Shakespeare Street/Cook Street Roundabout

Post Construction Safety Assessment

SAFE SYSTEM SOLUTIONS
AOTEAROA | NEW ZEALAND

Report prepared for:

Waipa DISTRICT COUNCIL

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Executive Summary

Waipa District Council engaged Safe System Solutions to carry out a road safety review. The review focussed on the recent upgrade to the Shakespeare Street and Cook Street roundabout, constructed in June 2024. This assessment was based on a desktop study and site observations.

The safety improvements observed as a result of the works include:

- **Reduced circulating speeds** due to increased horizontal deflection at the roundabout.
- **Slower turning speeds** for left turns from Cook Street due to the kerb buildout.
- **Improved shared path** width on the northern side of Cook Street.
- **Slower vehicle speeds at the northern pedestrian crossing** (across Shakespeare Road) due to raised platforms and kerb buildouts.
- **Realigned traffic median islands** with a staggered pedestrian walkway and fence to prevent unsafe crossings and provide stacking space, accommodating bicycles without encroaching onto traffic lanes.
- **Swedish styled pedestrian crossing point** enables heavy vehicles, including 22 m truck and trailer and buses, more comfortable traversing of the raised safety platform than standard ramp gradients.

The assessment of pedestrian desire line and appropriate facilities was also undertaken as part of the review, and the following are the key findings:

- The **current Swedish-style pedestrian crossing point** is located at the desirable position. This is on balance of risk related to approach vehicle speeds, pedestrian desire line and traffic flows.
- **Raised Pedestrian Platform Crossing** (Swedish-styled pedestrian crossing point) is the preferable crossing facility, as it prevents ambiguity in road users' priority, minimises delays at the roundabout, reduces the risk of heavy commercial vehicles queuing, and lowers the likelihood of rear-end crashes.
- Based on site observation alone, vehicles, including 22 m trucks and trailers, were observed to be able to **safely navigate** the roundabout. However, specific turning checks are recommended.

Safety treatments are recommended to address further safety issues identified during desktop studies and site observations. Refer to Section 4.4 for further details.

Table of Contents

Appendices

List of Tables

List of Figures

1. PROJECT DESCRIPTION

1.1. PROJECT BACKGROUND AND OBJECTIVES

The project is located at the Shakespeare Street and Cook Street roundabout in Leamington, Cambridge. There is demand for pedestrians to cross the northern approach of the roundabout (Shakespeare Street) as it is a major connection to residential neighbourhoods, nearby shops, and recreation reserves. The community has expressed interest in creating a safer crossing at this location.

A permanent solution is being investigated by Waipa District Council. This solution may involve a major change in form of the intersection. While this solution is investigated, Waipa District Council sought interim improvements to enhance safety at this location in a cost-effective manner.

The constructed interim solution included an upgrade at the pedestrian crossing point on the northern approach of the roundabout, across Shakespeare Street, to reduce the likelihood and consequence of pedestrian crashes. The interim measures also included traffic calming to slow left turning traffic from Cook Street, traffic across the pedestrian crossing point as well as circulating traffic.

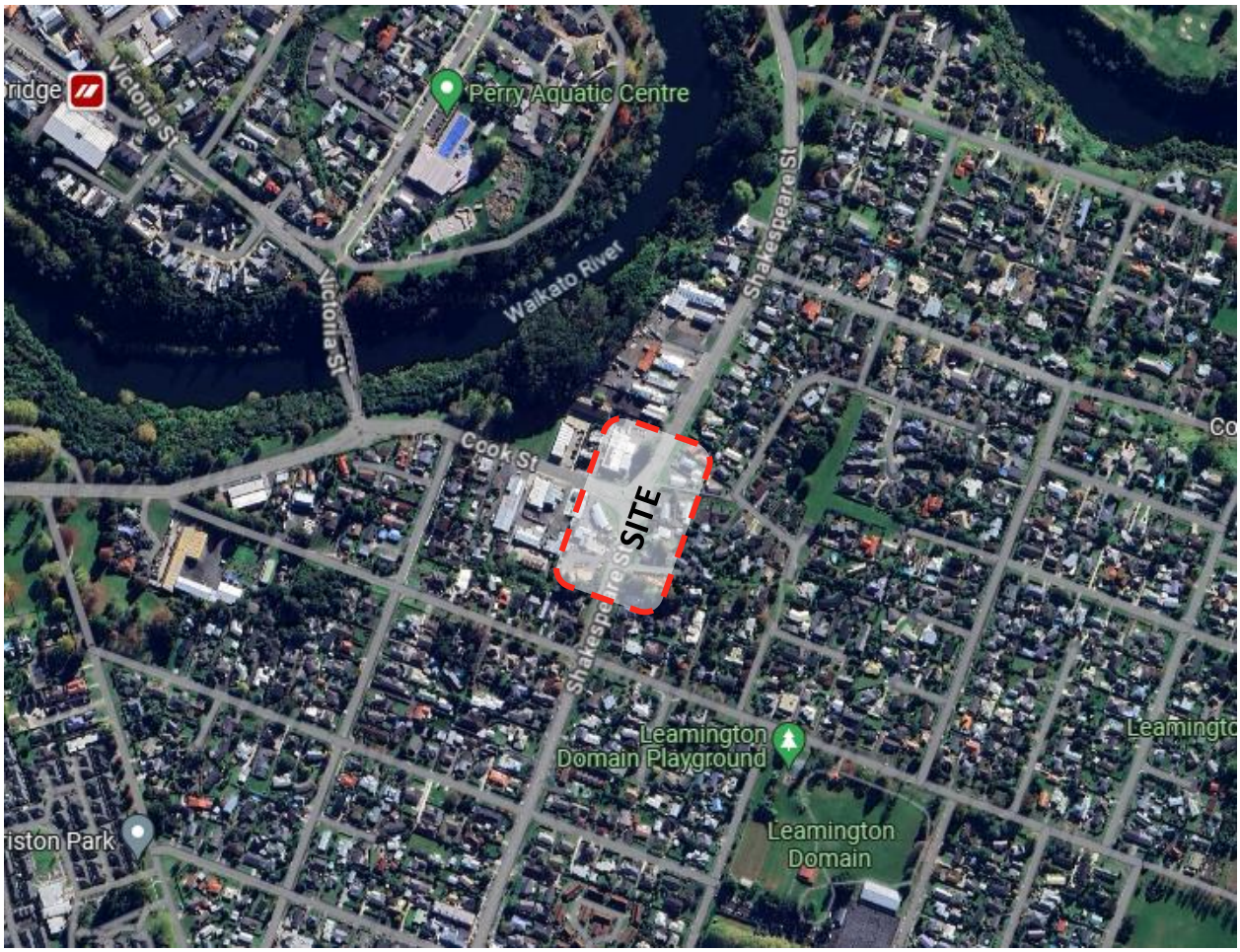


Figure 1: Site extent

1.2. REPORT PURPOSE

This report has been prepared by Safe System Solutions (NZ) Ltd for the exclusive use and benefit of Waipa District Council. The report is a summary of the post construction safety assessment at the Shakespeare Street and Cook Street roundabout, in the suburb of Leamington, Cambridge.

This safety assessment report documents key findings from the desktop study and site observations related to the upgrade at the Shakespeare Street/Cook Street roundabout, completed in June 2024. Additionally, the report proposes recommended safety treatments to further enhance the safety at this site. The process of the assessment is shown in Figure 2.

Figure 2: Post Construction Safety Assessment Process

1. Review site-specific data and characteristics and receive onsite briefing from Waipa District Council.
2. Conduct daytime site inspection and analyse provided camera footage of the roundabout.
3. Carry out a safety assessment of the operation of the roundabout following the changes.
4. Safety findings include reporting on the safety assessment from step 3 and recommending improvements to better align with Safe System principles.

1.3. PREVIOUS WORK

A design and safety review of the preliminary design drawings was conducted by Safe System Solutions in May 2024. The report is attached in Appendix A.

2. SITE VISITS

A post-construction site visit was undertaken on 22 July 2024. The site visit involved an on-site briefing from Waipa District Council at 2:00 pm. At 3:30 pm, a formal site inspection was carried out by the safety team. The following observations are detailed in the corresponding sections of the report shown in Table 1.

Table 1 - Observation Sections

Observation	Sections
New upgrade infrastructure	Section 3.4
Improvements from pre-construction	Section 4.1
Post-construction safety findings	Section 4.4

The site visit photos are attached in **Appendix B**.

A site visit was also conducted during the previous design and safety review stage in May 2024. The following observations from the previous visit has remain relevant after the recent upgrades, and will be carried forward for consideration in this review:

- The northern footpath on Cook Street is narrowed and has been observed to be shared by both pedestrians and cyclists
- Number of high use driveways located on Cook Street near the roundabout
- Large volume of heavy commercial vehicles including truck and trailers (T&T) were observed
- The existing crossing points generally have good visibility
- There were wheel tracks on the front berm area of northwestern corner of the roundabout
- Existing pavement condition is poor at the roundabout with rutting, cracking, and flushing, especially under the wheel paths
- Buses were observed using the roundabout.

3. SITE CHARACTERISTICS

3.1. TRANSPORT DATA

3.1.1. Vehicle Movements

A summary of the road vehicle movements is found in **Table 2**. Waipa District Council have advised the safety team that while traffic flows at peak are heavy, they are unlikely to queue through the roundabout.

Table 2: Vehicle Movement Summary

Type	Data	
AADT[1]	Shakespeare Street	13,000
	Cook Street	9,388
HCV%	Shakespeare Street	7.6%
	Cook Street	11.0%
Public Transport Network	• Shakespeare Street is a bus route for route #20, with a frequency of one bus per hour per direction • Cook Street is a 'Hail2Ride'bus route	

3.1.2. One Network Framework (ONF)

According to NZTA MegaMaps, the ONF categorisation[2] for this Shakespeare Street is Urban Connector, which aims to provide main connection between different parts of urban area. Therefore, the safe and appropriate speed is 40 km/h, or 50 km/h if there are formal cycling facilities are provided[3]. Under the proposed Setting of Speed Limit Rule 2024, (now being consulted on), the speed limit range would be 50 to 80 km/h.

Cook Street is classified as an Activity Street, which provides access to nearby shops and businesses. Therefore, the safe and appropriate speed for Cook Street is 30 km/h, as there is no formal cycling facilities provided[2]. Under the proposed Setting of Speed Limit Rule, this limit would change to 50 km/h except where there is a significant level of pedestrian or cycling activity. In this case, the proposed rule allows for the speed limit to be 40 km/h

The posted speed at the roundabout is currently 50 km/h.

[1] Vehicle volume and Heavy Commercial Vehicle (HCV) are based on NZTA MobileRoads estimated on 26/06/2023
[2] NZ Transport Agency: One Network Framework Detailed Design – D02:2022 (November 2022)
[3] NZ Transport Agency (2022) Setting of Speed Limit Guide

3.1.3. Walking and Cycling

Although pedestrian and cyclist volume data are not available, the Waipa District Council has been advised that approximately 50 pedestrians per hour use this area during peak periods, while pedestrian volumes remain low for the rest of the day. Therefore, pedestrian volumes are considered medium during peak hours and low for the remainder of the day.

3.2. LAND USE

According to the Waipa District Plan (revision 7 June 2024), as shown in **Figure 3,** the project site is surrounded by the Commercial Zone and the Residential Zone. It is also in close proximity to number of Reserve Zone.

Figure 3: Land Use Around the Project Site (Source: Waipa District Plan)

3.3. PRE-CONSTRUCTION CONDITIONS AND CONTEXT

Before the recent upgrade, the roundabout had a physical island with a diameter of approximately 17.5 m with concrete apron of approximately 1.3 m wide. The circulating lanes were between 7.0 and 8.0 m wide. The roundabout also has the following layout:

Table 3: Shakespeare Street/Cook Street Roundabout Layout

Features[4]	Shakespeare Street (N)	Shakespeare Street (S)	Cook Street
Approach lane Width (m)	5.8	6.5	6.2
Exit Lane Width (m)	5.1	6.8	6.3
Footpath Widths (m)	Eastern: 1.1 Western: 1.1	Eastern: 1.1 Western: 1.5	Northern: 1.7 Southern: 1.5
Pedestrian Refuge Depth[5] (m)	1.9	6.1	4.6

Figure 4: Shakespeare Street/Cook Street Roundabout: Pre-Construction

[4] Dimensions based on aerial imagery.
[5] The crossings at all approaches are pedestrian refuge crossings.

3.4. POST CONSTRUCTION UPGRADES

The recent upgrades at the roundabout include:

- Widening of roundabout apron using rubber speed humps
- Implementing 'Keep Clear' marking
- Kerb buildout at the northwestern corner to reduce vehicle turning speed
- Staggered Swedish-styled pedestrian crossing at the northern approach with traffic island, footpath refuge median realignment, 'Pedestrian Give Way to Traffic' signs, pedestrian rail, and tactile studs.
- Swedish-styled pedestrian crossing
- Footpath widening to 2.5 m to accommodate the shared-use path
- Shared path marking and signages
- Crossing location allows one vehicle space to stop in front.

Figure 5: Shakespeare Street/Cook Street Roundabout: Post-Construction

The proposed interim design aims to calm traffic speeds at the roundabout by increasing deflection and enhancing the visibility of the crossing point. Additional measures include further calming traffic at the crossing point and providing adequate refuge space at the traffic medians for cyclists and pedestrians, which is currently lacking, particularly for cyclists, as it forces them to encroach into traffic lanes. These changes are designed to improve safety without compromising the potential for future comprehensive redesign efforts.

4. SAFETY ASSESSMENTS

4.1. OBSERVED IMPROVEMENTS

The following improvements from the pre-construction conditions were observed during the post-construction site visit:

- Reduced circulating speed by all vehicles due to the improved horizontal deflections.
- Slower turning speeds for left turning vehicles from Cook Street due to the kerb buildouts.

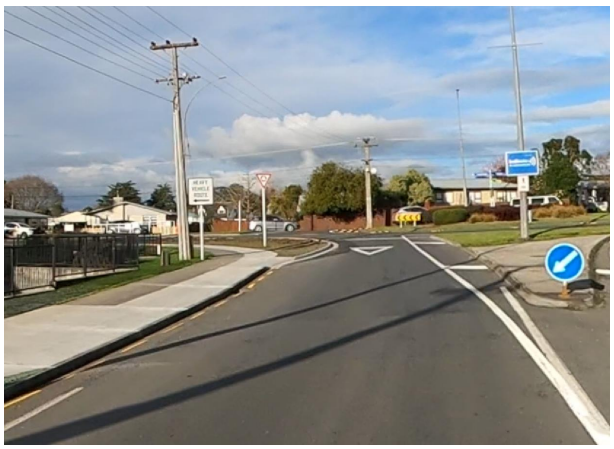


Figure 6: Kerb buildout constructed at the northwestern corner of the roundabout

- Improved path spacing and path markings on the northern side of Cook Street to encourage the shared use by path users.

Figure 7: Widened shared path at the northern side of Cook Street

- Vehicles approaching the Swedish-styled pedestrian crossing point on the northern approach to this roundabout travel at a slower speed due to the raised platform and the kerb buildout.

Figure 8: Swedish-Styled pedestrian crossing point Swedish-styled pedestrian crossing point on the northern approach of the roundabout

- The traffic median islands have been realigned with a staggered pedestrian walkthrough and pedestrian fence to discourage pedestrians from crossing the road without checking, as well as, providing sufficient stacking space for one car length before or after the crossing point to prevent cars from overhanging onto the circulating lane or crossing point. The widened traffic median island can also accommodate a bicycle at an angle, with the fence reducing the likelihood of bicycles from encroaching onto the traffic lane.

Figure 9: One vehicle space allowed before or after the Swedish-styled pedestrian crossing point on the northern approach of the roundabout

Figure 10: Widened traffic median island with pedestrian fence for the Swedish-styled pedestrian crossing point on the northern approach of the roundabout

- Heavy commercial vehicles, including 22 m truck and trailer and buses were observed travelling over the Swedish-style raised safety platform without issues as the gentle exit ramps provide less abrupt transitions.

4.2. VEHICLE TRACKING ASSESSMENTS

During post-construction observations, 22-m trucks and trailers, buses, and other heavy commercial vehicles were observed navigating through the roundabout at a slow speed with minimal need to mount the rubber speed humps (Figure 11). However, wheel tracks were observed on the berm of the northwestern corner of the roundabout (Figure 12). Safe System Solutions were informed by Waipa District Council that this was caused by a house mover, which had mistakenly taken the wrong route around the roundabout.

Since there were no other significant tracking issues observed on-site apart from the wheel tracks (mentioned above), the reviewer recommended the following:

- Prepare as-built drawings for the post-construction phase of the intersection.
- Identify the largest vehicle that will be using this roundabout and carry out vehicle tracking on the vehicle type to ensure that the new intersection configuration can accommodate all types of vehicles expected to use this intersection.
- If trucks larger than those identified are not expected to use this roundabout, consider liaising with the over dimension permit agency for assistance to enforce this restriction.

The recommendations have also been included in Section 4.4 for the record.

Figure 11: Various Heavy Commercial Vehicles Navigating the Roundabout Without Issues

Figure 12: Wheel Tracks Observed at Northwestern Corner of the Roundabout

4.3. CROSSING ASSESSMENTS

4.3.1. Post Construction Visibility Assessments

The visibility of the new Swedish-styled pedestrian crossing on the northern approach of this roundabout and existing crossings were assessed during the post-construction site visit with GoPro video footage, as attached in Appendix C.

The visibility assessments were based on the following assumptions:

- The setback distance adopted is 500 mm from the edge of kerb, with the assumption that pedestrians wait at the front row of the warning tactiles.
- Due to the roundabout is recently upgraded, the new operating speed is not available. Therefore, the following design speeds have been assumed:
    - Vehicles navigated across the roundabout and approaching the Swedish styled pedestrian crossing – 30 km/h
    - Vehicles travelling on a straight midblock – 50 km/h
- Walking speed – 1.2 km/h

The NZTA Crossing Sight Distance Principles require the inclusion of 3 seconds for pedestrian start up and end clearance (start up/clearance) time. However, the guidelines also mention that this might not be achievable in constrained situations (such as these). Therefore, where the pedestrian start up/clearance time cannot be achieved, safety risks will be identified, and safety treatments will be recommended. The following are the key findings from assessment:

- The Approach Sight Distances (ASD) at all crossing points are achieved.
- The Crossing Sight Distances (CSD) for all sites have either improved or stayed the same from the pre-existing condition.
- The Crossing Sight Distances (CSD) including the 3 seconds for pedestrian startup/clearance time, are achieved at all crossing points except for the following three locations (Table 4), which they still met the CSD requirements without the 3 seconds start up/clearance time. The risks or reasons for visibility obstruction have been identified and safety treatments recommended which will further improve safety at this intersection; these improvements will also be included in Section 4.4 as record.

Table 4: Crossing Points Achieving CSD Without Start Up/Clearance Time

Crossing Point	Conflicted Vehicles	Obstructed Visibility	Recommended Safety Treatments
Western side on Shakespeare Street (N)	Eastbound vehicles from Cook Street	"Heavy Vehicle Route" sign on Cook Street	Remove "Heavy Vehicle Route" sign on Cook Street

Crossing Point	Conflicted Vehicles	Obstructed Visibility	Recommended Safety Treatments
Western side on Shakespeare Street (N)	Northbound vehicles from Shakespeare Street (S)	Plantings and Information Direction Sign in the roundabout median island	• Trim/replace/remove plantings • Relocate Information Direction Sign
Southern side on Cook Street	Northbound vehicles from Shakespeare Street (S)	Parked vehicles and advertising sign outside Total Event Hire	• Restriction/ enforcement on parking • Relocate/ remove advertising sign

Note: the conflicted vehicles listed above will encounter other hazards, such as other vehicles and the roundabout island, so it is expected that vehicles will be travelling at slower speeds with higher awareness. This will mean that the risk is likely to be lower.

4.3.2. Crossing Location Assessment

An assessment for the safety of the crossing locations for pedestrians and cyclists near Shakespeare Street roundabout was undertaken based on both a desktop study and two site visits, as attached in Appendix D. The assessment considered two options, along with the benefits and implications:

- Northern Approach (current location)
- Southern Approach

Based on the evaluation of benefits and implications for the crossing points on both the northern and southern approaches in Table 8, the crossing point at the northern approach is more preferable. This is because:

- it aligns better with pedestrian desire lines due to access to Sheridan Crescent, and the shared path on the northern side of Cook Street
- it is also more frequently used by students from Cambridge Primary School
- cyclists using the shared path do not need to cross Cook Street to access the crossing point
- the flatter vertical terrain reduces the risk of harsh braking by vehicles travelling at speed

However, the council has received feedback that the pedestrian crossing point on the northern approach is not obvious to approaching vehicles from Cook Street. Therefore, it is recommended to enhance the visibility of the crossing point, which will be further discussed in Section 4.4.

4.3.3. Crossing Type Selections

Following the evaluation in Section 4.3.24.3, which indicates that the northern approach on Shakespeare Street is the preferable location, this section assesses the appropriateness of the current pedestrian safety platform (Swedish-Styled Pedestrian Crossing Point) in comparison with other options based on the NZTA PNG Crossing Selection Process and the Pedestrian Crossing Selection Guidance Note. The assessment outlined in **Table 9** of **Appendix D.**

The assessment shows that, each crossing facility type offers its own set of benefits and disbenefits to the site characteristics of this roundabouts. As a result, the following three crossing facilities have been shortlisted depending on the priority of Waipa District Council:

1. **Prioritising Both Pedestrian and Traffic – Raised Signalised Crossing:**
   A raised signalised crossing equipped with the latest technology, such as ITS dynamic signal phases, could balance both pedestrian crossing safety and traffic efficiency by adapting signal timings in real-time to manage traffic flow while ensuring pedestrians are protected while crossing. Construction cost of this treatment will be very high and is more aligned with the long-term upgrade plan for the intersection rather than an interim solution.

2. **Prioritising Pedestrians and Cyclists – Raised Zebra Crossing:**
   This option is, in principle, the next safest option as it prioritises and promotes safety for pedestrians and cyclists above vehicle traffic. However, vehicles are required to give way to pedestrians, which could lead to significant delays and substantial queuing at the roundabouts during school peak periods. Additionally, while the crossing is designed for medium to high pedestrian volumes to align drivers' expectations, it experiences low pedestrian demand outside of school peak periods. As a result, this may reduce drivers' awareness of potential pedestrians, leading to abrupt braking if pedestrians step out without checking for oncoming traffic. This could increase the likelihood of rear-end crashes.

3. **Prioritising Traffic Operation while improving pedestrian safety– Pedestrian Safety Platform/ Swedish-Styled Pedestrian Crossing (Current Facility)**
   This option will minimise delays at the roundabout from a raised crossing, reduce the risk of heavy commercial vehicles queuing across the roundabout, and reduce the likelihood of rear-end crashes. It is considered more preferable than the courtesy crossing, despite its recommended traffic volume parameters in NZTA PNG. This preference is due to the lower level of crossing sight distance achieved in this area, as discussed in Section 4.3.1, making it important to eliminate any ambiguity regarding priority at this crossing, to prevent pedestrians from stepping out without checking for vehicles. The installed "Pedestrian Give Way to Traffic" signs will further reduce confusion and clarify right-of-way.

Based on the assessed benefits and implications, the current facility – **Pedestrian Safety Platform (Swedish-Styled Pedestrian Crossing)** is considered a more desirable interim option if prioritising traffic operation on Shakespeare Street aligns with Council's strategy, as:

- it aligns better with the recommended parameters for traffic volume,
- reduce ambiguity and provide clear priority to road users, and

- minimises disruptions to traffic at the roundabout, especially on Shakespeare Street, which is an urban connector that carries a high volume of large heavy commercial vehicles on steep vertical grades.

However, additional improvements can be considered at this location to enhance the safety and visibility of the crossing point, this includes:

- Installing a W16-1 'Non-Motorised Users Pedestrians – Pedestrians' sign with a supplementary 'On Left' sign on Cook Street to provide advance warning for approaching eastbound vehicles.
- Installing a W14-4 'Hump' sign at the Swedish-styled pedestrian crossing to ensure drivers are aware of the vertical displacement device hazard and to encourage the slow speed environment.
- Replacing tactile studs with less slippery Tactile Ground Surface Indicators (TGSIs), such as concrete tactile pavers.
- Removing unnecessary signs to improve visibility.
- Trimming, replacing, or removing plantings in the roundabout island to improve visibility.
- Relocating the Information Direction Sign at the roundabout island to improve visibility.

These recommended safety treatments are also included in Section 4.4.

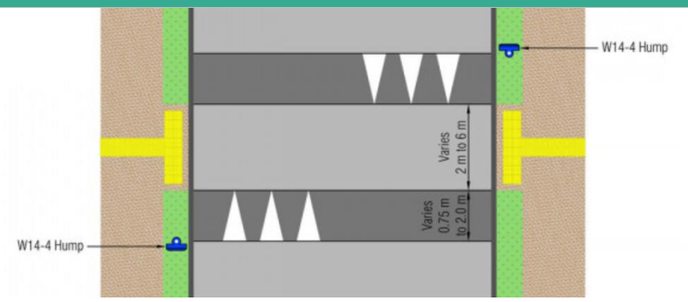
4.4. SAFETY FINDINGS AND RECOMMENDED TREATMENTS

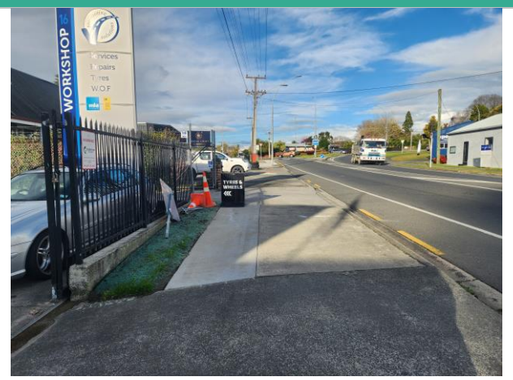
During post-construction desktop studies and site observations, the following safety findings were observed, along with recommended safety treatments to better align with the Safe System approach:

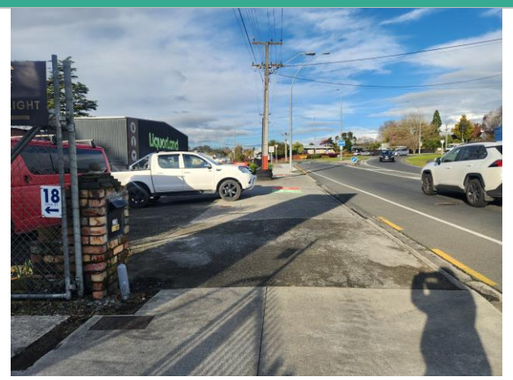
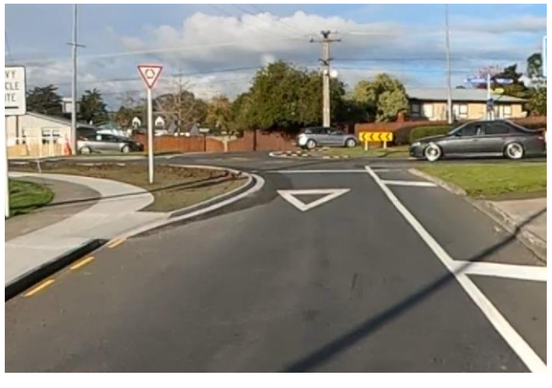
Table 5: Safety Treatment Recommendations for Shakespeare Street/Cook Street Roundabout

#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
1.	Vehicle Operations	During the site visit, reviewers noted that rubber speed hump modules were used as an extension to the mountable apron area, with spacing of approximately 2-3 m. While most vehicles, including the 22 m truck and trailer was observed to navigate around the speed humps without mounting onto the humps, several safety concerns were identified as follow:  **Figure 13: Heavy Commercial Vehicle Navigating the Roundabout Without Mounting the Rubber Speed Humps** I. **Rubber speed humps** are typically used in low-volume, low-speed environments. While they are sometimes installed at light industrial vehicle accesses, they are generally not as durable as concrete or asphalt aprons. Furthermore, rubber speed humps are designed to be oriented perpendicularly to the traffic flow. When vehicles enter or mount the speed humps at an angle, it can cause the front wheels to rise and fall not concurrently, potentially leading to instability and affect the safe operation of larger vehicles such as buses and heavy commercial vehicles. Additionally, the interlocking modules and fixings of the rubber speed humps are not designed for the heavy loads with high turning and mounting movements, this can reduce the speed humps durability. During the site visit, some damaged speed humps and broken pieces were observed. These damaged speed humps and fragments could pose hazards to vehicles, increasing the risk of loss-of-control crashes, especially for motorcyclists	Medium	Consider undertaking vehicle tracking checks on as-built drawings or post-construction survey to verify whether the largest vehicles that commonly use this roundabout require to mount the rubber speed hump area.	N/A	N/A
				If vehicles are expected to use the rubber speed hump area, consider using more robust materials that can be recommended by the manufacturer, or replacing it with a concrete or asphalt apron to withstand the mounting and turning impacts from the high volume of heavy commercial vehicles at this roundabout.	High	High
				If vehicles are not expected to use the rubber speed hump area, consider replacing the speed humps with more substantial features that discourage vehicle use, such as modular speed cushions, a semi-mountable kerb apron or concrete blocks. Careful consideration should be given when selecting the replacing measures to prevent the shifting of risk type.	Medium	Low to High
				Consider extending or realigning edge-line markings at the approaches of the roundabout based on tracking checks to provide more horizontal deflections	Low	Low

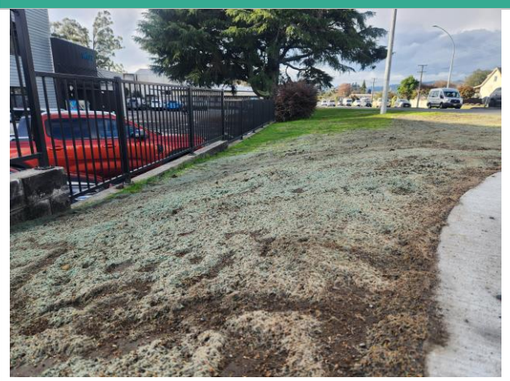
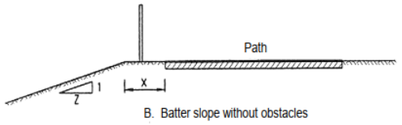
#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
		 Figure 14: Rubber Speed Humps Wide Spacing and Broken Parts				
2.	Walking and Cycling	Even though the approach sight distance assessment previously conducted on the preliminary design drawing (Appendix A) and during the post-construction site visit shows compliance. However, the close proximity of the Swedish-styled pedestrian crossing to the roundabout, combined with the potential distraction of drivers on Cook Street focusing on other roundabout approaches, may decrease awareness of the raised safety platform and increase the risk of abrupt braking and rear-end crashes. Furthermore, the lack of W14-4 'Hump' signs at the new raised platform, as recommended by the NZTA Pedestrian Network Guide (PNG), results in insufficient warning for approaching vehicles regarding the vertical displacement device hazard.  Figure 15: Pedestrian Crossing Point Visible but Not Prominent for Approaching Vehicles on Cook Street	Medium	Consider installing W16-1 'Non-Motorised Users Pedestrians – Pedestrians' sign with supplementary 'On Left' sign on Cook Street, to provide advance warning for approaching eastbound vehicles.  Consider installing W14-4 'Hump' sign at the Swedish-styled pedestrian crossing to ensure drivers are aware of the vertical displacement device hazard. 	Medium	Low

#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
				 Source: NZTA PNG		
3.	Walking and Cycling	The shared path on the northern side of Cook Street has been widened and enhance the safety and reduce conflicts between path users. Additional improvements can be considered at the path's narrow or pinch points due to timber bollards, power poles, and portable shop signs, to avoid the risks of: • path users to steering abruptly to avoid these obstacles, increasing the risk of conflicts with other path users, • conflicting with the street furniture due to unawareness, or • cyclists striking street furniture with their pedals, increasing the risk of losing control or falling.  **Figure 16: Timber Bollards and Power Pole Create Pinch Point**	Low	Consider relocating the street furniture to prevent them from posing a snagging hazard to path users.	High	High
				Should the above recommendation deemed infeasible due to budget constraints, consider path marking as per NZTA Access Control Devices on Paths Guidelines, to provide sufficient advance warning and tapering to avoid abrupt steering or conflicts with street furniture.	Medium	Low

#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
		 Figure 17: Portable Shop Sign Reduce Shared Path Width  Figure 18: Power Pole and Street Light Pole Create Pinch Point				
4.	Walking and Cycling	There are large number of commercial driveways on Cook Street, which conflicted with the shared path. This could increase the conflicts between vehicles accessing the driveways and path users.	Medium	Consider implementing the NZTA 'High-Use Driveway Treatment' across these driveways to highlight the presence of high conflict zone	Medium	Low

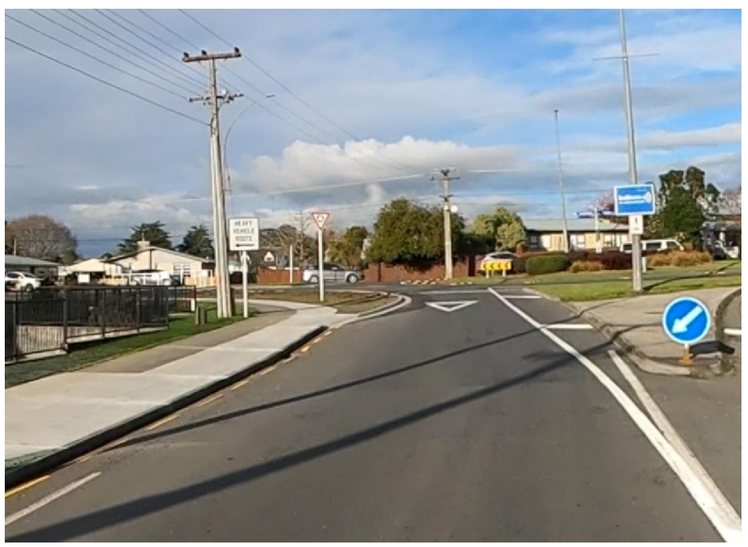
#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
		 Figure 19: Example of Commercial Driveway on Cook Street				
5.	Vehicle Operations	The kerb buildout was constructed at the northwestern corner of the roundabout to improve the vehicle approach angle closer to 90° as recommended by Austroads Guide to Road Design Part4B, which enhances driver's visibilities and reduces turning speeds. However, it was observed that the approaching lane width on Cook Street has reduced substantially, which this may impact vehicular movement, and vehicles may mount onto the kerb buildout or traffic median island.  Figure 20: Narrowed Approaching Lane Width on Cook Street As discussed in Section 4.2, wheel tracks were observed at the northwestern corner during the site visit, and the reviewers were informed that they were caused by a house-moving truck in the wrong direction, which is not a typical user of the roundabout.	Medium	Consider preparing as-built drawings for the post-construction phase of the intersection and identify the largest vehicle that will be using this roundabout and carry out vehicle tracking on the vehicle type to ensure that the new intersection configuration can accommodate all types of vehicles expected to use this intersection.	Low	Low
				If the movement of the largest vehicle that commonly uses the roundabout is restricted, consider realigning the kerbline to accommodate the vehicle's tracking	High	High
				If the vehicle that caused the wheel track marks is not permitted to use this route, liaise with the over dimension permitting agency for help to enforce this restriction.	Medium	Low

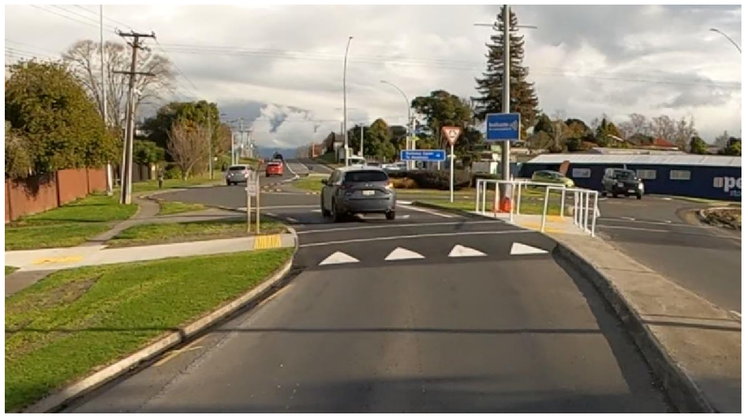
#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
		 **Figure 21: Wheel tracks Observed on the Western Side of Shakespeare Street northern Approach**  **Figure 22: Wheel tracks Observed on the Northern Side of the Cook Street Approach**				
6.	Walking and Cycling	The shared path on the western side of Shakespeare Street widens towards the back berm, which has steepened the existing batter slope to 16% and created a substantial vertical difference at the edge of the shared path and the bottom of the embankment. This could pose injury risks if a path user falls in this area.	Low	Consider a handrail or fence at the embankment side to ensure that path users are protected from the risk of drop-offs.	High	Medium

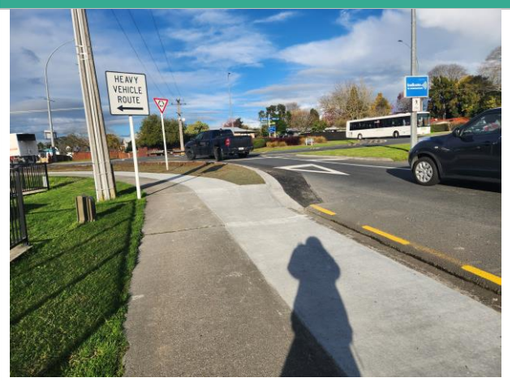
#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
		 **Figure 23: Steep Embankment Slope and Significant Vertical Difference Adjacent to the Western Footpath on the Northern Approach of Shakespeare Street** According to Austroads GTRD Part 6A, a fence or barrier is recommended for a slope greater than 12.5%, if the offset from the edge of the path is <1 m.  B. Batter slope without obstacles X (m) / Z (m) Fence not required: <1 / >8; 1 to 5 / >3 Partial barrier fence required: <5 / 1 to 3 Full barrier fence required: <5 / <1 Source: Austroads GTRD Part 6A.				
7.	Walking and Cycling	A number of cyclists and pedestrians were observed traveling north of the crossing point located on the western side of Shakespeare Street's northern approach, and this observation is supported by the cycle wheel tracks shown in the photo below. However, the lack of a continuing footpath north of this crossing point could result	Low	Consider constructing a footpath north of the crossing point on the western side of Shakespeare Street northern approach.	Medium	High

#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
		in instability for pedestrians and cyclists, increasing the risk of falls.  **Figure 24: Cycle Wheel Tracks Observed at the Grass Berm North of Pedestrian Crossing Point**				
8.	Walking and Cycling	Tactile studs were observed to be installed at the new crossing point on the northern approach of Shakespeare Street as warning and directional Tactile Ground Surface Indicators (TGSIs). However, these studs have been identified as a slippery hazard, particularly in wet weather conditions, leading to pedestrian slips and resulting in fractured injuries. Furthermore, some studs have also been found to be missing after a short period of time.  **Figure 25: Tactile Studs Installed at New Crossing on Shakespeare Street Northern Approach**	Medium	Consider replacing the tactile studs with concrete tactile pavers, which provide better skid resistance and durability.	High	Medium
9.	Walking and Cycling	The Swedish-styled pedestrian crossing implemented at the northern approach of Shakespeare Street appears to have an entry ramp with a gradient gentler than 1:15. According to research studies and Austroads AP-R642-20 on the Effectiveness and Implementation of Raised Safety Platforms, ramp grades less than 1:15 allow	Medium	Consider checking the ramp grade of the recently constructed raised platform at the northern approach. If the gradient is gentler than 1:15, consider realigning it to ensure a slower approaching speed, especially to a non-priority pedestrian crossing point.	Medium	Medium

#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
		for comfortable speeds exceeding 30 km/h, which exceeds the safety threshold for vulnerable users. This is especially important at this location, as it is a pedestrian crossing point.  **Figure 26: Ramp Grade for Pedestrian Crossing Appears to be Less Than 1:15.**				
10.	Vehicle Operations	The recent construction, which involved a kerb buildout, lane realignment, and pedestrian crossing upgrade, did not include a street lighting upgrade. A review of the street lighting should be undertaken to ensure compliance with AS/NZS 1158.3.1:2020 standards for Lighting for Roads and Public Spaces, as recommended in the NZTA PNG. This will help ensure that approaching drivers can clearly see pedestrians in low-light condition, enhancing safety at the crossing point.	Medium	Consider undertaking a street lighting review and/or upgrade to meet the AS/NZS 1158.3.1:2020 standards, ensuring that pedestrians crossing here are visible in low light conditions.	High	High
11.	Vehicle Operations	During site observations, some vehicles were observed to be travelling at speed approaching the roundabout, especially northbound traffic on Shakespeare Street's southern approach, due to the straight downhill grade leading to it.	Medium	The preliminary design and safety review attached in Appendix A suggest several additional speed-calming measures, including implementing side islands and edge-line markings to provide horizontal deflections and visually narrow the lane width, as well as considering a concrete apron at the corners of the roundabout to encourage slower turning speeds.	Medium	High
12.	Vehicle Operations	Some abandoned road markings have not been fully removed, which could create confusion for drivers.	Very Low	Consider permanently removing the abandoned road marking to avoid confusion.	High	Low

#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
		 Figure 27: Abandoned Marking Remained On-Site				
13.	Vehicle Operations	The new kerb buildout constructed at the northwestern corner of the roundabout could be a hazard to approaching vehicles on Cook Street, as it creates an abrupt pinch point. This risk is exacerbated during low-light conditions, as the buildout may not be as visible to drivers.  Figure 28: Kerb Buildout Forming an Abrupt Pinch Point	Medium	Consider improving the delineation to the kerb buildout to reduce potential conflict with the hazard and assist vehicles in better aligning when navigating the roundabout.	High	Low

#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
14.	Vehicle Operations	The R2-3 'Priority Give Way Roundabout' sign for southbound traffic on the northern approach of Shakespeare Street is missing from the left side. According to the TCD Rule, a controlled intersection sign must be installed on the left side of the approach lane to ensure a consistent message nationally and prevent potential driver confusion. Additionally, NZTA recommends installing a secondary R2-3 'Priority Give Way Roundabout' sign at the corner of the traffic medium island to enhance visibility for approaching drivers.  **Figure 29: Missing R2-3 'Priority Give Way Roundabout' Sign on the Right Side of the Approach**	Low	Consider installing a R2-3 'Priority Give Way Roundabout' sign on the left side of the Shakespeare Street northern approach. Additionally consider installing a R2-3 'Priority Give Way Roundabout' sign at all corners of the traffic median island.	Medium	Low
15.	Vehicle Operations	Several signs at the roundabout may no longer be relevant or necessary, including: • 'Heavy Vehicle Route' sign on Cook Street • 'No Parking' sign on Cook Street, where 'No Stopping at All Time' marking is in place • Shared path sign installed on the light pole at the traffic median island on Cook Street • Shared path sign on Shakespeare Street southern approach • 'Indicate to communicate' sign on all approaches Excessive signage can overload drivers with information, potentially distracting them from responding to more critical cues, such as pedestrians crossing the road. Furthermore, the 'Heavy Vehicle Route' sign is currently restricting the visibility of eastbound traffic to pedestrian crossing point on Shakespeare Street northern approach.	Medium	Identify all excessive signage and remove to avoid overloading information for drivers.	Medium	Low

#	Category	Safety Findings	Level of Safety Risk	Recommendation	Effectiveness	Cost
		 Figure 30: Excessive Signage at Cook Street Approach				
16.	Walking and Cycling	As discussed in Section 4.3.1, the sight distance between the pedestrian crossing point at the western side of Shakespeare Street northern approach and the northbound vehicles on Shakespeare Street is restricted by the plantings and Information Direction Sign at the roundabout median island, which reduce driver's awareness of the crossing point increasing the risk of conflict between crossing pedestrians and vehicles.	Medium	Consider: • Relocate the Information Direction Sign, • removing the planting in the roundabout island, • replacing the planting with low-level plantings that are below driver's eye level, or • trim plantings to improve visibilities	Medium	Medium
17.	Walking and Cycling	Vehicles were observed parked between the footpath and the property fence outside Total Event Hire on Cook Street. This could increase the risk of conflict between pedestrians on the footpath and vehicles entering or exiting the area. Furthermore, the parked vehicles are restricting visibility between the pedestrian crossing point on Cook Street and the southbound vehicles on Shakespeare Street, increasing the risk of conflict between crossing pedestrians and vehicles.	High	Consider restricting parking in this area to minimise conflict with pedestrians on the footpath and to improve visibility of the pedestrian crossing point on Cook Street.	High	Low
				Consider installing kerb buildouts or side islands at the pedestrian crossing point on Cook Street and relocating the advertising sign outside Total Event Hire to improve visibility. 	Medium	Medium

5. CONCLUSIONS

In summary, the recent upgrade of the roundabout has achieved the following improvements:

- Reduced circulating speeds
- Slower turning speeds
- Better shared path space
- Slower vehicle speeds at pedestrian crossing points on the northern approach
- Improved pedestrian safety crossing at the northern approach
- Minimise disruptions and discomfort to all vehicle types

The following key findings resulted from the vehicle and pedestrian assessments undertaken in this report:

- Vehicles, including 22 m trucks and trailers were observed to safely navigate the upgraded roundabout.
- Approach sight distances are compliant for all crossing points.
- The crossing sight distances (CSD), including the 3 seconds for pedestrian start up/clearance time, are achieved at all crossing points except for the three locations detailed in Appendix C, due to signs and plantings. However, they met the CSD requirements without the 3 seconds start up/clearance time.

The pedestrian desired line and appropriate facilities assessment has shown that:

- the northern approach on Shakespeare Street is better aligned with the pedestrian desired line than the southern approach.
- Raised Pedestrian Platform Crossing/Swedish-styled pedestrian crossing point) is the preferable crossing facility, as it prevents ambiguity in road users' priority, minimises delays at the roundabout, reduces the risk of heavy commercial vehicles queuing, and lowers the likelihood of rear-end crashes.

Safety treatments are recommended to address further safety issues identified during desktop studies and site observations. Refer to Section 4.4 for further details.

Appendix A – Preliminary Design and Safety Review Report

Appendix B – Site Visit

Appendix C – Visibility Assessments

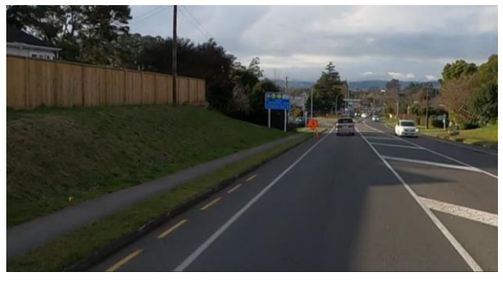
Table 6: Visibility Assessment for the New Crossing Point on Shakespeare Street Northern Approach

Crossing Point	Conflicted Vehicle Movement	Photo	Design Speed (km/h)	Sight Distance Achieved (m)	Crossing Sight Distance (m)				Approach Sight Distance (ASD)	
					NZTA Requirement (+3s[6])	Pass/Fail	NZTA Requirement (+0s[7])	Pass/Fail	NZTA Requirement	Pass/Fail
Shakespeare Street (N) – Western Crossing Point	Cook Street Eastbound		30	60	69	Fail (see Note 1)	43	Pass	22	Pass
Shakespeare Street (N) – Western Crossing Point	Shakespeare Street Northbound		30	45	68	Fail (see Note 2)	43	Pass	23	Pass
Shakespeare Street (N) – Eastern Crossing Point	Shakespeare Street Southbound		50	>150	73	Pass	48	Pass	21	Pass

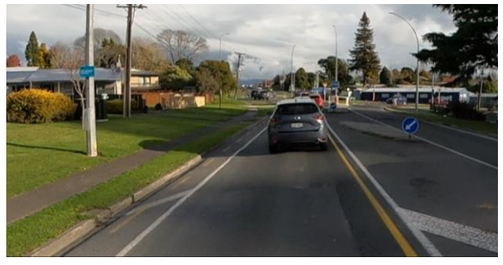
[6] Includes 3 seconds pedestrian start up and end clearance time.
[7] Excludes 3 seconds pedestrian start up and end clearance time.

Although visibility assessment of the existing crossing points on Cook Street and Shakespeare Street southern approach was outside the scope of this review. However, it was still undertaken during the site visit. The key findings are summarised in Table 7.

Table 7: Visibility Assessment for the Existing Crossing Points on Cook Street and Shakespeare Street Southern Approach

Crossing Point	Conflicted Vehicle Movement	Photo	Design Speed (km/h)	Sight Distance Achieved (m)	Crossing Sight Distance (m)				Approach Sight Distance (ASD)	
					NZTA Requirement (+3s[8])	Pass/Fail	NZTA Requirement (+0s[9])	Pass/Fail	NZTA Requirement	Pass/Fail
Cook Street – Northern Crossing Point	Cook Street Eastbound		50	>115	111	Pass	69	Pass	48	Pass
Cook Street – Southern Crossing Point	Shakespeare Street Northbound		30	65	80	Fail (see Note 3)	55	Pass	22	Pass
Shakespeare Street (S) – Western Crossing Point	Shakespeare Street Northbound		50	>150	133	Pass (see Note 4)	91	Pass	47	Pass

[8] Includes 3 seconds pedestrian start up and end clearance time.
[9] Excludes 3 seconds pedestrian start up and end clearance time.

Crossing Point	Conflicted Vehicle Movement	Photo	Design Speed (km/h)	Sight Distance Achieved (m)	Crossing Sight Distance (m)				Approach Sight Distance (ASD)	
					NZTA Requirement (+3s[8])	Pass/Fail	NZTA Requirement (+0s[9])	Pass/Fail	NZTA Requirement	Pass/Fail
Shakespeare Street (S) – Eastern Crossing Point	Shakespeare Street Southbound		50	>150	134	Pass	93	Pass	39	Pass

Note:

1. The crossing sight distance between the pedestrian crossing at the western side of Shakespeare Street northern approach and the eastbound vehicles on Cook Street is restricted by the "Heavy Vehicle Route" sign, and this is an existing situation. The visibility and awareness can be improved by removing the sign, installing crossing advance warning, and vertical displacement signs, which has been recommended in Section 4.4. Furthermore, as the eastbound vehicles approach the roundabout before the crossing point, they will encounter other hazards, such as other vehicles and the roundabout island, so it is expected that vehicles will be travelling at slower speeds with higher awareness. Therefore, the risk will be lower.
2. The crossing sight distance between the pedestrian crossing at the western side of Shakespeare Street northern approach and the northbound vehicles on Shakespeare Street is restricted by the plantings and Information Direction Sign in the roundabout median island, and this is an existing situation. The visibility can be improved by trimming, replacing or removing the planting, which has been recommended in Section 4.4. Furthermore, as the northbound vehicles will be approaching the roundabout before the crossing point, they will encounter other hazards, such as other vehicles and the roundabout island, so it is expected that vehicles will be travelling at slower speeds with higher awareness. Therefore, the risk will be lower.
3. The crossing sight distance between the pedestrian crossing at the southern side of Cook Street and the southbound vehicles on Shakespeare Street is restricted by the parked vehicles outside Total Event Hire and the advertising sign, safety recommended treatments including enforcement of illegal parking has been recommended in in Section 4.4. Furthermore, as the southbound vehicles will be approaching the roundabout before the crossing point, they will encounter other hazards, such as other vehicles and the roundabout island, so it is expected that vehicles will slow down before turning at the roundabout. Therefore, the risk will be lower.
4. The number of vehicles parked outside Total Event Hire could impact visibility between the pedestrian crossing on the western side of Shakespeare Street's southern approach and the southbound vehicles on Shakespeare Street, depending on the number and location of the parked vehicles.

Appendix D – Crossing Location Assessment

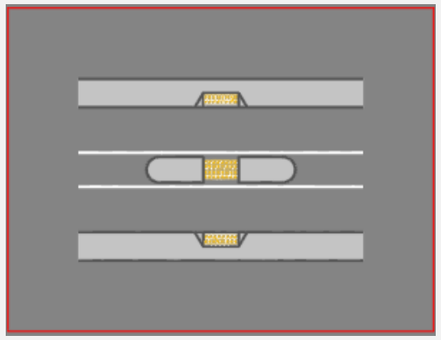
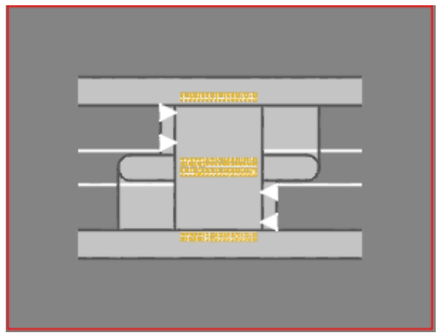
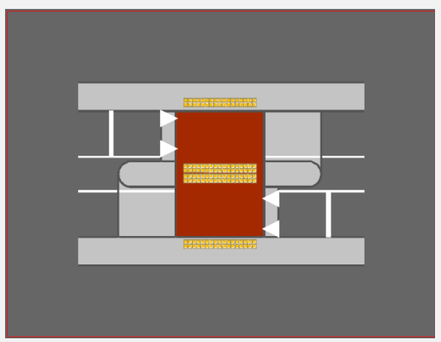
Table 8: Crossing Location Assessment on the Approaches of Shakespeare Street

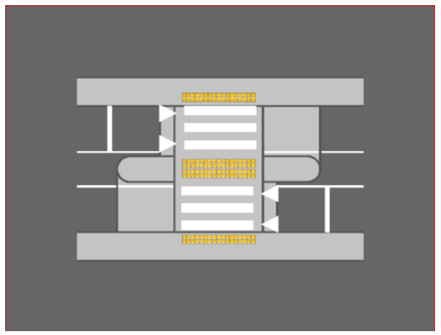
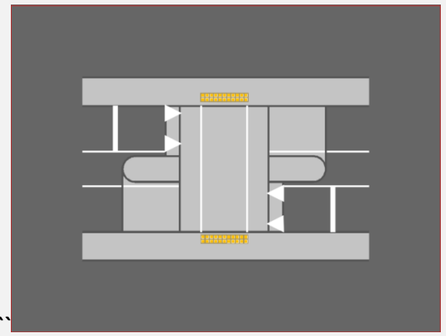
	Option 1 – Northern Approach (Current)	Option 2 – Southern Approach
Crossing Location		
Benefits	• More pedestrians and cyclists were observed crossing here due to the close proximity of the access that connects Sheridan Crescent and Shakespeare Street, as well as the shared path located on the northern side.  • More pedestrians and cyclists from Cambridge Primary were observed using this crossing. • Cyclists using the shared path on the northern side of Cook Street can access the eastern side of Shakespeare Street without needing to cross Cook Street.	• The very wide median island can accommodate cyclists without the need to wait at an angle. • The crossing only requires pedestrians to check for traffic from one direction at each stage. • Compliant visibility.

	Option 1 – Northern Approach (Current)	Option 2 – Southern Approach
	• The vertical terrain at this section of Shakespeare Street is flatter, leading fewer speeding vehicles and reduced stopping distances. • Vehicles approaching from Cook Street and the southern approach of Shakespeare Street will be travelling at a slower speed due to the improved horizontal deflections from the recent upgrades. • Sufficient stacking space for one car length in both directions prevents cars from overhanging into the circulating lane or crossing point, reducing the risk of conflicts with vehicles and pedestrians. • Compliant approach sight distances. • Shorter crossing distances (6.2-6.9 m).	
Implications	• The width of the median island requires cyclists to wait at an angle. • Pedestrians crossing from the western side will have to check for traffic from two directions: Cook Street and Shakespeare Street southern approach. • Even though the intervisibility between vehicles approaching from Cook Street and pedestrians crossing from the western side is compliant, the presence of the crossing is not obvious to traffic on Cook Street.	• Cyclists using the shared path on the northern side of Cook Street are required to cross at Cook Street to access the crossing point, increasing exposure to conflict with vehicles. • Fewer pedestrians were observed using this crossing during both pre-construction and post-construction site visits. • Wider crossing distance (7.9-8.0 m). • The vertical terrain at this section of Shakespeare Street is significantly steeper. Northbound traffic was observed travelling at high speeds towards the roundabout, increasing the risk of abrupt braking if a pedestrian steps out without checking. This may lead to pedestrian crashes at higher than survivable speed threshold and /or increased rear end crashes. High-friction surfacing can be considered to improve skid resistance. However, the high volume of heavy commercial vehicles at this location could increase wear and tear on the high-friction surfacing and deteriorate quickly after implementation.  • Path is not on the pedestrian desire line. This can lead to an increase of pedestrians crossing at locations without safety infrastructure to limit risk.

Appendix E – Crossing Type Assessment

Table 9: Crossing Facility Analysis for the Northern Approach

Type of Crossing Facility	Benefits	Implications	NZTA PNG Recommended Parameters
Pedestrian Refuge (Previous Facility) 	• Provides a smooth transition between the footpath and roadway.	• Does not give pedestrians priority. • Does not slow vehicle speeds.	✗ Only appropriate for low vehicle volume environments. ✗ Only appropriate on their own for low pedestrian demands. ✓ They are only appropriate where crossing distance is 9m or less. For longer crossing distances, consider kerb extensions. ✓ Ensure on-street parking does not block access or visibility from the crossing point.
Pedestrian Safety Platform/ Swedish-Styled Pedestrian Crossing (Current Facility) 	• Slows down vehicles approaching the pedestrian crossing. • Minimises traffic delays. • Reduces the risk of vehicles overhanging and queuing across the roundabout. • Directs pedestrians to safer crossing locations. • Eliminates grade changes in the pedestrian route, providing a smooth transition from the footpath. • Prevents discomfort for drivers and passengers when buses or heavy commercial vehicles traverse over the raised platform. • Avoids delays for buses and heavy commercial vehicles. • Prevents safety issues as passengers may be standing or moving around the bus.	• Does not prioritise pedestrians. • Can lead to unsafe situations if pedestrians mistakenly believe they have the right of way. • May increase noise levels as vehicles brake, slow down, pass over them, and then accelerate, especially heavy vehicles.	✗ Traffic volumes less than 3000vpd ✓ For low pedestrian volumes (most of the day). ✓ Should be combined with kerb extensions to minimise crossing distance. ✓ Vehicle operating speeds less than 50km/h (the platform should be designed to slow vehicle speeds to 30km/h) ✓ On a platform with approach ramps to reduce vehicle speeds ✗ Likely to be found on Local Streets and Activity Streets where the pedestrian volumes are low ✓ Crossing should be of an appearance that is clearly distinguishable from the footpath to indicate that pedestrians do not have priority. ✓ Crossing colour/texture should contrast with the footpath to indicate that pedestrians do not have priority and ideally be the same material as the road.
Courtesy Crossing 	In addition to Pedestrian Safety Platform: • Can encourage courteous behaviour, prompting drivers to give way to pedestrians. • Designed to facilitate eye contact between pedestrians and drivers, allowing them to negotiate who proceeds first. • Contrasted colour surfacing highlights the presence of the crossing and enhance driver awareness.	• The right of way is ambiguous, creating uncertainty and potentially making it unsuitable for less able or less confident pedestrians. • May lead to unsafe situations if pedestrians mistakenly believe they have the right of way.	✗ Ideally on a platform with steep approach ramps to reduce vehicle speeds ✓ Vehicle volume less than 7500vpd (could be higher if a median refuge is provided and an alternative crossing provided nearby). ✓ Vehicle operating speeds very low, at most 30km/h, ideally 20km/h or less. The lower the speed the more effective the crossing as vehicles are going to slower so are more likely to be courteous to pedestrians wishing to cross. ✓ Only appropriate for crossing distances 7m or less (can be combined with kerb extensions to achieve) as only used in slow speeds where people cycling, and motor vehicles share the roadway.

Type of Crossing Facility	Benefits	Implications	NZTA PNG Recommended Parameters
			✗ Likely to be found on Activity Streets, Main Streets and Civic Spaces where pedestrian volumes are high ✓ Can be combined with kerb extensions. • Crossing colour/texture should contrast with the road and footpath to indicate both users are guests over the crossing
Raised Zebra Crossing 	• Prioritises pedestrians, resulting in minimal delays for them. • Clearly indicates a designated pedestrian crossing for all road users. • Reduces vehicle speeds and enforce slower speed environment, increasing drivers' likelihood of give way. • Eliminates grade changes in the pedestrian route, providing a smooth transition from the footpath. • Is more suitable for less able or young pedestrians.	• Zebra crossings may not improve pedestrian safety or could even result in reduced safety unless they are on a platform or accompanied by measures such as kerb extensions and refuge islands. • High pedestrian demand, especially during school peak times, can dominate the flow and cause vehicle delays and queuing across the roundabout. • Higher construction cost due to additional signages and streetlight upgrade.	✓ Posted speed of 50km/h or less (>50km/h posted speed requires approval from NZTA as per TCD Rule Clause 8.2(2)). ✓ Maximum of one traffic lane in each direction to avoid traffic in adjacent lanes blocking visibility of people crossing or waiting to cross. ✗ Suitable for medium[10] to high pedestrian demand so drivers are expecting pedestrians. ✓ Can be combined with kerb extensions and/or a pedestrian refuge.
Raised Signalised Crossing 	• Provides clear signals for when pedestrians can cross, making it more suitable for less able or less confident individuals. • Encourages pedestrians to cross in groups rather than individually, minimising overall vehicle delays. • Eliminates grade changes on pedestrian routes, removing the need for kerb ramps. • Reduces vehicle speeds and enforce slower speed environment, increasing drivers' likelihood of give way. • Eliminates grade changes in the pedestrian route, providing a smooth transition from the footpath.	• Requires removing the roundabout and convert into a signalised intersection, which may result in substantial intersection delays. • Pedestrians may experience delays when vehicles are given longer green phase, potentially leading to frustration and crossing while the pedestrian signal is still red. • Slower pedestrians might struggle to cross within the allocated time. • There may be increased risk for pedestrians crossing near the signals due to drivers not expecting them. • Frequent activation can disrupt vehicle flows on Shakespeare Street. • Frequent stopping and braking movements may pose challenges for heavy vehicles such as 22 m trucks and trailers. • Noise levels may increase as vehicles brake, slow down, pass over, and accelerate, especially with heavy vehicles. • Very high construction costs due to the new traffic signal infrastructures.	• Suitable for high pedestrian demand so signals are activated regularly. ✓ Can be combined with kerb extensions and/or pedestrian refuge. • Allows pedestrians to cross unhindered by vehicles • Different signal display, activation and detection options are available • For locations with lower pedestrian demand conspicuous advance signal display is recommended.

[10] Medium pedestrian volume only during school peak periods, with low pedestrian volume outside of these times.