Traffix Group

Jetty Road Urban Growth Area Stage 2

Greater Geelong Planning Scheme Amendment C387GGEE

Traffic Engineering Evidence Statement to Planning Panels Victoria

Date of Statement: 8 April 2024
Date of Inspections: 31 March 2024

Prepared For: SOHO Living, Stockland and APD Projects
Instructed By: Norton Rose Fullbright

Reference: G34529A-01A

IN THE MATTER OF AMENDMENT C387GGEE OF THE GREATER GEELONG PLANNING SCHEME RELATING TO THE JETTY ROAD URBAN GROWTH AREA STAGE 2

STATEMENT TO PLANNING PANELS VICTORIA BY JASON LEE WALSH, TRAFFIC ENGINEER

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Introduction

1 I have been instructed by Norton Rose Fullbright on behalf of SOHO Living, Stockland and APD Projects (the Developer Group) to undertake a traffic engineering assessment of the proposed Greater Geelong Planning Scheme Amendment C387ggee (the Amendment).

2 In the course of preparing this statement, I inspected the subject site on 31 March 2024, reviewed exhibited Amendment documents and background material, and assessed the traffic engineering considerations of the proposed Amendment.

3 My qualifications and experience to undertake the following assessment in accordance with Planning Panels Victoria Note 1 are set out in Appendix A.

Background

4 The Developer Group is the proponent of the Amendment which aims to facilitate the residential development of land known as Stage 2 of the Jetty Road Urban Growth Area.

5 In 2020 the Developer Group lodged a request to amend the Greater Geelong Planning Scheme to rezone the land.

6 The neighbouring area, known as Stage 1 of the Jetty Road Urban Growth Area was rezoned in 2009 and has now largely developed with over 1,700 dwellings, an activity centre and public open space.

7 On 24th May 2022, City of Greater Geelong resolved to support the preparation and exhibition of the Amendment and request the Minister for Planning to authorize the preparation and exhibition of the Amendment.

8 The Amendment and associated material were exhibited, including the Jetty Road Stage 2 Urban Growth Area Framework Plan.

9 The exhibited material included the following Traffic Reports.

- Traffix Group Report G21702R-03E (Application Traffic Assessment).
- Traffix Group Report G21702R-04E (Application Development Plan Report).
- Traffix Group Report G21702R-05D (Application Development Contributions Plan Report).

10 These reports were prepared by my firm, but neither I nor any staff assisting in the preparation of this evidence statement had any involvement in the preparation of the abovementioned reports.

11 58 submissions were received.

12 The Developer Group and four other landowners support the Amendment but request changes to the DCP and Development Plan Overlay Schedule 46 (DPO46).

13 A number of other submitters object to the Amendment on a wide range of issues including some relating to traffic engineering and the planned road network.

14 Following consideration of submissions, Council adopted a revised Framework Plan, including changes to the Lower Order Connector Street.

15 My evidence is premised on the above material.

Amendment C387ggee

16 The Amendment proposes to rezone approximately 150 hectares of farming land and rural living land to General Residential Zone to facilitate the planned residential development of Stage 2 of the Jetty Road Urban Growth Area.

17 Specifically, the Amendment proposes the following changes to the Greater Geelong Planning Scheme:

- Rezoning the land from Farming Zone and Rural Living Zone to General Residential Zone Schedule 1 (GRZ1).
- Applying Development Plan Overlay Schedule 46 (DPO46) to the land being rezoned.
- Applying Development Contributions Plan Schedule 9 (DCPO9) to the land being rezoned.
- Applying the Environmental Audit Overlay to part of the land.
- Inserting the incorporated document: Jetty Road Urban Growth Area Stage 2 Development Contributions Plan (October 2023).

Development Plan Overlay (DPO)

18 The DPO includes the Jetty Road Stage 2 Urban Growth Area Framework Plan.

19 The updated Framework Plan is provided at Figure 1.

20 The Framework Plan illustrates a key local street network and local connections to provide connectivity through the framework plan area and to the abutting Jetty Road Stage 1 area.

21 The key local street network includes a loop road as a westerly extension of the northern and southern arms of Oceania Drive, as well as an 'L' shaped road connecting the westerly extension of the southern leg of Oceania Drive back to Greenvale Drive, south of the precinct park.

22 In the south western section of the framework plan there is another 'L' shaped road connecting Coriyule Road through to Tivoli Drive.

23 In the south eastern section of the framework plan, the road network includes an east west local street connecting Tivoli Drive and Hackwill Place.

24 The Framework Plan also nominates:

- The duplication of Tivoli Drive / Greenvale Drive between Portarlington Road and south of Centennial Boulevard.
- No new access to McDermotts Road or Portarlington Road.
- Traffic calming of Coriyule Road.

- Local street connections to Beach Vista Drive and Parkview Drive.

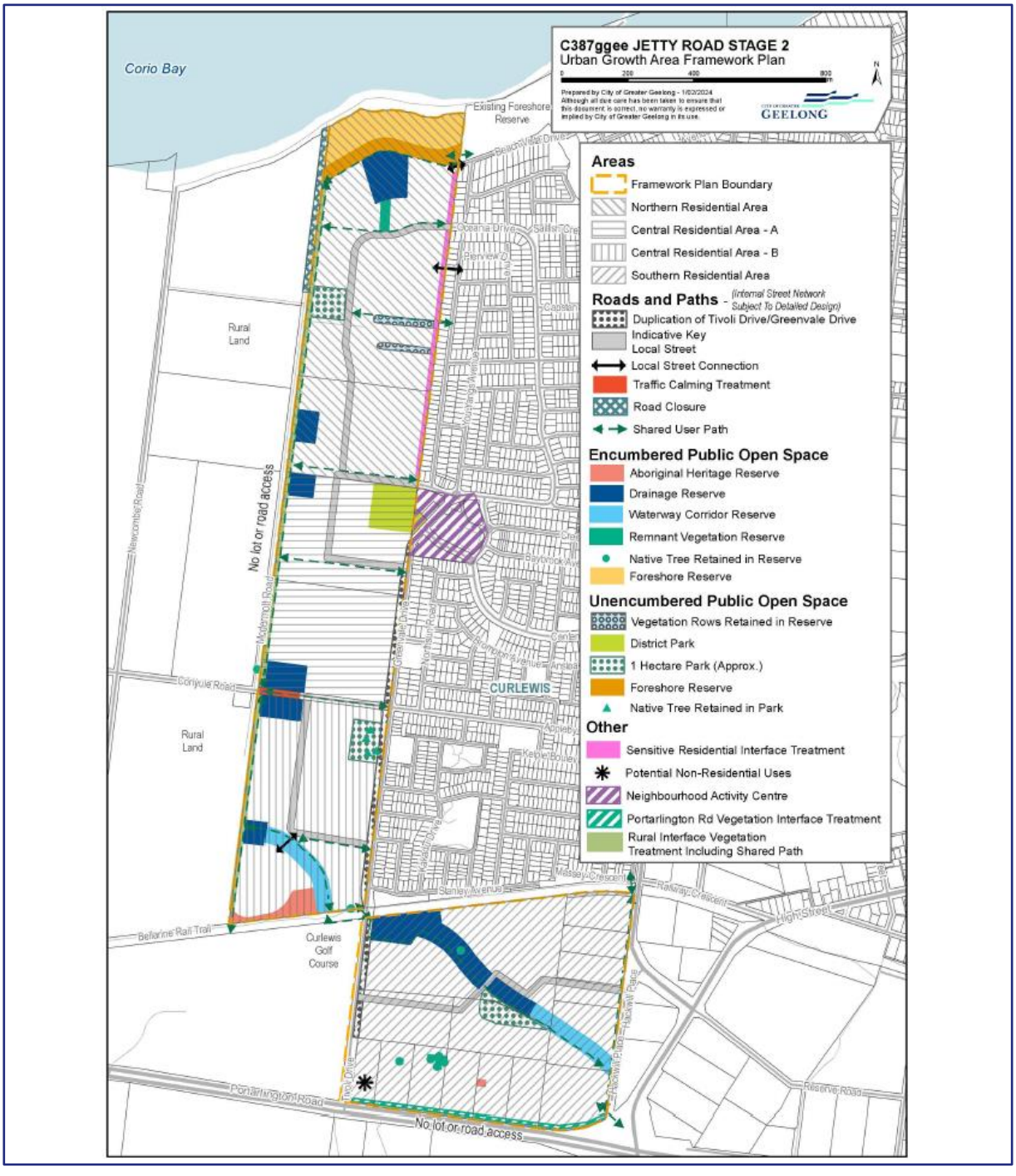


Figure 1: Updated Post-Exhibition Framework Plan

25 The DPO requires the preparation of a Development Plan, including a Road Network and Traffic Management Plan that is guided by the Traffix Group reports, provided as part of the exhibited material.

26 A plan depicting land holdings within Stage 2 is provided at Figure 2.

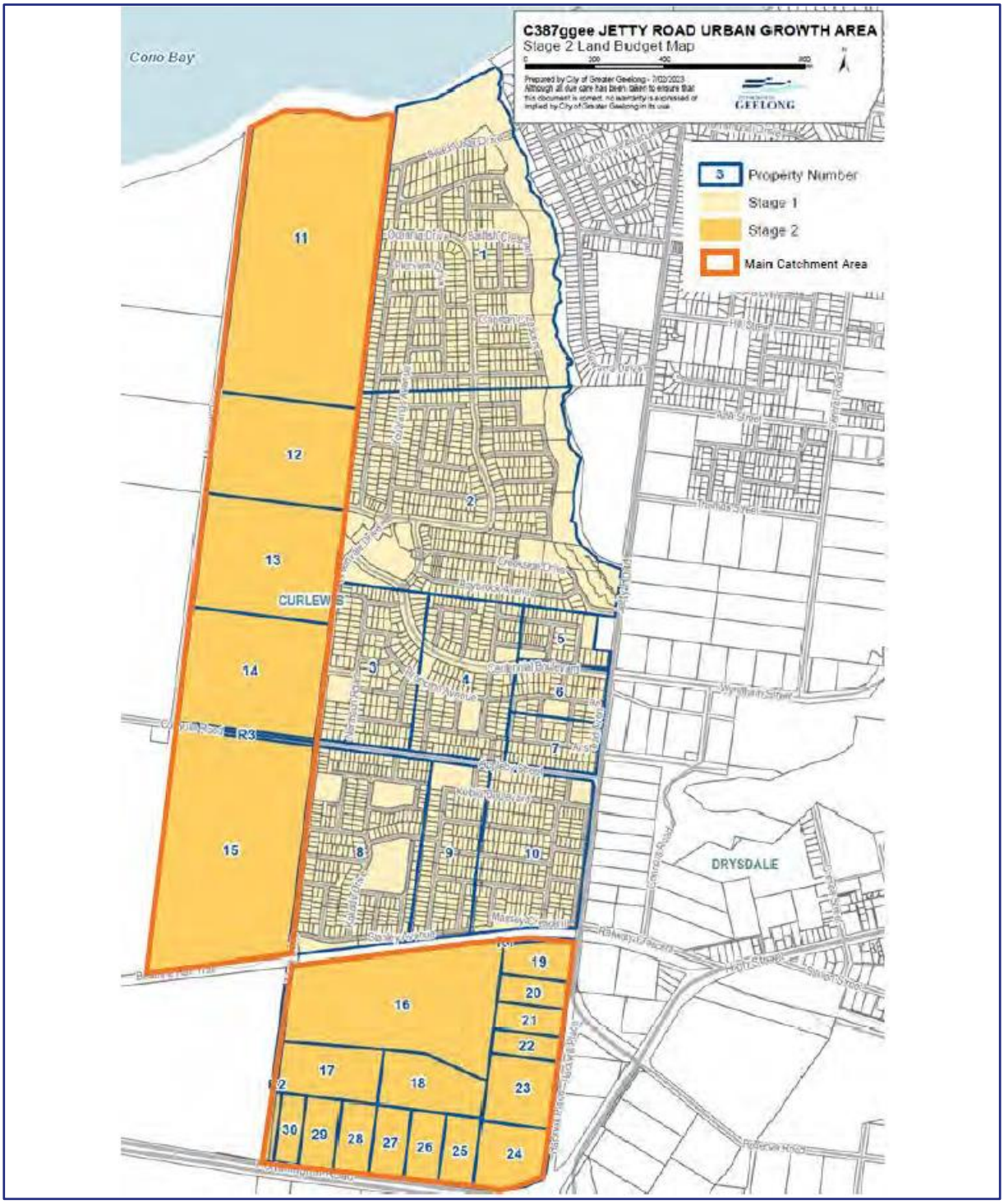


Figure 2: Land Holdings

Development Contributions Plan (DCP)

27 The DCP includes a number of traffic engineering infrastructure items to be completed as a part of the Jetty Road Stage 2 development. A summary of these items is provided in Table 1 with the DCP project map provided at Figure 3.

Table 1: Summary of Traffic Engineering Related DCP Items

DCP ID	Project Description	Indicative Timing
RD-01	Construction of upgraded Greenvale Dr cross-section between Centennial Blvd and Coriyule Rd.	Prior to the issue of Statement of Compliance for the first Stage of the subdivision on the subject land.
RD-01L	Land to allow for the construction of RD-01	
RD-02	Construction of upgraded Tivoli Dr cross-section between Coriyule Rd and Bellarine Rail Trail.	
RD-02L	Land to allow for the constriction of RD-01	
RD-03	Construction of upgraded Tivoli Dr cross-section between Bellarine Rail Trail and Portarlington Rd including extension of turn lanes on Tivoli Dr at Portarlington Rd intersection and upgrade of pedestrian crossing at Bellarine Rail Trail	
RD-03L	Land to allow for the construction of RD-03	
RD-04	Construction of a signalised intersection at Centennial Blvd and Greenvale Dr.	Prior to the delivery of 2,250 lots in the Jetty Road Urban Growth Area
RD-05	Construction of a roundabout intersection at Greenvale Dr, Tivoli Dr and Coriyule Rd.	Prior to the issue of Statement of Compliance for the first Stage of the subdivision on the subject land.

28 I understand there are draft section 173 agreements that will allow for the land component of RD-01, RD-02 and RD-03 to be delivered to City of Greater Geelong immediately following the rezoning of the subject land.

29 There is a discrepancy between the indicative timing of RD-03 outlined in the DCP and the DPO, with the DPO requiring:

> *Land south of the Bellarine Rail Trail relying on access from Tivoli Drive cannot be further subdivided until Tivoli Drive is constructed to its ultimate profile from the northern boundary of the Rail Trail Reserve to Portarlington Road including the lengthening of the turn lane from Tivoli Drive into Portarlington Road as proposed by Traffix Group and as shown in the relevant DCP scoping sheet unless otherwise agreed in writing by the Responsible Authority…*

30 In effect, the DPO requirement allows for development to the south of the Bellarine Rail Trail that does not rely on access from Tivoli Drive to be undertaken prior to the upgrade of Tivoli Drive to the south of the Bellarine Rail Trail.

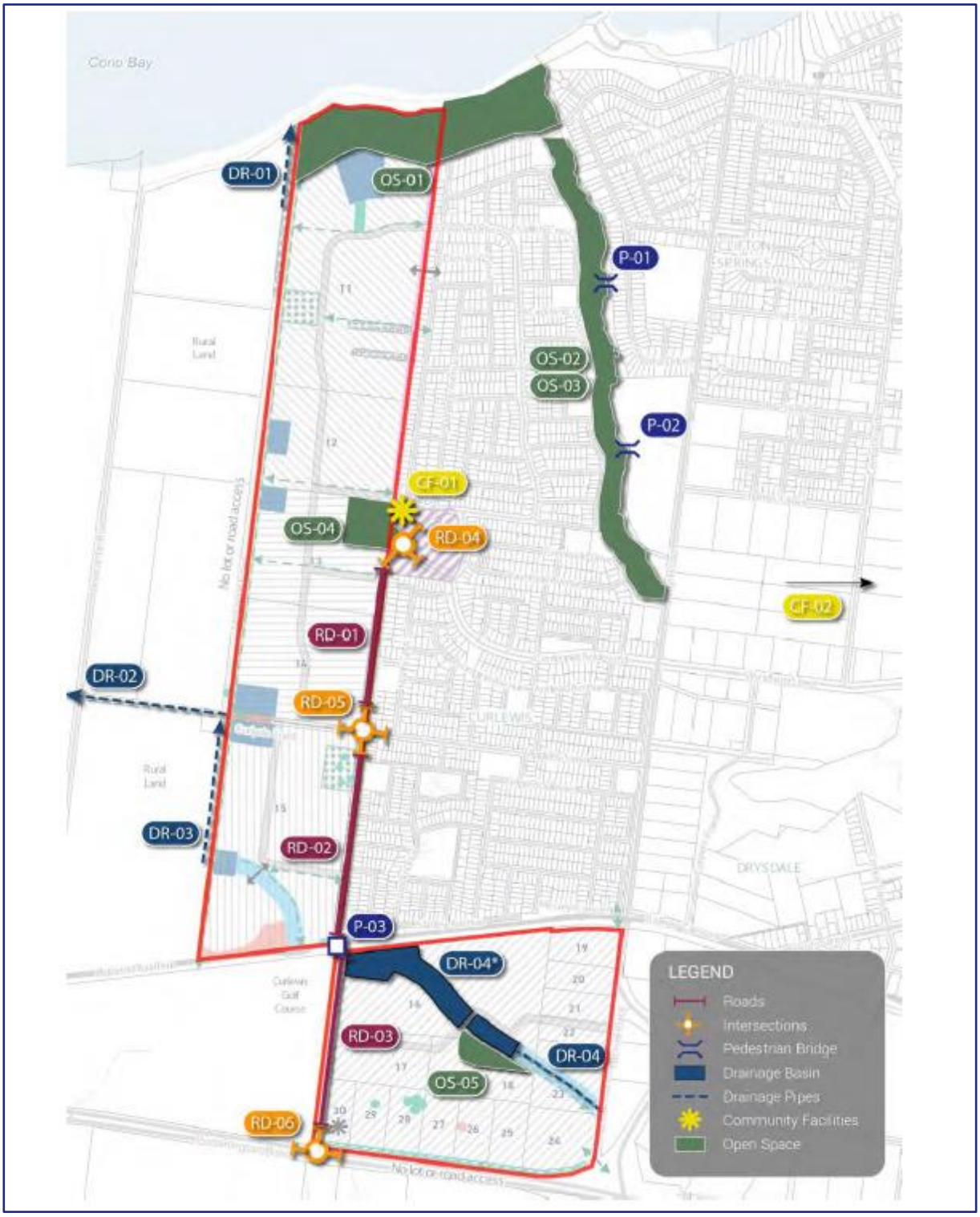


Figure 3: DCP Project Map

Existing Conditions

Subject Site & Planning Zones

31 The subject land affected by the proposed Amendment is located within Curlewis and is spread across two distinct areas with a total area of approximately 150 hectares as shown in Figure 4.

32 The western area of the subject land extends north from the Bellarine Rail Trail to Port Phillip Bay and is bound by McDermotts Road to the west and Tivoli Drive / Greenvale Drive and existing residential development to the east.

33 This land is zoned Farming Zone (FZ) and occupied by rural residential dwellings, agricultural land and a winery.

34 Vehicular access to properties within this land is currently provided by McDermotts Road along its western boundary and Coriyule Road, which bisects the western area of the subject land.

35 Established residential areas within Stage 1 of the Jetty Road Urban Growth area are located to the east of the western area, with rural areas located to the west. Curlewis Golf Club is located adjacent to the southern boundary of the western area.

36 The southern area of the subject land extends south from the Bellarine Rail Trail to Portarlington Road and is bound by Tivoli Drive to the west and Jetty Road/Hackwill Place to the east.

37 This land is zoned Rural Living Zone (RLZ) and occupied by low density residential development, agricultural land and a church.

38 Vehicular access to properties within this land is currently provided from Tivoli Drive on the western boundary, Portarlington Road along the southern boundary and Hackwill Place/Jetty Road along the eastern boundary.

39 Established residential areas within Stage 1 of the Jetty Road Urban Growth Area are located to the north of the southern area, with rural areas located to the south, and Curlewis Golf Club located immediately to the west.

40 A land use zoning map is provided at Figure 5.

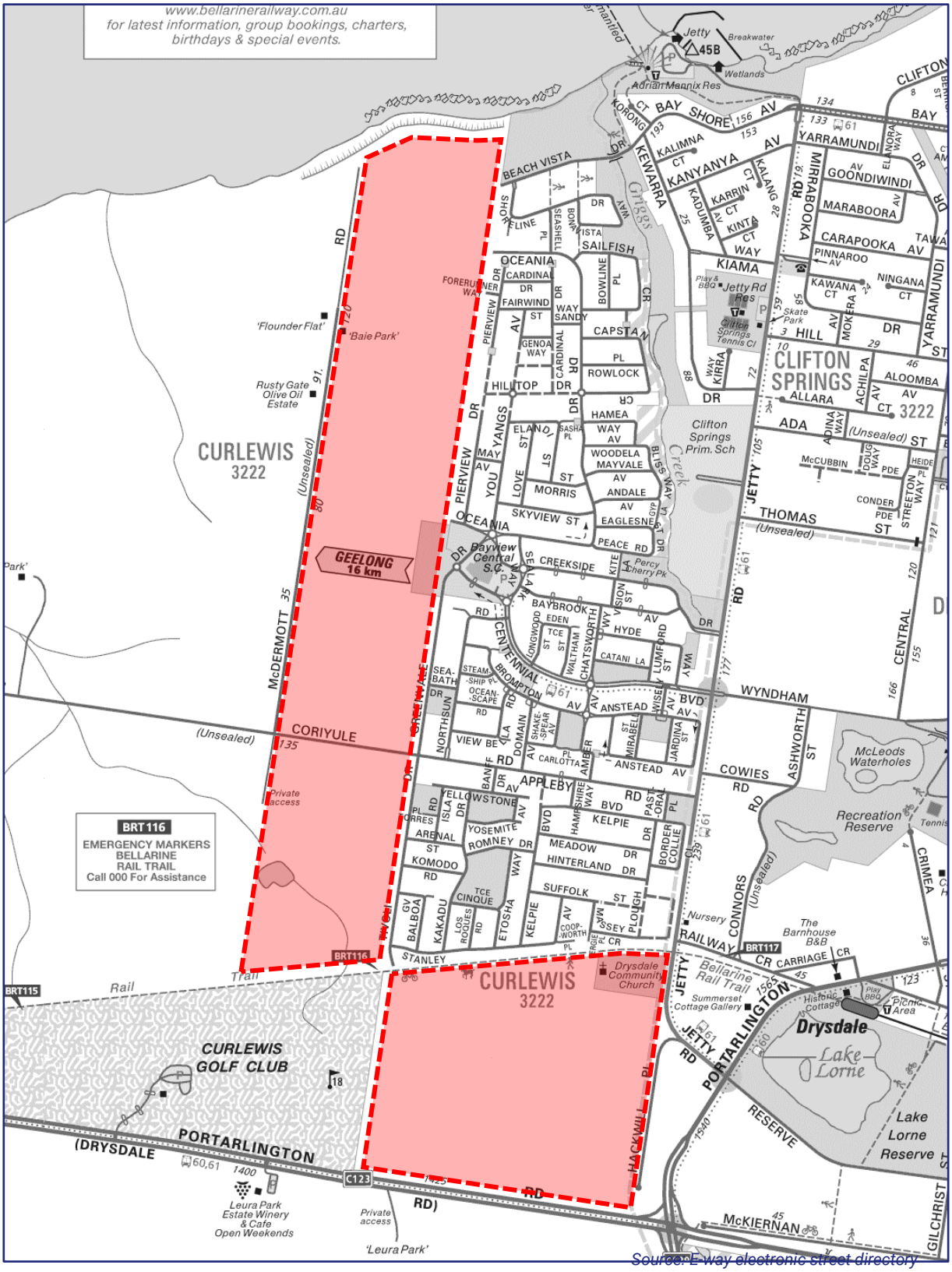


Figure 4: Locality Map

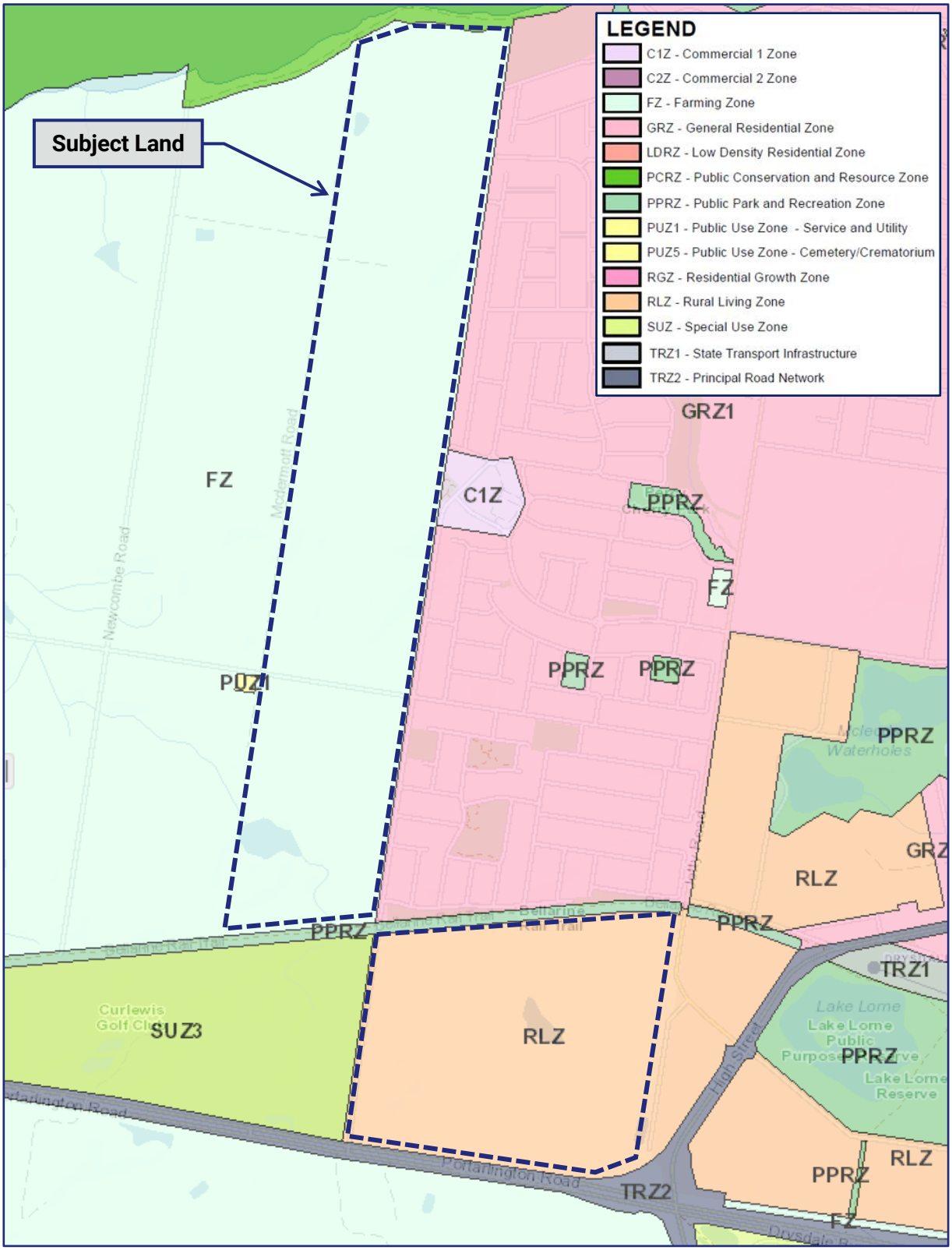


Figure 5: Land Use Zoning Map

Jetty Road Urban Growth Plan

41 The Jetty Road Urban Growth Plan, adopted 26th June 2007 and amended 23rd September 2008, provides strategic direction for land within the Jetty Road Growth Area.

42 The Jetty Road Urban Growth Plan includes a structure plan map, future road network plan and future pedestrian and bicycle network plan as shown at Figure 6, Figure 7 and Figure 8 respectively.

43 The future road network plan identifies Tivoli Drive and Greenvale Drive as a 'primary road' with a boulevard treatment.

44 The future road network plan identifies the following 'secondary roads' within and abutting the subject land:

- A road extending from Tivoli Drive to Hackwill Place/Jetty Road through the southern area.
- Coriyule Road within the growth area boundary.
- A road extending through the northern part of the western area providing a connection to the neighbourhood activity centre.

45 The future road network plan also restricts any new access to McDermotts Road from the growth area and discourages the use of Coriyule Road to the west of the growth area.

46 The pedestrian and bicycle network plan identifies a perimeter network including McDermotts Road and the Bellarine Rail Trail.

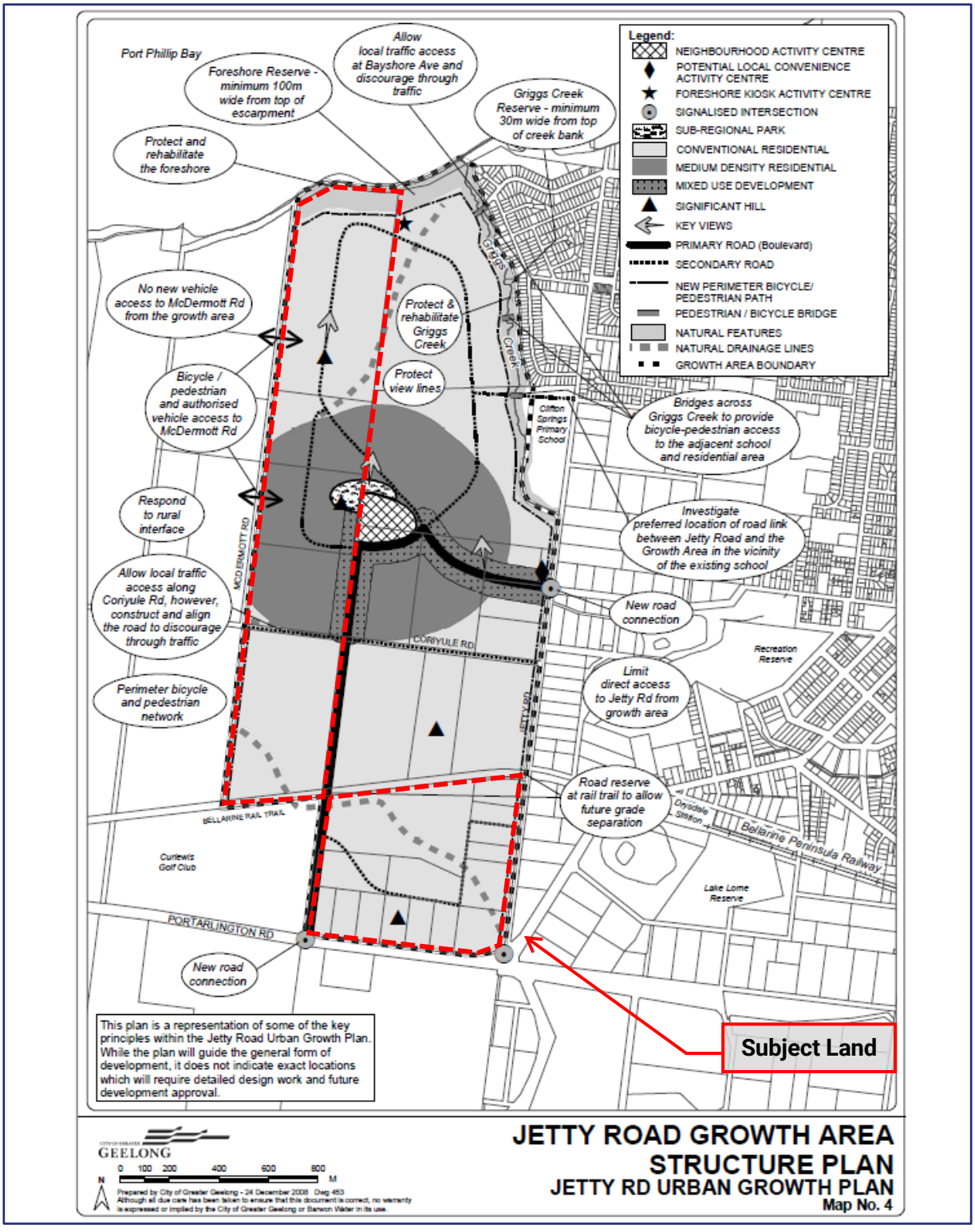


Figure 6: Jetty Road Growth Area Structure Plan

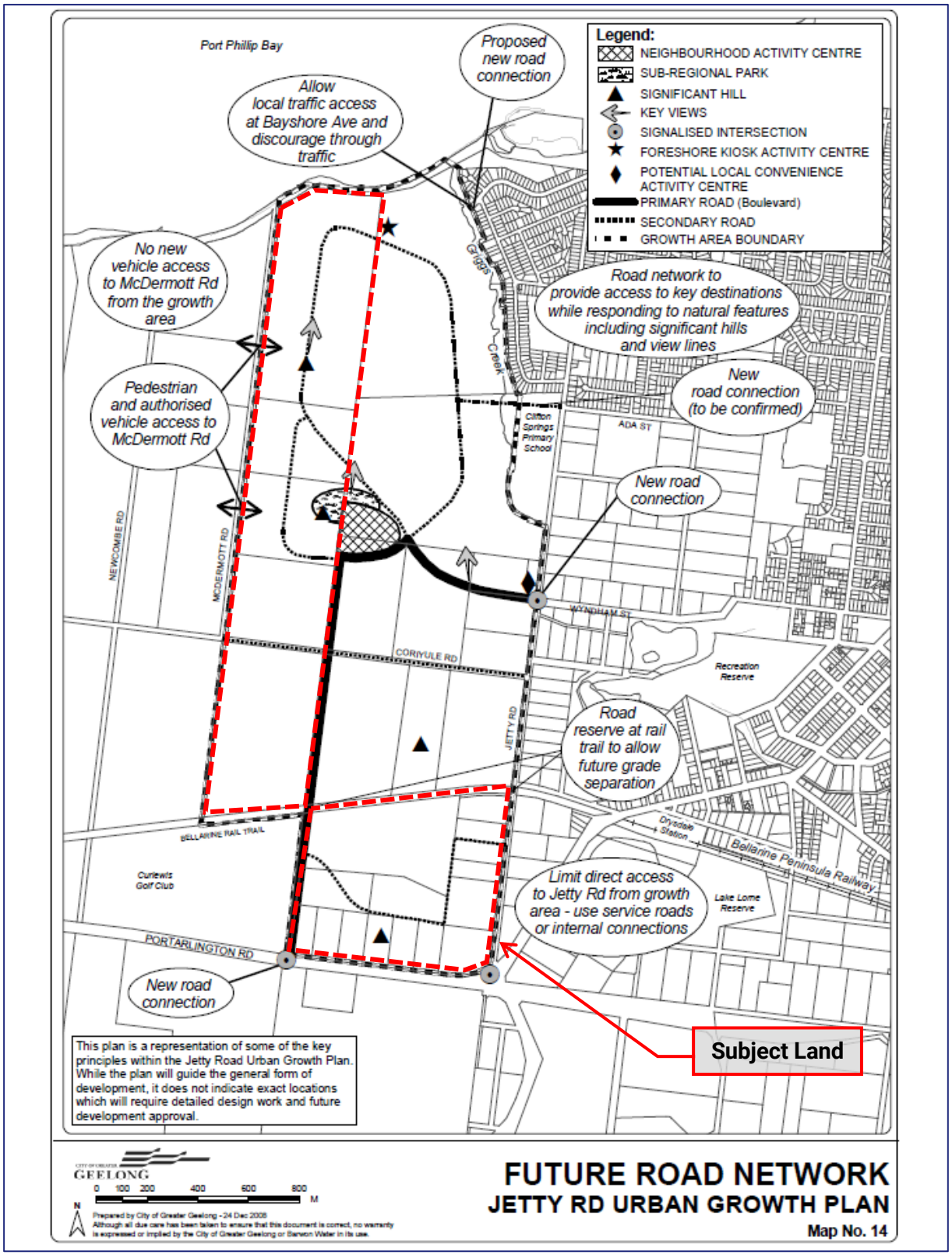


Figure 7: Jetty Road Growth Area Future Road Network

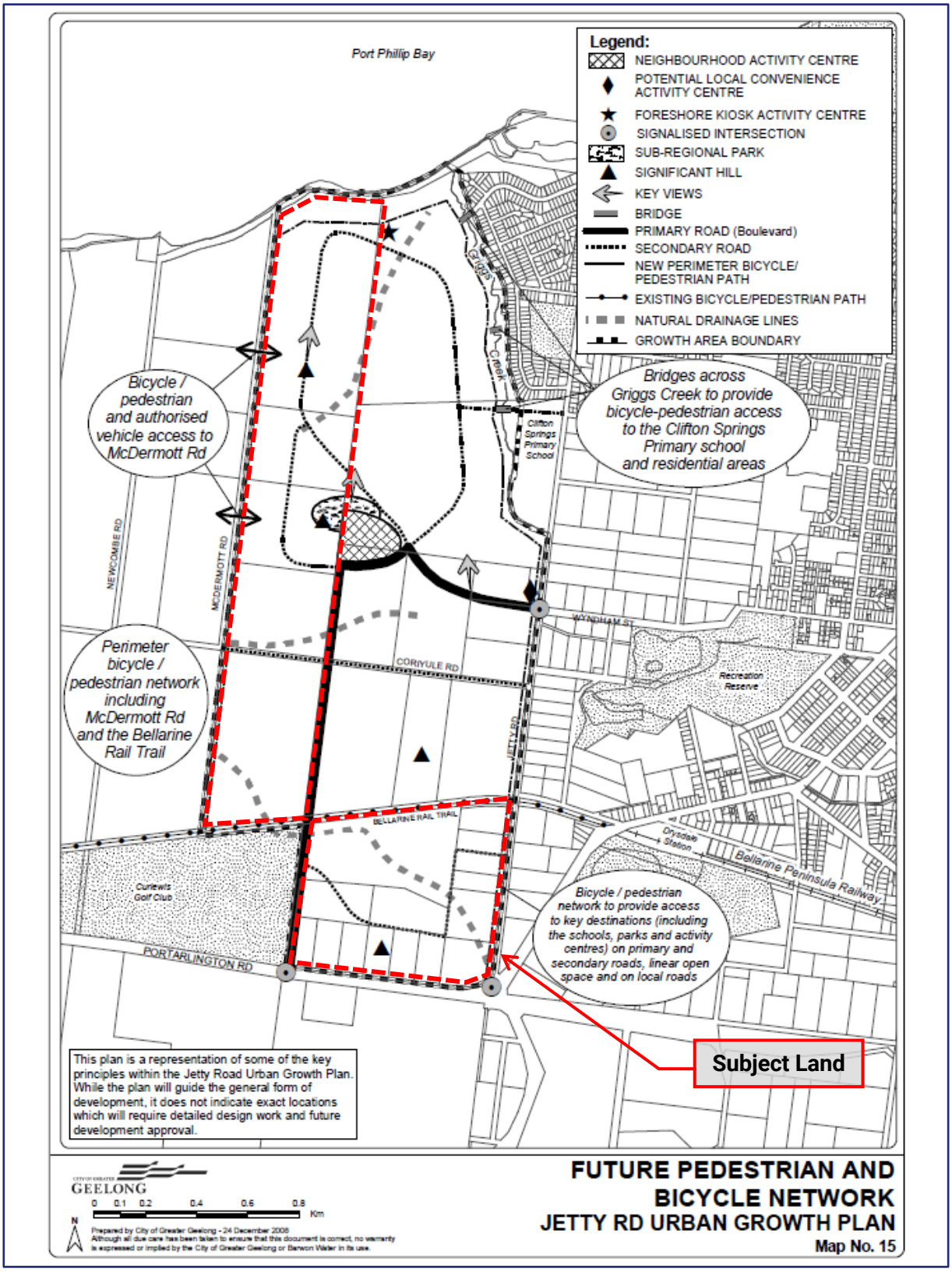


Figure 8: Jetty Road Growth Area Future Pedestrian and Bicycle Network

Traffic Considerations

Existing Road Network

47 **Portarlington Road** is a State declared arterial road and a Transport Zone 2 – Principal Road Network (TRZ2). The road is generally aligned in an east-west direction connecting Geelong and Portarlington.

48 Near to the subject land, Portarlington Road is constructed with a divided carriageway accommodating two through traffic lanes and a bicycle lane in each direction.

49 No footpaths are provided on Portarlington Road in the vicinity of the subject land.

50 A posted speed limit of 80 km/h applies to Portarlington Road near to the subject land.

51 **Tivoli Drive** is identified as a secondary distributor under Council's road register and aligns in a north-south direction between Coriyule Road, where it continues as Greenvale Drive, and Portarlington Road.

52 Tivoli Drive is constructed with an approximately 7.5 metre wide carriageway accommodating through traffic in each direction. Kerbside parallel parking is prohibited on both sides of the street to the south of the Bellarine Rail Trail but generally permitted on the east side of the street to north of the Bellarine Rail Trail.

53 A footpath is provided on the west side of the street between Portarlington Road and the Bellarine Rail Trail and on the east side of the street between the Bellarine Rail Trail and Coriyule Road.

54 A signalised pedestrian crossing is provided for the Bellarine Rail Trail across Tivoli Drive.

55 A posted speed limit of 50km/h applies to Tivoli Drive.

56 The Portarlington Road/Tivoli Drive intersection is signalised. Dedicated turn lanes are provided on the east and west approaches for movements into Tivoli Drive from Portarlington Road. Two turn lanes are provided on the Tivoli Drive approach with one dedicated right turn lane and one shared left and right turn lane.

57 Bus stops and associated footpath connections are provided on both sides of Portarlington Road immediately east of the Tivoli Drive intersection.

58 **Greenvale Drive** is identified as a local access street under Council's road register and aligns in a north-south direction between Oceania Drive and Coriyule Road, where it continues as Tivoli Drive.

59 Greenvale Drive is constructed with an approximately 7.5 metre wide carriageway accommodating through traffic in each direction. Kerbside parallel parking is permitted on the east side of the street only.

60 A footpath is provided on the east side of the street.

61 A posted speed limit of 50km/h applies to Greenvale Drive.

62 **Coriyule Road** is identified as a local access street under Council's road register and aligns in an east-west direction between Domain Avenue, where it continues as Appleby Street, and Hermsley Road.

63 To the east of Tivoli Drive/Greenvale Drive, Coriyule Road is constructed with an approximately 7.3 metre wide carriageway accommodating through traffic in each direction with kerbside parallel parking permitted on both sides of the street. Footpaths are provided on both sides of the road.

64 The urban default speed limit of 50km/h applies to Coriyule Road to the east of Tivoli Drive/Greenvale Drive.

65 To the west of Tivoli Drive/Greenvale Drive, Coriyule Road is constructed with an approximately 8.0 mere wide gravel carriageway accommodating through traffic in each direction. No footpaths are provided.

66 A posted speed limit of 80km/h applies to Coriyule Road to the west of Tivoli Drive/Greenvale Drive.

67 The intersection of Tivoli Drive, Greenvale Drive and Coriyule Road is provided as a sign controlled cross-intersection, with Tivoli Drive/Greenvale Drive having right of way.

68 **McDermotts Road** is identified as a local rural road under Council's road register and aligns in a north-south direction between Port Phillip Bay and Coriyule Road.

69 McDermotts Road is constructed with an approximately 5.5 metre wide gravel carriageway accommodating through traffic in both directions.

70 No posted speed limit is in place and accordingly, the rural default speed limit of 100km/h applies to McDermotts Road.

71 Figure 9 to Figure 20 illustrate views of the road network in the vicinity of the site.

Figure 9: Portarlington Rd - View East

Figure 10: Portarlington Rd - View West

Figure 11: Tivoli Dr - View North

Figure 12: Tivoli Dr – View South

Figure 13: Greenvale Dr - View North

Figure 14: Greenvale Dr - View South

Figure 15: Coriyule Rd (East of Tivoli Dr) - View East

Figure 16: Coriyule Rd (East of Tivoli Dr) - View West

Figure 17: Coriyule Rd (West of Tivoli Dr) - View East

Figure 18: Coriyule Rd (West of Tivoli Dr) View West

Figure 19: McDermotts Rd - View North

Figure 20: McDermotts Rd - View South

Existing Traffic Volumes

72 The traffic reports contained within the exhibited materials included traffic counts from 2021 / 2022 at the intersections of Tivoli Drive with Coriyule Road and Portarlington Road.

73 To understand more current traffic volumes my firm engaged Trans Traffic Survey to undertake tube count traffic surveys for a 7-day period from Thursday 29th February to Thursday 7th March 2024 at the following locations:

- Tivoli Drive, between Portarlington Road and the Bellarine Rail Trail.
- Tivoli Drive, between the Bellarine Rail Trail and Coriyule Road.
- Greenvale Drive, between Coriyule Road and Centennial Boulevard.

74 A summary of the recorded volumes is outlined in Table 2.

Table 2: Summary of Tube Count Data

Location	Two-Way Ave Weekday Traffic Volume
Tivoli Dr, between Portarlington Rd and the Bellarine Rail Trail	4,954 vehicles per day
Tivoli Dr, between the Bellarine Rail Trail and Coriyule Rd	3,904 vehicles per day
Greenvale Dr, between Coriyule Rd and Centennial Blvd	2,935 vehicles per day

75 Additionally turning movement counts were undertaken at the following intersections on Wednesday 6th March, 2024 from 7:00am to 9:30am and 2:30pm to 6:00pm:

- Tivoli Drive/Greenvale Drive/Coriyule Road intersection.
- Greenvale Drive/Centennial Boulevard intersection.

76 The recorded AM and PM peak hours for the Tivoli Drive/Greenvale Drive/Coriyule Road intersection were 8:00am - 9:00am and 4:30pm - 5:30pm respectively.

77 The recorded AM and PM peak hours for the Greenvale Drive/Centennial Boulevard intersection were 8:15am - 9:15am and 4:45pm - 5:45pm respectively.

78 SCATS traffic signal data for the Tivoli Drive/Portarlington Road intersection has been sourced for the same day as the turning movement counts (6/3/24). The recorded AM and PM peak hours were 7:45am - 8:45am and 4:30pm - 5:30pm respectively.

79 I note that the eastern lane on the north approach (Tivoli Drive) to this intersection is a shared left and right turn lane. SCATS data only provides the total volume of vehicles travelling within this lane and not a distinction between left and right turn movements. Accordingly, I have applied the left and right movement split from the exhibited materials Traffic Report (14% of vehicle movements to the east and 86% of vehicle movements to the west) to the total SCATS traffic volume on the north approach.

80 A summary of the peak hour turning movement counts at the abovementioned locations is provided in Figure 21. I note the peak periods for each intersection differs slightly, however I have adopted the individual peak hour volumes for a conservative assessment.

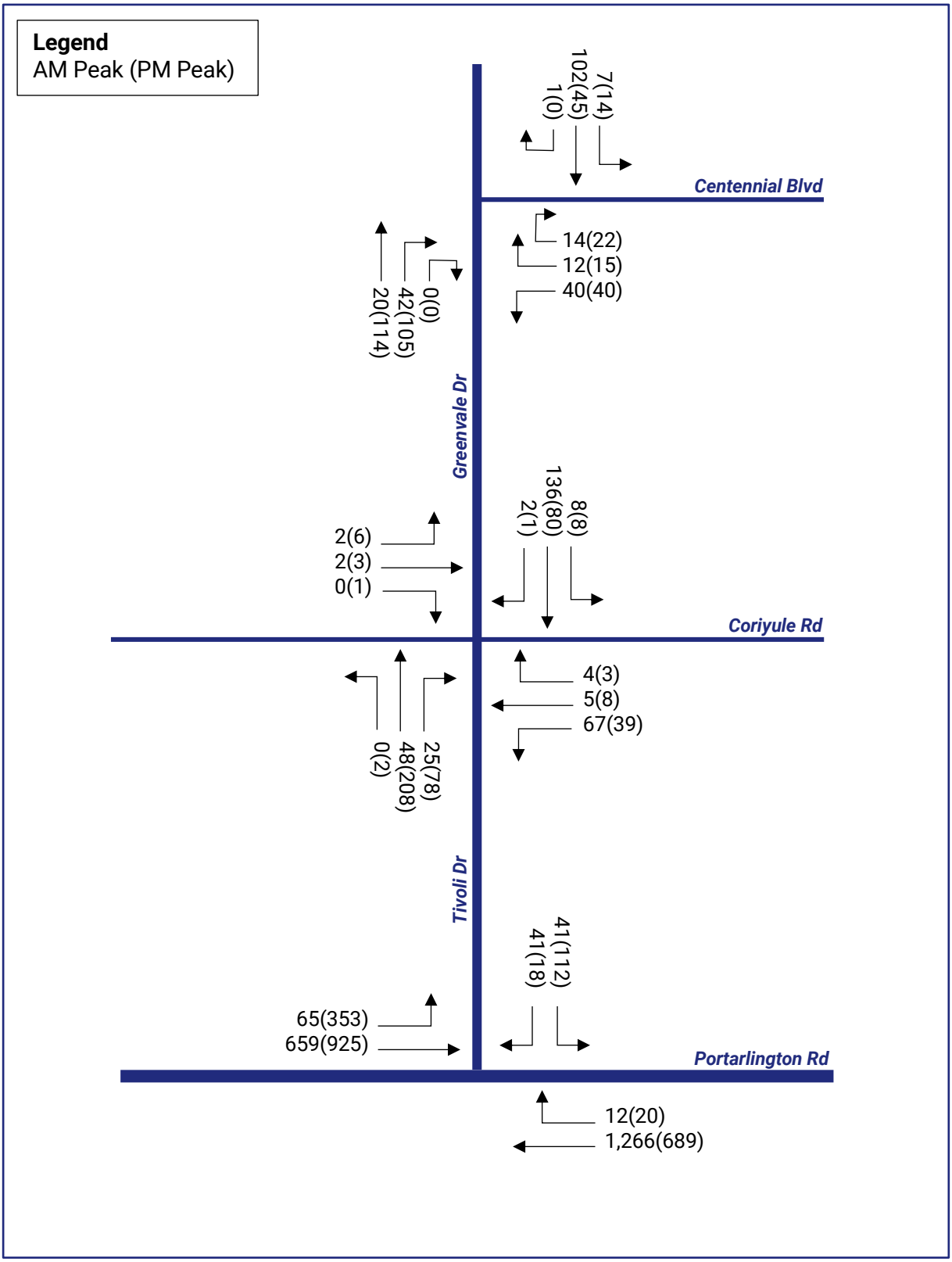


Figure 21: Peak Hour Turning Volumes

81 I note the current traffic counts do show an increase of traffic on Tivoli Drive / Greenvale Drive from the 2021/22 counts. This is not unexpected given more houses within Jetty Road Stage would have become occupied since this time.

Traffic Generation

82 The application traffic report adopted the following daily traffic generation rates for the subject land:

- Standard residential lots – 9 vehicle movements per day.
- Medium density residential lots – 9 vehicle movements per day.
- Residential village dwelling – 5 vehicle movements per day.

83 Peak hour generation rates were assumed to be 10% of daily traffic generation rates.

84 I am of the opinion that these rates are generally conservative, though are appropriate to adopt for the purposes of a robust traffic assessment.

85 The exhibited materials traffic report provides a diagram, reproduced at Figure 22, providing a breakdown of areas within the subject land.

Figure 22: Exhibited Materials Traffic Report Subject Land Breakdown

86 A summary of anticipated lot yields corresponding to the areas within the subject land is provided in the exhibited materials traffic report and is outlined in Table 3. However, on instruction, I have adopted a lower yield for Stockland's land. The projected yield is now 470 dwellings rather than the 550 contained in the exhibited material.

Table 3: Anticipated Development Yield

Area	Development Yield
A	297 standards residential lots 123 medium density residential lots
B	470 residential village dwellings
C	310 standard residential lots 177 medium density residential lots
D	24 standard residential lots 19 medium density residential lots
I	443 standard residential lots
II	239 standard residential lots

87 Application of the adopted traffic generation rates to the development yields outlined in Table 3 results in the anticipated traffic generation summarised in Table 4.

Table 4: Traffic Generation Summary

Area	Standard Density		Medium Density		Residential Village		Total Daily Trips	Peak Hour Trips
	No. Lots	Daily Trips	No. Lots	Daily Trips	No. Lots	Daily Trips		
A	297	2,673	132	1,188	0	0	**3,861**	**386**
B	0	0	0	0	470	2,350	**2,350**	**235**
C	310	2,790	177	1,593	0	0	**4,383**	**438**
D	34	306	19	171	0	0	**477**	**48**
I	443	3,987	0	0	0	0	**3,987**	**399**
II	239	2,151	0	0	0	0	**2,151**	**215**
Total	**1,323**	**11,907**	**328**	**2,952**	**470**	**2,350**	**17,209**	**1,721**

Traffic Distribution

88 The exhibited materials traffic report adopts the following overall traffic distribution assumptions for the subject land:

- 65% of trips generated will be external to the urban growth area.
- 80% of external trips will be distributed to/from the west and 20% of external trips will be distributed to/from the east.
- 35% of trips will be internal trips with the urban growth area in association with the town centre, nearby school (Clifton Spring Primary School) and recreation areas to the north-east of the subject land.
- No traffic will be distributed to the west along Coriyule Road beyond McDermotts Road.
- Trips will be split 80% outbound and 20% inbound in the AM peak and 30% outbound and 70% inbound in the PM Peak.

89 I am satisfied these overall assumptions are appropriate.

90 Given the size of the subject land, traffic distributed from different areas will take different routes through the subject land.

91 I have adopted the local traffic distribution, described in Table 5, associated with external and internal vehicle trips for areas within the subject land.

Table 5: Traffic Distribution Assumptions by Area

Area	Distribution Assumptions
A	• 75% of traffic will access Area A via Tivoli Dr and 25% via Coriyule Rd. • All external vehicle trips will access the external road network via the Tivoli Dr/Portarlington Rd intersection. • 50% of internal vehicle trips will travel to/from the north along Tivoli Dr and 50% to/from the east along Coriyule Rd.
B	• All external vehicle trips will access the road network via Tivoli Dr/Portarlington Rd intersection with 70% of these movements via Coriyule Rd and 30% via Greenvale Dr. • All internal vehicle trips will travel to/from the north along Greenvale Dr with 70% of these movements via Greenvale Dri directly and 30% via Coriyule Rd directly.
C&D	• All external vehicle trips will access the external road network via the Tivoli Dr / Portarlington Rd intersection with 20% of these movements travelling through the Greenvale Dr/Centennial Blvd intersection and 80% of these movements connecting to Greenvale Dr to the south of Centennial Blvd. • 50% of internal vehicle trips will travel to the east via the Greenvale Dr/Centennial Blvd intersection with 50% of these movements filtering to the east via other local roads.
I & II	• For external trips travelling to the west, 80% of vehicles will access the road network via the Tivoli Dr/Portarlington Rd intersection with 20% via Hackwill Pl and Jetty Rd. • For external trips to the east, 20% of vehicles will access the road network via Tivoli Dr / Portarlington Rd intersection with 80% via Hackwill Pl and Jetty Rd.

Area	Distribution Assumptions
	• For internal trips 50% of movements will travel to/from the north via Tivoli Dr and 50% will travel via Hackwill Pl and Jetty Rd.

92 The above traffic distribution assumptions relating to external movements are generally consistent with the exhibited materials traffic report, albeit no specific assumptions relating to internal trips on an area basis were provided.

Post-Development Traffic Volumes

93 The application traffic report adopted a growth rate of 2% for 10 years for through traffic on Portarlington Road. I am satisfied that this is appropriate.

94 This will result in an assessment year of 2034.

95 A review of aerial photography dated 19th October 2023 indicates that approximately 4% of lots within Stage 1 of the Jetty Road Urban Growth Area are still vacant. To account for these lots to be occupied, the existing traffic volumes recorded within and adjacent to the subject land, aside from through traffic on Portarlington Road, have been factored up by 4%.

96 Based on the preceding assessments, the anticipated post development daily and peak hour traffic volumes are outlined in Table 6 and Figure 23 respectively.

Table 6: Anticipated Post-Development Daily Traffic Volumes

Location	Two-Way Ave Weekday Traffic Volume
Tivoli Dr, between Portarlington Rd and the Bellarine Rail Trail	16,591 vehicles per day
Tivoli Dr, between the Bellarine Rail Trail and Coriyule Rd	12,307 vehicles per day
Greenvale Dr, between Coriyule Rd and Centennial Blvd	8,783 vehicles per day

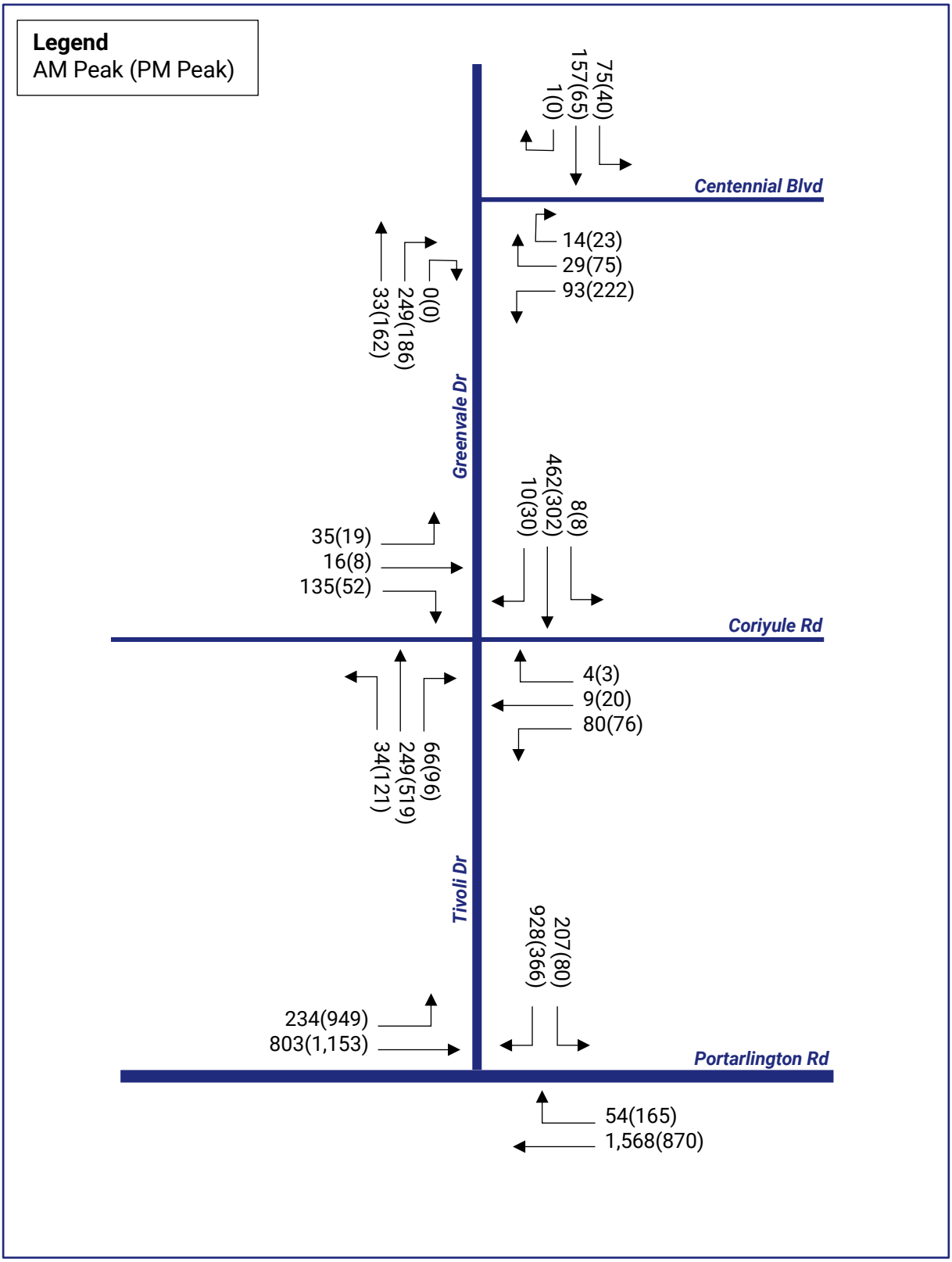


Figure 23: Anticipated Post-Development Peak Hour Traffic Volumes

Peak Hour Traffic Impact Assessment

97 My firm has undertaken a SIDRA assessment of the key intersections serving the subject land based on the anticipated post-development peak hour volumes outlined above and adopting the intersection layouts provided in the development contributions plan report.

98 SIDRA is intersection modelling software widely used within the industry to assess the performance of intersections. A summary of the key outputs of SIDRA analysis is as follows:

- Degree of Saturation (DOS) – The ratio of traffic volume to the practical absorption capacity for a particular movement.
- Average delay.
- 95th percentile queue.

99 Detailed SIDRA outputs are provided at Appendix B to this report.

Portarlington Road/Tivoli Drive Intersection

100 For a signalised intersection, a DOS of up to 0.95 is considered acceptable operating conditions, with a DOS of less than 0.9 considered good operating conditions.

101 I have adopted the following assumptions for the SIDRA model of the Portarlington Road/Tivoli Drive Intersection:

- 5% heavy vehicles for through traffic on Portarlington Road and 2% on all other movements.
- Pedestrian flows of 10 pedestrians per hour on each leg of the intersection with a pedestrian crossing.
- SIDRA assessed optimal signal cycle time between 90 and 120 seconds.

102 All other SIDRA default settings have been retained.

103 A summary of the key SIDRA outputs for the analysis of the Portarlington Road/Tivoli Drive intersection is provided in Table 7.

Table 7: SIDRA Analysis Results - Portarlington Rd/Tivoli Dr

Approach	Movement	DOS		Ave Delay (s)		95th %ile Queue (m)	
		AM	PM	AM	PM	AM	PM
Portarlington Rd (E)	Thru	0.87	0.36	30	6	277	62
	Right	0.47	0.71	53	49	19	56
Tivoli Dr (N)	Left	0.88	0.66	44	42	211	72
	Right	0.88	0.66	44	43	211	72
Portarlington Rd (W)	Left	0.17	0.74	8	13	17	181
	Thru	0.61	0.67	25	19	111	150

104 Based on the above SIDRA results, I am satisfied the proposed Portarlington Road/Tivoli Drive intersection arrangement can appropriately accommodate the anticipated post-development traffic volumes.

Tivoli Drive/Greenvale Drive/Coriyule Road

105 For a roundabout intersection, a DOS of up to 0.95 is considered acceptable operating conditions, with a DOS of less than 0.85 considered good operating conditions.

106 I have adopted the following assumptions for the SIDRA model of the Tivoli Drive/Greenvale Drive/Coriyule Road intersection:

- 2% heavy vehicles on all movements.

107 All other SIDRA default settings have been retained.

108 A summary of the key SIDRA outputs for the analysis of the Tivoli Drive/Greenvale Drive/Coriyule Road intersection is provided in Table 8.

Table 8: SIDRA Analysis Results - Tivoli Dr/Greenvale Dr/Coriyule Rd

Approach	Movement	DOS		Ave Delay (s)		95th %ile Queue (m)	
		AM	PM	AM	PM	AM	PM
Tivoli Dr (S)	Left	0.25	0.53	4	5	11	33
	Thru	0.25	0.53	4	5	11	33
	Right	0.25	0.53	9	9	11	33
Coriyule Rd (E)	Left	0.13	0.11	8	6	6	4
	Thru	0.13	0.11	8	7	6	4
	Right	0.13	0.11	12	11	6	4
Greenvale Dr (N)	Left	0.45	0.30	6	5	23	13
	Thru	0.45	0.30	6	5	23	13
	Right	0.45	0.30	10	10	23	13
Coriyule Rd (W)	Left	0.20	0.11	6	8	8	4
	Thru	0.20	0.11	6	8	8	4
	Right	0.20	0.11	10	12	8	4

109 Based on the above SIDRA results, I am satisfied the proposed Tivoli Drive/Greenvale Drive/Coriyule Road roundabout can appropriately accommodate the anticipated post-development traffic volumes.

110 Given the level of traffic anticipated at this intersection and the Tivoli Drive/Greenvale Drive cross-section proposed, I am satisfied that a roundabout arrangement is the appropriate intersection control to be implemented.

Greenvale Drive/Centennial Boulevard

Roundabout - Assessment

111 I have assessed the capacity of the existing roundabout arrangement at the Greenvale Drive/Centennial Bouelvard intersection to accommodate the anticipated post-development traffic volumes.

112 I have adopted the following assumptions for the SIDRA model of the Greenvale Drive/Centennial Boulevard intersection:

- 2% heavy vehicles on all movements.

113 All other SIDRA default settings have been retained.

114 A summary of the key SIDRA outputs for the analysis of the Greenvale Drive/Centennial Boulevard intersection based on the current roundabout arrangement is provided in Table 9.

Table 9: SIDRA Analysis - Greenvale Dr/Centennial Blvd Existing Roundabout

Approach	Movement	DOS		Ave Delay (s)		95th %ile Queue (m)	
		AM	PM	AM	PM	AM	PM
Centennial Blvd (SE)	Left	0.14	0.26	6	6	5	12
	Right	0.14	0.26	9	8	5	12
Greenvale Dr (NE)	Left	0.25	0.11	7	6	10	4
	Thru	0.25	0.11	7	6	10	4
Greenvale Dr (SW)	Thru	0.22	0.30	5	6	10	13
	Right	0.22	0.30	8	8	10	13

115 Based on the above SIDRA analysis, the current roundabout intersection arrangement can comfortably accommodate the post-development traffic volumes anticipated.

116 Accordingly, there is not a need to upgrade this roundabout to a signalised intersection on a traffic capacity basis.

117 However, I acknowledge the signalisation of this intersection will provide for an improved pedestrian outcome for access to the activity centre when compared to the current roundabout arrangement, by providing controlled crossing points from east to west across Greenvale Drive.

Traffic Signal - Assessment

118 I have assessed this intersection based on the proposed signalised arrangement.

119 I have adopted the following assumptions for the SIDRA model of the signalised arrangement of the Greenvale Drive/Centennial Boulevard Intersection:

- 2% heavy vehicles on all movements.
- Pedestrian flows of 50 pedestrians per hour on each leg of the intersection.
- SIDRA assessed optimal signal cycle time between 90 and 120 seconds.

120 A summary of the key SIDRA outputs for the analysis of the Greenvale Drive/Centennial Boulevard intersection based on the proposed signalised arrangement is provided in Table 10.

Table 10: SIDRA Analysis – Greenvale Dr/Centennial Blvd Intersection –Traffic Signals

Approach	Movement	DOS		Ave Delay (s)		95th %ile Queue (m)	
		AM	PM	AM	PM	AM	PM
Centennial Blvd (SE)	Left	0.09	0.18	14	10	13	23
	Right	0.28	0.25	49	37	14	27
Greenvale Dr (NE)	Left	0.10	0.05	22	21	15	8
	Thru	0.33	0.25	28	38	41	20
Greenvale Dr (SW)	Thru	0.02	0.13	2	7	2	20
	Right	0.33	0.25	24	23	55	39

121 Based on the above SIDRA results, the proposed signalised arrangement can comfortably accommodate the anticipated post-development traffic volumes, while providing an improved pedestrian crossing outcome for access to the activity centre.

Daily Traffic Volumes & Proposed Road Cross-sections

122 The anticipated post-development daily traffic volumes along Tivoli Drive and Greenvale Drive range from approximately 9,000 vehicles per day up to almost 17,000 vehicles per day.

123 These traffic volumes differ from those outlined in the application traffic report due to differences in the anticipated distribution of traffic as well as existing traffic volumes that were used as the basis for the assessment.

124 I am satisfied the proposed ultimate cross-section for Tivoli Drive/Greenvale Drive is appropriate for the volumes anticipated.

Internal Road Cross-Sections

125 The DPO background landscape report outlines cross-sections for roads.

126 The cross-sections for frontage roads along the western interface (McDermotts Road), the Bellarine Rail Trail interface with the southern area of the subject land and the Portarlington Road interface all show a 7.3 metre wide carriageways with single sided residential development.

127 In my experience, it is relatively common practice for roads with residential development on one side only to adopt a 5,5 metre carriageway.

128 In the locations noted above from the landscape report, I am of the view that a 5.5 metre carriageway is an acceptable outcome.

Timing of Road Infrastructure Upgrades

129 The DCP requires the upgrade of Tivoli Drive, including extension of the turn lanes at the Portarlington Road intersection, and Greenvale Drive, as well as the construction of the Tivoli Drive/Greenvale Drive/Coriyule Road intersection be undertaken prior to the issue of Statement of Compliance for the first Stage of the subdivision on the subject land.

130 Greenvale Drive and Tivoli Drive, to the north of the Bellarine Rail Trail are currently constructed and function as local access streets, where they allow for two-way vehicle movement and facilitate property access.

131 A local access street has a notional environmental capacity of 3,000 vehicles per day. The existing traffic volumes on Greenvale Drive (2,395 vehicles per day) and Tivoli Drive, to the north of the Bellarine Rail Trail (3,904 vehicles per day) meet or exceed this capacity.

132 On this basis, it is appropriate the upgrade of these sections of the existing road network to their ultimate form is undertaken as soon as practicable. Further, it is logical the construction of the ultimate Tivoli Drive/Greenvale Drive/Coriyule Road intersection is undertaken concurrently.

133 That said, I am satisfied that some level of development could be supported by these sections of Greenvale Drive and Tivoli Drive in their existing form, from a traffic capacity perspective.

134 The existing section of Tivoli Drive to the south of the Bellarine Rail Trail provides for an unobstructed through traffic lane in each direction with on-street parking only permitted in dedicated bays, and limited direct property access. There are currently no residential lots with access to this section.

135 This arrangement provides a mid block capacity of approximately 20,000 vehicles, and accordingly I am of the view this section of upgrade can occur as the abutting development occurs.

136 I am also of the view that some development of the southern area of the subject land can occur with access via Hackwill Place/Jetty Road, prior to any connection to Tivoli Drive. This timing is consistent with the timing outlined in the DPO rather than the DCP.

137 The level of development that can occur in this area would be dependent on the capacity of Hackwill Place, Jetty Road and nearby intersections.

138 An assessment has been undertaken by others assessing the capacity of Hackwill Place and Jetty Road to accommodate initial stages (in the order of 221 lots) of development in the southern area of the subject land. A copy of the report outlining this assessment is attached at Appendix C.

139 This assessment concludes that Hackwill Place and Jetty Road have sufficient capacity to accommodate the initial stages of development prior to the establishment of links to Tivoli Drive.

140 I agree with the outcomes of this assessment.

141 The assessment of the operation of the intersection of Greenvale Drive and Centennial Boulevard determined there is no need on a traffic (vehicle) basis for the upgrade of this intersection. However, as development progresses in Stage 2, there will be a pedestrian demand created to access the Activity Centre.

142 The conversion of the existing roundabout to traffic signals will better and more safely facilitate these pedestrian movements across Greenvale Drive.

143 The current trigger for the upgrade is nominated as 2,250 lots within the Jetty Road area. I think a more relevant cap would relate to development of lots within 32-70 McDermott Road or 72-100 McDermott Road.

144 I recommend an amendment to this trigger to provide for the traffic signals when up to 500 lots are developed in these land parcels.

145 This recommended trigger effectively retains the current overall trigger (approximately 1,700-1,750 lots are currently developed in Stage 1 with an additional 500 lots in stage 2 equating to the 2,250 lot trigger) but more closely links it to the anticipated pedestrian demands that generate the need for the upgrade.

Layout of Key Local Street Network

146 The framework plan was updated following exhibition and Council's consideration of the submissions with a section of the north-south key local street within the Stockland land removed. This change is illustrated in Figure 24.

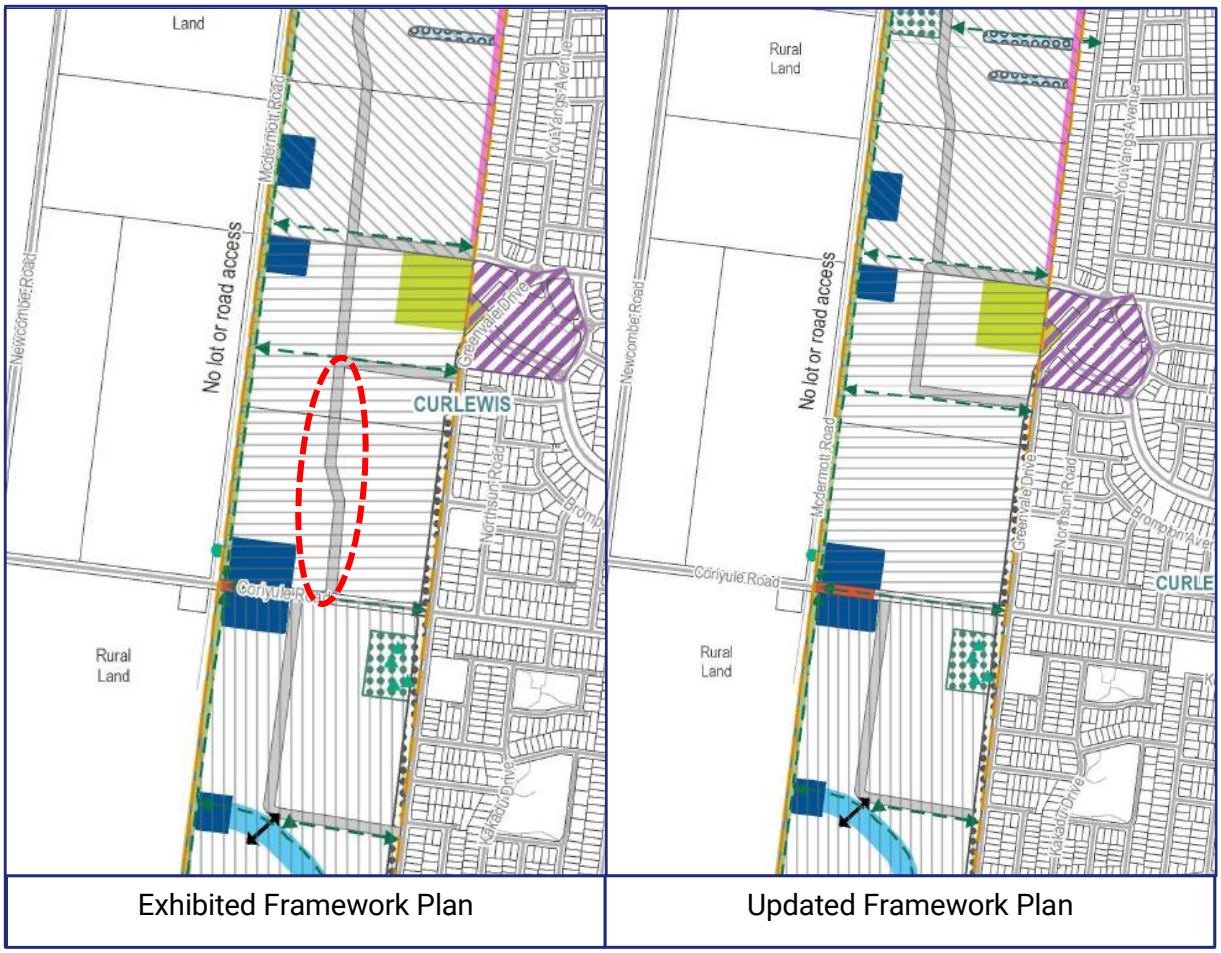


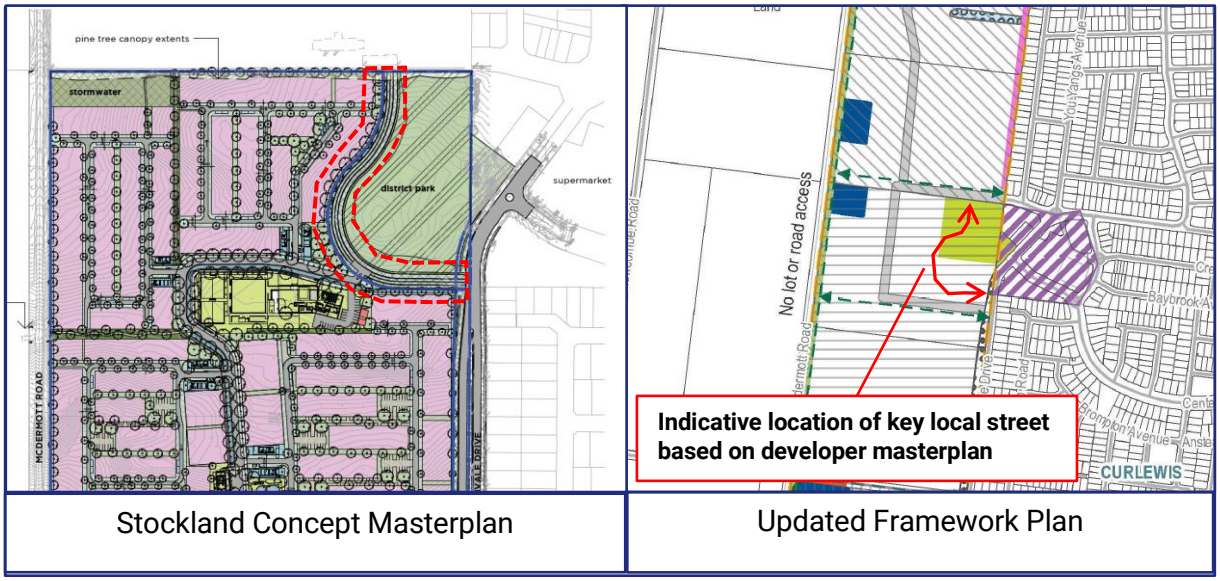
Figure 24: Changes to Key Local Street Network within Stockland Land

147 This change will result in effectively all traffic from the northern end of the subject land using Greenvale Drive, south of the east west key local street (to the south of the district park), whereas the former plan would have allowed some of this traffic to travel through to Coriyule Road before accessing Greenvale Drive / Tivoli Drive.

148 I am comfortable this is an acceptable change, and it will reduce traffic flows in Coriyule Road.

149 The updated key local street network also more closely aligns with the road network envisaged by the Jetty Road Growth Area Structure Plan.

150 I have been provided with a masterplan for the Stockland Concept Masterplan, which includes the district park located immediately west of the existing activity centre and a portion of the key local street network. The masterplan indicates the intention is to provide the key local street abutting the district park, as shown in Figure 25, rather than being offset from the district park as shown in the framework plan.



Stockland Concept Masterplan | Updated Framework Plan

Figure 25: Key Local Street Network Around District Park

151 In my view, this is a sensible change as it is typical to provide public open space (district park) with road abuttals.

152 To this end, I recommend the Framework Plan is amended to illustrate the key local street network wrapping around the park, rather than removed from it.

153 The Stockland Concept Masterplan indicates a 14 metre road reserve width for the key local street fronting the district park, which I understand is to be widened to 14.5 metres.

154 The cross-section presented allows for a 3 metre traffic lane in each direction with a 2.3 metre wide indented car parking on the park side and a footpath on the residential side only. A footpath is indicated on the park side, however this is within the park and not the road reserve.

155 I am satisfied this is an acceptable cross-section for a road with development on one side only.

Lot Access to External Road Network and Key Internal Roads

Impact on Existing Properties Along Tivoli Drive/Greenvale Drive

156 A number of existing properties located on the east side of Tivoli Drive, to the north of the Bellarine Rail Trail, and Greenvale Drive take access directly to Tivoli Drive/Greenvale Drive. These properties currently have fully directional access to Tivoli Drive/Greenvale Drive.

157 The construction of the ultimate cross-section of Tivoli Drive/Greenvale Drive with a median strip will limit access to these properties to a left-IN, left-OUT arrangement only.

158 The exhibited materials traffic report includes an access management strategy plan, reproduced at Figure 26.

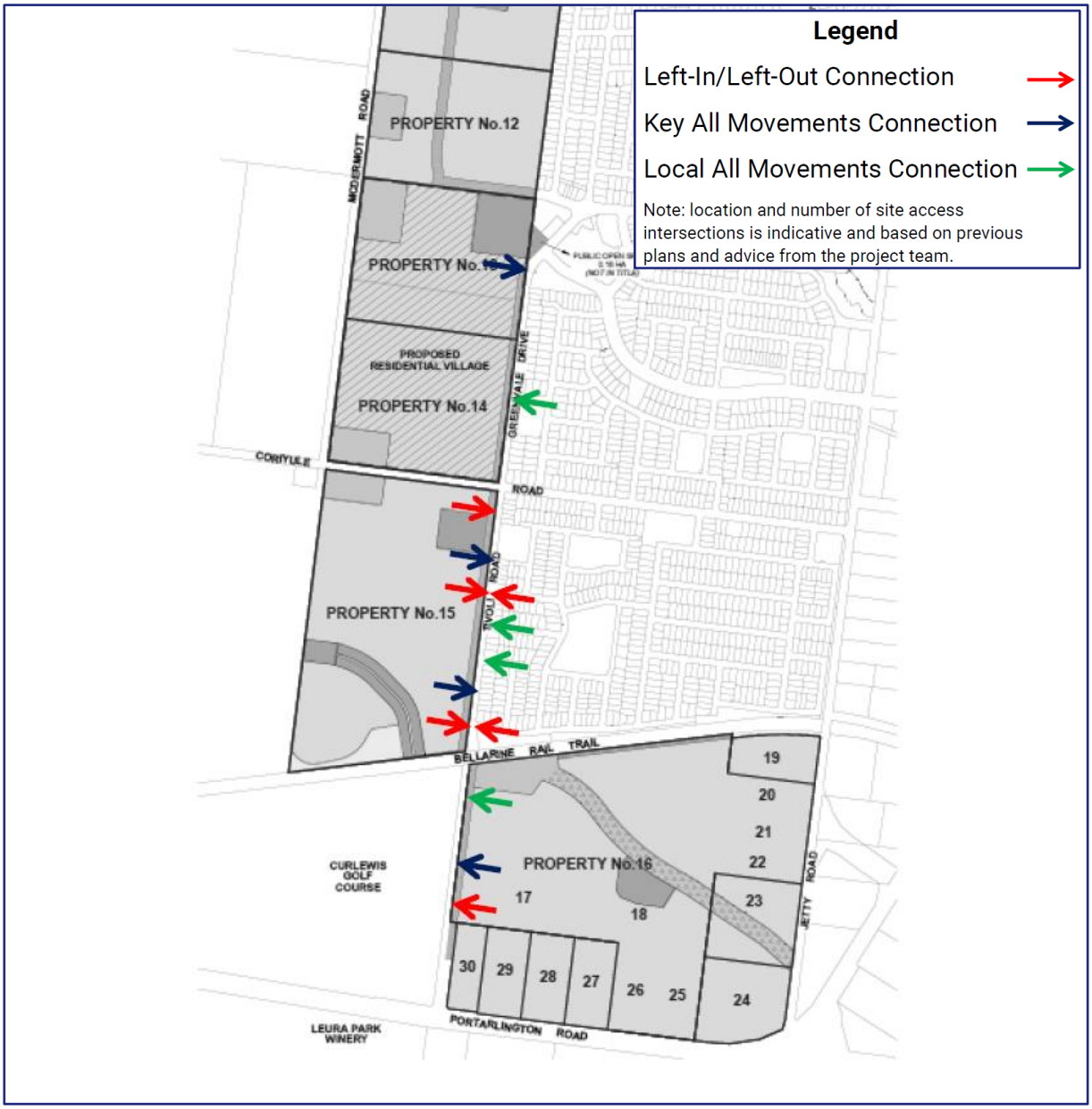


Figure 26: Exhibited Materials Traffic Report Tivoli Dr/Greenvale Dr Access Strategy

159 I am satisfied this access strategy provides an acceptable outcome with reasonably proximate U-turn opportunities provided for existing properties.

Access from Subject Land to Tivoli Drive/Greenvale Drive

160 Tivoli Drive/Greenvale Drive will ultimately carry significant traffic volumes and its primary function within the Jetty Road Urban Growth Area will be to carry traffic between the urban growth area and Portarlington Road.

161 Accordingly, direct lot access from Tivoli Drive/Greenvale Drive should be minimised and preferentially taken from the lower order internal street where possible.

Access Directly to Portarlington Road

162 The framework plan includes a vegetation interface treatment along the entire frontage of the subject land to Portarlington Road as well as notation of *'No lot or road access'*.

163 Portarlington Road is a Transport Zone 2 (TRZ2) and accordingly, any application to create or alter access to Portarlington Road would require a permit under Clause 52.29 of the Greater Geelong Planning Scheme. Approval of any such access would be subject to review by the Department of Transport and Planning.

164 In this regard, there are existing mechanisms within the Planning Scheme to ensure that inappropriate access to Portarlington Road is not established.

165 Therefore, I am of the view it is not necessary to further constrain access to Portarlington Road. Some non-residential land uses permitted within a residential zone would benefit by direct access to Portarlington Road, rather than being required to access from the local street network.

166 I recommend the Framework Plan is updated accordingly.

Pedestrian & Cycling Considerations

167 The Framework Plan illustrates a connective shared user path network that provides a north-south connection between the foreshore and Bellarine Rail Trail, as well a series of east-west connections between the path adjacent McDermotts Road and Greenvale Drive / Tivoli Drive.

168 I am generally satisfied with the shared path network, however the following changes could be considered.

- The shared path along McDermott Road is contained in private land. The existing verge on the eastern side of McDermott Road is in the order of 7.5 metres wide and is generally devoid of vegetation. This width is more than sufficient to accommodate a shared path and I am of the view this is a more logical outcome, rather than the path be in private land.
- There is a single tree in the southern section of McDermott Road within the verge, which may require a localised diversion of the shared path to retain the tree. Figure 27 illustrates a potential path solution around the tree.
- Removal of the east-west shared path connection within the Stockland land parcel. There is sufficient east-west connectivity provided by the paths on the extension of Oceania Drive and Coriyule Road.

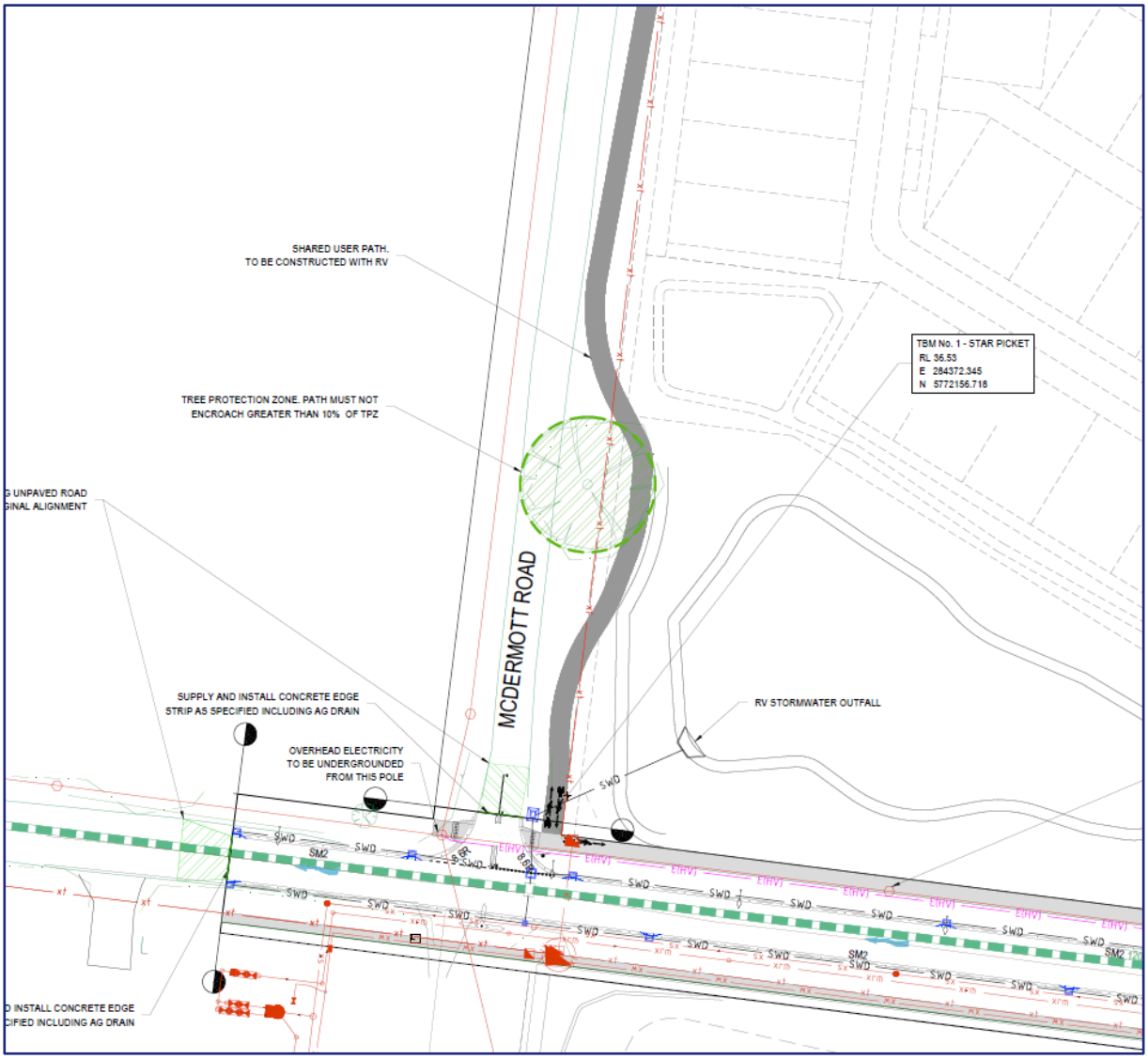


Figure 27: Shared Path Alignment Around Significant Tree

Response to Submissions

169 Council's delegate report provides a summary of submissions into the following key themes:

- Childrens and Community Hub.
- Coriyule Road, Tivoli Drive and Greenvale Drive.
- DPO46 requested changes.
- DCP requested changes.

170 I have considered the submission summaries provided by Council's delegate report relating to Coriyule Road, Tivoli Drive and Greenvale Drive as well as requested traffic engineering related changes to DPO46 and DCP.

Coriyule Road

Submission Summary

171 Coriyule Road is a local east-west road bisecting the growth area connecting to Hermsley Road at it's western end. Hermsley Road then connects to the signalised intersection at Portarlington Road. The Traffix Group engineering assessment report (Nov 2022) describes the road west of Tivoli/ Greenvale Drive as an unsealed carriageway which is sufficiently wide to accommodate simultaneous two-way movements with a posted speed limit of 80 km/h.

172 Submission no's 14, 22, 33 and 35 request that Coriyule Road west of McDermott Road (i.e., beyond the western edge of Jetty Rd Stage 2) be sealed to Hermsley Road. Submitters 22 and 35 propose the road be formalised as an east-west connection to the growth area and submitter 22 suggests developers should partly fund the cost. Submission no. 42 on the other hand is concerned the proposed traffic calming alone will be insufficient to divert vehicles away from Coriyule Road.

Response

173 McDermott Road provides a clear break between the proposed urban and rural uses in Coriyule Road. Coriyule Road to the west of McDermott Road will remain a gravel carriageway consistent with the rural nature of the area.

174 In my view this is an appropriate response and the growth area should not be encouraging traffic to use Coriyule Road west of McDermott Road. That is not to say that some future residents may choose to use this road, but if it was sealed it would likely attract more traffic.

175 Having regard to the above, I am satisfied the updated framework plan provides the appropriate outcome for Coriyule Road and that the inclusion of a traffic calming device to deter the use of Coriyule Road to the west of McDermotts Road is the appropriate traffic management approach.

176 That said, I have reviewed the Coriyule Road cross section provided in the exhibited materials Traffic Report and am of the view that the proposed slow point should have a minimum width of 4.0 metres, rather than the 2.5 metres shown.

177 Four metres will operate as a single lane but will comfortably provide for commercial / farm vehicles which can be up to 2.5 metres wide.

Tivoli Drive and Greenvale Drive

Submission Summary

178 Several submitters raise issues related to the planned duplication of Tivoli Drive and Greenvale Drive, though there is general support for a boulevard road as shown in the Traffic engineering assessment cross-section. Submission no. 1 suggests a mechanism for upgrading the road is needed should the upgrade be required prior to development of abutting land.

179 Submissions 14, 22, 25 and 33 say noise and speed mitigation measures are required to prevent dangerous driving or the road is a safety hazard. Two submitters (22 and 35) highlight safety issues at the Tivoli Drive crossing of the Bellarine Rail Trail. Submitters 14 and 22 suggest Tivoli Drive design changes to include service lanes and roundabouts to serve entry streets respectively.

Response

180 The section 173 agreements in place provide an appropriate mechanism for the early delivery of the Tivoli Drive and Greenvale Drive upgrades.

181 I am of the view the ultimate cross-section proposed for Tivoli Drive/Greenvale Drive is appropriate having regard to its function as the primary road serving the subject land.

182 I do not consider the inclusion of roundabouts at all local road intersections with Tivoli Drive/Greenvale Drive necessary and, as expressed previously, I am of the opinion the indicative access strategy outlined in the application traffic report is appropriate.

183 Council's response to submissions includes a markup from Council's traffic engineer showing changes to the proposed crossing at the Bellarine Rail Trail provided in the application traffic report. This markup is shown in Figure 28.

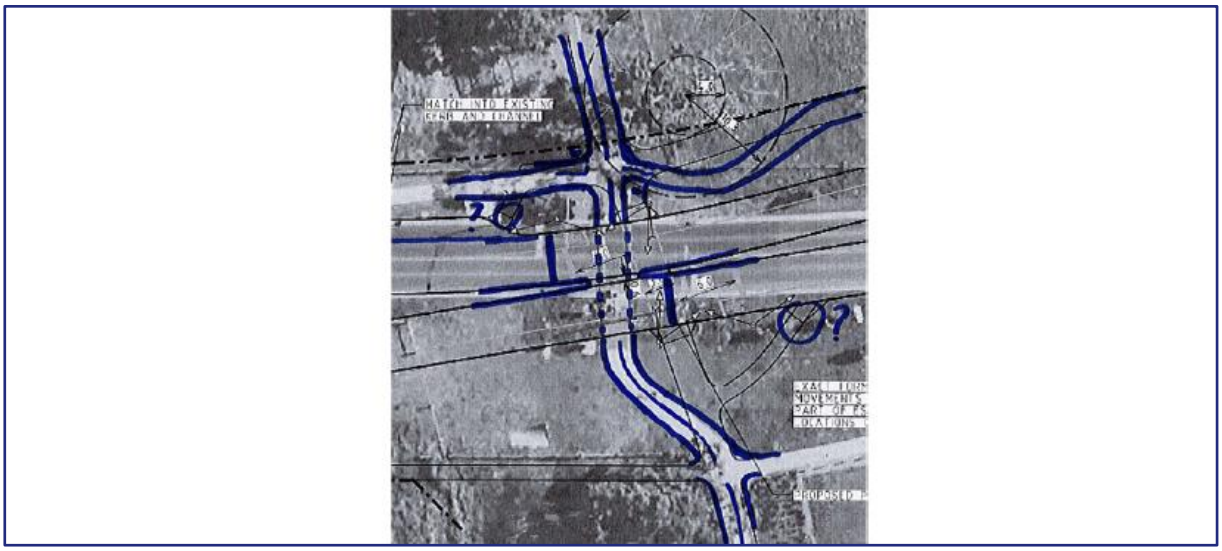


Figure 28: Council Traffic Engineers Markup of Bellarine Rail Trail Crossing Treatment

184 I recommend that a road safety audit is undertaken at the functional or detailed design stage to ensure the safety of the crossing for all users is considered in detail.

DPO46 Requested Changes

Submission Summary (Submission No.1 – Property 12)

185 The submitter suggests the road reserve shown traversing along the southern boundary of 32-70 McDermott Road (the owner's property) be moved to the south and shared between the property and 72-100 McDermott Road. It is requested that details be provided on how the residential interface will to be treated while the property remains undeveloped and used for agricultural purposes.

Response

186 The indicative key local street in this location aligns with the location of the existing Oceania Drive carriageway abutting the eastern edge of the subject land.

187 Furthermore, for practical construction it is better for the road to be contained in a single property.

188 On this basis, it is logical for this street to remain where it is currently shown in the framework plan.

Submission Summary (Submission No. 7 – Stockland Property 13 & 14)

189 Stockland supports the drafting of specific Residential village provisions in principle but submits that there should be adjustments to the drafting. Alternative drafting is provided, including associated Urban Design Masterplan provisions. The changes include removal of the north south road, removal of the restriction of a residential village not being located within 100m of the district park and adjustment to the western interface to McDermott Road.

Response

190 I am of opinion the removal of the north-south road, as outlined in the updated framework plan and my recommended changes, is appropriate.

Submission Summary (Submission No. 53 – Property 30)

191 The submission highlights Map 1 which reads 'no lot or road access' to Portarlington Road and the corresponding requirement at Clause 4.0, saying DPO46 should be drafted to relate to 'residential' lot access more specifically. Also submits the Portarlington Road/Tivoli Drive plan contained in Appendix E of the Traffix Group Traffic Development Plan Report should be amended to show a left-out access from the site onto Portarlington Road.

192 Regarding access to Tivoli Drive requirements, it is submitted that a right-turn-lane from Tivoli Drive to the site is imperative. Therefore, DPO46 and the Portarlington Road/Tivoli Drive plan should be amended to refer to the right-turn-lane to facilitate direct access to the site. A further Tivoli Drive change is that the timing requirement to complete upgrade of the road should not be applied where a non-residential use is proposed.

Response

193 Any lot access directly to Portarlington Road can be considered at the application stage and, as expressed previously, there are appropriate mechanisms within the Planning Scheme for this arrangement to be assessed.

194 As expressed in my evidence above, I am of the view that the framework plan should be updated so that direct access to Portarlington is not expressly prohibited.

195 Similarly, any access to the subject land from Tivoli Drive can be considered at the application stage and I do not consider it necessary at this time for changes to be made to the plans included in the application traffic report.

196 My view on the timing of upgrades to Tivoli Drive is outlined above.

DPO Requested Changes

Submission Summary (Submission No 32 - Property 11)

197 In line with typical arrangements whereby standard collector roads are not DCP funded items, we do not support the inclusion of the Tivoli Drive and Greenvale Drive works forming part of the DCP. Tivoli Drive – Rail Trail to Coriyule Road (RD-01 & RD-01-L), Greenvale Drive (RD-02 & RD-02-L) and Tivoli Drive - Portarlington Rd to Rail trail (RD-03 & RD-03-L) generally have development fronting the subject road (subject to retirement village outcomes) and as such should be developer funded.

Response

198 Tivoli Drive and Greenvale Drive are nominated as a 'primary road' within the Jetty Road Urban Growth Plan. While typically only arterial roads would be included as DCP items, it is my view that there is a clear nexus between the need for the upgrade of Tivoli Drive/Greenvale Road and the development of the subject land as a whole.

199 In this instance, I am of the view the inclusion of works associated with the upgrade of Tivoli Drive and Greenvale Drive in the DCP is appropriate.

Conclusions

200 Having undertaken a traffic engineering assessment of the proposed Planning Scheme Amendment for Stage 2 of the Jetty Road Urban Growth Area, I am of the opinion that:

a) The subject land is likely to generate in the order of 17,209 daily and 1,721 peak hour vehicle movements.

b) The key road network upgrade works identified in the exhibited material to serve the subject land are appropriate for the accommodation of future traffic volumes.

c) The upgrade of the southern section of Tivoli Drive (RD-03), between Portarlington Road and the Bellarine Rail Trail, could be delayed until abutting development occurs.

d) The upgrade of the Greenvale Drive/Centennial Boulevard roundabout to a signalised intersection (RD-04) should be tied to the development of land parcels immediately west of the activity with a suggested trigger being the development of 500 lots within lots within 32-70 McDermott Road or 72-100 McDermott Road.

e) The timings of the upgrade of the northern section of Tivoli Drive (RD-02), between the Bellarine rail trail and Coriyule Road, Greenvale Drive (RD-01) and the Tivoli Drive/Greenvale Drive/Coriyule Road intersection (RD-05) specified in the DCP are appropriate.

f) The framework plan is generally appropriate from a traffic engineering perspective but should be updated as follows:

   i) The key local street layout in the vicinity of the district park should be amended to align with the masterplan prepared by Stockland.

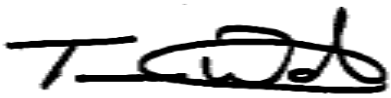
   ii) The vegetation interface treatment along the Portarlington Road frontage of the subject land as well as notation of *'No lot or road access'* should be removed.

   iii) The shared path on the western side of Framework Plan should be shown in the McDermott Road road reserve.

   iv) The east-west shared path connection within the Stockland land parcel should be removed.

g) There are no traffic engineering reasons to refuse the proposed Amendment to the Planning Scheme for Stage 2 of the Jetty Road Urban Growth Area, subject to the above recommendations.

201 I have made all the inquiries that I believe are desirable and appropriate and there are no matters of significance I regard as relevant, which to the best of my knowledge, have been withheld from the Panel.



JASON LEE WALSH
DIRECTOR
TRAFFIX GROUP
5 APRIL 2024

Appendix A
Qualifications & CV

Name

Jason Lee Walsh - Director, Traffix Group Pty Ltd

Address

Level 28, 459 Collins Street

MELBOURNE

VICTORIA 3000

Qualifications

My educational qualifications and membership of professional associations are as follows:-

- Bachelor of Civil Engineering, Monash University
- Bachelor of Science, Monash University
- Fellow, Victorian Planning & Environmental Law Association

Experience

I have over 25 years experience in Traffic Engineering including:

- 1995-2000 at Turnbull Fenner (now Traffix Group), including short term placements at the cities of Bayside and Whittlesea.
- 2000-2011 at Grogan Richards Pty Ltd (now Cardno).
- 2011-present at Traffix Group.

Areas of Expertise

- Car parking and Traffic.
- Traffic advice and assessment of land uses and development proposals to planning authorities, government agencies, corporations and developers (including major residential, retail, food and drink, commercial, industrial, institutional and mixed use projects).
- Preparation and presentation of evidence before VCAT and Panels.

Expertise to Prepare this Assessment

My experience and expertise over the past 25 years, including involvement with varied forms of developments, qualifies me to comment on the traffic implications of the proposed development.

Instructions

I was instructed by Norton Rose Fullbright on behalf of SOHO Living, Stockland and APD Projects to undertake a traffic engineering assessment and prepare an evidence statement for the proposed Planning Scheme Amendment C387GGEE.

Facts, Matters and Assumptions Relied Upon

- Amendment material.
- Jetty Road Stage 2 Urban Growth Area Framework Plan.
- Jetty Road Urban Growth Area Stage 2 – Development Contributions Plan.
- Section 173 Agreements relating to the early delivery of Tivoli Drive / Greenvale Drive.
- Jetty Road Urban Growth Plan (Adopted 26 June 2007 and Amended 23 September 2008).
- Traffix Group Reports (Traffic Engineering Assessment; Future Residential Subdivisions Jetty Road, Curlewis: Stage 2; and Development Plan Report).
- Submissions.
- Council's consideration of submissions, including updated Framework Plan.
- Stockland Masterplan.
- Greater Geelong Planning Scheme.
- Site inspection.
- Relevant experience.

Documents Taken into Account

See above.

Identity of Persons Undertaking Work

Jason Walsh as per the evidence statement.

Marcus Koorn (Senior Traffic Engineer, Traffix Group) assisted with preparation of the evidence report.

Summary of Opinions

See Conclusions section of the evidence statement.

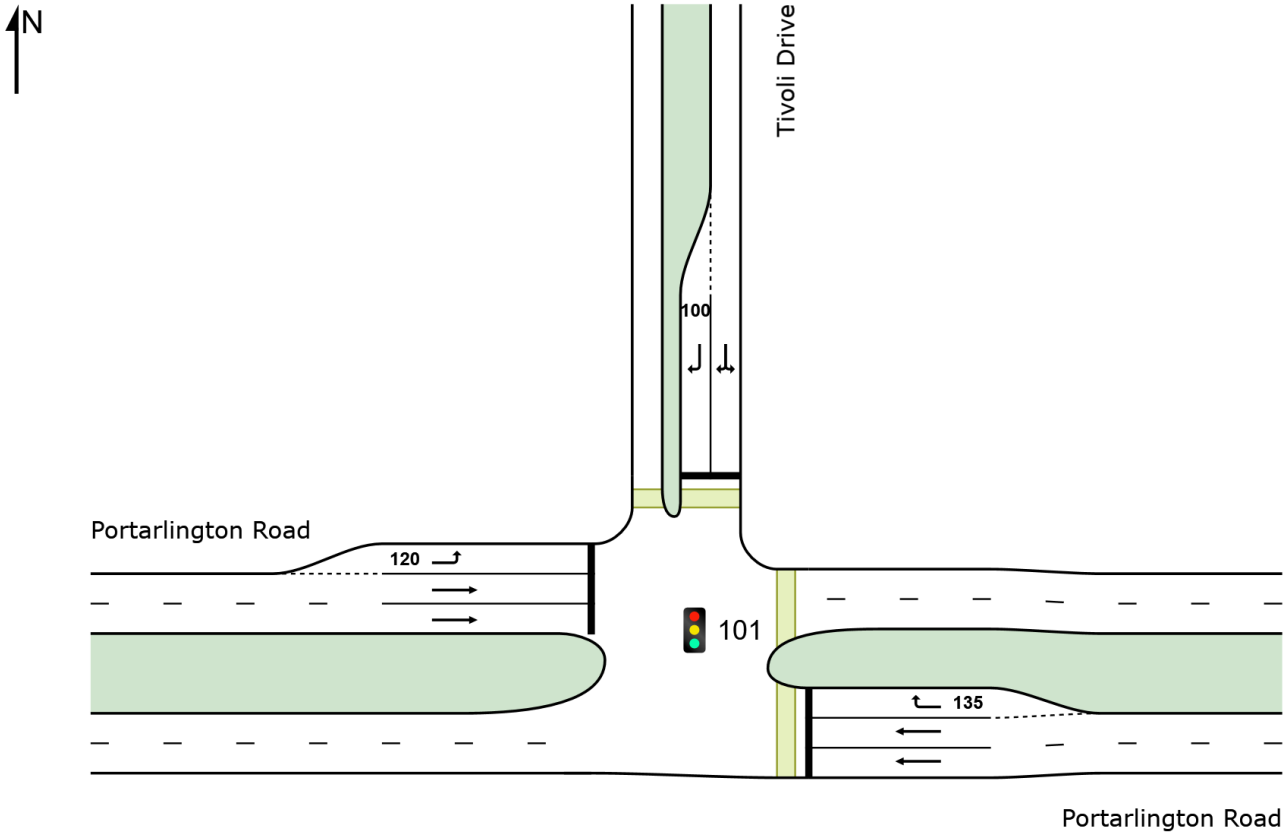
Appendix B
SIDRA Summaries

SITE LAYOUT

Site: 101 [Portarlington/Tivoli - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [Portarlington/Tivoli - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Portarlington Road														
5	T1	1568	5.0	1651	5.0	*0.874	30.2	LOS C	38.0	277.1	0.96	0.99	1.10	40.1
6	R2	54	2.0	57	2.0	0.466	52.6	LOS D	2.6	18.5	1.00	0.75	1.00	31.7
Approach		1622	4.9	1707	4.9	0.874	31.0	LOS C	38.0	277.1	0.96	0.98	1.10	39.7
North: Tivoli Drive														
7	L2	207	2.0	218	2.0	0.876	43.6	LOS D	29.7	211.2	1.00	0.98	1.21	34.4
9	R2	928	2.0	977	2.0	*0.876	44.2	LOS D	29.7	211.2	1.00	0.98	1.21	34.2
Approach		1135	2.0	1195	2.0	0.876	44.1	LOS D	29.7	211.2	1.00	0.98	1.21	34.3
West: Portarlington Road														
10	L2	234	2.0	246	2.0	0.168	7.8	LOS A	2.4	17.4	0.25	0.65	0.25	51.9
11	T1	803	5.0	845	5.0	0.610	25.2	LOS C	15.2	111.2	0.87	0.76	0.87	42.4
Approach		1037	4.3	1092	4.3	0.610	21.2	LOS C	15.2	111.2	0.73	0.73	0.73	44.2
All Vehicles		3794	3.9	3994	3.9	0.876	32.2	LOS C	38.0	277.1	0.91	0.91	1.03	39.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Portarlington Road												
P21	Stage 1	10	11	39.2	LOS D	0.0	0.0	0.93	0.93	201.4	210.9	1.05
P22	Stage 2	10	11	39.2	LOS D	0.0	0.0	0.93	0.93	198.9	207.6	1.04
North: Tivoli Drive												
P31	Stage 1	10	11	39.2	LOS D	0.0	0.0	0.93	0.93	198.9	207.6	1.04
P32	Stage 2	10	11	39.2	LOS D	0.0	0.0	0.93	0.93	196.4	204.3	1.04
All Pedestrians		40	42	39.2	LOS D	0.0	0.0	0.93	0.93	198.9	207.6	1.04

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Portarlington/Tivoli - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

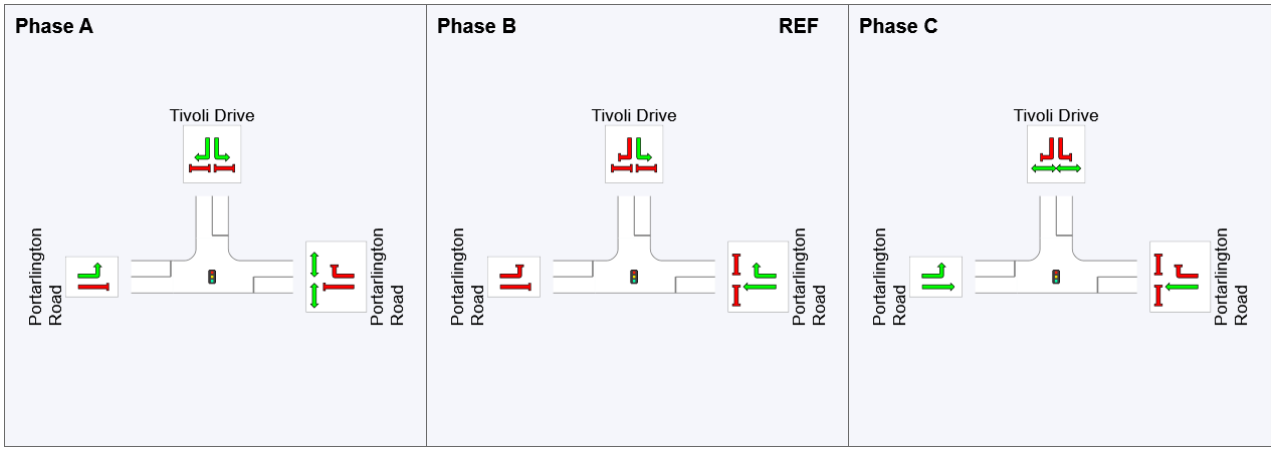
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	51	0	12
Green Time (sec)	33	6	33
Phase Time (sec)	39	12	39
Phase Split	43%	13%	43%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

MOVEMENT SUMMARY

Site: 101 [Portarlington/Tivoli - PM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Portarlington Road														
5	T1	870	5.0	916	5.0	0.358	6.5	LOS A	8.4	61.6	0.46	0.40	0.46	54.2
6	R2	165	2.0	174	2.0	* 0.711	49.1	LOS D	7.9	55.9	1.00	0.86	1.12	32.7
Approach		1035	4.5	1089	4.5	0.711	13.3	LOS B	8.4	61.6	0.54	0.48	0.56	49.0
North: Tivoli Drive														
7	L2	80	2.0	84	2.0	0.658	42.0	LOS D	10.1	72.0	0.97	0.84	1.00	34.9
9	R2	366	2.0	385	2.0	0.658	42.9	LOS D	10.1	72.0	0.98	0.84	1.00	34.6
Approach		446	2.0	469	2.0	0.658	42.8	LOS D	10.1	72.0	0.97	0.84	1.00	34.7
West: Portarlington Road														
10	L2	949	2.0	999	2.0	* 0.744	13.1	LOS B	25.5	181.3	0.64	0.80	0.64	48.2
11	T1	1153	5.0	1214	5.0	0.673	19.4	LOS B	20.5	149.5	0.83	0.74	0.83	45.5
Approach		2102	3.6	2213	3.6	0.744	16.6	LOS B	25.5	181.3	0.74	0.77	0.74	46.7
All Vehicles		3583	3.7	3772	3.7	0.744	18.9	LOS B	25.5	181.3	0.71	0.69	0.72	45.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Portarlington Road												
P21	Stage 1	10	11	39.2	LOS D	0.0	0.0	0.93	0.93	201.4	210.9	1.05
P22	Stage 2	10	11	39.2	LOS D	0.0	0.0	0.93	0.93	198.9	207.6	1.04
North: Tivoli Drive												
P31	Stage 1	10	11	39.2	LOS D	0.0	0.0	0.93	0.93	198.9	207.6	1.04
P32	Stage 2	10	11	39.2	LOS D	0.0	0.0	0.93	0.93	196.4	204.3	1.04
All Pedestrians		40	42	39.2	LOS D	0.0	0.0	0.93	0.93	198.9	207.6	1.04

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Portarlington/Tivoli - PM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

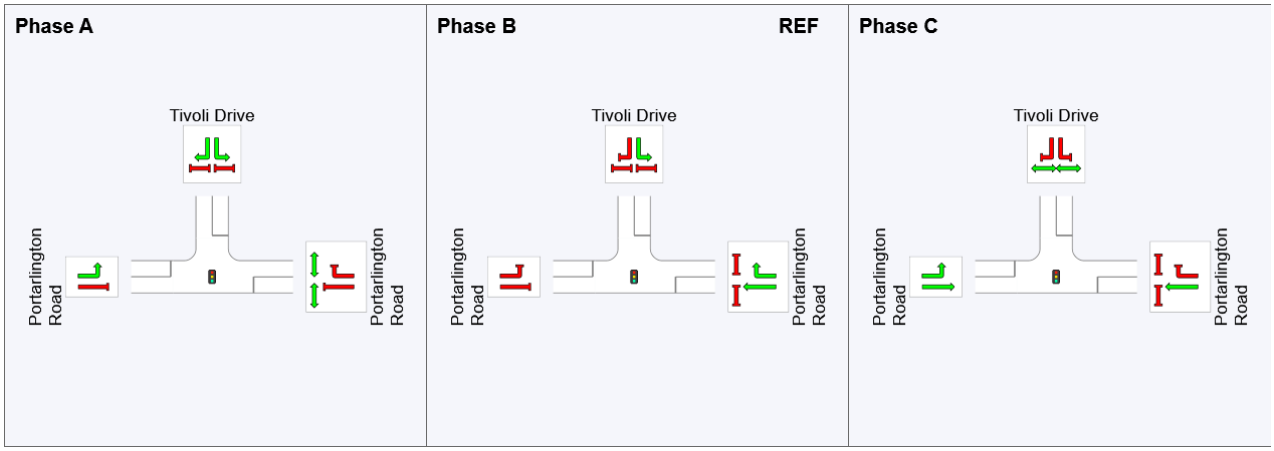
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

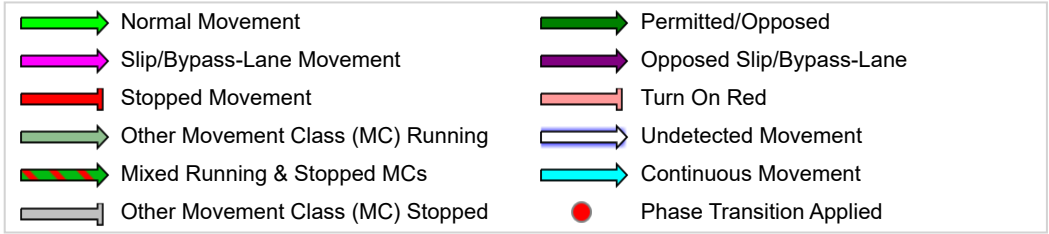
Phase	A	B	C
Phase Change Time (sec)	67	0	18
Green Time (sec)	17	12	43
Phase Time (sec)	23	18	49
Phase Split	26%	20%	54%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

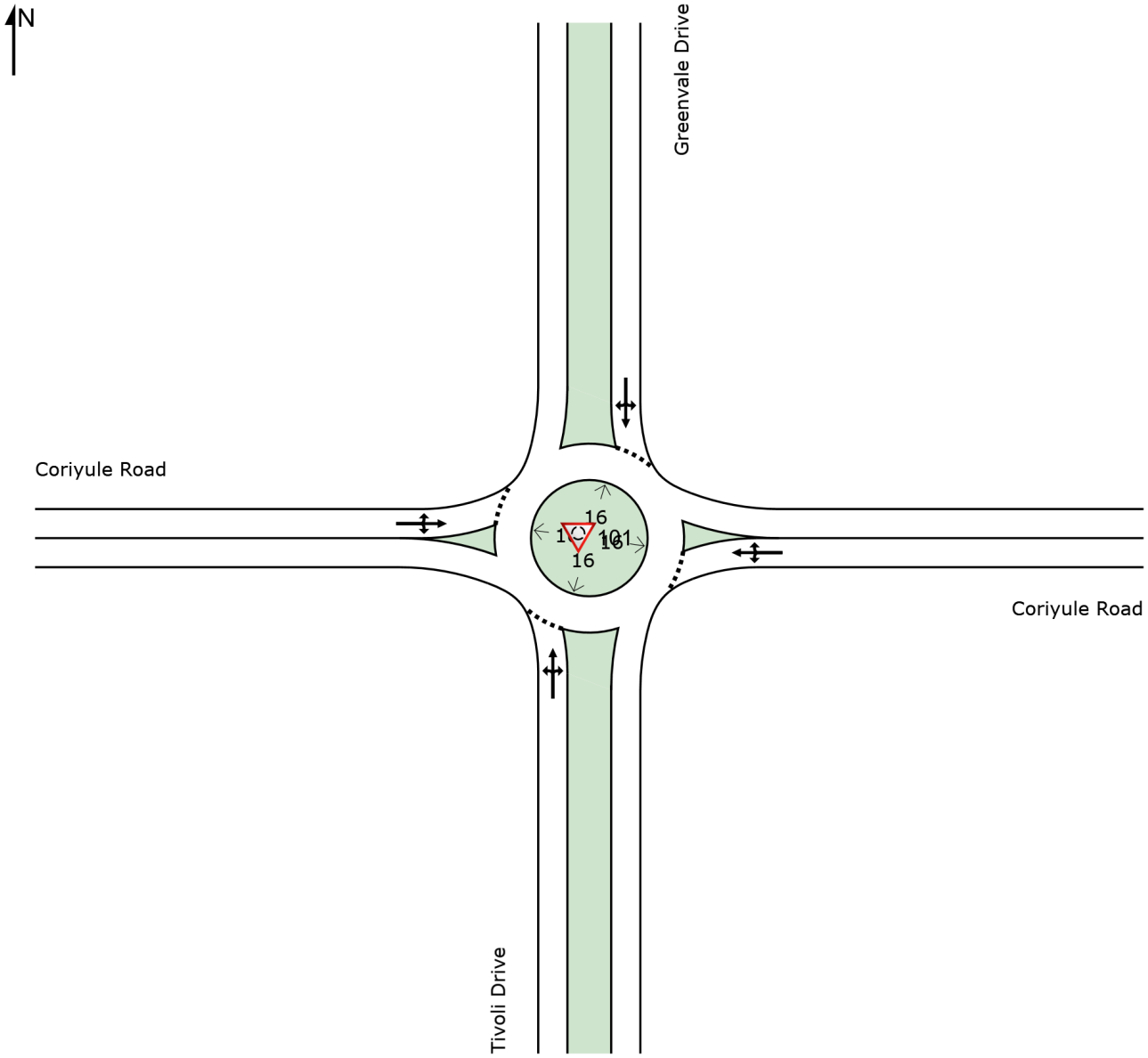


SITE LAYOUT

Site: 101 [Tivoli/Greenvale/Coriyule - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [Tivoli/Greenvale/Coriyule - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tivoli Drive														
1	L2	34	2.0	36	2.0	0.245	4.2	LOS A	1.5	11.0	0.13	0.47	0.13	53.8
2	T1	249	2.0	262	2.0	0.245	4.4	LOS A	1.5	11.0	0.13	0.47	0.13	55.0
3	R2	66	2.0	69	2.0	0.245	8.6	LOS A	1.5	11.0	0.13	0.47	0.13	54.8
Approach		349	2.0	367	2.0	0.245	5.2	LOS A	1.5	11.0	0.13	0.47	0.13	54.8
East: Coriyule Road														
4	L2	80	2.0	84	2.0	0.132	8.0	LOS A	0.8	5.5	0.69	0.73	0.69	51.9
5	T1	9	2.0	9	2.0	0.132	8.2	LOS A	0.8	5.5	0.69	0.73	0.69	53.0
6	R2	4	2.0	4	2.0	0.132	12.3	LOS B	0.8	5.5	0.69	0.73	0.69	52.8
Approach		93	2.0	98	2.0	0.132	8.2	LOS A	0.8	5.5	0.69	0.73	0.69	52.0
North: Greenvale Drive														
7	L2	8	2.0	8	2.0	0.454	5.8	LOS A	3.2	23.1	0.55	0.59	0.55	52.5
8	T1	462	2.0	486	2.0	0.454	6.0	LOS A	3.2	23.1	0.55	0.59	0.55	53.6
9	R2	10	2.0	11	2.0	0.454	10.1	LOS B	3.2	23.1	0.55	0.59	0.55	53.4
Approach		480	2.0	505	2.0	0.454	6.1	LOS A	3.2	23.1	0.55	0.59	0.55	53.6
West: Coriyule Road														
10	L2	35	2.0	37	2.0	0.196	6.0	LOS A	1.1	7.5	0.50	0.69	0.50	51.2
11	T1	16	2.0	17	2.0	0.196	6.3	LOS A	1.1	7.5	0.50	0.69	0.50	52.3
12	R2	135	2.0	142	2.0	0.196	10.4	LOS B	1.1	7.5	0.50	0.69	0.50	52.1
Approach		186	2.0	196	2.0	0.196	9.2	LOS A	1.1	7.5	0.50	0.69	0.50	51.9
All Vehicles		1108	2.0	1166	2.0	0.454	6.5	LOS A	3.2	23.1	0.42	0.58	0.42	53.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Tivoli/Greenvale/Coriyule - PM Peak (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tivoli Drive														
1	L2	121	2.0	127	2.0	0.534	4.5	LOS A	4.6	32.8	0.29	0.47	0.29	53.4
2	T1	519	2.0	546	2.0	0.534	4.7	LOS A	4.6	32.8	0.29	0.47	0.29	54.5
3	R2	96	2.0	101	2.0	0.534	8.9	LOS A	4.6	32.8	0.29	0.47	0.29	54.3
Approach		736	2.0	775	2.0	0.534	5.2	LOS A	4.6	32.8	0.29	0.47	0.29	54.3
East: Coriyule Road														
4	L2	76	2.0	80	2.0	0.113	6.3	LOS A	0.6	4.3	0.54	0.63	0.54	53.1
5	T1	20	2.0	21	2.0	0.113	6.5	LOS A	0.6	4.3	0.54	0.63	0.54	54.2
6	R2	3	2.0	3	2.0	0.113	10.6	LOS B	0.6	4.3	0.54	0.63	0.54	54.0
Approach		99	2.0	104	2.0	0.113	6.5	LOS A	0.6	4.3	0.54	0.63	0.54	53.3
North: Greenvale Drive														
7	L2	8	2.0	8	2.0	0.303	5.1	LOS A	1.9	13.2	0.40	0.52	0.40	53.0
8	T1	302	2.0	318	2.0	0.303	5.3	LOS A	1.9	13.2	0.40	0.52	0.40	54.1
9	R2	30	2.0	32	2.0	0.303	9.5	LOS A	1.9	13.2	0.40	0.52	0.40	53.9
Approach		340	2.0	358	2.0	0.303	5.7	LOS A	1.9	13.2	0.40	0.52	0.40	54.1
West: Coriyule Road														
10	L2	19	2.0	20	2.0	0.110	8.0	LOS A	0.6	4.4	0.67	0.75	0.67	50.1
11	T1	8	2.0	8	2.0	0.110	8.3	LOS A	0.6	4.4	0.67	0.75	0.67	51.1
12	R2	52	2.0	55	2.0	0.110	12.4	LOS B	0.6	4.4	0.67	0.75	0.67	50.9
Approach		79	2.0	83	2.0	0.110	10.9	LOS B	0.6	4.4	0.67	0.75	0.67	50.7
All Vehicles		1254	2.0	1320	2.0	0.534	5.8	LOS A	4.6	32.8	0.37	0.51	0.37	53.9

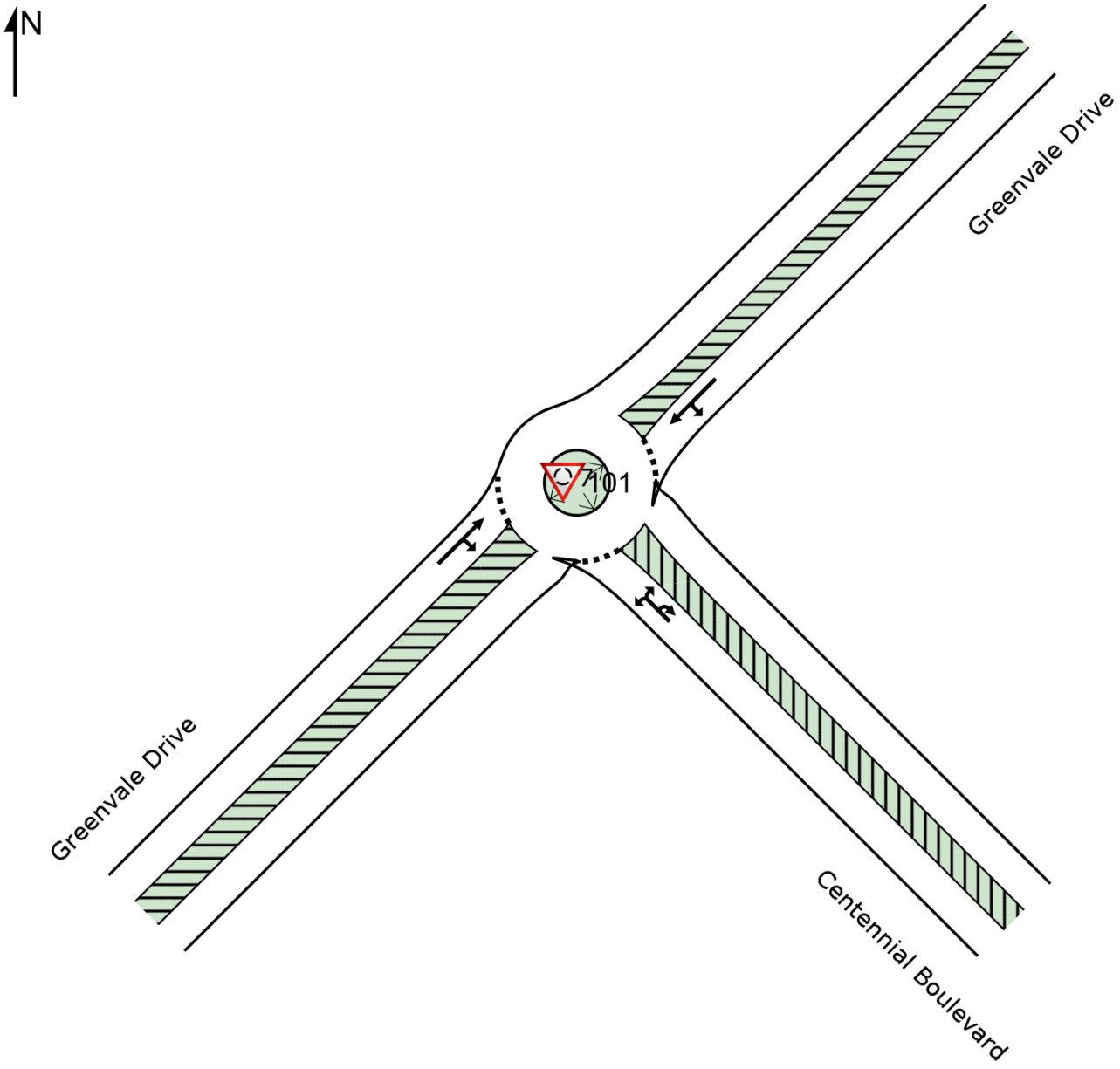
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Greenvale/Centennial - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [Greenvale/Centennial - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Centennial Boulevard														
21	L2	93	2.0	98	2.0	0.137	6.1	LOS A	0.7	5.3	0.38	0.61	0.38	51.8
23	R2	29	2.0	31	2.0	0.137	8.6	LOS A	0.7	5.3	0.38	0.61	0.38	52.1
23u	U	14	2.0	15	2.0	0.137	10.1	LOS B	0.7	5.3	0.38	0.61	0.38	52.5
Approach		136	2.0	143	2.0	0.137	7.0	LOS A	0.7	5.3	0.38	0.61	0.38	51.9
NorthEast: Greenvale Drive														
24	L2	75	2.0	79	2.0	0.254	7.0	LOS A	1.4	10.1	0.50	0.63	0.50	52.0
25	T1	157	2.0	165	2.0	0.254	6.8	LOS A	1.4	10.1	0.50	0.63	0.50	52.8
Approach		232	2.0	244	2.0	0.254	6.8	LOS A	1.4	10.1	0.50	0.63	0.50	52.5
SouthWest: Greenvale Drive														
31	T1	33	2.0	35	2.0	0.223	5.1	LOS A	1.3	9.6	0.20	0.61	0.20	52.2
32	R2	249	2.0	262	2.0	0.223	7.9	LOS A	1.3	9.6	0.20	0.61	0.20	51.7
Approach		282	2.0	297	2.0	0.223	7.6	LOS A	1.3	9.6	0.20	0.61	0.20	51.8
All Vehicles		650	2.0	684	2.0	0.254	7.2	LOS A	1.4	10.1	0.34	0.62	0.34	52.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Greenvale/Centennial - PM Peak (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Centennial Boulevard														
21	L2	222	2.0	234	2.0	0.263	5.5	LOS A	1.7	11.8	0.26	0.57	0.26	52.1
23	R2	75	2.0	79	2.0	0.263	8.1	LOS A	1.7	11.8	0.26	0.57	0.26	52.5
23u	U	23	2.0	24	2.0	0.263	9.5	LOS A	1.7	11.8	0.26	0.57	0.26	52.9
Approach		320	2.0	337	2.0	0.263	6.4	LOS A	1.7	11.8	0.26	0.57	0.26	52.3
NorthEast: Greenvale Drive														
24	L2	40	2.0	42	2.0	0.109	6.4	LOS A	0.6	4.0	0.41	0.57	0.41	52.3
25	T1	65	2.0	68	2.0	0.109	6.2	LOS A	0.6	4.0	0.41	0.57	0.41	53.1
Approach		105	2.0	111	2.0	0.109	6.2	LOS A	0.6	4.0	0.41	0.57	0.41	52.8
SouthWest: Greenvale Drive														
31	T1	162	2.0	171	2.0	0.301	5.5	LOS A	1.9	13.4	0.32	0.59	0.32	52.5
32	R2	186	2.0	196	2.0	0.301	8.3	LOS A	1.9	13.4	0.32	0.59	0.32	52.0
Approach		348	2.0	366	2.0	0.301	7.0	LOS A	1.9	13.4	0.32	0.59	0.32	52.2
All Vehicles		773	2.0	814	2.0	0.301	6.7	LOS A	1.9	13.4	0.31	0.58	0.31	52.3

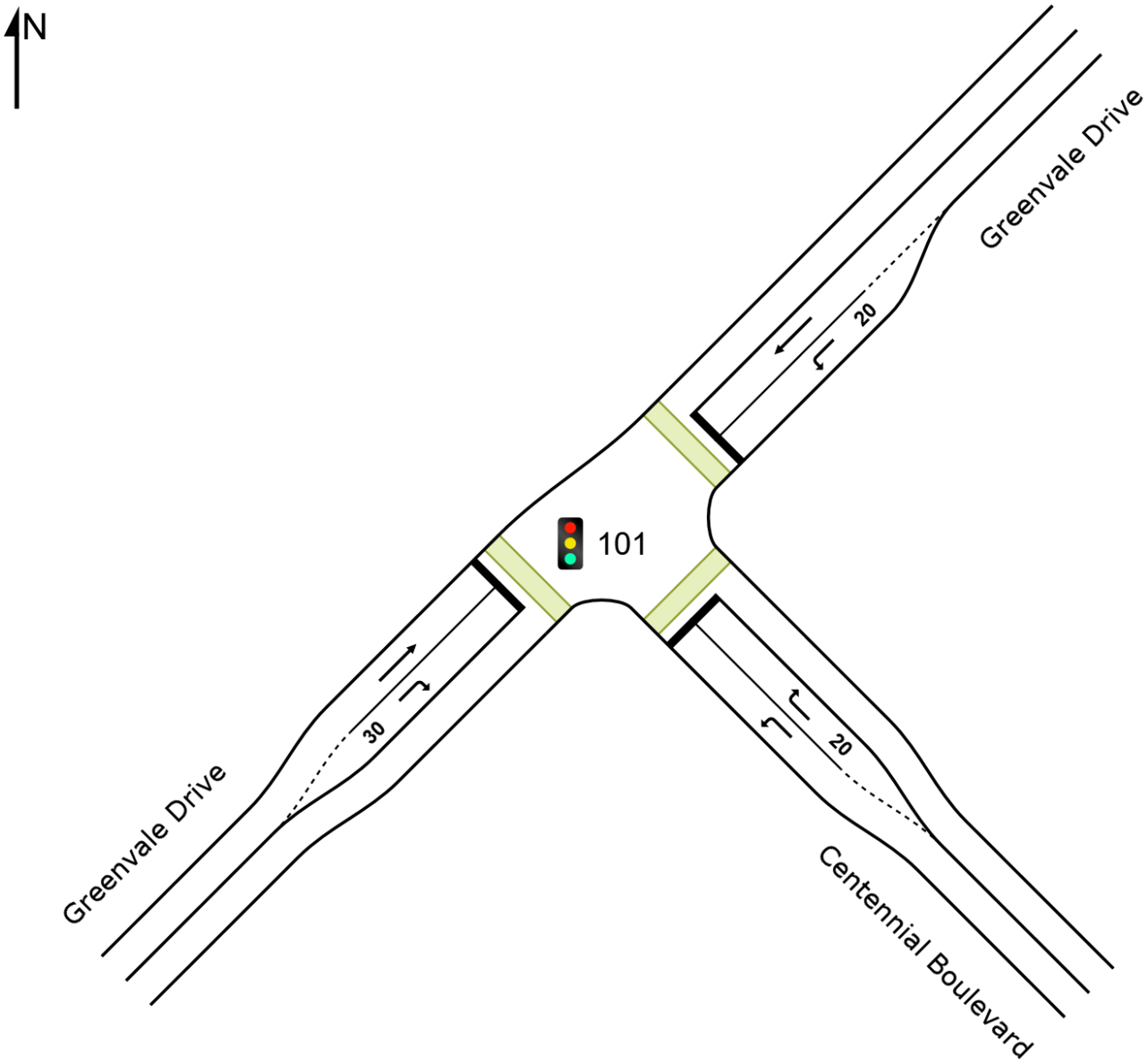
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Greenvale/Centennial Signals - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [Greenvale/Centennial Signals - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Centennial Boulevard														
21	L2	93	2.0	98	2.0	0.091	14.1	LOS B	1.8	13.1	0.46	0.68	0.46	47.6
23	R2	43	2.0	45	2.0	* 0.278	49.1	LOS D	2.0	14.0	0.97	0.74	0.97	32.6
Approach		136	2.0	143	2.0	0.278	25.1	LOS C	2.0	14.0	0.62	0.70	0.62	41.6
NorthEast: Greenvale Drive														
24	L2	75	2.0	79	2.0	0.099	21.7	LOS C	2.0	14.5	0.62	0.71	0.62	43.3
25	T1	157	2.0	165	2.0	* 0.334	27.9	LOS C	5.8	41.2	0.83	0.68	0.83	41.1
Approach		232	2.0	244	2.0	0.334	25.9	LOS C	5.8	41.2	0.77	0.69	0.77	41.8
SouthWest: Greenvale Drive														
31	T1	33	2.0	35	2.0	0.023	2.4	LOS A	0.3	2.4	0.24	0.18	0.24	57.8
32	R2	249	2.0	262	2.0	* 0.332	23.6	LOS C	7.6	54.1	0.70	0.77	0.70	42.2
Approach		282	2.0	297	2.0	0.332	21.1	LOS C	7.6	54.1	0.65	0.70	0.65	43.5
All Vehicles		650	2.0	684	2.0	0.334	23.7	LOS C	7.6	54.1	0.68	0.70	0.68	42.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
SouthEast: Centennial Boulevard												
P5	Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	202.3	211.9	1.05
NorthEast: Greenvale Drive												
P6	Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	202.3	211.9	1.05
SouthWest: Greenvale Drive												
P8	Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	202.3	211.9	1.05
All Pedestrians		150	158	39.3	LOS D	0.1	0.1	0.94	0.94	202.3	211.9	1.05

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Greenvale/Centennial Signals - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

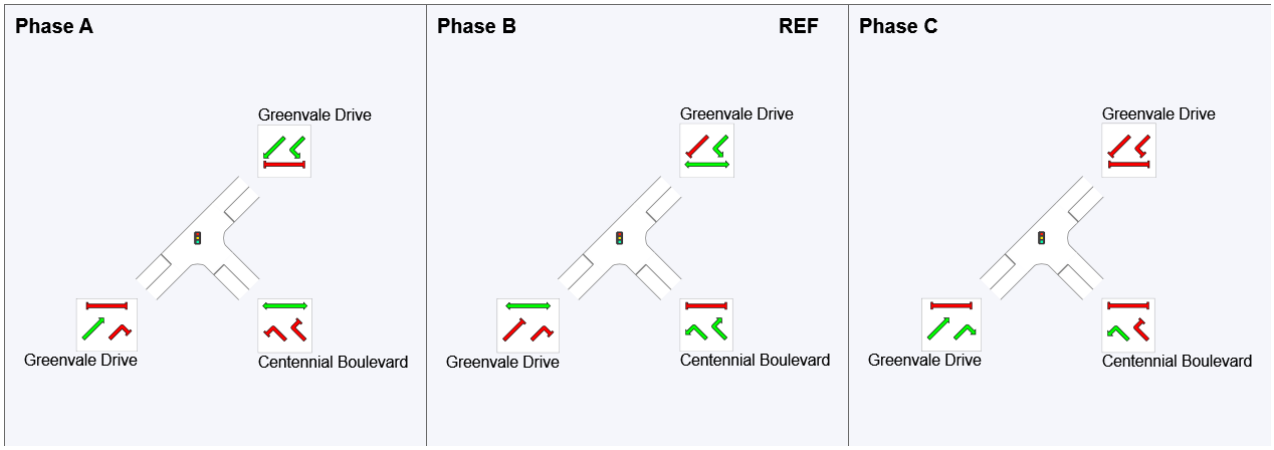
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

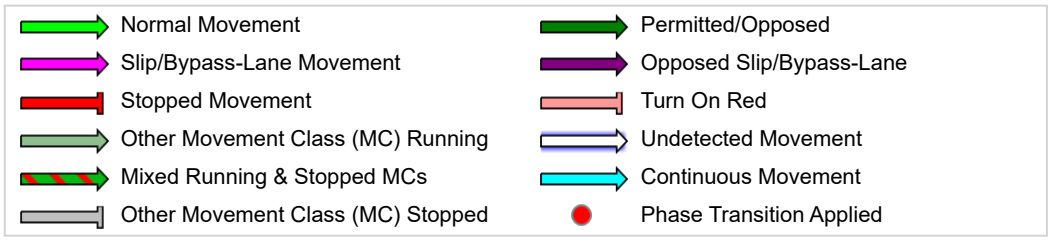
Phase	A	B	C
Phase Change Time (sec)	59	0	14
Green Time (sec)	25	8	39
Phase Time (sec)	31	14	45
Phase Split	34%	16%	50%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



MOVEMENT SUMMARY

Site: 101 [Greenvale/Centennial Signals - PM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Centennial Boulevard														
21	L2	222	2.0	234	2.0	0.177	9.8	LOS A	3.2	22.8	0.34	0.67	0.34	50.4
23	R2	98	2.0	103	2.0	* 0.254	37.1	LOS D	3.8	27.0	0.87	0.77	0.87	36.5
Approach		320	2.0	337	2.0	0.254	18.1	LOS B	3.8	27.0	0.50	0.70	0.50	45.2
NorthEast: Greenvale Drive														
24	L2	40	2.0	42	2.0	0.053	21.3	LOS C	1.1	7.5	0.61	0.69	0.61	43.5
25	T1	65	2.0	68	2.0	* 0.246	37.9	LOS D	2.7	19.5	0.93	0.71	0.93	37.0
Approach		105	2.0	111	2.0	0.246	31.5	LOS C	2.7	19.5	0.80	0.70	0.80	39.2
SouthWest: Greenvale Drive														
31	T1	162	2.0	171	2.0	0.137	6.6	LOS A	2.9	20.4	0.41	0.34	0.41	54.1
32	R2	186	2.0	196	2.0	* 0.247	22.9	LOS C	5.4	38.7	0.67	0.75	0.67	42.5
Approach		348	2.0	366	2.0	0.247	15.3	LOS B	5.4	38.7	0.55	0.56	0.55	47.2
All Vehicles		773	2.0	814	2.0	0.254	18.7	LOS B	5.4	38.7	0.56	0.64	0.56	45.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
SouthEast: Centennial Boulevard												
P5	Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	202.3	211.9	1.05
NorthEast: Greenvale Drive												
P6	Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	202.3	211.9	1.05
SouthWest: Greenvale Drive												
P8	Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	202.3	211.9	1.05
All Pedestrians		150	158	39.3	LOS D	0.1	0.1	0.94	0.94	202.3	211.9	1.05

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Greenvale/Centennial Signals - PM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

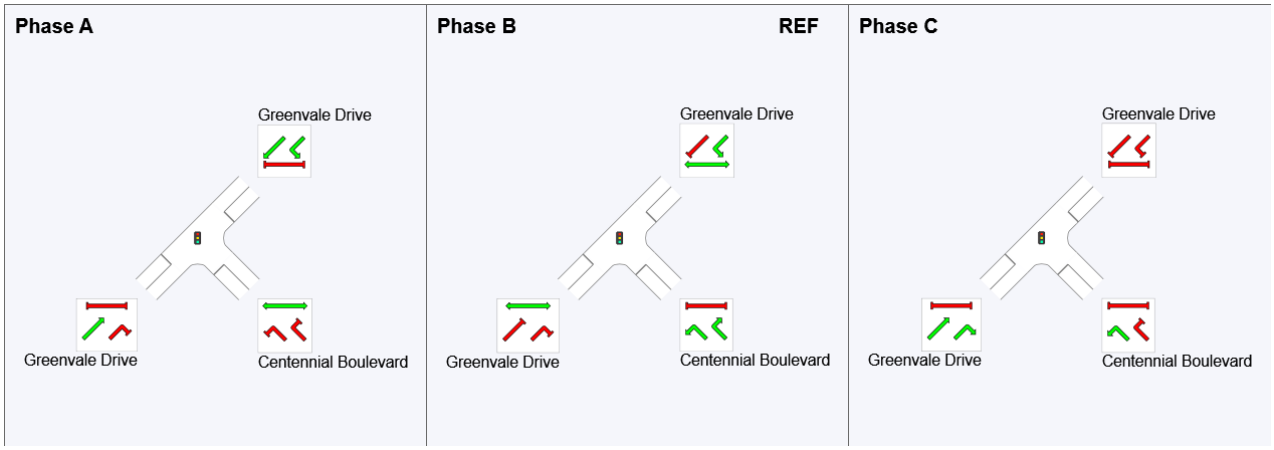
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

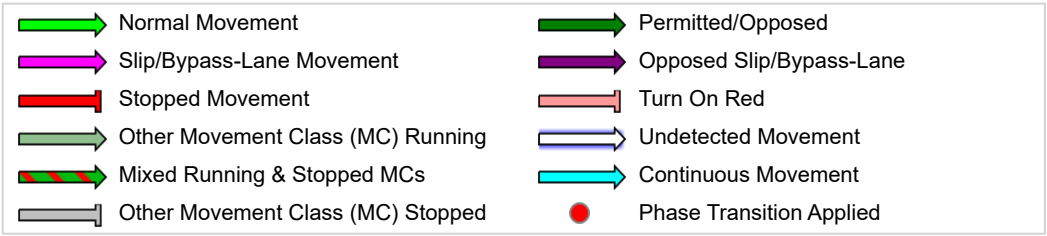
Phase	A	B	C
Phase Change Time (sec)	71	0	26
Green Time (sec)	13	20	39
Phase Time (sec)	19	26	45
Phase Split	21%	29%	50%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



Appendix C

Assessment of Initial Stages of Southern Area Development

Traffix Group

Our Reference: G34354L-01B

26 March 2024

APD Projects
Suite 2, Level 8, 412 St Kilda Road
MELBOURNE VIC 3004

Attention: Elizabeth Guyler

Dear Elizabeth,

1421-1423 Portarlington Road, Curlewis – Proposed Residential Subdivision
Interim Access Arrangements - Traffic Engineering Assessment

Further to your instructions, please find following our traffic engineering assessment of the interim access arrangements for the proposed residential subdivision at 1421-1423 Portarlington Road, Curlewis.

In particular, the following report provides an assessment of the proposed access arrangements of the site via Hackwill Place prior to the delivery of Stage 10, with regard to the impact to the Jetty Road / Hackwill Place intersection, shown below at Figure 1.

Figure 1: Jetty Road / Hackwill Place Intersection Aerial Photograph

Proposal

The proposal is to ultimately develop in the order of 531 residential allotments on the site.

Vehicle access for the site will ultimately be available via one connection to Hackwill Place (east) and three connections to Tivoli Drive (west). Prior to the delivery of Stage 10, which will include the duplication of Tivoli Drive within a portion of the site, all access to the external road network will be provided via the proposed Hackwill Place connection.

We have been advised that in the order of 221 residential allotments will be delivered within Stages 1 to 9.

A copy of the proposed development plan is attached at Appendix A.

Existing Traffic Volumes

Traffix Group commissioned peak hour turning movement counts at the Jetty Road / Hackwill Place intersection at the following times on Wednesday 13th March 2024:

- 7:30am-9:30am, and
- 3:00pm-6:00pm.

It is noted that the turning movement count periods were selected based on SCATS data sourced from the nearby High Street / Jetty Road signalised intersection in order to ensure that the peak AM and PM hours were captured.

The peak hours of the turning movement counts occurred between 8:00am-9:00am and 3:00pm-4:00pm, with a summary of results presented at Figure 2 and Figure 3.

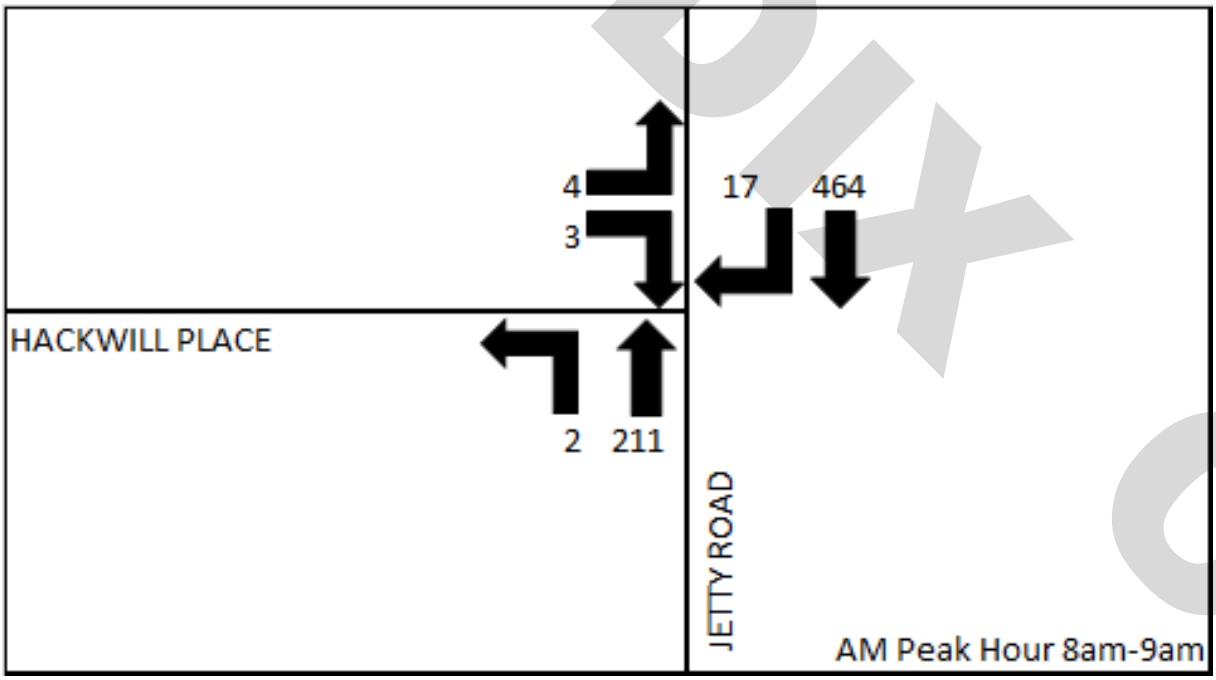


Figure 2: Turning Movement Counts Summary - AM Peak Hour (8am-9am)

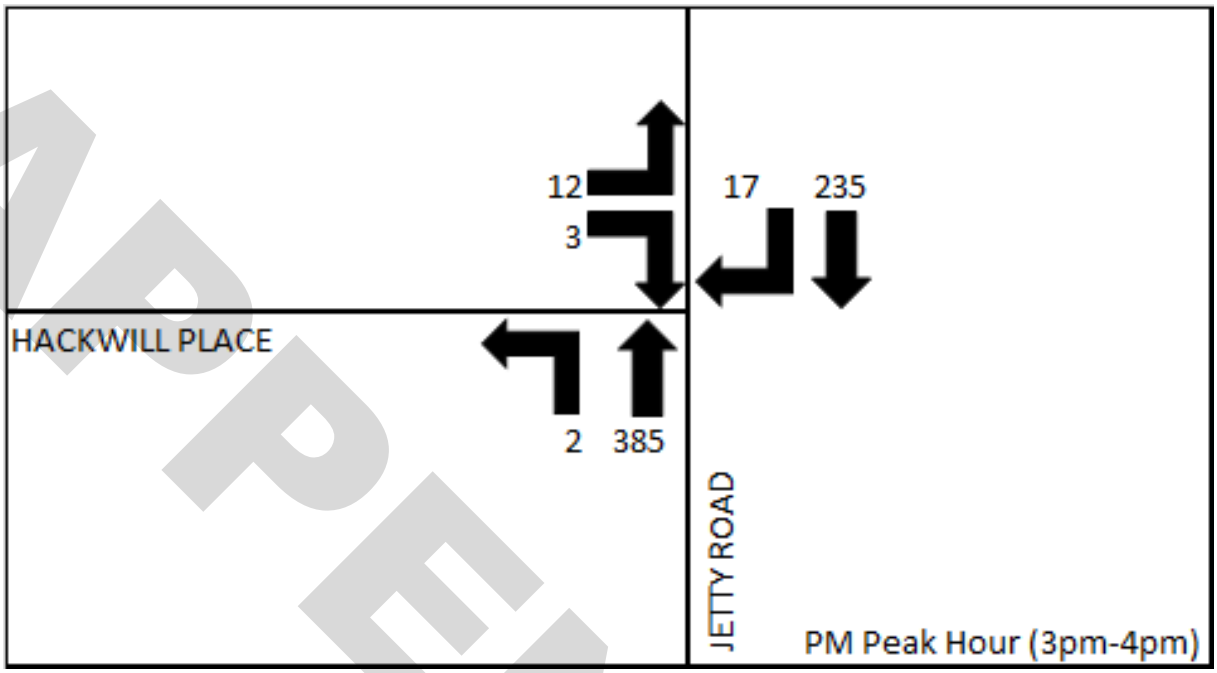


Figure 3: Turning Movement Counts Summary - PM Peak Hour (3pm-4pm)

Traffic Impact Assessment

Base Case

For the purposes of our assessments, we have considered a 'base case' scenario to allow for future growth and development of the surrounding area.

In particular, we have conservatively applied a linear growth rate of 2% per annum for a period of 10 years to through traffic on Jetty Road, noting that development of the site is expected to occur well within the next 10 years and that a large proportion of the area to the north of the site is already developed (thus traffic movements are already captured in our turning movement counts). It is also noted that no factor has been applied to turning movements into and out of Hackwill Place given that the subject site is effectively expected to represent the increase in traffic volumes to these movements.

The base case traffic volumes are presented at Figure 4 and Figure 5.

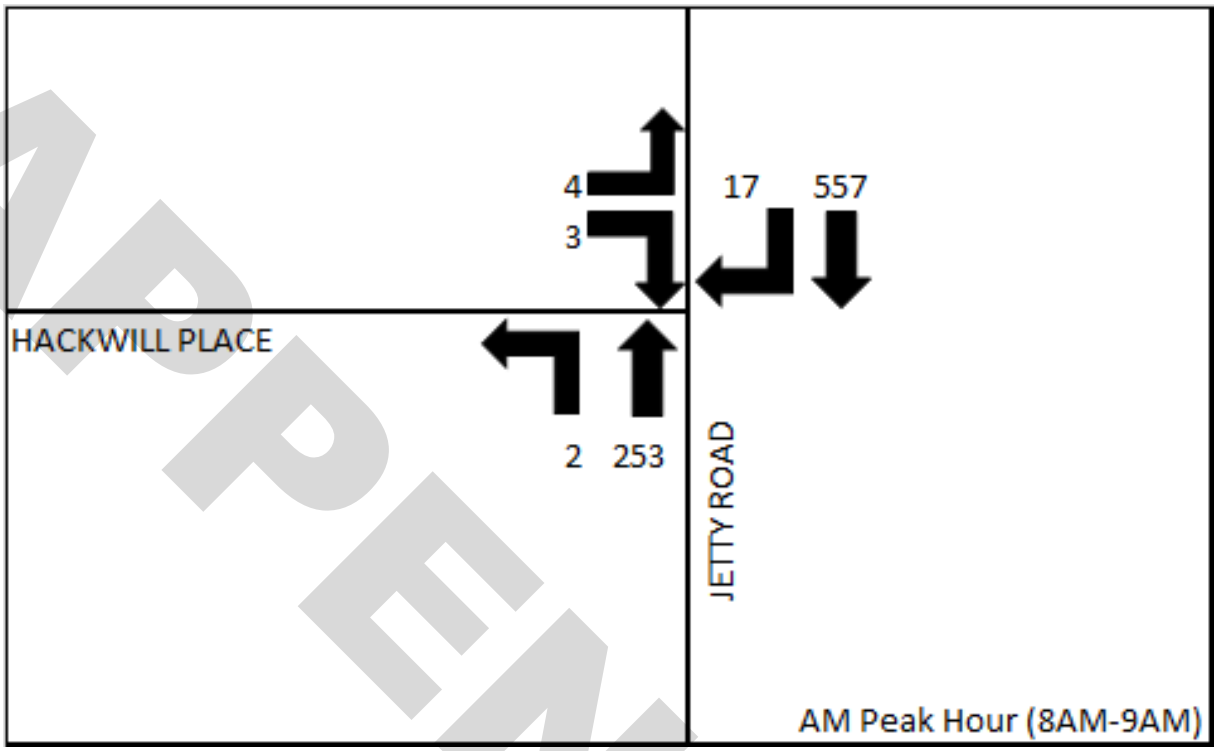


Figure 4: Base Case Summary - AM Peak Hour (8am-9am)

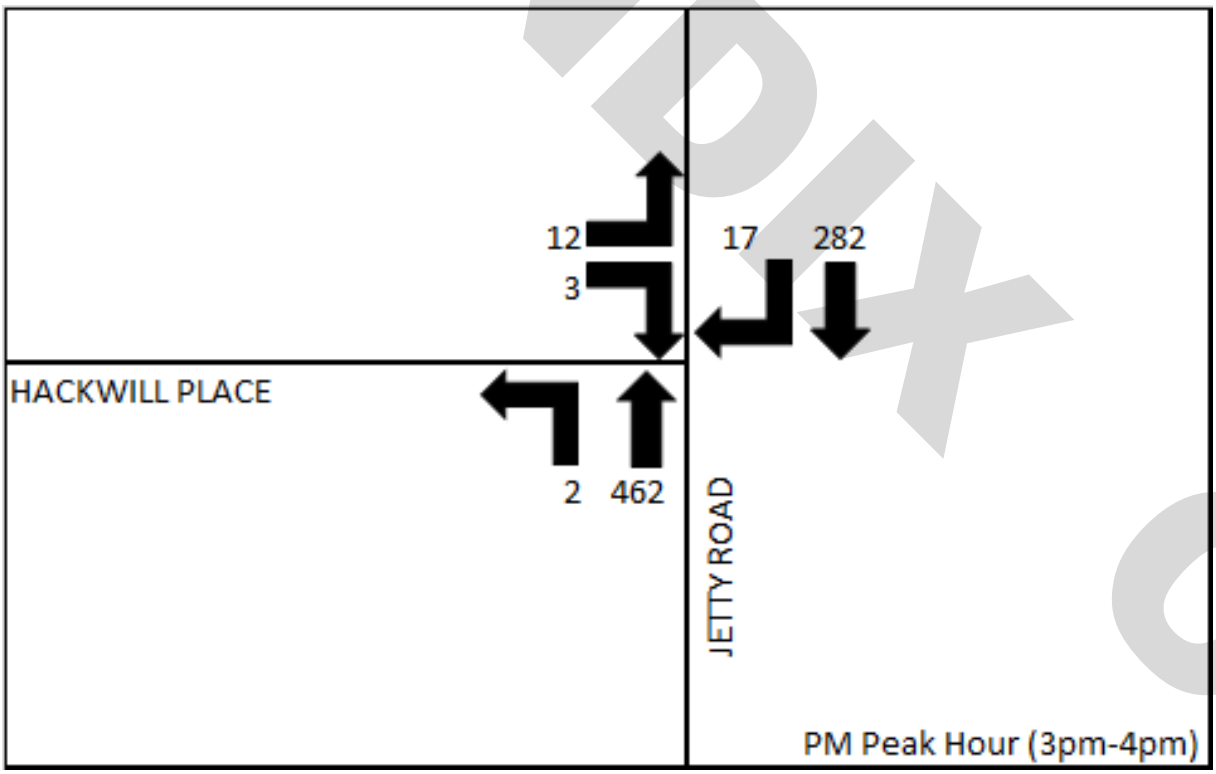


Figure 5: Base Case Summary - PM Peak Hour (3pm-4pm)

Site Generated Traffic

We have adopted an average conservative traffic generation rate of 0.9 trips per allotment for each peak hour, noting that this rate is consistent with what was adopted for previous analysis undertaken as part of the overall Jetty Road Stage 2 traffic analysis[1].

The traffic distribution that has been adopted for each peak hour is consistent with the northbound/southbound split of through traffic on Jetty Road that was recorded during each peak hour from our turning movement counts. This distribution is as follows:

- AM Peak Hour – 31% Northbound / 69% Southbound
- PM Peak Hour – 62% Northbound / 38% Southbound

We have also adopted an entry/exit split of 20%/80% and 70%/30% for the AM and PM peak hours, respectively, noting that this is also consistent with the methodology that was used for the Jetty Road Stage 2 traffic analysis.

The site generated traffic is presented at Figure 6 and Figure 7, noting that this unrealistically conservatively assumes that all allotments within Stages 1 to 9 would be built on and occupied prior to Stage 10, and a connection with Tivoli Drive, being constructed.

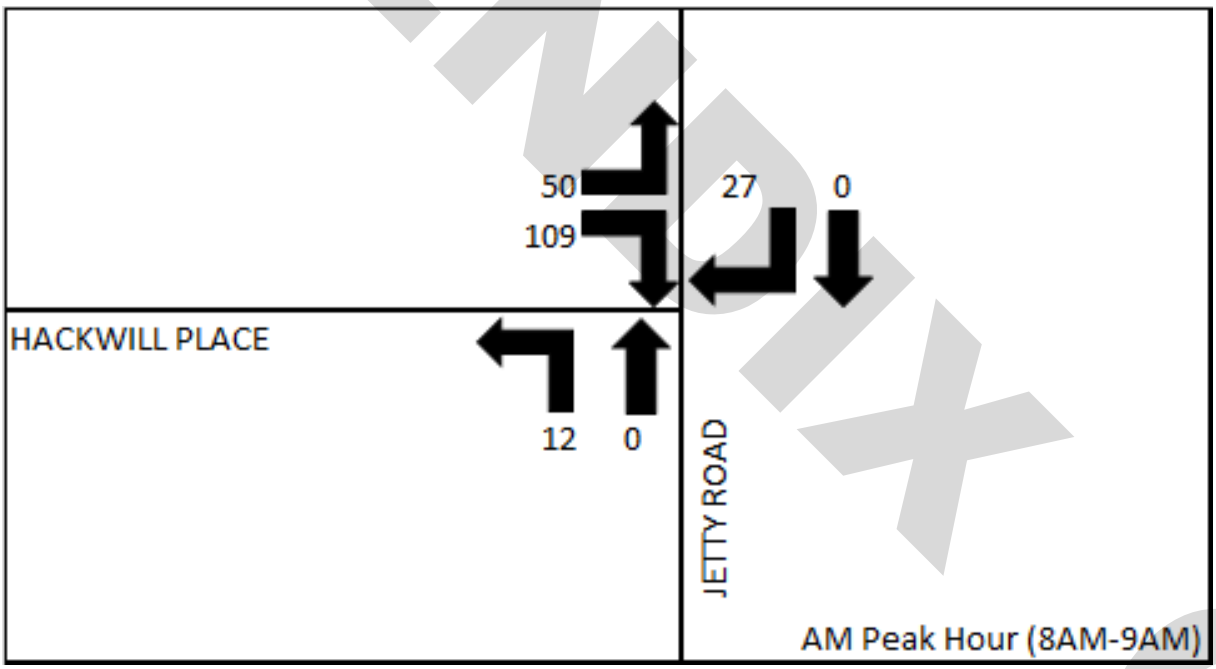


Figure 6: Site Generated Traffic - AM Peak Hour (8am-9am)

[1] Our vast experience with residential subdivisions suggests that a peak hour traffic generation rate of 0.8 trips per allotment is more representative of the actual level of traffic that is generated.

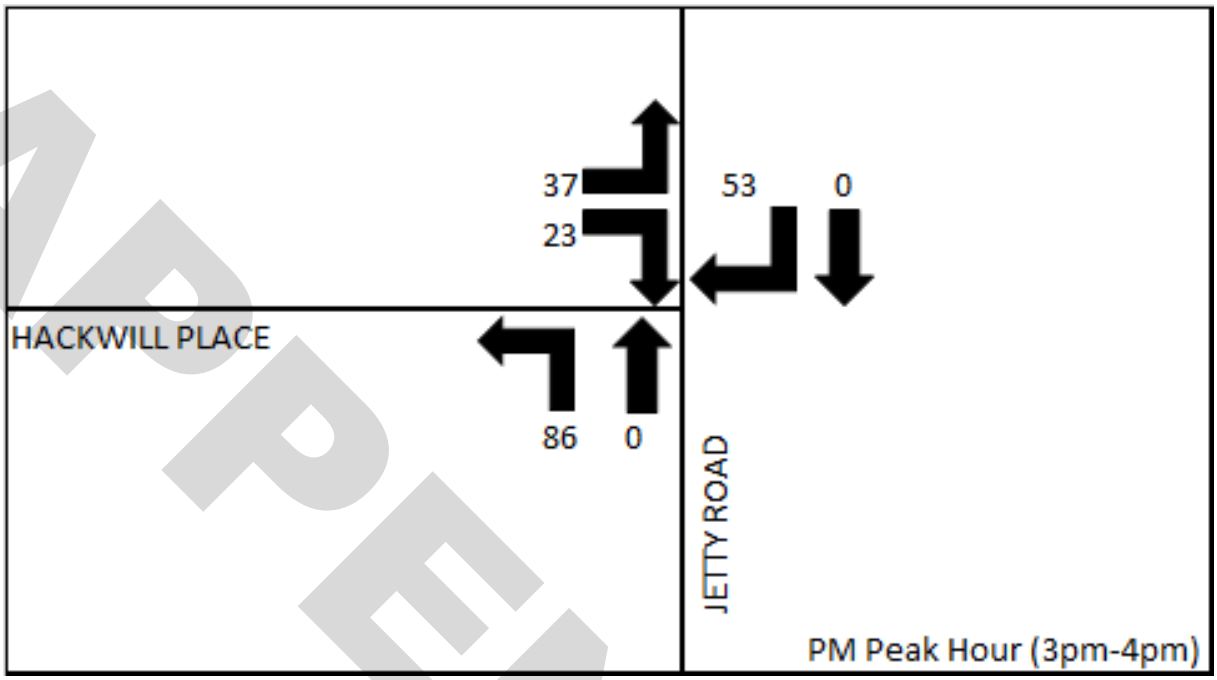


Figure 7: Site Generated Traffic - PM Peak Hour (3pm-4pm)

Post Development

By combining the base case and conservative site generated traffic volumes, the conservative post development traffic volumes are determined as presented at Figure 8 and Figure 9.

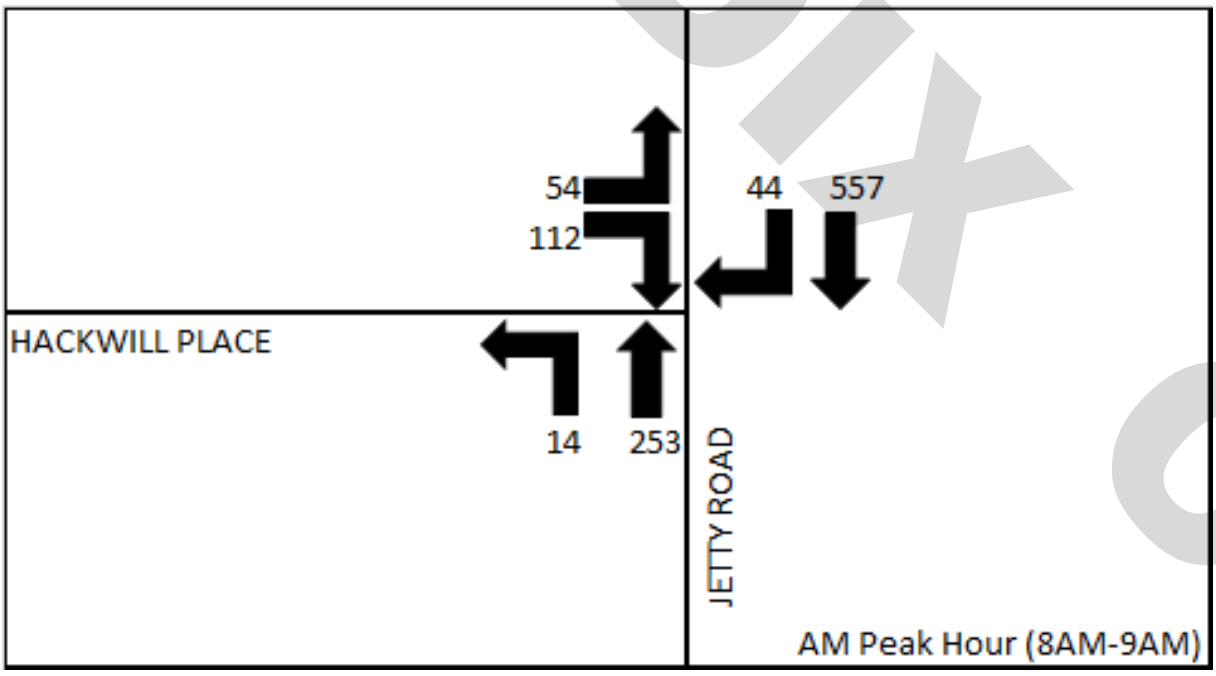


Figure 8: Post Development Traffic - AM Peak Hour (8am-9am)

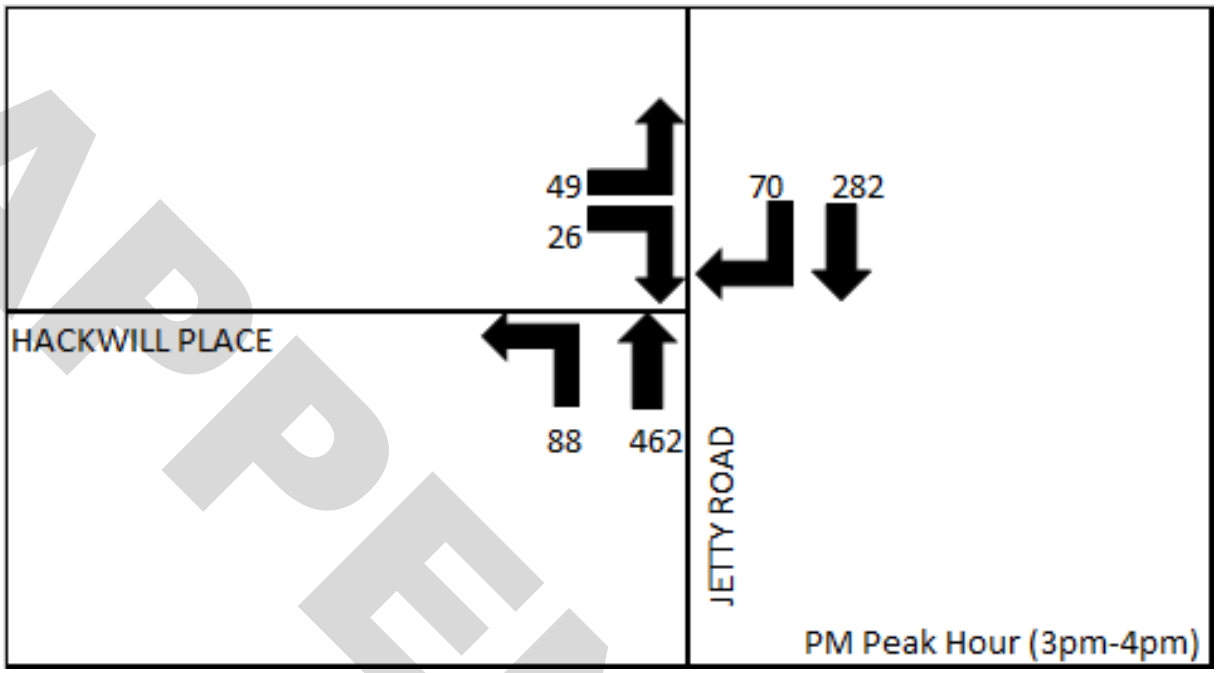


Figure 9: Post Development Traffic - PM Peak Hour (3pm-4pm)

Intersection Analysis

We have used SIDRA Intersection 9 to undertake an assessment of the post development operating conditions for the Jetty Road / Hackwill Place intersection.

SIDRA is a computer simulation package which assesses the operating performance of intersections and road networks.

A summary of key SIDRA outputs is as follows:

- Degree of Saturation (DoS) – The ratio of traffic volume to maximum capacity for a particular turning movement.
- Average Delay (Avg. Delay) – The average delay in seconds for a vehicle making a particular turning movement.
- 95th Percentile Queue (95% Queue) – The 95th percentile queue length9 is the length in metres which 95 per cent of all observed cycle queues fall below (or 5% exceed) during the peak analysis period.

Typically, a DoS of 0.90 for unsignalised is considered as the typical 'acceptable limit' for intersection operation, beyond which queues, and delays increase disproportionally with the addition of further traffic.

We have modelled the intersection as a 'staged' intersection to account for the ability of motorists to prop within the central median of Jetty Road when turning right out of Hackwill Place.

The layout of the network adopted for the SIDRA assessment is provided at Figure 10, with a summary of results provided at Table 1and Table 2. Full output of the SIDRA results is also provided at Appendix B.

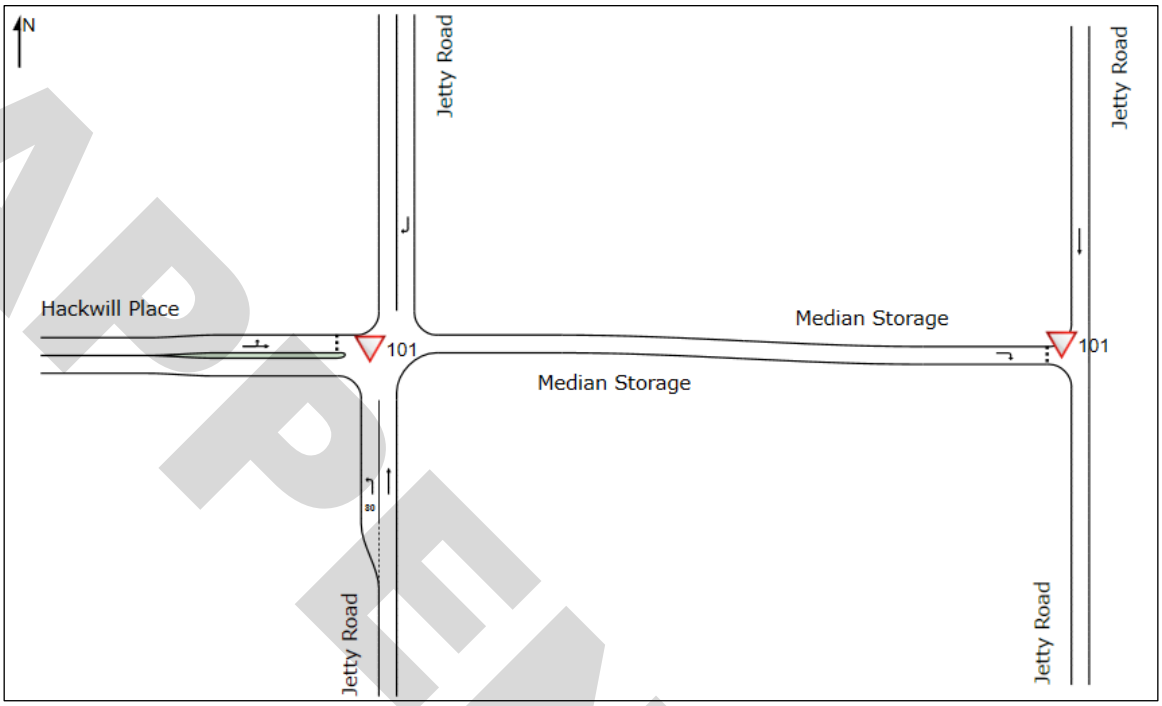


Figure 10: SIDRA Network Layout

Table 1: SIDRA Results Summary - AM Peak Hour

	Base Case			Post Development		
	DoS	Avg. Delay (s)	95% Queue (m)	DoS	Avg. Delay (s)	95% Queue (m)
Jetty Road – South (L)	0.001	6	0	0.008	6	0
Jetty Road – South (T)	0.140	0	0	0.140	0	0
Jetty Road – North (R)	0.016	6	0.4	0.043	7	1
Hackwill Place – West (L)	0.007	6	0.2	0.187	7	6
Hackwill Place – West (T)	0.007	6	0.2	0.187	7	6
Jetty Road – North (T)	0.304	0.1	0	0.304	0.1	0
Median Storage – West (R)	0.004	4	0.1	0.141	4	3

Table 2: SIDRA Results Summary - PM Peak Hour

	Base Case			Post Development		
	DoS	Avg. Delay (s)	95% Queue (m)	DoS	Avg. Delay (s)	95% Queue (m)
Jetty Road – South (L)	0.001	6	0	0.050	6	0
Jetty Road – South (T)	0.253	0.1	0	0.253	0.1	0
Jetty Road – North (R)	0.021	8	1	0.098	9	3
Hackwill Place – West (L)	0.018	7	1	0.102	8	3
Hackwill Place – West (T)	0.018	8	1	0.102	10	3
Jetty Road – North (T)	0.155	0	0	0.155	0	0
Median Storage – West (R)	0.003	3	0.1	0.024	3	1

Based on the above, the Jetty Road / Hackwill Place intersection is expected to continue to operate well within acceptable limits, with minimal queuing and delays expected following the development of Stages 1 to 9. The outcome has been reached by adopting all SIDRA default values, including the conservative critical gap and follow-up headway values.

Accordingly, we are satisfied that it would be appropriate for Stages 1 to 9 (i.e. in the order of 221 allotments) to develop on the site prior to the delivery of the Tivoli Drive connection(s).

Notwithstanding, regardless of the timing of the Hackwill Place connection, we acknowledge that an appropriate site connection will need to be established through consultation with Council and that this may also include the provision of traffic management treatment along Hackwill Place.

Tivoli Drive Duplication Delivery

As part of the proposed staging of the development, it is possible that developments to the north of the site that are located within the broader Jetty Road Stage 2 area may be completed prior to the delivery of Stage 10 of this site and the duplication of Tivoli Drive to the south of the rail trail.

The traffic impact assessment report that was prepared to accompany the Stage 2 Growth Area application (ref. G21702R-03E, dated November 2022) indicates the following in relation to Tivoli Drive to the south of the rail trail:

"The need to upgrade Tivoli Drive to the south of the rail trail would largely depend on the timing of development of the land to the south of the rail trail…"

"… it is not possible to determine when Greenvale Drive and the section of Tivoli Drive to the south of the rail trail would need to be upgraded until individual applications are submitted in the future…"

Given the specific access arrangements of Property 16 are now proposed, specifically with interim access to be provided via Hackwill Place, we are satisfied that Tivoli Drive to the south of the rail trail can continue to operate satisfactorily and within its environmental capacity without the need for duplication, even with the development of land to the north of the rail trail. The trigger point for the timing of these duplication works, i.e. to the south of the rail trail, is no later than when direct lot access is made available to Tivoli Drive for allotments located within the site (i.e. as proposed under Stage 10).

A concept functional layout plan demonstrating a suitable carriageway transition between a dual carriageway to the north of the rail trail crossing and a single carriageway to the south of the rail trail crossing is provided at Appendix C.

Please contact Kane Bullock or Nathan Woolcock at Traffix Group if you require any further information.

Yours faithfully,
TRAFFIX GROUP PTY LTD

NATHAN WOOLCOCK
Director
www.traffixgroup.com.au

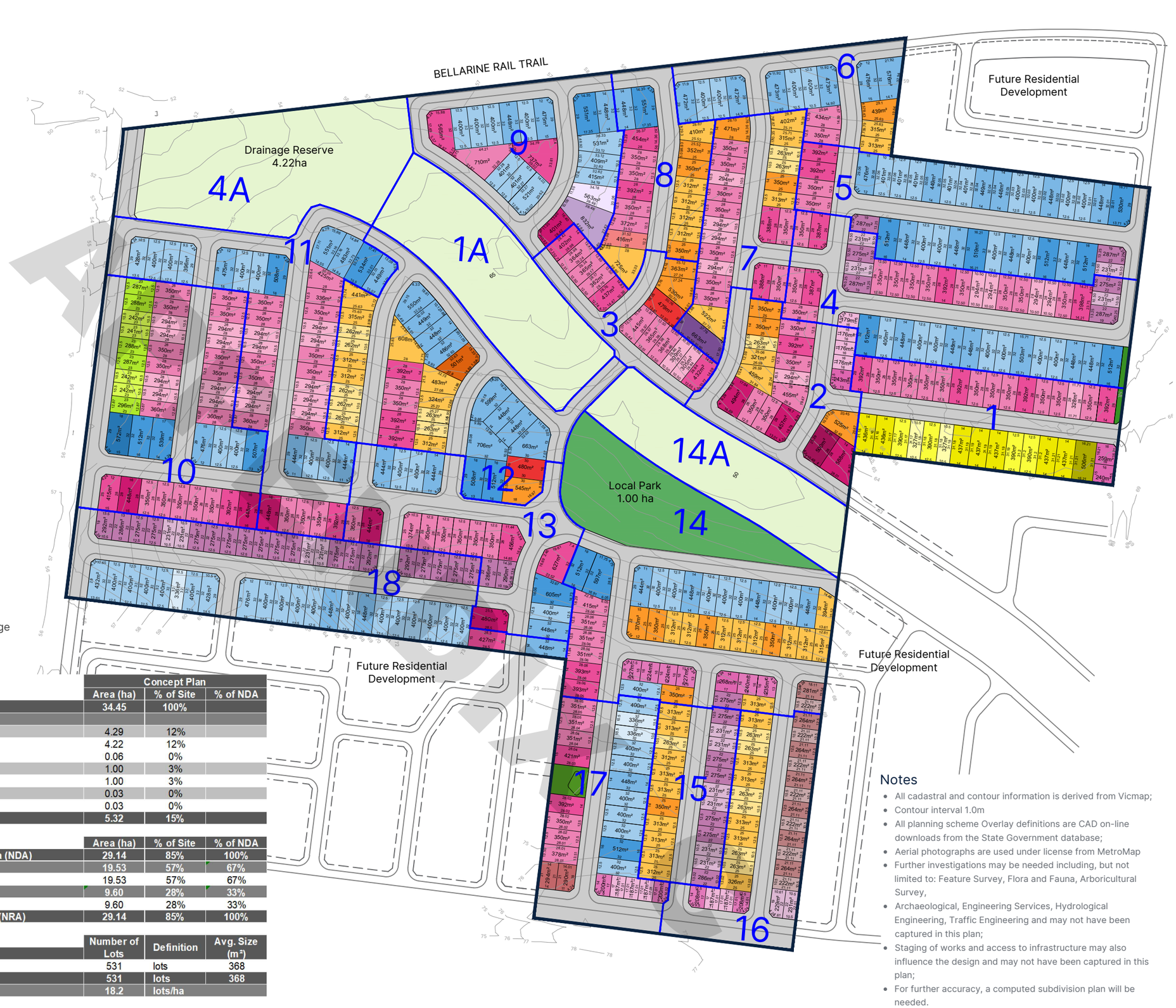
Appendix A

Development Plan

Lot Yield

Lot Type by width	Total Yield: Number of Lots	% Type	% Total
Front Loaded			
35m depth			
16m	1	50%	0%
12.5m	1	50%	0%
Subtotal	2	100%	0%
33m depth			
12.5m	1	1%	0%
Subtotal	1	1%	0%
32m depth			
18m	1	1%	0%
16m	20	13%	4%
14m	53	34%	10%
12.5m	81	51%	15%
10.5m	3	2%	1%
Subtotal	158	100%	30%
31m depth			
16m	1	7%	0%
14m	7	50%	1%
12.5m	4	29%	1%
10.5	2	14%	0%
Subtotal	14	100%	3%
30m depth			
16m	2	67%	0%
12.5m	1	33%	0%
Subtotal	3	100%	1%
28m depth			
18m	1	1%	0%
16m	9	5%	2%
14m	33	19%	6%
12.5m	99	58%	19%
10.5m	29	17%	5%
Subtotal	171	100%	32%
25m depth			
16m	1	1%	0%
14m	18	21%	3%
12.5m	48	57%	9%
10.5m	17	20%	3%
Subtotal	84	100%	16%
24m depth			
12.5m	5	6%	1%
10.5m	4	5%	1%
Subtotal	9	11%	2%
22m depth			
12.5m	34	68%	6%
10.5m	16	32%	3%
Subtotal	50	100%	9%
21m depth			
14m	2	4%	0%
12.5m	7	14%	1%
10.5m	7	14%	1%
Subtotal	16	32%	3%
16m depth			
16m	4	17%	1%
14m	6	26%	1%
12m	4	17%	1%
11m	9	39%	2%
Subtotal	23	100%	4%
Total Front Loaded	531		100%

Total Lots	531	
Density	18.2	lots/ha



Legend

- Site boundary
- Stage boundary
- Local roads
- Drainage reserve
- Local parks
- Landscape/heritage

Land Budget

	Concept Plan: Area (ha)	% of Site	% of NDA
Total Site Area	34.45	100%	
Open Space Network			
Encumbered Open Space	4.29	12%	
Drainage	4.22	12%	
Heritage Areas	0.06	0%	
Credited Open Space	1.00	3%	
Local Network Parks	1.00	3%	
Uncredited Open Space	0.03	0%	
Landscape Buffers	0.03	0%	
Total	5.32	15%	

	Area (ha)	% of Site	% of NDA
Total Net Developable Area (NDA)	29.14	85%	100%
Residential	19.53	57%	67%
Front Loaded	19.53	57%	67%
Roads	9.60	28%	33%
Local Access Roads	9.60	28%	33%
Total Net Residential Area (NRA)	29.14	85%	100%

Lot Yield	Number of Lots	Definition	Avg. Size (m²)
Front Loaded	531	lots	368
Total	531	lots	368
Density	18.2	lots/ha	

Notes

- All cadastral and contour information is derived from Vicmap;
- Contour interval 1.0m
- All planning scheme Overlay definitions are CAD on-line downloads from the State Government database;
- Aerial photographs are used under license from MetroMap
- Further investigations may be needed including, but not limited to: Feature Survey, Flora and Fauna, Arboricultural Survey,
- Archaeological, Engineering Services, Hydrological Engineering, Traffic Engineering and may not have been captured in this plan;
- Staging of works and access to infrastructure may also influence the design and may not have been captured in this plan;
- For further accuracy, a computed subdivision plan will be needed.

Preliminary Concept Masterplan

1421-1423 Portarlington Road, Curlewis

Date Issued: 26/02/2024 | Revision: Q
SMEC Project Reference: 30043260U | Drawing: 01.01
Drawn by: L. Nickels | Checked by: DRAFT

0 30 60 90 120 150
A1_1:1500 A3_1:3000

DRAFT

Urban Communities

SMEC
Member of the Surbana Jurong Group

Appendix B

SIDRA Outputs

MOVEMENT SUMMARY

Site: 101 [AM Peak Hour Stage 1 (Site Folder: Base Case)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [AM Peak Hour - Base Case (Network Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Jetty Road															
1	L2	All MCs	2	0.0	2	0.0	0.001	5.5	LOS A	0.0	0.0	0.00	0.58	0.00	52.9
2	T1	All MCs	266	3.6	266	3.6	0.140	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			268	3.5	268	3.5	0.140	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
North: Jetty Road															
9	R2	All MCs	18	0.0	18	0.0	0.016	6.4	LOS A	0.1	0.4	0.35	0.58	0.35	47.4
Approach			18	0.0	18	0.0	0.016	6.4	NA	0.1	0.4	0.35	0.58	0.35	47.4
West: Hackwill Place															
10	L2	All MCs	4	0.0	4	0.0	0.007	6.3	LOS A	0.0	0.2	0.37	0.54	0.37	48.0
11	T1	All MCs	3	0.0	3	0.0	0.007	5.9	LOS A	0.0	0.2	0.37	0.54	0.37	49.7
Approach			7	0.0	7	0.0	0.007	6.1	LOS A	0.0	0.2	0.37	0.54	0.37	48.6
All Vehicles			294	3.2	294	3.2	0.140	0.6	NA	0.1	0.4	0.03	0.05	0.03	58.6

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

MOVEMENT SUMMARY

Site: 101 [AM Peak Hour Stage 2 (Site Folder: Base Case)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [AM Peak Hour - Base Case (Network Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
North: Jetty Road															
8	T1	All MCs	586	1.6	586	1.6	0.304	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach			586	1.6	586	1.6	0.304	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
West: Median Storage															
12	R2	All MCs	3	0.0	3	0.0	0.004	4.1	LOS A	0.0	0.1	0.44	0.59	0.44	48.6
Approach			3	0.0	3	0.0	0.004	4.1	LOS A	0.0	0.1	0.44	0.59	0.44	48.6
All Vehicles			589	1.6	589	1.6	0.304	0.1	NA	0.0	0.1	0.00	0.00	0.00	59.8

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

MOVEMENT SUMMARY

Site: 101 [PM Peak Hour Stage 1 (Site Folder: Base Case)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [PM Peak Hour - Base Case (Network Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Jetty Road															
1	L2	All MCs	2	0.0	2	0.0	0.001	5.5	LOS A	0.0	0.0	0.00	0.58	0.00	52.9
2	T1	All MCs	486	1.9	486	1.9	0.253	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			488	1.9	488	1.9	0.253	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
North: Jetty Road															
9	R2	All MCs	18	0.0	18	0.0	0.021	7.7	LOS A	0.1	0.5	0.49	0.66	0.49	46.2
Approach			18	0.0	18	0.0	0.021	7.7	NA	0.1	0.5	0.49	0.66	0.49	46.2
West: Hackwill Place															
10	L2	All MCs	13	0.0	13	0.0	0.018	7.3	LOS A	0.1	0.5	0.49	0.64	0.49	46.8
11	T1	All MCs	3	0.0	3	0.0	0.018	8.0	LOS A	0.1	0.5	0.49	0.64	0.49	48.3
Approach			16	0.0	16	0.0	0.018	7.5	LOS A	0.1	0.5	0.49	0.64	0.49	47.1
All Vehicles			522	1.8	522	1.8	0.253	0.6	NA	0.1	0.5	0.03	0.04	0.03	58.7

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

MOVEMENT SUMMARY

Site: 101 [PM Peak Hour Stage 2 (Site Folder: Base Case)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [PM Peak Hour - Base Case (Network Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
North: Jetty Road															
8	T1	All MCs	297	3.2	297	3.2	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			297	3.2	297	3.2	0.155	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Median Storage															
12	R2	All MCs	3	0.0	3	0.0	0.003	2.9	LOS A	0.0	0.1	0.30	0.52	0.30	50.2
Approach			3	0.0	3	0.0	0.003	2.9	LOS A	0.0	0.1	0.30	0.52	0.30	50.2
All Vehicles			300	3.2	300	3.2	0.155	0.1	NA	0.0	0.1	0.00	0.01	0.00	59.9

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

MOVEMENT SUMMARY

Site: 101 [AM Peak Hour Stage 1 (Site Folder: Post Development)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [AM Peak Hour - Post Development (Network Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Jetty Road															
1	L2	All MCs	15	0.0	15	0.0	0.008	5.5	LOS A	0.0	0.0	0.00	0.58	0.00	52.9
2	T1	All MCs	266	3.6	266	3.6	0.140	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			281	3.4	281	3.4	0.140	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.3
North: Jetty Road															
9	R2	All MCs	46	0.0	46	0.0	0.043	6.5	LOS A	0.2	1.2	0.37	0.61	0.37	47.3
Approach			46	0.0	46	0.0	0.043	6.5	NA	0.2	1.2	0.37	0.61	0.37	47.3
West: Hackwill Place															
10	L2	All MCs	57	0.0	57	0.0	0.187	6.5	LOS A	0.8	5.8	0.46	0.64	0.46	47.7
11	T1	All MCs	118	0.0	118	0.0	0.187	6.6	LOS A	0.8	5.8	0.46	0.64	0.46	49.4
Approach			175	0.0	175	0.0	0.187	6.6	LOS A	0.8	5.8	0.46	0.64	0.46	48.8
All Vehicles			502	1.9	502	1.9	0.187	3.1	NA	0.8	5.8	0.19	0.29	0.19	54.3

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

MOVEMENT SUMMARY

Site: 101 [AM Peak Hour Stage 2 (Site Folder: Post Development)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [AM Peak Hour - Post Development (Network Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
North: Jetty Road															
8	T1	All MCs	586	1.6	586	1.6	0.304	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach			586	1.6	586	1.6	0.304	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
West: Median Storage															
12	R2	All MCs	118	0.0	118	0.0	0.141	4.4	LOS A	0.4	3.1	0.48	0.73	0.48	48.1
Approach			118	0.0	118	0.0	0.141	4.4	LOS A	0.4	3.1	0.48	0.73	0.48	48.1
All Vehicles			704	1.3	704	1.3	0.304	0.8	NA	0.4	3.1	0.08	0.12	0.08	58.5

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

MOVEMENT SUMMARY

Site: 101 [PM Peak Hour Stage 1 (Site Folder: Post Development)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [PM Peak Hour - Post Development (Network Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Jetty Road															
1	L2	All MCs	93	0.0	93	0.0	0.050	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	52.9
2	T1	All MCs	486	1.9	486	1.9	0.253	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			579	1.6	579	1.6	0.253	0.9	NA	0.0	0.0	0.00	0.09	0.00	58.0
North: Jetty Road															
9	R2	All MCs	74	0.0	74	0.0	0.098	8.5	LOS A	0.4	2.6	0.54	0.76	0.54	45.4
Approach			74	0.0	74	0.0	0.098	8.5	NA	0.4	2.6	0.54	0.76	0.54	45.4
West: Hackwill Place															
10	L2	All MCs	52	0.0	52	0.0	0.102	7.5	LOS A	0.4	2.8	0.54	0.73	0.54	46.1
11	T1	All MCs	27	0.0	27	0.0	0.102	9.5	LOS A	0.4	2.8	0.54	0.73	0.54	47.4
Approach			79	0.0	79	0.0	0.102	8.2	LOS A	0.4	2.8	0.54	0.73	0.54	46.5
All Vehicles			732	1.3	732	1.3	0.253	2.5	NA	0.4	2.8	0.11	0.23	0.11	55.3

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

MOVEMENT SUMMARY

Site: 101 [PM Peak Hour Stage 2 (Site Folder: Post Development)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [PM Peak Hour - Post Development (Network Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

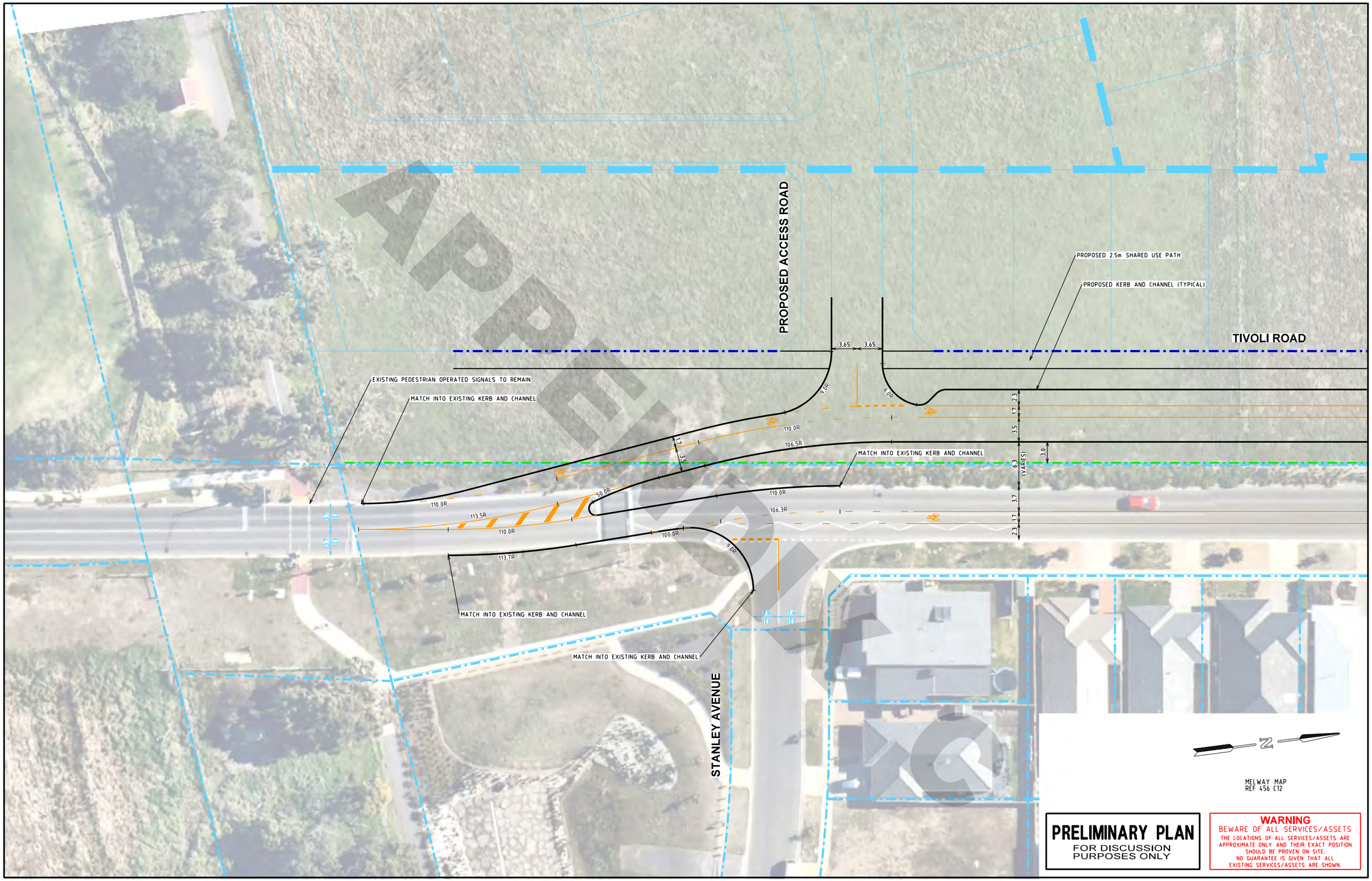
Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
North: Jetty Road															
8	T1	All MCs	297	3.2	297	3.2	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			297	3.2	297	3.2	0.155	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Median Storage															
12	R2	All MCs	27	0.0	27	0.0	0.024	2.9	LOS A	0.1	0.5	0.30	0.56	0.30	50.1
Approach			27	0.0	27	0.0	0.024	2.9	LOS A	0.1	0.5	0.30	0.56	0.30	50.1
All Vehicles			324	2.9	324	2.9	0.155	0.3	NA	0.1	0.5	0.03	0.05	0.03	59.4

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

Appendix C

Tivoli Drive Carriageway Transition Concept FLP



PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY

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

ISSUE	ISSUE DESCRIPTION	ISSUE DATE
A	CONCEPT LAYOUT PLAN	04 10 2021
B	UPDATED SUBDIVISION LAYOUT INCLUDED	25 10 2021
C	COUNCIL COMMENTS INCORPORATED (PARKING REMOVED)	25 03 2024

GENERAL NOTES
1 BASE INFORMATION FROM AERIAL PHOTOGRAPH (SOURCE NEARMAP OCT 2021)
2 ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL
3 MAIN ROAD - TIVOLI ROAD (SPEED ZONE 50km/h)
4 ALL PROPOSED FOOTPATHS AND PRAM CROSSINGS ARE TO BE CONSTRUCTED WITH TACTILE GROUND SURFACE INDICATORS TO DDA COMPLIANCE GUIDELINES REFER TO AS 1428.4 2009

DESIGNED
MATT O'BRIEN 25 10 2021
CHECKED/APPROVED
NATHAN WOOLCOCK 25 10 2021
FILE NAME
G21702-01

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JETTY ROAD STAGE 2
SINGLE - DOUBLE CARRIAGEWAY TRANSITION
GREATER GEELONG COUNCIL
CONCEPT LAYOUT PLAN

SCALE 1:500 (A3) 0 2.5 5 7.5 10
SHEET No. 1 OF 1
DWG No. G21702-01-01