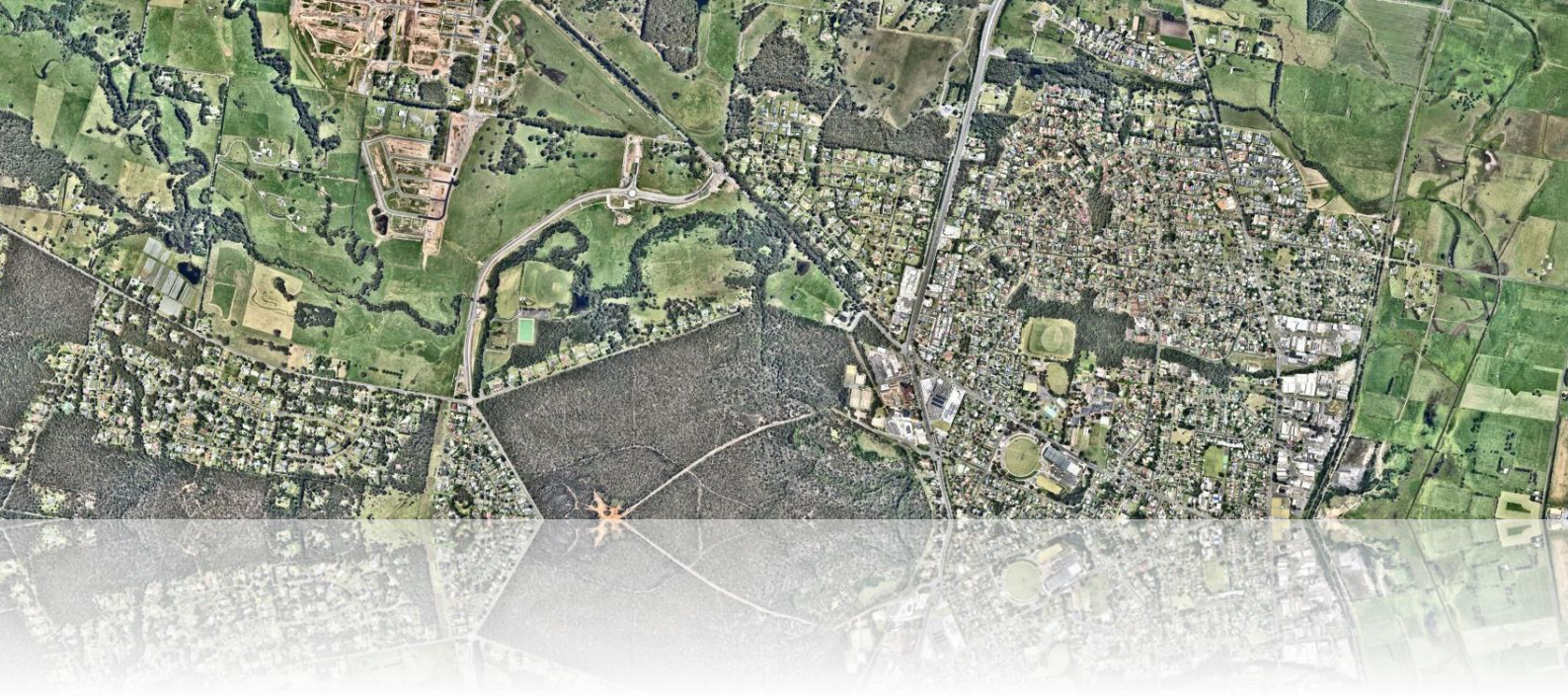

TRAFFIC AND PARKING IMPACT ASSESSMENT OF THE PROPOSED MIXED USE DEVELOPMENT AT 25 MOSS VALE ROAD, BOMADERRY

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Transport Planning, Traffic Impact Assessments, Road Safety Audits, Expert Witness

240264.01FB - 11 November 2024

Development Type: **Mixed Use Development**

Site Address: **25 Moss Vale Road, Bomaderry**

Prepared for: **Southern Cross Housing**

Document reference: **240264.01FB**

Status	Issue	Prepared By	Checked By	Approved By	Date
Draft	A	AI / LS	MM	MM	15 July 2024
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Draft	C	MM			8 October 2024
Final	A	MM			17 October 2024
Final	A	MM			11 November 2024

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1 INTRODUCTION

M^CLaren Traffic Engineering was commissioned by *Southern Cross Housing* to provide a traffic and parking impact assessment of the proposed Mixed Use Development at 25 Moss Vale Road, Bomaderry as depicted in **Annexure A**.

1.1 Description and Scale of the Approved Development

The development has been approved for the following scale, under application number SF10851 on 20 December 2022 with consideration to a possible future development scale as detailed below:

- Bowling Club premises including:
    - One (1) Indoor Bowling Green and One (1) Outdoor Bowling Green, each accommodating up to 64 people;
    - Club Building Area of 739m^2 GFA, with 499m^2 GFA available for public use including:
        - 135m^2 Function Room;
        - 96m^2 Bistro Area;
        - Members Lounge Areas of 147m^2 GFA
        - Gaming Lounge areas of 55m^2 GFA;
        - 66m^2 Foyer entry;
        - The remaining 240m^2 area outside of public use will be assessed as office area.
    - Maximum of 10 staff on-site.
- Residential development comprising of townhouses, residential apartments and aged care units as per the following:
    - Twelve (12) x townhouses;
    - 121 x residential apartments;
    - 85 x Seniors Living units;
        - Maximum of 24 staff on-site.
- Commercial area of a total of 2,100m^2 GFA comprised of:
    - 1,500m^2 GFA commercial uses located beneath the aged care units;
    - 600m^2 GFA of Southern Cross Housing (SCH) Office.

The approved subdivision proposed a road reserve from Moss Vale Road which bounds the structures of the site on the east, south and west boundaries of the site. The road will be connected to Moss Vale Road via one intersection forming a fourth leg of the existing intersection of Give Way controlled junction of Elvin Drive / Moss Vale Road with the approved intersection controlled by traffic signals. The development will also include an

emergency vehicle access provided between Moss Vale Road and the cul-de-sac of the approved development at the north west of the site.

As part of the approved subdivision, it is understood that the applicant will contribute to the future signalised intersection treatment of the approved intersection of the Site Road / Moss Vale Road / Elvin Drive, which will be undertaken by Transport for NSW. A plan of the intended intersection layout is reproduced in **Annexure B** for reference.

1.2 Description and Scale of the Proposed Development

For the purposes of this mixed-use subdivision, the assessed scale has the following characteristics relevant to traffic and parking:

- Lot 1 will follow the approved "Bowling Club" scale described in **Section 1.1** and as follows:
    - Bowling Club premises including:
        - One (1) Indoor Bowling Green and One (1) Outdoor Bowling Green, each accommodating up to 64 people;
        - Club Building Area of 739m^2 GFA, with 499m^2 GFA available for public use including:
            - 135m^2 Function Room;
            - 96m^2 Bistro Area;
            - Members Lounge Areas of 147m^2 GFA:
            - Gaming Lounge areas of 55m^2 GFA;
            - 66m^2 Foyer entry;
            - The remaining 240m^2 area outside of public use will be assessed as office area.
        - Maximum of 10 staff on-site.
- Retail area consisting of 215m^2 NLA;
- Medical Centre / Retail use consisting of 462m^2;
    - This area will be assumed to be a Medical Centre to assess the greatest quantity for both traffic and parking impacts for the purposes of worst-case scenario assessments;
- Commercial uses consisting of 880m^2 NLA;
- Boarding House consisting of:
    - 18 Studio Units;
    - 1 Bedroom for Manager.
- Attached Housing / Multi dwelling housing consisting of:
    - 6 x 1-bedroom house;

- 28 x 3-bedroom houses;
- 13 x 4-bedroom houses;

- Dual Key Apartments consisting of:
  - 8 x 2-bedroom apartments;
  - 6 x 3-bedroom apartments;
- Apartments consisting of:
  - 73 x 1-bedroom apartments'
  - 45 x 2-bedroom apartments.
- A Child Care Centre accommodating 55 children and 10 staff members as per the following:
  - 15 children between 0-2 years old (staff assigned at 1 per 4 children, or 4 staff);
  - 20 children between 2-3 years old (staff assigned at 1 per 5 children, or 4 staff);
  - 20 children between 3-5 years old (staff assigned at 1 per 10 children, or 2 staff).
- A "Maintenance Workshop" consisting of 233m^2.

The proposed development details a proposed road network including a minimum 15m width road reserve which bounds the structures of the site on the east, south and west boundaries of the proposed works, providing access from Moss Vale Road, which is consistent with the previous approval. The road will be connected to Moss Vale Road via one intersection forming a fourth leg of the existing intersection of Elvin Drive / Moss Vale Road which will be controlled by traffic signals, consistent with the existing approval. The development will also include an emergency vehicle access provided between Moss Vale Road and the internal road of the proposed development at the north west of the site.

1.3 State Environmental Planning Policy (Transport and Infrastructure) 2021

The proposed development does qualify as a traffic generating development with relevant size and/or capacity under *Clause 2.122* of the *SEPP (Transport and Infrastructure) 2021,* as the proposal exceeds 75 dwellings with connection to Moss Vale Road, a TfNSW Classified STATE Road (No. 261). Accordingly, formal referral to Transport for NSW (TfNSW) is necessary and the application will be assessed by Department of Planning and Infrastructure (DPHI) officers in conjunction with TfNSW officers.

In addition to this, the proposed development has frontage to a classified road and therefore qualifies as such with reference to *Clause 2.119 of SEPP (Transport and Infrastructure) 2021*. The development therefore must satisfy that:

> *(b) the safety, efficiency, and ongoing operation of the classified road will not be adversely affected by the development as a result of:*
>
> *(i) the design of the vehicular access to the land.*
>
> *(ii) the emission of smoke or dust from the development*
>
> *(iii) the nature, volume or frequency of vehicles using the classified road to gain access to the land.*

The proposed site access is via the single frontage to Moss Vale Road, a TfNSW Classified State Road (No. 261) and accordingly, DPHI must be satisfied that the development meets the above criteria. It is noted that Transport for NSW has endorsed the design of the approved access arrangements for the currently approved subdivision. Further assessment in relation to *Clause 2.119* of the SEPP is detailed in **Section 5.7** of this report.

1.4 Planning Secretary's Environmental Assessment Requirements

The subject development is subject to the Planning Secretary's Environmental Assessment requirements. A description of the requirements and where to find the assessment within this report is outlined below:

Item 1: - *An analysis of the existing transport network, including the road hierarchy and any pedestrian, bicycle or public transport infrastructure, current daily and peak hour vehicle movements, and existing performance levels of near intersections* (refer to **Section 2**)

Item 2: *Details of the proposed development, including pedestrian and vehicular access arrangements (including swept path analysis of the largest vehicle and height clearances), parking arrangements and rates (including bicycle and end-of-trip facilities), drop-off/pick-up-zone(s) and bus bays (if applicable), and provisions for servicing and loading / unloading* (refer to **Section 4**)

Item 3 – *Analysis of the impacts of the proposed development during construction and operation (including justification for th methodology used), including predicted modal split, a forecast of additional daily and peak hour multimodal network flows as a result of the development (using industry standard modelling), identification of potential traffic impacts*

on road capacity, intersection performance and road safety (including pedestrian and cyclist conflict) and any cumulative impact from surrounding approved development. (refer to **Section 5**¸ construction traffic impacts are not covered by this TPIA)**.**

Item 4 – *Measures to mitigate any traffic impacts, including details of any new or upgraded infrastructure to achieve acceptable performance and safety, and the timing, viability and mechanisms of delivery (including proposed arrangements with local councils of government agencies) of any infrastructure improvements in accordance with relevant standards.* (refer to Section 5)

Item 5 – *Provide a Construction Traffic Management Plan detailing predicted construction vehicle routes, access and parking arrangements, coordination with other construction occurring in the area, and how impacts on existing traffic, p[pedestrian and bicycle networks would be managed and mitigated* (not covered by this TPIA)

1.5 Site Description

The subject site is formally identified as Lot 110 DP 131219 and is located at 25 Moss Vale Road, Bomaderry. The subject site is currently occupied by ”Nowra Saleyards” at the west of site. The site has a single site frontage to Moss Vale Road to the north. The site has existing vehicular access from Moss Vale Road via a two-way driveway to Nowra Saleyards provided opposite Elvin Drive.

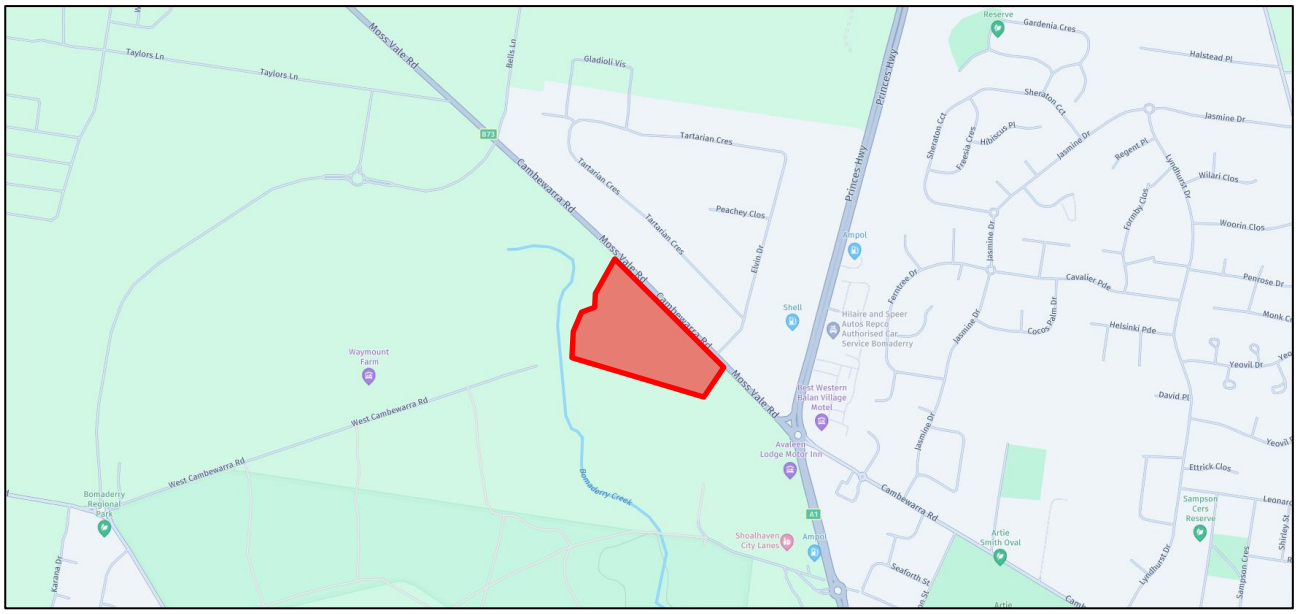
The subject site is currently zoned *MU1 – Mixed Use* under the *Shoalhaven Local Environmental Plan 2014*. The subject site is generally surrounded by low-density residential developments to the north, agricultural land to the west, environmental sensitive land to the south, and public recreation land to the east.

1.6 Site Context

The location of the site is shown on an aerial photo and a street map in **Figure 1** and **Figure 2** respectively.

Site Location

FIGURE 1: SITE CONTEXT – AERIAL PHOTO



Site Location

FIGURE 2: SITE CONTEXT – STREET MAP

2 EXISTING TRAFFIC AND PARKING CONDITIONS

2.1 Road Hierarchy

The road network servicing the site has characteristics as described in the following sub-sections.

2.1.1 Moss Vale Road

- TfNSW Classified STATE Road (No. 261);
- Approximately 8m wide carriageway facilitating one (1) traffic flow lane in each direction;
- Signposted 60km/h speed limit within close proximity to Elvin Drive, with a signposted 80km/h speed limit to the west of Elvin Drive (approximately 70m);
- No kerbside parking permitted on either side of the road.

2.1.2 Elvin Drive

- Unclassified LOCAL Road;
- Approximately 7m wide carriageway facilitating two-way traffic flow;
- Signposted 50km/h speed limit;
- Unsealed road shoulders provided, which would result in informal unrestricted kerbside parking along both sides of the road partly within the verge.

2.2 Existing Traffic Management

- "Give Way" controlled intersection of Elvin Drive / Moss Vale Road;
- Roundabout controlled intersection of Moss Vale Road / Princes Highway / Cambewarra Road.

2.3 Existing Traffic Environment

A turning movement count traffic survey was conducted at the intersection of Elvin Drive / Site Access Driveway from 7:00AM to 9:30AM and 2:30PM to 6:00PM on Thursday 9 May 2024 representing a typical operating weekday. The full survey results are shown in **Annexure C** for reference.

2.3.1 Existing Road Performance

The performance of the surrounding intersections under the existing traffic conditions has been assessed using SIDRA INTERSECTION 9.1, **Table 1** summarises the resultant intersection performance data, with full SIDRA results reproduced in **Annexure D**.

TABLE 1: EXISTING INTERSECTION PERFORMANCES (SIDRA INTERSECTION 9.1)

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/veh)	Level of Service[3][4]	Control Type	Worst Movement
EXISTING PERFORMANCE						
Elvin Drive / Moss Vale Road / Site Access	AM	0.19	1 (Worst: 9.5)	**NA** (Worst: A)	Give Way	RT from Site Access
	PM	0.20	1 (Worst: 9.7)	**NA** (Worst: A)		RT from Site Access

Notes:

(1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.
(2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.
(3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.
(4) No overall Level of Service is provided for Give Way and Stop controlled intersections as the low delays associated with the dominant movements skew the average delay of the intersection. The Level of Service of the worst approach is an indicator of the operation of the intersection, with a worse Level of Service corresponding to long delays and reduced safety outcomes for that approach.

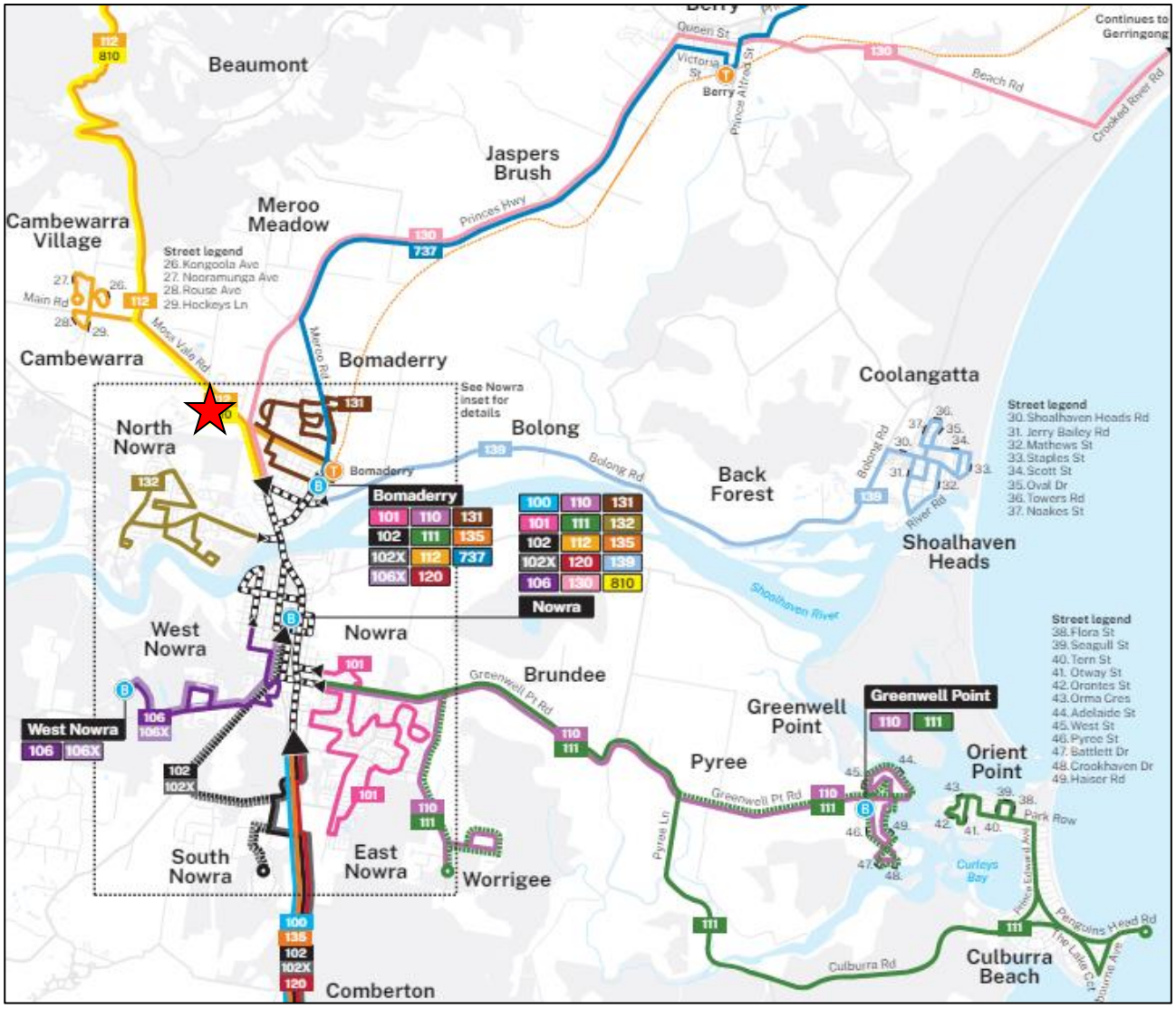
As shown, the existing intersection is currently performing at a high level of efficiency, with a worst movement Level of Service "A" or conditions in both the AM & PM peak hour periods. The Level of Service "A" and performance is characterised by low approach delays and spare capacity.

2.4 Public Transport

There are limited public transport services surrounding the subject site. The closest bus stop is located approximately 350m walking distance (5 mins) on Cambewarra Road. The bus stop (ID: 2541109) services bus route 131 (Bomaderry to Nowra via Bomaderry Station [Loop Service]) provided by Shoalbus. In addition to this, existing bus stop (ID: 2541165) located approximately 550m walking distance (8 mins) on Cambewarra Road services bus route 112 (Kangaroo Valley to Nowra via Cambewarra & Bomaderry) provided by Kennedy's Bus and Coach.

Bomaderry Train Station is located approximately 2.4km walking distance to the east of the site. Bomaderry Train Station services the South Coast Line which provides access from Bomaderry to Central and Bondi Junction. A service is provided every 60 - 90 minutes.

The location of the site subject to the surrounding public transport network is shown in **Figure 3**.



Site Location

FIGURE 3: PUBLIC TRANSPORT NETWORK MAP

2.5 Future Road and Infrastructure Upgrades

2.5.1 Urban Release Areas

To the west of the subject site, there are two Urban Release Areas called Moss Vale Road North Urban Release Area and Moss Vale Road South Urban Release Area which are expected to accommodate 2,500 - 3,000 dwellings (subject to planning completion) and 950 dwellings respectively. The construction of these two Urban Release Areas will increase the traffic volumes along Moss Vale Road.

The locations of the Urban Release Areas are shown in **Figure 4** and **Figure 5** below.

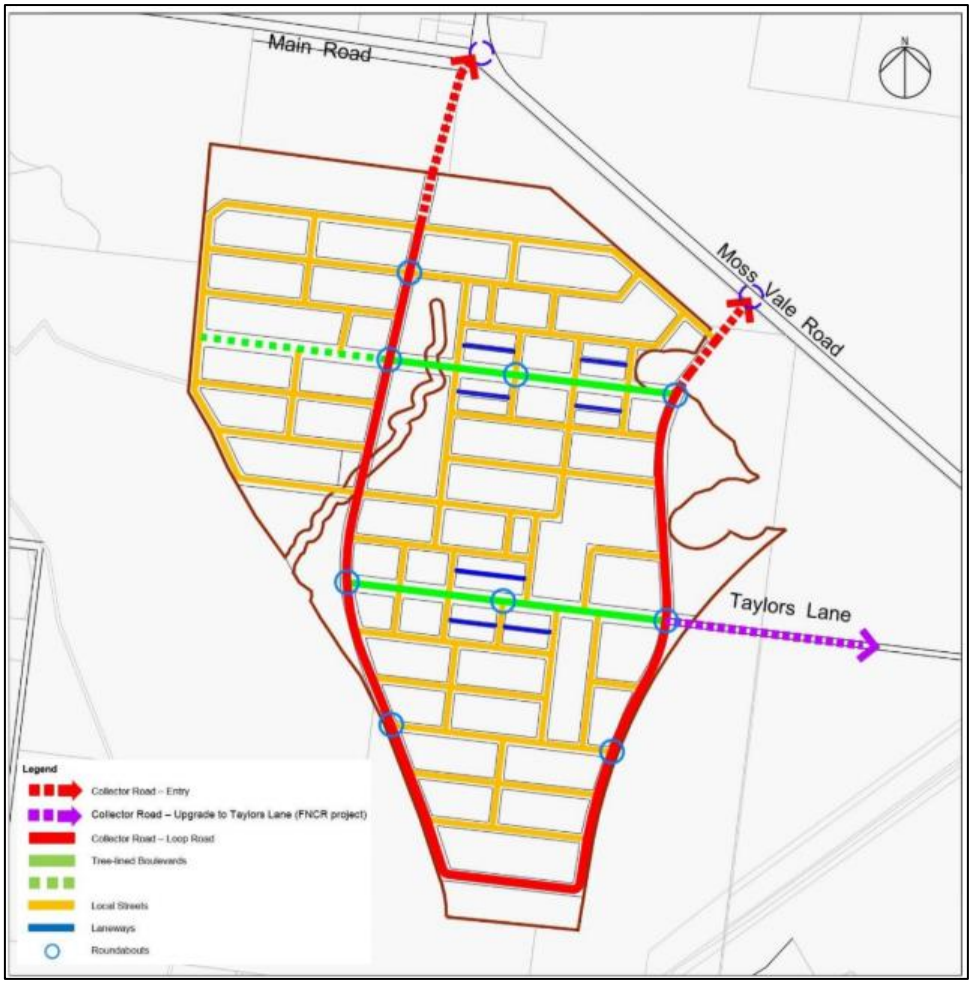


FIGURE 4: MOSS VALE ROAD SOUTH URBAN RELEASE AREA

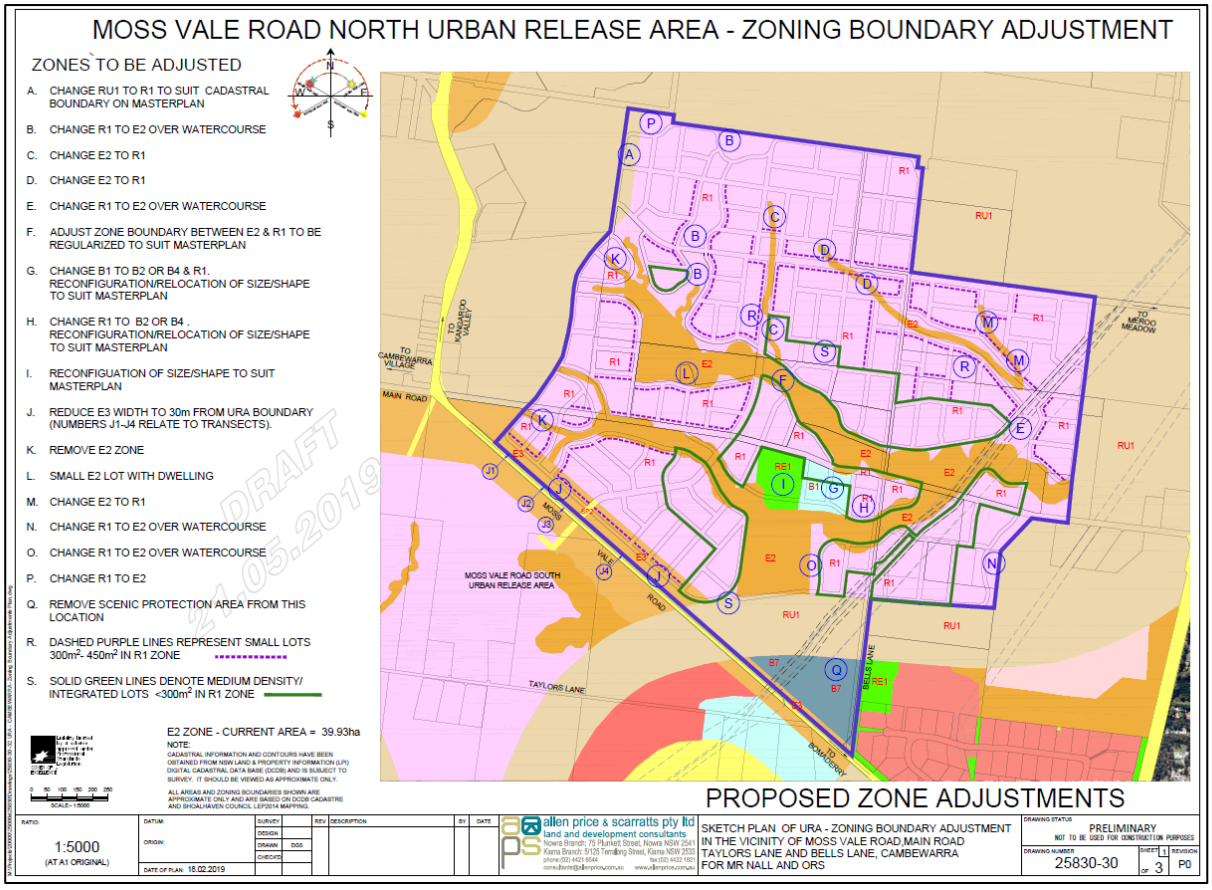


FIGURE 5: MOSS VALE ROAD NORTH URBAN RELEASE AREA

The construction of the Moss Vale South Urban Release Area has commenced, whilst planning for the Moss Vale North Urban Release Area is ongoing.

These urban release areas have been considered within the assessment of the traffic impacts of the proposed development.

2.5.2 Far North Collector Road and North Nowra Link Road

To the west of the site, the Far North Collector Road project is currently being constructed with Stage 2 of these works scheduled to be complete by the end of June 2024. The project can be divided into four (4) stages:

- Stage 1: Illaroo Road Roundabout;
- Stage 2: Moss Vale Road intersection with Far North Collector Road;
- Stage 3: The connection between Illaroo Road and Moss Vale Road with a connection to Taylors Lane;
- Stage 4: Connection to Taylors Lane.

Stage 1 was completed in March 2021 and Stage 2 is due to be completed in the second quarter of 2024. The project is expected to have a direct impact on Moss Vale Road, both during the construction phase and upon completion. It is relevant to note that Taylors Lane will connect to the southern Urban Release Area. Whilst the proposed signalised intersection at Bells Lane / Moss Vale Road will allow safe access onto Moss Vale Road from both the southern and northern urban release areas.

The project objectives of the Far North Collector Road from the Council website are quoted below:

> *As an integral component of the adopted Nowra Bomaderry Structure Plan, the Far North Collector Road Network project will:*
>
> - *Assist to reduce traffic volumes on Illaroo Road (currently the only access into/out of North Nowra) and alleviate traffic congestion near the Shoalhaven River Bridge crossing*
> - *Allow new growth from the Moss Vale Road (South) Urban Release Area to access North Nowra directly (mitigating the impacts of the Moss Vale Road Urban Release Area's on the State Road network) i.e. without the Far North Collector Road Network the full impacts of the Moss Vale Road Urban Release Area's would be absorbed by the State Road network (Moss Vale Road and the Princes Highway)*
> - *Alleviate local access problems during construction of the Moss Vale Road (South) Urban Release Area.*

It is expected that the construction of this road will lessen the potential traffic impact of the proposed development on the State Road network; in particular, the intersection of Moss Vale Road / Cambewarra Road / Princes Highway by providing an alternate route to the wider State Road network.

FIGURE 6: FAR NORTH COLLECTOR ROAD

2.5.3 Nowra Bypass – Early Planning Only

In broader planning aspects, there is early planning underway for a Nowra Bypass with the Australian Government committing an additional $65 million for "planning and preparatory works" in January 2023. If a bypass were to be implemented, this would reduce traffic volumes travelling along Princes Highway in proximity to the subject site and likely improve

the Level of Service and operation of nearby intersections with reduced average delays. As the implementation of this bypass is not yet confirmed, this possible road will not form part of this assessment.

In view of the above, there are significant projects being undertaken within close proximity to the site, with likely significant infrastructure upgrades to increase capacity at relevant intersections with the Urban Release areas along Moss Vale Road, with additional link roads being provided to minimise the impacts to the existing roundabout intersection of Moss Vale Road / Princes Highway / Cambewarra Road.

3 SUBDIVISION STREET DESIGN

3.1 Design Standards

Whilst Council's controls do not apply to the site due to the nature of the application, Council's DCP has been used as a point of reference to undertake a merit assessment. Hence, reference is made to *Table 1* and *Table 5* of Shoalhaven City Council's *Shoalhaven Development Control Plan (*DCP*) 2014, Chapter 11: Subdivision, Supporting Document 1: Subdivision Technical Guidelines* which provides the recommended design principles for Residential Streets and Road Types. These tables are reproduced in **Figure 7** and **Figure 8** below (accessed 30th April 2024).

Table 1: Classification of streets

Road Typology	Speed km/h [1]	AADT[2]	Carriageway Widths[3] (m)
Collector Road (Tier 1) (Local Distributor Road)	60	7,500-19,999	14[4]
Collector Road (Tier 2)	50	3,000-7,499	13[5]
Local and Retail Streets	50	1,500-4,999	11.6
Local Street (Riparian)	50	1,500-2,999	10
Access Street (Tier 1)[6]	40	750 to 1,499	9.5
Access Street (Tier 2)[7]	30	300 to 749	7.5
Access Place	30	<299	7
Laneways	10	<150	6[8]
Industrial	50-60	N/A	13

[1] Streets shall be designed to achieve the target street speed and sight distances to accord with design speed.
[2] For single dwellings, apply a traffic generation rate of 10 vehicles per day per dwelling. For multi-unit dwellings apply a rate of 6 vehicles per day per dwelling unless a different rate can be demonstrated.
[3] The carriageway width is measured from invert to invert. Widening may be required at bends to allow for wider vehicle paths (subject to review using *AUSTROADS Turning Templates)*.
[4] Local distributor roads must be line marked.
[5] Collector roads must be line marked.
[6] Includes traditional cul-de-sac type streets.
[7] Includes traditional cul-de-sac type streets.
[8] Laneways are generally used when smaller lot layouts justify access to garages at the rear, and where alternative vehicle access is needed for lots fronting major streets or parklands (i.e., rear loaded lots). Laneways are to only be considered in strategic circumstances, for example, when part of a master plan and are to be designed as self-enforcing shared zones.

FIGURE 7: TABLE 1 OF DCP CHAPTER G11

A more detailed breakdown of the above table is provided below in **Figure 8** and **Figure 9**.

Table 5: Street and Road Types

Street Type	Road Reserve Width (m)	Carriageway Width (m)	Verge Width (m)	Kerb Type	Street Longitudinal Grade Max	Pavement Treatment	Footpath Requirement	Parking Provision within Road Reserve	Minimum Boundary Splay at Intersections (m)[11]	Entrance Kerb Return Radium (m)[12]
Collector Road (Tier 1) (Local Distributor Road)	23.5	14	4.5 - 5	Barrier	16%	AC	Yes, both sides	Carriageway – able to be converted in future to No Parking/ Clearway	5 x 5	12
Collector Road (Tier 2)	22.5	13	4.5 - 5	Barrier	16%	AC	Yes, both sides	Carriageway	5 x 5	12
Local and Retail Street	20.6 – 21.6	11.6	4.5 – 4.5	Barrier	16%	AC	Yes, both sides	Carriageway	4 x 4	9
Local Street (Riparian)	17	10	2.5 – 4.5	Layback	16%	AC	Yes, riparian side	Carriageway	4 x 4	9
Access Street (Tier 1)	17.5 – 18.5	9.5	4 - 5	Layback	16%	AC, or stamped or patterned concrete	Yes, both sides	No	4 x 4	9
Access Street (Tier 2)	16 - 17	7.5	4 - 5	Layback	16%	AC, or stamped or patterned concrete	Yes, both sides	No	4 x 4	9
Access Place	15.5 – 16.5	7	4 - 5	Layback	16%	AC, or stamped or patterned concrete	Yes, one side	No	4 x 4	9
Laneways	11	6	2.5	Barrier or concrete V-drain	16%	AC or concrete	No	No	4 x 4	9
Industrial	21.5 – 22.5	13	4 - 5	Barrier	16%	AC	Yes, one side	Carriageway	5 x 5	12
Car parks						AC or patterned concrete				

[11] Splay dimensions may need to be increased to adequately accommodate shared paths and services. The design is to be prepared in accordance with AUSTROADS requirements.

[12] Any variation to the radii must be approved by Council's Engineers and should accommodate the intended vehicular movement using AUSTROADS templates. The specified minimum kerb radii and minimum splay corners may be subject to amendment according to intersection treatments and associated traffic control devices. Should such be identified for an intersection, then both radii and splays will be designed in accordance with the intersection treatment design. When reduced kerb returns are specified due consideration must be given to the following:

a) The provision of kerb levels (on the nominal kerb lines) at tangent points, quarter points and wherever necessary to ensure accurate construction of junctions and turning heads.
b) Offsets to all crests and low points to be shown on the kerb profile.
c) The kerb return profile is to be generally designed by adopting the grades of the approach and exit kerbs to the return, by quartering the length of the return and by computing kerb levels adopting two vertical curves as required.
d) As far as practicable, low points within the kerb return shall be avoided to eliminate the use of pits with curved lintels.

FIGURE 8: TABLE 5 (PART 1) OF DCP CHAPTER G11

Table 5 (Part 2): Large Residential Development

Allotment Size	Gutter	Drainage
2000m² - 3,999m²	Layback kerb and gutter	Underground
4,000m² and greater	Grassed table drain with concrete edge strip Grade 10% plus layback kerb	Underground with table drains to drain road reserve

Table 9 and Table 9 (Part 2) Notes:

- Each verge must be of sufficient width to accommodate relevant services, plantings and pathways.
- The minimum street reserve widths apply after satisfying the other criteria within this table and possible future pavement widening to 5m.
- An integrated design of street and building layout is necessary for speed control and to achieve the optimum result. Appropriate considerations are required for the collection of waste.
- A minimum kerb radius is desirable for pedestrian safety and control of vehicle speeds. A threshold treatment or driveway crossing may be used at the intersection entry.
- Grades greater than 12% require special design considerations for pedestrians, cyclists, waste collection vehicles and road layout e.g. Grade on curves, grade for turning vehicles at the street turning head.
- Pathway reserve width 4m.
- Cycleway reserve width 6m.

FIGURE 9: TABLE 5 (PART 2) OF DCP CHAPTER G11

Whilst the proposed road design does not comply with the abovementioned current DCP requirements, it is important to note that it was designed in accordance with a previous DCP in relation to geometric design where it was assessed to be compliant, and subsequently approved. Whilst this is the case, a summary is provided below of the various roads within the subdivision, with the reference of roads shown in **Figure 10**.

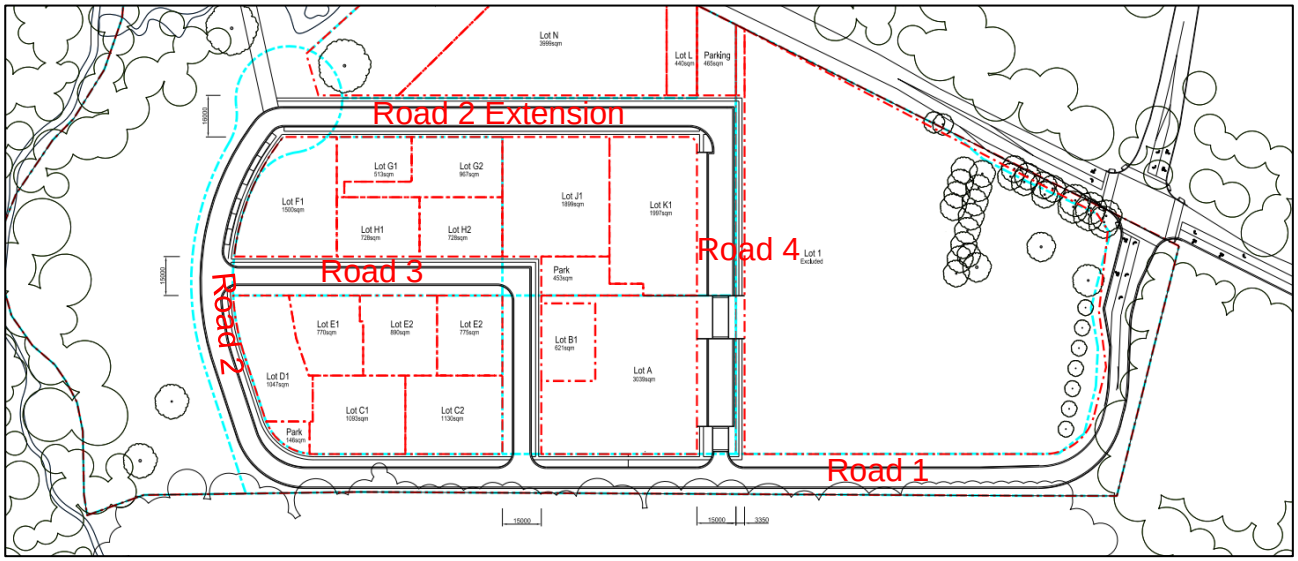


FIGURE 10: SUBDIVISION ROAD LABELLING

TABLE 2: PROPOSED ROAD GEOMETRY

Road	Commentary / Road Type	Lots Served	Indicative AADT(1)	Road Reserve	Carriageway Width	Verge Width	Parking Conditions
Road 1	As Approved (Local Road)	N/A	<2000	15m	8m	5m one side and 2m one side	No Parking permitted
Road 2	As Approved (Local Road)	29 dwellings + 98 units	<2000	16m	8m	4.5m one side and 3.5m one side	Indented Parking Only
Road 2 Extension	Continuation of geometry of Road 2 (Access Street Tier 2)	98 units	300 - 749	16m	7.5	4.5m one side and 4m one side	One Side Only
Road 3	Access Place	18 dwellings + 19 boarding rooms	<299	15m	7m	4m both sides	One Side Only
Road 4	Local Street (Riparian)	N/A	1,500 – 2,999	18.4m	6m between cars 10.2m with parked vehicles	6.2m both sides (including parking)	Indented parking on both sides

Note: 1 – Based upon Council's Old DCP requirements for Local Roads

Whilst the approved Road 1 and Road 2 does not fit into the current DCP road design requirements. It has been historically approved and hence the continuation of this road into the Road 2 extension makes the most practical sense rather than changing the geometric design of the road in the extended portion.

Further, as shown above, the newly created Road 3 complies with the Access Place requirements of Council's DCP and Road 4 would operate with less daily vehicle trips than 2,999 vehicles and is hence acceptable. Hence, in view of the above, the proposed road design is appropriate for the intended use of the subdivision.

3.1.1 Two Way Passing at Intersections and Bends in the Road Carriageway

Swept path testing has been undertaken to assess the ability of vehicles to access and pass each other around bends or at intersections of the proposed subdivision, with results provided in **Annexure E**. The swept path testing has been undertaken using *AutoTurn 11* software with a design vehicle of a 5.2m length passenger vehicle in accordance with *Austroads' Design Vehicles and Turning Path Templates Guide* (2023) with two-way passing of this design vehicle tested with an Australian 85th percentile light vehicle (B85) in accordance with AS2890.1:2004. The results indicate that a passenger vehicle (B99) and B85 can successfully pass each other at the relevant intersections and bends within the proposed road carriageways. However, it is recommended that the centreline around bends in the roads be detailed during the construction certificate state to ensure that this two-way passing is achieved.

It is reiterated that the design and testing of the intended design and checking vehicles for waste collection and emergency vehicle access is being undertaken by others and is shown on the enineering drawings. Accordingly, testing of these vehicles is excluded from this assessment.

4 PARKING ASSESSMENT

4.1 Council Parking Requirements

Reference is made to Shoalhaven City Council's *Shoalhaven Development Control Plan* (DCP) *2014 – Chapter G21: Car Parking and Traffic – Section 5: Controls* which provides the following car parking rates applicable to the proposed development.

Bowling Green

30 spaces for the first green; plus 15 spaces for each additional green.

Pub, Registered club

1 space per 5m² of licensed floor area (e.g. bar, lounge, beer garden, games room).

1 space per 40m² of gross floor area of office space.

Function rooms/restaurant or cafe:

- *1 space per 24m² of gross floor area within CBD areas; or*
- *1 space per 6.5m² of gross dining area outside CBD area.*

Dance areas and other recreation areas will be considered separately.

Commercial premises (Business premises, Office premises, Retail premises)

Land zoned E2 Commercial Centre:

- *1 space per 24m2 of gross floor area:*
  - *At ground level; or*
  - *Where access to the development is from ground level above an underground level of car parking.*
  - *1 space per 40m2 of gross floor area at first floor and above.*

Elsewhere, 1 space per 40m2 of gross floor area.

Boarding House

As per the requirements of State Environmental Planning Policy (Housing) 2021

Attached dwellings (not fronting a public road), Multi dwelling housing, Residential flat buildings

1 space per one bedroom dwelling.

1.5 spaces per two bedroom dwelling.

2 spaces per dwelling containing three or more bedrooms.

0.2 spaces per dwelling must be provided for visitor parking (rounded up).

Child care centre

1 space for every 3 children.

Section 19(2)(f) of the Housing State Environmental Planning Policy

(f) the following number of parking spaces for dwellings not used for affordable housing—

(i) for each dwelling containing 1 bedroom—at least 0.5 parking spaces,

(ii) for each dwelling containing 2 bedrooms—at least 1 parking space,

(iii) for each dwelling containing at least 3 bedrooms—at least 1.5 parking spaces,

In accordance with the DCP requirements for Boarding Houses, reference is made to the *State Environmental Planning Policy (Housing) 2021*, which outlines the following parking requirements:

(i) if a relevant planning instrument does not specify a requirement for a lower number of parking spaces – at least the following number of parking spaces –

(i) for development on land within an accessible area – 0.2 parking spaces for each boarding room,

(ii) otherwise – 0.5 parking spaces for each boarding room.

***accessible area** means land within –*

(a) 800m walking distance of –

(i) A public entrance to a railway, metro or light rail station, or

(ii) for a light rail station with no entrance—a platform of the light rail station, or

(iii) a public entrance to a wharf from which a Sydney Ferries ferry service operates, or

(b) (Repealed)

(c) 400m walking distance of a bus stop used by a regular bus service, within the meaning of the Passenger Transport Act 1990, that has at least 1 bus per hour servicing the bus stop between—

(i) 6am and 9pm each day from Monday to Friday, both days inclusive, and

(iii) 8am and 6pm on each Saturday and Sunday.

The subject site is not located within an accessible area, thus the rate of 0.5 parking spaces per room will apply.

In addition, it is understood the subject residential portion of the development will be subject to infill development under the SEPP Housing and will be assessed as such.

4.1.1 Parking Requirements

Based on the Council DCP parking rates and the applicable SEPP, the car parking requirement for the development is summarised in

Table 3.

TABLE 3: PARKING REQUIREMENTS

Land Use	Type	Scale	Rate	Parking Required
Bowling Club	Bowling Green	2 Greens	30 spaces for the first green, plus 15 spaces for each additional green	45
	Licensed Area	202m^2 GFA	1 space per 5m^2 of licensed floor area	40.4 (**40**)
	Restaurant / Function Room	231m^2 GFA(1)	1 space per 6.5m^2 gross dining area	35.5 (**36**)
	Office	240m^2 GFA	1 space per 40m^2 GFA	6
Commercial	Retail	215m^2 GFA	1 space per 40m^2 GFA	5.38 (**5**)
	Commercial	580m^2 GFA		14.5 (**15**)
Medical Centre / Retail	Medical Centre(2)	462m^2 GFA	4 spaces per 100m^2	18.48 (**18**)
Boarding House	Boarding House	19 rooms	0.5 spaces per room	9.5 (**10**)
Attached Housing / Multi Dwelling Housing	1-bedroom houses	6	0.5 spaces per dwelling.	3
	2-bedroom houses	0	1 spaces per dwelling	0
	3-bedroom houses	28	1.5 spaces per dwelling	42
	4-bedroom houses	13	2 spaces per dwelling	26
Apartments	1-bedroom unit	73 dwellings	0.5 spaces per 1 bedroom unit	36.5
	2-bedroom unit	53 dwellings	1 spaces per 2 bedroom unit	53
	3-bedroom unit	6 dwellings	1.5 spaces per 3 bedroom unit	9
Health and Community Services	Child Care Centre	55 children	1 space per 3 children.	18.3 (**18**)
Commercial	Maintenance Workshop	233m^2	1 space per 40m^2 GFA	5.8 (**6**)
TOTAL	**-**	**-**	**-**	**369 car spaces**

Notes:
(1) Gross Dining Area assessed as equivalent to total GFA as a conservative assessment.
(2) Retail / medical centre development assessed as medical centre for the highest parking requirement.

As shown above the minimum car parking requirements for the subdivision is **369** spaces.

Whilst the Bowling Club does not form part of the proposed development, it has been included in the assessment for completeness and determine cumulative impacts.

4.2 Accessible Parking Requirements

Shoalhaven City Councils DCP outlines that accessible parking is to be provided in accordance with *Part D3* of the *Building Code of Australia* (BCA). The BCA has since been updated as part of the *National Construction Code 2022* (NCC) such that the applicable accessible parking rates are now provided in *Section D4D6* of the BCA. This section specifies the accessible parking requirements for a range of building classes, with the relevant requirements quoted below.

> *(a) Class 1b and 3 buildings:*
>
> *(i) For a boarding house, guest house, hostel, lodging house, backpackers' accommodation or the residential part of a hotel or motel, the number of accessible carparking spaces required is to be calculated by multiplying the total number of carparking spaces by the percentage of —*
>
> > *(A) accessible sole-occupancy units to the total number of sole-occupancy units; or*
> >
> > *(B) accessible bedrooms to the total number of bedrooms.*
>
> *(ii) For the purposes of (i), the calculated number is taken to the next whole figure.*
>
> *Class 5, 7, 8 or 9c buildings*
>
> > *1 accessible space for every 100 carparking spaces or part thereof*
>
> *(c) Class 6 buildings—*
>
> > *(i) with up to 1000 carparking spaces — 1 accessible space for every 50 carparking spaces or part thereof;*
>
> *(e) Class 9b buildings:*
>
> *(ii) For other assembly buildings—*
>
> > *(A) with up to 1000 carparking spaces — 1 accessible space for every 50 carparking spaces or part thereof*

accessible car parking spaces will be required to be provided in accordance with the BCA requirements detailed above, plus the number of disabled accessible spaces required for the residential units.

Best practice for residential accessible car parking provision is to provide parking at a rate of one (1) accessible space for every adaptable or accessible dwelling.

4.3 Bicycle Parking Requirements

Reference is made to Shoalhaven City Council's *Shoalhaven DCP 2014– Chapter G21: Car Parking and Traffic – Section 5: Controls* which outlines the following regarding bicycle parking:

Performance Criteria

P5 To encourage the use of bicycles.

Acceptable Solutions

A5.1 New developments, particularly educational establishments, recreational facilities, shops and civic buildings, should provide appropriate bicycle parking/storage facilities in accordance with current AUSTROADS Guidelines and or Australian Standards.

A5.2 The design and installation of bicycle parking facilities should also comply with AS2890.3.

A5.3 Larger developments should provide showers and associated amenities to encourage and cater for bicycle use.

Whilst Shoalhaven City Council does not strictly require the provision of bicycle parking spaces, reference is made to Austroads' *Cycling Aspects of Austroads Guides - Appendix I* which provides indicative bicycle parking provision rates for a range of land uses. The requirements outlined for the land uses relevant to the proposed subdivision are tabulated below in **Table 4.**

TABLE 4: AUSTROADS BICYCLE PARKING REQUIREMENTS FOR THE PROPOSED DEVELOPMENT

Land Use	Rate	Class	Scale	Required Bicycle Parking
EMPLOYEE / RESIDENT				
Flat	1 per 3 flats	1	179 flats	60
Hotel(1)	1 per 25m^2 bar floor area	1	202m^2 Lounge area	2
	1 per 100m^2 lounge beer garden	1		
Office	1 per 200m^2 GFA	1 or 2	580m^2	**3**
Shop	1 per 300m^2 GFA	1	215m^2	0.7 (**1**)
			462m$^{2(2)}$	1.5 (**2**)
Residential Building(3)	1 per 4 lodging rooms	2	19 rooms	4.8 (**5**)
Childcare Centre(4)	No applicable rate provided	N/A	N/A	N/A
General Industry	1 per 150m^2 GFA	1 or 2	233m^2	1.6 (**2**)
Subtotal	**-**	**-**	**-**	**75**
VISITOR / CUSTOMER				
Flat	1 per 12 flats	3	179 flats	15
Hotel(1)	1 per 25m^2 bar floor area	3	202m^2 Lounge area	2
	1 per 100m^2 lounge beer garden			
Office	1 per 750 m^2 over 1000 m^2	3	580m^2	0
Shop	1 per 500m^2 over 1000m^2	3	215m^2	0
			462m$^{2(2)}$	0
Residential Building(3)	1 per 16 lodging rooms	3	19 rooms	1
Childcare Centre(4)	No applicable rate provided	N/A	N/A	N/A
General Industry	-	-	-	-
Subtotal	**-**	**-**	**-**	**18**
Total	**-**	**-**	**-**	**93**

Notes:

(1) There is some overlap in GFA in the hotel and Bowling Club uses within the calculations.
(2) Potential for medical centre use.
(3) Boarding house considered as residential building.
(4) The AUSTROADS Guide does not provide an applicable rate for Child Care Centre developments.

Based upon Austroads' bicycle parking rates, the proposed development requires **93** bicycle spaces. The site is not constrained by its ability to provide an adequate quantum of bicycle parking and the bicycle parking demands of the considered uses can be fully provided on-site.

Whilst the Bowling Club does not form part of the proposed development, it has been included in the assessment for completeness and determine cumulative impacts.

4.4 Motorcycle Parking Requirements

Reference is made to Shoalhaven City Council's *Shoalhaven DCP 2014– Chapter G21: Car Parking and Traffic – Section 5: Controls* which outlines the following regarding motorcycle parking:

> *A1.7 Redundant areas within car parks should be considered for motorcycle parking. A maximum of 2% total car parking provision can be provided as motorcycle parking.*

In accordance with Shoalhaven City Council's DCP a maximum of eight (8) motorcycle spaces (2% of 369 car spaces) could be provided within redundant areas within car parking areas instead of car spaces for the proposed development. The site is not constrained by its ability to provide an adequate quantum of motorcycle parking and the motorcycle parking demands of the considered uses can be fully provided on-site.

4.5 Servicing & Loading

Shoalhaven City Council's DCP does not provide specific rate of provision for facilities for servicing or loading vehicles. However, reference is made to *Shoalhaven DCP 2014– Chapter G21: Car Parking and Traffic, Section 6.4 Service Areas* which outlines the following general requirements regarding service areas.

> ***Performance Criteria***
>
> *P13 Suitable areas for safe and efficient loading/unloading of goods is provided.*
>
> ***Acceptable Solutions***
>
> *A13.1 Service areas should operate independently of other parking areas.*
>
> *A13.2 The location of loading/servicing areas should be clearly indicated by the use of signs.*
>
> ***Performance Criteria***
>
> *P14 All servicing occurs on-site.*
>
> ***Acceptable Solutions***
>
> *A14.1 Internal roadways must be adequate in construction and design for the largest vehicle anticipated to utilise the site.*

A14.2 Service docks are designed to cater for the largest vehicle anticipated to use the premises.

A14.3 Service areas are designed to avoid the need for service vehicles to reverse across the pedestrian desire lines.

With consideration for the proposed land uses, it is expected that the largest vehicle required to service the site would be a 12.5m length Heavy Rigid Vehicle (HRV). The driveways, road layouts and intersections of the site should be designed to provide access for up to a 12.5m length Heavy Rigid Vehicle. However, it has been advised that heavy vehicle access to and from the site (including emergency vehicle access) for this application is being assessed by others, which are shown on the engineering drawings. Accordingly, the assessment of heavy vehicle access is excluded from this report.

4.6 Car Park Design & Compliance

The car parking layout and access thereto, shall be assessed for compliance against the relevant sections of AS2890.1:2004, AS2890.2:2018 and AS2890.6:2022. The design is to achieve the following:

- **Car Parking Modules**:
    - **Staff only (User Class 1A)**: If a parking module is allocated only to staff use, then parking spaces can have minimum dimensions 2.4m width and a minimum 5.4m length for employees. The parking module must also have a minimum width 5.8 metres to comply with AS2890.1:2004.
    - **Shared module (User Class 3)**: If a parking module is to be shared by both visitors and staff, then the parking spaces can have minimum dimensions 2.6m width and a minimum 5.4m length, with an associated minimum aisle width of 5.8m.
    - A 300mm widening of any parking space is required for each side wall obstruction for car door opening effects. If any small car parking bays are included, these can have the minimum dimensions of 5.0 metres long by 2.3 metres wide.
    - At blind aisles, the aisle shall be extended a minimum of 1 m beyond the last parking space, and the last parking space widened by at least 300mm if it is bounded by a wall or fence to comply with AS2890.1:2004, but ideally widened by the same amount as the aisle is lengthened.
- **Car Parking Access Driveway Widths:** The minimum widths of access driveways servicing the site are dependent on the following factors: the nature of the frontage road, the number of car parking spaces the driveway services, and the user class of the parking module.
    - For example, a driveway servicing between 25-100 Class 1 and 1A (i.e. all-day parkers including employees) parking spaces from a local road is required to provide a Category 1 driveway in accordance with Table 3.1 of AS2890.1:2004. To allow for two-way passing at the driveway, this category of driveway should have a minimum width of 5.5m. Justification of a reduced

access driveway width can be considered on a case by case basis based upon the traffic generation of the site and carparking area.

  - However, driveways servicing parking modules of a higher User Class, or of a larger volume, may require larger widths subject to further assessment during the DA stage.
  - All driveways shall provide a 2m by 2.5m sight triangle upon departure to the road boundary to provide adequate sight lines to pedestrians. See Figure 3.3 of AS2890.1-2004 or Figure 3.4 of AS2890.2:2018.

- **Accessible Car Parking Space:** Accessible car parking spaces are to be designed in accordance with AS2890.6:2022, requiring a 2.4m wide spaces by 5.4m in length with adjacent shared space of the same dimensions.
- **Shared Zone**: A shared zone must be located adjacent to the disabled parking bay on either side. A shared zone must also be included at the front or rear of the parking bay. It should be noted that the aisle can be deemed a shared zone for the front or rear of the parking bay. Where a shared zone separates two parking bays or separates the disabled space and a wall, a Bollard is to be installed in accordance to *Figure 2.2* of *AS2890.6 2022*.
- **Headroom**: Minimum of 2.2m through all carparking and car circulation areas EXCEPT for the area directly above disabled parking spaces (including shared spaces) where minimum headroom of 2.5m is required in accordance with Clause 2.4 of AS2890.6:2022. Circulation roadways and service areas to accommodate vehicles up to and including a 6.4m length Small Rigid Vehicle must have a minimum headroom clearance of 3.5m. Any Circulation roadways and service areas to accommodate vehicles of greater size must provide a minimum headroom clearance of 4.5m.
- **Heavy Vehicle Servicing Bay dimensions:** Service bays for the following vehicles should have the following minimum dimensions
  - SRV: 6.4m length x 3.5m width;
  - MRV: 8.8m length x 3.5m width;
  - HRV: 12.5m length x 3.5m length;
  - AV: 20m length x 3.5m length.
- **Driveway Gradient for User Class 1 and 1A (i.e. all-day parkers including employees)**: To satisfy sight lines to pedestrians on footpaths and to comply with under carriage clearance and overhang checks. In this regard driveways need to achieve acceptable performance as follows:
  - Provide a 2m by 2.5m sight triangle upon departure to the road boundary to provide adequate sight lines to pedestrians. See Figure 3.3 of AS2890.1-2004.
  - 1:20 for the first 6 metres from the property boundary however this can be reduced if necessary based on individual assessments.

- Maximum 1:8 for the next 2 to 3m.
- Maximum 1:4 for up to 20m reducing to maximum of 1:6 if the ramp is greater than 20m, unless otherwise justified.
- 1:8 transition over 2 metres to the car parking level, unless otherwise justified.

- **Driveway Gradient for Heavy Vehicles (including delivery and waste collection)**: To satisfy sight lines to pedestrians on footpaths and to comply with under carriage clearance and overhang checks. In this regard driveways need to achieve acceptable performance as follows:
  - Provide a 2m by 2.5m sight triangle upon departure to the road boundary to provide adequate sight lines to pedestrians. See Figure 3.4 of AS2890.1-2004.
  - Maximum 1:6.5 gradient for access by vehicles up to and including at 20m length Articulated Vehicle (AV).
  - Maximum rate of change for heavy vehicles as below:
    - SRV: 1:12 (8.3%) in 4.0m of travel;
    - MRV: 1:16 (6.25%) in 7.0m of travel;
    - HRV: 1:16 (6.25%) in 10m of travel.

5 TRAFFIC ASSESSMENT

The impact of the expected traffic generation levels associated with the approved subdivision and the subject proposal is discussed in the following sub-sections.

5.1 Traffic Generation of the Proposed Development

5.1.1 RTA Guide to Traffic Generating Developments

Traffic generation rates for the relevant land uses are provided in the *RTA Guide to Traffic Generating Developments* (2002) and recent supplements as adopted by *Transport for NSW* (TfNSW) and are as follows:

> ***RTA Guide***
>
> ***3.11.3 Child care centres***
>
> *Long-day care*
>
> *7.00-9.00am 0.8 peak vehicle trips per child*
>
> *2.30-4.00pm 0.3 peak vehicle trips per child*
>
> *4.00-6.00pm 0.7 peak vehicle trips per child*
>
> ***3.3.2 Medium density residential flat building.***
>
> *Smaller units and flats (up to two bedrooms):*
>
> *Weekday peak hour vehicle trips = 0.4-0.5 per dwelling.*
>
> *Larger units and town houses (three or more bedrooms):*
>
> *Weekday peak hour vehicle trips = 0.5-0.65 per dwelling.*
>
> ***3.5 Office and commercial.***
>
> *Evening peak hour vehicle trips = 2 per 100 m^2 gross floor area.*
>
> ***3.6.1 Shopping centres***
>
> *Friday:*
>
> *V(P) = 11 A(S) + 23 A(F) + 138 A(SM) + 56 A(SS) + 5 A(OM) (vehicle trips per 1000m^2)*
>
> *A(SS): Specialty shops, secondary retail GLFA - includes specialty shops and take-away stores such as McDonalds. These stores are grouped as they tend to not be primary attractors to the centre.*
>
> *3.7.2 Restaurants*
>
> *Evening peak hour vehicle trips = 5 per 100 m^2 gross floor area*
>
> *3.7.3 Clubs.*

…evening peak period traffic generation of 10 veh/hr/100 m^2 licensed floor area

3.11.2 Extended hours medical centres

During the Monday evening peak period the mean peak vehicle trip generation rate was 8.8 veh/hr/100 m^2 gross floor area...

In the morning period of 9.00 am to 12.00 pm the mean peak vehicle trip generation rate was 10.4 veh/hr/100 m^2 gross floor area

TDT 2013/04a

High density residential flat dwellings

AM peak (1 hour) vehicle trips per unit: Regional Average = 0.53

PM peak (1 hour) vehicle trips per unit: Regional Average = 0.32

5.1.2 Bowling Greens

It is emphasised that the Bowling Club does not form part of the scope of the proposed development, however, has been included to consider cumulative impacts. As the RMS Guide does not outline traffic generation rates for bowling greens or similar developments during AM and PM peak hour periods, alternative considerations must be made. Bowling Greens are not considered to generate much traffic during these commuter peak periods as most lawn bowling games take place during the middle of the day on weekdays (between 10am and 4pm).

With consideration for the RMS traffic generation rate for Clubs, the RMS Guide provides a traffic generation rate for 10 surveyed clubs in 1978. The RMS Guide states that behaviour of drivers to licensed hotels has changed since 1978 partly due to the introduction of random breath testing. The shifting of societal values and the introduction of blood alcohol driving limits has greatly changed the transport characteristics of patrons of licensed hotels. As such, it is expected that the effective traffic generation of registered clubs is significantly lower than the surveys from 1978, such that using this rate will result in a conservative estimate.

Additionally, it is expected a large proportion of dual-use in traffic generation between the bowling greens and the bowling club will occur, as people playing lawn bowls will often attend the bistro or bar area of a bowling club before or after a game. On this basis it is considered reasonable that, for peak hour traffic generation purposes, the bowling greens can be considered as ancillary to the bowling club.

The resulting traffic generation for the scale of the development is shown in **Table 5** below.

TABLE 5: ESTIMATED TRAFFIC GENERATION FOR THE PROPOSED DEVELOPMENT

Use	Type	Scale	Peak Period	Rate	Traffic Generation
Childcare Centre	-	55 children	AM	0.8 per child	**44**(1) (22 in, 22 out)
			PM	0.7 per child	**39**(1) (19 in, 20 out)
Medium-Density Residential	Attached Housing / Multi Dwelling Housing	47 dwellings	AM	0.58 trips per dwelling(2)	**27**(3) (6 in, 21 out)
			PM		**27**(3) (21 in, 6 out)
Office and commercial	Commercial	580m^2	AM	2 per 100m^2 GFA	**11**(4) (10 in, 1 out)
			PM		**11**(4) (1 in, 10 out)
Bowling Club(5)	Restaurant(4)	96m^2	PM	5 per 100 m^2	**5** trips(1) (3 in, 2 out)
	Office	240m^2	AM	2 per 100m^2 GFA	**5** trips(7) (4 in, 1 out)
			PM		**5** trips(7) (1 in, 4 out)
	Licensed Area (members lounge area, function room and foyer)(6)	348m^2	PM	10 per 100m^2 GFA	**35** trips(1) (17 in, 18 out)
Retail	Retail	215m^2	AM	56 per 1000m^2 GFA	**12**(1) (6 in, 6 out)
			PM		**12**(1) (6 in, 6 out)
Medical Centre	Medical Centre	462m^2	AM	10.4 per 100m^2 GFA	**48**(1) (24 in; 24 out)
			PM	8.8 per 100m^2 GFA	**41**(1) (20 in; 21 out)
Apartments	Dual Key-Apartments	132 dwellings	AM	0.53 trips per unit	**70**(3) (14 in, 56 out)
			PM	0.32 trips per unit	**42**(3) (33 in, 9 out)
Office and commercial	Maintenance Workshop	233m^2	AM	2 per 100m^2 GFA	**5**(4) (4 in, 1 out)
			PM		**5**(4) (1 in, 4 out)
Total	**-**	**-**	**AM**	**-**	**222 (90 in, 132 out)**
			PM	**-**	**222 (122 in, 100 out)**

Notes:

(1) Assumes 50% inbound and 50% outbound during AM and PM peak.
(2) Adopted rate for medium density was the average between the larger units and town house rates (i.e. 0.5 + 0.65 / 2).
(3) Assumes 20% inbound & 80% outbound during AM peak. Vice versa for PM.
(4) Assumes 80% inbound & 20% outbound during AM peak. Vice versa for PM.
(5) The Restaurant and Bowling Club are not likely to generate demand for patrons during the AM peak commuter period (7am to 9am).
(6) Gaming lounge considered ancillary for traffic generation purposes. That is, it is not expected that people will attend the bowling club for the sole purpose of using the gaming lounge.
(7) Assumes 90% inbound & 10% outbound during AM peak. Vice versa for PM
(8) The high-density residential rate 'per unit' has been adopted for a boarding house development.
(9) Medical centre use assumed for the area labelled Medical Centre / Retail as a worst case scenario.

Whilst the Bowling Club does not form part of the proposed development, it has been included in the assessment for completeness and determine cumulative impacts.

As shown in **Table 5,** the scale of the proposed mixed-use subdivision is estimated to generate **222** trips in the AM (90 in, 132 out) peak hour period and **222** vehicle trips in the PM (122 in, 100 out) peak hour period.

Table 6 below details the net difference between the traffic generated by the approved subdivision and the proposed development.

TABLE 6: NET CHANGE IN TRAFFIC GENERATED BETWEEN THE APPROVED AND THE PROPOSED DEVELOPMENT

Peak Period	Approved Development	Proposed Development	Net Change
AM	153 (63 in, 90 out)	222 (90 in, 132 out)	69 (27 in, 42 out)
PM	167 (89 in, 78 out)	222 (122 in, 100 out)	55 (33 in, 22 out)

As shown in **Table 6**, the scale of the proposed mixed-use subdivision is estimated to generate a net difference of **69** trips in the AM (27 in, 42 out) peak hour period and **55** vehicle trips in the PM (33 in, 22 out) peak hour period.

5.2 Traffic Assignment

For this assessment the traffic generated by the development during the AM and PM peak periods will be assessed as being distributed across the surrounding intersections as per the assignment shown in **Figure 11**.

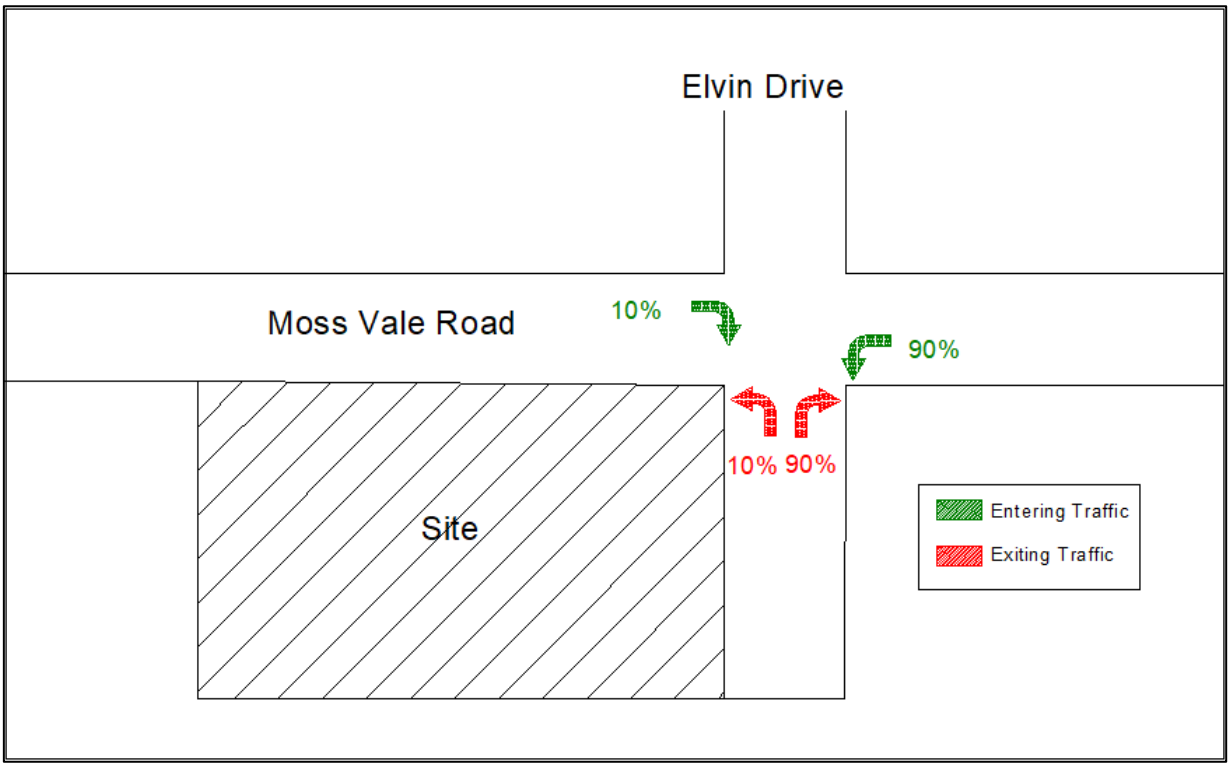


FIGURE 11: TRAFFIC ASSIGNMENT

5.3 Traffic Impact

The traffic generation outlined in **Sections 5.1** and **5.2** above has been added to the existing traffic volumes recorded. SIDRA INTERSECTION 9.1 was used to assess the intersections performance. The purpose of this assessment is to compare the existing intersection operations to the future scenario under the increased traffic load. The results of this assessment are shown in **Table 7**.

TABLE 7: INTERSECTION PERFORMANCE (SIDRA INTERSECTION 9.1)

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/veh)	Level of Service[3][4]	Control Type	Worst Movement
EXISTING PERFORMANCE						
Elvin Drive / Moss Vale Road / Site Access	AM	0.19	1 (Worst: 9.5)	**NA** (Worst: A)	Give Way	RT from Site Access
	PM	0.20	1 (Worst: 9.7)	**NA** (Worst: A)		RT from Site Access
FUTURE PERFORMANCE (Existing + Development Traffic)						
Elvin Drive / Moss Vale Road / Site Access	AM	0.29	3.3 (Worst: 11.8)	**NA** (Worst: A)	Give Way	RT from Site Access
	PM	0.26	3 (Worst: 11.5)	**NA** (Worst: A)		RT from Site Access

Notes:

(1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.

(2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.

(3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

(4) No overall Level of Service is provided for Give Way and Stop controlled intersections as the low delays associated with the dominant movements skew the average delay of the intersection. The Level of Service of the worst approach is an indicator of the operation of the intersection, with a worse Level of Service corresponding to long delays and reduced safety outcomes for that approach.

As shown, the intersection of Elvin Drive / Moss Vale Road / Site Access retains the same overall level of service under future conditions with minimal delays and additional capacity, indicating that there will be no adverse impact on the existing road network as a result of the proposed development.

5.4 Growth Scenarios and Intersection Treatments

5.4.1 Intersection Treatment

For the purposes of this assessment, the proposed intersection has been initially assessed as a four-leg Give-Way Intersection with Elvin Drive and the site's eastern access as the minor legs of the intersection which will give-way to the priority movements of Moss Vale Road. However, as a result of the construction of the Moss Vale Road North and South Urban Release Areas, the growth in through traffic along Moss Vale Road will be so significant that right turns into or out of the site access will become unachievable under a give-way arrangement.

Therefore, either the give-way intersection of the subject site would need to be restricted to a left-in, left-out arrangement in the future or an alternative intersection treatment would become necessary, such as traffic signals

As part of the approved subdivision application on the site, an agreement has been made between TfNSW and the Applicant that the intersection of Moss Vale Road / Site Access / Elvin Drive will be upgraded by TfNSW to a signalised intersection in the future where the Applicant will cover the costs of construction.

Using the proposed signalised intersection arrangement endorsed by Transport for NSW, the traffic generation outlined in **Sections 5.1** and **5.2** above has been added to the existing traffic volumes recorded. SIDRA INTERSECTION 9.1 was used to assess the intersections performance. The purpose of this assessment is to compare the potential use of traffic signals for both the existing intersection volumes and the future scenario under the increased traffic load from the development. A user given cycle time of 90 seconds has been implemented for all testing of a signalised intersection. The results of this assessment are shown in **Table 8**.

TABLE 8: SIGNALISED INTERSECTION PERFORMANCE (SIDRA 9.1)

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/veh)	Level of Service[3][4]	Control Type	Worst Movement
EXISTING PERFORMANCE WITH TRAFFIC SIGNAL INTERSECTION TREATMENT						
Elvin Drive / Moss Vale Road / Site Access	AM	0.26	7.8	**A**	Signals	RT from Elvin Drive
	PM	0.22	7.3	**A**		RT from Elvin Drive
FUTURE PERFORMANCE WITH TRAFFIC SIGNALS (Existing + Development)						
Elvin Drive / Moss Vale Road / Site Access	AM	0.34	17.7	**B**	Signals	RT from Site Access
	PM	0.35	13.4	**A**		RT from Site Access

Notes:

(1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.

(2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.

(3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

(4) No overall Level of Service is provided for Give Way and Stop controlled intersections as the low delays associated with the dominant movements skew the average delay of the intersection. The Level of Service of the worst approach is an indicator of the operation of the intersection, with a worse Level of Service corresponding to long delays and reduced safety outcomes for that approach.

As shown, the intersection of Elvin Drive / Moss Vale Road / Site Access would be expected to perform at a high level of efficiency with either existing volumes or with the existing volumes plus development traffic added, with an overall Level of Service "A" or "B" conditions in both the AM & PM peak hour periods. The Level of Service "A" and "B" performance is characterised by low approach delays and spare capacity.

It is important to note that none of the assessed scenarios above have considered the growth from the Urban Release Areas. As part of a development, it is typical to assess the potential traffic impacts of the development following background growth on the surrounding road network over a 10-year period. However, as a result of the construction of the Moss Vale Road North and South Urban Release Areas, the background growth along Moss Vale Road will be larger than typical and the timing of this growth is currently unknown.

5.5 Future Urban Release Area (URA) Growth Testing

A signalised intersection such as that proposed at the intersection of the Site Access with Moss Vale Road can provide safe and efficient access to / from the subdivision. It is understood that in order to accommodate the growth Moss Vale Road, it is planned to increase the width of Moss Vale Road from two (2) lanes (1 in each direction) to a total width of four (4) lanes (2 in each direction).

Hence a sensitivity test has been undertaken based upon increasing increments of 50 dwellings constructed within the Moss Vale Road URAs to determine the point at which the proposed signalised intersection with one lane in each direction fails. This assessment is provided to hopefully assist TfNSW in planning the timing for the future construction of traffic signals at the intersection of Moss Vale Road and the site access road along with the widening of Moss Vale Road to four lanes.

5.5.1 Traffic Generation Rate of Urban Release Areas

To assess the growth of the Moss Vale Road URAs, and for the purposes of simplicity, the additional traffic generation will be assessed in increments of 50 low-density residential dwellings. Traffic generation rates for low density residential dwellings are provided in the *RTA Guide to Traffic Generating Developments* (2002) (RTA Guide) and recent supplements as adopted by *Transport for NSW* (TfNSW) and are as follows:

> ***Low density residential dwellings***
>
> *Weekday average morning peak hour vehicle trips = 0.71 per dwelling in regional areas*
>
> *Weekday average evening peak hour vehicle trips = 0.78 per dwelling in regional areas*

The resulting traffic generation for the scale of every 100 additional dwellings within the URAs is shown in **Table 9** below.

TABLE 9: TRAFFIC GENERATION PER 100 URA DWELLINGS

Use	Scale	Peak Period	Rate	Traffic Generation
Low-Density Residential	100 dwellings	AM	0.71 trips per dwelling	71(1) (14 in, 57 out)
		PM	0.78 trips per dwelling	78(1) (62 in, 16 out)

Notes:
(1) Assumes 20% inbound & 80% outbound during AM peak. Vice versa for PM.

Under this test, all traffic generated by the Urban Release Areas will be modelled to proceed through the intersection of Moss Vale Road / Elvin Drive / Site Access as through movements along Moss Vale Road as a worst-case scenario. It is noted that this assessment will not assess increases in traffic that may result from the construction of the Far North Collector Road.

5.6 Sensitivity Traffic Impacts

To assess when the conditions at the intersection of Moss Vale Road / Elvin Drive / Site Access would warrant an improvement from the proposed signalised intersection of one lane in each direction to two lanes in each direction, a number of criteria will be used as indicative points for unacceptable levels of performance of the signalised intersection, as detailed in the following subsections. SIDRA Intersection 9.1 was used to assess the intersections performance, with detailed results of the following assessments provided in **Annexure D**.

5.6.1 Degree of Saturation of 0.8

The RTA Guide states the following with respect to the Degree of Saturation for intersections:

> *"When DS exceeds 0.8 - 0.85, overflow queues start to become a problem. Satisfactory intersection operation is generally achieved with a DS of about 0.7 - 0.8"*

Accordingly, the assessment of an intersection reaching a Degree of Saturation of 0.8 is considered a reasonable indication that an intersection is reaching unacceptable levels of performance. The assessed intersection reaches a Degree of Saturation of 0.8 at the following numbers of additional dwellings:

- AM peak hour period – 1250 dwellings
- PM peak hour period – 950 dwellings

5.6.2 Degree of Saturation of 0.9

Following from the above, The RTA Guide also states the following with respect to the Degree of Saturation for intersections:

> *At intersections controlled by traffic signals, both queue length and delays increase rapidly as DS approaches 1.0. An upper limit of 0.9 is appropriate."*

Accordingly, the assessment of an intersection reaching a Degree of Saturation of 0.9 is considered a reasonable indication that an intersection is reaching an upper limit of unacceptable levels of performance. The assessed intersection reaches a Degree of Saturation of 0.9 at the following numbers of additional dwellings:

- AM peak hour period – 1500 dwellings
- PM peak hour period – 1150 dwellings

5.6.3 Level of Service Classification of "E"

The *RTA Guide, Table 4.2* states that traffic signal intersections which perform at a Level of Service of "E" are classified as "*At capacity; at signals, incidents will cause excessive delays*". The assessed intersection reaches a Level of Service of "E" at the following numbers of additional dwellings:

- AM peak hour period – 1800 dwellings;
- PM peak hour period – 1400 dwellings.

5.6.4 95th Percentile Queue Length of Eastern Intersection Leg

With regard for the context of the subject intersection, the proposed intersection is located approximately 240m to the west of the roundabout intersection of Moss Vale Road / Princes Highway / Cambewarra Road. As Princes Highway is a TfNSW classified STATE Arterial Road, it is considered that the extension of queues to this intersection would impact upon the efficient operation of this road and would represent an unacceptable outcome.

The eastern leg of the assessed intersection reaches a 95th percentile queue length of 240m at the following numbers of additional dwellings:

- AM peak hour period – At the highest assessed quantity of additional dwellings of 1800, the 95th percentile queue length of the eastern intersection leg was 70.4m. It is considered highly likely that at least one of the other assessed criteria will instead determine the performance of the intersection in this case.
- PM peak hour period – 1000 dwellings.

5.6.5 Summary

A summary of the traffic generation equivalent of the additional dwellings detailed above to achieve the above criteria is provided in **Table 10**.

TABLE 10: SIGNALISED INTERSECTION PERFORMANCE WITH ADDITIONAL DWELLINGS (SIDRA INTERSECTION 9.1)

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/veh)	Level of Service[3][4]	Control Type	Worst Movement	95th Percentile Queue
FUTURE PERFORMANCE (EXISTING + DEVELOPMENT) + 950 DWELLINGS							
Elvin Drive / Moss Vale Road / Site Access	AM	0.68	14.8	**B**	Signals	RT from Site Access	21.6 veh (153.2m) Moss Vale Road
	PM	0.80	14.6	**B**		RT from Site Access	30.2 veh (213.6m) Moss Vale Road
FUTURE PERFORMANCE (EXISTING + DEVELOPMENT) + 1000 DWELLINGS							
Elvin Drive / Moss Vale Road / Site Access	AM	0.69	15	**B**	Signals	RT from Site Access	22.9 veh (162.9m) Moss Vale Road
	PM	0.83	16.1	**B**		RT from Site Access	34.2 veh (241.3m) Moss Vale Road
FUTURE PERFORMANCE (EXISTING + DEVELOPMENT) + 1150 DWELLINGS							
Elvin Drive / Moss Vale Road / Site Access	AM	0.76	15.8	**B**	Signals	RT from Site Access	27.7 veh (196.4m) Moss Vale Road
	PM	0.91	24.3	**B**		RT from Site Access	51.3 veh (361.8m) Moss Vale Road
FUTURE PERFORMANCE (EXISTING + DEVELOPMENT) + 1250 DWELLINGS							
Elvin Drive / Moss Vale Road / Site Access	AM	0.80	16.5	**B**	Signals	RT from Site Access	31.5 veh (223m) Moss Vale Road
	PM	0.96	35.1	**C**		LT from Moss Vale Road	69 veh (487m) Moss Vale Road
FUTURE PERFORMANCE (EXISTING + DEVELOPMENT) + 1400 DWELLINGS							
Elvin Drive / Moss Vale Road / Site Access	AM	0.87	20.4	**B**	Signals	RT from Site Access	42.6 veh (301.4m) Moss Vale Road
	PM	1.03	62	**E**		LT from Moss Vale Road	100.6 veh (709.7m) Moss Vale Road
FUTURE PERFORMANCE (EXISTING + DEVELOPMENT) + 1500 DWELLINGS							
Elvin Drive / Moss Vale Road / Site Access	AM	0.91	25.6	**B**	Signals	RT from Site Access	54 veh (382m) Moss Vale Road
	PM	1.08	85	**F**		LT from Moss Vale Road	120.4 veh (848.9m) Moss Vale Road
FUTURE PERFORMANCE (EXISTING + DEVELOPMENT) + 1800 DWELLINGS							
Elvin Drive / Moss Vale Road / Site Access	AM	1.04	63.8	**E**	Signals	LT from Moss Vale Road	107.5 veh (759.6m) Moss Vale Road

Notes:

(1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.

(2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.

(3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

(4) No overall Level of Service is provided for Give Way and Stop controlled intersections as the low delays associated with the dominant movements skew the average delay of the intersection. The Level of Service of the worst approach is an indicator of the operation of the intersection, with a worse Level of Service corresponding to long delays and reduced safety outcomes for that approach.

TABLE 11: SENSITIVITY TESTING SUMMARY

Criteria Assessed	Additional Dwellings	
	AM Peak Hour Period	PM Peak Hour Period
Degree of Saturation of 0.8	1250	950
Degree of Saturation of 0.9	1500	1150
Level of Service of E	1800	1400
95th Percentile Queue Length	N/A	1000

5.7 SEPP (Transport and Infrastructure) 2021 Clause 2.119

The proposed development has a single frontage to Moss Vale Road, a classified State Road (No. 261) and as such an assessment against the criteria in *Clause 2.119 of SEPP (Transport and Infrastructure)* is presented below. The relevant items raised in Clause 2.119 are presented below (italicised) with MTE response thereafter.

> *(a) where practicable and safe, vehicular access to the land is provided by a road other than the classified road, and*

MTE Response: The subject site has a single frontage to Moss Vale Road, therefore, no alternate access is possible.

> *(b) the safety, efficiency, and ongoing operation of the classified road will not be adversely affected by the development as a result of:*

i. the design of the vehicular access to the land.

MTE Response: The proposed vehicular access is to be provided via a signalised intersection which has been previously endorsed by Transport for NSW as part of the approved subdivision. Traffic signal controls represent the highest efficiency design for the sites vehicular access and for the ongoing operation of the classified road when considering the likely future volumes following growth along Moss Vale Road.

ii. the emission of smoke or dust from the development

MTE Response: For others to address.

iii. the nature, volume or frequency of vehicles using the classified road to gain access to the land.

MTE Response: Section 5 outlines the expected peak hour traffic generation and impact on the surrounding intersections. The traffic generation of the site will have negligible impact on the surrounding intersections.

6 CONCLUSION

In view of the foregoing, the subject Mixed Use Development proposal at 25 Moss Vale Road, Bomaderry (as depicted in **Annexure A**) has been assessed in terms of its traffic and parking impacts. The following outcomes of this traffic and parking impact assessment are relevant to note:

a) The proposed subdivision would require **369** car parking spaces based on the applicable DCP and RTA Guide parking requirements.

b) The scale of the proposed mixed-use subdivision is estimated to generate **222** trips in the AM (90 in, 132 out) peak hour period and **222** vehicle trips in the PM (122 in, 100 out) peak hour period. The intersection of Elvin Drive / Moss Vale Road / Site Access in the proposed signalised layout has been modelled to perform at a high level of efficiency with either existing volumes or with the existing volumes plus development traffic added, with an overall Level of Service “A” or “B” conditions in both the AM & PM peak hour periods. The Level of Service “A” and “B” performance is characterised by low approach delays and spare capacity.

c) Hence, the mixed used development will require the installation of traffic signals at Moss Vale Road / Site Access / Elvin Drive, consistent with the requirements of the subdivision approval.

d) It is understood that in order to accommodate the growth Moss Vale Road, it is planned to increase the width of Moss Vale Road from two (2) lanes (1 in each direction) to a total width of four (4) lanes (2 in each direction). A sensitivity test has been undertaken (with further details provided in **Section 5.6**) based upon increasing increments of 50 dwellings constructed within the Moss Vale Road URAs to determine the point at which the proposed signalised intersection with one lane in each direction fails. This assessment is provided to hopefully assist TfNSW in planning the timing for the future construction of traffic signals at the intersection of Moss Vale Road and the site access road along with the widening of Moss Vale Road to four lanes.

ANNEXURE A: PROPOSED PLANS
(1 SHEET)

Development Schedule

Area A - SCCH Office	
GF Retail	215 m2 NLA
GF Commercial	300 m2 NLA
L1 Commercial	580 m2 NLA
1 Bedroom Apt	6 Units
Area B - Boarding House	
Studio Units	18 Units
Manager 1 Bed	1 Unit
Area C - Multi Dwelling Housing	
3 Bedroom House	6 Unit
1 Bedroom + Study House	6 Units
Area D - Attached Housing	
3 Bedroom House	9 Units
Area E - Attached Housing	
3 Bedroom House	3 Units
3 Bedroom House + 1B Studio	7 Units
Area F - Dual Key Apartment	
2 Bedroom Unit	8 Units
3 Bedroom Unit	6 Units
Area G - Attached Housing	
3 Bedroom House	8 Units
Area H - Attached Housing	
3 Bedroom House	2 Units
3 Bedroom + 1B Studio	6 Units
Area J - SCCH Apartments	
1 Bedroom Unit	12 Units
2 Bedroom Unit	15 Units
Area K - Shoptop Apartments	
Medical Centre/Retail	462 m2
Childcare Centre	342 m2 (55 Place)
K-2 yr	15 Place
2-4 yr	20 Place
3-5 yr	20 Place
1 Bedroom Unit	28 Units
Area L - Maintenance Workshop	
Commercial	233 m2
Area M - Apartments	
1 Bedroom Unit	12 Units
2 Bedroom Unit	18 Units
Area N - Apartments	
1 Bedroom Unit	15 Units
2 Bedroom Unit	12 Units
Total Units	198 Units

N

0 15M 30M 45M 60M 75M

Nominated Architect: David Dove
BArch (Hons), AssDipAppSci (Arch), Cert IV (Building)
Registered Architect (NSW) No. 8932
Registered Architect (Vic) 19019
Licenced Building Contractor (NSW) 253780C
28/194 Elizabeth Bay Road
Elizabeth Bay, NSW, 2011
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EG

Southern Cross Housing
BUILDING COMMUNITY FUTURES

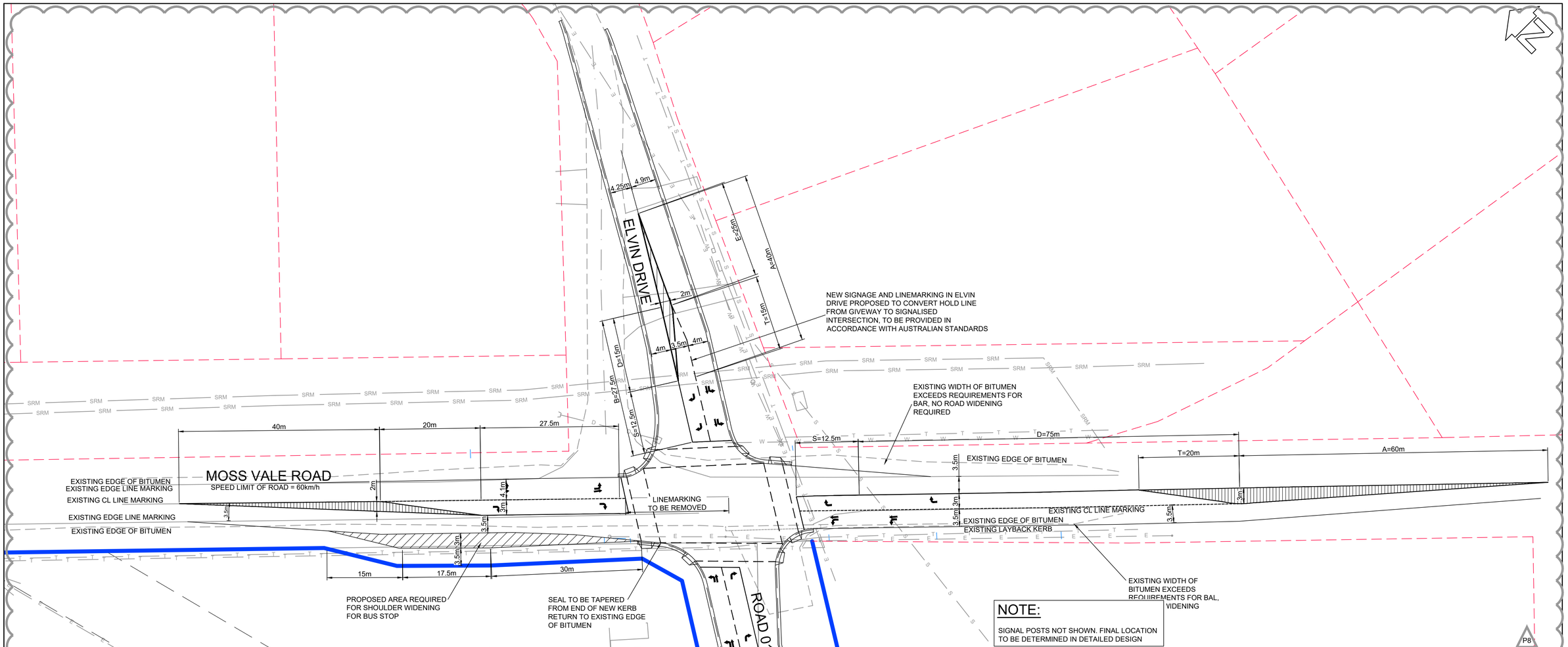
The Yards

Moss Vale Road, Bomaderry

Drawing Title
Master Plan Concept - SSDA
Development Mix

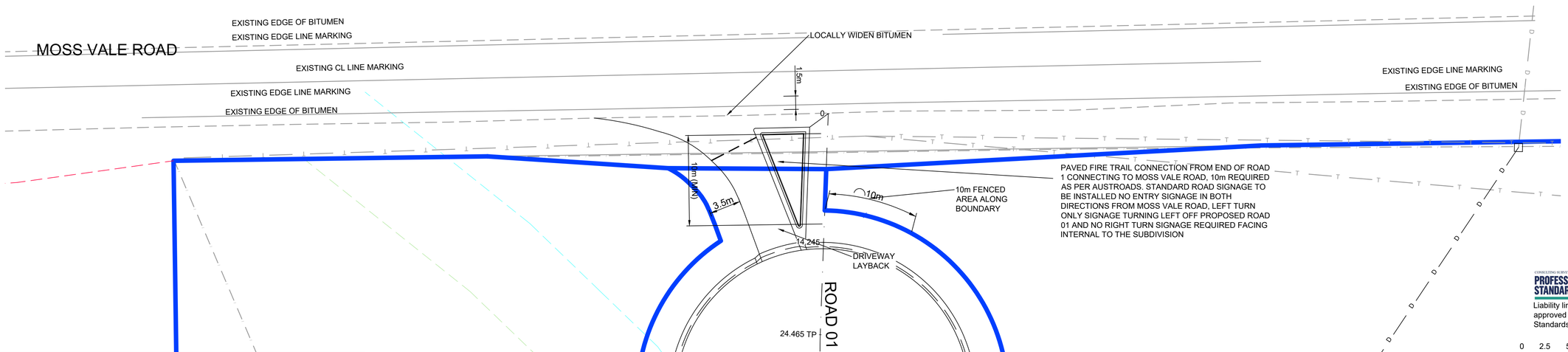
		Date	12th August 2024
Drawn	DJD	Scale	1:1500 @ A3
Job No.	SYB01	Dwg No.	MP105 Rev. F

ANNEXURE B: INTERSECTION SIGNALISATION PLAN
(1 SHEET)



SIGNALISED INTERSECTION TREATMENT FOR EASTERN ENTRY/EXIST LAYOUT PLAN

SCALE 1:400



EMERGENCY VEHICLE ONLY ENTRY/EXIT LAYOUT PLAN

SCALE 1:250

BEWARE!

THE CONTRACTOR IS TO VERIFY THE LOCATION OF ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL BE RESPONSIBLE, AT THE CONTRACTOR'S EXPENSE, FOR ANY REPAIRS TO DAMAGE CAUSED DURING CONSTRUCTION.

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CONSULTING SURVEYORS NATIONAL PROFESSIONAL STANDARDS SCHEME
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SCALE:- 1:250

SCALE:- 1:400

RATIO: AS NOTED (AT A1 ORIGINAL)

DATUM: AUSTRALIAN HEIGHT DATUM
ORIGIN: PM15204 RL52.718
DATE OF PLAN: JUNE 2020

SURVEY	APS
DESIGN	CEG
DRAWN	CEG
CHECK'D	RH

REV	DESCRIPTION	BY	DATE
P1	FOR DA APPROVAL	CEG	29.06.2020
P2	LOT LAYOUT AMNEDED	CEG	03.11.2020
P3	CUL-DE-SAC ADDED + CURVES WIDENED	CEG	07.04.2021
P4	INTERSECTION UPDATED	CJG	26.07.2021
P5	INTERSECTION UPDATED	CJG	17.09.2021
P6	INTERSECTION UPDATED	CJG	05.11.2021
P7	INTERSECTION UPDATED	CJG	17.11.2021
P8	INTERSECTION UPDATED	CJG	29.03.2022

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CONCEPT INTERSECTION TREATMENT PLAN
PROPOSED SUBDIVISION
OVER LOT129 DP3060 LOT110 DP131219 & LOT1 DP520502
AT 25 MOSS VALE ROAD, BOMADERRY
FOR SOUTHERN CROSS HOUSING

DRAWING STATUS: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWING NUMBER: N27790-403
SHEET 3 OF 6
REVISION: P8

M:\Projects\2000\27000s\N27790 Drawings\N27790-403.dwg

ANNEXURE C: TRAFFIC SURVEY DATA
(1 SHEET)

TRANS TRAFFIC SURVEY

trafficsurvey.com.au

TURNING MOVEMENT SURVEY

Intersection of Moss Vale Rd and Elvin Dr, Bomaderry

GPS	-34.840722, 150.591788
Date:	Thu 09/05/24
Weather:	Fine
Suburban:	Bomaderry
Customer:	McLaren

North:	Elvin Dr
East:	Moss Vale Rd
South:	Site Access Driveway
West:	Moss Vale Rd

Survey Period	AM:	7:00 AM-9:30 AM
	PM:	2:30 PM-6:00 PM
Traffic Peak	AM:	8:00 AM-9:00 AM
	PM:	3:30 PM-4:30 PM

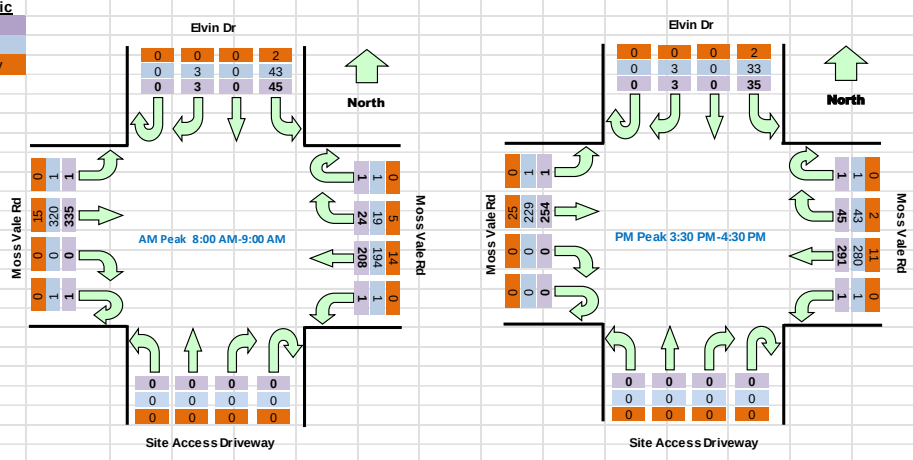
All Vehicles

Time		North Approach Elvin Dr				East Approach Moss Vale Rd				South Approach Site Access Driveway				West Approach Moss Vale Rd				Hourly Total	
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
7:00	7:15	0	1	0	3	0	2	44	0	0	0	0	0	0	0	42	0	445	
7:15	7:30	0	0	0	5	0	2	44	0	0	0	0	0	0	0	65	0	497	
7:30	7:45	0	0	0	13	0	5	42	0	0	0	0	0	0	0	50	1	548	
7:45	8:00	0	1	0	8	1	4	36	0	0	1	0	0	0	1	73	1	594	
8:00	8:15	0	0	0	14	0	7	45	0	0	0	0	0	0	0	77	1	619	Peak
8:15	8:30	0	1	0	12	1	7	42	0	0	0	0	0	1	0	103	0	589	
8:30	8:45	0	2	0	12	0	5	56	0	0	0	0	0	0	0	82	0	532	
8:45	9:00	0	0	0	7	0	5	65	1	0	0	0	0	0	0	73	0		
9:00	9:15	0	0	0	7	0	8	36	0	0	0	0	0	0	0	62	1		
9:15	9:30	0	0	0	6	0	7	48	0	0	0	1	0	0	0	48	0		
14:30	14:45	0	0	0	6	0	6	50	1	0	0	0	0	0	0	51	0	549	
14:45	15:00	0	0	0	11	0	5	62	0	0	1	0	0	0	0	62	0	579	
15:00	15:15	0	0	0	10	0	8	43	0	0	0	0	0	0	0	82	0	599	
15:15	15:30	0	0	0	5	0	14	76	0	0	0	0	0	0	0	55	1	614	
15:30	15:45	0	0	0	7	0	9	64	0	0	0	0	0	0	0	64	0	631	Peak
15:45	16:00	0	2	0	12	0	14	77	0	0	0	0	0	0	0	55	1	627	
16:00	16:15	0	0	0	4	0	10	69	0	0	0	0	0	0	0	75	0	602	
16:15	16:30	0	1	0	12	1	12	81	1	0	0	0	0	0	0	60	0	598	
16:30	16:45	0	1	0	6	2	8	66	1	0	0	1	0	0	0	55	0	593	
16:45	17:00	0	1	0	9	0	4	72	0	0	0	0	1	0	0	49	0	577	
17:00	17:15	0	0	0	2	0	9	87	0	0	0	0	0	0	0	56	0	569	
17:15	17:30	0	1	0	5	1	11	85	0	0	0	0	0	1	0	59	0		
17:30	17:45	0	0	0	7	0	9	55	1	0	0	0	0	0	0	51	1		
17:45	18:00	0	0	0	6	0	8	63	0	0	1	0	0	0	0	49	1		

Peak Time		North Approach Elvin Dr				East Approach Moss Vale Rd				South Approach Site Access Driveway				West Approach Moss Vale Rd				Peak
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	total
8:00	9:00	0	3	0	45	1	24	208	1	0	0	0	0	1	0	335	1	619
15:30	16:30	0	3	0	35	1	45	291	1	0	0	0	0	0	0	254	1	631

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic
Total
Light
Heavy



ANNEXURE D: SIDRA RESULTS
(21 SHEETS)

MOVEMENT SUMMARY

Site: 101 [(Existing AM) Moss Vale Road / Elvin Drive / Site Eastern Access (Site Folder: 2024 Existing Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
AM Peak Period
Existing Road Conditions
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	1	0.0	1	0.0	0.003	6.2	LOS A	0.0	0.1	0.43	0.56	0.43	51.2
3	R2	All MCs	1	0.0	1	0.0	0.003	9.5	LOS A	0.0	0.1	0.43	0.56	0.43	50.9
Approach			2	0.0	2	0.0	0.003	7.9	LOS A	0.0	0.1	0.43	0.56	0.43	51.0
East: Moss Vale Road (E)															
4	L2	All MCs	1	0.0	1	0.0	0.143	7.3	LOS A	0.3	2.0	0.13	0.15	0.13	56.5
5	T1	All MCs	219	6.7	219	6.7	0.143	0.3	LOS A	0.3	2.0	0.13	0.15	0.13	59.0
6	R2	All MCs	25	20.8	25	20.8	0.143	7.5	LOS A	0.3	2.0	0.13	0.15	0.13	55.2
Approach			245	8.2	245	8.2	0.143	1.1	NA	0.3	2.0	0.13	0.15	0.13	58.5
North: Elvin Drive (N)															
7	L2	All MCs	47	4.4	47	4.4	0.048	6.9	LOS A	0.2	1.3	0.41	0.62	0.41	51.5
9	R2	All MCs	3	0.0	3	0.0	0.048	9.5	LOS A	0.2	1.3	0.41	0.62	0.41	51.4
Approach			51	4.2	51	4.2	0.048	7.1	LOS A	0.2	1.3	0.41	0.62	0.41	51.5
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.187	5.6	LOS A	0.0	0.1	0.00	0.00	0.00	57.4
11	T1	All MCs	353	4.5	353	4.5	0.187	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	60.0
12	R2	All MCs	1	0.0	1	0.0	0.187	5.5	LOS A	0.0	0.1	0.00	0.00	0.00	57.1
Approach			355	4.5	355	4.5	0.187	0.0	NA	0.0	0.1	0.00	0.00	0.00	59.9
All Vehicles			653	5.8	653	5.8	0.187	1.0	NA	0.3	2.0	0.08	0.11	0.08	58.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [(Existing PM) Moss Vale Road / Elvin Drive / Site Eastern Access (Site Folder: 2024 Existing Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
PM Peak Period
Existing Road Conditions
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	1	0.0	1	0.0	0.003	6.5	LOS A	0.0	0.1	0.46	0.58	0.46	51.0
3	R2	All MCs	1	0.0	1	0.0	0.003	9.7	LOS A	0.0	0.1	0.46	0.58	0.46	50.7
Approach			2	0.0	2	0.0	0.003	8.1	LOS A	0.0	0.1	0.46	0.58	0.46	50.9
East: Moss Vale Road (E)															
4	L2	All MCs	1	0.0	1	0.0	0.198	6.7	LOS A	0.4	2.9	0.13	0.16	0.13	56.3
5	T1	All MCs	306	3.8	306	3.8	0.198	0.2	LOS A	0.4	2.9	0.13	0.16	0.13	58.7
6	R2	All MCs	47	4.4	47	4.4	0.198	6.7	LOS A	0.4	2.9	0.13	0.16	0.13	55.8
Approach			355	3.9	355	3.9	0.198	1.1	NA	0.4	2.9	0.13	0.16	0.13	58.3
North: Elvin Drive (N)															
7	L2	All MCs	37	5.7	37	5.7	0.036	6.6	LOS A	0.1	1.0	0.37	0.59	0.37	51.6
9	R2	All MCs	3	0.0	3	0.0	0.036	9.7	LOS A	0.1	1.0	0.37	0.59	0.37	51.5
Approach			40	5.3	40	5.3	0.036	6.8	LOS A	0.1	1.0	0.37	0.59	0.37	51.6
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.147	5.6	LOS A	0.0	0.1	0.00	0.01	0.00	57.4
11	T1	All MCs	267	9.8	267	9.8	0.147	0.0	LOS A	0.0	0.1	0.00	0.01	0.00	59.9
12	R2	All MCs	1	0.0	1	0.0	0.147	5.6	LOS A	0.0	0.1	0.00	0.01	0.00	57.1
Approach			269	9.8	269	9.8	0.147	0.0	NA	0.0	0.1	0.00	0.01	0.00	59.9
All Vehicles			666	6.3	666	6.3	0.198	1.0	NA	0.4	2.9	0.10	0.12	0.10	58.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [(Future AM) Moss Vale Road / Elvin Drive / Site Eastern Access (Site Folder: 2024 Future Conditions - Existing + Development)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
AM Peak Period
Future Road Conditions (existing + development)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	16	0.0	16	0.0	0.289	6.8	LOS A	1.2	8.1	0.60	0.86	0.70	48.8
3	R2	All MCs	138	0.0	138	0.0	0.289	11.8	LOS A	1.2	8.1	0.60	0.86	0.70	48.6
Approach			154	0.0	154	0.0	0.289	11.3	LOS A	1.2	8.1	0.60	0.86	0.70	48.6
East: Moss Vale Road (E)															
4	L2	All MCs	83	0.0	83	0.0	0.187	6.2	LOS A	0.4	2.7	0.13	0.27	0.13	55.4
5	T1	All MCs	219	6.7	219	6.7	0.187	0.3	LOS A	0.4	2.7	0.13	0.27	0.13	57.7
6	R2	All MCs	25	20.8	25	20.8	0.187	7.6	LOS A	0.4	2.7	0.13	0.27	0.13	54.1
Approach			327	6.1	327	6.1	0.187	2.4	NA	0.4	2.7	0.13	0.27	0.13	56.8
North: Elvin Drive (N)															
7	L2	All MCs	47	4.4	47	4.4	0.048	6.9	LOS A	0.2	1.3	0.41	0.62	0.41	51.5
9	R2	All MCs	3	0.0	3	0.0	0.048	9.7	LOS A	0.2	1.3	0.41	0.62	0.41	51.4
Approach			51	4.2	51	4.2	0.048	7.1	LOS A	0.2	1.3	0.41	0.62	0.41	51.5
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.194	6.5	LOS A	0.1	0.6	0.03	0.03	0.03	57.2
11	T1	All MCs	353	4.5	353	4.5	0.194	0.0	LOS A	0.1	0.6	0.03	0.03	0.03	59.7
12	R2	All MCs	9	0.0	9	0.0	0.194	6.5	LOS A	0.1	0.6	0.03	0.03	0.03	56.9
Approach			363	4.3	363	4.3	0.194	0.2	NA	0.1	0.6	0.03	0.03	0.03	59.6
All Vehicles			895	4.2	895	4.2	0.289	3.3	NA	1.2	8.1	0.19	0.29	0.20	55.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [(Future PM) Moss Vale Road / Elvin Drive / Site Eastern Access (Site Folder: 2024 Future Conditions - Existing + Development)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
PM Peak Period
Future Road Conditions (Existing + Development)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	11	0.0	11	0.0	0.202	6.7	LOS A	0.7	4.9	0.60	0.84	0.60	49.0
3	R2	All MCs	91	0.0	91	0.0	0.202	11.5	LOS A	0.7	4.9	0.60	0.84	0.60	48.7
Approach			101	0.0	101	0.0	0.202	11.0	LOS A	0.7	4.9	0.60	0.84	0.60	48.8
East: Moss Vale Road (E)															
4	L2	All MCs	123	0.0	123	0.0	0.264	6.0	LOS A	0.6	4.0	0.14	0.27	0.14	55.3
5	T1	All MCs	306	3.8	306	3.8	0.264	0.2	LOS A	0.6	4.0	0.14	0.27	0.14	57.6
6	R2	All MCs	47	4.4	47	4.4	0.264	6.7	LOS A	0.6	4.0	0.14	0.27	0.14	54.7
Approach			477	2.9	477	2.9	0.264	2.4	NA	0.6	4.0	0.14	0.27	0.14	56.7
North: Elvin Drive (N)															
7	L2	All MCs	37	5.7	37	5.7	0.036	6.6	LOS A	0.1	1.0	0.37	0.59	0.37	51.6
9	R2	All MCs	3	0.0	3	0.0	0.036	9.9	LOS A	0.1	1.0	0.37	0.59	0.37	51.5
Approach			40	5.3	40	5.3	0.036	6.8	LOS A	0.1	1.0	0.37	0.59	0.37	51.6
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.158	7.3	LOS A	0.1	1.0	0.06	0.08	0.06	57.0
11	T1	All MCs	267	9.8	267	9.8	0.158	0.1	LOS A	0.1	1.0	0.06	0.08	0.06	59.4
12	R2	All MCs	14	0.0	14	0.0	0.158	7.2	LOS A	0.1	1.0	0.06	0.08	0.06	56.6
Approach			282	9.3	282	9.3	0.158	0.5	NA	0.1	1.0	0.06	0.08	0.06	59.3
All Vehicles			900	4.7	900	4.7	0.264	3.0	NA	0.7	4.9	0.18	0.29	0.18	56.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [(Existing AM) Moss Vale Road / Elvin Drive (Site Folder: 2024 Existing Volumes (Signals))]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
AM Peak Period
Exsiting Road Volumes with Signal Intersection Treatment
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	1	0.0	1	0.0	0.005	43.0	LOS D	0.0	0.3	0.89	0.59	0.89	34.3
3	R2	All MCs	1	0.0	1	0.0	0.005	43.1	LOS D	0.0	0.3	0.89	0.60	0.89	34.2
Approach			2	0.0	2	0.0	0.005	43.1	LOS D	0.0	0.3	0.89	0.59	0.89	34.2
East: Moss Vale Road (E)															
4	L2	All MCs	1	0.0	1	0.0	0.163	10.4	LOS A	3.0	22.1	0.34	0.29	0.34	53.9
5	T1	All MCs	219	6.7	219	6.7	0.163	4.2	LOS A	3.0	22.1	0.34	0.29	0.34	56.1
6	R2	All MCs	25	20.8	25	20.8	0.042	11.3	LOS A	0.4	3.1	0.36	0.65	0.36	48.1
Approach			245	8.2	245	8.2	0.163	4.9	LOS A	3.0	22.1	0.34	0.32	0.34	55.2
North: Elvin Drive (N)															
7	L2	All MCs	47	4.4	47	4.4	0.186	43.1	LOS D	1.9	14.0	0.92	0.74	0.92	34.2
8	T1	All MCs	1	0.0	1	0.0	* 0.186	37.5	LOS C	1.9	14.0	0.92	0.74	0.92	35.2
9	R2	All MCs	3	0.0	3	0.0	0.015	43.5	LOS D	0.1	0.9	0.90	0.63	0.90	34.1
Approach			52	4.1	52	4.1	0.186	43.0	LOS D	1.9	14.0	0.91	0.73	0.91	34.2
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	* 0.258	10.8	LOS A	5.2	37.9	0.37	0.32	0.37	53.7
11	T1	All MCs	353	4.5	353	4.5	0.258	4.5	LOS A	5.2	37.9	0.37	0.32	0.37	55.8
12	R2	All MCs	1	0.0	1	0.0	0.001	10.1	LOS A	0.0	0.1	0.32	0.60	0.32	49.5
Approach			355	4.5	355	4.5	0.258	4.5	LOS A	5.2	37.9	0.37	0.32	0.37	55.8
All Vehicles			654	5.8	654	5.8	0.258	7.8	LOS A	5.2	37.9	0.40	0.36	0.40	52.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Existing PM) Moss Vale Road / Elvin Drive (Site Folder: 2024 Existing Volumes (Signals))]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
PM Peak Period
Existing road volumes with signalised intersection treatment
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	1	0.0	1	0.0	0.005	43.0	LOS D	0.0	0.3	0.89	0.59	0.89	34.3
3	R2	All MCs	1	0.0	1	0.0	0.005	43.2	LOS D	0.0	0.3	0.90	0.60	0.90	34.1
Approach			2	0.0	2	0.0	0.005	43.1	LOS D	0.0	0.3	0.89	0.60	0.89	34.2
East: Moss Vale Road (E)															
4	L2	All MCs	1	0.0	1	0.0	* 0.224	10.6	LOS A	4.4	31.7	0.35	0.31	0.35	53.8
5	T1	All MCs	306	3.8	306	3.8	0.224	4.4	LOS A	4.4	31.7	0.35	0.31	0.35	56.0
6	R2	All MCs	47	4.4	47	4.4	0.064	10.8	LOS A	0.7	5.1	0.35	0.66	0.35	48.9
Approach			355	3.9	355	3.9	0.224	5.2	LOS A	4.4	31.7	0.35	0.35	0.35	54.9
North: Elvin Drive (N)															
7	L2	All MCs	37	5.7	37	5.7	0.147	42.9	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
8	T1	All MCs	1	0.0	1	0.0	* 0.147	37.3	LOS C	1.5	11.0	0.91	0.72	0.91	35.3
9	R2	All MCs	3	0.0	3	0.0	0.015	43.5	LOS D	0.1	0.9	0.90	0.63	0.90	34.1
Approach			41	5.1	41	5.1	0.147	42.8	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.203	10.6	LOS A	3.8	28.6	0.35	0.30	0.35	53.8
11	T1	All MCs	267	9.8	267	9.8	0.203	4.3	LOS A	3.8	28.6	0.35	0.30	0.35	56.0
12	R2	All MCs	1	0.0	1	0.0	0.001	10.4	LOS A	0.0	0.1	0.33	0.60	0.33	49.3
Approach			269	9.8	269	9.8	0.203	4.3	LOS A	3.8	28.6	0.35	0.30	0.35	56.0
All Vehicles			667	6.3	667	6.3	0.224	7.3	LOS A	4.4	31.7	0.39	0.36	0.39	53.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future AM) Moss Vale Road / Elvin Drive (Site Folder: 2024 Future Conditions (Signals) - Existing + Development)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
AM Peak Period
Future Road Volumes with Signal Intersection Treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	16	0.0	16	0.0	0.029	30.0	LOS C	0.5	3.5	0.74	0.68	0.74	39.1
3	R2	All MCs	138	0.0	138	0.0	* 0.333	33.2	LOS C	4.9	34.0	0.83	0.78	0.83	37.7
Approach			154	0.0	154	0.0	0.333	32.8	LOS C	4.9	34.0	0.82	0.77	0.82	37.8
East: Moss Vale Road (E)															
4	L2	All MCs	83	0.0	83	0.0	0.295	17.7	LOS B	7.0	50.9	0.57	0.56	0.57	47.8
5	T1	All MCs	219	6.7	219	6.7	0.295	11.0	LOS A	7.0	50.9	0.57	0.56	0.57	49.5
6	R2	All MCs	25	20.8	25	20.8	0.059	20.6	LOS B	0.6	5.2	0.58	0.69	0.58	42.8
Approach			327	6.1	327	6.1	0.295	13.5	LOS A	7.0	50.9	0.57	0.57	0.57	48.5
North: Elvin Drive (N)															
7	L2	All MCs	47	4.4	47	4.4	0.086	29.2	LOS C	1.5	10.9	0.74	0.71	0.74	39.4
8	T1	All MCs	1	0.0	1	0.0	0.086	23.6	LOS B	1.5	10.9	0.74	0.71	0.74	40.7
9	R2	All MCs	3	0.0	3	0.0	0.007	29.8	LOS C	0.1	0.7	0.73	0.63	0.73	39.1
Approach			52	4.1	52	4.1	0.086	29.1	LOS C	1.5	10.9	0.74	0.71	0.74	39.4
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	* 0.338	20.0	LOS B	8.4	61.2	0.59	0.51	0.59	48.6
11	T1	All MCs	353	4.5	353	4.5	0.338	13.3	LOS A	8.4	61.2	0.59	0.51	0.59	50.3
12	R2	All MCs	9	0.0	9	0.0	0.018	20.3	LOS B	0.2	1.5	0.55	0.66	0.55	44.3
Approach			363	4.3	363	4.3	0.338	13.5	LOS A	8.4	61.2	0.58	0.51	0.58	49.1
All Vehicles			896	4.2	896	4.2	0.338	17.7	LOS B	8.4	61.2	0.63	0.59	0.63	45.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future PM) Moss Vale Road / Elvin Drive (Site Folder: 2024 Future Conditions (Signals) - Existing + Development)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
PM Peak Period
Future road volumes with signalised intersection treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	11	0.0	11	0.0	0.030	37.7	LOS C	0.4	2.6	0.84	0.67	0.84	36.1
3	R2	All MCs	91	0.0	91	0.0	* 0.317	40.5	LOS C	3.5	24.8	0.90	0.77	0.90	35.0
Approach			101	0.0	101	0.0	0.317	40.3	LOS C	3.5	24.8	0.90	0.76	0.90	35.1
East: Moss Vale Road (E)															
4	L2	All MCs	123	0.0	123	0.0	* 0.350	13.6	LOS A	8.3	59.6	0.48	0.51	0.48	50.4
5	T1	All MCs	306	3.8	306	3.8	0.350	7.1	LOS A	8.3	59.6	0.48	0.51	0.48	52.3
6	R2	All MCs	47	4.4	47	4.4	0.072	13.6	LOS A	0.9	6.3	0.44	0.68	0.44	47.1
Approach			477	2.9	477	2.9	0.350	9.4	LOS A	8.3	59.6	0.48	0.53	0.48	51.2
North: Elvin Drive (N)															
7	L2	All MCs	37	5.7	37	5.7	0.100	36.8	LOS C	1.4	9.9	0.84	0.72	0.84	36.4
8	T1	All MCs	1	0.0	1	0.0	0.100	31.1	LOS C	1.4	9.9	0.84	0.72	0.84	37.5
9	R2	All MCs	3	0.0	3	0.0	0.011	37.5	LOS C	0.1	0.8	0.83	0.64	0.83	36.1
Approach			41	5.1	41	5.1	0.100	36.7	LOS C	1.4	9.9	0.84	0.71	0.84	36.4
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.223	13.1	LOS A	4.7	35.6	0.43	0.37	0.43	52.0
11	T1	All MCs	267	9.8	267	9.8	0.223	6.6	LOS A	4.7	35.6	0.43	0.37	0.43	54.1
12	R2	All MCs	14	0.0	14	0.0	0.025	15.2	LOS B	0.3	1.9	0.47	0.66	0.47	46.3
Approach			282	9.3	282	9.3	0.223	7.1	LOS A	4.7	35.6	0.43	0.38	0.43	53.6
All Vehicles			901	4.7	901	4.7	0.350	13.4	LOS A	8.3	59.6	0.53	0.52	0.53	48.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future AM) Moss Vale Road / Elvin Drive +950 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
AM Peak Period
Future Road Volumes with Signal Intersection Treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	16	0.0	16	0.0	0.070	44.2	LOS D	0.6	4.4	0.91	0.69	0.91	33.9
3	R2	All MCs	138	0.0	138	0.0	* 0.676	49.5	LOS D	6.2	43.7	1.00	0.84	1.10	32.2
Approach			154	0.0	154	0.0	0.676	49.0	LOS D	6.2	43.7	0.99	0.83	1.08	32.4
East: Moss Vale Road (E)															
4	L2	All MCs	83	0.0	83	0.0	0.327	11.0	LOS A	7.0	50.3	0.39	0.41	0.39	52.6
5	T1	All MCs	361	4.1	361	4.1	0.327	4.7	LOS A	7.0	50.3	0.39	0.41	0.39	54.7
6	R2	All MCs	25	20.8	25	20.8	0.123	21.1	LOS B	0.7	5.4	0.59	0.70	0.59	42.6
Approach			469	4.3	469	4.3	0.327	6.7	LOS A	7.0	50.3	0.40	0.43	0.40	53.5
North: Elvin Drive (N)															
7	L2	All MCs	47	4.4	47	4.4	0.186	43.1	LOS D	1.9	14.0	0.92	0.74	0.92	34.2
8	T1	All MCs	1	0.0	1	0.0	0.186	37.5	LOS C	1.9	14.0	0.92	0.74	0.92	35.2
9	R2	All MCs	3	0.0	3	0.0	0.016	43.6	LOS D	0.1	0.9	0.90	0.63	0.90	34.0
Approach			52	4.1	52	4.1	0.186	43.0	LOS D	1.9	14.0	0.91	0.73	0.91	34.2
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	* 0.671	18.3	LOS B	21.6	153.2	0.59	0.54	0.59	51.7
11	T1	All MCs	921	1.7	921	1.7	0.671	11.6	LOS A	21.6	153.2	0.59	0.54	0.59	53.7
12	R2	All MCs	9	0.0	9	0.0	0.016	16.0	LOS B	0.1	1.0	0.37	0.64	0.37	48.5
Approach			932	1.7	932	1.7	0.671	11.6	LOS A	21.6	153.2	0.58	0.54	0.58	50.3
All Vehicles			1606	2.4	1606	2.4	0.676	14.8	LOS B	21.6	153.2	0.58	0.54	0.59	47.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future PM) Moss Vale Road / Elvin Drive + 950 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
PM Peak Period
Future road volumes with signalised intersection treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	11	0.0	11	0.0	0.046	43.9	LOS D	0.4	2.9	0.91	0.67	0.91	34.0
3	R2	All MCs	91	0.0	91	0.0	* 0.466	47.3	LOS D	3.9	27.3	0.97	0.78	0.97	32.9
Approach			101	0.0	101	0.0	0.466	46.9	LOS D	3.9	27.3	0.97	0.77	0.97	33.0
East: Moss Vale Road (E)															
4	L2	All MCs	123	0.0	123	0.0	* 0.803	20.3	LOS B	30.2	213.6	0.72	0.68	0.72	50.1
5	T1	All MCs	931	1.2	931	1.2	0.803	13.3	LOS A	30.2	213.6	0.72	0.68	0.72	51.9
6	R2	All MCs	47	4.4	47	4.4	0.080	16.7	LOS B	0.8	5.7	0.39	0.67	0.39	48.1
Approach			1101	1.2	1101	1.2	0.803	14.2	LOS A	30.2	213.6	0.71	0.68	0.71	48.4
North: Elvin Drive (N)															
7	L2	All MCs	37	5.7	37	5.7	0.147	42.9	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
8	T1	All MCs	1	0.0	1	0.0	0.147	37.3	LOS C	1.5	11.0	0.91	0.72	0.91	35.3
9	R2	All MCs	3	0.0	3	0.0	0.015	43.5	LOS D	0.1	0.9	0.90	0.63	0.90	34.1
Approach			41	5.1	41	5.1	0.147	42.8	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.313	11.1	LOS A	6.6	48.5	0.39	0.34	0.39	53.5
11	T1	All MCs	423	6.2	423	6.2	0.313	4.8	LOS A	6.6	48.5	0.39	0.34	0.39	55.6
12	R2	All MCs	14	0.0	14	0.0	0.080	28.1	LOS B	0.4	3.0	0.70	0.70	0.70	39.8
Approach			438	6.0	438	6.0	0.313	5.5	LOS A	6.6	48.5	0.40	0.35	0.40	54.9
All Vehicles			1681	2.5	1681	2.5	0.803	14.6	LOS B	30.2	213.6	0.65	0.60	0.65	48.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future AM) Moss Vale Road / Elvin Drive +1000 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
AM Peak Period
Future Road Volumes with Signal Intersection Treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	16	0.0	16	0.0	0.070	44.2	LOS D	0.6	4.4	0.91	0.69	0.91	33.9
3	R2	All MCs	138	0.0	138	0.0	* 0.676	49.5	LOS D	6.2	43.7	1.00	0.84	1.10	32.2
Approach			154	0.0	154	0.0	0.676	49.0	LOS D	6.2	43.7	0.99	0.83	1.08	32.4
East: Moss Vale Road (E)															
4	L2	All MCs	83	0.0	83	0.0	0.332	11.0	LOS A	7.1	51.3	0.39	0.41	0.39	52.6
5	T1	All MCs	368	4.0	368	4.0	0.332	4.7	LOS A	7.1	51.3	0.39	0.41	0.39	54.7
6	R2	All MCs	25	20.8	25	20.8	0.131	22.5	LOS B	0.7	5.7	0.62	0.71	0.62	41.9
Approach			477	4.2	477	4.2	0.332	6.7	LOS A	7.1	51.3	0.40	0.43	0.40	53.5
North: Elvin Drive (N)															
7	L2	All MCs	47	4.4	47	4.4	0.186	43.1	LOS D	1.9	14.0	0.92	0.74	0.92	34.2
8	T1	All MCs	1	0.0	1	0.0	0.186	37.5	LOS C	1.9	14.0	0.92	0.74	0.92	35.2
9	R2	All MCs	3	0.0	3	0.0	0.016	43.6	LOS D	0.1	0.9	0.90	0.63	0.90	34.0
Approach			52	4.1	52	4.1	0.186	43.0	LOS D	1.9	14.0	0.91	0.73	0.91	34.2
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	* 0.693	18.9	LOS B	22.9	162.9	0.60	0.56	0.60	51.5
11	T1	All MCs	951	1.7	951	1.7	0.693	12.1	LOS A	22.9	162.9	0.60	0.56	0.60	53.5
12	R2	All MCs	9	0.0	9	0.0	0.016	16.3	LOS B	0.1	1.0	0.37	0.64	0.37	48.5
Approach			961	1.6	961	1.6	0.693	12.1	LOS A	22.9	162.9	0.60	0.56	0.60	50.0
All Vehicles			1643	2.3	1643	2.3	0.693	15.0	LOS B	22.9	162.9	0.59	0.55	0.60	47.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future PM) Moss Vale Road / Elvin Drive + 1000 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
PM Peak Period
Future road volumes with signalised intersection treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	11	0.0	11	0.0	0.046	43.9	LOS D	0.4	2.9	0.91	0.67	0.91	34.0
3	R2	All MCs	91	0.0	91	0.0	* 0.466	47.3	LOS D	3.9	27.3	0.97	0.78	0.97	32.9
Approach			101	0.0	101	0.0	0.466	46.9	LOS D	3.9	27.3	0.97	0.77	0.97	33.0
East: Moss Vale Road (E)															
4	L2	All MCs	123	0.0	123	0.0	* 0.828	22.8	LOS B	34.2	241.3	0.75	0.72	0.77	48.7
5	T1	All MCs	963	1.2	963	1.2	0.828	15.8	LOS B	34.2	241.3	0.75	0.72	0.77	50.5
6	R2	All MCs	47	4.4	47	4.4	0.081	17.1	LOS B	0.8	5.7	0.39	0.67	0.39	48.1
Approach			1134	1.2	1134	1.2	0.828	16.6	LOS B	34.2	241.3	0.74	0.72	0.76	46.9
North: Elvin Drive (N)															
7	L2	All MCs	37	5.7	37	5.7	0.147	42.9	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
8	T1	All MCs	1	0.0	1	0.0	0.147	37.3	LOS C	1.5	11.0	0.91	0.72	0.91	35.3
9	R2	All MCs	3	0.0	3	0.0	0.015	43.5	LOS D	0.1	0.9	0.90	0.63	0.90	34.1
Approach			41	5.1	41	5.1	0.147	42.8	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.319	11.1	LOS A	6.8	49.7	0.39	0.34	0.39	53.5
11	T1	All MCs	432	6.1	432	6.1	0.319	4.8	LOS A	6.8	49.7	0.39	0.34	0.39	55.6
12	R2	All MCs	14	0.0	14	0.0	0.087	30.5	LOS C	0.5	3.2	0.74	0.70	0.74	38.7
Approach			446	5.9	446	5.9	0.319	5.6	LOS A	6.8	49.7	0.40	0.35	0.40	54.9
All Vehicles			1722	2.4	1722	2.4	0.828	16.1	LOS B	34.2	241.3	0.67	0.63	0.68	47.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future AM) Moss Vale Road / Elvin Drive +1150 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
AM Peak Period
Future Road Volumes with Signal Intersection Treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	16	0.0	16	0.0	0.070	44.2	LOS D	0.6	4.4	0.91	0.69	0.91	33.9
3	R2	All MCs	138	0.0	138	0.0	* 0.676	49.5	LOS D	6.2	43.7	1.00	0.84	1.10	32.2
Approach			154	0.0	154	0.0	0.676	49.0	LOS D	6.2	43.7	0.99	0.83	1.08	32.4
East: Moss Vale Road (E)															
4	L2	All MCs	83	0.0	83	0.0	0.348	11.1	LOS A	7.6	54.6	0.40	0.42	0.40	52.6
5	T1	All MCs	391	3.8	391	3.8	0.348	4.8	LOS A	7.6	54.6	0.40	0.42	0.40	54.7
6	R2	All MCs	25	20.8	25	20.8	0.162	26.4	LOS B	0.8	6.4	0.68	0.72	0.68	40.1
Approach			499	4.0	499	4.0	0.348	6.9	LOS A	7.6	54.6	0.41	0.43	0.41	53.3
North: Elvin Drive (N)															
7	L2	All MCs	47	4.4	47	4.4	0.186	43.1	LOS D	1.9	14.0	0.92	0.74	0.92	34.2
8	T1	All MCs	1	0.0	1	0.0	0.186	37.5	LOS C	1.9	14.0	0.92	0.74	0.92	35.2
9	R2	All MCs	3	0.0	3	0.0	0.016	43.6	LOS D	0.1	0.9	0.90	0.63	0.90	34.0
Approach			52	4.1	52	4.1	0.186	43.0	LOS D	1.9	14.0	0.91	0.73	0.91	34.2
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	* 0.757	20.6	LOS B	27.7	196.4	0.67	0.61	0.67	51.0
11	T1	All MCs	1040	1.5	1040	1.5	0.757	13.7	LOS A	27.7	196.4	0.67	0.61	0.67	52.9
12	R2	All MCs	9	0.0	9	0.0	0.016	17.6	LOS B	0.2	1.1	0.38	0.64	0.38	48.2
Approach			1051	1.5	1051	1.5	0.757	13.8	LOS A	27.7	196.4	0.66	0.61	0.66	48.9
All Vehicles			1755	2.2	1755	2.2	0.757	15.8	LOS B	27.7	196.4	0.63	0.58	0.64	47.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future PM) Moss Vale Road / Elvin Drive + 1150 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
PM Peak Period
Future road volumes with signalised intersection treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	11	0.0	11	0.0	0.046	43.9	LOS D	0.4	2.9	0.91	0.67	0.91	34.0
3	R2	All MCs	91	0.0	91	0.0	* 0.466	47.3	LOS D	3.9	27.3	0.97	0.78	0.97	32.9
Approach			101	0.0	101	0.0	0.466	46.9	LOS D	3.9	27.3	0.97	0.77	0.97	33.0
East: Moss Vale Road (E)															
4	L2	All MCs	123	0.0	123	0.0	0.905	35.8	LOS C	51.3	361.8	0.88	0.91	1.00	42.4
5	T1	All MCs	1062	1.1	1062	1.1	* 0.905	28.5	LOS B	51.3	361.8	0.88	0.91	1.00	43.8
6	R2	All MCs	47	4.4	47	4.4	0.084	19.2	LOS B	0.8	5.9	0.41	0.67	0.41	47.8
Approach			1233	1.1	1233	1.1	0.905	28.8	LOS C	51.3	361.8	0.86	0.90	0.98	40.5
North: Elvin Drive (N)															
7	L2	All MCs	37	5.7	37	5.7	0.147	42.9	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
8	T1	All MCs	1	0.0	1	0.0	0.147	37.3	LOS C	1.5	11.0	0.91	0.72	0.91	35.3
9	R2	All MCs	3	0.0	3	0.0	0.015	43.5	LOS D	0.1	0.9	0.90	0.63	0.90	34.1
Approach			41	5.1	41	5.1	0.147	42.8	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.337	11.3	LOS A	7.3	53.3	0.39	0.35	0.39	53.4
11	T1	All MCs	456	5.8	456	5.8	0.337	5.0	LOS A	7.3	53.3	0.39	0.35	0.39	55.5
12	R2	All MCs	14	0.0	14	0.0	0.116	39.8	LOS C	0.5	3.7	0.85	0.71	0.85	35.3
Approach			471	5.6	471	5.6	0.337	6.0	LOS A	7.3	53.3	0.41	0.36	0.41	54.5
All Vehicles			1845	2.3	1845	2.3	0.905	24.3	LOS B	51.3	361.8	0.75	0.75	0.83	42.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future AM) Moss Vale Road / Elvin Drive +1250 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
AM Peak Period
Future Road Volumes with Signal Intersection Treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	16	0.0	16	0.0	0.070	44.2	LOS D	0.6	4.4	0.91	0.69	0.91	33.9
3	R2	All MCs	138	0.0	138	0.0	* 0.676	49.5	LOS D	6.2	43.7	1.00	0.84	1.10	32.2
Approach			154	0.0	154	0.0	0.676	49.0	LOS D	6.2	43.7	0.99	0.83	1.08	32.4
East: Moss Vale Road (E)															
4	L2	All MCs	83	0.0	83	0.0	0.359	11.2	LOS A	7.9	57.0	0.40	0.42	0.40	52.6
5	T1	All MCs	406	3.6	406	3.6	0.359	4.8	LOS A	7.9	57.0	0.40	0.42	0.40	54.7
6	R2	All MCs	25	20.8	25	20.8	0.186	29.8	LOS C	0.8	6.9	0.73	0.73	0.73	38.7
Approach			515	3.9	515	3.9	0.359	7.1	LOS A	7.9	57.0	0.42	0.44	0.42	53.2
North: Elvin Drive (N)															
7	L2	All MCs	47	4.4	47	4.4	0.186	43.1	LOS D	1.9	14.0	0.92	0.74	0.92	34.2
8	T1	All MCs	1	0.0	1	0.0	0.186	37.5	LOS C	1.9	14.0	0.92	0.74	0.92	35.2
9	R2	All MCs	3	0.0	3	0.0	0.016	43.6	LOS D	0.1	0.9	0.90	0.63	0.90	34.0
Approach			52	4.1	52	4.1	0.186	43.0	LOS D	1.9	14.0	0.91	0.73	0.91	34.2
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	* 0.801	22.0	LOS B	31.5	223.0	0.72	0.66	0.72	50.5
11	T1	All MCs	1100	1.4	1100	1.4	0.801	15.0	LOS B	31.5	223.0	0.72	0.66	0.72	52.4
12	R2	All MCs	9	0.0	9	0.0	0.017	18.3	LOS B	0.2	1.1	0.38	0.64	0.38	48.2
Approach			1111	1.4	1111	1.4	0.801	15.1	LOS B	31.5	223.0	0.71	0.66	0.71	48.1
All Vehicles			1831	2.1	1831	2.1	0.801	16.5	LOS B	31.5	223.0	0.66	0.61	0.67	46.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future PM) Moss Vale Road / Elvin Drive + 1250 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
PM Peak Period
Future road volumes with signalised intersection treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	11	0.0	11	0.0	0.046	43.9	LOS D	0.4	2.9	0.91	0.67	0.91	34.0
3	R2	All MCs	91	0.0	91	0.0	* 0.466	47.3	LOS D	3.9	27.3	0.97	0.78	0.97	32.9
Approach			101	0.0	101	0.0	0.466	46.9	LOS D	3.9	27.3	0.97	0.77	0.97	33.0
East: Moss Vale Road (E)															
4	L2	All MCs	123	0.0	123	0.0	0.956	52.4	LOS D	69.0	487.0	0.98	1.10	1.25	36.1
5	T1	All MCs	1127	1.0	1127	1.0	* 0.956	44.9	LOS D	69.0	487.0	0.98	1.10	1.25	37.1
6	R2	All MCs	47	4.4	47	4.4	0.086	20.5	LOS B	0.8	5.9	0.41	0.67	0.41	47.8
Approach			1298	1.1	1298	1.1	0.956	44.7	LOS D	69.0	487.0	0.96	1.09	1.22	34.5
North: Elvin Drive (N)															
7	L2	All MCs	37	5.7	37	5.7	0.147	42.9	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
8	T1	All MCs	1	0.0	1	0.0	0.147	37.3	LOS C	1.5	11.0	0.91	0.72	0.91	35.3
9	R2	All MCs	3	0.0	3	0.0	0.015	43.5	LOS D	0.1	0.9	0.90	0.63	0.90	34.1
Approach			41	5.1	41	5.1	0.147	42.8	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.350	11.6	LOS A	7.6	55.8	0.40	0.36	0.40	53.3
11	T1	All MCs	473	5.6	473	5.6	0.350	5.2	LOS A	7.6	55.8	0.40	0.36	0.40	55.5
12	R2	All MCs	14	0.0	14	0.0	0.139	48.0	LOS D	0.6	4.1	0.93	0.71	0.93	32.8
Approach			487	5.4	487	5.4	0.350	6.5	LOS A	7.6	55.8	0.41	0.37	0.41	54.2
All Vehicles			1927	2.2	1927	2.2	0.956	35.1	LOS C	69.0	487.0	0.82	0.88	0.99	37.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future AM) Moss Vale Road / Elvin Drive +1400 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
AM Peak Period
Future Road Volumes with Signal Intersection Treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	16	0.0	16	0.0	0.070	44.2	LOS D	0.6	4.4	0.91	0.69	0.91	33.9
3	R2	All MCs	138	0.0	138	0.0	* 0.676	49.5	LOS D	6.2	43.7	1.00	0.84	1.10	32.2
Approach			154	0.0	154	0.0	0.676	49.0	LOS D	6.2	43.7	0.99	0.83	1.08	32.4
East: Moss Vale Road (E)															
4	L2	All MCs	83	0.0	83	0.0	0.375	11.3	LOS A	8.4	60.5	0.41	0.42	0.41	52.6
5	T1	All MCs	428	3.4	428	3.4	0.375	4.9	LOS A	8.4	60.5	0.41	0.42	0.41	54.6
6	R2	All MCs	25	20.8	25	20.8	0.227	36.2	LOS C	1.0	7.8	0.82	0.74	0.82	36.2
Approach			537	3.7	537	3.7	0.375	7.4	LOS A	8.4	60.5	0.43	0.44	0.43	53.0
North: Elvin Drive (N)															
7	L2	All MCs	47	4.4	47	4.4	0.186	43.1	LOS D	1.9	14.0	0.92	0.74	0.92	34.2
8	T1	All MCs	1	0.0	1	0.0	0.186	37.5	LOS C	1.9	14.0	0.92	0.74	0.92	35.2
9	R2	All MCs	3	0.0	3	0.0	0.016	43.6	LOS D	0.1	0.9	0.90	0.63	0.90	34.0
Approach			52	4.1	52	4.1	0.186	43.0	LOS D	1.9	14.0	0.91	0.73	0.91	34.2
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	* 0.865	28.9	LOS C	42.6	301.4	0.81	0.78	0.86	47.0
11	T1	All MCs	1189	1.3	1189	1.3	0.865	21.7	LOS B	42.6	301.4	0.81	0.78	0.86	48.6
12	R2	All MCs	9	0.0	9	0.0	0.017	19.9	LOS B	0.2	1.1	0.40	0.64	0.40	48.0
Approach			1200	1.3	1200	1.3	0.865	21.7	LOS B	42.6	301.4	0.80	0.78	0.86	44.2
All Vehicles			1942	2.0	1942	2.0	0.865	20.4	LOS B	42.6	301.4	0.72	0.69	0.76	44.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future PM) Moss Vale Road / Elvin Drive + 1400 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
PM Peak Period
Future road volumes with signalised intersection treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	11	0.0	11	0.0	0.046	43.9	LOS D	0.4	2.9	0.91	0.67	0.91	34.0
3	R2	All MCs	91	0.0	91	0.0	* 0.466	47.3	LOS D	3.9	27.3	0.97	0.78	0.97	32.9
Approach			101	0.0	101	0.0	0.466	46.9	LOS D	3.9	27.3	0.97	0.77	0.97	33.0
East: Moss Vale Road (E)															
4	L2	All MCs	123	0.0	123	0.0	1.031	93.1	LOS F	100.6	709.7	1.00	1.48	1.63	26.1
5	T1	All MCs	1226	0.9	1226	0.9	* 1.031	85.3	LOS F	100.6	709.7	1.00	1.48	1.63	26.6
6	R2	All MCs	47	4.4	47	4.4	0.089	22.6	LOS B	0.8	6.1	0.42	0.67	0.42	47.6
Approach			1397	1.0	1397	1.0	1.031	83.9	LOS F	100.6	709.7	0.98	1.46	1.59	25.2
North: Elvin Drive (N)															
7	L2	All MCs	37	5.7	37	5.7	0.147	42.9	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
8	T1	All MCs	1	0.0	1	0.0	0.147	37.3	LOS C	1.5	11.0	0.91	0.72	0.91	35.3
9	R2	All MCs	3	0.0	3	0.0	0.015	43.5	LOS D	0.1	0.9	0.90	0.63	0.90	34.1
Approach			41	5.1	41	5.1	0.147	42.8	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.367	12.0	LOS A	8.1	59.5	0.41	0.36	0.41	53.3
11	T1	All MCs	497	5.3	497	5.3	0.367	5.6	LOS A	8.1	59.5	0.41	0.36	0.41	55.4
12	R2	All MCs	14	0.0	14	0.0	0.156	55.1	LOS D	0.6	4.4	1.00	0.67	1.00	30.9
Approach			512	5.1	512	5.1	0.367	6.9	LOS A	8.1	59.5	0.42	0.37	0.42	53.8
All Vehicles			2051	2.1	2051	2.1	1.031	62.0	LOS E	100.6	709.7	0.84	1.14	1.26	29.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future AM) Moss Vale Road / Elvin Drive +1500 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
AM Peak Period
Future Road Volumes with Signal Intersection Treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	16	0.0	16	0.0	0.070	44.2	LOS D	0.6	4.4	0.91	0.69	0.91	33.9
3	R2	All MCs	138	0.0	138	0.0	* 0.676	49.5	LOS D	6.2	43.7	1.00	0.84	1.10	32.2
Approach			154	0.0	154	0.0	0.676	49.0	LOS D	6.2	43.7	0.99	0.83	1.08	32.4
East: Moss Vale Road (E)															
4	L2	All MCs	83	0.0	83	0.0	0.385	11.3	LOS A	8.8	62.8	0.41	0.43	0.41	52.5
5	T1	All MCs	443	3.3	443	3.3	0.385	5.0	LOS A	8.8	62.8	0.41	0.43	0.41	54.6
6	R2	All MCs	25	20.8	25	20.8	0.257	41.9	LOS C	1.0	8.5	0.88	0.74	0.88	34.3
Approach			552	3.6	552	3.6	0.385	7.6	LOS A	8.8	62.8	0.44	0.44	0.44	52.9
North: Elvin Drive (N)															
7	L2	All MCs	47	4.4	47	4.4	0.186	43.1	LOS D	1.9	14.0	0.92	0.74	0.92	34.2
8	T1	All MCs	1	0.0	1	0.0	0.186	37.5	LOS C	1.9	14.0	0.92	0.74	0.92	35.2
9	R2	All MCs	3	0.0	3	0.0	0.016	43.6	LOS D	0.1	0.9	0.90	0.63	0.90	34.0
Approach			52	4.1	52	4.1	0.186	43.0	LOS D	1.9	14.0	0.91	0.73	0.91	34.2
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.908	37.3	LOS C	54.0	382.0	0.88	0.90	1.00	42.9
11	T1	All MCs	1249	1.3	1249	1.3	* 0.908	30.0	LOS C	54.0	382.0	0.88	0.90	1.00	44.3
12	R2	All MCs	9	0.0	9	0.0	0.018	20.8	LOS B	0.2	1.1	0.40	0.64	0.40	48.0
Approach			1260	1.3	1260	1.3	0.908	29.9	LOS C	54.0	382.0	0.88	0.90	1.00	40.2
All Vehicles			2017	1.9	2017	1.9	0.908	25.6	LOS B	54.0	382.0	0.77	0.77	0.85	42.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future PM) Moss Vale Road / Elvin Drive + 1500 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
PM Peak Period
Future road volumes with signalised intersection treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	11	0.0	11	0.0	0.046	43.9	LOS D	0.4	2.9	0.91	0.67	0.91	34.0
3	R2	All MCs	91	0.0	91	0.0	* 0.466	47.3	LOS D	3.9	27.3	0.97	0.78	0.97	32.9
Approach			101	0.0	101	0.0	0.466	46.9	LOS D	3.9	27.3	0.97	0.77	0.97	33.0
East: Moss Vale Road (E)															
4	L2	All MCs	123	0.0	123	0.0	* 1.079	127.1	LOS F	120.4	848.9	1.00	1.72	1.95	21.0
5	T1	All MCs	1292	0.9	1292	0.9	1.079	119.4	LOS F	120.4	848.9	1.00	1.72	1.95	21.4
6	R2	All MCs	47	4.4	47	4.4	0.091	23.0	LOS B	0.8	6.1	0.42	0.68	0.42	47.5
Approach			1462	0.9	1462	0.9	1.079	116.9	LOS F	120.4	848.9	0.98	1.69	1.90	20.5
North: Elvin Drive (N)															
7	L2	All MCs	37	5.7	37	5.7	0.147	42.9	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
8	T1	All MCs	1	0.0	1	0.0	0.147	37.3	LOS C	1.5	11.0	0.91	0.72	0.91	35.3
9	R2	All MCs	3	0.0	3	0.0	0.015	43.5	LOS D	0.1	0.9	0.90	0.63	0.90	34.1
Approach			41	5.1	41	5.1	0.147	42.8	LOS D	1.5	11.0	0.91	0.72	0.91	34.3
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.379	12.2	LOS A	8.5	62.2	0.41	0.37	0.41	53.2
11	T1	All MCs	514	5.1	514	5.1	0.379	5.9	LOS A	8.5	62.2	0.41	0.37	0.41	55.4
12	R2	All MCs	14	0.0	14	0.0	0.156	55.3	LOS D	0.6	4.4	1.00	0.67	1.00	30.9
Approach			528	5.0	528	5.0	0.379	7.1	LOS A	8.5	62.2	0.43	0.38	0.43	53.6
All Vehicles			2133	2.0	2133	2.0	1.079	85.0	LOS F	120.4	848.9	0.84	1.30	1.47	25.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [(Future AM) Moss Vale Road / Elvin Drive +1800 dwellings (Site Folder: 2024 Future Conditions (Signals) Sensitivity Test - Existing + Development +URA Dwellings)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Intersection of Moss Vale Road / Elvin Drive / Site Eastern Access
AM Peak Period
Future Road Volumes with Signal Intersection Treatment (Existing + Development)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

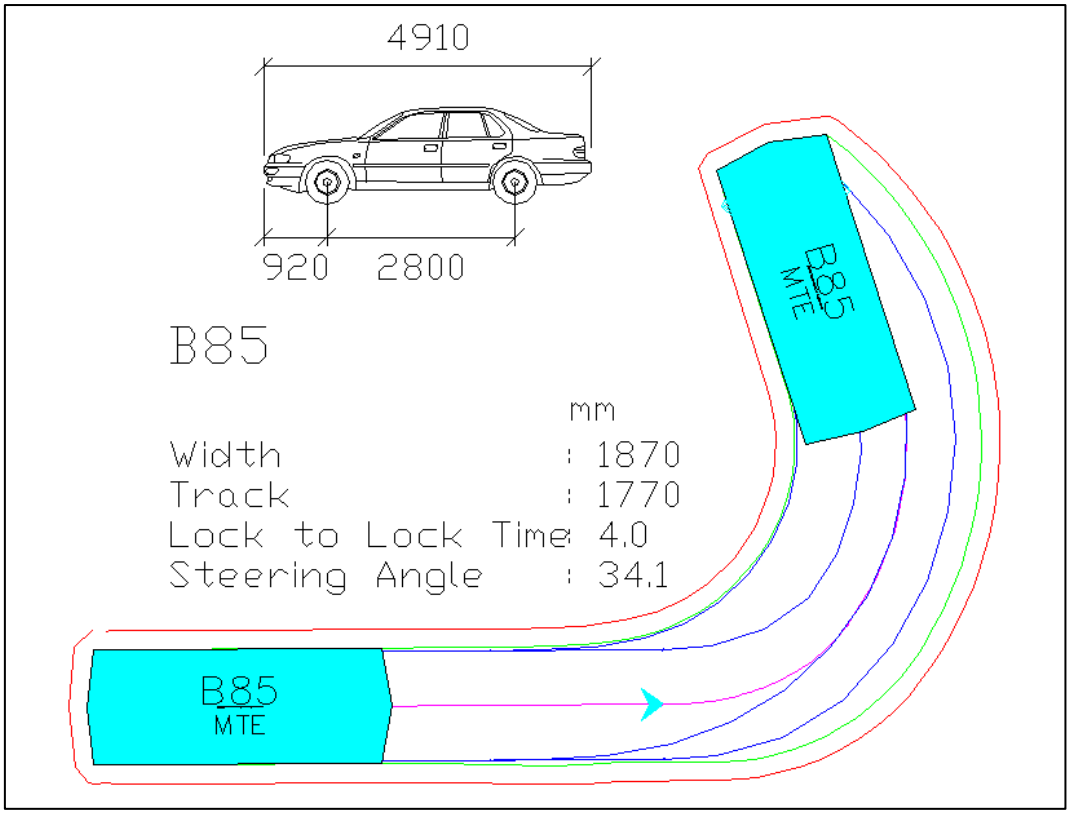
Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Site Access (S)															
1	L2	All MCs	16	0.0	16	0.0	0.070	44.2	LOS D	0.6	4.4	0.91	0.69	0.91	33.9
3	R2	All MCs	138	0.0	138	0.0	* 0.676	49.5	LOS D	6.2	43.7	1.00	0.84	1.10	32.2
Approach			154	0.0	154	0.0	0.676	49.0	LOS D	6.2	43.7	0.99	0.83	1.08	32.4
East: Moss Vale Road (E)															
4	L2	All MCs	83	0.0	83	0.0	0.417	11.5	LOS A	9.8	70.4	0.43	0.44	0.43	52.5
5	T1	All MCs	488	3.0	488	3.0	0.417	5.1	LOS A	9.8	70.4	0.43	0.44	0.43	54.5
6	R2	All MCs	25	20.8	25	20.8	0.307	55.7	LOS D	1.2	9.8	1.00	0.70	1.00	30.3
Approach			597	3.4	597	3.4	0.417	8.2	LOS A	9.8	70.4	0.45	0.45	0.45	52.5
North: Elvin Drive (N)															
7	L2	All MCs	47	4.4	47	4.4	0.186	43.1	LOS D	1.9	14.0	0.92	0.74	0.92	34.2
8	T1	All MCs	1	0.0	1	0.0	0.186	37.5	LOS C	1.9	14.0	0.92	0.74	0.92	35.2
9	R2	All MCs	3	0.0	3	0.0	0.016	43.6	LOS D	0.1	0.9	0.90	0.63	0.90	34.0
Approach			52	4.1	52	4.1	0.186	43.0	LOS D	1.9	14.0	0.91	0.73	0.91	34.2
West: Moss Vale Road (W)															
10	L2	All MCs	1	0.0	1	0.0	1.037	97.3	LOS F	107.5	759.6	1.00	1.52	1.66	25.7
11	T1	All MCs	1428	1.1	1428	1.1	* 1.037	89.6	LOS F	107.5	759.6	1.00	1.52	1.66	26.2
12	R2	All MCs	9	0.0	9	0.0	0.019	24.0	LOS B	0.2	1.1	0.41	0.64	0.41	47.7
Approach			1439	1.1	1439	1.1	1.037	89.1	LOS F	107.5	759.6	1.00	1.52	1.65	24.3
All Vehicles			2241	1.7	2241	1.7	1.037	63.8	LOS E	107.5	759.6	0.85	1.17	1.27	29.2

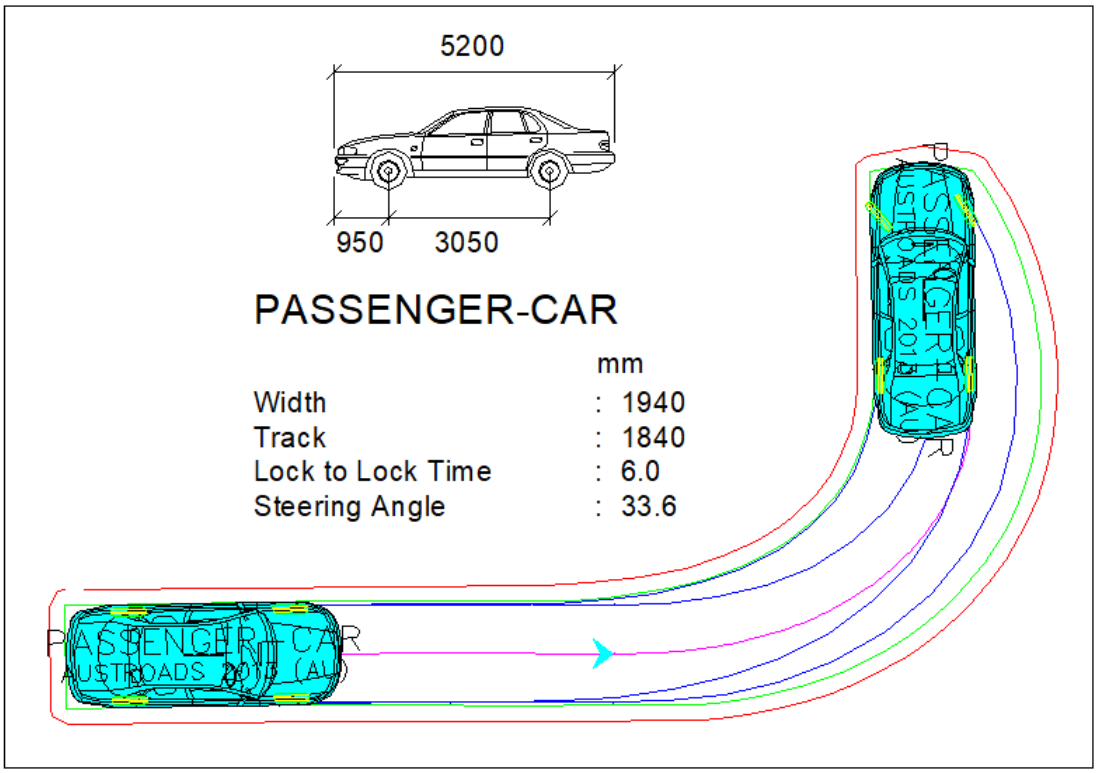
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

ANNEXURE E: SWEPT PATH TESTING
(6 SHEETS)



AUSTRALIAN STANDARD 85TH PERCENTILE SIZE VEHICLE (B85)



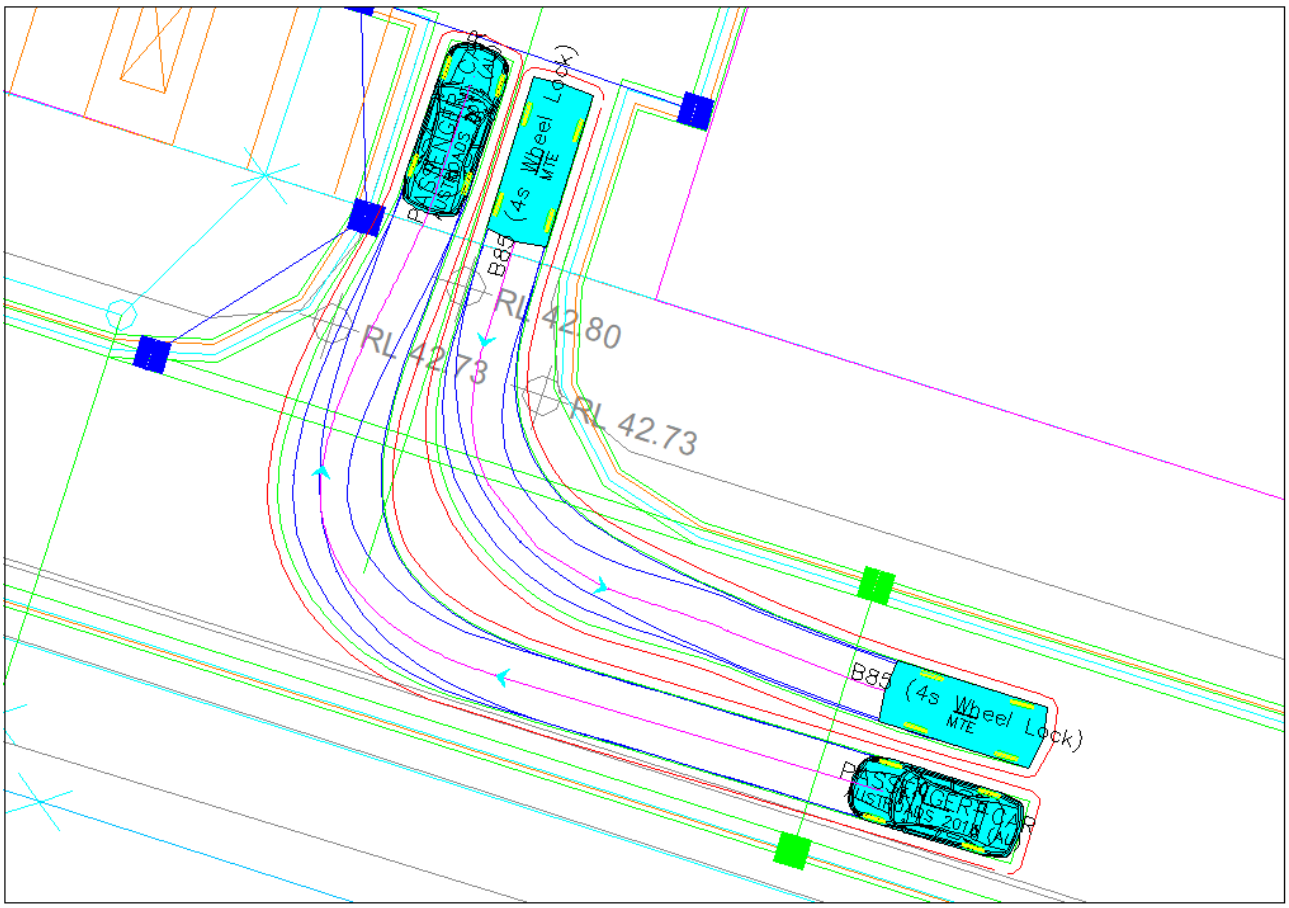
AUSTROADS 5.2M LENGTH PASSENGER CAR

Blue – Tyre Path

Green – Vehicle Body

Red – 300mm Clearance

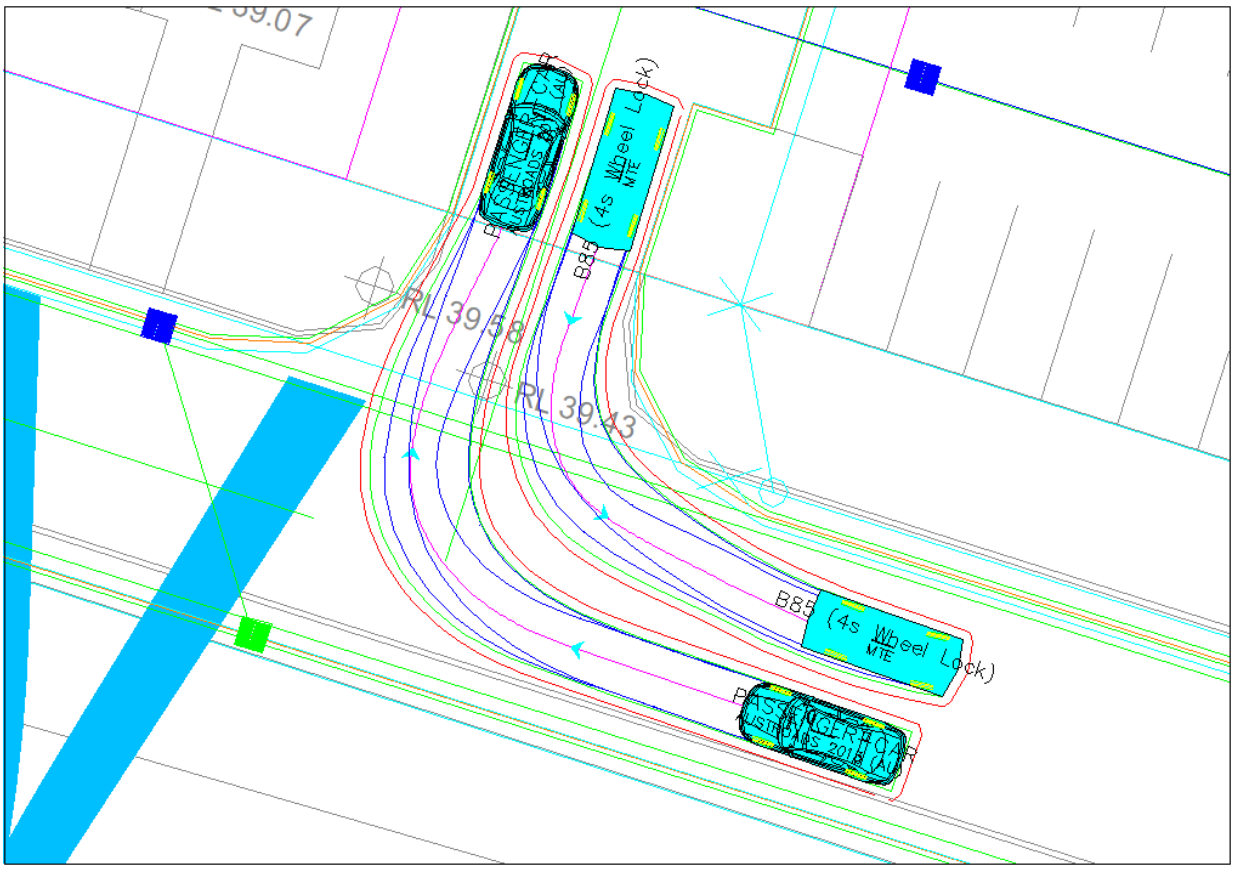
All tests performed at 10km/h on public roads and 5km/h internally.



B85 and Passenger Car Two-Way Passing

Passenger Car Right Turn IN / B85 Left Turn OUT

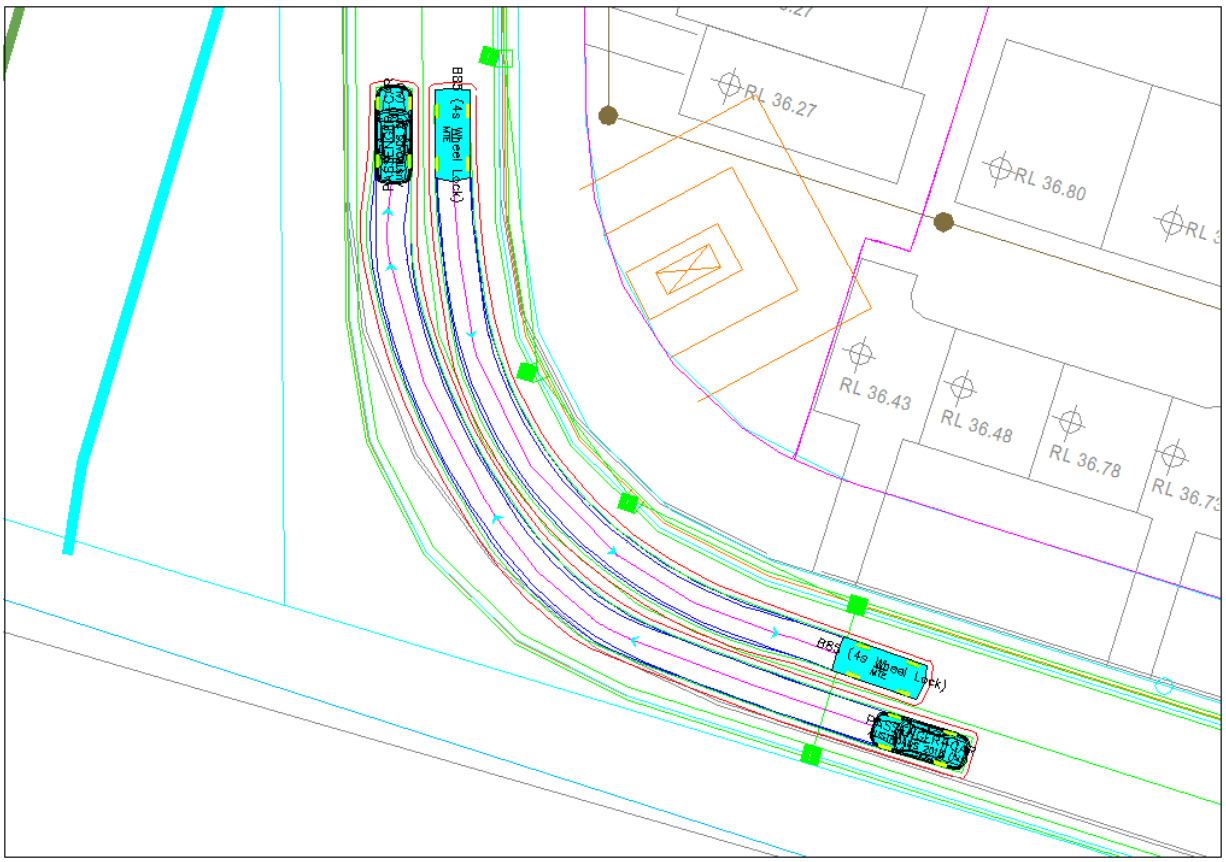
SUCCESSFUL



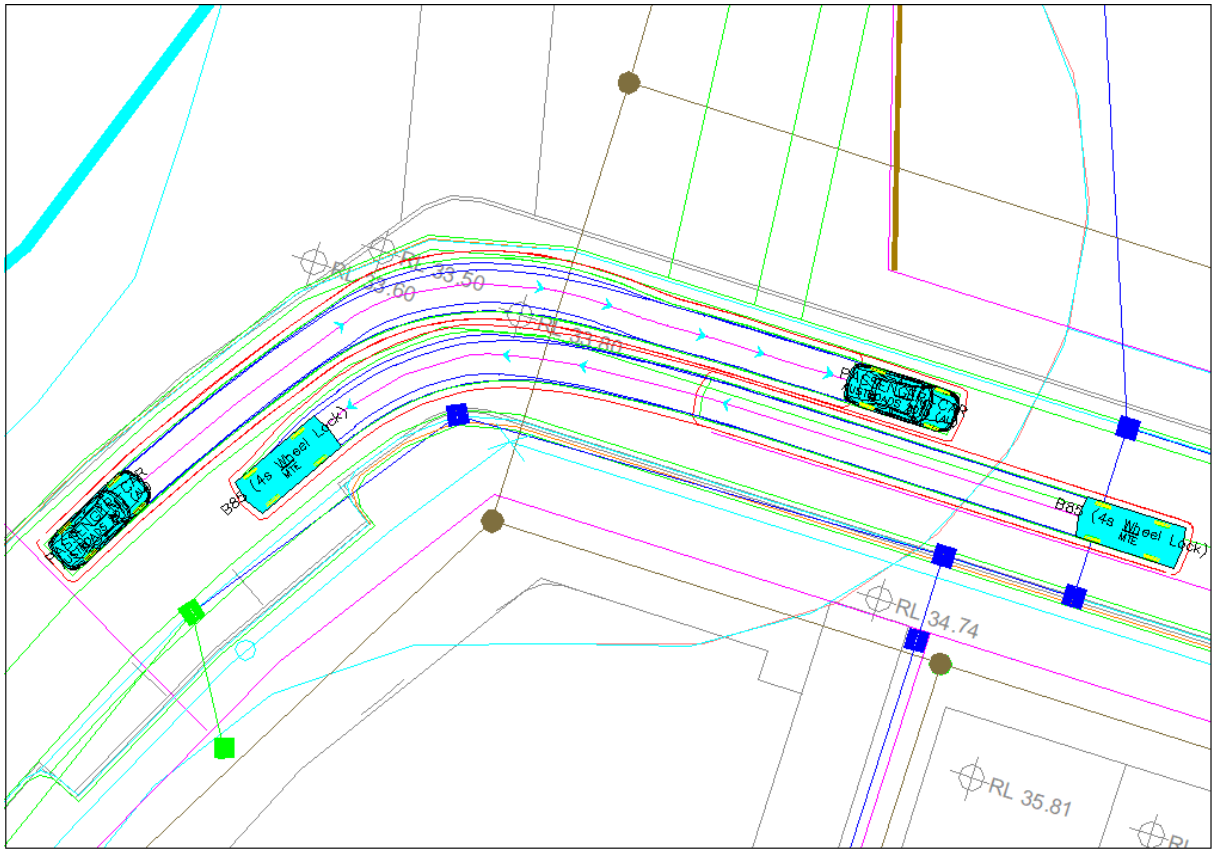
B85 and Passenger Car Two-Way Passing – Road 1 and Road 2 intersection

Passenger Car Right Turn IN / B85 Left Turn OUT

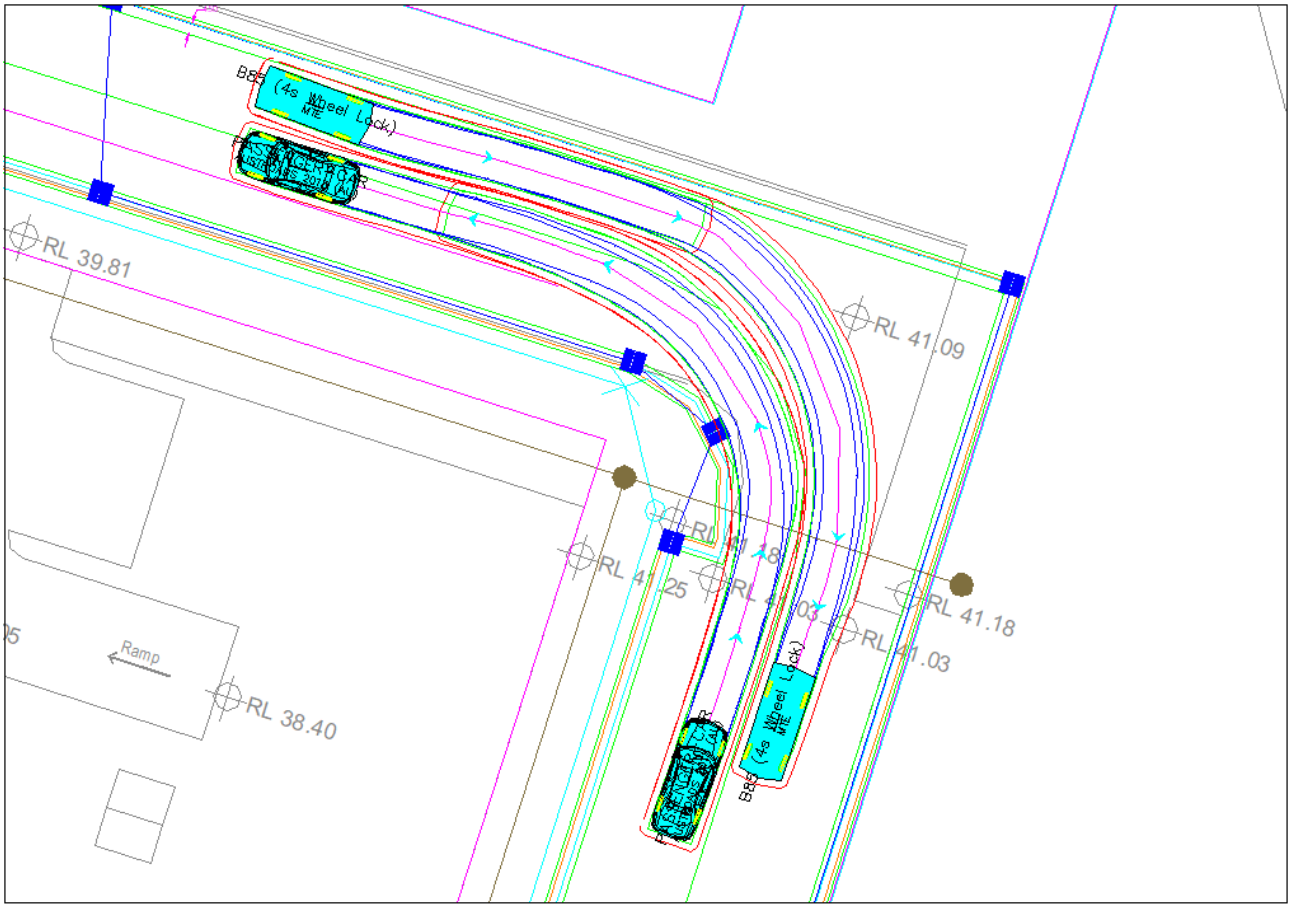
SUCCESSFUL



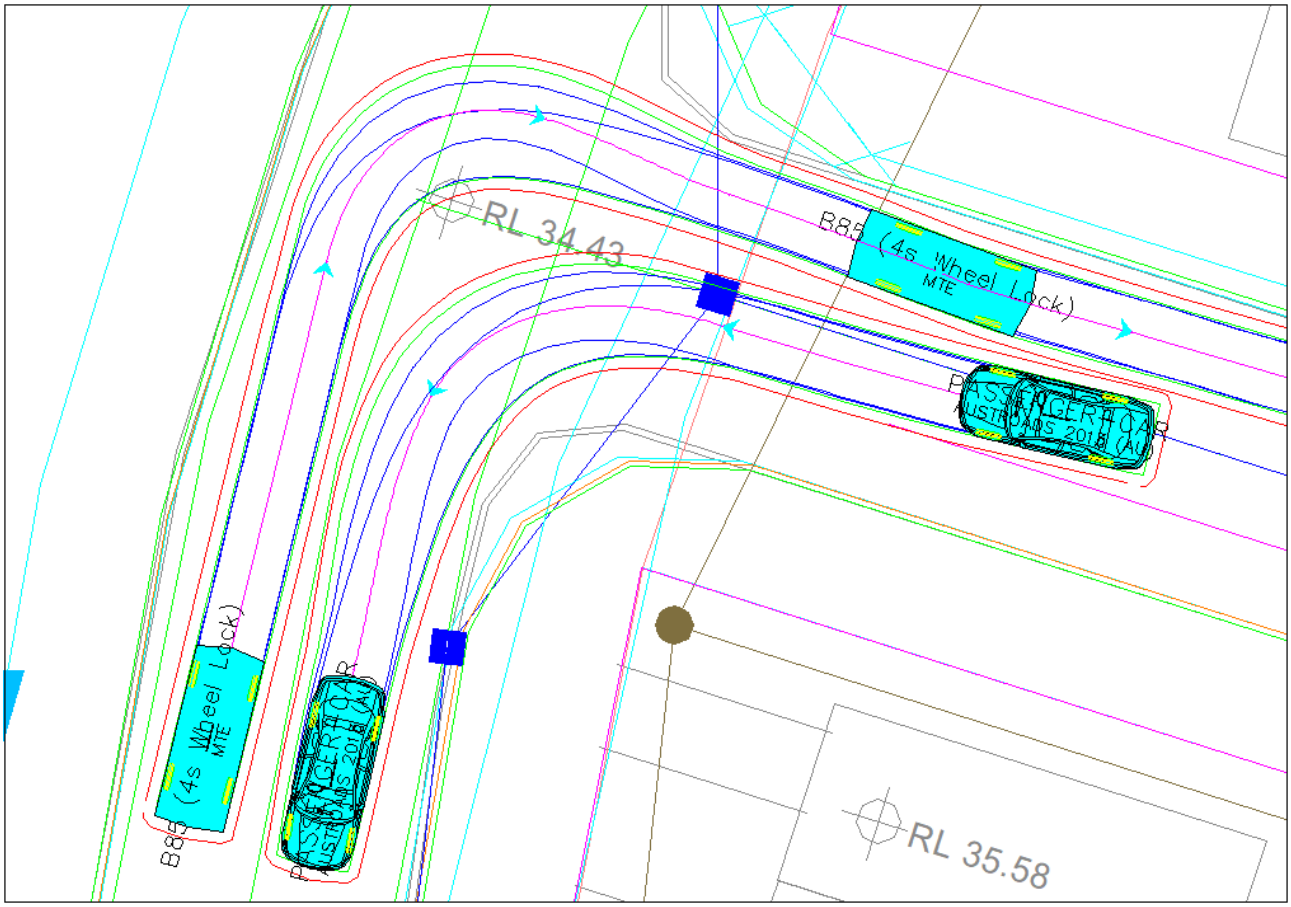
B85 and Passenger Car Two-Way Passing on Road 1
SUCCESSFUL



B85 and Passenger Car Two-Way Passing on Road 1
SUCCESSFUL



B85 and Passenger Car Two-Way Passing on Road 1
SUCCESSFUL



B85 and Passenger Car Two-Way Passing – Road 1 and Road 2 intersection

B85 Right Turn IN / Passenger Car Left Turn OUT

SUCCESSFUL