Health Infrastructure

Randwick Campus Redevelopment

Traffic and Transport Assessment Response to Submissions - Sydney Children's Hospital Stage 1/ Children's Comprehensive Cancer Centre (SSD-10831778)

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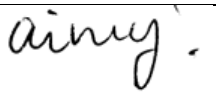
		Signature			
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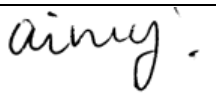
		Signature			
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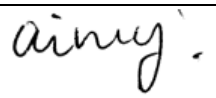
		Signature			
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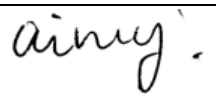
		Signature			

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1 Introduction

This report has been prepared in response to traffic and transport submissions received in relation to the Sydney Children's Hospital Stage 1/ Children's Comprehensive Cancer Centre State Significant Development Application (SSDA -10831778).

In particular, this report addresses submissions received from the Department of Planning, Industry and Environment (DPIE), Randwick City Council (Council) and Transport for NSW (TfNSW), relating to traffic access and queuing in consideration of the Australian Standards, the existing car park and safety in design. This report should be read in conjunction with the Traffic and Transport Assessment (the TTA) prepared by Arup and issued on the 23 April 2020 for the SSDA submission.

1.1 Site description

The Randwick Campus Redevelopment (RCR) is situated approximately 7.2km south east of the Sydney CBD and is bounded by High Street to the north, Avoca Street to the east, Barker Street to the south and Hospital Road to the west. The Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre herein known as the Project is within the RCR site.

The Project is situated west of the existing RHC as shown in Figure 1.

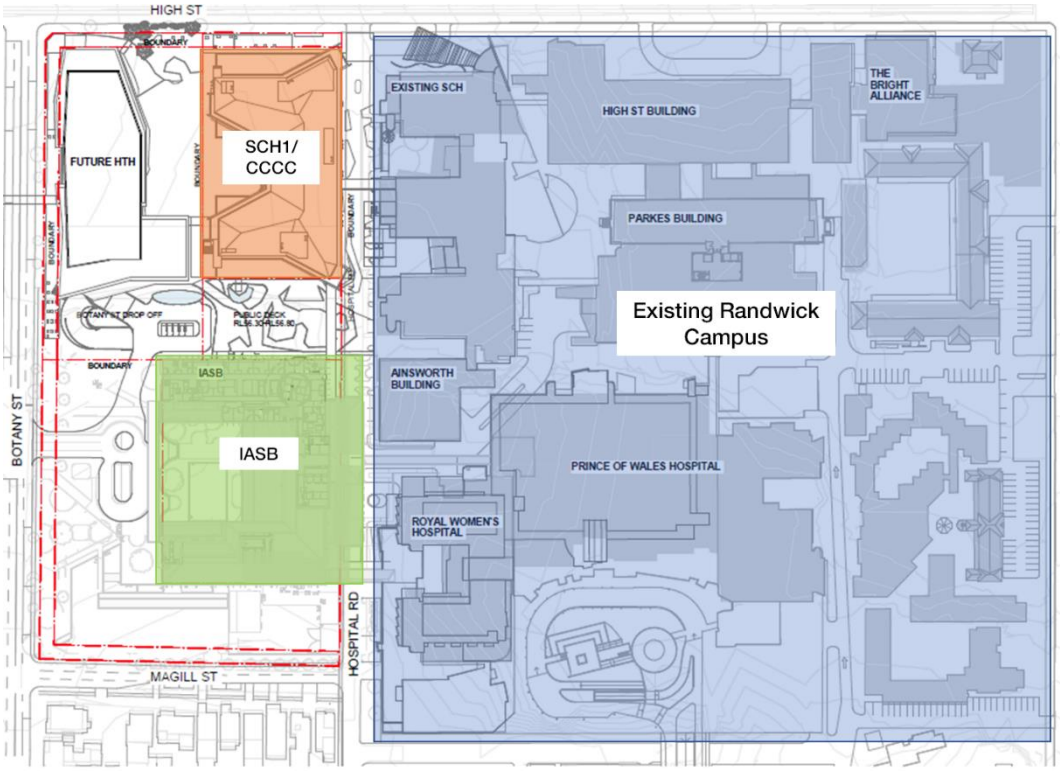


Figure 1: Existing Randwick Hospital Campus and RCR site including proposed SCH1/CCCC Project

1.2 Report structure

This document will follow the general structure outlined in Table 1.

Table 1: Context and report structure

Section	Context
1. Introduction	Outlines the site and context of the SSDA, report purpose and relevant supporting documents for this report.
2. Submissions received	Summarises the submissions received for the SSDA relevant to traffic and transport.
3. Parking Demand and Management	Provides further detail regarding case studies focused on improvement in the operation of an existing multi-storey car park.
4. Queuing at the forecourt and Botany Street access	Details impact assessment undertaken at the Emergency Department (ED) drop-off/ pick-up area and Botany Street access in consideration of the IASB drop-off.
5. Vehicle access and circulation	Summarises the largest design vehicle for key access points and facilities for the Project and the outcomes of compliance checks undertaken in accordance with the Australian Standards 2890 (AS2890).

2 Submissions received

Table 2 to Table 4 summarises the submissions received and addressed in the following sub sections. The table also summarises the relevant section to reference for each submission item.

2.1 Transport for New South Wales

Table 2: TfNSW submissions received on 15 June 2021

Item No.	Submission	Response location
2	Section 5.2 of the Traffic and Transport Assessment prepared to support the development application states the following: "Currently parking behaviours indicate that the average occupancy of the car park during the peak period is 91% on a weekday. A review of literature indicates that a dynamic wayfinding system has the potential to increase operational capacity of a multi-storey car park to the vicinity of 95%." "For the Project, this means an additional 95 parking bays will be required in the main car park to offset staff parking demand and to account for additional visitor/outpatient parking demand." **Recommendation** It is requested that the applicant provides the following as part of the applicant's Response to Submissions: • Details on the measures including associated technologies (implementation of dynamic wayfinding systems and car stackers) that would be used to demonstrate the suggested utilisation can be achieved; and • Evidence such as calculations or examples of car parks, with a similar turnover rate to the existing hospital car park, can or do operate effectively at 95% utilisation.	Section 3 Section 3
3	It is noted that a Green Travel Plan (GTP) has been prepared as part of the Traffic and Transport Assessment. It is advised that • The applicant updates and expands the existing GTP developed for the Randwick Hospitals Campus (SSD-10339-Mod-1), to provide for sustainable travel solutions for travel demand generated by the development; • The GTP needs to be developed in collaboration with the UNSW Health Translations Hub development (SSD-10822510) due to their cumulative impact, and to ensure consistency across the project sites and to identify potential synergies; • The applicant needs to identify how ongoing activities and/or those that are not completed by the Health Infrastructure prior to occupancy will be transferred to and/or delivered by Sydney Children Hospital, including provision of funding	Noted

	and resourcing for those activities, for a period of at least 5 years post-occupancy; and • TfNSW would welcome further discussions with the proponent regarding these matters to ensure their delivery. **Recommendation** It is requested that the applicant be conditioned to update the Green Travel Plan in consultation with TfNSW and submit a copy of the final plan for TfNSW endorsement, prior to the issue of the Occupation Certificate.	
4	The proposed access arrangement allows light and heavy vehicle movements via Botany Street with multiple conflicts at the access to the loading dock to the Health Translation Hub, the loop road and the cark park access for the subject site. The following conflicts in vehicle / pedestrian movements would have the potential to cause safety issues: • Vehicles accessing the loading dock for the Health Translation Hub (HTH) and the car park for the subject development; • Vehicles accessing the loading dock for the HTH and the proposed loop road; and • Vehicles accessing the subject site as well as other properties adjacent to the site and pedestrian accessing these sites. • Swept paths analysis has not been undertaken for the maximum size of the vehicle accessing the loop road (Ambulances) via Botany Street in the Traffic and Transport Assessment. **Recommendation** It is requested that the applicant undertakes the following as part of the Response to Submissions. Based on the results of the road safety audit and the swept path analysis, the design drawings need to be reviewed to identify safety measures that may need to be implemented.	
	Consider providing a consolidated loading dock for the subject site as well as the Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre with access via Hospital Road. This is to remove the heavy vehicle access via Botany Street;	Section 5.1
	A Stage 2 (Concept Plan) Road Safety Audit for the proposed vehicle and pedestrian access arrangement to the subject site in accordance with Austroads Guide to Road Safety Part 6: Managing Road Safety Audits and Austroads Guide to Road Safety Part 6A: Implementing Road Safety Audits by an independent TfNSW accredited road safety auditor; and	Section 5.3 and Appendix B
	A swept path analysis for the maximum size of the vehicle (Ambulances) entering and leaving the loop road to / from Botany Street.	Appendix A
5	It is noted that a number of different users from multiple sites will be accessing the proposed entry route/ drop off area/ loop road. It is not clear how this area will be managed such that queuing back onto Botany Road will not occur.	Section 4

	Recommendation It is requested that the applicant provides the details on the estimated number of vehicles using the proposed entry route/ drop off area/ loop road and undertakes a queuing analysis to confirm that the proposed access and internal circulation arrangements would not cause queuing on Botany Street as part of the applicant's Response to Submissions.	
6	It is noted that a Preliminary Construction Pedestrian and Traffic Management Plan (CPTMP) has been prepared as part of the Traffic and Transport Assessment. It is advised that the applicant updates and expands this Plan in consultation with TfNSW to prepare a CPTMP. **Recommendation** It is requested that the applicant be conditioned to prepare a Construction Pedestrian and Traffic Management Plan (CPTMP) in consultation with TfNSW and the Sydney Light Rail Operator and submit a copy of the final CPTMP for TfNSW endorsement, prior to the issue of any construction certificate or any preparatory, demolition or excavation works, whichever is the earlier.	Noted The appointed Contractor will update the CPTMP in consultation with TfNSW and the Sydney Light Rail Operator.

2.2 Department of Planning, Industry and Environment (DPIE)

Table 3: DPIE submissions received on 24 June 2021

Item No.	Submission	Response location
2	Provide swept path diagrams and analysis for the largest proposed vehicle types at each vehicle entrance and loading bay area. Where necessary, revise the design to ensure swept paths are appropriate.	Section 5.2 and Appendix A
3	Provide sections for all vehicle access ramps (including the enclosed Hospital Road) demonstrating adequate clearances are provided the largest proposed vehicles in accordance with AS 2890.	Section 5.2 and Appendix A
4	Provide specific details of the proposed dynamic wayfinding system to be implemented in the main carpark and confirmation if, and how, these measures will be delivered to support the proposed development.	Section 3

2.3 Randwick City Council

Table 4: Randwick Council submissions received on 21 June 2021

Item No.	Submission	Response location
11	It is acknowledged that for the 40 extra beds proposed by 2025, the provision of a new visitor car park will result in up to 50 additional parking bays. It is also acknowledged that the proposal seeks to optimise the operation of existing parking assets with the existing RHC main car park, which	Section 3

	is being investigated for potential optimisation in efficiency which includes implementation of dynamic wayfinding systems and car stackers. The details of these proposals are not provided within the submitted EIS or accompanying documentation. Detail should be provided during the assessment and prior to the approval of the proposal.	
12	It is indicated that a proposed dynamic wayfinding system has the potential to increase operational capacity of a multi-storey car park in the vicinity of 95%. This may result in an increase in efficiency of 4%, potentially providing an additional capacity of 65 parking spaces during peak times. However, the details of this approach are not provided. Further details and recommendations should be provided during the assessment and prior to approval of the proposal.	Section 3

3 Car park efficiency measures

This chapter provides a summary of previous studies undertaken for multi-storey car parks (MSCP) which focused on implementing systems to improve occupancy and travel time to parking spaces.

As outlined in the TTA, the existing RHC car park has displayed an average peak occupancy rate of 91% for the weekday. There are a number of ways a car park can improve occupancy rates such as the introduction of new technology e.g. dynamic wayfinding system or stacking of vehicles which provides additional capacity in the car park. Improving the efficiency of the car park through measures such as implementing a dynamic wayfinding system has the potential to further increase the occupancy rate of the car park to 95%.

3.1 Parking Guidance Systems (PGS)

As noted above, a Parking Guidance System (PGS) is one system that the RHC may potentially consider to improve the occupancy rates above the noted peak of 91%.

A PGS encompasses technologies which help drivers find unoccupied parking spaces, car location when returning to the vehicle and improves their overall parking experience. This includes dynamic wayfinding including adaptive lighting sensors and parking space led indicators (red for occupied, green for available and blue is reserved for the disabled; above every parking space), and indoor positioning system (IPS) which encompasses technologies which to locate objects indoors to assist in activities such as inventory management and wayfinding. PGS are designed to aid in the search for vacant parking spaces by directing drivers to car parks where occupancy levels are low.

PGS have been rolled out extensively in large public car parks such as shopping centres and airports where they provide efficiency in circulation of vehicles searching for a space as well as increasing utilisation of the available spaces particularly for constrained sites. The system benefits in these circumstances have been well documented and so, implementation of PGS into hospital car parks are being investigated noting these sites are generally constrained with multiple users competing for parking spaces on a given day.

Generally, staff use private vehicles to travel to the hospital as designated staff car parking spaces are provided on-site. These car parks have traditionally been provided as at-grade open lot car parks. In these circumstances the benefits of PGS are limited. With hospital redevelopment programs however, open lot car parks are being consumed by building footprint and car parking is being provided in MSCP. This is where the benefits of PGS are more evident by improving utilisation of all spaces which assist to offset future parking demand.

Previous investigations in improving MSCP efficiency through the implementation of a PGS have previously been undertaken by Arup for Blacktown Hospital (August, 2018) and Westfield Parramatta (February, 2010). The key outcome for both studies focussed on how PGS reduces travel time to

each parking space, therefore resulting in higher occupancy rates as parking spaces would stay empty for a shorter amount of time and congestion within the carpark would be minimised.

3.1.1 Case Study 1: Blacktown Hospital MSCP

The Blacktown Hospital study undertook a Post Occupancy Evaluation of the MSCP following installation of a PGS. This study included questionnaire surveys from car park users (staff and visitors) which highlighted that both user groups are utilising the system and improving their parking experience with the majority indicated that they found the PGS useful.

3.1.1.1 PGS response to Blacktown Hospital MSCP

Table 5 below outlines the responsiveness of PGS to characteristics identified for Blacktown Hospital MSCP. A comparison of the characteristics against the Project has identified the following:

- The layout of the RHC MSCP is not intuitive and so reduces the efficiency of use and utilisation of the parking bays;
- Parking demand will increase in line with the forecasted increase in activity associated with Stage 1 of the Project;
- A range of user groups will continue to use the on-site parking spaces including visitors and staff. With the increase in future activity, this will need to be streamlined to improve user experience; and
- The RHC MSCP does not currently have systems in place to provide more detailed parking data such as occupancy rates and length of stay for future planning.

Based on this, the outcomes of this study can assist in outlining the potential benefits afforded by a PGS for the Project.

Table 5: PGS response to characteristics of Blacktown Hospital MSCP

Characteristics of Blacktown Hospital MSCP	PGS response
Multiple decision points that would be well served by real time dynamic directional information to available parking	Inclusion of key decision points on each floor in the PGS improves efficiency of use
The proposed traffic flow design will restrict access to significant numbers of parking bays which may result in an unbalanced utilisation of the car park within specific areas and much longer parking times for patrons. This can be significantly reduced by the implementation of PGS.	Time savings per floor if drivers follow the PGS, resulting in spaces being filled up from the bottom up.
Visitor and day patient user groups accessibility to parking (or lack thereof) which may result in dissatisfaction which can be mitigated by the implementation of PGS	Provision of car parking space availability in the MSCP results in users being more satisfied by finding a parking space more easily

Increase in future parking demand due to proposed works at the hospital	System is easily expandable to simple way-finding through to an entire Campus RGS
Information provided by the PGS systems will also be instrumental in review of actual and accurate parking information such as average length of stay, occupancy rates, demand curves, etc. at different time of the week/month/year. This information can be utilised to monitor the demand of the multi-deck car park and allow decisions for increases in supply to be undertaken prior to saturation of the site in relation to supply and demand.	More accurate data is being collected from the PGS which can be used for monitoring and future planning

3.1.1.2 Key summary of outcomes

The study undertaken for Blacktown Hospital MSCP outlined that the hospital's car park efficiency was improved by providing drivers with information about available car parking spaces on each floor. This enabled drivers to proceed directly to the next available space without needing to search each floor and a time saving of approximately 1.5 minutes per floor. The operation of each aisle was also improved as drivers did not need to search for a space as they travelled along the aisle. The red and green indicator lights also allowed drivers to proceed to the next available space along the aisle. As a result of the time savings provided by the PGS, a higher occupancy rate is possible as parking spaces are staying empty for shorter amounts of time.

It was also highlighted in the study that the benefits of PGS implementation across multi-storey and at-grade car parks has the potential to further increase as connected vehicles and campus wide systems are utilised. The benefits are likely to expand beyond the on-site efficiencies to move into travel choice as car parking become more managed and staff and visitors have a greater choice of mode of travel. Information being provided by the system can also indicate the availability of car parking at peak times which may result in people changing mode or choosing to travel at a different time.

3.1.2 Case Study 2: Westfield Parramatta MSCP

A before and after study of the PGS was undertaken for the Westfield Parramatta Campbell Street car park in 2009 which is characterised by multiple access points and levels. This study focussed on measuring the impact to search time reductions and environmental benefits with a PGS.

Two (2) sensitivity analysis were untaken for the 'after' scenario:

- Scenario 1: PGS set to providing a percentage buffer to allow for circulating traffic at high occupancy levels; and
- Scenario 2: Percentage buffer turned off, displaying the actual number of empty spaces at all times.

Figure 2 displays results of the before and after parking occupancy survey. Parking occupancy for the Scenario 2 survey was at a higher level compared to

the preceding surveys. The November survey was the busiest day out of all survey days. This is believed to be caused by very warm weather exceeding 30 degrees Celsius and attracting more people to the Centre. For all scenarios it can also be observed that occupancy rates reached a 95% occupancy rate during the peak hour.

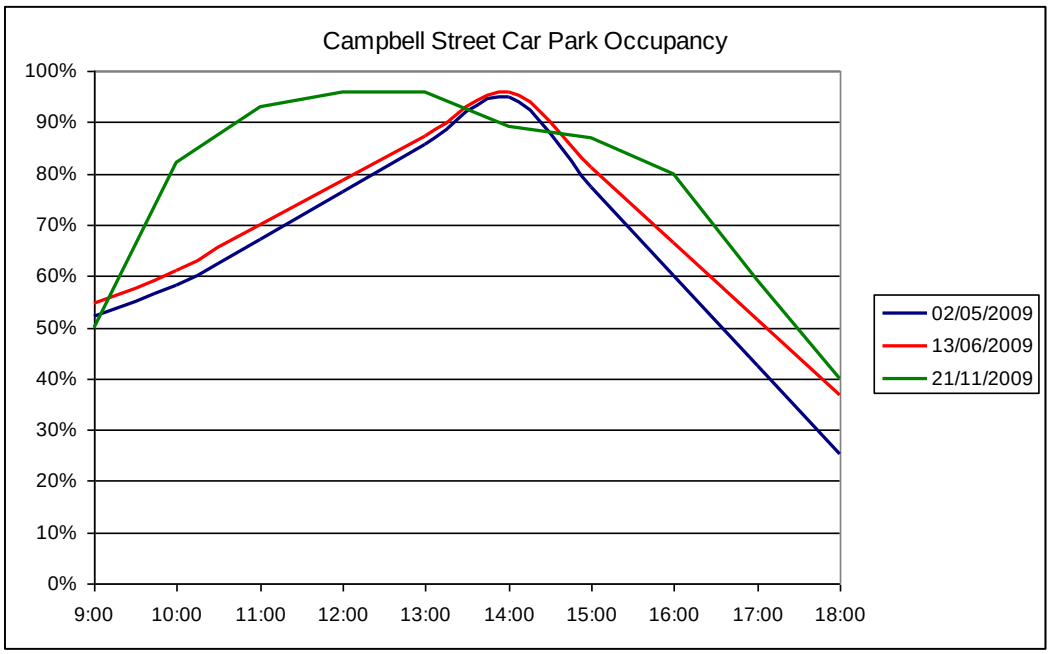


Figure 2: Campbell Street Car Par Occupancy level before and both after survey days

3.1.2.1 Key summary of outcomes

A summary of overall key findings based on analysis of the before and after scenarios are provided below:

- The PGS improved the search time on most levels of the MSCP with an overall 22% search time saving and 24% search time saving when the car park occupancy was above 75%;
- The PGS reduced the variance in search times and made them more consistent;
- More efficient use of the car park was observed after the PGS was installed as the system spreads the parking demand across all levels;
- Generally the PGS has changed drivers' behaviour in finding an empty car parking space. Rather than finding parking at their "favourite" level, most drivers were observed to follow directions displayed by the system and parked where the system directed them to park. Some drivers who opted to go to their "favourite" level despite a high occupancy were observed to stop at each circulation driveway scanning for green lights rather than driving into each driveway searching for a space;
- The Scenario 1 survey showed that when the PGS was set to providing a percentage buffer to allow for circulating traffic at high occupancy levels, this led to drivers ignoring what was displayed by the PGS and finding the free car

park space on their own. Whereas Scenario 2 showed that when the PGS was set to showing real free car parking spaces drivers were compliant with the system which led them to the free car parking spaces; and

- Installing the PGS was estimated to have reduced the overall fuel consumption and carbon emissions by 22% and by 24% when the car park occupancy was above 75%.

3.1.3 Summary of case study findings

The studies presented in this review reflect MSCPs which explore the benefits of implementing PGS in both a hospital and large retail/ commercial context. Both studies prior to the implementation of a PGS, relied on car park users searching for an available parking space which resulted in a number of outcomes such as unequal distribution of parking across levels and overall reduction in efficiency of use.

The studies analysed the potential benefits of implementing a PGS, specifically for constrained MSCPs which is reflective of the current conditions of the RHC MSCP which currently exhibits a peak occupancy rate of 91%. The analysis highlighted key benefits afforded by PGS such as overall improvements in user experience, reduction in search time, more spreading of parking demand across floors and a more streamlined approach when encountering multiple decision points. A reduction in search time would mean car parking spaces are left emptier for shorter amounts of time and therefore more vehicles are able to use the parking bays throughout the day. The increase in vehicles using the MSCP parking bays can potentially support a further increase in parking occupancy to 95% as proposed in the TTA.

With the forecasted increase in activity associated with the Project by 2031, the case studies reflect PGS as one potential strategy to offset the parking demand and provide additional occupancy within a carpark. This strategy focuses on maximising use of the existing parking assets to deliver the required parking efficiency with no requirement to implement invasive structural changes. It should be noted that the RHC MSCP parking strategy currently remains under investigation.

4 Queuing at the forecourt and Botany Street access

This chapter refers to a queuing assessment undertaken for the forecourt and Botany Street access using the trip generation from the various projects.

4.1 IASB impact assessment

A summary of the combined trip generation for the Project, IASB (Integrated Acute Services Building) drop-off and University of NSW (UNSW) HTH (Health Translation Hub) is provided in Section 7.1.7 of the TTA for the year 2031. The breakdown of trips via the Botany Street access and the IASB drop-off are as follows:

- Botany Street access point peak hour (two-way): 224 trips; and
- IASB drop-off peak hour (two-way): 160 trips.

The 2031 trips generated by the IASB drop-off has been based on the trip generation provided in the ASB Transport Assessment Traffic report (July, 2018) prepared by Arup as part of the approved SSDA no. 9113. The ASB report made an allowance for approximately 360 two-way additional trips during the peak hour to account for future expansion north of the IASB (i.e. HTH Loading Dock and the Project). As this allowance is higher than the current forecasted peak hour movements (224 peak hour trips) for the developments, the intersection at Botany Street and UNSW Gate 11 is anticipated to operate within practical capacity with minimal impact to local access as noted in the TTA.

This is further supported by a queuing assessment undertaken which used a Poisson distribution to determine whether the forecasted demand at the IASB drop-off was able to be supported by the proposed parking bays.

The IASB drop-off has proposed four (4) 2-minute parking bays and three (3) 15-minute parking bays. Based on the proportional split between 2-minute and 15-minute parking assumptions provided in the IASB report – 91% and 9% respectively, the analysis has indicated that the proposed parking bays are able to accommodate the 90th percentile demand (i.e. the number of bays provided will satisfy the peak hour demand 90% of the time). Therefore, the queuing expected at the Botany Street access is likely to be minimal (10% probability of occurring during the peak hour) and is not expected to impact the existing road network.

4.2 Project impact assessment at the ED drop-off

Furthermore, a review of the ED drop-off area was undertaken during the development of the Project's design to inform the parking bay requirements. The review was based on 2018/19 ED presentation profiles and private vehicle mode shares provided to Arup. The data was projected to the future year scenario 2031 to determine the hourly traffic demand accessing the ED drop-off area throughout a typical day.

Time restrictions of up to 15 minutes was considered to reflect the current dwell time restrictions for drop-off facilities across the hospital campus. Table 6 outlines the number of parking bays required depending on a given time restriction.

Table 6: 2031 projected SCH1/CCCC ED kerbside parking demand

Average duration of stay (minutes)	2031 Demand (No. of Bays)*
2	1
5	2
15	5

* An 85th percentile demand has been represented. This is an industry standard practice and implies that the number of bays provided will satisfy the peak hour demand 85% of the time.

The Project has proposed four 15-minute parking bays located at the central island in the forecourt and three 2-minute kerbside parking spaces (signed as No Parking spaces), equating to a total of 106 vehicles accommodated hourly.

The number of parking bays proposed for the Project has been informed by a Poisson distribution. In the context of this study, this distribution has been used to determine the required number of parking bays at the 85th percentile (15% probability of being exceeded during the peak period). An additional sensitivity has also been undertaken to determine potential queuing at the ED drop-off. This has been based on a 60%/40% split between 2-minute and 15-minute parking i.e. 4 trips use 2-minute parking and 3 trips use 15-minute during the peak hour. The results of the analysis are as follows:

- Two (2) 2-minute is required to accommodate an 100th percentile demand. As three (3) 2-minute parking are proposed, no queuing is expected at this location; and
- Four (4) 15-minute is required to accommodate an 100th percentile demand. Therefore, the current proposed 15-minute parking bays is sufficient to support the forecasted demand and therefore no queuing is expected at this location.

4.2.1 Summary – queuing assessment

The queuing assessment undertaken at the ED drop-off area has indicated that queuing is not expected at the forecourt area as the proposed parking bays is shown to accommodate an 100th percentile demand based on a Poisson distribution. Queuing at the IASB drop-off is expected to be minimal with the proposed parking bays accommodating the 90th percentile demand i.e. the number of bays provided will satisfy the peak hour demand 90% of the time.

5 Vehicle access and circulation

As outlined in the TTA, the design of the Project was developed in consideration of the largest design vehicle access to the various facilities of the project as outlined below:

- Emergency drop-off/ pick-up: B99 vehicle;
- Ambulance bay: Bariatric ambulance;
- Logistics area: 12.5m heavy rigid vehicle (HRV); and
- Visitor car park on basement level 2: Newborn and Paediatric Emergency Transport Service (NETS) ambulance.

It should be noted that the Botany Street access has been designed based on a HRV as this is the largest vehicle expected to use this entry road in order to access the HTH loading dock.

5.1 Consolidated Loading Dock Considerations

The SCH1/CCCC and UNSW HTH project teams have worked collaboratively throughout design development. A consolidated loading dock was considered during the masterplanning phase of the project. A consolidated loading dock, accessed via Hospital Road, was not deemed to be a feasible solution due to:

- Staging of the respective projects;
- Potential conflicts between clinical and UNSW operations; and
- Different proposed loading dock levels between the HTH and SCH1/CCCC.

5.2 Swept path and vertical clearance analysis

Swept paths have been undertaken for the largest design vehicle for the facilities outlined above in accordance with AS2890.1: Parking facilities – Off-street car parking and AS2890.2: Parking facilities – Off-street commercial vehicle facilities. Additional headroom and ground clearance checks have also been undertaken at the ramp to the car park on basement level 2 and the ramp to the ambulance bay and logistics area on Hospital Road. The swept paths indicate that the Project's design satisfactorily accommodates access for the largest vehicle types.

The findings from the headroom and ground clearance checks have indicated satisfactory provisions for vehicle access to the B02 car park and ambulance area. However, assessment of HRV access to the loading dock has identified a number of conflicts points (refer to Appendix A for identified conflict points). The conflicts will be resolved as part of Detailed Design development with the design team through the following:

- Headroom conflicts: Ongoing coordination with relevant services and adjustments to impacted structural elements to provide adequate headroom clearance in line with the AS2890.2; and

- Ground conflicts: Adjustment to levels and ramp grading to comply with HRV requirements in AS2890.2.

Details of the swept paths and vertical clearance checks are provided in Appendix A.

5.3 Safety Assessment

A Stage 2 Road Safety Audit (RSA) has been prepared in accordance with Austroads Guide to Road Safety Part 6 and Part 6A. The key outcomes of the RSA are as summarised as follows:

- Most audit findings noted a lack of information which will be developed through the completion of the detailed design phase, including signage and linemarking. This has flow on impacts to:
    - Priority at key decision points, which will be addressed through a series of give-way signs and linemarking; and
    - Delineation and direction for road users throughout the scheme including the basement carpark.
- Some audit findings were relating to the barriers between the carpark ramp and drop off area, which will be coordinated and provided in compliance with relevant codes and standards for safety.
- A number of findings were raised in relation to the IASB scope, which will be addressed in a separate project outside the boundary of the SCH1/CCCC SSDA. The SCH1/CCCC project team will liaise with the IASB project team to ensure these items are sufficiently addressed.

Further details regarding the outcomes and actions addressed are provided in the RSA report in Appendix B.

6 Summary

This report has been prepared in response to traffic and transport submissions received in relation to the Sydney Children's Hospital Stage 1/ Children's Comprehensive Cancer Centre State Significant Development Application (SSDA -10831778).

In particular, this report addresses submissions received from the Department of Planning, Industry and Environment (DPIE), Randwick City Council (Council) and Transport for NSW (TfNSW), relating to traffic access and queuing, the existing car park and safety in design. This report should be read in conjunction with the Traffic and Transport Assessment (the TTA) prepared by Arup and issued on the 23 April 2020 for the SSDA submission.

In summary, the report notes car park efficiency measures, focusing on potential measures such as Parking Guidance Systems and is supported by case studies at Westfield Parramatta and the recently constructed Blacktown Hospital multi-storey carpark.

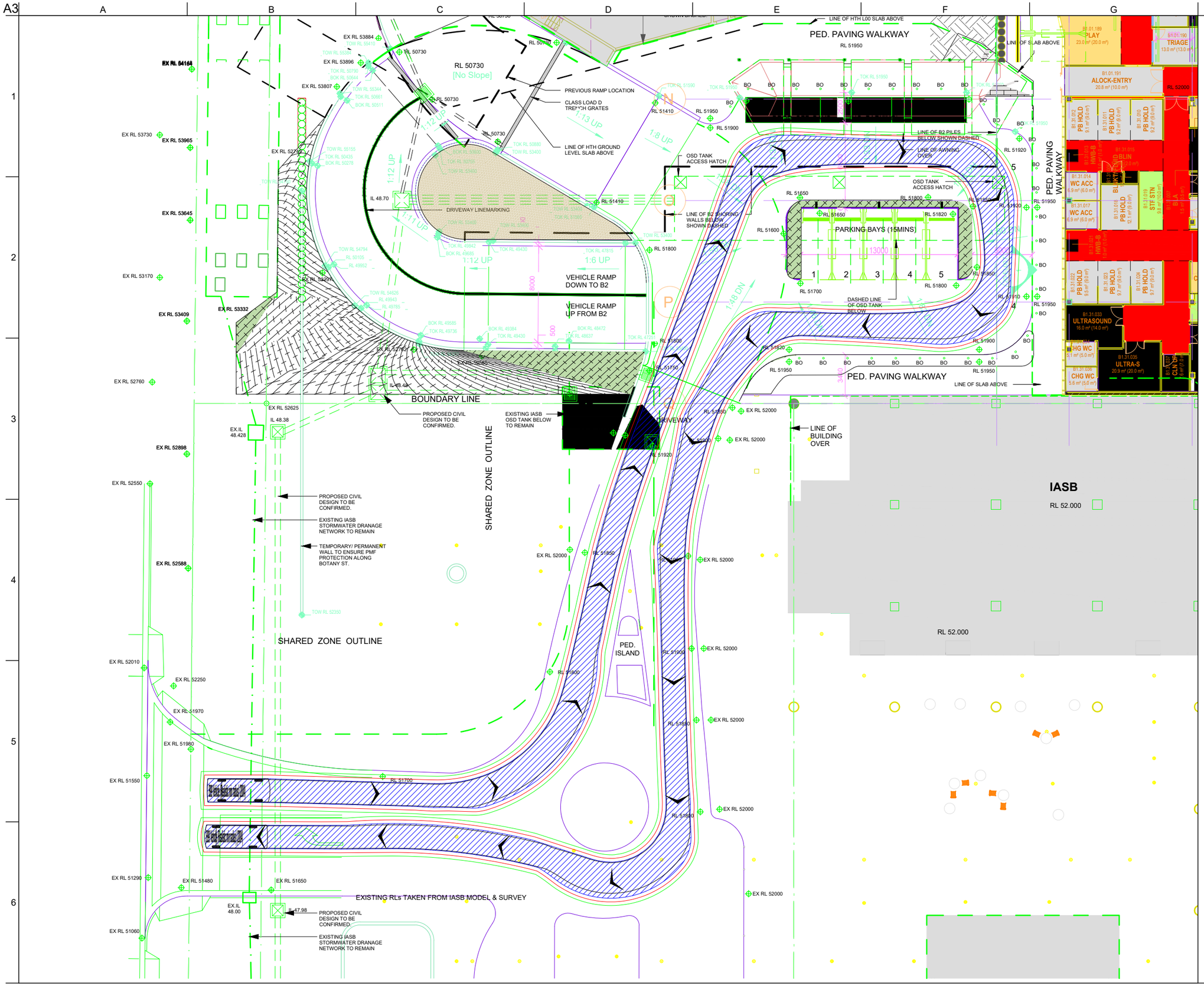
It also provides a summary of the queuing at the forecourt including an assessment of the impacts of both the IASB and SCH1/CCCC ED drop-off. It was found that queuing is not significant, and the arrangement will work adequately without congestion impacts.

Lastly, the vehicle access and configuration has been considered including a road safety audit, swept path analysis and justification of the loading dock arrangement. These studies are appended to the report.

Appendix A

Swept paths

A3



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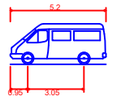
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Design Vehicle(s)



B99 Vehicle (Realistic min radius) (2004)	
Overall Length	5.200m
Overall Width	1.940m
Overall Body Height	2.200m
Min Body Ground Clearance	0.312m
Track Width	1.840m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	6.250m

Issue	Date	By	Chkd	Appd
A	23/08/21	AN	JRT	JRT
For information				

ARUP

Arup, Level 5, 151 Clarence St
Sydney, NSW, 2000
Tel +61(02)9320 9320 Fax +61(02)9320 9321
www.arup.com.au

Client
HI

Job Title
SCH1/CCCC

Drawing Title
Turning Paths
Vehicle access to SCH1/CCCC
Emergency drop-off area

Scale at A3 1:300

Discipline Traffic and Transport

Drawing Status
Draft

Job No	Drawing No	Issue
257913-00	**SKT001**	**A**

Do not scale

A3

HTH FUTURE BUILDING

SUBSTATION 1

HTH

SUBSTATION 2

SSDA BOUNDARY LINE

REFER TO HTH FUTURE BUILDING OVER SHOWN DASHED.

SITE BOUNDARY LINE

CULVERT EASEMENT L

EX RL 54516

EX RL 54180

EX RL 54168

EX RL 53730

EX RL 53965

EX RL 52745

EX RL 53645

EX RL 53170

EX RL 53297

EX RL 53332

EX RL 53409

EX RL 52760

EX RL 52625

EX RL 52898

EX RL 52550

RL 50730

RL 50730 [No Stone]

EX RL 53884

EX RL 53896

EX RL 53807

EX RL 52762

EX RL 52565

PREVIOUS RAMP LOCATION

CLASS LOAD D TRENCH GRATES

LINE OF HTH GROUND LEVEL SLAB ABOVE

DRIVEWAY LINEMARKING

VEHICLE RAMP DOWN TO B2

VEHICLE RAMP UP FROM B2

NSW NETS Ambulance

IL 48.70

IL 48.48

IL 48.38

EX.IL 48.428

BOUNDARY LINE

PROPOSED CIVIL DESIGN TO BE CONFIRMED.

EXISTING IASB OSD TANK BELOW TO REMAIN

PROPOSED CIVIL DESIGN TO BE CONFIRMED.

SHARED ZONE OUTLINE

LINE OF HTH L00 SLAB

PED. PAVING WALK

RL 51950

RL 51410

RL 51900

RL 51590

RL 51950

OSD TANK ACCESS HATCH

LINE OF B2 SHORING WALLS BELOW SHOWN DASHED

RL 51650

RL 51600

RL 51800

RL 51700

PARKING BAYS

DASHED LINE OF OSD TANK BELOW

RL 51820

RL 51750

RL 51850

RL 51920

EX RL 52000

DRIVEWAY

LINE OF BUILDING OVER

PED. PAV

1:15 UP

1:12 UP

1:33 DN

1:38 DN

1:56 DN

1:48 DN

1:46 DN

6500

8400

2500

3440

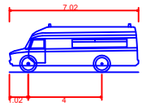
1300

BO

Legend

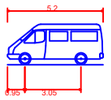
- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Design Vehicle(s)



NSW Bariatric Ambulance

Overall Length	7.020m
Overall Width	2.600m
Overall Body Height	2.630m
Min Body Ground Clearance	0.355m
Track Width	2.600m
Lock-to-lock time	4.00s
Wall to Wall Turning Radius	7.500m



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Curb to Curb Turning Radius	6.250m

Issue	Date	By	Chkd	Appd
A	23/08/21	AN	JRT	JRT
For information				

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www.arup.com.au

Client

HI

Job Title

SCH1/CCCC

Drawing Title

Turning Paths
Vehicle access to SCH1/CCCC B02 car park

Scale at A3 1:200

Discipline Traffic and Transport

Drawing Status

Draft

Job No	Drawing No	Issue
257913-00	**SKT002**	**A**

Do not scale

A3

PARKING
55 BAY

RL 52000

RL 47500
[No Slope]

[No Slope]
RL 51050

1:8

1:8

150MM HIGH KERB

150MM HIGH KERB

LINE MARKING

GLASS LIFT CAR DOOR & SHAFT

150MM HIGH KERB

LIGHT RESTICTION BAR

BOUNDARY LINE

HOSPITAL ROAD

COLUMN ALIGNM
WITH ONE BELOV
TO BE REVIEWED

NSW Bariatric Ambulance

IASB SATELLITE IMAGING
(MRI & CT)

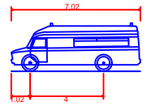
RL 52.000

RL 52.000

Legend

- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Design Vehicle(s)



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Min Body Ground Clearance	0.355m
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Wall to Wall Turning Radius	7.500m

Issue	Date	By	Chkd	Appd
A	23/08/21	AN	JRT	JRT

For information

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www.arup.com.au

Client
HI

Job Title
SCH1/CCCC

Drawing Title
Turning Paths
Vehicle access to SCH1/CCCC ambulance area

Scale at A3
1:200

Discipline
Traffic and Transport

Drawing Status
Draft

Job No	Drawing No	Issue
257913-00	**SKT003**	**A**

A3

PIPES - 500W X 300H

SPOON DRAIN TO INNER SID OF ALL PILINGS AT B2

BULK TANK REFILL PIPEWORK OVERHEAD

DIESEL PUMP

ELECTRICAL SUBSTATION ABOVE

CONCRETE SLAB OVER AT 3000MM

FUTURE BREAKTHROUGH TO SCH STAGE 2

B2.20.001 ? 18 m² (60 m³) 25 m³

COMPACTUS

HOOKLIFT VEHICLE

B2.20.002 GWASTE COMPACT 18 m² (30 m³) 25 m³

HOOKLIFT VEHICLE

HRV - Heavy Rigid Vehicle

DASHED LINE OF TRANSFER BEAM ABOVE

LOADING DOCK

MIN. 5000mm CLEAR HEIGHT ZONE (AT POINT OF COMPACTOR LIFT)

DASHED LINE OF TRANSFER BEAM ABOVE

B2.36.001 H01 CW PLNT 18 m² (0 m³)

B2.21.026 WASTE ST TANK 5 m³ (3 m³)

R/S

HANDRAILS TO BOTH SIDES OF THE RAMP

RAMP

RAMP

SPOON DRAIN TO INNERSIDE OF ALL PILINGS AT B2

B2.20.004 ASTE (40 m²)

B2.20.005 HWB/PPE 1 m² (1 m²)

B2.20.006 RAMP COUR DLV 28 m² (3 m²)

FM / CONTRACTOR

FM / CONTRACTOR

FM / CONTRACTOR

MRV

MRV

MRV

B2.20.015 CLN LIN STR 50 m² (50 m²)

B2.20.016 RAMP COUR DLV 21 m² (3 m²)

HRV - Heavy Rigid Vehicle

HRV - Heavy Rigid Vehicle

B2.20.007 IN HOLD (40 m²)

B2.20.009 COR 201 m² (0 m²)

DIRTY BAYS

B2.20.011 DIRT-D SETDWN 30 m² (30 m²)

B2.20.012 DOCK LIFT 5 m² (3 m²)

B2.20.013 CLEAN REC 30 m² (30 m²)

RECEIVING / DECANTING

B2.20.024 SIGN-IN 1 m² (1 m²)

B2.20.023 SIGN-IN 1 m² (0 m²)

B2.20.020 HWB/PPE 1 m² (1 m²)

B2.20.008 ED LIN HOLD 0 m² (50 m²)

B2.20.010 EQ CHARG 6 m² (6 m²)

B2.20.022 RCPTN 9 m² (6 m²)

B2.20.019 SEC CG 21 m² (20 m²)

B2.20.018 MAIL 20 m² (20 m²)

B2.20.014 COR 118 m² (0 m²)

B2.20.037 SHWR-E 1 m² (1 m²)

B2.20.031 NON FLAM CYL 6 m² (6 m³)

B2.20.032 OX LAB GAS 10 m² (15 m³)

B2.20.030 MED-GAS STR 49 m² (49 m²)

B2.20.329 STR PCOPY/STNRY 10 m² (8 m³)

20.04.011-20.04.013 STAFF WS x 3 13 m² (13m³)

B2.20.025 OFF 2P 11 m² (12 m³)

B2.20.021 STR PCOPY/STNRY 8 m² (8 m³)

EDB

MECH COMMS

FLR DIST.

FS02

B2.20.049 ACC (6 m²)

B2.20.034 HAZ/FL GOODS 9 m² (8 m³)

B2.20.039 STR 21 m² (20 m³)

B2.20.041 OFF 2P 12 m² (12 m³)

B2.21.025 VENDOR FLUID 11 m² (10 m³)

ELEC RISER

LFT 15

H06

B2.20.043 MEET 12 m² (12 m²)

B2.20.017 EQ CHARGE 6 m² (6 m³)

B2.20.048 R STF (3 m²)

SPILL KIT 1 m² (0 m³)

HANDRAIL

B2.20.045 MED ENG (60 m²)

B2.29.010 COR 83 m² (0 m²)

BOUNDARY LINE

B2.20.035 M WST HD (10 m²)

B2.20.042 STF 37 m² (25 m²)

RAMP

B1.35.001 SW 2 84 m² (0 m²)

B2.35.003 SW 83 m² (0 m²)

LFT 14.75 m²

B2.20.044 LAB STR INTRM HOLD 44 m² (40 m²)

B2.35.004 UPS 1 m² (0 m²)

FIRE ST COMPLY

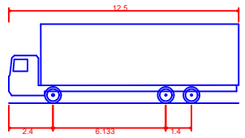
1:18

HRV - Heavy Rigid Vehicle

Legend

- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Design Vehicle(s)



HRV - Heavy Rigid Vehicle	
Overall Length	12.500m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.417m
Track Width	2.500m
Lock to Lock Time	6.00 sec
Curb to Curb Turning Radius	12.500m

Issue	Date	By	Chkd	Appd
A	23/08/21	AN	JRT	JRT
For information				

ARUP

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Tel +61(02)9320 9320 Fax +61(02)9320 9321
www.arup.com.au

Client
HI

Job Title
SCH1/CCCC

Drawing Title
Turning Paths
Vehicle access to SCH1/CCCC
Logistics Area

Scale at A3
1:200

Discipline
Traffic and Transport

Drawing Status
Draft

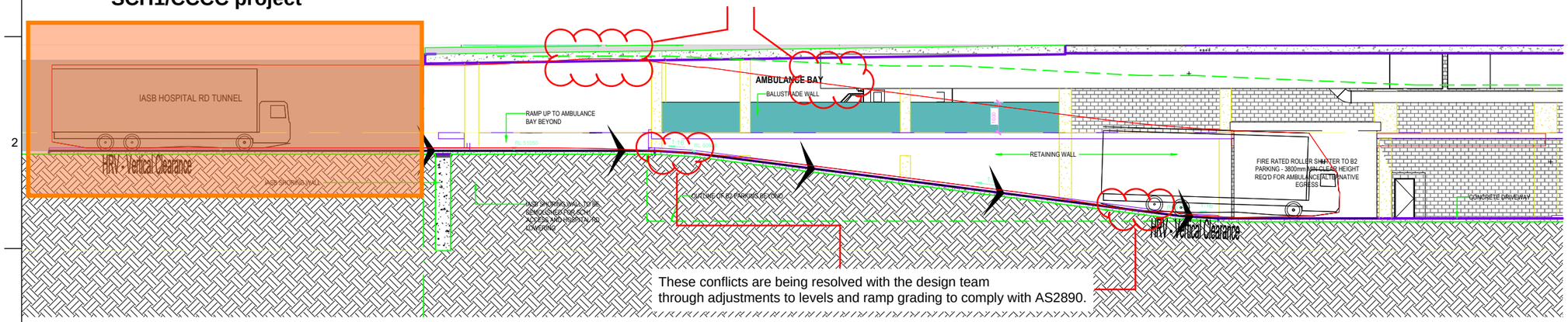
Job No	Drawing No	Issue
257913-00	**SKT004**	**A**

Do not scale

These conflicts are being resolved as part of design development with the design team through coordination with relevant services and adjustments to structural elements.

It should also be noted that the assessed HRV has a height of 4.3m, with the head clearance conflicts associated with a headroom clearance of 4.5m in line with AS2890.

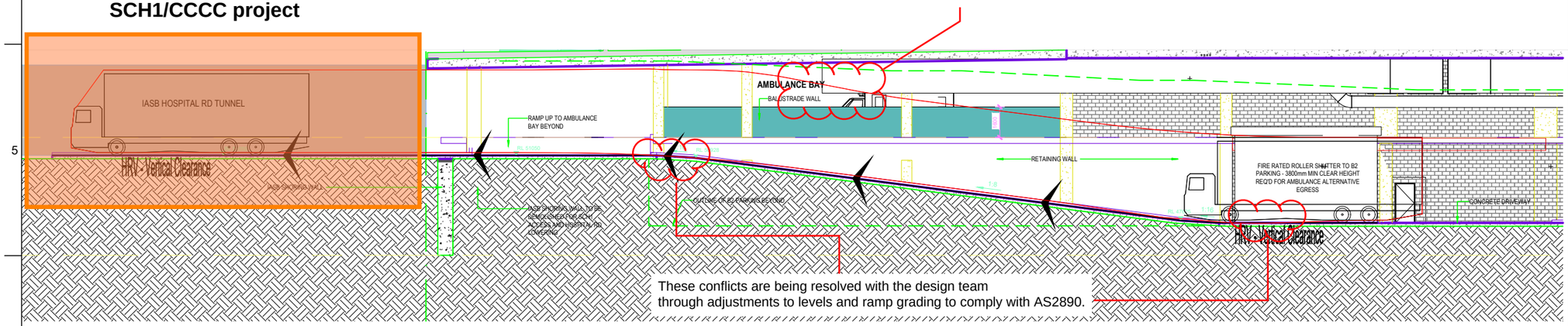
Outside scope of SCH1/CCCC project



These conflicts are being resolved with the design team through adjustments to levels and ramp grading to comply with AS2890.

This conflict is being resolved as part of design development with the design team which includes coordination with services at this location.

Outside scope of SCH1/CCCC project

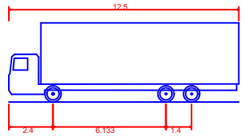


These conflicts are being resolved with the design team through adjustments to levels and ramp grading to comply with AS2890.

Legend

Body Envelope

Design Vehicle(s)



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Issue	Date	By	Chkd	Appd
A	24/08/21	AN	JRT	JRT
For information				

ARUP

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Tel +61(02)9320 9320 Fax +61(02)9320 9321
www.arup.com.au

Client
HI

Job Title
SCH1/CCCC

Drawing Title
Vertical clearance Hospital Road southern section

Scale at A3
1:300

Discipline
Traffic and Transport

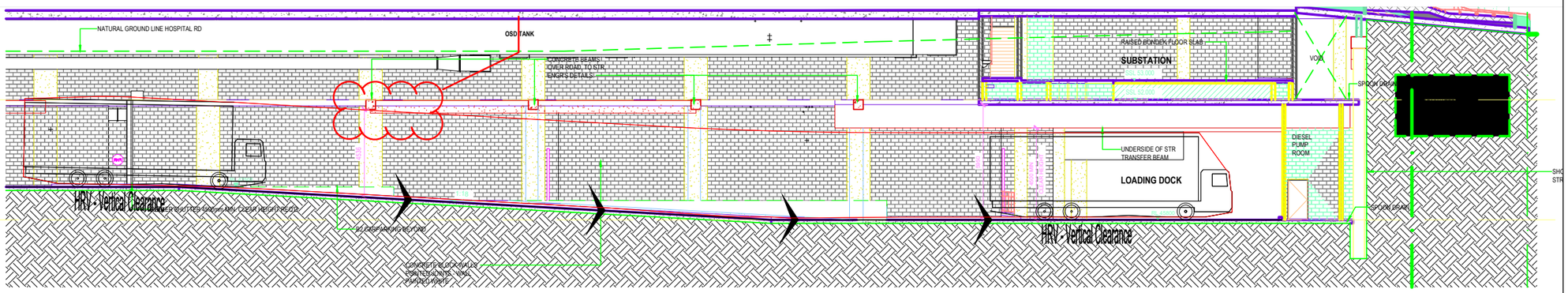
Drawing Status
Draft

Job No	Drawing No	Issue
257913-00	**SKT005**	**A**

Do not scale

This conflict is being resolved as part of design development with the design team through coordination with relevant services and adjustments to structural elements.

It should also be noted that the assessed HRV has a height of 4.3m, with the head clearance conflicts associated with a headroom clearance of 4.5m in line with AS2890.



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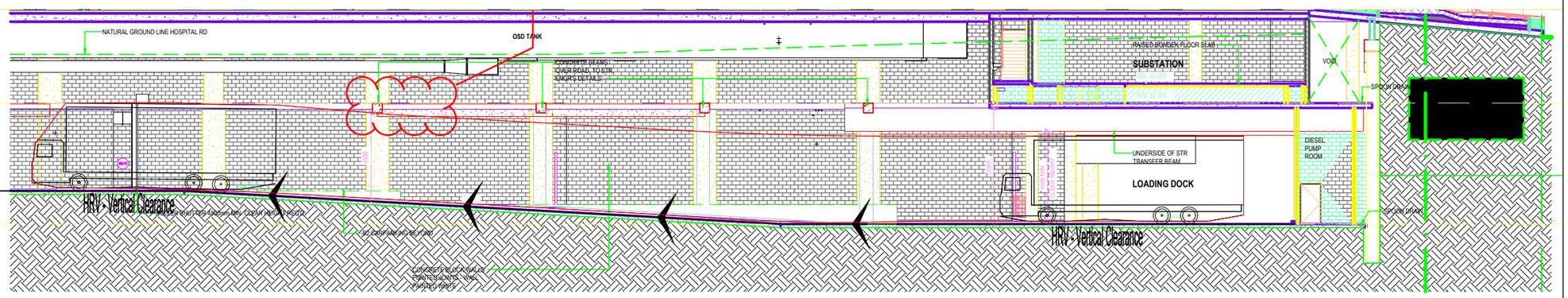

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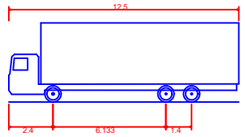
Design Vehicle(s)



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Lock to Lock Time	6.00 sec
Curb to Curb Turning Radius	12.500m

Issue	Date	By	Chkd	Appd
A	24/08/21	AN	JRT	JRT
For information				

ARUP

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Sydney, NSW, 2000
Tel +61(02)9320 9320 Fax +61(02)9320 9321
www.arup.com.au

Client
HI

Job Title
SCH1/CCCC

Drawing Title
Vertical clearance Hospital Road northern section

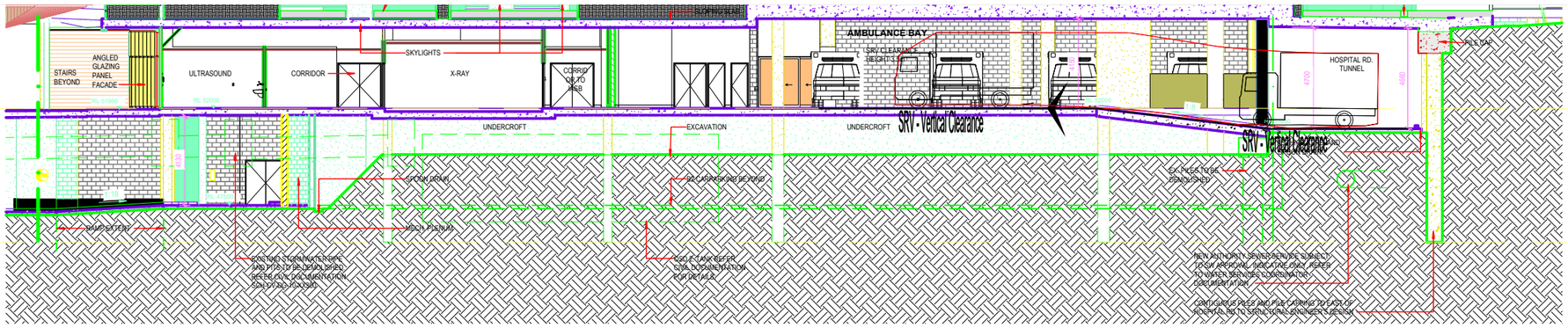
Scale at A3
1:250

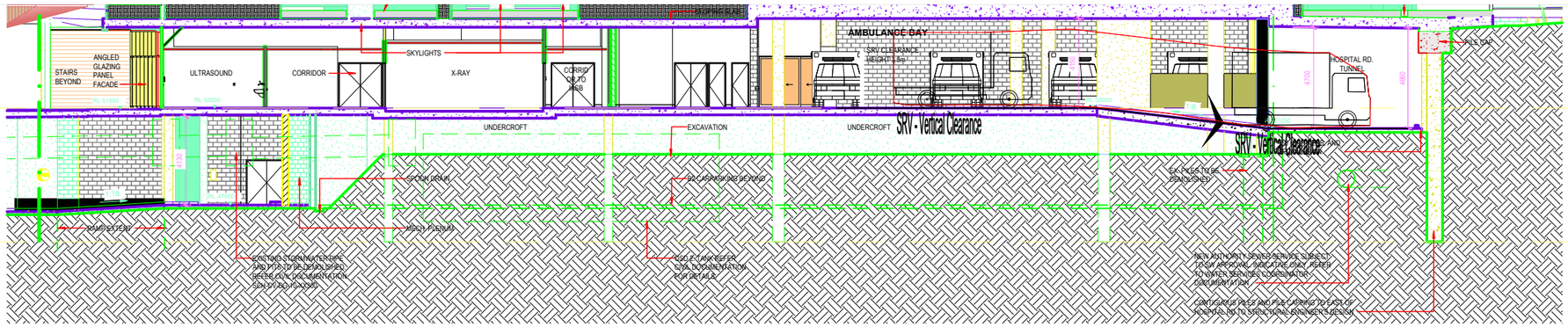
Discipline
Traffic and Transport

Drawing Status
Draft

Job No	Drawing No	Issue
257913-00	**SKT006**	**A**

Do not scale

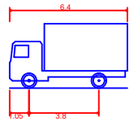




Legend

Body Envelope

Design Vehicle(s)



SRV - Small Rigid Vehicle

Overall Length	6.400m
Overall Width	2.330m
Overall Body Height	3.500m
Min Body Ground Clearance	0.398m
Track Width	2.330m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	7.100m

Issue	Date	By	Chkd	Appd
A	24/08/21	AN	JRT	JRT
For information				

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Sydney, NSW, 2000
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www.arup.com.au

Client
HI

Job Title
SCH1/CCCC

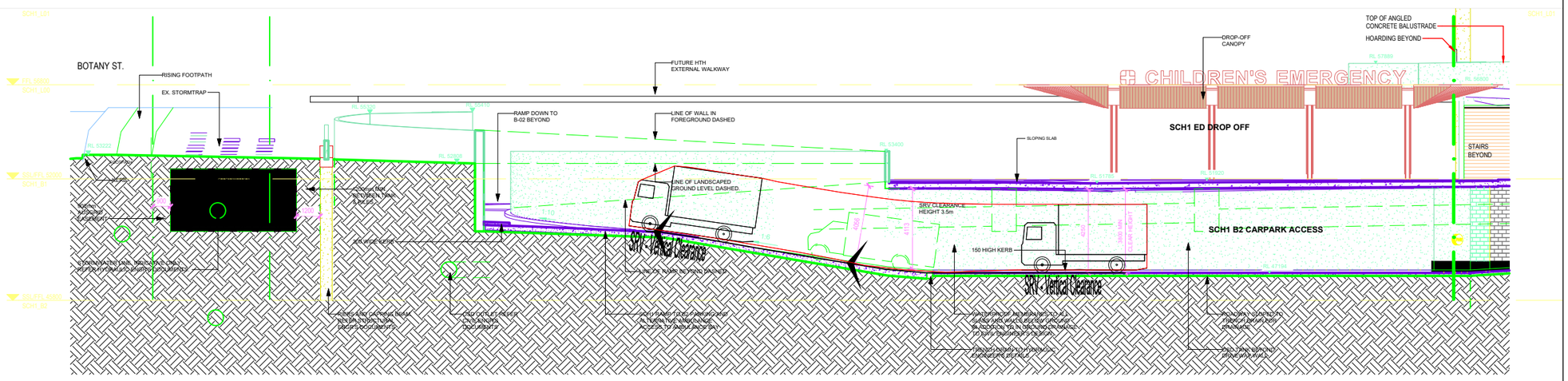
Drawing Title
Vertical clearance ambulance area

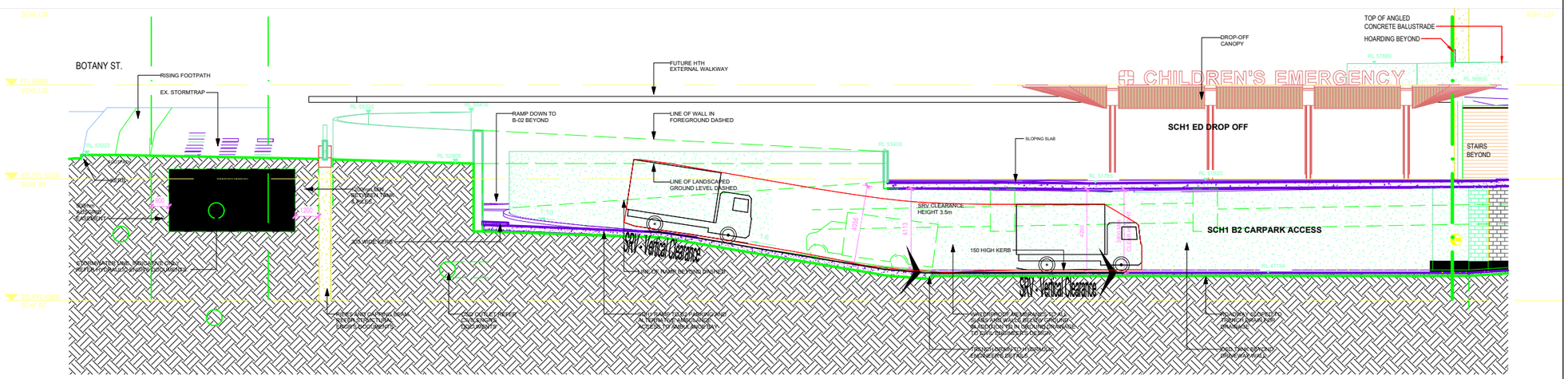
Scale at A3
1:250

Discipline
Traffic and Transport

Drawing Status
Draft

Job No	Drawing No	Issue
257913-00	**SKT007**	**A**

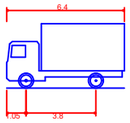




Legend

Body Envelope

Design Vehicle(s)



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Issue	Date	By	Chkd	Appd
A	24/08/21	AN	JRT	JRT
For information				

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Tel +61(02)9320 9320 Fax +61(02)9320 9321
www.arup.com.au

Client
HI

Job Title
SCH1/CCCC

Drawing Title
Vertical clearance B02 car park access

Scale at A3
1:250

Discipline
Traffic and Transport

Drawing Status
Draft

Job No	Drawing No	Issue
257913-00	**SKT008**	**A**

Do not scale

Appendix B

Stage 2 Road Safety Audit

Health Infrastructure

Sydney Children's Hospital Stage 1/ Children's Comprehensive Cancer Centre

Concept Design – Road Safety Audit

Issue 3 | 13 August 2021

Project ID 257913-00

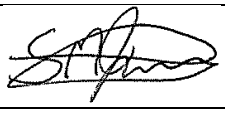
Arup Pty Ltd ABN 18 000 966 165

Arup
Level 5
151 Clarence Street
Sydney NSW 2000
Australia
www.arup.com

ARUP

Document Verification

ARUP

Job title		Sydney Children's Hospital Stage 1/ Children's Comprehensive Cancer Centre			**Job number** 257913-00
Document title		Concept Design – Road Safety Audit			**File reference**
Document ref					
Revision	**Date**	**Filename**	*SCH1-CCCC-ARP-RSA-RPT-001.doc*		
Issue 1	29/07/21	**Description**	Draft		
			Prepared by	Checked by	Approved by
		Name	Antonio Villacorta	Steven Jones	Antonio Villacorta
		Signature			
Issue 2	06/08/21	**Filename**	*SCH1-CCCC-ARP-RSA-RPT-002.doc*		
		Description	Final		
			Prepared by	Checked by	Approved by
		Name	Antonio Villacorta	Steven Jones	Antonio Villacorta
		Signature			
Issue 3	13/08/21	**Filename**	*SCH1-CCCC-ARP-RSA-RPT-003.doc*		
		Description	Final – Sign off		
			Prepared by	Checked by	Approved by
		Name	Antonio Villacorta	Steven Jones	Antonio Villacorta
		Signature			
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		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
				Issue Document Verification with Document	✓

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2.2 Project Description 3
2.3 Purpose of this report 3
2.4 Scope of the Audit 3

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Appendix A

1 Project Summary

Project Number	**257913-00**
Final Report Date	13 August 2021
Title of Audit	Sydney Children's Hospital Stage 1/ Children's Comprehensive Cancer Centre - Concept Design – Road Safety Audit
Location of Audit	Sydney CBD
Project Description	The key outcome of the Project is to meet the needs of SCH and CCCC, while being cognisant of HTH and IASB requirements to promote connectivity and integration; reflecting the objectives of the precinct. SCH1/CCCC proposes to include the following key infrastructure: - A new Emergency Department; - Short Stay Unit; - Children's Comprehensive Cancer Centre (CCCC); and - Relocated existing SCH clinical spaces.
Purpose of Audit	The aim of this road safety audit is to assess the concept design for the proposed vehicle and pedestrian access arrangement of the SCH1/CCCC building in the context of the existing conditions, proposed design, and its interface.
State of Audit	NSW
Stage of Audit	Concept Design – Road Safety Audit
Client Company	Health Infrastructure
Client Contact	James R. Turner
Client Phone	02 93209259
Client Email	James-R.Turner@arup.com
Audit Date	22/07/21
Audit Team Lead	Antonio Villacorta (AV) – RSA-02-0805.
Audit Team Members	Steven Jones (SJ) – RSA-07-0822

2 Introduction

2.1 Project Background

The Randwick Hospitals Campus (the Campus) is situated within the heart of the Randwick Collaboration Area. It resides within the Eastern Harbour City as outlined in the Greater Sydney Commission's (GSC) Greater Sydney Regional Plan: A Metropolis of Three Cities (Greater Sydney (GSC, 2018). The Place Strategy for this collaboration area was approved by the GSC in 2018 and included key objectives to guide future projects in the area towards a common vision. Notably some of these objectives included:

- Creating one of Australia's premier health, education and innovation districts;
- Making sure it is well connected to the rest of Greater Sydney by public transport; and
- Prioritising walking and cycling connections and vibrant centres of activity.

The Campus is also part of the Randwick Health and Innovation Precinct. This vision from the NSW Government looks to physically connect the Campus with the University of NSW (UNSW), integrating health services with research and teaching facilities. The first stage of the Campus redevelopment pertains to the Integrated Acute Services Building, scheduled to open in 2022. Refer to SSD-10822510 for further detail of the planning and design of UNSW's Health Translation and Hub (HTH). Refer to SSD-10822510 for further details.

The Sydney Children's Hospital (SCH) Stage 1/ Children's Comprehensive Cancer Centre (CCCC) project (the Project) is situated north of the IASB and east of the HTH (refer to Figure 1). The Project is part of the Sydney Children's Hospital Network which includes the Randwick and Westmead Hospital sites.

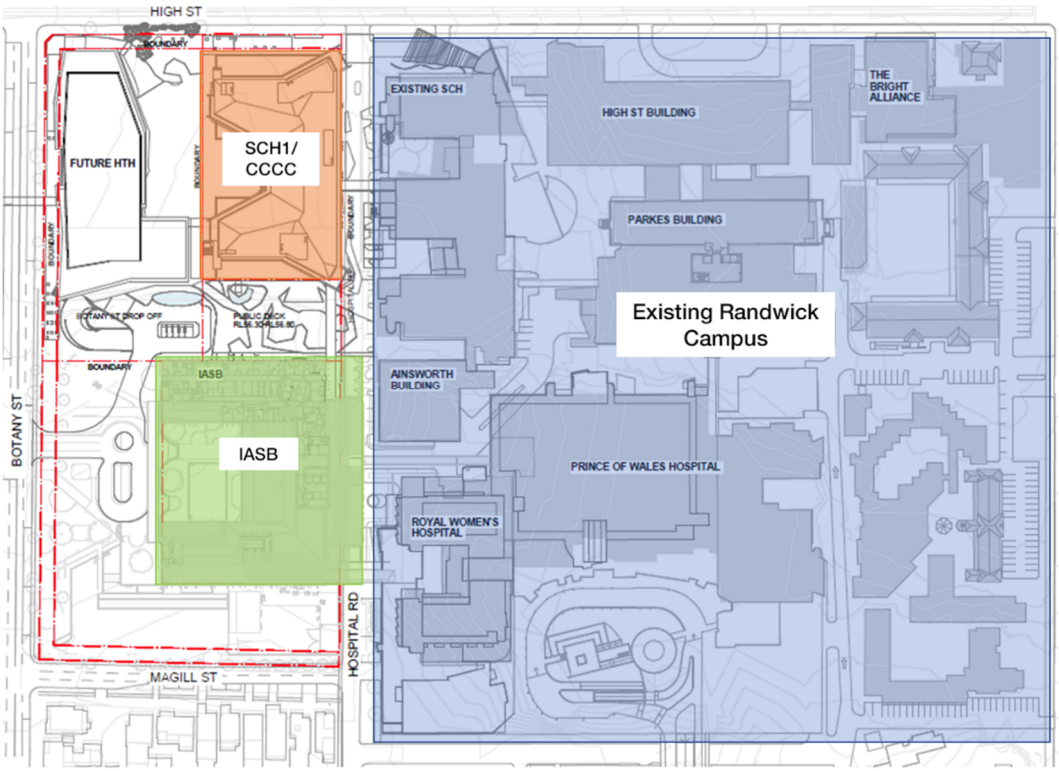


Figure 1: Existing Randwick Hospitals Campus and RCR site including proposed SCH1/CCCC
Source: BLP Architects, 2021.

2.2 Project Description

In March 2019, the NSW and Federal Governments committed $608 million towards the Project which is supported by the Sydney Children's Hospitals Foundation, the Children's Cancer Institute and UNSW.

SCH1/CCCC proposes to include the following key infrastructure:

- A new Emergency Department;
- Short Stay Unit;
- Children's Comprehensive Cancer Centre (CCCC); and
- Relocated existing SCH clinical spaces.

The key outcome of the Project is to meet the needs of SCH and CCCC, while being cognisant of HTH and IASB requirements to promote connectivity and integration; reflecting the objectives of the precinct.

2.3 Purpose of this report

The aim of this road safety audit is to assess the concept design for the proposed vehicle and pedestrian access arrangement of the SCH1/CCCC building in the context of the existing conditions, proposed design, and its interface.

2.4 Scope of the Audit

The audit area comprises the proposed access for vehicles and pedestrians off Botany Road, ramps to the carparks and carpark circulation, excluding the proposed signalised intersection off Botany Street and UNSW access. The secondary entry / exit of the carpark from Hospital Road, and the interface with High Street and Light Rail are not part of the scope for this audit. Figure 2 illustrates the audit area.

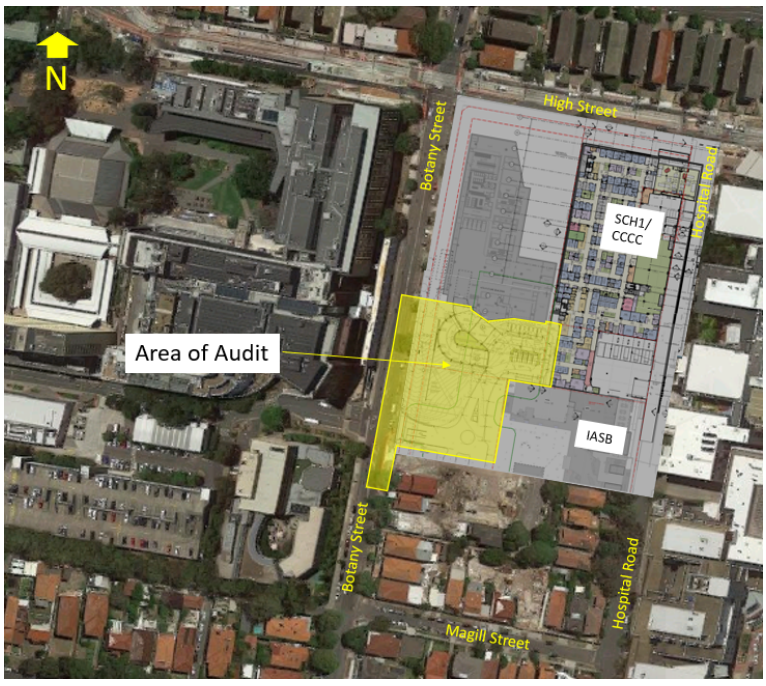


Figure 2 Road safety audit area

Source: Google Maps

3 Road Safety Audit

3.1 Audit Process

An audit is not a check against the design standards and does not imply compliance with the standards, which may represent the minimum requirements. It does not guarantee safety.

The essential elements of this definition are that the audit is:

- A formal process and not an informal check
- An independent process
- Carried out by persons with appropriate experience and training
- Restricted to road safety issues.

The objectives of this road safety audit are:

- To identify potential safety problems for all road users and others affected by a road project
- To ensure that measures to eliminate or reduce the problems are considered in full.
- The benefits of conducting road safety audits include:
- The likelihood of crashes on the road network can be reduced
- The severity of crashes can be reduced.

Whilst road safety audits are detailed in some respects, they represent a relatively brief assessment of a road network or of an associated feature and are not intended to extend to or investigate every aspect which may potentially have some level of influence on road function or safety.

It should not be expected that a review has been carried out in relation to issues requiring specific verification testing to confirm conformity with all the relevant (and possibly exacting) standards, or where a level of detailed investigation is required that is inconsistent with the general audit process.

In general, auditors are unfamiliar with the roads under review, they are independent from the design team, and may be unaware of all the circumstances of use of a road or all the conditions that exist from time to time (e.g. specific traffic manoeuvres, sun glare from a building during a short period of a day).

3.2 Assessment methodology

This road safety audit was carried out to identify areas where the existing conditions have the potential to compromise road user safety. It was undertaken in accordance with Roads and Maritime Road Safety Audit procedures.

The audit covers physical features of the project which may affect road user safety and it has sought to identify potential safety hazards.

Non-conformances or hazards identified in this report have been rated based on the probability and severity of a traffic accident resulting from the identified issue as described in the tables below. The risk, frequency and severity tables provided below are from the Austroads Guide to Road Safety Part 6: Road Safety Audit

(2009) and have been used to provide a consistent and structured approach to the ratings assigned to each safety issue identified.

Table 1: Frequency of the problem leading to a crash

Frequency	Description
Frequent (F)	Once or more a week
Probable (P)	Once or more per year (but less than once week)
Occasional (O)	Once every five or ten years
Improbable (I)	Less often than once every ten years

Table 2: Severity of crash

Severity	Description	Examples
Catastrophic (C)	Likely multiple deaths	High-speed, multi vehicle crash on freeway. Car runs into a crowded bus stop. Bus and petrol tanker collide. Collapse of a bridge or tunnel.
Serious (S)	Likely death or serious injury	High or medium-speed vehicle collisions. High or medium-speed collision with a fixed roadside object. Pedestrian struck at high speed. Cyclist is hit by a car.
Minor (M)	Likely minor injury	Some low-speed vehicle collisions. Cyclists' fall from bicycle at low speed. Left-turn, rear-end, type crash in a slip lane.
Limited (L)	Likely trivial injury or property damage only	Some low-speed vehicle collisions. Pedestrian walks into object (no head injury). Car reverses into post.

Table 3: Resulting level of risk

	Frequent	Probable	Occasional	Improbable
Catastrophic	Intolerable	Intolerable	Intolerable	High
Serious	Intolerable	Intolerable	High	Medium
Minor	Intolerable	High	Medium	Low
Limited	High	Medium	Low	Low

Table 4: Treatment

Risk	Description
Intolerable (I)	Must be corrected.
High (H)	Should be corrected or the risk significantly reduced, even if the treatment cost is high.
Medium (M)	Should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high.
Low (L)	Should be corrected or the risk reduced, if the treatment cost is low.

3.3 Reference Standards

The audit was conducted using the background documents provided by the project representative listed in Appendix A of this report.

The information shows the extent of the audit area and design. The drawings which the audit related to are listed in Appendix A. Landscaping plans and Construction Staging plans were not assessed.

The audit was performed using the following sources of information:

- Austroads Guide to Road Safety Part 6A: Road Safety Audit (2019)
- Roads and Maritime Services Guidelines for Road Safety Audit Practices (2011).

3.4 Exclusions

The following design components were excluded or not provided to the audit team at the time of finalising this report.

- Audit limited to the scope area defined in Section 2.4, **Error! Reference source not found.** of this report and the list of drawings provided in Appendix A

3.5 Audit Team

This road safety audit was undertaken by:

- Lead Auditor – Antonio Villacorta (AV)
- Audit Team Member – Steven Jones (SJ)

Antonio Villacorta is registered with TfNSW as a Level 3 Lead Road Safety Auditor. Registration number RSA-02-0805.

Steven Jones is registered with TfNSW as a Level 3 Lead Road Safety Auditor. Registration number RSA-07-0822.

The auditors are independent from the project design team.

3.6 Audit Program

Table 5: Audit Program

Activity	Responsible	Date
Inception Meeting	AV, SJ, JRT, AN	20/07/21
Draft Report	AV, SJ	29/07/21
Report amended comments	AV	10/08/21
Sign off Report, Completion Meeting	AV, SJ, JRT	13/08/21

4 Limitations of the Road Safety Audit

4.1 Covid-19

Arup has currently effectively mandated a travel ban for business and is suggesting that staff do not travel for personal reasons given the Government Health Order across Greater Sydney during the Covid-19 pandemic. In addition, it is noted that there are limitations for the audit team to undertake physical site inspections due to current operation in lockdowns and border closures in place by the Governments which restrict the movement of the audit team to the audit site.

This has therefore impacted the ability to undertake the due site visit processes required as part of the audit process. As such, no site visits were undertaken for the road safety audit as the area is currently under construction and access is limited.

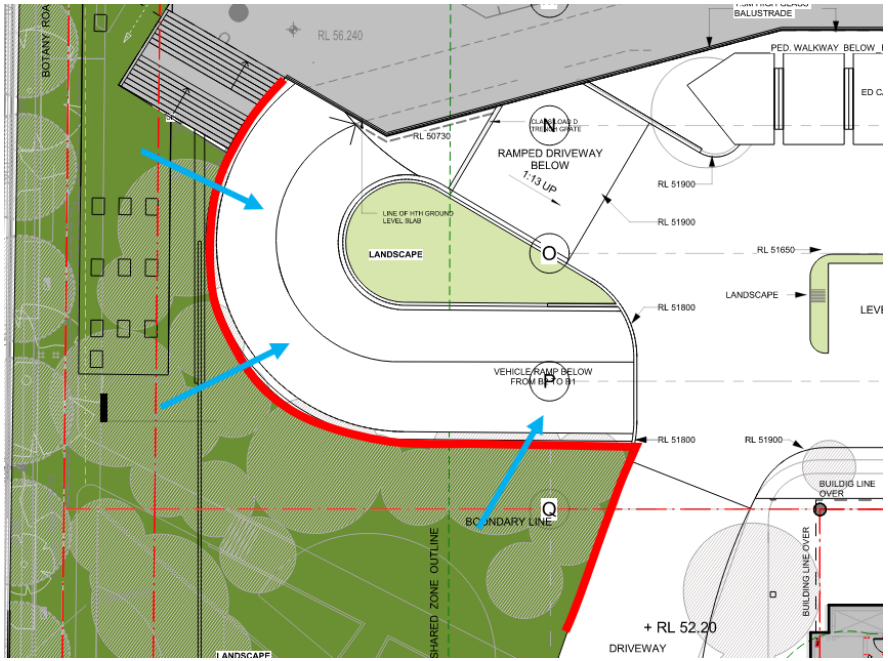
4.2 Interpretation of Audit Results

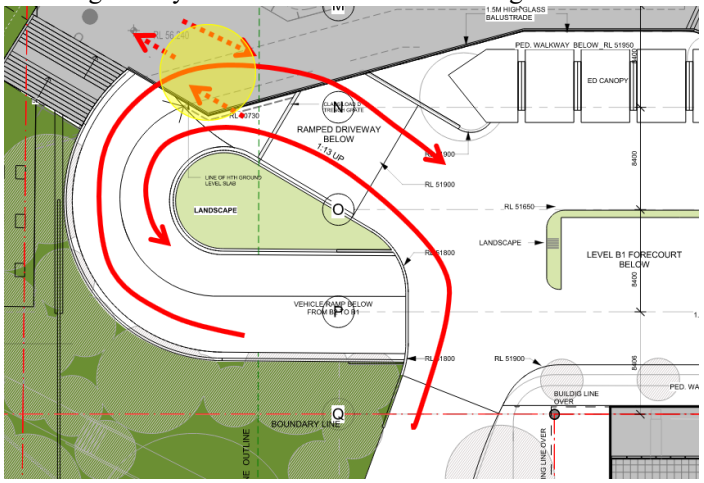
As set out in the road safety audit guidelines, responsibility for actioning the audit always rests with the project sponsor and not with the auditor. The audit highlights potential safety issues for consideration by the sponsor, in conjunction with all other project considerations. The sponsor is under no obligation to mitigate all the audit findings and it is not the role of the auditor to agree to or approve of the sponsor's proposed action in response to the audit.

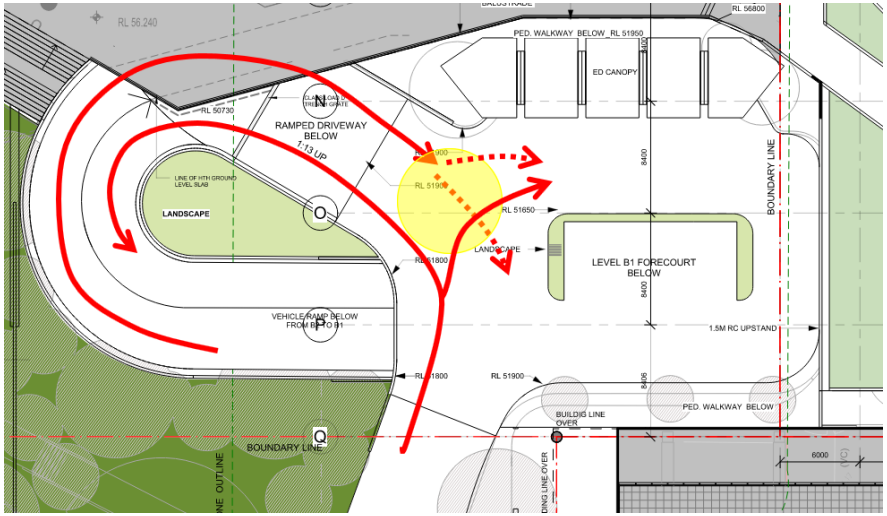
Note also that there may be instances where there is a contradiction between the audit findings and the requirements of the contract. Where this is the case, the sponsor's response to the audit findings may choose to indicate compliance with the contract.

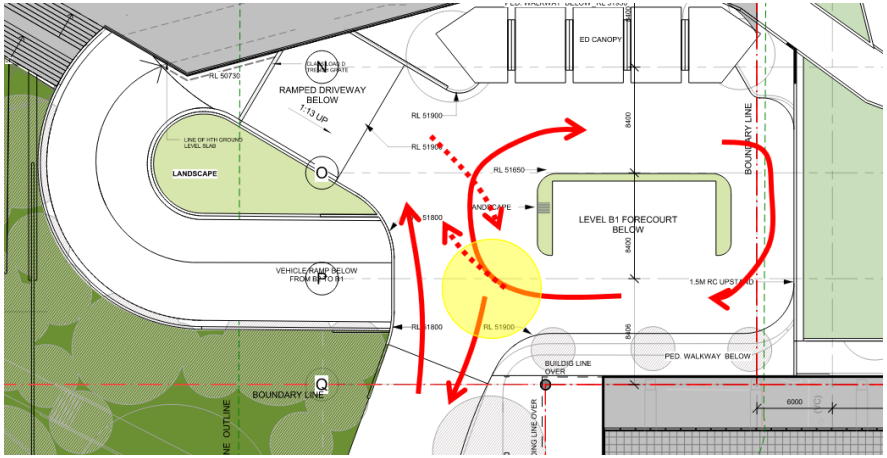
5 Audit Findings

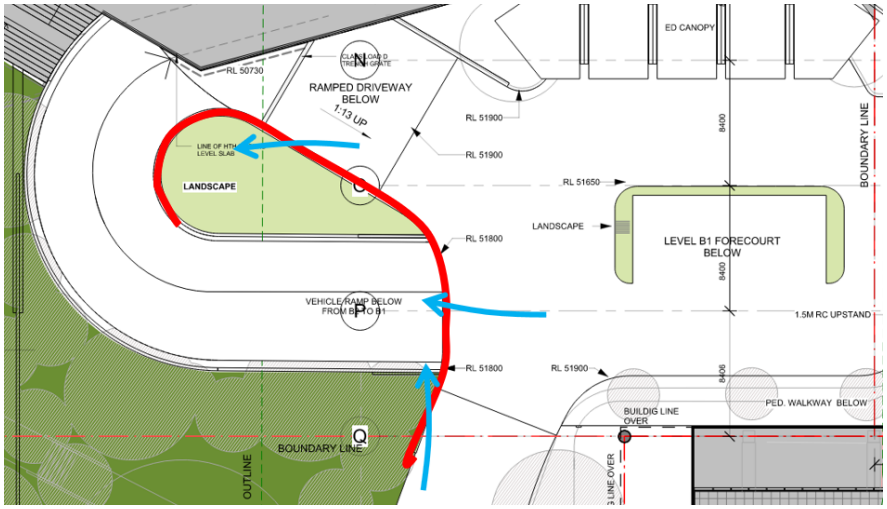
Table 6 Audit Findings and Risk rating

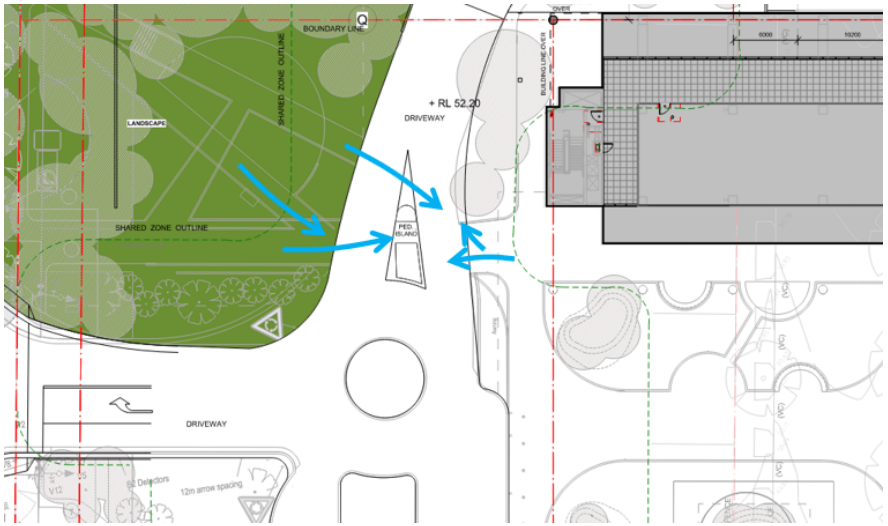
Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
1. Carpark ramp access *Road furniture, barrier protections.*	It is not clear to the audit team a proposed barrier or fence to prevent pedestrians to continue to the carpark ramp access. There is a risk that pedestrian could fall to the bottom of the ramp 	Occasional	Serious	HIGH	A barrier system of suitable height will be coordinated with BLP and Aspect so that pedestrian safety and falls from height is maintained in the next design drawings.

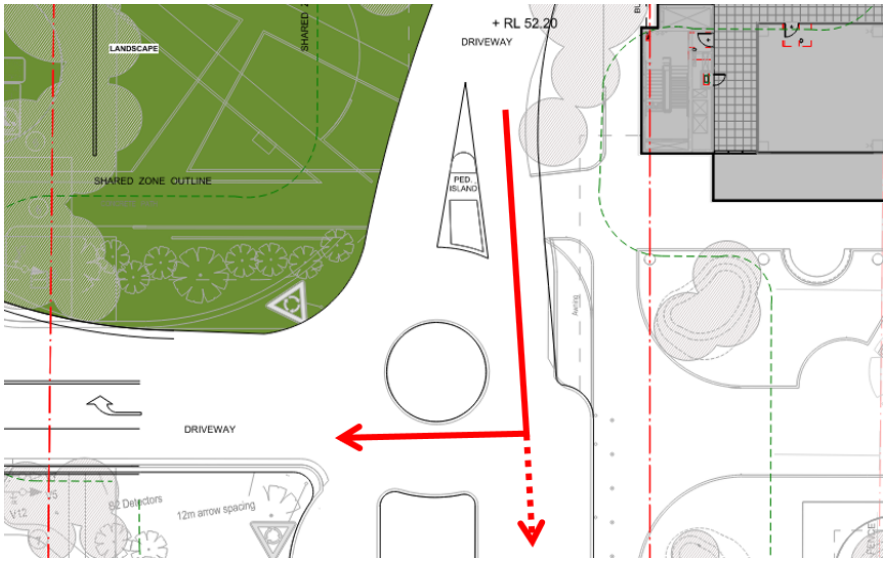
Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
2. Carpark ramp access *Traffic circulation*	It is not clear the control priority at the access / egress of future HTH building located halfway on the ramp access. Vehicles entering or exiting the HTH building may not be able to see vehicles exiting the carpark increasing the risk of collisions. Vehicles from the carpark may have some difficulties exiting the ramp if they have to give way to vehicles from HTH building. 	Improbable	Serious	MEDIUM	The basement ramp to B1 will have priority with HTH giving way. This will be coordinated with the Civil Engineer when they develop a detailed set of traffic signs and lines drawing.

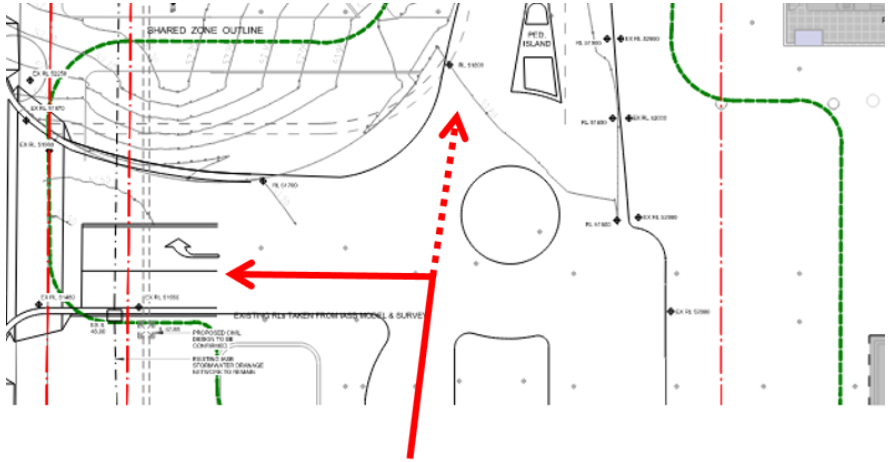
Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
3. Carpark ramp access *Traffic circulation*	It is not clear if the traffic circulation adjacent to the pick-up and drop-off area is one way one only. Intersection control priorities are not provided to the audit team. Vehicles exiting from the carpark or HTH building may conflict with vehicles entering the pick-up / drop-off area. This could increase the risk of front and side collisions. 	Improbable	Serious	MEDIUM	The drop off will have priority with basement ramp to B1 and HTH giving way. This will be coordinated with the Civil Engineer when they develop a detailed set of traffic signs and lines drawing.

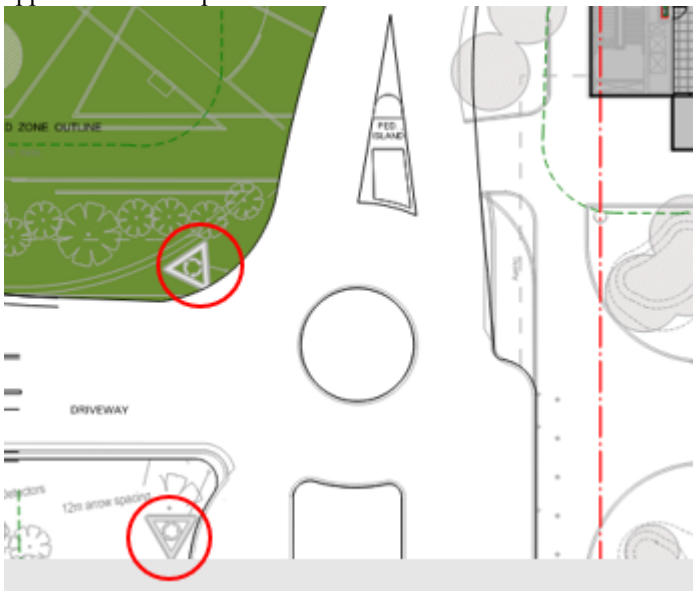
Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
4. Pick-up / drop-off area *Traffic circulation*	It is not clear if the traffic circulation at the pick-up and drop-off area. Intersection control priorities are not provided to the audit team. Vehicles circulating the loop of the pick-up and drop-off area may conflict with vehicles entering or exiting the carpark and HTH building. This could increase the risk of side collisions. 	Improbable	Serious	MEDIUM	The drop off will be a clockwise loop and give way to the main road when exiting. This will be coordinated with the Civil Engineer when they develop a detailed set of traffic signs and lines drawing.

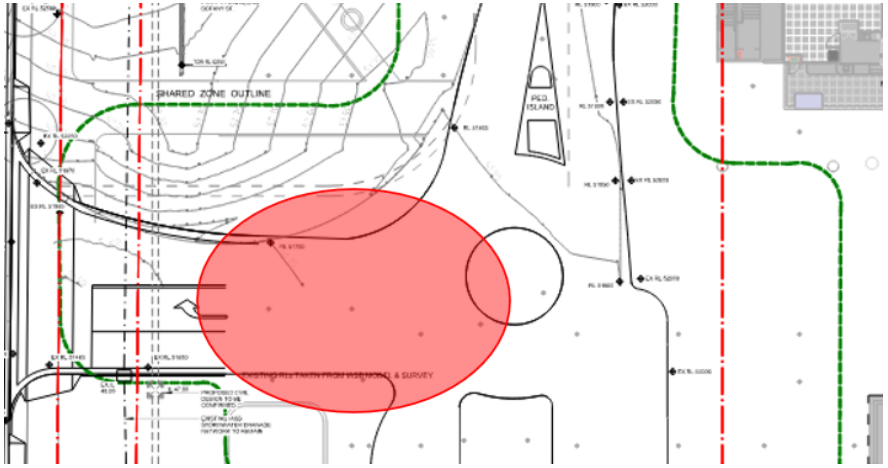
Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
5. Carpark ramp access Road furniture, barrier protection	There are not details provided to identify a suitable barrier system along the ramp access and edge of the pick-up and drop-off area. There is a risk of vehicles falling on the step landscape area and ramp to the lower carpark. 	Occasional	Serious	HIGH	A barrier of suitable design and height will be coordinated with BLP and Aspect so that both vehicle and pedestrian safety is maintained in the next design drawings.

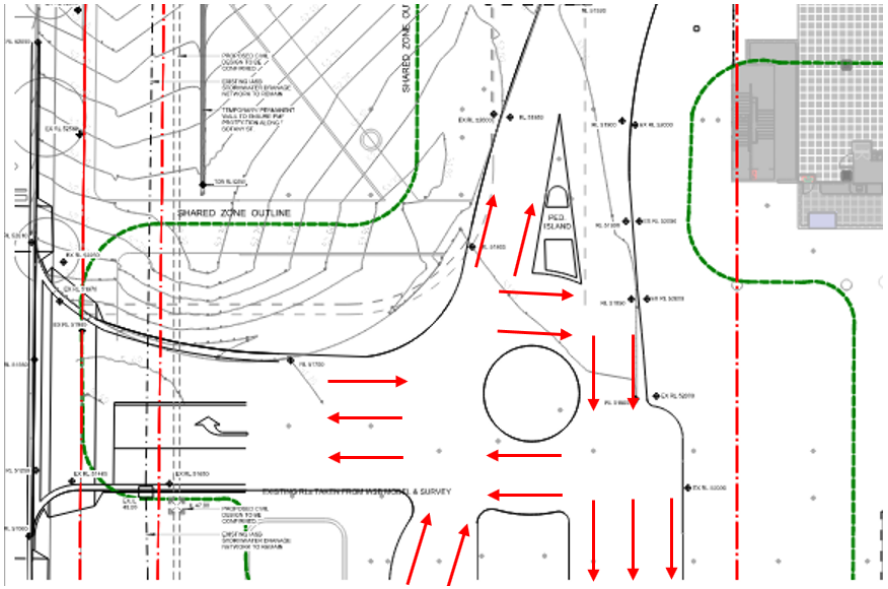
Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
6. Roundabout main access *Pedestrian connectivity*	The proposed open space adjacent to the main access creates some desired lines for pedestrians to and from the IASB building that are not fully covered by the proposed pedestrian refuge. There is a risk that pedestrian may not use the provided refuge increasing the risk of being hit by vehicle. 	Improbable	Serious	MEDIUM	This is considered part of the IASB scope. The landscape plan will be coordinated with Lendlease and Aspect so that pedestrian paths are perpendicular to the road and in line with the crossing as required.

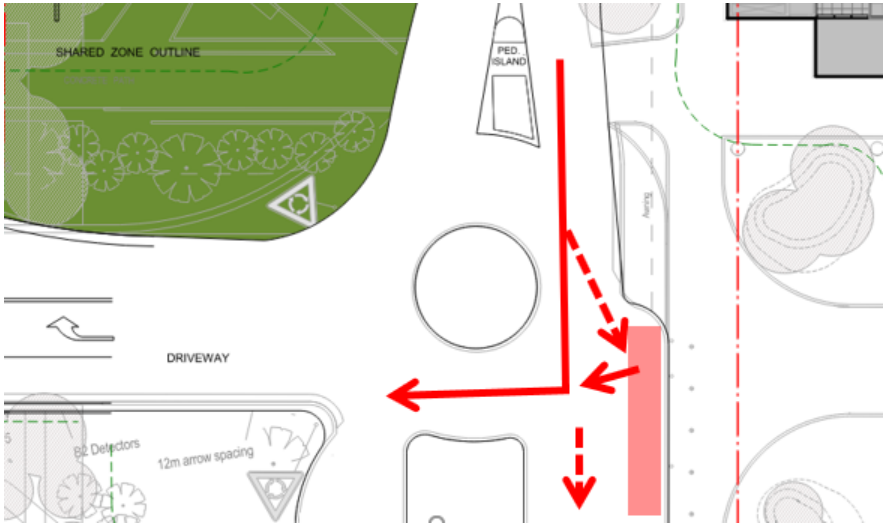
Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
7. Roundabout main access Road alignment	There is no geometric deflection through the proposed roundabout for vehicles approaching the roundabout from the northern site. Vehicles may not reduce the speed as expected or may have to reduce their speed abruptly when approaching the roundabout before turning right onto the driveway exit. This could increase the risk of side and rear end collisions with vehicles approaching the roundabout from the other two approaches. In addition, vehicles could continue straight south missing the roundabout defeating the purpose of the roundabout. 	Occasional	Minor	MEDIUM	This is considered part of the IASB scope. The vehicles from the north will be turning right to exit and not travelling straight to the IASB drop-off from the SCH or HTH site. There will be appropriate TB (holding) lines on approach and C1 (continuous) lines around the roundabout to direct vehicles. This will be coordinated with Lendlease when they develop a detailed set of traffic signs and lines drawing.

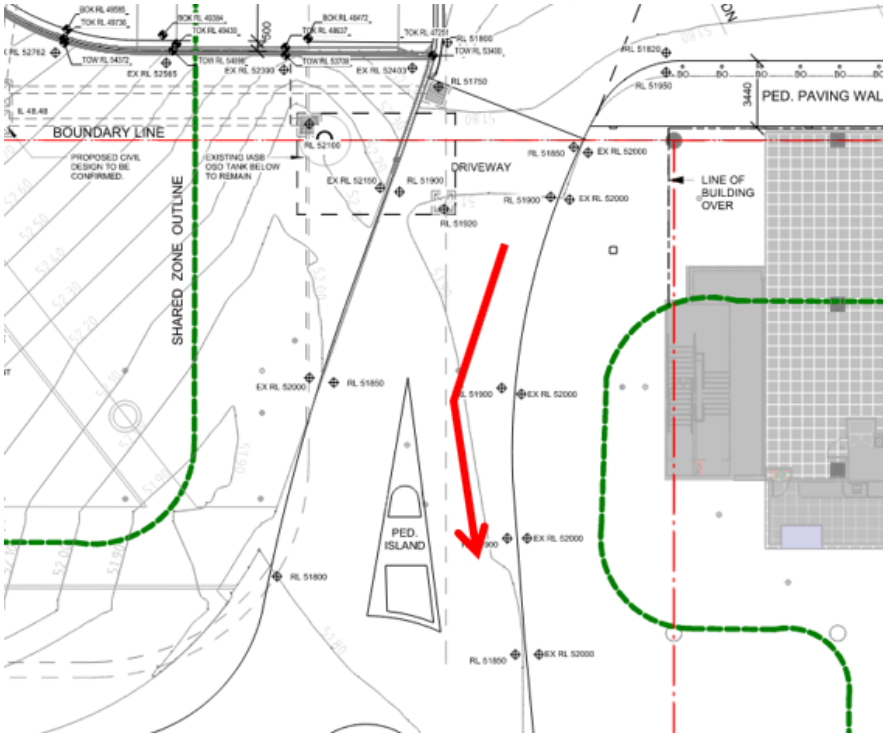
Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
8. Roundabout main access Road alignment	There is no geometric deflection through the proposed roundabout for vehicles approaching the roundabout from the southern site. Vehicles may not reduce the speed as expected or may have to reduce their speed abruptly when approaching the roundabout before turning left onto the driveway exit. This could increase the risk of side and rear end collisions with vehicles approaching the roundabout from the other two approaches. In addition, vehicles could continue straight north missing the roundabout defeating the purpose of the roundabout. 	Occasional	Minor	MEDIUM	This is considered part of the IASB scope. The vehicles from the south will be turning left to exit (or recirculating via the roundabout) and not travelling straight to the SCH or HTH site. There will be appropriate TB (holding) lines on approach and C1 (continuous) lines around the roundabout to direct vehicles. This will be coordinated with Lendlease when they develop a detailed set of traffic signs and lines drawing.

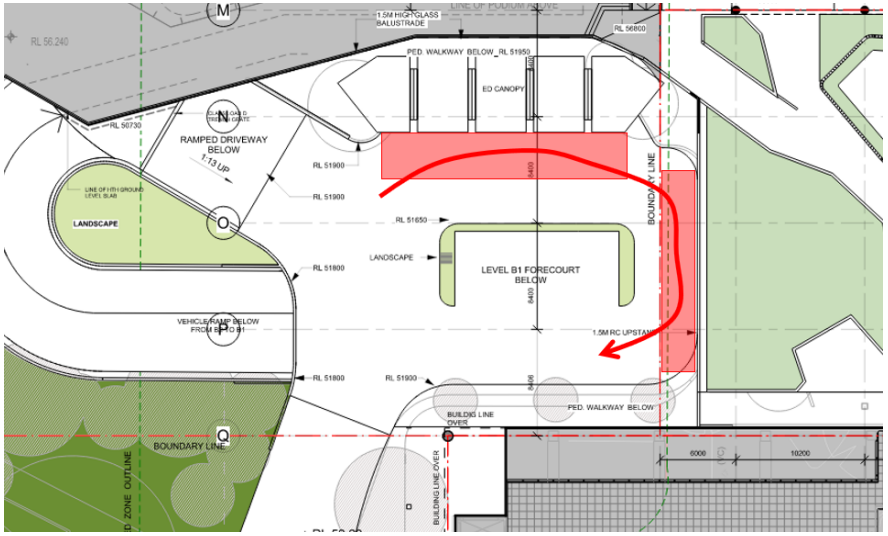
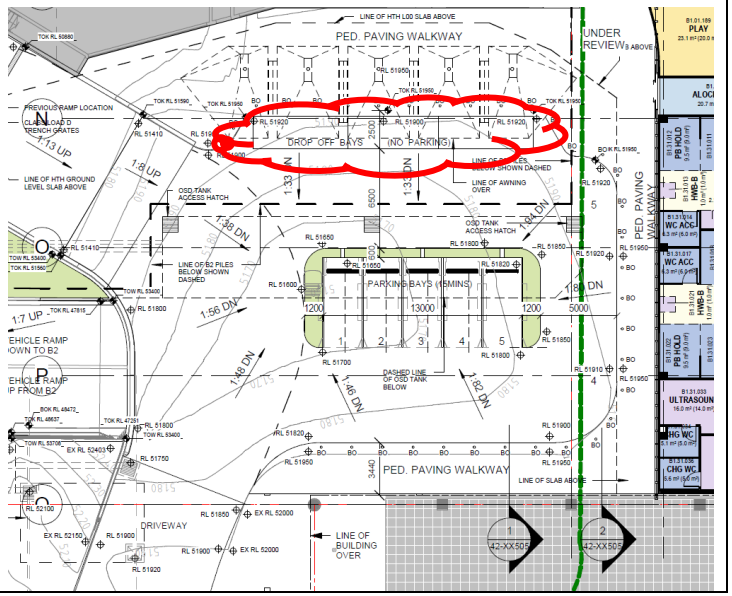
Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
9. Roundabout main access Road signage	There is no roundabout signage on the northern approach. Drivers exiting the northern site may not use the area under the roundabout give way priorities and road rules. This could increase the risk of collisions at the roundabout and in case of large traffic volumes, may increase the risk of traffic conflicts blocking the approaches and departures of the roundabout. 	Occasional	Minor	MEDIUM	This is considered part of the IASB scope. There will be appropriate R1-3 (roundabout give-way) signs on approach around the roundabout to direct vehicles. This will be coordinated with Lendlease when they develop a detailed set of traffic signs and lines drawing.

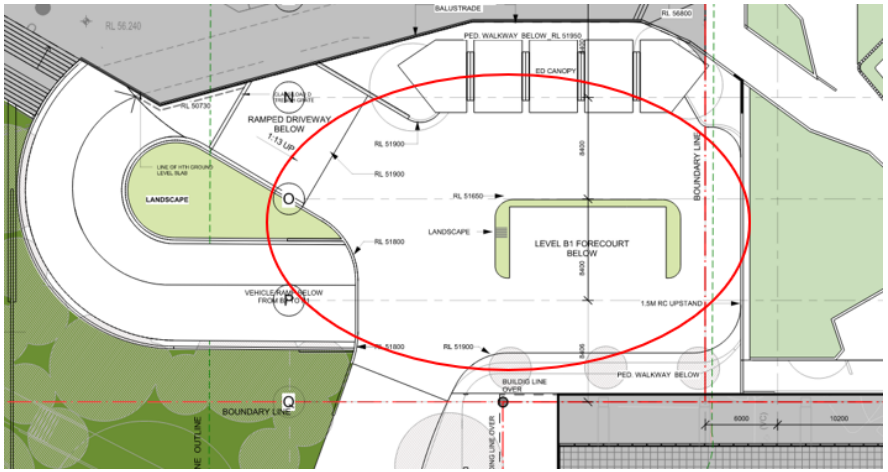
Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
10. Roundabout main access Road linemarking	There is no proposed delineation of traffic lanes or splitter island on the western side of the proposed roundabout. There is a risk of traffic conflicts and front collisions between entering and exiting traffic. 	Occasional	Minor	MEDIUM	This is considered part of the IASB scope. There will be appropriate BB (centre) lines and L1 (lane) lines on approach to the signals to delineate vehicles. This will be coordinated with Lendlease when they develop a detailed set of traffic signs and lines drawing.

Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
11. Roundabout main access Road linemarking / delineation	The lack of delineation of traffic lanes approaching, departing and within the roundabout may confuse drivers from position vehicles in the correct area for the desired turning. This could increase the risk of side collisions, particularly for vehicles exiting the site queueing at the traffic signals. 	Occasional	Minor	MEDIUM	This is considered part of the IASB scope. There will be appropriate lines at the signals and roundabout to delineate vehicles. This will be coordinated with Lendlease when they develop a detailed set of traffic signs and lines drawing.

Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
12. Roundabout main access Road linemarking / delineation	It is not clear if the area adjacent to the roundabout is a designated parking / standing area or an additional traffic lane to the southern site. There is a risk that vehicles could park in this area and attempt to exit directly back to the roundabout increasing the risk of side collisions with vehicles from the northern site entering the roundabout. 	Improbable	Minor	LOW	This is considered part of the IASB scope. Drop-off bays will sit outside the roundabout diameter and hence are permissible to sign posted as such. It should be noted that vehicles leaving the drop-off bay closest to the roundabout will need to perform multiple point turns to exit directly back onto the roundabout therefore this risk is not likely to be mitigated completely.

Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
13. Roundabout main access Road alignment / delineation	There is a sharp angle for vehicles approaching the pedestrian refuge from the northern site. There is no delineation provided for the traffic lanes. There is a risk that vehicles may mount the pedestrian refuge island increasing the risk of hitting pedestrians. 	Occasional	Minor	MEDIUM	This is considered part of the IASB scope. There will be appropriate BB (centre) lines the roadway between the SCH drop-off and roundabout to delineate vehicles on the curve. This will be coordinated with Lendlease when they develop a detailed set of traffic signs and lines drawing.

Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
14.	There are no details for the delineation and operation of emergency drop-offs. There is a risk of collisions between entering vehicles and pedestrians standing by. Vehicles picking-up or dropping-off patients may block traffic circulation. 	Improbable	Minor	LOW	Level B1 indicates 3 drop-off bays on the north of the loop. The remainder will be signposted with No Stopping. Signage will be coordinated with BLP as required. 

Item (CAR Reference)	Safety Hazard Findings	Frequency	Severity	Level of Risk	Project Team Response
15. Traffic circulation Signage and linemarking strategy	There is no signage and linemarking strategy details for the pick-up / drop-off area and traffic circulation (to and from the carpark ramp). No further assessment was carried out. 	Note Only			As per previously raised issues, the drop off will be a clockwise loop and give way to the main road when exiting. There will be give-ways from the HTH and the main B1 ramp, and a give-way from the exit of the drop-off loop. All signage and linemarking will be coordinated with the Civil Engineer when they develop a detailed set of traffic signs and lines drawing.

6 Formal Statement

This road safety audit was conducted reviewing the material listed in this report and identified the risks to road safety.

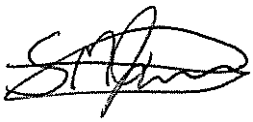
It should be noted that while every effort has been made to identify potential risks to road safety, no guarantee can be made that every problem or deficiency has been identified or listed in this report.

It is recommended that the audit findings be reviewed, and corrective actions implemented where appropriate. While the Road Safety Audit may provide recommendations about possible remedial measures in response to identified road safety issues, it is ultimately the responsibility of the project sponsor / client to determine how best to respond to each identified safety issue.

The audit was undertaken by the undersigned accredited road safety auditors engaged by Arup Pty Limited. It noted that the auditors are independent of the design project.

Antonio Villacorta

Lead Road Safety Auditor – TfNSW accredited Level 3



Steven Jones

Lead Road Safety Auditor – TfNSW accredited Level 3

Appendix A

List of Drawings

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Item	Drawing Package	Date
1	SCH1-AR-DG-10-00002[AH] - PLAN - GENERAL ARRANGEMENT - LEVEL 00 - SOUTH.pdf	16/07/21
2	SCH1-AR-DG-10-B1002[AJ] - PLAN - GENERAL ARRANGEMENT - LEVEL B1 - SOUTH.pdf	16/07/21
3	SCH-CV-DG-00-XX300 - GENERAL ARRANGEMENT PLAN[E].pdf	Nov 2020
4	SSD-10831778 - TfNSW.pdf (letter)	15/06/2021