TRAFFIC PLANNING CONSULTANTS LTD

Ref: 21803

4th October 2023

VACO INVESTMENTS (WAIPU PROJECT) LIMITED
RESOURCE CONSENT APPLICATION REFERENCE: SL2300006 AT MILLBROOK ROAD, WAIPU
S92(1) TRANSPORT RESPONSE

In item 2 of their Section 92(1) request regarding Resource Consent Application Reference: SL2300006 at Millbrook Road, Waipu, the Whangarei District Council advised:

"A review of the traffic assessment has been undertaken by Northland Transportation Alliance (Whangarei DC Roading and Waka Kotahi NZTA). That review undertaken by Matt Collins at AECOM Ltd is attached. The twelve (12) comments identified in that review require consideration and response from the applicant's traffic engineer."

Each of the twelve comments, and our response, is set out below.

1. There are discrepancies in the land use activities assumed in the AEE, the ITA, and the Architectural drawings. We recommend that the Applicant clarify the area of land use activities that are proposed.

The proposed land use activities have been refined as the proposal has been developed. In this memorandum we have revisited the traffic modelling using the most up to date activity levels, labelled "Option 1" and "Option 2".

2. The ITA uses peak hour trip generation rates that may not be reflective of the proposed land uses. We recommend that the ITA provides references/evidence to support the trip rates used. This should include any amendments to activity areas, as discussed in Comment 1.

The reviewer takes issue with the peak hour trip rate of 5.6 vehicle movements per 100m2 GFA used for the retail and café activities in buildings 12,13, 19-20A, and 23 to 29. This rate corresponds to the 85th percentile trip generation rate for bulk retail given in Table C.1 of Waka Kotahi Research Report 453 and to the Friday peak hour traffic generation of specialty shops in shopping centres given in Section 3.6.1 of the RTA NSW Guide to Traffic Generating Developments.

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We can see no basis for suggesting that this trip rate is not entirely appropriate for buildings 25, 28, 29 and 30, which comprise farming/agricultural supplies, rural/home supplies, warehousing, and marine/vehicle sales/service.

To satisfy the reviewer we have, however, revisited the traffic analysis with revised trip rates for the other buildings types listed as follows:

Buildings 12 and 23 (food outlet/café) – While the RTA NSW Guide to Traffic Generating Developments indicates the traffic generation rate for restaurants is 5 vehicle movements per 100m2, which is slightly less than the rate used in our ITA, in this response we will use 0.5 vehicle movements per seat, as suggested by the reviewer. As no café seating estimates are available, the numbers of seats are estimated by assuming 50% of the GFA of cafés would be set aside for diner seating, and that (based on RTA surveys) the mean eating gross floor area per seat is 1.5m2. This translates to a trip rate of 16.7 vehicle movements per 100m2 GFA.

Buildings 13 and 24 (retail tenancies) and building 19-20A (food stores) – the reviewer has suggested "a mix of 15.3 trips/100m2 and 18.9 trips/100m2 which is the surveyed rate for Discount Retail and Shopping Centre (small) respectively in NZTARR453". We have adopted the average rate, 17.1 vehicle movements per 100m2 GFA, which corresponds to the 85th percentile trip generation rate of medium sized shopping centres in Waka Kotahi Research Report 453.

Buildings 1 to 9 (service station) – the service station comprises 20 filling bays and four EV charging stations. The Waka Kotahi "National Guidance for Public Electric Vehicle Charging Infrastructure" indicates that a rapid charge facility will take 30 minutes to charge an EV for 100km of travel. On this basis, the vehicle turnover for the EV charging stations will be negligible. Furthermore, given the waiting time involved, motorists can reasonably be expected to use other service centre facilities while their vehicle is charging, and thus trips to EV charging stations will be linked trips. Thus, the proposed location of the EV charging stations is next to retail and food activities and not in the service station. On this basis, no additional peak hour trip generation is associated with the three EV charging stations in our analysis.

We have estimated the peak hour trip generation for the most up to date activity levels, labelled "Option 1" and "Option 2", and the revised trip rates as above.

The trip generation rates and peak hour vehicle movements are tabulated overleaf.

								New Option 1		New Option 2	
Building	Activity	GFA total (m2)	Seats*	Bays	Trip generation rate	Trip rate Unit	Estimated peak hour vehicle movements	GFA total (m2)	Estimated peak hour vehicle movements	GFA total (m2)	Estimated peak hour vehicle movements
1 to 9	Service Station	N/A	N/A	20	20.4	/bay	408	20 bays	408	20 bays	408
10, 11	Fast Food Outlet	260	N/A	N/A	52	/100m2 GFA	135	260	135	260	135
12	Food outlet/café	148	N/A	N/A	16.7	/100m2 GFA	25	148	25	148	25
13	Retail tenancies	408	N/A	N/A	17.1	/100m2 GFA	70	408	70	408	70
14	Café	113	38	N/A	0.5	/seat	19	113	19	113	19
16	Supermarket	1,170	N/A	N/A	18.9	/100m2 GFA	221	1,170	221	1,170	221
18	Automotive Care Centre	296	N/A	N/A	7.7	/100m2 GFA	23	296	23	296	23
19 to 20A	Food speciality stores	429	N/A	N/A	17.1	/100m2 GFA	73	439	75	439	75
21, 22	Fast Food Outlet	260	N/A	N/A	52	/100m2 GFA	135	260	135	260	135
23	Food outlet/café	148	N/A	N/A	16.7	/100m2 GFA	25	148	25	148	25
24	Retail tenancies	294	N/A	N/A	17.1	/100m2 GFA	50	294	50	294	50
25	Farming/agricultural supplies	572	N/A	N/A	5.6	/100m2 GFA	32	500	28	500	28
28, 30	Rural/home supplies, warehousing, marine or vehicle sales & service	2,507	N/A	N/A	5.6	/100m2 GFA	140	1,648	92	3,569	200
29	Marine/vehicle sales & service	930	N/A	N/A	5.6	/100m2 GFA	52	930	52	930	52
TOTAL		7,535					1,408	6,614	1,358		1,466

As Option 2 generates more trips than Option 1, Option 2 has been used for the traffic modelling in this memorandum.

3. We consider that the linked trip reduction factor adopted by the ITA may be overly optimistic. We also consider that further evidence is required to justify the pass-by trip reduction factor adopted by the ITA. We recommend that further evidence and sensitivity testing is provided.

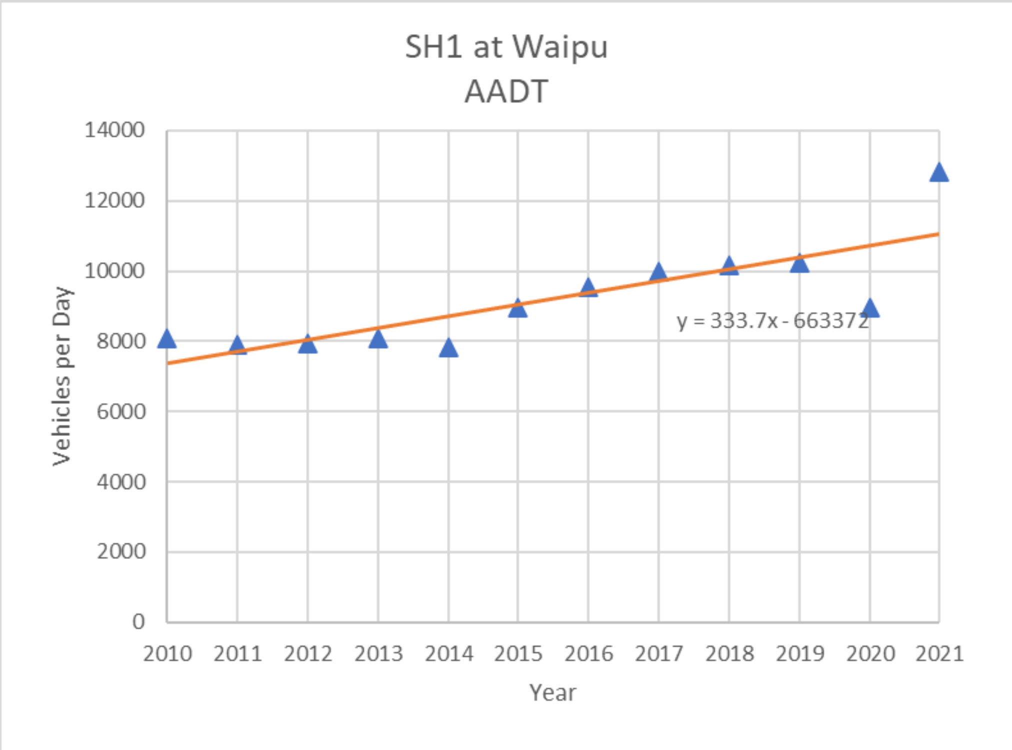
As suggested by the reviewer, an intercept survey was undertaken at The Grange, Warkworth, on Friday 16 June 2023 from 4:30pm to 6:30pm. Of 31 observations, 18 (58%) were pass-by trips. 13 trips also included a trip to another activity that was located within the same site (The Grange) and another three trips included a trip to the local supermarket. As the proposed Waipu Gateway service centre will include a supermarket, these three trips would also be linked trips, i.e., trips that include a trip to another activity that would be located in the Waipu Service centre, meaning for Waipu a total of 16 (52%) linked trips. Of 13 linked trips where the other activity was within The Grange, seven (54%) went to BP first.

These surveyed rates have been used for the traffic modelling in this memorandum.

4. We recommend that the traffic modelling test a higher growth assumption for AADT on SH1, based on historic growth rates for this section of road.

The reviewer incorrectly states that applying a 30% growth factor to the 2019 estimated peak hour traffic movements to represent 2032 volumes “equates to an annual growth rate of 2.0%.” The 30% growth over 10 years used in the ITA actually equates to an annual growth rate of 3.0%.

The reviewer quotes the AADT increase between 2017 and 2021. We see no reason to exclude earlier years in the AADT trend analysis. The AADT trend graph for SH1, including the 2021 AADT, is shown below:



The 2021 AADT is clearly an outlier. It may represent a release of suppressed demand from the covid travel restrictions of 2020. It would be inappropriate to base the future growth rate to accommodate one outlier, as suggested by the reviewer.

In the graph above we have included the linear regression line for AADT from 2010 to 2021 inclusive. The average annual increase in AADT from 2010 to 2021 is 334 vehicles per day. This represents 3.3% of the AADT of the 10,225 vpd.

On the basis of the above analysis, we see no valid reason to change the future annual traffic growth rate used in the analysis from 3%.

5. We recommend that the ITA assesses the traffic effects of the development based on surveys of the existing holiday peak period, to allow a comparison with the 2032 holiday period scenario.

Traffic levels in the latest holiday peak period are not considered to be a reliable estimate of stable holiday peak travel. On the one hand, as evident above, traffic volumes may represent the release of suppressed demand post-covid. On the other hand, the most recent summer in Northland has been reported to be the worst summer in 30 years – see:

https://www.stuff.co.nz/business/131069632/northland-businesses-try-to-see-sunny-side-despite-worst-summer-in-10-years
It was not considered appropriate to utilise surveys data from this period under these conditions.

6. We recommend that the ITA is verified to ensure that all traffic volume inputs into SIDRA are consistent with the assumptions stated in the body of the ITA report. We recommend that a single network diagram is presented showing traffic volumes on approaches that includes all SIDRA scenarios, so changes in traffic movements can be more easily compared and verified.

The reviewer suggests that "*some input volumes do not seem to match other sections of the ITA. For example, the 2032 base case SIDRA scenario for SH1/The Braigh has 915 veh/hr (north approach) and 606 veh/hr (south approach) flows, however Appendix C Table 1 states 1,053 (north approach) and 571 veh/hr (south approach).*"

The reviewer has misunderstood what the volumes at Appendix C Table 1 represent. These are the estimated 2032 holiday peak hour volumes northbound and southbound on SH1 in the vicinity of count station ID: 01N00309, which is to the south of both the Milbrook Road intersection and the subject site. They should not be compared to the approach volumes on SH1 at The Braigh.

Nevertheless, there do appear to be some discrepancies between estimated and modeled turning movement volumes. To minimise the potential for future confusion, we have appended to this S92 response the spreadsheet used to calculate the turning movements from the updated GFAs, trip rates, and pass-by and linked trip proportions mentioned above in the responses to comments 1-3. The spreadsheet can be downloaded from the following link:
https://www.dropbox.com/scl/fi/dma7yk32o15669mmpnxeb/1408-tripgen-58-PB-50-linked.xlsx?rlkey=0z8iew6xofkhk6uamfkguxe2y&dl=0

The Appendix also includes updated SIDRA modelling results. The SIDRA model can be downloaded from the following link:
https://www.dropbox.com/scl/fi/rfwdn35f81c6ct7u0h3ym/21803-BP-Waipu-Bypass-Service-Station-v5.sip9?rlkey=4ynycaa2yfs3xhhtugytlmn9g&dl=0

While there are variations in the turning movements and the detail of the SIDRA outputs, the fundamental finding remains the same as per the ITA, notably:

- the Milbrook Road and The Braigh intersections with SH1 cannot accommodate 2032 holiday peak traffic even without the service centre in place, with delays on the side road right turns of 152s and 158s and LOS F;
- with service centre traffic included, the Milbrook Road and The Braigh intersections cannot accommodate 2032 holiday peak traffic, with delays on the side road right turns of 326s and 582s and LOS F; and
- the proposed service centre roundabout will readily accommodate 2032 holiday peak traffic with the service centre in place, with the worst movement having an average delay of 25s and LOS C.

7. Comment 7: We recommend that further analysis of queuing and driver decision making is provided for drivers entering the site from SH1.

As mentioned above in the response to comment 3, some 50% of linked trips at The Grange, Warkworth, visited the service station first. We have modelled the performance of the internal roundabout on this basis, using the peak hour traffic generation figures from the response to comment 2 above, and a linked trip proportion of 50%. The resulting turning movements and 95%ile queues are summarised below.

MOVEMENT SUMMARY

Site: 111 [Service Centre Internal Roundabout (Site Folder: Service Centre Internal Rndbt)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

Service Centre Internal Rnbt Peak Hour
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	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Link to SH1															
1	L2	All MCs	107	12.9	107	12.9	0.307	2.9	LOS A	2.0	15.4	0.34	0.54	0.34	28.7
3	R2	All MCs	278	12.9	278	12.9	0.307	7.3	LOS A	2.0	15.4	0.34	0.54	0.34	27.7
Approach			385	12.9	385	12.9	0.307	6.1	LOS A	2.0	15.4	0.34	0.54	0.34	28.0
East: Balance of Service Centre															
4	L2	All MCs	278	12.9	278	12.9	0.309	2.9	LOS A	2.1	16.0	0.36	0.40	0.36	32.5
5	T1	All MCs	107	12.9	107	12.9	0.309	3.0	LOS A	2.1	16.0	0.36	0.40	0.36	33.6
Approach			385	12.9	385	12.9	0.309	2.9	LOS A	2.1	16.0	0.36	0.40	0.36	32.8
West: Service Station															
11	T1	All MCs	107	12.9	107	12.9	0.213	4.0	LOS A	1.2	9.4	0.50	0.57	0.50	29.5
12	R2	All MCs	107	12.9	107	12.9	0.213	8.4	LOS A	1.2	9.4	0.50	0.57	0.50	27.8
Approach			215	12.9	215	12.9	0.213	6.2	LOS A	1.2	9.4	0.50	0.57	0.50	28.6
All Vehicles			985	12.9	985	12.9	0.309	4.9	LOS A	2.1	16.0	0.38	0.49	0.38	29.7

With the 95%ile queue on the link to the internal roundabout being 15.4 metres long, and a separation of some 48m between the departure from the SH1 roundabout and the entry to the internal roundabout, we are confident that queuing from the internal roundabout will not affect flows on SH1 and the performance of the proposed roundabout on SH1.

8. We consider that the SIDRA model results are demonstrating that the proposed development may have significant effects on the safe and efficient operation of the SH1 intersections with Millbrook Road and The Braigh.

The crash analysis included in Section 2.4 of the ITA, as updated in comment 10 of this S92 response, shows that the reported crash history does not indicate an existing safety problem at the SH1 intersections with Millbrook Road and The Braigh. This includes during the peak holiday seasons when demands at these intersections would be increased and longer delays experienced by turning traffic.

As noted in Section 3.3 of the ITA, in the 2032 holiday peak hour the right turn out of Millbrook Road and both the left and right turn out of The Braigh will experience significant delay, with LOS F, even without Service Centre traffic, while the delay to state highway traffic will be negligible.

Many roads in New Zealand are heavily congested during the peak periods of the summer holidays. This represents what is experienced for a limited number of days and hours each year and is generally not seen to be sufficient justification for increasing road capacity. It is our understanding that Waka Kotahi does not design State Highway infrastructure to accommodate peak period traffic in the summer holidays and there seems no valid reason to do so in this case.

Nevertheless, we note that the section of SH1 including its intersections with Millbrook Road and The Braigh are within the central section of the SH1 Whangarei to Wellsford Safety Improvements project. The publicity material for this project[1] indicates that this section of SH1 will be addressed by "Stage 2" of the Central Section, with works commencing in late 2024. The works are to include intersection safety improvements at The Braigh/Millbrook Road intersections, and turnaround facilities to reduce the need for right turns to be made across both directions of SH1 traffic at the same time. Thus, if Waka Kotahi has any concerns about the safety of the SH1 intersections with Millbrook Road and The Braigh in the future holiday peak periods, they should be addressed as part of the "Stage 2" safety improvements.

9. We recommend that safe pedestrian and cycle access is provided between the site and Waipu town centre.

The Ministry for the Environment publication *People + Places + Spaces – A Design Guide for Urban New Zealand* notes that "a five-minute walk (400 metres walk) to convenience shops, bus stops and other daily facilities is considered reasonable. With the proposed service centre being a distance of 1.4 kilometres from the edge of the Waipu town centre, it would be well beyond a convenient walking distance.

Also, there is no obvious reason for pedestrians or cyclists who are already at the Waipu town centre, to leave its cafes and retail shops and walk or cycle to the proposed service centre.

At present there is a footpath on the south side of The Centre but no footpath on The Braigh, and on both roads cyclist must share the carriageway with other road users. Applying the Safe Systems Assessment framework, the proposed service centre would make negligible difference to pedestrian and cyclist exposure, and no difference to the likelihood or severity of any pedestrian or cyclist crashes that might occur on The Centre or The Braigh. However, by reducing speeds on SH1 by the provision of a roundabout, and with the proposed traffic islands on SH1 at the roundabout, the proposed service centre would reduce the severity and the

[1] https://www.nzta.govt.nz/projects/connecting-northland/sh1-whangarei-to-wellsford/central-section/

already negligible likelihood of any pedestrian or cyclist crashes that might occur on SH1 between the service centre and The Braigh.

Thus, the proposed service centre provides no justification to change pedestrian and cycle access to it from the Waipu town centre.

10. We recommend that the crash assessment include records up to 2022, and that the assessment take account of all crashes within a 1km radius of the SH1/The Braigh intersection.

We have undertaken a crash assessment of crashes reported between 2018 and 2022 for an area within 1km of SH1/The Braigh intersection but added crashes up to 1.4km south of the Milbrook Road intersection to include crashes within 1km of the proposed roundabout.

These crashes are summarised in the table below:

Location	Reported Crashes			Key Factors
	Total	Injury	Non-Injury	
Midblock: On SH1 up to 1.4km south of Milbrook Road	5	1 serious	4	2 – Lost control, went off road 1 – Rear end (1 serious) 1 – Lane Change
Intersection: SH1 / Milbrook Road	0	0	0	
Intersection: SH1 / The Braigh	0	0	0	
Midblock: SH1 between The Braigh and Shoemaker Road	4	1 fatal	3	2 – Head On (1 fatal) 1 – Rear End 1 – Lost control, went off road
Intersection: SH1 / Shoemaker Road	4	2 minor	2	1 – Crossing – No Turns (1 minor) 3 – Crossing – Vehicle Turning (1 minor)
Midblock: The Braigh	2	1 minor	1	1 – Lost control, went off road (1 minor) 1 – Merging from driveway
Total	15	1 fatal, 1 serious, 3 minor	10	

None of the reported crashes concern pedestrians or cyclists, and none occurred at the SH1 intersections with Milbrook Road or The Braigh.

The only patterns in the reported crashes are four crashes at the SH1/Shoemaker Road intersection, four crashes involving vehicles losing control and going off the road, and two head-on crashes (including one fatal crash) on SH1 between The Braigh and Shoemaker Road.

The head-on crashes would be addressed by the median barrier that Waka Kotahi is proposing to install on this section of SH1, and the intersection crashes at the SH1/Shoemaker Road intersection should be addressed as part of the "Stage 2" safety improvements.

There is no pattern in the reported crashes that is relevant to the proposed development. However, we note that, the proposed service centre roundabout would provide a safe location for motorists to undertake U-turns in lieu of some crossing and turning movements should Waka Kotahi chose to install a median barrier across any of the SH1 intersections in the vicinity.

11. We recommend that an assessment against Waka Kotahi's TCDM3 is provided.

We agree that signs visible from the State Highway should be assessed against Waka Kotahi's Traffic Control Devices Manual 3: Advertising Signs, however as is evident from the Architectural drawing H03, the detail of these signs has not yet been determined, and they cannot be determined until site tenants are finalized. Thus, at this stage the signs can only be assessed against the placement considerations set out in section 5 of the Traffic Control Devices Manual.

Our assessment is tabulated below. Because of the proximity of Sign 1 and Sign 3 to the roundabout, the vehicle operating speed will be below 50 km/h, while for sign 2 we have assumed a 100km/h operating speed.

TCD Placement Consideration	Comment
5.3 Visibility of Signs	• Signs 1 and 3 will be within the field of vision of northbound motorists on SH1, while sign 2 will be in the field of vision for southbound motorists on SH1. • There will be ample forward sight distance to Signs 1 and 2. Forward sight distance to Sign 3 will be some 67 metres, which is considered acceptable as it will function as a repeater/confirmation sign and is within the low-speed environment of the proposed roundabout. • Signs 1 and 3 will not impede sight distances for any intersection or driveway. The location of Sign 2 will allow for adequate Safe Intersection Sight Distance to the right down SH1 from Milbrook Road to the roundabout departure.
5.4 Sign Position	• The location of signs 1 and 2 may need to be reviewed to ensure that they are at least 5 metres away from the edge of the carriageway on SH1. • Sign 3 will be over 1.5 metres from the edge of the carriageway. • Even though vehicle speeds in the vicinity will be constrained by the roundabout, Sign 1 and sign 3 are more than 250 metres apart and thus exceed the 250-metre spacing desirable for a 100km/h speed limit area. Sign 3 is approximately 67 metres past sign 1. This is considered to be is acceptable as it will function as a

TCD Placement Consideration	Comment
	repeater/confirmation sign and is within the low-speed environment of the proposed roundabout. • Although all three signs are within 100 metres of an intersection, they effectively function as directional signage and thus it is not considered that they will detract from the effectiveness of traffic control devices at the roundabout or at Milbrook Road.
5.6 Sign Supports	The proposed signs will not have frangible supports, and thus they will need to be protected by a barrier so as not to become a roadside hazard.
5.7 Sign Density	As per Figure 5.2 of Traffic Control Devices Manual 3: Advertising Signs, the proposed signs are grouped together in pylon signs to avoid excessive clutter.

On this basis the proposed sign locations are considered to be consistent with the requirements of Waka Kotahi's Traffic Control Devices Manual 3: Advertising Signs.

12. <u>We are concerned that the reduction of the existing southbound passing lane by approximately 300m will have a negative effect on the safe and efficient function of the passing lane.</u>

The existing southbound passing lane is some 1km long excluding tapers. As noted in Section 5.6.3 of Austroads Guide to Road Design Part 1, Overtaking Establishment Sight Distance (OED) is calculated as follows:

$$\text{OED} = G_{T85}\frac{(V+u)}{3.6}$$

where

G_{T85} = 85th percentile critical time gap secs

u = $V/1.17$ (speed of slow vehicle)

V = operating speed

Thus, overtaking establishment sight distance is proportional to operating speed.

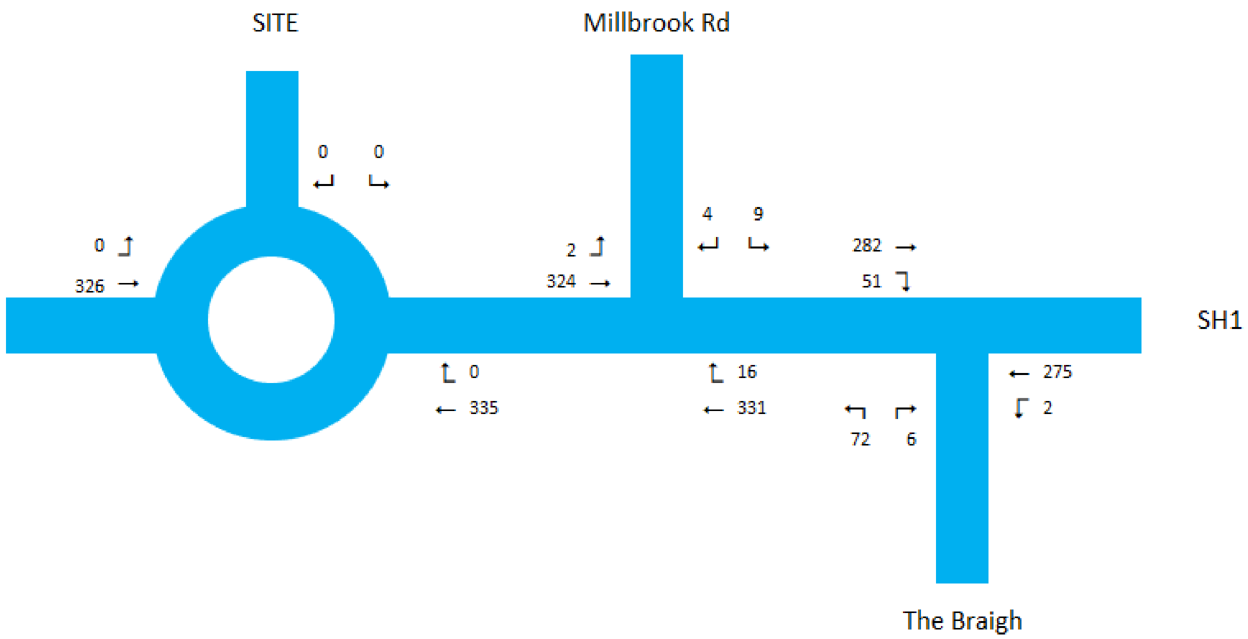
The existing southbound operating speed entering the passing lane is 100km/h. With the roundabout in place, the southbound speed through the roundabout will be limited to 50km/h and the speed entering the passing lane 100m downstream will be some 70km/h, a reduction of 30%. Thus, to maintain its current level of service, the passing lane can be 30% shorter, which is what is proposed.

Anatole Sergejew
Senior Associate
Traffic Planning Consultant Ltd.

APPENDIX

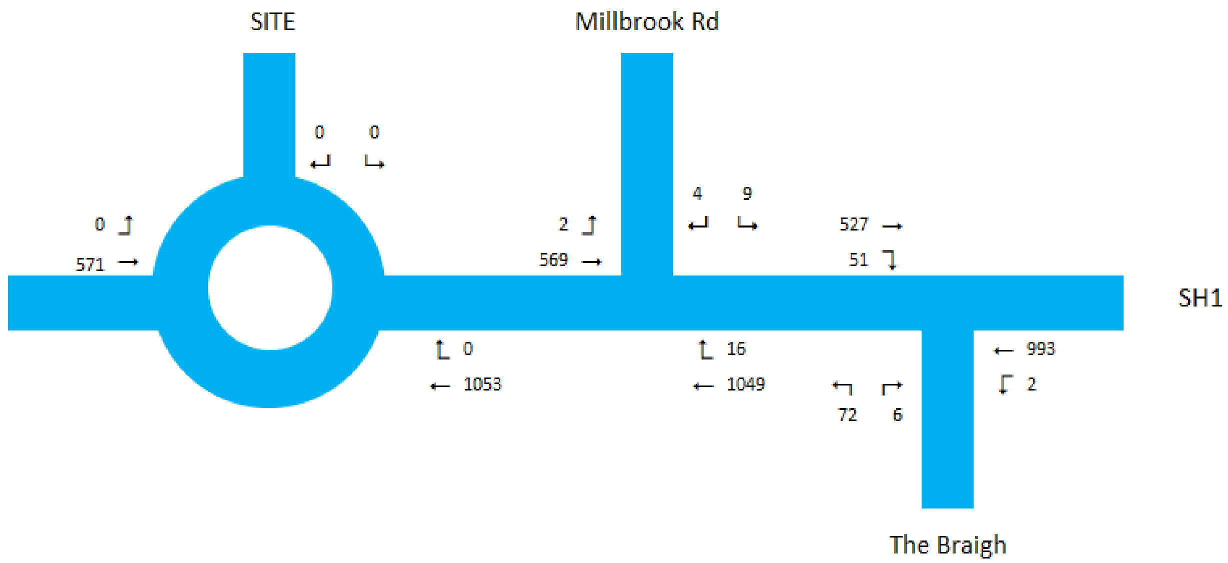
BP Waipu

COUNTED TURNING MOVEMENTS 12NOON TO 1PM, WED 9TH FEB 2022



	NBD	SBD	TOTAL
SH1 WELLSFORD HOLIDAY PEAK HOUR	491	906	
SH1 WELLSFORD AADT	11438		
AADT→HOLDAY PEAK FACTOR	4.3%	7.9%	
SH1 WAIPU AADT	10225		
SH1 WAIPU HOLIDAY PEAK HOUR	439	810	
SH1 INCREASE 2022-2032	30%		
2032 SH1 WAIPU HOLIDAY PEAK HOUR	571	1053	1624
PERCENT	35%	65%	
	NBD	SBD	

ESTIMATED 2032 HOLIDAY PEAK HOUR TURNING MOVEMENTS (EXCL DEVELOPMENT TRAFFIC)



MOVEMENT SUMMARY

Site: 101 [SH1/Millbrook Road - 2032 no dev (Site Folder: 2032 Holiday Peak Base)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

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	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
NorthEast: SH1 North															
25	T1	All MCs	1104	12.9	1104	12.9	0.614	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.3
26	R2	All MCs	17	12.9	17	12.9	0.022	11.1	LOS B	0.1	0.6	0.57	0.74	0.57	65.2
Approach			1121	12.9	1121	12.9	0.614	0.3	NA	0.1	0.6	0.01	0.01	0.01	98.6
NorthWest: Millbrook Road															
27	L2	All MCs	9	12.9	9	12.9	0.351	20.7	LOS C	0.7	5.4	0.95	1.02	1.02	35.3
29	R2	All MCs	4	12.9	4	12.9	0.351	151.8	LOS F	0.7	5.4	0.95	1.02	1.02	35.3
Approach			14	12.9	14	12.9	0.351	61.0	LOS F	0.7	5.4	0.95	1.02	1.02	35.3
SouthWest: SH1 south															
30	L2	All MCs	2	12.9	2	12.9	0.334	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	81.0
31	T1	All MCs	599	12.9	599	12.9	0.334	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.7
Approach			601	12.9	601	12.9	0.334	0.1	NA	0.0	0.0	0.00	0.00	0.00	99.6
All Vehicles			1736	12.9	1736	12.9	0.614	0.7	NA	0.7	5.4	0.01	0.02	0.01	97.5

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

Organisation: TRAFFIC PLANNING CONSULTANTS LTD | Licence: PLUS / 1PC | Processed: Wednesday, 4 October 2023 4:23:35 PM
Project: C:\Users\Anatole Sergejew\Traffic Planning Dropbox\A TPC Projects\2021 Projects\21803 - BP Waipu Bypass Service Centre\S92 \21803 - BP Waipu Bypass Service Station v5.sip9

MOVEMENT SUMMARY

Site: 101 [SH1/The Braigh - 2032 No dev (Site Folder: 2032 Holiday Peak Base)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

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

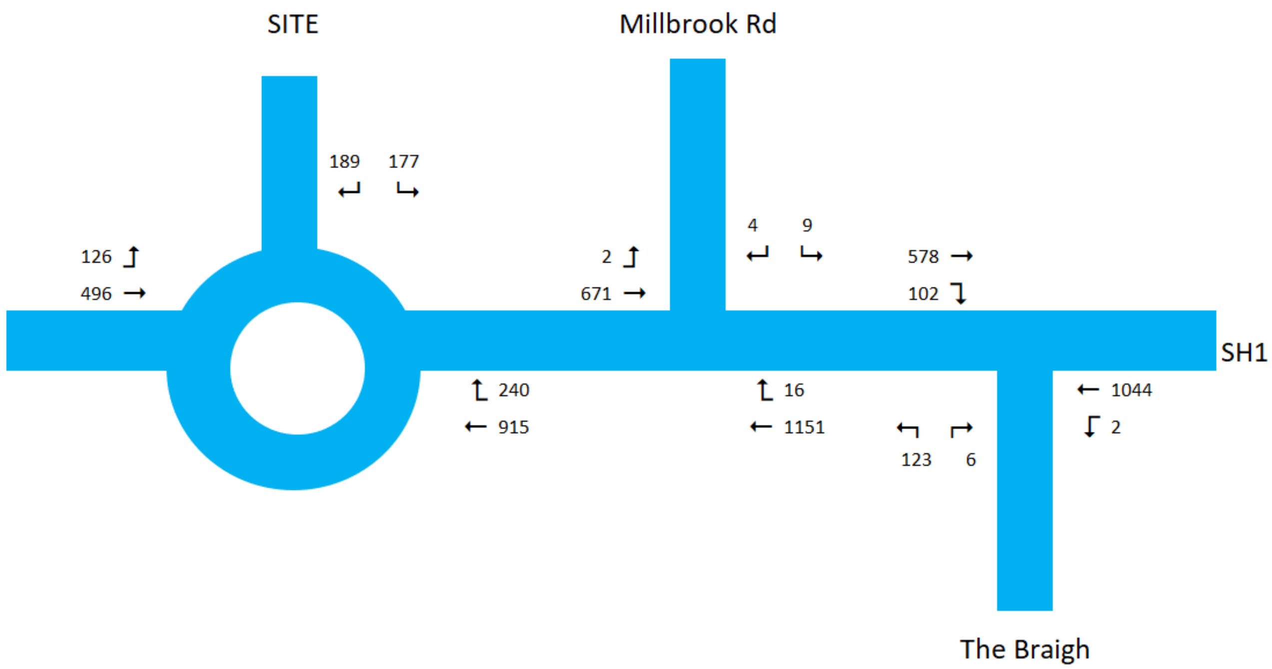
Vehicle Movement Performance

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	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: The Braigh															
21	L2	All MCs	76	12.9	76	12.9	0.812	56.4	LOS F	2.7	20.8	0.98	1.24	1.79	26.7
23	R2	All MCs	6	12.9	6	12.9	0.812	158.2	LOS F	2.7	20.8	0.98	1.24	1.79	26.6
Approach			82	12.9	82	12.9	0.812	64.2	LOS F	2.7	20.8	0.98	1.24	1.79	26.7
NorthEast: SH1 north															
24	L2	All MCs	2	12.9	2	12.9	0.582	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	80.7
25	T1	All MCs	1045	12.9	1045	12.9	0.582	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.2
Approach			1047	12.9	1047	12.9	0.582	0.1	NA	0.0	0.0	0.00	0.00	0.00	99.1
SouthWest: SH1 south															
31	T1	All MCs	555	12.9	555	12.9	0.308	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
32	R2	All MCs	54	12.9	54	12.9	0.203	19.3	LOS C	0.6	4.8	0.85	0.95	0.91	38.5
Approach			608	12.9	608	12.9	0.308	1.7	NA	0.6	4.8	0.08	0.08	0.08	87.5
All Vehicles			1738	12.9	1738	12.9	0.812	3.7	NA	2.7	20.8	0.07	0.09	0.11	84.3

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

	NBD	SBD	TOTAL
WAIPU GATEWAY RAW PEAK HOUR TRIP GEN			1466
PERCENT LINKED TRIPS			50%
WAIPU GATEWAY HOLIDAY PEAK HOUR TRIP GEN			733
PERCENT PASS-BY TRIPS			58%
TOTAL PASS-BY VEH MOVEMENTS			425
PERCENT PASS-BY BY DIRECTION	35%	65%	
PASS-BY MOVEMENTS BY DIRECTION	149	276	
%IN	50%	50%	
PASS-BY IN MOVEMENTS BY DIRECTION	75	138	
PASS-BY OUT MOVEMENTS BY DIRECTION	75	138	
PERCENT PRIMARY TRIPS			42%
TOTAL PRIMARY VEH MOVEMENTS			308
SPLIT BETWEEN SH1 NBD, SH1 SBD AND WAIPU			33%
NUMBER OF PRIMARY MOVEMENTS PER ORIGIN			103
%IN			50%
PRIMARY IN MOVEMENTS PER ORIGIN			51
PRIMARY OUT MOVEMENTS PER ORIGIN			51

ESTIMATED 2032 HOLIDAY PEAK HOUR TURNING MOVEMENTS INCLUDING DEVELOPMENT TRAFFIC



MOVEMENT SUMMARY

Site: 101 [Service Centre roundabout with dev (Site Folder: 2032 Holiday Peak with dev - 58% pass by, 50% linked)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
NorthEast: SH1 north																
25	T1	All MCs	963	12.9	963	12.9	0.940	17.6	LOS B	28.9	224.4	1.00	0.96	1.37	60.7
26	R2	All MCs	253	12.9	253	12.9	0.940	25.0	LOS C	28.9	224.4	1.00	0.96	1.37	45.2
Approach			1216	12.9	1216	12.9	0.940	19.1	LOS B	28.9	224.4	1.00	0.96	1.37	56.7
NorthWest: site access																
27	L2	All MCs	186	12.9	186	12.9	0.436	3.8	LOS A	3.3	25.5	0.80	0.65	0.80	46.7
29	R2	All MCs	199	12.9	199	12.9	0.436	8.3	LOS A	3.3	25.5	0.80	0.65	0.80	46.2
Approach			385	12.9	385	12.9	0.436	6.2	LOS A	3.3	25.5	0.80	0.65	0.80	46.5
SouthWest: SH1 south																
30	L2	All MCs	133	12.9	133	12.9	0.553	8.6	LOS A	5.1	39.4	0.70	0.59	0.70	49.6
31	T1	All MCs	522	12.9	522	12.9	0.553	8.9	LOS A	5.1	39.4	0.70	0.59	0.70	68.6
Approach			655	12.9	655	12.9	0.553	8.8	LOS A	5.1	39.4	0.70	0.59	0.70	63.7
All Vehicles			2256	12.9	2256	12.9	0.940	13.9	LOS B	28.9	224.4	0.88	0.80	1.08	56.3

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

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MOVEMENT SUMMARY

Site: 101 [SH1/Millbrook Road - 2032 with dev (Site Folder: 2032 Holiday Peak with dev - 58% pass by, 50% linked)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

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

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
NorthEast: SH1 North																
25	T1	All MCs	1212	12.9	1212	12.9	0.673	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	99.1
26	R2	All MCs	17	12.9	17	12.9	0.027	12.3	LOS B	0.1	0.7	0.61	0.79	0.61	63.7
Approach			1228	12.9	1228	12.9	0.673	0.3	NA	0.1	0.7	0.01	0.01	0.01	98.4
NorthWest: Millbrook Road																
27	L2	All MCs	9	12.9	9	12.9	0.553	60.5	LOS F	1.6	12.2	0.99	1.02	1.11	19.8
29	R2	All MCs	4	12.9	4	12.9	0.553	325.7	LOS F	1.6	12.2	0.99	1.02	1.11	19.8
Approach			14	12.9	14	12.9	0.553	142.1	LOS F	1.6	12.2	0.99	1.02	1.11	19.8
SouthWest: SH1 south																
30	L2	All MCs	2	12.9	2	12.9	0.394	8.2	LOS A	0.0	0.0	0.00	0.00	0.00	80.9
31	T1	All MCs	706	12.9	706	12.9	0.394	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.7
Approach			708	12.9	708	12.9	0.394	0.1	NA	0.0	0.0	0.00	0.00	0.00	99.6
All Vehicles			1951	12.9	1951	12.9	0.673	1.2	NA	1.6	12.2	0.01	0.01	0.01	96.1

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

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MOVEMENT SUMMARY

Site: 101 [SH1/The Braigh - 2032 with dev (Site Folder: 2032 Holiday Peak with dev - 58% pass by, 50% linked)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

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	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: The Braigh																
21	L2	All MCs	129	12.9	129	12.9	1.425	435.9	LOS F	28.3	220.2	1.00	3.43	9.45	7.1
23	R2	All MCs	6	12.9	6	12.9	1.425	581.7	LOS F	28.3	220.2	1.00	3.43	9.45	7.1
Approach			136	12.9	136	12.9	1.425	442.7	LOS F	28.3	220.2	1.00	3.43	9.45	7.1
NorthEast: SH1 north																
24	L2	All MCs	2	12.9	2	12.9	0.612	8.3	LOS A	0.0	0.0	0.00	0.00	0.00	80.7
25	T1	All MCs	1099	12.9	1099	12.9	0.612	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.1
Approach			1101	12.9	1101	12.9	0.612	0.1	NA	0.0	0.0	0.00	0.00	0.00	99.1
SouthWest: SH1 south																
31	T1	All MCs	608	12.9	608	12.9	0.338	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
32	R2	All MCs	107	12.9	107	12.9	0.490	27.8	LOS D	1.7	13.2	0.92	1.07	1.27	35.3
Approach			716	12.9	716	12.9	0.490	4.2	NA	1.7	13.2	0.14	0.16	0.19	78.3
All Vehicles			1953	12.9	1953	12.9	1.425	32.4	NA	28.3	220.2	0.12	0.30	0.73	49.5

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

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