Statement of Advice

Warringah Mall Ticketless Parking

Technical Design Report

CLIENT: Scentre Group	**DATE:** 19 December 2024
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AUTHOR: Drew Mansini	**REVIEWER:** Jeffrey Baczynski

1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Scentre Group to assist in the design and development of an upgrade to the managed parking system at Westfield Warringah Mall Shopping Centre (Warringah Mall), located at Brookvale in Sydney, New South Wales.

The associated project seeks to enhance the customer experience within the shopping centre car park environment by replacing the existing ticketed parking control equipment with contemporary ticketless parking control equipment that utilises number plate recognition technology.

The aim of this report is to inform Transport for New South Wales (TfNSW) and the Northern Beaches Council (Council) of the implications of the project including any changes that may impact the surrounding external road network by summarising the assessment methodology, design considerations and operational improvements related to the new ticketless parking system. This report is prepared as a supplement to the Development Application submitted by Scentre Group to facilitate approval of the changes to the centre on account of the upgrade to the proposed new ticketless parking system.

2.0 Project Summary

As noted previously, the project seeks to enhance the customer experience within the Warringah Mall car park environment by replacing the existing ticketed parking control equipment with ticketless parking control equipment (i.e. number plate recognition). This is a program that has already been undertaken at various other Westfield sites across Australia, with Warringah Mall being one of last remaining assets still reliant on older / ticketed infrastructure. It is noted that in many cases this infrastructure has reached its end of life and is becoming more challenging to maintain.

The proposed equipment replacement will not only replace the older ticketed parking control equipment with new and contemporary ticketless parking control equipment, but will also increase car park efficiency via the added throughput provided by the ticketless

technology. This system upgrade will particularly improve vehicle entry to the shopping centre as drivers will no longer be required to stop on entry to collect tickets, thereby reducing the potential for queueing to extend back to the external road network. Vehicle exits are also streamlined as in the majority of cases there is no customer interaction required with ticket machines.

Whilst several locations have been proposed for replacement of the existing ticketed equipment in a like-for-like manner, there are also locations where more extensive upgrades have been proposed that are beyond a direct bolt out / bolt in equipment upgrade. These more extensive upgrades have been proposed to remedy existing congestion issues due to constraints that are not likely to be fully resolved by simply upgrading the equipment in a near like-for-like manner. Additionally, an effort has been made across the site to consolidate the parking control points towards the extremities of the site to reduce the occurrences of internal "nesting" whereby movements between one area of the car park and another may require multiple entry and exits from different regions with the parking control system. This helps to improve customer experience and reduce internal car park congestion. On account of the above, the reconfigurations summarised within this report have been categorised as:

- Direct Replacement Upgrades – Locations where the ticketed parking control infrastructure is predominantly a like-for-like upgrade to ticketless parking control infrastructure.
- Consolidation / Enhancement Upgrades – Locations where the ticketed parking control infrastructure has incorporated more significant customer experience or capacity improvements via either consolidation of parking control points or enhancements to the design of the existing system to facilitate additional capacity or amenity.

2.1 Data Collection / Summary

To assess the predicted peak queues at each parking control exit location, Scentre Group provided SLR with boom gate entry and exit data for the following periods that align with typical peak trading hours for the centre:

- Thursday the 17th of June 2024, 12:00pm to 6:00pm.
- Saturday the 29th of June 2024, 11:00am to 3:00pm.

This data provided the separate entry and exit volumes for each boom gate across the site on an hour-by-hour basis. Using the data, SLR was able to determine the typical peak exit flows for each parking control location, including the combined exit flows where there was a desire to consolidate two or more exits to one location.

Further to this, SLR also set up several observation cameras at key locations across the site to provide additional data and context to areas that were identified as being often congested by the Scentre Group team.

With the utilisation of this data, SLR was able to undertake further queue assessments to determine the following:

- Existing exit locations that warranted capacity upgrading (ie. additional exit lanes) based on queue analysis.
- The recommended capacity of consolidated exit locations (ie. how many exit lanes would be needed when consolidating several individual exit gates to a single control point further towards the extremities of the site) based on queue analysis.

For some locations the queue analysis indicated that capacity upgrades (ie. additional exit gates) may assist in further reducing peak queuing beyond that provided solely by a bolt in / bolt out equipment upgrade, although due to spatial limitations or economic feasibility upgrading was not warranted. As such, the queue analysis alone was not the sole factor considered by the team during design though was highly contributing.

Nonetheless, all locations are anticipated to operate at an improved level relative to present given the increased performance and efficiency of the ticketless parking control system. The results of this capacity analysis are reported in the summaries provided herein.

2.2 Queue Modelling

SLR has developed a proprietary queue modelling tool to estimate the parking control queues for sites implementing ticketless solutions. This utilises a Monte-Carlo Simulation, which is a computer-based algorithm that simulates the outcomes of a scenario by applying a random generator with a specified set of variables. In conjunction with the Queensland University of Technology (QUT), SLR developed this proprietary tool which was based on real surveys at multiple sites.

The simulation can be run to predict the possible outcome of a wait time and queue and as a result evaluate the expected exit queues and exit delays given an input vehicle flow and number of exit lanes. The simulation tool as it is currently configured will run 10,000 simulations in each iteration and reports for those 10,000 simulations the 95%ile vehicle queue, average wait time, 95%ile wait time as well as other metrics.

The Monte-Carlo simulation tool was run at various demand intervals for both single and double lane exit configurations. It is noted that as the tool is a simulation, and not based on a simplistic formula, there are slight variances between runs consistent with “randomness” observed in the real world.

3.0 Direct Replacement Upgrades

A number of parking control access locations at Warringah Mall were nominated for direct upgrading of the existing ticketed parking control infrastructure with ticketless parking control infrastructure. This is for locations where the quantity and locations of parking control gates were nominated to remain the same as present. Typically, these locations were determined for direct replacement upgrades based on the following criteria:

- The existing infrastructure has adequate capacity and does not warrant a capacity upgrading (ie. additional lanes),

  And,

- The existing infrastructure is positioned appropriately and would not benefit from consolidation with other accesses.

  Or,

- Adding capacity or relocating the infrastructure would be challenging due to spatial limitations or economic feasibility.

In any case, the direct upgrading to Ticketless infrastructure is expected to improve the performance of these access locations by providing a frictionless entry arrangement and more streamlined vehicle egress.

Note that the ticketless access locations in the following sub-section haves been presented in numerical order according to the naming conventions for the locations per the DA plans prepared by Scentre Group for the Ticketless parking upgrade. The individual gate numbers are the historic identifiers from the ticketed boom gate data used in the queue analysis.

It is further noted that the figures presented herein represent SLR's concept designs for the Ticketless access locations, with Scentre Group having subsequently progressed these into more detailed designs. As such, the designs herein should be considered as representative only for the purposes of displaying queue forecasts and not the final designs for approval.

The following provides a brief summary of each of these locations as well as the queue modelling results for these locations.

3.1 Ticketless Access NO.03 (Gates 121, 123, 221, 225)

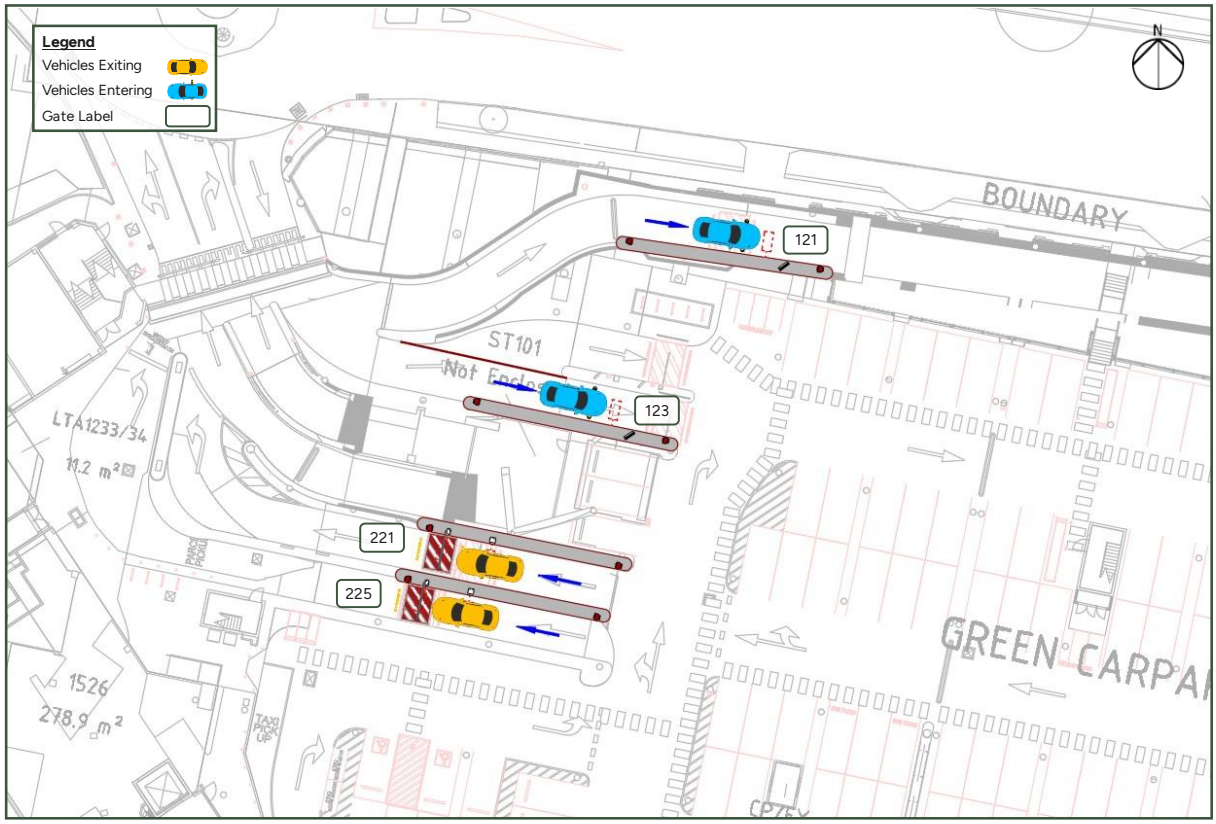
Ticketless Access NO.03 consists of two separate entry gates (121 and 123) and two separate exit gates (221 and 225). To implement ticketless parking control infrastructure at this location it is proposed to use the existing placement of the ticketed entry and exit gates with direct upgrading to a ticketless system. This includes traffic islands and other infrastructure adjustments necessary to accommodate new numberplate recognition cameras. For Entry Gate 123, the second adjacent lane is proposed to be removed given the additional capacity is not required and a single lane will allow for more streamlined vehicle ingress without the need for an unnecessary merge. It should be noted that Exit Gate 225 exclusively services a parcel pick-up and therefore does not function as a combined dual exit with Exit Gate 221.

Evaluating the two separate exit gates, the anticipated 95th percentile peak hour queues are:

- Exit Gate 221: Thursday PM peak hour queue 1.0 vehicle.
- Exit Gate 221: Saturday peak hour queue of less than 1 vehicle.
- Exit Gate 225: Thursday PM peak hour queue less than 1 vehicle.
- Exit Gate 225: Saturday peak hour queue of less than 1 vehicle.

The proposed layouts at Ticketless Access NO.03 including the anticipated 95th percentile peak exit queues (greater of Thursday or Saturday peaks) can be seen on **Figure 1**. The corresponding drawing from within the design package is Ticketless Access NO.03.

Figure 1 Ticketless Access NO.03 – Proposed Layouts and 95%ile Peak Exit Queues



3.2 Ticketless Access NO.09 (Gate 222 / 223)

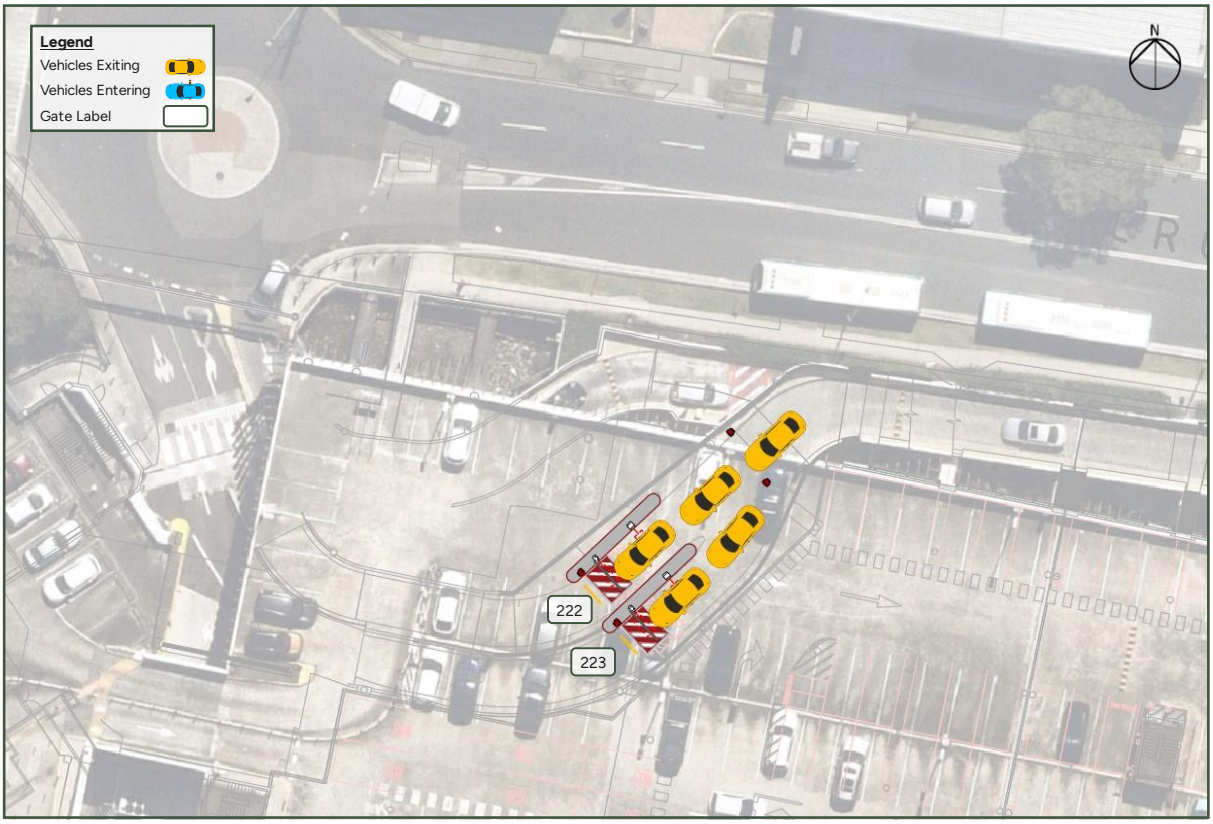
Ticketless Access NO.09 consists of Exit Gates 222 and 223 in a dual exit lane arrangement. To implement ticketless parking control infrastructure at this location it is proposed to use the existing placement of the ticketed exit gates with direct upgrading to a ticketless system. This includes traffic islands and other infrastructure adjustments necessary to accommodate new numberplate recognition cameras.

Evaluating the dual exit gates, the anticipated 95th percentile peak hour queues are:

- Thursday PM peak hour queue of less than 1 vehicle per lane (<1 vehicle in total).
- Saturday peak hour queue of 2.4 vehicles per lane (4.8 vehicles in total)

The proposed layouts at Ticketless Access NO.09 and the anticipated 95th percentile peak exit queues (greater of Thursday or Saturday peaks) can be seen on **Figure 2**. The corresponding drawing from within the design package is Ticketless Access NO.09.

Figure 2 Ticketless Access NO.09 – Proposed Layouts and 95%ile Peak Exit Queues



3.3 Ticketless Access NO.11 (Gate 210 / 211)

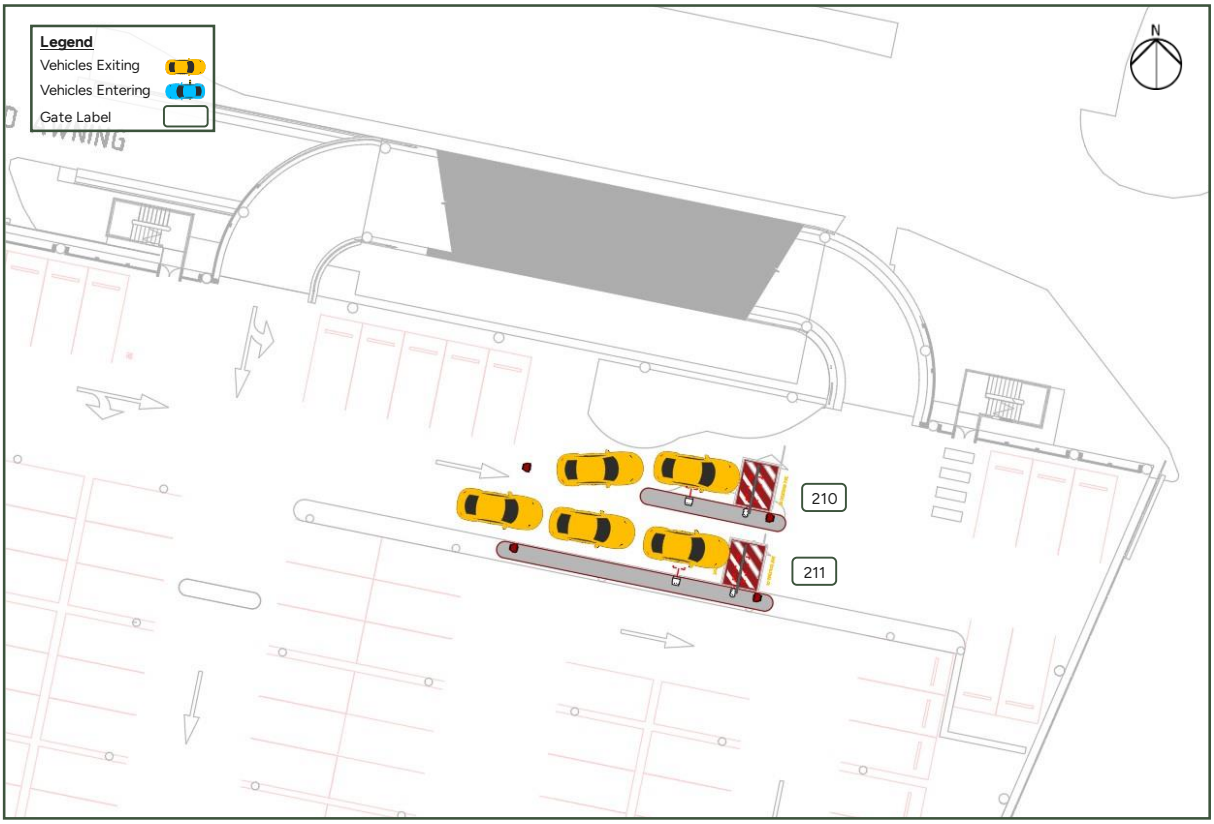
Ticketless Access NO.11 consists of Exit Gates 210 and 211 in a dual exit arrangement. To implement ticketless parking control infrastructure at this location it is proposed to use the existing placement of the ticketed exit gates with direct upgrading to a ticketless system. This includes traffic islands and other infrastructure adjustments necessary to accommodate new numberplate recognition cameras.

Evaluating the dual exit gates, the anticipated 95th percentile peak hour queues are:

- Thursday PM peak hour queue of less than 1 vehicle per lane (<1 vehicle in total).
- Saturday peak hour queue of 2.8 vehicles per lane (5.6 vehicles in total).

The proposed layouts at Ticketless Access NO.11 and the anticipated 95th percentile peak exit queues (greater of Thursday or Saturday peaks) can be seen on **Figure 3**. The corresponding drawing from within the design package is Ticketless Access NO.11.

Figure 3 Ticketless Access NO.11 – Proposed Layouts and 95%ile Peak Exit Queues



3.4 Ticketless Access NO.12 (Gates New, 205 / 206)

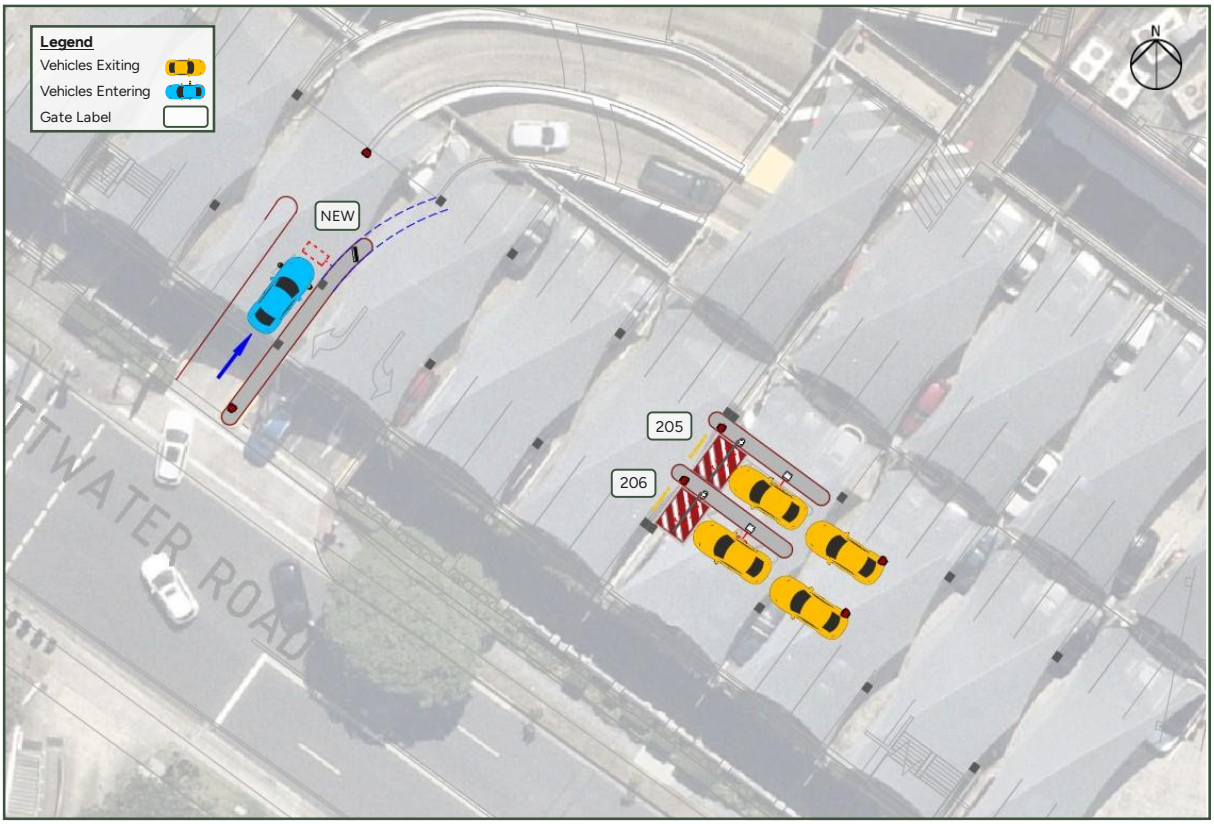
Ticketless Access Location NO.12 consists of one new entry gate and Exit Gates 205 and 206 in a dual exit arrangement. To implement Ticketless parking control infrastructure at this location it is proposed to use the existing placement of the ticketed exit gates with direct upgrading to a ticketless system. This includes traffic islands and other infrastructure adjustments necessary to accommodate new numberplate recognition cameras. The new entry gate replace the exiting Entry Gate 104 and Entry Gate 105 which reside on the ramps below and above the entry from Old Pittwater Road.

Evaluating the dual exit gates, the anticipated 95th percentile peak hour queues are:

- Thursday PM peak hour queue of less than 1 vehicle per lane (<1 vehicle in total).
- Saturday peak hour queue of 1.6 vehicles per lane (3.2 vehicles in total).

The proposed layouts at Ticketless Access NO.12 and the anticipated 95th percentile peak exit queues (greater of Thursday or Saturday peaks) can be seen on **Figure 4**. The corresponding drawing from within the design package is Ticketless Access NO.12.

Figure 4 Ticketless Access NO.12 – Proposed Layouts and 95%ile Peak Exit Queues



3.5 Ticketless Access NO.13 (Gate 207)

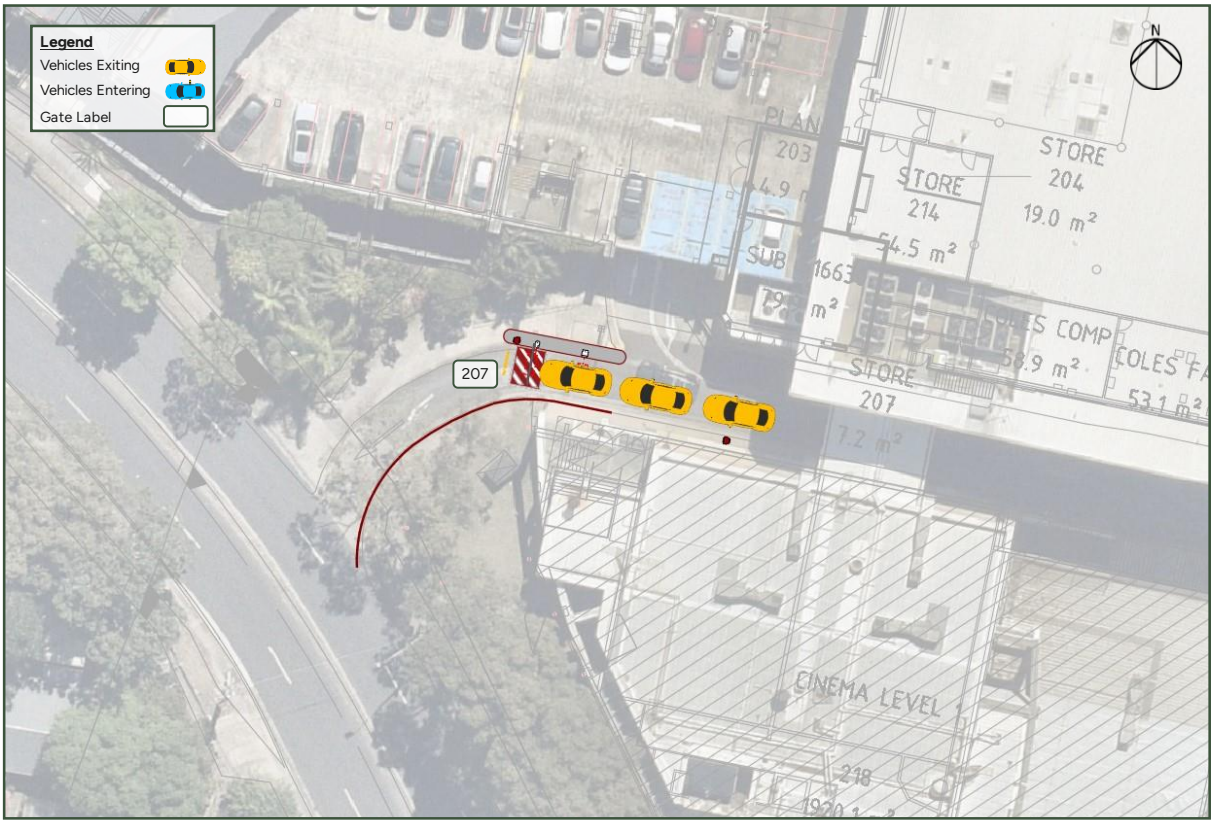
Ticketless Access NO.13 consists of Exit Gate 207. To implement Ticketless parking control infrastructure at this location it is proposed to use the existing placement of the ticketed exit gate with direct upgrading to a ticketless system. This includes traffic islands and other infrastructure adjustments necessary to accommodate new numberplate recognition cameras.

Evaluating the exit gate, the anticipated 95th percentile peak hour queues are:

- Exit Gate 207: Thursday PM peak hour queue of 1.1 vehicles.
- Exit Gate 207: Saturday peak hour queue of 2.8 vehicles.

The proposed layout at Ticketless Access NO.13 including the anticipated 95th percentile peak exit queue (greater of Thursday or Saturday peaks) can be seen on **Figure 5**. The corresponding drawing from within the design package is Ticketless Access NO.13.

Figure 5 Ticketless Access NO.13 – Proposed Layout and 95%ile Peak Exit Queue



4.0 Consolidation / Enhancement Upgrades

A number of parking control access locations at Warringah Mall were nominated for more comprehensive upgrading of the existing ticketed parking control infrastructure, which includes improvements such as capacity upgrades (additional exit gates) and / or consolidation with other accesses to go along with the ticketless infrastructure. Such locations for more comprehensive upgrading were selected based on the following criteria:

- The existing infrastructure would benefit from additional capacity and it was feasible to implement this at the same, or in a similar location.

  Or,

- The location of the existing infrastructure warranted consolidation with other infrastructure locations to either improve capacity, the customer experience or both.

Note that the ticketless access locations in the following sub-section haves been presented in numerical order according to the naming conventions for the locations per the DA plans prepared by Scentre Group for the Ticketless parking upgrade. The individual gate numbers are the historic identifiers from the ticketed boom gate data used in the queue analysis.

It is further noted that the figures presented herein represent SLR's concept designs for the Ticketless access locations, with Scentre Group having subsequently progressed these into more detailed designs. As such, the designs herein should be considered as representative only for the purposes of displaying queue forecasts and not the final designs for approval.

This section provides a brief summary of each of these more comprehensive upgrade locations along with the design considerations and queue modelling results that validated more significant changes to the existing parking control system.

4.1 Ticketless Access NO.01 (West Zone Consolidated 1)

Ticketless Access NO.01 consists of a new entry gate and a new exit gate. This access location forms part of the consolidation of the western car parking zone which encompasses the Blue Car Park, Pink Car Park, Teal Car Park and other internal loading dock areas.

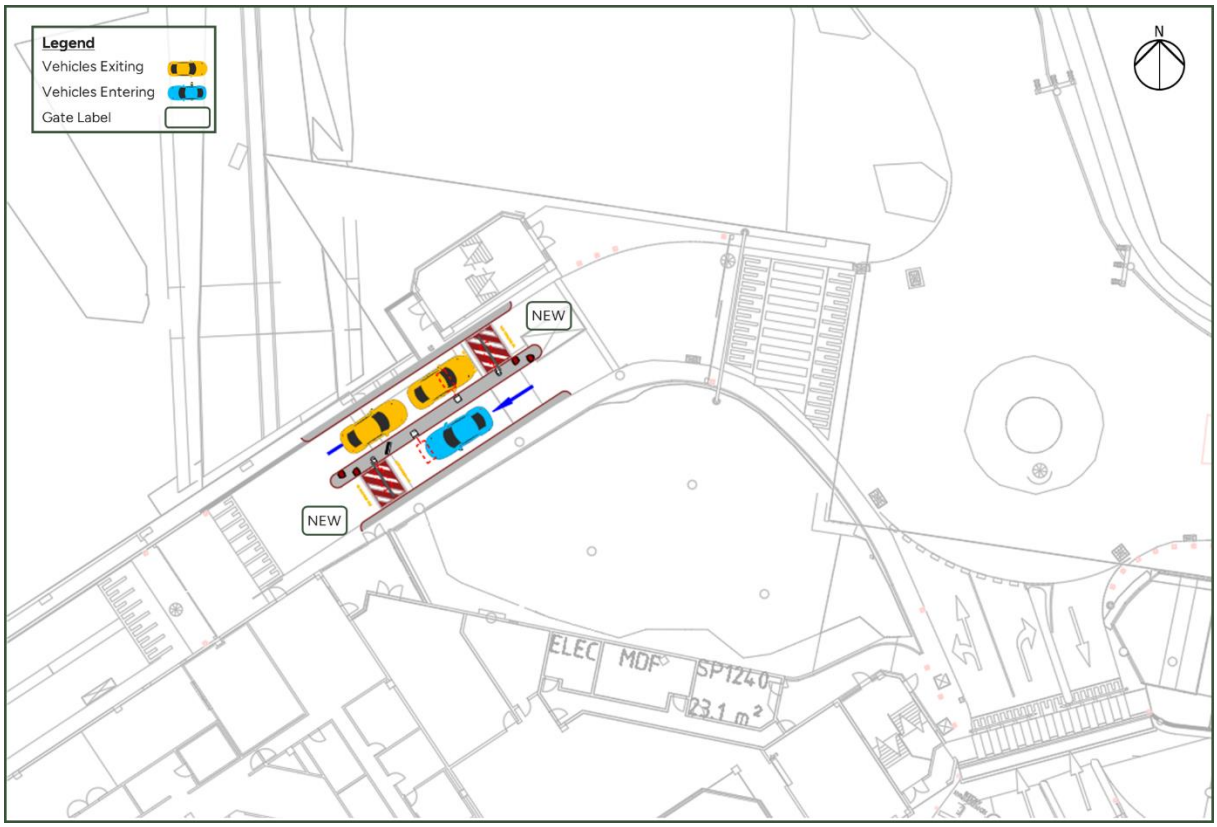
The queue analysis was determined on the basis of some Blue Car Park traffic and all Pink Car Park traffic using this route for access to and from the parking areas within.

Evaluating the exit gate, the anticipated 95th percentile peak hour queues are:

- Thursday PM peak hour queue of less than 1 vehicle.
- Saturday peak hour queue of 1.2 vehicles.

The proposed layouts at Ticketless Access NO.01 and the anticipated 95th percentile peak exit queue (greater of Thursday or Saturday peaks) can be seen on **Figure 6**. The corresponding drawing from within the design package is Ticketless Access NO.01.

Figure 6 Ticketless Access NO.01 – Proposed Layouts and 95%ile Peak Exit Queues



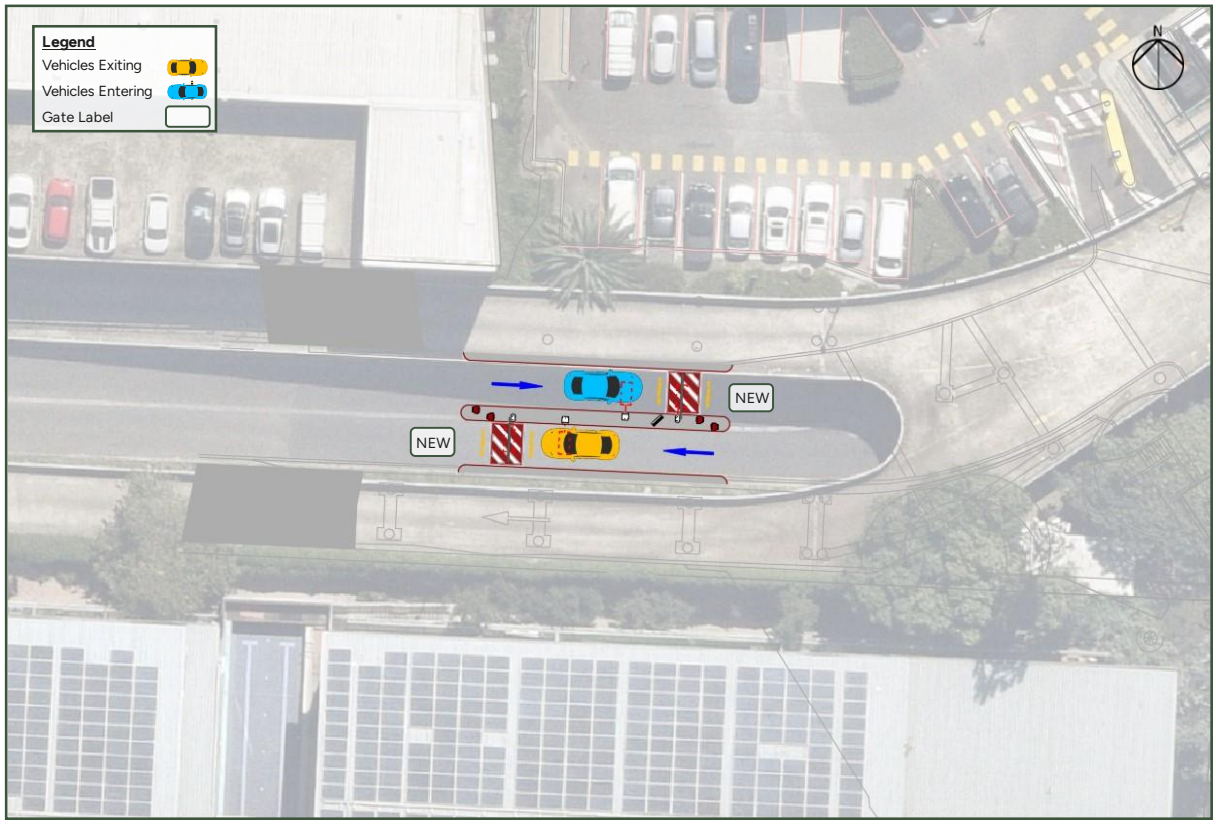
4.2 Ticketless Access NO.02 (West Zone Consolidated 2)

Ticketless Access NO.02 consists of a new entry gate and a new exit gate. This access location forms part of the consolidation of the western car parking zone which encompasses the Blue Car Park, Pink Car Park, Teal Car Park and other internal loading dock areas.

It is understood that little to no traffic uses this route for access to and from the parking areas within and so no further modelling has been undertaken for this location.

The proposed layouts at Ticketless Access NO.02 and the anticipated 95th percentile peak exit queue (assumed as less than 1) can be seen on **Figure 7**. The corresponding drawing from within the design package is Ticketless Access NO.02.

Figure 7 Ticketless Access NO.02 – Proposed Layouts and 95%ile Peak Exit Queues



4.3 Ticketless Access NO.04 (Gates 122, 224)

Ticketless Access NO.04 consists of Entry Gate 122 and Exit Gates 224a and 224b in a dual exit lane arrangement. It is noted that Entry Gate 122 is existing at the location shown on **Figure 6** below, although the base plans do not represent this. Entry Gate 122 is proposed for direct upgrading of the existing ticketed entry to a ticketless entry.

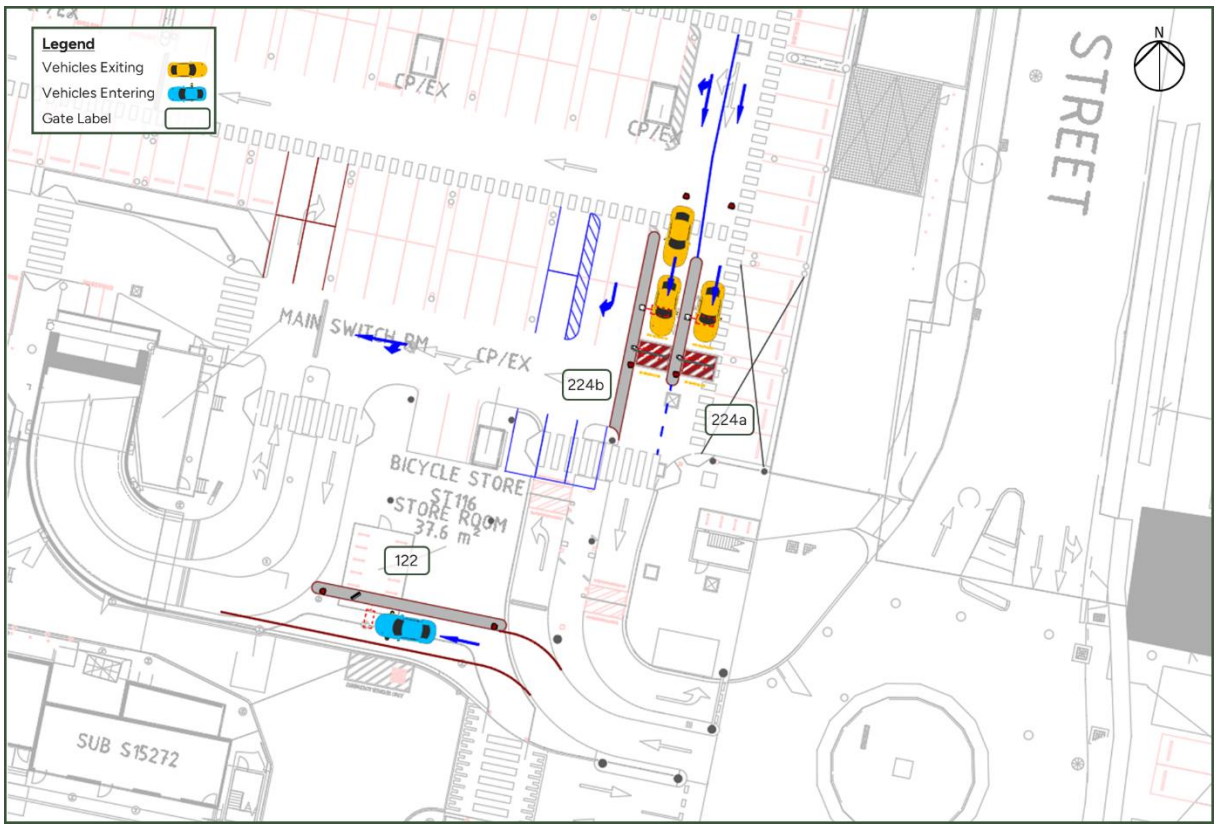
Exit Gates 224a and 224b are new gates that replace the existing single Exit Gate 224. This location was both observed and modelled to have extensive internal queuing during peak traffic periods which banks up inside the car park causing heavy congestion. Whilst the upgrading of the existing ticketed exit gate to a ticketless exit gate would have relieved queuing to some degree via an increase in throughput, the modelling still indicated a strong case for upgrading to a dual exit arrangement if feasible. The proposed solution sets the parking control point back further from the Green Street roundabout in combination with an additional exit gate to significantly increase the throughput capacity of the system and provide a larger storage reservoir between the parking control exit point and the roundabout.

Evaluating the dual exit gates, the anticipated 95th percentile peak hour queues are:

- Thursday PM peak hour queue of less than 1 vehicle per lane (<1 vehicle in total).
- Saturday peak hour queue of 1.1 vehicles per lane (2.2 vehicles in total)

The proposed layouts at Ticketless Access NO.04 and the anticipated 95th percentile peak exit queues (greater of Thursday or Saturday peaks) can be seen on **Figure 8**. The corresponding drawing from within the design package is Ticketless Access NO.04.

Figure 8 Ticketless Access NO.04 – Proposed Layouts and 95%ile Peak Exit Queues



4.4 Ticketless Access NO.05 (East Zone Consolidated 2)

Ticketless Access NO.05 consists of two new entry gates. This access location forms part of the consolidation of the eastern car parking zone which encompasses the Purple Car Park, Red Car Park, Orange Car Park, internal bus stops and other internal loading dock areas.

The location of the ticketless entry gates has been selected so that traffic entering the site is able to utilise both approach lanes to the Cross Street roundabout whilst also permitting the recirculation of traffic from the small parking area at the west and entry to the parking area at the east. Given the frictionless entry arrangements provided by the ticketless parking system, no queuing would be anticipated as a result of the ticketless entry gate locations and as such the proposal does not present any new risk to the external road network.

The proposed layouts at Ticketless Access NO.05 can be seen on **Figure 9**. The corresponding drawing from within the design package is Ticketless Access NO.05.

Figure 9 Ticketless Access NO.05 – Proposed Layouts

4.5 Ticketless Access NO.06 (East Zone Consolidated 1)

Ticketless Access NO.06 consists of two new exit gates. This access location forms part of the consolidation of the eastern car parking zone which encompasses the Purple Car Park, Red Car Park, Orange Car Park, internal bus stops and other internal loading dock areas.

The queue analysis was determined on the basis of 70% of Purple Car Park traffic and all traffic from Red Exit Gates 212 and 213 using this route as an exit from the site.

Evaluating the exit gates, the anticipated 95th percentile peak hour queues are:

- Thursday PM peak hour queue of 1.1 vehicles per lane (2.2 vehicles in total).
- Saturday peak hour queue of 1.3 vehicles per lane (2.6 vehicles in total).

A single exit gate option was investigated although modelling indicated that the capacity would not be adequate given the volume of traffic likely to use this route that provides a direct exit onto Pittwater Road.

The proposed layouts at Ticketless Access NO.06 and the anticipated 95th percentile peak exit queues (greater of Thursday or Saturday peaks) can be seen on **Figure 10**. The corresponding drawing from within the design package is Ticketless Access NO.06.

Figure 10 Ticketless Access NO.06 – Proposed Layouts and 95%ile Peak Exit Queues

4.6 Ticketless Access NO.07 (East Zone Consolidated 3)

Ticketless Access NO.07 consists of a new entry gate and a new exit gate. This access location forms part of the consolidation of the eastern car parking zone which encompasses the Purple Car Park, Red Car Park, Orange Car Park, internal bus stops and other internal loading dock areas.

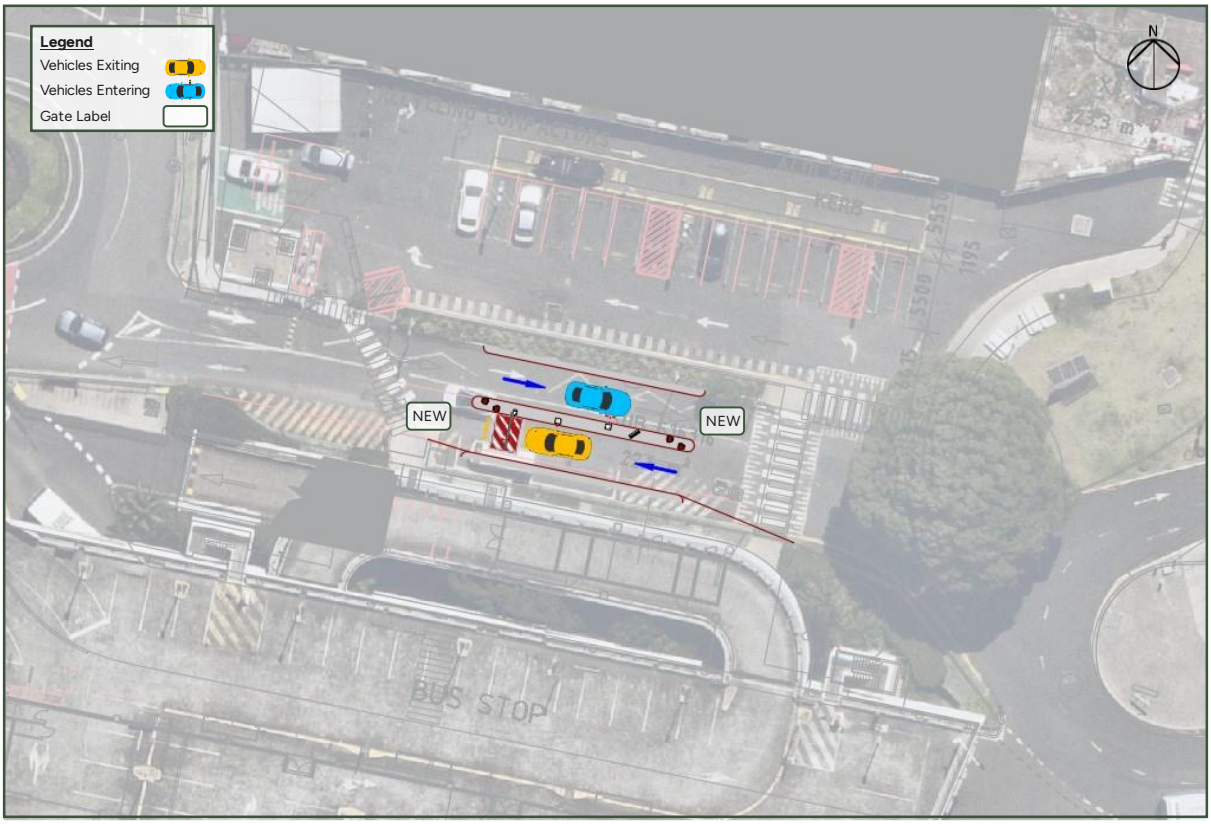
The queue analysis was determined on the basis of 30% of Purple Car Park traffic and all traffic from Red Exit Gate 209 using this route to exit the site.

Evaluating the exit gate, the anticipated 95th percentile peak hour queues are:

- Thursday PM peak hour queue of less than 1 vehicle.
- Saturday peak hour queue of less than 1 vehicle.

The proposed layouts at Ticketless Access NO.07 and the anticipated 95th percentile peak exit queue (greater of Thursday or Saturday peaks) can be seen on **Figure 11**. The corresponding drawing from within the design package is Ticketless Access NO.07.

Figure 11 Ticketless Access NO.07 – Proposed Layouts and 95%ile Peak Exit Queues



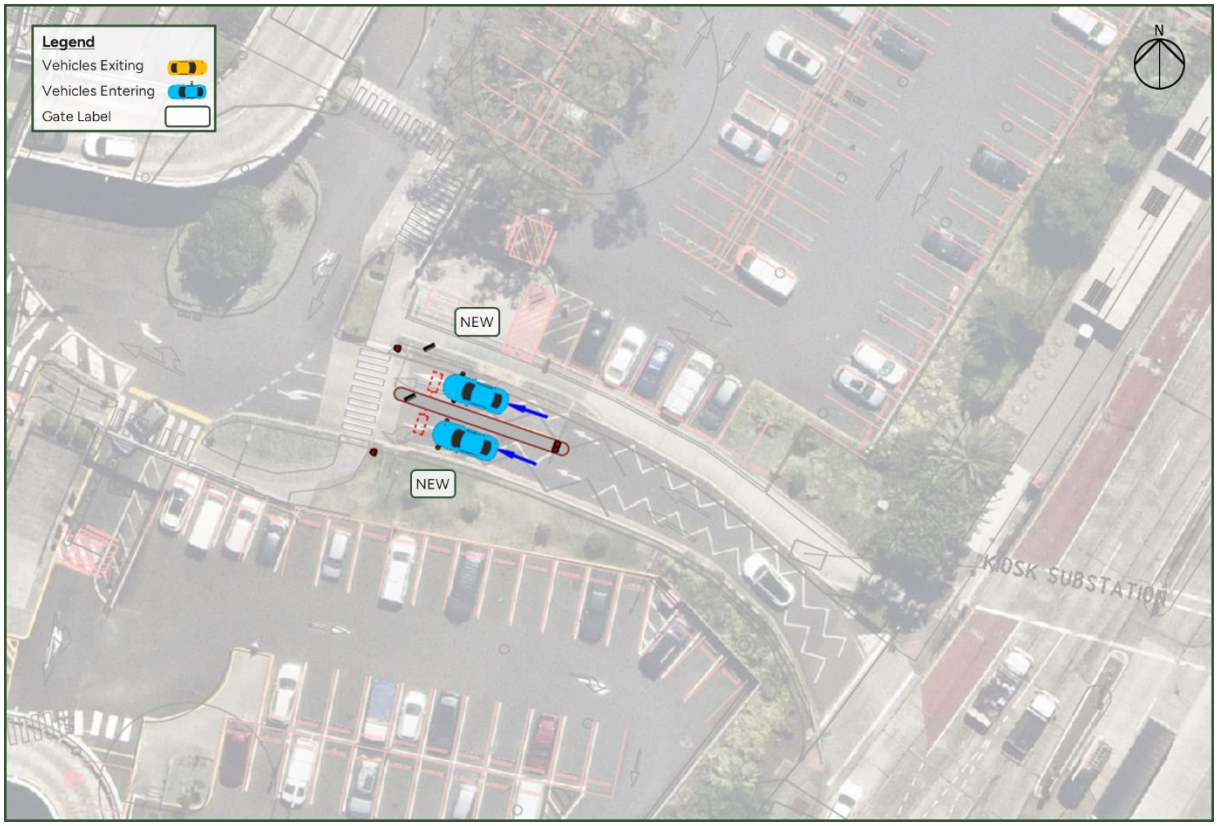
4.7 Ticketless Access NO.08 (Condamine Street Access)

Ticketless Access NO.08 consists of two new entry gates. This replaces multiple existing internal entry gates for the Purple Car Park, Red Car Park and Orange Car Park and consolidates access prior to the internal roundabout.

The location of the ticketless entry gates are positioned in the same location as ticketed infrastructure from an earlier iteration of the current ticketed system prior to the redevelopment of the Purple car park in 2017. This earlier system operated as two gated entries on approach to the roundabout. Whilst the parking control hardware was relocated in 2017, the traffic island and two entry lanes remain. Given the frictionless entry arrangement provided by the ticketless parking system, no queuing would be anticipated as a result of the entry gates being reverted to this location and as such the proposal does not present any new risk to the external road network.

The proposed layout at Ticketless Access NO.08 can be seen on **Figure 12**. The corresponding drawing from within the design package is Ticketless Access NO.08.

Figure 12 Ticketless Access NO.08 – Proposed Layout



4.8 Ticketless Access NO.10 (West Zone Consolidated 3)

Ticketless Access NO.10 consists of a new entry gate and two new exit gates in a dual exit arrangement. The existing Exit Gate 203 is proposed to be retained to allow staff access to areas directly adjacent the building. This access location forms part of the consolidation of the western car parking zone which encompasses the Blue Car Park, Pink Car Park, Teal Car Park and other internal loading dock areas.

The queue analysis was determined on the basis of some Blue Car Park traffic and all Teal Car Park traffic using this route for access to and from the parking areas within.

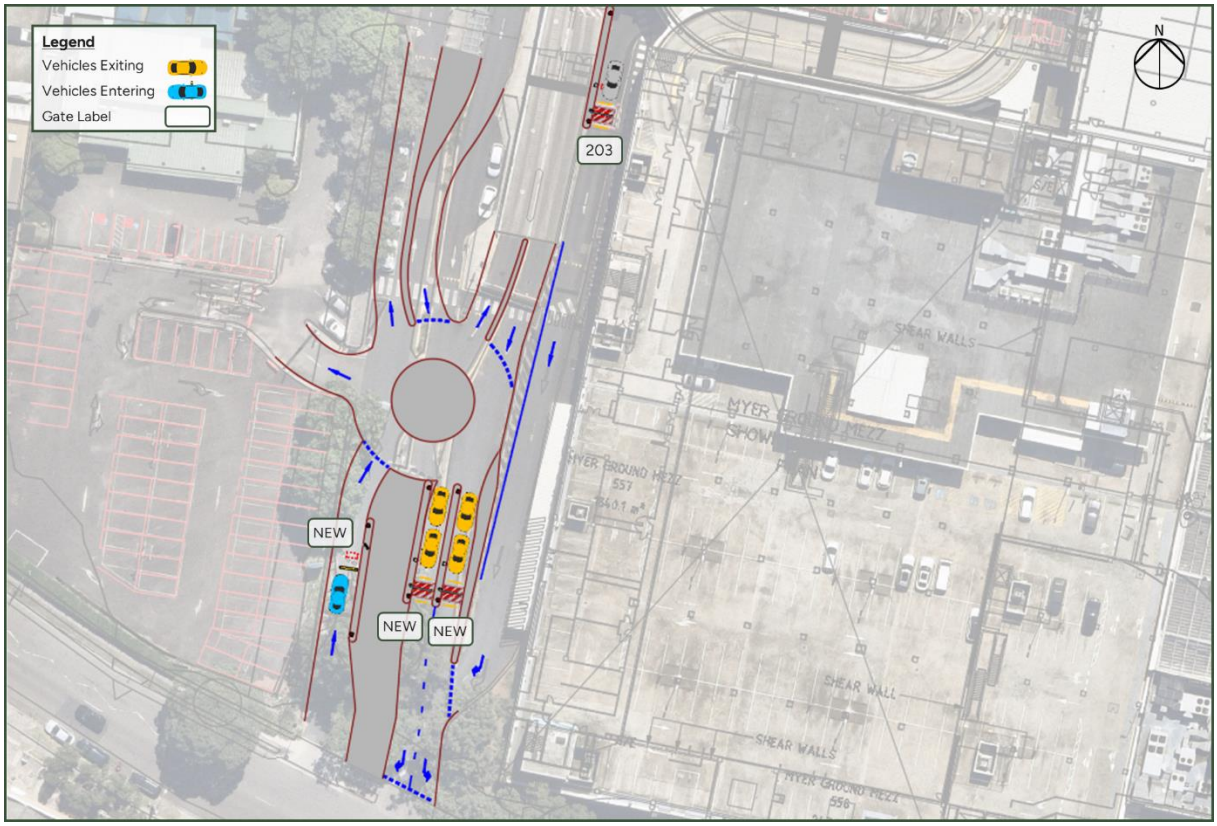
Evaluating the exit gates, the anticipated 95th percentile peak hour queues are:

- Thursday PM peak hour queue of less than 1 vehicle per lane (<1 vehicle in total).
- Saturday peak hour queue of 1.8 vehicles per lane (3.6 vehicles in total).

The reasoning behind the significant redesign of this area was due to the awkward existing lane arrangements which require entering vehicles to cross against oncoming traffic to enter the Blue Car Park via the ramp. After an extensive options analysis was undertaken, it was determined that a roundabout would better accommodate the various opposing traffic movements whilst also futureproofing any potential changes to the Teal car park immediately west. Based on the existing operations at this location, it is still expected that the majority of traffic flow will be between the Blue car park ramp and Old Pittwater Road, although accommodating of the various other turning movements which have lower demands

The proposed layouts at Ticketless Access NO.10 and the anticipated 95th percentile peak exit queues (greater of Thursday or Saturday peaks) can be seen on **Figure 13**. The corresponding drawing from within the design package is Ticketless Access NO.10.

Figure 13 Ticketless Access NO.10 – Proposed Layouts and 95%ile Peak Exit Queues



5.0 Other Considerations

5.1 Service Vehicle Access

SLR has identified during the concept design phase the access locations that would need to accommodate service vehicles. For these locations, the parking control lane widths have been increased as necessary from the typical 3.0m width up to 3.5m in width. It is anticipated that these locations may also require specific hardware to accommodate service vehicles such as taller intercoms. Such details would be resolved by Scentre Group during detailed design.

5.2 Public Bus Access

There is an existing on-site bus stop for public buses at the northern end of Warringah Mall, with buses entering via Cross Street and exiting via Green Street. With the consolidation of the eastern parking areas now including the bus stop area, the ticketless parking control system has been designed to also accommodate the bus movements with minimal interruptions.

Both entry gates on Cross Street have been designed with additional width to accommodate bus and service vehicle movements into the site, with the western entry gate aligning with the western entry lane to the Cross Street roundabout (for access to the bus stop area). The exit from the bus stop area to Green Street is proposed to be gated to prevent vehicles from using the bus stop area to circumvent the parking control system. A height sensor is proposed for the exit gate from the bus stop area to allow buses to exit without having to interact with the parking control system.

Scentre Group already has similar height activated gates across their portfolio and these operate without issue. Further they have already consulted with the bus operator and will work with them on the height sensor location and sensitivity / specification to ensure smooth egress of the buses from the internal busway.

5.3 Dynamic Wayfinding Signage

As part of the Development Application for the implementation of ticketless parking at Warringah Mall, Scentre Group has developed a suite of parking guidance and wayfinding signage upgrades across the site. This includes both static and dynamic signage designed to inform and guide customers towards lesser utilised areas of the car park and also to assist with egress by guiding vehicles to less congested exit points. This signage is expected to work in conjunction with the ticketless parking system to deliver more efficient access, parking and circulation across the site.

5.4 Car Parking Quantum

It is understood that the upgrades to ticketless parking control are likely to incur a small number of parking losses across the site. This is due to the slightly greater spatial requirements that ticketless systems require as well as the proposed additional capacity (ie. new exit gates) having been incorporated into the upgrade. SLR does not believe such losses are of concern on account of the below:

- Initial losses are anticipated to be approximately 28 spaces across the site relative to the existing total provision of 4,577 parking spaces. This is less than 0.6% of the total car parking capacity.

- The upgrades are expected to greatly enhance the customer experience at the site and allow for much more efficient vehicular egress, particularly where capacity upgrades have been proposed.
- Scentre Group are also planning to upgrade their parking management and wayfinding system across the site to improve overall utilisation across the centres various car parks.

The points above will combine to improve the utilisation across the car park and reduce the dwell times of customers attempting to vacate the car park, therefore freeing up additional capacity within car parking areas at a higher rate.

6.0 Conclusion

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Scentre Group to assist in the design and development of an upgrade to the managed parking system at Westfield Warringah Mall Shopping Centre (Warringah Mall), located at Brookvale in Sydney, New South Wales.

The designs for the upgrading of the existing ticketed parking system to a ticketless parking system, which includes a combination of Direct Replacement upgrades and Consolidation / Enhancement upgrades, has been supported by capacity analysis including the modelling of exit vehicle queues and considerations of site design constraints, efficiency and redundancy.

Based on the analysis and discussions documented herein, the following is concluded:

- The proposed parking control upgrades will replace the outdated ticketed equipment with new and contemporary ticketless equipment, consistent with upgrade programs that have been rolled out at other Westfield sites across Australia.
- The proposed parking control upgrades will increase car park efficiency via the added throughput provided by the ticketless technology. This technology creates a frictionless entry arrangement and more streamlined exit arrangement as in the majority of cases there is no customer interaction required with ticket machines.
- The consolidation and enhancements proposed as part of the parking control upgrades will improve the overall operation of the managed parking system at Warringah Mall by adding additional capacity to the system, reducing the number of separate “nested” parking control areas within the site, and addressing some of the key parking constraints within the car park that have been identified as currently being sub-optimal.
- All existing locations being upgraded to ticketless parking control have been assessed via queue analysis to determine if further upgrades are warranted where feasible.
- All new locations for ticketless parking control have been assessed via queue analysis to ensure adequate capacity is integrated into the designs accommodating the traffic demands of typical peak trading hours.
- Ticketless parking control points have been designed to accommodate service vehicles where applicable.
- Access to the bus stop area by buses is retained, with the current proposal to implement an exit gate with a height sensor to allow buses to exit uninterrupted, whilst also preventing customers from using the bus stop area to bypass the parking control.
- The new parking guidance and wayfinding signage will work in conjunction with the ticketless parking system to deliver more efficient access, parking and circulation across the site.
- The minimal parking losses anticipated (less then 0.6%) will be more than offset by the efficiencies gained through improved egress, utilisation and wayfinding.

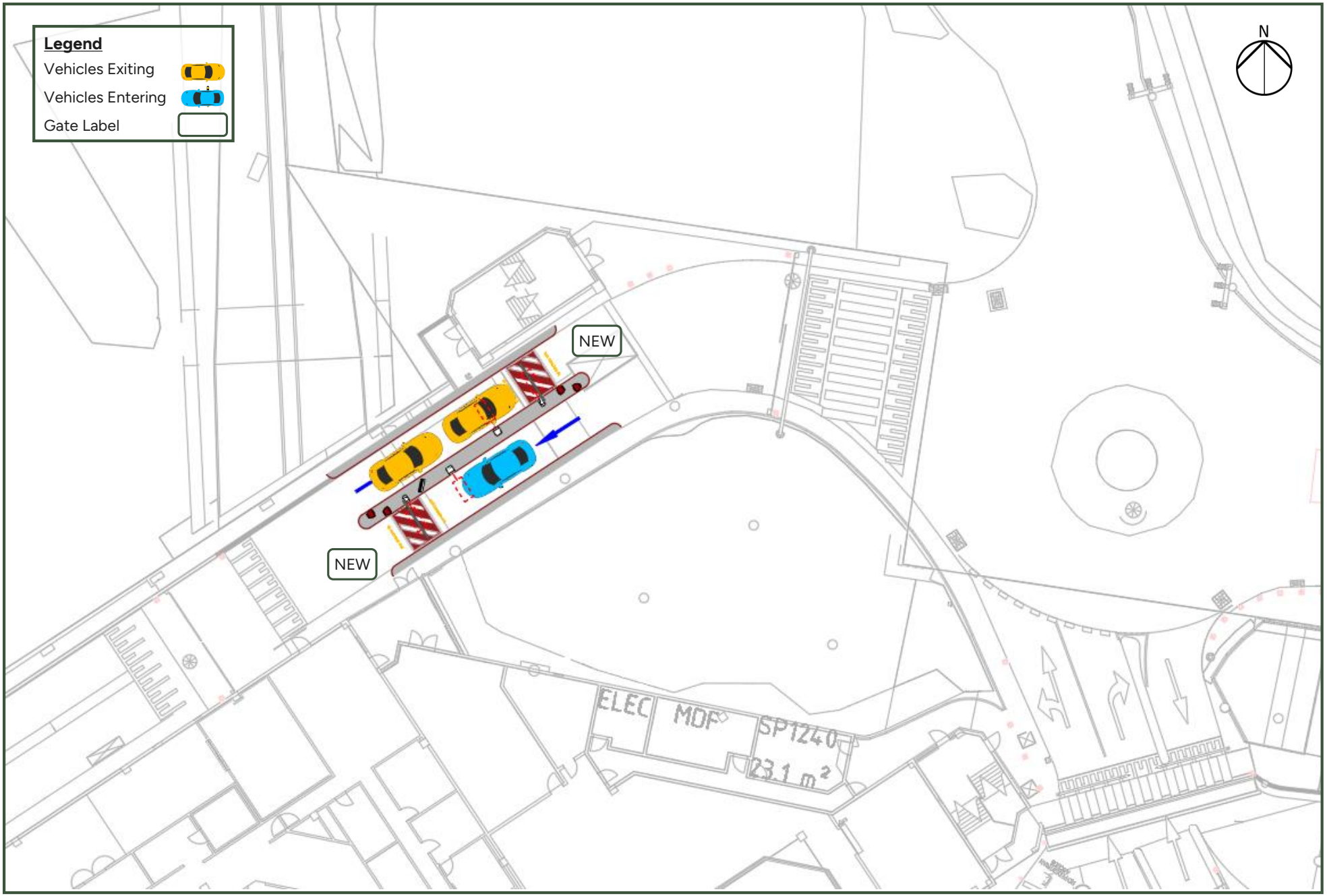
Based on the above, SLR is confident that the overall design of the ticketless managed parking upgrade will support Scentre Group’s aims to enhance the efficiency of the current parking control system and provide a better customer experience within the car park.

Furthermore, SLR does not anticipate any detrimental impacts to the external road network through the provisions of the frictionless entry arrangements.

Jeffrey Baczynski
Technical Director – Transport Advisory

Drew Mansini
Associate Consultant – Transport Advisory

Appendix A Design Package



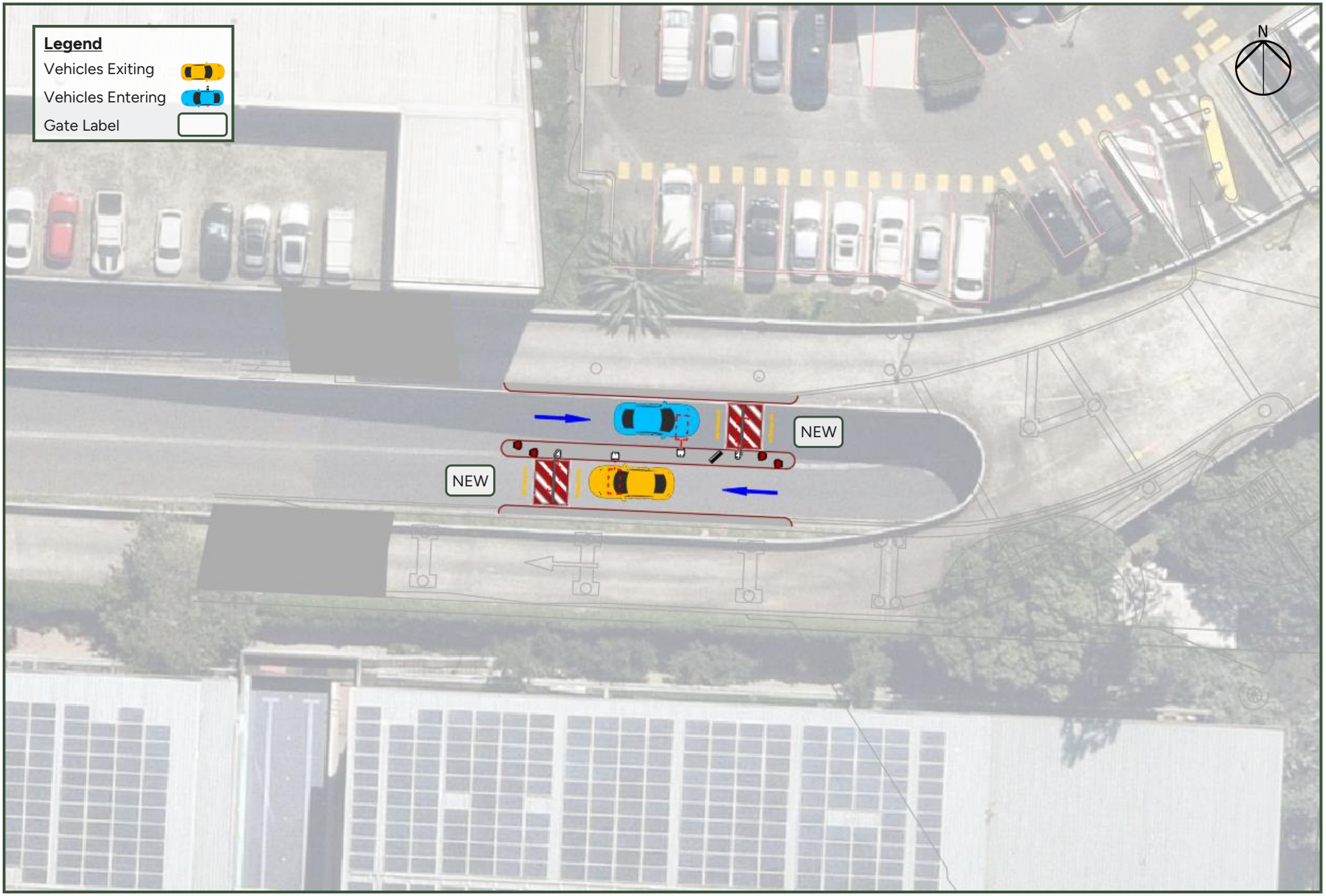
SLR

Concept Design: Queue Forecast Figure

Ticketless Access NO.01

620.V31285.00003
Warringah Mall Ticketless Parking

Date: 19/12/2023
Prepared by: DM

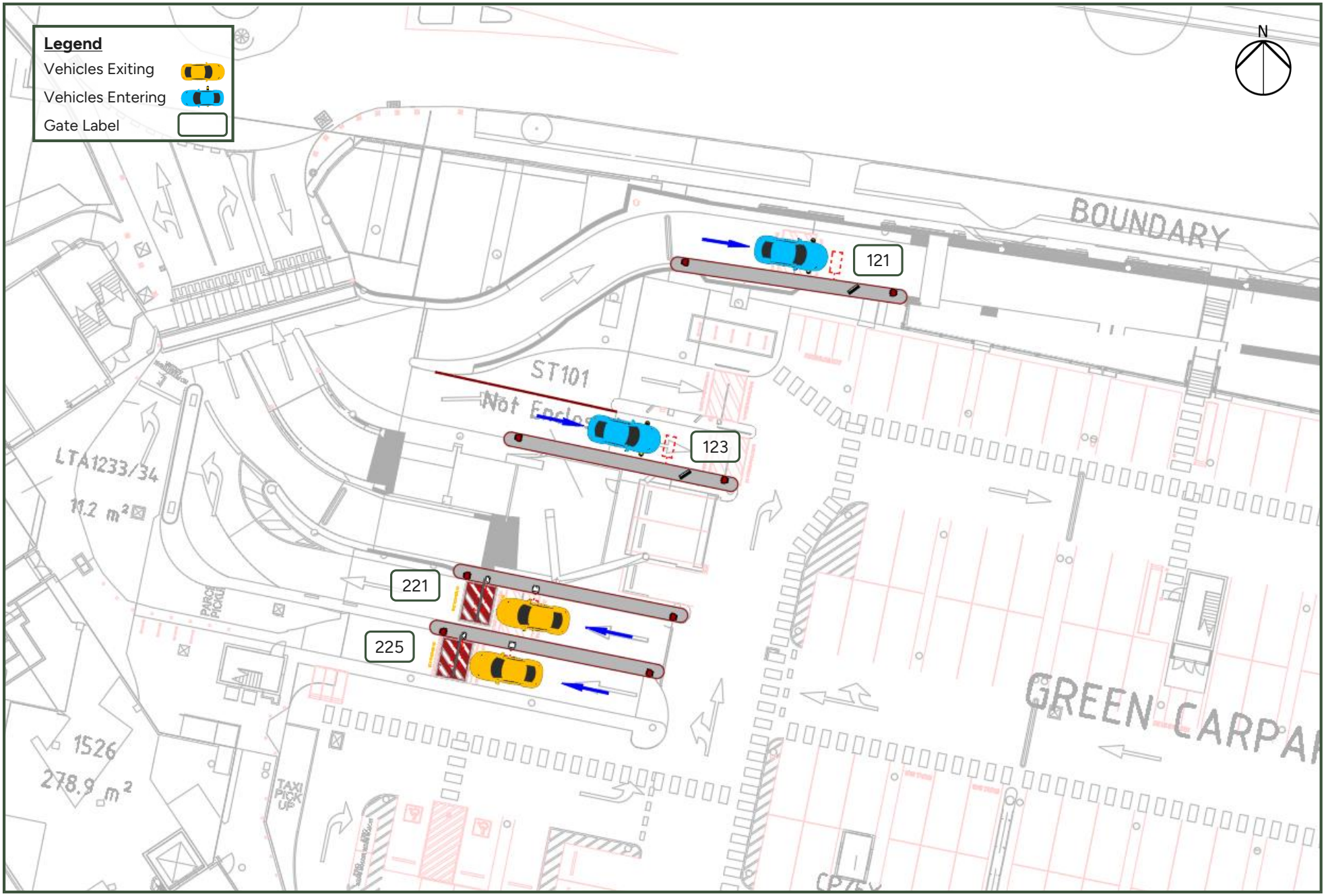


Concept Design: Queue Forecast Figure

Ticketless Access NO.02

620.V31285.00003
Warringah Mall Ticketless Parking

Date: 19/12/2023
Prepared by: DM



Concept Design: Queue Forecast Figure

Ticketless Access NO.03

620.V31285.00003
Warringah Mall Ticketless Parking

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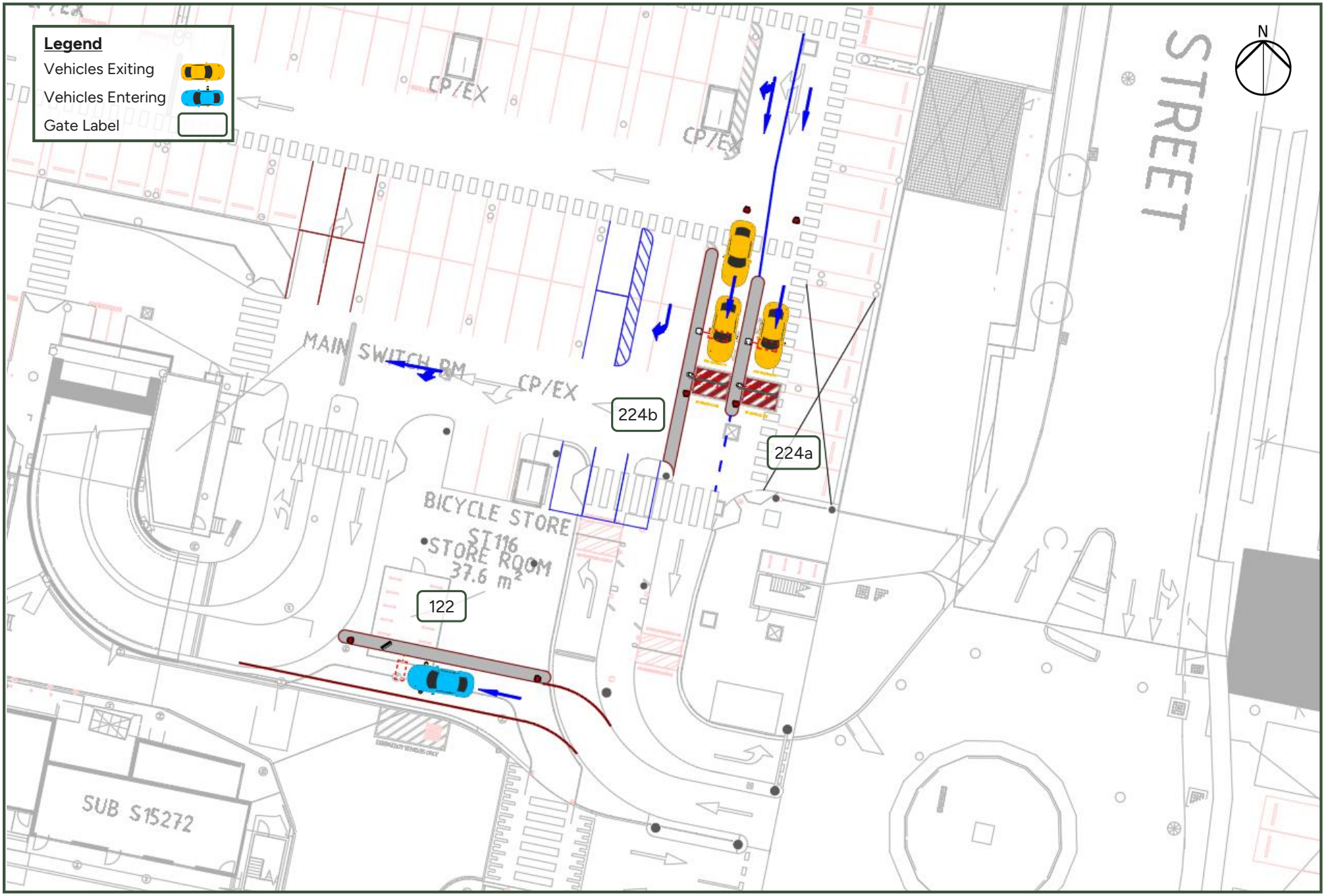


Concept Design: Queue Forecast Figure

Ticketless Access NO.04

Concept Design: Queue Forecast Figure

Ticketless Access NO.05

620.V31285.00003
Warringah Mall Ticketless Parking

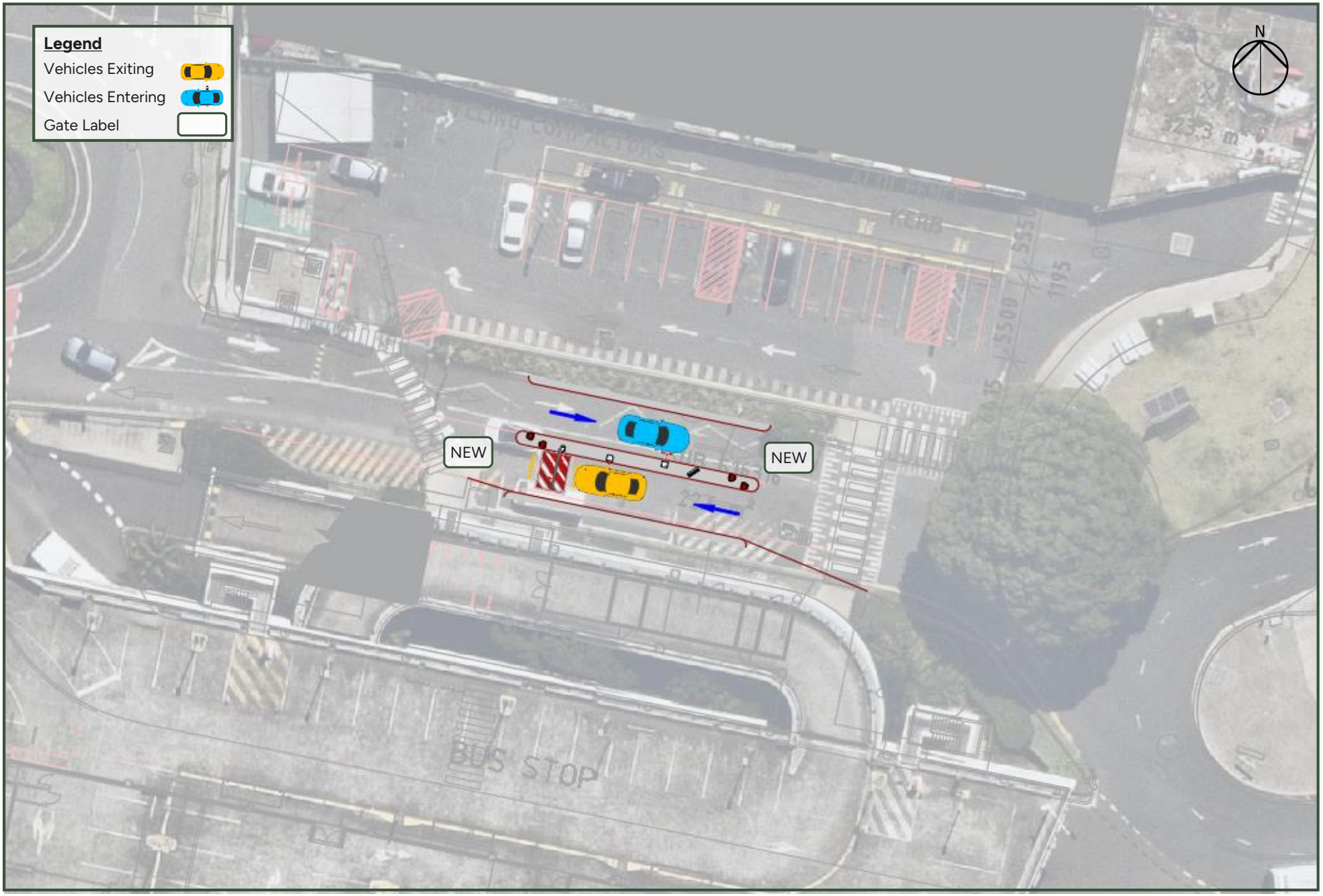
Date: 19/12/2023
Prepared by: DM

Concept Design: Queue Forecast Figure

Ticketless Access NO.06

620.V31285.00003
Warringah Mall Ticketless Parking

Date: 19/12/2023
Prepared by: DM



Concept Design: Queue Forecast Figure

Ticketless Access NO.07

620.V31285.00003
Warringah Mall Ticketless Parking

Date: 19/12/2023
Prepared by: DM

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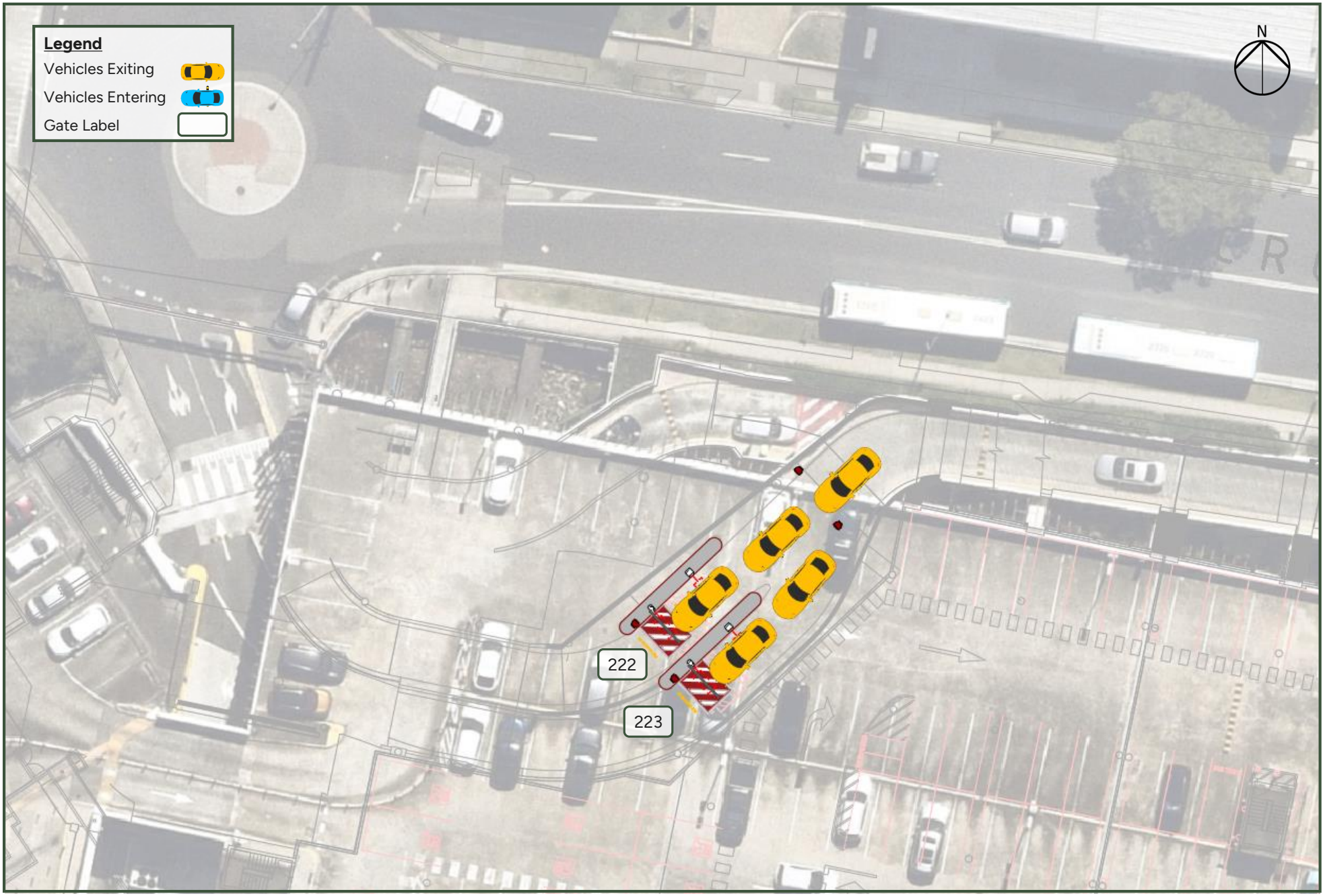
Concept Design: Queue Forecast Figure

Ticketless Access NO.08

620.V31285.00003
Warringah Mall Ticketless Parking

Date: 19/12/2023
Prepared by: DM



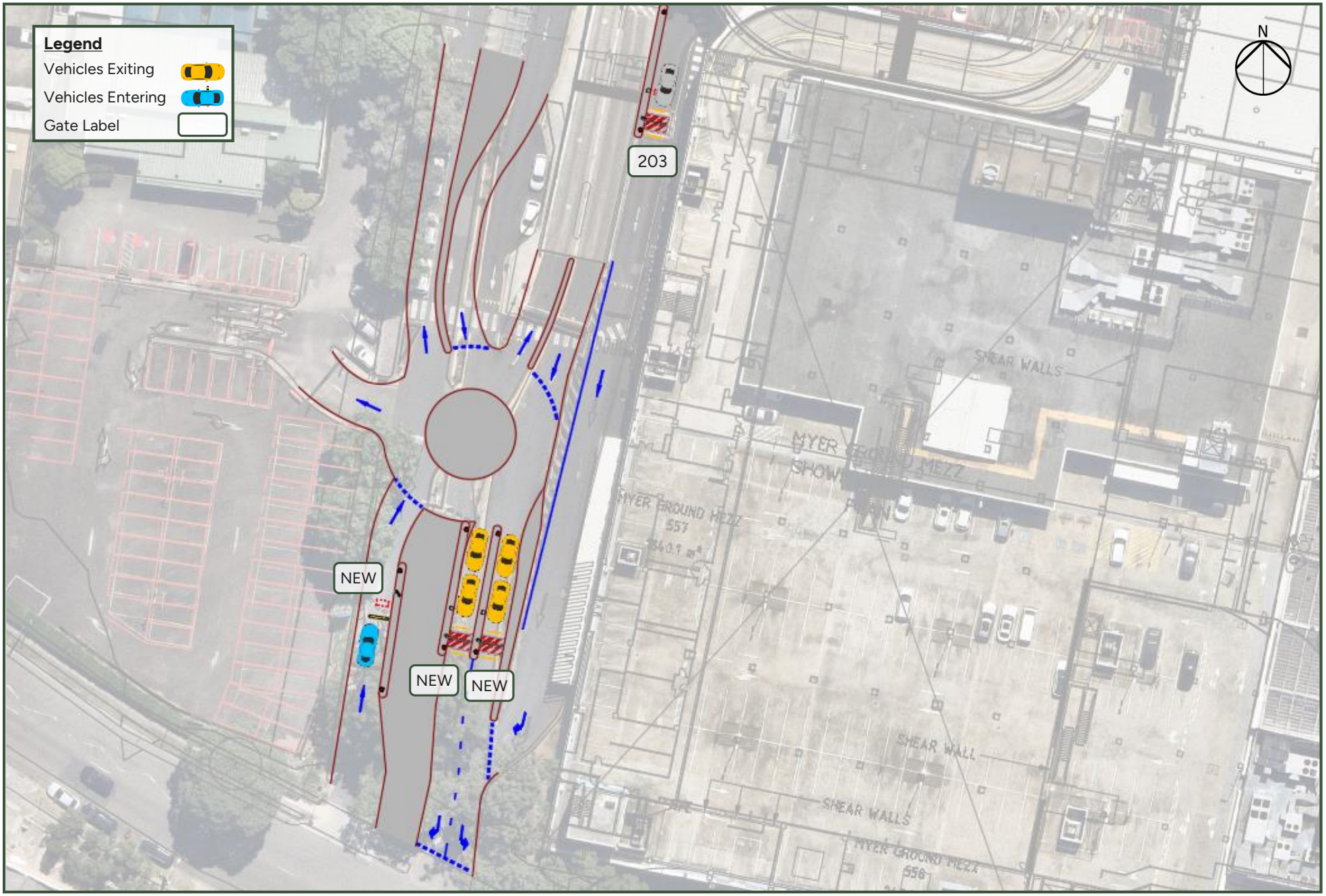
SLR

Concept Design: Queue Forecast Figure

Ticketless Access NO.09

620.V31285.00003
Warringah Mall Ticketless Parking

Date: 19/12/2023
Prepared by: DM



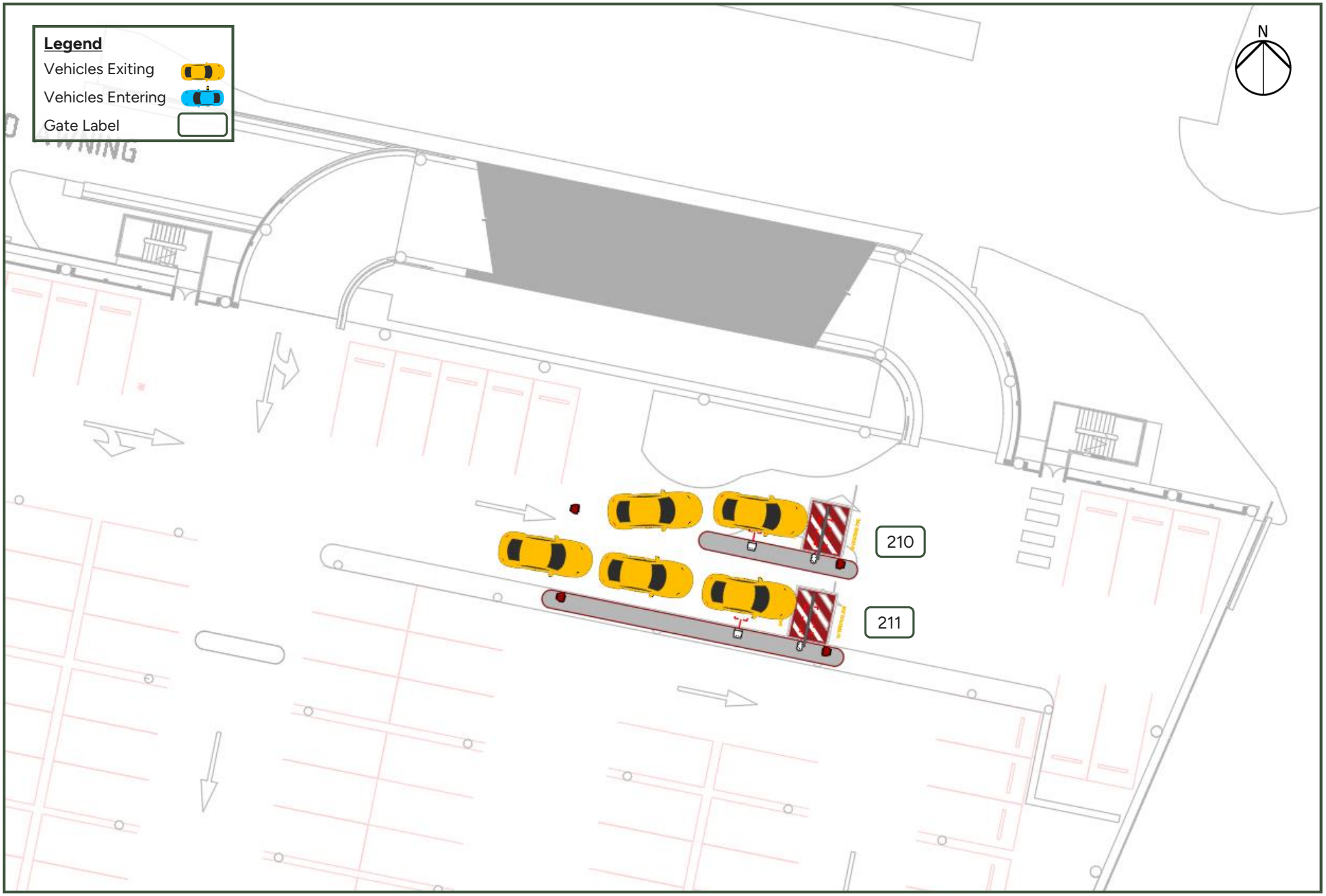
SLR

Concept Design: Queue Forecast Figure

Ticketless Access NO.10

620.V31285.00003
Warringah Mall Ticketless Parking

Date: 19/12/2023
Prepared by: DM



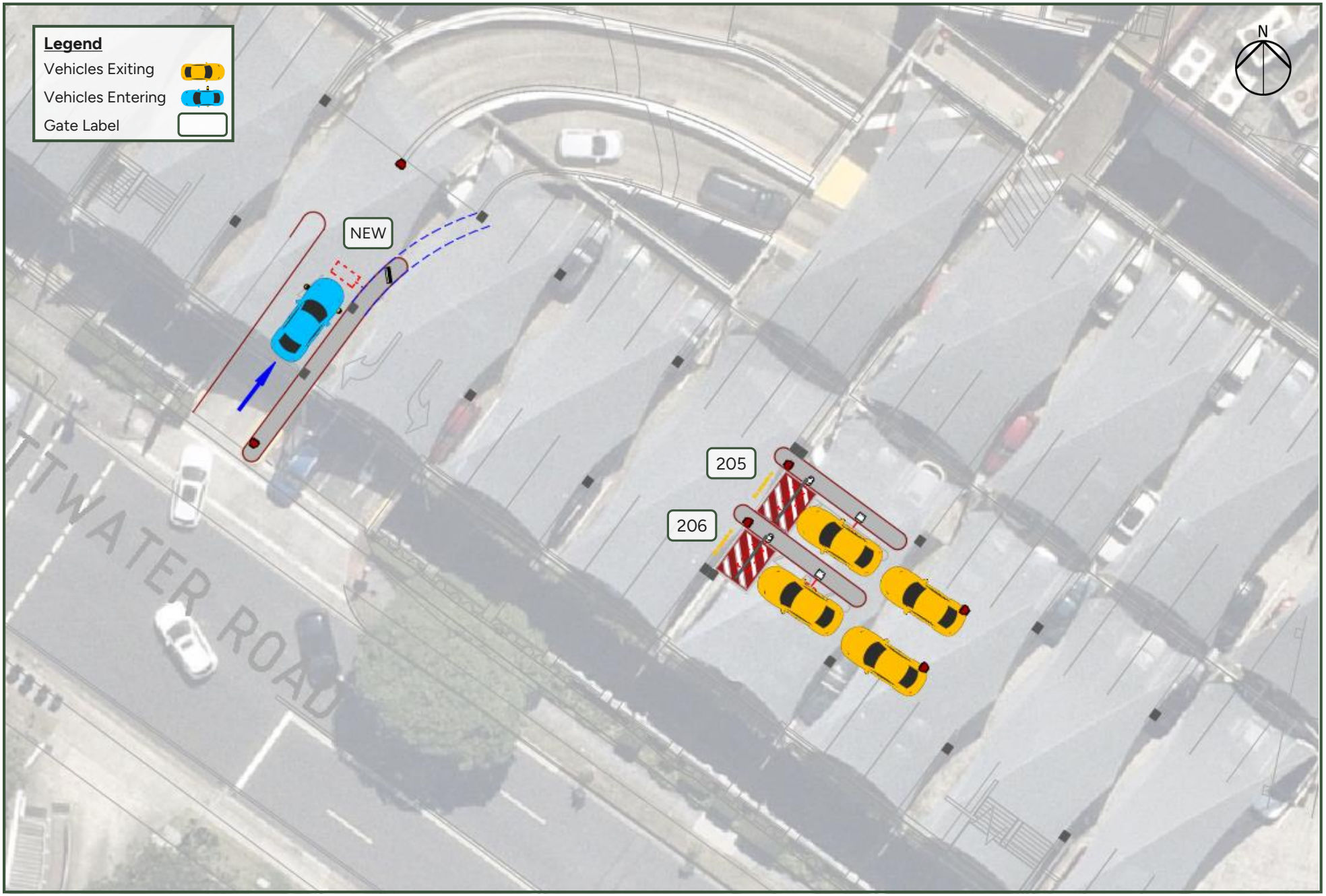
SLR

Concept Design: Queue Forecast Figure

Ticketless Access NO.11

620.V31285.00003
Warringah Mall Ticketless Parking

Date: 19/12/2023
Prepared by: DM



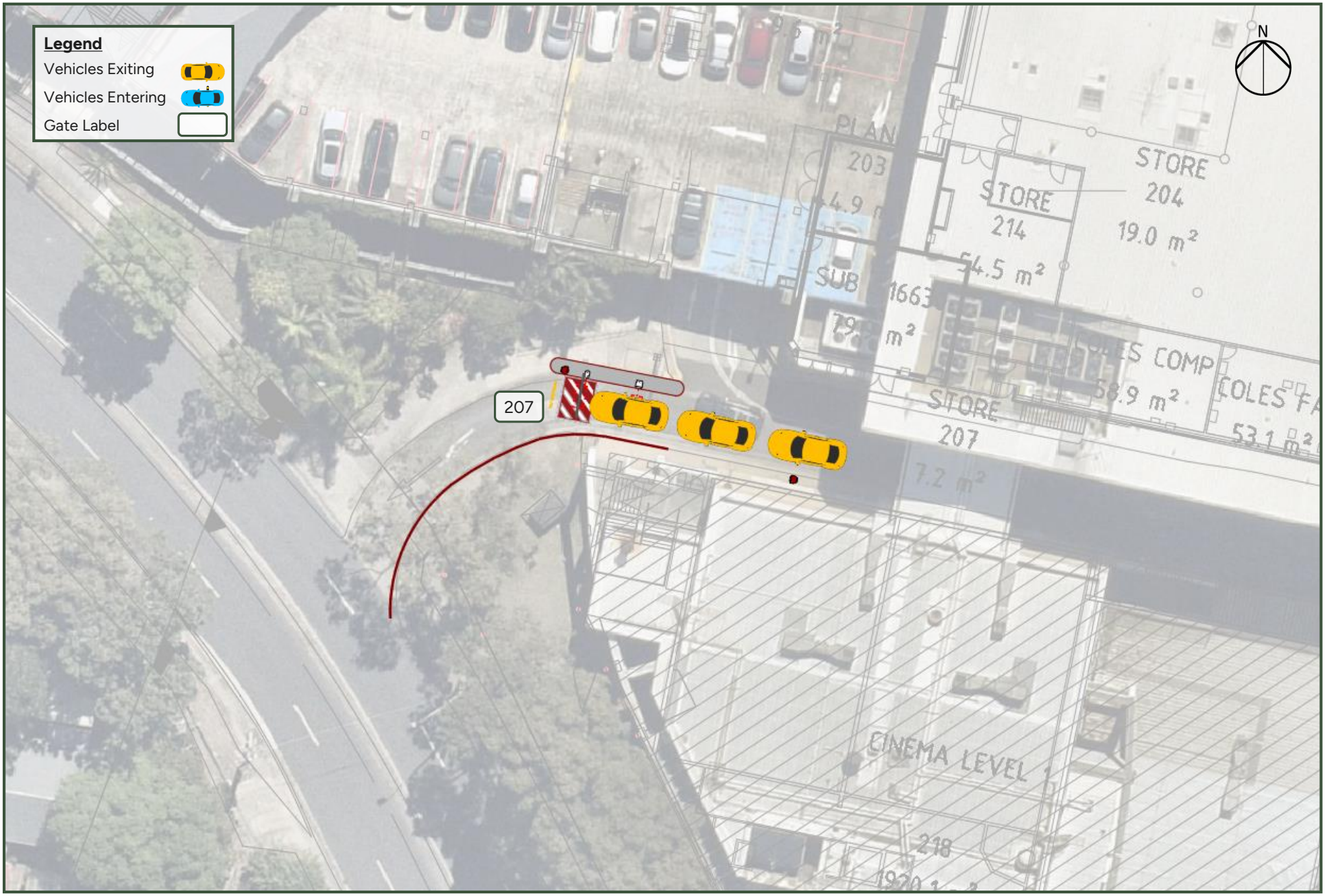
SLR

Concept Design: Queue Forecast Figure

Ticketless Access NO.12

620.V31285.00003
Warringah Mall Ticketless Parking

Date: 19/12/2023
Prepared by: DM



SLR

Concept Design: Queue Forecast Figure

Ticketless Access NO.13

620.V31285.00003
Warringah Mall Ticketless Parking

Date: 19/12/2023
Prepared by: DM