Planning | Surveying | Engineering | Environmental

Seven Oaks
c/o Sarah Hunt
Cheal Consultants Ltd
Level 1, 4 Horomatangi St
Taupo

Ref: B22049
5 April 2025

Subject: **Seven Oaks Subdivision – Section 92 Response**
Issued via: **sarahh@cheal.co.nz**

Dear Sarah

We are pleased to provide this response to the section 92 request in relation to the Seven Oaks development at Kinloch.

Executive Summary

CKL previously prepared an Integrated Transportation Assessment (ITA) dated 7 March 2023 as part of the original consent application for the Seven Oaks subdivision. CKL prepared a response to a peer review undertaken by Abley Consultants on behalf of Taupo District Council (TDC) dated 5 April 2024. A new application for the subdivision was lodged with an updated ITA in September 2024. A Section 92 Request for Additional Information was provided by Abley on 5 December 2024. Following receipt of the S92, there have been multiple meetings and conversations between CKL, Abley and TDC to enable a collaborative approach between the organisations. This document formally captures the outputs from those discussions and meetings.

The updated analysis focuses on the operation of the Wairakei Drive corridor between Poihipi Road and Spa Road. A key part of this network is the Control Gates Bridge which has been identified as a critical location on the road network. As part of the update, trip generation rates applied to the proposed Seven Oaks residential development and other known residential developments have been reviewed. A more focused trip rate reflective of the more rural nature of the Kinloch area has been applied to development in that location, whilst the trip rates from the Nukuhau Plan Change have been adopted for developments within and on the fringes of Taupo. Trips for the site and its surrounds have also been distributed to the network in accordance with observed turning proportions at the relevant intersections, ensuring that an appropriate degree of traffic is loaded onto the Control Gates Bridge and adjacent intersections. To test the effects of the proposed Kinloch Seven Oaks development, a number of models have been run as follows:

- Establishing the existing operation of the network;
- Testing the effects of the proposed Seven Oaks development against that existing background;
- Considering the accepted Nukuhau Plan Change modelling as the future year baseline model; and
- Testing the effects of the proposed Seven Oaks development against that future 'with Nukuhau' network.

Sensitivity testing has also been undertaken in relation to phase times and pedestrian volumes at the Norman Smith Street / Wairakei Drive intersection within the modelling. It was found that these parameters do not materially affect the model outputs.

Considering each intersection in turn for the critical AM peak hour:

- At Poihipi Road / Wairakei Drive, the proposed Seven Oaks residential subdivision is expected to increase delay by less than one second;
- At Norman Smith Street / Wairakei Drive intersection, the development increases overall average delay by 6 seconds; and
- At the Tongariro Street / Spa Road intersection, the development increases overall average delay by 5 seconds.

Overall, the proposed development is expected to add one new vehicle every 2 minutes to the Norman Smith Street / Control Gates Bridge / Spa Road section of the network and delays are likely to increase by a few seconds. This is considered to be a negligible effect.

TDC has identified that a capacity upgrade to the road network across the Waikato River is required and funding for identifying such solutions is included within the Lond Term Plan. This funding includes a proportion from development contributions, suggesting that a degree of development prior to completion of the Control Gates Bridge is necessary for this project to achieve its funding targets. It is considered that the traffic effects of the proposed development will be addressed by delivery of the new river crossing and that the levying of development contributions towards the Council-led solution is an appropriate mitigation approach. As such, we conclude that there are no traffic or transportation reasons why the proposed development should not occur prior to delivery of the new river crossing.

S92 Responses

As a note, all analysis undertaken in the document does not include any upgrades to Control Gates Bridge. The Control Gates Bridge is the current bottleneck on the transport network and its completion is expected to unlock network capacity.

It is also noted that an upgrade to the Control Gates Bridge will require funding from development contributions as indicated in the TDC LTP. This suggests that allowing a degree of development prior to provide the DC for its development is necessary.

1. *Provide details of calibration of queue lengths or delays in morning peak on Poihipi Road approach to Poihipi Rd / Wairakei Drive intersection.*

No specific calibration was undertaken as queue data was not captured for this intersection. However, Google Map imagery has been used to indicate likely queue lengths. Figure 1 and Figure 2 suggest peak hour queuing at this intersection is in the order of 20m as shown in the yellow line. These values broadly align with the modelled results which indicate 95%ile queuing to be in the order of 18m-22m. Queuing results from the modelling are provided within Appendix A to this document.

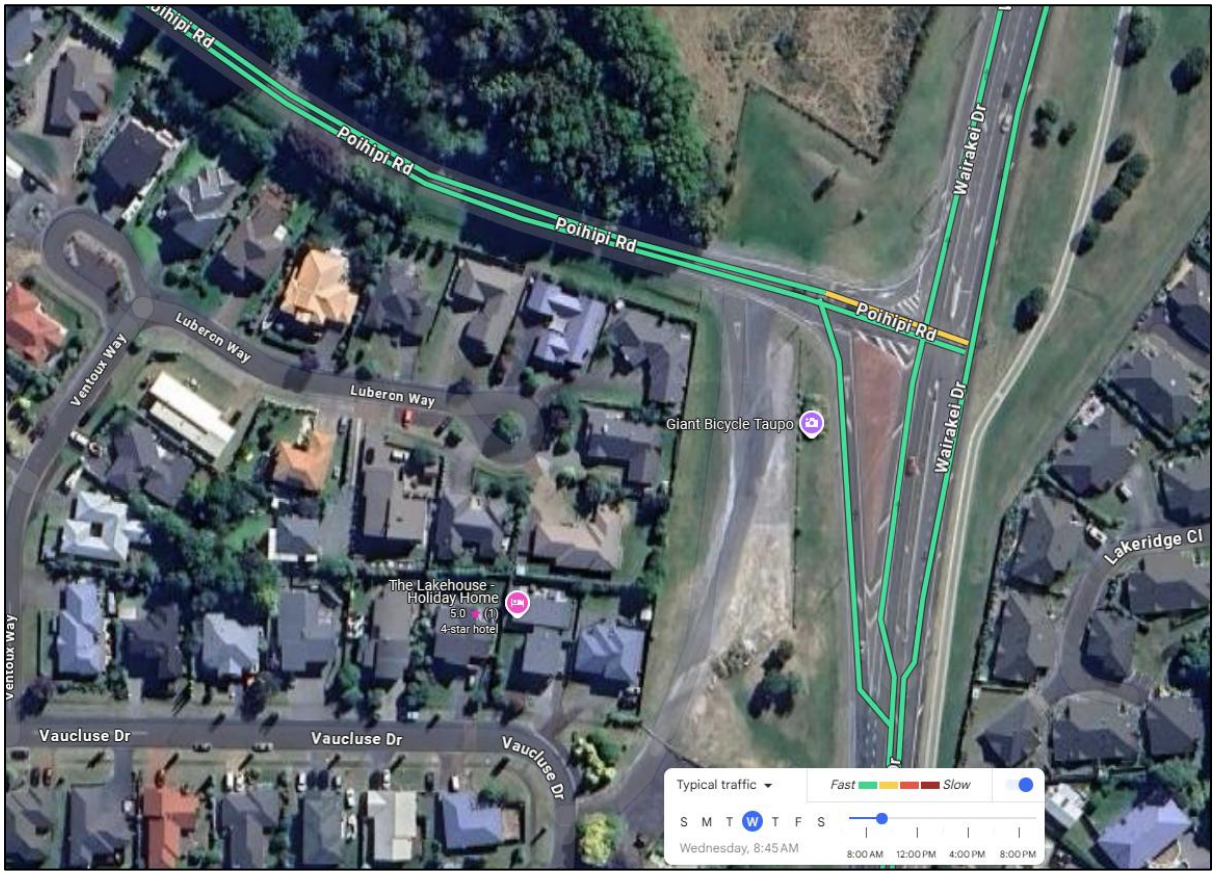

Figure 1: AM Queueing Google Overlay

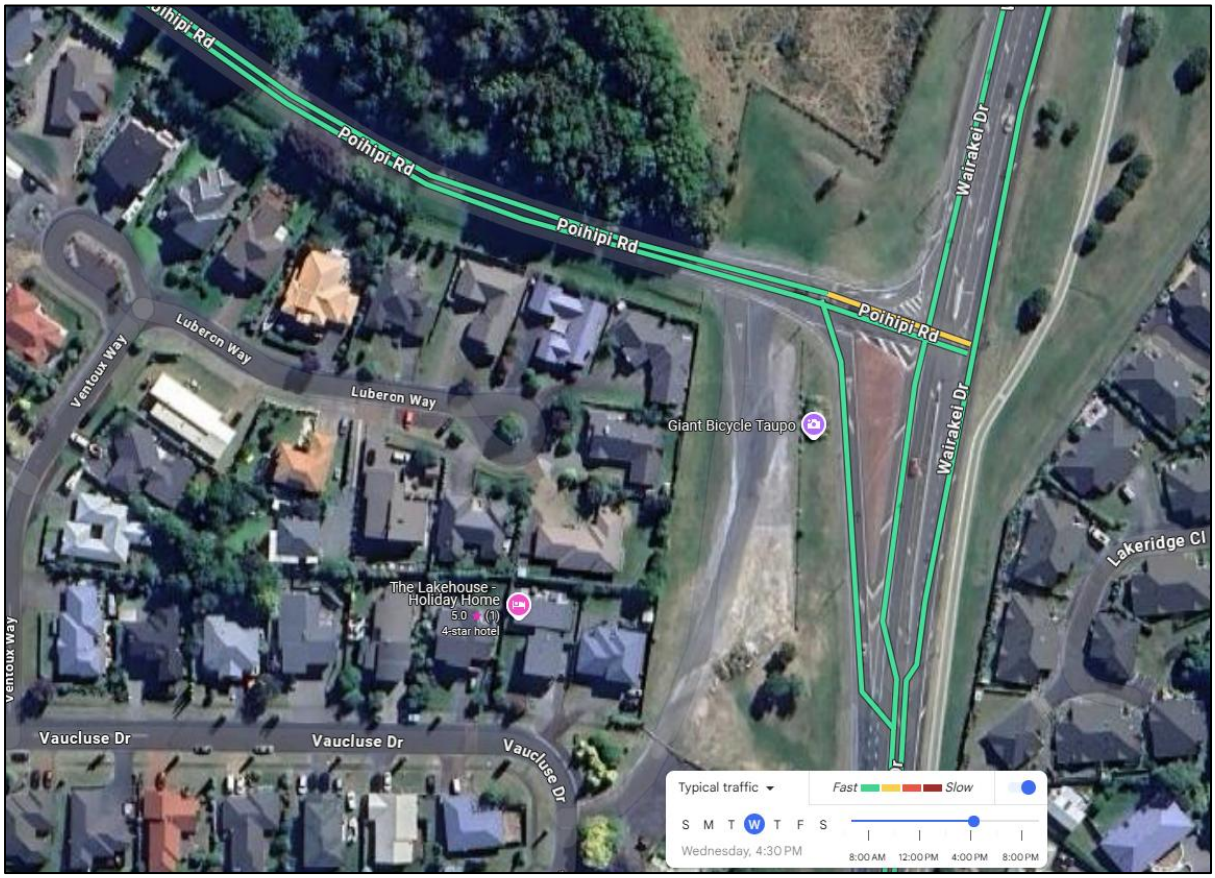

Figure 2: PM Queueing Google Overlay

2. *Confirm pedestrian volume assumptions in modelling of Norman Smith / Wairakei Intersection.*

Signal phasing data was provided by Tauranga City Council who manage phase times for signalised intersections within Taupo. The data provided was for the morning, midday and evening peaks hours for the week commencing 11 Nov 2024 to represent a typical week and the week commencing 27 Dec 2023 to represent the peak summer season week (excluding the Sundays). This data is provided in Appendix B. The data provided indicted that the pedestrian phase for crossing Wairakei Drive was called very infrequently and occurred in only 4 times out of the total 36 hours of data provided (11%). As such, adopting the default pedestrian demands of 50peds/h is greater than the demands indicated by the signal phasing data.

To provide further robustness, sensitivity testing was undertaken at the Norman Smith Street / Wairakei Drive intersection with different pedestrian demands. Testing was undertaken with hourly demands of 0, 1, 5 and 50. The vehicle volumes modelled are those provided by Council as a base case to ensure a consistent comparison to also compare with existing operations. As a note, the 50 ped volume is the SIDRA default value, the 5 ped volume is a conservative estimate of pedestrian demand given that pedestrian phases are hardly called to extend minimum green times, and tests at 1 and 0 to identify the effects of excluding pedestrian phase entirely.

In summary, there are no changes to intersection performance which demonstrates that pedestrian volumes at this intersection do not affect network performance and that traffic volumes govern phase times. The movement summarises from the pedestrian sensitivity testing are provided below:

AM Peak

0 peds:

MOVEMENT SUMMARY

Site: 101 [ExistingAM - No Peds (Site Folder: Wairakei Norman Smith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	337	8.6	337	8.6	0.193	4.5	LOS A	0.0	0.0
2	T1	All MCs	323	9.3	323	9.3	0.549	15.7	LOS B	6.7	51.0
Approach			660	8.9	660	8.9	0.549	10.0	LOS A	6.7	51.0
North: Wairakei											
8	T1	All MCs	723	5.4	723	5.4	* 0.908	27.6	LOS C	17.8	130.3
Approach			723	5.4	723	5.4	0.908	27.6	LOS C	17.8	130.3
West: Norman Smith											
10	L2	All MCs	10	10.0	10	10.0	0.308	20.0	LOS B	4.1	29.2
12	R2	All MCs	925	2.5	925	2.5	* 0.946	42.3	LOS D	25.9	184.8
Approach			935	2.6	935	2.6	0.946	42.1	LOS D	25.9	184.8
All Vehicles			2318	5.3	2318	5.3	0.946	28.4	LOS C	25.9	184.8

1 ped:

MOVEMENT SUMMARY

Site: 101 [ExistingAM (Site Folder: Wairakei Norman Smith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	337	8.6	337	8.6	0.193	4.5	LOS A	0.0	0.0
2	T1	All MCs	323	9.3	323	9.3	0.549	15.7	LOS B	6.7	51.0
Approach			660	8.9	660	8.9	0.549	10.0	LOS A	6.7	51.0
North: Wairakei											
8	T1	All MCs	723	5.4	723	5.4	* 0.908	27.6	LOS C	17.8	130.3
Approach			723	5.4	723	5.4	0.908	27.6	LOS C	17.8	130.3
West: Norman Smith											
10	L2	All MCs	10	10.0	10	10.0	0.308	20.0	LOS B	4.1	29.2
12	R2	All MCs	925	2.5	925	2.5	* 0.946	42.3	LOS D	25.9	184.8
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Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Trav
North: Wairakei										
P3	Full	1	1	19.4	LOS B	0.0	0.0	0.88	0.88	
West: Norman Smith										
P4	Full	1	1	19.4	LOS B	0.0	0.0	0.88	0.88	
All Pedestrians		2	2	19.4	LOS B	0.0	0.0	0.88	0.88	

5 peds:

MOVEMENT SUMMARY

Site: 101 [ExistingAM (Site Folder: Wairakei Norman Smith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	337	8.6	337	8.6	0.193	4.5	LOS A	0.0	0.0
2	T1	All MCs	323	9.3	323	9.3	0.549	15.7	LOS B	6.7	51.0
Approach			660	8.9	660	8.9	0.549	10.0	LOS A	6.7	51.0
North: Wairakei											
8	T1	All MCs	723	5.4	723	5.4	* 0.908	27.6	LOS C	17.8	130.3
Approach			723	5.4	723	5.4	0.908	27.6	LOS C	17.8	130.3
West: Norman Smith											
10	L2	All MCs	10	10.0	10	10.0	0.308	20.0	LOS B	4.1	29.2
12	R2	All MCs	925	2.5	925	2.5	* 0.946	42.3	LOS D	25.9	184.8
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All Vehicles			2318	5.3	2318	5.3	0.946	28.4	LOS C	25.9	184.8

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Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
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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)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Trav
North: Wairakei										
P3	Full	5	5	19.4	LOS B	0.0	0.0	0.88	0.88	
West: Norman Smith										
P4	Full	5	5	19.4	LOS B	0.0	0.0	0.88	0.88	
All Pedestrians		10	11	19.4	LOS B	0.0	0.0	0.88	0.88	

50 Peds

MOVEMENT SUMMARY

Site: 101 [ExistingAM (Site Folder: Wairakei Norman Smith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	337	8.6	337	8.6	0.193	4.5	LOS A	0.0	0.0
2	T1	All MCs	323	9.3	323	9.3	0.549	15.7	LOS B	6.7	51.0
Approach			660	8.9	660	8.9	0.549	10.0	LOS A	6.7	51.0
North: Wairakei											
8	T1	All MCs	723	5.4	723	5.4	* 0.908	27.6	LOS C	17.8	130.3
Approach			723	5.4	723	5.4	0.908	27.6	LOS C	17.8	130.3
West: Norman Smith											
10	L2	All MCs	10	10.0	10	10.0	0.308	20.0	LOS B	4.1	29.2
12	R2	All MCs	925	2.5	925	2.5	* 0.946	42.3	LOS D	25.9	184.8
Approach			935	2.6	935	2.6	0.946	42.1	LOS D	25.9	184.8
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Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Trav
North: Wairakei										
P3	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	
West: Norman Smith										
P4	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	
All Pedestrians		100	105	19.4	LOS B	0.1	0.1	0.88	0.88	

PM Peak

0 Peds:

MOVEMENT SUMMARY

Site: 101 [ExistingPM - No Peds (Site Folder: Wairakei Norman Smith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	869	3.5	869	3.5	0.479	4.6	LOS A	0.0	0.0
2	T1	All MCs	647	4.9	647	4.9	*0.721	10.6	LOS B	11.2	81.5
Approach			1516	4.1	1516	4.1	0.721	7.2	LOS A	11.2	81.5
North: Wairakei											
8	T1	All MCs	580	7.6	580	7.6	0.497	7.9	LOS A	6.1	45.3
Approach			580	7.6	580	7.6	0.497	7.9	LOS A	6.1	45.3
West: Norman Smith											
10	L2	All MCs	7	14.3	7	14.3	0.224	17.3	LOS B	1.7	12.7
12	R2	All MCs	444	4.3	444	4.3	*0.687	20.0	LOS B	6.6	48.1
Approach			451	4.4	451	4.4	0.687	19.9	LOS B	6.6	48.1
All Vehicles			2547	4.9	2547	4.9	0.721	9.6	LOS A	11.2	81.5

1 ped:

MOVEMENT SUMMARY

Site: 101 [ExistingPM (Site Folder: Wairakei Norman Smith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
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West: Norman Smith											
10	L2	All MCs	7	14.3	7	14.3	0.224	17.3	LOS B	1.7	12.7
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Approach			451	4.4	451	4.4	0.687	19.9	LOS B	6.6	48.1
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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)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate
North: Wairakei									
P3	Full	1	1	14.5	LOS B	0.0	0.0	0.85	0.85
West: Norman Smith									
P4	Full	1	1	14.5	LOS B	0.0	0.0	0.85	0.85
All Pedestrians		2	2	14.5	LOS B	0.0	0.0	0.85	0.85

5 peds:

MOVEMENT SUMMARY

Site: 101 [ExistingPM (Site Folder: Wairakei NormanSmith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	Demand Flows HV] %	Arrival Flows [Total veh/h	Arrival Flows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	95% Back Of Queue Dist] m
South: Tongariro											
1	L2	All MCs	869	3.5	869	3.5	0.479	4.6	LOS A	0.0	0.0
2	T1	All MCs	647	4.9	647	4.9	*0.721	10.6	LOS B	11.2	81.5
Approach			1516	4.1	1516	4.1	0.721	7.2	LOS A	11.2	81.5
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Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	AVERAGE BACK OF QUEUE Dist] m	Prop. Que	Eff. Stop Rate
North: Wairakei									
P3	Full	5	5	14.5	LOS B	0.0	0.0	0.85	0.85
West: Norman Smith									
P4	Full	5	5	14.5	LOS B	0.0	0.0	0.85	0.85
All Pedestrians		10	11	14.5	LOS B	0.0	0.0	0.85	0.85

50 peds:

MOVEMENT SUMMARY

Site: 101 [ExistingPM (Site Folder: Wairakei NormanSmith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	Demand Flows HV] %	Arrival Flows [Total veh/h	Arrival Flows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	95% Back Of Queue Dist] m
South: Tongariro											
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Approach			580	7.6	580	7.6	0.497	7.9	LOS A	6.1	45.3
West: Norman Smith											
10	L2	All MCs	7	14.3	7	14.3	0.224	17.3	LOS B	1.7	12.7
12	R2	All MCs	444	4.3	444	4.3	*0.687	20.0	LOS B	6.6	48.1
Approach			451	4.4	451	4.4	0.687	19.9	LOS B	6.6	48.1
All Vehicles			2547	4.9	2547	4.9	0.721	9.6	LOS A	11.2	81.5

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	AVERAGE BACK OF QUEUE Dist] m	Prop. Que	Eff. Stop Rate
North: Wairakei									
P3	Full	50	53	14.5	LOS B	0.1	0.1	0.85	0.85
West: Norman Smith									
P4	Full	50	53	14.5	LOS B	0.1	0.1	0.85	0.85
All Pedestrians		100	105	14.5	LOS B	0.1	0.1	0.85	0.85

3. *Note that the trip rates assumed are highly conservative. Some sensitivity tests around this may be appropriate including making provision for background growth in traffic over and above the known Kinloch and Nukuhau developments.*

Trip Generation

It is acknowledged that the initial peak hour trip rate of 0.9 trips/dwelling adopted were conservative. A survey was undertaken of a 188-dwelling subdivision off Alec Craig Way in Gulf Harbour, Whangaparaoa. The observed peak hour trip rate was 0.59/dwelling as reported in the joint evidence statement by D. Hughes and B. Harries as part of Plan Change 88 for enabling growth in Beachlands, Auckland. The environmental characteristics of the dwellings surveyed are similar to Kinloch in that the surrounding environment is predominantly residential with a nearby beach/marina. In both locations, the nearest shops are about a 15-minute drive away and there is limited public transport infrastructure.

From Census 2023, the percentage of dwellings in Kinloch (SA2) that are unoccupied is 55%. In contrast, Gulf Harbour North (SA2) has an unoccupancy rate of 5%. This indicates that number of holiday homes etc within Kinloch is higher compared to Gulf Harbour. Therefore, the trip rate in Kinloch in unlikely to exceed what was surveyed at Gulf Harbour given that the number of unoccupied dwellings in Kinloch is likely to be higher.

An alternative method for calculating trip rates has been taken as 45% of the 0.9 trips/dwelling base rate from RR453. The 45% is the occupancy rate for dwellings in Kinloch. This would give a trip rate of 0.41/dwelling. It is possible that some of the unoccupied homes may have been those under construction and not just holiday homes.

The 0.41 rate may therefore result in an underestimate of future trip rates for dwellings in Kinloch. Adopting the surveyed trip rate of 0.59 trips/dwelling is therefore considered to be appropriate and to provide a degree of robustness without undue conservatism. In comparison, the Nukuhau Plan Change traffic modelling adopted trip rates of 0.72/dwellings and 0.85/dwelling for the morning and evening peak hour. The Lochviews development had a trips rate of 0.9/dwelling. These values have continued to be used so as not to retrospectively affect the previous assessment that have been undertaken and consented. It is also noted that those developments are closer to the Taupo urban area.

The 0.59/dwelling rate has been applied to other anticipated development within the Kinloch area. Table 1 below summarises the other consented development in Kinloch and the expected delivery dates. The 2027 future year has been considered as the anticipated year when the control gates bridge upgrade would commence.

Table 1: Other Kinloch Development

Development	Total Lots	Timing	Lots by 2027
Hunt Club Inc	30	2030-2035	0
The Terraces	55	2025-2035	17
Seven Oaks	160	2020-2026	160
Oakdale Drive	12	2025-2030	7
Workshop Site	6	2025	6
The Poplars	12	2020-2025	12
The Fairways	54	2020-2040	8
Kinloch Golf Course	108	2035-2050	0
The Kinloch Manor	12	2025-2030	7
Edmund Hillary Outdoor Education	1	2025	1
Locheagle Developments	30	2020-2035	10
Total	**480**		**228**

Trip Distribution

Greater consideration has been given to the distribution of trips from Kinloch. Data from Commuter Waka (which itself is based on 2018 census data) has been used as 2023 data is not yet available. The Mapara SA2 area has been used as the relevant SA2 block given that this includes the subject Seven Oaks site. The distribution of departures from Mapara area are summarised in Table 2 below. The full distribution of departures is provided in Appendix C.

Table 2: Census Trip Distribution

Destination	Percentage
Taupo Central/East (via Control Gates Bridge)	61.4%
North East (head north on Wairakei Dr)	2.8%
West (head west on Poihipi Rd)	4.1%
Internal/Acacia Bay (east of site but not using Wairakei Dr)	29.8%
Total	**100%**

Overall, only 61.4% of trips generated are expected to use Control Gates Bridge with remaining trips heading to other parts so the network or being internal to the Kinloch area.

For additional clarity, an inbound/outbound distribution of 25/75% AM Peak and 63/37% PM Peak has been adopted. These are the in/out distribution of trips taken from the ITE Manual for the Single Detached Dwelling.

The above trip rate values and distributions were agreed with Abley and Taupo District Council. It is also noted that the Nukuhau development is only permitted to develop up to 140 dwellings prior to the upgrade of the Control Gates Bridge. There does not appear to be any such similar control over development within Lochviews.

Table 3 below summarises the peak hour trip generation for the site and the neighbouring developments.

Table 3: Trip Generation Summary

		Trip Gen	Trip Gen		Trips Generated		AM Peak disti		PM Peak distributi		AM Peak Flows		PM Peak Flows	
Activity	Size	AM Peak	PM Peak	Source	AM Peak	PM Peak	In	Out	In	Out	In	Out	In	Out
Site	87	0.59	0.59	A22377 D Hughe	51	51	0.25	0.75	0.63	0.37	13	38	32	19
Other Kinloch	228	0.59	0.59	A22377 D Hughe	135	135	0.25	0.75	0.63	0.37	34	101	85	50
Nukuhau	140	0.72	0.85	WSP Report Nuk	101	119	0.25	0.75	0.63	0.37	25	76	75	44
Lochviews	546	0.9	0.9	Stantec Report l	491	491	0.25	0.75	0.63	0.37	123	369	310	182
Total	**1001**				**778**	**796**					**195**	**584**	**502**	**295**
												778		796

Based on the above, up to 51 trips would be generated by the subject development of which 32 would be expected to use Control Gates Bridge in each of the peak hours (AM = 24 south, 8 north; PM = 20 north, 12 south). The maximum of 24 trips travelling in the peak direction on the bridge represents less than one vehicle every two minutes.

All SIDRA models have also been updated to reflect the changes to the above. Movement summarises from the modelling are provided as an Appendix to this document. Table 4 and Table 5 in response to items below include a summary of the additional modelling undertaken. The modelling results indicate that adding less than one vehicle every two minutes is unlikely to significantly change the performance of the road network.

4. *Please provide commentary about the likely split in traffic crossing the CGB between turning at the Poihipi Road and Norman Smith Street intersections.*

All traffic from the site is expected to turn onto Wairakei Drive via Poihipi Road. There is no direct route between Kinloch and Norman Smith Street.

5. *Check and confirm the trip rates assumed in the modelling of the immediate intersections to ensure consistency throughout and re-run the models if required.*

See above response to item 3 for discussion on trip generation. It is confirmed that these trip rates have been used consistently through the SIDRA modelling.

6. *For the modelling of Wairakei / Poihipi please supply model outputs for the current intersection configuration accompanying the page 52 summary.*

It is noted that the Poihipi Road / Wairakei Drive intersection will be relocated and signalised as part of PC37. It is understood that this is required to unlock the full PC37 development and would occur after the Control Gate Bridge upgrade is in place. The assessment of effects of the proposed Seven Oaks development focuses on the pre-Control Gates Bridge scenario.

The Poihipi Road / Wairakei Drive intersection has been modelled as a network to represent the stage right turn movement out of Poihipi Road. The modelled layout of the intersection is shown in Figure 3. Note that the length of the median is modelled as being 30m which is less than the approximate 60m length of the median lane to reflect that some vehicles may seek to merge earlier within the lane length.

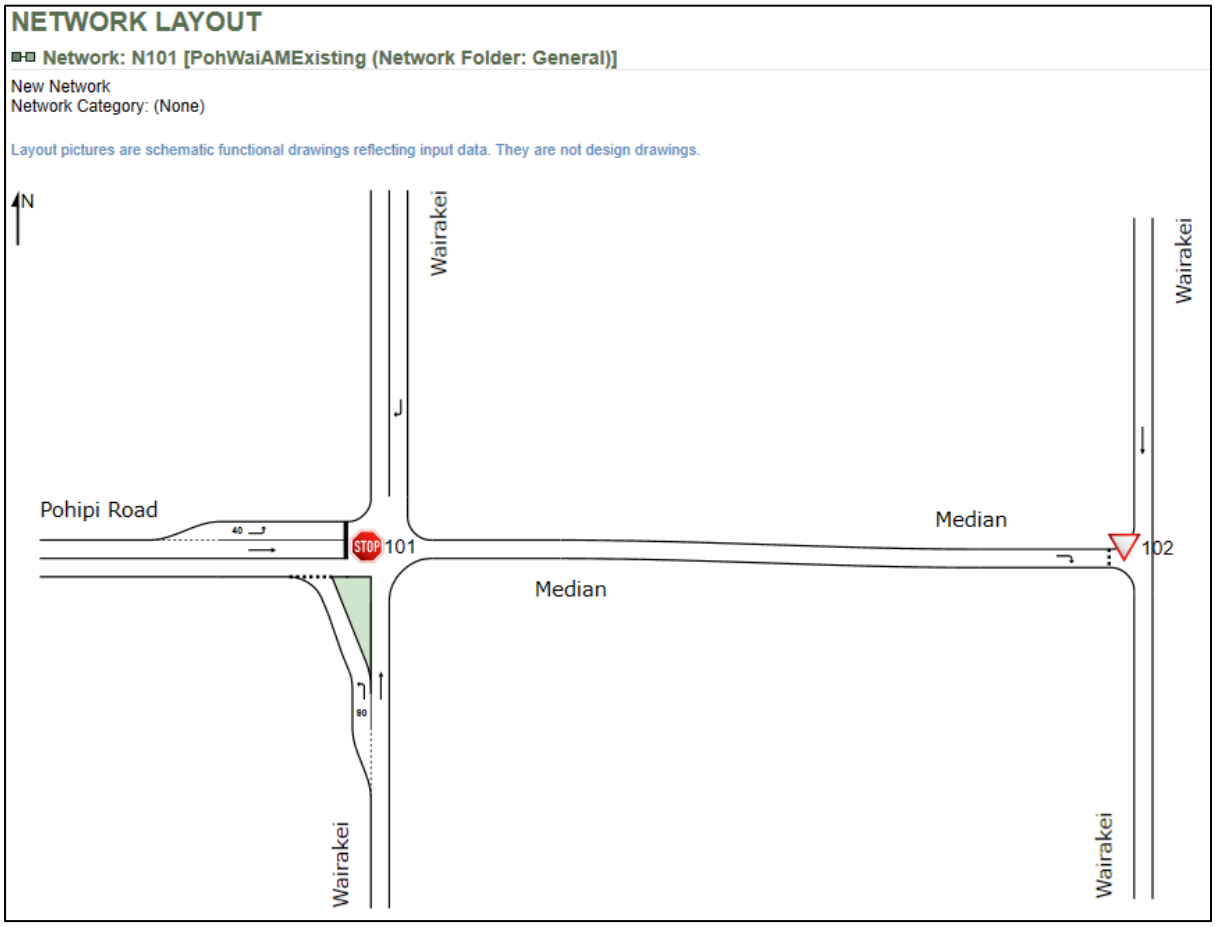

Figure 3: Modelling Poihipi Rd / Wairakei Dr Intersection

The modelling results for the intersection are included as an Appendix to this document. Note that the delays for the right turn out of Poihipi Road are the sum of the through movement of the first stage plus the right turn for the second stage. This to reflect the delay time for a vehicle to complete the full movement of the right turn out as discussed in item 1. This also ensures consistency with using Google to calibrate queuing as discussed in item 1 as Google considers speed throughout the turn and not just time spent at the limit line.

The PC37 modelling undertaken by WSP did not consider this intersection for a scenario with the PC37 landuse but without the relocated intersection. Therefore, the PC37 modelling was not applicable for this intersection. Four scenarios for the Poihipi Road / Wairakei Drive intersection have therefore been assessed as follows:

- The 'Existing' scenario is the traffic volumes based on surveyed data organised by CKL dated 10 August 2022.
- The 'Existing with Development' scenario adds the traffic from the subject site to the surveyed volumes which assesses effects of the site if it is to be developed prior to other consented developments.
- The 'Background' scenario adds traffic from other known developments to the surveyed volumes.
- The 'Background with Development' scenario adds development traffic to the Background scenario to assess effects of the development if it is developed after other development.

No future growth to existing traffic volumes have been applied for future years as any growth is expected to be generated by the new developments. Applying additional growth to the surveyed traffic volumes would likely result in double counting of future growth.

The key movement for the Poihipi Road / Wairakei Drive intersection is the right turn out of Poihipi Road. Table 4 below summarises the total delay for the right turn out of Poihipi Road for each of the scenarios assessed.

Table 4: Poihipi Rd / Wairakei Dr Model Results Summary

Intersection	Scenario	AM (s)	PM (s)
Poihipi / Wairakei	Existing	14.4	16.7
	Existing with Development	14.6	17.0
	Background	15.1	17.6
	Background with Development	15.5	17.9

For the Poihipi Road / Wairakei Drive intersection, the delay for the right turn out of Poihipi Road increases by less than 1 second in either scenario that adds traffic related to the subject site. The development is therefore not considered to have a practical effect on the operation of this intersection.

7. *Confirmation of the trip rates assumed in the modelling including those for the background Kinloch development and Nukuhau Plan Change.*

See above response to item 3 for discussion on trip generation.

8. *For the modelling of Wairakei / Tongariro / Spa and Wairakei / Norman Smith Street please supply:*
    a. *both morning and evening peak turning movement volumes (separately and confirming observed peak hours times) for each survey day at both intersections.*
    b. *the future development assumptions including trip rates assumed for the future model scenarios.*
    c. *confirmation of the trip rates assumed in the modelling for Seven Oaks development traffic.*

The input traffic volumes for the Norman Smith St / Wairakei Drive and Tongariro St / Spa St intersections have been based on the modelling undertaken by WSP as part of previous Plan Change 37 (PC37). Use of the PC37 modelling was considered to be more appropriate than using existing surveyed volumes at the intersections. The PC37 modelling used a network of the wider Taupo area and therefore allows for redistribution of trips throughout the network. This allows for a more consistent comparison with modelling that has been previously accepted.

The PC37 modelling a variety of different land use scenarios. The most relevant scenario is the 2030 Scenario #3 which includes 2,185 dwellings across various developments to the northwest of Taupo. This exceeds the 1,001 dwellings currently anticipated prior to the upgrade of the Control Gates Bridge as outlined in Table 3 in response to item 3 previously. It is understood therefore that the WSP modelling has allowed for Nukuhau, Lochviews and other developments to the northwest of Taupo.

It is noted that the WSP modelling included two approach lanes for the southern approach to the Tongariro St roundabout. Since PC37 modelling was undertaken, the southern approach to the Tongariro Street roundabout has been reduced to one lane as part of TDC's conversion to change the function of Tongariro Street. Within the SIDRA modelling, this layout change was resulting in unrealistic queuing on this approach.

Consideration was given to using the Stantec modelling for the Lochviews development given that this had updated the design of the Tongariro St / Spa St roundabout. However, this had not taken the PC37 traffic volumes into account. Therefore, the Stantec modelling was not adopted.

To address the change in layout at the roundabout, it was proposed to adopt the WSP modelling volumes and to shift 50% of demands from the southern approach onto the eastern approach of Spa Road. This allows for the redistribution of traffic from the CBD given that there are multiple routing options to both Tongariro Street and Spa Road from the CBD. This approach was agreed with Abley and ensures that total volumes through the intersection are still consistent while allowing for rebalancing of the road network. Development traffic from the subject site was then added to the WSP values while ensuring that the SIDRA modelling reflecting the current intersection layouts.

Overall, there have been two scenarios tested for each of these intersections. The WSP volumes represent a baseline scenario and then development traffic has been added. Full modelling results, including signal phase times for the Norman Smith Street signals, are provided in Appendix A with a summary of overall average delay for the intersection provided in Table 5 below. See also the response to item 3 for discussion on trip generation and distribution in relation to the site.

Table 5: Model Results Summary

Intersection	Scenario	AM (s)	PM (s)
Norman Smith / Wairakei	WSP	103.4	45.7
	WSP with Development	109.2	54.1
Tongariro / Spa	WSP with 50% shift from south to east	29.1	180.1
	WSP with 50% shift from south to east with Development	34.1	187.7

For the Norman Smith Street / Wairakei Drive intersection, the morning peak is the critical time period. The intersection is already expected to be congested. The development adds just under 6 seconds average delay to other vehicles. An increase of this magnitude is unlikely to be noticed by other road users and is unlikely to affect their travel choices.

The Tongariro Street / Spa Road intersection is more critical in the evening peak. Similar, to the Norman Smith Street / Wairakei Drive intersection, the development only adds less than 8 seconds of delay and that an increase of this magnitude is unlikely to be noticed by other road users.

Additional sensitivity testing was undertaken in relation to the phase times of the Wairakei Drive / Norman Smith Street intersection. This was to test the sensitivity of the outputs with respect to changes to the input phase times. It was found that slight changes to phase times do not have a significant bearing on overall delay. There are some changes to delays on individual movements and it is likely that in practice the SCATS system will balance the delays between movements depending on conditions on the day.

Testing was also undertaken to increase the overall cycle times. However, this generally reduced performance. This is likely due to the extra approach lanes and ensuring that they are being used efficiently. At the start of the green phase, when both approach lanes are full, two vehicles can get through the intersection at the same time. Once the short lane is empty, there is effectively only vehicle passing through at once. Hence SIDRA is calculating that the optimal times are reasonably low as both lanes can then be used efficiently on each approach.

Results from this sensitivity testing are also included in the Appendix of results.

9. *With respect to the Norman Smith St approach in the morning peak and Tongariro St south approach in the evening peak, provide additional commentary as to the likely implications of additional delay and queueing on road users and the operation of the Nukuhau and town centre networks.*

The response to item 8 above includes a summary and discussion of the modelling for the Norman Smith Street / Wairakei Drive and Tongariro Street / Spa Road intersections.

As outlined in the response to item 3, the development is expected to add only 32 vehicles per hour to the Norman Smith Street / Wairakei Drive and Tongariro Street / Spa Road intersections. This represents 1 vehicle approximately every 2 minutes. The trips generated would also be distributed to different movements at the intersection further reducing the concentration of any effects. As such, the practical increase of one vehicle every two minutes is low and therefore unlikely to have a practical effect on the road network.

We trust this meets your requirements. Please do not hesitate to contact us if you have any questions or require any additional information.

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CKL

Appendix A – SIDRA Results

Poihipi Road / Wairakei Drive

Existing

MOVEMENT SUMMARY

Site: 101 [Site1ExistingAM (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Wairakei											
1	L2	All MCs	153	11.7	153	11.7	0.103	4.8	LOS A	0.4	3.4
2	T1	All MCs	156	3.4	156	3.4	0.082	0.0	LOS A	0.0	0.0
Approach			308	7.5	308	7.5	0.103	2.4	LOS A	0.4	3.4
North: Wairakei											
9	R2	All MCs	49	4.3	49	4.3	0.032	5.1	LOS A	0.1	1.0
Approach			49	4.3	49	4.3	0.032	5.1	NA	0.1	1.0
West: Pohipi Road											
10	L2	All MCs	81	3.9	81	3.9	0.067	8.2	LOS A	0.3	1.9
11	T1	All MCs	313	7.1	313	7.1	0.371	10.0	LOS B	1.9	14.3
Approach			394	6.4	394	6.4	0.371	9.6	LOS A	1.9	14.3
All Vehicles			752	6.7	752	6.7	0.371	6.4	NA	1.9	14.3

MOVEMENT SUMMARY

Site: 102 [Site2ExistingAM (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
North: Wairakei											
8	T1	All MCs	282	4.5	282	4.5	0.149	0.0	LOS A	0.0	0.0
Approach			282	4.5	282	4.5	0.149	0.0	NA	0.0	0.0
West: Median											
12	R2	All MCs	313	7.1	313	7.1	0.287	4.4	LOS A	1.1	8.0
Approach			313	7.1	313	7.1	0.287	4.4	LOS A	1.1	8.0
All Vehicles			595	5.8	595	5.8	0.287	2.3	NA	1.1	8.0

MOVEMENT SUMMARY

Site: 101 [Site1ExistingPM (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Wairakei											
1	L2	All MCs	281	1.5	281	1.5	0.188	4.9	LOS A	0.9	6.1
2	T1	All MCs	287	1.1	287	1.1	0.148	0.0	LOS A	0.0	0.0
Approach			568	1.3	568	1.3	0.188	2.4	LOS A	0.9	6.1
North: Wairakei											
9	R2	All MCs	97	2.2	97	2.2	0.072	5.6	LOS A	0.3	2.3
Approach			97	2.2	97	2.2	0.072	5.6	NA	0.3	2.3
West: Pohipi Road											
10	L2	All MCs	47	28.9	47	28.9	0.054	10.3	LOS B	0.2	1.8
11	T1	All MCs	222	5.7	222	5.7	0.352	12.4	LOS B	1.7	12.4
Approach			269	9.8	269	9.8	0.352	12.0	LOS B	1.7	12.4
All Vehicles			935	3.8	935	3.8	0.352	5.5	NA	1.7	12.4

MOVEMENT SUMMARY

Site: 102 [Site2ExistingPM (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
North: Wairakei											
8	T1	All MCs	292	1.4	292	1.4	0.151	0.0	LOS A	0.0	0.0
Approach			292	1.4	292	1.4	0.151	0.0	NA	0.0	0.0
West: Median											
12	R2	All MCs	222	5.7	222	5.7	0.203	4.3	LOS A	0.7	5.2
Approach			222	5.7	222	5.7	0.203	4.3	LOS A	0.7	5.2
All Vehicles			514	3.3	514	3.3	0.203	1.9	NA	0.7	5.2

Existing With Development

MOVEMENT SUMMARY

Site: 101 [Site1ExistingAM+Dev (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m
South: Wairakei											
1	L2	All MCs	161	11.1	161	11.1	0.109	4.8	LOS A	0.2	1.4
2	T1	All MCs	156	3.4	156	3.4	0.082	0.0	LOS A	0.0	0.0
Approach			317	7.3	317	7.3	0.109	2.4	LOS A	0.2	1.4
North: Wairakei											
9	R2	All MCs	49	4.3	49	4.3	0.032	5.1	LOS A	0.1	0.4
Approach			49	4.3	49	4.3	0.032	5.1	NA	0.1	0.4
West: Pohipi Road											
10	L2	All MCs	82	3.8	82	3.8	0.068	8.2	LOS A	0.1	0.8
11	T1	All MCs	338	6.5	338	6.5	0.402	10.2	LOS B	0.9	6.7
Approach			420	6.0	420	6.0	0.402	9.8	LOS A	0.9	6.7
All Vehicles			786	6.4	786	6.4	0.402	6.6	NA	0.9	6.7

MOVEMENT SUMMARY

Site: 102 [Site2ExistingAM+Dev (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m
North: Wairakei											
8	T1	All MCs	282	4.5	282	4.5	0.149	0.0	LOS A	0.0	0.0
Approach			282	4.5	282	4.5	0.149	0.0	NA	0.0	0.0
West: Median											
12	R2	All MCs	338	6.5	338	6.5	0.309	4.4	LOS A	0.5	3.5
Approach			338	6.5	338	6.5	0.309	4.4	LOS A	0.5	3.5
All Vehicles			620	5.6	620	5.6	0.309	2.4	NA	0.5	3.5

MOVEMENT SUMMARY

Site: 101 [Site1ExistingPM+Dev (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m
South: Wairakei											
1	L2	All MCs	302	1.4	302	1.4	0.202	4.9	LOS A	0.4	2.7
2	T1	All MCs	287	1.1	287	1.1	0.148	0.0	LOS A	0.0	0.0
Approach			589	1.3	589	1.3	0.202	2.5	LOS A	0.4	2.7
North: Wairakei											
9	R2	All MCs	98	2.2	98	2.2	0.072	5.6	LOS A	0.1	0.9
Approach			98	2.2	98	2.2	0.072	5.6	NA	0.1	0.9
West: Pohipi Road											
10	L2	All MCs	48	28.3	48	28.3	0.055	10.2	LOS B	0.1	0.7
11	T1	All MCs	235	5.4	235	5.4	0.377	12.7	LOS B	0.8	5.5
Approach			283	9.3	283	9.3	0.377	12.3	LOS B	0.8	5.5
All Vehicles			971	3.7	971	3.7	0.377	5.7	NA	0.8	5.5

MOVEMENT SUMMARY

Site: 102 [Site2ExistingPM+Dev (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m
North: Wairakei											
8	T1	All MCs	292	1.4	292	1.4	0.151	0.0	LOS A	0.0	0.0
Approach			292	1.4	292	1.4	0.151	0.0	NA	0.0	0.0
West: Median											
12	R2	All MCs	235	5.4	235	5.4	0.214	4.3	LOS A	0.3	2.2
Approach			235	5.4	235	5.4	0.214	4.3	LOS A	0.3	2.2
All Vehicles			526	3.2	526	3.2	0.214	1.9	NA	0.3	2.2

Background

MOVEMENT SUMMARY

Site: 101 [Site1ExistingAM+Back (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m
South: Wairakei											
1	L2	All MCs	175	10.2	175	10.2	0.117	4.8	LOS A	0.2	1.6
2	T1	All MCs	156	3.4	156	3.4	0.082	0.0	LOS A	0.0	0.0
Approach			331	7.0	331	7.0	0.117	2.5	LOS A	0.2	1.6
North: Wairakei											
9	R2	All MCs	51	4.2	51	4.2	0.033	5.1	LOS A	0.1	0.4
Approach			51	4.2	51	4.2	0.033	5.1	NA	0.1	0.4
West: Pohipi Road											
10	L2	All MCs	84	3.8	84	3.8	0.070	8.2	LOS A	0.1	0.8
11	T1	All MCs	378	5.8	378	5.8	0.451	10.6	LOS B	1.2	8.5
Approach			462	5.5	462	5.5	0.451	10.2	LOS B	1.2	8.5
All Vehicles			843	6.0	843	6.0	0.451	6.9	NA	1.2	8.5

MOVEMENT SUMMARY

Site: 102 [Site2ExistingAM+Back (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m
North: Wairakei											
8	T1	All MCs	282	4.5	282	4.5	0.149	0.0	LOS A	0.0	0.0
Approach			282	4.5	282	4.5	0.149	0.0	NA	0.0	0.0
West: Median											
12	R2	All MCs	378	5.8	378	5.8	0.344	4.5	LOS A	0.6	4.2
Approach			378	5.8	378	5.8	0.344	4.5	LOS A	0.6	4.2
All Vehicles			660	5.3	660	5.3	0.344	2.6	NA	0.6	4.2

MOVEMENT SUMMARY

Site: 101 [Site1ExistingPM+Back (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m
South: Wairakei											
1	L2	All MCs	336	1.3	336	1.3	0.225	4.9	LOS A	0.4	3.0
2	T1	All MCs	287	1.1	287	1.1	0.148	0.0	LOS A	0.0	0.0
Approach			623	1.2	623	1.2	0.225	2.6	LOS A	0.4	3.0
North: Wairakei											
9	R2	All MCs	99	2.1	99	2.1	0.073	5.6	LOS A	0.1	0.9
Approach			99	2.1	99	2.1	0.073	5.6	NA	0.1	0.9
West: Pohipi Road											
10	L2	All MCs	48	28.3	48	28.3	0.055	10.2	LOS B	0.1	0.7
11	T1	All MCs	255	5.0	255	5.0	0.417	13.3	LOS B	0.9	6.4
Approach			303	8.7	303	8.7	0.417	12.8	LOS B	0.9	6.4
All Vehicles			1025	3.5	1025	3.5	0.417	5.9	NA	0.9	6.4

MOVEMENT SUMMARY

Site: 102 [Site2ExistingPM+Back (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m
North: Wairakei											
8	T1	All MCs	292	1.4	292	1.4	0.151	0.0	LOS A	0.0	0.0
Approach			292	1.4	292	1.4	0.151	0.0	NA	0.0	0.0
West: Median											
12	R2	All MCs	255	5.0	255	5.0	0.231	4.3	LOS A	0.3	2.4
Approach			255	5.0	255	5.0	0.231	4.3	LOS A	0.3	2.4
All Vehicles			546	3.1	546	3.1	0.231	2.0	NA	0.3	2.4

Background with Development

MOVEMENT SUMMARY

Site: 101 [Site1ExistingAM+Back+Dev (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Wairakei											
1	L2	All MCs	183	9.8	183	9.8	0.123	4.8	LOS A	0.5	4.1
2	T1	All MCs	156	3.4	156	3.4	0.082	0.0	LOS A	0.0	0.0
Approach			339	6.8	339	6.8	0.123	2.6	LOS A	0.5	4.1
North: Wairakei											
9	R2	All MCs	51	4.2	51	4.2	0.033	5.1	LOS A	0.1	1.1
Approach			51	4.2	51	4.2	0.033	5.1	NA	0.1	1.1
West: Pohipi Road											
10	L2	All MCs	85	3.7	85	3.7	0.071	8.2	LOS A	0.3	2.0
11	T1	All MCs	403	5.5	403	5.5	0.483	10.9	LOS B	3.3	24.1
Approach			488	5.2	488	5.2	0.483	10.5	LOS B	3.3	24.1
All Vehicles			878	5.8	878	5.8	0.483	7.1	NA	3.3	24.1

MOVEMENT SUMMARY

Site: 102 [Site2ExistingAM+Back+Dev (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
North: Wairakei											
8	T1	All MCs	282	4.5	282	4.5	0.149	0.0	LOS A	0.0	0.0
Approach			282	4.5	282	4.5	0.149	0.0	NA	0.0	0.0
West: Median											
12	R2	All MCs	403	5.5	403	5.5	0.366	4.6	LOS A	1.6	11.7
Approach			403	5.5	403	5.5	0.366	4.6	LOS A	1.6	11.7
All Vehicles			685	5.1	685	5.1	0.366	2.7	NA	1.6	11.7

MOVEMENT SUMMARY

Site: 101 [Site1ExistingPM+Back+Dev (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Wairakei											
1	L2	All MCs	357	1.2	357	1.2	0.239	4.9	LOS A	1.1	8.1
2	T1	All MCs	287	1.1	287	1.1	0.148	0.0	LOS A	0.0	0.0
Approach			644	1.1	644	1.1	0.239	2.7	LOS A	1.1	8.1
North: Wairakei											
9	R2	All MCs	100	2.1	100	2.1	0.074	5.6	LOS A	0.3	2.3
Approach			100	2.1	100	2.1	0.074	5.6	NA	0.3	2.3
West: Pohipi Road											
10	L2	All MCs	49	27.7	49	27.7	0.056	10.2	LOS B	0.2	1.8
11	T1	All MCs	266	4.7	266	4.7	0.441	13.6	LOS B	2.4	17.4
Approach			316	8.3	316	8.3	0.441	13.1	LOS B	2.4	17.4
All Vehicles			1060	3.4	1060	3.4	0.441	6.1	NA	2.4	17.4

MOVEMENT SUMMARY

▽ Site: 102 [Site2ExistingPM+Back+Dev (Site Folder: Pohipi Wairakei)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
North: Wairakei											
8	T1	All MCs	292	1.4	292	1.4	0.151	0.0	LOS A	0.0	0.0
Approach			292	1.4	292	1.4	0.151	0.0	NA	0.0	0.0
West: Median											
12	R2	All MCs	266	4.7	266	4.7	0.242	4.3	LOS A	0.9	6.4
Approach			266	4.7	266	4.7	0.242	4.3	LOS A	0.9	6.4
All Vehicles			558	3.0	558	3.0	0.242	2.1	NA	0.9	6.4

Norman Smith Street / Wairakei Drive

AM Peak

MOVEMENT SUMMARY

Site: 101 [ExistingAM WSP 2025#2 (Site Folder: Wairakei Norman Smith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	385	5.0	385	5.0	0.215	4.5	LOS A	0.0	0.0
2	T1	All MCs	296	5.0	296	5.0	0.448	21.8	LOS C	9.0	65.6
Approach			681	5.0	681	5.0	0.448	12.0	LOS B	9.0	65.6
North: Wairakei											
8	T1	All MCs	858	5.0	858	5.0	* 1.091	117.3	LOS F	52.2	381.1
Approach			858	5.0	858	5.0	1.091	117.3	LOS F	52.2	381.1
West: Norman Smith											
10	L2	All MCs	4	5.0	4	5.0	0.370	32.1	LOS C	7.3	53.3
12	R2	All MCs	1181	5.0	1181	5.0	* 1.136	146.3	LOS F	82.5	601.9
Approach			1185	5.0	1185	5.0	1.136	145.9	LOS F	82.5	601.9
All Vehicles			2724	5.0	2724	5.0	1.136	103.4	LOS F	82.5	601.9

PHASING SUMMARY

Site: 101 [ExistingAM WSP 2025#2 (Site Folder: Wairakei Norman Smith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

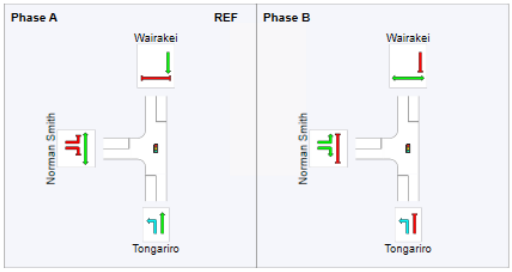
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Four-Phase Leading Right Turns
Input Phase Sequence: A, B
Output Phase Sequence: A, B
Reference Phase: Phase A

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	33
Green Time (sec)	28	42
Phase Time (sec)	33	47
Phase Split	41%	59%
Phase Frequency (%)	100.0	100.0

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

Output Phase Sequence



MOVEMENT SUMMARY

Site: 101 [ExistingAM WSP 2025#2 withDev (Site Folder: Wairakei NormanSmith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	385	5.0	385	5.0	0.215	4.5	LOS A	0.0	0.0
2	T1	All MCs	304	5.0	304	5.0	0.460	21.9	LOS C	9.3	67.8
Approach			689	5.0	689	5.0	0.460	12.2	LOS B	9.3	67.8
North: Wairakei											
8	T1	All MCs	882	5.0	882	5.0	*1.122	135.5	LOS F	58.3	425.4
Approach			882	5.0	882	5.0	1.122	135.5	LOS F	58.3	425.4
West: Norman Smith											
10	L2	All MCs	4	5.0	4	5.0	0.370	32.1	LOS C	7.3	53.3
12	R2	All MCs	1181	5.0	1181	5.0	*1.136	146.4	LOS F	82.5	601.9
Approach			1185	5.0	1185	5.0	1.136	146.0	LOS F	82.5	601.9
All Vehicles			2756	5.0	2756	5.0	1.136	109.2	LOS F	82.5	601.9

PHASING SUMMARY

Site: 101 [ExistingAM WSP 2025#2 withDev (Site Folder: Wairakei NormanSmith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

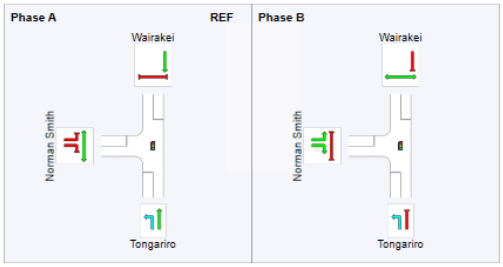
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Four-Phase Leading Right Turns
Input Phase Sequence: A, B
Output Phase Sequence: A, B
Reference Phase: Phase A

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	33
Green Time (sec)	28	42
Phase Time (sec)	33	47
Phase Split	41%	59%
Phase Frequency (%)	100.0	100.0

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

Output Phase Sequence



PM Peak

MOVEMENT SUMMARY

Site: 101 [ExistingPM WSP 2025#2 (Site Folder: Wairakei NormanSmith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	1185	5.0	1185	5.0	0.661	4.9	LOS A	0.0	0.0
2	T1	All MCs	794	5.0	794	5.0	*1.094	119.3	LOS F	51.5	375.9
Approach			1979	5.0	1979	5.0	1.094	51.7	LOS D	51.5	375.9
North: Wairakei											
8	T1	All MCs	434	5.0	434	5.0	0.366	7.4	LOS A	4.2	30.6
Approach			434	5.0	434	5.0	0.366	7.4	LOS A	4.2	30.6
West: Norman Smith											
10	L2	All MCs	1	5.0	1	5.0	0.328	21.9	LOS C	2.7	19.4
12	R2	All MCs	609	5.0	609	5.0	*1.009	56.5	LOS E	18.9	137.8
Approach			610	5.0	610	5.0	1.009	56.4	LOS E	18.9	137.8
All Vehicles			3023	5.0	3023	5.0	1.094	45.7	LOS D	51.5	375.9

PHASING SUMMARY

Site: 101 [ExistingPM WSP 2025#2 (Site Folder: Wairakei NormanSmith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

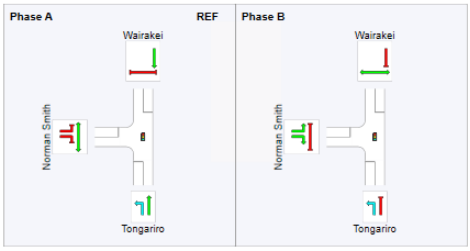
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Four-Phase Leading Right Turns
Input Phase Sequence: A, B
Output Phase Sequence: A, B
Reference Phase: Phase A

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	24
Green Time (sec)	19	11
Phase Time (sec)	24	16
Phase Split	60%	40%
Phase Frequency (%)	100.0	100.0

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

Output Phase Sequence



MOVEMENT SUMMARY

Site: 101 [ExistingPM WSP 2025#2 withDev (Site Folder: Wairakei Norman Smith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	1185	5.0	1185	5.0	0.661	4.9	LOS A	0.0	0.0
2	T1	All MCs	814	5.0	814	5.0	*1.091	117.0	LOS F	52.4	382.7
Approach			1999	5.0	1999	5.0	1.091	51.3	LOS D	52.4	382.7
North: Wairakei											
8	T1	All MCs	446	5.0	446	5.0	0.358	6.7	LOS A	4.1	30.0
Approach			446	5.0	446	5.0	0.358	6.7	LOS A	4.1	30.0
West: Norman Smith											
10	L2	All MCs	1	5.0	1	5.0	0.356	23.4	LOS C	2.7	19.8
12	R2	All MCs	609	5.0	609	5.0	*1.094	100.6	LOS F	28.1	204.8
Approach			610	5.0	610	5.0	1.094	100.5	LOS F	28.1	204.8
All Vehicles			3055	5.0	3055	5.0	1.094	54.1	LOS D	52.4	382.7

PHASING SUMMARY

Site: 101 [ExistingPM WSP 2025#2 withDev (Site Folder: Wairakei Norman Smith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

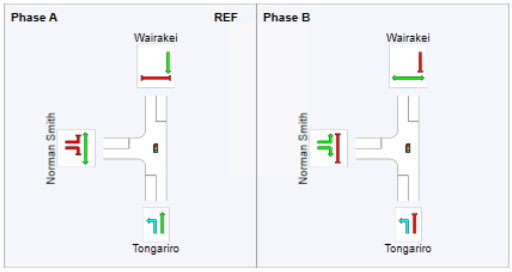
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Four-Phase Leading Right Turns
Input Phase Sequence: A, B
Output Phase Sequence: A, B
Reference Phase: Phase A

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	25
Green Time (sec)	20	10
Phase Time (sec)	25	15
Phase Split	63%	38%
Phase Frequency (%)	100.0	100.0

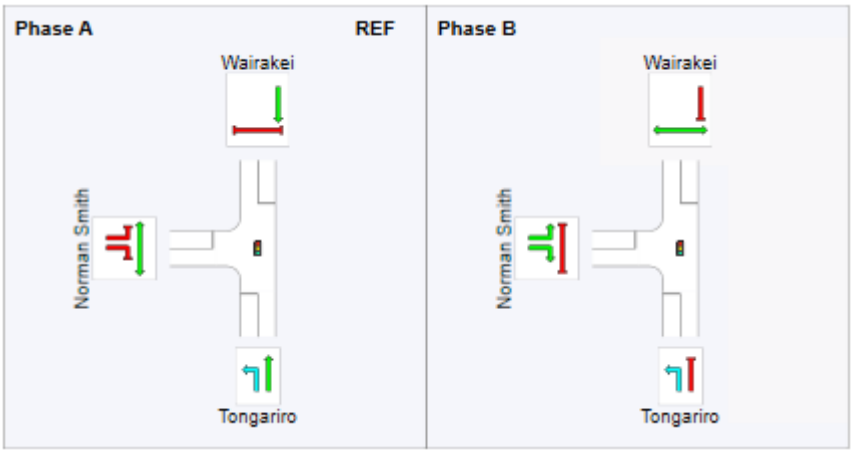
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence



Norman Smith Street / Wairakei Drive Sensitivity Testing

Phase sequence for the intersection used in all scenarios:



Morning Peak

No Dev:

Site: 101 [ExistingAM WSP 2025#2 (Site Folder: Wairakei Norman Smith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	385	5.0	385	5.0	0.215	4.5	LOS A	0.0	0.0
2	T1	All MCs	296	5.0	296	5.0	0.448	21.8	LOS C	9.0	65.6
Approach			681	5.0	681	5.0	0.448	12.0	LOS B	9.0	65.6
North: Wairakei											
8	T1	All MCs	858	5.0	858	5.0	*1.091	117.3	LOS F	52.2	381.1
Approach			858	5.0	858	5.0	1.091	117.3	LOS F	52.2	381.1
West: Norman Smith											
10	L2	All MCs	4	5.0	4	5.0	0.370	32.1	LOS C	7.3	53.3
12	R2	All MCs	1181	5.0	1181	5.0	*1.136	146.3	LOS F	82.5	601.9
Approach			1185	5.0	1185	5.0	1.136	145.9	LOS F	82.5	601.9
All Vehicles			2724	5.0	2724	5.0	1.136	103.4	LOS F	82.5	601.9

Phase	A	B
Phase Change Time (sec)	0	33
Green Time (sec)	28	42
Phase Time (sec)	33	47
Phase Split	41%	59%
Phase Frequency (%)	100.0	100.0

With Dev – Optimal Phasing

Site: 101 [ExistingAM WSP 2025#2 withDev (Site Folder: Wairakei NormanSmith)]
Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	385	5.0	385	5.0	0.215	4.5	LOS A	0.0	0.0
2	T1	All MCs	304	5.0	304	5.0	0.460	21.9	LOS C	9.3	67.8
Approach			689	5.0	689	5.0	0.460	12.2	LOS B	9.3	67.8
North: Wairakei											
8	T1	All MCs	882	5.0	882	5.0	*1.122	135.5	LOS F	58.3	425.4
Approach			882	5.0	882	5.0	1.122	135.5	LOS F	58.3	425.4
West: Norman Smith											
10	L2	All MCs	4	5.0	4	5.0	0.370	32.1	LOS C	7.3	53.3
12	R2	All MCs	1181	5.0	1181	5.0	*1.136	146.4	LOS F	82.5	601.9
Approach			1185	5.0	1185	5.0	1.136	146.0	LOS F	82.5	601.9
All Vehicles			2756	5.0	2756	5.0	1.136	109.2	LOS F	82.5	601.9

Phase	A	B
Phase Change Time (sec)	0	33
Green Time (sec)	28	42
Phase Time (sec)	33	47
Phase Split	41%	59%
Phase Frequency (%)	100.0	100.0

With Dev – 1s increase to North, 1s decrease to West

Site: 101 [ExistingAM WSP 2025#2 withDev PhaseTimeTest (Site Folder: Wairakei NormanSmith)]
Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	385	5.0	385	5.0	0.215	4.5	LOS A	0.0	0.0
2	T1	All MCs	304	5.0	304	5.0	0.444	21.0	LOS C	9.1	66.4
Approach			689	5.0	689	5.0	0.444	11.8	LOS B	9.1	66.4
North: Wairakei											
8	T1	All MCs	882	5.0	882	5.0	*1.088	115.1	LOS F	53.2	388.2
Approach			882	5.0	882	5.0	1.088	115.1	LOS F	53.2	388.2
West: Norman Smith											
10	L2	All MCs	4	5.0	4	5.0	0.378	33.3	LOS C	7.4	54.3
12	R2	All MCs	1181	5.0	1181	5.0	*1.161	162.2	LOS F	87.4	638.0
Approach			1185	5.0	1185	5.0	1.161	161.8	LOS F	87.4	638.0
All Vehicles			2756	5.0	2756	5.0	1.161	109.4	LOS F	87.4	638.0

Phase	A	B
Phase Change Time (sec)	0	34
Green Time (sec)	29	41
Phase Time (sec)	34	46
Phase Split	43%	58%
Phase Frequency (%)	100.0	100.0

Results above show that a slight change to % of phase time does not have significant bearing on overall average delay however there is a reasonable change to delay for the individual movements. In reality there is likely to be some balancing between the above phase times to balance the approaches.

Testing was undertaken to increase the overall cycle time by 10s while keeping proportion of phases broadly the same. Results below show that the increase in overall time makes the overall delay notably worse. This suggests that the 80s cycle time calculated by SIDRA is about right.

With Dev – 90s cycle time

Site: 101 [ExistingAM WSP 2025#2 withDev PhaseTimeTest (Site Folder: Wairakei NormanSmith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	385	5.0	385	5.0	0.215	4.5	LOS A	0.0	0.0
2	T1	All MCs	304	5.0	304	5.0	0.453	24.1	LOS C	10.3	75.2
Approach			689	5.0	689	5.0	0.453	13.1	LOS B	10.3	75.2
North: Wairakei											
8	T1	All MCs	882	5.0	882	5.0	*1.123	141.0	LOS F	61.2	446.5
Approach			882	5.0	882	5.0	1.123	141.0	LOS F	61.2	446.5
West: Norman Smith											
10	L2	All MCs	4	5.0	4	5.0	0.412	36.2	LOS D	6.2	45.4
12	R2	All MCs	1181	5.0	1181	5.0	*1.266	250.2	LOS F	122.5	894.3
Approach			1185	5.0	1185	5.0	1.266	249.5	LOS F	122.5	894.3
All Vehicles			2756	5.0	2756	5.0	1.266	155.7	LOS F	122.5	894.3

Phase	A	B
Phase Change Time (sec)	0	37
Green Time (sec)	32	48
Phase Time (sec)	37	53
Phase Split	41%	59%
Phase Frequency (%)	100.0	100.0

Evening Peak

No Dev:

Site: 101 [ExistingPM WSP 2025#2 (Site Folder: Wairakei NormanSmith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	1185	5.0	1185	5.0	0.661	4.9	LOS A	0.0	0.0
2	T1	All MCs	794	5.0	794	5.0	*1.094	119.3	LOS F	51.5	375.9
Approach			1979	5.0	1979	5.0	1.094	51.7	LOS D	51.5	375.9
North: Wairakei											
8	T1	All MCs	434	5.0	434	5.0	0.366	7.4	LOS A	4.2	30.6
Approach			434	5.0	434	5.0	0.366	7.4	LOS A	4.2	30.6
West: Norman Smith											
10	L2	All MCs	1	5.0	1	5.0	0.328	21.9	LOS C	2.7	19.4
12	R2	All MCs	609	5.0	609	5.0	*1.009	56.5	LOS E	18.9	137.8
Approach			610	5.0	610	5.0	1.009	56.4	LOS E	18.9	137.8
All Vehicles			3023	5.0	3023	5.0	1.094	45.7	LOS D	51.5	375.9

Phase	A	B
Phase Change Time (sec)	0	24
Green Time (sec)	19	11
Phase Time (sec)	24	16
Phase Split	60%	40%
Phase Frequency (%)	100.0	100.0

With Dev – Optimal Phasing

Site: 101 [ExistingPM WSP 2025#2 withDev (Site Folder: Wairakei Norman Smith)]
Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	1185	5.0	1185	5.0	0.661	4.9	LOS A	0.0	0.0
2	T1	All MCs	814	5.0	814	5.0	*1.091	117.0	LOS F	52.4	382.7
Approach			1999	5.0	1999	5.0	1.091	51.3	LOS D	52.4	382.7
North: Wairakei											
8	T1	All MCs	446	5.0	446	5.0	0.358	6.7	LOS A	4.1	30.0
Approach			446	5.0	446	5.0	0.358	6.7	LOS A	4.1	30.0
West: Norman Smith											
10	L2	All MCs	1	5.0	1	5.0	0.356	23.4	LOS C	2.7	19.8
12	R2	All MCs	609	5.0	609	5.0	*1.094	100.6	LOS F	28.1	204.8
Approach			610	5.0	610	5.0	1.094	100.5	LOS F	28.1	204.8
All Vehicles			3055	5.0	3055	5.0	1.094	54.1	LOS D	52.4	382.7

Phase	A	B
Phase Change Time (sec)	0	25
Green Time (sec)	20	10
Phase Time (sec)	25	15
Phase Split	63%	38%
Phase Frequency (%)	100.0	100.0

With Dev – 1s decrease to north, 1s increase to west

Site: 101 [ExistingPM WSP 2025#2 withDev PhaseTimeTest (Site Folder: Wairakei Norman Smith)]
Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	1185	5.0	1185	5.0	0.661	4.9	LOS A	0.0	0.0
2	T1	All MCs	814	5.0	814	5.0	*1.119	139.4	LOS F	58.0	423.1
Approach			1999	5.0	1999	5.0	1.119	60.8	LOS E	58.0	423.1
North: Wairakei											
8	T1	All MCs	446	5.0	446	5.0	0.376	7.4	LOS A	4.3	31.6
Approach			446	5.0	446	5.0	0.376	7.4	LOS A	4.3	31.6
West: Norman Smith											
10	L2	All MCs	1	5.0	1	5.0	0.300	20.3	LOS C	2.5	18.5
12	R2	All MCs	609	5.0	609	5.0	*0.921	33.7	LOS C	12.9	94.2
Approach			610	5.0	610	5.0	0.921	33.6	LOS C	12.9	94.2
All Vehicles			3055	5.0	3055	5.0	1.119	46.8	LOS D	58.0	423.1

Phase	A	B
Phase Change Time (sec)	0	23
Green Time (sec)	19	12
Phase Time (sec)	24	16
Phase Split	60%	40%
Phase Frequency (%)	100.0	80.0[2]

The slight adjustment to phase times has improved the overall delays. Individual delays are also quite sensitive. Testing was also undertaken with a 2s increase/decrease however this was not quite as optimal as the 1s increase/decrease above.

Also ran a test with an increase in cycle team which has increased delays throughout:

With Dev – 50s Cycle Time

Site: 101 [ExistingPM WSP 2025#2 withDev PhaseTimeTest (Site Folder: Wairakei NormanSmith)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
1	L2	All MCs	1185	5.0	1185	5.0	0.661	4.9	LOS A	0.0	0.0
2	T1	All MCs	814	5.0	814	5.0	* 1.186	200.9	LOS F	76.2	556.0
Approach			1999	5.0	1999	5.0	1.186	86.7	LOS F	76.2	556.0
North: Wairakei											
8	T1	All MCs	446	5.0	446	5.0	0.344	7.6	LOS A	4.9	35.6
Approach			446	5.0	446	5.0	0.344	7.6	LOS A	4.9	35.6
West: Norman Smith											
10	L2	All MCs	1	5.0	1	5.0	0.333	28.1	LOS C	3.4	24.6
12	R2	All MCs	609	5.0	609	5.0	* 1.025	71.2	LOS E	22.9	166.8
Approach			610	5.0	610	5.0	1.025	71.1	LOS E	22.9	166.8
All Vehicles			3055	5.0	3055	5.0	1.186	70.7	LOS E	76.2	556.0

Phase	A	B
Phase Change Time (sec)	0	31
Green Time (sec)	26	14
Phase Time (sec)	31	19
Phase Split	62%	38%
Phase Frequency (%)	100.0	95.0[2]

Tongariro Stret / Spa Road

AM Peak

MOVEMENT SUMMARY

Site: 102 [AM WSP 2025#2 50%Adjust (Site Folder: Tongariro Spa)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
2	T1	All MCs	195	5.0	195	5.0	0.300	6.5	LOS A	2.1	15.3
3	R2	All MCs	94	5.0	94	5.0	0.300	9.4	LOS A	2.1	15.3
Approach			288	5.0	288	5.0	0.300	7.4	LOS A	2.1	15.3
East: Spa											
4	L2	All MCs	65	5.0	65	5.0	0.313	14.4	LOS B	2.5	18.4
6	R2	All MCs	574	5.0	574	5.0	1.090	129.6	LOS F	47.9	350.0
Approach			639	5.0	639	5.0	1.090	117.8	LOS F	47.9	350.0
North: Tongariro											
7	L2	All MCs	1132	5.0	1132	5.0	0.775	5.7	LOS A	11.8	86.3
8	T1	All MCs	995	5.0	995	5.0	0.772	5.1	LOS A	11.5	84.0
Approach			2126	5.0	2126	5.0	0.775	5.4	LOS A	11.8	86.3
All Vehicles			3054	5.0	3054	5.0	1.090	29.1	LOS C	47.9	350.0

MOVEMENT SUMMARY

Site: 102 [AM WSP 2025#2 50%Adjust withDev (Site Folder: Tongariro Spa)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
2	T1	All MCs	197	5.0	197	5.0	0.297	6.4	LOS A	2.1	15.1
3	R2	All MCs	94	5.0	94	5.0	0.297	9.3	LOS A	2.1	15.1
Approach			291	5.0	291	5.0	0.297	7.3	LOS A	2.1	15.1
East: Spa											
4	L2	All MCs	65	5.0	65	5.0	0.325	14.6	LOS B	2.6	19.1
6	R2	All MCs	580	5.0	580	5.0	1.133	155.9	LOS F	56.3	411.1
Approach			645	5.0	645	5.0	1.133	141.6	LOS F	56.3	411.1
North: Tongariro											
7	L2	All MCs	1147	5.0	1147	5.0	0.785	5.8	LOS A	12.3	90.0
8	T1	All MCs	1004	5.0	1004	5.0	0.779	5.2	LOS A	11.8	86.3
Approach			2152	5.0	2152	5.0	0.785	5.5	LOS A	12.3	90.0
All Vehicles			3087	5.0	3087	5.0	1.133	34.1	LOS C	56.3	411.1

PM Peak

MOVEMENT SUMMARY

Site: 102 [PM WSP 2025#2 50%Adjust (Site Folder: Tongariro Spa)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
2	T1	All MCs	482	5.0	482	5.0	1.552	524.4	LOS F	122.4	893.4
3	R2	All MCs	31	5.0	31	5.0	1.552	525.2	LOS F	122.4	893.4
Approach			513	5.0	513	5.0	1.552	524.5	LOS F	122.4	893.4
East: Spa											
4	L2	All MCs	34	5.0	34	5.0	0.356	8.1	LOS A	2.6	18.7
6	R2	All MCs	1627	5.0	1627	5.0	1.243	192.6	LOS F	176.9	1291.0
Approach			1661	5.0	1661	5.0	1.243	188.9	LOS F	176.9	1291.0
North: Tongariro											
7	L2	All MCs	545	5.0	545	5.0	0.335	4.7	LOS A	2.9	21.1
8	T1	All MCs	541	5.0	541	5.0	0.374	3.9	LOS A	3.3	24.1
Approach			1086	5.0	1086	5.0	0.374	4.3	LOS A	3.3	24.1
All Vehicles			3260	5.0	3260	5.0	1.552	180.1	LOS F	176.9	1291.0

MOVEMENT SUMMARY

Site: 102 [PM WSP 2025#2 50%Adjust withDev (Site Folder: Tongariro Spa)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m
South: Tongariro											
2	T1	All MCs	487	5.0	487	5.0	1.563	533.8	LOS F	124.9	912.1
3	R2	All MCs	31	5.0	31	5.0	1.563	534.6	LOS F	124.9	912.1
Approach			518	5.0	518	5.0	1.563	533.9	LOS F	124.9	912.1
East: Spa											
4	L2	All MCs	34	5.0	34	5.0	0.361	8.1	LOS A	2.6	19.0
6	R2	All MCs	1643	5.0	1643	5.0	1.260	204.8	LOS F	186.9	1364.0
Approach			1677	5.0	1677	5.0	1.260	200.8	LOS F	186.9	1364.0
North: Tongariro											
7	L2	All MCs	553	5.0	553	5.0	0.340	4.7	LOS A	2.9	21.5
8	T1	All MCs	545	5.0	545	5.0	0.377	3.9	LOS A	3.3	24.4
Approach			1098	5.0	1098	5.0	0.377	4.3	LOS A	3.3	24.4
All Vehicles			3293	5.0	3293	5.0	1.563	187.7	LOS F	186.9	1364.0

Appendix B – Norman Smith St / Wairakei Dr Signal Timings

Mon 11 Nov 2024.

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

Data item	Frequency	Minimum
A phase	54	19
B phase	55	14
Nominal cycle length	21	49
Active cycle length	21	49
Actual cycle	54	33
Split plan 2	2	420
Split plan 3	1	280
Signal group 1	54	14
Signal group 2	54	14
Signal group 3	55	9
Signal group 4	55	9
Signal group 5	12	4
Signal group 7	12	4
Signal group 8	4	10
XSF 1	55	3

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	57	27
B phase	58	11
Nominal cycle length	42	47
Active cycle length	42	47
Actual cycle	57	45
Split plan 1	4	53
Split plan 2	1	140
Split plan 3	8	48
Split plan 4	11	53
Signal group 1	57	22
Signal group 2	57	22
Signal group 3	58	6
Signal group 4	58	6
Signal group 5	10	3
Signal group 7	10	4
Signal group 8	6	6
XSF 1	57	13

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	68	21
B phase	68	11
Nominal cycle length	61	45
Active cycle length	61	45
Actual cycle	67	38
Split plan 1	7	45
Split plan 3	5	45
Split plan 4	12	47
Signal group 1	68	17
Signal group 2	68	17
Signal group 3	68	6
Signal group 4	68	6
Signal group 5	7	4
Signal group 7	7	4
Signal group 8	8	13
XSF 1	69	9

Tues.

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

Data item	Frequency	Minimum
A phase	51	25
B phase	52	25
Nominal cycle length	5	47
Active cycle length	5	47
Actual cycle	51	50
Split plan 2	2	140
Split plan 3	3	140
Split plan 4	1	69
Signal group 1	51	19
Signal group 2	51	19
Signal group 3	52	20
Signal group 4	52	6
Signal group 5	14	4
Signal group 7	14	4
Signal group 8	6	5
XSF 1	51	8

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	65	22
B phase	66	11
Nominal cycle length	58	45
Active cycle length	58	45
Actual cycle	65	37
Split plan 1	2	47
Split plan 2	5	55
Split plan 3	6	61
Split plan 4	4	46
Signal group 1	65	16
Signal group 2	65	16
Signal group 3	66	6
Signal group 4	66	6
Signal group 5	8	4
Signal group 7	8	4
Signal group 8	5	5
XSF 1	65	6

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	68	25
B phase	69	11
Nominal cycle length	57	45
Active cycle length	57	45
Actual cycle	68	39
Split plan 1	9	47
Split plan 3	1	45
Split plan 4	10	45
Signal group 1	68	20
Signal group 2	68	20
Signal group 3	69	6
Signal group 4	69	6
Signal group 5	8	3
Signal group 7	8	4
Signal group 8	3	12
XSF 1	69	11

Wed.

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

Data item	Frequency	Minimum
A phase	51	27
B phase	52	26
Nominal cycle length	5	56
Active cycle length	5	56
Actual cycle	51	53
Split plan 2	3	210
Split plan 3	3	70
Signal group 1	52	22
Signal group 2	52	22
Signal group 3	52	21
Signal group 4	52	12
Signal group 5	13	4
Signal group 7	13	4
Signal group 8	6	10
XSF 1	52	11

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	59	26
B phase	59	11
Nominal cycle length	37	46
Active cycle length	37	46
Actual cycle	59	41
Split plan 2	1	185
Split plan 3	6	50
Split plan 4	5	48
Signal group 1	59	21
Signal group 2	59	21
Signal group 3	59	6
Signal group 4	59	6
Signal group 5	9	4
Signal group 7	9	4
Signal group 8	3	9
XSF 1	59	10

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	63	19
B phase	64	11
Nominal cycle length	60	45
Active cycle length	60	45
Actual cycle	63	37
Split plan 1	6	45
Split plan 3	4	58
Split plan 4	9	47
Signal group 1	63	14
Signal group 2	63	14
Signal group 3	64	6
Signal group 4	64	6
Signal group 5	8	4
Signal group 7	8	4
Signal group 8	7	8
XSF 1	63	11

Thurs.

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

Data item	Frequency	Minimum
A phase	52	20
B phase	52	20
Nominal cycle length	11	49
Active cycle length	11	49
Actual cycle	51	42
Split plan 2	2	490
Split plan 3	1	140
Signal group 1	52	15
Signal group 2	52	15
Signal group 3	52	15
Signal group 4	52	9
Signal group 5	7	4
Signal group 7	7	4
Signal group 8	6	20
XSF 1	52	13

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	56	24
B phase	56	12
Nominal cycle length	49	49
Active cycle length	49	49
Actual cycle	56	37
Split plan 1	1	123
Split plan 2	2	68
Split plan 3	6	50
Split plan 4	6	100
Signal group 1	57	19
Signal group 2	57	19
Signal group 3	56	7
Signal group 4	56	6
Signal group 5	10	3
Signal group 7	10	4
Signal group 8	4	15
XSF 1	57	13

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	66	22
B phase	66	11
Nominal cycle length	57	45
Active cycle length	57	45
Actual cycle	65	34
Split plan 1	7	45
Split plan 3	4	47
Split plan 4	10	49
Signal group 1	66	17
Signal group 2	66	17
Signal group 3	66	6
Signal group 4	66	6
Signal group 5	7	4
Signal group 7	7	4
Signal group 8	3	7
XSF 1	68	12

Fri.

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

Data item	Frequency	Minimum
A phase	54	21
B phase	53	16
Nominal cycle length	20	48
Active cycle length	20	48
Actual cycle	53	43
Signal group 1	54	16
Signal group 2	54	16
Signal group 3	53	11
Signal group 4	53	7
Signal group 5	9	4
Signal group 7	9	4
Signal group 8	1	26
XSF 1	54	5

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	54	30
B phase	53	13
Nominal cycle length	32	50
Active cycle length	32	50
Actual cycle	53	43
Split plan 1	3	68
Split plan 2	1	70
Split plan 3	4	70
Split plan 4	5	69
Signal group 1	54	26
Signal group 2	54	26
Signal group 3	53	8
Signal group 4	53	6
Signal group 5	3	4
Signal group 7	3	4
Signal group 8	4	6
XSF 1	54	14

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	70	18
B phase	71	10
Nominal cycle length	24	45
Active cycle length	23	45
Actual cycle	70	34
Split plan 1	9	45
Split plan 3	2	135
Split plan 4	11	45
Signal group 1	70	13
Signal group 2	70	13
Signal group 3	71	5
Signal group 4	71	5
Signal group 5	2	4
Signal group 7	2	4
XSF 1	70	11

SAT.

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

Data item	Frequency	Minimum
A phase	84	13
B phase	84	11
Nominal cycle length	6	45
Active cycle length	6	45
Actual cycle	83	25
Split plan 2	8	45
Split plan 3	11	45
Split plan 4	4	45
Signal group 1	84	8
Signal group 2	84	8
Signal group 3	85	6
Signal group 4	85	6
Signal group 5	3	3
Signal group 7	3	4
Signal group 8	4	12
XSF 1	85	6

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	70	16
B phase	70	11
Nominal cycle length	50	45
Active cycle length	50	45
Actual cycle	69	34
Split plan 1	2	45
Split plan 3	8	51
Split plan 4	10	52
Signal group 1	70	11
Signal group 2	70	11
Signal group 3	70	6
Signal group 4	70	6
Signal group 5	6	4
Signal group 7	6	4
Signal group 8	3	10
XSF 1	71	8

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	79	17
B phase	79	11
Nominal cycle length	30	45
Active cycle length	30	45
Actual cycle	79	28
Split plan 1	2	45
Split plan 2	2	50
Split plan 3	11	45
Split plan 4	11	45
Signal group 1	80	12
Signal group 2	80	12
Signal group 3	79	6
Signal group 4	79	6
Signal group 5	6	4
Signal group 7	6	4
Signal group 8	1	25
XSF 1	80	9

Wed 27th Dec 2023

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

Data item	Frequency	Minimum
A phase	90	11
B phase	89	11
Nominal cycle length	8	45
Active cycle length	8	45
Actual cycle	89	23
Split plan 3	1	45
Signal group 1	90	6
Signal group 2	90	6
Signal group 3	89	6
Signal group 4	89	6
Signal group 5	3	4
Signal group 7	3	4
Signal group 8	5	11
XSF 1	90	2

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	58	17
B phase	59	14
Nominal cycle length	39	45
Active cycle length	39	45
Actual cycle	58	39
Split plan 1	2	68
Split plan 2	1	63
Split plan 3	2	207
Split plan 4	3	191
Signal group 1	58	12
Signal group 2	58	12
Signal group 3	59	9
Signal group 4	59	6
Signal group 5	3	4
Signal group 7	3	4
Signal group 8	3	26
XSF 1	58	11

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	75	13
B phase	75	11
Nominal cycle length	51	45
Active cycle length	51	45
Actual cycle	74	32
Split plan 2	4	45
Split plan 3	7	91
Split plan 4	4	49
Signal group 1	75	8
Signal group 2	75	8
Signal group 3	76	6
Signal group 4	76	6
Signal group 5	6	4
Signal group 7	6	4
Signal group 8	4	15
XSF 1	75	6

Thursday

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

Data item	Frequency	Minimum
A phase	91	11
B phase	91	11
Nominal cycle length	10	45
Active cycle length	10	45
Actual cycle	91	25
Split plan 2	3	45
Split plan 3	4	45
Signal group 1	91	6
Signal group 2	91	6
Signal group 3	91	6
Signal group 4	91	6
Signal group 5	8	4
Signal group 7	8	4
Signal group 8	2	11
XSF 1	92	3

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	61	19
B phase	60	12
Nominal cycle length	43	45
Active cycle length	43	45
Actual cycle	60	38
Split plan 1	1	68
Split plan 3	7	59
Split plan 4	9	54
Signal group 1	61	14
Signal group 2	61	14
Signal group 3	60	7
Signal group 4	61	6
Signal group 5	1	4
Signal group 7	1	4
Signal group 8	6	7
XSF 1	61	8

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	72	16
B phase	73	11
Nominal cycle length	55	45
Active cycle length	55	45
Actual cycle	72	33
Split plan 2	3	90
Split plan 3	10	45
Split plan 4	8	45
Signal group 1	72	11
Signal group 2	72	11
Signal group 3	73	6
Signal group 4	73	6
Signal group 5	6	4
Signal group 7	6	4
Signal group 8	5	8
XSF 1	72	6

Friday

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

Data item	Frequency	Minimum
A phase	93	12
B phase	93	10
Nominal cycle length	2	45
Active cycle length	2	45
Actual cycle	93	23
Signal group 1	93	7
Signal group 2	93	7
Signal group 3	93	5
Signal group 4	93	5
Signal group 5	3	4
Signal group 7	3	4
XSF 1	93	2

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	71	20
B phase	71	11
Nominal cycle length	53	45
Active cycle length	53	45
Actual cycle	70	39
Split plan 2	1	45
Split plan 3	10	47
Split plan 4	9	47
Signal group 1	71	15
Signal group 2	71	15
Signal group 3	71	6
Signal group 4	71	6
Signal group 5	2	4
Signal group 7	2	4
Signal group 8	1	26
XSF 1	72	7

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	77	17
B phase	78	10
Nominal cycle length	31	45
Active cycle length	31	45
Actual cycle	77	31
Split plan 2	3	45
Split plan 3	9	45
Split plan 4	5	45
Signal group 1	77	12
Signal group 2	77	12
Signal group 3	78	5
Signal group 4	78	5
Signal group 5	1	4
Signal group 7	1	4
Signal group 8	2	15
XSF 1	78	6

Sat

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

Data item	Frequency	Minimum
A phase	92	11
B phase	92	11
Nominal cycle length	2	45
Active cycle length	2	45
Actual cycle	92	23
Split plan 4	1	0
Signal group 1	92	6
Signal group 2	92	6
Signal group 3	92	6
Signal group 4	92	6
Signal group 5	4	4
Signal group 7	4	4
Signal group 8	2	10
XSF 1	93	2

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	65	25
B phase	65	11
Nominal cycle length	60	45
Active cycle length	60	45
Actual cycle	65	39
Split plan 2	1	164
Split plan 3	6	55
Split plan 4	6	0
Signal group 1	65	19
Signal group 2	65	19
Signal group 3	65	6
Signal group 4	66	6
Signal group 5	5	4
Signal group 7	5	4
Signal group 8	5	19
XSF 1	65	8

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	75	16
B phase	75	11
Nominal cycle length	56	45
Active cycle length	56	45
Actual cycle	74	35
Split plan 2	1	47
Split plan 3	5	227
Split plan 4	5	0
Signal group 1	75	11
Signal group 2	75	11
Signal group 3	74	6
Signal group 4	74	6
Signal group 5	2	4
Signal group 7	2	4
Signal group 8	3	11
XSF 1	75	7

Mon 1 Jan 2024

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

Data item	Frequency	Minimum
A phase	90	11
B phase	91	11
Actual cycle	90	23
Split plan 2	1	45
Split plan 3	2	90
Signal group 1	90	6
Signal group 2	90	6
Signal group 3	91	6
Signal group 4	91	6
XSF 1	97	3

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	56	30
B phase	57	11
Nominal cycle length	38	49
Active cycle length	38	49
Actual cycle	56	47
Split plan 3	6	49
Split plan 4	7	57
Signal group 1	56	25
Signal group 2	56	25
Signal group 3	57	6
Signal group 4	57	6
Signal group 5	10	4
Signal group 7	10	4
Signal group 8	4	21
XSF 1	56	14

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	73	17
B phase	74	11
Nominal cycle length	45	45
Active cycle length	45	45
Actual cycle	73	34
Split plan 1	1	54
Split plan 2	3	45
Split plan 3	7	45
Split plan 4	5	45
Signal group 1	73	11
Signal group 2	73	11
Signal group 3	74	6
Signal group 4	74	6
Signal group 8	1	19
XSF 1	74	7

Tues

Statistics for site 6004, between 7:45:00 AM and 8:45:00 AM

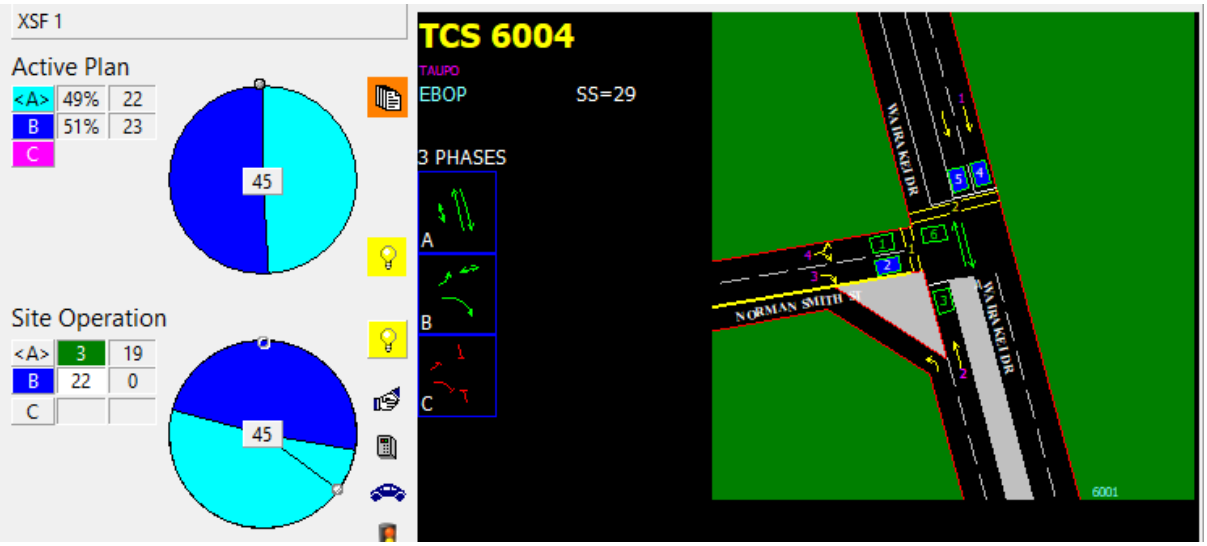
Data item	Frequency	Minimum
A phase	93	11
B phase	93	10
Actual cycle	92	23
Signal group 1	93	6
Signal group 2	93	6
Signal group 3	93	5
Signal group 4	93	5
Signal group 5	2	3
Signal group 7	2	4
Signal group 8	4	13
XSF 1	94	3

Statistics for site 6004, between 2:30:00 PM and 3:30:00 PM

Data item	Frequency	Minimum
A phase	61	23
B phase	62	11
Nominal cycle length	50	45
Active cycle length	50	45
Actual cycle	61	41
Split plan 1	1	49
Split plan 3	6	54
Split plan 4	7	112
Signal group 1	62	18
Signal group 2	62	18
Signal group 3	62	6
Signal group 4	62	6
Signal group 5	4	4
Signal group 7	4	4
Signal group 8	5	15
XSF 1	62	10

Statistics for site 6004, between 4:30:00 PM and 5:30:00 PM

Data item	Frequency	Minimum
A phase	71	19
B phase	70	11
Nominal cycle length	60	45
Active cycle length	60	45
Actual cycle	70	34
Split plan 1	1	45
Split plan 2	1	90
Split plan 3	6	49
Split plan 4	6	57
Signal group 1	71	14
Signal group 2	71	14
Signal group 3	70	6
Signal group 4	70	6
Signal group 5	7	4
Signal group 7	7	4
Signal group 8	5	26
XSF 1	71	6



Signal Group 8 Ped Movement 1 operates in A Phase
Signal Group 7 Ped Movement 2 operates in B Phase

Appendix C – Commuter Waka Distribution for Mapara

Site zone = Mapara

1158	**Total Departures**
711	Destinations via Control Gates Bridge
61.4%	
99	Wairakei-Broadlands
111	Tauhara
12	Nukuhau-Rangatira Park
222	Taupo Central West
99	Taupo Central East
42	Mountview
18	Bird Area
99	Hilltop (Taupo District)
9	Richmond Heights
33	Destinations via North East
2.8%	
24	Ohakuri
9	Tokoroa Central
48	Destinations to Taupo West
4.1%	
9	Acacia Bay
39	Brentwood (Taupo District)
21	Destinations to West of Kinloch
1.8%	
21	Marotiri
345	Internal Departures
29.8%	internal trips