Appendix D

Integrated Transport Assessment

Planning. Traffic. Development.

Integrated Transport Assessment

Prepared for

ROLLESTON INDUSTRIAL DEVELOPMENTS LTD

423 Selwyn Road
Rolleston

October 2021

Integrated Transport Assessment
Prepared for

Rolleston Industrial Developments Ltd

423 Selwyn Road
Rolleston

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Introduction

1. Rolleston Industrial Developments Ltd has commissioned Novo Group to prepare an Integrated Transport Assessment (ITA) for a Plan Change to rezone Rural land to Residential at Dunns Crossing Road and Selwyn Road, in Rolleston.

2. This report provides an assessment of the transport aspects of the proposed development. It also describes the transport environment in the vicinity of the site, describes the transport related components of the proposal. It has been prepared broadly in accordance with the Integrated Transportation Assessment Guidelines specified in New Zealand Transport Agency Research report 422, November 2010.

3. It is proposed to rezone 28.43Ha of Outer *Plains* (rural) land to become *Living Z* (residential) land, which would facilitate the development of up to 350 dwellings. The location of this land is illustrated in **Figure 1** and a copy of the Outline Development Plan (ODP) is included in **Appendix 1**.

Figure 1: Site Location

4. The predicted traffic generation of the rezoning proposal is:

   i. Peak hours: 315 vehicle movements per hour; and

   ii. Daily: 2,870 vehicle movements per day.

Transport Environment

Road Network

5. The following discussion sets out the transport network in the vicinity of the Plan Change site. The key locations of interest are outlined in **Figure 2**.

Figure 2: Transport Network

State Highway 1

6. **Table 1** sets out the transport characteristics of State Highway 1 (SH1) in the vicinity of the application site.

Table 1: State Highway 1 Road Characteristics

Key Feature or Characteristic	Comment
Road Classification	State Highway and Arterial Road
Cross-Section Description	3.5m lanes in both directions, plus sealed shoulders.
Traffic Volumes	20,500 vehicles per day[1].
Speed	100km/hr (although currently a temporary 70km/hr limit at the intersection with Dunns Crossing Road)
Cycling, Pedestrian Infrastructure and Public Transport	None

State Highway 1 / Dunns Crossing Road / Walkers Road Intersection

7. The SH1 / Dunns Crossing Road / Walkers Road intersection is a priority controlled cross-road, with SH1 having the priority. This intersection is currently operating poorly with regards to traffic capacity and Waka Kotahi (NZ Transport Agency) are committed to upgrading this intersection with the current proposal being a roundabout. The design of this roundabout is under investigation and is programmed for construction in 2024. There is funding committed for this project, although the final design of the roundabout is not yet known.

8. The NZTA Crash Analysis System (CAS) has been reviewed to identify crashes that have been reported within 100m of this intersection in the most recent five-year period available[2]. A total of 16 crashes were reported in that period, of which one included severe injuries and seven resulted in minor injuries. **Figure 3** is the collision diagram, and the crashes are summarised below.

    i. SH1 South-Westbound Approach: 1 minor injury and 2 non-injury crashes:

        (a) Head-on when a south-west bound driver hit a vehicle waiting to turn right into Dunns Crossing Road – 1 minor injury crash.

        (b) Merging crash where a driver in the right turn bay changed to the through lane without checking – 1 non-injury crashes.

        (c) Rear-end when vehicles have stopped for road works – 1 non-injury crash.

    ii. Dunns Crossing Road: 1 serious, 4 minor injury and 3 non-injury crashes. These were all failure to give-way.

    iii. SH1 North-Eastbound Approach: 2 non-injury crashes:

        (a) Loss of control when turning – 1 non-injury crash.

        (b) Loss of control because of fatigue - 1 non-injury crash.

[1] From Mobile Road website.
[2] 01/06/2016 to 01/06/2021.

iv. Walkers Road: 2 minor injury and 1 non-injury crashes. These were all failure to give-way.

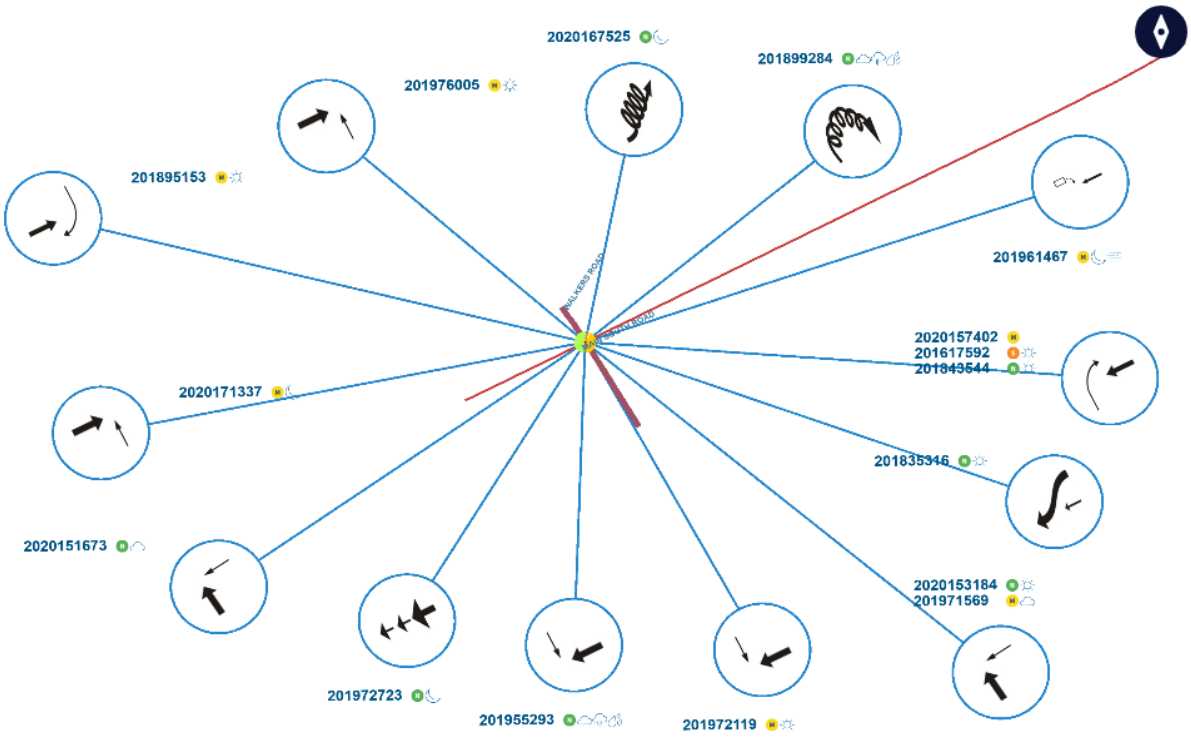


Figure 3: SH1 / Dunns Crossing Rd / Walkers Rd Collision Diagram

9. The above identifies that a number of crashes have occurred at the SH1 / Dunns Crossing Road / Walkers Road intersection. These are primarily caused by vehicles on the minor arms failing to give-way to through traffic on SH1 and these crashes will be addressed by the provision of a roundabout, as anticipated to occur at this location. Planned road upgrades in this area are further discussed at paragraph 24.

Dunns Crossing Road

10. **Table 2**sets out the transport characteristics of Dunns Crossing Road.

Table 2: Dunns Crossing Rd Characteristics

Key Feature or Characteristic	Comment
Road Classification	Arterial Road immediately south of SH1 to Lowes Road, then a Local Road to Selwyn Road.
Cross-Section Description	Carriageway width of 8.4m (i.e. two 4.2m wide traffic lanes) north of Lowes Road. Variable carriageway south of Lowes Road, being approximately 6.2m wide at the Application site.
Traffic Volumes	Varies between 3,250 to 5,100 vehicles per day[3] depending on location.
Speed	Variable depending on location, although 100km/hr at the Application site.
Cycling, Pedestrian Infrastructure and Public Transport	None provided in the immediate vicinity of the site. Footpaths are provided in the urbanised area north of the application site.

Selwyn Road

11. **Table 3** sets out the transport details of Selwyn Road in the vicinity of the Plan Change site.

Table 3: Selwyn Rd Characteristics

Key Feature or Characteristic	Comment
Road Classification	Local Road, although this becomes an Arterial Road east of Lincoln Rolleston Road.
Cross-Section Description	Carriageway width of 6.6m (i.e. two 3.3m wide traffic lanes)
Traffic Volumes	700 to 3,000 vehicles per day[4] depending on location.
Speed	80km/hr
Cycling, Pedestrian Infrastructure and Public Transport	None.
Connectivity	Provides a connection to Shands Road, which links toward the Christchurch Southern Motorway interchange.

12. **Table 4** sets out the transport details of Goulds Road within the vicinity of the Plan Change site.

[3] From Mobile Road website
[4] From Mobile Road website

Table 4: Goulds Road Characteristics

Key Feature or Characteristic	Comment
Road Classification	Local Road
Cross-Section Description	Carriageway width of 6.8m (i.e. two 3.4m wide traffic lanes)
Traffic Volumes	984 vehicles per day.
Speed	80km/h from Selwyn Road northward, then reducing to 60 km/h south of East Maddisons Road.
Cycling, Pedestrian Infrastructure and Public Transport	None.
Connectivity	Provides a link to / from centre Rolleston.

13. Dunns Crossing Road forms a 'T' intersection with Goulds Road immediately north of the intersection of Goulds Road and Selwyn Road. This configuration is illustrated in **Figure 4.**

Figure 4: Dunns Crossing Rd / Goulds Rd / Selwyn Rd Intersection Arrangement

14. The NZTA CAS database has been reviewed to identify crashes that have been reported within 100m of this intersection (including the 'T' intersection and the cross-roads) in the most recent five-year period available. **Figure 5** is the collision diagram, and the crashes are summarised below.

    i. Goulds Road Northbound Approach: 2 minor injury and 1 non-injury crashes:

(a) Failure to give-way – 2 minor injury crashes and 1 non-injury crash.

ii. Goulds Road Southbound Approach: 1 serious injury, 1 minor injury and 2 non-injury crashes:

(a) Failure to give-way – 1 serious injury crash, 1 minor injury crash and 2 non-injury crash.

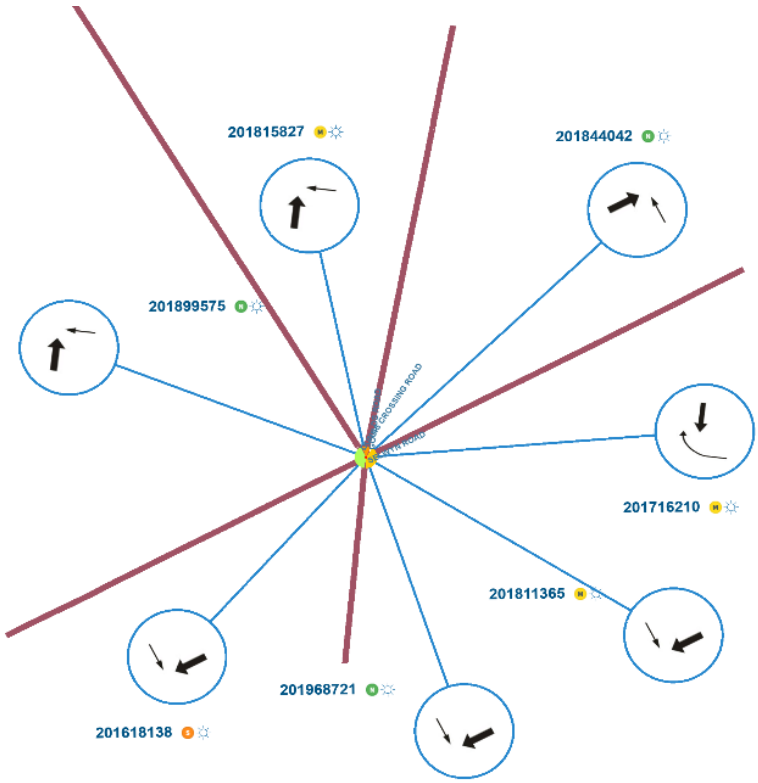


Figure 5: Dunns Crossing Rd / Goulds Rd / Selwyn Rd Collision Diagram

15. The above crash review indicates there is a trend in which drivers exiting the Goulds Road approaches are failing to give-way to traffic on Selwyn Road.

Lowes Road

16. **Table 5** sets out the transport details of Lowes Road.

Table 5: Lowes Rd Characteristics

Key Feature or Characteristic	Comment
Road Classification	Arterial Road
Cross-Section Description	Carriageway width of 6.0m (i.e. two 3.0m wide traffic lanes), plus on-street parking on both sides.
Traffic Volumes	1,700 to 4,000 vehicles per day[5] depending on location.
Speed	50km/hr
Cycling, Pedestrian Infrastructure and Public Transport	1.5m wide footpaths are provided on both sides of the road. No dedicated cycling facilities or public transport are provided.
Connectivity	Provides a connection to Levi Road, which links toward central Rolleston, plus the Weedons – Ross interchange with SH1.

17. The Dunns Crossing Road / Lowes Road intersection is a priority controlled T-intersection, with Dunns Crossing Road having the priority. No crashes have been reported at this intersection in the most recent five-year period available.

Burnham School Road

18. **Table 6** sets out the transport details of Burnham School Road, east of Dunns Crossing Road.

Table 6: Burnham School Rd Characteristics – East of Dunns Crossing Rd

Key Feature or Characteristic	Comment
Road Classification	Local Road
Cross-Section Description	Carriageway of approximately 7.0m.
Traffic Volumes	800 vehicles per day[6].
Speed	50km/hr.
Cycling, Pedestrian Infrastructure and Public Transport	1.5m wide footpaths are provided on both sides of the road. No dedicated cycling facilities or public transport are provided.

19. The Dunns Crossing Road / Burnham School Road intersection is a priority controlled cross-road, with Dunns Crossing Road having the priority. No crashes have been reported at this intersection in the most recent five-year period available.

20. We understand that Council is investigating a set of traffic signals at this intersection, although we are unaware of the specific design for these signals at this stage.

[5] From Mobile Road website
[6] From Mobile Road website

Alternate Transport Modes

21. Shared paths are proposed on the Dunns Crossing Road frontage as part of Plan Change applications further north along this road (compared to this Plan Change site location). This will provide a safe walking and cycling facility that can be continued as part of this application.

22. Although no bus services operate in the immediate vicinity of the Application site, this is to be expected given there is no significant development of this area. Route 5 currently turns at Lowes Road / East Maddisons Road, as illustrated in **Figure 6**. This service travels from Rolleston to Christchurch City and to New Brighton every 30 minutes on weekdays and weekends.

23. **Figure 7** illustrates the route travelled by the Route 85 bus service, which currently starts and ends in the Faringdon subdivision. This service travels between Rolleston and Christchurch City and is an express service designed to get residents quickly between the two locations in the AM and PM peak periods, with three services in a one-hour period in both peaks.

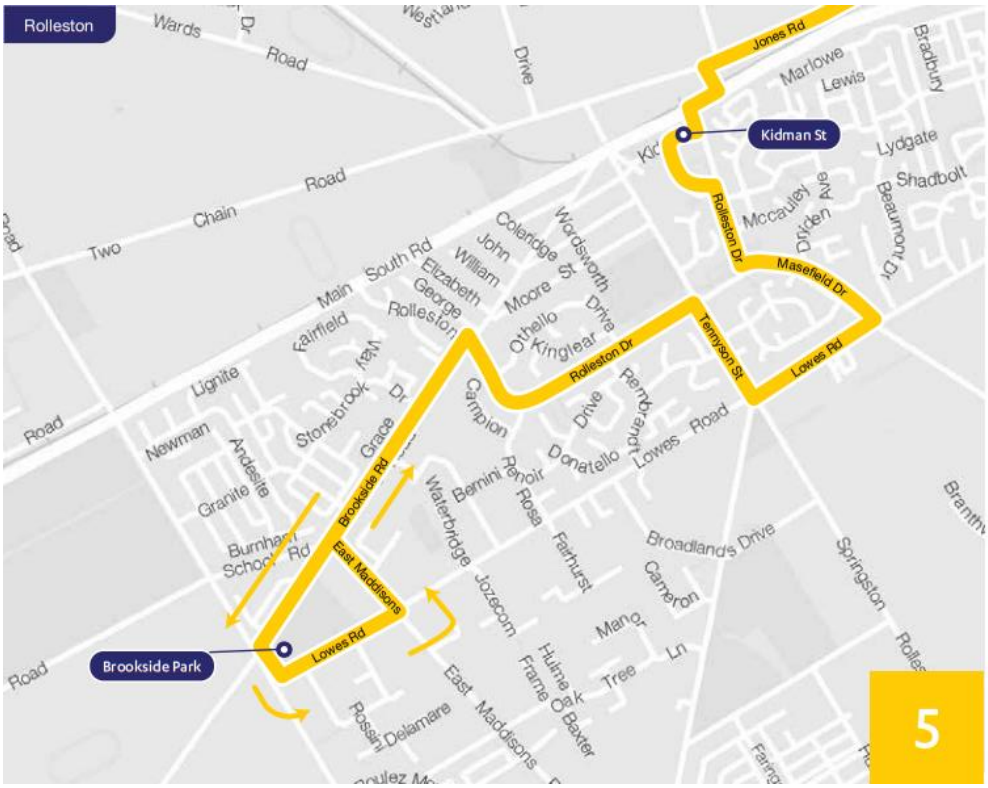


Figure 6: Route 5

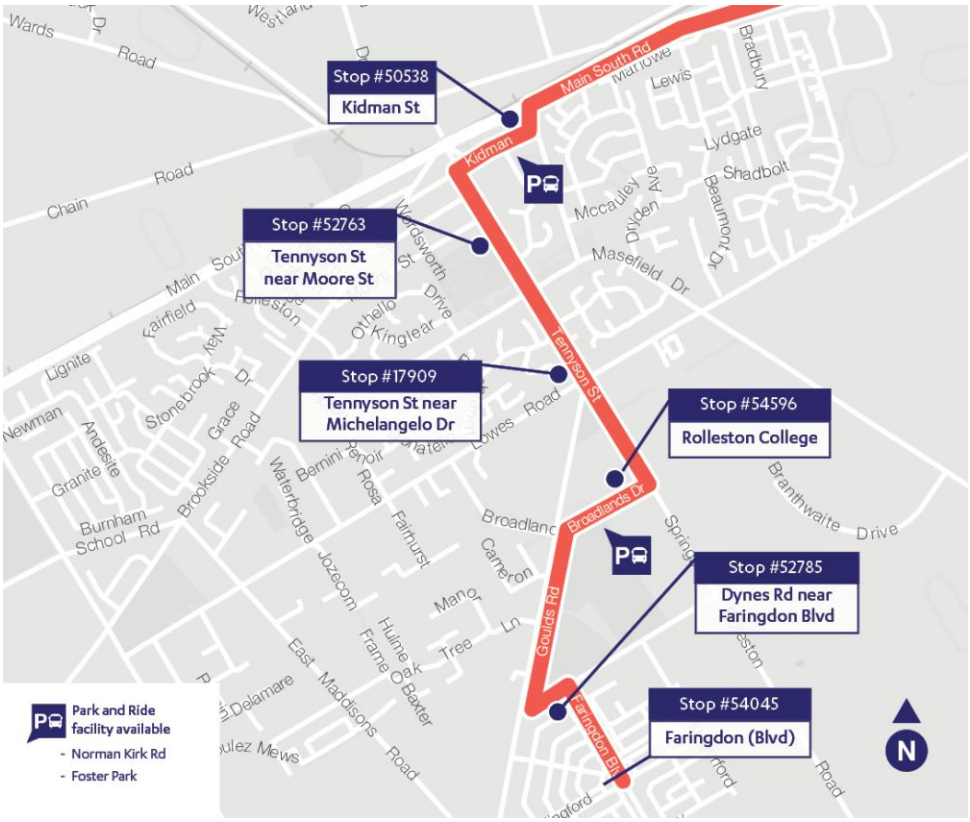


Figure 7: Route 85

Wider Transport Network

Waka Kotahi Planned Upgrades

24. The New Zealand Upgrade Programme (NZUP) is a government initiative to improve transport safety and efficiency in the country's growth areas. This has led to funding for a package of works in Rolleston that is being led by Waka Kotahi, in conjunction with Selwyn District Council (SDC) and KiwiRail. Broadly, the package of works includes the following:

    i. Fly-over from Rolleston Drive to Jones Road (near Hoskyns Road), facilitating a closure of the SH1 intersections with Rolleston Drive and Hoskyns Road in this location. The fly-over will include pedestrian and cycle facilities; and

    ii. A new roundabout at the SH1 / Dunns Crossing Road / Walkers Road intersection. Discussions with Waka Kotahi have indicated this will be complete in 2024.

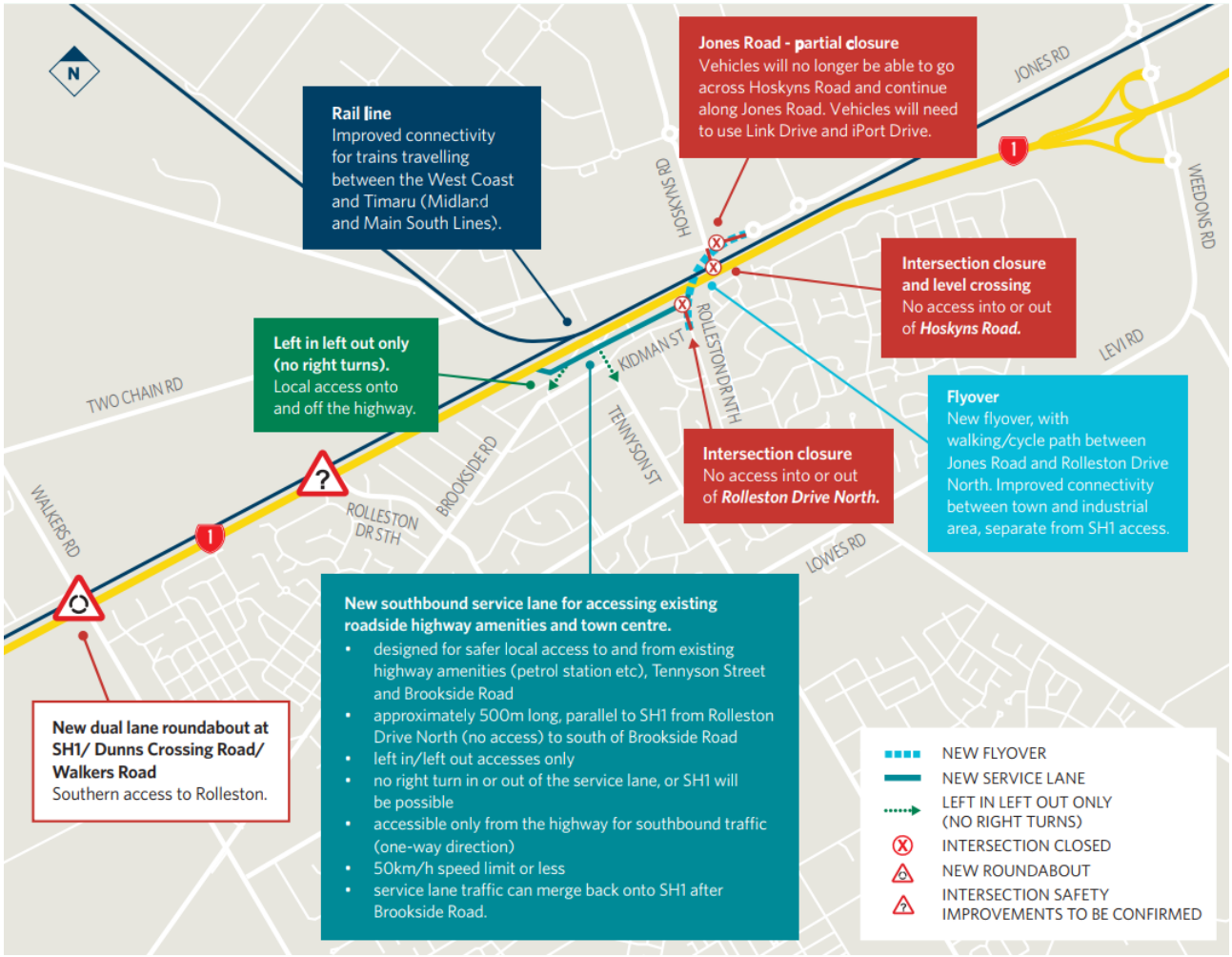


Figure 8: NZUP Transport Improvements

(Sourced from Waka Kotahi Newsletter dated July 2021)

25. **Figure 8** illustrates the resultant traffic movement priorities for the Rolleston Road network upon completion of the above works. This identifies that Dunns Crossing Road south of Lowes Road is currently intended to provide local access.

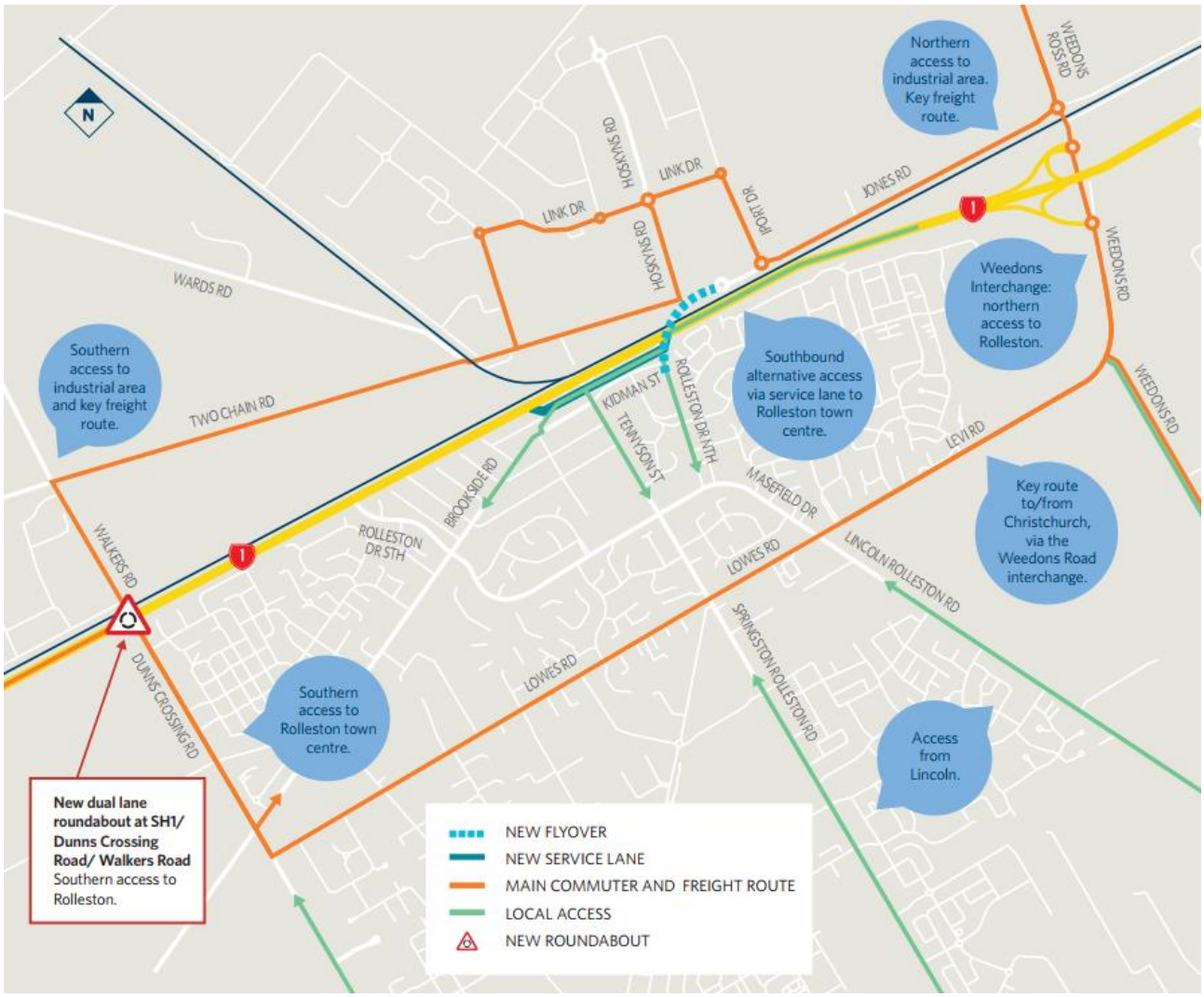


Figure 9: NZUP Transport Network

(Sourced from Waka Kotahi Newsletter dated July 2021)

Rolleston Plan Changes

26. In addition to the Application site, there are a series of Plan Changes that have been lodged in Rolleston. These are illustrated in **Figure 10**.

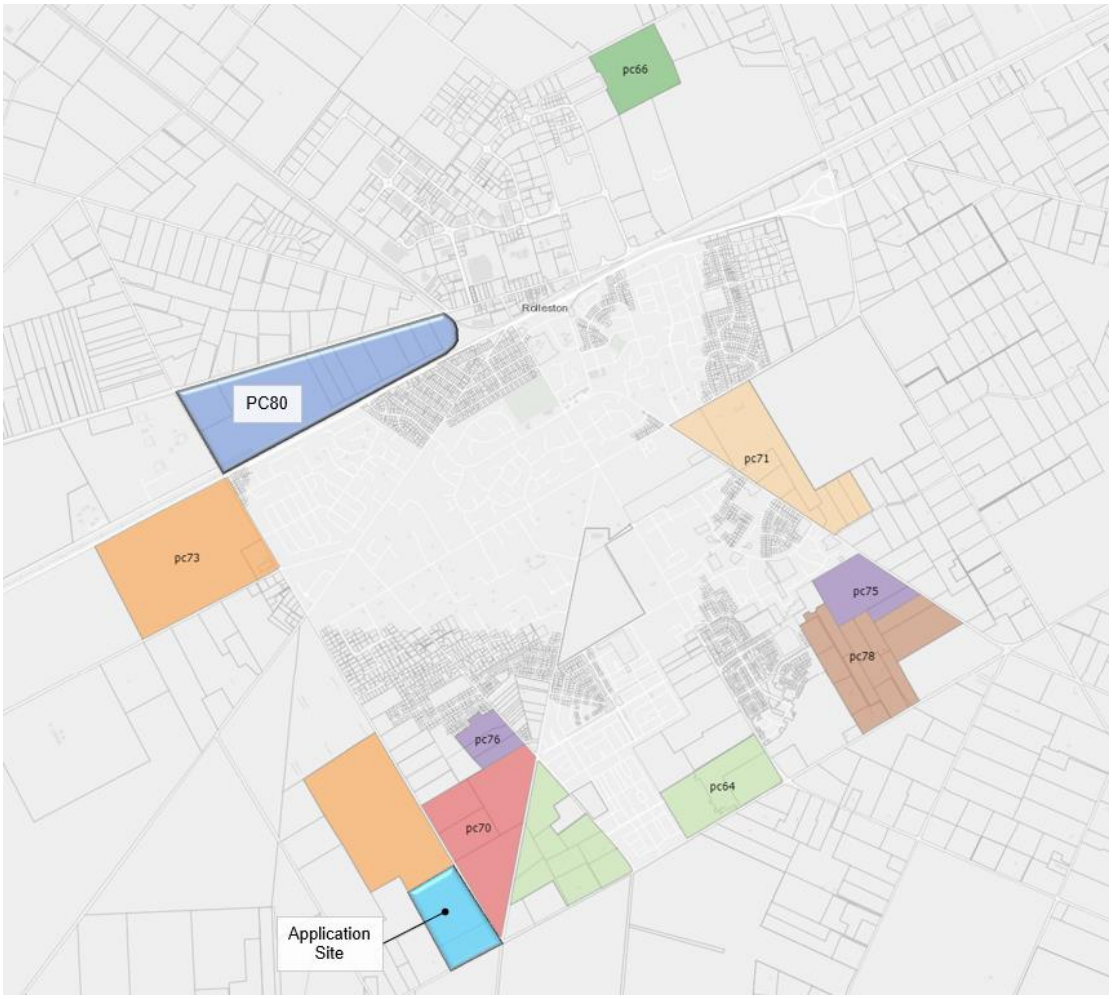


Figure 10: Rolleston Plan Change Sites

(Sourced from SDC Website)

27. The above Plan Change applications comprise:

i. Plan Change 64 – 969 residential lots;

ii. Plan Change 66 – 27ha of industrial land;

iii. Plan Change 70 – 800 residential lots;

iv. Plan Change 71 – 660 residential lots;

v. Plan Change 73 – 2,100 residential lots;

vi. Plan Change 75 – 280 residential lots;

vii. Plan Change 76 – 150 residential lots;

viii. Plan Change 78 – 750 residential lots;

ix. Plan Change 80 – 98Ha of Industrial land lodged but not yet notified.

28. A micro-simulation traffic model (owned by SDC) has been created of the Rolleston network. This model includes the above notified Plan Changes and includes the following key assumptions regarding transport upgrades in the vicinity of this Plan Change site:

    i. The NZUP project as discussed at paragraph 24;

    ii. Traffic signals at the Dunns Crossing Road / Burnham School Road intersection;

    iii. Upgrades to the Lowes Road / Dunns Crossing Road intersection to provide a roundabout at this location; and

    iv. Upgrade to the Goulds Road / Dunns Crossing Road / Selwyn Road intersection to provide a roundabout.

The Proposal

29. It is proposed to rezone 28.43ha of rural (Outer Plains) land at the application site for residential use (Living Z). A copy of the ODP is illustrated in **Figure 11** and included in **Appendix 1**.

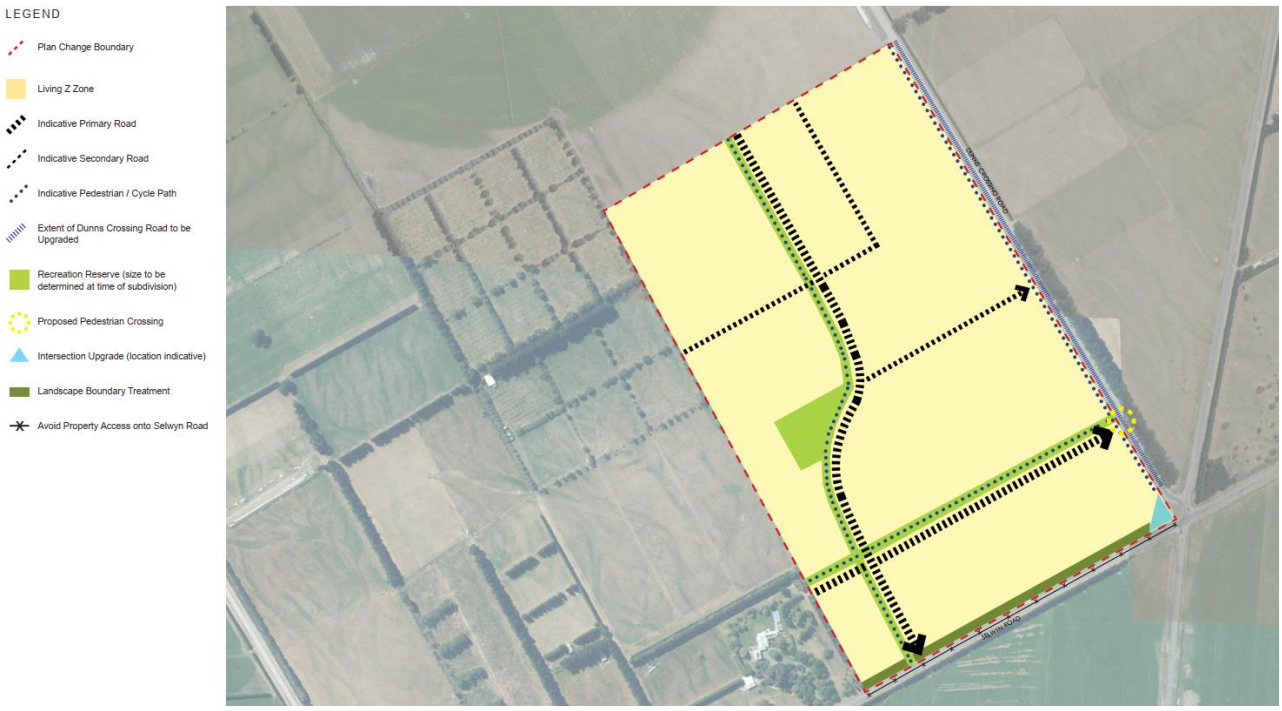


Figure 11: Proposed ODP

30. The following provides a description of the transport components of the proposed Plan Change.

Traffic Generation

31. The traffic generation is based on an 85th percentile rate of 0.9 vehicles per dwelling in the peak hours and 8.2 vehicles per dwelling per day[7]. Applying this to the proposed up to 350 dwellings leads to the

[7] Based on Outer Suburban dwellings in the NZTA Research Report 453 – *Trips and Parking Related to Land Use*.

traffic generation set out in **Table 7**. This assumes the following arrival / departure splits from the ITE *Trip Generation* guidebook:

i. AM Peak – 25% arrivals / 75% departures;

ii. PM Peak – 63% arrivals / 37% departures: and

iii. Daily – 50% arrivals / 50% departures.

Table 7: Skellerup South Traffic Generation

	Arrivals	Departure	Total
AM Peak	79	236	315
PM Peak	198	114	315
Daily	1,435	1,435	2,870

32. The assignment and distribution of this traffic has been determined by the Rolleston Paramics traffic model. This distribution is illustrated in **Figure 12** and **Figure 13**.

Figure 12: AM Peak Traffic Volume Change Plots

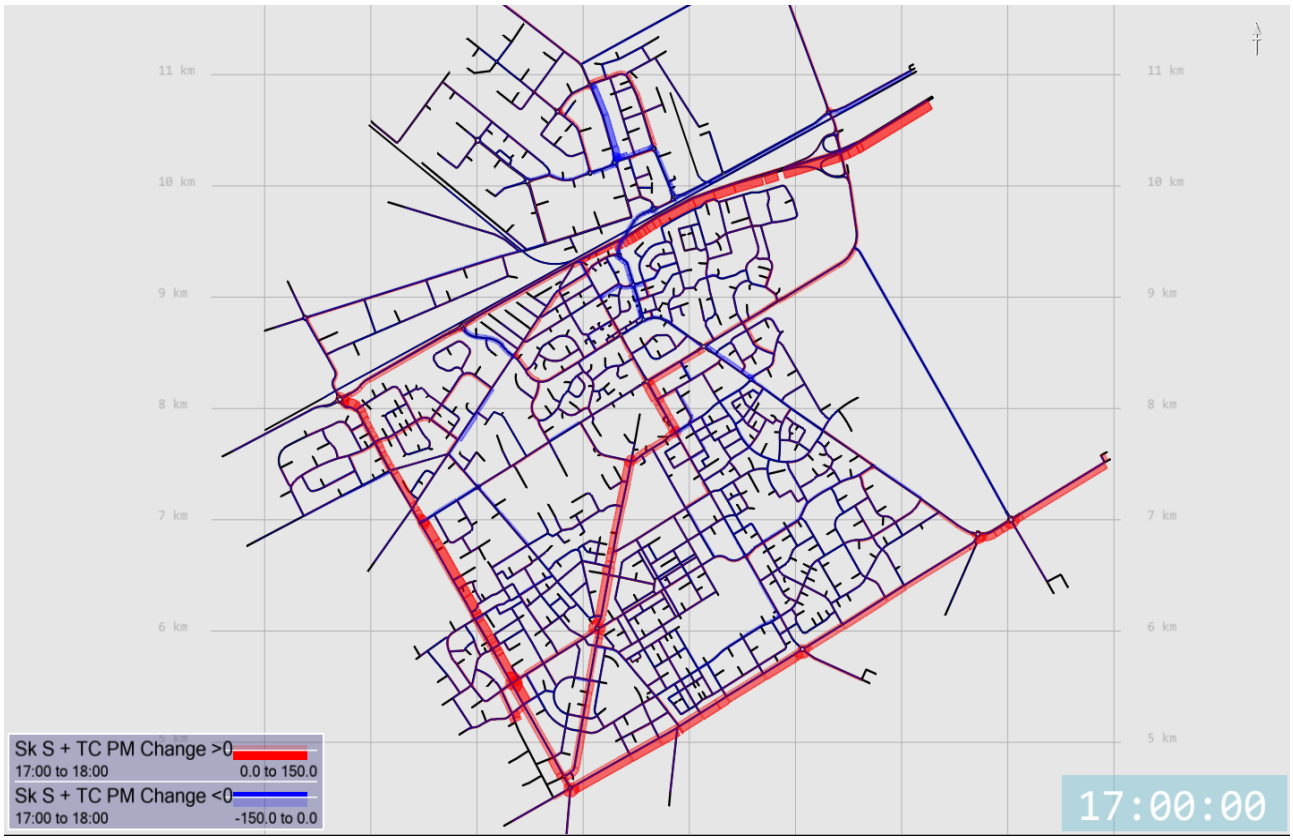


Figure 13: PM Peak Traffic Volume Change Plots

Site Layout

Access Arrangements & Internal Roads

33. The ODP indicates the primary road network within the Application site. This includes:

    i. Two accesses to Dunns Crossing Road, both of which would be cross-roads with Dunns Crossing Road retaining the priority; and

    ii. Access to Selwyn Road, which would be a priority-controlled T intersection, with Selwyn Road having the priority.

34. The Dunns Crossing Road accesses are located to link to the Plan Change 70 access on the eastern side of Dunns Crossing Road and the realigned Gould Road link to Dunns Crossing Road. The final design of all accesses will be considered at subdivision stage, although there is ample room within the road corridor to provide turning lanes if required.

35. The internal road network is proposed to meet the requirements of the Selwyn District Plan[8] and Engineering Code of Practice. The primary network will be designed such that it can accommodate passenger transport should that be routed through the site.

[8] Be it the currently Operative District Plan or the Replacement District Plan,

36. The internal network has been designed to provide links to the PC73 site to the north, should that site be developed. Other possible links to the west are shown for potential future development in that direction.

37. Direct property access is not proposed to Selwyn Road.

Pedestrian & Cycle Network

38. The internal road network will be designed to accommodate on-road cycle facilities (where appropriate) as well as footpaths. Separate pedestrian and cycle links have been provided within the ODP that also link to the PC73 site to the north, should that site be developed. That will enable a continuous link to the PC73 site.

Off-Site Upgrades

39. The ODP includes a commitment to upgrading Dunns Crossing Road along the site boundary. This upgrade would be discussed with Council at the time of subdivision, although it is anticipated to be a continuation of the urbanisation of this road as has occurred elsewhere along Dunns Crossing Road.

40. The road frontage upgrade along the Dunns Crossing Road would also include a shared path (pedestrian and cycle facility) on the same side of the road as the application site. A pedestrian crossing facility is also proposed at the Dunns Crossing / PC70 / Site Access intersection.

41. A segment of land has been set aside in the south-eastern corner of the site to assist in facilitating the proposed upgrade of the Goulds Road / Dunns Crossing Road / Selwyn Road intersection.

Timing of Development Relative to Infrastructure Improvements

42. It is assumed that the following infrastructure upgrades would be complete prior to occupation of any development at the Application site:

    i. SH1 / Walkers Road / Dunns Crossing Road upgrade;

    ii. Dunns Crossing Road / Burnham School Road traffic signals; and

    iii. Goulds Road / Dunns Crossing Road / Selwyn Road intersection.

43. The above are all planned by Council or Waka Kotahi, although the timing of development of the Plan Change site would likely bring these forward. In this regard, development contributions are understood to be provided from a range of Plan Change sites that will fund the work (for the Goulds Road / Dunns Crossing Road / Selwyn Road intersection in particular) and this Plan Change has allocated land to provide for the upgrade.

District Plan Requirements

44. It is proposed that the transport related rules and standards of the Living Z zone would apply to the Application site.

Assessment of Effects

Traffic Effects

Basis of Assessment

45. The basis of the assessment of traffic effects is from a Paramics model of Rolleston. The modelling has been undertaken by Abley and a copy of the results is included in **Appendix 2**. This modelling is representative of 2033 and includes:

    i. The NZUP works set out from paragraph 24;

    ii. The Plan Change application sites set out in paragraph 26(the 'base network'); and

    iii. Both with and without this proposed Plan Change site (but always with the Plan Change sites set out in paragraph 26) to compare the effects of the proposal against the base network operation.

Network Operation

State Highway 1 / Dunns Crossing Road / Walkers Road Intersection

46. The traffic modelling assumed this intersection would be constructed as a roundabout prior to development occurring at the Plan Change site. **Table 8** provides a summary of the intersection operation for the base model (without Plan Change) and with the Plan Change.

Table 8: SH1 / Dunns Crossing Rd / Walkers Rd Intersection – Paramics Results

Period	Approach	Base Model		With Plan Change	
		Delay (seconds)	Level of Service	Delay (seconds)	Level of Service
AM Peak	Walkers Road	17	B	18	B
	SH1 East	5	A	5	A
	Dunns Crossing Rd	37	D	41	D
	SH1 West	69	E	82	F
	Overall	***32***	***C***	***37***	***D***
PM Peak	Walkers Road	14	B	14	B
	SH1 East	10	B	13	B
	Dunns Crossing Rd	6	A	6	A
	SH1 West	8	A	9	A
	Overall	***10***	***A***	***11***	***B***

47. The above results indicate that the State Highway 1 / Dunns Crossing Road / Walkers Road intersection will be over capacity in the weekday AM peak period with this Plan Change. This is because the SH1 west approach (that is predicted to operate at Level of Service E in the base model) is predicted to operate at Level of Service F with the inclusion of this Plan Change.

48. The operation of this intersection (with the Plan Change traffic) has been further reviewed by creating an isolated intersection model in SIDRA. This model assumed the layout illustrated in **Figure 14**, an 80km/hr speed environment and the default settings. The results are included in **Appendix 3** and summarised in **Table 9**, along with the Paramics model results for comparison.

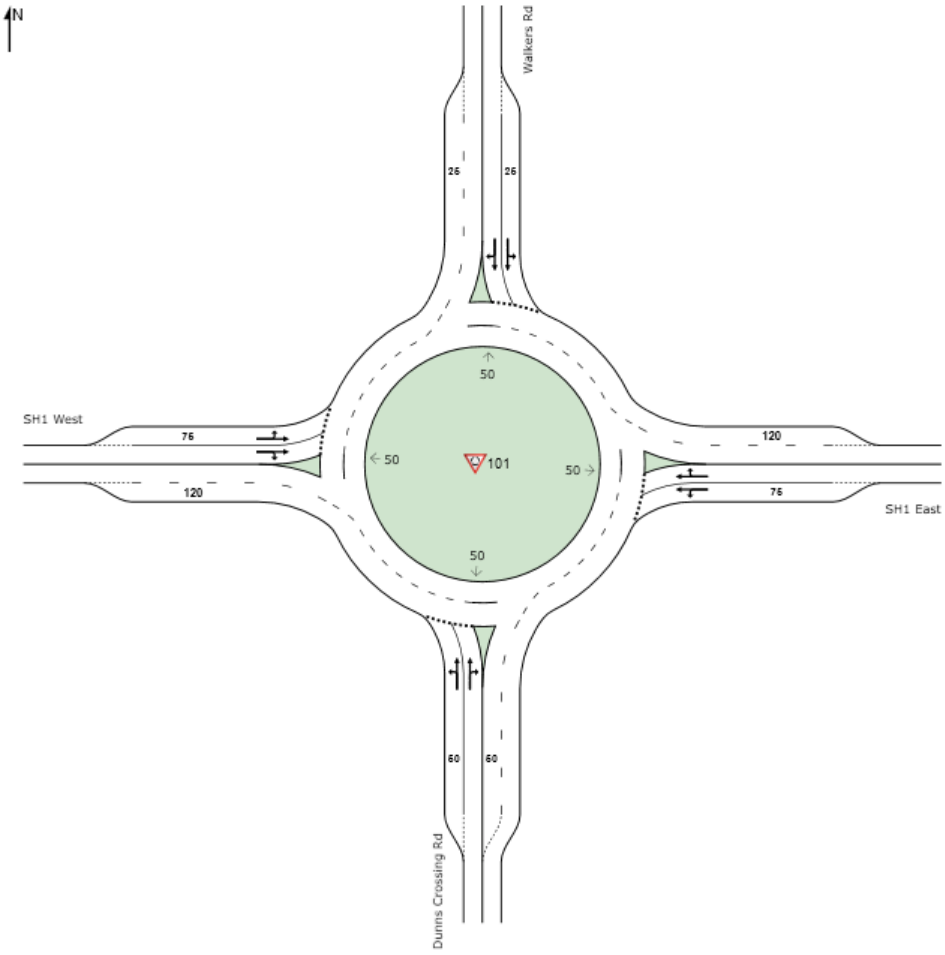


Figure 14: SH1 / Dunns Crossing Road / Walkers Road Assumed Layout

Table 9: SH1 / Dunns Crossing Rd / Walkers Rd Intersection – Paramics Comparison to SIDRA Results

Period	Approach	Paramics Model With Plan Change		SIDRA Results With Plan Change	
		Delay (seconds)	Level of Service	Delay (seconds)	Level of Service
AM Peak	Walkers Road	18	B	14	B
	SH1 East	5	A	8	A
	Dunns Crossing Rd	41	D	16	B
	SH1 West	82	F	16	B
	Overall	***37***	***D***	***13***	***B***
PM Peak	Walkers Road	14	B	11	B
	SH1 East	13	B	11	B
	Dunns Crossing Rd	6	A	18	B
	SH1 West	9	A	10	B
	Overall	***11***	***B***	***12***	***B***

49. The results identify a much-improved operation in the AM compared to that of the Paramics model. PM model results indicate a similar level of operation being predicted by the Paramics model and the SIDRA model. Overall, it is considered that the Paramics model may be underestimating the capacity of this roundabout and the operation would likely be better than predicted. As such, it is considered that the effects of the proposed Plan Change at this location will be acceptable.

Dunns Crossing Road / Newman Road Intersection

50. **Table 10** summarises the traffic modelling results of the Dunns Crossing Road / Newman Road intersection from the Paramics model, including the Base Model and with the proposed Plan Change.

Table 10: Dunns Crossing Road / Newman Road Intersection – Paramics Results

Period	Approach	Base Model		With Plan Change	
		Delay (seconds)	Level of Service	Delay (seconds)	Level of Service
AM Peak	Dunns Crossing Rd North	1	A	1	A
	Newman Rd	40	E	53	F
	Dunns Crossing Rd South	12	B	19	C
	Overall	***40***	***E***	***53***	***F***
PM Peak	Dunns Crossing Rd North	1	A	2	A
	Newman Rd	20	C	22	C
	Dunns Crossing Rd South	3	A	3	A
	Overall	***20***	***C***	***22***	***C***

51. The results in **Table 10** indicate that the Newman Road approach to this intersection is over-capacity in the base model during the AM peak. The implication of the traffic modelling is also that queuing from the SH1 / Dunns Crossing Road / Walkers Road intersection is extending through the Newman Road intersection. This is because the through traffic on Dunns Crossing Road (south) is predicted to have a delay of 20 seconds on what should be a free-flowing movement. Similarly, the right turn into Newman Road is predicted to incur a delay of 62 seconds in the evening peak, whereas the right turn out of Newman Road has a delay of 26 seconds (for a higher volume movement that needs to give-way to the right turn in). As such, it is anticipated that the operation of this intersection would be improved if the operation of the SH1 / Dunns Crossing Road / Walkers Road intersection were similar to that of the SIDRA results in **Table 9**, which have a much improved performance for Dunns Crossing Road (and therefore reduce queue lengths).

Dunns Crossing Road / Burnham School Road Intersection

52. The Paramics traffic modelling also assumed this intersection would be upgraded to traffic signals prior to development occurring at the Plan Change site. The results of the traffic modelling of this intersection are included in **Table 11**.

53. The following results indicate that the Dunns Crossing Road / Burnham School Road intersection operates satisfactorily with the Plan Change traffic added to the road network.

Table 11: Dunns Crossing Road / Burnham School Road Intersection – Paramics Results

Period	Approach	Base Model		With Plan Change	
		Delay (seconds)	Level of Service	Delay (seconds)	Level of Service
AM Peak	Dunns Crossing Rd Nth	16	B	16	B
	Burnham School Rd East	14	B	17	B
	Dunns Crossing Rd Sth	16	B	17	B
	Burnham School Rd West	22	C	22	C
	Overall	***17***	***B***	***18***	***B***
PM Peak	Dunns Crossing Rd Nth	7	A	7	A
	Burnham School Rd East	17	B	14	B
	Dunns Crossing Rd Sth	11	B	12	B
	Burnham School Rd West	20	C	21	C
	Overall	***10***	***B***	***11***	***B***

Dunns Crossing Road / Lowes Road Intersection

54. The Paramics traffic modelling also assumed this intersection would be upgraded to a roundabout prior to development occurring at the Plan Change site. The results of the traffic modelling of this intersection are included in **Table 12**.

55. The following results indicate that the Dunns Crossing Road / Lowes Road intersection operates satisfactorily with the Plan Change traffic added to the road network.

Table 12: Dunns Crossing Road / Lowes Road Intersection – Paramics Results

Period	Approach	Base Model		With Plan Change	
		Delay (seconds)	Level of Service	Delay (seconds)	Level of Service
AM Peak	Dunns Crossing Rd Nth	3	A	4	A
	Lowes Rd	7	A	7	A
	Dunns Crossing Rd Sth	10	A	10	A
	Overall	***7***	***A***	***7***	***A***
PM Peak	Dunns Crossing Rd Nth	7	A	8	A
	Lowes Rd	25	C	32	D
	Dunns Crossing Rd Sth	4	A	5	A
	Overall	***8***	***A***	***9***	***A***

Dunns Crossing Road / Selwyn Road / Goulds Road Intersection

56. The traffic modelling also assumed this intersection would be constructed as a roundabout along with Goulds Road realignment prior to development occurring at the Plan Change site. The results of the traffic modelling of this intersection are included in **Table 13**.

57. The following results indicate that the Dunns Crossing Road / Selwyn Road / Goulds Road intersection operates satisfactorily with the Plan Change traffic added to the road network.

Table 13: Dunns Crossing Road / Selwyn Road Intersection – Paramics Results

Period	Approach	Base Model		With Plan Change	
		Delay (seconds)	Level of Service	Delay (seconds)	Level of Service
AM Peak	Dunns Crossing Rd Nth	2	A	2	A
	Selwyn Rd East	5	A	4	A
	Goulds Rd	7	A	6	A
	Selwyn Rd West	3	A	3	A
	Overall	***3***	***A***	***3***	***A***
PM Peak	Dunns Crossing Rd Nth	2	A	3	A
	Selwyn Rd East	5	A	5	A
	Goulds Rd	6	A	6	A
	Selwyn Rd West	3	A	3	A
	Overall	***3***	***A***	***4***	***A***

Alternate Transport Modes

Passenger Transport

58. Paragraph 22 identifies the existing bus routes in the vicinity of the Plan Change site. These could be extended into the site as illustrated in **Figure 15** (or similar alignments depending on the approval of other Plan Change applications). These changes would need to be agreed with Environment Canterbury, as they are the passenger transport administrator. However, it is considered that the site could be served by buses and the internal road network will be designed to accommodate this.

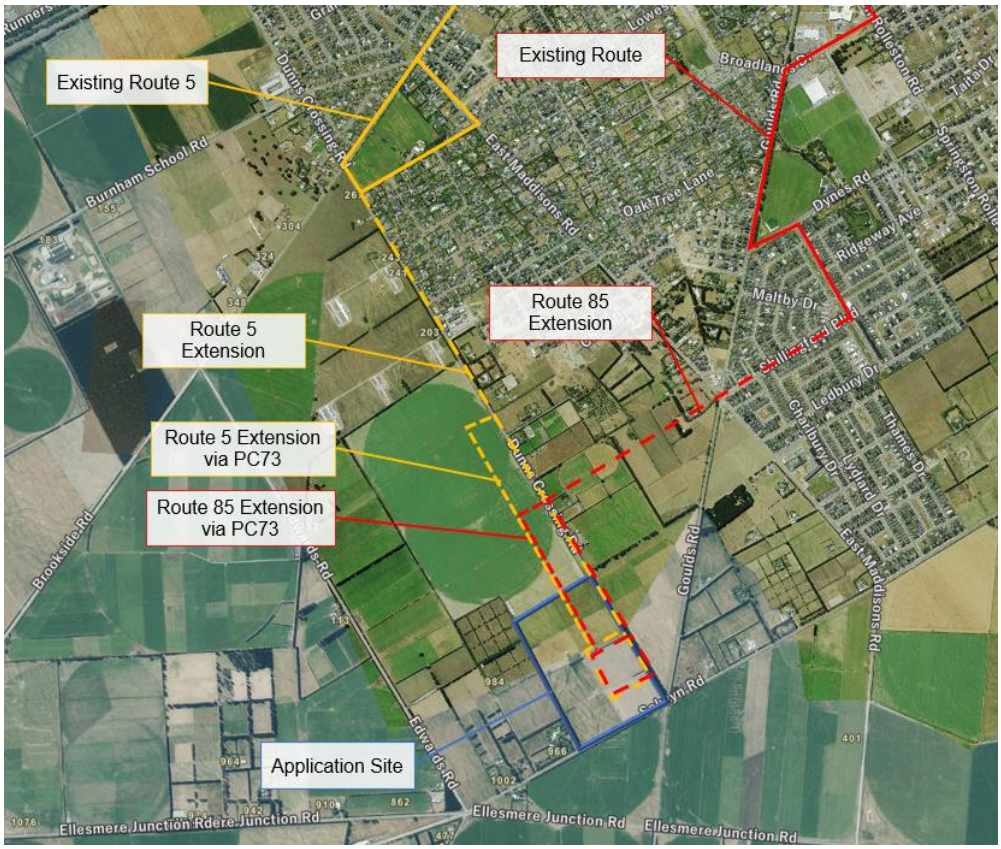


Figure 15: Potential Passenger Transport Alterations

Walking & Cycling

59. The ODP includes the provision of a shared path along Dunns Crossing Road as part of the proposed upgrade. The internal network also provides for a range of walking and cycling opportunities within the road corridors as well as a reserve that could also accommodate these modes. These link to the proposed networks that form part of Plan Change 73 (to the north) and Plan Change 70 (to the east).

60. The above is considered to be sufficient to accommodate walking and cycling through, as well as to / from the Plan Change site.

Summary & Conclusion

Summary

61. It is proposed to rezone 28.43Ha of Outer Plains (rural) land to become Living Z (residential) land, which would facilitate the development of up to 350 dwellings. The traffic generation of the proposed activity is:

    i. Peak hours: 315 vehicle movements per hour; and

    ii. Daily: 2,870 vehicle movements per day.

62. The Plan Change site would gain access to Dunns Crossing Road and Selwyn Road. It is assumed that the following transport upgrades would be completed prior to occupation of development at the Plan Change site:

    i. SH1 / Walkers Road / Dunns Crossing Road upgrade;

    ii. Dunns Crossing Road / Burnham School Road traffic signals; and

    iii. Goulds Road / Dunns Crossing Road / Selwyn Road intersection.

63. A road frontage upgrade is proposed to Dunns Crossing Road, which would include the provision of a shared path.

64. It has been identified that existing passenger transport routes could be extended to serve the site, should Environment Canterbury be amenable to this change. The site will facilitate the shared path along Dunns Crossing Road to tie in with a similar facility provided for adjacent Plan Change sites. There would also be pedestrian and cycle facilities (if required) provided within the Plan Change site.

65. The application site could comply with the relevant Code of Practice and the design can be tailored to the satisfaction of the Council when a subdivision application is eventually proposed. This includes detailed design pertaining to roads, intersections, berms and footpath widths, lighting, cross fall and kerb design. It is noted that any residential development on any proposed allotments (once subdivided) could comply with all the relevant transport related requirements of the Living zone in the District Plan. This for example, includes access and manoeuvring for each new allotment. Failure to comply with any of these standards would result in the requirement for resource consent approval.

Conclusion

66. Given the above assessment (and subject to the timing of infrastructure provision), the transport effects of the proposed Plan Change are considered to be acceptable.

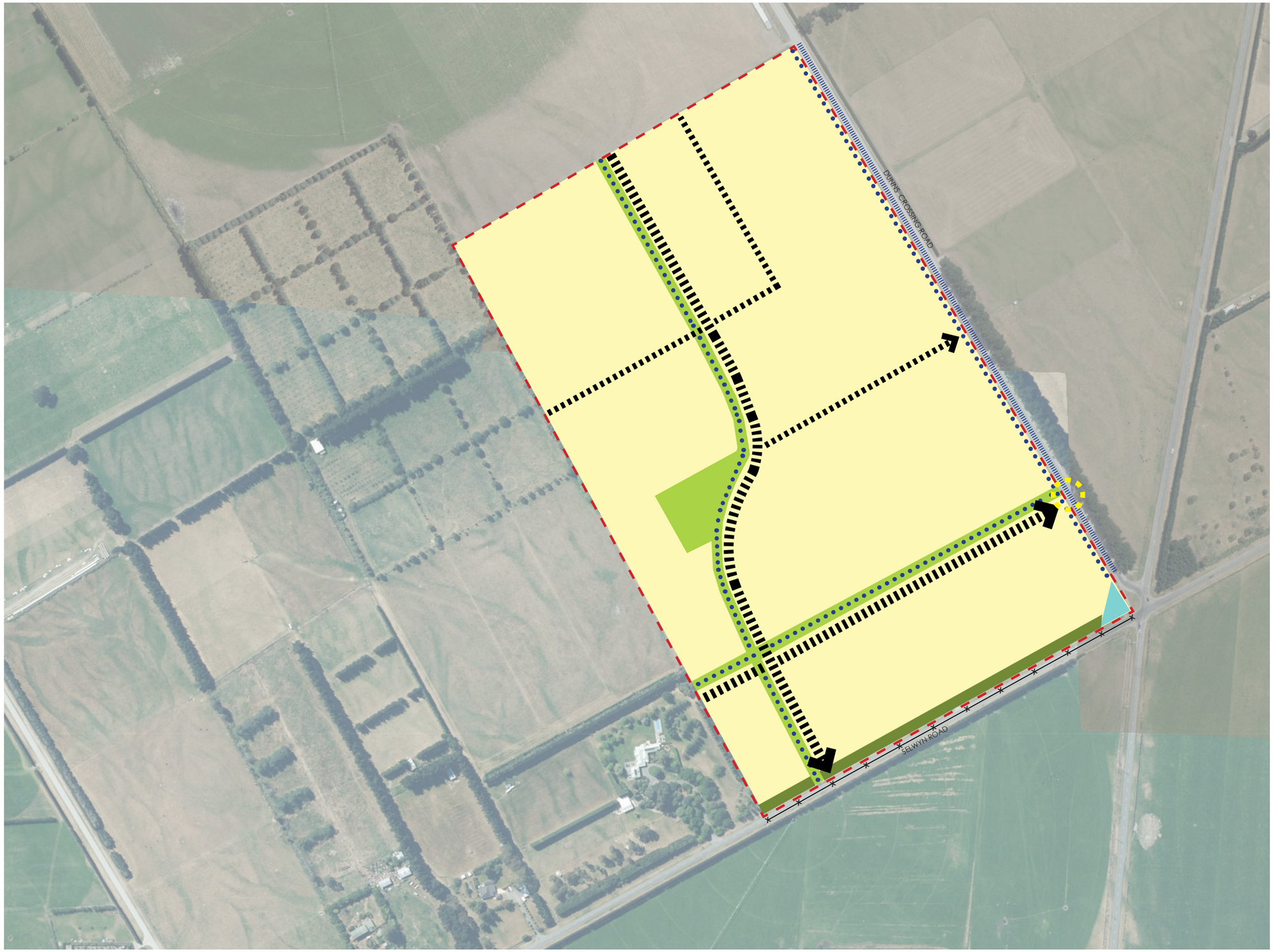
Appendix 1

Proposed Outline Development Plan

OUTLINE DEVELOPMENT PLAN - SKELLERUP SOUTH

LEGEND

- Plan Change Boundary
- Living Z Zone
- Indicative Primary Road
- Indicative Secondary Road
- Indicative Pedestrian / Cycle Path
- Extent of Dunns Crossing Road to be Upgraded
- Recreation Reserve (size to be determined at time of subdivision)
- Proposed Pedestrian Crossing
- Intersection Upgrade (location indicative)
- Landscape Boundary Treatment
- Avoid Property Access onto Selwyn Road



Appendix 2

Paramics Model Results

Skellerup South: Base Model Results

SH1 / Dunns Crossing Road / Walkers Road roundabout

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	Movement	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Walkers Road North	Left	130	70	14	B	17	B	116	71	11	B	14	B	186	39	9	A	13	B	202	46	10	B	14	B
Walkers Road North	Through	79	96	20	B			99	84	16	B			231	67	15	B			268	66	16	B		
Walkers Road North	Right	22	90	24	C			24	69	22	C			67	65	18	B			57	62	18	B		
SH1 East	Left	66	9	3	A	5	A	80	9	3	A	5	A	473	21	5	A	7	A	679	28	8	A	10	B
SH1 East	Through	719	20	5	A			698	21	5	A			646	39	9	A			746	53	12	B		
SH1 East	Right	214	22	7	A			218	30	7	A			105	34	10	A			125	54	14	B		
Dunns Crossing Road South	Left	123	79	23	C	37	D	124	66	14	B	23	C	72	16	4	A	6	A	96	15	4	A	6	A
Dunns Crossing Road South	Through	238	79	23	C			269	69	14	B			120	19	3	A			129	24	4	A		
Dunns Crossing Road South	Right	532	208	46	D			526	165	30	C			140	44	9	A			155	38	9	A		
SH1 West	Left	81	162	46	D	69	E	79	122	28	C	41	D	42	23	6	A	8	A	36	15	5	A	8	A
SH1 West	Through	563	280	67	E			480	266	40	D			643	35	8	A			591	39	8	A		
SH1 West	Right	83	278	105	F			80	251	59	E			115	32	9	A			155	35	9	A		
Intersection Total		2847		32	C	32	C	2792		20	B	20	B	2837		8	A	8	A	3238		10	A	10	A

Brookside Road / Dunns Crossing Road priority intersection

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	Movement	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Dunns Crossing Road North	Left	34	8	2	A	3	A	26	9	2	A	3	A	19	5	2	A	3	A	19	5	2	A	3	A
Dunns Crossing Road North	Through	373	34	3	A			474	34	3	A			547	16	3	A			720	17	3	A		
Dunns Crossing Road North	Right	6	30	10	B			7	30	11	B			4	11	5	A			6	12	7	A		
Brookside Road East	Left	65	51	8	A	18	C	77	32	8	A	15	B	160	50	12	B	12	B	134	97	17	C	19	C
Brookside Road East	Through	8	165	69	F			8	110	42	E			8	69	25	D			10	99	38	E		
Brookside Road East	Right	13	174	42	E			12	128	41	E			10	51	18	C			7	95	41	E		
Dunns Crossing Road South	Right	7	42	13	B	10	A	8	19	7	A	7	A	2	10	5	A	4	A	4	12	5	A	7	A
Dunns Crossing Road South	Right	574	64	8	A			665	48	6	A			383	38	4	A			462	57	6	A		
Dunns Crossing Road South	Right	163	67	15	B			167	45	11	B			89	40	8	A			105	56	12	B		
Brookside Road West	Left	2	11	5	A	20	C	2	30	14	B	35	E	3	8	5	A	16	C	3	12	9	A	29	D
Brookside Road West	Through	3	37	25	D			6	91	43	E			9	43	16	C			8	50	24	C		
Brookside Road West	Right	3	46	26	D			2	46	38	E			4	51	29	D			3	117	57	F		
Intersection Total		1251		69	F	20	C	1451		43	E	35	E	1237		29	D	16	C	1478		57	F	29	D

Brookside Road / Burnham School Road / East Maddisons Road priority intersection

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	Movement	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Brookside Road North	Left	169	13	2	A	2	A	217	16	2	A	2	A	272	18	2	A	3	A	300	19	3	A	4	A
Brookside Road North	Through	73	9	3	A			82	10	3	A			170	14	5	A			148	19	6	A		
Brookside Road North	Right	5	6	3	A			8	9	3	A			6	5	2	A			6	9	4	A		
East Maddisons Road East	Left	8	99	30	D	38	E	9	64	22	C	26	D	9	35	10	A	12	B	9	65	23	C	20	C
East Maddisons Road East	Through	5	79	33	D			7	62	19	C			3	32	23	C			5	56	21	C		
East Maddisons Road East	Right	243	138	39	E			266	97	27	D			276	52	12	B			343	78	20	C		
Brookside Road South	Left	1	1	1	A	4	A	1	9	4	A	4	A	0	0	0	A	4	A	0	0	0	A	7	A
Brookside Road South	Through	187	31	4	A			187	31	3	A			108	19	3	A			124	69	6	A		
Brookside Road South	Right	24	38	9	A			21	38	10	B			10	26	9	A			11	73	24	C		
Burnham School Road West	Left	7	23	8	A	11	B	8	8	4	A	5	A	4	13	5	A	11	B	5	10	4	A	8	A
Burnham School Road West	Through	6	35	16	C			3	16	9	A			3	54	17	C			2	22	15	B		
Burnham School Road West	Right	0	0	0	A			1	5	5	A			1	29	14	B			1	14	14	B		
Intersection Total		728		39	E	38	E	809		27	D	26	D	861		23	C	12	B	953		24	C	20	C

Lowes Road / Dunns Crossing Road roundabout

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	Movement	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Dunns Crossing Road North	Left	188	16	2	A	2	A	241	20	3	A	3	A	186	19	3	A	5	A	229	27	6	A	7	A
Dunns Crossing Road North	Through	250	16	3	A			308	20	3	A			519	22	5	A			630	30	7	A		
Lowes Road East	Left	28	30	7	A	8	A	35	17	6	A	7	A	43	48	12	B	13	B	53	109	26	D	25	C
Lowes Road East	Right	145	39	8	A			162	35	7	A			114	53	13	B			135	106	25	C		
Dunns Crossing Road South	Through	599	80	17	B	17	B	678	46	10	A	10	A	362	17	4	A	3	A	434	21	4	A	4	A
Dunns Crossing Road South	Right	85	74	16	B			86	34	11	B			42	12	3	A			39	12	4	A		
Intersection Total		1295		11	B	11	B	1509		7	A	7	A	1265		5	A	5	A	1519		8	A	8	A

Dunns Crossing Road / Newmans Road / PC73 priority intersection

Approach	Movement	07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
		Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Dunns Crossing Road North	Left	31	1	0	A	1	A	32	2	0	A	1	A	132	5	1	A	1	A	166	6	1	A	1	A
Dunns Crossing Road North	Through	194	5	1	A			228	5	1	A			683	8	1	A			936	9	1	A		
Newmans Road East	Left	20	96	19	C	40	E	25	75	10	A	30	D	28	37	9	A	11	B	31	71	18	C	20	C
Newmans Road East	Right	118	226	43	E			109	201	35	E			57	60	12	B			53	91	21	C		
Dunns Crossing Road South	Through	797	86	13	B	12	B	795	85	8	A	8	A	277	4	1	A	2	A	329	5	1	A	3	A
Dunns Crossing Road South	Right	16	44	11	B			16	42	6	A			15	57	18	C			19	193	47	E		
Intersection Total		1176		43	E	40	E	1205		35	E	30	D	1191		18	C	11	B	1533		47	E	20	C

Dunns Crossing Road / Burnham School Road signalised intersection

Approach	Movement	07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
		Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Dunns Crossing Road North	Left	2	13	8	A	15	B	2	15	10	B	16	B	4	7	4	A	7	A	5	8	3	A	7	A
Dunns Crossing Road North	Through	193	34	15	B			214	35	16	B			421	32	7	A			587	33	7	A		
Dunns Crossing Road North	Right	7	47	22	C			23	49	18	B			15	26	9	A			20	37	11	B		
Burnham School Road East	Left	4	25	10	B	14	B	4	26	9	A	14	B	2	22	7	A	12	B	3	33	23	C	17	B
Burnham School Road East	Through	1	26	21	C			5	23	13	B			2	24	14	B			2	24	17	B		
Burnham School Road East	Right	5	36	15	B			4	39	22	C			1	20	20	C			2	21	9	A		
Dunns Crossing Road South	Left	117	49	15	B	17	B	191	42	15	B	16	B	157	31	9	A	10	B	200	33	11	B	11	B
Dunns Crossing Road South	Through	457	56	18	B			491	46	16	B			231	35	11	B			272	35	12	B		
Dunns Crossing Road South	Right	4	16	9	A			4	29	14	B			1	22	17	B			2	23	16	B		
Burnham School Road West	Left	51	41	14	B	19	B	50	42	16	B	22	C	12	40	17	B	21	C	13	34	9	A	20	C
Burnham School Road West	Through	6	27	12	B			5	21	10	A			3	18	13	B			2	21	11	B		
Burnham School Road West	Right	217	62	21	C			240	65	24	C			144	56	22	C			153	64	21	C		
Intersection Total		1063		17	B	17	B	1231		17	B	17	B	991		10	B	10	B	1260		10	B	10	B

Dunns Crossing Road / Goulds Road priority intersection

Approach	Movement	07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
		Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Dunns Crossing Road North	Left	6	3	2	A	1	A	5	3	3	A	1	A	2	2	1	A	1	A	4	4	3	A	1	A
Dunns Crossing Road North	Through	264	5	1	A			317	5	1	A			165	4	1	A			189	4	1	A		
Dunns Crossing Road North	Right																								
Goulds Road East	Left	130	32	5	A	5	A	133	19	5	A	5	A	102	14	3	A	3	A	116	22	3	A	3	A
Goulds Road East	Through																								
Goulds Road East	Right	4	8	6	A			7	16	8	A			4	15	7	A			6	11	6	A		
Goulds Road South	Left																								
Goulds Road South	Through	112	2	0	A	1	A	137	2	0	A	1	A	188	2	0	A	0	A	224	2	0	A	1	A
Goulds Road South	Right	62	17	3	A			64	15	3	A			89	11	1	A			92	14	2	A		
Goulds Road West	Left																								
Goulds Road West	Through																								
Goulds Road West	Right																								
Intersection Total		**577**		**6**	**A**	**5**	**A**	**662**		**8**	**A**	**5**	**A**	**551**		**7**	**A**	**3**	**A**	**630**		**6**	**A**	**3**	**A**

Dunns Crossing Road / Selwyn Road roundabout

Approach	Movement	07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
		Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Dunns Crossing Road North	Left	189	9	1	A	2	A	233	8	1	A	2	A	80	7	1	A	2	A	97	8	1	A	2	A
Dunns Crossing Road North	Through	49	7	2	A			57	10	2	A			86	8	2	A			95	9	2	A		
Dunns Crossing Road North	Right	155	11	3	A			161	11	4	A			98	9	4	A			114	10	4	A		
Selwyn Road East	Left	7	7	3	A	4	A	8	8	3	A	5	A	6	5	2	A	5	A	6	7	3	A	5	A
Selwyn Road East	Through	118	20	5	A			135	15	5	A			108	20	5	A			116	17	5	A		
Selwyn Road East	Right	44	13	4	A			65	14	5	A			123	22	5	A			151	20	4	A		
Goulds Road South	Left	0	0	0	A	6	A	0	0	0	A	7	A	0	0	0	A	4	A	0	0	0	A	6	A
Goulds Road South	Through	76	31	6	A			79	35	7	A			60	21	4	A			66	25	6	A		
Goulds Road South	Right	4	9	3	A			7	18	7	A			6	10	3	A			5	8	4	A		
Selwyn Road West	Left	53	8	2	A	3	A	56	10	2	A	3	A	95	14	3	A	3	A	99	10	2	A	3	A
Selwyn Road West	Through	64	11	3	A			66	12	3	A			70	13	4	A			77	12	3	A		
Selwyn Road West	Right	0	0	0	A			0	0	0	A			0	0	0	A			0	0	0	A		
Intersection Total		**758**		**3**	**A**	**3**	**A**	**866**		**3**	**A**	**3**	**A**	**730**		**3**	**A**	**3**	**A**	**824**		**3**	**A**	**3**	**A**

Skellerup South: With Plan Change Model Results

SH1 / Dunns Crossing Road / Walkers Road roundabout

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	Movement	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Walkers Road North	Left	134	80	16	B			117	46	11	B			195	41	11	B			203	39	11	B		
Walkers Road North	Through	83	100	21	C	18	B	95	71	17	B	15	B	238	80	15	B	14	B	289	62	15	B	14	B
Walkers Road North	Right	24	66	23	C			22	82	27	C			70	66	19	B			57	65	19	B		
SH1 East	Left	70	9	3	A			78	8	3	A			527	27	6	A			728	42	10	B		
SH1 East	Through	722	21	5	A	5	A	696	19	5	A	5	A	643	39	9	A	8	A	740	61	15	B	13	B
SH1 East	Right	210	23	7	A			212	24	7	A			104	33	10	B			118	60	17	B		
Dunns Crossing Road South	Left	131	77	26	C			137	61	12	B			75	13	2	A			101	16	3	A		
Dunns Crossing Road South	Through	252	90	28	C	41	D	282	63	13	B	20	C	125	21	3	A	5	A	135	23	3	A	6	A
Dunns Crossing Road South	Right	541	200	51	D			553	141	27	C			139	47	9	A			167	44	9	A		
SH1 West	Left	81	176	59	E			79	118	25	C			41	17	6	A			36	16	5	A		
SH1 West	Through	553	370	80	F	82	F	478	202	38	D	38	D	643	35	9	A	9	A	590	44	9	A	9	A
SH1 West	Right	84	347	118	F			82	206	54	D			125	35	11	B			161	41	11	B		
Intersection Total		2885		37	D	37	D	2830		19	B	19	B	2925		9	A	9	A	3323		11	B	11	B

Brookside Road / Dunns Crossing Road priority intersection

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	Movement	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Dunns Crossing Road North	Left	32	7	1	A			27	3	1	A			15	4	2	A			20	14	3	A		
Dunns Crossing Road North	Through	371	20	3	A	2	A	479	16	2	A	2	A	589	14	3	A	3	A	782	29	3	A	3	A
Dunns Crossing Road North	Right	4	20	8	A			6	15	7	A			2	6	5	A			6	24	8	A		
Brookside Road East	Left	72	30	7	A			82	31	8	A			165	71	14	B			131	86	20	C		
Brookside Road East	Through	7	106	50	F	15	C	9	77	37	E	14	B	10	62	25	D	15	B	10	102	39	E	23	C
Brookside Road East	Right	12	111	43	E			11	125	47	E			9	58	20	C			7	94	51	F		
Dunns Crossing Road South	Right	6	21	7	A			8	29	8	A			3	5	4	A			3	22	10	A		
Dunns Crossing Road South	Right	591	59	7	A	8	A	705	54	7	A	8	A	394	45	5	A	6	A	472	72	9	A	10	B
Dunns Crossing Road South	Right	183	59	11	B			166	53	12	B			109	46	9	A			113	70	14	B		
Brookside Road West	Left	3	15	10	B			2	9	6	A			4	7	3	A			3	32	10	A		
Brookside Road West	Through	5	61	32	D	25	D	5	52	37	E	26	D	10	80	31	D	27	D	8	65	32	D	30	D
Brookside Road West	Right	2	37	29	D			3	39	26	D			4	80	45	E			5	87	43	E		
Intersection Total		1287		50	F	25	D	1503		47	E	26	D	1313		45	E	27	D	1560		51	F	30	D

Brookside Road / Burnham School Road / East Maddisons Road priority intersection

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	Movement	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Brookside Road North	Left	182	20	3	A			216	17	3	A			274	26	3	A			289	35	3	A		
Brookside Road North	Through	76	11	3	A	3	A	89	9	3	A	3	A	182	14	4	A	3	A	145	15	4	A	4	A
Brookside Road North	Right	3	8	5	A			6	9	4	A			4	5	3	A			4	7	5	A		
East Maddisons Road East	Left	11	61	14	B			8	79	30	D			10	33	11	B			9	58	23	C		
East Maddisons Road East	Through	7	65	21	C	27	D	7	71	28	D	32	D	4	40	18	C	16	C	8	73	34	D	27	D
East Maddisons Road East	Right	258	115	28	D			269	114	32	D			289	68	16	C			354	90	27	D		
Brookside Road South	Left	0	0	0	A			1	1	1	A			0	0	0	A			0	0	0	A		
Brookside Road South	Through	203	46	5	A	5	A	187	41	4	A	5	A	127	44	4	A	5	A	133	46	4	A	5	A
Brookside Road South	Right	26	46	10	B			22	45	13	B			10	54	20	C			11	79	21	C		
Burnham School Road West	Left	8	14	6	A			8	10	4	A			3	4	3	A			5	12	4	A		
Burnham School Road West	Through	5	40	17	C	9	A	3	34	16	C	7	A	3	17	9	A	6	A	1	35	35	D	9	A
Burnham School Road West	Right	1	2	2	A			1	7	4	A			2	8	5	A			1	8	7	A		
Intersection Total		778		28	D	27	D	815		32	D	32	D	907		20	C	16	C	959		35	D	27	D

Lowes Road / Dunns Crossing Road roundabout

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	Movement	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Dunns Crossing Road North	Left	185	20	3	A			240	19	3	A			174	28	4	A			213	25	6	A		
Dunns Crossing Road North	Through	255	22	4	A	3	A	323	24	4	A	4	A	575	31	6	A	6	A	709	30	8	A	8	A
Lowes Road East	Left	30	27	7	A			38	24	6	A			49	85	19	B			53	120	33	D		
Lowes Road East	Right	129	51	9	A	8	A	160	32	7	A	7	A	117	82	19	B	19	B	128	145	31	D	32	D
Dunns Crossing Road South	Through	656	102	19	B			718	49	10	B			395	25	4	A			458	27	5	A		
Dunns Crossing Road South	Right	91	79	15	B	18	B	95	42	11	B	10	B	47	21	4	A	4	A	41	19	5	A	5	A
Intersection Total		1345		12	B	12	B	1573		7	A	7	A	1357		7	A	7	A	1602		9	A	9	A

Dunns Crossing Road / Newmans Road / PC73 priority intersection

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	Movement	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS	Flow	Max Delay	Avg Delay	LOS	Approach delay	Approach LOS
Dunns Crossing Road North	Left	32	1	0	A			30	1	0	A			133	5	1	A			177	6	2	A		
Dunns Crossing Road North	Through	204	5	1	A	1	A	226	5	1	A	1	A	752	8	1	A	1	A	1002	10	2	A	2	A
Newmans Road East	Left	15	196	39	E			29	127	16	C			30	47	11	B			30	75	17	C		
Newmans Road East	Right	118	238	55	F	53	F	104	235	34	D	30	D	56	61	14	B	13	B	51	95	26	D	22	C
Dunns Crossing Road South	Through	826	99	20	C			852	59	5	A			286	4	1	A			352	4	1	A		
Dunns Crossing Road South	Right	15	57	16	C	19	C	23	28	5	A	5	A	15	128	25	D	2	A	14	202	62	F	3	A
Intersection Total		1209		55	F	53	F	1263		34	D	30	D	1271		25	D	13	B	1625		62	F	22	C

Dunns Crossing Road / Holmes North Secondary Access priority intersection

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	**Movement**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**
Dunns Crossing Road North	Through	199	4	1	A	2	A	237	4	1	A	2	A	711	6	1	A	1	A	955	14	1	A	2	A
Dunns Crossing Road North	Right	19	69	15	B			18	26	8	A			68	20	5	A			77	24	6	A		
Dunns Crossing Road South	Left	14	32	5	A	13	B	22	8	1	A	3	A	28	3	1	A	1	A	44	4	1	A	1	A
Dunns Crossing Road South	Through	745	100	13	B			753	59	3	A			261	6	1	A			324	7	1	A		
Holmes Access West	Left	104	434	69	F	61	F	116	207	20	C	19	C	43	12	3	A	8	A	39	16	4	A	13	B
Holmes Access West	Right	32	298	36	E			33	113	16	C			34	62	15	B			29	101	26	D		
Intersection Total		1112		69	F	61	F	1178		20	C	19	C	1144		15	B	8	A	1467		26	D	13	B

Dunns Crossing Road / Granite Drive / PC73 priority intersection

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	**Movement**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**
Dunns Crossing Road North	Left	57	25	6	A	10	A	57	25	6	A	9	A	119	27	7	A	9	A	160	30	10	A	11	B
Dunns Crossing Road North	Through	129	31	8	A			163	30	7	A			422	29	8	A			591	32	10	A		
Dunns Crossing Road North	Right	43	85	21	C			52	63	17	B			200	42	12	B			238	46	15	B		
Granite Road East	Left	20	112	27	C	50	D	38	138	21	C	44	D	22	48	24	C	24	C	28	51	22	C	27	C
Granite Road East	Through	28	101	25	C			37	157	27	C			50	53	22	C			70	72	24	C		
Granite Road East	Right	71	286	66	E			75	296	64	E			52	86	27	C			76	108	32	C		
Dunns Crossing Road South	Left	40	55	7	A	12	B	56	42	6	A	6	A	42	25	11	B	12	B	58	25	10	B	12	B
Dunns Crossing Road South	Through	483	95	13	B			498	66	6	A			180	29	12	B			233	30	13	B		
Dunns Crossing Road South	Right	23	41	14	B			37	34	12	B			20	40	14	B			17	52	21	C		
Homes Central Primary Access West	Left	214	107	28	C	26	C	191	76	21	C	21	C	58	48	21	C	21	C	58	46	19	B	21	C
Homes Central Primary Access West	Through	58	77	25	C			65	56	24	C			63	50	21	C			68	51	20	C		
Homes Central Primary Access West	Right	54	50	20	B			80	59	20	C			48	51	21	C			51	57	23	C		
Intersection Total		1218		19	B	19	B	1348		14	B	14	B	1276		13	B	13	B	1646		14	B	14	B

Dunns Crossing Road / Burnham School Road signalised intersection

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	**Movement**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**
Dunns Crossing Road North	Left	2	12	5	A	16	B	1	9	8	A	16	B	4	7	3	A	7	A	5	19	9	A	7	A
Dunns Crossing Road North	Through	185	34	15	B			219	35	15	B			466	33	7	A			650	33	7	A		
Dunns Crossing Road North	Right	6	50	28	C			22	77	26	C			14	30	10	B			13	39	12	B		
Burnham School Road East	Left	4	24	9	A	13	B	3	15	11	B	17	B	2	17	9	A	13	B	3	23	12	B	14	B
Burnham School Road East	Through	3	37	20	B			3	32	20	B			1	32	25	C			4	27	15	B		
Burnham School Road East	Right	6	33	14	B			4	30	19	B			2	19	14	B			2	26	16	B		
Dunns Crossing Road South	Left	117	47	15	B	16	B	192	51	16	B	17	B	169	30	9	A	10	B	187	32	10	A	12	B
Dunns Crossing Road South	Through	475	52	16	B			532	55	18	B			231	35	11	B			295	35	13	B		
Dunns Crossing Road South	Right	2	14	10	B			3	18	7	A			2	38	25	C			3	31	25	C		
Burnham School Road West	Left	57	43	14	B	20	C	48	42	17	B	22	C	10	42	19	B	20	C	11	43	16	B	21	C
Burnham School Road West	Through	6	37	21	C			5	31	20	B			1	26	20	C			3	24	12	B		
Burnham School Road West	Right	216	71	22	C			244	69	24	C			138	65	21	C			151	65	21	C		
Intersection Total		1078		17	B	17	B	1275		18	B	18	B	1039		10	B	10	B	1325		11	B	11	B

Dunns Crossing Road / Goulds Road priority intersection

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	**Movement**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**
Dunns Crossing Road North	Left	21	3	2	A	1	A	14	3	2	A	1	A	11	3	1	A	2	A	11	3	2	A	2	A
Dunns Crossing Road North	Through	279	5	1	A			326	5	1	A			173	5	2	A			200	5	2	A		
Dunns Crossing Road North	Right	3	2	1	A			4	4	2	A			2	3	2	A			1	0	0	A		
Goulds Road East	Left	119	32	7	A	7	A	134	26	6	A	6	A	92	18	4	A	5	A	113	21	4	A	5	A
Goulds Road East	Through	25	41	11	B			22	23	8	A			36	21	6	A			34	23	6	A		
Goulds Road East	Right	12	15	6	A			13	12	6	A			13	14	6	A			23	15	5	A		
Goulds Road South	Left	2	1	1	A	1	A	1	1	0	A	1	A	4	1	0	A	0	A	4	1	1	A	1	A
Goulds Road South	Through	124	2	0	A			144	2	0	A			210	2	0	A			260	2	0	A		
Goulds Road South	Right	61	18	3	A			65	17	3	A			82	12	2	A			88	13	2	A		
Goulds Road West	Left	10	6	3	A	6	A	9	6	3	A	6	A	8	7	4	A	4	A	8	8	4	A	5	A
Goulds Road West	Through	36	24	8	A			25	18	7	A			24	15	5	A			23	17	6	A		
Goulds Road West	Right	33	27	6	A			24	21	6	A			10	15	3	A			10	15	4	A		
Intersection Total		**723**		**11**	**B**	**7**	**A**	**779**		**8**	**A**	**6**	**A**	**661**		**6**	**A**	**5**	**A**	**773**		**6**	**A**	**5**	**A**

Dunns Crossing Road / Selwyn Road roundabout

		07:00 to 08:00						08:00 to 09:00						16:00 to 17:00						17:00 to 18:00					
Approach	**Movement**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**	**Flow**	**Max Delay**	**Avg Delay**	**LOS**	**Approach delay**	**Approach LOS**
Dunns Crossing Road North	Left	239	10	1	A	2	A	275	10	2	A	2	A	104	9	2	A	3	A	119	9	2	A	3	A
Dunns Crossing Road North	Through	50	10	2	A			59	8	2	A			81	11	2	A			98	10	2	A		
Dunns Crossing Road North	Right	135	13	4	A			148	11	4	A			87	11	4	A			106	10	4	A		
Selwyn Road East	Left	7	7	3	A	4	A	7	9	3	A	4	A	6	11	4	A	4	A	6	12	5	A	5	A
Selwyn Road East	Through	125	16	4	A			134	19	4	A			125	17	4	A			142	22	4	A		
Selwyn Road East	Right	53	13	4	A			69	16	4	A			145	18	4	A			192	24	5	A		
Goulds Road South	Left	2	9	8	A	6	A	2	7	5	A	6	A	1	4	3	A	5	A	1	6	6	A	6	A
Goulds Road South	Through	76	32	6	A			80	32	6	A			62	21	5	A			68	32	7	A		
Goulds Road South	Right	6	15	6	A			5	11	5	A			5	10	4	A			7	14	6	A		
Selwyn Road West	Left	40	9	3	A	3	A	49	11	3	A	3	A	83	17	3	A	3	A	89	13	3	A	3	A
Selwyn Road West	Through	65	11	3	A			66	12	3	A			72	14	4	A			76	14	4	A		
Selwyn Road West	Right	0	0	0	A			0	0	0	A			0	0	0	A			0	0	0	A		
Intersection Total		**798**		**3**	**A**	**3**	**A**	**893**		**3**	**A**	**3**	**A**	**771**		**4**	**A**	**4**	**A**	**904**		**4**	**A**	**4**	**A**

Appendix 3

SH1 / Dunns Crossing Road / Walkers Road Intersection Model Results

MOVEMENT SUMMARY

Site: 101 [SH1 / Dunns Crossing / Walkers - 2033 PM (Site Folder: SH1 / Dunns / Walkers)]

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: Dunns Crossing Rd														
1	L2	92	10.0	97	10.0	0.232	15.3	LOS B	1.6	11.8	0.91	0.92	0.91	59.6
2	T1	139	10.0	146	10.0	0.527	14.9	LOS B	5.3	40.0	1.00	1.03	1.20	57.2
3	R2	167	10.0	176	10.0	0.527	22.9	LOS C	5.3	40.0	1.00	1.03	1.20	57.1
Approach		398	10.0	419	10.0	0.527	18.3	LOS B	5.3	40.0	0.98	1.00	1.13	57.7
East: SH1 East														
4	L2	709	10.0	746	10.0	0.784	11.3	LOS B	8.3	63.3	0.85	1.03	1.19	61.0
5	T1	743	10.0	782	10.0	0.776	9.8	LOS A	8.4	64.0	0.82	0.89	1.08	63.4
6	R2	127	10.0	134	10.0	0.776	17.7	LOS B	8.4	64.0	0.82	0.89	1.08	63.5
Approach		1579	10.0	1662	10.0	0.784	11.1	LOS B	8.4	64.0	0.83	0.95	1.13	62.3
North: Walkers Rd														
7	L2	205	10.0	216	10.0	0.437	10.0	LOS B	2.7	20.8	0.76	0.75	0.83	62.7
8	T1	288	10.0	303	10.0	0.437	9.9	LOS A	2.7	20.8	0.74	0.76	0.78	64.7
9	R2	59	10.0	62	10.0	0.244	16.5	LOS B	1.2	8.9	0.70	0.78	0.70	63.1
Approach		552	10.0	581	10.0	0.437	10.6	LOS B	2.7	20.8	0.74	0.76	0.79	63.8
West: SH1 West														
10	L2	36	10.0	38	10.0	0.383	7.9	LOS A	2.4	18.0	0.65	0.60	0.65	62.9
11	T1	591	10.0	622	10.0	0.412	8.1	LOS A	2.8	21.3	0.65	0.62	0.65	64.9
12	R2	159	10.0	167	10.0	0.412	19.0	LOS B	2.8	21.3	0.66	0.64	0.66	64.0
Approach		786	10.0	827	10.0	0.412	10.3	LOS B	2.8	21.3	0.65	0.63	0.65	64.6
All Vehicles		3315	10.0	3489	10.0	0.784	11.7	LOS B	8.4	64.0	0.79	0.85	0.96	62.5

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 [SH1 / Dunns Crossing / Walkers - 2033 AM (Site Folder: SH1 / Dunns / Walkers)]

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: Dunns Crossing Rd														
1	L2	127	10.0	134	10.0	0.329	10.2	LOS B	1.6	11.8	0.69	0.79	0.71	63.1
2	T1	248	10.0	261	10.0	0.750	11.0	LOS B	7.2	54.9	0.80	0.97	1.07	61.0
3	R2	558	10.0	587	10.0	0.750	19.7	LOS B	7.2	54.9	0.86	1.08	1.29	58.4
Approach		933	10.0	982	10.0	0.750	16.1	LOS B	7.2	54.9	0.82	1.01	1.15	59.7
East: SH1 East														
4	L2	70	10.0	74	10.0	0.387	6.0	LOS A	2.2	16.7	0.42	0.49	0.42	64.7
5	T1	724	10.0	762	10.0	0.416	6.6	LOS A	2.5	19.1	0.42	0.53	0.42	66.6
6	R2	205	10.0	216	10.0	0.416	13.7	LOS B	2.5	19.1	0.41	0.56	0.41	65.5
Approach		999	10.0	1052	10.0	0.416	8.0	LOS A	2.5	19.1	0.42	0.53	0.42	66.3
North: Walkers Rd														
7	L2	132	10.0	139	10.0	0.246	14.7	LOS B	1.6	11.9	0.84	0.86	0.84	62.2
8	T1	84	10.0	88	10.0	0.246	10.6	LOS B	1.6	11.9	0.82	0.87	0.82	63.4
9	R2	24	10.0	25	10.0	0.138	18.9	LOS B	0.7	5.6	0.79	0.89	0.79	62.0
Approach		240	10.0	253	10.0	0.246	13.7	LOS B	1.6	11.9	0.83	0.87	0.83	62.6
West: SH1 West														
10	L2	81	10.0	85	10.0	0.551	15.0	LOS B	4.2	31.8	0.90	1.02	1.16	58.6
11	T1	556	10.0	585	10.0	0.593	15.4	LOS B	5.5	41.9	0.93	1.05	1.21	61.0
12	R2	83	10.0	87	10.0	0.593	21.2	LOS C	5.5	41.9	0.95	1.06	1.23	61.1
Approach		720	10.0	758	10.0	0.593	16.0	LOS B	5.5	41.9	0.93	1.05	1.20	60.8
All Vehicles		2892	10.0	3044	10.0	0.750	13.1	LOS B	7.2	54.9	0.71	0.84	0.88	62.3

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.