



Tatura Structure Plan
Future Strategic Residential Growth Corridor
Traffic Impact Assessment Report

Client:

Greater Shepparton Council

Project No. 190877

Final3 Report – 9/03/2023

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EXECUTIVE SUMMARY

Trafficworks has been engaged by Greater Shepparton Council (the Council) to undertake a traffic impact assessment to assist Council with developing the Tatura Structure Plan. This report will help inform the road layout of each precinct for the next level of design and form part of the initial design/investigation of the future strategic residential growth corridors to the north, northeast and east of Tatura.

This traffic impact assessment was carried out to:

- estimate traffic generation and distribution associated with the proposed development
- determine the suitability of the proposed access location onto the adjacent road network
- determine the likely traffic impacts on the existing road network
- identify any necessary mitigating works.

A summary is shown below.

Address	Tatura Structure Plan Study Area (refer to Figure 1)
Zoning	<ul style="list-style-type: none"> • Farming zone <ul style="list-style-type: none"> ○ schedule 1 ○ schedule 2 • Rural living zone • low-density residential zone • Industrial 1 zone
Proposed development	Approximately 3,110 residential dwellings
Road network	Midland Highway (state arterial road – A300) Tatura-Undera Road (state arterial road – C357) Dhurringile Road Pyke Road Ferguson Road Bayunga Road Murton Road
Traffic generation	31,125 vehicles per day (vpd) 2,646 vehicles per hour (vph) peak hour traffic

<p>Recommendations</p>	<p>It is recommended that:</p> <ul style="list-style-type: none"> • Recommendation 1: the development of the study area includes sealing unsealed roads that are relied upon for access to the newly developed residential dwellings • Recommendation 2: the Council should consider advocating for DTP to audit the safety of the Midland Highway / Dhurringile Road intersection • Recommendation 3: the Council consults with the local bicycle user groups to determine the frequency of occurrence of safety issues and look at implementing mitigating measures • Recommendation 4: a review of the Midland Highway / Dhurringile Road intersection is undertaken to consider if improvements are required to maintain the satisfactory operation of the intersection • Recommendation 5: ensure all intersections provide the required turn lane treatments • Recommendation 6: SIDRA analysis is undertaken of Intersection G to confirm if a cross intersection will operate satisfactorily • Recommendation 7: a new intersection is provided to Dhurringile Road from precinct B, approximately mid-block between Ferguson Road and the level crossing • Recommendation 8: ensure all proposed intersections are located to confirm that turn lane lengths do not conflict with any existing or future turn lanes associated with existing intersections and that the access does not conflict with any access to the surrounding land • Recommendation 9: ensure all intersections are checked against the AGRD4A sight distance requirements at the detailed design phase to ensure compliance • Recommendation 10: ALCAM assessments are undertaken for the level crossings at Tatura-Undera Road, Hogan Street, Dhurringile Road and Bayunga Road, based on current and future operating conditions.
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Referenced documents

References used in the preparation of this report include the following:

- RTA Guide to Traffic Generating Developments, Version 2.2, October 2002, for traffic generation predictions and parking requirements
- Austroads Guide to
 - Road Design
 - Part 4 (AGRD4)
 - Part 4A (AGRD4a)
- Austroads Guide to Traffic Management
 - Part 3 (AGTM3)
 - Part 6 (AGTM6)
- Greater Shepparton City Council Planning Scheme
Local Government Infrastructure Design Association's Infrastructure Design Manual (IDM), Version 5.20, was released in March 2019.

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1 INTRODUCTION

Trafficworks has been engaged by Greater Shepparton Council (the Council) to undertake a traffic impact assessment to assist Council with developing the Tatura Structure Plan. This report will help inform the road layout of each precinct for the next level of design and form the initial design/investigation work for the future strategic residential growth corridors to the north, northeast and east of Tatura.

This traffic impact assessment was carried out to:

- estimate traffic generation and distribution associated with the proposed development
- determine the suitability of the proposed access location onto the adjacent road network
- determine the likely traffic impacts on the existing road network
- identify any necessary mitigating works.

2 BACKGROUND

2.1 Tatura structure plan

Greater Shepparton City Council (Council) is commencing design and investigation work for a future strategic residential growth corridor for Tatura. The council has engaged Trafficworks to undertake a traffic impact assessment of the study area to identify the transport infrastructure required for development within the growth area.

The Tatura Structure Plan study area comprises approximately 760 hectares to the north, northeast and east of the Tatura township, which is currently zoned (but not limited to) Farming zone – schedule 1 and 2 (FZ1, FZ2), Rural living zone (RLZ), Low-density residential zone (LDRZ) and Industrial 1 zone (IN1Z).

The Tatura Structure Plan study area, precincts and the surrounding road network is shown in Figure 1, and the zoning map of the study area is shown in Figure 2.

Figure 1: Location Plan (reproduced with permission from Melway Publishing Pty Ltd)

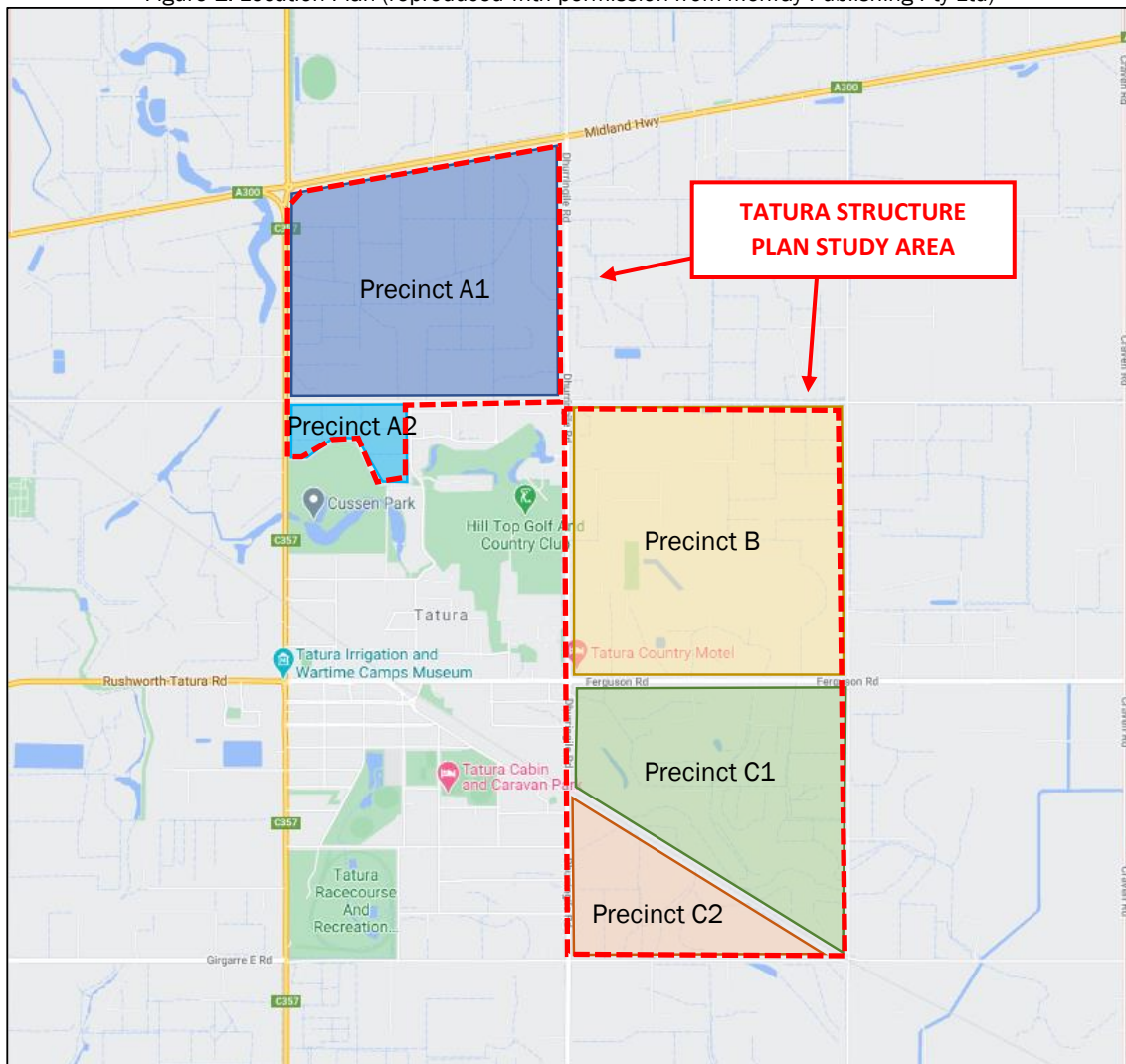
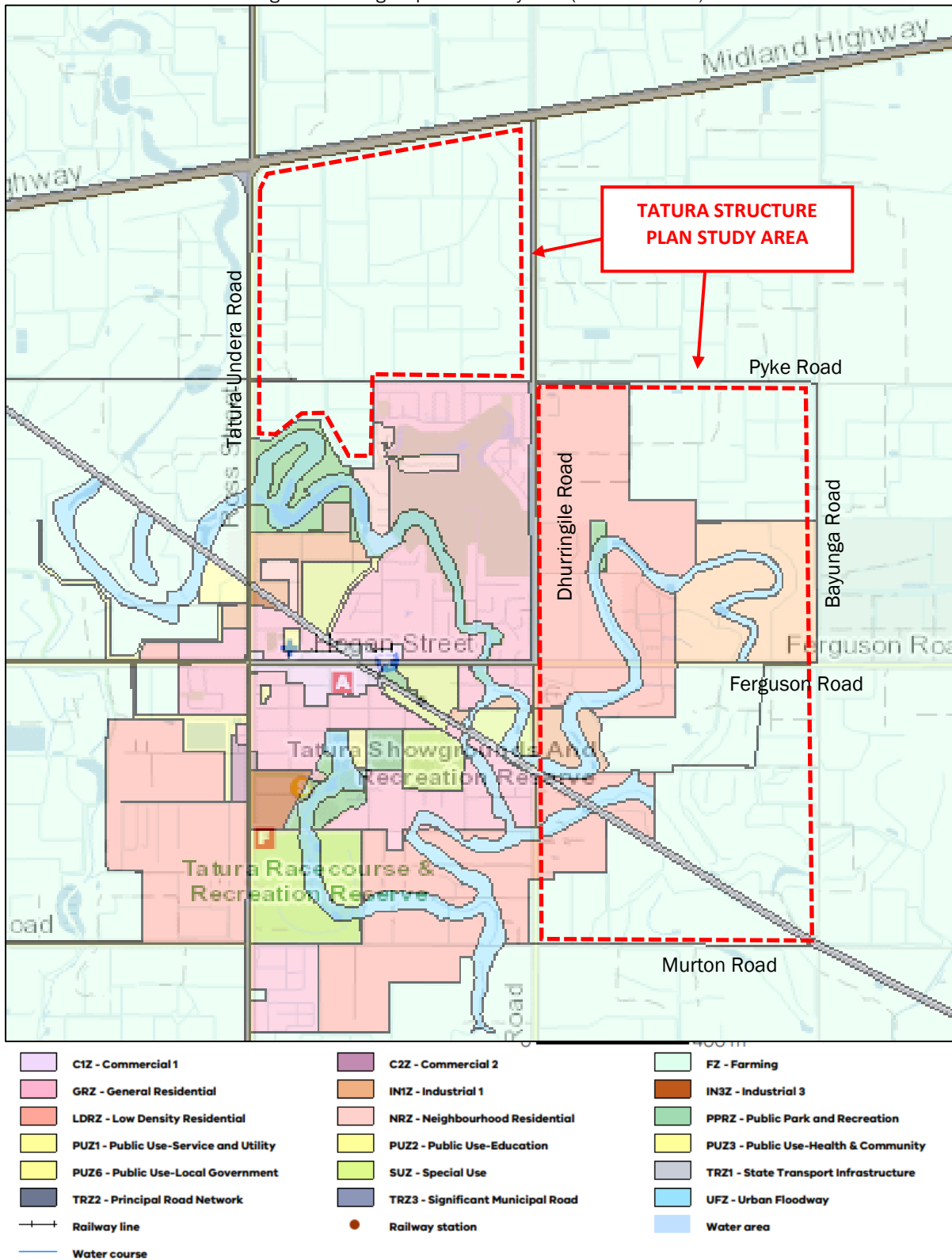


Figure 2: Zoning map of the study area (source: VicPlan)



2.2 Road network

2.2.1 Midland Highway

The Midland Highway (A300) is a state arterial road under the Department of Transport and Planning (DTP¹) management. It is generally aligned in an east-west direction and connects Benalla to the east and Bendigo to the southwest. Near the study area, the Midland Highway forms a two-lane, two-way road (2 x 3.5 m traffic lanes) divided by a centreline wire rope safety barrier with 2.5 m – 3.5 m sealed shoulders on each side (refer to Photos 1 and 2).

The Midland Highway is subject to a posted speed limit of 100 km/h (refer to Figure 3).

Photo 1: The Midland Highway intersection with the Tatura-Undera Road, looking west



Photo 2: Typical cross-section of the centreline wire rope safety barrier on the Midland Highway, looking east



¹ DTP, formerly the Department of Transport (DoT / VicRoads / Regional Roads Victoria (RRV))

2.2.2 Tatura-Undera Road

The Tatura-Undera Road (C357) (also known locally as Ross Street) is a state arterial road under the management of the DoT. It is aligned in a north-south direction and connects Undera to the north and Murchison (via the Murchison-Tatura Road, also the C357) to the south. Near the study area, Tatura-Undera Road forms a two-lane, two-way (2 x 3.4 m traffic lanes) undivided road with 1.3 m sealed shoulders on each side (refer to Photos 3 and 4).

Photo 3: typical urban area cross-section of the Tatura-Undera Road, looking north



Photo 4: typical rural area cross-section of the Tatura-Undera Road, looking south



Tatura-Undera Road is subject to a posted speed limit of 100 km/h (refer to Figure 3). A reduced speed limit of 60 km/h applies to Tatura-Undera Road through the town centre, approximately 650 m south of Pyke Road and Murton Road (south of the Tatura Racecourse).

2.2.3 Pyke Road

Pyke Road is a local road under the management of the Council. It is aligned east-to-west and connects Mahoney Track to the east and Winter Road to the west. Near the study area, Pyke Road between Charter Street and Bayunga Road is a two-lane, two-way sealed road with a carriageway width of approximately 6.2 m (refer to Photo 5). Pyke Road is a two-way gravel road between Tatura-Undera Road and Charter Street and to the west of Bayunga Road (refer to Photo 6).

Photo 5: Pyke Road, looking west, at the intersection with Charter Street, the unsealed section in the background



Photo 6: the unsealed section of Pyke Road, looking west near the intersection with the Tatura-Undera Road



Pyke Road is subject to a rural default speed limit of 100 km/h, reduced to 60 km/h between Charter Street and Dhurringile Road (refer to Figure 3).

2.2.4 Ferguson Road

Ferguson Road is a local road under the management of the Council. It is aligned east-to-west and connects Turnbull Road to the east and Hogan Street to the west. Ferguson Road is a two-lane, two-way undivided road near the study area with 2.1 m sealed shoulders on each side. On-road bicycle lanes are provided along Ferguson Road adjacent to the new residential development at 65 Ferguson Road (refer to Photo 7).

Photo 7: typical rural area cross-section of Ferguson Road, looking east



The following speed limits apply to Ferguson Road in the vicinity of the study area (refer to Figure 3):

- posted speed limit of 60 km/h applies east of Dhurringile Road for approximately 830 m
- posted speed limit of 100 km/h applies approximately 830 m east of Dhurringile Road.

2.2.5 Murton Road

Murton Road is a local road under the management of the Council. It is aligned in an east-to-west direction, connecting Downer Road to the east and Tatura-Undera Road to the west. Murton Road is a two-way undivided road near the study area with a sealed carriageway width of approximately 4.6 m (refer to Photos 8 and 9). Murton Road is unsealed on approach to the Bayunga Road intersection (refer to Photo 10).

Photo 8: typical rural residential area cross-section of Murton Road, looking east



Photo 9: typical rural area cross-section of Murton Road, looking east



Photo 10: Cross-section of Murton Road on approach to Bayunga Road, looking east



Murton Road is subject to a posted speed limit of 80 km/h from Dhurringile Road and increases to 100 km/h approximately 200 m east of Dhurringile Road (refer to Figure 3).

2.2.6 Dhurringile Road

Dhurringile Road is a local road under the management of the Council. It is aligned north-to-south and connects the Midland Highway to the north with Hammond Road to the south. Dhurringile Road is a two-lane, two-way undivided road near the study area with 0.5 m sealed shoulders on each side (Photos 11 and 12).

Photo 11: typical rural cross-section of Dhurringile Road, looking south



Photo 12: typical rural residential cross-section of Dhurringile Road, looking north



The following speed limits apply to Dhurringile Road in the vicinity of the study area (refer to Figure 3):

- posted speed limit of 60 km/h applies approximately 800 m north of Ferguson Road to Hampton Road
- posted speed limit of 80 km/h applies from 800 m north of Ferguson Road to 360 m north of Pyke Road
- posted speed limit of 100 km/h applies from approximately 360 m north of Pyke Road to the Midland Highway. It also applies to the south of Murton Road.

2.2.7 Bayunga Road

Bayunga Road is a local road under the management of the Council. It is aligned north-to-south and connects the Midland Highway north and Hammond Road south. Near the study area, Bayunga Road is a two-way unsealed (with some sealed sections near residences and on approach to intersections) road with a carriageway width of approximately 4.0 m (refer to Photos 13 and 14).

Photo 13: typical sealed cross-section of Bayunga Road, looking south



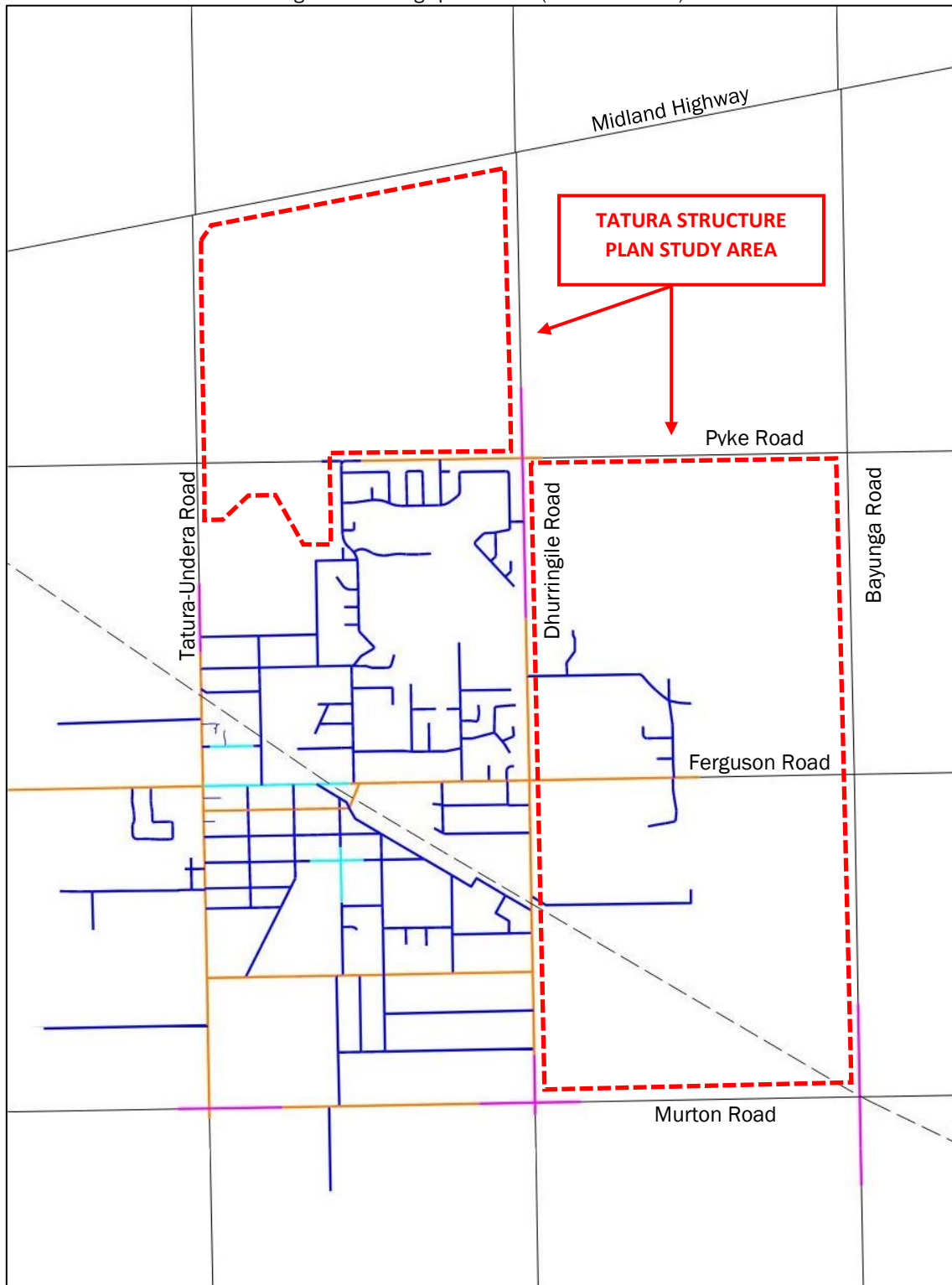
Photo 14: typical unsealed cross-section of Bayunga Road, looking south



Bayunga Road is subject to a rural default speed limit of 100 km/h, reduced to 80 km/h approximately 500 m north of Murton Road (refer to Figure 3).

The existing speed zones within Tatura are shown in Figure 3.

Figure 3: Existing speed zones (Source: Council)



LEGEND

40 km/h		70 km/h		100 km/h	
50 km/h		80 km/h		School Zones	
60 km/h		90 km/h			

Conclusion 1: As the developments occur, the speed zones on the adjoining road will need to be reviewed to ensure that appropriate posted speed limits are maintained.

Conclusion 2: the assessment revealed that there are sections of roads within the study area that are unsealed and will need to be sealed as part of the development of the study area.

Recommendation 1: the development of the study area includes sealing unsealed roads that are relied upon for access to the newly developed residential dwellings.

2.3 Existing intersection

2.3.1 Major road intersections

The existing intersections in Tatura are give-way, roundabout or staggered intersections, as summarised in Figure 4.

2.3.2 Internal road intersections

Existing internal road connections that could be upgraded to provide access to the future development areas are discussed as follows and are shown in Figure 5:

- Johnstone Road is an existing local access road that intersects with Dhurringile Road approximately 500 m north of Ferguson Road, which provides access to precinct B
- Mako Drive is the new local road that intersects with Ferguson Road and is being constructed, providing access to precinct B. This intersection provides a CHR and AUL turn treatment.
- Doller Court is an existing local access road that intersects with Ferguson Road, providing access to precinct B and approximately opposite Mako Drive (refer to Figure 4). This intersection provides a CHR(s) turn treatment.

Gowrie Park Road is an existing local access road intersecting Dhurringile Road approximately 10 m north of the rail crossing, providing access to precinct C1.

Figure 4: Existing intersection treatments

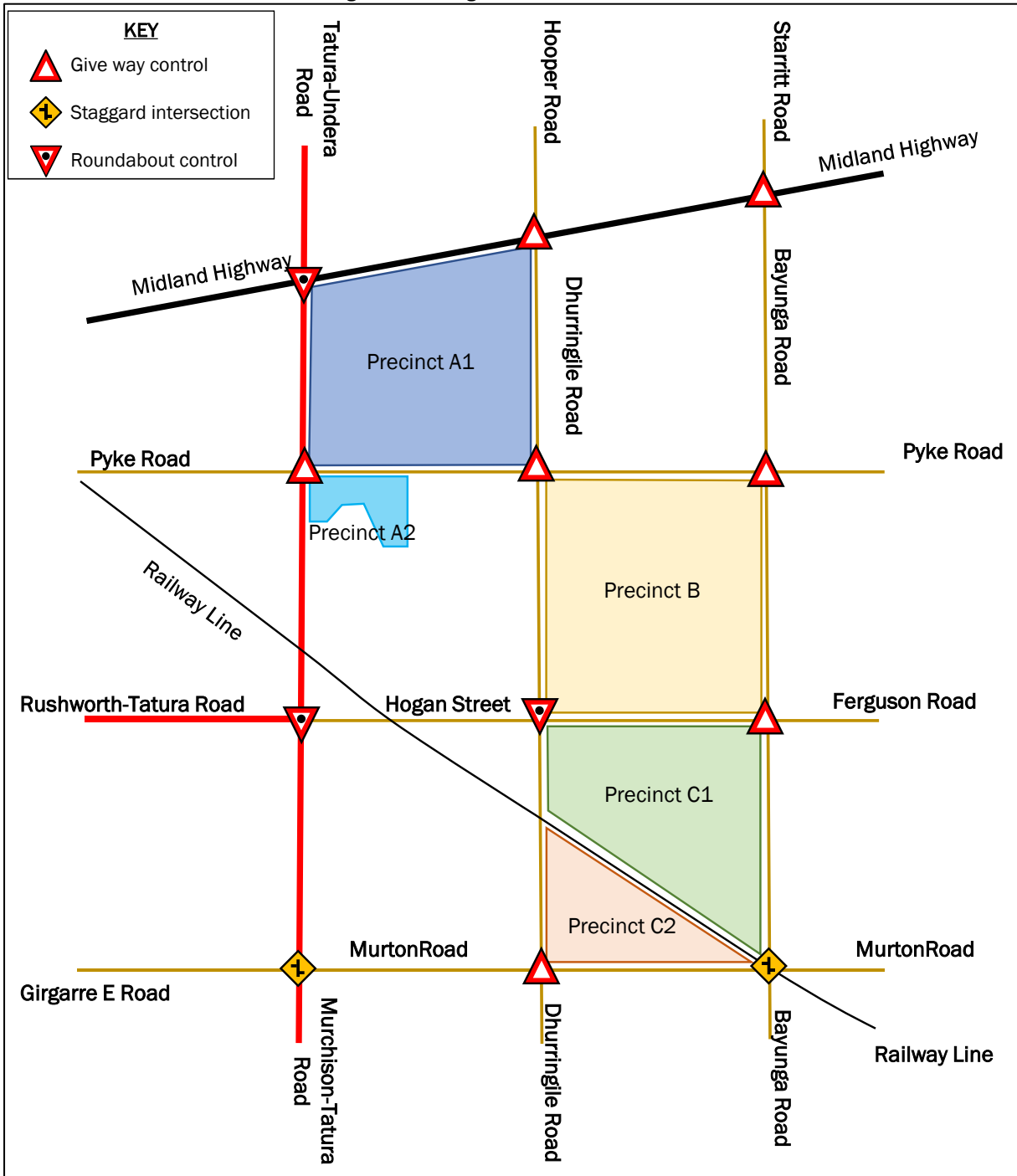
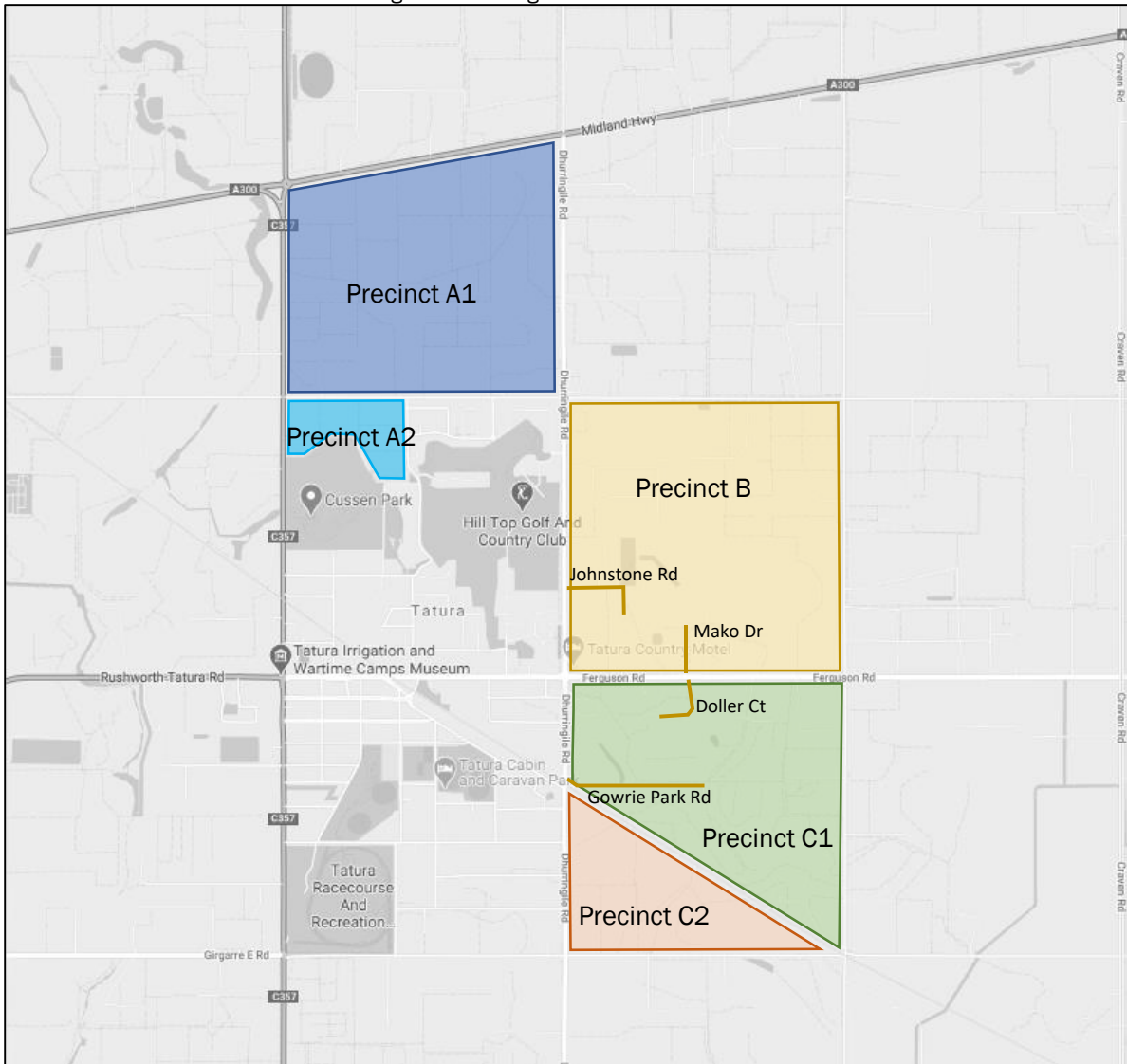


Figure 5: Existing local road connections



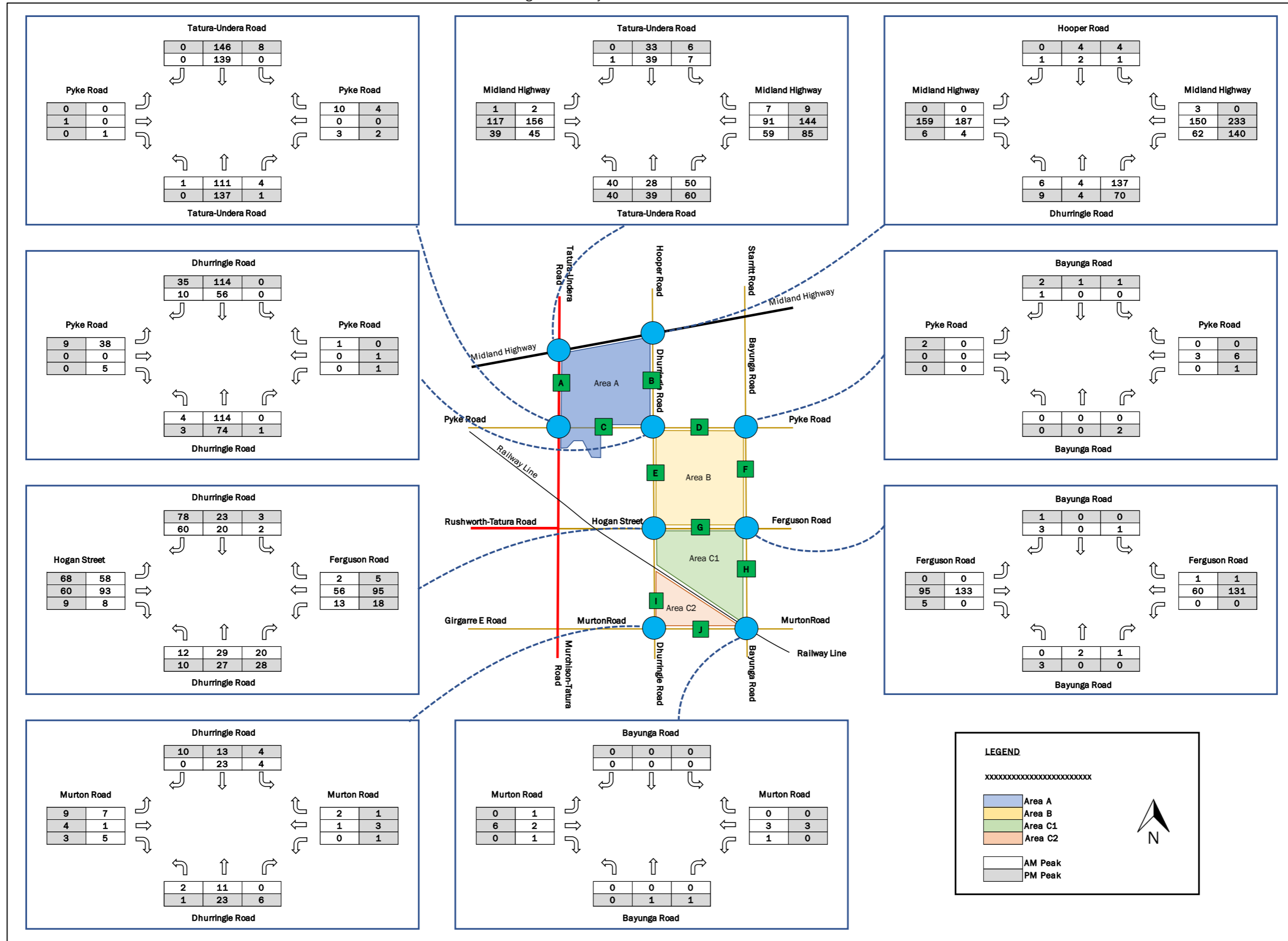
2.4 Traffic volumes

Traffic surveys were undertaken for Council by Real Time Traffic from 14 October to 20 October 2021 at the following intersections:

- Tatura-Undera Road intersection with:
 - Midland Highway
 - Pyke Road
- Dhurringile Road intersection with:
 - Midland Highway
 - Pyke Road
 - Ferguson Road / Hogan Road
 - Murton Road
- Bayunga Road intersection with:
 - Pyke Road
 - Ferguson Road / Hogan Road
 - Murton Road

The locations of the surveys and the peak hour traffic volumes are summarised in Figure 6.

Figure 6: Surveyed traffic volumes – October 2021



2.5 Crash history

The DTP Open Data web portal details all injury crashes on roads throughout Victoria. Scrutiny of these records indicates that seven casualty crashes have occurred in the vicinity of the Tatura Structure Plan study area in the last five years of available data:

Midland Highway / Dhurringile Road intersection

- one ‘right near’ type collision (DCA 113) occurred on Tuesday, 2 November 2018, at 4:00 pm, resulting in a serious injury
- two ‘left near’ type collision (DCA 116) occurred on:
 - Thursday, 22 February 2018 at 5:15 pm, resulting in an ‘other’ injury
 - Friday 1 December 2018 at 12:30 pm resulting in an ‘other’ injury

Pyke Road / Dhurringile Road intersection

- one ‘right rear’ type collision (DCA 132) occurred on Sunday, 7 July 2019, at 1:51 am, resulting in an ‘other’ injury

Ferguson Road / Dhurringile Road intersection

- one ‘cross traffic’ type collision (DCA 110) occurred on Monday, 23 May 2016, at 9.10 am, resulting in a serious injury

Mactier Street / Dhurringile Road intersection

- one ‘right through’ type collision (DCA 121) occurred on Wednesday, 16 January 2019, at 12.30 pm, resulting in an ‘other’ injury

Ferguson Road, approximately mid-block

- one ‘right off carriageway into object/parked vehicle’ type collision (DCA 173) occurred on Sunday, 29 September 2019, at 2.30 am, resulting in a serious injury

DTP completed a road safety infrastructure in mid-2018 to improve safety along the Midland Highway between Stanhope and Shepparton. As part of this project, a centreline barrier was installed on the Midland Highway on approach to the Dhurringile Road intersection. This work was completed between the two casualty crashes detailed above (DCA 116). Therefore, these crashes have not been considered a trend as the intersection environment was altered.

No trends in crashes have been observed. Hence, the roads near the Tatura Structure Plan study area do not have a traffic safety problem that requires urgent remedial action.

Conclusion 3: No crash trends were observed near the Tatura Structure Plan study area in the last five years of available data. Hence there are no traffic safety problems that require urgent remedial action.

2.6 Pedestrians and cyclists

No shared path network connects the study area with the Tatura town centre. However, the Tatura 10 km loop provides access from the study area to the town centre via a mix of on-road and off-road paths.

In addition, the existing pedestrian / cycling facilities within Tatura include the following:

- Jodie Ridges trail – on-road bicycle trail providing access from Shepparton to Cussen Park in Tatura via Pyke Road and Charters Street
- existing shared paths within the North Links Estate
- existing shared path along the eastern side of Dhurringile Road
- existing shared path along Mako Drive.

Pedestrians and cyclists were observed travelling within and adjacent to the existing rural living access roads.

2.7 Public transport

Tatura is located on a V-Line regional coach service that operates between:

- Barmah to Melbourne (via Shepparton or Heathcote)
- Moama – Echuca – Melbourne (via Seymour and Murchison East).

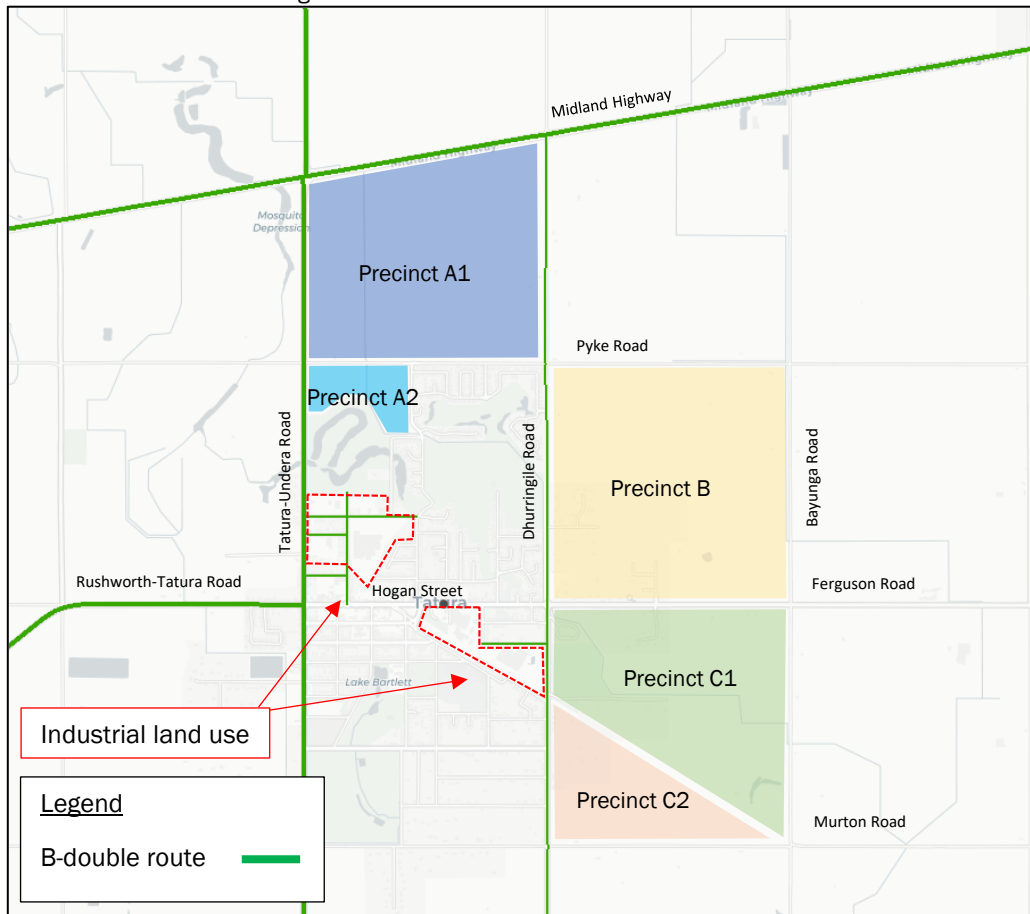
Buses on this route stop in Fraser Street in the centre of town. No known town bus service caters for local trips within Tatura.

2.8 Heavy vehicle routes

B-double trucks are permitted to use Tatura-Undera Road (Ross Street) and Dhurringile Road within Tatura, as gazetted by Council under the National Heavy Vehicle Register.

The B-Double routes provide access to the industrial estates within Tatura, as shown in Figure 7.

Figure 7: Gazetted B-double routes within Tatura



2.9 Community consultation

On behalf of Trafficworks, Council contacted the Tatura community plan group to request information regarding residents' travel patterns to different destinations within and around Tatura and the wider area.

The responses indicated that residents typically travel to/from the town centre or Shepparton and Mooropna (to the east), with few trips to/from the broader area to the north and west.

In addition, the responses indicated that upgrades to the Midland Highway / Dhurringile Road intersection cause concerns for residents, including poor visibility, short turning lanes and limited overtaking opportunities. As a result of these safety concerns, residents avoid this intersection and use Ferguson Road as an alternative route to the east.

As noted above, this intersection has been upgraded as a road safety infrastructure program. However, the community has identified that there are still ongoing road safety concerns at the intersection that need further ameliorative treatments.

Recommendation 2: the Council should consider advocating for DTP to audit the safety of the Midland Highway / Dhurringile Road intersection.

Some responses indicated that local trips to/from the town centre were being undertaken by bicycle and 'dooring' was an issue, particularly on Hogan Street.

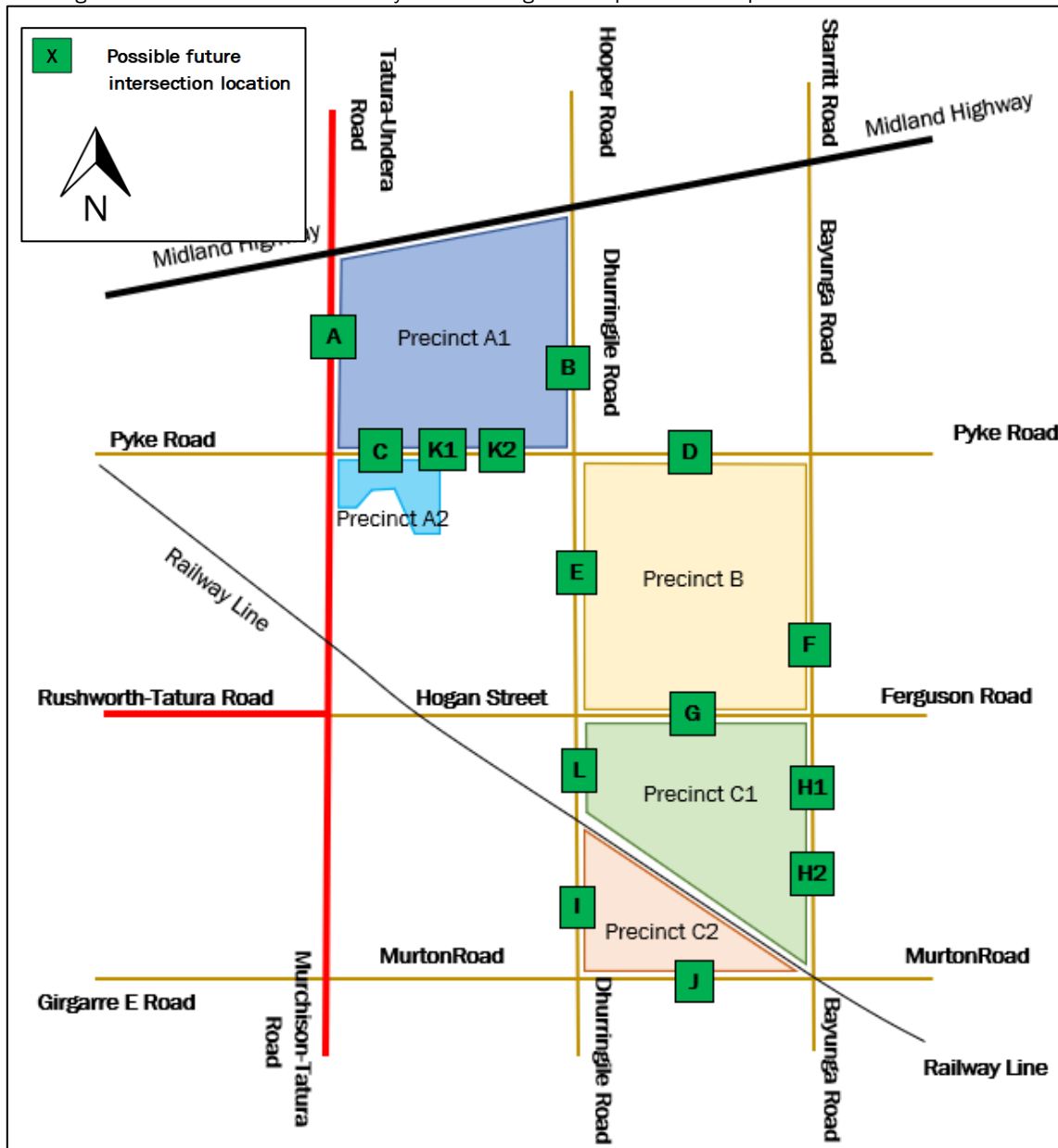
Recommendation 3: the Council consults with the local bicycle user groups to determine the frequency of occurrence of safety issues and look at implementing mitigating measures.

3 PROPOSED DEVELOPMENT

3.1 Proposed development summary

The Tatura Structure Plan study area was divided into precincts for this assessment, as highlighted in Figure 8.

Figure 8: Tatura Structure Plan study area showing the five precincts and possible future connections



The number of dwellings for the Tatura Structure Plan study area was determined based on the approximate land area of each precinct and the average lot sizes (using the dwelling densities identified in the Tatura Framework Plan). It was assumed that 10% of each precinct would be set aside for roads and drainage services.

Therefore, it is anticipated that at full development, the Tatura Structure Plan study area will yield approximately 3,110 residential dwellings, as follows:

- Precinct A1 1,178 dwellings
- Precinct A2 275 dwellings
- Precinct B 1,154 dwellings
- Precinct C1 421 dwellings
- Precinct C2 84 dwellings

It has been assumed that DTP would not support any new connections from precinct A1 to the Midland Highway.

For this assessment, the connections shown to each abutting road are theoretical. They will determine the road connections required to service the development area. The intersection locations only represent the traffic that could gain access to each abutting road. The suitability of the existing internal road connections is considered further in Section 4.5 of this report.

The location of each theoretical road connection is indicatively shown in Figure 8.

3.2 Applicable IDM cross-sections

The *Infrastructure Design Manual (IDM)* includes a series of standard road cross-sections that apply to the Tatura Structure Plan study area.

The design criteria for roads applicable to the Tatura Structure Plan study area are summarised in the following subsections.

3.2.1 Connector Street (Level 2)

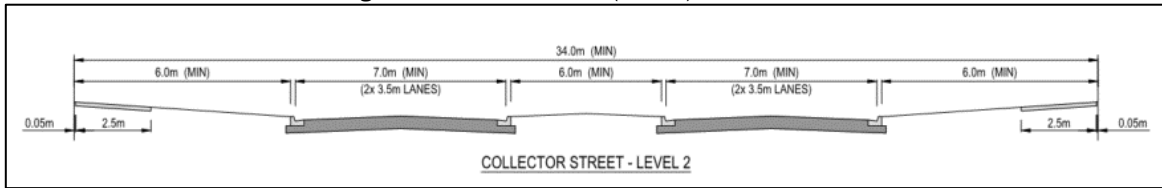
Connector streets (level 2) carry higher traffic volumes and connect access places and streets through and between neighbourhoods. A summary of the design criteria for this type of road is as follows:

- traffic volumes up to 6,000 – 12,000 vpd²
- 2 x 7.0 m carriageway widths with indented on-street parallel parking on both sides
- 6.0 m wide central median
- verge width of 6.0 m to accommodate services
- pedestrian paths are provided on both sides of the road
- shared paths are provided on both sides of the road
- road reserve width of 34.0 m.

Refer to Figure 9 for the Connector street (level 2) cross-section.

² vpd = vehicles per day

Figure 9: Connector street (level 2) cross-section



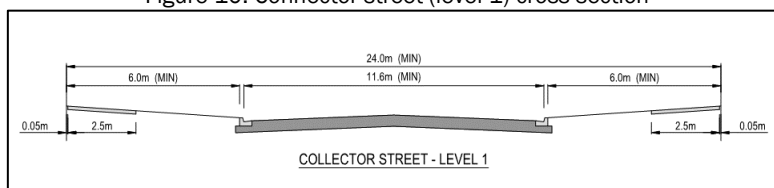
3.2.2 Connector Street (Level 1)

Connector streets (level 1) carry higher traffic volumes, connecting places and streets through and between neighbourhoods. A summary of the design criteria for this type of road is as follows:

- traffic volumes up to 2,500 – 6,000 vpd
- 11.6 m carriageway width with indented on-street parallel parking on both sides
- verge width of 6.0 m to accommodate services
- shared paths are provided on both sides of the road
- road reserve width of 24.0 m.

Refer to Figure 10 for the Connector street (level 1) cross-section.

Figure 10: Connector street (level 1) cross-section



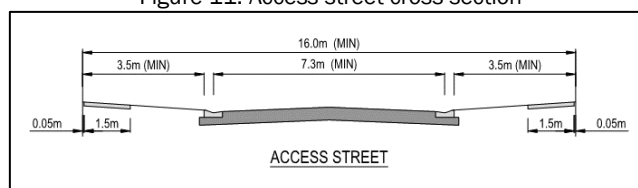
3.2.3 Access Street

Access street provides local residential access where traffic is subservient, speed and volumes are low, and pedestrian movements are facilitated. A summary of the design criteria for this type of road is as follows:

- traffic volumes up to 1,000 – 2,500 vpd
- 7.3 m carriageway width with on-street parallel parking on both sides
- verge width of 6.0 m to accommodate services
- pedestrian paths are provided on both sides of the road
- road reserve width of 16.0 m.

Refer to Figure 11 for the access street cross-section.

Figure 11: Access street cross-section



3.3 Theoretical Road Capacity

It is noted that the traffic volume range provided for the IDM cross-sections relates to delivering an intended level of amenity along the roadway rather than the actual road capacity.

Austrroads Guide to Traffic Management Part 3 (AGTM3) specifies a one-way mid-block capacity for urban arterial roads with interrupted flows, as shown in Table 5.1 of AGTM3. This road capacity range is based on factors including the road environment, side road access, property access and on-street parking. It ranges between 600 vph and 900 vph for undivided roads.

Hence, if the directional splits are 50:50 and assuming 10% of daily traffic occurs within the peak hours, the theoretical capacity of an undivided two-lane, two-way is between 12,000 to 18,000 vpd.

4 ASSESSMENT

4.1 Trip generation and distribution

4.1.1 Traffic generation

Traffic generation for new developments is typically estimated using the traffic generation rates provided in the *RTA Guide to Traffic Generating Developments* (2002) or the rates provided in the *Infrastructure Design Manual* (IDM). As per the RTA Guide, the traffic generation rates applicable to the residential development are:

- 9 vehicle trips per dwelling per day
- 0.85 vehicle trips per dwelling per hour (during the peak hour).

The IDM traffic generation rate for residential development is 10 vehicle trips per dwelling per day.

This assessment adopted a daily traffic generation rate of 10 vehicle trips per dwelling per day and 0.85 vehicle trips per dwelling per hour to determine the anticipated traffic generation to/from the Tatura Structure Plan study area.

Refer to Table 1 for a summary of the traffic generation for the Tatura Structure Plan study area.

Table 1: Development of traffic volumes

Precinct	Lots	RTA Guide / IDM Traffic Generation Rate		Study area Traffic Generation	
		Hourly	Daily	Hourly	Daily
A1	1,178	0.85	10	1,002	11,785
A2	275	0.85	10	234	2,748
B	1,154	0.85	10	981	11,540
C1	421	0.85	10	358	4,215
C2	84	0.85	10	71	837
TOTAL				2,646	31,125

Conclusion 4: the general Tatura Structure Plan study area will likely generate 31,125 vpd with a peak traffic volume of 2,646 vph (vehicles per hour).

4.1.2 Traffic distribution

Full development of the Tatura Structure Plan study area will likely occur within the next 30-year period; however, it is difficult to forecast the annual compounded growth rate for the underlying traffic volumes beyond 10 years.

Therefore, for this traffic assessment, it has been assumed that the full development will occur within the next ten year period. An annual compounded growth rate of 1%³ was applied on all roads to project the existing traffic volumes to 2030.

Furthermore, it is assumed that 85% of the development traffic is likely to travel to/from Tatura town centre (local trips), and the remaining traffic is expected to travel to:

- 10% to the east
- 1% to the north
- 2% to the south
- 2% to the west

As discussed in Section 2.7, consultation with residents indicated that many residents travelling to/from the east avoid the Midland Highway / Dhurringile Road intersection due to various safety concerns and are utilising Ferguson Road as an alternative route. Therefore, this distribution assumes that most traffic travelling to/from the east will use Ferguson Road.

The percentage of traffic that is anticipated to generate by each road connection is summarised in Table 2. It is noted that it is assumed that 60% of precinct A2 will generate to/from Charter Street, an established local road that provides access to existing dwellings to the east of precinct A2.

Table 2: Intersection splits

Intersection	Precinct				
	A1	A2	B	C1	C2
A	35%				
B	25%				
C		50%			
D			30%		
E			25%		
F			25%		
G			20%	60%	
H1/H2				20%	
I					60%
J					40%
K1/K2	40%				
L				20%	
existing ⁴		50%			

³ DTP data for both the Midland Highway and the Tatura-Undera Road indicate a growth rate of 1%

⁴ Existing access to precinct A2 via Charter Street

The splits for the AM and PM peak hours at each intersection based on existing traffic patterns are shown in Figure 12. It is noted that the traffic distribution and operation of the intersections to the major roads will need to be re-evaluated during the next design stage (once the internal road network is established).

4.1.3 Anticipated traffic volumes

The anticipated 2030 traffic volumes, assuming full development of the Tatura Structure Plan study area, are shown in Figure 13.

4.2 Existing road network ultimate cross-section

The anticipated post-development traffic volumes on the existing road network impacted by the development of the Tatura Structure Plan study area are summarised in Table 3, and the post-development IDM road classification is shown graphically in Figure 14.

Based on the anticipated post-development traffic volumes, Ferguson Road, Dhurringile Road, and Tatura-Undera Road will be designed as connector streets (level 2) due to the existing travel patterns. The current road reservation widths are constrained by existing dwellings and must be increased to provide the cross-section for a connector street (level 2).

As discussed in Section 3.3, the theoretical road capacity of a two-lane, two-way road is between 12,000 to 18,000 vpd and is sufficient to accommodate the anticipated post-development traffic volumes. In addition, the above analysis considers the existing travel patterns of residents. As the land is developed, these travel patterns may change as the surrounding roads are upgraded to provide safer and more convenient travel routes. The higher-order road cross-section may not be required if travel patterns change.

Conclusion 5: the theoretical capacity of a two-lane, two-way road (i.e. Connector Road level 1) is sufficient to accommodate the anticipated post-development traffic volumes of Ferguson Road, Dhurringile Road and Tatura-Undera Road.

Traffic volumes along Dhurringile Road are currently high south of intersection B due to residents avoiding the Midland Highway / Dhurringile Road intersection. As traffic volumes along Dhurringile Road increase as the future residential development within the study area grow, it is recommended that a review of the Midland Highway / Dhurringile Road intersection is undertaken to consider if improvements are required to maintain the satisfactory operation of the intersection.

Recommendation 4: a review of the Midland Highway / Dhurringile Road intersection is undertaken to consider if improvements are required to maintain the satisfactory operation of the intersection.

Figure 12: Anticipated intersection splits

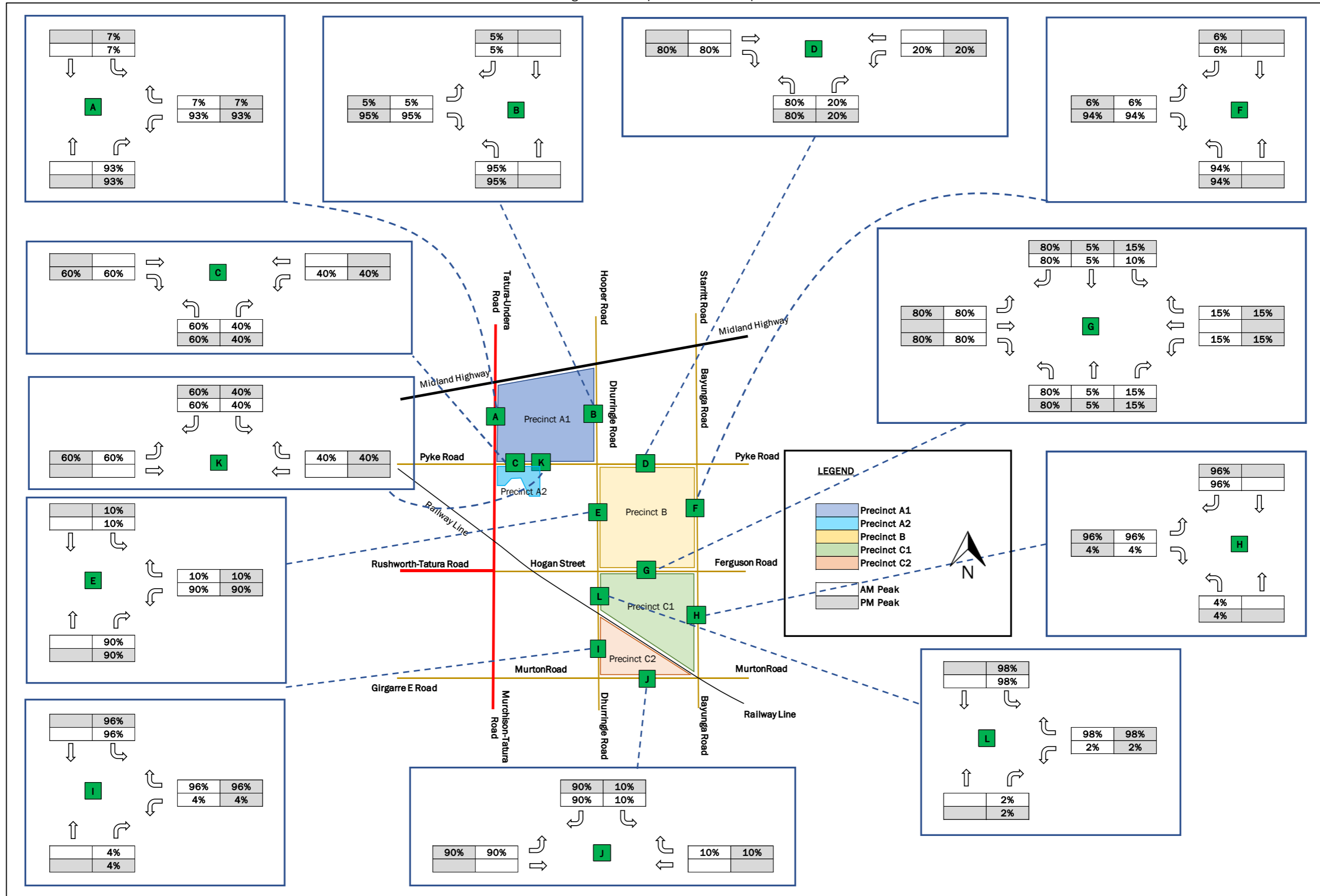


Figure 13: Anticipated peak hour traffic volumes

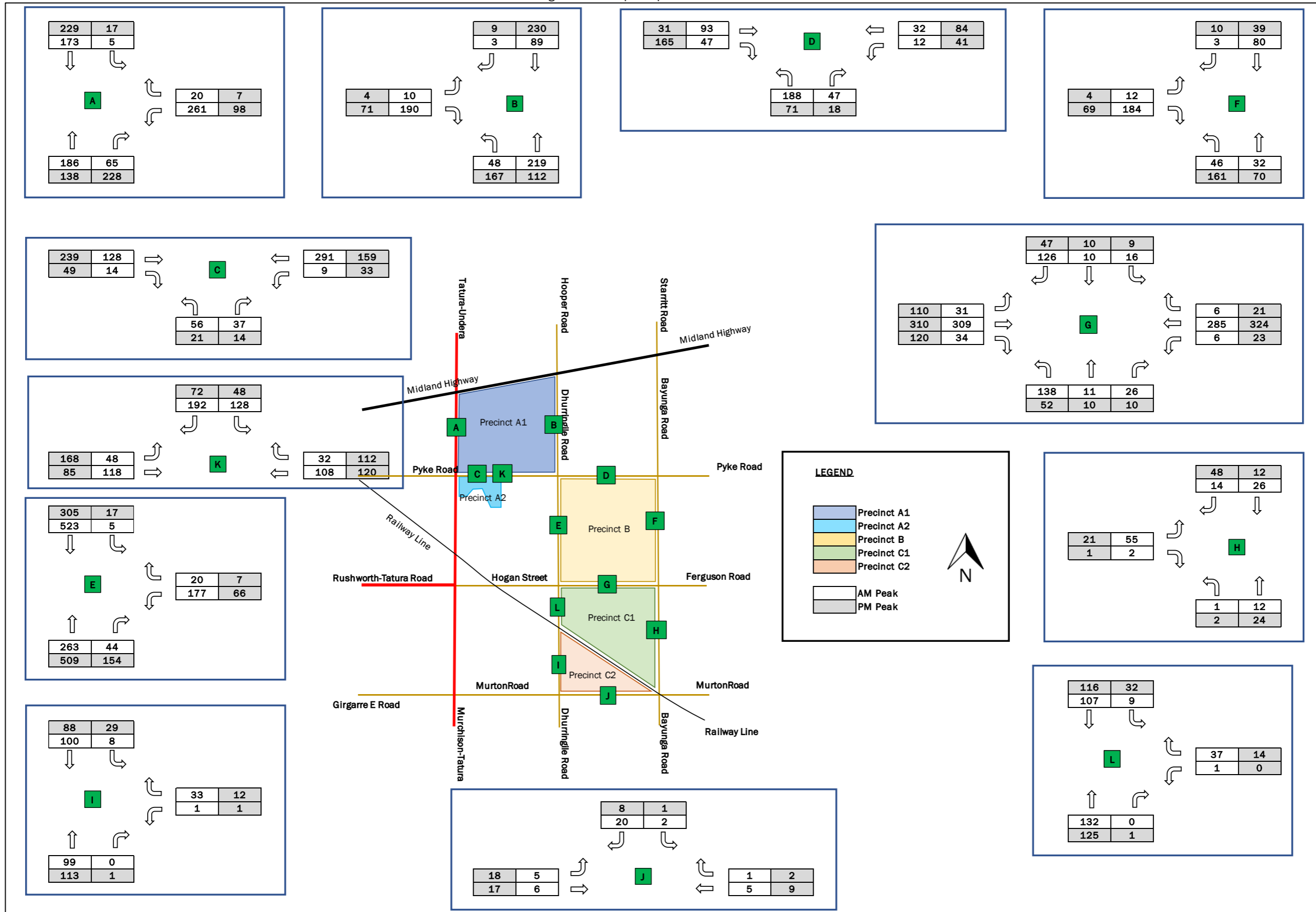
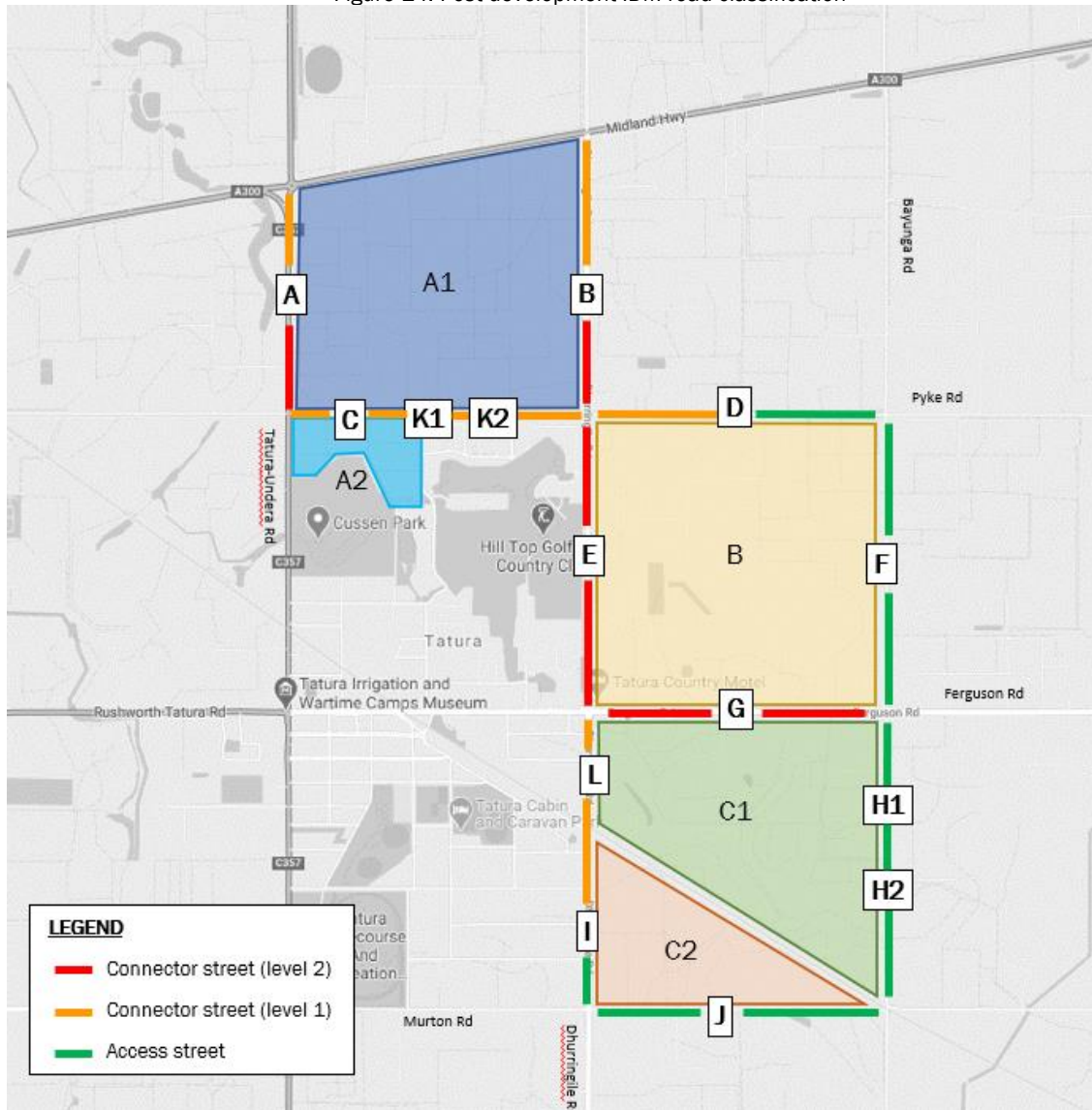


Table 3: Anticipated post-development two-way daily traffic volumes

Road	Intersection	Location	Daily two-way volume	IDM Road Classification
Tatura-Undera Road	A	North	3,915	Connector Street – Level 1
		South	6,930	Connector Street – Level 2
Dhurringile Road	B	North	3,549	Connector Street – Level 1
		South	5,803	Connector Street – Level 2
	E	North	8,389	Connector Street – Level 2
		South	10,351	Connector Street – Level 2
	L	North	2,870	Connector Street – Level 1
		South	2,421	Connector Street – Level 1
	I	North	2,421	Connector Street – Level 1
		South	2,029	Access Street
Ferguson Road	G	East	4,664	Connector Street – Level 2
		West	4,898	Connector Street – Level 2
Pyke Road	C	East	1,836	Connector Street – Level 1
		West	3,601	Connector Street – Level 1
	D	East	3,863	Access Street
		West	4,664	Connector Street – Level 1
	K1/K2	East	1,261	Connector Street – Level 1
		West	3,419	Connector Street – Level 1
Bayunga Road	F	North	1,063	Access Street
		South	404	Access Street
	H1/H2	North	6,953	Access Street
		South	9,625	Access Street
Murton Road	J	East	279	Access Street
		West	506	Access Street

Figure 14: Post-development IDM road classification



Conclusion 6: based on the anticipated post-development traffic volumes, Pyke Road will be designed as a connector street (level 1).

Conclusion 7: based on the anticipated post-development traffic volumes, Bayunga Road will be designed as an access street.

4.3 Major road intersections

The traffic generated post-development of the study area will increase traffic volumes at existing major road intersections. As discussed in Section 2.3, cross-intersections that are subject to sign control will require an upgrade to a roundabout to improve safety and capacity, including the following intersections:

- Dhurringile Road / Pyke Road
- Dhurringile Road / Murton Road
- Ferguson Road / Bayunga Road
- Bayunga Road / Pyke Road

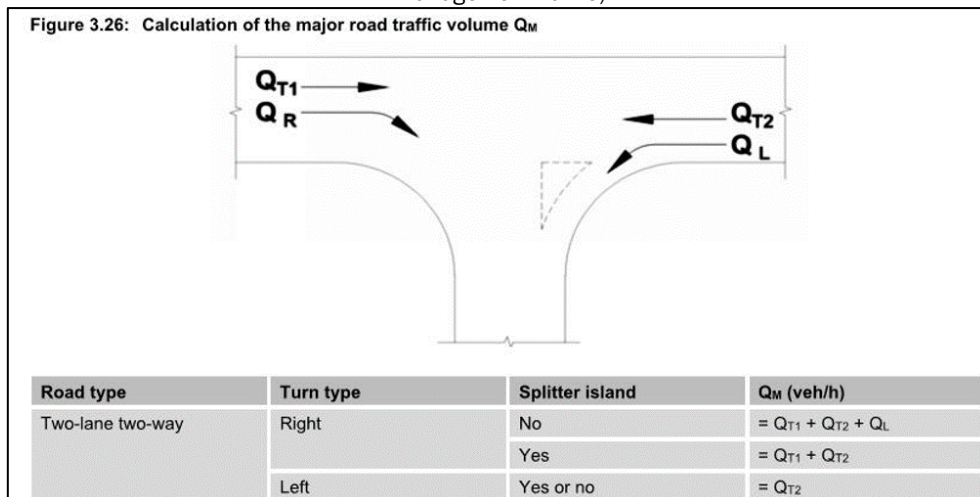
Given the increase in traffic volumes, it is unlikely that any intersections will require signalisation. However, the operation of the major road intersections could be evaluated during the next design stage once the internal road layout is determined.

4.4 Turn provisions

Separate turn lanes are usually provided to avoid congestion and traffic delays and improve safety for traffic movements at intersections and significant access points.

The formulas (Figure 15) determined the major road volume (Q_M). The results were then applied to Figure 3.26 from Austroads Guide to Traffic Management Part 6 AGTM6 to determine the turning treatments for the intersections.

Figure 15: Formulas used to determine major road traffic (Source: Figure 3.26 from Austroads Guide to Traffic Management Part 6)



Based on the posted speed limit at each road intersection, the turn warrants for each access road intersection are summarised in Table 4.

Table 4: Turn lane treatments at local road intersections

Intersection	Peak Period	Right Turn Treatment		Right Turn Warrant	Left Turn Treatment		Left Turn Warrant
		QM	QR		QM	QL	
Intersection A	AM	364	65	CHR	173	5	BAL
	PM	384	80	CHR	229	17	AUL(S)
Intersection B	AM	355	3	BAR	219	48	AUL(S)
	PM	509	9	CHR(S)	112	80	AUL(S)
Intersection C	AM	429	14	CHR(S)	291	9	BAL
	PM	431	49	CHR	159	33	AUL(S)
Intersection D	AM	136	47	CHR(S)	32	12	BAL
	PM	156	80	CHR(S)	84	41	BAL
Intersection E	AM	791	44	CHR	523	5	BAL
	PM	832	120	CHR	305	17	BAL
Intersection F	AM	157	3	BAR	32	46	BAL
	PM	270	10	CHR(S)	70	80	BAL
Intersection G Precinct C1	AM	600	34	CHR	285	6	BAL
	PM	656	120	CHR	324	23	BAL
Intersection H1/H2	AM	38	14	BAR	12	1	BAL
	PM	39	48	BAR	24	2	BAL
Intersection I	AM	207	0	BAR	100	8	BAL
	PM	230	1	BAR	88	29	BAL
Intersection J	AM	16	1	BAR	6	5	BAL
	PM	43	2	BAR	17	18	BAL
Intersection K1/K2	AM	274	32	CHR(S)	118	48	BAL
	PM	372	80	CHR	85	80	BAL
Intersection L	AM	248	0	BAR	107	9	BAL
	PM	273	1	BAR	116	32	BAL

Based on the above, the access road intersections warrant various turn treatments based on the anticipated traffic volumes.

Recommendation 5: ensure all intersections provide the required turn lane treatments.

4.5 Precinct local road connections

Section 4.1 indicates that one access to each abutting road (excluding the Midland Highway) will sufficiently service each precinct based on the anticipated post-development traffic volumes.

As the internal road layout is unknown, possible locations for each precinct's indicative local road connections are discussed below. Once the internal road network is determined, the operation of the intersections to the major roads will need to be re-evaluated.

4.5.1 Precinct A1

The indicative intersections to precinct A1 are shown in Figure 16 and discussed below. It is noted that there are no existing local road accesses to the abutting roads, and therefore new road connections will be required.

Figure 16: Local road connections to precinct A1



Intersection A

Intersection A has been indicatively shown approximately mid-block between the Midland Highway and Pyke Road. It is recommended that this intersection be located to ensure that the turn lane requirements (i.e. CHR and AUL(S) turn treatments) do not conflict with any existing or future turning lanes along Tatura-Undera Road.

Intersection B

Intersection B has been indicatively shown approximately mid-block between the Midland Highway and Pyke Road. It is recommended that this intersection be located to ensure that the turn lane requirements (i.e. CHR(S) and AUL(s) turn treatments) do not conflict with any existing or future turning lanes along Dhurringile Road.

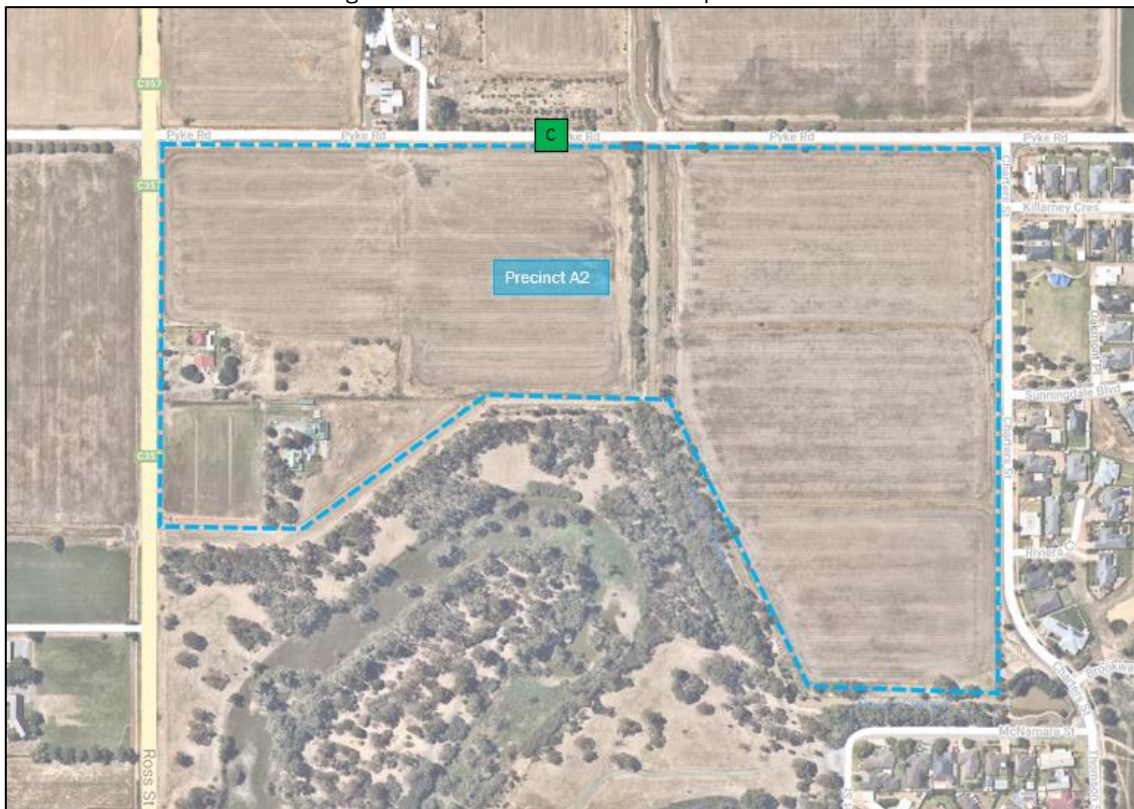
Intersection K1/K2

Intersections K1 and K2 have been indicatively shown approximately mid-block between Dhurringile Road and Tatura-Undera Road. It is recommended that these intersections be located within the existing 60 km/h speed zone on Pyke Road. It should be located to ensure that the turn lane requirements (i.e. CHR and BAL turn treatments) do not conflict with any existing or future turning lanes associated with Charter Street or Dhurringile Road. In addition, it should be ensured that the access locations do not conflict with any access to the southern side of Pyke Road.

4.5.2 Precinct A2

The indicative intersections to precinct A2 are shown in Figure 17 and discussed below. It is noted that it is anticipated that a proportion of precinct A2 will utilise Charter Street.

Figure 17: Local road connections to precinct A2



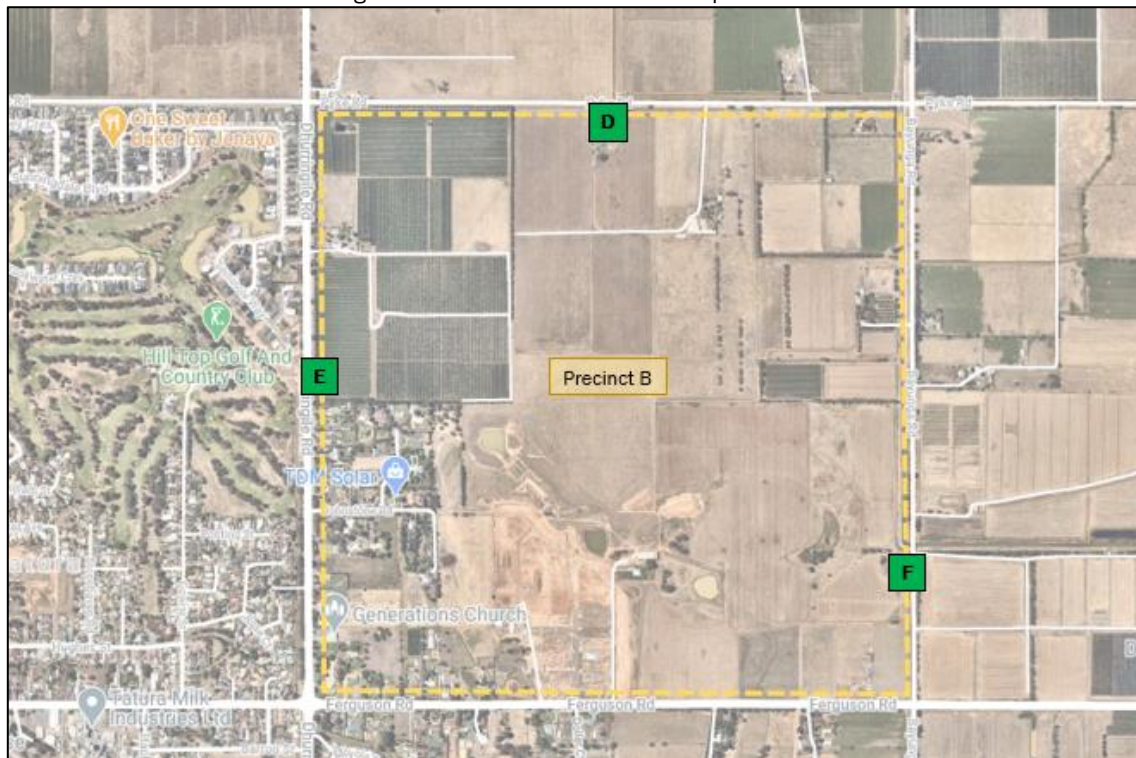
Intersection C

Intersection C is indicatively shown approximately mid-block along Precinct A2's frontage. It is recommended that this intersection be located to ensure that the turn lane requirements (i.e. CHR and AUL(S) turn treatments) do not conflict with any existing or future turning lanes associated with the intersection of Charter Street with Pyke Road.

4.5.3 Precinct B

The indicative intersections to precinct B are shown in Figure 18 and discussed below. It is noted that precinct B has an existing local road connection to Dhurringile Road (Johnstone Road) and a connection to Ferguson Road (Mako Drive), providing access to precinct B.

Figure 18: Local road connections to precinct B



Intersection D

Intersection D has been indicatively shown approximately mid-block between Dhurringile Road and Bayunga Road. It is recommended that this intersection be located to ensure that the turn lane requirements (i.e. CHR(s) and BAL turn treatments) do not conflict with any existing or future turning lanes associated with Dhurringile Road or Bayunga Road. In addition, it should be ensured that the access location does not form a cross intersection with any future access to the northern side of Pyke Road.

Intersection E

Intersection E is approximately 195 Dhurringile Road, approximately mid-block between Ferguson Road and Pyke Road. It is recommended that this intersection be located to ensure that the turn lane requirements (i.e. CHR(s) and BAL turn treatments) do not conflict with any existing turning lanes.

Intersection F

Intersection F has been indicatively shown approximately mid-block between Pyke Road and Ferguson Road. It is recommended that this intersection be located to ensure that it does not conflict with the GMW channel and that the turn lane requirements (i.e. CHR(S) and AUL(S) turn treatments) do not conflict with any existing or future turning lanes associated with Pyke Road or Ferguson Road. In addition, it should be ensured that the access does not create a conflict by forming a cross intersection with any future access to the eastern side of Bayunga Road.

4.5.4 Precinct C1

The indicative intersections to precinct C1 are shown in Figure 19 and discussed below. It is noted that precinct C1 has an existing local road connection to Ferguson Road (Doller Court) and a connection to Dhurringile Road (Gowrie Park Road), which may be appropriate to provide access to precinct C1.

Precinct C1 is divided by a creek that may affect the access arrangements to each abutting road.

Intersection G

Due to the location of Doller Court opposite Mako Drive, this approach may not be appropriate for Intersection G. SIDRA analysis should be undertaken of Intersection G to confirm if a cross intersection will operate satisfactorily.

Conclusion 8: the existing Doller Court approach to Ferguson Road may not be appropriate to provide access from precinct C1 due to the intersection being opposite the Mako Drive intersection on the northern side of Ferguson Road.

Recommendation 6: SIDRA analysis is undertaken of Intersection G to confirm if a cross intersection will operate satisfactorily.

Additional access may be required from Area C1 if the Dollar Court / Mako Drive intersection does not operate satisfactorily as a cross-intersection at full development.

Intersection H1/H2

Intersection H1 and H2 have been indicatively shown mid-block between Ferguson Road and Murton Road. It is noted that from a capacity perspective, only one access is required from precinct C1 to Bayunga Road; however, additional access to Bayunga Road may be needed due to the alignment of the creek.

It is recommended that these intersections be located to ensure that the turn lane requirements (i.e. BAR and BAL turn treatments) do not conflict with any existing or future turning lanes associated with Pyke Road or Ferguson Road. In addition, it should be ensured that the access locations do not conflict with any access to the eastern side of Bayunga Road.

Figure 19: Local road connections to precinct C1



Intersection L

Gowrie Park Road is an existing local access road intersection from precinct C1 to Dhurringile Road located approximately 10 m north of the rail crossing (refer to Figure 20). Although turning movements to/from Intersection L are low, Gowrie Park Road is near the rail crossing. It may result in queues extending across the Toolamba-Echuca railway line level crossing. It is noted that the Toolamba-Echuca railway line is currently out of use.

Conclusion 9: the existing Gowrie Park Road intersection with Dhurringile Road may not be appropriate to provide access from precinct C1.

Due to the level crossing, consideration should be given to providing a new intersection approximately mid-block between Ferguson Road and the level crossing and ensure that it does not form a cross intersection with any access to the western side of Dhurringile Road.

Recommendation 7: a new intersection is provided to Dhurringile Road from precinct B, approximately mid-block between Ferguson Road and the level crossing.

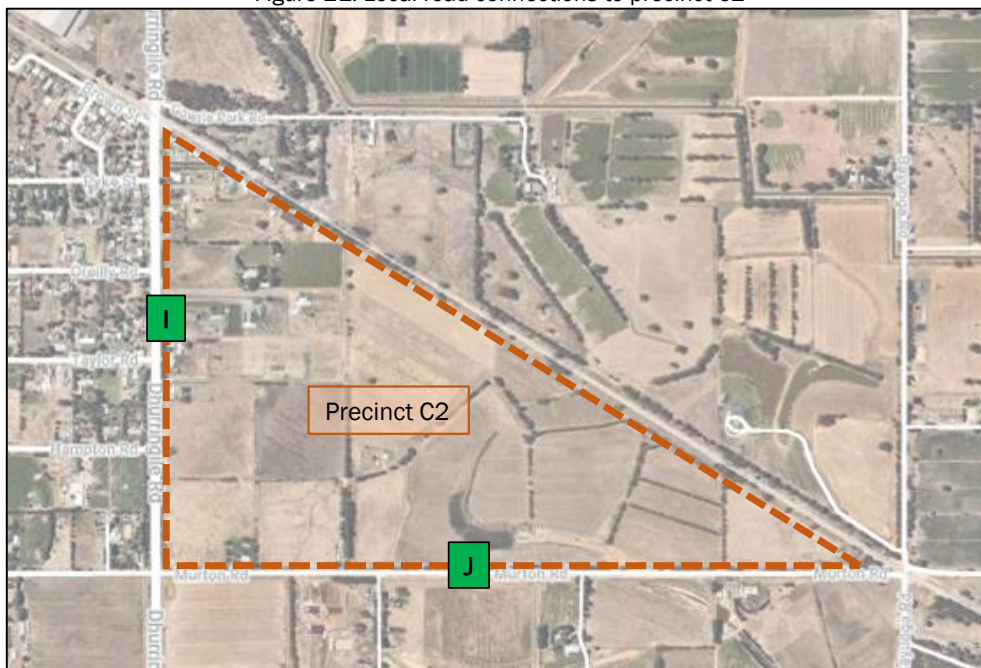
Figure 20: Gowrie Park Road / Dhurringile Road intersection (source: Nearmap Aerial Photography)



4.5.5 Precinct C2

The indicative intersections to precinct C2 are shown in Figure 21 and discussed below. It is noted that there are no existing local road accesses to the abutting roads, and therefore new road connections will be required.

Figure 21: Local road connections to precinct C2



Intersection I

Intersection I has been indicatively shown mid-block between the level crossing and Murton Road. It is recommended that this intersection be located to ensure that the turn lane requirements (i.e. BAR and BAL turn treatments) do not conflict with any existing or future turning lanes associated with Murton Road. In addition, it should be ensured that the access location does not conflict with the Toolamba-Echuca railway line level crossing or any existing access to the western side of Dhurringile Road.

Intersection J

Intersection J has been indicatively shown mid-block between Dhurringile Road and Bayunga Road. It is recommended that this intersection be located to ensure that the turn lane requirements (i.e. BAR and BAL turn treatments) do not conflict with any existing or future turning lanes associated with Dhurringile Road or Bayunga Road. In addition, it should be ensured that the access does not conflict with any access to the southern side of Murton Road.

Recommendation 8: ensure all proposed intersections are located to confirm that turn lane lengths do not conflict with any existing or future turn lanes associated with existing intersections and that the access does not conflict with any access to the surrounding land.

Conclusion 10: once the internal road network is determined, the operation of the intersections to the major roads will need to be re-evaluated.

4.6 Sight distance

The visibility criterion typically applied to intersections is Safe Intersection Sight Distance (SISD). This is nominated in the Austroads Guide to Road Design, Part 4A (AGRD4) as the minimum distance which should be provided on the major road at any intersection (refer to Section 3.2.2 in AGRD4A) and provides sufficient distance for a driver of a vehicle on the major road to observe a vehicle from the minor access approach moving into a collision situation (e.g. in the worst-case, stalling across the traffic lanes) and to decelerate to a stop before reaching the collision point (refer Figure 22).

The minimum SISD criterion specified in Table 3.2 of the Austroads Guide requires clear visibility for a desirable minimum distance of:

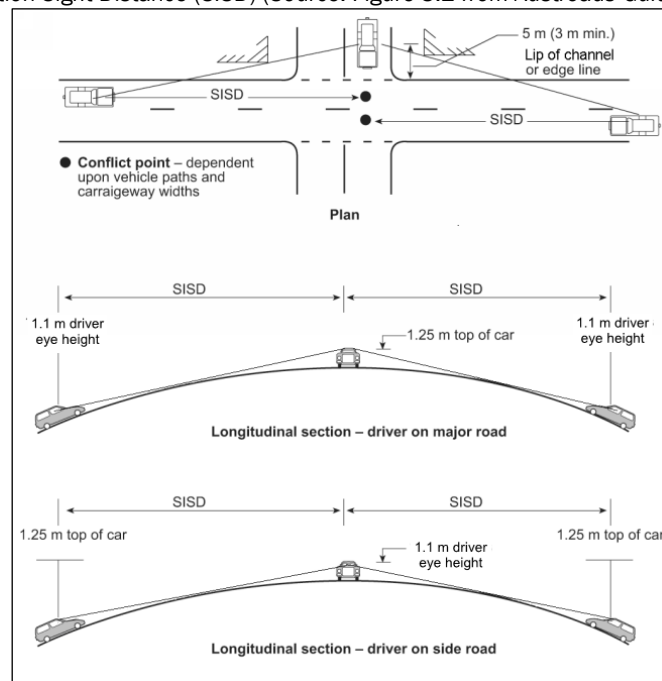
- 123 m relating to a 60 km/h design speed⁵, applicable to:
 - any access road connecting to Ferguson Road (depending on the ultimate location of the intersection)
 - any access road connecting to Dhurringile Road (depending on the ultimate location of the intersection)
- 181 m relating to an 80 km/h design speed, applicable to:
 - any access road connecting to Ferguson Road (depending on the ultimate location of the intersection)

⁵ Design speed is equivalent to the posted speed limit (for 60 km/h and less)

- any access road connecting to Dhurringile Road (depending on the ultimate location of the intersection)
- 248 m relating to a 100 km/h design speed; this applies to:
 - any access roads connecting to Tatura-Undera Road / Ross Street
 - any access road connecting to Ferguson Road (depending on the ultimate location of the intersection)
 - any access road connecting to Dhurringile Road (depending on the ultimate location of the intersection)
 - any access roads connecting to Pyke Road
 - any access roads connecting to Murton Road
 - any access roads connecting to Bayunga Road

All intersections within the proposed development and the surrounding road network should be designed to meet the AGRD4A sight distance requirements mentioned above.

Figure 22: Safe Intersection Sight Distance (SISD) (Source: Figure 3.2 from Austroads *Guide to Road Design Part 4A*)



At the detailed design stage for each sub-precinct, all intersections impacted by the associated development traffic should be checked for compliance with the AGRD4A sight distance requirements.

Recommendation 9: ensure all intersections are checked against the AGRD4A sight distance requirements at the detailed design phase to ensure compliance.

4.7 Rail Crossing Upgrades

It is noted that the Toolamba-Echuca railway line is currently out of use.

Active control level crossings are present at the following locations:

- Tatura-Undera Road, approximately 430 m north of Hogan Street (refer to Photo 14)

Photo 14: Tatura-Undera Road rail crossing



- Hogan Street, approximately 600 m east of Tatura Under Road (refer to Photo 15)

Photo 15: Hogan Road rail crossing



Passive sign-controlled level crossings occurred at the following locations during the site inspections. The Council have advised that the Stop signs have since been removed at both level crossings. As follows:

- Dhurringile Road, approximately 10 m south of Gowrie Park Road (refer to Photo 16)

Photo 16: Dhurringile Road rail crossing



- Bayunga Road / Murton Road intersection (refer to Photo 17)

Photo 17: Bayunga Road rail crossing



The Australian Level Crossing Assessment Model (ALCAM) is an assessment tool used to identify key potential risks at level crossings and assist in prioritising crossings for upgrades. The risk model supports a decision-making process for road and pedestrian level crossings and helps determine the most cost-effective treatments.

Therefore, the relevant authority should undertake a new ALCAM assessment to determine if the existing level crossings are appropriate or whether these require upgrading.

Conclusion 11: an ALCAM assessment should be undertaken for the level crossings at Tatura-Undera Road, Hogan Street, Dhurringile Road and Bayunga Road to determine if any upgrades are required to the current level crossings.

Recommendation 10: ALCAM assessments are undertaken for the level crossings at Tatura-Undera Road, Hogan Street, Dhurringile Road and Bayunga Road, based on current and future operating conditions.

4.8 Public transport / pedestrians / cyclists

The development of the Tatura Structure Plan should consider the future provision of public transport, and pedestrian and cyclists' facilities, including:

- seek to improve access and connectivity of all relevant transport modes within Tatura and, where possible, connect to other towns both now and into the future
- provision of direct cycling paths, including off-road paths, to link the town centre with residential developments and schools
- the need for pedestrian and bicycle crossings where appropriate

Conclusion 12: the Tatura Structure Plan road network should consider the future provision of public transport and pedestrian and cyclists' facilities.

The Structure Plan should consider the connectivity of proposed pedestrian and cycling facilities to existing facilities and ensure that all existing paths provide access to the town centre. Existing cycling facilities that will need to be considered for future connectivity include:

- Jodie Ridges trail – on-road trail providing access from Shepparton to Cussen Park in Tatura via Pyke Road and Charters Street
- Existing shared paths within the North Links Estate
- Existing shared path along the eastern side of Dhurringile Road
- Existing shared path along Mako Drive

4.9 Heavy vehicle routes

As discussed in Section 2.8, Dhurringile Road is an approved B-double route. As residential development extends to the eastern side of Dhurringile Road, this may not be an appropriate route for heavy vehicles with increased pedestrians and cyclists.

Future developments adjacent to Dhurringile Road must maintain heavy vehicle access. The following should be taken into consideration for developments adjacent to Dhurringile Road:

- shared paths should be provided along Dhurringile Road for pedestrians and cyclists. No on-road bicycle facilities are to be provided on Dhurringile Road
- limit direct vehicle access by providing access via service road arrangements
- maintain existing setbacks to reduce noise impacts on residents.

Consideration must be given to ensure the Pyke Road / Dhurringile Road intersection is designed to accommodate B-double trucks. In addition, Council should consider restricting B-double access outside of business hours to reduce the impact on nearby residents.

4.10 Internal network set up

The design and road safety considerations made to ensure the layout of the Tatura Structure Plan is compliant with the relevant reference documents in determining the road network for the structure plan are detailed below.

Clause 56.06 – Access and Mobility Management

Clause 56.06 sets out the access and mobility requirements concerning walking, cycling, public transport, street network and lot access that must be met for residential subdivision proposals in an urban area within Victoria. The objectives of Clause 56.06 describe the outcomes to be achieved in a new residential subdivision. The associated standards contain the requirements or measures that meet the objectives.

Clause 56.06 applies to an application to subdivide land in a Residential 1, Residential 2, Residential 3, Mixed-Use and Township Zone and any Comprehensive Development Zone or Priority Development Zone that provides for residential development.

Clause 56.06 includes:

- 56.06-1 – Integrated mobility objectives
 - Planning for walking, cycling, public transport and other motor vehicles should occur in an integrated manner.
- 56.06-2 – Walking and cycling network objectives
 - Provide safe, direct travel paths through and between neighbourhoods to encourage daily walking and cycling.
- 56.06-3 – Public transport network objectives
 - Provide an arterial road and neighbourhood street network designed to encourage maximum use of public transport and provide for direct, safe, energy-efficient public transport operations.
- 56.06-4 – Neighbourhood street network objective
 - Provide safe and easy connections through and between neighbourhoods for pedestrians, cyclists, public transport and other vehicles.
- 56.06-5 – Walking and cycling network detail objectives
 - Ensure the detailed design and construction of footpaths, shared paths and bicycle paths are safe, comfortable and accessible for all users, including wheelchairs, scooters and prams.
- 56.06-6 – Public transport network detail objectives
 - Ensure that public transport runs safely and efficiently and is comfortable and convenient for passengers, including people with disabilities, to use.
- 56.06-7 – Neighbourhood street network detail objective

- Ensure the detailed design of carriageways and verges, so that street geometry and traffic speeds provide an accessible and safe neighbourhood street system for pedestrians (footpath-bound vehicles), cyclists, public transport and other motor vehicles.
- 56.06-8 – Lot access objective
 - Provide safe access between lots and roads.

The key clauses for determining the extent of a suitable local road network for the development plan area are Clauses 56.06-4 and Clause 56.06-6. Each subclause has an associated standard containing the requirements or measures to meet the objectives.

56.06-4 – Neighbourhood street network objective

Clause 56.06-4 sets out the neighbourhood street network objective. Standard C17 applies to Clause 56.06-4, and the purposes of the clause are met when:

- proposed roads and streets connect with the existing network of arterial roads and neighbourhood streets, footpaths, shared paths, cycle paths and public transport routes
- the design of arterial roads and neighbourhood street types are distinguished
- access to arterial roads from neighbourhood streets and lots abutting arterial roads is per VicRoads' Arterial Road Access Management⁶ policies
- provision is made for safe and:
 - efficient access to activity centres by commercial and freight vehicles
 - accessible pedestrian and cyclist movements
 - easy access to public transport.
- local service vehicles such as refuse trucks and emergency vehicles can safely move throughout the network. A well-connected street system minimises the number of cul-de-sacs and the associated need for large vehicles to make complicated turning or reversing manoeuvres. This can help manage related risks for small children.
- necessary traffic control measures are provided in the layout of the street network. The layout of streets and street types should manage pedestrian, cyclist, public transport and other motor vehicle volumes and movement needs. Pedestrian, cyclist and public transport movements should come first when planning the neighbourhood street network.

The design of neighbourhood street networks should have the following characteristics:

- that the transport strategy, plan or policy for the area set out in the local planning scheme is implemented
- arterial roads are approximately 1.6 kilometres apart, with connector streets halfway between arterial roads at around 800 metres. This mobility framework broadly provides walkable distances to public transport and neighbourhood centres that are located on arterial roads and connector streets
- connector streets should line up between neighbourhoods so that pedestrian, cyclist and bus movements are direct without turning at intersections. Planning for public transport should come before planning for motor vehicles

⁶ Although the VicRoads Arterial Road Access Management Policies were never formerly published, many components have been adopted in Austroads Guide to Traffic Management Part 5: Link Management.

- the network of access lanes, access places and access streets, connector streets and arterial roads is well designed to disperse traffic within and between neighbourhoods appropriately
- provide a speed environment that is appropriate to the street type
- user movement demand within the neighbourhood street network as a whole is appropriately managed for all users – pedestrians, cyclists, public transport and other motor vehicles
- road reservation widths must accommodate footpath, shared path and bicycle lane configurations suited to expected user demand and encourage safe user behaviour. For example, provide sufficient space for pedestrian movements and appropriate integration or separation of the different modes of movement according to traffic volumes and speed
- safe sharing of access lanes and access places (with less than 5 dwellings served) where the provisions do not require footpaths.

56.06-7 – Neighbourhood street network detail objective

Clause 56.06-7 sets out the neighbourhood street network detail objective. Standard C20 applies to Clause 56.06-7, and the design of the streets and roads should:

- meet the requirements of Table C1⁷, design of roads and neighbourhood streets. Where the widths of access lanes, access places, and access streets do not comply with the requirements of Table C1, the needs of the relevant fire authority⁸ and roads authority⁹ must be met
- provide street blocks that are generally between 120 metres and 240 metres in length and generally between 60 metres to 120 metres in width to facilitate pedestrian movement and control traffic speed
- have verges of sufficient width to accommodate footpaths, shared paths, cycle paths, integrated water management, street tree planting, lighting and utility needs
- have street geometry appropriate to the street type and function, the physical land characteristics and achieve a safe environment for all users
- provide a low-speed environment while allowing all road users to proceed without unreasonable inconvenience or delay
- provide a safe environment for all street users by applying speed control measures where appropriate
- ensure intersection layouts indicate the travel path and priority of movement for pedestrians, cyclists and vehicles
- provide a minimum 5 metre by 5 metre corner splays at junctions with arterial roads and a minimum 3 metre by 3 metre corner splays at other junctions unless site conditions justify a variation to achieve safe sight lines across corners
- ensure carriageways of:
 - planned arterial roads are designed to the requirements of the relevant road authority
 - neighbourhood streets are designed for a minimum 20 year life span.

⁷ Table C1 is detailed in Clause 56-06-8, Lot access objective, as part of Standard C21

⁸ for the CFA, this is their Access Requirements document

⁹ for Council, this is the Infrastructure Design Manual (IDM)

- provide pavement edges, kerbs, channel and crossover details designed to:
 - delineate the edge of the carriageway for all street users.
 - provide efficient and comfortable access to abutting lots at appropriate locations.

A street detail plan should be prepared that shows, as appropriate:

- the street hierarchy and typical cross-sections for all street types
- location of carriageway pavement, parking, bus stops, kerbs, crossovers, footpaths, tactile surface indicators, cycle paths and speed control and traffic management devices
- any relevant details for the design and location of street furniture, lighting, seats, bus stops, telephone boxes and mailboxes.

Conclusion 13: the Tatura Structure Plan road network should comply with the objectives and standards set out in Clause 56.06 of the Council's Planning Scheme.

Conclusion 14: where the Tatura Structure Plan road network does not comply with Clause 56.06, the requirements of the relevant fire authority¹³ and roads authority¹⁴ must be met.

Infrastructure Design Manual

The Cities of Greater Bendigo, Greater Shepparton, and the Shire of Campaspe initially prepared the Infrastructure Design Manual (IDM). Since the preparation of the IDM, many other Councils have adopted the IDM. These Councils have formed the Local Government Infrastructure Design Association (LGIDA), which now owns and maintains the IDM.

The objectives of the IDM are:

- document the Council's requirements for the design and development of infrastructure that is or will become the Council's Infrastructure
- standardise development criteria as much as possible and thus expedite Council's engineering reviews
- ensure that minimum design criteria are met regarding the design and construction of Infrastructure within the municipalities, regardless of whether it is constructed by the Council or a developer
- recognise and deal with the various issues impacting the land development industry, particularly sustainability, integrated water cycle management, timeliness and affordability.

The key clause for determining the extent of a suitable road network for the development plan area is Clause 12, Design of Roads.

Clause 12 – Design of Roads

Clause 12 sets out the standard design criteria for road works. For items not explicitly referred to in the IDM, they should generally be per the following documents:

- the road cross-sections included in any applicable Precinct Structure Plan (PSP)
- Austroads: Guide to Road Design
- the Standard Drawings associated with the IDM.

Proposed lot sizes up to 2,000 m² are considered urban, and sub Clause 12.3 (Urban Roads) is applicable. Included in the section that contains Clause 12 in Table 2, Urban Road/Street Characteristics, which has relevant infrastructure details for each street type, including:

- Access
 - Lane (0 – 300 vpd)
 - Place (0 – 300 vpd)
 - Street (0 – 2,500 vpd)
- Collector/Connector Street
 - Level 1 (2,500 – 6,000 vpd)
 - Level 2 (6,000 – 12,000 vpd)
- Commercial Street
- Industrial Street
- Court Bowl
 - Residential (10.0 m radius)
 - Industrial (15.0 m radius)

Guide to Road Safety

The Guide to Road Safety guides road designers' road safety responsibilities based on Safe System principles. Of the nine parts that make up the Guide to Road Safety, the following part is key when considering the layout for the Tatura Structure Plan road network, as follows:

- Part 3: Speed Limits and Speed Management provides an overview of speed limits and their application as a speed management tool. Using appropriate speed limits forms an integral part of a safe road system.

Guide to Traffic Management

The Guide to Traffic Management guides traffic engineering, road design, and road safety. Of the 13 parts that make up the Guide to Traffic Management, the following parts are key when considering the layout for the Tatura Structure Plan road network, as follows:

- Part 5: Link Management guides how to manage road corridor links (i.e. sections between intersections)
- Part 6: Intersections, Interchanges, and Crossings Management guides how to manage intersections, interchanges and crossings and covers the selection of intersection types, roundabouts, signalised and unsignaled intersections and pedestrian and cyclist crossings
- Part 8: Local Street Management guides how to manage local streets through implementing local area traffic management (LATM) and is focused on calming vehicular traffic within local streets.

Some of the key considerations when developing the road network for a new development area includes:

- location of intersections
- intersection treatments

- management of vehicle speeds.

Location of intersections

The location and spacing of intersections and property access can affect the safety and operation of a road. In urban situations, the location of the intersection is usually limited by the layout of the existing streets and the constraints of property boundaries. The road authority may determine the appropriate degree of access according to a roads classification based on access management categories (as per the earlier reference to the VicRoads Arterial Road Access Management Policies and Part 5 of the Austroads Guide to Traffic Management).

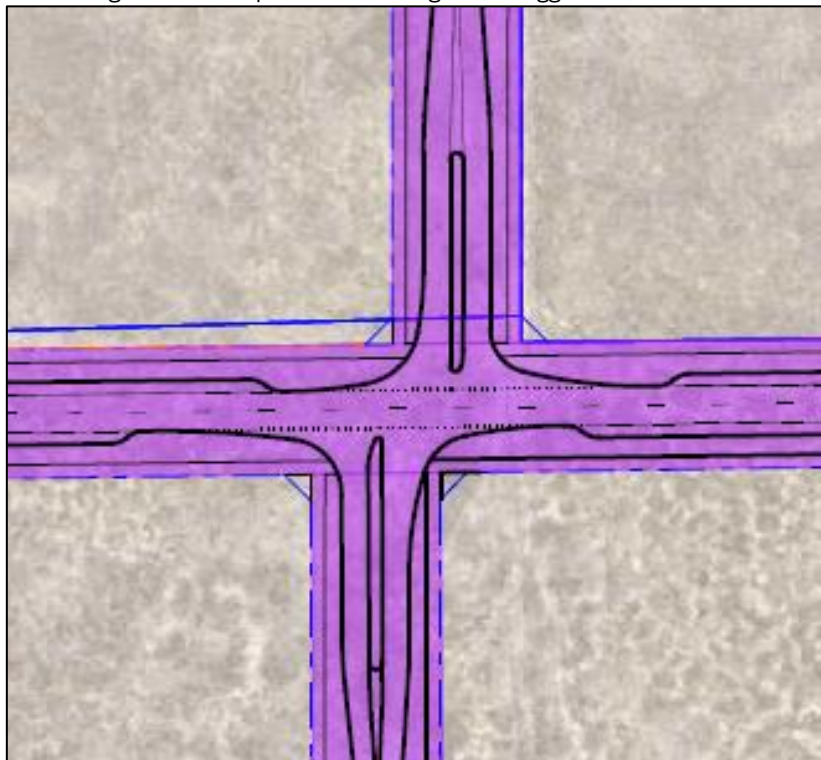
Intersection treatments

Generally, sign-controlled (Give Way or Stop) T- intersections within residential developments will operate satisfactorily; however, where higher volumes are present (for instance, at collector/collector road intersections), roundabouts or traffic signal-controlled intersections may be required.

A good practice is to avoid sign-controlled cross-road intersections. However, these can be managed (safely and operationally) through the implementation of roundabouts or traffic signals (traffic intersection analysis may be required, using SIDRA analysis).

If two side roads cannot be aligned to meet at the same point when connecting to a higher-order through road (i.e. to facilitate a roundabout), a right-left stagger should be introduced (similar to the image shown in Figure 23).

Figure 23: Example of an urban right-left staggered T-intersection



The right-left treatment has some relative advantages for safety due to the reduced number of conflict points compared to a cross intersection (effectively providing two separate T-intersections).

The right-left treatment allows a right-turning vehicle to enter the through road to make an unopposed left turn into the second side road. The left-right treatment will need turn lanes/manoeuvring space for the right turning vehicle waiting in the through route to enter the second side road. The distance between the two side streets should be a minimum of 15.0 m, and splitter islands should be installed where the traffic volume between the two side roads is likely to be high to ensure better compliance and lane discipline.

Management of vehicle speeds

Local Area Traffic Management (LATM) schemes can be introduced to manage vehicle operating speeds within residential developments. LATM devices come in many forms; however, there are four main treatments, which are (including examples):

- vertical deflection devices
 - road humps
 - raised pavements at intersections
- horizontal deflection devices
 - lane narrowing
 - slow points
- diversion devices
 - left in/left out treatments at intersections
 - partial road closures (for a single direction)
- signs, line marking and other treatments
 - speed limits / shared zones
 - threshold line marking treatments.

Conclusion 15: the Tatura Structure Plan road network should satisfy the relevant Austroads guides regarding selecting the location/type of intersections.

Conclusion 16: the Tatura Structure Plan road network should satisfy the relevant Austroads guides concerning introducing LATM to manage vehicle operating speeds.

5 CONCLUSIONS

A traffic impact assessment was undertaken for the proposed residential development at the Tatura Structure Plan study area. The key findings from this assessment are summarised below:

- as the developments occur, the speed zones on the adjoining road will need to be reviewed to ensure that appropriate posted speed limits are maintained.
- the assessment revealed there are sections of roads within the study area that are unsealed and will need to be sealed as part of the development of the study area.
- no trends in crashes were observed within the vicinity of the Tatura Structure Plan study area in the last five years of available data. Hence there are no traffic safety problems that require urgent remedial action.
- the general Tatura Structure Plan study area will likely generate 31,125 vpd with a peak traffic volume of 2,646 vph (vehicles per hour)
- the theoretical capacity of a two-lane, two-way road (i.e. Connector Road level 1) is sufficient to accommodate the anticipated post-development traffic volumes of Ferguson Road, Dhurringile Road and Tatura-Undera Road
- based on the anticipated post-development traffic volumes:
 - Pyke Road will be designed as a connector street (level 1)
 - Bayunga Road will be designed as an access street.
- the existing Doller Court approach to Ferguson Road may not be appropriate to provide access from precinct C1 due to the intersection being opposite the Mako Drive intersection on the northern side of Ferguson Road
- the existing Gowrie Park Road intersection with Dhurringile Road may not be appropriate to provide access from precinct C1
- once the internal road network is determined, the operation of the intersections to the major roads will need to be re-evaluated
- an ALCAM assessment should be undertaken for the level crossings at Tatura-Undera Road, Hogan Street, Dhurringile Road and Bayunga Road to determine if any upgrades are required to the current level crossings
- the Tatura Structure Plan road network should:
 - consider the future provision of public transport and pedestrian and cyclists facilities
 - comply with the objectives and standards set out in Clause 56.06 of the Council's Planning Scheme.
- where the Tatura Structure Plan road network does not comply with Clause 56.06, the requirements of the relevant fire authority and roads authority must be met
- the Tatura Structure Plan road network should satisfy the relevant Austroads guides:
 - regarding selecting the location/type of intersections
 - concerning introducing LATM to manage vehicle operating speeds.

The key recommendations from this assessment are summarised below:

- **Recommendation 1:** the development of the study area includes sealing unsealed roads that are relied upon for access to the newly developed residential dwellings
- **Recommendation 2:** the Council should consider advocating for DTP to audit the safety of the Midland Highway / Dhurringile Road intersection
- **Recommendation 3:** the Council consults with the local bicycle user groups to determine the frequency of occurrence of safety issues and look at implementing mitigating measures
- **Recommendation 4:** a review of the Midland Highway / Dhurringile Road intersection is undertaken to consider if improvements are required to maintain the satisfactory operation of the intersection
- **Recommendation 5:** ensure all intersections provide the required turn lane treatments
- **Recommendation 6:** SIDRA analysis is undertaken of Intersection G to confirm if a cross intersection will operate satisfactorily
- **Recommendation 7:** a new intersection is provided to Dhurringile Road from precinct B, approximately mid-block between Ferguson Road and the level crossing
- **Recommendation 8:** ensure all proposed intersections are located to confirm that turn lane lengths do not conflict with any existing or future turn lanes associated with existing intersections and that the access does not conflict with any access to the surrounding land
- **Recommendation 9:** ensure all intersections are checked against the AGRD4A sight distance requirements at the detailed design phase to ensure compliance
- **Recommendation 10:** ALCAM assessments are undertaken for the level crossings at Tatura-Undera Road, Hogan Street, Dhurringile Road and Bayunga Road, based on current.



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Tatura Structure Plan

Future Strategic Residential Growth Corridor

Infrastructure Contributions Plan

Client:

Greater Shepparton Council

Project No. 190877

Final Report – 9/03/2023

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EXECUTIVE SUMMARY

Trafficworks has been engaged by Greater Shepparton Council (the Council) to prepare an Infrastructure Contributions Plan for the upgrade works required to support the future strategic residential growth corridor as part of the Tatura Structure Plan.

This infrastructure contributions plan was carried out to determine the following:

- the percentage contributions required for the upgrade works to support the development area
- the trigger points for the required upgrade works
- high-level concept plans for the required upgrade works.

A summary of the Tatura Structure Plan is shown below.

Address	Tatura Structure Plan Study Area (refer to Figure 1)
Zoning	<ul style="list-style-type: none"> • farming zone <ul style="list-style-type: none"> ○ schedule 1 ○ schedule 2 • rural living zone • low-density residential zone • industrial 1 zone
Proposed development	Approximately 3,110 residential dwellings
Road network	<p>State Arterial Roads:</p> <ul style="list-style-type: none"> • Midland Highway (A300) • Tatura-Undera Road (C357) <p>Local Roads:</p> <ul style="list-style-type: none"> • Dhurringile Road • Pyke Road • Ferguson Road • Bayunga Road • Murton Road
Traffic generation	<ul style="list-style-type: none"> • 31,125 vehicles per day (vpd) • 2,646 vehicles per hour (vph) peak hour traffic

Referenced documents

References used in the preparation of this report include the following:

'Tatura Structure Plan - Traffic Impact Assessment Report' prepared by Trafficworks, dated 5 August 2022

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ATTACHMENT A – TATURA STRUCTURE PLAN TRAFFIC IMPACT ASSESSMENT REPORT

ATTACHMENT B – HIGH-LEVEL CONCEPT PLANS

ATTACHMENT C – INDICATIVE COST CONTRIBUTIONS

1 INTRODUCTION

Trafficworks has been engaged by Greater Shepparton Council (the Council) to prepare an Infrastructure Contributions Plan for the upgrade works required to support the future strategic residential growth corridor as part of the Tatura Structure Plan.

This infrastructure contributions plan was carried out to determine the following:

- the percentage contributions required for the upgrade works to support the development area
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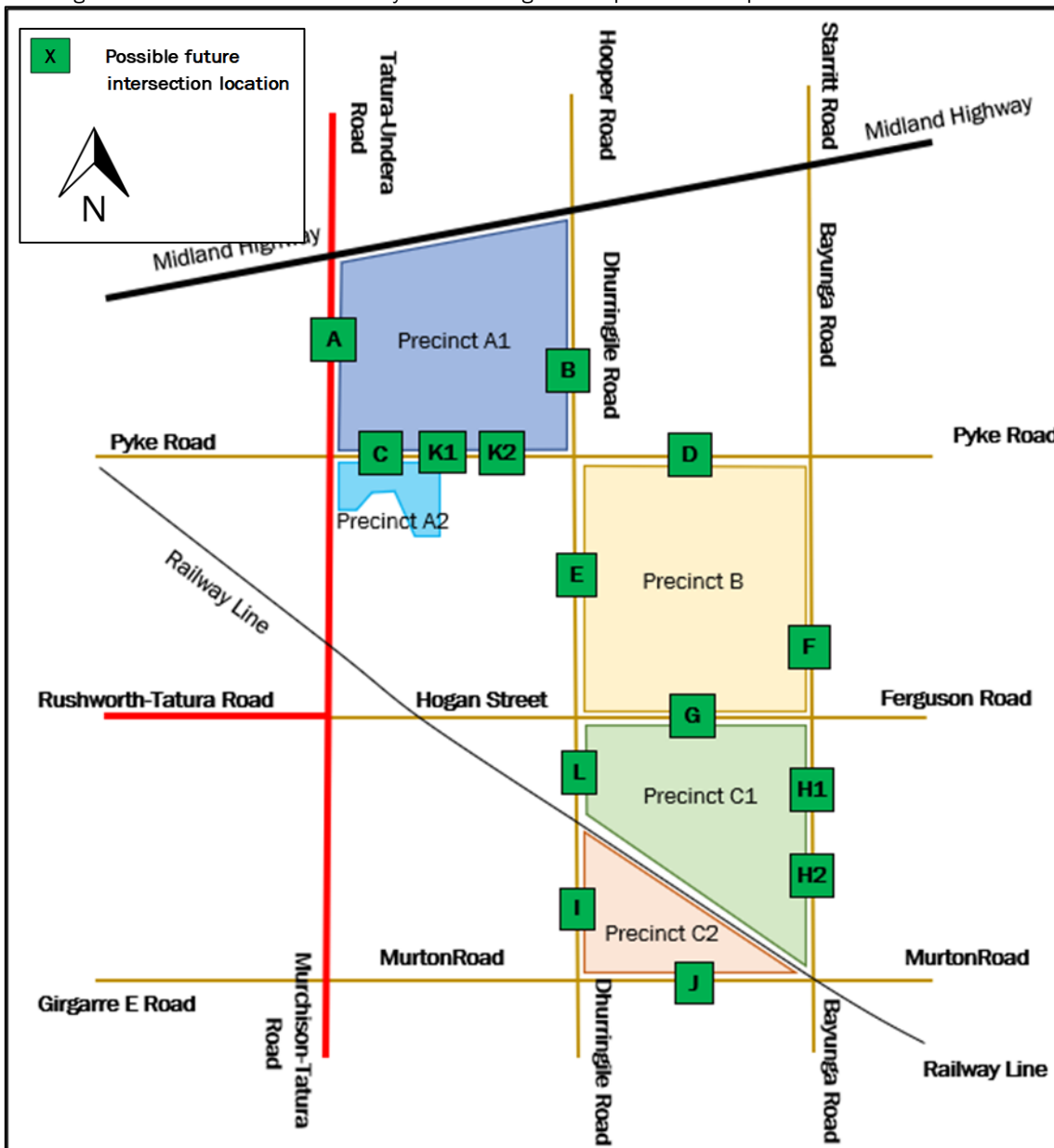
2 BACKGROUND

2.1 Tatura Structure Plan

The Tatura Structure Plan study area comprises approximately 760 hectares to the north, northeast and east of the Tatura township, which is currently zoned Farming zone – schedule 1 and 2 (FZ1, FZ2), Rural living zone (RLZ), Low-density residential zone (LDRZ) and Industrial 1 zone (IN1Z).

The Tatura Structure Plan study area was divided into precincts for this assessment, as highlighted in Figure 1.

Figure 1: Tatura Structure Plan study area showing the five precincts and possible future connections



The number of dwellings for the Tatura Structure Plan study area was determined based on the approximate land area of each precinct and the average lot sizes (using the dwelling densities identified in the Tatura Framework Plan). It was assumed that 10% of each precinct would be set aside for roads and drainage services.

Therefore, it is anticipated that at full development, the Tatura Structure Plan study area will yield approximately 3,110 residential dwellings, as follows:

- Precinct A1 1,178 dwellings
- Precinct A2 275 dwellings
- Precinct B 1,154 dwellings
- Precinct C1 421 dwellings
- Precinct C2 84 dwellings

It has been assumed that the Department of Transport (DoT) would not support any new connections from precinct A1 to the Midland Highway.

For this assessment, the connections shown to each abutting road are theoretical. They will determine the road connections required to service the development area. The intersection locations only represent the traffic that could gain access to each abutting road.

The location of each theoretical road connection is indicatively shown in Figure 1.

2.2 Previous work undertaken

Trafficworks prepared a traffic impact assessment report (dated 26 August 2022) of the study area to identify the upgrade works required to support the development area. The report is provided in Attachment A and should be read in conjunction with this report.

The traffic impact assessment report identified the following:

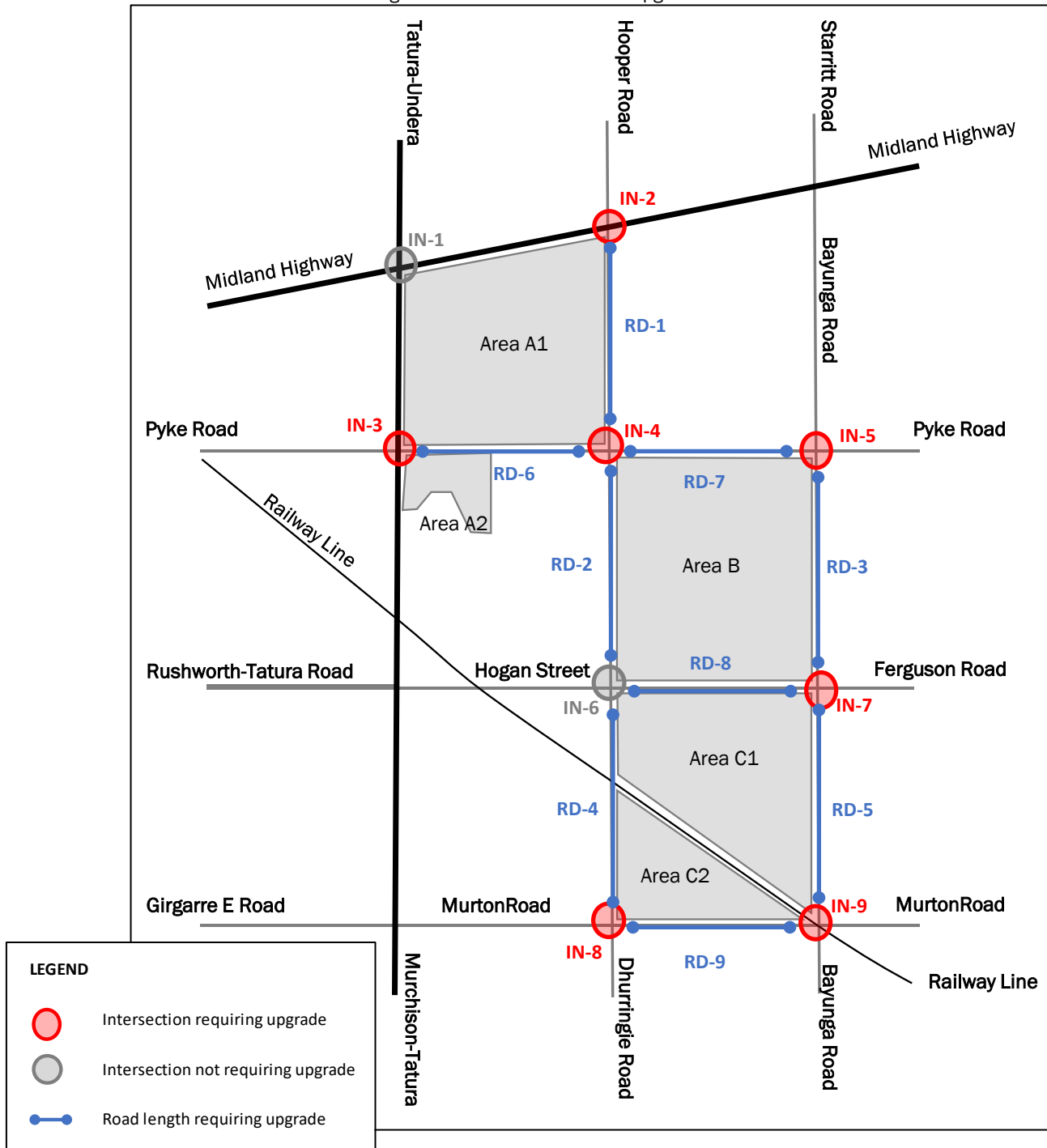
- Intersection upgrades would be required at the following major council road intersections for safety and capacity reasons:
 - Dhurringile Road / Pyke Road
 - Dhurringile Road / Murton Road
 - Ferguson Road / Bayunga Road
 - Bayunga Road / Pyke Road
- Possible future development road connections to each precinct and the works required at each connection

3 INFRASTRUCTURE CONTRIBUTIONS PLAN

A requirement of the Tatura Structure Plan is the preparation of an Infrastructure Contributions Plan. This section provides the relevant information to determine the proportional contributions applicable to each Sub-Precinct and other external stakeholders.

The upgrades required for the structure plan are shown in Figure 2. High level concept plans for the necessary upgrade works are provided in Attachment B.

Figure 2: Intersection and road upgrade works



3.1 DoT managed intersection upgrade works

The structure plan will increase traffic volumes at DoT managed road intersections. The traffic impact assessment report did not recommend any specific upgrade works for these intersections as DoT is the responsible authority at these intersections. These intersections are discussed as follows:

3.1.1 Tatura-Undera Road / Midland Highway (IN-1)

The Tatura-Undera Road / Midland Highway intersection has been upgraded to a roundabout. The existing intersection layout is anticipated to have sufficient capacity to accommodate the additional traffic generated by the development area.

If analysis indicates that upgrade works are required, the percentage contribution of each precinct to the upgrade works is shown in Table 1.

Table 1: Percentage cost contribution – IN-1 works

IN-1	Percentage cost contribution
By Other	82%
By Development	18%
<i>Area A1</i>	<i>10%</i>
<i>Area A2</i>	<i>4%</i>
<i>Area B</i>	<i>3%</i>
<i>Area C1</i>	<i>1%</i>
<i>Area C2</i>	<i>0%</i>

Analysis would be required to determine the necessary upgrade works to this intersection and the trigger point for the upgrade.

3.1.2 Dhurringile Road / Midland Highway / Hooper Road (IN-2)

The Dhurringile Road / Midland Highway / Hooper Road intersection is a sign-controlled cross intersection. The crash data indicates three crashes at the intersection in the last five years of available data (DoT Open Data portal). The TIA report discussed that residents avoid this intersection due to safety concerns because of poor visibility, short turning lanes and limited overtaking opportunities.

The additional traffic generated from the development to this intersection may exacerbate the existing issues and result in collisions. The TIA report recommended that Council advocate DoT to upgrade this intersection from a safety perspective.

Table 2 summarises the percentage cost contribution for each precinct to upgrade this intersection to a roundabout (refer to the high-level concept plan provided in Attachment B).

Table 2: Percentage cost contribution – IN-2 works

IN-2	Percentage cost contribution
By Other	81%
By Development	19%
<i>Area A1</i>	9%
<i>Area A2</i>	3%
<i>Area B</i>	5%
<i>Area C1</i>	2%
<i>Area C2</i>	1%

3.1.3 Tatura-Undera Road / Pyke Road (IN-3)

The Tatura-Undera Road / Pyke Road intersection is a sign-controlled cross intersection. Due to the additional traffic generated by the Tatura Structure Plan area, it is recommended that Council advocate DoT to upgrade this intersection to a roundabout.

The percentage contribution of each precinct to the upgrade works is shown in Table 3.

Table 3: Percentage cost contribution – IN-3 works

IN-3	Percentage cost contribution
By Other	29%
By Development	71%
<i>Area A1</i>	53%
<i>Area A2</i>	13%
<i>Area B</i>	4%
<i>Area C1</i>	1%
<i>Area C2</i>	0%

3.2 Major council road intersection upgrade works

The traffic impact assessment report identified that the following major council road intersections required upgrade works including:

- Dhurringile Road / Pyke Road (IN-4)
- Bayunga Road / Pyke Road (IN-5)
- Ferguson Road / Bayunga Road (IN-7)
- Dhurringile Road / Murton Road (IN-8)
- Murton Road / Bayunga Road (IN-9)

The percentage cost contribution for these intersections has been established using the intersection traffic volumes for different development areas.

The cost contribution from each development area has been determined based on the anticipated traffic generation and projected traffic volumes. Therefore, it should be noted that a portion of the cost has been excluded (from what is mentioned above) to compensate for the underlying growth in traffic volumes (and, therefore, the responsibility of the relevant road authority).

The percentage cost contribution for the major council road intersections is summarised in Table 4. High-level concept plans have been prepared for these intersections and are shown in Attachment B.

Table 4: Percentage cost contribution – major council road intersection works

Area	IN-4	IN-5	IN-7	IN-8	IN-9
By Other	24%	6%	29%	43%	22%
Development contribution	76%	94%	71%	57%	78%
Area A1	39%	27%	12%	10%	3%
Area A2	9%	12%	4%	2%	2%
Area B	26%	49%	41%	22%	54%
Area C1	2%	6%	13%	7%	13%
Area C2	0%	0%	1%	16%	6%

Noting that the above intersection upgrade works are recommended from a safety perspective rather than a capacity perspective, the trigger point for the upgrade work is based on the increase in turning traffic at the intersection. The intersections will likely require an upgrade from a safety perspective with the increase in turning traffic associated with the following development areas:

- Dhurringile Road / Murton Road (IN-8) Area C2
- Dhurringile Road / Pyke Road (IN-4) Area B
- Bayunga Road / Pyke Road (IN-5) Area B
- Ferguson Road / Bayunga Road (IN-7) Area B or C1 (whichever is developed first)

- Murton Road / Bayunga Road (IN-9) Area C2

The TIA did not identify upgrade works at the following intersections:

- Ferguson Road / Dhurringile Road (IN-3) as this intersection is a roundabout and will likely have the capacity to accommodate the traffic generated by the development area

3.3 Development road intersections

The development road intersections with each precinct will be constructed as part of the development of each precinct, and the cost associated with these intersections will be the responsibility of the land developers. The indicative development road intersections are shown in Figure 1 and are discussed in detail in Section 4.5 of the TIA report provided in Attachment A.

3.4 Road upgrade works

The percentage cost contribution for road upgrade works within the Tatura Structure Plan has been established using the anticipated two-way through traffic volumes along each road and the development areas likely to utilise each road section.

The cost contribution from each development area has been determined based on the anticipated traffic generation and projected traffic volumes. Therefore, it should be noted that a portion of the cost has been excluded (from what is mentioned above) to compensate for the underlying growth in traffic volumes (and, therefore, the responsibility of the road authority).

The percentage cost contribution for each local road length intersection is summarised in Table 5.

Each development area will deliver the road upgrades for their fronting roads to the satisfaction of the responsible authority.

Table 5: Percentage cost contribution – local road works

Area	RD-1	RD-2	RD-3	RD-4	RD-5	RD-6	RD-7	RD-8	RD-9
By Other	55%	22%	1%	40%	5%	8%	2%	29%	39%
By Development	45%	78%	99%	60%	95%	92%	98%	71%	61%
Area A1	31%	35%	15%	7%	0%	55%	20%	8%	4%
Area A2	2%	7%	8%	2%	0%	25%	8%	1%	2%
Area B	9%	34%	72%	17%	36%	10%	70%	41%	0%
Area C1	2%	2%	4%	15%	55%	2%	0%	20%	6%
Area C2	1%	0%	0%	19%	4%	0%	0%	1%	49%

3.4.1 Total cost contribution

The total indicative cost contribution for each development area is summarised in Table 6 and Attachment C.

The following indicative costs¹ were applied:

- \$500,000 was adopted for the major council road intersection upgrade works (i.e. roundabout).
- \$500/linear metre for road construction and sealing was used to determine the contribution from each area within the Tatura Structure Plan area for each assessed road section.

Table 6: Indicative cost calculation summary

Development Area	Indicative Intersection Costs	Indicative Road Works Costs	Indicative Total Costs
Area A1	\$ 451,300	\$ 1,390,300	\$ 1,841,600
Area A2	\$ 139,400	\$ 447,100	\$ 586,500
Area B	\$ 960,400	\$ 2,314,700	\$ 3,275,100
Area C1	\$ 202,500	\$ 852,800	\$ 1,055,300
Area C2	\$ 122,100	\$ 611,900	\$ 734,000
By other ²	\$ 622,700	\$ 1,608,500	\$ 2,231,200
		TOTAL	\$ 9,723,700

¹ Cost estimates do not take into consideration land acquisition, service relocation, flora / fauna impacts

² Percentage of cost attributed to existing traffic volumes

4 CONCLUSIONS

An infrastructure contributions plan was undertaken for the proposed residential development at the Tatura Structure Plan study area. This report details:

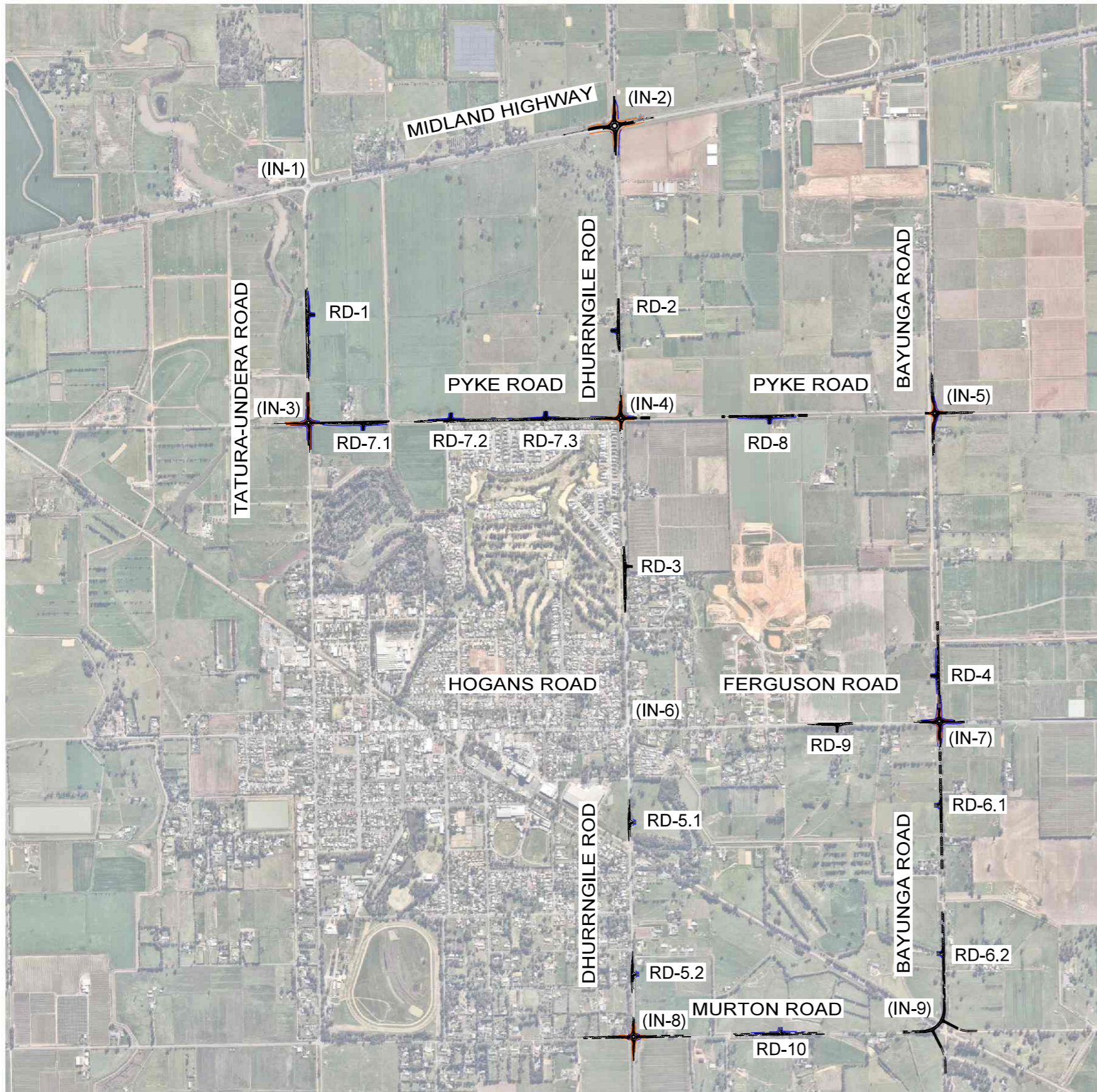
- the percentage contributions required for the upgrade works to support the development area
- the trigger points for the required upgrade works
- high-level concept plans for the required upgrade works.

ATTACHMENT A – TATURA STRUCTURE PLAN TRAFFIC IMPACT ASSESSMENT REPORT



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ATTACHMENT B – HIGH-LEVEL CONCEPT PLANS



SITE	TREATMENTS	DESIGN SPEED	SHEET
IN-1	ROUNDAABOUT		CTP-02
IN-2	ROUNDAABOUT		CTP-03
IN-3	ROUNDAABOUT		CTP-04
IN-4	ROUNDAABOUT		CTP-05
IN-5	ROUNDAABOUT		CTP-06
IN-6	ROUNDAABOUT		CTP-07
IN-7	ROUNDAABOUT		CTP-08
IN-8	ROUNDAABOUT		CTP-09
IN-9	RAILWAY CROSSING	50 km/h	CTP-10
RD-1	CHR, AUL(s)	110 km/h	CTP-11
RD-2	CHR(s), AUL(s)	110 km/h	CTP-12
RD-3	CHR, BAL	90 km/h	CTP-13
RD-4	CHR(s), BAL	110 km/h	CTP-14
RD-5.1	BAR, BAL	70 km/h	CTP-15
RD-5.2	BAR, BAL	70 km/h	CTP-16
RD-6.1	BAR, BAL	110 km/h	CTP-17
RD-6.2	BAR, BAL	110 km/h	CTP-18
RD-7.1	CHR, AUL(s)	110 km/h	CTP-19
RD-7.2	CHR, BAL	70 km/h	CTP-20
RD-7.3	CHR, BAL	70 km/h	CTP-21
RD-8	CHR(s), BAL	110 km/h	CTP-22
RD-9	CHR, BAL	70 km/h	CTP-23
RD-10	BAR, BAL	110 km/h	CTP-24

FOR DISCUSSION PURPOSES ONLY

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Drawing Record				
ISSUE	DRAWN	APP'D	DATE	AMENDMENT
P2	GL	SRM	15.02.23	PRELIMINARY ISSUE FOR COMMENT

WARNING

BEWARE OF UNDERGROUND SERVICES

THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

PRELIMINARY PLAN

FOR DISCUSSION PURPOSES ONLY

SUBJECT TO CHANGE WITHOUT NOTIFICATION

DATE OF ISSUE: 15/02/23

Notes & Legend
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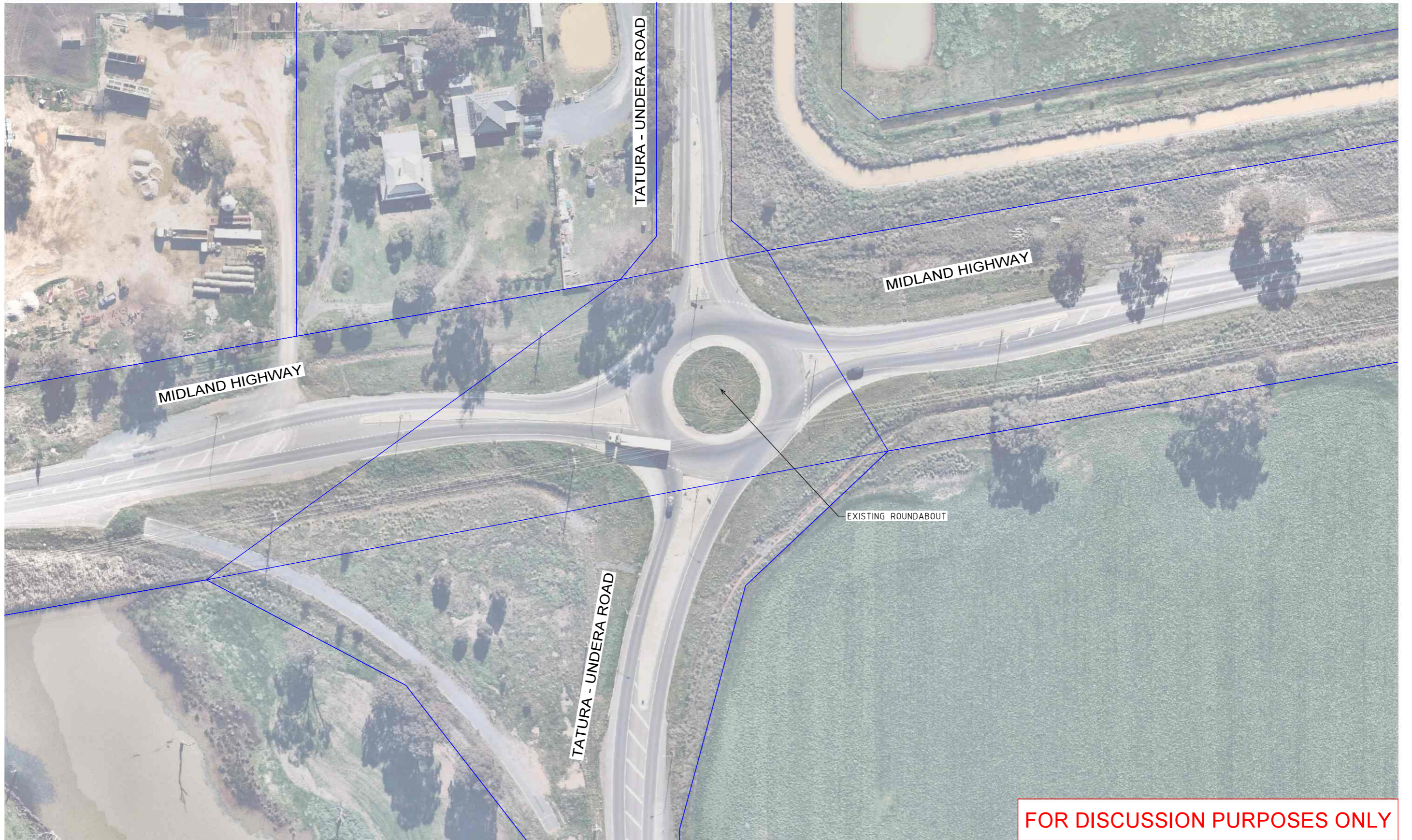
GREATER SHEPPARTON CITY COUNCIL

Tatura Structural Plan

Greater Shepparton City Council

Overall Plan

SHEET NO.	DRAWING NO.	ISSUE
1	190877-CTP-01	P2



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Drawing Record				
ISSUE	DRAWN	APP'D	DATE	AMENDMENT
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PRELIMINARY PLAN
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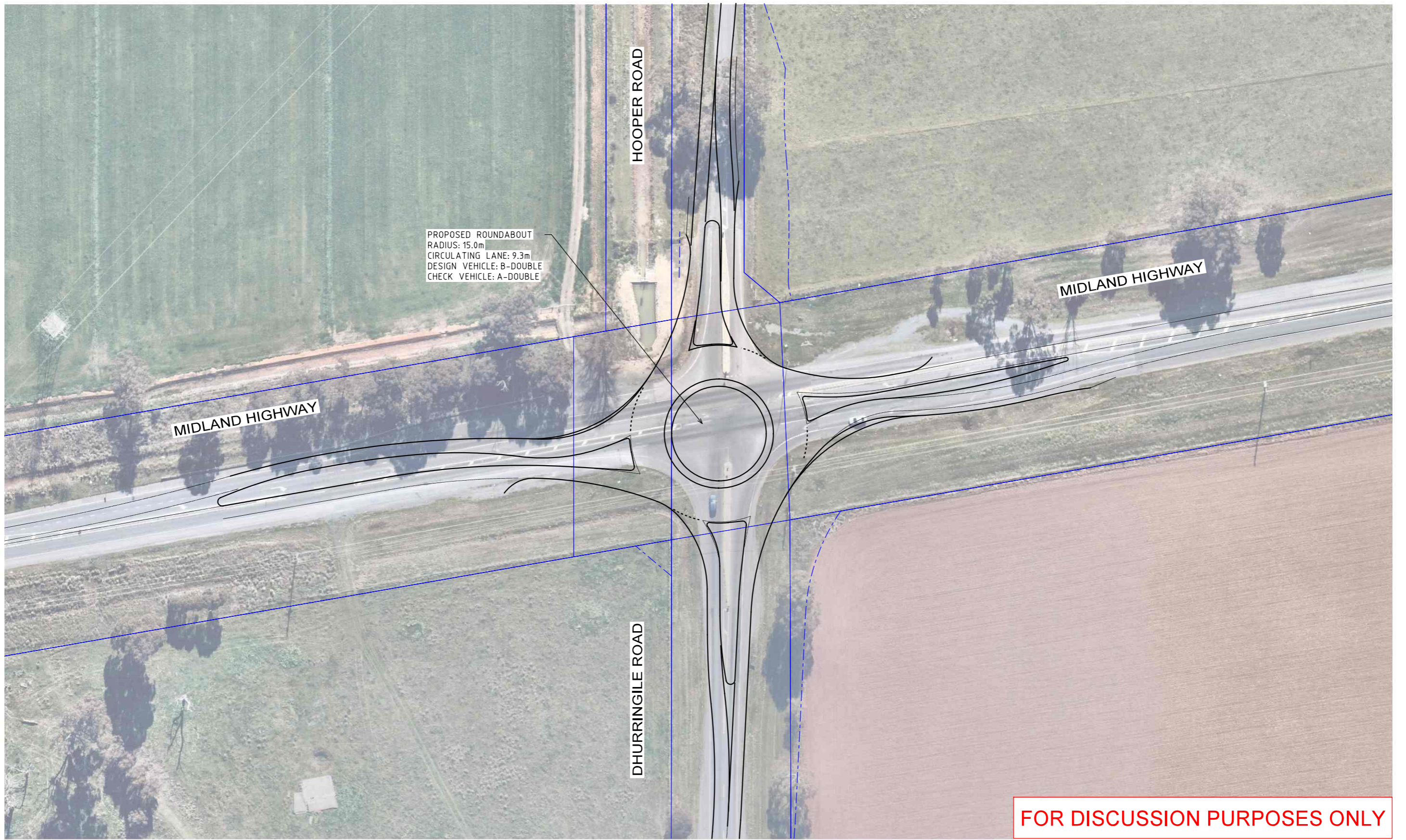
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Tatura Structural Plan
Tatura - Undera Rd / Midland Hwy
Greater Shepparton City Council

Concept Plan - Intersection 1

SHEET NO. 02	DRAWING NO. 190877-CTP-02	ISSUE P2
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PROPOSED ROUNDABOUT
 RADIUS: 15.0m
 CIRCULATING LANE: 9.3m
 DESIGN VEHICLE: B-DOUBLE
 CHECK VEHICLE: A-DOUBLE

FOR DISCUSSION PURPOSES ONLY

16/02/2023 190877-CTP-03
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Drawing Record				
ISSUE	DRAWN	APP'D	DATE	AMENDMENT
P2	GL	SRM	15.02.23	PRELIMINARY ISSUE FOR COMMENT

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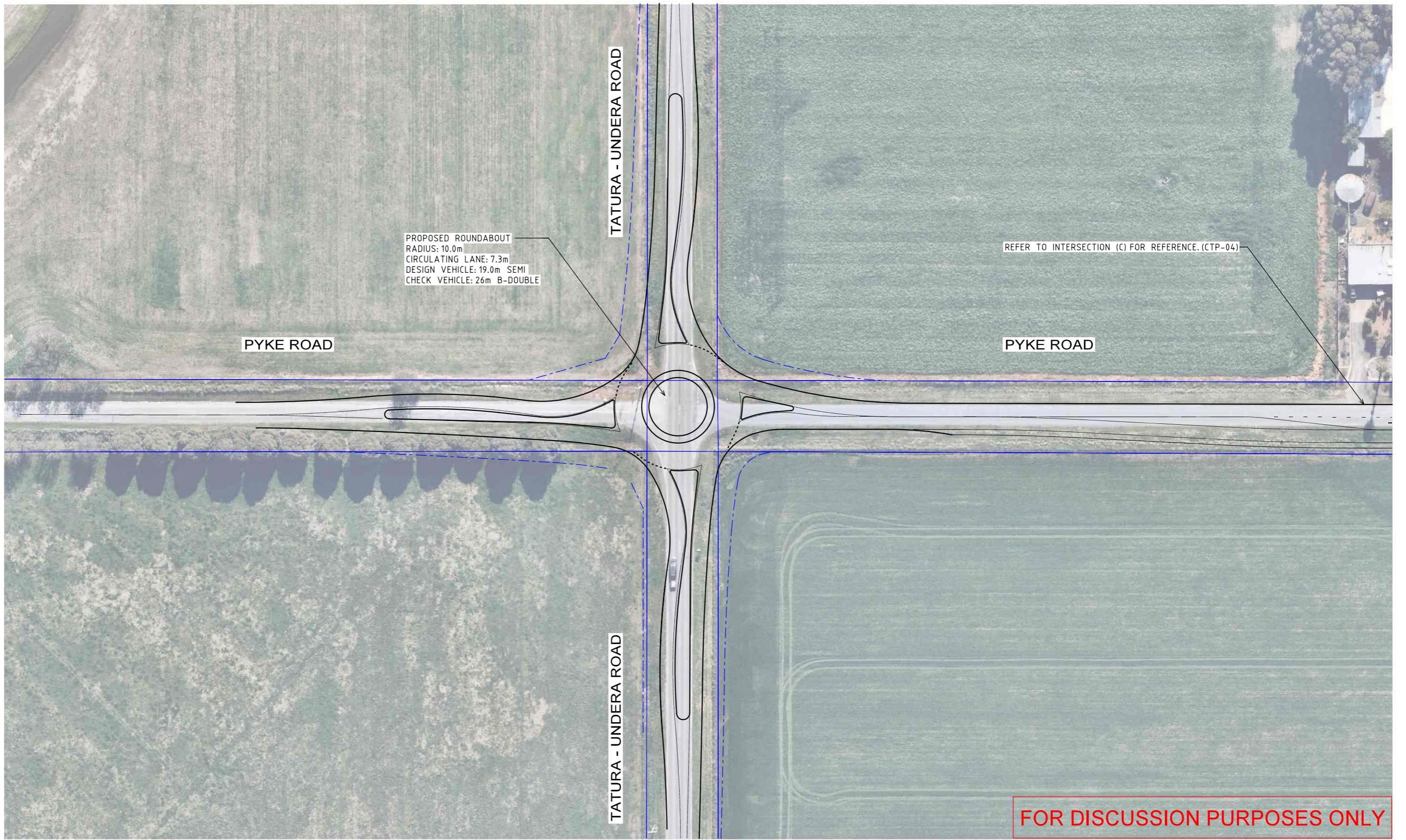
Notes & Legend	
1.	AERIAL IMAGE FROM NEARMAP UNDER LICENSE AGREEMENT WITH TRAFFICWORKS PTY LTD.
2.	ALL DIMENSIONS ARE TO FACE OF KERB UNLESS SHOWN OTHERWISE.
	Design by Trafficworks
	Cadastre
	Indicative Boundary Adjustment

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SCALE OF METRES
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Tatura Structural Plan Dhurringile Rd / Midland Hwy Greater Shepparton City Council		
Concept Plan - Intersection 2		
SHEET NO. 03	DRAWING NO. 190877-CTP-03	ISSUE P2



PROPOSED ROUNDABOUT
 RADIUS: 10.0m
 CIRCULATING LANE: 7.3m
 DESIGN VEHICLE: 19.0m SEMI
 CHECK VEHICLE: 26m B-DOUBLE

REFER TO INTERSECTION (C) FOR REFERENCE. (CTP-04)

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16/02/2023 190877-CTP-04
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ISSUE	DRAWN	APP'D	DATE	AMENDMENT
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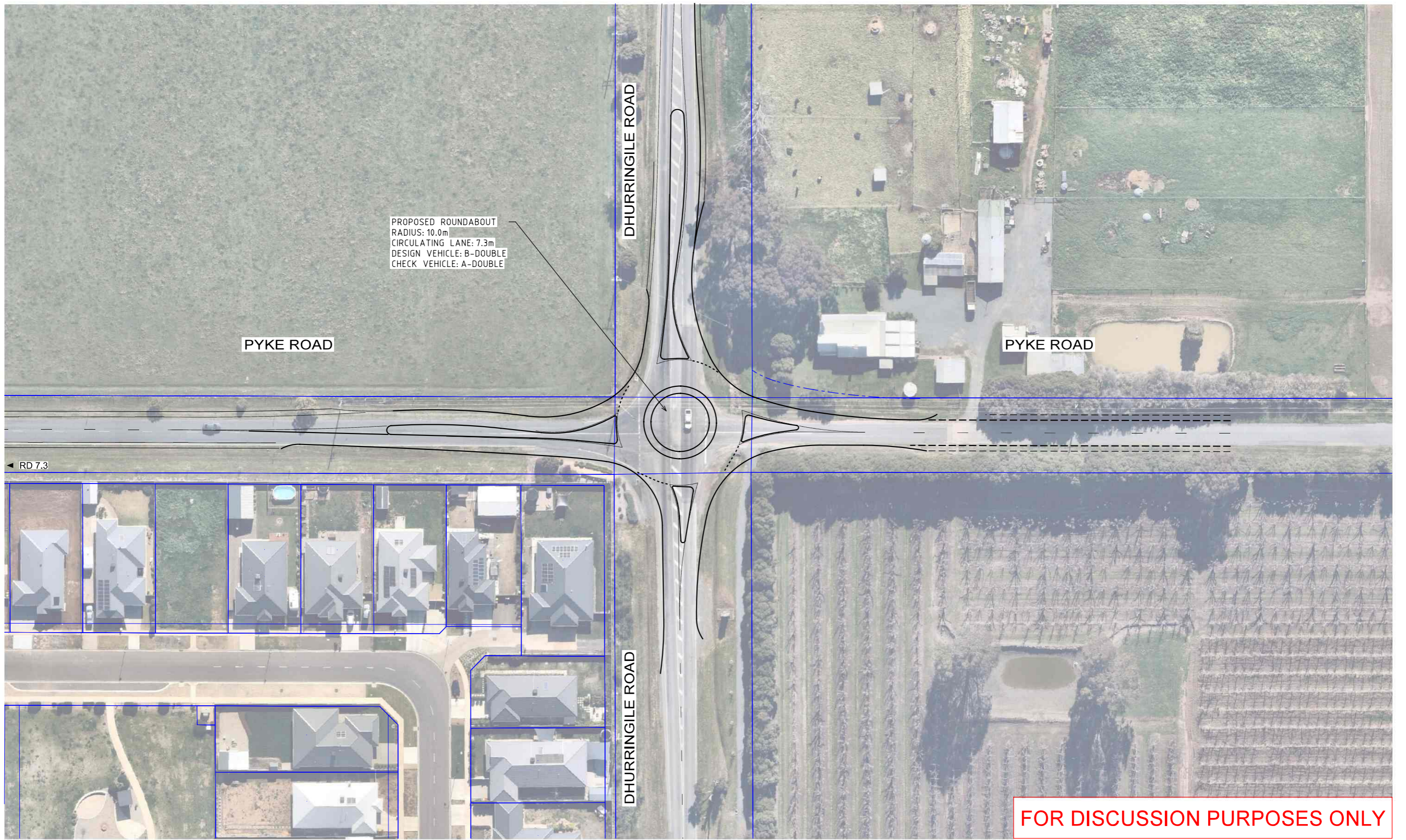
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	Cadastral
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SCALE OF METRES
 0 10 20

Tatura Structural Plan Tatura - Undera Rd / Pike Rd Greater Shepparton City Council		
Concept Plan - Intersection 3		
SHEET NO. 04	DRAWING NO. 190877-CTP-04	ISSUE P2



PROPOSED ROUNDABOUT
 RADIUS: 10.0m
 CIRCULATING LANE: 7.3m
 DESIGN VEHICLE: B-DOUBLE
 CHECK VEHICLE: A-DOUBLE

PYKE ROAD

DHURRINGILE ROAD

PYKE ROAD

← RD 7.3

DHURRINGILE ROAD

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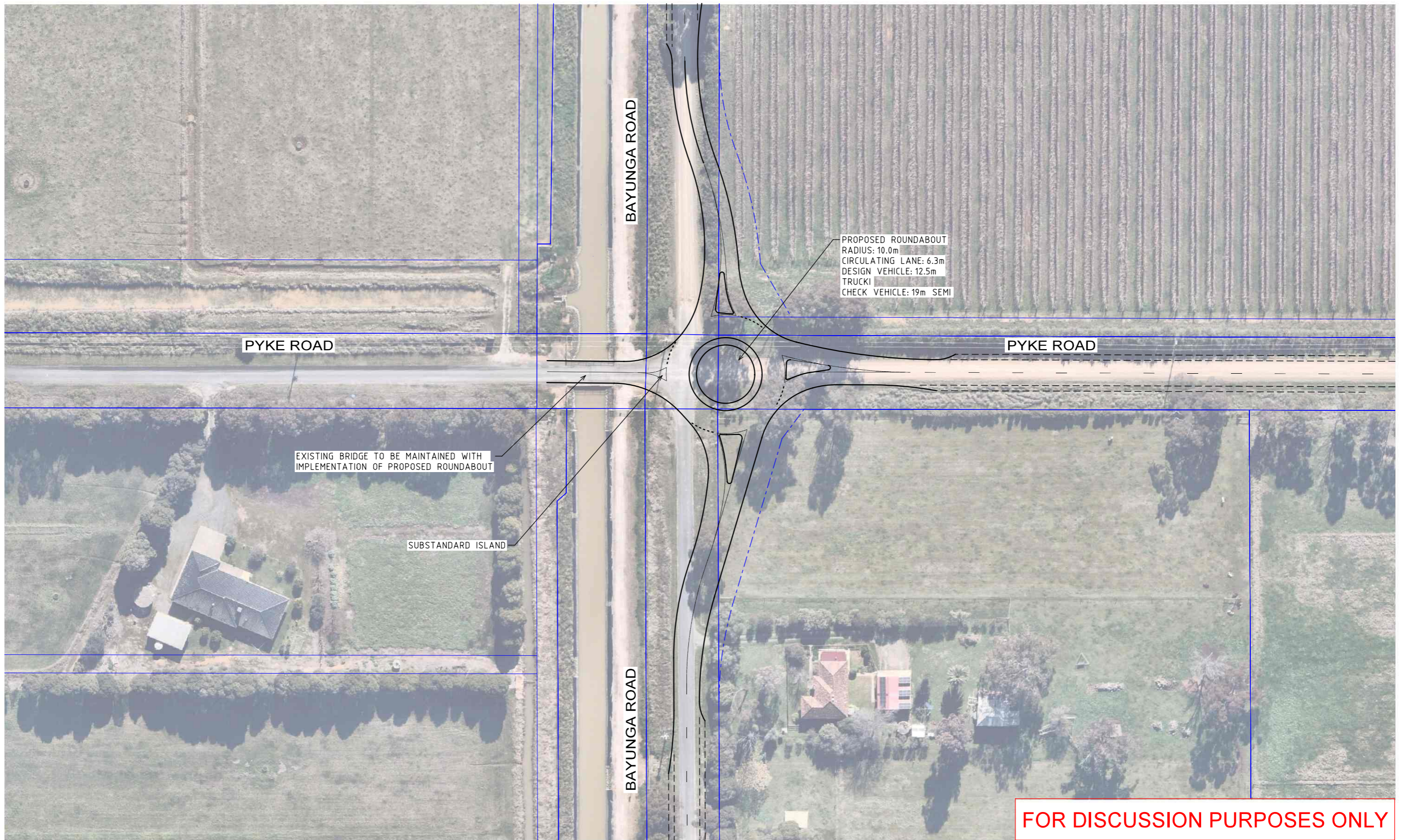
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SCALE OF METRES
 0 10 20

Tatura Structural Plan
Dhurringile Rd / Pike Rd
 Greater Shepparton City Council

Concept Plan - Intersection 4

SHEET NO. 05	DRAWING NO. 190877-CTP-05	ISSUE P2
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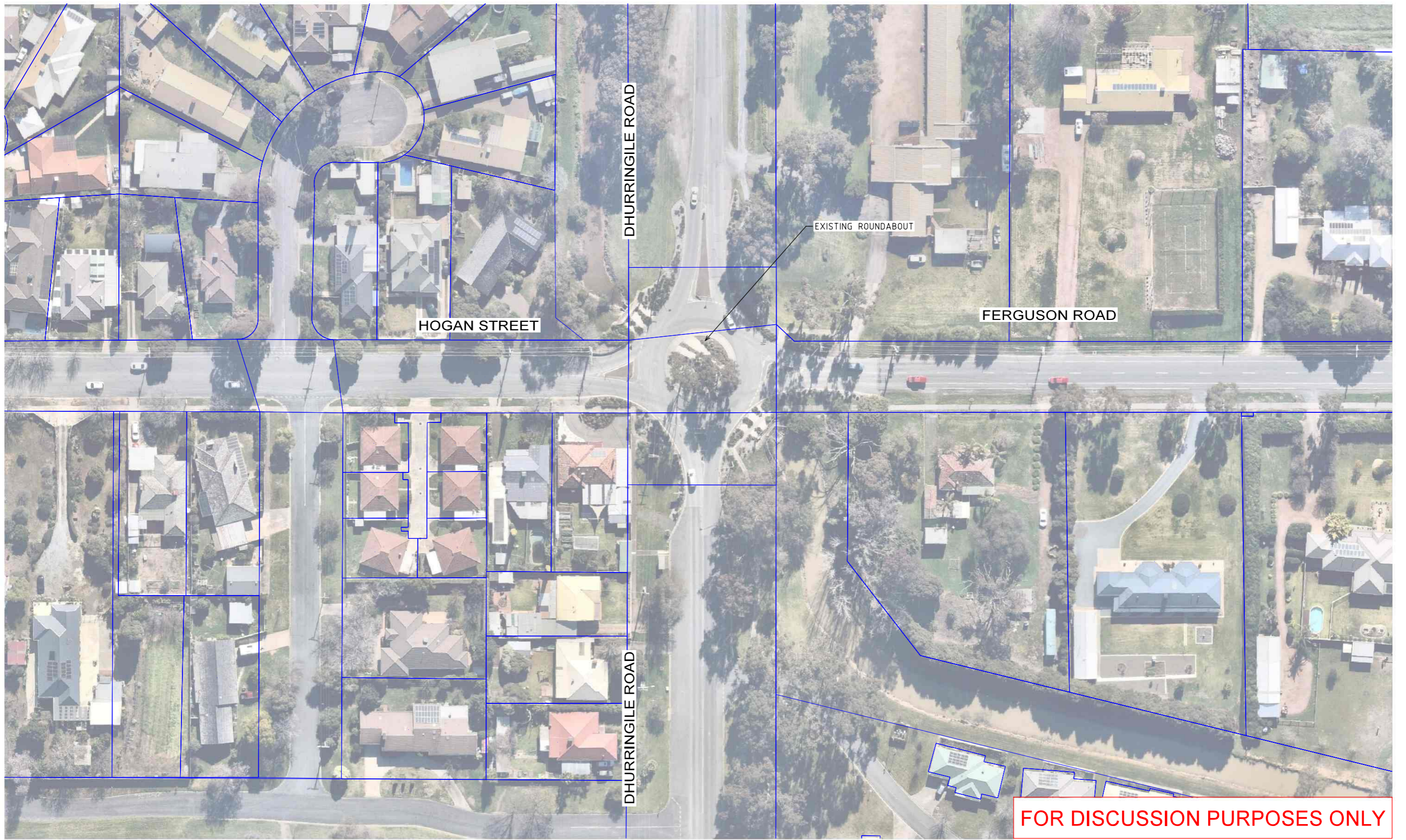
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Notes & Legend	
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Tatura Structural Plan Bayunga Rd / Pike Rd Greater Shepparton City Council		
Concept Plan - Intersection 5		
SHEET NO. 06	DRAWING NO. 190877-CTP-06	ISSUE P2



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 	<p>Design by Trafficworks</p> <p>Cadastral</p> <p>Indicative Boundary Adjustment</p>

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Tatura Structural Plan

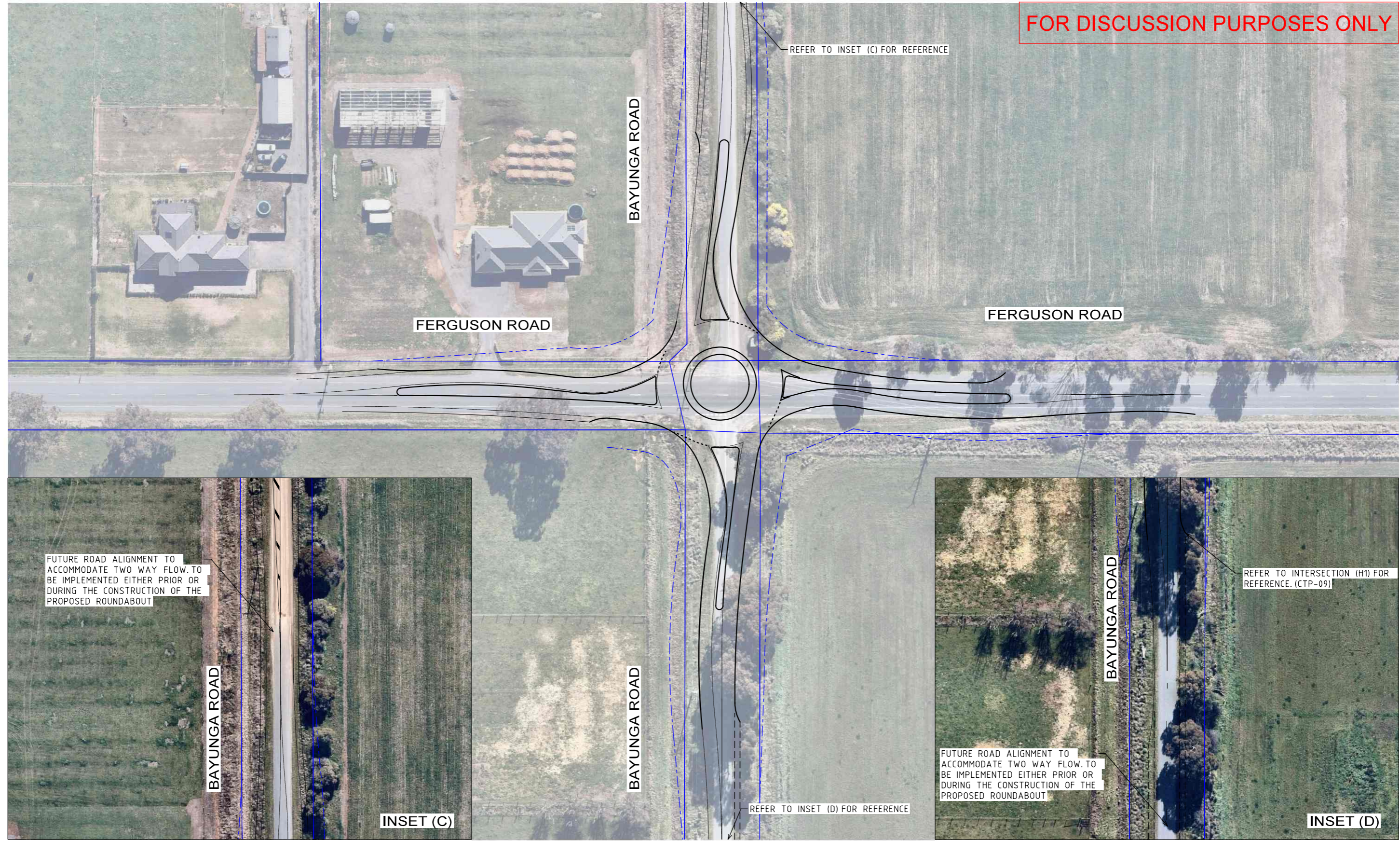
Dhurringile Rd / Ferguson Rd

Greater Shepparton City Council

Concept Plan - Intersection 6

SHEET NO. 07	DRAWING NO. 190877-CTP-07	ISSUE P2
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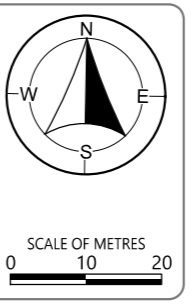
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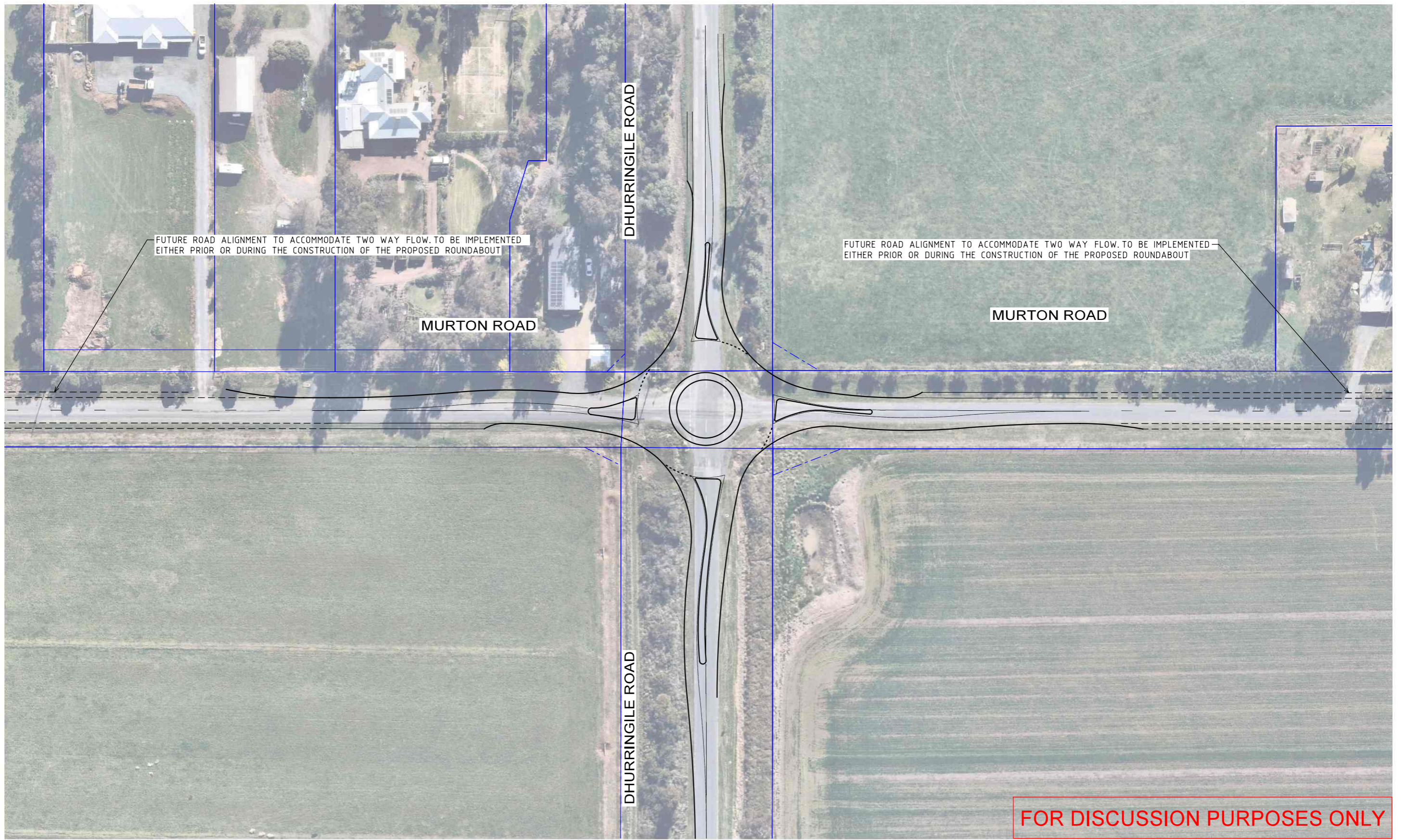
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Tatura Structural Plan
Bayunga Rd / Ferguson Rd
Greater Shepparton City Council

Concept Plan - Intersection 7

SHEET NO. 08	DRAWING NO. 190877-CTP-08	ISSUE P2
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SCALE OF METRES

Tatura Structural Plan

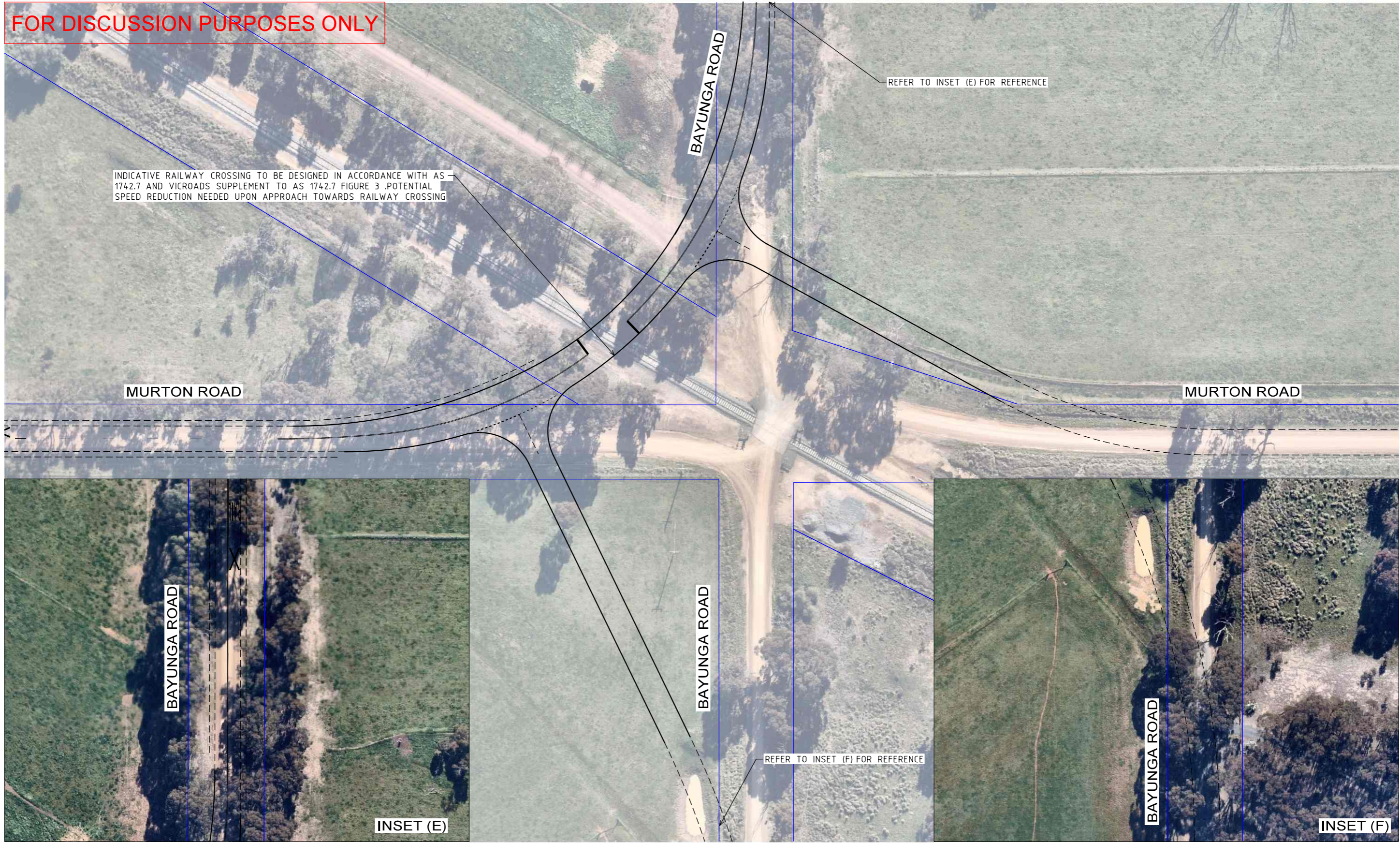
Dhurringile Rd / Ferguson Rd

Greater Shepparton City Council

Concept Plan - Intersection 8

SHEET NO. 09	DRAWING NO. 190877-CTP-09	ISSUE P2
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INDICATIVE RAILWAY CROSSING TO BE DESIGNED IN ACCORDANCE WITH AS 1742.7 AND VICROADS SUPPLEMENT TO AS 1742.7 FIGURE 3 .POTENTIAL SPEED REDUCTION NEEDED UPON APPROACH TOWARDS RAILWAY CROSSING

REFER TO INSET (E) FOR REFERENCE

MURTON ROAD

MURTON ROAD

BAYUNGA ROAD

BAYUNGA ROAD

BAYUNGA ROAD

BAYUNGA ROAD

INSET (E)

REFER TO INSET (F) FOR REFERENCE

INSET (F)

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SCALE OF METRES
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Tatura Structural Plan
Bayunga Rd / Murton Rd
Greater Shepparton City Council

Concept Plan - Intersection 9

SHEET NO. 10	DRAWING NO. 190877-CTP-10	ISSUE P2
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FOR CONTINUATION REFER TO INSET (A) FOR REFERENCE



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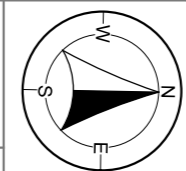
Notes & Legend

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Tatura Structural Plan

Greater Shepparton City Council

Concept Plan - Road 1

SHEET NO. 11	DRAWING NO. 190877-CTP-11	ISSUE P2
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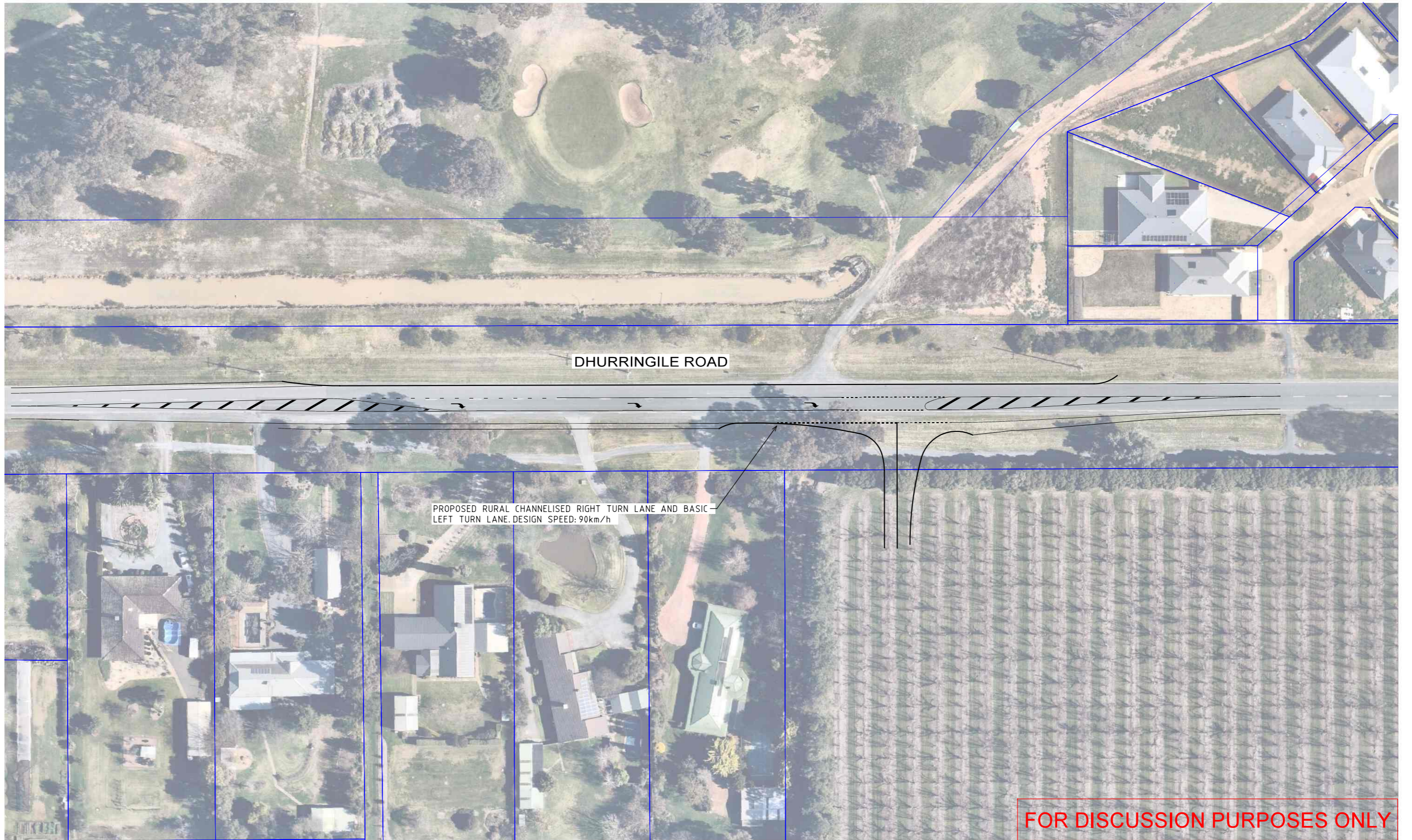
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<ul style="list-style-type: none"> — Design by Trafficworks — Cadastre - - - Indicative Boundary Adjustment

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Tatura Structural Plan		
Greater Shepparton City Council		
Concept Plan - Road 2		
SHEET NO. 12	DRAWING NO. 190877-CTP-12	ISSUE P2



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<ul style="list-style-type: none"> Design by Trafficworks Cadastre Indicative Boundary Adjustment

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Concept Plan - Road 3		
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Tatura Structural Plan		
Greater Shepparton City Council		
Concept Plan - Road 4		
SHEET NO. 14	DRAWING NO. 190877-CTP-14	ISSUE P2



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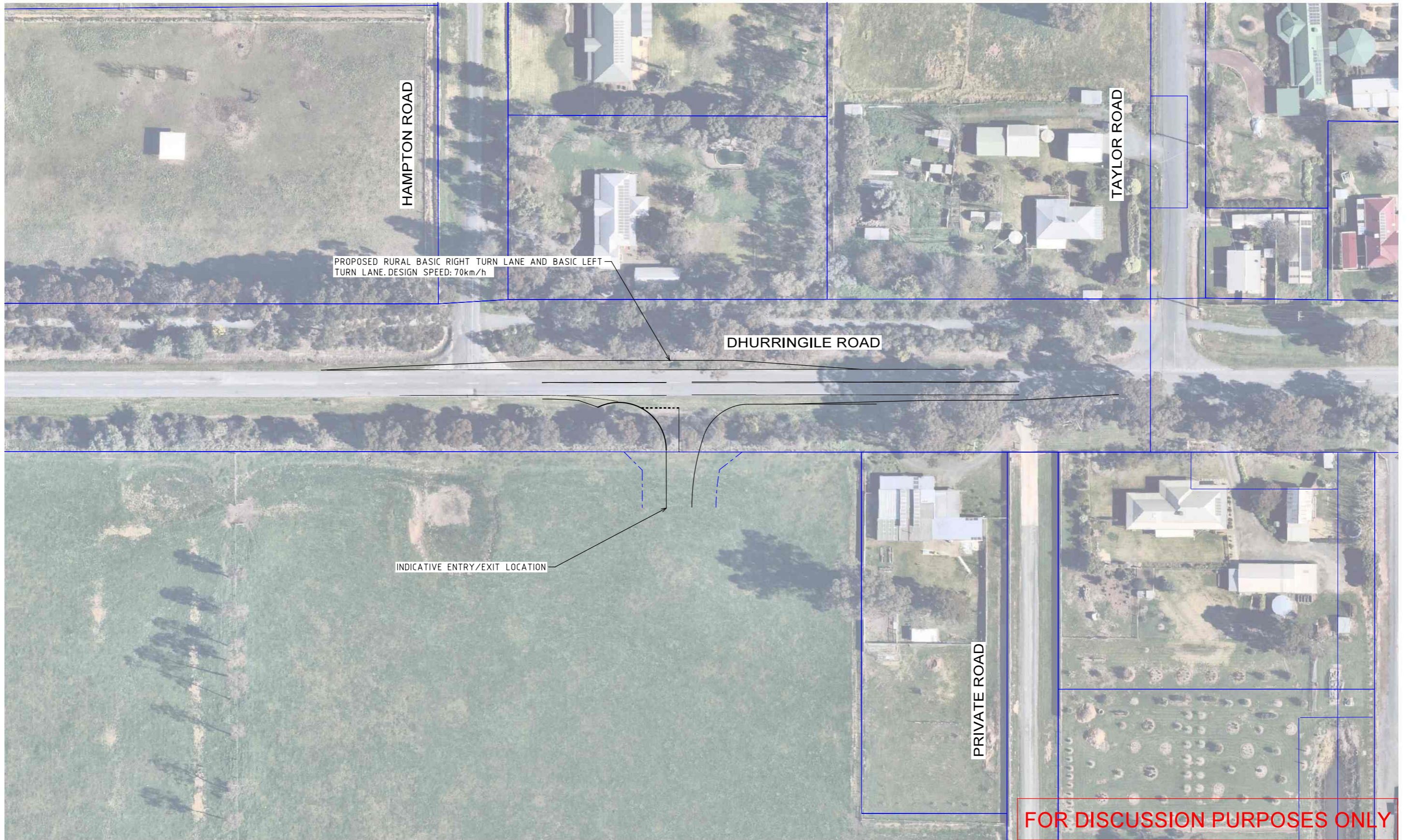
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Tatura Structural Plan		
Greater Shepparton City Council		
Concept Plan - Road 5.1		
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Greater Shepparton City Council		
Concept Plan - Road 5.2		
SHEET NO. 16	DRAWING NO. 190877-CTP-16	ISSUE P2



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Tatura Structural Plan		
Greater Shepparton City Council		
Concept Plan - Road 6.1		
SHEET NO. 17	DRAWING NO. 190877-CTP-17	ISSUE P2



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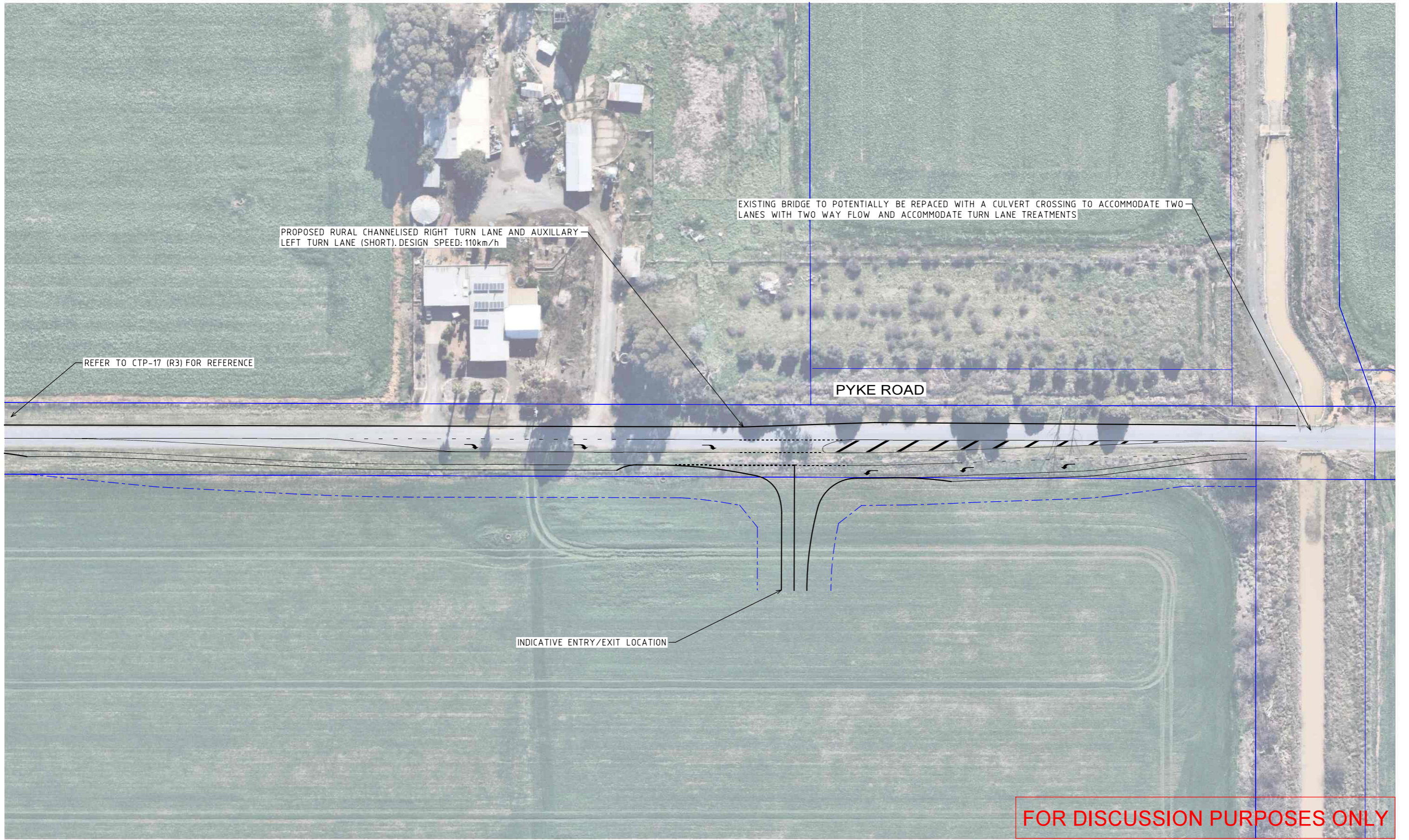
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Greater Shepparton City Council		
Concept Plan - Road 6.2		
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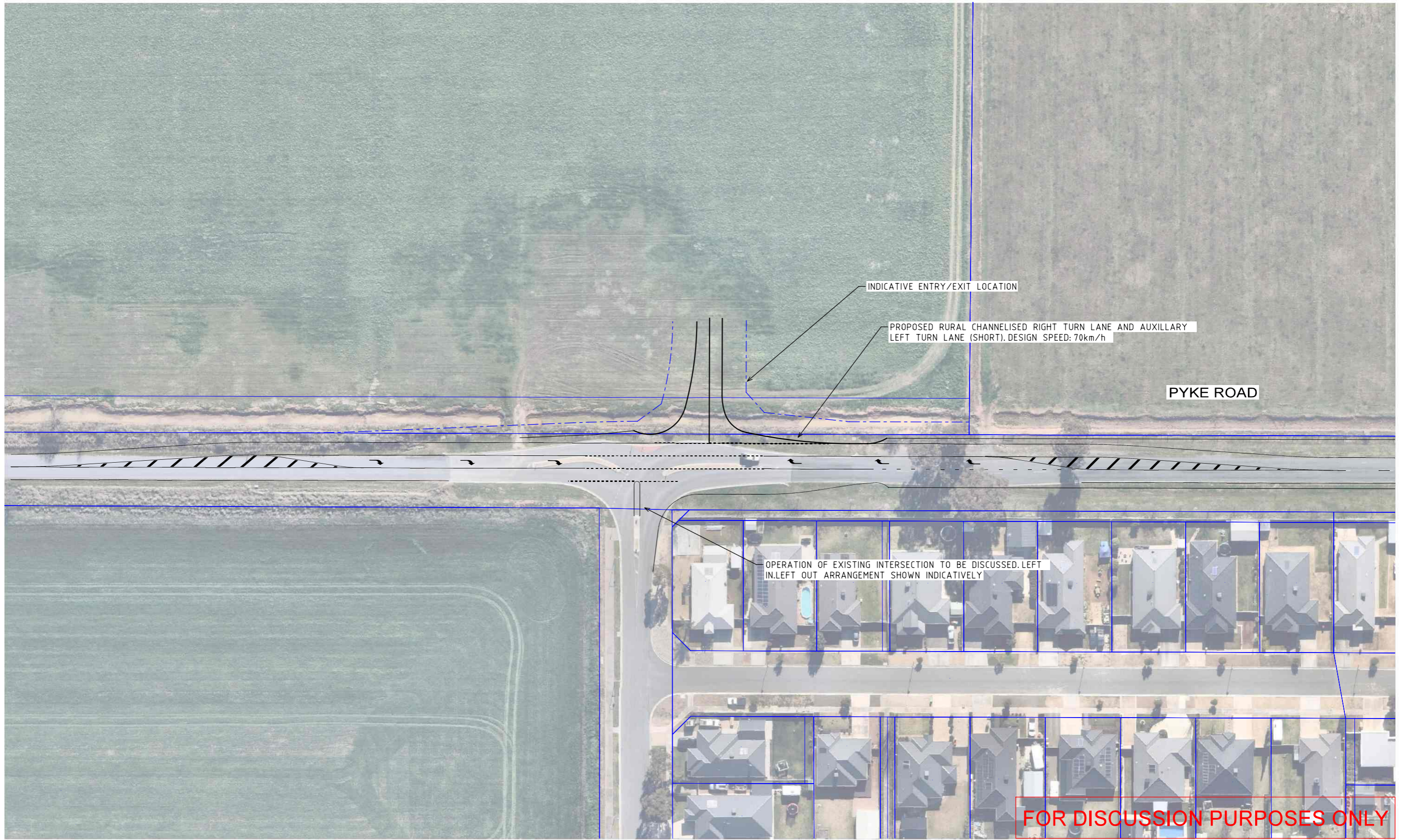
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Design by Trafficworks Cadastre Indicative Boundary Adjustment	

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Concept Plan - Road 7.1		
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Drawing Record				
ISSUE	DRAWN	APP'D	DATE	AMENDMENT
P2	GL	SRM	15.02.23	PRELIMINARY ISSUE FOR COMMENT

WARNING

BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

PRELIMINARY PLAN

FOR DISCUSSION PURPOSES ONLY
SUBJECT TO CHANGE WITHOUT NOTIFICATION
DATE OF ISSUE: 15/02/23

Notes & Legend	
—	Design by Trafficworks
—	Cadastral
---	Indicative Boundary Adjustment

1. AERIAL IMAGE FROM NEARMAP UNDER LICENSE AGREEMENT WITH TRAFFICWORKS PTY LTD.
2. ALL DIMENSIONS ARE TO FACE OF KERB UNLESS SHOWN OTHERWISE.

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GREATER SHEPPARTON CITY COUNCIL

SCALE OF METRES

Tatura Structural Plan		
Greater Shepparton City Council		
Concept Plan - Road 7.2		
SHEET NO.	DRAWING NO.	ISSUE
20	190877-CTP-20	P2



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Drawing Record				
ISSUE	DRAWN	APP'D	DATE	AMENDMENT
P2	GL	SRM	15.02.23	PRELIMINARY ISSUE FOR COMMENT

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PRELIMINARY PLAN
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SUBJECT TO CHANGE WITHOUT NOTIFICATION

DATE OF ISSUE: 15/02/23

Notes & Legend
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<ul style="list-style-type: none"> — Design by Trafficworks — Cadastre - - - Indicative Boundary Adjustment

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SCALE OF METRES
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Tatura Structural Plan		
Greater Shepparton City Council		
Concept Plan - Road 7.3		
SHEET NO.	DRAWING NO.	ISSUE
21	190877-CTP-21	P2



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Drawing Record				
ISSUE	DRAWN	APP'D	DATE	AMENDMENT
P2	GL	SRM	15.02.23	PRELIMINARY ISSUE FOR COMMENT

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FOR DISCUSSION PURPOSES ONLY

SUBJECT TO CHANGE WITHOUT NOTIFICATION

DATE OF ISSUE: 15/02/23

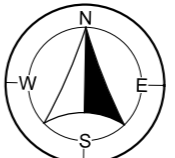
Notes & Legend
<ol style="list-style-type: none"> AERIAL IMAGE FROM NEARMAP UNDER LICENSE AGREEMENT WITH TRAFFICWORKS PTY LTD. ALL DIMENSIONS ARE TO FACE OF KERB UNLESS SHOWN OTHERWISE.
<ul style="list-style-type: none"> Design by Trafficworks Cadastre Indicative Boundary Adjustment



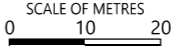
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SCALE OF METRES



Tatura Structural Plan		
Greater Shepparton City Council		
Concept Plan - Road 8		
SHEET NO.	DRAWING NO.	ISSUE
22	190877-CTP-22	P2



FERGUSON ROAD

FERGUSON ROAD

PROPOSED RURAL CHANNELISED RIGHT TURN LANE (SHORT) AND BASIC LEFT TURN LANE. DESIGN SPEED: 70km/h

INDICATIVE ENTRY/EXIT LOCATION

FOR DISCUSSION PURPOSES ONLY

16/02/2023 190877-CTP-23 5:12:38 PM T:\1920 Projects\190877\Design\190877-CTP-01-P2.dgn

Drawing Record				
ISSUE	DRAWN	APP'D	DATE	AMENDMENT
P2	GL	SRM	15.02.23	PRELIMINARY ISSUE FOR COMMENT

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FOR DISCUSSION PURPOSES ONLY
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DATE OF ISSUE: 15/02/23

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Tatura Structural Plan		
Greater Shepparton City Council		
Concept Plan - Road 9		
SHEET NO. 23	DRAWING NO. 190877-CTP-23	ISSUE P2



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Drawing Record				
ISSUE	DRAWN	APP'D	DATE	AMENDMENT
P2	GL	SRM	15.02.23	PRELIMINARY ISSUE FOR COMMENT

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SCALE OF METRES
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Tatura Structural Plan		
Greater Shepparton City Council		
Concept Plan - Road 10		
SHEET NO. 24	DRAWING NO. 190877-CTP-24	ISSUE P2

ATTACHMENT C – INDICATIVE COST CONTRIBUTIONS

Intersection	IN-1	
By Other	82%	
Development Contribution	18%	
Stage	Percentage	Contribution
A1	57%	
A2	21%	
B	15%	
C1	7%	
C2	0%	
Total	100%	

Road Section	RD-1	
By Other	\$ 425,225	55%
Development Contribution	\$ 349,775	45%
Projected	Percentage	Contribution
A1	70%	\$ 244,496
A2	5%	\$ 16,172
B	19%	\$ 66,648
C1	4%	\$ 15,366
C2	2%	\$ 7,094
Total	100%	\$ 349,775

Intersection	IN-2	
By Other	81%	
Development Contribution	19%	
Stage	Percentage	Contribution
A1	47%	
A2	16%	
B	26%	
C1	8%	
C2	3%	
Total	100%	

Road Section	RD-2	
By Other	\$ 175,107	22%
Development Contribution	\$ 624,893	78%
Projected	Percentage	Contribution
A1	44%	\$ 277,571
A2	9%	\$ 56,763
B	44%	\$ 273,665
C1	2%	\$ 13,377
C2	1%	\$ 3,518
Total	100%	\$ 624,893

Intersection	IN-3	
By Other	29%	
Development Contribution	71%	
Stage	Percentage	Contribution
A1	75%	
A2	18%	
B	6%	
C1	1%	
C2	0%	
Total	100%	

Road Section	RD-3	
By Other	\$ 11,869	1%
Development Contribution	\$ 788,131	99%
Projected	Percentage	Contribution
A1	15%	\$ 114,973
A2	8%	\$ 62,388
B	73%	\$ 575,137
C1	4%	\$ 33,733
C2	0%	\$ 1,900
Total	100%	\$ 788,131

Intersection	IN-4	
By Other	\$	119,481 24%
Development Contribution	\$	380,519 76%
Stage	Percentage	Contribution
A1	52%	\$ 196,951
A2	12%	\$ 43,811
B	34%	\$ 128,686
C1	2%	\$ 7,308
C2	1%	\$ 1,922
Total	100%	\$ 378,678

Road Section	RD-4	
By Other	\$	322,950 40%
Development Contribution	\$	477,050 60%
Projected	Percentage	Contribution
A1	12%	\$ 57,259
A2	3%	\$ 13,266
B	29%	\$ 137,206
C1	24%	\$ 116,632
C2	32%	\$ 152,686
Total	100%	\$ 477,050

Intersection	IN-5	
By Other	\$	31,332 6%
Development Contribution	\$	468,668 94%
Stage	Percentage	Contribution
A1	29%	\$ 135,635
A2	12%	\$ 57,664
B	52%	\$ 242,435
C1	7%	\$ 31,178
C2	0%	\$ 1,756
Total	100%	\$ 468,668

Road Section	RD-5	
By Other	\$	40,603 5%
Development Contribution	\$	784,397 95%
Projected	Percentage	Contribution
A1	0%	\$ -
A2	0%	\$ -
B	38%	\$ 297,934
C1	58%	\$ 453,420
C2	4%	\$ 33,043
Total	100%	\$ 784,397

Intersection	IN-6	
By Other	23%	
Development Contribution	77%	
Stage	Percentage	Contribution
A1	22%	
A2	5%	
B	51%	
C1	18%	
C2	4%	
Total	100%	

Road Section	RD-6	
By Other	\$ 64,734	8%
Development Contribution	\$ 735,266	92%
Projected	Percentage	Contribution
A1	60%	\$ 444,743
A2	27%	\$ 200,632
B	11%	\$ 77,522
C1	2%	\$ 12,369
C2	0%	\$ -
Total	100%	\$ 735,266

Intersection	IN-7	
By Other	\$	145,683 29%
Development Contribution	\$	354,317 71%
Stage	Percentage	Contribution
A1	16%	\$ 57,494
A2	5%	\$ 18,511
B	58%	\$ 207,074
C1	18%	\$ 64,495
C2	2%	\$ 6,743
Total	100%	\$ 354,317

Road Section	RD-7	
By Other	\$	17,521 2%
Development Contribution	\$	782,479 98%
Projected	Percentage	Contribution
A1	20%	\$ 157,142
A2	9%	\$ 66,807
B	71%	\$ 558,531
C1	0%	\$ -
C2	0%	\$ -
Total	100%	\$ 782,479

Intersection	IN-8	
By Other	\$	214,636 43%
Development Contribution	\$	285,364 57%
Stage	Percentage	Contribution
A1	17%	\$ 48,086
A2	4%	\$ 11,771
B	39%	\$ 111,556
C1	12%	\$ 33,242
C2	28%	\$ 80,709
Total	100%	\$ 285,364

Road Section	RD-8	
By Other	\$	231,523 29%
Development Contribution	\$	568,477 71%
Projected	Percentage	Contribution
A1	11%	\$ 61,226
A2	2%	\$ 11,924
B	58%	\$ 328,027
C1	28%	\$ 158,889
C2	1%	\$ 8,411
Total	100%	\$ 568,477

Intersection	IN-9	
By Other	\$	111,487.47 22%
Development Contribution	\$	388,512.53 78%
Stage	Percentage	Contribution
A1	3%	\$ 13,075.15
A2	2%	\$ 7,621.54
B	70%	\$ 270,613.90
C1	17%	\$ 66,247.62
C2	8%	\$ 30,954.32
Total	100%	\$ 388,512.53

Road Section	RD-9	
By Other	\$	318,913 39%
Development Contribution	\$	506,087 61%
Projected	Percentage	Contribution
A1	6%	\$ 32,807
A2	4%	\$ 19,123
B	0%	\$ -
C1	10%	\$ 48,970
C2	80%	\$ 405,188
Total	100%	\$ 506,087