



PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2022/1276

Date: 5 April 2023

Aura *Precinct 15* Traffic Modelling Refresh

Stockland

*Aura P15 Traffic
Modelling Refresh*

March 2022

Disclaimer

This report is not intended to be read or used by anyone other than Stockland.

We prepared this report solely for Stockland's use and benefit in accordance with and for the purpose set out in PwC's proposal dated 25th January 2022. In doing so, we acted exclusively for Stockland and considered no-one else's interests.

We accept no responsibility, duty or liability:

- to anyone other than Stockland in connection with this report
- to Stockland for the consequences of using or relying on it for a purpose other than that referred to above.

We make no representation concerning the appropriateness of this report for anyone other than Stockland. If anyone other than Stockland choose to use or rely on it, they do so at their own risk. Without limiting the above, the report was not intended to be used in connection with any transaction.

The forecasts contained in the report were produced using the Aura Visum Model and data (Licensed Data) as supplied by Stockland, Government agencies, and, from other sources identified in this report. PwC did not verify or audit the information (Licensed Data) provided to us and we make no representation as to its accuracy.

It's also important to appreciate that Traffic and Transport Models and Forecasts are not a precise science and are only an indication of what might happen in the future and may not be achieved. They rely upon complex sets of data, assumptions and numerous factors which can influence actual demand, many being beyond the control or reasonable foresight of the forecaster. Any traffic forecast or other information contained in this report is based on the information provided by Stockland, Government agencies and obtained from the sources identified, and the assumptions Stockland has agreed, and therefore is inherently subject to uncertainties. Inevitably, some assumptions used to develop our report will not be realised and unanticipated events and circumstances may occur.

Therefore, PwC cannot provide any form of assurance that the forecasts documented in the Report will be achieved and no warranty should be implied as to the accuracy of the forecasts.

The Report is intended to be read in its entirety including this disclaimer and any assumptions set out in the Report.

This disclaimer applies:

- to the maximum extent permitted by law and, without limitation, to liability arising in negligence or under statute; and
- even if we consent to anyone other than Stockland receiving or using this report.

Liability limited by a scheme approved under Professional Standards legislation.

Contents

Disclaimer	i
1 Introduction	3
1.1 Model history	3
1.2 Purpose of this report	6
2 Modelling approach and assumptions	7
2.1 Study area	7
2.2 Land use assumptions	8
2.3 Road network	9
3 Modelling results	10
3.1 Model convergence	10
3.2 Link volumes	11
3.3 Link level of service	14
3.4 Intersection level of service	16
3.5 Intersection degree of saturation	19
4 Conclusion	21

1 *Introduction*

The Caloundra South Priority Development Area (PDA) is one of the largest master planned communities in Australia, set to house a population of approximately 50,000 persons and provide 20,000 dwellings over the next 30 years. The site, which is located to the south of the Caloundra Urban Area on the Sunshine Coast is set to become one of the largest greenfield developments across Australia. The Caloundra South PDA has 19 precincts with a broad range of land uses including residential dwellings, retail developments, commercial/showroom precincts, an industrial precinct, integrated sports uses, schools and numerous active transport pathways.

To assess the traffic demand from this development significant transport modelling has been undertaken, the history of model developed for the Caloundra South PDA is summarised below.

1.1 *Model history*

This report represents the latest step in the transport modelling undertaken for the Caloundra South PDA. The history of the modelling work is summarised in Figure 1 and outlined in detail below¹.

¹ Further details on model history are provided in MWH Australia (2016), *Caloundra South Town Centre Visum Modelling Report*.

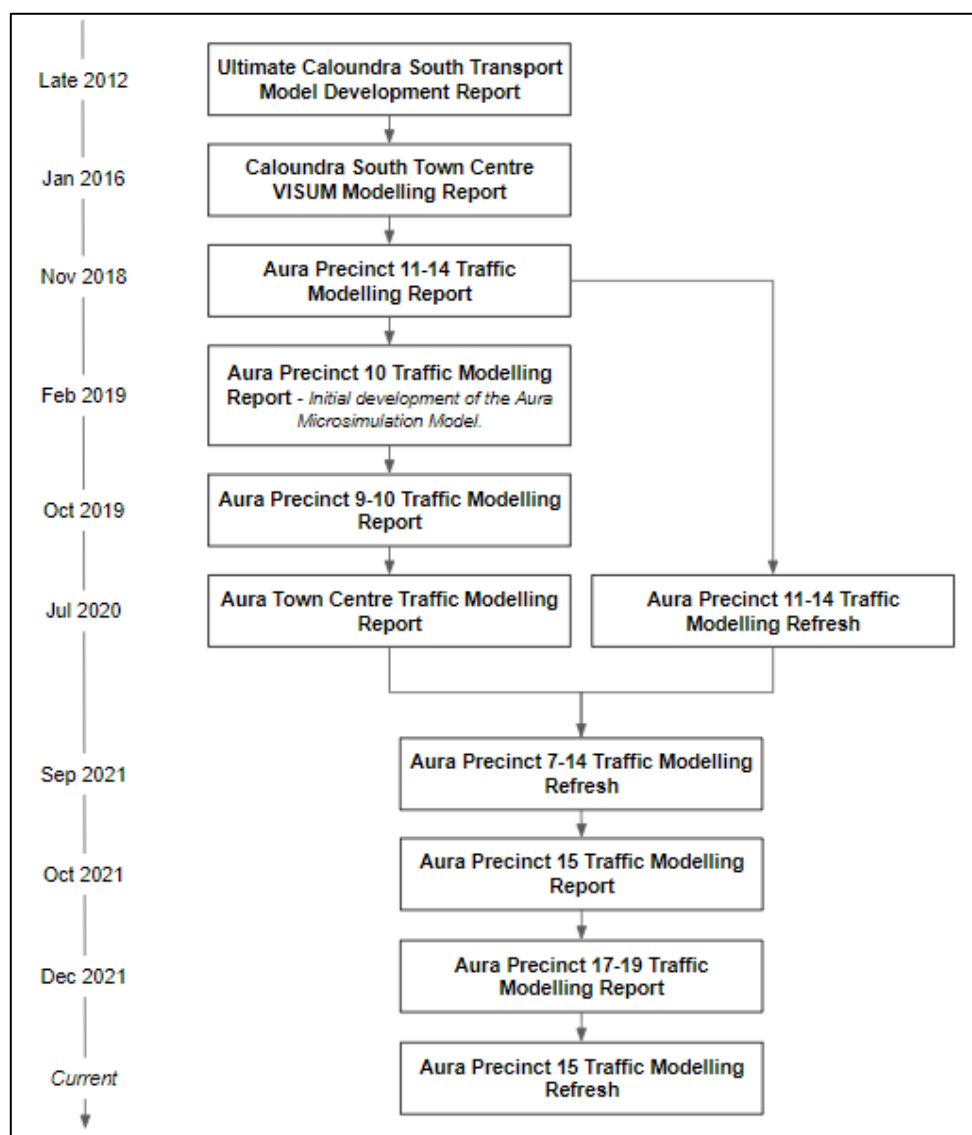


Figure 1: Aura traffic modelling history

- **Late 2012 (*Ultimate Caloundra South Transport Model Development Report*):** An initial model was developed late 2012 with a report released for comment in February 2013. This model was based on data from SCTFM v3.5.
- **June 2013 (*No documentation*):** Following the release of SCTFMv5, the model was refined and released to Department of Transport and Main Roads (TMR) and Sunshine Coast Regional Council (SCRC) for comment in June 2013. No documentation accompanied the model at this time.
- **October 2013 (*UCTSM Revised Model Development Report Rev 7*):** A report was released in October which was based on the June 2013 release of the model. There were some minor network changes to the model to remove some route choice issues. The modifications included removing u-turns.
- **November 2013 (*UCTSM Revised Model Development Report Rev 7.11*):** Further modifications were made to the model and associated reporting documents.
- **January 2016 (*Caloundra South Town Centre Visum Modelling Report*):** Additional modifications were made to the model approved in November 2013 as part of the Caloundra South Town Centre project based on the discussions with TMR, SCRC, Department of Infrastructure, Local Government and Planning (DILGP) and Stockland. These updates focussed on the Town Centre, refining the model within Precincts 7 and 8.

The updated model was submitted in October 2015 for approval to all stakeholders. Based on the comments received in December 2015 and January 2016 by SCRC and TMR, the model was revised and re-submitted in March 2016. The final model was approved by SCRC on 8th April 2016 and TMR on 7th April 2016.

- **November 2018 (*Aura Precinct 11-14 Traffic Modelling Report*):** This transport assessment was completed for Aura Precincts 11-14 as part of the approvals process for the Caloundra South PDA. It provided an update to the January 2016 report and associated Visum model to represent changes in Stockland's planning assumptions.
- **February 2019 (*Aura Precinct 10 Traffic Modelling Report*):** This report outlined a transport assessment as part of Condition 12 in the PDA decision notice requiring a simulation model developed prior to the first stage of the Town Centre. This model is referred to as the Aura Vissim Model and focussed on Precinct 10. In February 2019 this report and associated models were endorsed by EDQ.
- **October 2019 (*Aura Precinct 9-10 Traffic Modelling Report*):** This report was completed as part of Stockland's development approval process. The modelling undertaken as part of this report included the latest planning assumptions from Stockland. This report summarises the latest modelling of the Aura development to be undertaken (both from the Aura Visum Model and the Aura Vissim Model). This report and associated models were endorsed by EDQ on 15 April 2020 as part of DEV2013/469.
- **July 2020 (*Aura Town Centre Traffic Modelling Report*):** This report was commissioned by Stockland to form part of the ROL application. The report summarised the modelling results (both from the Aura Visum Model and the Aura Vissim Model) due to changes in Stockland's planning assumptions in the Town Centre (Precincts 7-8).
- **July 2020 (*Aura Precinct 11-14 Traffic Modelling Refresh*):** This report provided a refresh to the November 2018 traffic assessment for Precinct 11-14 to ensure the traffic assessment aligned with the latest Stockland planning assumptions.
- **September 2021 (*Aura Precinct 7-14 Traffic Modelling Refresh*):** This report provided a refresh to previous traffic assessments across Precincts 7-14 to ensure alignment with the latest Stockland planning assumptions.
- **October 2021 (*Aura Precinct 15 Traffic Modelling Report*):** This transport assessment was completed for Aura Precinct 15 as part of the approvals process for the Caloundra South PDA.
- **December 2021 (*Aura Precinct 17-19 Traffic Modelling Report*):** This transport assessment was completed for Aura Precincts 17-19 as part of the approvals process for the Caloundra South PDA. This report and associated models represent the latest version and underpin the Precinct 15 refresh.

1.2 Purpose of this report

PwC have been engaged by Stockland to assist in the transport assessment and associated approvals process for the Caloundra South PDA. As part of Stockland's ROL Application for Aura Precincts 15 the following requirements must be met under the Local Government Infrastructure Agreement (LGIA):

Clause 2.8: At the time of lodging the first application for an ROL Approval for a Precinct, the Developer must provide to MEDQ and Council, a Precinct Traffic Analysis.

"Precinct Traffic Analysis" means an analysis of the transport network for a Precinct, where that analysis identifies:

a) The volume and capacity of road links; and

b) The capacity and operation of key intersections,

For road Classifications of Neighbourhood Connector, Centre Connector, Industrial Connector, Trunk Collector, Sub-Arterial and above.

This report and the accompanying transport models meet the following tasks as part of Stockland's ROL Application:

1. Updates made to the MWH Aura Visum Model to ensure it is reflective of the latest planning assumptions within Precinct 15.
2. A Precinct Traffic Analysis to be completed for Precinct 15.

2 *Modelling approach and assumptions*

The modelling approach used for this assessment is based on the following process:

1. Update model inputs with latest Stockland planning assumptions.
2. Update demand matrices.
3. Perform traffic assignment in updated model.

The key assumptions used within this process are further outlined in the following sections.

2.1 *Study area*

This assessment uses the Aura Visum Model as last updated in December 2021, with planning assumptions for Precincts 15 reviewed as part of this process. Figure 2 highlights Precincts 15 of the Aura development.

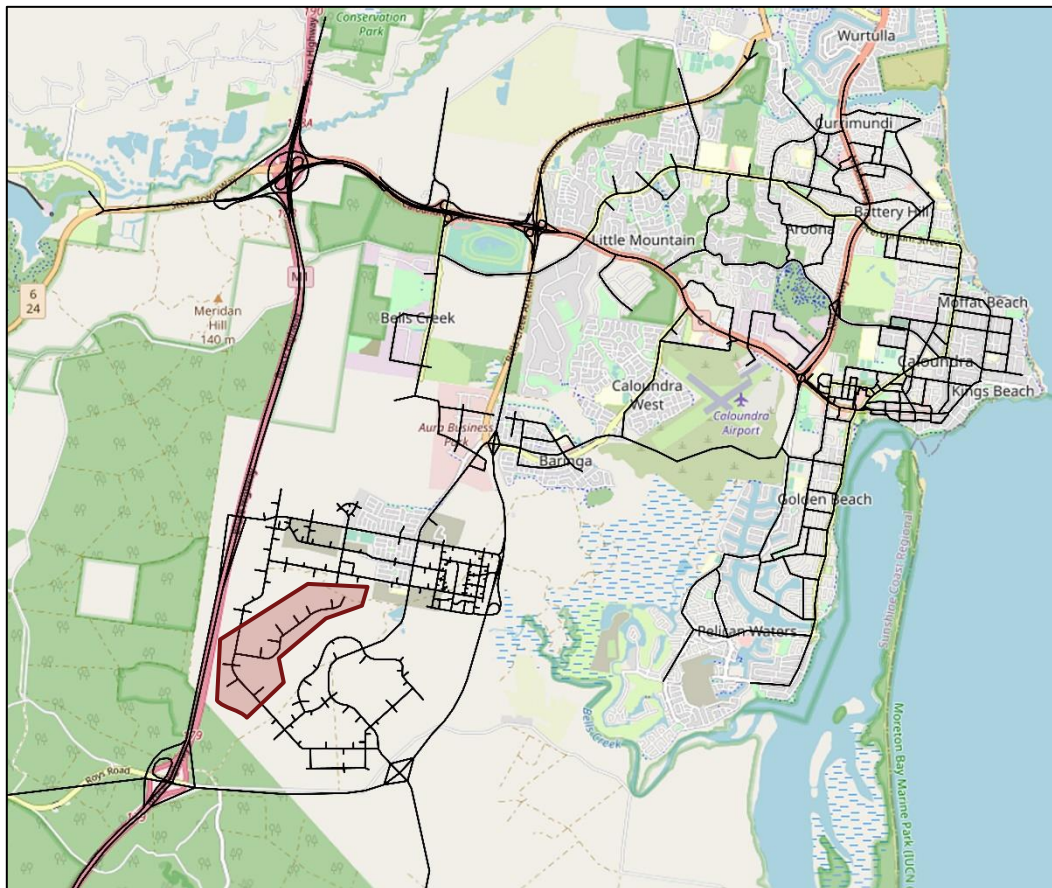


Figure 2: Study area

Source: Aura Visum Model, Bing Maps

2.2 Land use assumptions

To reflect Stockland's latest land use planning assumptions, updates have been made to the existing model for Precincts 15. Table 1 provides a high-level comparison of the updated land use assumptions to those from the most recent assessment (Aura Precinct 17-19 Traffic Modelling Report, December 2021).

Table 1: Land use modelling assumptions

Area	Aura Precinct 17-19 Traffic Modelling Report				Updated Inputs			
	Population	Dwellings	Floorspace (m ²)	Enrolments	Population	Dwellings	Floorspace (m ²)	Enrolments
Eastern	2,524	905	0	1,500	2,934	1,052	0	0
LLC ²	900	500	0	0	900	500	0	0
Western	1,024	367	12,400	0	627	225	10,000	1,500
Total	4,449	1,773	12,400	1,500	4,461 (0%)	1,777 (0%)	10,000 (-24%)	1,500 (0%)

Source: URBIS, Stockland

The key changes to land use across Precincts 15 include:

- Redistribution of dwellings across the site, resulting in no change in dwellings and population.
- Moving the school site from the eastern side of the main north-south link to the western.
- Reduction in floorspace in the western area.

All other precincts maintained the same land use assumptions as per the existing model version, Table 2 provides zone level land use assumptions for Precincts 15.

Table 2: Detailed land use assumptions

Area	Model Zone	Land Use Yield	Model Zone	Land Use Yield
Eastern	1065	200 dwellings	1157	212 dwellings
	1155	247 dwellings	1053	128 dwellings
	1017	265 dwellings		
LLC	1156	250 dwellings	1169	250 dwellings
Western	1158	1,500 P-12 Private School	1069	4,100m ² community centre & 55,000m ² sports field
	1054	225 dwellings & 5,900m ² community centre		

Source: URBIS, Stockland

² LLC site assumes a lower population per dwelling than the rest of the precinct (1.8 compared to 2.8).

2.3 Road network

The Aura Visum Model network was reviewed to ensure it represents the latest Stockland planning assumptions within Precinct 15. This section outlines the road network updates that have been incorporated within the Aura Visum Model. Figure 3 summarises the Precinct 15 road network, updated to align with Stockland's latest planning assumptions. This includes updates and refinements to:

- Improve the representation of the proposed road network, where:
 - Number of lanes: 1 lane (each direction) for all roads within P15.
 - Posted Speed: 60km/hr for all roads within P15 except for zone access/egress links which are 40km/hr.
- Zone access/egress to better reflect fine grained road network connections.
- Intersection form, including a left-in left-out priority intersection between a signalised intersection and a roundabout (the remainder of Precinct 15 are two-way yield intersections).
- Other minor network assumptions.

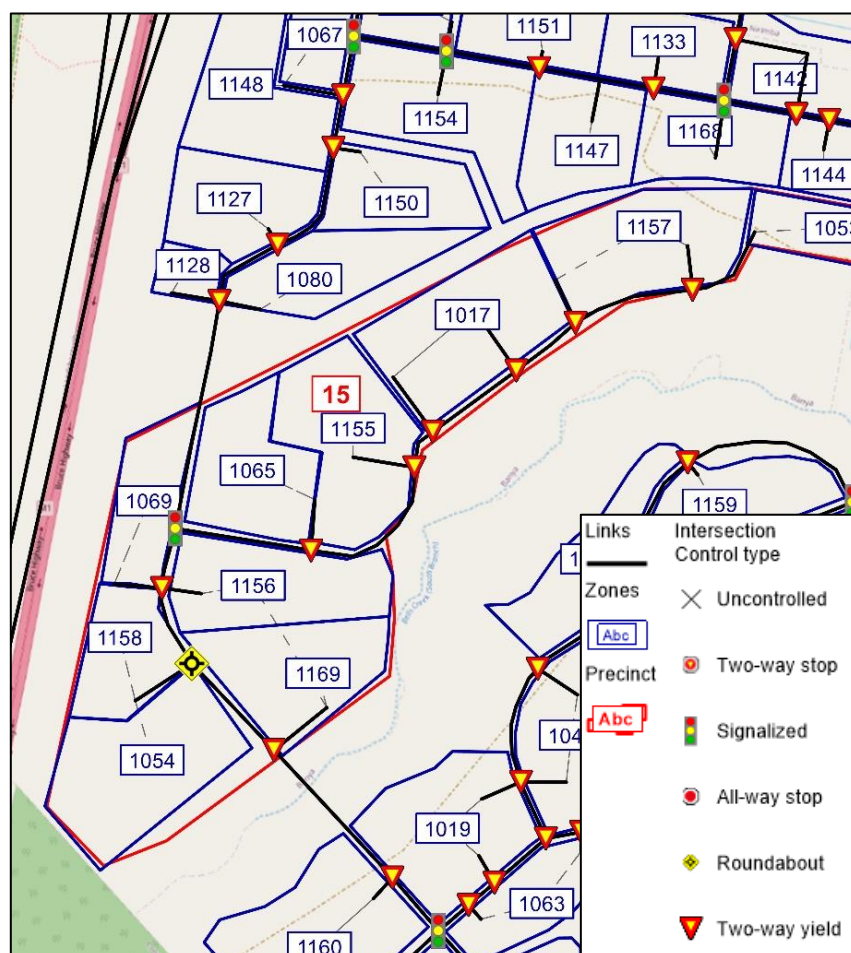


Figure 3: Road network summary

Source: Stockland

3 Modelling results

The demand modelling process has remained consistent with the process used for the MWH Aura Visum Model. This was based on the 2031+ UCSTM modelling which utilises an ultimate demographic dataset for the Aura Development. This represents a ‘full build’ scenario as the most likely representation of the ultimate scenario, AM and PM peak periods in the 2031+ forecast year. For this assessment, the 2031+ forecast scenario was modified to incorporate the most up to date land use data (as outlined in Section 2.3).

The following four step approach was undertaken:

1. Trip Generation.
2. Mode Share.
3. Trip Distribution.
4. Assignment.

The following section outlines key results of the modelling process.

3.1 Model convergence

To test the stability of the model, convergence tests were performed on both peak period models. Model convergence criteria remains as per previous modelling³ which states that:

1. The last batch of equilibrium assignment iterations has reached a gap of 0.001.
2. 95% of assigned turn flows between two successive loop iterations have converged within 1%.
3. 90% of turn delays from calibrated turn volume delay functions are within 5% of turn delays calculated from the junction capacity analysis module.

The model convergence results are shown below in Table 3 and Table 4.

Table 3: AM peak period model convergence summary

Iteration	Criteria 1		Criteria 2		Criteria 3	
	Value	Achieved	Value	Achieved	Value	Achieved
1	9.85×10^{-6}	✓	0	✗	0	✗
2	8.59×10^{-6}	✓	0.308	✗	0.545	✗
3	3.26×10^{-6}	✓	0.462	✗	0.643	✗
4	2.27×10^{-6}	✓	0.811	✗	0.764	✗
5	4.77×10^{-6}	✓	0.939	✗	0.881	✗
6	4.81×10^{-6}	✓	0.968	✓	0.964	✓

Source: Model outputs

³ MWH Australia (2016), *Caloundra South Town Centre VISUM Modelling Report*.

Table 4: PM peak period model convergence summary

Iteration	Criteria 1		Criteria 2		Criteria 3	
	Value	Achieved	Value	Achieved	Value	Achieved
1	9.91×10^{-6}	✓	0	✗	0	✗
2	7.62×10^{-6}	✓	0.304	✗	0.544	✗
3	3.39×10^{-6}	✓	0.462	✗	0.644	✗
4	9.55×10^{-6}	✓	0.818	✗	0.770	✗
5	4.13×10^{-6}	✓	0.940	✗	0.883	✗
6	4.83×10^{-6}	✓	0.971	✓	0.965	✓

Source: Model outputs

The model convergence results outlined above suggest that the updated models have converged to an appropriate level of granularity.

3.2 Link volumes

Figure 4 and Figure 5 outline the link volumes for the AM and PM peak period models respectively⁴.

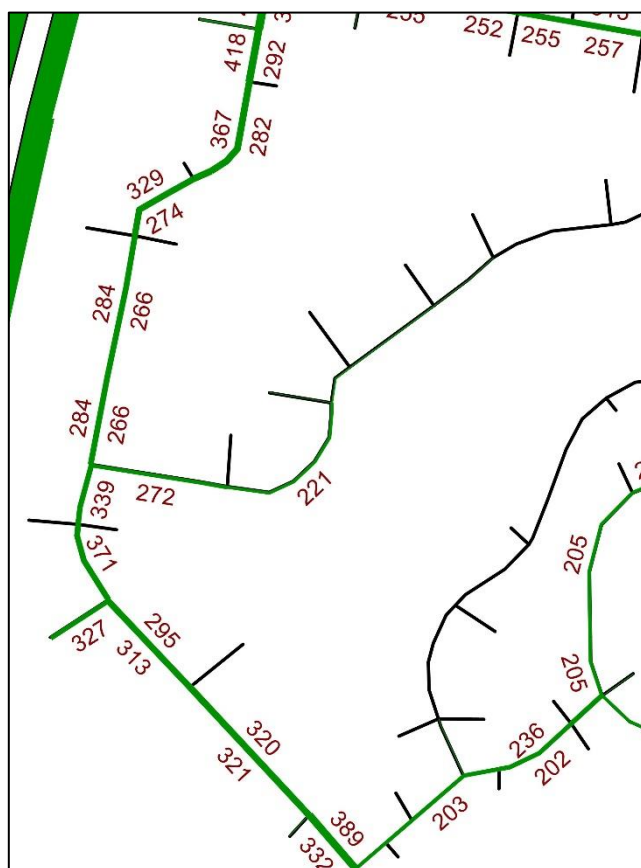


Figure 4: AM peak hour link volumes

Source: Model outputs

⁴ Links with Volume < 100 vph have been excluded for clarity.

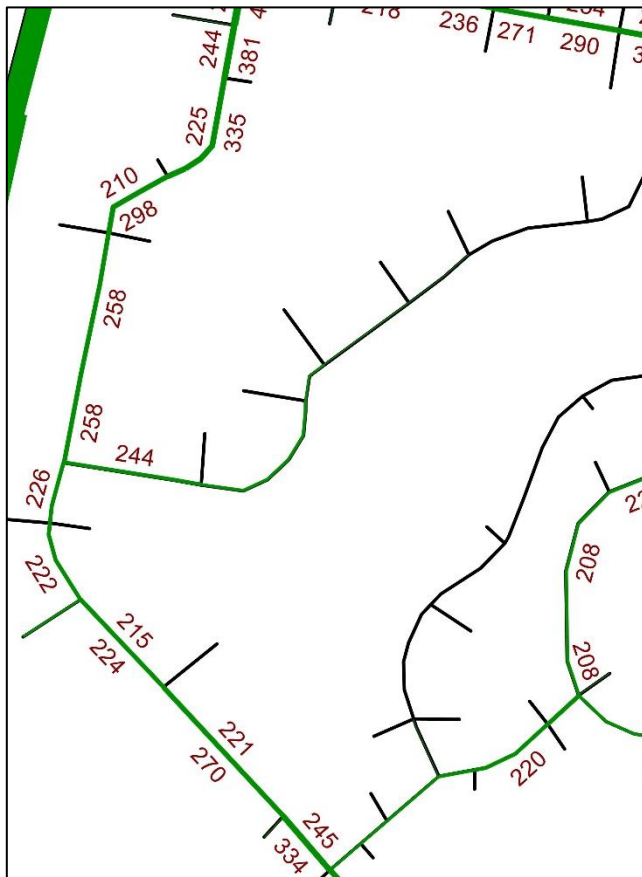


Figure 5: PM peak hour link volumes

Source: Model outputs

A comparison of link volumes has been undertaken to show the effect of the changes in assumptions on the forecasted network traffic volumes. Figure 6 and Figure 7 show the link volume difference plots⁵ where the following key changes in demand across the network can be seen:

- An increase in demand to the western area and a reduction to the eastern area (especially in the AM peak), resulting from moving the proposed school's location.
- Due to zone 1156 being accessed by a left-in left-out only intersection, there are additional u-turn movements occurring at the roundabout for vehicles travelling north from the LLC.
- Minor redistribution across the Aura traffic network, reflecting better representation of traffic within Precinct 15 and its subsequent impact on route choice.

⁵ Green bars represent updated model > original model, red bars represent updated model < original model, grey links are not directly comparable between model versions.

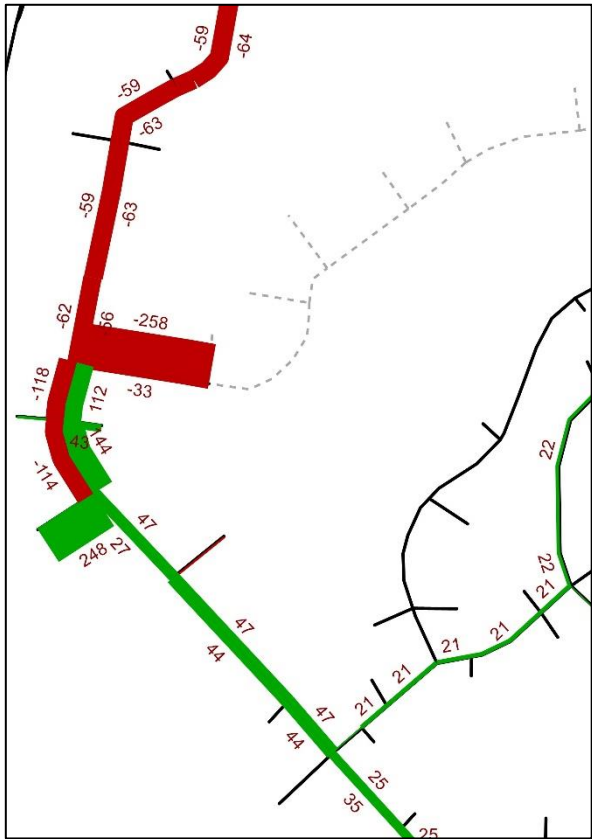


Figure 6: AM peak link volumes difference plot
Source: Model outputs

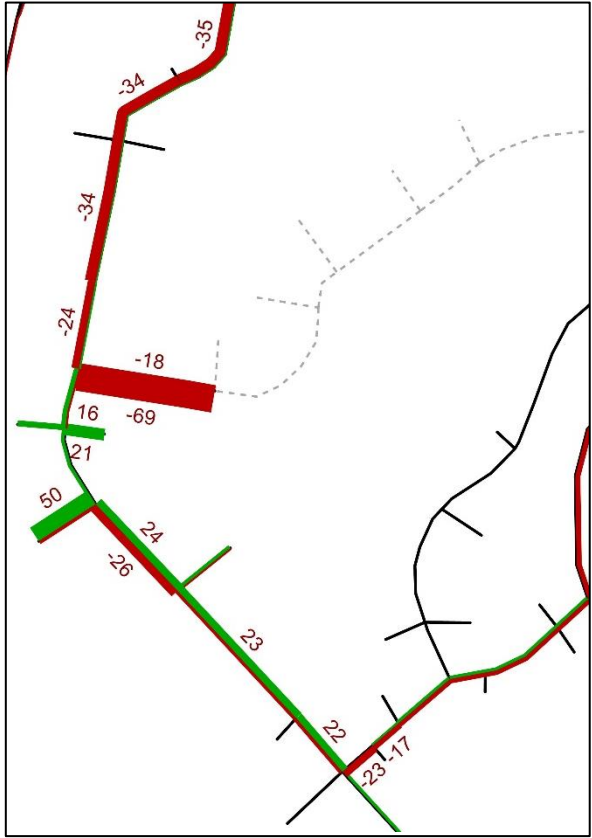


Figure 7: PM peak link volumes difference plot
Source: Model outputs

3.3 Link level of service

The link LOS thresholds are based on Austroads⁶ and Transport Research Board⁷ and are consistent with previous traffic assessments for the Caloundra South development. Table 5 outlines the link LOS thresholds based on the Volume on Capacity (V/C) ratio.

Table 5: Link LOS thresholds

Level of Service	V/C
A	$\leq 35\%$
B	$35\% \leq 55\%$
C	$55\% \leq 80\%$
D	$80\% \leq 95\%$
E	$95\% \leq 100\%$
F	$>100\%$

Source: *Highway Capacity Manual, Austroads*

Figure 8 and Figure 9 show that links in Precinct 15 and surrounds operate at LOS B or better during the AM and PM peak period.



Figure 8: AM peak link LOS

Source: *Model outputs*

⁶ Austroads (2017), *Guide to Traffic Management Part 3: Traffic Studies and Analysis*.

⁷ Transport Research Board (2010), *Highway Capacity Manual*.



Figure 9: PM peak link LOS
Source: Model outputs

3.4 Intersection level of service

Table 6 provides intersection LOS thresholds which are based on the Highway Capacity Manual⁸.

Table 6: Intersection LOS thresholds (average delay, seconds)

Level of Service	Signalised Intersection	Unsignalised Intersection ⁹
A	≤ 10	≤ 10
B	$10 \leq 20$	$10 \leq 15$
C	$20 \leq 35$	$15 \leq 25$
D	$35 \leq 55$	$25 \leq 35$
E	$55 \leq 80$	$35 \leq 50$
F	> 80	> 50

Source: Highway Capacity Manual

The following figures show that all intersections within Precinct 15 and surrounds operate at LOS D or better in both the AM and PM peak period. Figure 10 and Figure 11 summarise the signalised intersections LOS in the AM and PM peak period models respectively.

LEGEND: ■ LOS A ■ LOS B ■ LOS C ■ LOS D ■ LOS E ■ LOS F



Figure 10: AM peak signalised intersection LOS

Source: Model outputs

⁸ Transport Research Board (2010), *Highway Capacity Manual*.

⁹ Includes roundabouts and priority intersections.



Figure 11: PM peak signalised intersection LOS

Source: Model outputs

Figure 12 and Figure 13 summarise the unsignalised intersections LOS in the AM and PM peak period models respectively.

LEGEND: ■ LOS A ■ LOS B ■ LOS C ■ LOS D ■ LOS E ■ LOS F

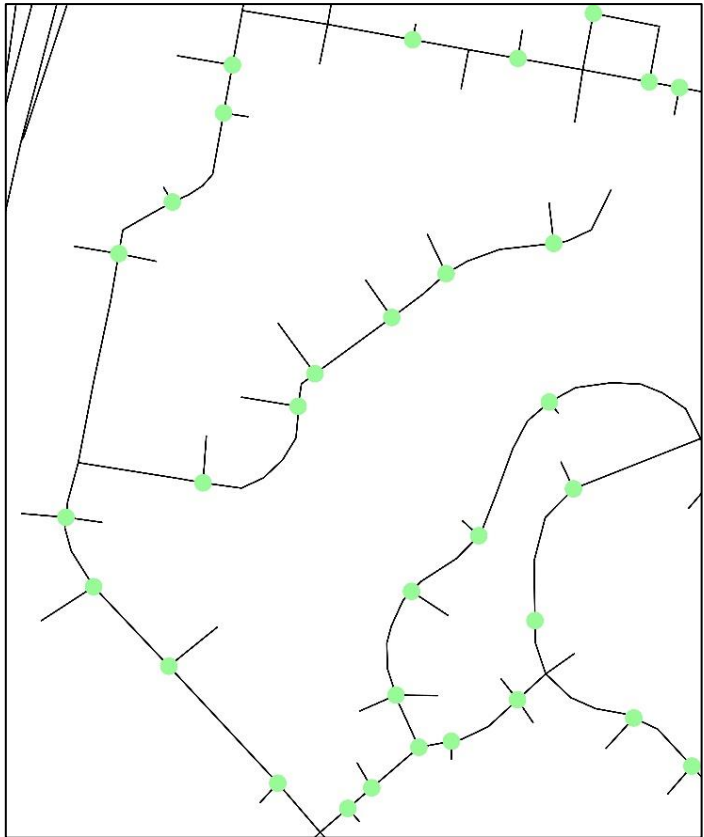


Figure 12: AM peak unsignalised intersection LOS
Source: Model outputs

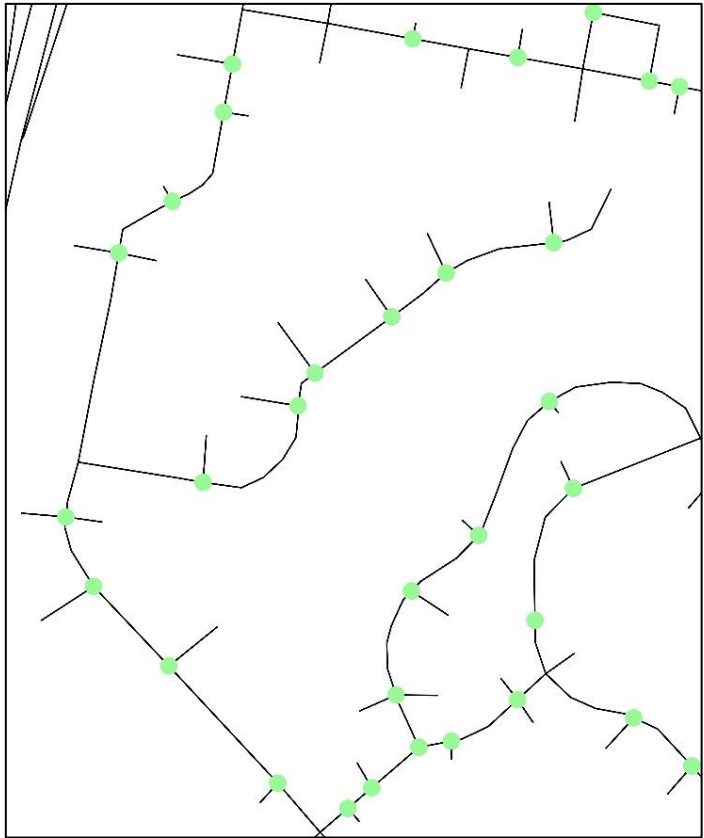


Figure 13: PM peak unsignalised intersection LOS
Source: Model outputs

3.5 Intersection degree of saturation

Intersection Degree of Saturation (DOS) thresholds were based on Volume on Capacity (V/C) values from the LGIA, which are:

- Signalised Intersections: $V/C \leq 90\%$.
- Roundabouts: $V/C \leq 85\%$.
- Other priority intersections: $V/C \leq 80\%$.

Figure 14 and Figure 15 show that intersections within Precinct 15 meet the DOS criteria as outlined above in both the AM and PM peak period¹⁰.

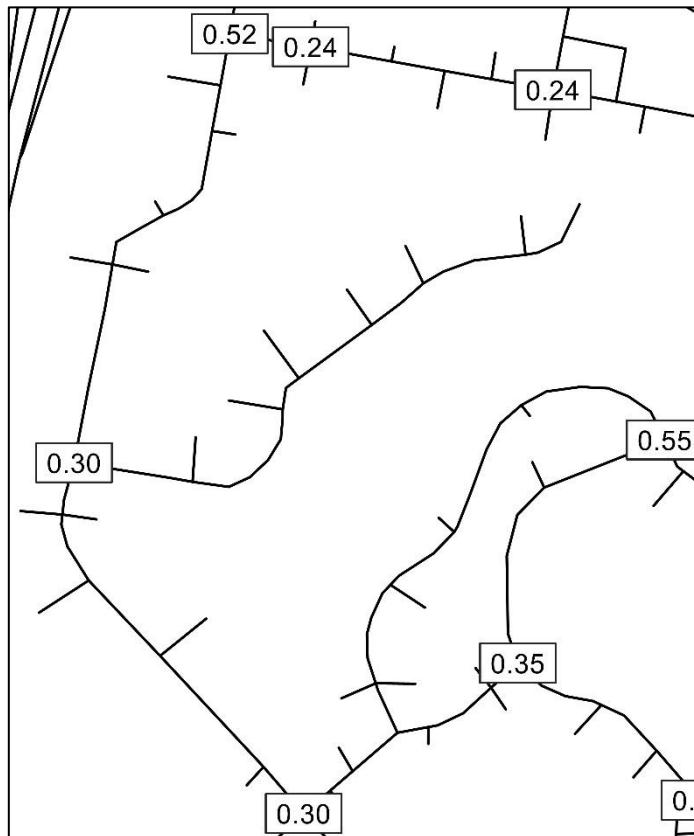


Figure 14: AM peak intersection DOS

Source: Model outputs

¹⁰ Intersections with DOS < 15% have been excluded for clarity.

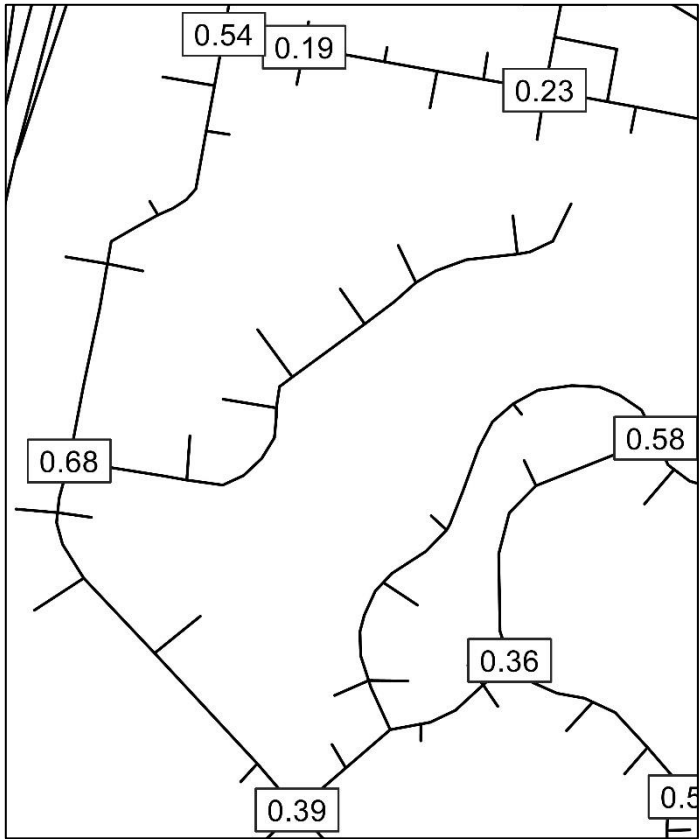


Figure 15: PM peak intersection DOS
Source: Model outputs

4 *Conclusion*

The Aura Visum Model has been updated within Precinct 15 for use within this study. As part of this assessment, updates have been made to the modelled assumptions to reflect Stockland's latest planning (including land use and road network). The demand modelling process (including trip generation, distribution, and mode choice parameters) has remained consistent with the previously approved approach.

For this assessment, Precinct 15 and the surrounding network has been analysed in the updated model for road classifications of Neighbourhood Connector, Centre Connector, Industrial Connector, Trunk Collector, Sub-Arterial and above. The updated model results indicate that the proposed traffic network for Precinct 15 operates efficiently with the model forecasting:

- Each link operates at LOS C or better in both peak periods.
- Each intersection operates at LOS D or better in both peak periods (with respect to average delay).
- Each intersection operates at a level that meets the benchmarks from the LGIA.

As such the proposed road infrastructure for Precinct 15 is considered appropriate to support the development's target land use.

