Attachment A27

Addendum to transport impact assessment

31 July 2026

Strategic Planning and Urban Design
City of Sydney Council
465 Kent Street
Sydney

ATTN: Sally Peters, James Dirickx-Jones

Dear Sally, James

Response to TfNSW Comments on Porte Cochere removal – PP-2025-550 – 150 Day Street, Sydney

The response provided in this letter is in addition to our intial agency response provided on 2 June 2026 and follows our meeting with the City of Sydney and TfNSW on 3 July 2026 where the following matters were discussed:

- **Removal of Porte Cochere** – TfNSW raised concern for the removal of the existing porte cochere and reliance for on-street pick-up/drop-off on Day Street, which is under the ownership/management of TfNSW. In particular, TfNSW raised concern regarding:
    - Potential for queing of traffic onto Bathurst Street,
    - Ability for vehicles to occupy and safely pass vehicles occupying pick-up/drop-off bays, and
    - Potential redevelopment of Day Street and the need to consider alternative arrangements in such a circumstance (*Note: TfNSW confirmed in the meeting there are currently no future plans to redesign Day Street in the future*).
- **SIDRA Modelling** – updates required to:
    - model to correct intersection cycle times,
    - compare 'with development' and 'without development' scenarios for 2034,
    - correct modelling to show no turn from Day Street to Bathurst Street (West).

These items are discussed in further detail below and supported by PTC's TfNSW Response dated 30 July 2026 which is provided under separate cover.

1. Removal of Porte Cochere

(a) Reasons for Pote Cochere removal and alternatives considered

Noting the adapative reuse of the existing base building, significant strengthening to the column structure is required to accomodate the verticle extension as well as additional servicing (lift and utilities) back of house and lobby space to cater for the additional hotel rooms and dual hotel offering at the site. Consequently, the removal of the existing porte cochere is required to enable the adaptive reuse and hotel extension above. Furthermore, the removal of the porte cochere will achieve an improved urban design outcome by removing car parking access infrastructure and creating a more permeable and active ground floor plane.

As discussed with TfNSW, use of the basement for pick-up/drop-off was considered following TfNSW feedback, however due to the adaptive reuse of the existing basement levels and flood constraints, this was not considered a viable option. At present, the basement is operated as a valet service only due to the constrained nature of the basement level. With significant strengtheing of coloumns, removal of exit ramp and porte cochere to accommodate hotel needs (as described above), single lane access, and to mitigate flood risks, the basement was deemed unsuitable for public access pick-up/drop-off.

With particular regard to existing flood conditions, public use of the basement level is strongly discouraged noting the shelter in place flood emergency response required for the site. Further details of the development's preliminary flood emergency Managemennt Plan and Shelter in Place Flood response strategy is detailed within TTW's Flood Impact and Risk Assessment.

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(b) Possibility of queing traffic onto Bathurst Street – Poisson Distribution Analysis

A Poisson Distribution Analysis has been prepared by PTC to assess the capacity of the proposed hotel drop-off bays and potential queing to accommodate forecast demand.

For the analysis, PTC have considered a worst case scenario being ‘2034 AM peak hour with proposed development’ being:

- 2034 AM peak traffic with proposed development – 45 vehicles
- The proposed drop-off area accommodates 4 vehicles, with each space having a length of 5.4 metres.
- Analysis Time period – 60 minutes
- Drop-off Service Time – 120seconds (A service time of 120 seconds per vehicle has been adopted to reflect typical hotel drop-off operations, including passenger alighting, luggage handling, and vehicle manoeuvring within the drop-off area. Vehicle arrivals are assumed to occur randomly throughout the AM peak hour.)

Based on the results of the Poisson distribution analysis, a maximum of four vehicles is expected to occupy the proposed drop-off bays at a 95% confidence level, with no vehicles expected to queue.

For robustness, a 5 minute service time was also considered which demonstrates a maximum of two vehicles queueing at 95% confidence level. As shown in **Figure 1** below, approximately 50 metres of queing space (approximately 8 car spaces – 6m per vehicle) is also available withing the existing road design. Moreover, an existing taxi zone capable of accommodating 3 taxi vehicles is already provided on Day Street providing additional queing capacity.

Acccordingly, the assessment confirms that the proposed drop-off bays have adequate capacity to accommodate the expected traffic demand at typical and highly conservative service times which can be suitably managed by way of a future Operational Traffic Management Plan at DA stage.

It should also be noted that this analysis is based on existing circumstances only and opportunities to improve vehicle movements is capable of being considered should this be required by TfNSW.

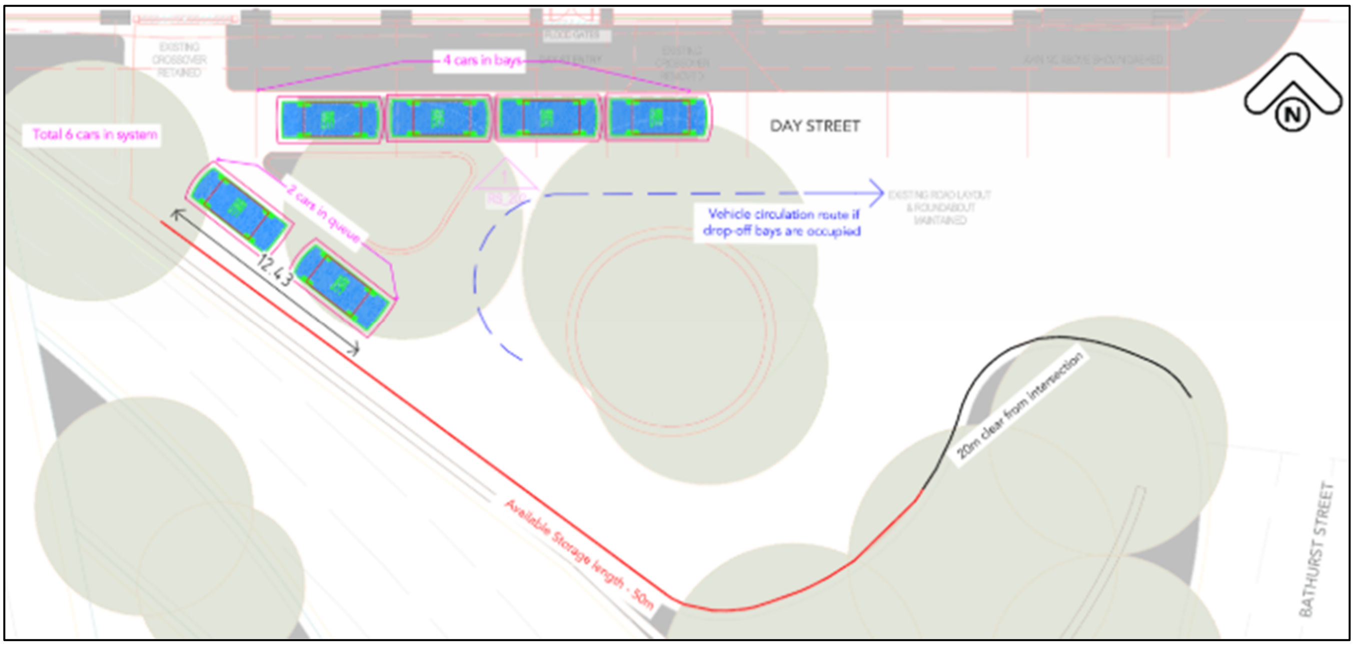

Figure 1 - Available Queue Storage for the Proposed Hotel Drop-off Bay
Source: PTC

(c) Ability to safely pass pick-up/drop-off bays

As shown by the blue dashed line in Figure 1, cars at the rear of the potential queue have the ability to exit the queue and pass proposed parking bays. This arrangement reflects existing circumstances and typical hotel operations where some arriving guests will arrive without luggage and simply exit the vehicle in a matter of seconds.

(d) Precedent Examples and current functional use of Day Street

On street pick-up/drop-off from local streets within the City of Sydney is a common occurrence where on site porte cochere or basement is not appropriate. Such examples include but are not limited to:

- 372-382A Pitt Street, Sydney
- 757-763 George Street, Haymarket
- 24 Loftus Street, Sydney (Capella)
- 203 Castlereagh Street, Sydney (The Porter House Hotel)
- 339 Pitt Street, Sydney (Kimpton Margot Sydney)
- 47-53 Wentworth Avenue, Sydney (Ace Hotel Sydney)
- 65 Sussex Street, Sydney (West Hotel Sydney)
- 26 Clarence Street, Sydney (Little Nation Sydney)
- 412 Pitt Street, Haymarket (Hotel Morris)

This approach is reinforced by the *Central Sydney On-Street Parking Policy*, which expressly supports the provision of kerbside pick-up/drop-off, taxi zones and short-stay parking to support hotel operations.

As Day Street is a local road which effectively services 150 Day Street (north of Bathurst Street) exclusively, the provision of kerb-side pick-up/drop-off can be accomodated and is suitable in this circumstance, particuarly noting TfNSW have no future/alternative plan for Day Street.

(e) Conclusion

As established above, the removal of the existing porte cochere is necessary to accommodate the substantive adaptive reuse development.

Poisson Distribution Analysis undertaken by PTC demonstrates that under a worst case scenario, a maximum of four vehicles is expected to occupy the proposed drop-off bays at a 95% confidence level, with no vehicles expected to queue (120 second service time). Notwithstanding, the existing road design is capable of accommodating up to 8 queued vehicles in addition to an existing taxi bay capable of accomodating up to 3 taxi vehicles. Accordingly, the traffic demand generated by the development is not considered to have adverse impacts on the Day/Bathurst Street intersection.

In an unlikely queing event, sufficient space is available to enable vehicles to pass any queued/parked vehicles associated with the future development.

On street pick-up/drop off is a common occurrence on local streets within the City of Sydney. With regard to the many precedent examples within the City of Sydney, the propsoed on-street pick-up/drop-off arrangement is suitable for the site.

2. SIDRA Modelling

SIDRA modelling has been updated in accordance with TfNSW comments as provided within PTC's response provided under separate cover. Overall, the amendments to SIDRA modelling were recognised to be minor and do not change the conclusions presented previously.

Conclusion

We trust the above adeuately considers the matters raised by TfNSW. Should you wish to discuss any aspect of the above further, please do not hesitate to contact me at jrixon@mecone.com.au.

Yours sincerely

Jack Rixon
Associate

30th July 2026

Transport for New South Wales (TfNSW)

1. 150 Day Street – Response to TfNSW

This letter has been prepared by **ptc.** on behalf of UOL in response to the TfNSW comments regarding the SIDRA modelling of the Bathurst Street / Day Street intersection and the potential impact of queueing associated with the proposed hotel drop-off bays for the proposed development at 150 Day Street, Sydney.

TfNSW *comments* and **ptc.** responses are provided below.

1.1. TfNSW comment

The SIDRA movement summaries provided for 2024 (without development) modelling scenario indicates cycle time of 120-125 seconds have been adopted. However, the Bathurst Street/ Day Street signalised intersection (TCS 2331) currently operates at 110 seconds. SIDRA models should be updated accordingly.

<u>ptc. response</u>

The SIDRA models have been updated to reflect the existing 110 second traffic signal cycle time at the Bathurst Street / Day Street intersection.

The updated SIDRA movement summaries are provided in Attachment 1.

1.2. TfNSW comment

The SIDRA movement summaries have been provided for 2024 (without development) and 2034 (with development) modelling scenarios. Outputs for the 2034 (without development) scenario should also be provided to enable relative comparison between 'with development' and 'without development' scenarios in 2034. Furthermore, Day Street (North) does not permit right-turn out to Bathurst Street (West) and Day Street (Southwest) does not permit left-turn out to Bathurst Street (West). SIDRA models should be updated to restrict these movements and allow through-traffic movements on these approaches.

<u>ptc. response</u>

The turning movements within the SIDRA model were already consistent with the existing traffic restrictions. However, the intersection geometry has been updated to accurately reflect the existing road layout. The updated movement summaries for the existing, 2034 without development, and 2034 with development scenarios are provided in Attachment 1.

The updated SIDRA results indicate that the 95th percentile queue on Day Street during the AM peak hour increases marginally from approximately 1.4 vehicles (9.8 m) in the '2034 without development' scenario to 1.8 vehicles (12.6 m) in the '2034 with development scenario'. This represents a minor increase in queue length (2.8m / cars), indicating that the proposed development has a negligible impact on the operation of the Bathurst Street / Day Street intersection, as previously presented.

1.3. TfNSW comment

It is recommended the applicant demonstrate that the proposed bays have sufficient capacity to accommodate the future demand, considering peak demands and queuing impacts.

<u>ptc. response</u>

A queueing analysis has been undertaken to assess the capacity of the proposed hotel drop-off bays to accommodate the forecast demand.

The following inputs and assumptions have been adopted based on the worst-case demand scenario, being the '2034 AM peak hour with proposed development':

- 2034 AM peak traffic with proposed development – 45 vehicles
- The proposed drop-off area accommodates 4 vehicles, with each space having a length of 5.4 metres.
- Analysis Time period – 60minutes
- Drop-off Service Time – Two service times have been adopted to assess both typical and robust hotel drop-off operations:
    1. 2 minutes – A service time of 2 minutes has been adopted to reflect the typical hotel operations.
    2. 5 minutes - A service time of 5 minutes per vehicle has been adopted to reflect a robust assessment of the hotel drop-off operations, including passenger alighting, luggage handling, and vehicle manoeuvring within the drop-off area. Vehicle arrivals are assumed to occur randomly throughout the AM peak hour.

For the purposes of this analysis, a Poisson distribution has been adopted to analyse the queueing system based on the arrival rate, departure rate and service time.

A summary of the queueing analysis is shown in Table 1.

Table 1: Queueing Analysis Summary from Poisson Distribution

Model	Vehicle Arrivals	Inputs		Outputs	
		Time period (mins)	Service time (secs)	95% confidence	
				Cars in system	Cars queueing
2034 AM peak hour with proposed development – Hotel Drop-off	45 vehicles	60minutes	2 minutes	4	0
			5 minutes	6	2

Using these inputs, the Poisson distribution analysis indicates that, under the typical hotel drop-off operation assuming a 2-minute service time, all forecast vehicles can be accommodated within the four proposed drop-off bays, with no queueing expected. A further assessment was undertaken using a conservative 5-minute service time to represent a worst-case scenario where all 45 forecast hotel drop-off vehicles arrive during the AM peak hour and occupy a drop-off bay for 5 minutes. Under this scenario, the proposed drop-off bays are expected to be fully occupied, with up to two vehicles queueing at the 95% confidence level.

It is noted that the distance from the rear of the fourth drop-off bay to a point 20 metres clear of the Bathurst Street / Day Street intersection is approximately 50 metres, providing storage for approximately eight vehicles (based on 6m per vehicle). Under the 5 minute service time, a maximum queue of two vehicles is expected beyond the proposed drop-off bays, the available storage length is more than sufficient to accommodate the forecast demand without affecting the operation of the Bathurst Street / Day Street intersection. Accordingly, the assessment confirms that the proposed drop-off bays have adequate capacity to accommodate the expected traffic demand.

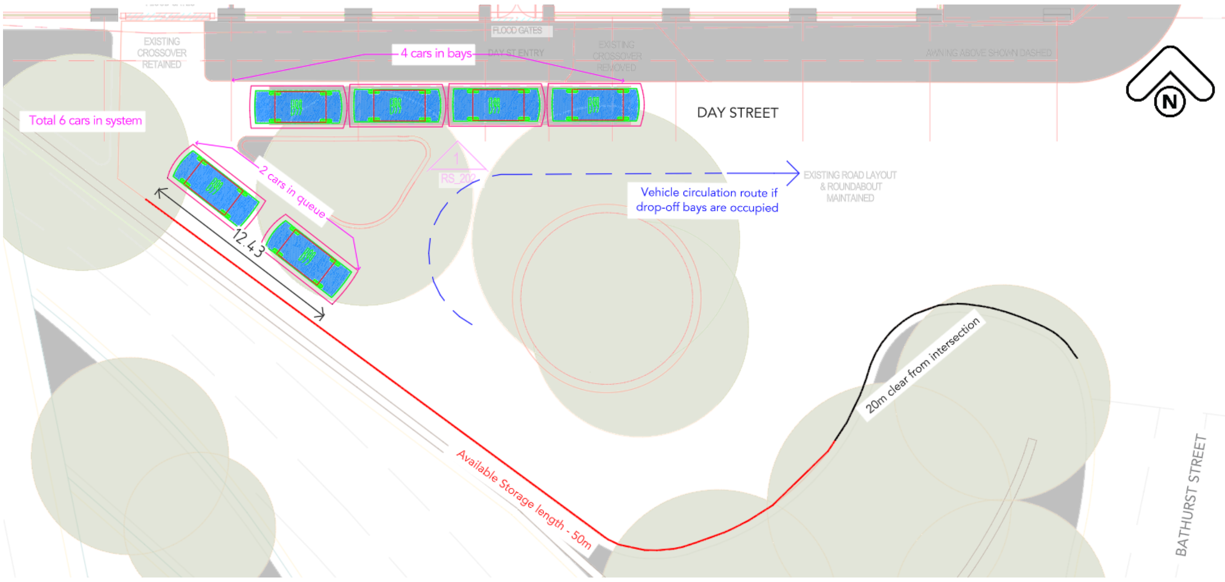

Figure 1: Available Queue Storage for the Proposed Hotel Drop-off Bays (5-minute service time)

Based on the assessment, no queueing is expected under the typical 2-minute service time. Under the worst-case scenario assuming a 5-minute service time, the available queue storage significantly exceeds the forecast maximum queue demand of two vehicles as shown in Figure 1. Furthermore, cars at the rear of the potential queue have the ability to exit the queue by following the blue dashed line in Figure 1, which reflects typical hotel operations where some arriving guests will arrive without luggage and simply exit the vehicle in a matter of seconds.

Accordingly, the proposed hotel drop-off bays have sufficient capacity to accommodate the forecast demand, and the likelihood of vehicle queues extending back to or affecting the operation of the Bathurst Street / Day Street intersection is considered negligible.

The detailed results of the drop-off queueing analysis for both the service times are provided in Attachment 2.

Yours faithfully

Priya Baaskaraun

Traffic Engineer

Document Control: Prepared by *PB* on *28 July 2026*. Reviewed by *DP* on *30 July 2026*

Attachment 1. SIDRA Modelling Results

MOVEMENT SUMMARY

Site: 2331 [2024 AM Bathurst Street/ Day Street (Site Folder: 2024 AM Existing Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Network: N101 [2024 Existing AM Peak (Network Folder: Existing Scenario_95th Queue)]

2024 AM Bathurst Street/ Day Street_Existing
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 110 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Day Street															
2	T1	All MCs	18	0.0	18	0.0	0.698	40.2	LOS C	5.0	36.4	1.00	0.87	1.08	4.5
3	R2	All MCs	215	4.9	214	4.8	* 0.698	64.4	LOS E	7.6	55.5	1.00	0.86	1.06	2.6
Approach			233	4.5	232	4.4	0.698	62.5	LOS E	7.6	55.5	1.00	0.87	1.06	2.8
East: Bathurst Street															
4	L2	All MCs	18	11.8	18	11.8	0.116	47.4	LOS D	1.0	7.7	1.00	0.71	1.00	4.9
6	R2	All MCs	2	0.0	2	0.0	* 0.116	67.7	LOS E	1.0	7.7	1.00	0.71	1.00	6.9
Approach			20	10.5	20	10.5	0.116	49.5	LOS D	1.0	7.7	1.00	0.71	1.00	5.1
North: Day Street															
7	L2	All MCs	24	0.0	24	0.0	0.246	54.6	LOS D	1.3	8.9	0.94	0.73	0.94	3.4
8	T1	All MCs	16	0.0	16	0.0	0.116	46.2	LOS D	0.8	5.4	0.90	0.65	0.90	4.0
Approach			40	0.0	40	0.0	0.246	51.3	LOS D	1.3	8.9	0.93	0.70	0.93	3.6
West: Bathurst Street															
10	L2	All MCs	15	14.3	10	14.6	0.671	26.4	LOS B	7.2	52.2	0.83	0.74	0.83	8.9
11	T1	All MCs	1494	3.5	1051	3.6	* 0.671	23.5	LOS B	7.3	52.2	0.83	0.75	0.83	6.3
12	R2	All MCs	165	0.0	116	0.0	0.671	26.7	LOS B	7.3	52.2	0.85	0.76	0.85	6.2
Approach			1674	3.3	1178	3.3	0.671	23.8	LOS B	7.3	52.2	0.84	0.75	0.84	6.4
All Vehicles			1966	3.4	1470	4.6	0.698	31.0	LOS C	7.6	55.5	0.87	0.76	0.88	5.1

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Day Street											
P1	Full	252	49.7	LOS E	0.8	0.8	0.96	0.96	203.5	200.0	0.98
East: Bathurst Street											
P2	Full	383	50.0	LOS E	1.2	1.2	0.96	0.96	216.6	200.0	0.92

All Pedestrians	635	49.9	LOS E	1.2	1.2	0.96	0.96	211.4	200.0	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2331 [2024 PM Bathurst Street/ Day Street (Site Folder: 2024 PM Existing Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Network: N101 [2024 Existing PM Peak (Network Folder: Existing Scenario_95th Queue)]

2024 PM Bathurst Street/ Day Street_Existing
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 110 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Day Street															
2	T1	All MCs	8	0.0	8	0.0	0.574	35.3	LOS C	5.0	35.0	1.00	0.83	1.01	4.7
3	R2	All MCs	204	1.0	204	1.0	* 0.574	61.5	LOS E	6.9	48.7	1.00	0.83	1.00	2.7
Approach			213	1.0	212	1.0	0.574	60.5	LOS E	6.9	48.7	1.00	0.83	1.00	2.8
East: Bathurst Street															
4	L2	All MCs	39	5.4	39	5.4	0.174	43.2	LOS D	2.0	14.8	1.00	0.75	1.00	5.3
6	R2	All MCs	3	0.0	3	0.0	* 0.174	62.8	LOS E	2.0	14.8	1.00	0.75	1.00	7.5
Approach			42	5.0	42	5.0	0.174	44.7	LOS D	2.0	14.8	1.00	0.75	1.00	5.5
North: Day Street															
7	L2	All MCs	13	0.0	13	0.0	0.089	51.0	LOS D	0.6	4.4	0.91	0.69	0.91	3.6
8	T1	All MCs	11	10.0	11	10.0	0.040	42.9	LOS D	0.5	3.7	0.88	0.61	0.88	4.3
Approach			23	4.5	23	4.5	0.089	47.3	LOS D	0.6	4.4	0.90	0.65	0.90	3.9
West: Bathurst Street															
10	L2	All MCs	15	7.1	14	7.4	0.506	25.5	LOS B	7.2	52.2	0.74	0.66	0.74	9.1
11	T1	All MCs	1007	3.6	924	3.7	* 0.506	25.9	LOS B	7.3	52.2	0.81	0.69	0.81	5.9
12	R2	All MCs	33	0.0	30	0.0	0.506	32.0	LOS C	7.3	52.2	0.87	0.73	0.87	5.3
Approach			1055	3.5	968	3.6	0.506	26.1	LOS B	7.3	52.2	0.81	0.69	0.81	5.9
All Vehicles			1333	3.2	1245	3.4	0.574	33.0	LOS C	7.3	52.2	0.85	0.72	0.85	4.9

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Day Street											
P1	Full	252	49.7	LOS E	0.8	0.8	0.96	0.96	203.5	200.0	0.98
East: Bathurst Street											
P2	Full	383	50.0	LOS E	1.2	1.2	0.96	0.96	216.6	200.0	0.92

All Pedestrians	635	49.9	LOS E	1.2	1.2	0.96	0.96	211.4	200.0	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2331 [2034 AM Bathurst Street/ Day Street (Site Folder: 2034 AM Future Do Minimum_Signal Optimise)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Network: N101 [2034 Future AM Peak (Network Folder: Future Do Minimum_95th Queue_Signal Optimise)]

2024 AM Bathurst Street/ Day Street_Existing
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 110 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Day Street															
2	T1	All MCs	20	0.0	20	0.0	0.619	36.9	LOS C	6.3	45.2	1.00	0.85	1.02	4.8
3	R2	All MCs	242	4.8	240	4.7	* 0.619	62.0	LOS E	7.6	55.5	1.00	0.85	1.01	2.7
Approach			262	4.4	260	4.3	0.619	60.1	LOS E	7.6	55.5	1.00	0.85	1.01	2.9
East: Bathurst Street															
4	L2	All MCs	20	10.5	20	10.5	0.113	43.9	LOS D	1.1	8.1	1.00	0.72	1.00	5.2
6	R2	All MCs	2	0.0	2	0.0	* 0.113	65.8	LOS E	1.1	8.1	1.00	0.72	1.00	7.4
Approach			22	9.5	22	9.5	0.113	46.0	LOS D	1.1	8.1	1.00	0.72	1.00	5.4
North: Day Street															
7	L2	All MCs	27	0.0	27	0.0	0.208	53.3	LOS D	1.4	9.8	0.94	0.73	0.94	3.5
8	T1	All MCs	18	0.0	18	0.0	0.133	46.4	LOS D	0.9	6.2	0.90	0.66	0.90	4.0
Approach			45	0.0	45	0.0	0.208	50.6	LOS D	1.4	9.8	0.92	0.70	0.92	3.7
West: Bathurst Street															
10	L2	All MCs	17	12.5	11	12.8	0.641	27.1	LOS B	7.2	52.2	0.81	0.73	0.81	8.7
11	T1	All MCs	1682	3.5	1064	3.6	* 0.641	28.7	LOS C	7.3	52.2	0.88	0.76	0.88	5.3
12	R2	All MCs	186	0.0	118	0.0	0.641	35.6	LOS C	7.3	52.2	0.94	0.79	0.94	4.6
Approach			1885	3.2	1192	3.3	0.641	29.4	LOS C	7.3	52.2	0.88	0.76	0.88	5.3
All Vehicles			2215	3.4	1520	4.9	0.641	35.5	LOS C	7.6	55.5	0.91	0.77	0.91	4.5

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* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Day Street											
P1	Full	252	49.7	LOS E	0.8	0.8	0.96	0.96	203.5	200.0	0.98
East: Bathurst Street											
P2	Full	383	50.0	LOS E	1.2	1.2	0.96	0.96	216.6	200.0	0.92

All Pedestrians	635	49.9	LOS E	1.2	1.2	0.96	0.96	211.4	200.0	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2331 [2034 PM Bathurst Street/ Day Street (Site Folder: 2034 PM Future Do Minimum_Signal Optimise)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Network: N101 [2034 Future PM Peak (Network Folder: Future Do Minimum_95th Queue_Signal Optimise)]

2024 PM Bathurst Street/ Day Street_Existing
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 110 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Day Street															
2	T1	All MCs	9	0.0	9	0.0	0.558	34.9	LOS C	5.5	38.8	1.00	0.83	1.00	4.8
3	R2	All MCs	229	0.9	229	0.9	* 0.558	60.4	LOS E	7.7	54.2	1.00	0.84	1.00	2.7
Approach			239	0.9	238	0.9	0.558	59.4	LOS E	7.7	54.2	1.00	0.84	1.00	2.8
East: Bathurst Street															
4	L2	All MCs	43	4.9	43	4.9	0.175	42.0	LOS C	2.2	16.1	1.00	0.75	1.00	5.4
6	R2	All MCs	3	0.0	3	0.0	* 0.175	63.9	LOS E	2.2	16.1	1.00	0.75	1.00	7.7
Approach			46	4.5	46	4.5	0.175	43.5	LOS D	2.2	16.1	1.00	0.75	1.00	5.6
North: Day Street															
7	L2	All MCs	15	0.0	15	0.0	0.088	53.3	LOS D	0.7	5.2	0.94	0.69	0.94	3.5
8	T1	All MCs	12	9.1	12	9.1	0.047	44.0	LOS D	0.5	4.1	0.89	0.62	0.89	4.2
Approach			26	4.0	26	4.0	0.088	49.2	LOS D	0.7	5.2	0.92	0.66	0.92	3.8
West: Bathurst Street															
10	L2	All MCs	17	6.3	14	6.6	0.538	27.4	LOS B	7.2	52.2	0.78	0.69	0.78	8.7
11	T1	All MCs	1135	3.5	962	3.7	* 0.538	28.0	LOS B	7.2	52.2	0.84	0.72	0.84	5.5
12	R2	All MCs	37	0.0	31	0.0	0.538	34.0	LOS C	7.2	52.2	0.90	0.75	0.90	5.0
Approach			1188	3.5	1007	3.7	0.538	28.1	LOS B	7.2	52.2	0.84	0.72	0.84	5.5
All Vehicles			1500	3.1	1318	3.5	0.558	34.7	LOS C	7.7	54.2	0.88	0.74	0.88	4.7

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Day Street											
P1	Full	252	49.7	LOS E	0.8	0.8	0.96	0.96	203.5	200.0	0.98
East: Bathurst Street											
P2	Full	383	50.0	LOS E	1.2	1.2	0.96	0.96	216.6	200.0	0.92

All Pedestrians	635	49.9	LOS E	1.2	1.2	0.96	0.96	211.4	200.0	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2331 [2034 AM Bathurst Street/ Day Street (Site Folder: 2034 AM Future with Development_Signal Optimise)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Network: N101 [2034 Future with Development AM Peak (Network Folder: Future with Development_95th Queue_Signal Optimise)]

2024 AM Bathurst Street/ Day Street_Existing
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Day Street															
2	T1	All MCs	26	0.0	26	0.0	0.626	37.6	LOS D	6.5	46.9	1.00	0.85	1.02	4.8
3	R2	All MCs	242	4.8	240	4.6	* 0.626	62.5	LOS E	7.6	55.5	1.00	0.85	1.01	2.7
Approach			268	4.3	266	4.2	0.626	60.0	LOS E	7.6	55.5	1.00	0.85	1.02	2.9
East: Bathurst Street															
4	L2	All MCs	20	10.5	20	10.5	0.132	42.9	LOS D	1.1	8.4	1.00	0.72	1.00	5.2
6	R2	All MCs	3	0.0	3	0.0	* 0.132	64.2	LOS E	1.1	8.4	1.00	0.72	1.00	7.4
Approach			23	9.1	23	9.1	0.132	45.8	LOS D	1.1	8.4	1.00	0.72	1.00	5.5
North: Day Street															
7	L2	All MCs	35	0.0	35	0.0	0.265	53.8	LOS D	1.8	12.6	0.95	0.74	0.95	3.5
8	T1	All MCs	22	0.0	22	0.0	0.164	46.7	LOS D	1.1	7.7	0.91	0.67	0.91	4.0
Approach			57	0.0	57	0.0	0.265	51.1	LOS D	1.8	12.6	0.93	0.71	0.93	3.7
West: Bathurst Street															
10	L2	All MCs	22	9.5	14	9.7	0.641	27.2	LOS C	7.2	52.2	0.81	0.73	0.81	8.7
11	T1	All MCs	1682	3.5	1061	3.6	* 0.641	28.7	LOS C	7.3	52.2	0.88	0.76	0.88	5.3
12	R2	All MCs	186	0.0	117	0.0	0.641	35.5	LOS D	7.3	52.2	0.94	0.79	0.94	4.6
Approach			1891	3.2	1193	3.3	0.641	29.4	LOS C	7.3	52.2	0.88	0.76	0.88	5.3
All Vehicles			2239	3.3	1539	4.9	0.641	35.7	LOS D	7.6	55.5	0.91	0.77	0.91	4.5

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Day Street											
P1	Full	252	49.7	LOS E	0.8	0.8	0.96	0.96	203.5	200.0	0.98
East: Bathurst Street											

P2 Full	383	50.0	LOS E	1.2	1.2	0.96	0.96	216.6	200.0	0.92
All Pedestrians	635	49.9	LOS E	1.2	1.2	0.96	0.96	211.4	200.0	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2331 [2034 PM Bathurst Street/ Day Street (Site Folder: 2034 PM Future with Development_Signal Optimise)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Network: N101 [2034 Future with Development PM Peak (Network Folder: Future with Development_95th Queue_Signal Optimise)]

2024 PM Bathurst Street/ Day Street_Existing
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: RoadName															
2	T1	All MCs	12	0.0	12	0.0	0.560	35.2	LOS C	5.6	39.4	1.00	0.83	1.00	4.8
3	R2	All MCs	229	0.9	229	0.9	* 0.560	60.6	LOS E	7.7	54.4	1.00	0.84	1.00	2.7
Approach			241	0.9	240	0.9	0.560	59.3	LOS E	7.7	54.4	1.00	0.84	1.00	2.8
East: Bathurst Street															
4	L2	All MCs	43	4.9	43	4.9	0.189	41.6	LOS C	2.2	16.3	1.00	0.75	1.00	5.5
6	R2	All MCs	4	0.0	4	0.0	* 0.189	63.2	LOS E	2.2	16.3	1.00	0.75	1.00	7.7
Approach			47	4.4	47	4.4	0.189	43.5	LOS D	2.2	16.3	1.00	0.75	1.00	5.7
North: Day Street															
7	L2	All MCs	18	0.0	18	0.0	0.107	53.5	LOS D	0.9	6.3	0.94	0.70	0.94	3.5
8	T1	All MCs	15	7.1	15	7.1	0.059	44.1	LOS D	0.7	5.1	0.89	0.63	0.89	4.2
Approach			33	3.2	33	3.2	0.107	49.3	LOS D	0.9	6.3	0.92	0.67	0.92	3.8
West: Bathurst Street															
10	L2	All MCs	21	5.0	18	5.3	0.541	27.4	LOS B	7.2	52.2	0.78	0.69	0.78	8.7
11	T1	All MCs	1135	3.5	962	3.7	* 0.541	28.0	LOS B	7.2	52.2	0.84	0.72	0.84	5.5
12	R2	All MCs	37	0.0	31	0.0	0.541	34.1	LOS C	7.2	52.2	0.90	0.75	0.90	5.0
Approach			1193	3.4	1011	3.6	0.541	28.2	LOS B	7.2	52.2	0.84	0.72	0.84	5.5
All Vehicles			1514	3.1	1331	3.5	0.560	34.9	LOS C	7.7	54.4	0.88	0.74	0.88	4.7

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: RoadName											
P1	Full	252	49.7	LOS E	0.8	0.8	0.96	0.96	203.5	200.0	0.98
East: Bathurst Street											

P2 Full	383	50.0	LOS E	1.2	1.2	0.96	0.96	216.6	200.0	0.92
All Pedestrians	635	49.9	LOS E	1.2	1.2	0.96	0.96	211.4	200.0	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Attachment 2. AM Peak Drop-off Queuing Model

76.66666667

100

Inputs		
Total Arriving	*45*	Cars
Time Period	*60.0*	Mins
Arrival Time	*80.0*	Seconds/Car
Service Time	*120.0*	Seconds/Car
No. of Services (N)	*4*	Spaces

***This queuing system is based on Arrival Rate Nature/Departure Rate Nature/Number of Service Channels (M/M/N) Model.**

M - Exponential Distribution

Factors that could affect your analysis:

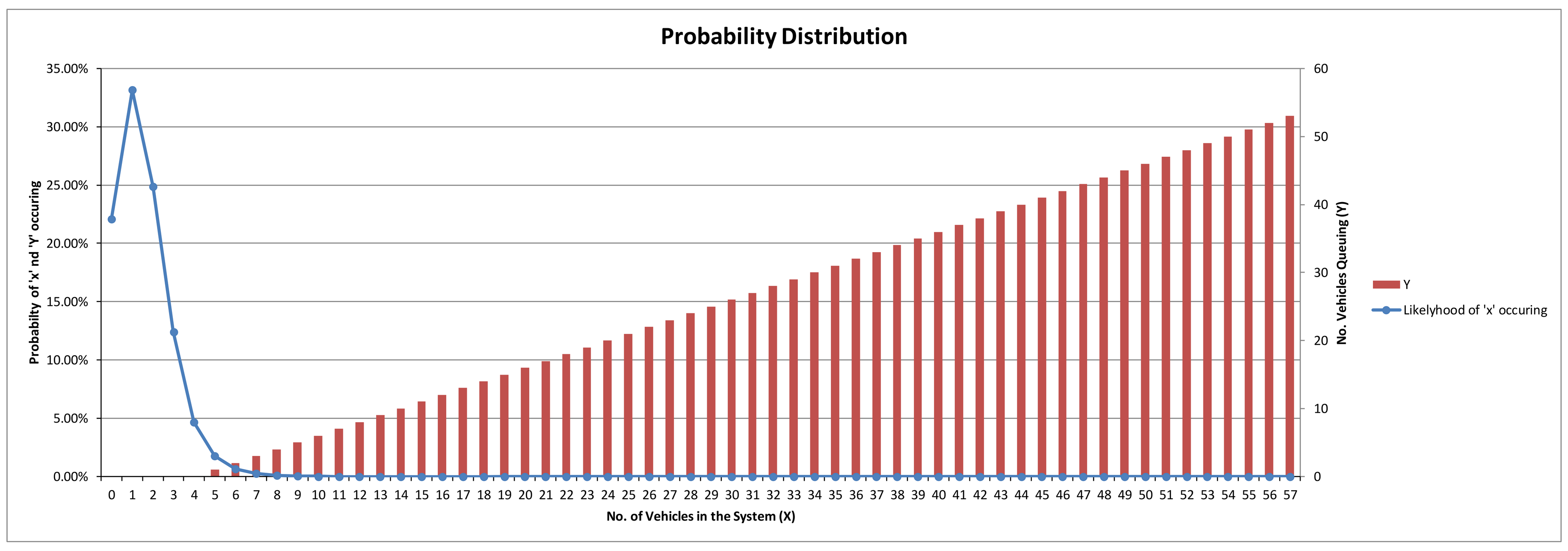
- Neighboring system
- Time-dependant variations in arrivals and departures (Peak hour effects in traffic volumes, human service rate changes)
- Breakdown in discipline (People jumping queues! More than one vehicle in a lane!)
- Time-dependent service channel variations (Grocery store counter lines)

0.061728

Model			
Arrival Rate (λ)	*0.75*	Cars/Min	*Average arrival rate
Service Rate (μ)	*0.500*	Cars/Min	*Average depature rate at each channel
ρ (= λ/μ)	*1.50*		
ρ / N	*0.38*		*Traffic Intensity < 1. If it's higher than 1 then the queue will grow without bound, please adjust inputs.
Poisson Distribution Calc based on 4 No. Spaces.	*4.19*	*0.34*	***Note: Calculation of Poisson Distribution needs to be adjusted manually when the number of service channels changes.***

iNTERPRETING THE RESULTS: **P(x) means the probability of "x" cars in the system with "y" cars are queuing**

P(X)	likihood of 'x' occuring	"x"		Y		Confidence
P(0) (Poisson Distribution)	22.10%	*0*	Car in System	*0*	Cars in queuing	77.90%
P(1) (Poisson Distribution)	33.15%	*1*	Car in System	*0*	Cars in queuing	66.85%
P(2) (Poisson Distribution)	24.86%	*2*	Cars in System	*0*	Cars in queuing	75.14%
P(3) (Poisson Distribution)	12.43%	*3*	Cars in System	*0*	Cars in queuing	87.57%
P(4) (Poisson Distribution)	4.66%	*4*	Cars in System	*0*	Cars in queuing	95.34%
P(5) (Poisson Distribution)	1.75%	*5*	Cars in System	*1*	Cars in queuing	98.25%
P(6) (Poisson Distribution)	0.66%	*6*	Cars in System	*2*	Cars in queuing	99.34%
P(7) (Poisson Distribution)	0.25%	*7*	Cars in System	*3*	Cars in queuing	99.75%
P(8) (Poisson Distribution)	0.09%	*8*	Cars in System	*4*	Cars in queuing	99.91%
P(9) (Poisson Distribution)	0.03%	*9*	Cars in System	*5*	Cars in queuing	99.97%
P(10) (Poisson Distribution)	0.01%	*10*	Cars in System	*6*	Cars in queuing	99.99%
P(11) (Poisson Distribution)	0.00%	*11*	Cars in System	*7*	Cars in queuing	100.00%
P(12) (Poisson Distribution)	0.00%	*12*	Cars in System	*8*	Cars in queuing	100.00%
P(13) (Poisson Distribution)	0.00%	*13*	Cars in System	*9*	Cars in queuing	100.00%
P(14) (Poisson Distribution)	0.00%	*14*	Cars in System	*10*	Cars in queuing	100.00%
P(15) (Poisson Distribution)	0.00%	*15*	Cars in System	*11*	Cars in queuing	100.00%
P(16) (Poisson Distribution)	0.00%	*16*	Cars in System	*12*	Cars in queuing	100.00%
P(17) (Poisson Distribution)	0.00%	*17*	Cars in System	*13*	Cars in queuing	100.00%
P(18) (Poisson Distribution)	0.00%	*18*	Cars in System	*14*	Cars in queuing	100.00%
P(19) (Poisson Distribution)	0.00%	*19*	Cars in System	*15*	Cars in queuing	100.00%
P(20) (Poisson Distribution)	0.00%	*20*	Cars in System	*16*	Cars in queuing	100.00%
P(21) (Poisson Distribution)	0.00%	*21*	Cars in System	*17*	Cars in queuing	100.00%
P(22) (Poisson Distribution)	0.00%	*22*	Cars in System	*18*	Cars in queuing	100.00%
P(23) (Poisson Distribution)	0.00%	*23*	Cars in System	*19*	Cars in queuing	100.00%
P(24) (Poisson Distribution)	0.00%	*24*	Cars in System	*20*	Cars in queuing	100.00%
P(25) (Poisson Distribution)	0.00%	*25*	Cars in System	*21*	Cars in queuing	100.00%
P(26) (Poisson Distribution)	0.00%	*26*	Cars in System	*22*	Cars in queuing	100.00%
P(27) (Poisson Distribution)	0.00%	*27*	Cars in System	*23*	Cars in queuing	100.00%
P(28) (Poisson Distribution)	0.00%	*28*	Cars in System	*24*	Cars in queuing	100.00%
P(29) (Poisson Distribution)	0.00%	*29*	Cars in System	*25*	Cars in queuing	100.00%
P(30) (Poisson Distribution)	0.00%	*30*	Cars in System	*26*	Cars in queuing	100.00%
P(31) (Poisson Distribution)	0.00%	*31*	Cars in System	*27*	Cars in queuing	100.00%
P(32) (Poisson Distribution)	0.00%	*32*	Cars in System	*28*	Cars in queuing	100.00%
P(33) (Poisson Distribution)	0.00%	*33*	Cars in System	*29*	Cars in queuing	100.00%
P(34) (Poisson Distribution)	0.00%	*34*	Cars in System	*30*	Cars in queuing	100.00%
P(35) (Poisson Distribution)	0.00%	*35*	Cars in System	*31*	Cars in queuing	100.00%
P(36) (Poisson Distribution)	0.00%	*36*	Cars in System	*32*	Cars in queuing	100.00%
P(37) (Poisson Distribution)	0.00%	*37*	Cars in System	*33*	Cars in queuing	100.00%
P(38) (Poisson Distribution)	0.00%	*38*	Cars in System	*34*	Cars in queuing	100.00%
P(39) (Poisson Distribution)	0.00%	*39*	Cars in System	*35*	Cars in queuing	100.00%
P(40) (Poisson Distribution)	0.00%	*40*	Cars in System	*36*	Cars in queuing	100.00%
P(41) (Poisson Distribution)	0.00%	*41*	Cars in System	*37*	Cars in queuing	100.00%
P(42) (Poisson Distribution)	0.00%	*42*	Cars in System	*38*	Cars in queuing	100.00%
P(43) (Poisson Distribution)	0.00%	*43*	Cars in System	*39*	Cars in queuing	100.00%
P(44) (Poisson Distribution)	0.00%	*44*	Cars in System	*40*	Cars in queuing	100.00%
P(45) (Poisson Distribution)	0.00%	*45*	Cars in System	*41*	Cars in queuing	100.00%
P(46) (Poisson Distribution)	0.00%	*46*	Cars in System	*42*	Cars in queuing	100.00%
P(47) (Poisson Distribution)	0.00%	*47*	Cars in System	*43*	Cars in queuing	100.00%
P(48) (Poisson Distribution)	0.00%	*48*	Cars in System	*44*	Cars in queuing	100.00%
P(49) (Poisson Distribution)	0.00%	*49*	Cars in System	*45*	Cars in queuing	100.00%
P(50) (Poisson Distribution)	0.00%	*50*	Cars in System	*46*	Cars in queuing	100.00%
P(51) (Poisson Distribution)	0.00%	*51*	Cars in System	*47*	Cars in queuing	100.00%
P(52) (Poisson Distribution)	0.00%	*52*	Cars in System	*48*	Cars in queuing	100.00%
P(53) (Poisson Distribution)	0.00%	*53*	Cars in System	*49*	Cars in queuing	100.00%
P(54) (Poisson Distribution)	0.00%	*54*	Cars in System	*50*	Cars in queuing	100.00%
P(55) (Poisson Distribution)	0.00%	*55*	Cars in System	*51*	Cars in queuing	100.00%
P(56) (Poisson Distribution)	0.00%	*56*	Cars in System	*52*	Cars in queuing	100.00%
P(57) (Poisson Distribution)	0.00%	*57*	Cars in System	*53*	Cars in queuing	100.00%



Probability of no vehicles

$$P_0 = \frac{1}{\sum_{n_c=0}^{N-1} \frac{\rho^{n_c}}{n_c!} + \frac{\rho^N}{N!(1-\rho/N)}}$$

Probaliblity of having n vehicles

$$P_n = \frac{\rho^n P_0}{n!} \quad \text{for } n \leq N$$

$$P_n = \frac{\rho^n P_0}{N^{n-N} N!} \quad \text{for } n \geq N$$

Results		
Average Length of Queue	*0.04*	Cars in queuing
$\overline{Q} = \frac{P_0 \rho^{N+1}}{N! N} \left[\frac{1}{(1-\rho/N)^2} \right]$		
Average Time Spent in System	*2.06*	Mins/Car
	123.58	Seconds
$\bar{t} = \frac{\rho + \overline{Q}}{\lambda}$		
Average Time Waiting in Queue	*0.06*	Mins/Car
	3.58	Seconds
$\overline{w} = \frac{\rho + \overline{Q}}{\lambda} - \frac{1}{\mu}$		

Probability of Queue

2.80%

76.66666667

100

Inputs		
Total Arriving	45	Cars
Time Period	60.0	Mins
Arrival Time	80.0	Seconds/Car
Service Time	300.0	Seconds/Car
No. of Services (N)	4	Spaces

***This queuing system is based on Arrival Rate Nature/Departure Rate Nature/Number of Service Channels (M/M/N) Model.**

M - Exponential Distribution

Factors that could affect your analysis:

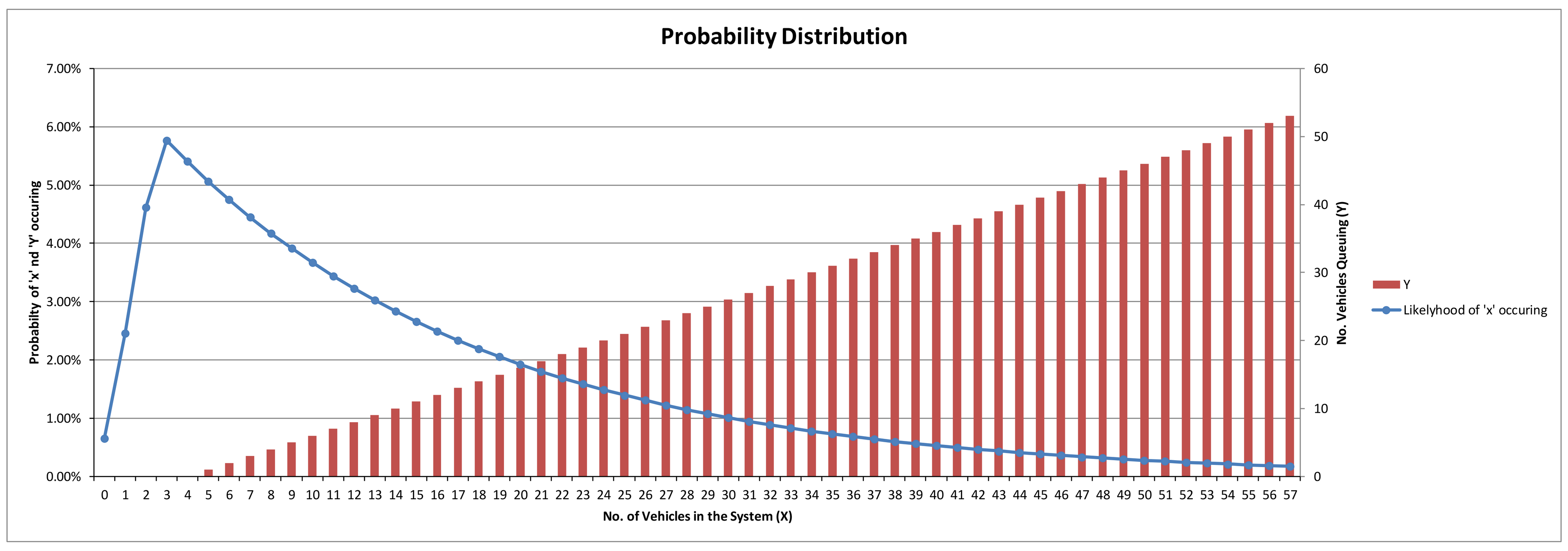
- Neighboring system
- Time-dependant variations in arrivals and departures (Peak hour effects in traffic volumes, human service rate changes)
- Breakdown in discipline (People jumping queues! More than one vehicle in a lane!)
- Time-dependent service channel variations (Grocery store counter lines)

0.061728

Model			
Arrival Rate (λ)	0.75	Cars/Min	*Average arrival rate
Service Rate (μ)	0.200	Cars/Min	*Average depature rate at each channel
ρ (= λ/μ)	3.75		
ρ / N	0.94		*Traffic Intensity < 1. If it's higher than 1 then the queue will grow without bound, please adjust inputs.
Poisson Distribution Calc based on 4 No. Spaces.	20.57	131.84	***Note: Calculation of Poisson Distribution needs to be adjusted manually when the number of service channels changes.***

INTERPRETING THE RESULTS: P(x) means the probability of "x" cars in the system with "y" cars are queuing

P(X)	likihood of 'x' occuring	"x"		Y		Confidence
P(0) (Poisson Distribution)	0.66%	0	Car in System	0	Cars in queuing	99.34%
P(1) (Poisson Distribution)	2.46%	1	Car in System	0	Cars in queuing	97.54%
P(2) (Poisson Distribution)	4.61%	2	Cars in System	0	Cars in queuing	95.39%
P(3) (Poisson Distribution)	5.77%	3	Cars in System	0	Cars in queuing	94.23%
P(4) (Poisson Distribution)	5.41%	4	Cars in System	0	Cars in queuing	94.59%
P(5) (Poisson Distribution)	5.07%	5	Cars in System	1	Cars in queuing	94.93%
P(6) (Poisson Distribution)	4.75%	6	Cars in System	2	Cars in queuing	95.25%
P(7) (Poisson Distribution)	4.45%	7	Cars in System	3	Cars in queuing	95.55%
P(8) (Poisson Distribution)	4.18%	8	Cars in System	4	Cars in queuing	95.82%
P(9) (Poisson Distribution)	3.92%	9	Cars in System	5	Cars in queuing	96.08%
P(10) (Poisson Distribution)	3.67%	10	Cars in System	6	Cars in queuing	96.33%
P(11) (Poisson Distribution)	3.44%	11	Cars in System	7	Cars in queuing	96.56%
P(12) (Poisson Distribution)	3.23%	12	Cars in System	8	Cars in queuing	96.77%
P(13) (Poisson Distribution)	3.02%	13	Cars in System	9	Cars in queuing	96.98%
P(14) (Poisson Distribution)	2.84%	14	Cars in System	10	Cars in queuing	97.16%
P(15) (Poisson Distribution)	2.66%	15	Cars in System	11	Cars in queuing	97.34%
P(16) (Poisson Distribution)	2.49%	16	Cars in System	12	Cars in queuing	97.51%
P(17) (Poisson Distribution)	2.34%	17	Cars in System	13	Cars in queuing	97.66%
P(18) (Poisson Distribution)	2.19%	18	Cars in System	14	Cars in queuing	97.81%
P(19) (Poisson Distribution)	2.05%	19	Cars in System	15	Cars in queuing	97.95%
P(20) (Poisson Distribution)	1.93%	20	Cars in System	16	Cars in queuing	98.07%
P(21) (Poisson Distribution)	1.80%	21	Cars in System	17	Cars in queuing	98.20%
P(22) (Poisson Distribution)	1.69%	22	Cars in System	18	Cars in queuing	98.31%
P(23) (Poisson Distribution)	1.59%	23	Cars in System	19	Cars in queuing	98.41%
P(24) (Poisson Distribution)	1.49%	24	Cars in System	20	Cars in queuing	98.51%
P(25) (Poisson Distribution)	1.39%	25	Cars in System	21	Cars in queuing	98.61%
P(26) (Poisson Distribution)	1.31%	26	Cars in System	22	Cars in queuing	98.69%
P(27) (Poisson Distribution)	1.23%	27	Cars in System	23	Cars in queuing	98.77%
P(28) (Poisson Distribution)	1.15%	28	Cars in System	24	Cars in queuing	98.85%
P(29) (Poisson Distribution)	1.08%	29	Cars in System	25	Cars in queuing	98.92%
P(30) (Poisson Distribution)	1.01%	30	Cars in System	26	Cars in queuing	98.99%
P(31) (Poisson Distribution)	0.95%	31	Cars in System	27	Cars in queuing	99.05%
P(32) (Poisson Distribution)	0.89%	32	Cars in System	28	Cars in queuing	99.11%
P(33) (Poisson Distribution)	0.83%	33	Cars in System	29	Cars in queuing	99.17%
P(34) (Poisson Distribution)	0.78%	34	Cars in System	30	Cars in queuing	99.22%
P(35) (Poisson Distribution)	0.73%	35	Cars in System	31	Cars in queuing	99.27%
P(36) (Poisson Distribution)	0.69%	36	Cars in System	32	Cars in queuing	99.31%
P(37) (Poisson Distribution)	0.64%	37	Cars in System	33	Cars in queuing	99.36%
P(38) (Poisson Distribution)	0.60%	38	Cars in System	34	Cars in queuing	99.40%
P(39) (Poisson Distribution)	0.56%	39	Cars in System	35	Cars in queuing	99.44%
P(40) (Poisson Distribution)	0.53%	40	Cars in System	36	Cars in queuing	99.47%
P(41) (Poisson Distribution)	0.50%	41	Cars in System	37	Cars in queuing	99.50%
P(42) (Poisson Distribution)	0.47%	42	Cars in System	38	Cars in queuing	99.53%
P(43) (Poisson Distribution)	0.44%	43	Cars in System	39	Cars in queuing	99.56%
P(44) (Poisson Distribution)	0.41%	44	Cars in System	40	Cars in queuing	99.59%
P(45) (Poisson Distribution)	0.38%	45	Cars in System	41	Cars in queuing	99.62%
P(46) (Poisson Distribution)	0.36%	46	Cars in System	42	Cars in queuing	99.64%
P(47) (Poisson Distribution)	0.34%	47	Cars in System	43	Cars in queuing	99.66%
P(48) (Poisson Distribution)	0.32%	48	Cars in System	44	Cars in queuing	99.68%
P(49) (Poisson Distribution)	0.30%	49	Cars in System	45	Cars in queuing	99.70%
P(50) (Poisson Distribution)	0.28%	50	Cars in System	46	Cars in queuing	99.72%
P(51) (Poisson Distribution)	0.26%	51	Cars in System	47	Cars in queuing	99.74%
P(52) (Poisson Distribution)	0.24%	52	Cars in System	48	Cars in queuing	99.76%
P(53) (Poisson Distribution)	0.23%	53	Cars in System	49	Cars in queuing	99.77%
P(54) (Poisson Distribution)	0.21%	54	Cars in System	50	Cars in queuing	99.79%
P(55) (Poisson Distribution)	0.20%	55	Cars in System	51	Cars in queuing	99.80%
P(56) (Poisson Distribution)	0.19%	56	Cars in System	52	Cars in queuing	99.81%
P(57) (Poisson Distribution)	0.18%	57	Cars in System	53	Cars in queuing	99.82%



Probability of no vehicles

$$P_0 = \frac{1}{\sum_{n_c=0}^{N-1} \frac{\rho^{n_c}}{n_c!} + \frac{\rho^N}{N!(1-\rho/N)}}$$

Probabliblity of having n vehicles

$$P_n = \frac{\rho^n P_0}{n!} \quad \text{for n} \leq \text{N} \qquad P_n = \frac{\rho^n P_0}{N^{n-N} N!} \quad \text{for n} \geq \text{N}$$

Results

Average Length of Queue — **12.98** Cars in queuing

$$\overline{Q} = \frac{P_0 \rho^{N+1}}{N!N}\left[\frac{1}{(1-\rho/N)^2}\right]$$

Average Time Spent in System — **22.30** Mins/Car; **1338.04** Seconds

$$\bar{t} = \frac{\rho + \overline{Q}}{\lambda}$$

Average Time Waiting in Queue — **17.30** Mins/Car; **1038.04** Seconds

$$\overline{w} = \frac{\rho + \overline{Q}}{\lambda} - \frac{1}{\mu}$$

Probability of Queue

78.45%