

Our Reference: **PT22014**

Allam Property Group & Stockland

26 February 2024

Via Email: carmeno@allam.com.au

Proposed Rezoning for Residential Subdivision – The Gables Box Hill
Response to Council RFI Dated 8 December 2023

As requested, please find below and attached additional information in response to traffic, access and modelling matters raised in the Hills Shire Council Request for Additional Information letter dated 8 December 2023. For ease of reference each item has been repeated with a response following.

Item

Traffic Impact Assessment Report:

A review of the Traffic Impact Assessment Report, prepared by Positive Traffic Pty Ltd and dated December 2022, has been undertaken. It is noted that the report utilised a number of previous reports to determine the assumptions underpinning the traffic impact assessment for 2036. These assumptions are subject to approval from TfNSW, and some of the proposed intersection layouts used for the analysis are outdated and have been superseded. It is recommended that, following confirmation of the matters outlined below, a comprehensive revision of the Sidra model be undertaken with a specific focus on analysing the intersections as a network model.

Response

As advised by Hills Shire Council, a response from Transport for NSW has not been forthcoming at the time of preparing this response report. Thus, as advised at the recent meeting with Council representatives the potential future modelling requirements are not fully known until such time as Transport for NSW has responded.

It would not be prudent to undertake costly further 'network' modelling on two separate occasions at this stage until such time as the potential scope of additional modelling work is understood following a review by Transport for NSW. In particular, network modelling which includes the Windsor Road corridor.

As there has been extensive future year modelling work on the key intersections with Old Pitt Town Road by both Stockland / Allam alliance along with studies commissioned by Hills Shire Council all of which have shown satisfactory future year operating conditions with intersection arrangements as currently designed, this ensures Council is able to consider the current rezoning application on its own merit noting that future modelling will be undertaken as part of development applications for the precinct.

However, as requested by Council the SIDRA modelling prepared to date have been revised to accommodate the current intersection design arrangements as advised by Council so at this stage of the assessment, a consistent assessment in line with the approach of other reports provided by Council has been undertaken. That is, single site SIDRA assessments of future year conditions of enhanced intersections along Old Pitt Town Road.

The original traffic report intersection operating conditions of Old Pitt Town Road / Boundary Road (previous arrangements) versus the expanded intersection arrangement as provided by Hills Shire Council is provided below in **Table 1**.

Table 1 – Existing vs 2036 Weekday AM / PM Intersection Operating Conditions With & Without Development

Intersection	Control	Morning Peak		Evening Peak	
		Av Delay	LOS	Av Delay	LOS
2036 With Development – Original TIA Report					
Boundary Rd / Old Pitt Town Rd	Signals	50.5	D	32.6	C
2036 With Development – Expanded Intersection					
Boundary Rd / Old Pitt Town Rd	Signals	39.4	C	28.9	C

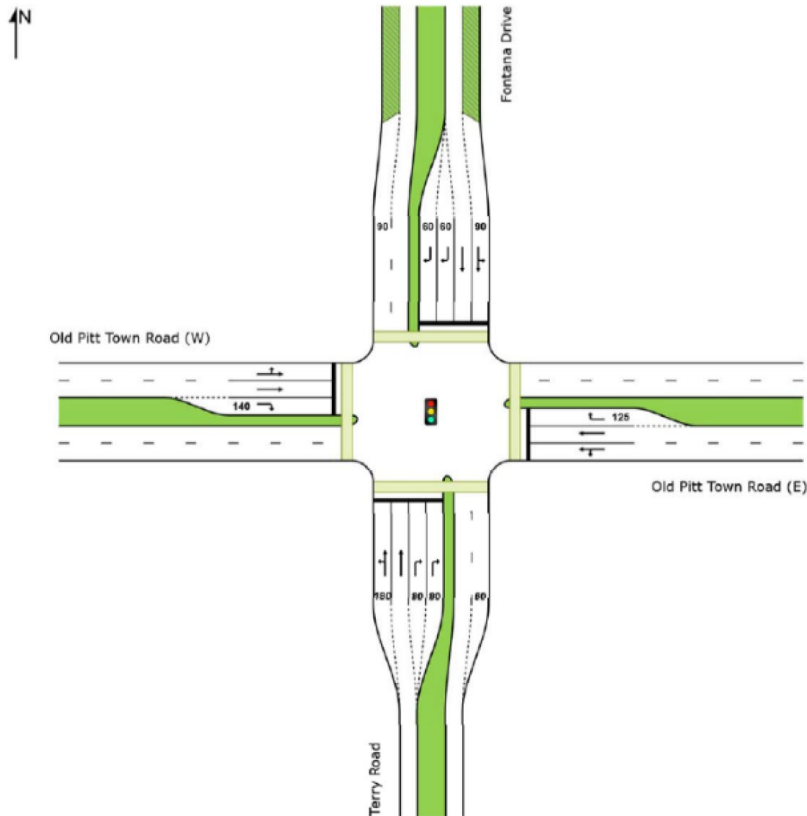
Avg Delay (sec/veh) is over all movements at signals, and for worst movement at priority and roundabouts

From **Table 1** it is noted that in 2036 following full development of the Box Hill Precinct and the subject site the expanded intersection of Old Pitt Town Road / Boundary Road as currently proposed where land has been set aside to accommodate by the proposal, would operate with improved intersection operating conditions than originally modelled.

Revised SIDRA model outputs are provided in **Appendix A** of this report.

Item

Fontana Drive, Terry Road and Old Pitt Town Road intersection The Fontana Drive, Terry Road and Old Pitt Town Road intersection is to be upgraded to signals. The warrant study has been approved by TfNSW and the updated intersection layout is provided below:



This intersection is currently partially funded through a combination of contributions from the existing Box Hill North VPA and Box Hill Contributions Plan (CP15). Noting that Old Pitt Town Road is a flood evacuation route, that future residents of West Gables will need to utilise to safely evacuate in the event of a flood, it is appropriate for development that would be permitted through this planning proposal to also contribute to the upgrade to signals. Land acquisition costs are already funded through CP15, therefore only contributions toward capital works would be needed. It is estimated that approximately 10% of the capital works should be apportioned to the development facilitated by this planning proposal.

Response

It is noted that the number of intersection connections to Old Pitt Town Road from The Gables was previously three in the form of dual lane roundabouts which have not been reduced to two (2) signalised intersections.

Further, it is noted that the proposal for an additional 1,100 – 1,200 dwellings not previously included in The Gables release area provides Council with monetary contributions not previously thought available to fund intersection upgrades along Old Pitt Town Road.

As shown in Figures 42, 43, 44 and 45 of the traffic report¹, the potential traffic generation through the intersection of Old Pitt Town Road / Fontana Drive / Terry Road was in the order of 70 vehicles per hour two way.

¹ Proposed Rezoning for Residential Subdivision West Gable, the Gables Box Hill Traffic Impact Assessment Report – Positive Traffic Pty Ltd December 2022

The forecast 2036 traffic volumes modelled in the Thompson Stanbury Traffic Signal Warrant Assessment report of Old Pitt Town Road / Valetta Drive at the intersection of Old Pitt Town Road / Fontana Drive are shown below

Table 2 - Old Pitt Town Road at Fontana Drive 2036 Forecast Traffic Flows

PM	AM	
1,350	1,259	
	1,108	1,388
	AM	PM

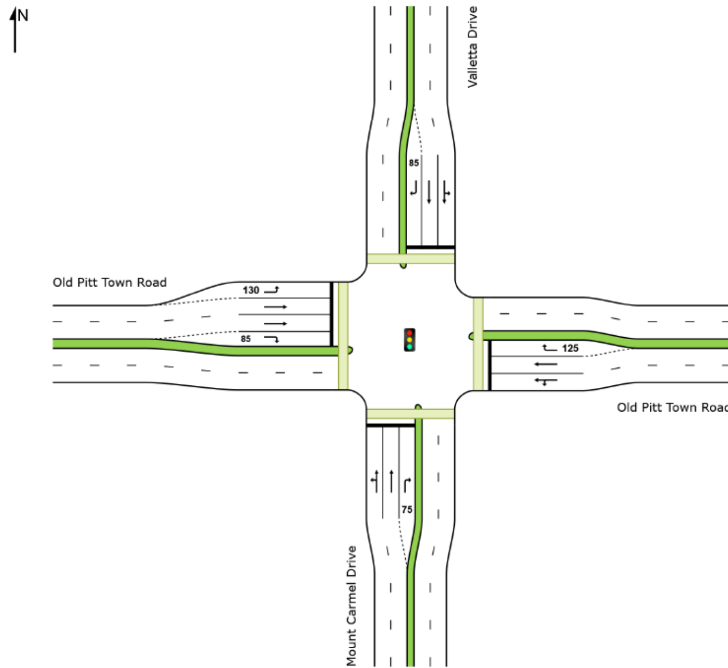
Thus, the potential additional traffic of the subject rezoning proposal would only represent a 2.5 – 3.0% increase in traffic through the intersection along Pitt Town Road. Further, a negligible change in future year intersection operating conditions at the intersection after accounting for the potential traffic generation of the subject rezoning application without any further change to Council's current design.

The imposition of a 10% contribution for the works at this intersection is not justified and it is expected that the monetary contributions which arise for the additional 1,100 – 1,200 potential lots would provide Council with more than the requested 10% contribution which could be allocated towards the delivery of this signalised intersection.

Item

Valetta Drive, Mt Carmel Road and Old Pitt Town Road intersection

This intersection is to be upgraded to signals. The traffic report provided with the planning proposal indicates additional turn lanes and slip lanes beyond the current intersection design are required. This will require additional lanes, service relocations and land on the north side of Old Pitt Town Road. Noting that the proposal generates the need for the redesign of this intersection and Old Pitt Town Road is the flood evacuation route, it is appropriate that contribution be made toward this intersection upgrade. The updated intersection layout is shown below



Response

As discussed, the proposed development would contribute to both the land cost and infrastructure costs to provide the additional lanes at the intersection of Old Pitt Town Road / Valetta Drive given the intersection is funded by the existing contributions plan without the lands subject to this rezoning application included as a monetary source for these works.

Item

Old Pitt Town Road

The Traffic Impact Assessment Report indicates that the forecast 2036 conditions have assumed that Old Pitt Town Road is widened to 2 lanes in each direction.

The section of Old Pitt Town Road where the upgrade to 4 lanes has been assumed needs to be clarified. It is assumed that this would include the section between Boundary Road and Fontana Drive, fronting the planning proposal land. It is noted that development in the Box Hill precinct, to the south, will complete half road width construction along this section of Old Pitt Town Road. Accordingly, this planning proposal should ensure delivery of the remaining half road width construction and any associated land for road widening for the northern half of Old Pitt Town Road, between Boundary Road and Fontana Drive.

Response

As discussed at the recent meeting with Council representatives, the designs provided for Old Pitt Town Road / Boundary Road, Old Pitt Town Road / Valetta Drive and Old Pitt Town Road / Fontana all include the provision of four (4) lanes in Old Pitt Town Road. Thus, the traffic report as it includes 2036 future year conditions as the basis of the assessment, assumed these works would be completed following full completion of the housing delivery of Box Hill.

As also advised the proposal would provide the 'missing works' between the signalised intersections listed above in terms of kerb and gutter / asphalt roadway across the frontages in Old Pitt Town Road in their ultimate positions to accommodate four (4) travel lanes. These works would include provision of a shared pedestrian / cycleway along between Boundary Road and the eastern boundary of the site fronting Old Pitt Town Road where such facilities are currently not provided.

However, these works would not extend the full distance between Boundary Road to Fontana Drive as land holdings subject to this rezoning proposal do not extend for that full length. It would be expected that the remaining parcels of land fronting Old Pitt Town Road between Valetta Drive and Fontana Drive would be required to also deliver kerb and gutter / asphalt road construction part of their future rezoning applications.

Item

Proposed new road and Old Pitt Town intersection

There is a new proposed road accessing Old Pitt Town on the western side of the proposed open space land. This intersection is located approximately 235m from Boundary Road. The Traffic Impact Assessment Report notes that this intersection is to be left-in/left-out. In this case, a central median island may be required and some additional land will be required to provide the median island across the intersection. It is requested that the treatment of this intersection be clarified/confirmed and the necessary infrastructure items to deliver the intersection detailed.

Response

As discussed, the left in / left out arrangements of this intersection would be achieved through the provision central triangular island which physically constrains the intersection to left in / left out without the need for a central island in Old Pitt Town Road and changes to the kerb alignment to accommodate such an island.

The centre island would include provision for pedestrians / cyclists to provide a crossing facility linking the shared pedestrian / cycleway along the frontage of the site in Old Pitt Town Road as described above.

This central island design would be provided as part of a future development application for the subdivision.

Item

Boundary Road and Old Pitt Town Road intersection This intersection is to be upgraded to signals. Additional land is likely required, in accordance with the attached preliminary intersection design (additional land take shown shaded in red). It is requested that the intersection design be accommodated in the indicative layout plan and planning proposal. This item would be suitable for inclusion in any infrastructure offer.

Response

It is confirmed that the latest plans for the subdivision have fully accounted for the land provision requirements to accommodate the ultimate signalised intersection of Old Pitt Town Road / Boundary Road as provided in plan by Hills Shire Council.

Item

Boundary Road

The Traffic Impact Assessment Report indicates that the forecast 2036 conditions have assumed that Boundary Road is widened to 2 lanes in each direction. It is assumed that this refers to the section of Boundary Road along the West Gables precinct boundary, between the intersections with Old Pitt Town Road and Red Gables Road to be delivered in association with this planning proposal. This needs to be clarified and confirmed

Response

It is acknowledged that the provision of four (4) trafficable lanes in Boundary Road between Old Pitt Town Road along the West Gables precinct boundary is predicated on delivery of rezoned land on the opposite side of Boundary Road within the Hawkesbury Shire Council LGA. Thus, the responsibility of this rezoning proposal is the provision of kerb and gutter / asphalt road works along the full frontage of the site in Boundary Road which is agreed. These works would include provision of a 2.5m – 3.0m shared pedestrian pathway which would link with the shared pedestrian pathway along the site frontage in Old Pitt Town Road as described above.

As noted in the approved traffic impact assessment report prepared by GTA for The Gables precinct, 2036 traffic conditions in isolation of rezoned land within the Hawkesbury Council LGA only requires a single travel lane in each direction in Boundary Road through the priority controlled intersections of Red Gables Road and Cataract Road to accommodate the full 2036 traffic generation of The Gables.

As also confirmed in the traffic impact assessment report prepared for this rezoning proposal by Positive Traffic Pty Ltd, the single lane in each direction in Boundary Road priority controlled intersections with Red Gables Road / Cataract Road would continue to operate at a satisfactory level of service in 2036 in their current form without a need for any upgrade to accommodate the full development of this rezoning proposal.

Item

Boundary Road and Cataract Road intersection

The Cataract Road and Boundary Road intersection is shown as priority controlled, with a seagull treatment and single lanes in Boundary Road. Boundary Road is to be upgraded to two lanes in either direction so this intersection layout will need to be amended. It may potentially be safer and more efficient to provide either a dual lane roundabout or traffic signals at this intersection which will likely require additional land to be utilised for the intersection.

Boundary Road and Red Gables Road intersection

The Red Gables Road and Boundary Road intersection is shown as priority controlled, with a seagull treatment and single lanes on Boundary Road. Boundary Road is to be upgraded to two lanes in either direction so this intersection layout will need to be amended. It may potentially be safer and more efficient to provide a dual lane roundabout or traffic signals at this intersection which will likely require additional land to be utilised for the intersection.

Response

As stated above and confirmed with Council, the provision of four (4) trafficable lanes in Boundary Road relies on additional land provided as part of any rezoning of lands within the Hawkesbury Council LGA which is beyond the scope of this rezoning proposal to provide.

Further, the intersection arrangements in Red Gables Road and Cataract Road are noted to be in their *ultimate position* which at some time in the future could facilitate dual lane roundabouts as part of a rezoning proposal for lands opposite within the Hawkesbury Council LGA.

However, as also stated above, the development would provide kerb and gutter works with a 3.5m nature strip to accommodate the potential future four (4) lane arrangement of Boundary Road across the full frontage of the site. It is considered that the works delivered as part of this rezoning proposal future proofs the anticipated arrangements of Boundary Road.

Bus Access – Red Gables Road / Cataract Road

On a related matter, it is noted that Council is seeking a potential improvement to safety for pedestrians crossing Boundary Road from the existing bus stop near Cataract Road northbound. The location of this bus stop relative to the existing intersection arrangements is shown below.

Figure 1 - Existing Northbound Bus Stop in Boundary Road



The provision of a central pedestrian facility would be better located on the northern side of the intersection which only requires pedestrians to cross a single of traffic at time compared if such a facility was located on the southern side of the intersection where the right turn bay is located.

It would require the removal of the acceleration lane and given little to no traffic turns right from this intersection, on the basis a reduction in speed limit could be supported a pedestrian refuge would be considered the best interim option to provide a safe crossing facility in Boundary Road at Cataract Road. The arrangements are shown below and could form a future condition of consent.

Figure 2 – Potential Location for Pedestrian Refuge in Boundary Road at Cataract Road Linking Bus Stops



Please do not hesitate to contact myself on 0414 462247 should you require any additional information.

Yours sincerely

A handwritten signature in black ink, appearing to read 'D Brodie'.

DEAN BRODIE

Managing Director

B.Eng (Civil) MIEAust NER

RMS Accredited Level 3 (Lead) Road Safety Auditor

RPEQ 27423

Expert Traffic Engineering & Road Safety Witness at NSW Land & Environment & NSW Supreme Court

APPENDIX A - SIDRA OUTPUTS

MOVEMENT SUMMARY

 Site: 101v [Boundary_Old Pitt Town_PM 2036 + Dev_Upgrade
(Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 70 seconds (Site Practical Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%				[Veh. veh	Dist] m				km/h
South: Boundary Rd															
1	L2	All MCs	205	2.0	205	2.0	0.707	21.5	LOS C	14.3	101.5	0.93	0.84	0.96	41.3
		LV	201		201		0.707	21.5	LOS C	14.3	101.5	NA	NA	NA	41.3
		HV	4		4		0.707	21.5	LOS C	14.3	101.5	NA	NA	NA	41.3
2	T1	All MCs	700	2.0	700	2.0	* 0.707	25.4	LOS C	14.3	101.5	0.94	0.84	0.97	43.0
		LV	686		686		* 0.707	25.4	LOS C	14.3	101.5	NA	NA	NA	43.0
		HV	14		14		0.707	25.4	LOS C	14.3	101.5	NA	NA	NA	43.0
3	R2	All MCs	175	2.0	175	2.0	* 0.537	41.5	LOS D	3.1	22.1	1.00	0.78	1.03	35.1
		LV	171		171		* 0.537	41.5	LOS D	3.1	22.1	NA	NA	NA	35.1
		HV	3		3		0.537	41.5	LOS D	3.1	22.1	NA	NA	NA	35.1
Approach			1080	2.0	1080	2.0	0.707	27.3	LOS C	14.3	101.5	0.94	0.83	0.98	41.2
East: Old Pitt Town Rd															
4	L2	All MCs	219	2.0	219	2.0	0.738	30.9	LOS C	11.0	78.0	0.98	0.90	1.09	37.7
		LV	215		215		0.738	30.9	LOS C	11.0	78.0	NA	NA	NA	37.7
		HV	4		4		0.738	30.9	LOS C	11.0	78.0	NA	NA	NA	37.7
5	T1	All MCs	353	2.0	353	2.0	* 0.738	34.6	LOS C	11.0	78.0	1.00	0.90	1.12	39.1
		LV	346		346		* 0.738	34.6	LOS C	11.0	78.0	NA	NA	NA	39.1
		HV	7		7		0.738	34.6	LOS C	11.0	78.0	NA	NA	NA	39.1
6	R2	All MCs	184	2.0	184	2.0	0.566	41.7	LOS D	3.3	23.4	1.00	0.79	1.05	35.0
		LV	181		181		0.566	41.7	LOS D	3.3	23.4	NA	NA	NA	35.0
		HV	4		4		0.566	41.7	LOS D	3.3	23.4	NA	NA	NA	35.0
Approach			756	2.0	756	2.0	0.738	35.3	LOS D	11.0	78.0	0.99	0.87	1.10	37.6
North: Boundary Rd															
7	L2	All MCs	151	2.0	151	2.0	0.568	19.6	LOS B	10.5	74.5	0.87	0.78	0.87	42.3
		LV	148		148		0.568	19.6	LOS B	10.5	74.5	NA	NA	NA	42.3
		HV	3		3		0.568	19.6	LOS B	10.5	74.5	NA	NA	NA	42.3
8	T1	All MCs	575	2.0	575	2.0	0.568	23.1	LOS C	10.5	74.5	0.88	0.77	0.88	44.0
		LV	563		563		0.568	23.1	LOS C	10.5	74.5	NA	NA	NA	44.0
		HV	11		11		0.568	23.1	LOS C	10.5	74.5	NA	NA	NA	44.0
9	R2	All MCs	24	2.0	24	2.0	0.074	39.1	LOS D	0.4	2.9	0.95	0.67	0.95	35.8
		LV	24		24		0.074	39.1	LOS D	0.4	2.9	NA	NA	NA	35.8
		HV	0		0		0.074	39.1	LOS D	0.4	2.9	NA	NA	NA	35.8
Approach			749	2.0	749	2.0	0.568	22.9	LOS C	10.5	74.5	0.88	0.76	0.88	43.4
West: Old Pitt Town Rd															
10	L2	All MCs	29	2.0	29	2.0	0.405	24.7	LOS C	4.5	31.7	0.93	0.75	0.93	39.5
		LV	29		29		0.405	24.7	LOS C	4.5	31.7	NA	NA	NA	39.5
		HV	1		1		0.405	24.7	LOS C	4.5	31.7	NA	NA	NA	39.5
11	T1	All MCs	252	2.0	252	2.0	0.405	29.6	LOS C	4.5	31.7	0.93	0.75	0.93	40.8
		LV	247		247		0.405	29.6	LOS C	4.5	31.7	NA	NA	NA	40.8
		HV	5		5		0.405	29.6	LOS C	4.5	31.7	NA	NA	NA	40.8
12	R2	All MCs	107	2.0	107	2.0	* 0.660	42.6	LOS D	3.9	27.9	1.00	0.84	1.14	34.7

	LV	105	105	* 0.660	42.6	LOS D	3.9	27.9	NA	NA	NA	34.7		
	HV	2	2	0.660	42.6	LOS D	3.9	27.9	NA	NA	NA	34.7		
Approach		388	2.0	388	2.0	0.660	32.8	LOS C	4.5	31.7	0.95	0.77	0.99	38.8
All Vehicles		2974	2.0	2974	2.0	0.738	28.9	LOS C	14.3	101.5	0.94	0.82	0.98	40.4

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)

INTERSECTION SUMMARY

 Site: 101v [Boundary_Old Pitt Town_AM 2036 + Dev_Upgrade
(Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles:	All MCs	Persons
Travel Speed (Average)	km/h	36.2	36.2 km/h
Travel Distance (Total)	veh-km/h	3701.5	4441.8 pers-km/h
Travel Time (Total)	veh-h/h	102.2	122.6 pers-h/h
Desired Speed	km/h	60.0	
Speed Efficiency		0.60	
Travel Time Index		5.60	
Congestion Coefficient		1.66	
Demand Flows (Total)	veh/h	3612	4334 pers/h
Arrival Flows (Total)	veh/h	3612	
Percent Heavy Vehicles (Demand)	%	2.0	
Percent Heavy Vehicles (Arrivals)	%	2.0	
Degree of Saturation		0.890	
Practical Spare Capacity	%	1.1	
Effective Intersection Capacity	veh/h	4057	
Control Delay (Total)	veh-h/h	39.54	47.44 pers-h/h
Control Delay (Average)	sec	39.4	39.4 sec
Control Delay (Worst Lane by MC)	sec	50.4	
Control Delay (Worst Movement by MC)	sec	50.4	50.4 sec
Geometric Delay (Average)	sec	2.1	
Stop-Line Delay (Average)	sec	37.3	
Idling Time (Average)	sec	31.0	
Intersection Level of Service (LOS)		LOS D	
95% Back of Queue - Veh (Worst Lane)	veh	26.4	
95% Back of Queue - Dist (Worst Lane)	m	187.7	
Ave. Que Storage Ratio (Worst Lane)		0.23	
Effective Stops (Total)	veh/h	3440	4128 pers/h
Effective Stop Rate		0.95	0.95
Proportion Queued		0.97	0.97
Performance Index		293.5	293.5
Cost (Total)	\$/h	4549.33	4549.33 \$/h
Fuel Consumption (Total)	L/h	377.1	
Carbon Dioxide (Total)	kg/h	890.6	
Hydrocarbons (Total)	kg/h	0.080	
Carbon Monoxide (Total)	kg/h	0.97	
NOx (Total)	kg/h	0.969	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Intersection LOS value for Vehicles is 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.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.

In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %

Number of Iterations: 2 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 0.0% 13.4% 0.0%

Intersection Performance - Annual Values			
Performance Measure	Vehicles:	All MCs	Persons
Demand Flows (Total)	veh/y	1,733,558	2,080,270 pers/y
Delay (Total)	veh-h/y	18,977	22,773 pers-h/y
Effective Stops (Total)	veh/y	1,651,313	1,981,576 pers/y
Travel Distance (Total)	veh-km/y	1,776,714	2,132,057 pers-km/y

Travel Time (Total)	veh-h/y	49,044	58,853 pers-h/y
Cost (Total)	\$/y	2,183,676	2,183,676 \$/y
Fuel Consumption (Total)	L/y	181,009	
Carbon Dioxide (Total)	kg/y	427,510	
Hydrocarbons (Total)	kg/y	38	
Carbon Monoxide (Total)	kg/y	467	
NOx (Total)	kg/y	465	

1 Hours per Year: 480 (Site)

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Project: Z:\2022 Projects\PT22014 - The Gables Rezoning\SIDRA\PT22014_V4.sip9

MOVEMENT SUMMARY

 Site: 101v [Boundary_Old Pitt Town_AM 2036 + Dev_Upgrade
(Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%				[Veh. veh	Dist] m				km/h
South: Boundary Rd															
1	L2	All MCs	71	2.0	71	2.0	0.548	16.7	LOS B	11.5	81.7	0.87	0.76	0.87	41.6
		LV	69		69		0.548	16.7	LOS B	11.5	81.7	NA	NA	NA	41.6
		HV	1		1		0.548	16.7	LOS B	11.5	81.7	NA	NA	NA	41.6
2	T1	All MCs	642	2.0	642	2.0	0.548	25.2	LOS C	11.5	82.0	0.87	0.75	0.87	43.0
		LV	629		629		0.548	25.2	LOS C	11.5	82.0	NA	NA	NA	43.0
		HV	13		13		0.548	25.2	LOS C	11.5	82.0	NA	NA	NA	43.0
3	R2	All MCs	267	2.0	267	2.0	0.805	50.4	LOS D	5.8	41.4	1.00	0.94	1.31	32.4
		LV	262		262		0.805	50.4	LOS D	5.8	41.4	NA	NA	NA	32.4
		HV	5		5		0.805	50.4	LOS D	5.8	41.4	NA	NA	NA	32.4
Approach			980	2.0	980	2.0	0.805	31.4	LOS C	11.5	82.0	0.91	0.80	0.99	39.4
East: Old Pitt Town Rd															
4	L2	All MCs	263	2.0	263	2.0	0.800	39.9	LOS D	13.1	93.1	1.00	0.93	1.17	34.8
		LV	258		258		0.800	39.9	LOS D	13.1	93.1	NA	NA	NA	34.8
		HV	5		5		0.800	39.9	LOS D	13.1	93.1	NA	NA	NA	34.8
5	T1	All MCs	254	2.0	254	2.0	0.800	43.6	LOS D	13.1	93.1	1.00	0.94	1.23	35.7
		LV	249		249		0.800	43.6	LOS D	13.1	93.1	NA	NA	NA	35.7
		HV	5		5		0.800	43.6	LOS D	13.1	93.1	NA	NA	NA	35.7
6	R2	All MCs	111	2.0	111	2.0	0.179	37.6	LOS D	1.9	13.6	0.90	0.73	0.90	36.4
		LV	108		108		0.179	37.6	LOS D	1.9	13.6	NA	NA	NA	36.4
		HV	2		2		0.179	37.6	LOS D	1.9	13.6	NA	NA	NA	36.4
Approach			627	2.0	627	2.0	0.800	41.0	LOS D	13.1	93.1	0.98	0.90	1.15	35.4
North: Boundary Rd															
7	L2	All MCs	202	2.0	202	2.0	* 0.888	30.4	LOS C	26.4	187.7	1.00	1.06	1.25	35.5
		LV	198		198		* 0.888	30.4	LOS C	26.4	187.7	NA	NA	NA	35.5
		HV	4		4		0.888	30.4	LOS C	26.4	187.7	NA	NA	NA	35.5
8	T1	All MCs	960	2.0	960	2.0	0.888	40.8	LOS D	26.4	187.7	1.00	1.07	1.25	36.8
		LV	941		941		0.888	40.8	LOS D	26.4	187.7	NA	NA	NA	36.8
		HV	19		19		0.888	40.8	LOS D	26.4	187.7	NA	NA	NA	36.8
9	R2	All MCs	117	2.0	117	2.0	0.352	45.0	LOS D	2.3	16.3	0.98	0.75	0.98	33.8
		LV	115		115		0.352	45.0	LOS D	2.3	16.3	NA	NA	NA	33.8
		HV	2		2		0.352	45.0	LOS D	2.3	16.3	NA	NA	NA	33.8
Approach			1279	2.0	1279	2.0	0.888	39.5	LOS D	26.4	187.7	1.00	1.04	1.23	36.3
West: Old Pitt Town Rd															
10	L2	All MCs	85	2.0	85	2.0	* 0.890	43.6	LOS D	11.2	79.5	1.00	1.07	1.43	32.5
		LV	84		84		* 0.890	43.6	LOS D	11.2	79.5	NA	NA	NA	32.5
		HV	2		2		0.890	43.6	LOS D	11.2	79.5	NA	NA	NA	32.5
11	T1	All MCs	377	2.0	377	2.0	0.890	49.7	LOS D	11.2	79.5	1.00	1.06	1.44	33.6
		LV	369		369		0.890	49.7	LOS D	11.2	79.5	NA	NA	NA	33.6
		HV	8		8		0.890	49.7	LOS D	11.2	79.5	NA	NA	NA	33.6
12	R2	All MCs	263	2.0	263	2.0	0.853	48.6	LOS D	11.6	82.6	1.00	1.00	1.31	32.9

	LV	258		258		0.853	48.6	LOS D	11.6	82.6	NA	NA	NA	32.9
	HV	5		5		0.853	48.6	LOS D	11.6	82.6	NA	NA	NA	32.9
Approach		725	2.0	725	2.0	0.890	48.6	LOS D	11.6	82.6	1.00	1.04	1.39	33.2
All Vehicles		3612	2.0	3612	2.0	0.890	39.4	LOS D	26.4	187.7	0.97	0.95	1.18	36.2

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)

INTERSECTION SUMMARY

 Site: 101v [Boundary_Old Pitt Town_PM 2036 + Dev_Upgrade
(Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 70 seconds (Site Practical Cycle Time)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles:	All MCs	Persons
Travel Speed (Average)	km/h	40.4	40.4 km/h
Travel Distance (Total)	veh-km/h	3047.1	3656.5 pers-km/h
Travel Time (Total)	veh-h/h	75.4	90.5 pers-h/h
Desired Speed	km/h	60.0	
Speed Efficiency		0.67	
Travel Time Index		6.37	
Congestion Coefficient		1.49	
Demand Flows (Total)	veh/h	2974	3568 pers/h
Arrival Flows (Total)	veh/h	2974	
Percent Heavy Vehicles (Demand)	%	2.0	
Percent Heavy Vehicles (Arrivals)	%	2.0	
Degree of Saturation		0.738	
Practical Spare Capacity	%	21.9	
Effective Intersection Capacity	veh/h	4029	
Control Delay (Total)	veh-h/h	23.90	28.68 pers-h/h
Control Delay (Average)	sec	28.9	28.9 sec
Control Delay (Worst Lane by MC)	sec	42.6	
Control Delay (Worst Movement by MC)	sec	42.6	42.6 sec
Geometric Delay (Average)	sec	2.1	
Stop-Line Delay (Average)	sec	26.9	
Idling Time (Average)	sec	22.0	
Intersection Level of Service (LOS)		LOS C	
95% Back of Queue - Veh (Worst Lane)	veh	14.3	
95% Back of Queue - Dist (Worst Lane)	m	101.5	
Ave. Que Storage Ratio (Worst Lane)		0.12	
Effective Stops (Total)	veh/h	2427	2912 pers/h
Effective Stop Rate		0.82	0.82
Proportion Queued		0.94	0.94
Performance Index		197.5	197.5
Cost (Total)	\$/h	3403.84	3403.84 \$/h
Fuel Consumption (Total)	L/h	295.0	
Carbon Dioxide (Total)	kg/h	696.8	
Hydrocarbons (Total)	kg/h	0.061	
Carbon Monoxide (Total)	kg/h	0.78	
NOx (Total)	kg/h	0.765	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Intersection LOS value for Vehicles is 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.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.

In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %

Number of Iterations: 2 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 0.0% 3.3% 0.0%

Intersection Performance - Annual Values			
Performance Measure	Vehicles:	All MCs	Persons
Demand Flows (Total)	veh/y	1,427,369	1,712,843 pers/y
Delay (Total)	veh-h/y	11,471	13,765 pers-h/y
Effective Stops (Total)	veh/y	1,164,998	1,397,997 pers/y
Travel Distance (Total)	veh-km/y	1,462,603	1,755,124 pers-km/y

Travel Time (Total)	veh-h/y	36,214	43,457 pers-h/y
Cost (Total)	\$/y	1,633,844	1,633,844 \$/y
Fuel Consumption (Total)	L/y	141,588	
Carbon Dioxide (Total)	kg/y	334,453	
Hydrocarbons (Total)	kg/y	29	
Carbon Monoxide (Total)	kg/y	372	
NOx (Total)	kg/y	367	

1 Hours per Year: 480 (Site)

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