Before the Independent Hearings Panel
at Waimakariri District Council

under: the Resource Management Act 1991

in the matter of: Proposed private plan change RCP31 to the Operative Waimakariri District Plan

and: **Rolleston Industrial Developments Limited**
Applicant

Summary of evidence of Nicholas Peter Fuller

Dated: 3 August 2023

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SUMMARY OF EVIDENCE OF NICHOLAS PETER FULLER

1 My full name is Nicholas Peter Fuller.

2 I am a Principal Transport Engineer at Novo Group Limited and have worked on resource management transport planning and engineering projects for over 20 years. My experience during this time includes development planning, preparing Traffic and Transport Assessments for resource consents, preparation of Project Feasibility and Scheme Assessment Reports for Council's and the New Zealand Transport Agency.

3 My qualifications include a Bachelor of Engineering (Honours) in Civil Engineering. I have prepared Integrated Transport Assessments for a range of activities and Plan Change requests. This specifically includes several recent Plan Change requests in Rolleston.

SUMMARY

4 Changes have been proposed to the development content of the Plan Change, most notably the proposal to replace the high school with a potential 250 pupil primary school. The overall effect is a slight reduction in traffic generation from the Plan Change site.

5 The intersections in the immediate vicinity of the Plan Change site are predicted to operate satisfactorily with the development traffic added to the network, as is the Mill Road / Ōhoka Road intersection. Similarly, the Tram Road / State Highway 1 interchange will operate satisfactorily, with a consenting requirement providing scope to consider the need for, and nature of, any upgrades over and above 250 allotments. Notably, if required, I consider that upgrades within the existing bridge width of the interchange can fully accommodate the Plan Change's traffic.

6 The existing road links are generally able to accommodate the predicted increase in traffic associated with the Plan Change. The exception is the segment of Tram Road between Bradleys Road and Jacksons Road, which requires widening to meet the Waimakariri District Plan standards. There are no physical impediments to this widening and development contributions are envisaged to pay for the cost of the works.

7 Satisfactory access arrangements to the Plan Change site can be accommodated. The internal road cross-sections generally comply with the requirements of the Waimakariri District Plan, although onstreet car parking is not currently proposed. That said, Council will have discretion at subdivision stage to consider road cross-sections and intersection spacing to ensure these details are acceptable.

8 The proposed commercial areas and potential primary school provide for walking and cycling trips within the site. This is supported by the internal pedestrian and cycle network along road corridors and as recreational routes. The site also fits within the Council's proposed walking and cycling network that will ultimately link the site to wider destinations.

9 The section 42A report identifies concerns regarding potential safety effects on Tram Road. However, I understand that this is already being addressed by Council and funding is allocated in their Infrastructure Strategy.

10 Lastly, I note that Clause 3.8 of the National Policy Statement on Urban Development 2020 (NPS-UD) requires that local authorities have particular regard to the development capacity of plan changes if they are "well-connected along transport corridors". Tram Road is an Arterial Road and Mill Road is a Collector Road and therefore, the plan change site is consistent with this requirement.

RESPONSE TO SUBMITTER EVIDENCE

Mr Metherell (on Behalf of Waimakariri District Council)

11 I have read the evidence of Mr Metherell on behalf of the Waimakariri District Council. I have grouped together the concerns raised in Mr Metherell's evidence and respond to them in the following sections.

Traffic Distribution

12 The first concern raised is with regards to the potential distribution of traffic from the Plan Change site onto the surrounding road network. The key differences between the distribution used in the ITA and that suggested by Mr Metherell is an increase in traffic towards the Mill Road / Ōhoka Road intersection and the Threlkelds Road / Flaxton Road intersection, with a reduction in traffic to Tram Road as he shows in Table 2 of his evidence.

13 I have undertaken a sensitivity test of the Mill Road / Ōhoka Road intersection model using the distribution in Mr Metherell's evidence. I have also undertaken assessments of the Mill Road / Threlkelds Road intersection and Flaxton Road / Threlkelds Road intersection using the distribution in Mr Metherell's evidence. The results of this modelling are included in **Attachment 1**, which indicates that these intersections can satisfactorily accommodate the increased traffic volumes if this distribution were to occur.

14 The reduced traffic volume to Tram Road (as suggested by Mr Metherell) would improve the operation of the Tram Road intersections with Whites Road and Bradleys Road, so I have not updated these traffic models.

15 The above confirms that the operation of the road network is not sensitive to a redistribution that sends additional traffic to / from Rangiora and Kaiapoi compared to that assessed in the ITA.

Traffic Growth

16 Mr Metherell raises concerns that traffic growth has not been included in the traffic assessment undertaken. I address this by reviewing the Tram Road corridor and Flaxton Road / Skewbridge Road corridors separately.

Tram Road Corridor

17 The traffic count information presented in Attachment 2 of my evidence in Chief identified that traffic volumes on Tram Road have not increased between the preparation of the ITA (in July 2021) and the Council counts (late 2022). The updated counts were typically less than those counted for the ITA.

18 During the course of preparing the ITA, I reviewed the District Plan zoning and compared this to the currently developed areas to understand what undeveloped areas may lead to additional traffic growth along the Tram Road corridor. None were identified.

19 I understand that the proposed Waimakariri District Plan includes potential growth in a new proposed Large Lot Residential Zone across Oxford and Swannanoa. These areas are the black hatch land illustrated in **Figure 1** (Oxford) and **Figure 2** (Swannanoa). Although these areas have been identified as potentially accommodating growth, I understand that separate to this process an assessment of transport effects will be required to confirm the traffic from these areas is acceptable before any such rezoning (and consequential development) is approved.

Figure 1: Rural Residential Growth Areas - Oxford

Figure 2: Rural Residential Growth Areas - Swannanoa

20 Nevertheless, I have considered the possibility of further growth in these areas, and as a result I anticipate they would generate the following traffic volumes along Tram Road in the vicinity of the Plan Change 31 site (see also **Attachment 2**).

Table 1: Growth Area Traffic Passing PC31 – vehicles per hour

	Arrivals (from East)	Departures (To East)	Total
AM Peak	10	40	50
PM Peak	32	19	50
Daily	230	230	460

21 The above traffic volumes have in turn been added to the Tram Road / Bradleys Road and Tram Road / Whites Road intersections in **Attachment 3**. These updated models also include the suggested traffic distribution from Mr Metherell's evidence (i.e. 36% to 41% of traffic to / from Tram Road east). These models indicate that the Tram Road intersections with Bradleys Road and Whites Road would operate acceptably under this growth scenario.

22 Given the above, I consider that identified potential for growth along the Tram Road corridor can be accommodated at the key intersections in the vicinity of the Plan Change 31 site.

Tram Road Interchange Threshold

23 The inclusion of traffic growth along Tram Road would also lead to additional traffic going through the Tram Road / State Highway 1

interchange. I discuss the operation of the Tram Road Interchange with the proposed upgrade at paragraph 33.

24 A threshold of 250 dwellings is proposed for the Plan Change 31 site, above which an assessment of the operation of the Tram Road Interchange is required. The inclusion of background traffic growth could affect this threshold.

25 In **Attachment 2** I estimated that development at Oxford and Swannanoa would lead to approximately 56 dwellings sending traffic to / from the Tram Road Interchange. The difference in traffic distribution to / from the Interchange between my ITA reporting and that of Mr Metherell's evidence is 24% (65% in my ITA and 41% in Mr Metherell's evidence). For the 250 dwelling threshold, this change in distribution equates to approximately 60 dwellings.

26 Given the above, the change in distribution from the Plan Change 31 site of 60 dwellings would balance the increase in traffic of 56 dwellings associated with development at Oxford and Swannanoa. As such, the 250 dwelling threshold remains appropriate.

Flaxton Road – Skewbridge Road Corridor

27 In addition to the LLRZ I discuss in my paragraph 19, the proposed District Plan proposes a West Rangiora New Development Area. If approved (and noting that the proposed District Plan has also proposed the need for a traffic effects assessment at the future subdivision design and consent stage[1]), this area would result in an increase in traffic in the Flaxton Road – Skewbridge Road Corridor. I have considered this possible future growth.

28 To do this I have undertaken sensitivity tests of the traffic models of the Mill Road / Ōhoka Road intersection, Mill Road / Threlkelds Road intersection and Flaxton Road / Threlkelds Road intersection using the distribution in Mr Metherell's evidence as well as assuming a 35% increase in traffic on the through vehicles along the Flaxton Road corridor (i.e. ten years of growth adopting the 3.5% growth per year suggested in Mr Metherell's evidence).

29 The results of these intersection models are included in **Attachment 4**, which indicates that the intersections are predicted to operate satisfactorily. This again indicates that these locations are not sensitive to changes in background traffic or distribution.

Road Hierarchy

30 Mr Metherell has queried whether the changes in traffic volumes on local roads would warrant a change in function of these roads and their classification under the District Plan. The roads in question are Whites

[1] (DEV-WR-S1(1)(f) - Certification for West Rangiora Development Area - Criteria

Road (currently a Local Road), Threlkelds Road (currently a Collector Road) and parts of Mill Road (also currently a Collector Road).

31 I consider that it is likely that Whites Road would be re-categorised as a Collector Road, given the increase in traffic and because it becomes a road that would be the preferred route for travel between the site and the Arterial network (Tram Road). I also consider this remains the appropriate classification for Mill Road and Threlkelds Road.

32 I would not expect these roads to become Arterial Roads, as they do not serve significant populations or link major centres within the District, which is the District Plan definition for Arterial Roads. I also note that these roads would continue to accommodate much lower traffic volumes than the existing flows on Arterial Roads in the District, such as Tram Road and Flaxton Road.

Tram Road Interchange

33 Mr Metherell has queried whether the Tram Road interchange could accommodate an additional traffic lane on the bridge and whether the proposed arrangement could accommodate traffic growth. I address these matters in turn.

Additional Traffic Lanes

34 I consider there are different options for how this could accommodate three traffic lanes across the existing bridge, depending on subsequent agreement with Waka Kotahi. The bridge has an overall width of approximately 13.4m between the barriers and this could be split as follows:

34.1 **Option 1:** Provision of a central 3.0m wide right turning lane, plus 2 x 3.5m traffic lanes, 1.2m clearance to the barrier on the southern side of the bridge and a 2.2m shared path on the northern side of the bridge (see **Figure 3**).

34.2 **Option 2**: Provision of a central 3.5m right turning lane plus 2 x 3.5m wide traffic lanes both with 0.7m shoulders (to achieve a 4.2m wide effective lane to accommodate on-road cycles) A clip-on pedestrian bridge would be provided on the northern side (see Figure 4); and

34.3 **Option 3:** As per Option 2, although with a wider clip-on bridge to be a shared path.

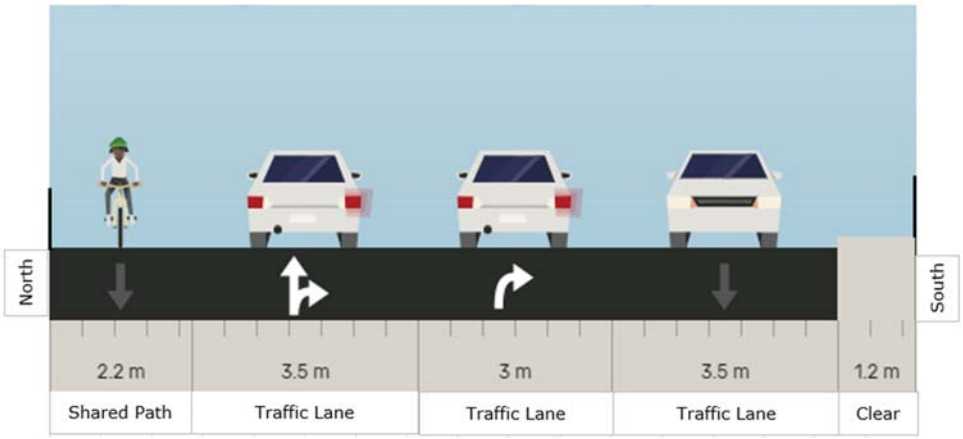

Figure 3: Tram Road Bridge Cross-Section – Option 1

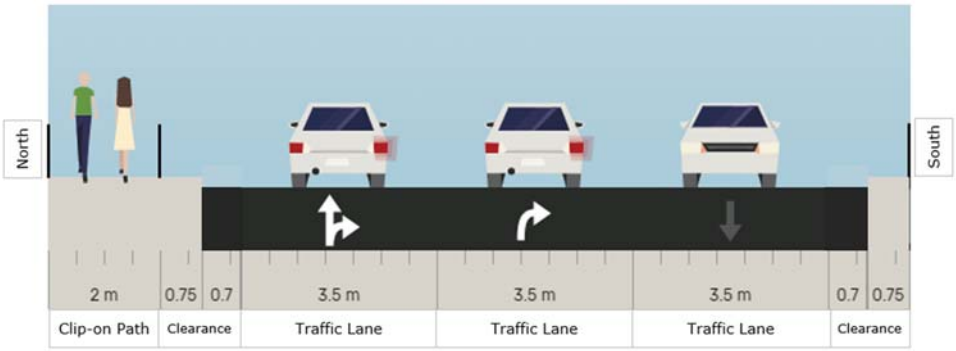

Figure 4: Tram Road Bridge Cross-Section – Option 2

35 Each of the above options has advantages and disadvantages. For example, the Option 1 arrangement includes a right turn bay that is narrower than desirable, although it is consistent with the right turn bays on the Lineside Road interchange. Similarly, the shared path proposed in Option 1 is consistent with the minimum typical requirement for a local access path. That said, I observed negligible pedestrian and cycling demands crossing the Tram Road interchange during my site visits.

36 Option 2 accommodates cyclists in the road by providing additional shoulder space to have an effective lane width of 4.2m (3.5m plus the 0.7m shoulder). This option (and Option 3) would require an additional structure to accommodate pedestrians, which I have assumed to be on the northern side of the bridge. This is because there are barriers / fencing on the existing shared-path on the south eastern side of the interchange that prevent cyclists and pedestrians from travelling across the bridge (see **Figure 5**). A path on the northern side would be able to extend to the Tram Road / Main North Road intersection (to the east), although a termination point to the west would need to be agreed with Waka Kotahi and Waimakariri District Council.

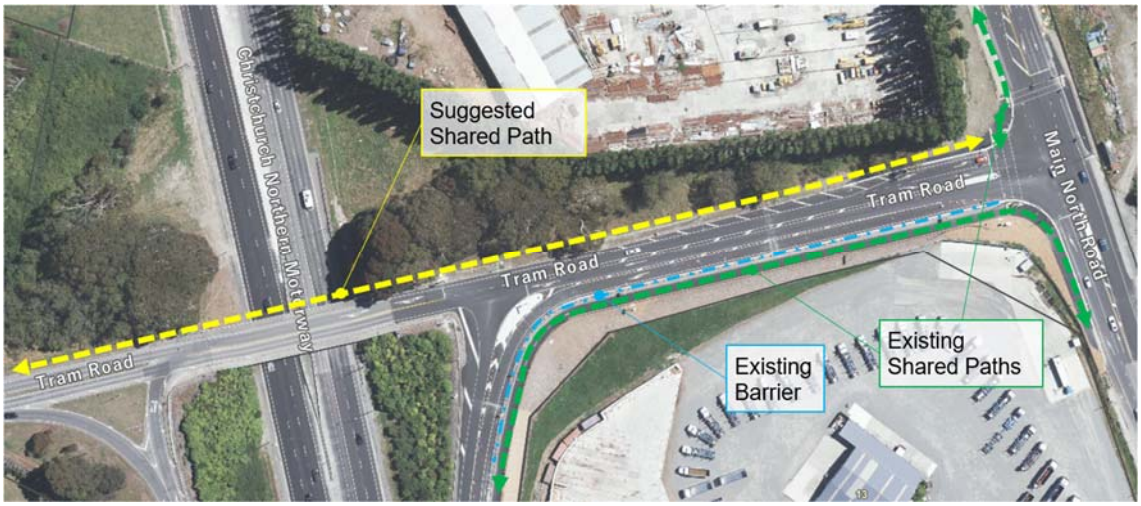

Figure 5: Existing & Suggested Tram Road Interchange Pedestrian & Cycle Routes

37 Overall, I consider that there are options to accommodate all modes of transport across the Tram Road interchange although the details of these need to be agreed with the relevant Road Controlling Authorities.

Additional Traffic Growth

38 A concern was raised that the traffic model of the proposed Tram Road / State Highway 1 interchange arrangement did not include traffic growth. I have undertaken a sensitivity test of the traffic model (with the proposed upgrade) that increases all traffic movements through the interchange by 15%, including the traffic associated with Plan Change 31.

39 The results of this modelling are included in **Attachment 5** and these indicate that the interchange would operate acceptably under this scenario.

40 I note there was an error in Attachment 6 of my Evidence in Chief, which set out the operation of the proposed Tram Road interchange arrangement with the Plan Change traffic included. The updated results are included in **Attachment 6** of this Summary Statement.

41 I also note the comment in Mr Metherell's evidence that he considers micro-simulation modelling to typically be undertaken to understand the interaction of closely spaced intersections. The modelling I undertook linked the on-ramp and off-ramp intersections to understand the interaction of traffic flows and queuing, so I consider that the modelling is appropriate.

Road Safety

42 Mr Metherell has identified concerns regarding the potential safety effects of the traffic generated by the Plan Change. As set out in my Evidence in Chief, Council has identified a budget of $12m for Tram Road safety improvements between 2021 and 2032 in their

Infrastructure Strategy. I understand that the Plan Change site would be developed over an approximate ten-year period, which leads to a gradual increase in traffic enabling these safety improvements to be gradually implemented. Furthermore, the Plan Change site would provide development contributions to assist with funding these improvements.

43 I also note that the draft Waimakariri Speed Management Plan (2023 – 2027) proposes to reduce the speed limit on Tram Road to 80km/h from the current 100km/h. This is expected to provide road safety benefits, with the KiwiRAP[2] suggesting this would have 15% to 40% reductions in a range of crash types[3] per 10km/h reduction. Further low-cost improvements could also be implemented (such as rumble strip edge-lines, trimming of vegetation and relocation of road signage) prior to undertaking more costly works to progressively improve the safety of the corridor.

44 Again, I consider the detail of this to be best worked through with Council based on the anticipated projects in the Council's Infrastructure Strategy and there is time to undertake these as the development of the Plan Change site progresses.

Cycling Connections

45 Mr Metherell has queried whether the cycle facilities already planned by Council that link the Plan Change site to wider destinations would be needed to be of a higher quality than currently planned. Whilst I agree that additional width for these facilities would be beneficial in promoting an alternative to car travel, I would not expect these to be a sealed facility given the nature of the area.

46 As with other network improvements, the development contributions provided by the Plan Change site will assist in providing these facilities.

Site Layout & Connections

47 Mr Metherell has raised concerns regarding the number of access intersections proposed to White Road and the bespoke cross-sections proposed within the site. These matters can be considered at the subdivision stage with Council to ensure that they are acceptable. However, I consider that reducing the number of intersections to Whites Road would still facilitate safe and efficient access based on the traffic volumes at these locations.

Fire & Emergency NZ Evidence

48 I note that Fire & Emergency NZ evidence requests that:

[2] New Zealand Road Assessment Programme.

[3] Head-on crashes, run-off road and intersection crashes.

"proposed roads are designed in accordance with transport standards to ensure fire appliances can manoeuvre easily along roads".

49 This will be provided for during the subdivision stage of the development, through the usual engineering approvals and internal safety audit processes.

CONCLUSION

50 For the reasons set out above, I consider that the transport effects of the Plan Change are acceptable subject to:

50.1 Tram Road widening (between Bradleys Road and Jacksons Road);

50.2 A consenting requirement providing scope to consider the need for, and the nature of, any upgrades for the Tram Road / State Highway 1 interchange above 250 allotments; and

50.3 Provision of shared paths on the Whites Road and Bradleys Road frontage, with an upgrade of the existing Mill Road path.

Dated: 3 August 2023

Nicholas Fuller

ATTACHMENT 1: MILL RD / ŌHOKA RD, MILL ROAD / THRELKELDS ROAD & FLAXTON RD / THRELKELDS RD INTERSECTION MODEL RESULTS

MOVEMENT SUMMARY

Site: 101 [Mill Rd & Ohoka Rd - 2023 AM + Dev S-Test (Site Folder: Mill Rd & Ohoka Rd)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Ohoka Rd														
1	L2	66	0	69	0.0	0.148	7.0	LOS A	0.0	0.0	0.00	0.16	0.00	70.9
2	T1	201	12	212	6.0	0.148	0.0	LOS A	0.0	0.0	0.00	0.16	0.00	76.9
Approach		267	12	281	4.5	0.148	1.7	NA	0.0	0.0	0.00	0.16	0.00	75.3
North: Skewbridge Rd														
8	T1	549	21	578	3.8	0.304	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
9	R2	1	0	1	0.0	0.001	7.4	LOS A	0.0	0.0	0.36	0.56	0.36	63.2
Approach		550	21	579	3.8	0.304	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.7
West: Mill Rd														
10	L2	1	0	1	0.0	0.285	10.3	LOS B	1.2	8.2	0.66	1.03	0.77	58.4
12	R2	161	3	169	1.9	0.285	15.6	LOS C	1.2	8.2	0.66	1.03	0.77	57.7
Approach		162	3	171	1.9	0.285	15.6	LOS C	1.2	8.2	0.66	1.03	0.77	57.7
All Vehicles		979	36	1031	3.7	0.304	3.1	NA	1.2	8.2	0.11	0.21	0.13	73.9

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

MOVEMENT SUMMARY

Site: 101 [Mill Rd & Ohoka Rd - 2023 PM + Dev S-Test (Site Folder: Mill Rd & Ohoka Rd)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Ohoka Rd														
1	L2	142	1	149	0.7	0.449	7.1	LOS A	0.0	0.0	0.00	0.11	0.00	71.3
2	T1	692	5	728	0.7	0.449	0.1	LOS A	0.0	0.0	0.00	0.11	0.00	77.6
Approach		834	6	878	0.7	0.449	1.3	NA	0.0	0.0	0.00	0.11	0.00	76.5
North: Skewbridge Rd														
8	T1	310	5	326	1.6	0.169	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
9	R2	2	1	2	50.0	0.007	18.0	LOS C	0.0	0.2	0.76	0.79	0.76	44.4
Approach		312	6	328	1.9	0.169	0.1	NA	0.0	0.2	0.00	0.01	0.00	79.5
West: Mill Rd														
10	L2	2	0	2	0.0	0.292	15.1	LOS C	0.9	6.6	0.80	1.04	0.96	53.1
12	R2	87	3	92	3.4	0.292	21.5	LOS C	0.9	6.6	0.80	1.04	0.96	52.2
Approach		89	3	94	3.4	0.292	21.3	LOS C	0.9	6.6	0.80	1.04	0.96	52.2
All Vehicles		1235	15	1300	1.2	0.449	2.4	NA	0.9	6.6	0.06	0.15	0.07	74.7

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

MOVEMENT SUMMARY

Site: 101 [Mill & Threlkelds - 2023 AM + Dev (Site Folder: Mill & Threlkelds)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Mill Rd														
5	T1	66	2	69	3.0	0.043	0.0	LOS A	0.1	0.5	0.12	0.14	0.12	58.9
6	R2	8	0	8	0.0	0.043	8.9	LOS A	0.1	0.5	0.12	0.14	0.12	56.2
Approach		74	2	78	2.7	0.043	1.0	NA	0.1	0.5	0.12	0.14	0.12	58.6
North: Threlkelds Rd														
7	L2	7	1	7	14.3	0.126	9.4	LOS A	0.4	3.1	0.40	0.92	0.40	50.0
9	R2	90	1	95	1.1	0.126	9.5	LOS A	0.4	3.1	0.40	0.92	0.40	50.3
Approach		97	2	102	2.1	0.126	9.5	LOS A	0.4	3.1	0.40	0.92	0.40	50.3
West: Mill Rd														
10	L2	217	9	228	4.1	0.210	5.6	LOS A	0.0	0.0	0.00	0.34	0.00	54.5
11	T1	158	0	166	0.0	0.210	0.1	LOS A	0.0	0.0	0.00	0.34	0.00	56.9
Approach		375	9	395	2.4	0.210	3.3	NA	0.0	0.0	0.00	0.34	0.00	55.5
All Vehicles		546	13	575	2.4	0.210	4.1	NA	0.4	3.1	0.09	0.42	0.09	54.9

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

MOVEMENT SUMMARY

Site: 101 [Mill & Threlkelds - 2023 PM + Dev (Site Folder: Mill & Threlkelds)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Mill Rd														
5	T1	137	4	144	2.9	0.080	0.0	LOS A	0.1	0.4	0.05	0.06	0.05	59.5
6	R2	8	0	8	0.0	0.080	7.3	LOS A	0.1	0.4	0.05	0.06	0.05	56.7
Approach		145	4	153	2.8	0.080	0.4	NA	0.1	0.4	0.05	0.06	0.05	59.3
North: Threlkelds Rd														
7	L2	14	1	15	7.1	0.270	8.8	LOS A	1.1	7.4	0.41	0.90	0.41	50.4
9	R2	207	1	218	0.5	0.270	9.4	LOS A	1.1	7.4	0.41	0.90	0.41	50.4
Approach		221	2	233	0.9	0.270	9.4	LOS A	1.1	7.4	0.41	0.90	0.41	50.4
West: Mill Rd														
10	L2	132	0	139	0.0	0.122	5.6	LOS A	0.0	0.0	0.00	0.35	0.00	54.6
11	T1	89	0	94	0.0	0.122	0.0	LOS A	0.0	0.0	0.00	0.35	0.00	56.9
Approach		221	0	233	0.0	0.122	3.3	NA	0.0	0.0	0.00	0.35	0.00	55.5
All Vehicles		587	6	618	1.0	0.270	4.9	NA	1.1	7.4	0.16	0.48	0.16	54.3

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2023 AM + Dev (Site Folder: Threlkelds & Flaxton)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Threlkelds Rd														
1	L2	222	6	234	2.7	0.247	9.0	LOS A	1.0	7.4	0.37	0.66	0.37	70.5
3	R2	16	0	17	0.0	0.247	14.3	LOS B	1.0	7.4	0.37	0.66	0.37	71.5
Approach		238	6	251	2.5	0.247	9.4	LOS A	1.0	7.4	0.37	0.66	0.37	70.6
East: Skewbridge Rd														
4	L2	12	1	13	8.3	0.007	8.1	LOS A	0.0	0.0	0.00	0.66	0.00	70.7
5	T1	190	20	200	10.5	0.110	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		202	21	213	10.4	0.110	0.5	NA	0.0	0.0	0.00	0.04	0.00	97.5
West: Flaxton Rd														
11	T1	500	21	526	4.2	0.274	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
12	R2	92	3	97	3.3	0.086	8.6	LOS A	0.3	2.5	0.33	0.65	0.33	71.0
Approach		592	24	623	4.1	0.274	1.4	NA	0.3	2.5	0.05	0.10	0.05	93.9
All Vehicles		1032	51	1086	4.9	0.274	3.0	NA	1.0	7.4	0.12	0.22	0.12	87.8

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2023 PM + Dev (Site Folder: Threlkelds & Flaxton)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Threlkelds Rd														
1	L2	137	0	144	0.0	0.317	13.5	LOS B	1.3	8.8	0.68	0.92	0.83	64.7
3	R2	18	1	19	5.6	0.317	24.3	LOS C	1.3	8.8	0.68	0.92	0.83	63.2
Approach		155	1	163	0.6	0.317	14.7	LOS B	1.3	8.8	0.68	0.92	0.83	64.5
East: Skewbridge Rd														
4	L2	30	1	32	3.3	0.017	7.9	LOS A	0.0	0.0	0.00	0.66	0.00	72.4
5	T1	644	2	678	0.3	0.348	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
Approach		674	3	709	0.4	0.348	0.4	NA	0.0	0.0	0.00	0.03	0.00	98.1
West: Flaxton Rd														
11	T1	231	5	243	2.2	0.125	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
12	R2	219	4	231	1.8	0.385	14.2	LOS B	1.9	13.3	0.69	0.94	0.91	64.7
Approach		450	9	474	2.0	0.385	6.9	NA	1.9	13.3	0.34	0.46	0.44	79.0
All Vehicles		1279	13	1346	1.0	0.385	4.4	NA	1.9	13.3	0.20	0.29	0.26	85.5

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

ATTACHMENT 2: TRAM ROAD TRAFFIC GROWTH

Development Areas
The Oxford and Swannanoa development areas are estimated as accommodating approximately 228 dwellings (based on a maximum density of 5,000m^2 lots). Oxford accommodates 55% of the development areas, which equates to 125 dwellings and the remaining 103 dwellings would be at Swannanoa.

Distribution
The census data for Oxford suggests that 11% of people living there may work in Christchurch and therefore use Tram Road past the Plan Change 31 site. Although there are other trip purposes that may alter the distribution to reduce this percentage, it is adopted for the purpose of this assessment. This equates to 14 dwellings generating traffic along Tram Road near Plan Change 31.

Assuming the Swannanoa traffic distribution is similar to that of Ōhoka as outlined in Mr Metherell's evidence, up to 41% of traffic from Swannanoa may use Tram Road to head to / from Christchurch. This equates to 42 dwellings generating traffic along Tram Road near Plan Change 31.

Tram Road Traffic Generation
The effect of the above is to increase through traffic on Tram Road by the following volumes.

	Arrivals (from East)	**Departures (To East)**	**Total**
AM Peak	10	40	50
PM Peak	32	19	50
Daily	230	230	460

ATTACHMENT 3: TRAM RD / BRADLEYS RD & TRAM RD / WHITES RD WITH GROWTH INTERSECTION MODEL RESULTS

MOVEMENT SUMMARY

Site: 101 [Tram Rd & Bradleys Rd - 2021 AM Peak + 850 Dev + Sch + Growth (Site Folder: Tram Rd & Bradleys Rd)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: McHughes Rd														
1	L2	8	0	8	0.0	0.007	9.2	LOS A	0.0	0.2	0.19	0.88	0.19	63.2
2	T1	54	1	57	1.9	0.664	31.7	LOS D	3.6	25.5	0.89	1.16	1.64	44.3
3	R2	92	3	97	3.3	0.664	37.3	LOS E	3.6	25.5	0.89	1.16	1.64	44.2
Approach		154	4	162	2.6	0.664	33.9	LOS D	3.6	25.5	0.85	1.15	1.56	44.9
East: Tram Rd														
4	L2	38	2	40	5.3	0.023	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	63.6
5	T1	96	7	101	7.3	0.054	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
6	R2	43	3	45	7.0	0.054	9.3	LOS A	0.2	1.5	0.48	0.71	0.48	60.5
Approach		177	12	186	6.8	0.054	3.8	NA	0.2	1.5	0.12	0.31	0.12	70.6
North: Bradleys Rd														
7	L2	212	6	223	2.8	0.261	11.4	LOS B	1.0	7.4	0.49	0.95	0.49	60.9
8	T1	88	5	93	5.7	0.581	29.3	LOS D	3.0	22.1	0.84	1.13	1.39	46.3
9	R2	50	1	53	2.0	0.581	31.9	LOS D	3.0	22.1	0.84	1.13	1.39	47.0
Approach		350	12	368	3.4	0.581	18.8	LOS C	3.0	22.1	0.63	1.02	0.85	54.3
West: Tram Rd														
10	L2	56	3	59	5.4	0.034	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	63.6
11	T1	378	4	398	1.1	0.203	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	8	0	8	0.0	0.007	7.6	LOS A	0.0	0.2	0.24	0.57	0.24	64.3
Approach		442	7	465	1.6	0.203	1.1	NA	0.0	0.2	0.00	0.09	0.00	77.0
All Vehicles		1123	35	1182	3.1	0.664	11.5	NA	3.6	25.5	0.33	0.56	0.50	62.0

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

MOVEMENT SUMMARY

Site: 101 [Tram Rd & Bradleys Rd - 2021 PM Peak + 850 Dev + Sch + Growth (Site Folder: Tram Rd & Bradleys Rd)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: McHughes Rd														
1	L2	19	0	20	0.0	0.022	10.5	LOS B	0.1	0.5	0.40	0.87	0.40	62.4
2	T1	71	1	75	1.4	0.637	39.1	LOS E	3.1	21.7	0.90	1.13	1.55	42.1
3	R2	45	0	47	0.0	0.637	40.4	LOS E	3.1	21.7	0.90	1.13	1.55	42.4
Approach		135	1	142	0.7	0.637	35.5	LOS E	3.1	21.7	0.83	1.10	1.39	44.2
East: Tram Rd														
4	L2	119	2	125	1.7	0.070	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	64.8
5	T1	351	4	369	1.1	0.191	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	201	6	212	3.0	0.174	7.6	LOS A	0.8	5.5	0.30	0.62	0.30	63.0
Approach		671	12	706	1.8	0.191	3.5	NA	0.8	5.5	0.09	0.30	0.09	71.3
North: Bradleys Rd														
7	L2	115	3	121	2.6	0.105	9.6	LOS A	0.4	2.8	0.24	0.89	0.24	62.3
8	T1	72	1	76	1.4	0.577	40.2	LOS E	2.6	18.2	0.90	1.10	1.41	41.5
9	R2	22	0	23	0.0	0.577	41.8	LOS E	2.6	18.2	0.90	1.10	1.41	41.8
Approach		209	4	220	1.9	0.577	23.5	LOS C	2.6	18.2	0.54	0.99	0.77	50.9
West: Tram Rd														
10	L2	22	0	23	0.0	0.013	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
11	T1	128	4	135	3.1	0.070	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
12	R2	18	0	19	0.0	0.022	9.4	LOS A	0.1	0.6	0.48	0.67	0.48	62.9
Approach		168	4	177	2.4	0.070	1.9	NA	0.1	0.6	0.05	0.15	0.05	75.6
All Vehicles		1183	21	1245	1.8	0.637	10.5	NA	3.1	21.7	0.25	0.49	0.35	62.9

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

MOVEMENT SUMMARY

Site: 101 [Tram Rd & Whites Rd - 2021 AM Existing + 850 Dev + Sch + Growth (Site Folder: Tram Rd & Whites Rd)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Whites Rd														
1	L2	1	0	1	0.0	0.314	12.5	LOS B	1.1	7.9	0.87	1.02	1.02	45.0
2	T1	8	0	8	0.0	0.314	28.0	LOS D	1.1	7.9	0.87	1.02	1.02	44.9
3	R2	41	1	43	2.4	0.314	35.9	LOS E	1.1	7.9	0.87	1.02	1.02	44.5
Approach		50	1	53	2.0	0.314	34.1	LOS D	1.1	7.9	0.87	1.02	1.02	44.5
East: Tram Rd														
4	L2	5	0	5	0.0	0.065	7.0	LOS A	0.0	0.0	0.00	0.03	0.00	74.1
5	T1	111	8	117	7.2	0.065	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	79.4
6	R2	115	0	121	0.0	0.144	10.1	LOS B	0.6	4.1	0.60	0.83	0.60	61.5
Approach		231	8	243	3.5	0.144	5.2	NA	0.6	4.1	0.30	0.43	0.30	69.3
North: Whites Rd														
7	L2	301	0	317	0.0	0.534	16.4	LOS C	3.0	20.7	0.73	1.10	1.16	57.2
8	T1	7	1	7	14.3	0.058	28.3	LOS D	0.2	1.6	0.84	1.01	0.84	44.8
9	R2	2	1	2	50.0	0.058	40.9	LOS E	0.2	1.6	0.84	1.01	0.84	39.6
Approach		310	2	326	0.6	0.534	16.9	LOS C	3.0	20.7	0.73	1.10	1.15	56.7
West: Tram Rd														
10	L2	6	4	6	66.7	0.349	8.2	LOS A	0.0	0.0	0.00	0.01	0.00	53.1
11	T1	638	10	672	1.6	0.349	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	79.7
12	R2	3	0	3	0.0	0.002	6.9	LOS A	0.0	0.1	0.23	0.57	0.23	64.3
Approach		647	14	681	2.2	0.349	0.2	NA	0.0	0.1	0.00	0.01	0.00	79.2
All Vehicles		1238	25	1303	2.0	0.534	6.7	NA	3.0	20.7	0.27	0.40	0.39	68.4

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

MOVEMENT SUMMARY

Site: 101 [Tram Rd & Whites Rd - 2021 PM Existing + 850 Dev + Sch + Growth (Site Folder: Tram Rd & Whites Rd)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Whites Rd														
1	L2	6	0	6	0.0	0.094	13.4	LOS B	0.3	2.1	0.81	1.00	0.81	56.7
2	T1	2	0	2	0.0	0.094	31.8	LOS D	0.3	2.1	0.81	1.00	0.81	56.6
3	R2	11	0	12	0.0	0.094	30.8	LOS D	0.3	2.1	0.81	1.00	0.81	56.6
Approach		19	0	20	0.0	0.094	25.4	LOS D	0.3	2.1	0.81	1.00	0.81	56.6
East: Tram Rd														
4	L2	38	1	40	2.6	0.359	7.9	LOS A	0.0	0.0	0.00	0.04	0.00	86.2
5	T1	613	19	645	3.1	0.359	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	98.5
6	R2	212	2	223	0.9	0.152	8.4	LOS A	0.7	5.2	0.35	0.64	0.35	72.3
Approach		863	22	908	2.5	0.359	2.4	NA	0.7	5.2	0.09	0.19	0.09	90.0
North: Whites Rd														
7	L2	119	0	125	0.0	0.115	10.4	LOS B	0.4	3.0	0.31	0.89	0.31	72.4
8	T1	10	1	11	10.0	0.162	38.6	LOS E	0.5	4.2	0.88	1.00	0.89	46.8
9	R2	11	3	12	27.3	0.162	35.7	LOS E	0.5	4.2	0.88	1.00	0.89	44.2
Approach		140	4	147	2.9	0.162	14.4	LOS B	0.5	4.2	0.40	0.90	0.40	66.5
West: Tram Rd														
10	L2	9	0	9	0.0	0.113	7.8	LOS A	0.0	0.0	0.00	0.03	0.00	87.9
11	T1	199	5	209	2.5	0.113	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	99.0
12	R2	3	1	3	33.3	0.005	12.8	LOS B	0.0	0.2	0.61	0.71	0.61	58.6
Approach		211	6	222	2.8	0.113	0.5	NA	0.0	0.2	0.01	0.04	0.01	97.5
All Vehicles		1233	32	1298	2.6	0.359	3.8	NA	0.7	5.2	0.12	0.26	0.12	86.8

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

ATTACHMENT 4: MILL RD / ŌHOKA RD & FLAXTON RD / THRELKELDS RD WITH GROWTH INTERSECTION MODEL RESULTS

MOVEMENT SUMMARY

Site: 101 [Mill Rd & Ohoka Rd - 2023 AM + Dev S-Test & Growth (Site Folder: Mill Rd & Ohoka Rd)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Ohoka Rd														
1	L2	66	0	69	0.0	0.186	7.0	LOS A	0.0	0.0	0.00	0.13	0.00	72.4
2	T1	271	16	285	5.9	0.186	0.0	LOS A	0.0	0.0	0.00	0.13	0.00	77.5
Approach		337	16	355	4.7	0.186	1.4	NA	0.0	0.0	0.00	0.13	0.00	76.4
North: Skewbridge Rd														
8	T1	741	28	780	3.8	0.410	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
9	R2	1	0	1	0.0	0.001	7.7	LOS A	0.0	0.0	0.41	0.56	0.41	63.6
Approach		742	28	781	3.8	0.410	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.6
West: Mill Rd														
10	L2	1	0	1	0.0	0.408	12.1	LOS B	1.8	12.5	0.81	1.06	1.09	55.0
12	R2	161	3	169	1.9	0.408	21.3	LOS C	1.8	12.5	0.81	1.06	1.09	54.2
Approach		162	3	171	1.9	0.408	21.2	LOS C	1.8	12.5	0.81	1.06	1.09	54.2
All Vehicles		1241	47	1306	3.8	0.410	3.2	NA	1.8	12.5	0.11	0.17	0.14	74.2

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

MOVEMENT SUMMARY

Site: 101 [Mill Rd & Ohoka Rd - 2023 PM + Dev S-Test & Growth (Site Folder: Mill Rd & Ohoka Rd)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Ohoka Rd														
1	L2	142	1	149	0.7	0.579	7.1	LOS A	0.0	0.0	0.00	0.09	0.00	72.5
2	T1	934	7	983	0.7	0.579	0.2	LOS A	0.0	0.0	0.00	0.09	0.00	77.8
Approach		1076	8	1133	0.7	0.579	1.1	NA	0.0	0.0	0.00	0.09	0.00	77.1
North: Skewbridge Rd														
8	T1	419	7	441	1.7	0.229	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
9	R2	2	1	2	50.0	0.013	28.3	LOS D	0.0	0.4	0.88	0.95	0.88	39.6
Approach		421	8	443	1.9	0.229	0.2	NA	0.0	0.4	0.00	0.00	0.00	79.5
West: Mill Rd														
10	L2	2	0	2	0.0	0.476	25.3	LOS D	1.8	12.7	0.93	1.06	1.23	45.1
12	R2	87	3	92	3.4	0.476	34.9	LOS D	1.8	12.7	0.93	1.06	1.23	44.3
Approach		89	3	94	3.4	0.476	34.7	LOS D	1.8	12.7	0.93	1.06	1.23	44.3
All Vehicles		1586	19	1669	1.2	0.579	2.7	NA	1.8	12.7	0.05	0.12	0.07	74.6

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2023 AM + Dev & Growth (Site Folder: Threlkelds & Flaxton)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Threlkelds Rd														
1	L2	222	6	234	2.7	0.280	9.5	LOS A	1.2	8.3	0.46	0.70	0.46	69.6
3	R2	16	0	17	0.0	0.280	18.8	LOS C	1.2	8.3	0.46	0.70	0.46	70.5
Approach		238	6	251	2.5	0.280	10.1	LOS B	1.2	8.3	0.46	0.70	0.46	69.7
East: Skewbridge Rd														
4	L2	12	1	13	8.3	0.007	8.1	LOS A	0.0	0.0	0.00	0.66	0.00	70.7
5	T1	257	27	271	10.5	0.148	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		269	28	283	10.4	0.148	0.4	NA	0.0	0.0	0.00	0.03	0.00	98.1
West: Flaxton Rd														
11	T1	675	28	711	4.1	0.370	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
12	R2	92	3	97	3.3	0.093	9.0	LOS A	0.4	2.7	0.39	0.68	0.39	70.6
Approach		767	31	807	4.0	0.370	1.1	NA	0.4	2.7	0.05	0.08	0.05	95.1
All Vehicles		1274	65	1341	5.1	0.370	2.6	NA	1.2	8.3	0.11	0.19	0.11	89.5

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2023 PM + Dev & Growth (Site Folder: Threlkelds & Flaxton)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Threlkelds Rd														
1	L2	137	0	144	0.0	0.554	21.2	LOS C	2.2	15.2	0.87	1.04	1.36	55.2
3	R2	18	1	19	5.6	0.554	49.7	LOS E	2.2	15.2	0.87	1.04	1.36	54.1
Approach		155	1	163	0.6	0.554	24.5	LOS C	2.2	15.2	0.87	1.04	1.36	55.0
East: Skewbridge Rd														
4	L2	30	1	32	3.3	0.017	7.9	LOS A	0.0	0.0	0.00	0.66	0.00	72.4
5	T1	869	2	915	0.2	0.470	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.7
Approach		899	3	946	0.3	0.470	0.3	NA	0.0	0.0	0.00	0.02	0.00	98.4
West: Flaxton Rd														
11	T1	310	5	326	1.6	0.167	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
12	R2	219	4	231	1.8	0.601	22.4	LOS C	3.1	22.0	0.87	1.07	1.47	56.5
Approach		529	9	557	1.7	0.601	9.3	NA	3.1	22.0	0.36	0.44	0.61	75.8
All Vehicles		1583	13	1666	0.8	0.601	5.7	NA	3.1	22.0	0.21	0.26	0.34	83.6

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

ATTACHMENT 5: TRAM ROAD INTERCHANGE WITH GROWTH MODEL RESULTS

MOVEMENT SUMMARY

Site: 101 [Tram Rd On-Ramp - 2023 AM Upgrade - Growth % (Site Folder: Tram Rd Int + Dev - 3 Lanes - Growth %)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [Upgrade AM + % (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 40 seconds (Network Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Tram Rd															
4	L2	All MCs	219	18.8	219	18.8	0.455	13.4	LOS B	1.8	14.5	0.82	0.78	0.82	47.8
5	T1	All MCs	89	15.3	89	15.3	* 0.335	17.8	LOS B	1.0	8.3	0.93	0.72	0.93	24.2
Approach			308	17.7	308	17.7	0.455	14.7	LOS B	1.8	14.5	0.85	0.76	0.85	43.4
West: Tram Rd															
11	T1	All MCs	193	13.1	193	13.1	* 0.840	8.0	LOS A	8.4	61.0	0.66	0.85	0.86	36.1
12	R2	All MCs	1516	2.6	1516	2.6	0.840	14.9	LOS B	9.7	69.7	0.74	0.88	0.93	49.0
Approach			1708	3.8	1708	3.8	0.840	14.1	LOS B	9.7	69.7	0.73	0.88	0.93	48.0
All Vehicles			2017	5.9	2017	5.9	0.840	14.2	LOS B	9.7	69.7	0.75	0.86	0.91	47.2

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

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101v [Tram Rd Off-Ramp - 2023 AM Upgrade - Growth % (Site Folder: Tram Rd Int + Dev - 3 Lanes - Growth %)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [Upgrade AM + % (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 40 seconds (Network Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Off-Ramp															
1	L2	All MCs	336	5.6	336	5.6	0.177	9.1	LOS A	0.0	0.0	0.00	0.63	0.00	71.0
3	R2	All MCs	81	2.6	81	2.6	* 0.305	25.4	LOS C	0.9	6.7	0.93	0.76	0.93	42.0
Approach			417	5.1	417	5.1	0.305	12.2	LOS B	0.9	6.7	0.18	0.66	0.18	66.1
East: Tram Rd															
5	T1	All MCs	87	10.8	87	10.8	0.087	9.7	LOS A	1.0	7.6	0.99	0.47	0.99	47.7
Approach			87	10.8	87	10.8	0.087	9.7	LOS A	1.0	7.6	0.99	0.47	0.99	47.7
West: Tram Rd															
11	T1	All MCs	1619	3.8	1619	3.8	* 0.786	11.0	LOS B	9.4	68.1	0.85	0.86	1.00	44.1
Approach			1619	3.8	1619	3.8	0.786	11.0	LOS B	9.4	68.1	0.85	0.86	1.00	44.1
All Vehicles			2123	4.3	2123	4.3	0.786	11.2	LOS B	9.4	68.1	0.73	0.80	0.84	49.3

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

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [Tram Rd On-Ramp - 2023 PM Upgrade - Growth % (Site Folder: Tram Rd Int + Dev - 3 Lanes - Growth %)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [Upgrade PM + % (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 30 seconds (Network Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Tram Rd															
4	L2	All MCs	108	1.0	108	1.0	0.139	8.9	LOS A	0.4	2.9	0.63	0.69	0.63	56.6
5	T1	All MCs	228	2.3	228	2.3	* 0.591	13.2	LOS B	2.1	14.8	0.95	0.81	1.04	28.7
Approach			337	1.9	337	1.9	0.591	11.8	LOS B	2.1	14.8	0.85	0.77	0.91	41.6
West: Tram Rd															
11	T1	All MCs	262	3.6	262	3.6	* 0.560	3.9	LOS A	2.1	15.0	0.55	0.58	0.55	45.2
12	R2	All MCs	587	0.5	587	0.5	0.560	12.4	LOS B	3.1	21.8	0.75	0.75	0.75	53.1
Approach			849	1.5	849	1.5	0.560	9.8	LOS A	3.1	21.8	0.69	0.70	0.69	51.5
All Vehicles			1186	1.6	1186	1.6	0.591	10.3	LOS B	3.1	21.8	0.73	0.72	0.75	48.9

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

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101v [Tram Rd Off-Ramp - 2023 PM Upgrade - Growth % (Site Folder: Tram Rd Int + Dev - 3 Lanes - Growth %)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [Upgrade PM + % (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 30 seconds (Network Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Off-Ramp															
1	L2	All MCs	1252	1.3	1252	1.3	0.640	11.9	LOS B	0.0	0.0	0.00	0.63	0.00	72.2
3	R2	All MCs	197	1.6	197	1.6	* 0.443	19.1	LOS B	1.6	11.6	0.90	0.80	0.90	49.1
Approach			1448	1.4	1448	1.4	0.640	12.8	LOS B	1.6	11.6	0.12	0.66	0.12	69.8
East: Tram Rd															
5	T1	All MCs	228	3.2	228	3.2	0.326	11.4	LOS B	2.1	14.8	1.00	0.72	1.00	46.0
Approach			228	3.2	228	3.2	0.326	11.4	LOS B	2.1	14.8	1.00	0.72	1.00	46.0
West: Tram Rd															
11	T1	All MCs	657	1.4	657	1.4	* 0.457	8.2	LOS A	2.4	16.8	0.81	0.67	0.81	47.3
Approach			657	1.4	657	1.4	0.457	8.2	LOS A	2.4	16.8	0.81	0.67	0.81	47.3
All Vehicles			2334	1.6	2334	1.6	0.640	11.4	LOS B	2.4	16.8	0.40	0.67	0.40	62.1

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

* Critical Movement (Signal Timing)

ATTACHMENT 6: TRAM ROAD INTERCHANGE WITH PLAN CHANGE MODEL RESULTS

MOVEMENT SUMMARY

Site: 101 [Tram Rd On-Ramp - 2023 AM Upgrade (Site Folder: Tram Rd Int + Dev - 3 Lanes)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [Upgrade AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 40 seconds (Network Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Tram Rd															
4	L2	All MCs	191	18.8	191	18.8	0.368	10.8	LOS B	1.2	10.1	0.69	0.74	0.69	50.2
5	T1	All MCs	77	13.7	77	13.7	* 0.285	17.6	LOS B	0.9	6.9	0.92	0.70	0.92	24.4
Approach			267	17.3	267	17.3	0.368	12.8	LOS B	1.2	10.1	0.76	0.73	0.76	45.3
West: Tram Rd															
11	T1	All MCs	167	13.2	167	13.2	* 0.731	4.0	LOS A	4.9	35.8	0.53	0.73	0.58	41.4
12	R2	All MCs	1318	2.6	1318	2.6	0.731	10.5	LOS B	5.9	42.6	0.59	0.78	0.65	54.3
Approach			1485	3.8	1485	3.8	0.731	9.7	LOS A	5.9	42.6	0.59	0.77	0.64	53.3
All Vehicles			1753	5.9	1753	5.9	0.731	10.2	LOS B	5.9	42.6	0.61	0.77	0.66	51.9

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

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101v [Tram Rd Off-Ramp - 2023 AM Upgrade (Site Folder: Tram Rd Int + Dev - 3 Lanes)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [Upgrade AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 40 seconds (Network Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Off-Ramp															
1	L2	All MCs	293	5.8	293	5.8	0.154	9.0	LOS A	0.0	0.0	0.00	0.63	0.00	71.0
3	R2	All MCs	71	3.0	71	3.0	* 0.249	25.1	LOS C	0.8	5.8	0.92	0.75	0.92	42.3
Approach			363	5.2	363	5.2	0.249	12.1	LOS B	0.8	5.8	0.18	0.66	0.18	66.2
East: Tram Rd															
5	T1	All MCs	76	11.1	76	11.1	0.076	9.6	LOS A	0.9	6.6	0.99	0.47	0.99	47.7
Approach			76	11.1	76	11.1	0.076	9.6	LOS A	0.9	6.6	0.99	0.47	0.99	47.7
West: Tram Rd															
11	T1	All MCs	1407	3.7	1407	3.7	* 0.662	7.1	LOS A	6.1	44.4	0.76	0.68	0.76	48.7
Approach			1407	3.7	1407	3.7	0.662	7.1	LOS A	6.1	44.4	0.76	0.68	0.76	48.7
All Vehicles			1846	4.3	1846	4.3	0.662	8.2	LOS A	6.1	44.4	0.65	0.67	0.66	52.9

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

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [Tram Rd On-Ramp - 2023 PM Upgrade (Site Folder: Tram Rd Int + Dev - 3 Lanes)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [Upgrade PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 30 seconds (Network Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Tram Rd															
4	L2	All MCs	95	1.1	95	1.1	0.116	8.4	LOS A	0.3	2.3	0.59	0.68	0.59	57.2
5	T1	All MCs	198	2.1	198	2.1	* 0.512	12.6	LOS B	1.7	12.3	0.94	0.75	0.94	29.4
Approach			293	1.8	293	1.8	0.512	11.2	LOS B	1.7	12.3	0.82	0.73	0.83	42.3
West: Tram Rd															
11	T1	All MCs	228	3.7	228	3.7	* 0.488	3.7	LOS A	1.7	12.0	0.50	0.55	0.50	45.6
12	R2	All MCs	512	0.6	512	0.6	0.488	12.1	LOS B	2.6	18.2	0.71	0.73	0.71	53.5
Approach			740	1.6	740	1.6	0.488	9.5	LOS A	2.6	18.2	0.64	0.67	0.64	51.8
All Vehicles			1033	1.6	1033	1.6	0.512	10.0	LOS A	2.6	18.2	0.70	0.69	0.70	49.4

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

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101v [Tram Rd Off-Ramp - 2023 PM Upgrade (Site Folder: Tram Rd Int + Dev - 3 Lanes)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [Upgrade PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 30 seconds (Network Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Off-Ramp															
1	L2	All MCs	1088	1.4	1088	1.4	0.557	10.5	LOS B	0.0	0.0	0.00	0.63	0.00	72.2
3	R2	All MCs	172	1.8	172	1.8	* 0.387	18.9	LOS B	1.4	10.0	0.88	0.79	0.88	49.3
Approach			1260	1.4	1260	1.4	0.557	11.6	LOS B	1.4	10.0	0.12	0.66	0.12	69.9
East: Tram Rd															
5	T1	All MCs	199	3.2	199	3.2	0.284	11.2	LOS B	1.8	12.8	1.00	0.71	1.00	46.2
Approach			199	3.2	199	3.2	0.284	11.2	LOS B	1.8	12.8	1.00	0.71	1.00	46.2
West: Tram Rd															
11	T1	All MCs	603	1.4	603	1.4	* 0.419	8.1	LOS A	2.1	15.1	0.79	0.66	0.79	47.5
Approach			603	1.4	603	1.4	0.419	8.1	LOS A	2.1	15.1	0.79	0.66	0.79	47.5
All Vehicles			2062	1.6	2062	1.6	0.557	10.5	LOS B	2.1	15.1	0.40	0.66	0.40	62.0

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

* Critical Movement (Signal Timing)