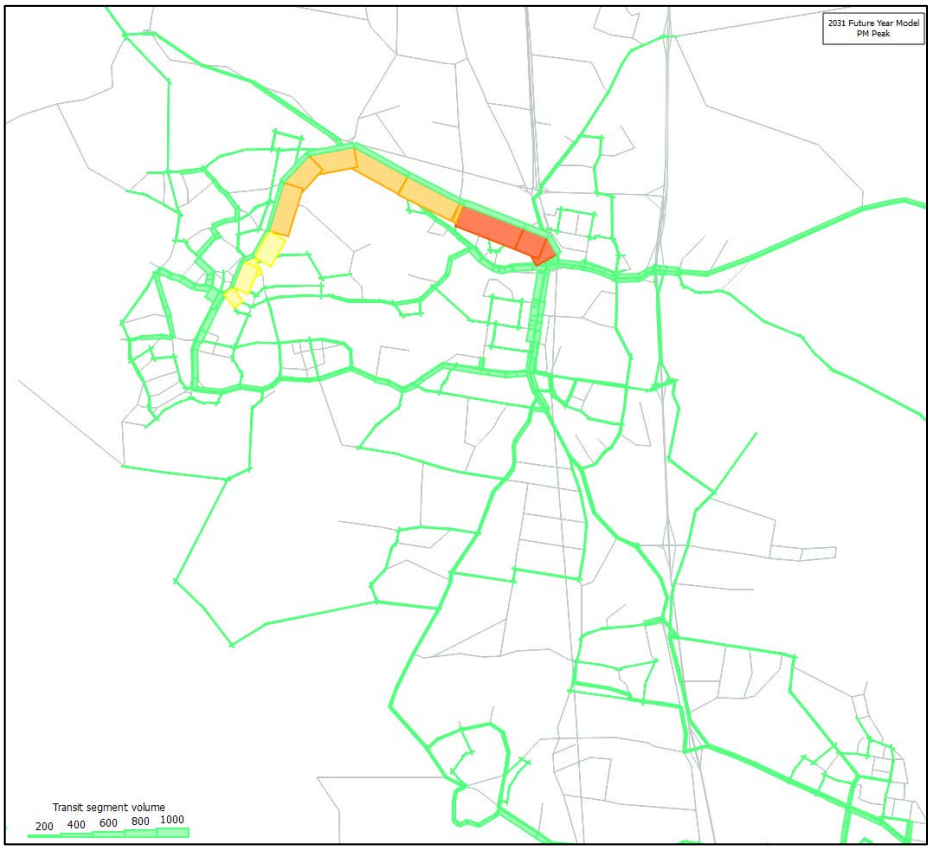

Figure 16: PT volume and volume to capacity ratios, PM peak (excluding rail)

4.6 Traffic impact

The forecast impact of the Caboolture West MPA on the assumed 2031 road network is not surprisingly significant given that the development is forecast to generate 163,000 vehicle trips on a typical weekday. The impact would be minimised by the high provision of public transport and active modes and the relatively high level of trip containment forecast. **Figure 17** and **Figure 18** show the impact of the traffic generated by the full development of Caboolture West development on the external road network in 2031 for the morning peak period and across the day respectively. Whilst it should be noted that the full development of Caboolture West is not likely to be realised until 2061, it shows some interesting trends:

- Strong demand to the north increasing traffic volumes on both King Street and the D'Aguilar Highway;
- Strong demand will increase traffic volumes on Bellmere Road to access Caboolture town centre;
- High demand on the various routes including Caboolture River Road to access Morayfield;
- Strong demand south to Burpengary via a new southern connection along Petersen Road to access the park and ride facility (noting limited forecast spaces available at Caboolture Town Centre and Morayfield); and

- The model indicated that Grant Road could be used as to access Morayfield Road from River Drive and Torrens Road.

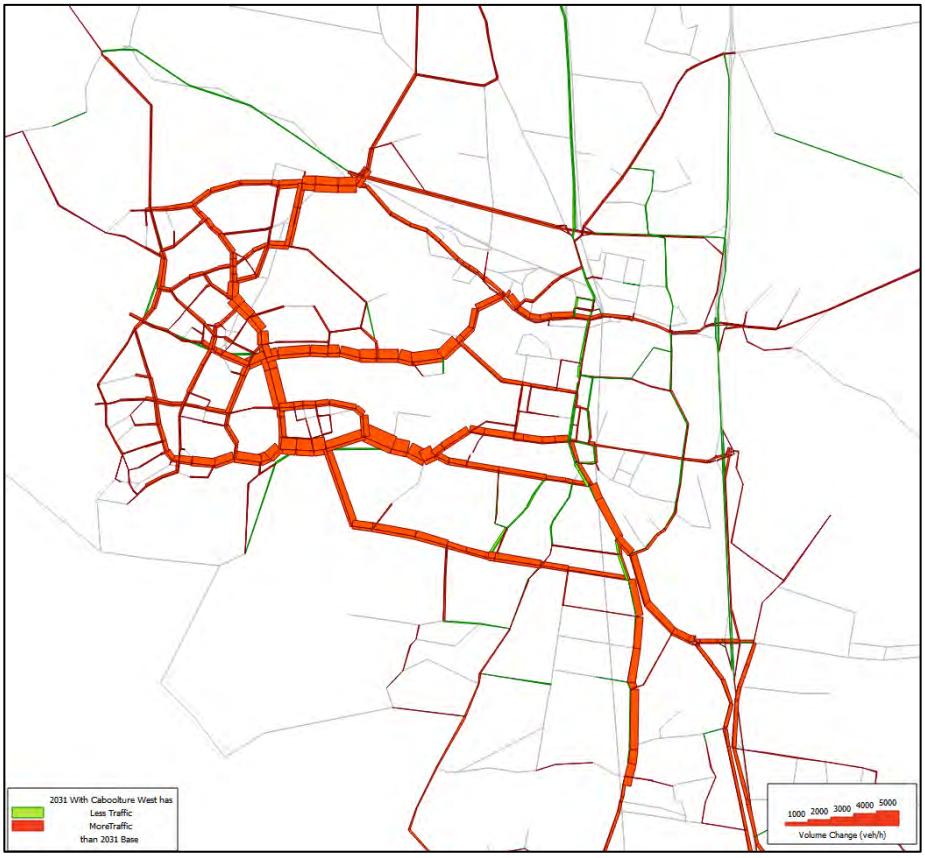

Figure 17: Difference Plot With and Without Caboolture West - AM Peak 2031

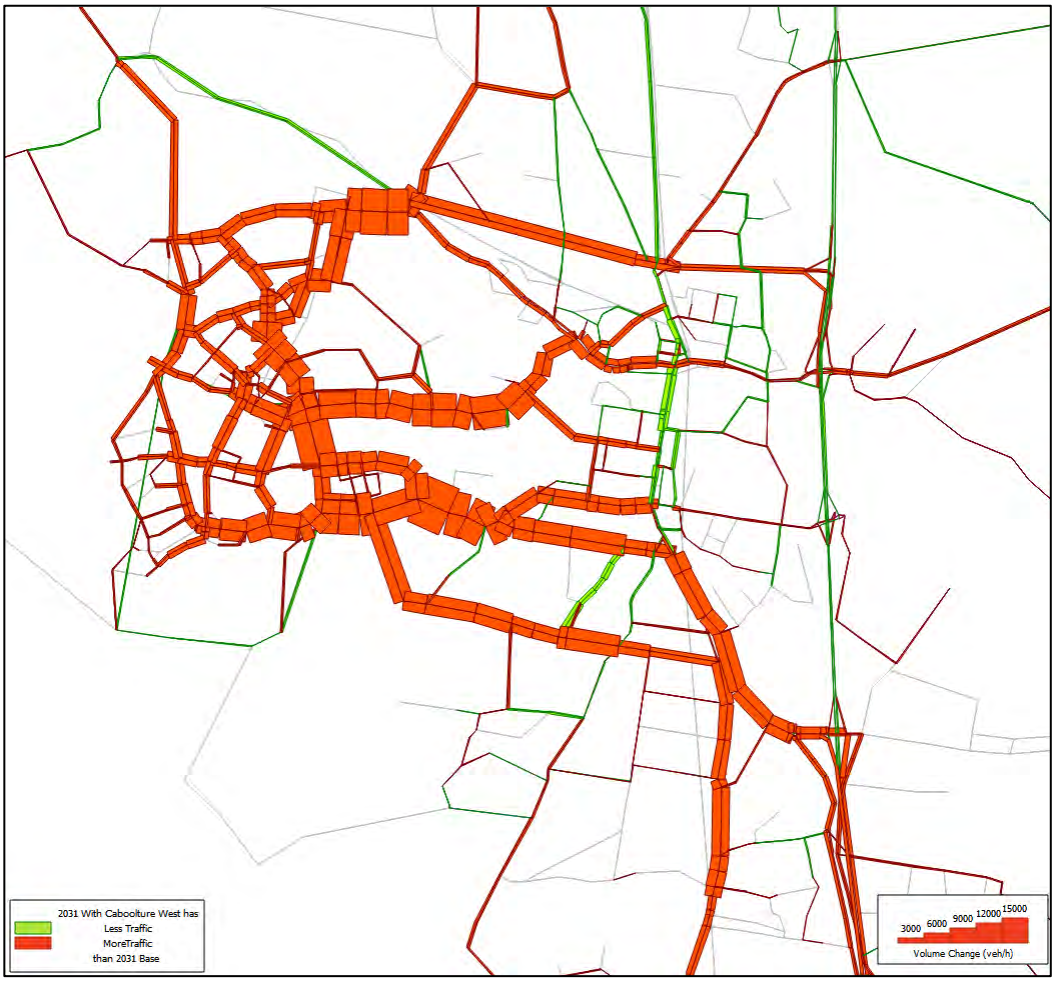

Figure 18: 4 Difference Plot With and Without Caboolture West – Daily Volumes

Plots of the forecast traffic volumes and volume to capacity (V/C) ratios for the AM peak periods modelled are given in **Figure 19** and **Figure 22** without and with the Caboolture West development respectively. **Figure 21** and **Figure 22** show the traffic volumes and volume to capacity ratio for the road network for the PM Peak period without and with the Caboolture West development respectively.

As for the public transport volumes and V/C ratio plots presented in Section 4.1, the bandwidths in the plots represent the relative magnitude of trips whilst the colours denote the V/C ratios as per **Table 9**. The light red indicates roads approaching or at congestion and the dark red indicates severe congestion. In both the AM peak and PM peak periods increased congestion is forecast on key roads in Caboolture such as Morayfield Road, Oakley Flat Road and the D'Aguilar Highway due to background growth to 2031. Of particular note is that the Bruce Highway is forecast to operate with a V/C ratio over 1 on both directions.

These figures show that the Caboolture West MPA would increase traffic levels and congestion on key arterials particularly on key access roads to Caboolture West. However the identified external road improvements generally result in adequate capacity on key routes to accommodate the additional traffic flows, noting that some locations are forecast to be quite congested in the base case scenario.

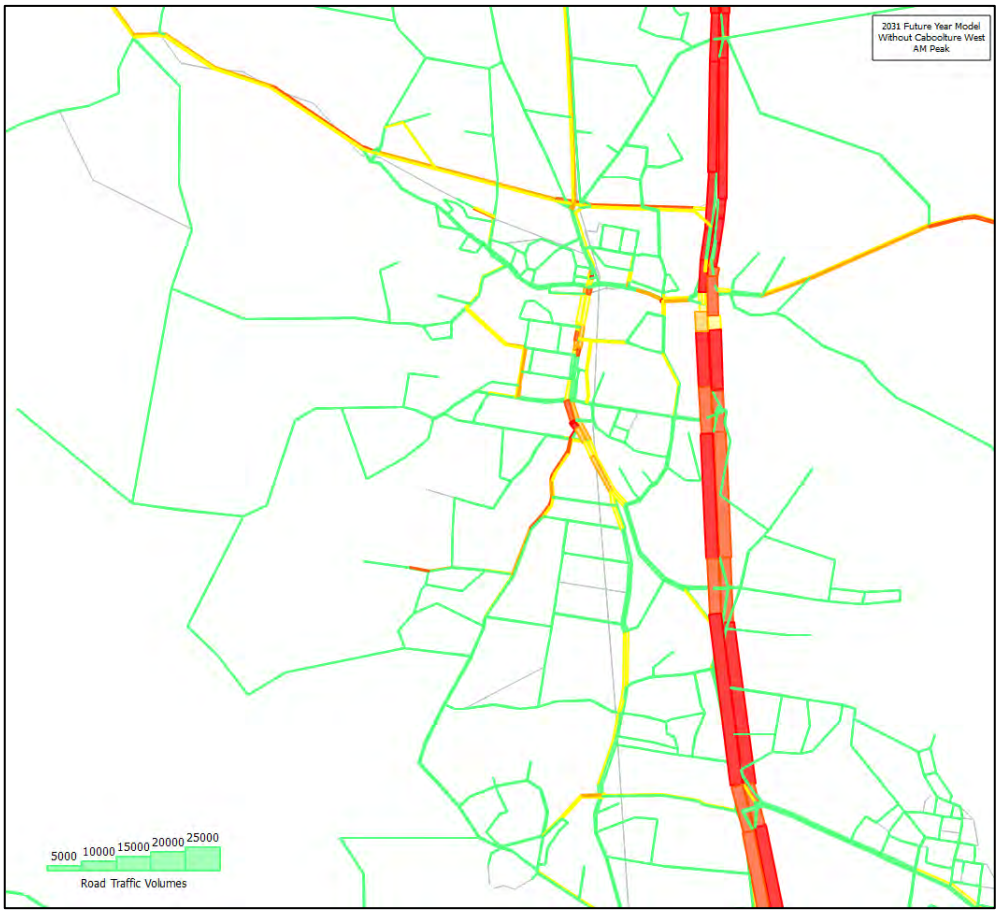

Figure 19: Traffic volume and v/c ratio base case 2031 AM Peak

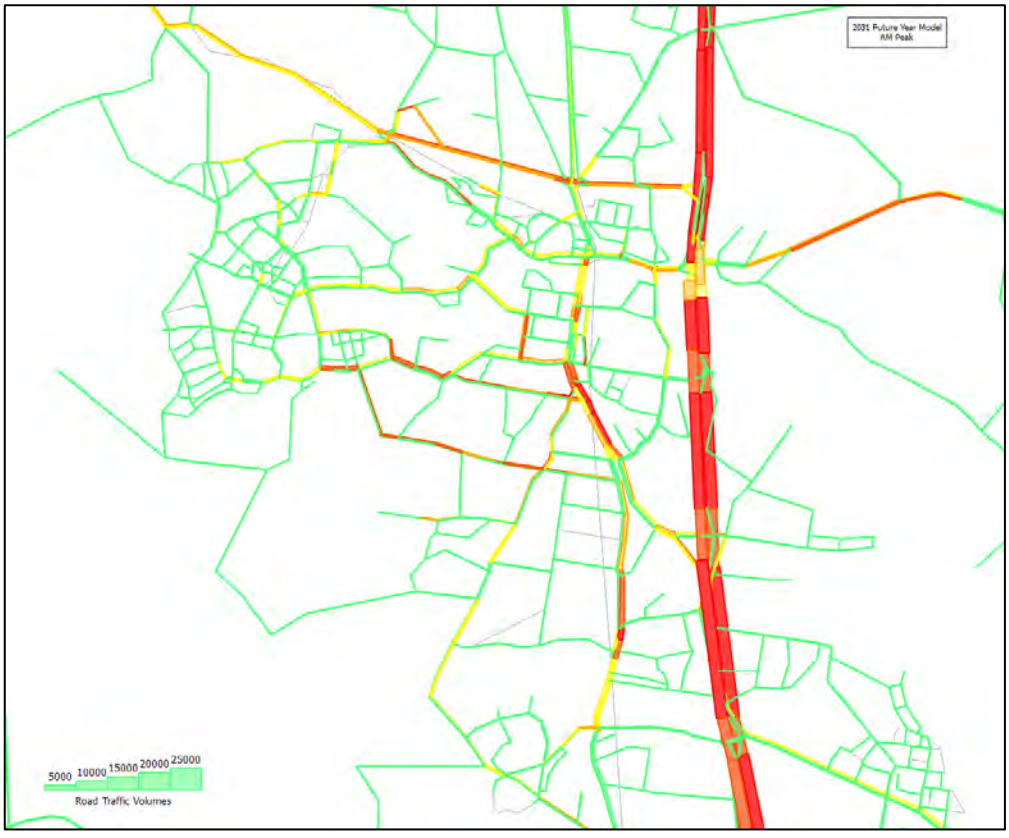

Figure 20: Traffic volume and v/c ratios, with Caboolture West 2031 AM peak

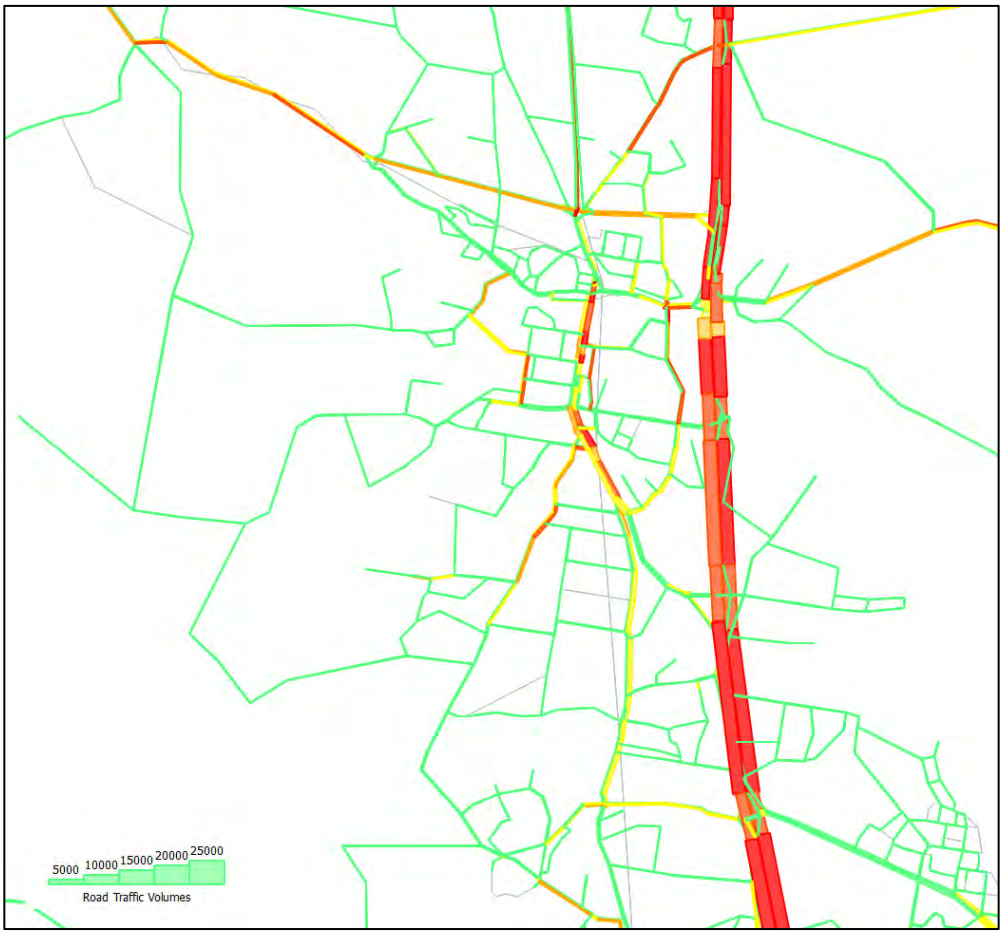

Figure 21: Traffic volume and v/c ratio, base case, 2031 PM Peak

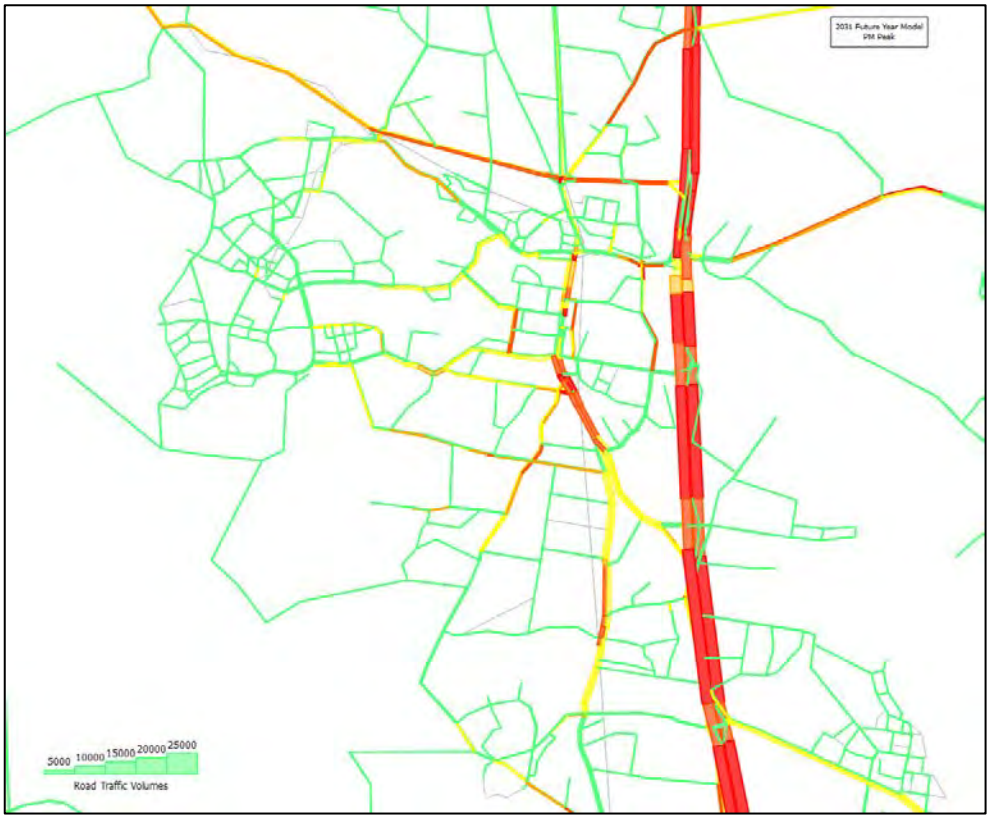

Figure 22: Traffic volume and v/c ratio, with Caboolture West, 2031 PM peak

A plot of the travel speeds around Caboolture for the AM peak period is given in **Figure 23**. The image shows a significant reduction in travel speed surrounding the town centres with auto speeds around 20 km/hr. The connections between Caboolture West and Caboolture also show some strain with travel speeds around 40 km/hr. The PM Peak period displays similar travel speed characteristics.

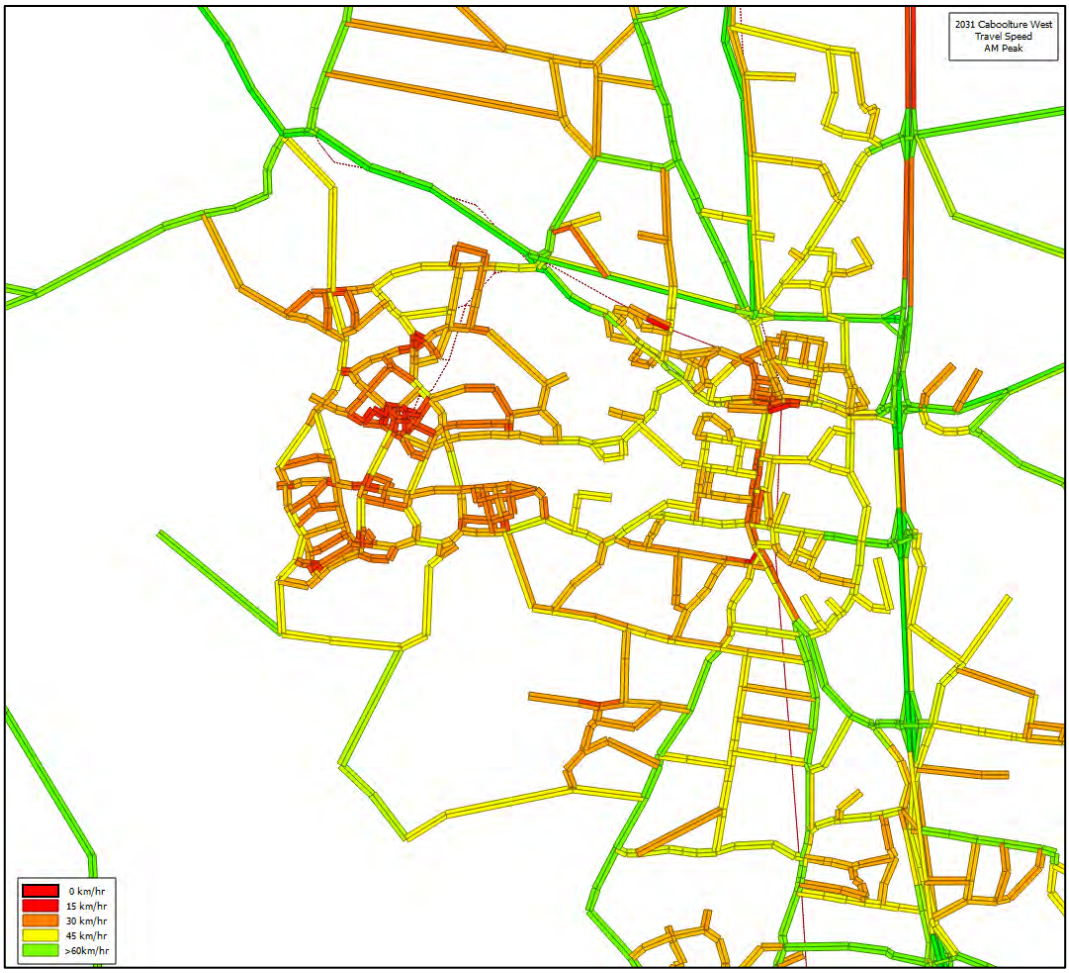

Figure 23 Travel speeds, AM Peak

5 Intersection improvements

5.1 Approach

This section summarises the approach to assess the intersection upgrade requirements to accommodate the traffic demand generated by the Caboolture West MPA.

5.2 Desired Standard of Service

The capacity of the road network has been assessed using desired standards of service defined within MBRC's new draft planning scheme. It aligns with MBRC's recent Transport and Corridor Network Strategy. A Desired Standard of Service (DSS) has been defined separately for each place type using place type groupings as summarised below.

- Place Type Grouping 1: activity centres;
- Place Type Grouping 2: urban neighbourhoods, next generation suburban neighbourhoods, suburban neighbourhoods, enterprise employment areas, rural townships, coastal villages; and
- Place Type Grouping 3: rural residential, rural areas.

It should be noted that the suburban neighbourhoods place type is grouped in Place Type Group 3.

The DSS was based on an upper limit level of service, defined using degree of saturation (DOS), applicable during peak travel periods. This was defined for each place type grouping shown in **Table 10**.

Table 10: Desired standard of service for road capacity

		Place Type Grouping		
		1	2	3
Desired Standard of Service (Level of Service)		D/E	D	C
Intersection DOS	Signalised	0.95	0.95	0.90
	Roundabout	0.95	0.95	0.85
	Priority	0.90	0.90	0.80

The DSS recognises the different expectations for acceptable peak period traffic conditions across the different place types. For example, in built-up areas such activity centres, a lower level of service is tolerated compared to rural areas.

Council has adopted level of service definitions for the DSS that are generally lower in activity centres and urban areas than has been used in the previous PIPs for Caboolture, Pine Rivers and Redcliffe. This aligns with Council's objectives for creating more sustainable transport outcomes such as an increased mode share of walking, cycling and public transport.

5.2.1 Deficiency Identification Process

The intersection deficiencies and improvements were determined using SIDRA analysis, using peak hour traffic volumes predicted by the strategic model. An intersection was identified as being deficient if the degree of saturation of any movement exceeded the thresholds shown in **Table 10** and if more than 10% of the traffic was attributed to Caboolture West.

As the MBRSTM is a strategic model that does not explicitly model intersection delay or capacity, a process to 'flag' potentially deficient intersections using the model output was used to select candidate intersection for analysis in SIDRA.

The process to select intersections for SIDRA analysis used the modelled mid-block link capacity parameter to calculate a volume to capacity ratio (v/c) of the approaches (links) to intersections. Intersections were then selected for SIDRA analysis if:

- 1 leg exceeded a v/c of 0.8; or
- 2 legs exceeded a v/c of 0.64; or
- 3 legs exceeded a v/c of 0.48.

The results of the selection process are shown in Appendix D showing the intersections that were selected and those that were subsequently identified as being deficient.

The determination of the upgrade requirements follows the process detailed in **Figure 24**.

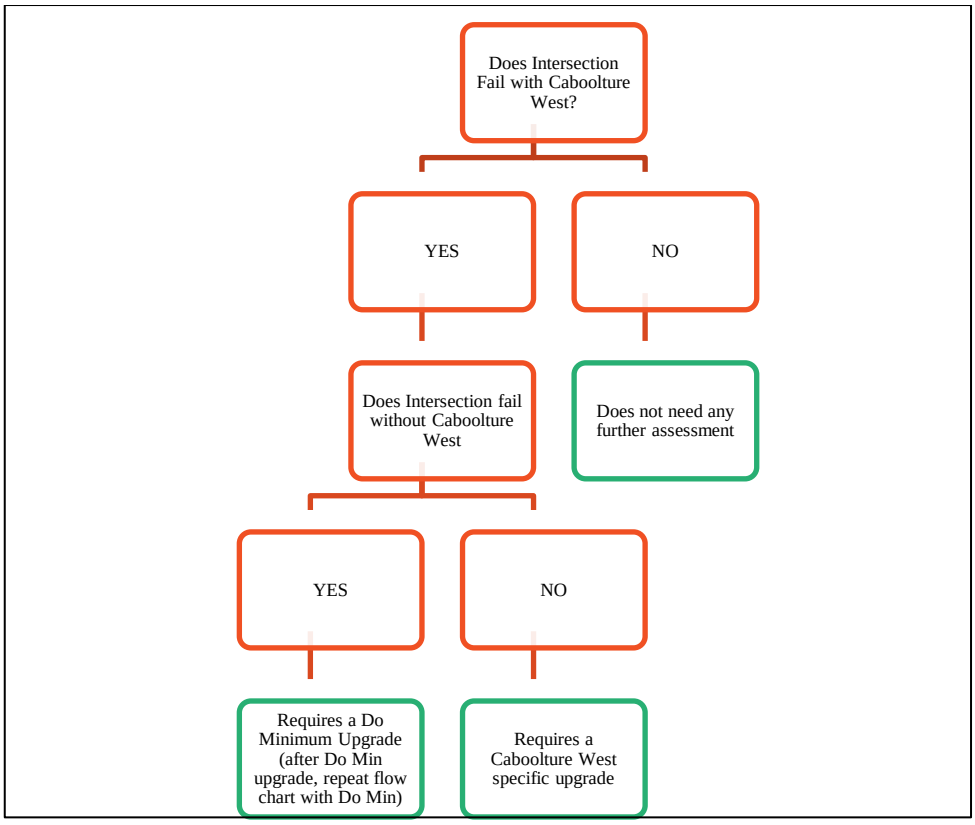

Figure 24 SIDRA assessment steps

5.3 Deficiencies and Solutions

The MBRSTM identified a number of intersections as potentially being deficient as illustrated in **Figure 25**. This list was then evaluated using SIDRA resulting in the identification of 34 intersections that would not meet the level of service criteria in 2031 with Caboolture West, as shown in **Figure 26**. This provided the basis for costing the external road network upgrades.

The deficiency analysis identified several intersections, such as Morayfield Road/Caboolture River Road and Morayfield/Walkers Road intersections that would require significant upgrades by 2031 without Caboolture West. The impact of additional traffic from Caboolture West may require consideration of further capacity improvements including grade separation or lane management which would have wider implications and require a more comprehensive and holistic assessment. Such major upgrades are considered outside the scope of the deficiency analysis and have not been costed.

The analysis and proposed intersection layouts of the candidate intersections are outlined in detail in Appendix D.

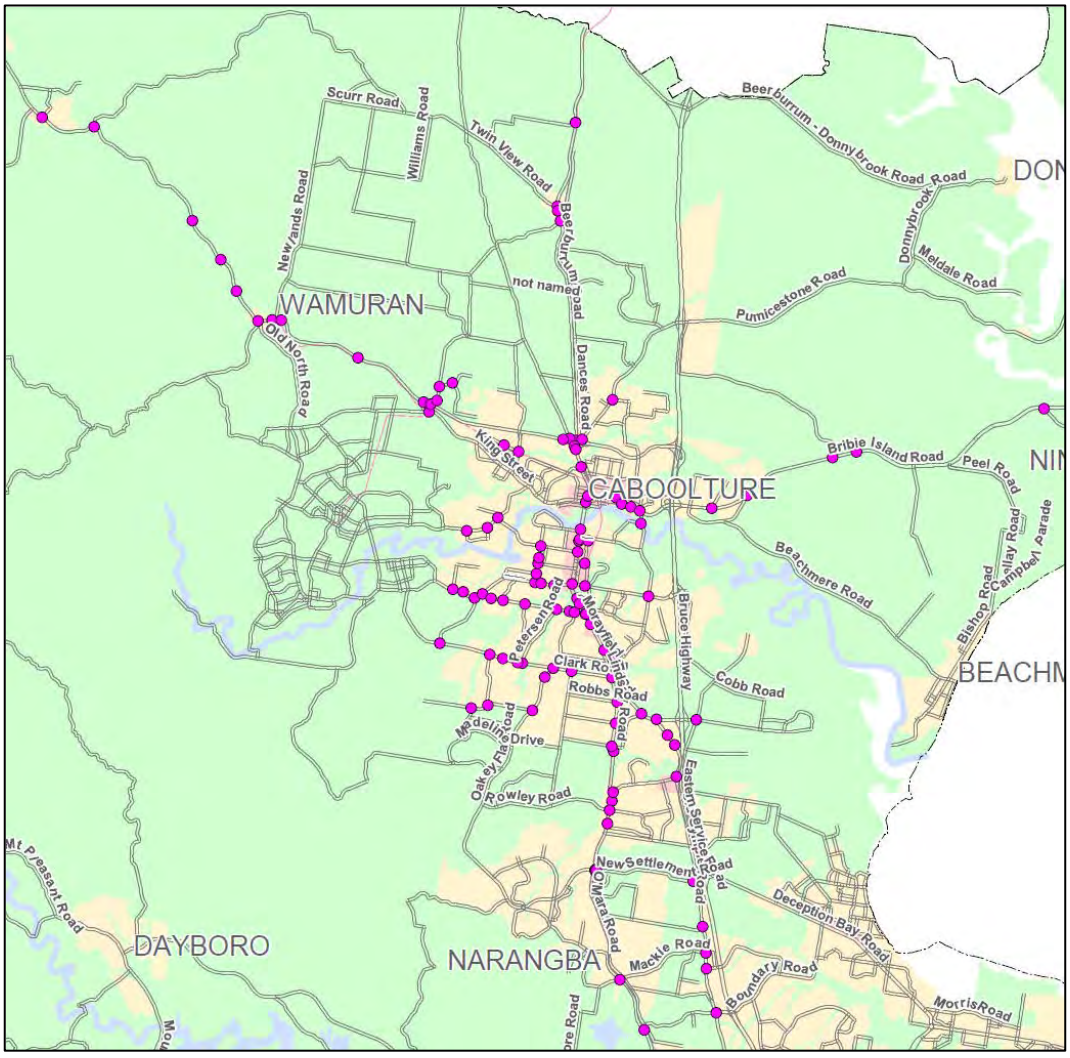

Figure 25 Intersections flagged for assessment

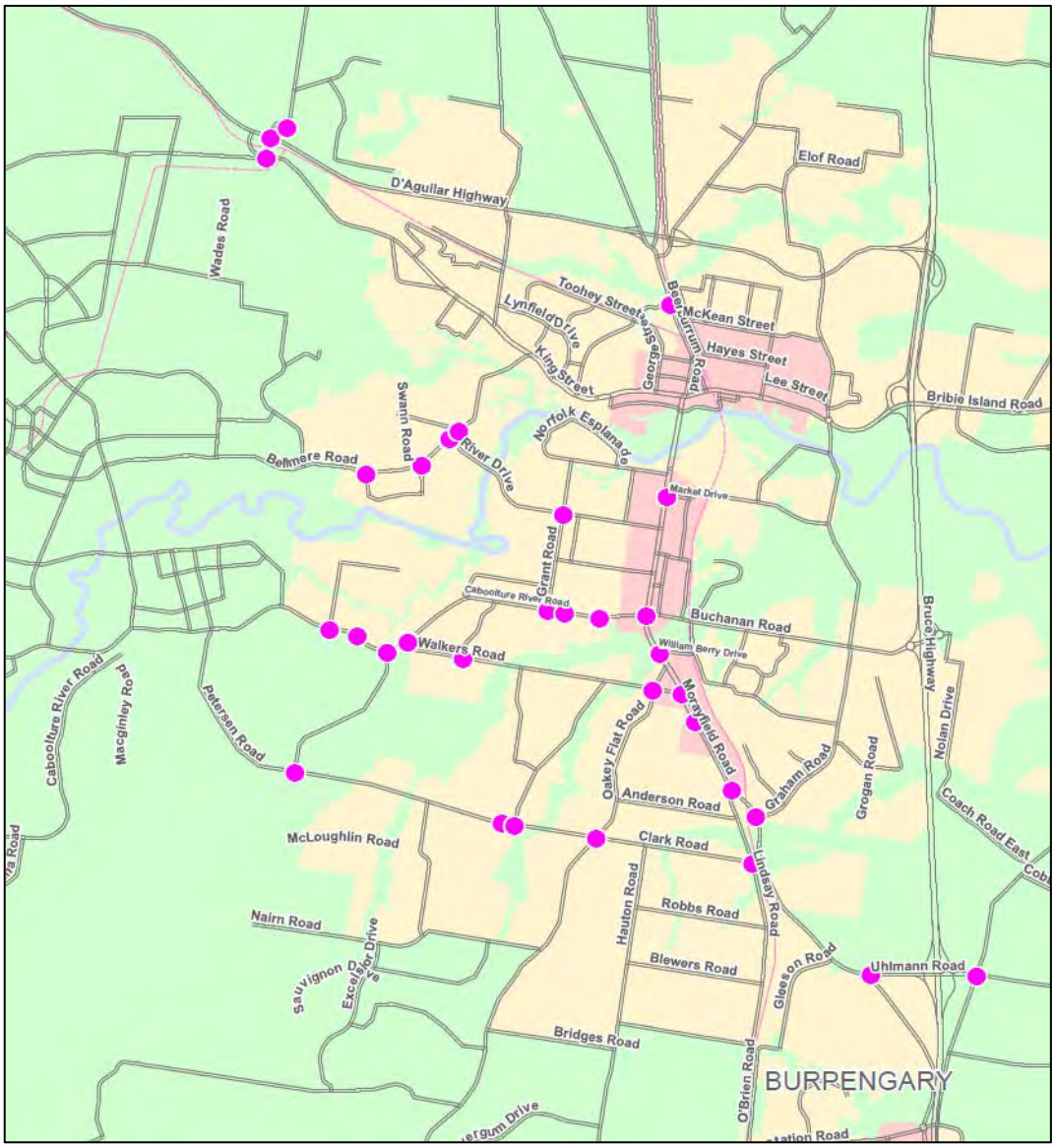

Figure 26: Intersections requiring upgrade due to Caboolture West MPA

6 Staging Assessment

6.1 Approach

The approach to assess the staging requirements of road upgrades involved the following steps:

- MBRC identified the assumed development levels of Caboolture West at 5 year intervals to ultimate build out at 2056;
- An MBRSTM model run was undertaken for each 5 year Caboolture West development interval using the 2031 base demand to estimate traffic volumes on the internal and external road networks;
- SIDRA analysis for each 5 year interval was undertaken on the intersections identified as requiring upgrades as outlined in Section 5; and
- The deficiency identification process was used to identify upgrade requirements at each year for mid-block and intersection upgrades.

6.2 Assumptions

6.2.1 Land use

The development assumptions for Caboolture West are outlined in **Table 11** in 5 year intervals to 2056.

Table 11: Development and Trip Generation Assumptions

	Population	Dwellings	Enrolment	Jobs	Mode Share			
					Trip Gen (total)	PV	PT	Active
2016	8%	8%	7%	4%	11,584	75%	13%	12%
2021	19%	18%	33%	11%	30,197	76%	10%	14%
2026	37%	36%	41%	17%	73,313	78%	10%	12%
2031	56%	55%	47%	26%	108,810	75%	14%	11%
2036	70%	70%	51%	55%	139,001	72%	16%	12%
2041	85%	86%	87%	77%	181,388	74%	13%	13%
2046	94%	94%	93%	87%	198,424	74%	13%	13%
2051	100%	100%	100%	97%	-	-	-	-
2056	100%	100%	100%	100%	218,196	75%	13%	12%

As shown in **Figure 27**, Caboolture West is expected to experience steady growth in the population and number of dwellings, whilst the highest rate of increase in jobs and enrolments is expected to occur around 2031 and 2036 respectively.

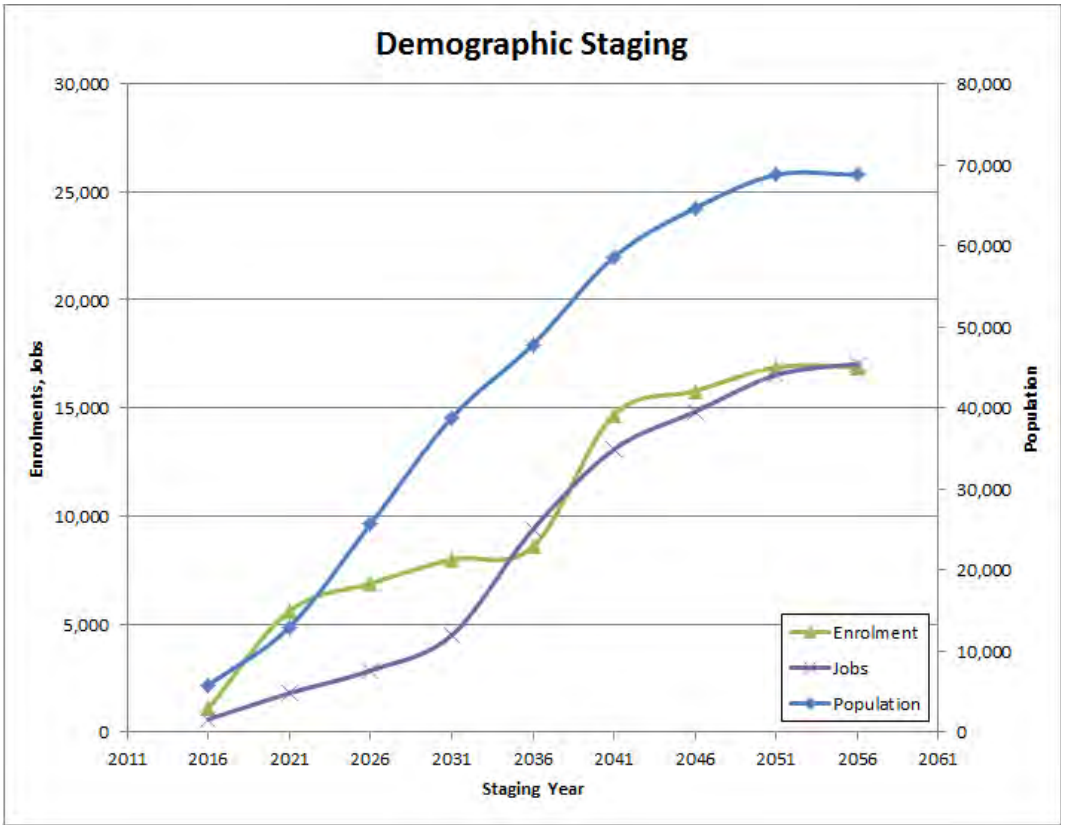

Figure 27: Demographic data for staging years

The key assumptions for the staging analysis are summarised as follows:

- All deficiency analysis has been based on a 2031 background model. Therefore staging could change if background traffic and assumptions are changed to be year specific (i.e. 2016, 2021 etc.);
- The 2031 network includes 4 laning of Buchanan Road with an overpass of the rail line. This has not been costed and is assumed as a "background" improvement;
- The 2031 network includes 4 laning of the Lindsay Road-O'Brien Road-Burpengary Road as a proxy for the Moreton West Corridor. This has not been costed and is assumed as a "background" improvement;
- C-Bahn and the North–South Arterial Road were not included until 2036 when the central section of Caboolture West including the town centre is developed; and
- Intersection upgrades were identified by determining the level of upgrade required in addition to "Do Minimum" (i.e. in addition to an upgrade that would be required without Caboolture West).

6.3 Strategic modelling results

Analysis of the Caboolture West was undertaken at for each development level at 5 year intervals using the MBRSTM 2031 model to provide traffic forecasts as a basis to assess the required road and intersection provision.

The key outcomes of the strategic analysis were:

- The staging of the development drives where traffic impacts occur. In particular the initial development to the south and east of the site tend to place pressure on Caboolture River Road and Bellmere Road to access Caboolture prior to the north south road and central development, including the town centre;
- In 2026 both Caboolture River Road and Bellmere Road start to show strain and in 2031 they are forecast to be over capacity. In 2036 when the Petersen Road connection is planned to be opened, this releases pressure on both roads
- The connection of the North–South Arterial to the D'Aguilar Highway (i.e. the Williams Road connection) reduces the impact on Bellmere Road in particular, with flows increasing due to the Town Centre and Enterprise Employment zone development.

Detailed strategic modelling results are contained in Appendix E.

6.4 Timing of road improvements

The identified intersection staging is detailed in **Figure 28**. It shows that Caboolture River Road and Morayfield Road will need to be upgraded early in the development, followed by Bellmere Road and the extension of Petersen Road. Increasing pressure will be placed on Caboolture River Road and Bellmere Road as the development progresses until Petersen Road is extended to Clark Road.

In summary the key outcomes of the analysis were as follows:

- The 4 laning of Caboolture River Road would be required by 2021 – this could perhaps be staged with the section west of Thornbill required by 2026.
- The 6 laning of Morayfield Road would be required by 2021 – it could be argued that this upgrade would be required regardless of Caboolture West, as there are a number of intersections that will require upgrading in the near term. Also, solutions could not be found for some intersections that would fully cater for forecast volumes (i.e. intersection reached maximum at-grade footprints). Further network or corridor studies would be required to determine a solution for Morayfield Road.
- The 4 laning of Bellmere Road would be required by 2026.
- The Petersen Rd connection and upgrade would be required by 2031 to relieve Caboolture River Road and Walkers Road.
- The Williams Road connection would be required by 2031.
- Upgrades to the D'Aguilar Highway or King Street were not found to be required for capacity reasons along these specific links, however testing of 4 laning of the D'Aguilar Highway showed that a significant level of traffic would be attracted to the link, providing traffic reductions and potential benefits in other areas of the network.

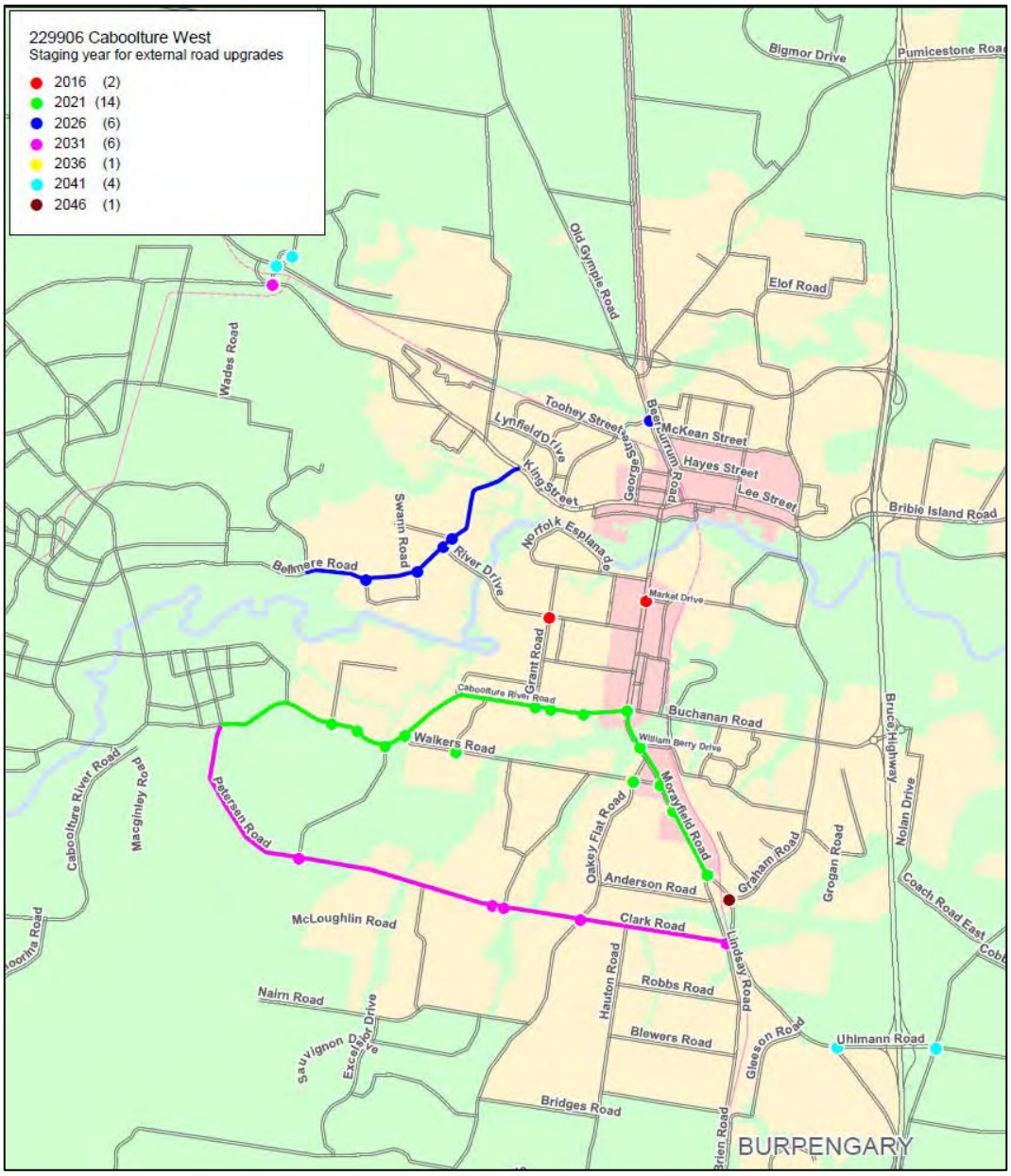

Figure 28 Staging of road upgrades

7 Transport Infrastructure Cost

This section summarises the preliminary costs developed for the internal trunk road network within Caboolture West and the external road network improvements identified as required for Caboolture West.

7.1 Internal Road Network

High level cost estimates of the internal trunk road network were developed based on conceptual cross sections (provided by Moreton Bay Regional Council). The costs included should be treated as indicative only until further investigations and design are undertaken. This may include, but not limited to, road design using detailed survey, geotechnical and hydraulics investigation, land resumption requirements and services requirements.

For the purpose of costing, each stage of development was divided into different road type cross sections, which included:

- Two Lane Boulevard;
- Four Lane Boulevard;
- Four Lane Industrial; and
- Main Road.

In addition to the above road sections, costings were undertaken for 5 bridges and 145 intersections.

Table 12 summarises the preliminary internal road network costs for Caboolture West. It should be noted that these are base costs, which are not escalated and are not discounted.

Table 12: Preliminary internal road network costs by stage

Stage of Development	Base Cost ($)
Stage 1 (2016)	17,771,000
Stage 2 (2021)	58,189,000
Stage 3 (2026)	57,919,000
Stage 4 (2031)	106,714,000
Stage 5 (2036)	52,533,000
Stage 6 (2041)	61,982,000
Stage 7 (2046)	6,590,000
Stage 8 (2051)	5,024,000
Total	**366,722,000**

Documentation of the preliminary costing of the internal road network is provided in Appendix F.

7.2 External Road Network

Indicative cost estimates estimated were developed for the external works for the corridors and intersections identified in Section 3.6.4 and Section 5.3. **Table 13** provides a summary of the preliminary cost estimates for the external road improvements required to accommodate Caboolture West. It should be noted that these are base costs, which are not escalated and are not discounted.

Table 13: Preliminary external road network costs by stage

Stage of Development	Base Cost ($)
Stage 1 (2016)	$562,000
Stage 2 (2021)	$59,194,000
Stage 3 (2026)	$39,524,000
Stage 4 (2031)	$79,080,000
Stage 5 (2036)	-
Stage 6 (2041)	$1,769,000
Stage 7 (2046)	$206,000
Stage 8 (2051)	-
Total	**$180,336,000**

Documentation of the preliminary costing of the external road network is provided in Appendix G.

8 Summary and Conclusions

8.1 Introduction

This report documents the strategic transport planning and modelling undertaken to determine the form of the internal transport network and the required external transport connections for the proposed Caboolture West Master Plan Area (MPA).

MBRC's strategic transport model, the Moreton Bay Regional Strategic Transport Model (MBRSTM), has been used to assess the future travel demand impacts of the Caboolture West MPA on the wider transport network.

8.2 Preliminary Analysis

Initially the MBRSTM was used to assess existing travel characteristics and the potential travel demand impacts generated by Caboolture West to broadly identify accessibility and capacity issues. A range of land use and transport scenarios was then assessed using the MBRSTM to inform the development of the Caboolture West Structure Plan. The scenarios include variation of size and mix of development, the road network connections and the level of public transport provision. The key outcomes of the scenario tests are summarised as follows:

- Travel demand: The analysis suggested that a high proportion of trips to and from Caboolture West would generally be contained within Caboolture and Morayfield and most within the Moreton Bay Region.
- Public transport: Frequent bus services would be required to access the various centres within Caboolture West to key activity nodes within Caboolture and Morayfield. Strong demand for park and ride at Burpengary was forecast.
- Rapid transit: The analysis suggests that the provision of a high quality public transport service between the Caboolture West Town Centre and Caboolture that provides competitive travel times compared to the private vehicle would be attractive to travellers.
- Road network: The analysis highlighted potentially high demand for Caboolture West traffic to access Morayfield Road to either travel south to the Bruce Highway or access local employment zones. There was also strong demand forecast to Caboolture Town Centre and industrial areas to the north of Caboolture.

8.3 Proposed Development

The preferred development scenario for Caboolture West, known as the Sustainable Town, was assumed to have an ultimate population of 68,761, employment of 15,148 which incorporates a high proportion of retail employment primarily in the town centre and to a lesser extent in the neighbourhood centres. The other concentration of employment is planned to be in the enterprise employment area at the north end of the site. The 16,882 enrolments are mostly for primary and secondary education. The development is forecast to generate over 218,000 trips during a typical weekday with the majority predicted to travel destinations within the MBRC area with strong containment within Caboolture West and desire lines to Caboolture Town Centre and Morayfield.

A high mode share for public and active transport is forecast in Caboolture West. This reflects that a high level of public transport service is assumed to Caboolture West in 2031 including rapid transit that can compete with car travel times.

The assessment of the ultimate development scenario for Caboolture West it showed some interesting trends:

- Strong demand to the north increasing traffic volumes on both King Street and the D'Aguilar Highway bypass;
- Strong demand will increase traffic volumes on Bellmere Road to access Caboolture Town Centre;
- High demand on the various routes including Caboolture River Road to access Morayfield; and
- Strong demand south to Burpengary in particular to access the park and ride facility (noting limited forecast spaces available at Caboolture Town Centre and Morayfield).

8.4 Deficiency analysis

MBRSTM was used to identify sections of the road network that would require a capacity upgrade as a result of the Caboolture West MPA. This resulted in the identification of 34 intersections that would not meet the level of service criteria in 2031 with Caboolture West, as shown in **Figure 26.**

8.5 Staging requirements

The analysis of staging requirements for road infrastructure had the following key outcomes:

- The 4 laning of Caboolture River Road would be required by 2021 – this could perhaps be staged with the section west of Thornbill required by 2026;
- The 6 laning of Morayfield Road would be required by 2021 – it could be argued that this upgrade would be required regardless of Caboolture West, as there are a number of intersections that will require upgrading in the near term. Also, solutions could not be found for some intersections that would fully cater for forecast volumes (i.e. intersection reached maximum at-grade footprints). Further network or corridor studies would be required to determine a solution for Morayfield Road;
- The 4 laning of Bellmere Road would be required by 2026;
- The Petersen Road connection and upgrade would be required by 2031 to relieve Caboolture River Road and Walkers Road;
- The Williams Road connection would be required by 2031; and
- Upgrades to the D'Aguilar Highway or King Street were not found to be required for capacity reasons along these specific links, however testing of 4 laning of the D'Aguilar Highway showed that a significant level of traffic would be attracted to the link, providing traffic reductions and potential benefits in other areas of the network.

8.6 Preliminary road network costs

Preliminary costing of the internal road network and external road network upgrades are were undertaken for each development stage and these are documented in **Table 12** and **Table 13**.

Appendix A

Desire Line Analysis

Appendix B

Scenario Assessment Working Paper

Appendix C

Public Transport Network Review

Appendix D

Road Network Analysis

Appendix E

Staging Analysis

Appendix F

Preliminary Internal Road Network Costs

Appendix G

Preliminary External Road Network Costs