4. Proposed Car Park and Precinct Layout

In summary, the development proposes the following works for the Hughes Street multi storey car park and the town centre precinct;

- The provision of a three storey multi deck car park on the site of the existing Hughes Street at grade car park. This car park will accommodate 219 spaces (net gain of an additional 198 following minor modifications to the existing car parks)
- Alterations to the internal circulation of both the Dutton Lane and Dutton Plaza car parks
- The provision of 'Continuous Footpath Treatments' across Dutton Lane East and West, along the southern side of Hughes Street.
- The removal of the exit lane along Dutton Lane East.
- The reversing of traffic flow along a section of Dutton Lane West.
- Modifications to the loading zones within Dutton Loop.

4.1 Proposed Precinct Layout

As outlined in Section 4, it is proposed to modify the pedestrian facilities at the intersections between Dutton Lane East and West and Hughes Street and remove the northbound exit lane along Dutton Lane East.

The concept details of these proposals are shown in Figure 31.

- Continuous Footpath Treatments – These are to be provided to provide a safer crossing facility for the pedestrians traversing along Hughes Street and to provide physical indication to vehicles that they are entering a precinct of high pedestrian activity.
- Dutton Lane East – The existing exit lane onto Hughes Street will be removed and this will become solely the access point for the car parks and the precinct as a whole.
- Totem Signage – The approach totem signage will provide directional information to the individual car parks, along with parking guidance for the car park occupancy. This will be supplemented by a total car park occupancy sign at the entrance to Dutton Lane East. Any supplementary signage along Dutton Lane Loop will also be in the form of a totem to continue the precinct theme.

These modifications will be designed to meet RMS, Austroads and the relevant Australian Standards and details of the proposals will be finalised during the CC Stage of the project.

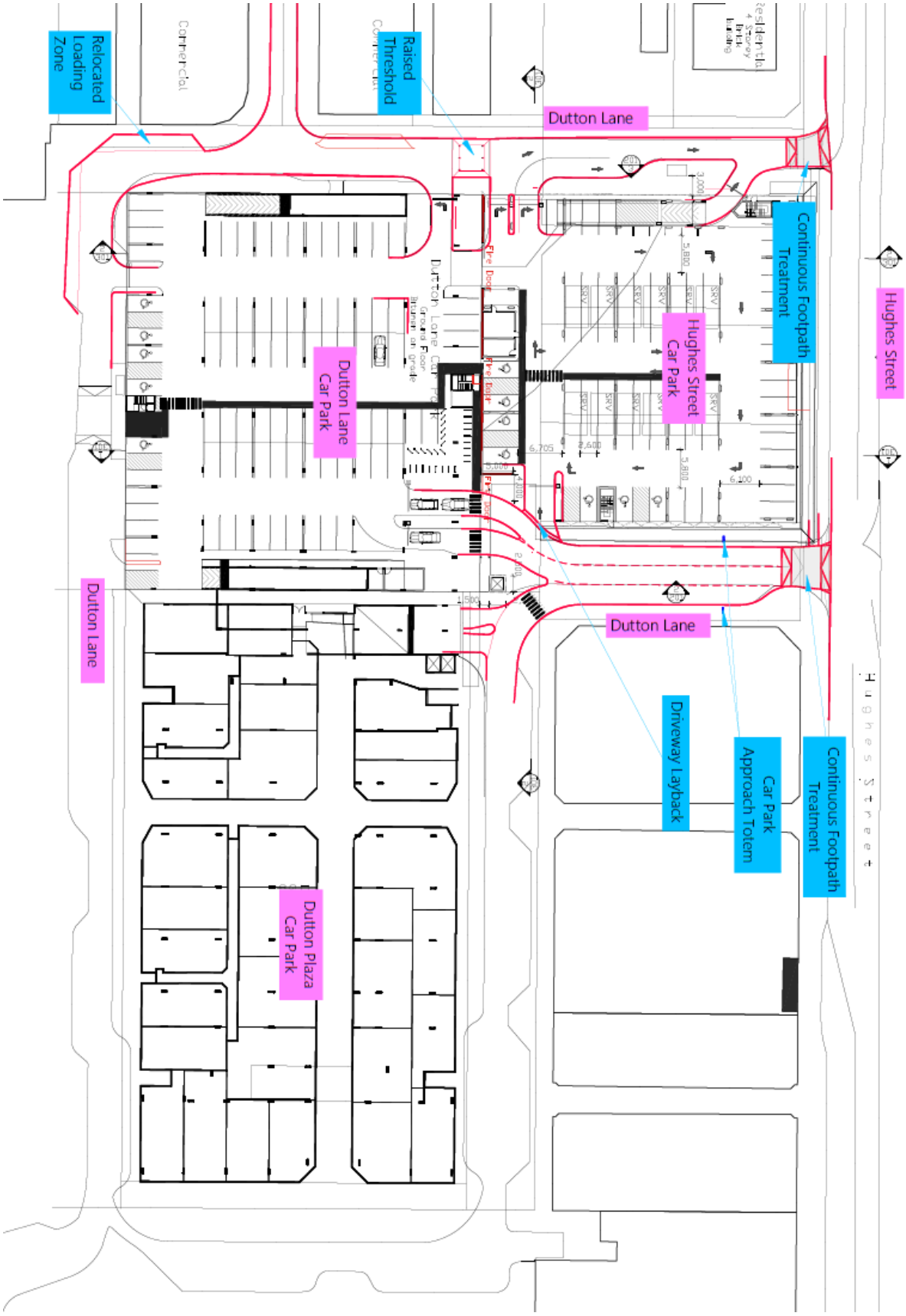


Figure 31 – Proposed Precint Layout

4.2 Proposed Access and Egress.

In conjunction with the precinct changes discussed in Section 4.1 and the car park circulation changes outlined later in this report in Section 4.3, the access and egress to and from the car park and precinct will be revised as shown in Figure 32.

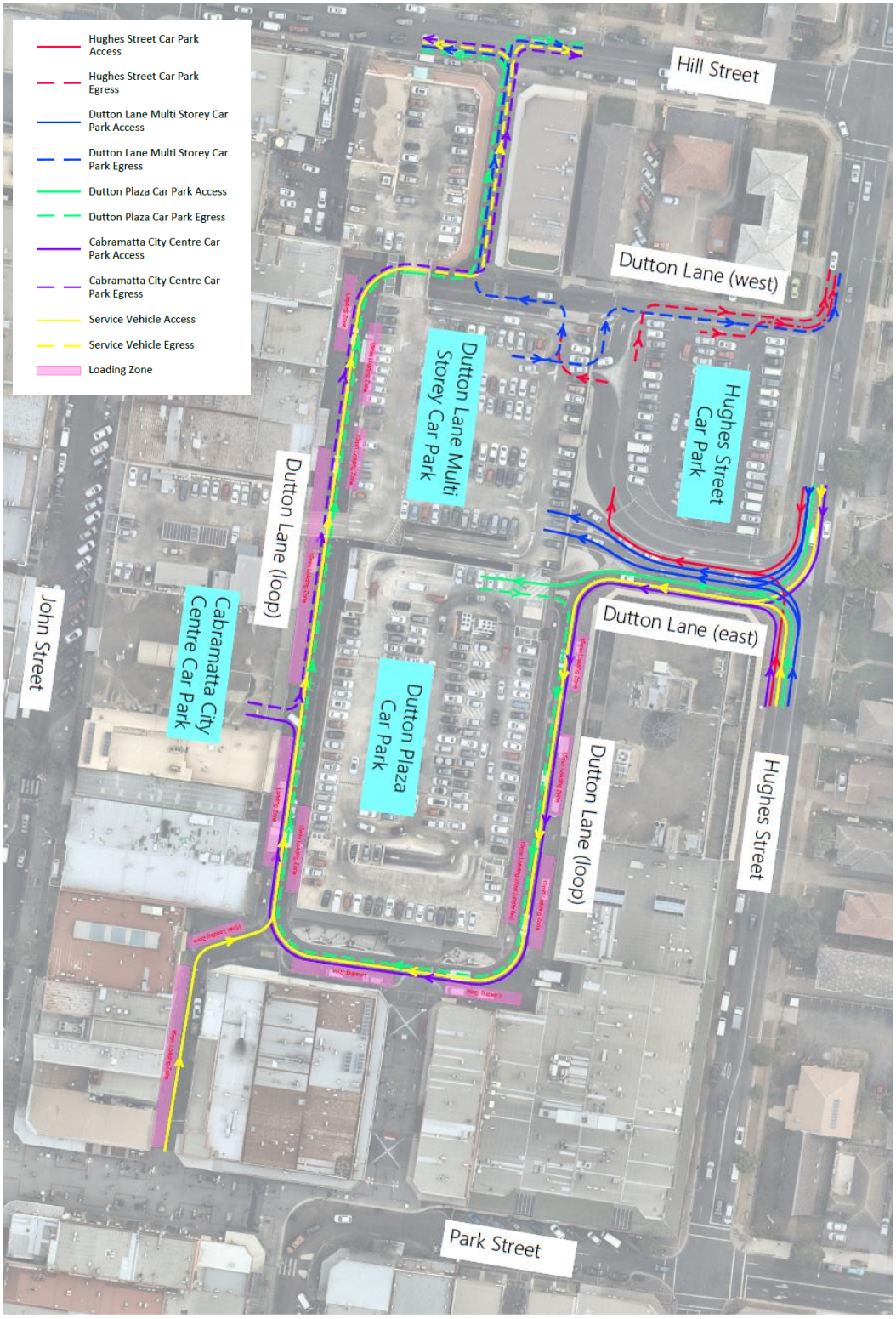


Figure 32 – Proposed Access and Egress

In summary, the access and egress for the different users is as follows:

- Hughes Street Car Park
    - Access via Dutton Lane East
    - Egress via either Dutton Lane West of Dutton Lane westbound towards Hill Street
- Dutton Lane Car Park
    - Access via Dutton Lane East
    - Egress Dutton Lane West of Dutton Lane westbound towards Hill Street
- Dutton Plaza Car Park
    - Access Dutton Lane East
    - Egress via Dutton loop and Hill Street
- Service Vehicles
    - Access (loop) via Dutton Lane East
    - Egress (loop) via Dutton loop and Hill Street
    - Access (Hughes Street car park) via Dutton Lane East *
    - Egress (Hughes Street car park) via Dutton Lane West*

*Service vehicle use of Hughes Street car park is discussed further in Section 4.4.5.

The exact re-configuration of the service bay restrictions will be confirmed during the CC design stage and all layouts will be designed to comply with RMS, Austroads and Australian Standards.

4.3 Proposed Car Park Configuration

The proposed Hughes Street Car Park will provide the following facilities:

- 198 additional car spaces, (net gain after changes to the Dutton Lane Car Park have been accounted for), including 13 accessible spaces (within Hughes Street and Dutton Lane car parks)
- Conversion of 16 spaces to small car spaces
- 62 bicycle spaces (within Dutton Lane Car Park)
- 31 motorbike spaces (within Dutton Lane Car Park)
- 12 Small Rigid Vehicle spaces (shared use spaces)
- The reversing of the internal ramp systems

It should be noted that the alterations to the Dutton Lane car park are based on layouts interpolated from site measurements and that a detailed survey will be required, prior to finalisation of the CC plans.

The proposed circulation of the Hughes Street, Dutton Lane and Dutton Plaza car parks is shown in Figure 33,Figure 34, Figure 35, Figure 36, Figure 37 and Figure 38.

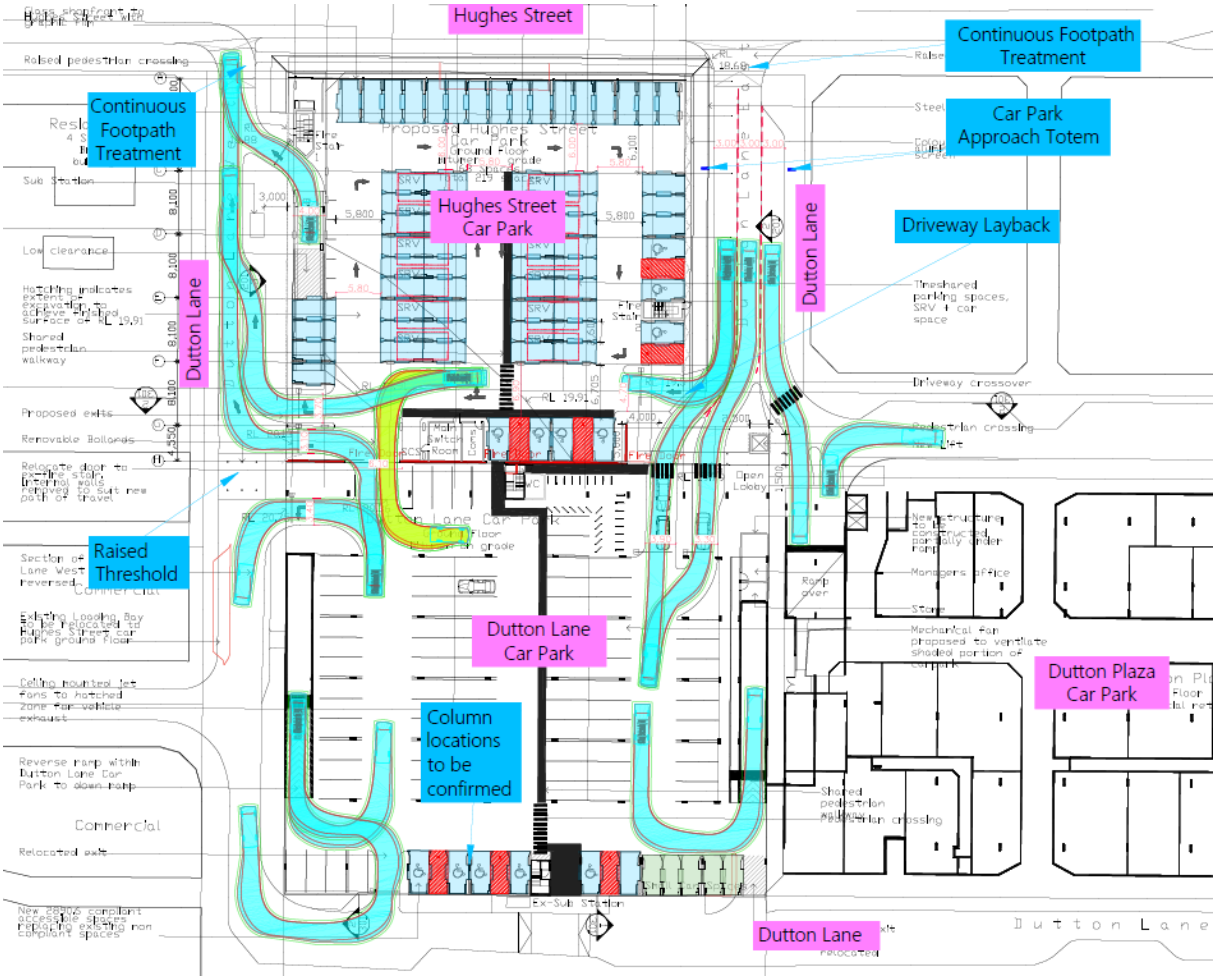


Figure 33 –Proposed Car Park Ground Floor Circulation – Cars

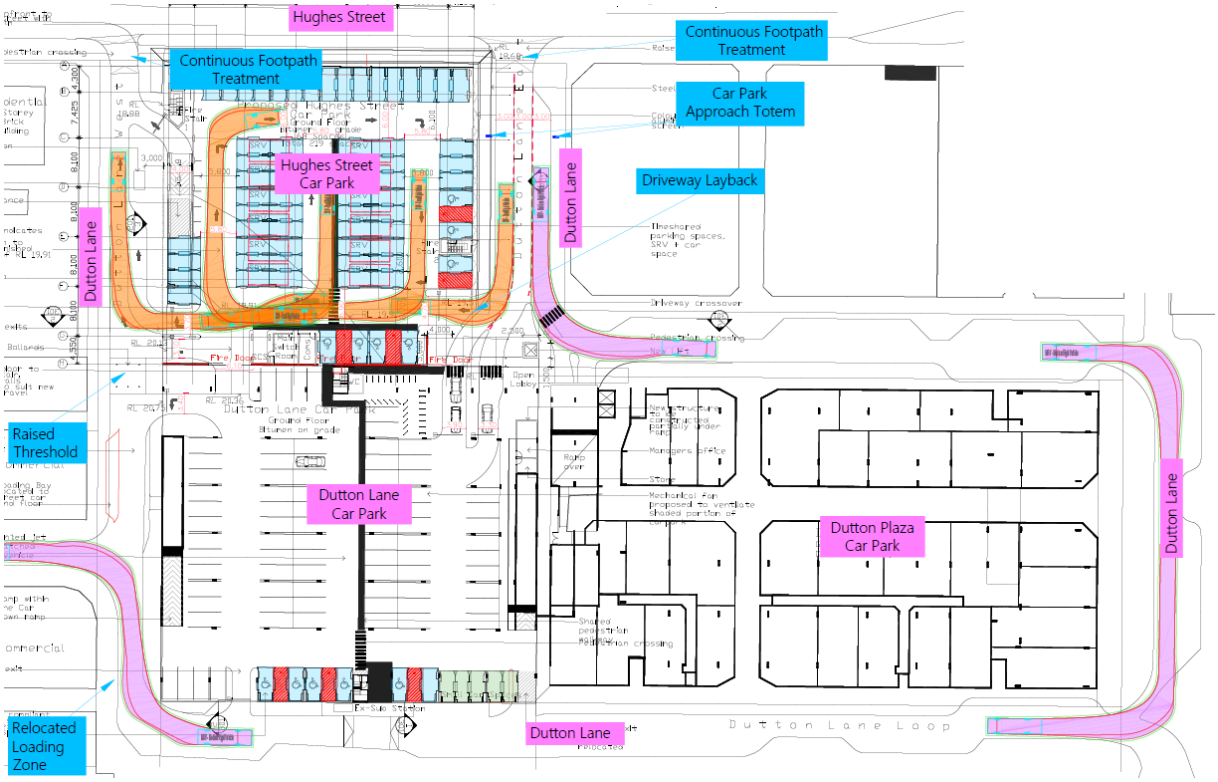


Figure 34 –Proposed Car Park Ground Floor Circulation – Service Vehicles

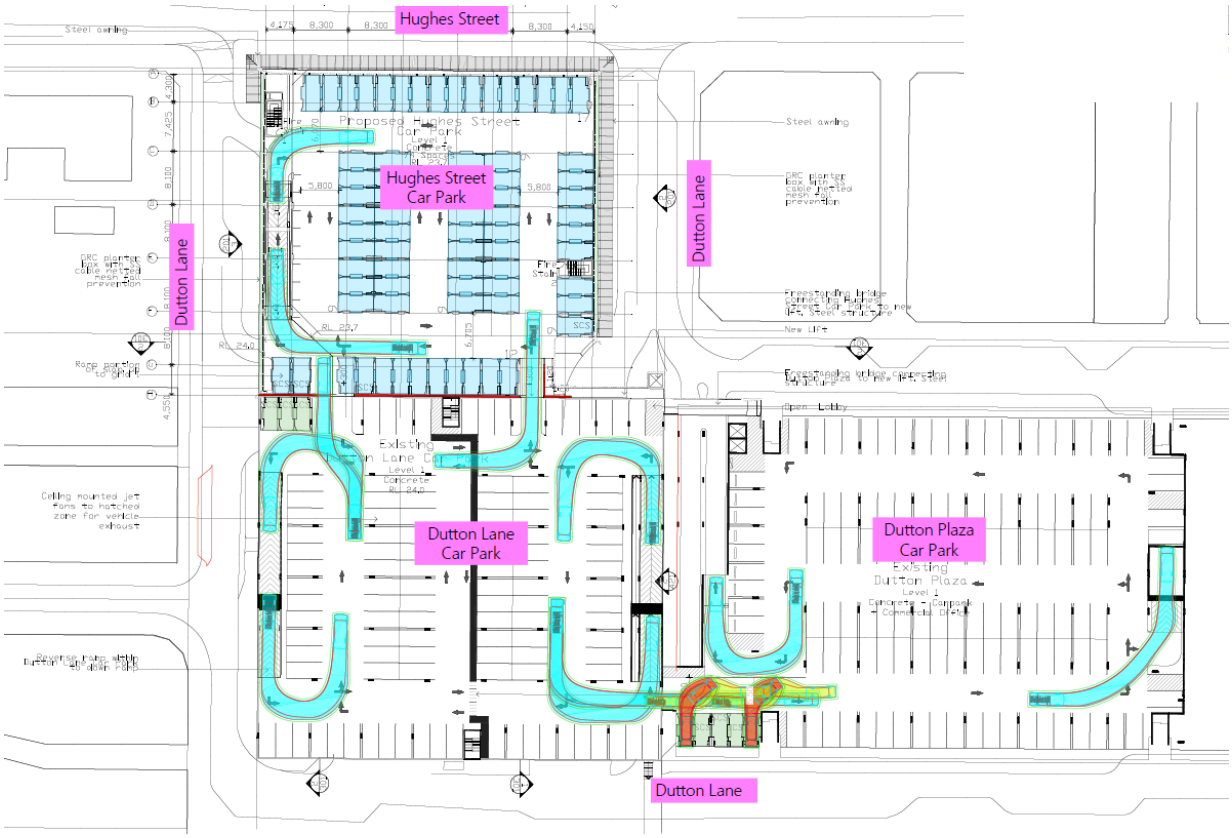


Figure 35 –Proposed Car Park First Floor Circulation

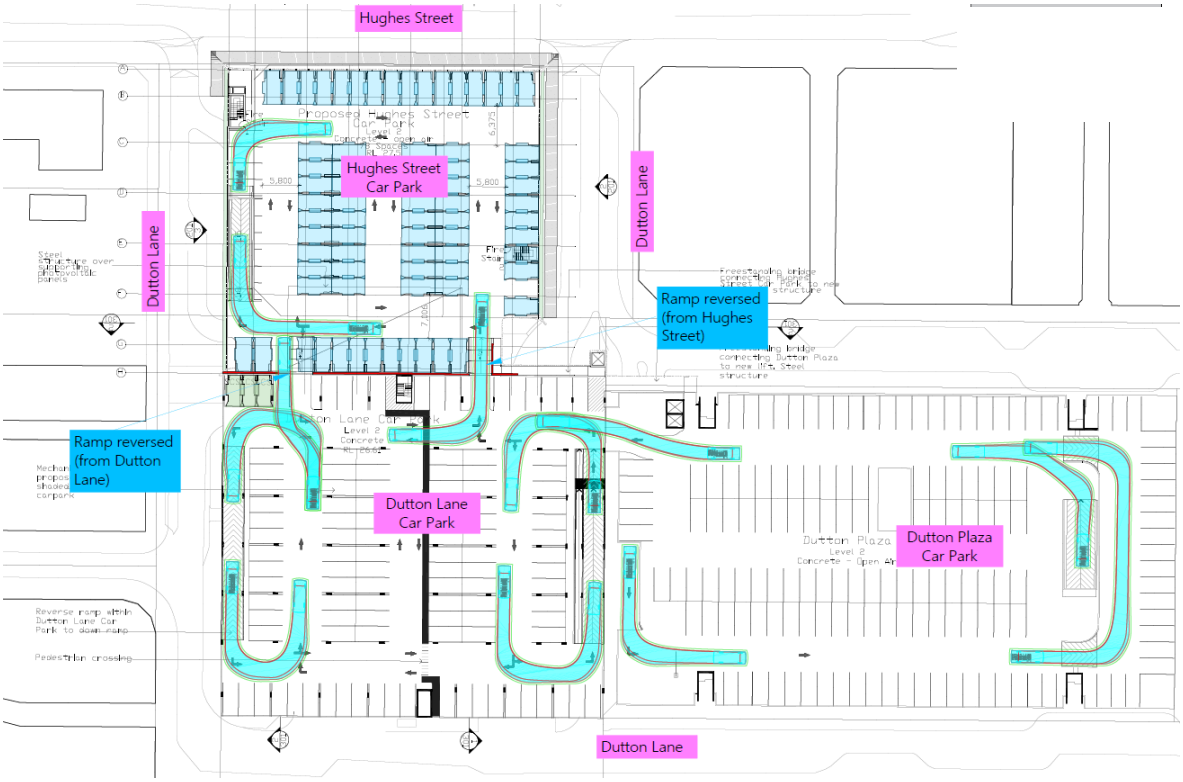


Figure 36 –Proposed Car Park Second Floor Circulation

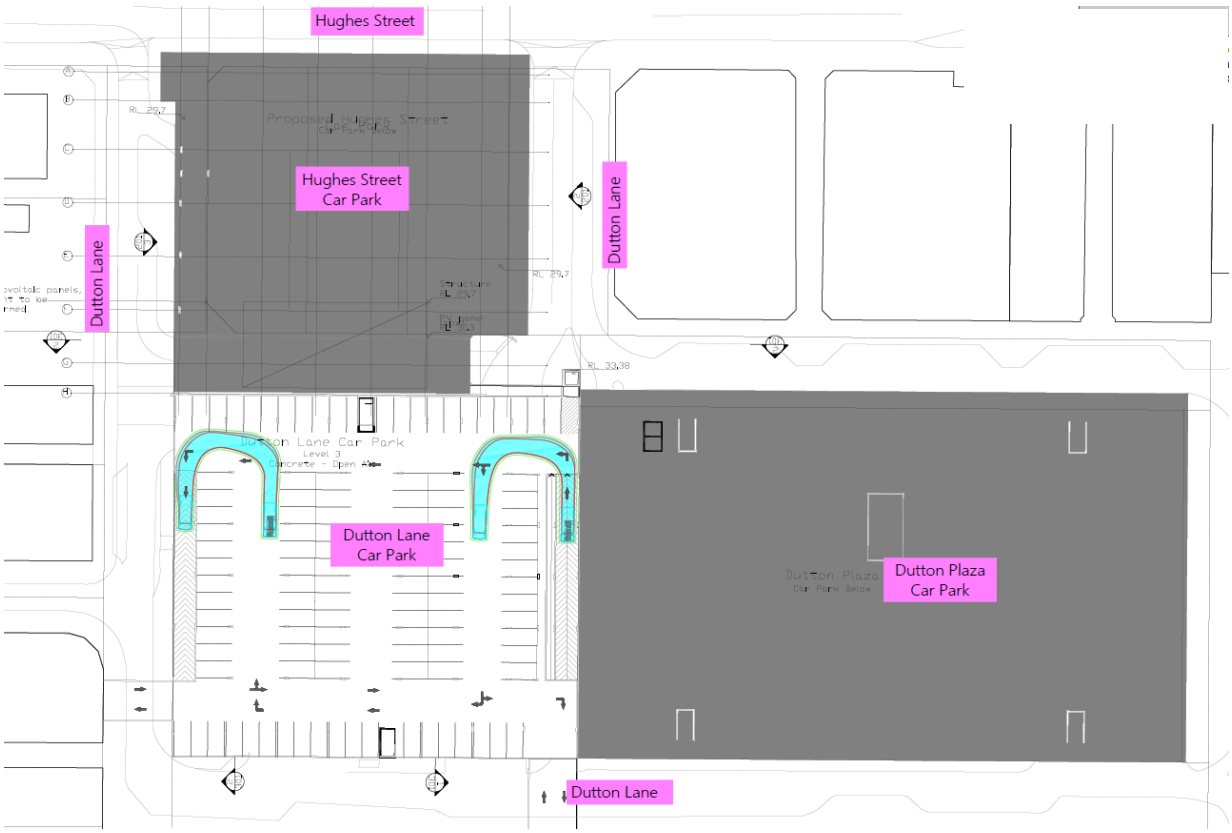


Figure 37 –Proposed Car Park Third Floor Circulation

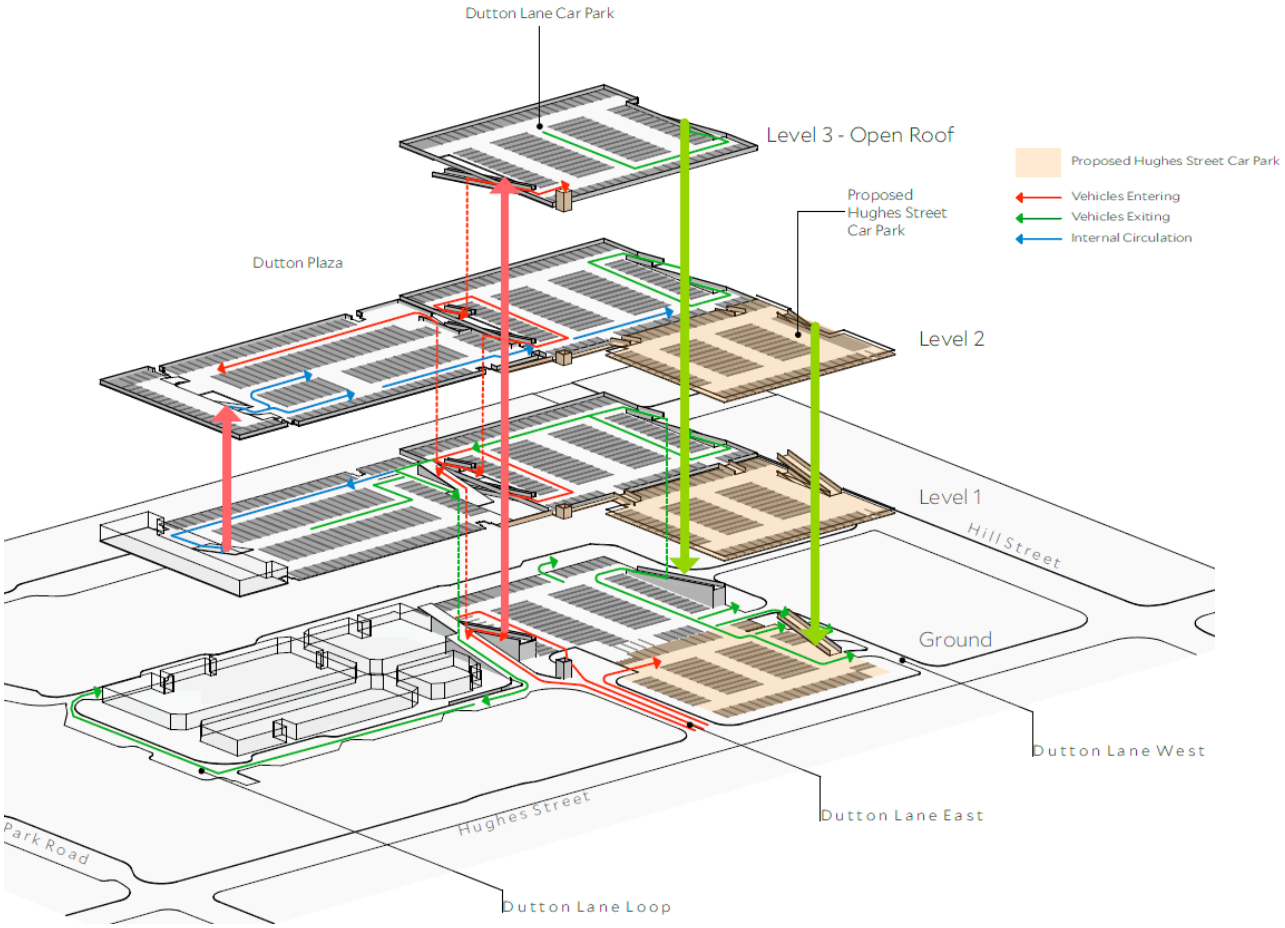


Figure 38 –Proposed Car Park Combined Circulation

In summary;

- Dutton Plaza Car Park –
    - The internal ramp between the two floors of the car park has been reversed to an up ramp, due to the changes to the ramp system in the Dutton Lane Car Park. It is noted that this does limit access to this car park to the specifics outlined below.
    - Vehicles enter the west plaza ramp off Dutton Lane East and proceed to the second floor of the car park. Vehicles can circulate this level and to exit will proceed to the Dutton Lane Car Park (via the north bridge) to exit the car parks (see below for Dutton Lane Car Park circulation). Vehicles wishing to access the first floor, will do so via the southern bridge from Dutton Lane Car Park and will exit by the eastern ramp onto Dutton Loop or proceed up to the second level and re-enter the Dutton Lane Car Park via the northern bridge.
- Dutton Lane Car Park –
    - The vehicle ramps in the Dutton Lane Car Park have been reversed to remove the vehicle conflict between entering and exiting vehicles along the southern traffic aisle and to reduce the traffic flow along the central north-south aisle and the centre section of the southern aisle. This provides a better traffic flow within the car park and provides a safer pedestrian access through the centre of the car park.
    - Vehicles enter the car park from Dutton Lane East on the ground floor, via two boom gates located in the north east corner. Vehicles then proceed to the eastern ramps to proceed up to the upper levels. To exit,

vehicles utilise the western ramps and exit via the two boom gates in the north west corner. Vehicles exiting via the north boom gate will proceed on north on Dutton Lane West to Hughes Street. Vehicles using the south boom gate will proceed south on the loop and exit onto Hill Street.

    - There is also a peak hour exit boom gate in the south west corner to allow vehicles to exit onto Dutton Lane Loop and exit via Hill Street. This has been relocated from the south east corner due to the ramp reconfiguration.

- Hughes Street Car Park –

    - Vehicles accessing the ground floor of Hughes Street Car Park, do so via a new boom gate off Dutton Lane East. Exit from the ground floor will be via a boom gate onto Dutton Lane West or via the ground floor of Dutton Lane Car Park.

    - Access to the upper floors of the Hughes Street Car Park will be via Dutton Lane Car Park. Egress will be either via the Dutton Lane Car Park ramps system or via the exit only ramp leading to a boom gate in the north west corner onto Dutton Lane West.

    - The Hughes Street Car Park also includes the provision of 12 spaces to accommodate Small Rigid Vehicles (SRV) and these are shared with 36 car spaces in the central parking aisles on the ground floor. These spaces will be time restricted for use by SRVs between 6.00am and 10.00pm and revert back to car spaces at all other times.

It should be noted that the alterations to the Dutton Lane car park are based on layouts interpolated from site measurements and that a detailed survey will be required, prior to finalisation of the CC plans.

4.4 Proposed Car Park Arrangement

4.4.1 Typical Requirements

All car parking associated with the proposed car park shall be designed in accordance with Class 3 parking requirements, classified under AS2890.1:2004 as 'short term city and town centre parking'.

Table 1.1 of AS2890.1 presents a number of classifications applicable to different land-uses. According to the Table, the most appropriate car park classification applicable to the subject car park will be a Class 3 facility, which is suitable for "short term city and town centre parking'".

The parking space dimensions and associated aisle widths for each classification are presented in Table 2.2, and accordingly, a Class 3 facility requires parking space dimensions of 2.6 x 5.4 metres with an access aisle width of 5.8 metres. The proposed car park has been designed to provide compliant parking space widths of 2.6 metres, length of 5.4 metres and aisle widths of 5.8m, which meet the minimum requirement.

The layout also provides 16 'small car' spaces and according to Section 2.4.1 (a) (iii) of the standard requires a space dimension of 2.3 x 5.0 metres. The proposed car park has been designed to provide compliant parking space widths of 2.3 metres and length of 5.0 metres, which meet the minimum requirement. It should be noted that in some areas the traffic aisle adjacent to the small car spaces has been reduced to 5.5 metres in width and in these locations, swept path analysis has been undertaken and this indicates that a small car can access and egress the spaces without affecting the circulation of any other vehicles.

An assessment of all elements of the car park has been undertaken including column locations, aisle extensions, and headroom and ramp grades and in this regard, the car park design complies with the requirements of AS2890.1, or has been assessed on a performance basis, meets the intent of the standards and is fit for purpose.

It should be noted that the alterations to the Dutton Lane car park are based on layouts interpolated from site measurements and that a detailed survey will be required, prior to finalisation of the CC plans.

4.4.2 Accessible Parking

The car park includes the provision of 13 accessible car spaces and these spaces have been provided in accordance with AS2890.6:2009.

The accessible spaces have been assessed against the requirements within AS2890.6:2009, which requires an accessible space dimension of 2.4 x 5.4 metres with a shared space of 2.4 metres width adjacent to any space. An assessment of theses spaces has been undertaken and, in this regard, the accessible spaces comply with the requirements of AS2890.6:2009.

4.4.3 Bicycle Parking

The development provides the provision of 62 bicycle spaces and the bicycle parking arrangements have been designed in accordance with the requirements of AS2890.3.

The bicycle parking has been provided as horizontal spaces and the space requirements for this are listed below;

- Horizontal spaces – 1.8m length, 0.5m width, 1.5m wide access aisle

An assessment of the bicycle spaces, including aisle widths and access has been undertaken and in this regard the bicycle parking provisions complies with the requirements of AS2890.3.

4.4.4 Motorcycle Parking

The car park layout provides 31 motorbike spaces and Section 2.4.7 of AS2890.1 requires motorcycle parking spaces with dimensions of 1.2 metres x 2.5 metres.

The car park has been designed to provide spaces compliant with this minimum standard.

4.4.5 Service Vehicles

The Hughes Street Car Park also includes the provision of 12 spaces to accommodate Small Rigid Vehicles (SRV) and these are shared with 36 car spaces in the central parking aisles on the ground floor. These spaces will be time restricted for use by SRVs between 6.00am and 10.00am and revert back to car spaces at all other times.

These spaces have designed in accordance with Table 4.1 of AS2890.2 and comply with the required bay dimensions of 6.4 metres x 3.5 metres.

As stated above these spaces are time restricted and shared with car spaces and a management system, appropriate signage and controls will be in place to operate the shared use of these spaces.

Access to the sub-station on the western side of the Dutton Lane Loop is also required. Vehicles will access the substation via the Dutton Lane East and Dutton Loop and will proceed north along Dutton Lane West to the sub-station. To accommodate this, the western exit from Dutton Lane Car Park (towards Hill Street) will be closed to egress, the temporary bollards will be removed from the raised threshold and traffic management placed to enable the service vehicle to north along this southbound section of Dutton Lane West.

4.5 Proposed Pedestrian Circulation

In conjunction with the alterations to the existing ramp systems in the Dutton Lane Car Park, a specified pedestrian route will be provided through the existing car park, linking the Hughes Street Car Park and the existing pedestrian access from Dutton Lane Car Park to the western section of Dutton Loop.

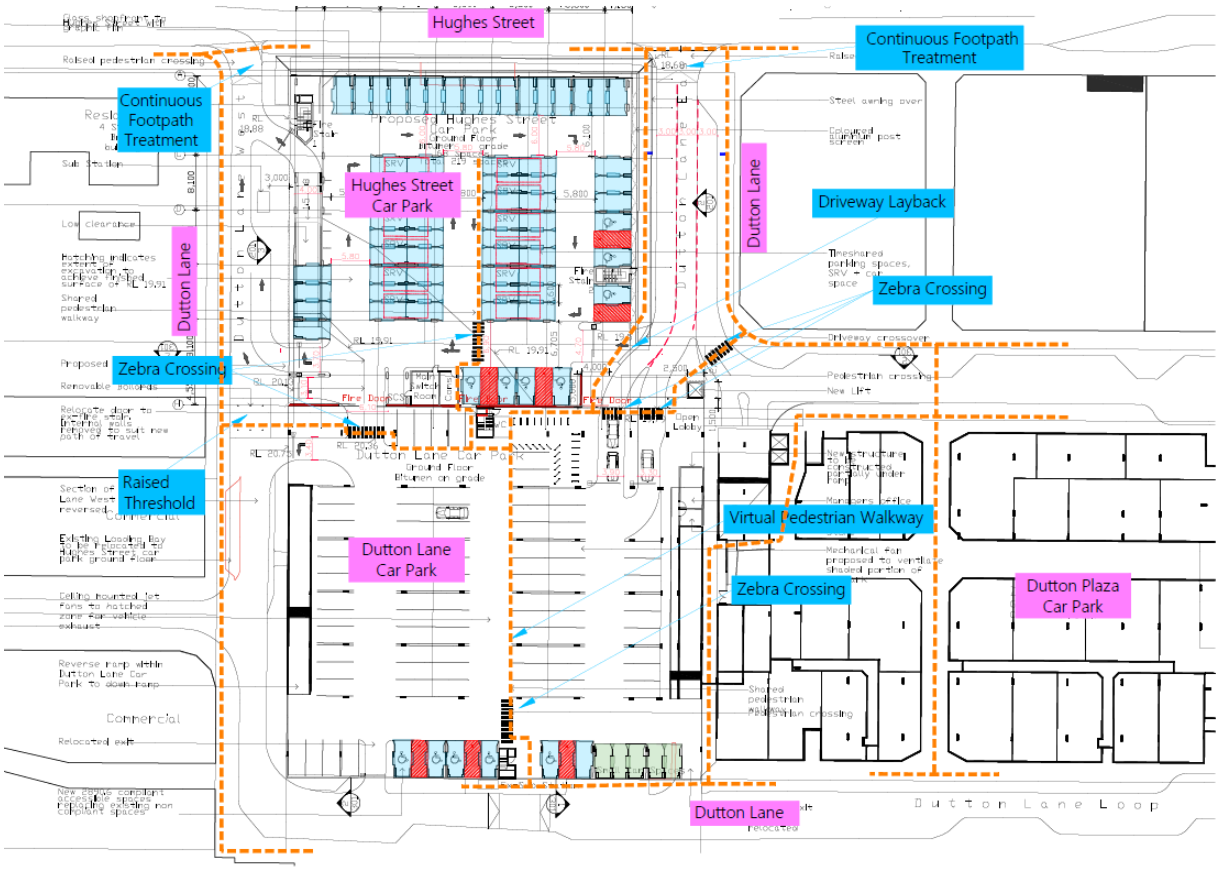


Figure 39 –Proposed Pedestrian Access

As shown in Figure 39, a 'virtual' pedestrian walkway is provided through the central north-south traffic aisle, with a zebra crossing across the southern traffic aisle leading to the existing access onto Dutton Loop.

Zebra crossings are also provided to link the existing external footways to the internal pedestrian links and the car parks.

5. Traffic Impact Assessment

The traffic impact assessment has been undertaken with reference to the RMS Guide to Traffic Generating Developments (2002), and intersection survey data collected on Saturday 8th September and Tuesday, 11th September 2018.

The assessment has been undertaken based on the proposed car park configuration outlined in Section 4, with an increased capacity of 198 spaces. It should be noted that 198 vehicles have been added to provide a worst-case scenario assessment.

5.1 Proposed Development Traffic Generation

The proposed development of the Hughes Street Car Park, will not generate any additional vehicles, however the proposed changes to the car park capacity (198 additional spaces) will affect the car park occupancy and capacity and turnover of the car parks.

This is discussed in more detail in Sections 5.3 and 5.4.

5.2 Proposed Network Operation

To model a worst-case scenario and to accommodate an additional 198 spaces. The 198 vehicles have been added to the existing modelling and evenly distributed to match the existing entry and exit flows into and out of the precinct.

The SIDRA results for each intersection are shown in Table 8

Table 8 – Summary of Proposed Intersection Modelling

Intersection	Period	Level of Service	Average Delay (sec)	Degree of Saturation	Average Queue Length (m)
Hughes Street and Hill Street	Saturday Peak	LOS C	33.4	0.867	71.8
	AM Peak	LOS B	19.7	0.612	30.7
	PM Peak	LOS B	24.8	0.895	50.0
Hughes Street and Dutton Lane West	Saturday Peak	LOS A	1.5	0.330	34.5
	AM Peak	LOS A	0.8	0.173	1.5
	PM Peak	LOS A	1.5	0.256	3.4
Hughes Street and Dutton Lane East	Saturday Peak	LOS A	4.8	0.619	23.2
	AM Peak	LOS A	2.4	0.354	5.6
	PM Peak	LOS A	2.6	0.365	5.9
Hughes Street and Park Street	Saturday Peak	LOS B	16.3	0.812	34.0
	AM Peak	LOS B	15.4	0.774	29.7
	PM Peak	LOS B	14.6	0.558	28.3
Hill Street and Dutton Lane (westbound)*	Saturday Peak	LOS A	2.7	0.521	7.8
	AM Peak	LOS A	1.6	0.235	2.8
	PM Peak	LOS A	1.6	0.235	2.8

*Note that the Hill Street and Dutton Lane (westbound) traffic volumes have been interpolated from data collected from the Hughes Street Hill Street survey and from a survey undertaken of vehicles utilising the Dutton Lane Loop.

It should be noted that the SIDRA modelling assesses the capacity of the exiting intersections without the constraint of the car park entries and exits and therefore is an assessment of the intersections capability to accommodate the proposed traffic volumes only.

Based on the traffic volumes, the results indicate the network and intersections (excluding the constraint of the car park turnover and capacity) would provide an acceptable level of service during the typical peak periods, with the addition of 198 vehicles.

5.3 Proposed Car Park Occupancy

The proposed development of the Hughes Street Car Park, will not generate any additional vehicles, however the proposed changes to the car park capacity (198 additional spaces) will affect the capacity and turnover of the car parks.

5.4 Proposed Car Park Capacity (Turnover)

Based on the data collected (as outlined in Section 3.8.3) the car park reaches at capacity between 11.00am and 2.00pm on a Saturday and vehicles can only enter the car park when a vehicle exits. Therefore, the 10.00am to 11.00 am time period has been utilised as 'free flow' access and egress to and from the car park.

During this period, currently 366 vehicles exit the car park, which equates to a vehicle approximately every 10 seconds and the addition of 198 spaces would potentially increase the exit volume to approximately 560 vehicles, which equates to approximately 1 vehicle every 6 seconds. To assess the turnover capacity of the proposed car parks, the entry rate during this time period has been increased by 198 vehicles utilising an entry rate of a vehicle every 6 seconds

The proposed development includes the provision of 5 exit and 4 entry boom gates and in accordance with Appendix D of AS280.1 the maximum entry and exit flow via a ticket-controlled boom gate is 300 vehicles per hour. Therefore, the car park entry and exits can accommodate the traffic associated with the additional parking spaces.

As outlined in Section 5.2, the road network and intersections can accommodate the addition of 198 vehicles (excluding the constraint of the car park) and could operate at the Levels of Service shown in Table 8

In addition to this, the turnover capacity of the car park, has been assessed using 'Autodesk Infraworks Mobility Simulation' (formally Azalient Commuter) modelling software. The traffic survey data outlined in Sections 3.6, 3.7 and 3.8 was used to simulate the existing traffic flows and to simulate the increased entry flow and therefore an additional 201 vehicles have been added increasing the entry rate to a vehicle every 6 seconds.

This simulation indicates that the additional 198 vehicles entering the car park via Dutton Lane East and the 4 entry boom gates can be accommodated within the approach lanes and the approximate maximum queue indicated by the simulation is 24 cars, which equates to 8 cars within each of the 3-approach lane.

Given that the 3 approach lanes are 60 metres long and allowing for 6 metres per vehicle, the approach capacity on Dutton Lane East is approximately 30 vehicles. Therefore, the expected vehicle queues of 24 vehicles on approach to the entry boom gates should be able to be accommodated within the proposed access configuration approach.

A screenshot of the simulation modelling for the proposed access configuration is shown in Figure 40 and the simulation modelling can be found at: https://youtu.be/6L8CAAaZ5O8

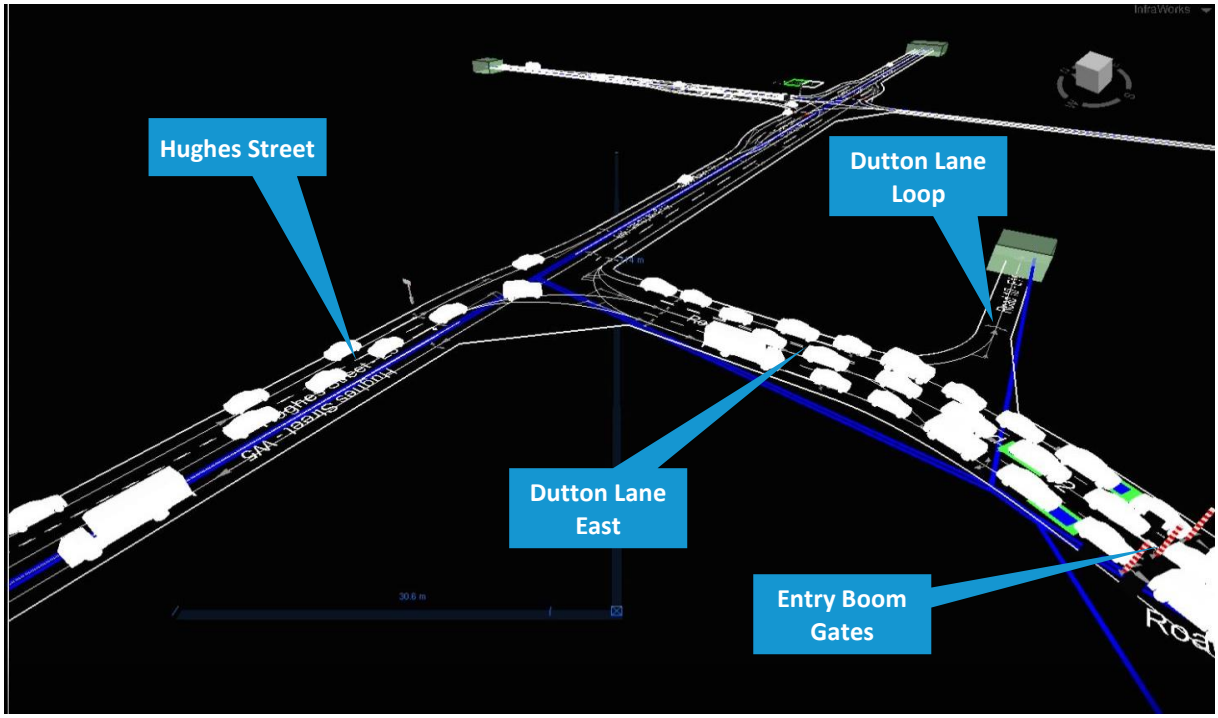


Figure 40 –Modelling Simulation

It should be noted that the simulation uses 3 entry boom gates as opposed to the proposed 4 boom gates. This provides a factor of safety in the operation of the entry approach.

5.5 Precinct Traffic Routing

As discussed in Section 3.4, access to the existing Hughes Street car park is via the Dutton Lane Loop and the proposed access to the new Hughes Street car park is to be directly off Dutton Lane East (as outlined in Section 4.2).

From the data collected during the traffic surveys (refer to Section 3.5) the traffic flow on the loop road was recorded at approximately 150 vehicles per hour during the peak periods.

Given that the existing Hughes Street Car park has a capacity of 68 spaces, it is reasonable to assume the relocating of the access to Dutton Lane East would reduce the traffic flow along the Dutton Lane Loop and provide a safer environment for pedestrians utilising Dutton Lane Loop.

Also, the reversing of the traffic flow on a section of Dutton Lane West will provide a location where pedestrians can cross Dutton Lane West without conflict with vehicles, therefore providing safer pedestrian access to the precinct.

6. Conclusion

In summary, the development proposal involves the construction of a 3 storey multi deck car park accommodating 198 parking spaces (net gain) on the site of the existing Hughes Street at grade car park. The proposed car park will be constructed to integrate with the existing Dutton Lane car park, with connecting traffic aisles on all 3 levels and a down ramp along the west edge.

The proposed 198 car, 12 (shared) SRV, 13 Accessible Spaces, 62 bicycle and 31 motorbike spaces are considered suitable for the size of development and the reconfiguration of the existing car park circulation should improve the safety and circulation of the overall facility.

The assessment of traffic activity has established that the development will not likely result an increase in traffic when compared to the current use of the site. However, it is likely that vehicle turnover will be increased and the modelling undertaken indicates that the existing road network can accommodate the additional traffic movements and is unlikely to have any detrimental impact on the overall performance of the surrounding road network. The removal of the exit lane along Dutton Road East and the provision of a shared zone along the Dutton Lane Loop should improve the safety for both drivers and pedestrians in the vicinity of the site.

The parking and vehicular access arrangements have been designed in accordance with the relevant standard, being AS2890 Part 1, Part 2, Part 3 and Part 6 or have been assessed, deemed to meet the intent of the standards and fit for use.

The location of the proposed access driveways and access and egress provisions should not present any traffic capacity constraints or safety concerns.

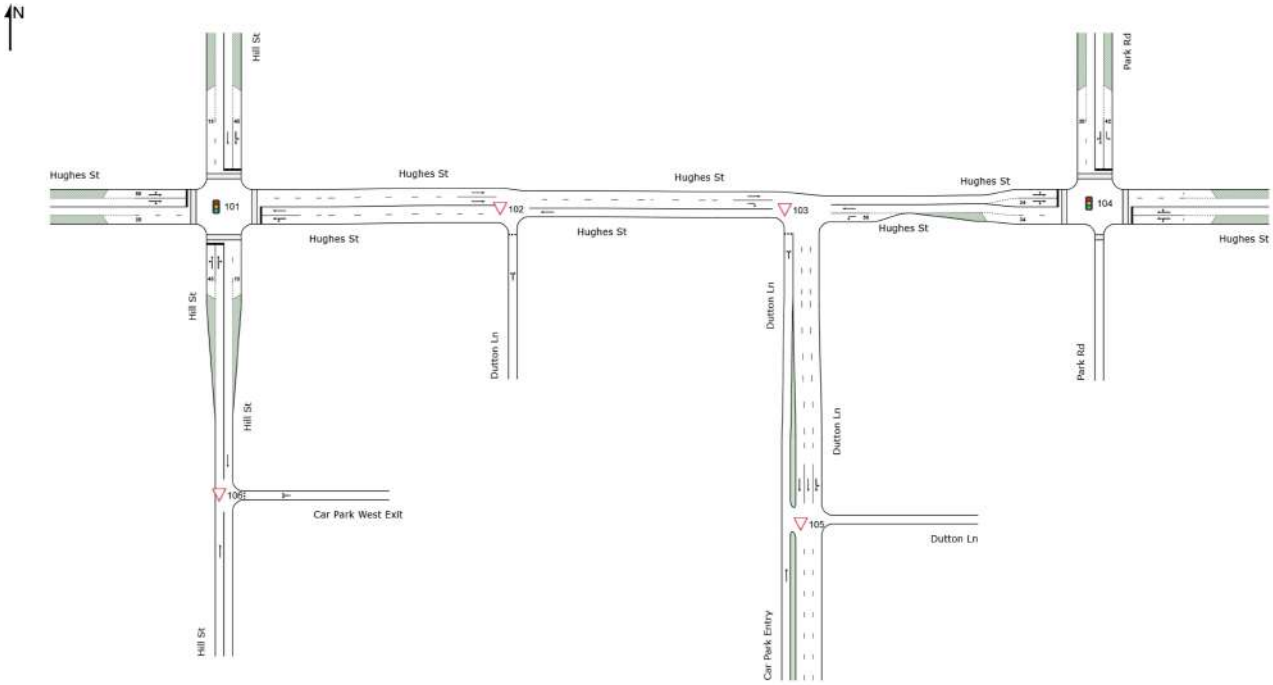
The proposed pedestrian facilities, the revised access and egress provisions and revised precinct wide traffic routing, should provide better pedestrian connectivity and a safer pedestrian environment.

Attachment 1 SIDRA Modelling

NETWORK LAYOUT

Network: N101 [EXISTING PEAK NETWORK]

Sat 08/09/18
EXISTING PEAK NETWORK
Network Category: Existing Network



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	Site 1 - Hughes St and Hill St Existing Peak
104	NA	Site 4 - Hughes St and Park Rd Existing Peak
103	NA	Site 3 - Hughes St and Dutton Ln East Existing Peak
102	NA	Site 2 - Hughes St and Dutton Ln West Existing Peak
105	NA	Site 5 - Dutton Ln Left Turn Only Existing Peak
106	NA	Site 6 - Hill St and Car Park West Exit Existing Peak

MOVEMENT SUMMARY

Site: 101 [Site 1 - Hughes St and Hill St Existing Peak]

Network: N101 [EXISTING PEAK NETWORK]

Sat 08/09/18 12:15-13:15
Site1 - Hughes St and Hill St Existing Peak
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Hill St														
1	L2	86	0.0	86	0.0	0.203	27.5	LOS B	1.5	10.5	0.85	0.73	0.85	26.5
2	T1	185	0.0	185	0.0	0.538	8.6	LOS A	4.9	34.5	0.74	0.71	0.74	27.3
3	R2	260	2.4	260	2.4	0.538	12.0	LOS A	4.9	34.5	0.74	0.71	0.74	17.5
Approach		532	1.2	532	1.2	0.538	13.3	LOS A	4.9	34.5	0.76	0.72	0.76	24.3
East: Hughes St														
4	L2	159	0.7	159	0.7	0.187	15.0	LOS B	2.1	14.5	0.62	0.67	0.62	11.4
5	T1	372	0.0	372	0.0	0.865	36.6	LOS C	7.1	50.0	0.99	1.11	1.33	23.3
Approach		531	0.2	531	0.2	0.865	30.1	LOS C	7.1	50.0	0.88	0.98	1.11	22.2
North: Hill St														
7	L2	121	0.0	121	0.0	0.285	28.0	LOS B	2.1	15.0	0.87	0.75	0.87	14.4
8	T1	182	0.6	182	0.6	0.410	25.5	LOS B	3.3	23.5	0.90	0.73	0.90	15.4
Approach		303	0.3	303	0.3	0.410	26.5	LOS B	3.3	23.5	0.88	0.74	0.88	15.0
West: Hughes St														
10	L2	66	0.0	66	0.0	0.687	32.6	LOS C	5.8	40.7	0.98	0.87	1.04	26.9
11	T1	306	0.3	306	0.3	0.687	31.3	LOS C	5.8	40.7	0.98	0.87	1.08	23.6
12	R2	38	0.0	38	0.0	0.687	39.8	LOS C	2.8	19.9	1.00	0.88	1.16	22.2
Approach		411	0.3	411	0.3	0.687	32.3	LOS C	5.8	40.7	0.98	0.87	1.08	24.1
All Vehicles		1776	0.5	1776	0.5	0.865	25.0	LOS B	7.1	50.0	0.87	0.83	0.96	22.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	122	29.4	LOS C	0.2	0.2	0.92	0.92
P2	East Full Crossing	177	29.5	LOS C	0.3	0.3	0.92	0.92
P3	North Full Crossing	34	29.3	LOS C	0.1	0.1	0.92	0.92
P4	West Full Crossing	61	29.3	LOS C	0.1	0.1	0.92	0.92
All Pedestrians		394	29.4	LOS C			0.92	0.92

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: 102 [Site 2 - Hughes St and Dutton Ln West Existing Peak]

Network: N101 [EXISTING PEAK NETWORK]

Sat 08/09/18 12:15-13:15
Site 2 - Hughes St and Dutton Ln West
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Dutton Ln														
1	L2	334	0.3	334	0.3	0.255	4.7	LOS A	0.5	3.4	0.34	0.58	0.34	26.4
3	R2	5	0.0	5	0.0	0.255	11.9	LOS A	0.5	3.4	0.34	0.58	0.34	26.4
Approach		339	0.3	339	0.3	0.255	4.8	LOS A	0.5	3.4	0.34	0.58	0.34	26.4
East: Hughes St														
5	T1	204	0.5	204	0.5	0.105	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		204	0.5	204	0.5	0.105	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
West: Hughes St														
11	T1	698	1.2	698	1.2	0.180	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		698	1.2	698	1.2	0.180	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
All Vehicles		1241	0.8	1241	0.8	0.255	1.3	NA	0.5	3.4	0.09	0.16	0.09	43.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [Site 3 - Hughes St and Dutton Ln East Existing Peak]

Network: N101 [EXISTING PEAK NETWORK]

Sat 08/09/18 12:45-13:45
Site 3 - Huges St and Dutton Ln East
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Dutton Ln														
1	L2	52	0.0	52	0.0	0.260	4.4	LOS A	0.4	2.9	0.45	0.62	0.48	14.2
3	R2	63	0.0	63	0.0	0.260	16.3	LOS B	0.4	2.9	0.45	0.62	0.48	14.2
Approach		115	0.0	115	0.0	0.260	10.9	LOS A	0.4	2.9	0.45	0.62	0.48	14.2
East: Hughes St														
4	L2	211	2.5	211	2.5	0.115	3.4	LOS A	0.0	0.0	0.00	0.45	0.00	32.6
5	T1	166	0.0	166	0.0	0.085	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		377	1.4	377	1.4	0.115	1.9	NA	0.0	0.0	0.00	0.25	0.00	35.5
West: Hughes St														
11	T1	312	2.0	312	2.0	0.162	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
12	R2	384	1.1	384	1.1	0.366	5.6	LOS A	0.8	6.0	0.50	0.65	0.52	19.7
Approach		696	1.5	696	1.5	0.366	3.1	NA	0.8	6.0	0.28	0.36	0.29	25.9
All Vehicles		1187	1.3	1187	1.3	0.366	3.5	NA	0.8	6.0	0.21	0.35	0.22	28.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 104 [Site 4 - Hughes St and Park Rd Existing Peak]

Network: N101 [EXISTING PEAK NETWORK]

Sat 08/09/18 11:15-12:15
Site 4 - Hughes St and Park Rd Sat Peak
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 40 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Hughes St														
4	L2	48	0.0	48	0.0	0.153	14.9	LOS B	0.8	5.6	0.77	0.66	0.77	25.3
5	T1	202	2.1	202	2.1	0.582	13.7	LOS A	2.4	17.1	0.86	0.75	0.90	19.2
6	R2	59	0.0	59	0.0	0.582	17.6	LOS B	2.4	17.1	0.88	0.77	0.93	26.2
Approach		309	1.4	309	1.4	0.582	14.6	LOS B	2.4	17.1	0.85	0.74	0.88	22.0
North: Park Rd														
7	L2	102	0.0	102	0.0	0.137	11.8	LOS A	0.8	5.6	0.67	0.68	0.67	28.4
8	T1	80	0.0	80	0.0	0.367	9.4	LOS A	2.4	16.9	0.74	0.71	0.74	27.1
9	R2	195	1.1	195	1.1	0.367	12.8	LOS A	2.4	16.9	0.74	0.71	0.74	22.9
Approach		377	0.6	377	0.6	0.367	11.8	LOS A	2.4	16.9	0.72	0.70	0.72	25.7
West: Hughes St														
10	L2	116	0.9	116	0.9	0.209	15.1	LOS B	1.1	7.6	0.78	0.72	0.78	26.6
11	T1	181	3.5	181	3.5	0.602	14.8	LOS B	3.0	21.6	0.92	0.81	0.97	25.1
12	R2	86	0.0	86	0.0	0.602	18.3	LOS B	3.0	21.6	0.92	0.81	0.97	23.8
Approach		383	1.9	383	1.9	0.602	15.7	LOS B	3.0	21.6	0.88	0.78	0.91	25.3
All Vehicles		1069	1.3	1069	1.3	0.602	14.0	LOS A	3.0	21.6	0.82	0.74	0.84	24.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	335	14.7	LOS B	0.3	0.3	0.86	0.86
P2	East Full Crossing	393	14.7	LOS B	0.4	0.4	0.86	0.86
P3	North Full Crossing	47	14.5	LOS B	0.0	0.0	0.85	0.85
P4	West Full Crossing	158	14.5	LOS B	0.2	0.2	0.86	0.86
All Pedestrians		933	14.6	LOS B			0.86	0.86

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: 105 [Site 5 - Dutton Ln Left Turn Only Existing Peak]

Network: N101 [EXISTING PEAK NETWORK]

Sat 08/09/18 11:00-12:00
Site 5 - Dutton Ln Left Turn Only
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Car Park Entry														
2	T1	115	0.0	115	0.0	0.059	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		115	0.0	115	0.0	0.059	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
North: Dutton Ln														
7	L2	165	4.5	165	4.5	0.104	3.9	LOS A	0.0	0.0	0.00	0.48	0.00	34.1
8	T1	429	0.5	429	0.5	0.104	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	57.5
Approach		595	1.6	595	1.6	0.104	1.1	NA	0.0	0.0	0.00	0.15	0.00	44.1
All Vehicles		709	1.3	709	1.3	0.104	0.9	NA	0.0	0.0	0.00	0.13	0.00	50.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 106 [Site 6 - Hill St and Car Park West Exit Existing Peak]

Network: N101 [EXISTING PEAK NETWORK]

Site 6 - Hill St and Car Park West Exit Existing Peak
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

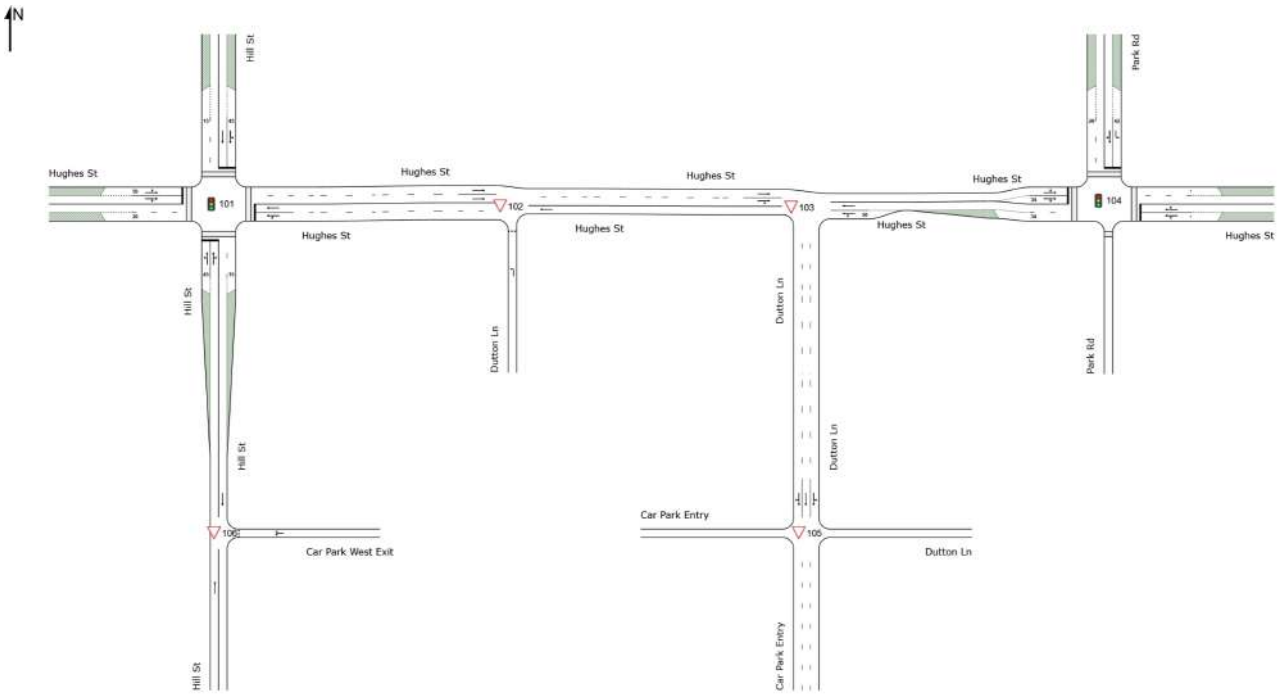
Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Hill St														
2	T1	448	0.0	448	0.0	0.230	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		448	0.0	448	0.0	0.230	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
East: Car Park West Exit														
4	L2	58	3.6	58	3.6	0.199	5.5	LOS A	0.3	2.2	0.50	0.73	0.50	26.7
6	R2	83	7.6	83	7.6	0.199	9.0	LOS A	0.3	2.2	0.50	0.73	0.50	19.9
Approach		141	6.0	141	6.0	0.199	7.5	LOS A	0.3	2.2	0.50	0.73	0.50	23.5
North: Hill St														
8	T1	379	0.6	379	0.6	0.195	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		379	0.6	379	0.6	0.195	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
All Vehicles		968	1.1	968	1.1	0.230	1.1	NA	0.3	2.2	0.07	0.11	0.07	50.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

NETWORK LAYOUT

Network: N101 [PROPOSED PEAK NETWORK]

PROPOSED PEAK NETWORK
Network Category: Post Development Network



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	Site 1 - Hughes St and Hill St Proposed Peak
104	NA	Site 4 - Hughes St and Park Rd Proposed Peak
103	NA	Site 3 - Hughes St and Dutton Ln East Proposed Peak
102	NA	Site 2 - Hughes St and Dutton Ln West Proposed Peak
105	NA	Site 5 - Dutton Ln Left Turn Only Proposed Peak
106	NA	Site 6 - Hill St and Car Park West Exit Proposed Peak

MOVEMENT SUMMARY

Site: 101 [Site 1 - Hughes St and Hill St Proposed Peak]

Network: N101 [PROPOSED PEAK NETWORK]

Site1 - Hughes St and Hill St Proposed Peak
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Hill St														
1	L2	86	0.0	86	0.0	0.261	38.6	LOS C	2.1	14.4	0.90	0.75	0.90	23.3
2	T1	185	0.0	185	0.0	0.681	11.4	LOS A	8.0	56.4	0.80	0.77	0.80	24.9
3	R2	365	1.7	365	1.7	0.681	14.8	LOS B	8.0	56.4	0.80	0.77	0.80	15.0
Approach		637	1.0	637	1.0	0.681	17.0	LOS B	8.0	56.4	0.82	0.77	0.82	20.8
East: Hughes St														
4	L2	191	0.6	191	0.6	0.187	24.7	LOS B	4.2	29.8	0.75	0.73	0.75	7.9
5	T1	445	0.0	445	0.0	0.867	42.5	LOS C	7.1	50.0	0.98	1.04	1.22	21.8
Approach		636	0.2	636	0.2	0.867	37.2	LOS C	7.1	50.0	0.91	0.95	1.08	20.1
North: Hill St														
7	L2	174	0.0	174	0.0	0.526	40.7	LOS C	4.4	30.6	0.96	0.80	0.96	11.2
8	T1	182	0.6	182	0.6	0.527	37.2	LOS C	4.6	32.2	0.96	0.78	0.96	12.0
Approach		356	0.3	356	0.3	0.527	38.9	LOS C	4.6	32.2	0.96	0.79	0.96	11.6
West: Hughes St														
10	L2	66	0.0	66	0.0	0.850	45.6	LOS D	10.2	71.8	0.98	1.03	1.23	23.6
11	T1	391	0.3	391	0.3	0.850	44.6	LOS D	10.2	71.8	0.99	1.03	1.28	20.2
12	R2	38	0.0	38	0.0	0.850	54.9	LOS D	4.3	30.0	1.00	1.04	1.42	18.8
Approach		495	0.2	495	0.2	0.850	45.5	LOS D	10.2	71.8	0.99	1.03	1.29	20.6
All Vehicles		2123	0.4	2123	0.4	0.867	33.4	LOS C	10.2	71.8	0.91	0.89	1.03	19.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	122	39.4	LOS D	0.3	0.3	0.94	0.94
P2	East Full Crossing	177	39.5	LOS D	0.4	0.4	0.94	0.94
P3	North Full Crossing	34	39.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	61	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		394	39.4	LOS D			0.94	0.94

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: 102 [Site 2 - Hughes St and Dutton Ln West Proposed Peak] Network: N101 [PROPOSED PEAK NETWORK]

Site 2 - Hughes St and Dutton Ln West Proposed Peak
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Dutton Ln														
1	L2	439	0.2	439	0.2	0.330	4.8	LOS A	0.6	4.5	0.36	0.59	0.36	26.2
Approach		439	0.2	439	0.2	0.330	4.8	LOS A	0.6	4.5	0.36	0.59	0.36	26.2
East: Hughes St														
5	T1	204	0.5	204	0.5	0.108	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		204	0.5	204	0.5	0.108	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
West: Hughes St														
11	T1	803	1.0	803	1.0	0.218	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		803	1.0	803	1.0	0.218	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
All Vehicles		1446	0.7	1446	0.7	0.330	1.5	NA	0.6	4.5	0.11	0.18	0.11	42.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.