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**Finance and Performance Committee**  
**ATTACHMENTS - UNDER SEPARATE COVER**

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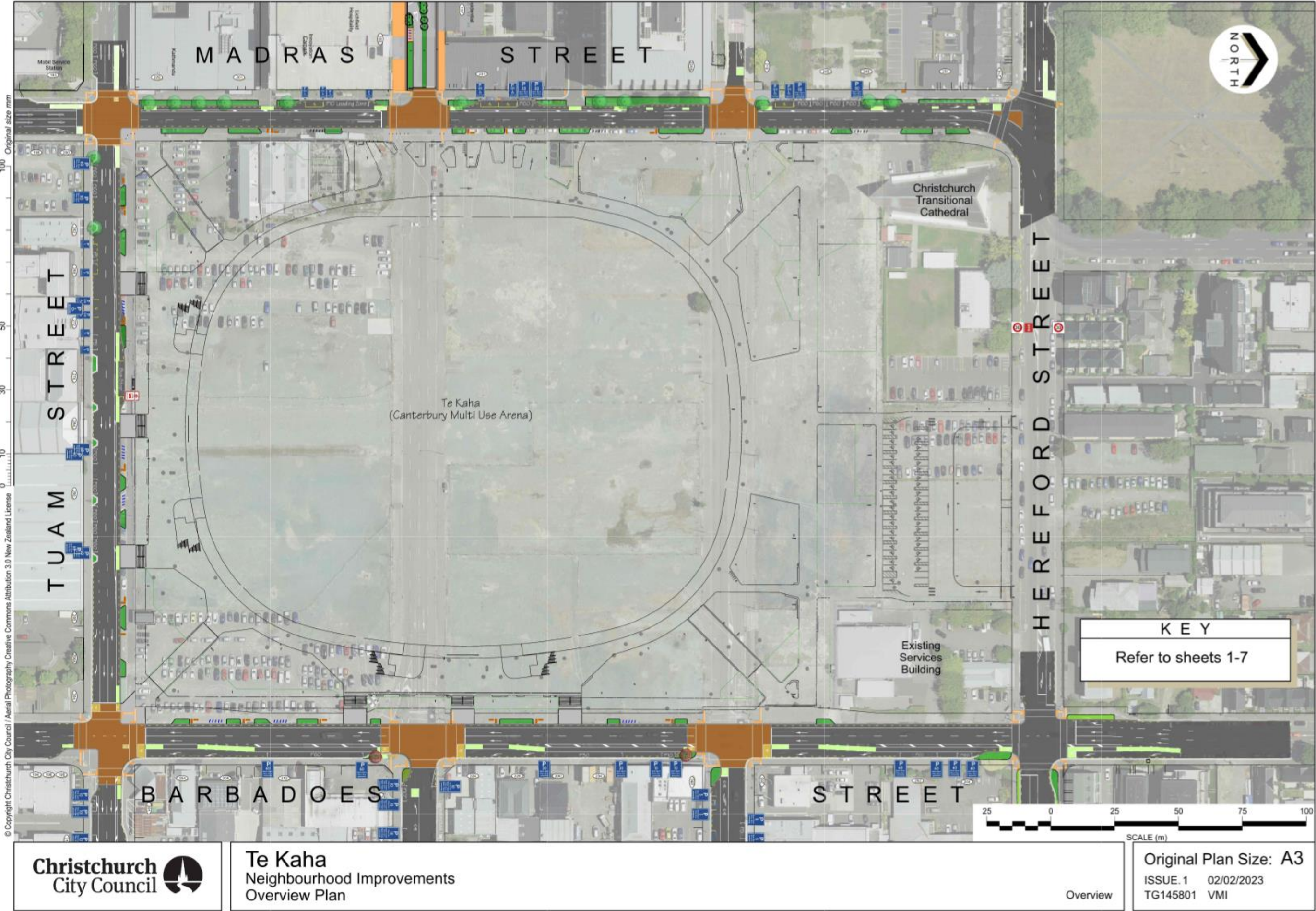
**Date:** Wednesday 28 June 2023  
**Time:** 9.30 am  
**Venue:** Council Chambers, Civic Offices,  
53 Hereford Street, Christchurch

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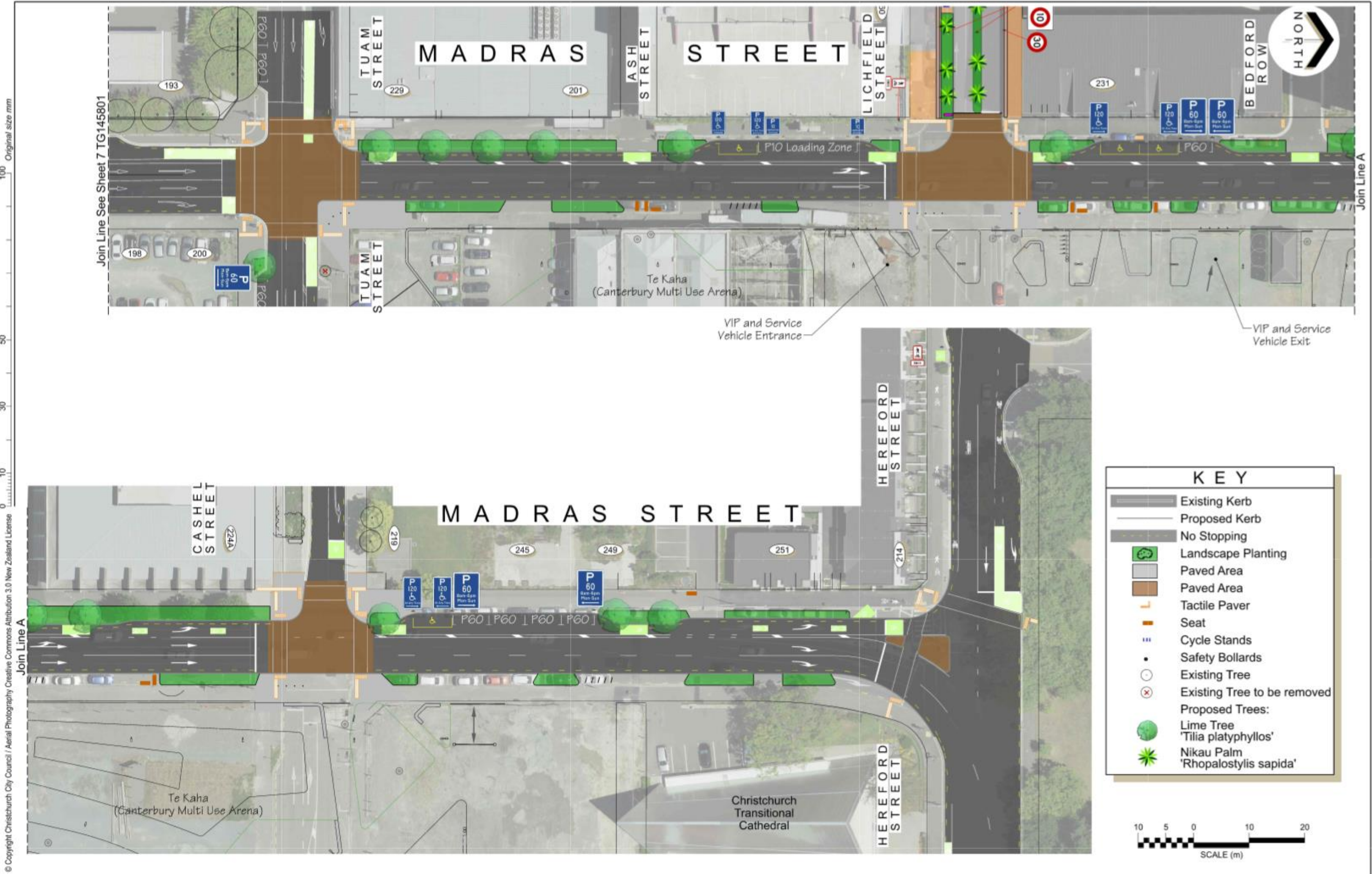
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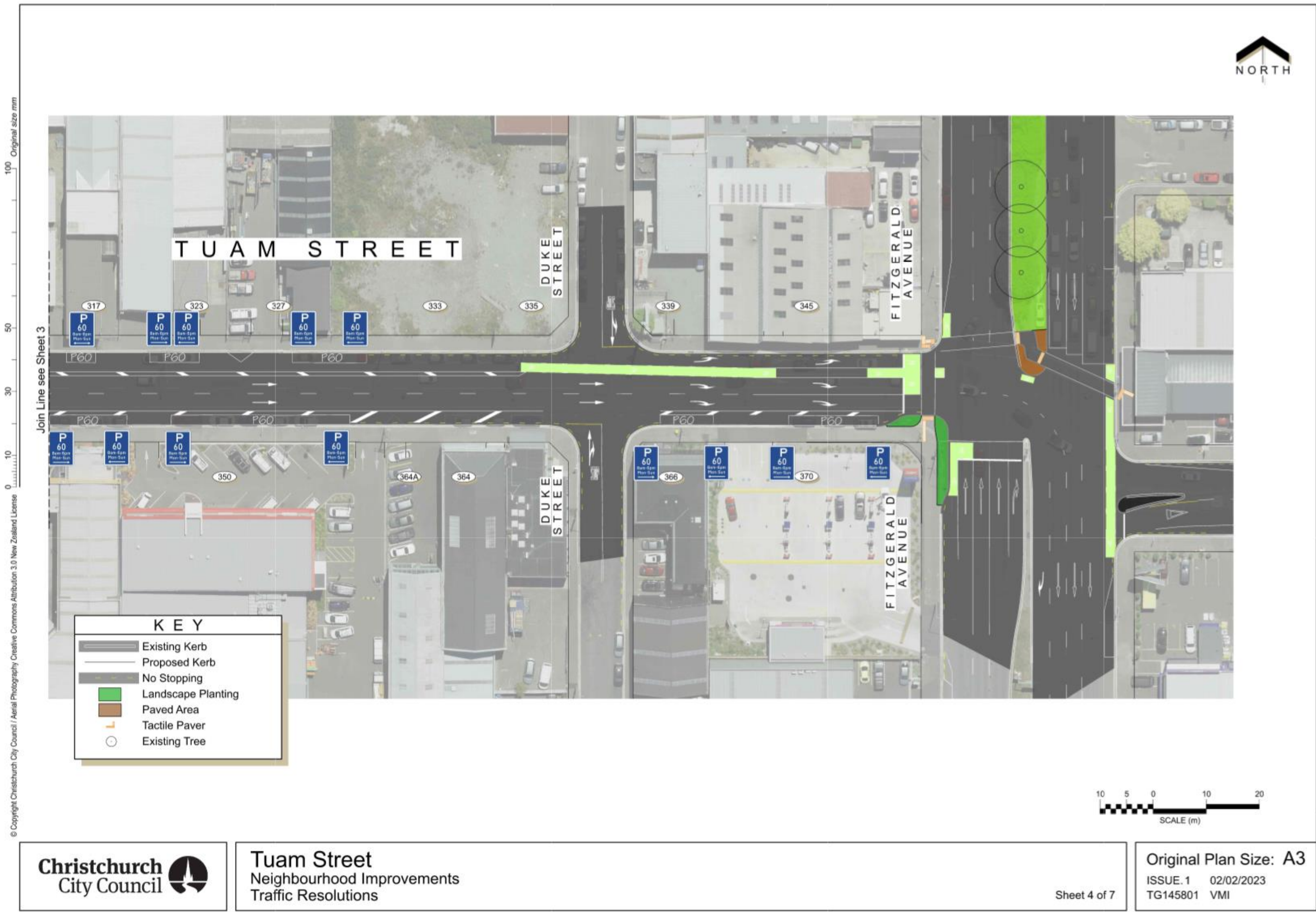




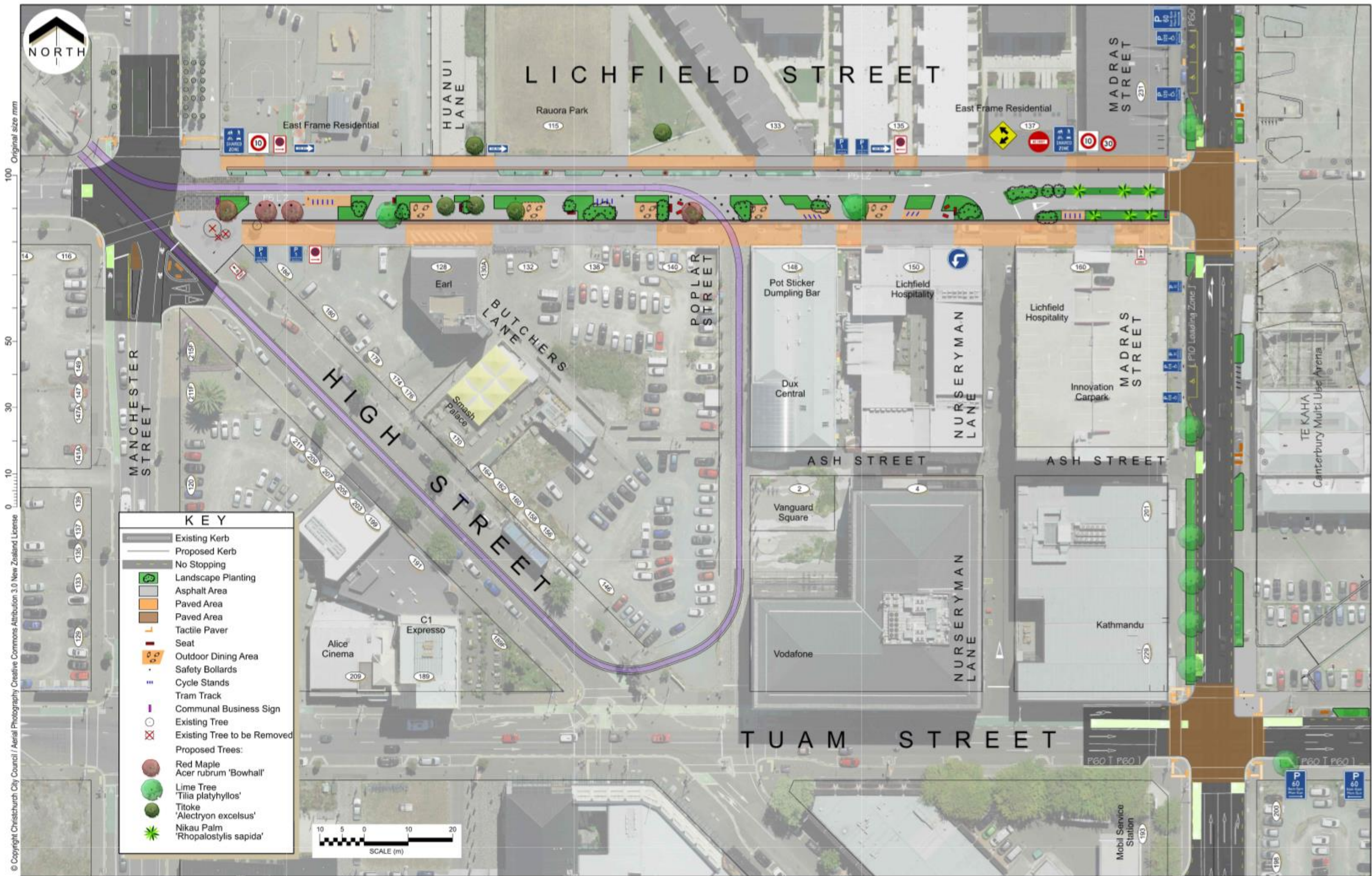








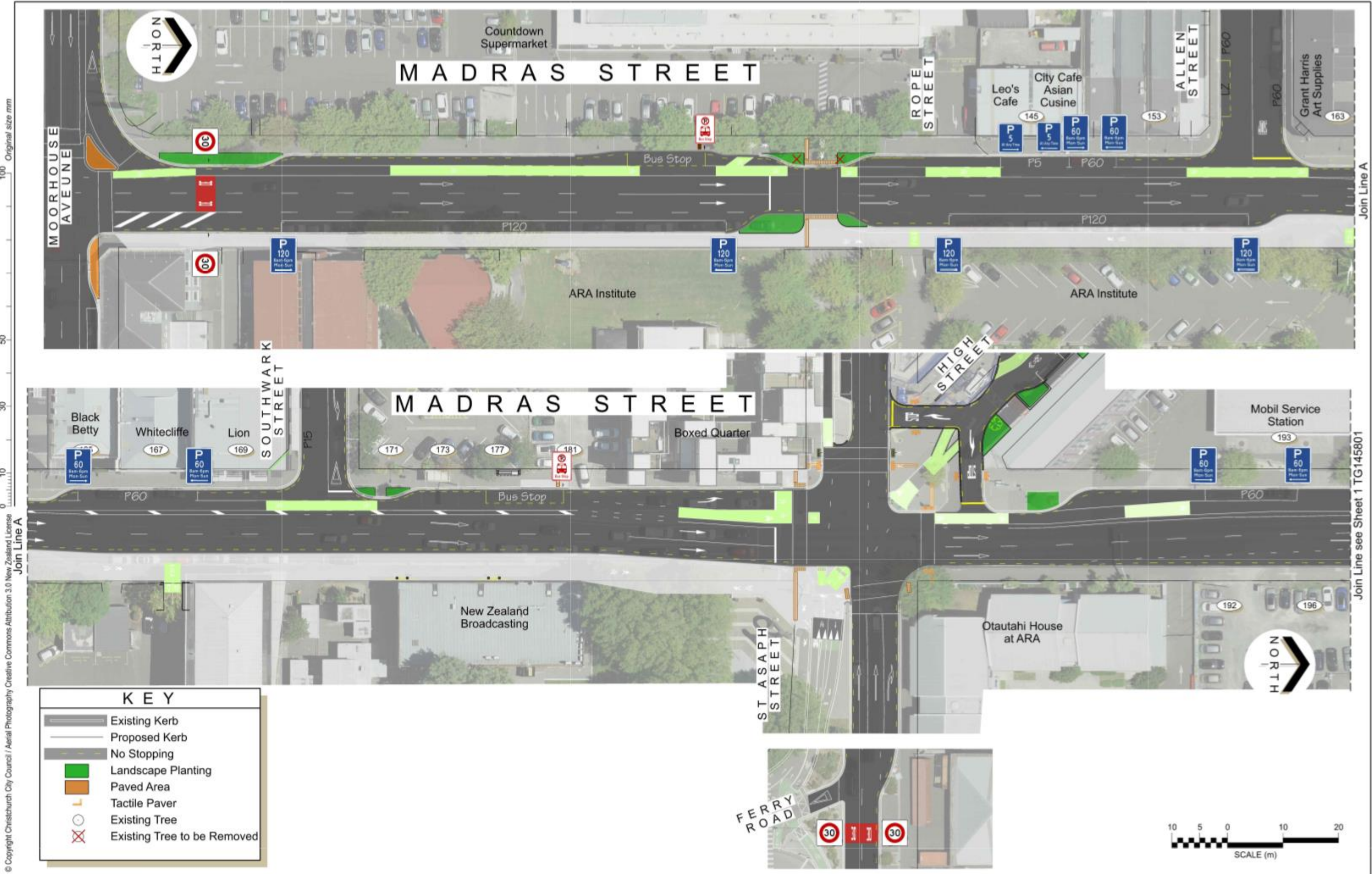




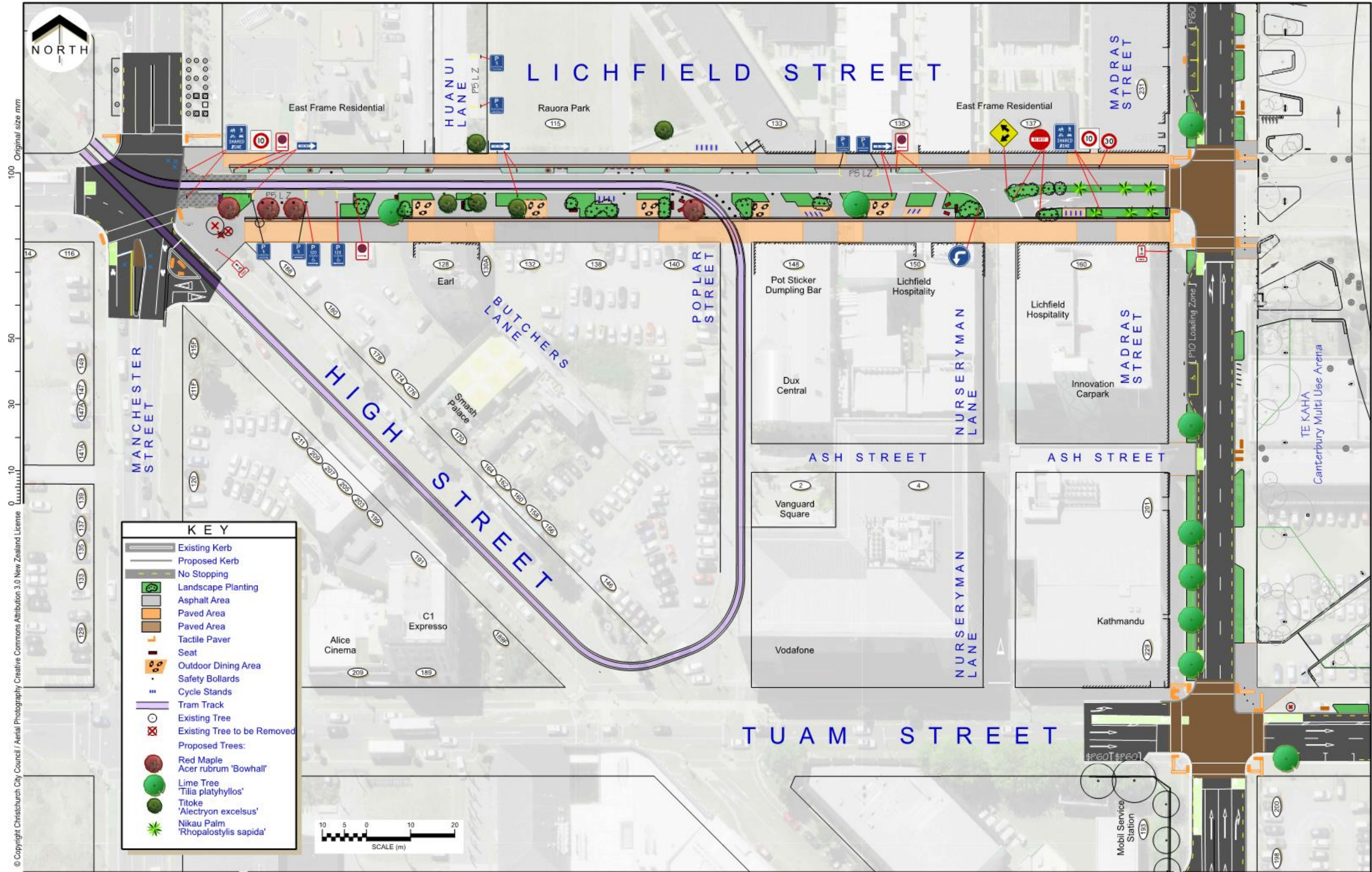










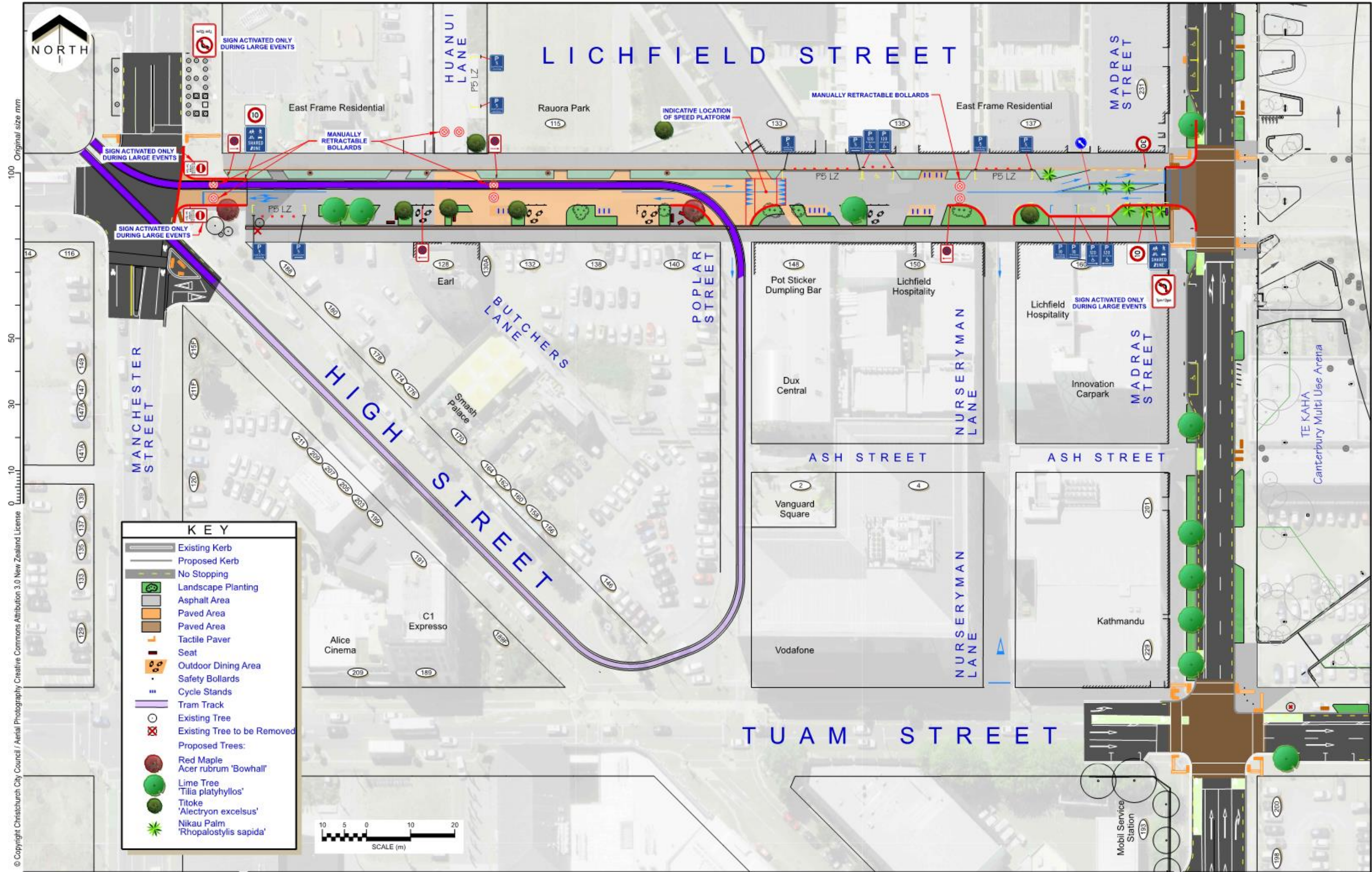


Lichfield Street (Option 1)  
Te Kaha Street Improvements  
For Council Approval

Option 1  
Sheet 5 of 7

Original Plan Size: A3  
ISSUE.1 27/04/2023  
TP360102 VMI







Te Kaha Adjacent Streets Hearings Panel – March 2023

**DRAFT TE KAHA ADJACENT STREETS HEARINGS PANEL – QUESTIONS AND RESPONSES**

	Panel member	Panel Query	Provisional Staff Response	Possible Action to Address
1	Councillor Coker	Can staff please explain the differences between lower speed signs, versus the variable speed signs that several submitters have raised? These might include cost, benefits, disadvantages.	<p>Some submitters have suggested a permanent lowering of speed limits (to 30km/h) on Tuam and Barbadoes Streets adjacent to Te Kaha, instead of temporary signs activated only at event times.</p> <p>Permanent lowering of the speed limits (which may come irrespective of the Te Kaha proposal, as part of Council's ongoing review of speed limits city-wide) would undoubtedly be cheaper, both in terms of the lower cost of fixed signing infrastructure as compared with the higher costs of electronic signs - or alternatively temporary signage being placed before and after Te Kaha event times.</p> <p>Speed determines whether anyone is killed, injured, or walks away unharmed from a crash. International best practice is that 30km/h is the desirable Safe System speed on roads and streets where there are high numbers of active road users. If a pedestrian is hit by a car travelling at 50km/h there's only a 20 percent chance they will survive. At 30km/h, the survival rate increases significantly to 90 percent. Having permanently lower speeds in the central city where people are travelling for journeys to school and around their community aligns with our proactive approach to road safety and reducing harm on the transport network.</p> <p>Existing traffic data on the public web site shows that daily average speeds on these sections of Madras, Tuam and Barbadoes street are between 35-39 km/h so the suspected delays by a permanent 30 are forecasted to be insignificant.</p>	Viewed in the context of future Council consideration of central city / city-wide speed limit consultation, the Panel may wish to recommend to Council permanent 30km/h speed limits be installed on streets surrounding Te Kaha to support active travel to schools and within the emerging residential neighbourhoods surrounding Te Kaha. This would likely offer improved alignment with the emerging speed management plan.



			As an example, we have received information in 2020 from the Eden Park Trust which indicates that they needed to employ 2 staff solely dedicated to the set up and pack down of the 430 temporary signs associated with Eden Park.	Staff recommend that the activation dates for the resolutions reflect the completion of physical works on the affected streets.
2	Councillor Coker	Can staff please provide an overview of the bus stops near Te Kaha, including Tuam St? Has there been an analysis of how many bus stops will be required, as well as drop off areas for coaches, taxis, ubers, and P5 areas etc	<p>Yes, analysis of potential areas for coach, taxi and rideshare service capacity has been considered for a range of events at Te Kaha, originating from the 2020 Integrated Transport Assessment for the Arena.</p> <p>The location of the bus interchange and Manchester Street superstops are anticipated to carry the bulk of Metro service patronage, with the arrangements for taxis, rideshare services and charter / special coaches subject to provisional Event Traffic Management Plans.</p> <p>In brief, Cashel and Lichfield Streets (east of Te Kaha) are seen as providing for taxis and rideshare services, with Tuam Street east of Barbadoes Street anticipated to handle event coaches for larger events.</p>	<p>The proposed Event Traffic Management Plans and recommended ongoing management of those through Council, Environment Canterbury, Venues Ōtautahi and Waka Kotahi will manage the capacity and availability of these modes up to Te Kaha opening and beyond in response to event monitoring.</p> <p>A copy of the Event Traffic Management Plans report for Te Kaha can be provided to the</p>



				Hearings Panel if Members wish?
3	Councillor Coker	Could sharrows be added to Lichfield Street?	If Council were to support the preferred option for Lichfield West (Madras to Manchester) as a shared zone / slow speed street, sharrows should be largely unnecessary. Current TCD guidance for sharrow markings states that these are only appropriate where traffic lanes are no wider than 3m, since wider lanes enable cars to overtake cyclists. Traffic lanes on Lichfield East (Barbadoes to Fitzgerald Avenue) are 4-8-5m so are considered inappropriate for sharrow markings.	The final arrangements would be subject to detailed design - and a subsequent detailed design stage safety audit (to ensure sharrows will provide improved safety)
4	Councillor Coker	Have staff looked at a cycle route between High St and Huanui Lane? Or encouraging Butchers Lane vs Poplar Lane as the route to join them?	The preferred proposal for Lichfield Street (Manchester to Madras) is expected to provide a much-improved north – south cycle and pedestrian path opportunity between Butchers Lane / Poplar Lane and the Rauora Park / Huanui Lane routes to the north, as it would be across a shared space / low speed zone environment.	The detailed design for Lichfield Street (Manchester to Madras) would ensure that the north – south cycle route opportunities are maximised and convenient in this location.
5	Councillor Coker	Can staff look at making the cyclist access to Latimer Square from Madras St wider, as requested by Anne from Spokes?	Staff initially investigated an option to provide a separated path south to north across Latimer Square but were advised by the Heritage Team that this would challenge the heritage setting of the location. Hence the route has been proposed around the western, quieter side of Latimer Square, as opposed to the eastern side which was considered to present serious safety risks to cyclists. Cycle parking on Latimer Square at event times has been identified as an option, although not explored further to date given the heritage setting.	If the Panel are of the view that an improved (widened path) across Latimer Square represents a better outcome, staff can explore that again under Council's direction, alongside event day



				cycle parking (if required).
6	Councillor Coker	Has a shared path on the east side of Madras St been investigated (as suggested by Anne from Spokes)?	In the early design phases for the adjacent Te Kaha streets of Madras and Barbadoes, designers did explore the potential to propose that the widened footpaths there be formally advertised as shared space. However, although it is expected cyclists may use those areas informally at times, the difficulties of linking those facilities safely into the onward cycle networks (where cyclists may be travelling contra flow in some locations) resulted in concluding that formal shared space would not represent the safest outcome.	Staff recommend no change to the proposed designs or resolutions.
7	Councillor Coker	Does the Madras Lichfield intersection include a Barnes dance (as asked by Michael Massey from Bedford Row)?	If and when the detailed designs for Madras and Lichfield Street are commenced following Council resolutions, staff would plan to explore signal phasing and staging arrangements at this important intersection in order to offer pedestrians maximum convenience and safety. The arrangement would be similar to a Barnes Dance – and staff will also be exploring the ability to increase pedestrian phases at times of larger Te Kaha events – in order to increase pedestrian priority at those times.	This will be carried forward into detailed design.
8	Councillor Coker	Do staff have any suggestions for recommendations the hearings panel could make for further work on Bedford Row?	Bedford Row is now a private road having been formally stopped by Council at the request of Otakaro Ltd in February 2016. The management of the parking spaces there (which are clearly signed and marked for use by local residents only) and the adjacent refurbished private parking building are matters over which the Council has no involvement. However, the proposed Event Traffic Management Plans for a range of events at Te Kaha, currently in development, would seek to maintain necessary access and egress for residents at the times of any selective road closures on Madras Street north of Tuam Street.	The detailed arrangements for retention of parking and servicing access to Bedford Row properties during large events at Te Kaha will be a matter for Venues Ōtautahi as the venue operator. They are aware of the desire by Bedford Row property owners to be directly consulted



				over such temporary traffic arrangements when in detailed planning. Staff recommend the Hearings Panel advise Council that subsequent Event Traffic Management Plans for Te Kaha prior to and after opening should ensure ongoing engagement with Bedford Row residents is achieved.
9	Councillor Coker	How does the cost of temporary management plans per year, compare to the capital costs of the street upgrades of the entire project?	<p>The projected Event Traffic Management costs have been assessed to be circa \$480,000 per year if associated with only “do minimum” street works being completed adjacent and near to Te Kaha. (These costs are based on Venues Ōtautahi estimates as the venue operator). Over the lifetime of Te Kaha, (circa 40 years for economic evaluation purposes) these have been estimated to have a “present value” of \$7.9m.</p> <p>These costs are expected to reduce by circa 70% per annum as a result of Council resolving to implement the preferred package of measures. This reduction is mainly associated with the likely lessened need for street closures and temporary parking restrictions. On the same basis, the present value of the traffic management costs of the preferred package is estimated to reduce to \$2.4m, i.e. a saving over the asset lifetime of circa \$5.5m.</p> <p>These present value event traffic management costs can be compared with the present value construction cost of the preferred Te Kaha Street works package of some \$21m.</p>	<p>If the Panel wishes, staff can provide a copy of the provisional Te Kaha Surrounding Streets Single Stage Business Case planned to be provided to Waka Kotahi, as well as the final Event Traffic Management Plan advisory report for Te Kaha which is an annex document to the Single Stage Business Case.</p>



10	Councillor Coker	Are there any plans for work on Barbadoes St (to make it safer for pedestrians and cyclists) on the other side of Ara in future?	<p>Council has made provision in its Long-Term Plan (2021-31) for a Central City Active Travel Area at a value of some \$24m. The projected spend is between the 2026 and 2031 financial years. Although no fixed scope exists for these works at the present time, they are likely to be directed at least in part towards further accessibility and safety improvements in the south-eastern quadrant of the central city. It is anticipated that further works to the southern section of Barbadoes Street may well feature in that package of work.</p> <p>One of the key action items in the Road to Zero Strategy is to set safe speed limits around all schools by the end of 2027, with an interim target of 40 percent of schools by 30 June 2024. Barbadoes Street is a route to school for children travelling to Catholic Cathedral School. A proposed reduction in the speed limit to 30km/h is proposed for this section to align with the requirements of the rule.</p>	Viewed in the context of future Council consideration of central city / city-wide speed limit consultation, the Panel may wish to recommend to Council permanent 30km/h speed limits be installed on streets surrounding Te Kaha to support active travel to schools and within the emerging residential neighbourhoods surrounding Te Kaha. This would likely offer improved alignment with the emerging speed management plan.
11	Councillor Coker	In response to Mandy Liu's submission, can staff give some details around mitigations that can be done for business in the area moving forward?	<p>There were concerns from the tenants of Mandy Liu's around the impact of construction on their businesses and the access to the outdoor dining opportunities.</p> <p>We are working closely with our Three Waters team to ensure the construction work will be delivered as a package to mitigate lengthy and</p>	If the panel wished, staff could look into more formal incentives.



			<p>protracted works being undertaken in the vicinity of businesses and residents in the area. We have also started discussions with the Te Kaha team around the significant work force coming on line to build the arena and how we can incentivise them to provide patronage to the nearby businesses.</p> <p>In terms of accessing outdoor dining opportunities, the cost of the application to utilise this space was seen to be a hurdle.</p> <p>Staff can explore these options further and brief the Panel prior its final report on options.</p>	<p>Staff recommend the panel advise Council to support a temporary reduction or free trial period to activate the outdoor dining facilities when they become available.</p>
12	Councillor Coker	In response to Harrison's McEvoy's submission, is there any possibility of adding any more greenspace and raingardens than already planned?	<p>The preferred package of measures contain what is considered to be an appropriate proportion of street trees and landscaping consistent with maintaining the functionality for all the proposed streets for a range of modes and access needs. Madras Street importantly needs to be protected as an over – dimension load route, which hampers the extent of tree planting possible.</p> <p>However, the plans for tree planning and soft landscaping have been the subject of detailed discussions with the Te Kaha / Te Kaharoa landscaping design team, where the final landscaping on each street is intended to offer a seamless transition between street (legal road) landscaping treatments and the adjacent Te Kaharoa public realm. The two treatments are therefore complementary.</p>	
13	Councillor Coker	Is it possible for the Tuam St cycleway to be made separated further east (i.e. past High St)?	<p>Yes, Council staff are happy to explore options and any additional costs for an appropriate form of limited physical separation on Tuam Street south of Te Kaha and eastwards. However, this will need to be assessed against the envisioned use of the Tuam Street northern lane for closure on exit from Te Kaha events, and the need to avoid tripping hazards. This investigation will also need to take into account the network implications of ensuring logical and consistent cycle connections to the wider cycle network.</p>	<p>If the Panel through Council wish to instruct staff to look further at this option it can be considered through detailed design</p>



14	Councillor Coker	Could the hearings panel make a recommendation to look at making Barbadoes St 30kph in future?	<p>Yes.</p> <p>One of the key action items in the Road to Zero Strategy is to set safe speed limits around all schools by the end of 2027, with an interim target of 40 percent of schools by 30 June 2024. Barbadoes Street is a route to school for children travelling to Catholic Cathedral School. A proposed reduction in the speed limit to 30km/h would align with the rule and promote safer outcomes for children travelling to school and Ara.</p>	<p>Viewed in the context of future Council consideration of central city / city-wide speed limit consultation, the Panel may wish to recommend to Council permanent 30km/h speed limits be installed on streets surrounding Te Kaha to support active travel to schools and within the emerging residential neighbourhoods surrounding Te Kaha. This would likely offer improved alignment with the emerging speed management plan.</p> <p>(This will also be referred to the project team delivering the Safe Speed Neighbourhood</p>
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				Programme that will be seeking Council approval shortly).
15	Councillor Coker	Could a loading zone on Lichfield St be incorporated, as requested by Otakaro?	A loading zone on the northern side of the street near the Huanui Lane access may be difficult to place as it would need to take account of the clearance required by passing trams, especially if large commercial vehicles use the loading bay.	
16	Councillor Templeton	Could we please add low-cost cycleway separation on Tuam St adjacent to Te Kaha to provide protection and stop cars pulling over into the bike lane to drop off or pick up people?	Yes, Council staff are happy to explore options and any additional costs for an appropriate form of limited physical separation on Tuam Street south of Te Kaha and eastwards. However, this will need to be assessed against the envisioned use of the Tuam Street northern lane for closure on exit from Te Kaha events, and the need to avoid tripping hazards. This investigation will also need to take into account the network implications of ensuring logical and consistent cycle connections to the wider cycle network. (See also response to Item 13)	
17	Councillor Templeton	Can we please add all the accessibility suggestions that the Living Streets submissions requested?	The Living Streets detailed comments on the preferred package of streets can be addressed through the subsequent detailed stage.	Staff will advise the panel as to how the amended scheme design will address the Living Streets submission.
18	Councillor Templeton	What contact did staff have with Carter Group in the earlier planning stages for the Te Kaha streets project?	Staff have provided to the Hearings Panel the full Engagement Log for this project to date.	
19	Councillor Templeton	How do the current plans line up with the Streets and Spaces design guide and what is the reason for any changes?	The Streets and Spaces Design Guide was published by CERA in June 2015 and was intended to serve as a supporting document to An Accessible City (the transport chapter of the Recovery Plan). Its stated purpose was to set out the vision, design principles and criteria, to achieve a consistent approach to the delivery of public realm projects	



			<p>(including those within the road boundary) across the central city. It made clear however that the information it contained was at a conceptual level and <i>“will require the skilled interpretation of designers at the detailed design stage of projects. This may involve adapting the concepts to suit and integrate the specific conditions of each location; for example, existing facilities and infrastructure”</i>.</p> <p>The SSDC did not contain an indicative cross section for this section of Lichfield Street (i.e. Manchester to Madras), unlike the western section of the street (Core) between Durham Street South and Manchester Street. It did however indicate in the Walking section, the need for the street to have wide footpaths throughout (i.e. from Durham Street to the Te Kaha site).</p> <p>The evolved preferred option for Lichfield Street (Manchester to Madras) therefore seeks to reflect these SSDG principles in the optional design prepared, but which has in turn sought to reflect more recent experiences of the delivery of shared space streets in Christchurch and elsewhere, as well as the Integrated Transport Assessment for the arena indicating the need for Lichfield Street to provide an important safe pedestrian connection between the bus interchange and Te Kaha. This has also reflected Council’s previous resolution for staff to explore the possibility of introducing a “Barnes dance” type arrangement at the Manchester / Lichfield / High Street intersection.</p> <p><i>(As an example of how the SSDC has been adapted in practice, the SSDG originally proposed the tram extension to apply south of Tuam Street to St Asaph Street. Through the design of that southern section of High Street and in response to improving knowledge of the local environment and local business owners’ feedback, the initial concept was modified to remove the tram from that section in order to deliver an improved outcome. This is a similar process adopted for the current scheme stage optional proposals for Lichfield Street).</i></p>	
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20	Councillor Templeton	Is it possible to switch the one way on Lichfield St to the other direction to enable cars from Madras to go down it to The Crossing carpark? Do we have any traffic assessments that show where the cars come from to get to The Crossing and how we leave the city when they come out?	<p>The proposals put forward to retain the eastbound movement (Manchester to Madras) principally enable improved and simplified crossing arrangements to be achieved at the existing Manchester Street / High Street / Lichfield Street intersection (<i>by the removal of one approach traffic movement</i>), while at the same time improving pedestrian priority and amenity on that block.</p> <p>However, they balance that goal with retention of the eastbound vehicle movement from Manchester Street to Madras Street, to in the same direction as the heritage tram (ie eastbound).</p> <p>The retention of the eastbound movement is especially helpful for exit vehicles from the Lichfield Street parking buildings, (notably the Crossing) to continue to access Madras Street to travel northwards in exiting the central city.</p> <p>Were the street to be westbound only instead, then 5 approach traffic movements would remain at the Lichfield / High / Manchester intersection, preventing a “barnes dance” type arrangement being achieved there.</p> <p>While arrival parking vehicles to the Lichfield Street parking buildings would benefit from a westbound approach, the local network diversionary effects for parking vehicles would switch to the exit movements. The plans for the proposed eastbound arrangement envisage that improved wayfinding approach signage to the key central city parking buildings would be installed in support of the scheme.</p> <p>All of the optional traffic arrangements for Lichfield Street have been subject to traffic modelling – when the effects at 2038 on alternative routes and intersections have been shown to be limited in terms of local network levels of service. The model has not been interrogated so far as to the specific effects on Crossing Car park zone vehicles, but that is being investigated further.</p>	Staff are looking at the Panels request into any studies around the efficacy of Barnes Dance intersections.
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Questions received after Hearings Panel meeting on 8 March 2023

21	Councillor Templeton	A couple more questions from me on The Carter heard submission yesterday as it was quite different to his written one and I'd like to clarify some things he said. It was before my time on Council, so how much \$ did CCC/ratepayers contribute towards The Crossing development?	The council contribution to the project was \$28m	
22	Councillor Templeton	My recollection is that the Catholic Diocese specifically asked us to not build a carpark on Gloucester St so that their planned one (with the Carters) would be viable, and Council agreed with this and decided not to sell the land. Was Carter Group represented in that submission or at the hearing? How much could CCC have sold the land to Wilsons for had we gone ahead?	Withdrawn.	
23	Councillor Templeton	My recollection is that Council made a decision on a financial arrangement with the Carter Group over DCs on land it owned in the central city as part of an arrangement over the sale of the	Withdrawn.	

		Catholic precinct and the building of the convention centre hotel. Could you please provide the report and decision to the hearings panel – public, if possible, but in PX if not?		
25	Councillor Templeton	Is it possible, or useful to have electric car chargers installed as part of the upgrade?	Detailed design of the Te Kaha adjacent streets works would commence following Council's resolution of the scheme designs currently under consideration. If Council wish staff to explore the potential for electric vehicle chargers on some street spaces that could be considered. However, some thought will need to be given as to their effectiveness, given that the majority of street spaces are short stay / high turnover, resulting in the available "top up" charge to vehicles being very limited.	Staff will provide a separate briefing on the Electric Car Charging programme.

**Questions received at site visit to surrounding streets on 9 March 2023**

26	Councillor Johanson	Could staff provide some cost data from the Orange Theory Stadium	<p>The larger events at the Orange Theory Stadium are probably more in line with anticipated Te Kaha attendances for the design event of 15,000 people. Examples of the type of event that has the equivalent impact on the roading network are:</p> <table><tr><td>All Blacks v Argentina 17.7.15</td><td>\$17,595.00</td></tr><tr><td>Foo Fighters Concert 27.2.15</td><td>\$22,143.92</td></tr><tr><td>Nitro Circus 27/1/13</td><td>\$18,181.55</td></tr><tr><td>AB v Ireland Test Match 16/6/12</td><td>\$25,350.55</td></tr></table> <p><i>Supplied by Venues Ōtautahi</i></p>	All Blacks v Argentina 17.7.15	\$17,595.00	Foo Fighters Concert 27.2.15	\$22,143.92	Nitro Circus 27/1/13	\$18,181.55	AB v Ireland Test Match 16/6/12	\$25,350.55	
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AB v Ireland Test Match 16/6/12	\$25,350.55											
27	Councillor Templeton	Focus on supporting small food vendors during the build and recommendation to	Opportunities to assist local vendors during the construction of Te Kaha and associated street works can be explored further as part of the Councils mobilisation of the street works construction package.									



		council for them to use the outdoor spaces during this period.	Licencing for dining on streets is required to ensure conditions, such as maintaining clear pathways and avoidance of tripping hazards, are adhered to. The fees associated with licenses are minimal and can be waived at the discretion of staff.	
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**Questions received via email 13 March 2023**

28	Councillor Johanson	How much FTEs/ resources are required for this project to proceed?	The programme of work was defined as part of the 2021-2031 LTP, updated with the 2022/2023 Annual Plan. The necessary resources for the detailed design and delivery of the streets works projects are and will be reflected in the scheme cost estimates.	
29	Councillor Johanson	Is it able to be split into several projects by street so that Lichfield and Tuam could be separated out and done at different times?	The projects have been prepared as a package of those works considered necessary for completion prior to the opening of Te Kaha in 2026. The works planned for Tuam and Barbadoes Streets have been proposed as interim works – as further works to the eastern side of Barbadoes and the southern side of Tuam are able to be delivered later when there is an improved understanding of the needs of those areas. This is outlining Single Stage Business Case which we have provided a provisional copy of prior to submission to Waka Kotahi.	Draft Single Stage Business Case to be supplied.
30	Councillor Johanson	What is the total budget for each street upgrade and can you advise how much committed funding has been given from external funders such as Waka Kotahi	The individual street budgets are as featuring in Council's Long-Term Plan (as amended by the 2022/23 Annual Plan) – and are \$22m for the street works elements, excluding 3 Waters works. The Council has prepared a single stage business case for submission to Waka Kotahi and following their advice as to its content. Waka Kotahi will not confirm funding for this package of projects prior to any Council decision for the works to go ahead, but our understanding is that it is likely to achieve funding support at the current funding rate of 51%.	

			Street	Construction cost estimate	
			Tuam (Madras to Fitzgerald)	\$4M	
			Barbadoes (Hereford to Tuam)	\$3.4M	
			Madras (Tuam to Hereford)	\$5.6M	
			Madras (Moorhouse to St. Asaph)	\$2.1M	
			Lichfield (Manchester to Madras)	\$5.2M	
			Lichfield (Barbadoes to Fitzgerald)	\$1.7M	
			<b>TOTAL (transport package)</b>	<b>\$22M</b>	
31	Councillor Johanson	What is the cost of Hostile Vehicle Mitigations and on which streets are they being installed or designed on?	<p>The specific hostile vehicle mitigation measures (bollards) will be placed on Madras Street at limited strategic locations – and their cost (installation and ongoing maintenance) is to be met by the Te Kaha budget.</p> <p>This is not a cost that staff can comment on in relation to this package of works.</p>		
32	Councillor Johanson	What is the physical condition assessment of Lichfield Street and where does it rank on either our maintenance schedule or renewal schedule? From our site visit the kerb and	<p>The asset condition data for Lichfield Street (Between Manchester and Madras St) has been reviewed. It confirms that the pavement and footpath condition is in very good condition. There are around 6m of kerb and channel which are in need of attention.</p> <p>As staff have highlighted in the hearings, there is however a need to upgrade the three waters infrastructure on this section of street, which will result in substantial excavations.</p>		



		channel and carriageway looked in quite good condition.		
33	Councillor Johanson	How could we do a transitional- streets for people type project for Lichfield Street that is similar to Gloucester in that we trial what works and what doesn't ahead of installing the permanent? What would the estimated costs be for something like this?	Due to the critical nature of the Lichfield St connection between the bus interchange and Te Kaha, it is staffs' advice that the completion of the full works should be achieved prior to Te Kaha's opening in 2026. The trialling of solutions is not recommended by staff in this circumstance.	
34	Councillor Johanson	Can we approach Otakaro about them providing loading zones and multi-storey car parking within their developments and if so what's the best way to control this through the consenting process or non-regulatory process?	Council staff have explored the opportunities to achieve loading zones within the proposed street designs, in accordance with Council's Parking Policy. The Crown funded and constructed Huanui Lane through the east frame development which is now vested as legal road. It may be possible to convert one or more parking spaces there to loading zones if that is a good outcome to serve remaining East Frame developments. The provision of off – road private parking to service East Frame residential and commercial developments is wholly a matter for the individual developers of the nearby lots.	
35	Councillor Johanson	Can I please have a copy of any accessibility reports/assessments, and can you please advise if we wanted to	The largely scheme stage designs prepared for each street to date have reflected current Waka Kotahi standards and best practice for pedestrian and mobility compliant infrastructure. Following Council's resolution(s) subsequent detailed design work on each street will continue to abide by best practice guidance, but to an increased degree of detail. As has been discussed at the Hearings, full engagement has been undertaken with	

		make this the best example of accessible design then what do we need to do?	pedestrian and disability group representatives and will continue through detailed design.	
36	Councillor Johanson	Can you provide a copy of the traffic assessment and advise if Lichfield is one wayed, what happens in regard to capacity of the existing streets adjacent to cope with the increased traffic to access the car parking buildings along it?	The current proposals for Lichfield Steet (Manchester to Madras) only propose a partial one-waying of the street (as 2-way traffic remains between Madras Street and Nurseryman Lane). The eastbound movement between Manchester Street and Madras Street is retained. An option removing the eastbound movement was discounted due to adverse effects on levels of service for nearby streets – especially Manchester Street.	A copy of the traffic analysis report for Lichfield Street will be supplied to the Hearings Panel.
37	Councillor Johanson	What work is being done to provide a safer pedestrian experience from the Bus Exchange between Colombo Street and Manchester Street along Lichfield? I note this area is already quite dangerous.	The recent removal of containers from the façade of 92 Lichfield Street (immediately east of the bus interchange access) will permit Council to complete footpath and carriageway refurbishment works there, in accordance with Council resolutions of December 2014	
38	Councillor Johanson	When is the stadium going to be completed, and what year is the construction of each street going to be?	Te Kaha is expected to be completed in 2026 – and, subject to Council resolutions regarding these streets, the construction works are planned to commence in January 2024, with project close out in April / May 2026, ahead of the Te Kaha opening.	



39	<b>1<sup>ST</sup> LOT OF QUESTIONS</b> Councillor Coker	On p41 of the original agenda it was noted that ECan confirmed no additional bus bays were required on Tuam St. Noting comments on bus parking etc, would it be likely that private bus groups would require additional parking to what ECan foresees?	The draft Event Traffic Management Plans for Te Kaha do assume a degree of private charter / special coach provision needed for larger events at the arena. Therefore, the plans assume an area of Tuam Street east of Barbadoes Street being set aside for such coach parking at event times.	
40	Councillor Coker	A majority of submitters on the speed reduction to 30pkm for Madras St were opposed, generally with the comment that the reduced speed will cause delays for drivers. Is there evidence from Montreal St that the traffic is delayed?	In many cases, the assumed extra delays and journey times that road users perceive will result from lowered speed limits do not eventuate. The smoothing of vehicle flows and better “platooning” of traffic that results from lowered speed limits, especially when supported by adjusted signalisation plans will likely mean that the extra times to travel the affected sections of Madras Street will be in seconds rather than minutes. Likewise, the result would likely have a very small effect on any journey across the central city (ie Moorhouse Avenue to Bealey Avenue). Due to current average speeds, it is unlikely that the lowering of speed limits from 50km/h to 30km/h will change existing journey times during the day. A UK study in 2014, identified that while during off-peak periods, including overnight, some people may experience a slight increase in journey times, introducing lowered speed limits has a negligible impact on journey times, given that overall journey times are largely dictated by intersection delays and not vehicle speeds.	
41	Councillor Coker	There is a similar comment on the reduction in speed on Lichfield Street causing congestion. Is there any evidence to agree with or refute this?	No, in many cases in urban areas, the smoothing of traffic flows and consequential reduction in headroom between vehicles which results from that will often lead to reduced congestion and improved capacity in the system. This is why variable speed limits are often deployed as a network capacity improving device on major motorways at times of peak period congestion.	

42	Councillor Coker	Could the panel recommend that the Cathedral be allowed to use parking within the Te Kaha site on Sunday mornings?	Yes, however it is the staff view that this would be a matter for the Diocese to discuss directly with the venue operator – Venues Ōtautahi in order to arrive at any mutually agreeable arrangement.	
43	Councillor Coker	Has any modelling on the number of coaches that will come to Te Kaha for the larger events, so that we know the coach parking on Tuam provided is sufficient?	The Event Traffic Management Plan report proposes that the street-works make provision for casual coach / bus parking on Tuam Street east of Barbadoes Street for larger events at Te Kaha – and this is proposed. The report also recommends ongoing monitoring of usage after Te Kaha’s opening – and adjustments made as necessary to both coach and available rideshare and taxi drop off / pick up zones. As a footnote, Eden Park experience in recent years has suggested that the use of casual coach / bus charters for larger events has diminished in recent years.	
44	Councillor Coker	On our walkabout, alternate options for Lichfield between Manchester and Madras were discussed. Could staff please get back to us with reasons for and against these scenarios in comparison to the two options a. 2 way so that the final result is similar to Cashel	The primary reasons for the preference for the eastbound direction of travel on Lichfield Street between Manchester and Madras are as outlined in the response to Question 20 (Cr Templeton). Staff are currently exploring an option to retain 2 – way movements on this section of Lichfield Street with an outcomes similar to Cashel Street and High Street (between Manchester and Tuam) which has the tram present and represents a closer outcome. The key difference in network terms is the retention of 2 – way, posing some challenges for a significant improvement to pedestrian amenity across Manchester Street at its intersection with High Street and Lichfield Street – but again mitigation options are being explored.	



		<p>St between Manchester and Madras</p> <p>b. 1 way from Madras to Manchester (the opposite direction proposed in Option 1)</p>		
45	<p><b>2<sup>ND</sup> LOT OF QUESTIONS</b></p> <p>Councillor Coker</p>	<p>Can the panel recommend for traffic calming to be investigated at the corner of Manchester into Madras, especially to make it safer for pedestrians crossing Manchester St?</p> <p><i>(This was asked generically by some submitters, and one was more specific, as in referring to a raised pedestrian ramp between the current traffic lights and the corner there. So really this is about making the pedestrian experience safer?)</i></p>	<p>As outlined in the responses to Questions 44, and 58-62, Council staff are currently exploring an alternative shared space / low speed environment option for Lichfield Street (Manchester to Madras) – and this may well involve re – configuration of the entry area from Manchester Street towards Huanui Lane.</p>	

46	Councillor Coker	Is there a way to separate cars and cycles more on Madras St, as suggested by submitter #49333?	Madras Street needs to be protected as an over dimension route which hampers the degree of physical cycle separation that can be achieved (see also question 12).	
47	Councillor Coker	The Carters, in their verbal submission, said they had not been consulted about the plan for Lichfield street. Is this the case?	As in response to Question 18 (Cr Templeton), staff have provided to the Hearings Panel the full Engagement Log for this project to date.	
48	Councillor Coker	Does it take longer for traffic to travel along 30kph streets compared to 50kph streets? As the time it takes cars on Madras vis Montreal ever been compared?	As response to Questions 40 and 41, the extra journey times and delays feared by the reduction of urban speed limits from 50km/h to 30km/h often do not eventuate for typical journeys, especially in peak travel times, when vehicles are often travelling at 30km/h or less anyway. In a highly signalled system such as Christchurch's central city, the effects can often be minimised by careful signal phasing plans which improve vehicle platooning. Due to current average speeds, it is unlikely that the lowering of speed limits from 50km/h to 30km/h will change existing journey times during the day. A UK study in 2014, identified that while during off-peak periods, including overnight, some people may experience a slight increase in journey times, introducing lowered speed limits has a negligible impact on journey times, given that overall journey times are largely dictated by intersection delays and not vehicle speeds.	
49	Councillor Coker	Is it possible for Uber eats cars etc to use Nurseryman Lane?	Not for parking, Nurseryman Lane has been created as a shared zone street and casual stopping / parking is prohibited in order to maintain access to the parking building and frontage premises. Provision is being explored for uber eats etc on Lichfield Street itself. Similar arrangements have been successfully achieved on Lichfield Street west adjacent to the Riverside Market site.	
50	Councillor Coker	Could Lichfield be the last of the streets to be upgraded to	It is certainly something we can consider. The timing and phasing of the construction works is largely tied-in to the delivery of the Te Kaha site as their construction programme is already underway. Staff will discuss options with future contractors	



		address the concerns of businesses who want to make sure they are “up and running” before any disruption due to the roadworks associated with this project?	around construction phasing, if possible, we will look to undertake the upgrade of Lichfield Street later in the programme.	
51	Councillor Coker	Submission #48525 says that cars travelling at 30kph make more emissions than cars travelling at 50kph. Is this the case?	<p>Modelling undertaken by Future Transport research in 2022 identified that the optimum speed limit in city traffic for minimising CO2 emissions for a small petrol hatchback is around 17.5mph (28.2km/h), and for minimising NOx it is around 12.5mph (20.1km/h). For larger vehicles, diesels and SUVs, CO2 emissions are minimised at a maximum speed of 12.5mph. In other words, in urban areas, 30km/h speed limits result in lower CO2 emissions than 50km/h. This was supported by earlier evaluations of the 20mph (30km/h) zones in London by Imperial College London (2013), which suggested that they had no net negative impact on exhaust emissions and resulted in clear benefits to driving style and associated particulate emissions.</p> <p>Waka Kotahi Guidance states that vehicle moving at a constant speed (with minimal acceleration and deceleration) produces fewer emissions than a vehicle moving between speeds and needing to use more fuel accelerating and decelerating. This is particularly relevant for urban areas where lowered speed limits can contribute to more consistent travel speeds and reduce acceleration and deceleration.</p>	

52	Councillor Coker	Has any evidence been provided by submitters to back up the claim that Lichfield St is an important route to get to the carparking buildings on this street?	Council staff are aware that Lichfield Street does provide a convenient entry route primarily from and to the east, to the two parking buildings on Lichfield Street - 33 Lichfield (the Council owned building) and the Crossing. Were the preferred proposal to proceed, then the plan would be to add necessary additional wayfinding direction signage to both parking buildings, likely via St Asaph Street and Manchester Street.	
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## Questions via email 14 March 2023

53	Councillor Templeton	Financial Implications of doing the preferred option are there, but only 4.2 briefly references the costs of not doing the preferred option. Could you please provide the panel with the information about the operational costs likely to be occurred over time if the capital project is not done? We had seen this in an earlier briefing to Council.	Council staff will provide to the Hearings Panel a copy of the Draft Single Stage Business case for the package of projects. This explains in some detail the make-up of alternative capital and operational costs around the options.	Copy of the draft Te Kaha Adjacent Streets Single Stage Business Case (March 2023) will be provided to the Hearings Panel.
54	Councillor Templeton	There's also concern about the maintenance costs of the preferred	As response to Question 53.	



		option. It is likely to be higher, lower or similar to the maintenance of the 'do minimum' option?		
55	Councillor Templeton	What would the costs of installing variable speed limit signs on Madras St be and what times would they be appropriate to use as a lower speed? Would it involve other changes to traffic light phasing to do this and is that possible? ie what are other intended impacts of variable speed signs?	<p>Installation of variable speed limit signs on Madras Street would be more expensive than standard, fixed signing. A safety concern would be operating a variable speed limit of 30km/h when the light sequencing is set at 50km/h as it may encourage people to speed through the zone to pass through a green signal and not wait for the next phase. This could encourage further red light running, in an area where there are large numbers of active users.</p> <p>Speed determines whether anyone is killed, injured, or walks away unharmed from a crash. International best practice is that 30km/h is the desirable Safe System speed on roads and streets where there are high numbers of active road users. If a pedestrian is hit by a car travelling at 50km/h there's only a 20 percent chance they will survive. At 30km/h, the survival rate increases significantly to 90 percent. Having permanently lower speeds in the central city where people are travelling for journeys to school and around their community aligns with our proactive approach to road safety and reducing harm on the transport network.</p>	
56	Councillor Templeton	Regarding the response to q13. My understanding is that Tuam St would stay	Yes, it is correct that Tuam Street south of Te Kaha would remain open at all times. The proposal as suggested in the Event Traffic Management Plan report, is for the north side lane to be closed for a	

	<p>open on event days to enable vehicles to leave and that we should not be encouraging people onto the road space. How much public realm is on the Te Kaha site at this end of the site that links to the footpath? Do we believe that any potential trip hazards a few times a year would outweigh vehicles moving into to the cycle lane on a daily basis? In the Lincoln Rd bus lane hearings panel, we were able to see designs for some pedestrian enhancements, cycle lanes etc. that were able to be recommended by the panel and approved by Council, rather than potentially being included by staff in detailed design later. Protecting the cycle lane would likely need another report and Council decision, it</p>	<p>short time on large event exit to enable significant numbers of pedestrians to exit Te Kaha. This is most likely to apply to the largest events only however.</p> <p>At such times it is likely that the lane drop would be achieved by signing and additional cones or removable bollards. Staff will explore detailed options for the delivery of some form of separation of the cycle lane for submission to Council if that is the Hearings Panel request.</p>	
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		would be easier to do it now I think.		
57	Councillor Templeton	Regarding q20, during the site visit I recall being told that an early design had been done that had the one way westward. Could we please see this and the modelled implications for the intersection? It's much easier to see a design on paper, rather than a description of it.	The draft reply to Question 20 has been updated to explain more fully the logic behind the preferred eastbound direction being retained on Lichfield Street, as opposed to westbound.	
58	Councillor Templeton	Is it possible to have a two-way section of Lichfield with pedestrian spaces as large as are needed to get the outcomes desired if we remove any parking etc?	Staff are exploring a further option for Lichfield Street that retains two-way flow but with an improved shared space / low speed environment. The design broadly seeks to achieve a design based upon a blend of High Street (Lichfield to Tuam) and Cashel Street (Manchester to Madras). The implications for re – configuration of the Manchester / High / Lichfield intersection pedestrian arrangements are being explored as part of that possible option. Such an alternative is at this point considered preferable to the reversal of the proposed one-way arrangement for Lichfield Street to westbound.	In order to brief the Hearings Panel on an amended two-way proposal, staff will require more time to prepare a scheme stage option and assess any implications for Venue Ōtautahi event management arrangements. It is staff's suggestion that the Hearings Panel reconvene in April 2023 to consider the alternative design.



Questions via email on 14 March 2023

59	Councillor Peters	Has there been consideration and design done of a modified 2-way design without parking on the Lichfield Street (Manchester to Madras)? Could this be a consideration to give extra pedestrian and cycle access as well as giving better outdoor amenity for local businesses?	Staff are currently exploring a “hybrid” design for Lichfield Street (Manchester to Madras) which seeks to maintain the concept of a slow speed / shared space environment but with retained 2 – way vehicle access throughout. This would seek to provide limited on street servicing / loading and mobility spaces along with some improvements to existing footpath and landscaping amenity. There would be additional costs associated with this option that would need to be budgeted for.	See 58.
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Questions via email on 15 March 2023

60	Councillor Fields	If Lichfield St was configured as a two-way slow-speed street, what loss would there be to al fresco dining spaces, and how would it affect pedestrian and cycle use of Lichfield St.	Staff are currently exploring a “hybrid” design for Lichfield Street (Manchester to Madras) which seeks to maintain the concept of a slow speed / shared space environment but with retained 2 – way vehicle access throughout. This would seek to provide limited on street servicing / loading and mobility spaces along with some improvements to existing footpath and landscaping amenity. An implication of such an arrangement is however that it will make improved pedestrian amenity across the Manchester Street / High Street / Lichfield Street signalled intersection more challenging to achieve, but options	See 58.
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			to improve on existing conditions are also being sought there.	
61	Councillor Fields	What would be the impact if the design included a handful of 5-minute parking bays in the context of #1, and in the context of the plan as it stands.	As the response to Question 59 (Councillor Peters).	
62	Councillor Fields	What would be the cost of a re-design as per #1 & #2	In the context of an amendment as described in response to Questions 59-61, it is possible that the current scheme cost could be reduced or scheduled for this project to increase in order to provide improved slow speed environment but with retained 2-way traffic. The quantum of such a change can be determined if the Panel wish to support such an alternative arrangement detailed.	
63	Councillor Fields	What provision is there for charging stations for electric bikes?	At present there are no detailed arrangements for electric bike charging, but if the Hearings Panel wish for those to be included, that can feature in the resulting detailed design work, which would commence subsequent to any Council decision.	



Questions received via email 17 March 2023

64	Councillor Templeton	<p>I spent an hour from 8.09am on the corner of Lichfield St and Manchester this morning, looking at the cars coming down Lichfield St from Madras and seeing where they were going. Traffic was busy on Manchester St and on Lichfield between Colombo and Manchester, but there was very little on Lichfield between Manchester and Madras.</p> <p>In summary 68 cars came west down Lichfield St, although about 6-7 of these came out of Huanui Lane or other spaces on Lichfield St. Of these 10 went straight ahead and went into the Crossing carpark. 34 went straight ahead but did not go into the Crossing carpark. 24 turned (mostly left) into Manchester St. At the same time, 27 vehicles drove east down that stretch of Lichfield, though the majority turned into it from Manchester.</p> <p>I don't have any data as to how many cars total entered The Crossing carpark during that hour, though Carters would know as its all-digital etc, but it looked really busy. Is there any data we have as to car park capacity at different times of day? I know we used to have it available to help people find parks – our data is online, but I couldn't see that for The Crossing.</p>	<p>A copy of the daily traffic and turning count has been provided to Emily for circulation.</p> <p>We do not have any data on the car park usage at various times of the day. This would need to come from The Carter group. Elements of the car park usage data may be commercially sensitive.</p> <p>Staff have interrogated the traffic model to explore the proportion of Lichfield Street traffic movements that may be generated by The Crossing carpark. The supplementary report by QTP has been provided for the panel.</p>	<p>Emily to check copy of 23/386863 uploaded on the BTC, this was presented on screen at Hearing 17/03/23.</p> <p>Emily to upload a copy of 23/503478 to the BTC.</p>
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Questions arising from Hearings Panel held on 23 March 2023

65	Councillor Coker	As Tuam St is proposed to become one way up to Fitzgerald Ave, what route should drivers who use the petrol station on the corner of Tuam and Fitzgerald take to travel to the west side of the central city?	Drivers wishing to head west within the city from the petrol station located on the corner of Fitzgerald and Tuam Street will be able to exit the petrol station onto Fitzgerald directly, making a left turn. Once on Fitzgerald Avenue, they can choose to make another left turn at Lichfield Street to go in a west bound and subsequently southbound direction via Barbadoes Street. Further north, Hereford Street or Armagh Street can be used by those wanting to head westwards within the Central City. Those wishing to head in a south or easterly direction away from the central city, are able to exit onto Tuam Street and use the right-hand turning lanes onto Fitzgerald Avenue.	
66	Councillor Coker	As the east side of Madras between St Asaph and Ara is proposed to be a shared path, what route can pedestrians on Madras St, who feel uncomfortable on shared paths, take to get to Ara?	The proposed shared path between St Asaph and ARA is proposed to be 4.2-5m wide, which is a significant space for pedestrians and cyclists to share. For example, the Hagley Park [near Hagley Ave] shared path is 4m wide and regularly carries high volumes of cyclists and pedestrians. If a person did not feel comfortable using this shared space, they would be able to stay on the west side of Madras Street and use the proposed new mid-block signalised crossing to cross to the east side of Madras Street. There is also a direct path into the heart of the ARA campus from the corner of Madras Street and St Asaph Street, which is probably the most logical alternative route for any pedestrians not comfortable with the shared facility.	

67	Councillor Coker	Can staff please clarify expectations around hospitality venues who use dining space on Lichfield St and under what circumstances they would need to remove that street furniture? An example of the types of events would be helpful.	As part of Option 1 and 2 outdoor dining opportunities would be able to be present under all event scenarios although it is likely that during events exceeding 15,000 people* servicing those tables during peak event times might become quite challenging. For Option 3, it is considered that a 2.8m wide area would be able to be present under all event scenarios but could be increased to 4.8m during non-event times. <i>(*An example of a 15,000-person event would be something like a Crusaders game)</i>																						
68	Councillor Coker	Could the costings provided in the table for the three options, include both capex, as well as expected opex over the expected lifetime of Te Kaha?	<table><tr><td></td><td colspan="2">Lichfield Street (Manchester to Madras)</td></tr><tr><td></td><td>Capex (Construction Estimate)*</td><td>Opex (Cost per Annum)</td></tr><tr><td>Option 1</td><td>\$ 3,267,266</td><td>\$ 9,065</td></tr><tr><td>Option 2</td><td>\$ 1,378,089</td><td>\$ 9,065</td></tr><tr><td>Option 3</td><td>\$ 4,488,163</td><td>\$ 9,435</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td colspan="2">*This excludes staff time, all contingencies and fees</td></tr></table>		Lichfield Street (Manchester to Madras)			Capex (Construction Estimate)*	Opex (Cost per Annum)	Option 1	\$ 3,267,266	\$ 9,065	Option 2	\$ 1,378,089	\$ 9,065	Option 3	\$ 4,488,163	\$ 9,435					*This excludes staff time, all contingencies and fees		
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	*This excludes staff time, all contingencies and fees																								
69	Councillor Coker	Could staff please come back with the detail around the likely signal phasings' at the Lichfield/Manchester St intersection? I would like to understand the amount of time that pedestrians on different journeys would have to cross the intersection in relation to the entire signal phasing sequence.	There are currently 5 phases in operation at the intersection of Lichfield/Manchester/High Street. These total 78 seconds, which is a typical cycle time for many central city signalled intersections. Staff have reviewed the options available to improve pedestrian safety and efficiency at this intersection. If no tram was to operate during event times (which are often outside peak periods), the 6 second walk phase per 78 second cycle could be increased to 30 seconds per cycle. This could clear a much larger volume of pedestrians across the intersection without impacting on the wider traffic network and would operate similarly to recognisable "barnes dance" type arrangements elsewhere at those times.																						



70	Councillor Coker	could staff update the table of quantitative data given that the council is likely to agree to make 4 car parks on Lichfield St and will likely change the number of car parks lost in the Te Kaha Hearing.	<b>Description</b>	<b>Option 1</b>	<b>Option 2</b>	<b>Option 3</b>	
			<b>Planting</b>	461.9 SQM	172 SQM	187 SQM	
			<b>Rain Garden</b>	116.1 SQM	0 SQM	227 SQM	
			<b>Footpath (Under ETMP)</b>	2061.61 SQM	1920 SQM	1828 SQM	
			<b>Footpath (Under day to day operation)</b>	2061.61 SQM	1920 SQM	1788 SQM	
			<b>Bike parking</b>	20	17	18	
			<b>Trees proposed</b>	17	10	18	
			<b>Parking Proposed (40 existing)</b>	0	25	3	
			<b>Loading Zones Proposed (5 existing)</b>	4	2	7	
			<b>Outdoor Dining (Under day to day operation)</b>	96.8 SQM	0	96.8 SQM	

Question received via email on 20 April 2023

71	Councillor Fields	Will we be doing any lowering of kerbs to aid the crossing of Manchester St by bicycle adjacent to where laneway ingress/egress intersects with Manchester St? In other words, can you come out of the area formerly known as Sol Square, or the South Frame, and cross Manchester St by bicycle?	The current plans for each of the options do not propose significant changes to cyclist desire lines around the Manchester Street intersection, where it is assumed the majority of cyclists will continue to use the carriageways. The proposals for two of the options to contain a 10km/h shared space environment on Lichfield Street between Manchester Street and Madras Street should however provide improved safety and clarity for cycle journeys in this area.	
72	Councillor Fields	In Option 1, how would we propose to mitigate the risk of collision where staff and patrons were constantly crossing footpaths to get to outdoor dining areas, given cyclists would be whizzing along that route?	We would anticipate that the majority of cyclists will benefit from the 10 km/h slow speed shared space environment which should reduce the number of cyclists who choose to ride parallel to the building lines.	

Questions received via email on 21 April 2023

73	Councillor Fields	For Option 3, what treatments would be available to ensure users would see the street as a 'slow street environment'? Is it possible that we could not differentiate pedestrian space from road space on some level?	A number of measures in the existing proposals for Option 3 address this issue. The independent safety assessment makes further recommendations for measures to address these issues. The panel have had this report shared with them and staff can advise the panel as to their view on those further measures. These measures can be incorporated as part of detailed design, should the option be supported by the panel and Council.	
74	Councillor Coker	The provided comparison table does not clearly show the difference between the cycling facilities in the options (shared with pedestrians' vs shared with road users). I realise that not all the pros and cons are listed, but I actually think it would be really useful to include them all so we can make a sound decision. It will also help councillors when it goes to council, so they can easily see the pros and cons.		
75	Councillor Coker	Could the table in answer to Question #70 please be merged with the other comparison table please?		
76	Councillor Coker	Also, could I get a clarification on the opex costs for Lichfield St? Is this the opex costs to Council alone? Or does this include he likely opex costs for VO?	The Opex costs listed in response 68 apply to Council alone, the costs are those associated with maintenance in future years of the Council owned street assets.	



77	Councillor Coker	I am confused why the safety audit looks at Options 0, 2 and 3, and not Option 1. I realise that Option 1 has already had a safety audit. I also realise that Options 0, 2 and 3 are all 2-way options that are easy to compare with each other. But it makes it challenging to see if there are any safety advantages between Option 1 and 3, which is what I'm most interested in knowing.		
78	Councillor Coker	Can staff point to where the original Safety Audit for Option 1 is? I am getting lost in all the paperwork!	Safety Audit for Option 1 link provided and in uploaded in BTC.	



## Te Kaha – Event Traffic Management Plans



## EXECUTIVE SUMMARY

Event Traffic Management Plans (ETMPs) have been prepared to outline the traffic management strategies for Te Kaha - Canterbury Multi Use Arena located in the Central City of Christchurch.

At the time of writing, Temporary Traffic Management Plans are required under the Code of Practice for Temporary Traffic Management (CoPTTM) and are subject to approval by Christchurch City Council as the Road Controlling Authority of the roads in the adjacent area.

As a range of events of different scales are expected to take place at Te Kaha, draft ETMPs have been developed for three scenarios. These are:

- Maximum weekend or weekday evening event (20-35K attendees)
- Design weekday evening, weekend afternoon or evening (10-20K attendees)
- Smaller event at any time (1k-10K attendees)

Bespoke TMPs will be needed when events coincide with evening commuter peak or maximum event during weekend afternoon. The purpose of this report is to document the development of the ETMPs and underlying assumptions.

The purpose of the ETMP is to detail how travel associated with events at Te Kaha will be managed to ensure the safe and efficient operation of the transport network. The development of the ETMPs has been informed through engagement with key stakeholders including Christchurch City Council, Venues Ōtautahi, Environment Canterbury and Waka Kotahi NZ Transport Agency, and ongoing engagement with these and other stakeholders is recommended. It is recommended that a Steering Group of key stakeholders is developed to manage the ETMPs over time.

The objectives of the ETMP are to:

- Facilitate travel choice for all visitors to Te Kaha
- Deliver a positive travel experience for visitors to Te Kaha
- Minimise disruption to general road users
- Support the operational requirements of Te Kaha

The ETMPs have been developed considering the likely level of uptake of various modes of transport to establish the needs of pedestrians, cyclists, public transport users and vehicle drivers, as well as considering the role of and access for rideshare and taxi services, coaches and emergency services. This has been informed by the current and anticipated future transport environments, scale and timing of events, anticipated mode split across available transport modes and an extensive transportation modelling study to understand the impacts of traffic associated with events on the local and wider transportation network. However, it is noted that the assumed level of uptake of the various modes has some flexibility, and a pragmatic approach has been taken. For example, a larger ride share zone has been allocated than would have been for the initial prediction of ride share spill.

A range of traffic management measures have been established to address the needs of all transport modes including parking management. This is supported by a wayfinding strategy including the utilisation of permanent and temporary Variable Messaging Signs and permanent signage as part of a broader central city wayfinding strategy.

The ETMPs have been established for each of the three event scenarios and are shown for maximum, design and smaller events in the following diagrams. These show the location of dedicating parking areas (including for valet cycle parking, mobility parking, rideshare services and coaches, where parking is proposed to be banned, any road closures or other restrictions to traffic movements that may





be implemented before, during and/or after an event. It is concluded that based on the mode share, vehicle occupancy and other assumptions from this report, there is ample parking within a suitable walking catchment of Te Kaha, and the traffic management measures proposed for each event will adequately manage impacts on the wider network, meeting the objectives of the ETMP.



Traffic management setup before a maximum capacity event



Traffic management setup before a maximum capacity event





Traffic management set up for a design capacity event



Traffic management set up for a small event



The ETMPs will be supported by a communications strategy and ongoing monitoring strategy. The communications strategy will reinforce the fundamental principles of the ETMPs, these being to:

- Encourage the uptake of sustainable modes for visitors to Te Kaha;
- Provide timely information to make the journey to and from Te Kaha safe and enjoyable; and
- Minimise the disruption to other road users.

The ongoing success of the ETMPs requires monitoring as proposed below for the following scenarios, the findings will be used to inform any changes to the ETMP for the next event:

- Pre-event monitoring - first Design, Maximum and events that required a bespoke TMP, and then annually.
- During the event - first Design, Maximum and events that required a bespoke TMP, and then annually.
- Immediately after the event - first Design, Maximum and events that required a bespoke TMP, and then annually.
- Post event user feedback - after each event

Reporting the outcomes of the monitoring will include recommendations towards updating the ETMPs. The corresponding ETMP should be updated at the earliest opportunity and forwarded to Council for approval, ideally prior to the next corresponding event.

Successful ETMPs will provide for a good visitor experience and avoid adverse outcomes for event operations and associated staff, visitors to events and other road users. Some key risks have been identified in this report. Of note if the assumed mode share and vehicle occupancy assumptions from this report are not achieved, and there are more private motor vehicle trips, there may be additional impacts on parking supply and wider network congestion. This risk is expected to be addressed through subsequent work exploring alternative mode share scenarios.

It is further recommended that to achieve successful outcomes, the ongoing development of the ETMPs be delivered through a partnership approach across key stakeholders.

## IMPORTANT NOTE

The draft Event Traffic Management Plans (ETMP) are still subject to stakeholder confirmation and refinement closer to the time of Te Kaha opening, specifically with:

- CCC regarding overall plan if the adjacent street upgrades do not proceed prior to opening
- CCC regarding the potential revisions of the mode split used in the modelling presented in this report
- CCC Reserves Team regarding the proposed valet cycle parking location
- Waka Kotahi regarding VMS strategy
- Emergency services regarding closures and access
- E-bikes and E-scooter rental-companies regarding parking zones etc
- Ride share providers (e.g. Uber) regarding drop off and pick up zones
- Integration of the ETMP with the emerging Evacuation and Emergency Management Plan (EEMP)

These matters may take time to resolve, therefore the draft ETMPs have been delivered under the Kōtui work and their further refinement will be undertaken by VO when the above matters are clearer.

It is also important to note that the Pedestrian Modelling undertaken by Mott Macdonald has not informed the ETMPs as the modelling focuses on the internal structure and immediate departure vicinity rather than the areas further away from the structure. The pedestrian aspects of the ETMPs are informed by the site mode share developed by Populus.

## CRITICAL SAFETY COMPONENTS OF THE ETMPs

It is important to note the following components of the ETMPs that are the critical to the safety of Te Kaha event attendees:

- The temporary closure of Madras Street (just north of Tuam Street to just south of Hereford Street) for large events allows patrons to spill out of the event and safely cross the road to then access the areas west of Madras Street. The majority of attendees are predicted to head west.
- Any Madras Street temporary road closures will be facilitated through the use of manned vehicles that can be moved immediately such that emergency vehicle access (if required) will be unimpeded.
- Potential temporary closures of Lichfield Street and Cashel Street (just west of Madras Street) will also support attendee road safety and contribute to reducing the risk of hostile vehicle access to the Te Kaha site (noting that most of the mitigations are on the site edges).
- The removal of on-street parking in the direct vicinity to the site prevents the ability of explosives being planted in parked vehicles that could cause mass harm.
- The provision of valet cycle parking and e-scooter drop off areas to west of Madras Street are aimed at reducing conflicts with pedestrians in the Te Kaha public realm area.



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## Appendices

**Appendix A. Event servicing details**

**Appendix B. Transport Modelling Assessment**





Te Kaha – Event Traffic Management Plans

Quality Assurance Information

<b>Prepared for</b>	Besix Watpac
<b>Job Number</b>	BWNZL-J001
<b>Prepared by</b>	Aini Fayaz Mansoor, Dave Smith
<b>Reviewed by</b>	Jeanette Ward

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## 1. Introduction

Event Traffic Management Plans (ETMPs) have been prepared to outline the traffic management strategies for Te Kaha - Canterbury Multi Use Arena located in the Central City of Christchurch.

Temporary traffic management plans are required under the Code of Practice for Temporary Traffic Management (CoPTTM) and are subject to approval by Christchurch City Council as the Road Controlling Authority of the roads in the adjacent area. Note the New Zealand Guide to Temporary Traffic Management (NZGTTM) is currently in its draft form and will eventually supersede CoPTTM. The ETMPs will need to be reviewed when this change takes place.

As a range of events of different scales are expected to take place at Te Kaha, ETMPs have been created for three scenarios. These are:

- Maximum weekend or weekday evening event (20-35K attendees)
- Design weekday evening, weekend afternoon or evening (10-20K attendees)
- Smaller event at any time (1k-10K attendees)

Bespoke TMPs will be needed when events coincide with evening commuter peak or maximum event during weekend afternoon, or it may be appropriate to prepare additional ETMP templates should these become more frequent events.

The purpose of this report is to document the development of the ETMPs and underlying assumptions.

The contents of this report are as follows:

- Background - the current and future transportation context for which the event traffic management plans were developed, and how changes to the system will be managed.
- Consultation and engagement approach - the key stakeholders involved and engagement processes.
- Event scenario modelling - the transportation modelling which informed the ETMPs.
- Even traffic management plans - traffic management plans for three event scenarios.
- Communications strategy - how the public will be informed of temporary changes to the network
- Monitoring strategy - how the event traffic management will be monitored for effectiveness.

## 2. Background

### 2.1 Philosophy

The purpose of the ETMP is to detail how travel associated with events at Te Kaha will be managed to ensure the safe and efficient operation of the transport network.

The objectives of the ETMP are to:

- Facilitate travel choice for all visitors to Te Kaha
- Deliver a positive travel experience for visitors to Te Kaha
- Minimise disruption to general road users
- Support the operational requirements of Te Kaha

A key measure of success for the delivery and application of the ETMPs will be there is no negative media, and user surveys and Venues Ōtautahi (VO) give positive feedback. These matters are considered further in the monitoring section of this report.

### 2.2 Site Layout

At the time of preparing this report the design and construction process had reached the end of the Developed Design stage. Significant changes to the design are not expected to impact on the outcomes of and recommendations arising from this report.

The site is bordered by three one-way streets to the east, west and south: Barbadoes Street (southbound), Madras Street (northbound), and Tuam Street (eastbound) respectively. Hereford Street is situated on the northern side of the site and is a two-way street. The site's layout is shown in Figure 2.1. There is a one-way coach entrance and exit on Madras Street, a heavy vehicle access/service access on Madras Street, and the access to the accessible parking and drop-off area is on Hereford Street. The only car parking provided on-site is mobility parking for mobility permit holders. It is noted that the car park will be used by VO staff for day to day needs outside of event periods. The coach entrance is for coaches transporting sports teams and also for small events that may have delegates arriving by charter coach.

The main gates into the arena for attendees are on the south and east sides. The north and west gates do not service the main seating areas, however the western entrance will be the main entrance for the three levels of patrons in Corporate Areas as well as an additional level for venue staff, broadcast, match officials and media. During concerts, the pitch access vomitories (PAVs) will also be used (aligned with diagonal paths).

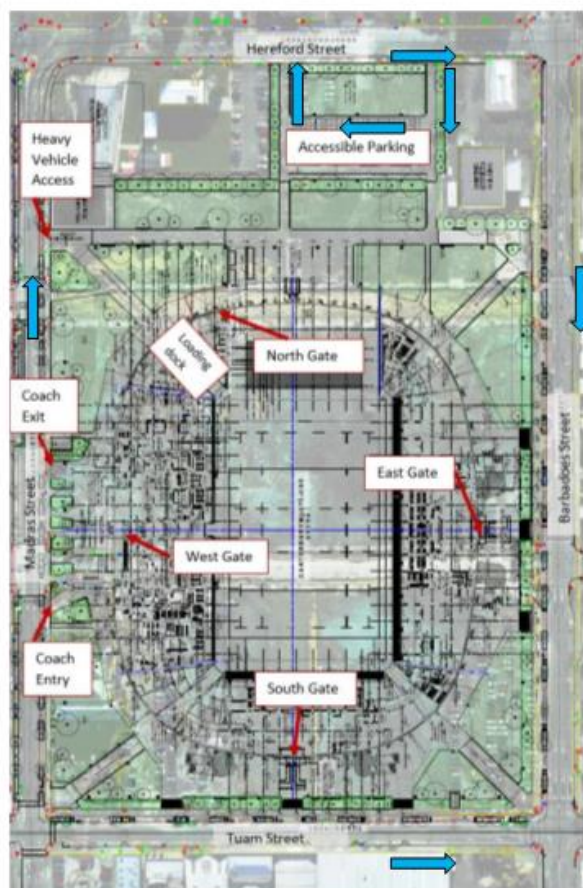


Figure 2.1 Te Kaha arena layout

### 2.3 Expected traffic and pedestrian movements on event days

As the only on-site car parking available during events is for mobility permit holders, all other event attendees will arrive at the arena on foot, on bikes, or using other micro-mobility.

A Preliminary Integrated Transport Assessment (ITA) was prepared by Aurecon (dated 12th October 2020) and has been used to inform the development of the ETMPs. The ITA estimates the likely trip generation, trip distribution and mode share of attendees of events at CMUA, and these estimates and underlying assumptions have been adopted for this assessment. However, it is noted that these may be revisited in the future especially for larger events. It is noted that the assumed level of uptake of the various modes has some flexibility, and a pragmatic approach has been taken. For example, a larger ride share zone has been allocated than would have been for the initial ride share spilt prediction.

The ITA predicted that people would arrive from each direction surrounding the area on event day and that 70% of pedestrians will come from the west and need to cross or walk along Madras Street. The predicted pedestrian flows for a large sports event are shown in Figure 2.2. The departure profile for a large sports event is shown in Figure 2.3. Around 60% of visitors are expected to depart the arena within 15 minutes of the event ending, and it is understood that patrons in corporate areas are likely to depart 60-90 minutes post-event. It is also important to note that the Pedestrian Modelling undertaken by Mott Macdonald has not informed the ETMPs as the modelling focuses on movement related to the





internal structure and immediate departure vicinity rather than the areas further away from the structure. The pedestrian modelling also uses shorter exit times (8 minutes).

Event servicing staff are expected to arrive and depart several hours before and after the event. The approximate timings of their arrivals and departures, vehicle type, and parking location are outlined in Appendix A; this also includes the team coaches and delivery vehicles in addition to servicing staff movements.

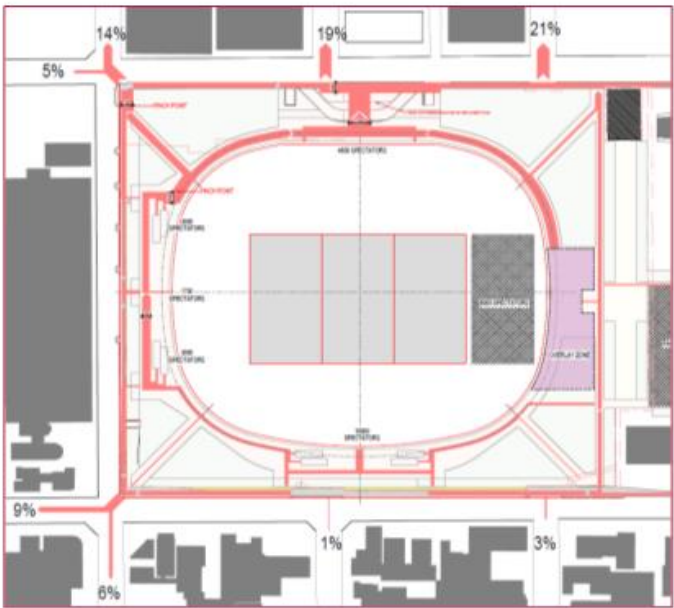


Figure 2.2 Predicted pedestrian flows on a sports event day (Source: Site Modal Split by Populous, 2021)

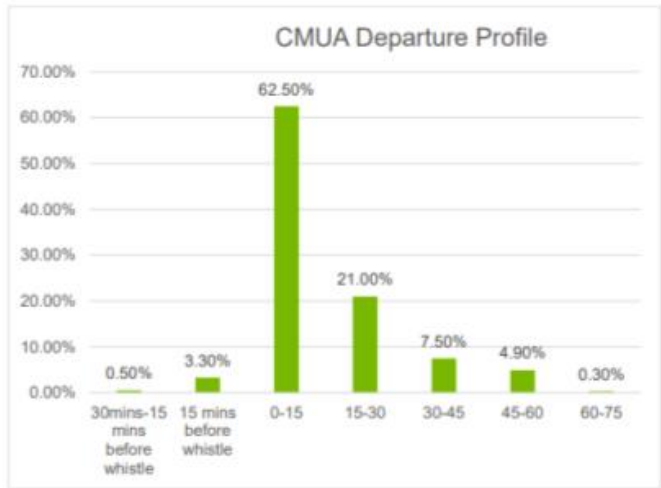


Figure 2.3 Departure profile for Te Kaha for a sporting event (Source: Preliminary ITA by Aurecon, 2020)

## 2.4 Current Network

The central city road network is set out in a grid format and the CMUA is located centrally in the south-eastern quadrant as shown in Figure 2.4. All streets bounding the site (Hereford, Barbadoes, Tuam, and Madras Streets) currently have a speed limit of 50 km/h. For a more detailed description of the transportation network please refer to the Aurecon ITA.

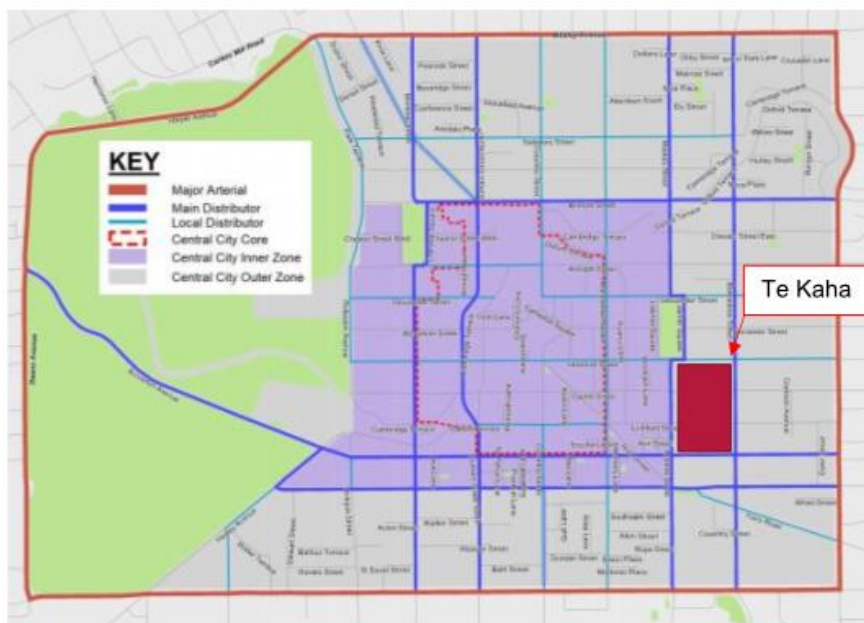


Figure 2.4 Christchurch central city road network

## Traffic Volumes

The north-south one-way pair, Barbadoes and Madras Streets, carry the most traffic of the four streets which front Te Kaha. During weekdays the peak flows are southbound in the morning and northbound in the evening peak periods. The morning peak occurs at 8 am, the evening peak is around 4 and 5 pm and the weekend peak is around 12 and 1 pm.

Peak traffic volumes on the four streets fronting Te Kaha in 2020 are shown in Table 2.1. Care will need to be taken for traffic management if events coincide with these traffic peaks to fully understand the impacts of road closures and lane drops on the central city network at peak times.

Table 2.1 Peak traffic volumes on frontage streets (Source: CCC Links Traffic Count Dashboard, 2020)

	Madras Street one-way northbound	Barbadoes Street one-way southbound	Hereford Street two-way east-west	Tuam Street one-way eastbound
Weekday AM peak traffic (8 am)	961	1735	300	565
Weekday PM peak traffic (4-5 pm)	1464	1238	406	816
Weekend peak traffic (12-1 pm)	877	843	237	362

### Public Transport

The central city Bus Interchange is located approximately 400 metres to the west of Te Kaha. There are currently 982 services that run through the interchange daily during weekdays, and 767 services running through the interchange during the weekend with peak times aligning with the morning and evening periods throughout the whole week. The ITA understood the practical peak period capacity of the bus interchange to provide for a minimum of 120 buses/hour and has a maximum capacity of 1946 persons within the interchange building at any time.

In addition, the Manchester Street Super Stop is located with the super stop located close by to the northwest of Te Kaha on Manchester Street. Comprising of three northbound and three southbound stops, it has an overall capacity of 45 buses per hour in each direction. Outside of the interchange and super stops, many of the remaining stops in the vicinity of the site have limited seating and shelter.

There is one bus service on the north side of the site – Route 60 between Hillmorton and Southshore, and two bus services on the south side in the eastbound direction – Route 3 (Airport - Sumner) and Route 60 (Lincoln-Parklands). Bus services, the Interchange and super stops near Te Kaha are indicated in Figure 2.5.

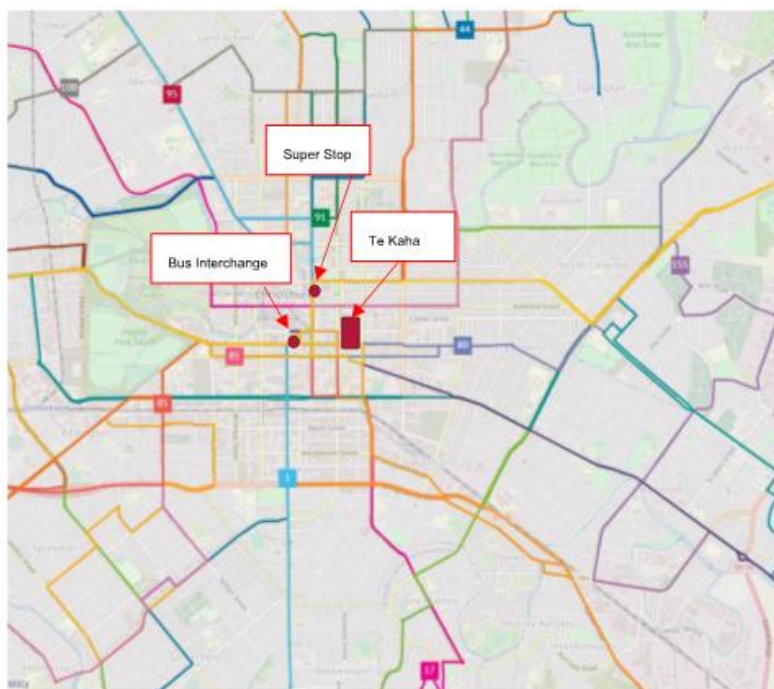


Figure 2.5 Public transport services around Te Kaha (Source: MetroInfo)



### Active Transportation

Figure 2.6 shows the cycling facilities around Te Kaha. On-road cycle lanes are provided along Tuam Street and Madras Street immediately outside the Te Kaha site. As part of Central City street upgrades, separated one directional cycleways have been implemented on Tuam Street (west of High Street) and St Asaph Street. Along the east side of the central portion of Manchester Street there is a wide shared path which is complemented by a parallel shared zone and shared path through the Rauora Park in the East Frame.

All streets in the vicinity of the site have footpaths on both sides of the road however the level of provision is variable. Recent streetscape works between the site and the central city to the west (including laneways) has provided high amenity and pedestrian level of service. The east frame has a particularly good provision for walking with high-quality finishes. Most of the streets immediately surrounding the site have on average 3m wide footpaths, as is typical for many central city streets. There are signalised pedestrian crossing points at each intersection surrounding the site. Many of the intersections surrounding the site lack tactile paving to assist visually impaired users.



Figure 2.6 Cycling facilities around Te Kaha (Source: CCC – Christchurch cycle map)

### Parking

The surrounding environment has a mixture of on and off-street parking for vehicles. Many empty lots from demolished commercial buildings are now being used as paid parking. On-street, there is a mixture of time limits depending on the adjacent land use and parking is typically metered west of Manchester Street. Recent occupancy data from Council live online sources indicate that the large off-street parking facilities reach optimal occupancy in the early afternoon (Hereford St 85% and The Crossing 65% at 1 pm) but this drops off by 6 pm as commuters leave the central city with only 20-40% occupancy reported.



## 2.5 Future network

### An Accessible City

Following the Canterbury Earthquakes, a transport policy framework was developed to guide the shape of the transport future of the Christchurch central city as it recovered. The "An Accessible City" (AAC) formed this policy which has a focus on prioritising routes for various modes of transport to provide efficient and safe access to and from the central city. This incorporates a road use hierarchy approach that identifies different, preferred routes to access the central city depending on how people choose to travel.

As part of the AAC there are key changes to roads in the vicinity of Te Kaha as follows:

- Tuam Street becomes an eastbound one-way street (between Madras Street and Fitzgerald Avenue). It is currently only eastbound one-way west of Madras Street
- Lichfield Street between Barbadoes Street and Fitzgerald Avenue is converted from a one-way to a two-way street
- Revitalisation of High Street with a Tram extension loop
- Improvements on High Street from Hereford Street to St Asaph Street
- Central City Wayfinding including signs, intelligent traffic and mapping systems
- Lichfield and Cashel Streets within the CMUA have been stopped

### Upgrades of streets bounding the site

CCC have prepared street designs for the following streets to reduce the area-wide event traffic management plans costs events, to create a sense of place and regeneration in the south-east city, and address planned sewerage, stormwater and water supply work in this area:

- Madras Street (Moorhouse Ave to Latimer Square)
- Lichfield Street (Manchester Street to Madras Street)
- Lichfield Street (Barbadoes Street to Fitzgerald Ave)
- Barbadoes Street (Hereford Street to Tuam Street)
- Tuam Street (Madras Street to Fitzgerald Ave)

If these upgrades do not proceed then additional ETMP aspects will be required, predominately in relation to pedestrian footpath capacity.

### Public Transport

The future of public transport in the Greater Christchurch area is currently being considered in the Greater Christchurch Public Transport Business Case (PT Futures). A range of short-, medium-, and long-term options will be put forward to the public transport (PT) system in a manner that results in increased patronage and mode share. From the ITA, the change in bus services anticipated at the Interchange is as follows. In the peak commuter periods, bus services are expected to almost double to around 160 per hour following medium term (7-10 years) improvements to the PT network (Figure 2.7). This would come about from increases to frequencies of current core routes and new high-frequency routes being proposed.

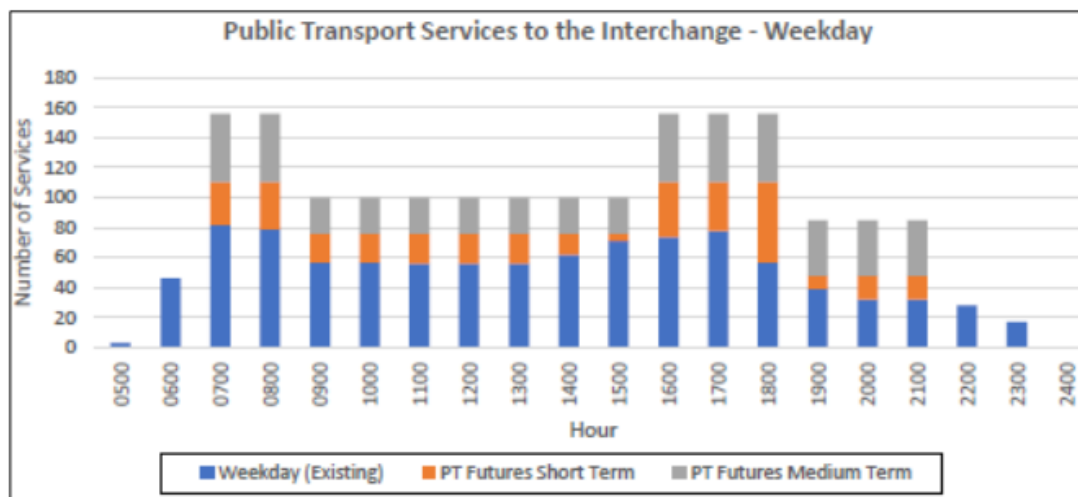


Figure 2.7 Greater Christchurch PT futures

### Active Transportation

The Christchurch Major Cycle Routes (MCRs) are being progressively rolled out over the city. Each of the thirteen routes are designed as a cycle arterial route for Christchurch City. These link commercial centres, schools and key designations in a manner that provides for the “interested but concerned” 8 to 80-year-old rider to experience a safer and more enjoyable cycle experience. Four routes are fully completed, three are partially open, three are under construction or consultation, and three more are planned.

### 2.6 Mode Share

The preliminary ITA by Aurecon (2020) provided a projected mode share for Te Kaha. This is shown in Figure 2.8. The modal share for Te Kaha was determined using the mode share for similar sites in New Zealand, Australia, the UK, and the US. Current local mode share proportions were added to add a local context. It is expected that most event attendees will arrive by private vehicle. There is no on-site car parking so these attendees will be required to park off-site and walk to the arena. It is reiterated that the mode share assumptions may be revisited in the future especially for larger events. It is also noted that the assumed level of uptake of the various modes has some flexibility, and a pragmatic approach has been taken. For example, a larger ride share zone has been allocated than would have been for the initial of ride share spilt prediction.

The mode share is likely to change in the future. This is discussed in Section 2.7.

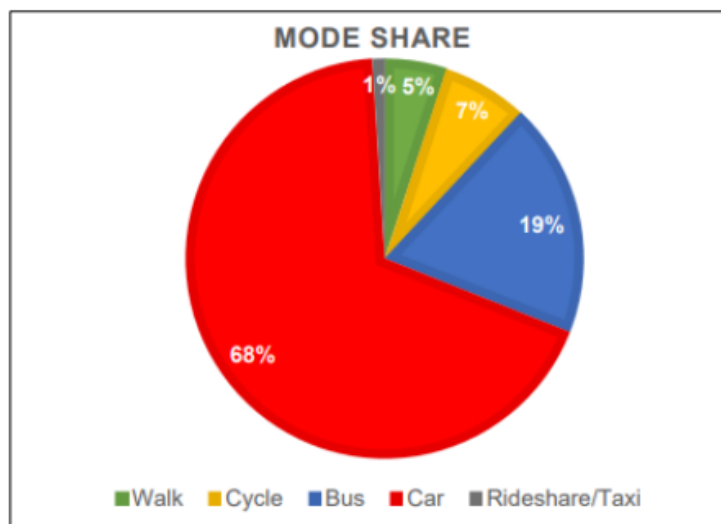


Figure 2.8 Anticipated mode share for Te Kaha<sup>1</sup> (Source: Preliminary ITA by Aurecon, 2020)

## 2.7 Change management process

Whilst the ETMPs are intended to be off-the-shelf plans that can be applied for corresponding events at CMUA, it is acknowledged that these are likely to require periodic updating as the surrounding environment changes. Specifically, future changes in transport infrastructure, public transport provision or available modes of transport may necessitate revision of the detail of the ETMP however the underlying philosophy is not anticipated to change.

Although it is recommended that the suitability of the ETMPs be formally reviewed on an annual (initially) or biannual basis to capture any changes in the surrounding environment, the change management process is also tied to ongoing monitoring which is addressed further in Section 7 of this report. This process would also capture learnings from the ongoing management of events held at Te Kaha.

<sup>1</sup> These may be revisited through further future assessment work



### 3. Consultation and engagement approach

The development of the ETMPs has been informed through engagement with key stakeholders. Individual stakeholder engagement meetings have been held with Environment Canterbury on 29 June 2021 and Christchurch City Council on 7 July 2021. A workshop was also held on 3 November 2021 with these two stakeholders as well as Waka Kotahi NZ Transport Agency, some Emergency Services and Venues Otautāhi (VO).

A final workshop was held on 19 October 2022 to discuss the draft report, this included VO, CCC, ECan, FENZ and Police.

The purpose of the individual stakeholder and workshop engagement was to:

- Provide an overview of the Traffic Management Plan process and philosophy
- Address the challenges for each mode of transport
- Seek input from stakeholders on requirements and concerns
- Share and seek feedback on strawman event TMPs

Further consideration has been given to the interdependencies between the ETMPs and the Emergency Management Plan which is being developed in parallel by Intelligent Risks. Any road closures or other restrictions imposed on the transport network should not impede access to the venue for emergency services.

The draft Event Traffic Management Plans (ETMP) are still subject to stakeholder confirmation and refinement, specifically:

- CCC – Overall plan, valet cycle parking location (Reserves team)
- Waka Kotahi - VMS strategy
- Emergency services – Closures and access
- E-bikes and E-scooter rental-companies – Parking zones etc.
- Ride share providers, e.g. Uber – Drop off and pick up zones
- Integration of the Evacuation and Emergency Management Plan (EEMP)

It is recommended that to achieve successful outcomes, the ongoing development of the ETMPs be delivered through a partnership approach across these stakeholders,



## 4. Event Scenario Modelling

The preparation of the ETMPs for Te Kaha has been supported by comprehensive transportation modelling undertaken by QTP Consultants using the Christchurch Assignment and Simulation Transport (CAST) Model. A range of scenarios have been run corresponding to the afternoon and evening event arrival times to understand the impacts of arrival traffic on the local and wider network. Additional scenarios which introduce proposed traffic management measures have also been tested to ensure that they do not lead to adverse operational impacts in the central city.

A full discussion of the modelling undertaken is in **Appendix B**.

The key outcomes arising from the modelling assessment are as follows:

- The quantum of traffic in the central city during afternoon and evening event arrival times is generally less than the weekday lunchtime peak and is much lower than the weekday commuter evening peak period;
- Traffic volumes at event departure times are anticipated to be lower again than the event arrival time periods;
- No traffic management is required for the design and maximum event scenarios from a network efficiency perspective;
- The introduction of the proposed TMP measures (which are introduced to improve pedestrian safety and avoid vehicles from diverting onto the key public transport corridor of Manchester Street) does not compromise the efficient operation of the network, an outcome which can further be supported through wayfinding;
- The impact of events and traffic management on travel times through the central city are considered minimal across all key corridors, and do not constitute adverse effects on the efficiency of the local and wider road network; and
- Ongoing monitoring of attendee's travel choices is recommended to ensure that the private vehicle mode share and subsequent parking requirements does not greatly exceed the levels included in this assessment.

## 5. Event Traffic Management Plans

Three scenarios have been considered for the ETMPs in this report. These are:

1. Maximum capacity event – 20-35K attendees
  - Weekend 7-7:30 pm start time
  - Weekday 7-7:30 pm start time
2. Design capacity event – 10-20k attendees
  - Weekday 7-7:30 pm start time
  - Weekend 2-2:30 pm start time
  - Weekend 7-7:30 pm start time
3. Smaller event – 1k-10k attendees
  - At any time

Bespoke TMPs will be needed when events coincide with evening commuter peak or maximum events on a weekend afternoon.

All ETMPs will be supported by communications and monitoring plans outlined in Sections 6 and 7.

### 5.1 Catering for all transportation modes

#### Walking

From the preliminary ITA by Aurecon, 5% of attendees are expected to arrive at the arena, having made their entire journey on foot. However, the actual amount of people on foot in the vicinity of the arena is expected to be significantly greater. The only car parking provided on site is for mobility card holders. Therefore, it is expected that all other visitors will walk to the site from bus stops, cycle valet parking area, the rideshare zone, or from car parks off-site. For this reason, pedestrian safety and wayfinding is important, particularly for maximum capacity and design events. The speed limit on all frontage roads to Te Kaha will be reduced to 30 km/h. Some of these speed limit changes are expected to be permanent. There will also be a need for temporary signal phasing changes on Barbadoes Street and Madras Street to provide pedestrians with more time to cross.

The ITA also showed that the around 60% of all attendees will typically depart the site within 15 minutes of the event ending. Therefore, for maximum capacity events, Madras Street between Tuam Street and Hereford Street will be closed, and a lane will be closed on Tuam Street during the event until pedestrian activity after the event has dissipated.

#### Cycling

Based on the preliminary ITA 7% of attendees are expected to cycle to the arena (noting that this may be revisited in future assessment work). Bikes will not be allowed to be ridden on the internal roads as they will cause conflicts with high pedestrian activity. Therefore, valet cycle parking is proposed to be provided off-site on the Lichfield Street end of Rauora Park for maximum and design capacity events. This site is subject to CCC Parks and Reserves approval and can cater for 300-450 bikes depending on the layout and rack style. Alternative sites are the green space just south of the Bus Interchange on Tuam Street, or the Ara Carpark adjacent to Barbadoes Street but these sites are further away so may be less desirable.

### Public Transport

Based on the preliminary ITA 19% of attendees are expected to use bus services to access the arena (noting that this may be revisited in future assessment work). This is a significant proportion. Te Kaha is served well by public transport as shown in Figure 2.5. Due to the road closures which will be in place for maximum capacity events, some rat-running through the city can be expected. As Manchester Street is an important bus route, private vehicle access from Tuam Street and St Asaph Street on to Manchester Street will be banned for maximum capacity events to reduce rat-running through Manchester Street.

### Driving for mobility card holders

On-site car parking is provided for mobility card holders as shown in Figure 2.1. The accessible car park can be accessed from Hereford Street.

### Driving (parking)

Almost 70% of attendees are expected to drive to the arena. There is no parking provided on-site other than for mobility parking, or on the streets fronting Te Kaha. For maximum capacity events, there will be no parking on Lichfield Street between Manchester Street and Madras Street. This is to minimise traffic in the vicinity of the arena where there will be high pedestrian activity and for security purposes. Parking will be limited on Lichfield Street and Cashel Street between Barbadoes Street and Fitzgerald Ave as these streets will also be used as a rideshare/taxi zone and coach parking.

Those who choose to drive to an event will be advised to park outside of the city centre and walk to the arena to minimise traffic in the city centre. There are an estimated 12,048 on-street and off-street parking spaces available within a 20-minute walk of Te Kaha taking into consideration parking which may be taken up for other purposes and that some attendees may have access to private parking (employee or leased parks in the central city). Based on modelling assessment (Appendix B), there is ample on-street and off-street parking available to support design events and maximum events. This is dependent on the assumptions in the model so mode share and private vehicle use needs to be carefully monitored for maximum events. Refer to Appendix B for details on parking occupancy and availability.

### Driving (wayfinding)

Most drivers will be familiar with the site location and how navigate to it. However, there is an opportunity for Council to add the arena as a destination to advanced directional signage on key arterial routes. This could be an icon approach, as used for the airport. Variable messaging signage will be used as per the ETMPs described below but this is mostly related to information about upcoming events and road closures. The arena will also be added to maps that inform navigation apps.

The wayfinding to assist with locating parking in the vicinity of the Arena will need to be carefully considered, given that there is no ancillary parking to the Te Kaha site itself. Agile wayfinding signs and apps that recommend parking buildings and availability for Arena events on the side of the city people approach from, and which seek to reduce "cross town" traffic to a minimum are key considerations in that regard.

### Rideshare and taxis

Around 1% of attendees were estimated in the Preliminary ITA to arrive using a rideshare service or taxi. However, this proportion is likely to be higher based on feedback from the current stadium operations (noting again that this percentage may be revisited in future work). The drop off is likely to be more dispersed over time and location with some attendees visiting other destinations prior to an event. The pick-up will require more control given the more time-compressed nature of post-event pick



up activity. A rideshare/taxi pick-up and drop-off zone is proposed to be provided on either Lichfield Street or Tuam Street between Barbadoes Street and Fitzgerald Avenue for maximum and design capacity events. The proposal is to create sub-zones (Zone A, B, C etc) when drivers can contact their customers stating the sub-zone they have parked in. Clear wayfinding signage will be required to guide customers to their ride. How this operates could be developed in conjunction with lessons learnt from other stadiums.

It is also plausible that patrons could be encouraged to call rideshare vehicles from further afield including from central city streets in the post-event hospitality areas. This would assist with dispersing ride share traffic and lengthen the time period over which pick-up occurs.

#### **Coaches**

A coach parking zone is proposed to be provided on Tuam Street between Barbadoes Street and Fitzgerald Avenue for maximum and design capacity events.

#### **Emergency services**

Evacuation and Emergency Management Plans for events at the arena are being developed by Intelligent Risks. Consideration for emergency service vehicle access is included in the ETMPs. Emergency service vehicles will have access to the site via the vehicle accesses on Hereford Street and Madras Street.

Madras Street will be closed for large events after and possibly during some or all the event duration. A manned temporary traffic management vehicle will be used to block Madras Street along with barriers. If emergency services require access to Madras Street, the vehicle will be moved immediately to allow unimpeded access for emergency services, especially fire trucks needing access to the fire control panel on the west side of the building. If a control panel is included on the east side of the building, then the fire trucks will stop in the traffic lane, with other vehicles using the eastern traffic lane.

Police vehicles are more flexible in terms of access through road closures as they are smaller.

### **5.2 Maximum capacity weekend or weekday evening event**

The ETMP for large events (20-35k attendees) will include a temporary traffic management set-up before the event as shown in Figure 5.1. The timing of the pre-event set up needs to be clearly communicated and would be included in the ETMP. Prior to a large event, the following interventions will be put in place:

- Speed limit reduction to 30 km/h on all road frontages
- No access to Madras Street via Cashel Street or Lichfield Street. Access will still be allowed on these streets at Manchester Street to various destinations such as residential apartments.
- Signal phasing changes on Barbadoes Street to provide more time for pedestrians.
- No car parking on the streets fronting Te Kaha for security and safety
- Cycle valet parking
- Pedestrian wayfinding (noting that much of the pedestrian wayfinding can be installed permanently as part of wider central city wayfinding)
- No access to Manchester Street from Tuam Street and St Asaph Street to limit rat-running through Manchester Street. Manchester Street is an important public transport route, so it is important to prevent buses from being held up by traffic before and during an event.



The VMS strategy for a maximum event is shown in Figure 5.4. Early messaging should be displayed in the week leading up to the event on all the temporary and permanent VMS.

Additionally, road closures and lane closures will be in place during the event as shown in Figure 5.3. These are to remain until the pedestrian activity has dissipated after the event. The closures in place are the following:

- Closure of Madras Street between Tuam and Hereford Streets so pedestrians can safely exist the site (most pedestrians are expected to use Madras Street – see Figure 2.2)
- Closure of the parking lane and potentially one lane on Tuam Street to create more space for pedestrians, particularly if the Tuam Street upgrade is not implemented prior to opening.



Figure 5.1 Traffic management setup before a maximum capacity event



Figure 5.2 Traffic management setup during maximum capacity event



Figure 5.3 Speed limits strategy

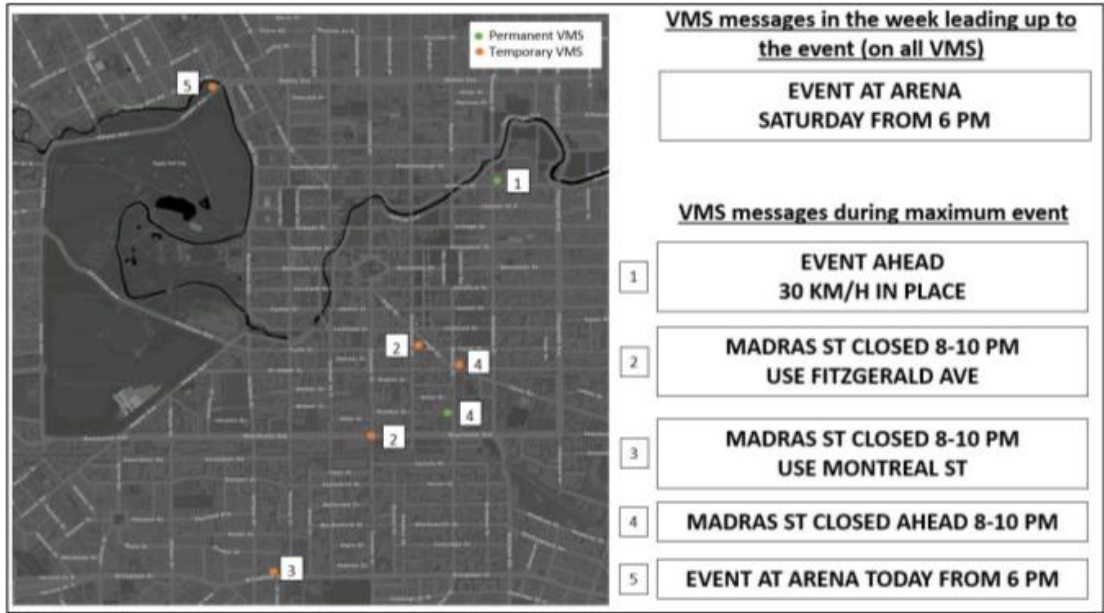


Figure 5.4 VMS strategy for maximum capacity event

Design capacity weekday evening, weekend afternoon or evening events

The proposed traffic management interventions for a design capacity event (10-20K attendees) are outlined in Figure 5.5.

The traffic management interventions to be implemented are the following:

- Speed limit reduction on all frontage streets to 30 km/h (Figure 5.3)
- Potential to restrict access to Madras Street via Cashel Street or Lichfield Street if adjacent street designs not implemented. Access will still be allowed on these streets at Manchester Street to various destinations such as residential apartments.
- Signal phasing changes on Madras Street and Barbadoes Street to provide more time for pedestrians.
- Valet cycle parking. This should be implemented for the first few events and the demand monitored. Valet parking can be removed if monitoring suggests that it is not needed for design events.
- No car parking on streets fronting the site for security and safety
- Rideshare and coach parking zones will be smaller than for a large event.
- Pedestrian wayfinding

The VMS strategy for a design event is shown in Figure 5.6. Early messaging should be three days prior to the event and displayed on all temporary and permanent VMS. The traffic speed strategy for design and maximum events are the same (Figure 5.3). There will be no road closures for these events.



Figure 5.5 Traffic management set up for a design capacity event



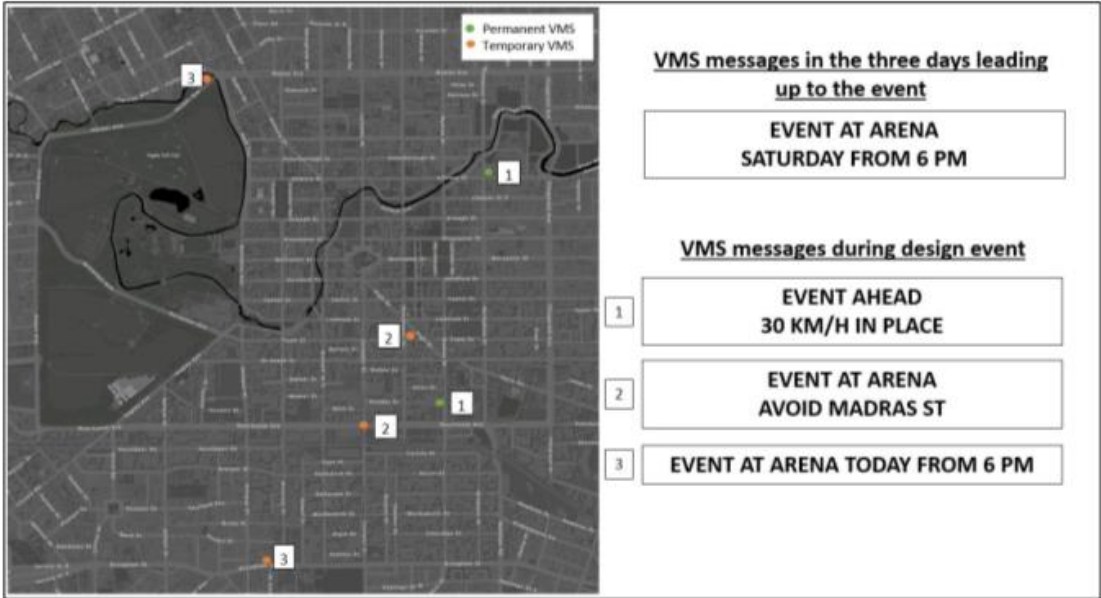


Figure 5.6 VMS for a design capacity event

5.3 Small events (1k-10k attendees)

For small events (1k-10k attendees), the traffic management strategy in Figure 5.7 will be in place.

There will be no road closures, additional speed limit reductions, signal phasing changes, or coach parking. A small rideshare zone will be designated for events expecting 1k-10k attendees. On-street parking will be banned, and pedestrian wayfinding will be needed.

The VMS strategy for these events only use the two permanent VMS (Figure 5.8).



Figure 5.7 Traffic management set up for a small event



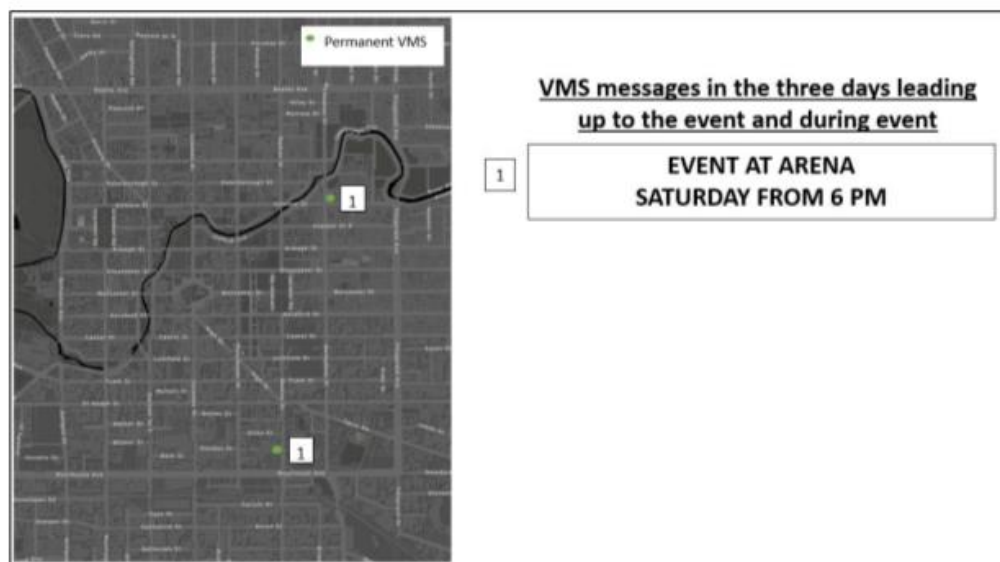


Figure 5.8 VMS strategy for small events

## 6. Communications strategy

A communications strategy will reinforce the fundamental principles of the ETMPs, these being to:

- Encourage the uptake of sustainable modes for visitors to Te Kaha;
- Provide timely information to make the journey to and from Te Kaha safe and enjoyable; and
- Minimise the disruption to other road users.

Several methods will be used to communicate information to visitors and the general public including wayfinding through static signage and the application of VMS (as shown in Figure 5.4, Figure 5.6, and Figure 5.8), digital media (websites and social media channels), traditional media (newspapers) and potentially a standalone app for the CMUA site. All media will include maps to provide a clear and easy-to-understand overview of the location of key destinations and preferred routes to and from the CMUA. VO intend to develop an app for the venue, this could communicate travel information by linking to other platforms such as Metroinfo, this will make event information widely accessible.

The three key principles stated above are addressed below in turn.

### 6.1 Encouraging the uptake of sustainable modes

The communication surrounding events will encourage the uptake of sustainable modes by providing information about:

- Public transport access including the location of the Manchester Street Super Stops and bus interchange in relation to the arena. The app should be designed to allow the address of the patron to be added and the best bus route option shown.
- Integrated public transport ticketing options.
- Cycle valet parking and e-scooter pick up/drop off locations in relation to the arena and how they work.
- The location of high-quality pedestrian and cycle facilities in the vicinity of the Te Kaha including pedestrian wayfinding to and from bus services, off-site cycle parking, and rideshare locations.
- Encouraging visitors to carpool and if driving, to park further out and walk in rather than seek parking in the vicinity of the arena. The app can show the 20-minute walking area to encourage the parking further out.
- Publicise the fact there is very little on-street parking available in the vicinity of the arena.

### 6.2 Provide timely information to visitors

The communications strategy seeks to provide timely information to visitors through:

- Provide notifications through the app of options and any network closures
- Advanced notification of events including using the VMS;
- Providing information regarding arena opening times and recommendations on when to arrive;
- List of pre-event, during event, and post-event actions to allow for visitors to plan accordingly;
- Identifying the location of designated on-site parking for mobility card holders;



- Identify access options and locations for all modes as noted in Section 6.1 including the location of ride share pick up and drop off areas;
- Notify drivers of areas where parking is not available, specifically:
  - There is no parking available on-site for spectators who do not hold mobility cards.
  - Mobility parking and drop-off zone is available on site.
  - There will be no parking adjacent to Te Kaha on Madras Street, Hereford Street, Barbadoes Street, Tuam Street, and very little parking elsewhere in the vicinity of Te Kaha.
  - There will be no parking on Lichfield Street (between Manchester Street and Madras Street).
  - Parking will be limited on Lichfield Street and Tuam Street between Fitzgerald Avenue and Barbadoes Street.
  - No access to Manchester Street from Tuam Street and St Asaph Street
- Recommend drivers park further out and do not cross through the central city from their intended origin or destination; and
- Provide links to the bus timetables and wider metro info.

### 6.3 Minimise disruption to other road users

Though the expected impacts on the road networks are minor, the changes to the road network relating to events at Te Kaha must be continually communicated to the public to ensure transport related impacts for other transport system users are minimised in the area. The messages that will be delivered are:

- Advanced notification of events including using the VMS encouraging road users to avoid the area during the peak times affected for larger events;
- Madras Street will be closed to traffic (for larger events only as per the ETMPs with corresponding time period of closure specified);
- No access to Madras Street from Lichfield or Cashel Street; and
- No parking available in the areas specified above in Section 6.2.

The public also needs to be aware of the road closures to be expected for events and alternate routes to take. VMS can be used for this in the week leading up to a major event.

## 7. Monitoring strategy

### 7.1 Overall approach

The ongoing success of the ETMPs requires monitoring as proposed below for the following scenarios, the findings will be used to inform any changes to the ETMP for the next event:

- Pre-event monitoring - first Design, Maximum and events that required a bespoke TMP, and then annually.
- During the event - first Design, Maximum and events that required a bespoke TMP, and then annually.
- Immediately after the event - first Design, Maximum and events that required a bespoke TMP, and then annually.
- Post event user feedback - after each event.

It is recommended that the monitoring be managed by a suitably qualified transportation engineer, noting that monitoring may require involvement of manual surveyors and observers.

Reporting the outcomes of the monitoring should be supplied within 10 working days of the completion of monitoring including recommendations towards updating the ETMPs. The corresponding ETMP should be updated at the earliest opportunity and forwarded to Council for approval, ideally prior to the next corresponding event.

### 7.2 Pre-event monitoring

The following aspects will be monitored in the two hours leading up the start of an event:

- Pedestrian arrival patterns.
- Any unacceptable traffic congestion in the vicinity of the site.
- Any unacceptable queues or capacity issues for the cycle valet parking.
- Any capacity issues for the coach drop off zone.
- Where e-scooter users are leaving the devices.
- Onsite accessibility parking capacity and access management.
- Capacity and operation of Manchester Street super stops and central bus interchange.
- Any non-compliant parking in the vicinity of the site.

### 7.3 During event monitoring

The following aspects will be monitored while an event is underway:

- Is security operating at cycle valet parking?
- Are any coaches remaining parked in the drop off zone?
- Are the e-scooter providers collecting the devices and leaving them in designated locations?
- Any non-compliant parking in the vicinity of the site blocking pedestrian access.





#### 7.4 Immediately after event monitoring

The following aspects will be monitored in the one-hour following an event ending:

- Pedestrian dispersal patterns.
- If no road closure how are pedestrians crossing Madras Street?
- Any unacceptable traffic congestion in the vicinity of the site.
- Any unacceptable queues for retrieving bikes at the cycle valet parking.
- Is the maximum capacity of the Bus Interchange being exceeded due to departing event attendees?
- How the rideshare pick up zones are operating.
- Any for capacity issues for the coach pick off zone.
- Any significant delays when departing from the onsite accessibility parking capacity.

#### 7.5 Post event user feedback

In addition to the on-site monitoring, it is recommended that surveys be undertaken on a regular basis to capture the user experience and seek feedback as to how events can be improved for all visitors. This would be mostly through the app for subscribed users and potentially through an online survey which can be emailed out to a sample of visitors to Te Kaha. Participation can be encouraged through a prize draw or future discounts for survey respondents.

It is further recommended that feedback is sought from VO on a regular basis. This may take the form of quarterly meetings to share experiences and look for opportunities for improvement. As with the monitoring any identified improvements to the ETMPs arising through the engagement should be identified and implemented as soon as practicable.

## 8. ETMP Risks

Successful ETMPs will provide for a good visitor experience and avoid the following poor outcomes:

- Long pedestrian crossing delays.
- Unmanaged cycle parking causing reduced footpath widths.
- Conflicts between modes resulting in safety issues.
- Delays to buses using the network including poor travel time reliability or insufficient capacity.
- People circulating for parking and causing congestion and safety issues.
- Property accesses being blocked by non-compliant parking behaviour.
- Extent of on-street parking is larger than assumed and spills wider into residential areas.
- Network congestion (impacts aspects such as emergency service access).

It is therefore important to consider the key risks to the proposed ETMPs. These are:

- The assumed mode share and vehicle occupancy expectations are not achieved, and there are more private motor vehicle trips, with associated impacts on parking supply and wider network congestion. This may be addressed through subsequent work exploring alternative mode share scenarios.
- The assumed bus capacity cannot be provided leading to dissatisfied event attendees as they may be late to the game or not be able to get home on the bus as planned.
- If CCC do not upgrade the adjacent streets then TMP costs will be higher.
- Communications strategy fails to be comprehensive enough (one example of this might be if a travel app is not developed) which means that people are not informed of travel options and wayfinding.
- The accessible parking provision does not meet the demand, and mobility impaired people do not get to attend events.
- Rideshare providers do not buy-into the zone/sub zone proposal which means that drivers park illegally (to get as close as possible), and ride share customers are confused about where to go for pick up.
- Stakeholders do not continue to work together to review and refine ongoing traffic management requirements for events.



Appendix A. Event servicing details





Table A.1 Event servicing details. GO = Gates open, KO = Kick off (game starts), FW = Final Whistle (game ends)

Staff	Arrival Time	Departure Time	Associated Vehicle	Parking Location
Kitchen staff	GO – 10.5hr	FW + 0.5hr	Delivery trucks, Private car	Delivery trucks into loading dock
Facilities/Venue Management	GO – 10.0hr	FW + 0.5hr	Private car	Off site
Cleaning	GO – 9.0hr	FW + 2.0hr	Waste trucks, Private car	Loading dock and off site
Security	GO – 1.5hrs	FW + 2.0hr	Private car	Off site
Retail Food and Beverage	GO – 1.5hrs	FW + 1.0hr	Private car	Off site
Ticketing / Hosting	GO – 1.0hr	FW + 0.5hr	Private car	Off site
Broadcast	KO – 7.0hr	FW + 3.0hr	Semi-Trailers, vans	Northern Plaza
Medical staff	KO – 3.0hr	FW + 1.5hr	Minivans, private cars	Off site
Players & Coaches	KO – 2.0hr	FW + 1.5hr	Team coaches, minivans, private cars	Coach lane and loading dock for drop off, parking off site
Police & public medical staff	KO – 2.0hr	FW + 0.5hr	Police cars and ambulances	Ambulance in loading dock, public ambulance Police cars
Crusaders Horses	KO – 1.5hr	KO – 0.25hr	Horse floats, horse trucks cars	Mobility parking area





Appendix B. Transport Modelling Assessment



# Canterbury Multi-Use Arena Transportation Modelling Assessment

## Technical Note

<b>Prepared for</b>	Besix Watpac NZ
<b>Job Number</b>	BWNZL-J001
<b>Revision</b>	A
<b>Issue Date</b>	22 <sup>nd</sup> April 2022
<b>Prepared by</b>	Dave Smith, Technical Director Transportation Planning
<b>Reviewed by</b>	Jeanette Ward, Technical Director Transportation Engineering

## 1. Introduction

The purpose of this technical note is to present the findings of a transportation modelling assessment undertaken to support the development of event Traffic Management Plans (TMPs) for the Canterbury Multi-Use Arena (CMUA).

## 2. Methodology

A transportation modelling assessment of the impacts of events at the CMUA on the wider network has been undertaken using the Christchurch Assignment and Simulation Transport (CAST) Model<sup>1</sup>.

The CAST model has been run by QTP consultants and has been used to understand the performance of the central city road network during the arrival times for events at CMUA and to understand the impact of the closure of Madras Street proposed as part of the event TMP for larger events. In all cases a model assessment year of 2028 is assumed.

The following scenarios were initially run through the CAST model:

- Scenario A weekday evening (6-7pm) with no event
- Scenario B
- Scenario C weekday evening (6-7pm so indicatively a 7pm-730pm start) event with 35,000 attendees
- Scenario C1 – scenario C with a lower vehicle occupancy and higher vehicle mode share
- Scenario D weekend afternoon (1-2pm) with no event
- Scenario E weekend afternoon (1-2pm so indicatively a 2pm-230pm start) event with 20,000 attendees
- Scenario E1 – scenario E with a lower vehicle occupancy and higher vehicle mode share

<sup>1</sup> Modelling undertaken in December 2021 using the Version 18 CAST model

- Scenario F weekend afternoon (1-2pm so indicatively a 2pm-230pm start) event with 35,000 attendees
- Scenario G weekend evening (6-7pm) with no event

In all instances the modelling forecasts the extent of traffic within the central city by factoring back the weekday interpeak model or weekday evening peak model to match the demand flows in the corresponding modelling period. The factors applied were calibrated from central city traffic counts on the one-way pairs bordering the CMUA site. This is considered a best practice approach in the absence of a fully calibrated and validated model for the arrival period for each event.

Whilst the modelling focused on the likely peak arrival hour for attendees at each event tested, it is noted that traffic management may impact on the departure time of an event. For all of the above scenarios the quantity of background traffic on the central city network (indicatively 9-10pm or later for all evening events and 4-5pm or later for weekend afternoon events) was less than the quantum of traffic during the modelled arrival period. This means that the results are representative for impacts on the network during the period that most attendees will arrive for an event but are conservative for the departure period.

The modelling assumptions corresponding to event traffic were consistent with those set out in the Preliminary ITA (Aurecon, 2020) with respect to:

- a) mode share and underlying assumptions relating to public transport provision and availability or other modes;
- b) vehicle occupancy;
- c) proportion of traffic arriving during peak arrival hour;
- d) location of available on-street and off-street parking in the central city was updated based on latest Council database;
- e) 'trip chaining' assumptions including the proportion of attendees that access the stadium from central city and locations other than the attendees residences; and
- f) future road infrastructure assumptions other than Tuam Street between Madras Street and Barbadoes Street assumed to be one way eastbound.

A second series of models were run to explore the impacts of some or all of reducing speeds on Madras Street, closing Madras Street between Tuam Street and Hereford Street, closing access to Madras Street from Lichfield Street and Cashel Street, reducing access to Manchester Street for general traffic, and implementing a potential lane drop on Tuam Street between Madras Street and Barbadoes Street. These are presented later in this report as traffic management measures to improve pedestrian safety, so the purpose of these model runs was to understand their impact on the local and wider network.

The second set of model runs retained the same methodology and assumptions as the first set, and are as follows:

- Scenario C\_TMP – scenario C with proposed traffic management implementation
- Scenario E\_TMP – scenario E with proposed traffic management implementation

A table capturing the full range of model runs is included below.

Table 2.1 Summary of Modelling Scenarios

Time of event start	No event	Design event - 20K attendees	Max event - 35K attendees
Weekday 7pm-7:30pm	Scenario A	Scenario B	Scenario C (and C1 sens. test and C_TMP with TMP in place)
Weekend 2pm-2:30pm	Scenario D	Scenario E (and E1 sens. test and E_TMP with TMP in place)	Scenario F
Weekend 7pm-7:30pm	Scenario G		

Scenario G (weekend 6-7pm hour with no event) was observed to have less traffic and less congestion compared to Scenario A (weekday 6-7pm with no event) therefore the model findings for the weekday evening event arrival hour are considered to (conservatively) be representative of the corresponding weekend evening event arrival hour.

### 3. Modelling Results – no Traffic Management Plan

There are three key sets of outputs that have been extracted from the model and are presented in the following sections as follows:

- intersection average delays;
- travel times on key cross-central city routes; and
- on-street parking uptake.

Intersection delay results are presented based on the quantum of delay using the legend presented below in Figure 3.1. Whilst these do not strictly align with intersection level of service they are based on the weighted average of delay across all approaches. The intersections that are categorised as black (that is with average delays of 70 seconds or greater in the modelled hour) are considered to result in an undesirable level of delay for road users.

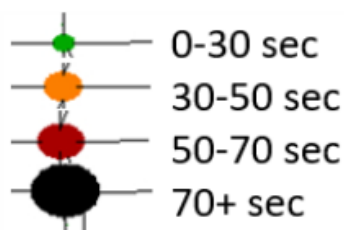


Figure 3.1 Legend for average intersection delay outputs

Travel times have been calculated from the model through the central city for across the two one-way pairs bordering the site and for Moorhouse Ave, Fitzgerald Ave and Manchester Street. These routes are shown in Figure 3.2. It is noted that the performance of Manchester Street is critical for public transport movement through the central city.





Figure 3.2 Modelling travel time routes

On-street parking uptake is presented as a function of the parking occupancy for various parts of the central city. This is an important indicator to understand the extent to which the central city parking supply can cater for parking demand, how far vehicle occupants are required to walk to/from the CMUA and how the ETMPs (and especially wayfinding) can assist with reducing the likelihood of parking circulation and localised congestion.

The performance of the central city road network during a typical weekday interpeak (corresponds to 12-1pm) and evening commuter peak (corresponds to 5-6pm) period is shown in Figure 3.3 respectively. This demonstrates that several key intersections perform poorly in the evening commuter peak with delays in the order of 70 seconds or more (black) and where delays are approaching these undesirable levels at between 50 and 70 seconds (in red). These are the future 2028 baseline models against which the CMUA scenarios are compared.

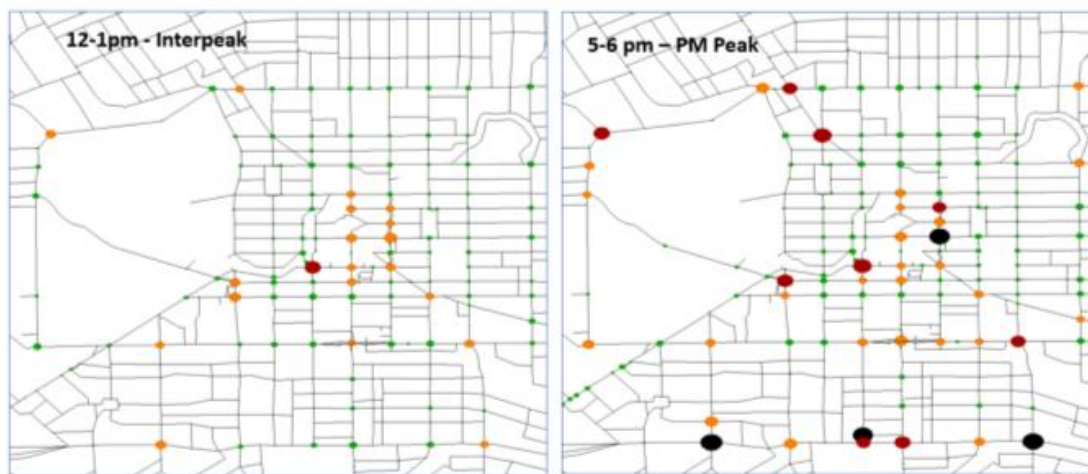


Figure 3.3 Weekday interpeak and evening peak intersection performance

The interpeak outputs corresponds to typical traffic congestion levels expected in 2028 between 12-1pm on a weekday with the central city operating with minimal delays and only one intersection (Durham / Lichfield) experiencing average delays of over 50 seconds. The evening peak results correspond to modelled typical traffic congestion during the commuter peak of 5-6pm in 2028. There are several intersection in the vicinity of the Brougham Street corridor and Manchester / Hereford (located one block from the CMUA) operating with average delays of over 70 seconds and a further 9 intersection with high relatively high delays.

#### Weekday (and weekend) evening events

The intersection performance outputs for the weekday evening peak modelled hour of 6-7pm with and without a design event of 20,000 attendees is shown in Figure 3.4.

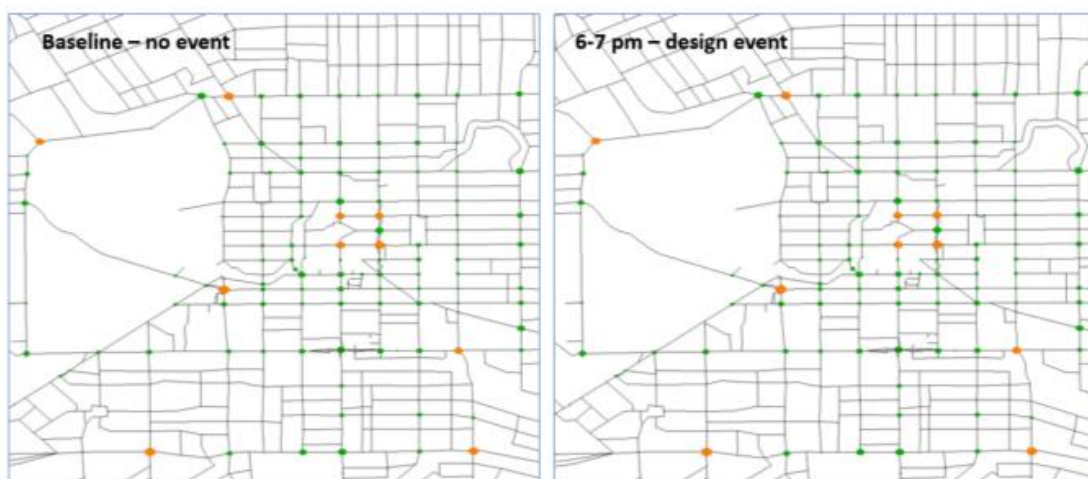


Figure 3.4 Scenario A and B – Weekday evening design event intersection performance

The weekday period of 6-7pm shown on the left has substantially less congestion than the modelled 12-1pm and 5-6pm weekday periods shown in Figure 3.3, with no intersections experiencing an average delay of over 50 seconds. The inclusion of design event traffic on the model makes little impact with intersection delays remaining largely unchanged. It is noted that the model assumes that traffic entering the central city to visit an event at the CMUA will park around the periphery rather than searching for a park closer to the CMUA. This in turn assumes that wayfinding for attendees to access preferred parking zones are well embedded through communication materials and attendees are compliant in that regard. It is concluded that no traffic management is required for this scenario from a network efficiency perspective.

The intersection performance outputs for the weekday evening peak modelled hour of 6-7pm with and without the larger maximum event of 35,000 attendees is shown in Figure 3.5. Changes in intersection performance are highlighted with red circles.

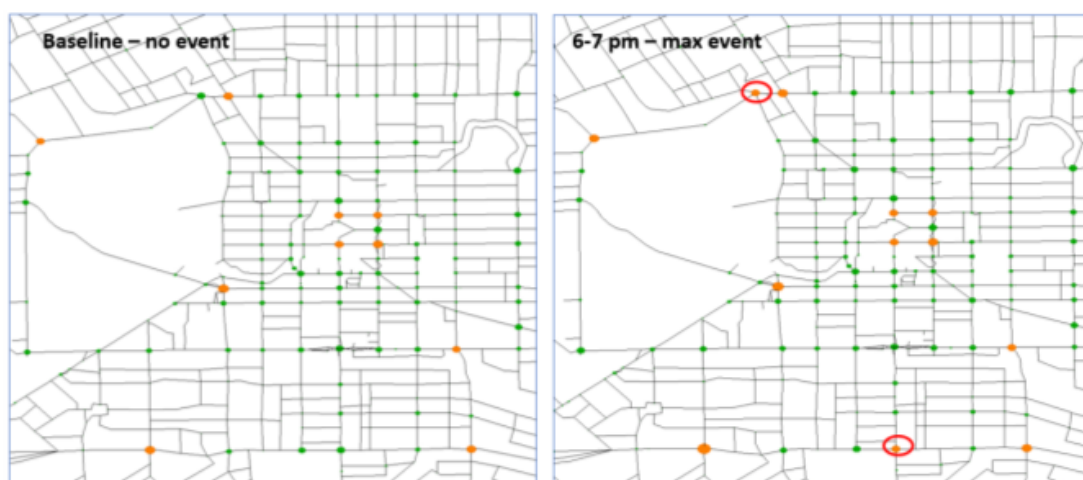


Figure 3.5 Scenario A and C – Weekday evening maximum event intersection performance

The inclusion of maximum event traffic on the model has a modest impact two intersections around the periphery of the central city shifting from the 0-30 second to 30-50 second category. There are no intersections with average delays in excess of 50 seconds and no worsening of performance adjacent to the CMUA. It is concluded that no traffic management is required for this scenario from a network efficiency perspective.

A sensitivity test has been included on the weekday evening peak maximum event scenario whereby a higher private vehicle mode share (of 80% as opposed to 69%) and lower vehicle occupancy (of 2.5 persons per vehicle down from 2.8 persons) is estimated resulting in high level of traffic on the road network. The intersection performance results are shown in Figure 3.6.





Figure 3.6 Scenario A and C1 – Weekday evening maximum event intersection performance – sensitivity test

The sensitivity test results for the maximum event show five intersections around the periphery of the central city deteriorating to the next delay category. Notably the intersection of Brougham Street and Selwyn Street experiences average delays in excess of 50 seconds. This is better than the current evening peak performance and is somewhat isolated from the location of the CMUA. The results of the sensitivity test reinforce the conclusion that no traffic management is required for this scenario from a network efficiency perspective.

It is reiterated that the results in this section apply to both the weekday and weekend evening events.

#### Weekend afternoon events

The modelled intersection performance for a weekend afternoon design event starting around 2pm-2:30pm are shown in Figure 3.7. It is noted that the traffic volumes in the central city network for a weekend late afternoon event with start time around 4pm-4:30pm are generally lower so this modelling would be suitable for considering the impacts of a broader range of start times.

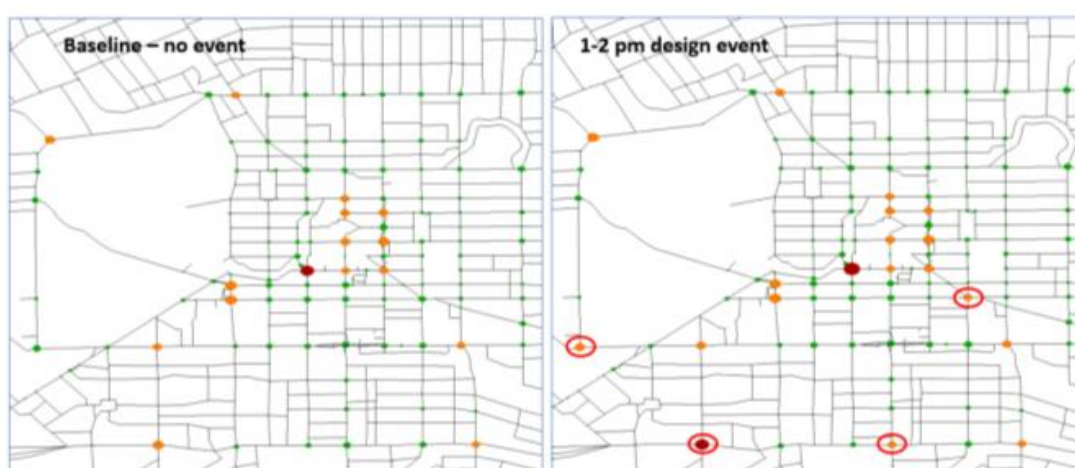


Figure 3.7 Scenario D and E - Weekend afternoon design event intersection performance



The intersection performance on a weekend afternoon in the central city is generally acceptable with only one intersection (Durham Street / Lichfield Street) experiencing delays of over 30 seconds on average. The inclusion of the design event traffic on the model has a modest impact with four intersections around the periphery of the central city deteriorating to the next delay category. There are no intersections with average delays in excess of 50 seconds, however the intersection of Madras Street and St Asaph Street increases to the 20-30 second delay range. The performance of the network with a design event is performing better than the typical weekday interpeak and evening peak models, and it is concluded that no traffic management is required for this scenario from a network efficiency perspective.

A sensitivity test has been included on the weekend afternoon peak design event scenario whereby a higher vehicle mode share and lower vehicle occupancy is estimated resulting in high level of traffic on the road network. The intersection performance results are shown in Figure 3.8.

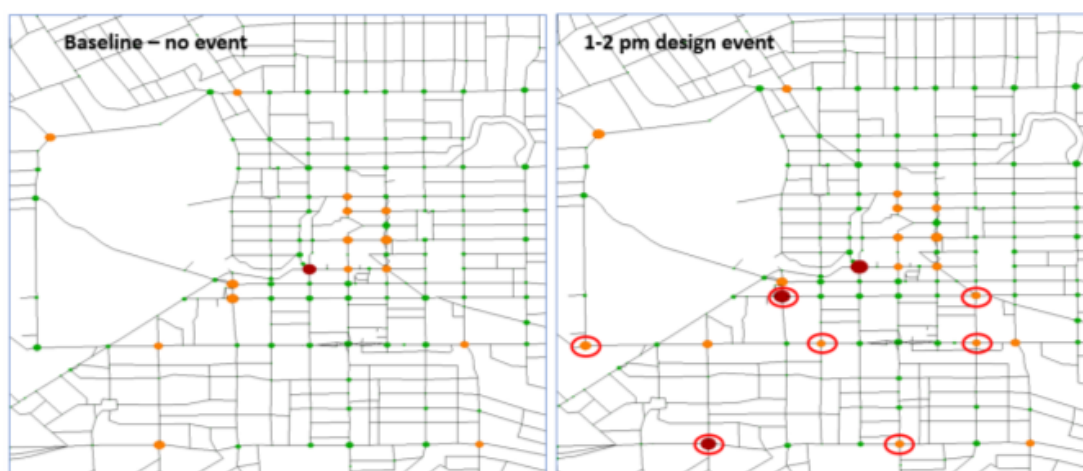


Figure 3.8 Scenario D and E1 - Weekend afternoon design event intersection performance - sensitivity test

The sensitivity test results for the design event show seven intersections around the periphery of the central city deteriorating to the next delay category. Notably no intersections experience delays of over 70 seconds however the intersections of Brougham Street / Selwyn Street, and St Asaph Street / Antigua Street experiences average delays in excess of 50 seconds. The overall central city network performance remains better than the current evening peak performance and worsening intersections are somewhat distant from the location of the CMUA. The results of the sensitivity test reinforce the conclusion that no traffic management is required for this scenario from a network efficiency perspective.

The modelled intersection performance for a weekend afternoon design event starting around 2pm-2:30pm are shown in Figure 3.9.

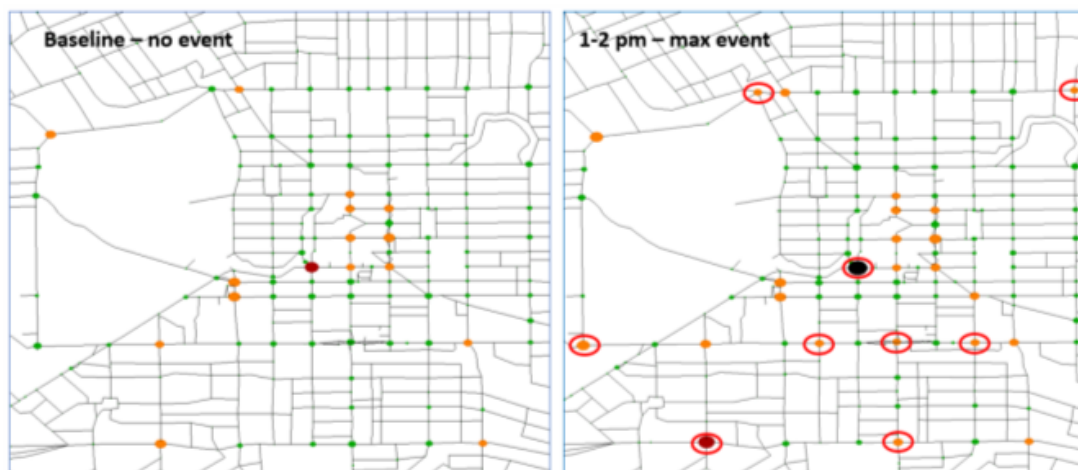


Figure 3.9 Scenario D and F - Weekend afternoon maximum event intersection performance

The introduction of a maximum event of up to 35,000 attendees on a weekend afternoon has modest impacts with nine intersections around the periphery of Hagley Park and the central city experiencing worsening a higher average delay category. Most notably, the intersection of Durham / Lichfield Streets has modelled delays of 50-70 seconds without and over 70 seconds with an event, and as noted in earlier in this section this is the worst performing intersection within the model. The Brougham / Selwyn Street intersection is the only other key intersection with delays in the order of 50-70 seconds. It is concluded that no traffic management is required for this scenario from a network efficiency perspective although it may be prudent to consider the ongoing management of delays at these two intersections irrespective of CMUA events.

## 4. Modelling Results – with Traffic Management Plan

The modelling results from the previous section have demonstrated that the impact of events on intersection delay are modest with no scenario leading to congestion at the level currently experienced in the weekday evening commuter peak period. Subsequently road closures, lane drops and/or restrictions to vehicle movements are not required to address issues relating to the efficiency of the transport network.

However, in considering pedestrian safety in the vicinity of the CMUA, several such measures are proposed to be implemented through the TMP to ensure the safe operation of the transport network prior to, during and after an event. These measures for the design event as modelled are:

- a) reduce Madras Street, Barbadoes Street, Tuam and Hereford Streets to 30 km/hour (noting that Madras Street may be a permanent change)
- b) close eastern end of Cashel Street and Lichfield Street between Manchester and Madras Streets (with corresponding green time allocated to Barne's Dance pedestrian movements), so still allowing access into these streets at Manchester Street to various destinations.

The TMP measures included for maximum events as modelled are:

- a) reduce Madras Street, Barbadoes Street, Tuam and Hereford Streets to 30 km/hour (noting that Madras Street may be a permanent change)
- b) ban left turn from Tuam into Manchester
- c) ban right turn from St Asaph into Manchester

- d) close Madras Street between Tuam and Hereford Streets
- e) close eastern end of Cashel Street and Lichfield Street between Manchester and Madras Streets (with corresponding green time allocated to Barne's Dance pedestrian movements), so still allowing access into these streets at Manchester Street to various destinations.

These TMP measures have been modelled to understand if they result in additional impacts on the central city network. The weekday evening peak maximum event scenario with TMP is compared to the no event (and no TMP) baseline scenario in Figure 4.1.

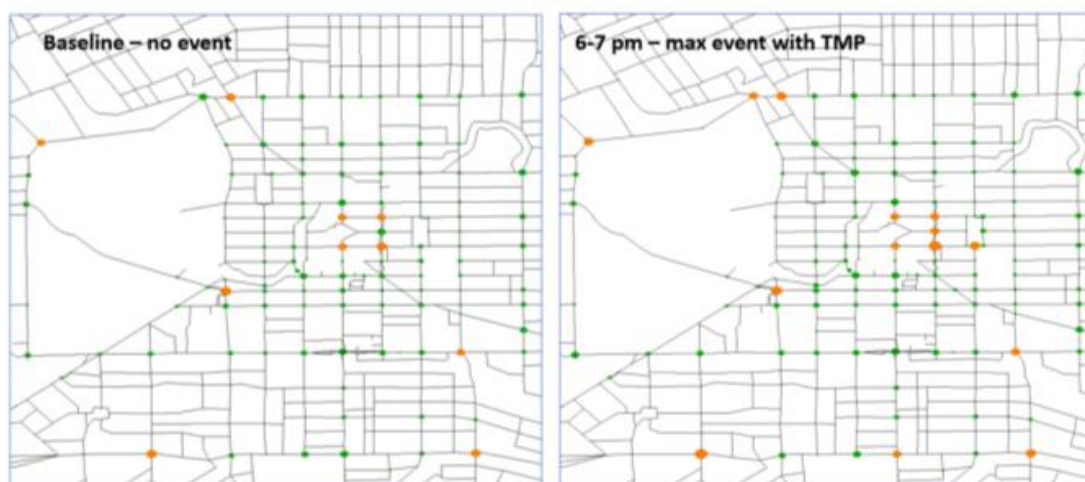


Figure 4.1 Scenario A and C\_TMP Weekday evening maximum event with TMP intersection performance

Whilst there are some small changes in delay category between 20-30 seconds and 30-50 seconds delay categories it is evident that there are no intersections operating with an average delay of 50 seconds or greater in either scenario. On this basis it is concluded that the implementation of the safety-focused closures and lane drop proposed in the TMP will not themselves lead to any adverse efficiency effects on the central city network for weekday (and weekend) evening events.

The TMP measures have also been applied to the weekend afternoon design event scenario which is compared to the no event (and no TMP) baseline scenario in Figure 4.2.

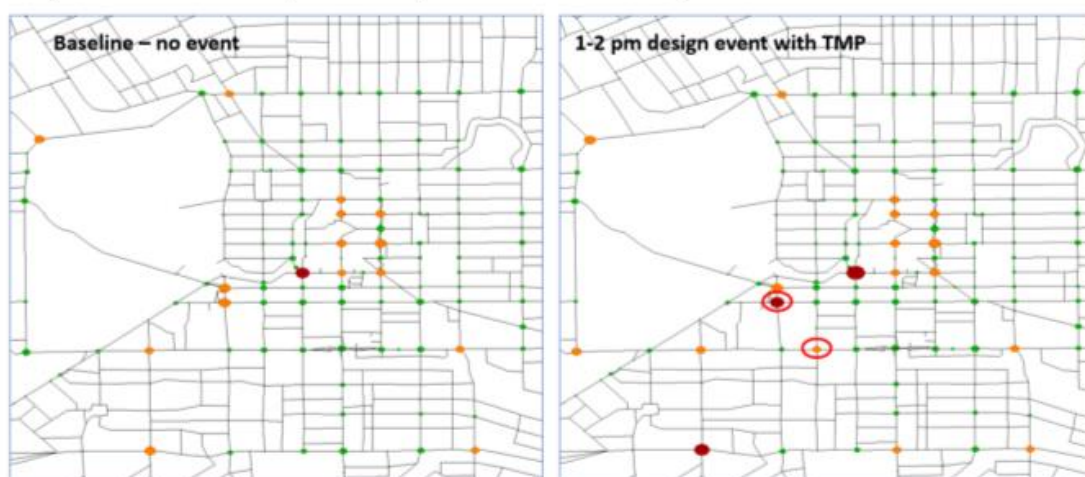


Figure 4.2 Scenario D and E\_TMP Weekend afternoon design event with TMP intersection performance



The most notable change in intersection performance is at Antigua Street / St Asaph Street which has an increase to 50-70 seconds of delay with the addition of the design event and implementation of TMP, however it is noted that this is somewhat remote from the CMUA site so is likely to be a result of vehicles re-routing in the vehicle assignment. There are no intersections observed to have an average delay of 70 seconds or greater in either scenario. On this basis it is concluded that the implementation of the safety-focused closures and lane drop proposed in the TMP will not themselves lead to any adverse efficiency effects on the central city network for weekend afternoon design events.

## 5. Travel time results

The impact of the events on travel times has been modelled using the travel times routes shown in Figure 3.2 which includes the one-way pairs in the vicinity of the CMUA and key through routes on the eastern and southern sides of the central city.

The travel time results for the weekday evening event scenarios are summarised in Table 5.1 and for the weekend afternoon event scenarios are shown in Table 5.2.

Additional travel time results have been analysed for the weekend evening event time period and it is confirmed that all travel times are similar to or less than the weekday evening event period travel time results. As with the intersection delay results the inferences made for the weekday evening 6-7pm arrival hour are considered to conservatively address network conditions for the weekend 6-7pm arrival hour.

The travel time paths travel through the central city and correspond to a 5-10 minute trip in the base case (no CMUA event) and the addition of design event traffic adds 0-18 seconds and 1-33 seconds of travel time in the weekday evening event arrival period and weekend afternoon arrival period respectively. The corresponding increase in travel times with a maximum event operating is 1-46 and 3-55 seconds for the weekday evening and weekend afternoon arrival times respectively.

The additional travel time results corresponding to the sensitivity tests add a further 5-10 seconds of travel time as a result of the additional traffic resulting from the vehicle occupancy and mode share assumptions with the worst result being an additional 13 seconds.

The travel time impacts of implementing the TMP has also been modelled for the weekend evening maximum event and weekday afternoon design event scenarios with a modest increase in travel times across the board but generally of no more than 10 seconds delay. The Tuam Street eastbound travel time has the largest increase of 18 seconds under the maximum event TMP scenario due to the lane drop on Tuam Street.





Table 5.1 Weekday evening event - base and changes in travel times (seconds)

Route	Description	Distance	Base (A)	Design (B)	Max (C)	Max Sens Test (C1)	Max with TMP (C_TMP)
1a	Fitzgerald Ave Nthbnd	2.402	310	+2	+3	+4	+17
ab	Fitzgerald Ave Sthbnd	2.402	307	+8	+12	+15	+14
2a	Moorhouse Ave Eastbnd	3.602	407	+18	+36	+46	+38
2b	Moorhouse Ave Westbnd	3.602	424	+2	+6	+8	+7
3	Tuam St Eastbound	1.969	384	+5	+11	+18	+29
4	St Asaph St Westbound	2.159	361	+0	+1	+3	+15
5a	Manchester St Nthbnd	2.120	536	+6	+3	+4	+13
5b	Manchester St Sthbnd	2.120	496	+9	+23	+36	+33
6	Madras St Nthbnd	2.218	330	+3	+10	+16	no path
7	Barbadoes St Sthbnd	2.416	312	+17	+31	+41	+38

Table 5.2 Weekend afternoon event - base and changes in travel times (seconds)

Route	Description	Distance	Base (D)	Design Event (E)	Design Sens Test (E1)	Design with TMP (E_TMP)	Max (F)
1a	Fitzgerald Ave Nthbnd	2.402	302	+1	+2	+2	+3
ab	Fitzgerald Ave Sthbnd	2.402	324	+10	+13	+10	+19
2a	Moorhouse Ave Eastbnd	3.602	430	+22	+29	+24	+38
2b	Moorhouse Ave Westbnd	3.602	447	+4	+4	+4	+7
3	Tuam St Eastbound	1.969	377	+7	+9	+13	+14
4	St Asaph St Westbound	2.159	397	+5	+7	+5	+11
5a	Manchester St Nthbnd	2.120	565	+2	+3	+2	+4
5b	Manchester St Sthbnd	2.120	563	+18	+26	+22	+34
6	Madras St Nthbnd	2.218	333	+14	+19	+20	no path
7	Barbadoes St Sthbnd	2.416	364	+33	+46	+41	+55
1a	Fitzgerald Ave Nthbnd	2.402	302	+1	+2	+2	+3

These results demonstrate that the addition of CMUA traffic and combination of sensitivity tests and TMP implementation limit the increase in travel times to no more than one minute which is considered minimal in the context of a 5-10 minute through trip across the town centre. For cross town trips the full journey may be 20 minutes or more such that the increase in travel time of one minute is even less substantive.

Of particular note for public transportation movement the worst performing scenarios on Manchester Street add 13 seconds to the northbound journey and 36 seconds to the southbound journey although this relates to general traffic movement and does not account for the bus priority measures which would mitigate any increase in travel times for bus services.

In summary the increases in travel times are considered minimal across all key corridors, and do not constitute adverse effects on the efficiency of the local and wider road network. On this basis the change in traffic patterns and proposed TMP measures can be supported with respect to network travel time impacts.

## 6. Parking occupancy and availability

There are an estimated 12,048 on street and off-street parking spaces that are available within a 20-minute walk of the CMUA taking into consideration the likely level of parking taken up for other purposes during typical event arrival times. This has built off the assessment in the Preliminary ITA prepared by Aurecon and extended to consider that some attendees may have access to private parking (such as using their own employee or leased parks in the central city).

The key assumptions which relate to available parking within this 20-minute catchment are conservative such that the resultant assessment is more likely to underestimate the extent of parking available during the arrival period for an event, and are as follows:

- Off-street parking is 40% occupied at the start of an event;
- On-street parking is 30% occupied at the start of an event; and
- Only 1 in 20 (5% of) private (employee and leased) parks will be used by visitors.

The CAST modelling holds an inventory of the location and quantity of available car parking in the central city. The model diverts the vehicle trip ends of vehicles whose occupants are attending events at the venue to the nearest available parking to the arena from the side of the City they are approaching the CMUA from. This means that attendees will not be travelling across the central city to locate parking but instead will curtail their trip short of the venue and walk the remainder of the distance.

The catchment of parking within an approximate 20-minute walk of the CMUA which includes 12,048 parks during the arrival period for an event is shown in Figure 6.1 (taken directly as Figure 26 from Preliminary ITA).

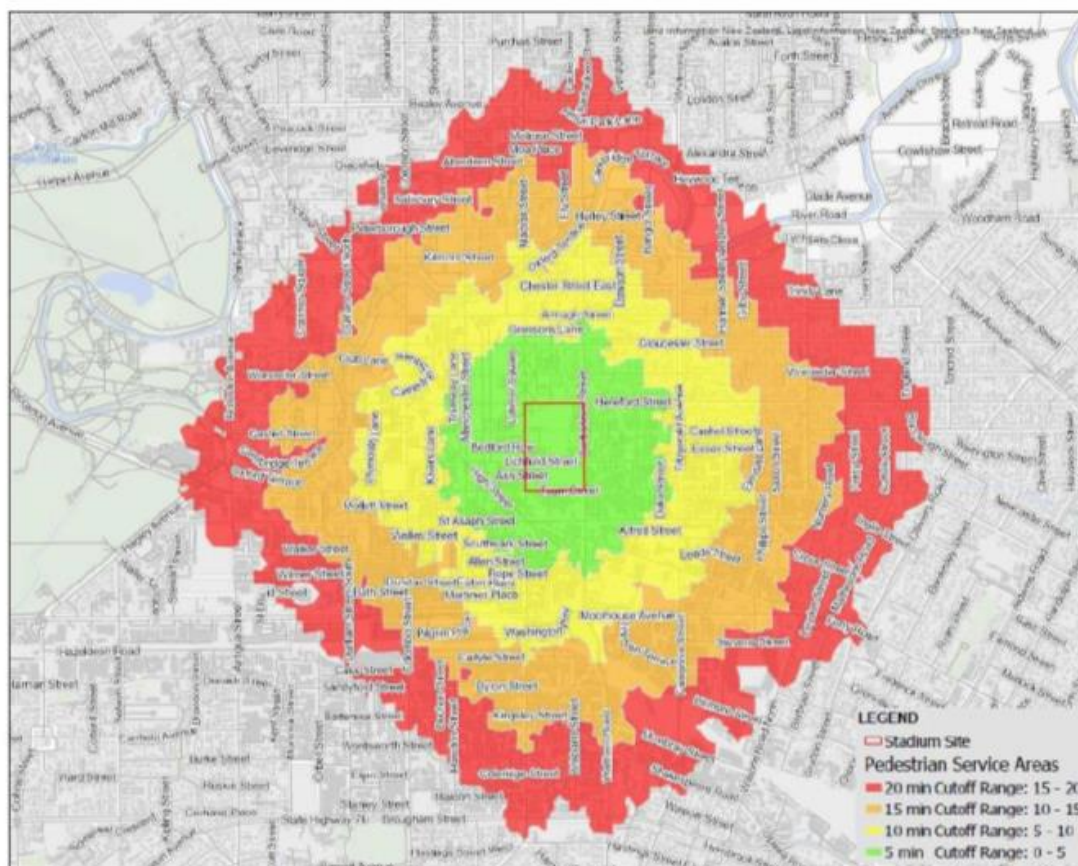


Figure 6.1 Pedestrian catchment within a 20 minute walk (Preliminary ITA, Aurecon)

The total number vehicles that are estimated to arrive and locate parking within this catchment are as follows:

- Design events =  $20000 \times 69\% / 2.8 = 4,930$  vehicles (40.7% occupied); and
- Design events sensitivity test =  $20000 \times 80\% / 2.5 = 6,400$  vehicles (53.1% occupied).
- Maximum events =  $35000 \text{ attendees} \times 69\% \text{ vehicle mode share} / 2.8 \text{ persons per vehicle} = 8625$  vehicles such that available parking within the walk catchment is 71.6% occupied;
- Maximum events sensitivity test =  $35000 \times 80\% / 2.5 = 11,200$  vehicles (92.9% occupied);

There is ample on-street and off-street parking available to support design events and based on the default assumptions for maximum events (of 69% private vehicle mode share at 2.8 persons per vehicle), there is ample parking for maximum events of 35,000 attendees.

However, there is a risk that a higher mode share is realised with less carpooling, the catchment within a 20-minute walking distance will experience a higher than desirable parking occupancy of over 85%. This reinforces the need to monitor the attendee mode share and extent of vehicle usage for maximum events, and to encourage the use of alternative modes as far as possible. Whilst a 20+ minute walk may not deter some visitors to the CMUA (or may encourage uptake of alternative modes) it may disincentivise attendance for maximum events. However, it is reiterated that the assumptions relating to the likely extent of use of private parking and occupancy of on-street and off-street parks prior to an event are intentionally conservative.



## 7. Conclusions

The preparation of the event TMPs for the CMUA has been supported by comprehensive transportation modelling undertaken by QTP Consultants using the Christchurch Assignment and Simulation Transport (CAST) Model. A range of scenarios have been run corresponding to the afternoon and evening event arrival times to understand the impacts of arrival traffic on the local and wider network. Additional scenarios which introduce proposed traffic management measures have also been tested to ensure that they do not lead to adverse operational impacts in the central city.

The key outcomes arising from the modelling assessment are as follows:

- The quantum of traffic in the central city during afternoon and evening event arrival times is generally less than the weekday lunchtime peak and is much lower than the weekday commuter evening peak period;
- Traffic volumes at event departure times are anticipated to be lower again than the event arrival time periods;
- No traffic management is required for the design and maximum event scenarios from a network efficiency perspective;
- The introduction of the proposed TMP measures (which are introduced to improve pedestrian safety and avoid vehicles from diverting onto the key public transport corridor of Manchester Street) does not compromise the efficient operation of the network, an outcome which can further be supported through wayfinding;
- The impact of events and traffic management on travel times through the central city are considered minimal across all key corridors, and do not constitute adverse effects on the efficiency of the local and wider road network; and
- Ongoing monitoring of attendee's travel choices is recommended to ensure that the private vehicle mode share and subsequent parking requirements does not greatly exceed the levels included in this assessment.

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**Auckland**

Level 1/70 Shortland Street  
PO Box 613, Shortland Street  
Auckland 1140  
Aotearoa New Zealand

**Wellington**

Digital Nomad  
Level 14/22 Willeston Street  
Wellington 6011  
Aotearoa New Zealand

**Christchurch**

Level 1/137 Victoria Street  
PO Box 36446, Merivale  
Christchurch 8146  
Aotearoa New Zealand

**hello@abley.com**

**+64 3 377 4703**

**abley.com**

# SCHEME DESIGN ROAD SAFETY AUDIT TE KAHA CANTERBURY MULTI-USE ARENA NEIGHBOURHOOD IMPROVEMENTS

PREPARED FOR CHRISTCHURCH CITY COUNCIL

07 July 2022



TRIM Number: 22/00001

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QUALITY STATEMENT

PROJECT MANAGER

Alix Newman

PREPARED BY

Rebecca Tinga

CHECKED BY

Melanie Muirson / Alex Lumsdon

REVIEWED BY

Dave Aldridge

APPROVED FOR ISSUE BY

Alix Newman

ROAD SAFETY AUDIT TEAM LEADER

Melanie Muirson

Refer to the Audit Statement in Section 9

**CHRISTCHURCH**  
Hazeldean Business Park, Level 2, 2 Hazeldean Road, Addington, Christchurch 8024  
PO Box 13-052, Armagh, Christchurch 8141  
TEL +64 3 366 7449, FAX +64 3 366 7780

REVISION SCHEDULE

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B	23/06/2022	Draft	R Tinga	A Lumsdon / M Muirson	D Aldridge	A Newman
C	07/07/2022	Updated Draft for Client	R Tinga	A Lumsdon / M Muirson	D Aldridge	A Newman



Abbreviations

CCC	Christchurch City Council
CMUA	Canterbury Multi Use Arena
HCV	Heavy Commercial Vehicle
RSA	Road Safety Audit
SAT	Safety Audit Team
TGSI	Tactile Ground Surface Indicators
TTM	Temporary Traffic Management
VMS	Variable Message Signs

## Christchurch City Council

### Te Kaha Canterbury Multi-Use Arena Neighbourhood Improvements

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## 1. Introduction

### 1.1 Safety Audit Definition and Purpose

A road safety audit is a term used internationally to describe an independent review of a future road project to identify any safety concerns that may affect the safety performance. The audit team considers the safety of all road users and qualitatively reports on road safety issues or opportunities for safety improvement.

A road safety audit is therefore a formal examination of a road project, or any type of project which affects road users (including cyclists, pedestrians, mobility impaired etc.), carried out by an independent competent team who identify and document road safety concerns.

A road safety audit is intended to help deliver a safe road system and is not a review of compliance with standards.

The primary objective of a road safety audit is to deliver a project that achieves an outcome consistent with Safer Journeys and the Safe System approach, which is a safe road system increasingly free of death and serious injury. The road safety audit is a safety review used to identify all areas of a project that are inconsistent with a Safe System and bring those concerns to the attention of the client so that the client can make a value judgement as to appropriate action(s) based on the risk guidance provided by the safety audit team.

The key objective of a road safety audit is summarised as:

'to deliver completed projects that contribute towards a safe road system that is free of death and serious injury by identifying and ranking potential safety concerns for all road users and others affected by a road project.'

A road safety audit should desirably be undertaken at project milestones such as:

- concept stage (part of business case);
- scheme or preliminary design stage (part of pre-implementation);
- detail design stage (pre-implementation or implementation); or
- pre-opening or post-construction stage (implementation or post-implementation).

A road safety audit is not intended to be a technical or financial audit and does not substitute for a design check of standards or guidelines. Any recommended treatment of an identified safety concern is intended to be indicative only, and to focus the designer on the type of improvements that might be appropriate. It is not intended to be prescriptive and other ways of improving the road safety or operational problems identified should also be considered.

In accordance with the procedures set down in the NZTA Road Safety Audit Procedures for Projects Guidelines - Interim release May 2013 the audit report should be submitted to the client who will instruct the designer to respond. The designer should consider the report and comment to the client on each of any concerns identified, including their cost implications where appropriate, and make a recommendation to either accept or reject the audit report recommendation.

For each audit team recommendation that is accepted, the client will make the final decision and brief the designer to make the necessary changes and/or additions. As a result of this instruction the designer shall action the approved amendments. The client may involve a safety engineer to provide commentary to aid with the decision.

Decision tracking is an important part of the road safety audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations. It is to be completed by the designer, safety engineer, and client for each issue, and should record the designer's response, client's decision (and asset manager's comments in the case where the client and asset manager are not one and the same) and action taken.

A copy of the report including the designer's response to the client and the client's decision on each recommendation shall be given to the road safety audit team leader as part of the important feedback loop. The road safety audit team leader will disseminate this to team members.

1.2 The Project

The Canterbury Multi-Use Arena (CMUA), which is also known as Te Kaha, is a proposed multi-use sport and entertainment venue to replace the Lancaster Park facility irreparably damaged in the Canterbury Earthquakes. The Te Kaha facility is currently in the developed design phase and a number of the details around the facilities features and operation are yet to be finalised by the design team.

The proposed facility will have pedestrian plazas on three road frontages: Madras Street, Barbadoes Street, and Tuam Street. Mobility parking is to be accessed from Hereford Street. The Madras Street frontage is proposed at-grade with the road, and the Tuam and Barbadoes frontages will be accessed via ramps and stairs. Provision for coaches to drop off from the Madras Street egresses while delivery vehicles servicing the facility are proposed to use an access on Madras Street at the northern end of the site.

The Scheme Design Safety Audit focuses on the Christchurch City Council's (CCC) improvements to the roads surrounding the Te Kaha/ Canterbury Multi-Use Arena. The major project borders Barbadoes Street, Lichfield Street, Madras Street and the Tuam Street area.

The surrounding streets (Barbadoes/ Lichfield/ Madras/Tuam) are currently in a poor state of repair in places. Street improvements for these streets are required to support the operation of the CMUA. The improvements for the surrounding streets are designed to provide quality public realm that supports users' experience and wayfinding, and streetscape works consistent with the Christchurch Central Streets and Spaces Design Guide. The street upgrades mainly focused on improving the urban realm through enhanced active travel (pedestrians, cycles, scooters) access opportunities to events at the Te Kaha/ CMUA. The extent of the scope for this scheme design safety audit is given in Figure 1-1.



Figure 1-1: Scope of CMUA Scheme Design Audit

1.3 The Road Safety Audit Team

This road safety audit has been carried out in accordance with the NZTA Road Safety Audit Procedure for Projects Guidelines – Interim release May 2013, by:

Table 1-1: Road Safety Audit Team Members

Name	Position	Organisation	Role
Melanie Muirson	Senior Principal Transportation Engineer	Stantec	Safety Audit Team Lead
David Aldridge	Senior Technical Director – Civil Engineering	Beca	Safety Audit Team Member
Alex Lumsdon	Associate – Transportation Engineering	Beca	Safety Audit Team Member / Traffic Signals Expert
Rebecca Tinga	Transportation Engineering Technologist	Stantec	Safety Audit Team Member

The safety audit team (SAT) undertook a site inspection during daylight hours on 26 May 2022 between 12:30 and 16:30. A night inspection was not undertaken for this audit.

1.4 Previous Road Safety Audits

No previous design road safety audits have been undertaken by the SAT above on this specific project. The SAT are not aware of any previous safety audits for the street improvements at the time of writing this report.

1.5 Scope of this Road Safety Audit

The scope of the Canterbury Multi-Use Arena Te Kaha Scheme Design Safety Audit includes the proposed upgrades to the road, cycleways, and footpaths of the following:

- Lichfield Street from Manchester Street to Madras Street,
- Tuam Street from Madras Street to Fitzgerald Avenue,
- Barbadoes Street from Hereford Street to Tuam Street,
- Madras Street from Moorhouse Avenue to St Asaph Street,
- Madras Street from Tuam Street to Hereford Street,
- Limited Improvements to Hereford Street at the Madras Street intersection and Barbadoes Street intersection,
- Limited improvements to Lichfield Street at the Barbadoes Street intersection, and
- Limited improvement to Cashel Street at the Barbadoes Street intersection.

1.6 Report Format

The potential road safety problems identified have been ranked as follows.

The expected crash frequency is qualitatively assessed on the basis of expected exposure (how many road users will be exposed to a safety issue) and the likelihood of a crash resulting from the presence of the issue. The severity of a crash outcome is qualitatively assessed on the basis of factors such as expected speeds, type of collision, and type of vehicle involved.

Reference to historic crash rates or other research for similar elements of projects, or projects as a whole, have been drawn on where appropriate to assist in understanding the likely crash types, frequency and likely severity that may result from a particular concern.

The frequency and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the concern assessment rating matrix in Table 1-3. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.



In ranking specific concerns, the auditors have considered the objectives of the Safe System approach, i.e. to minimise fatal or serious injury crashes.

In undertaking this assessment, the Safety Audit Team have utilised the following descriptor tables to enable a fair and reasonable rating of the risks.

Table 1-2: Crash Frequency Descriptor

Crash Frequency	Indicative Description
Frequent	Multiple crashes (more than 1 per year)
Common	1 every 1-5 years
Occasional	1 every 5-10 years
Infrequent	Less than 1 every 10 years

Crash Severity is determined on the likelihood of a crash resulting in death or serious injury. The reader is advised that the severity of an injury is determined in part by the ability of a person to tolerate the crash forces. An able bodied adult will have a greater ability to recover from higher trauma injuries, whereas an elderly person may have poor ability to recover from high trauma injuries. The auditors consider the likely user composition, and hence the likely severity of injury to that user.

Table 1-3: Concern Assessment Rating Matrix

Severity (likelihood of death or serious injury)	Frequency (probability of a crash)			
	Frequent	Common	Occasional	Infrequent
Very likely	Serious	Serious	Significant	Moderate
Likely	Serious	Significant	Moderate	Moderate
Unlikely	Significant	Moderate	Minor	Minor
Very unlikely	Moderate	Minor	Minor	Minor

While all safety concerns should be considered for action, the client or nominated project manager will make the decision as to what course of action will be adopted based on the guidance given in this ranking process with consideration to factors other than safety alone. As a guide a suggested action for each concern category is given in Table 1-4.

Table 1-4: Concern Categories

Concern	Suggested action
Serious	Major safety concern that must be addressed and requires changes to avoid serious safety consequences.
Significant	Significant safety concern that should be addressed and requires changes to avoid serious safety consequences.
Moderate	Moderate safety concern that should be addressed to improve safety.
Minor	Minor safety concern that should be addressed where practical to improve safety.

In addition to the ranked safety issues it is appropriate for the safety audit team to provide additional comments with respect to items that may have a safety implication but lie outside the scope of the safety audit. A comment may include items where the safety implications are not yet clear due to insufficient detail for the stage of project, items outside the scope of the audit such as existing issues not impacted by the project or an opportunity for improved safety but not necessarily linked to the project itself. While typically comments do not require a specific recommendation, in some instances suggestions may be given by the auditors.

## 1.7 Documents Provided

The SAT was provided with the following documents for this audit.

Table 1-5: Documents Provided to the SAT

Name	Date modified	Type	Size
1_CMUA surrounding streets consultation plan TP360101 merged 26.05.22.pdf	26/05/2022 10:16 pm	Adobe Acrobat D...	15,137 KB
2_CMUA Barbadoes Street scheme RD385755 updated 26.05.22.pdf	26/05/2022 10:17 pm	Adobe Acrobat D...	2,720 KB
3_CMUA Lichfield Street scheme minor landscape Rd3829s9 updates 26.05.22.pdf	26/05/2022 10:18 pm	Adobe Acrobat D...	5,000 KB
4_CMUA Madras Street Extension Calming Moorhouse ARA Rd3859s6 dated 2022_0525 .PDF	26/05/2022 10:17 pm	Adobe Acrobat D...	10,949 KB
5_CMUA Madras Street scheme RD3859 dated 2022_0525.PDF	26/05/2022 10:18 pm	Adobe Acrobat D...	5,600 KB
6_CMUA Tuam Street scheme Rd3854s3 dated 2022_0526 .pdf	26/05/2022 10:19 pm	Adobe Acrobat D...	3,372 KB
7_CMUA surrounding streets Existing Traffic Signals Plan.pdf	26/05/2022 10:19 pm	Adobe Acrobat D...	8,777 KB
7_CMUA surrounding streets Existing Traffic Signals Plan_Optimized v1.pdf	20/06/2022 9:26 am	Adobe Acrobat D...	2,081 KB
8A_CMUA Te Kaha Street Views - CONFIDENTIAL.pdf	26/05/2022 10:19 pm	Adobe Acrobat D...	5,335 KB
8B_CCC Streetscape workshop 9 Feb 2022_Abley slides - CONFIDENTIAL.pdf	26/05/2022 10:19 pm	Adobe Acrobat D...	3,841 KB
8C_CMUA Site Plan Parking - CONFIDENTIAL.png	26/05/2022 10:19 pm	PNG File	1,054 KB
8D_CMUA TMP - CONFIDENTIAL.pdf	26/05/2022 10:16 pm	Adobe Acrobat D...	966 KB
9a_CMUA Draft Traffic Signals Plans 9 sites_2022_0618.pdf	20/06/2022 9:26 am	Adobe Acrobat D...	2,759 KB
9b_CMUA Traffic Signals Markup 3 sites_2022_0618.pdf	20/06/2022 9:26 am	Adobe Acrobat D...	32,426 KB
rd3829s10-Lichfield with services.pdf	23/06/2022 12:46 pm	Adobe Acrobat D...	4,540 KB
TP360101-sheet 5 Lichfield 22.06.22.pdf	23/06/2022 12:46 pm	Adobe Acrobat D...	3,220 KB

The safety audit team were also supplied with several confidential documents that form part of the business case development for the arena. The safety audit was prepared with these in mind but they are not included in the Appendices.

## 1.8 Disclaimer

The findings and recommendations in this report are based on an examination of available relevant plans, the specified road and its environs, and the opinions of the SAT. However, it must be recognised that eliminating safety concerns cannot be guaranteed since no road can be regarded as absolutely safe and no warranty is implied that all safety issues have been identified in this report. Safety audits do not constitute a design review nor are they an assessment of standards with respect to engineering or planning documents.

Readers are urged to seek specific technical advice on matters raised and not rely solely on the report.

While every effort has been made to ensure the accuracy of the report, it is made available on the basis that anyone relying on it does so at their own risk without any liability to the safety audit team or their organisations.

2. General and Project-Wide Safety Concerns

2.1 CMUA Operation and Event Management Planning

Significant

Without transparency around how the CMUA facility is designed and will eventually operate, this safety audit has been undertaken based on a number of assumptions regarding the function of the vehicle and pedestrian entrances, and the expected behaviours of patrons and performers. Initial operational planning information has been provided to the SAT. The SAT can only offer high level comment without fully understanding how the CMUA will function, and it is likely that the proposed improvements will require further audits when the more detailed CMUA operations information becomes available.

There are currently only draft event management operation plans available for the SAT team to consider in undertaking the audit, and many of the judgements in the safety audit are made under the assumption that roads will be open and operating normally during events. The SAT has been advised that the “design event” will cater for between 15,000 and 20,000 patrons, such as a Crusaders rugby game or a medium sized concert. The draft information assumes that the current transport network and footpath widths can accommodate these pedestrian volumes with the assumption from the Integrated Transport Assessment that 70% of pedestrians will enter and exit the CMUA from the western / Madras Street interface. According to the information provided by CCC, only a “full sports event” or a “maximum concert event” will trigger the need for road closures on Cashel Street and Lichfield Street between Madras and Manchester Streets while a lane closure is proposed for the lane closest to the CMUA on Madras Street. The SAT is concerned that patrons from events will be placed at risk of being hit by vehicles where adequate (temporary or permanent) controls have not been implemented.

Similarly, of the SAT have not been privy to liaison with any of the emergency services around operational requirements during events.

Recommendation(s)

- 1. Create management plans for the operation of the roading network during events.
- 2. Liaise with emergency services for feedback on the proposed design and for input on operational management plans.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	1. ETMP are being developed by Abley for this purpose 2. These designs have been shared and discussed with the emergency services. No issues were raised.	
Safety Engineer comment	Agree with SAT and Designer response	
Client decision	Insert comment	
Action taken	Insert comment	



## 2.2 Design Omissions

Significant

A number of factors have been omitted from the overall design that are likely to have material impacts on the overall operation of the road network around the CMUA.

The extent of the project potentially does not extend far enough west and more consideration is needed around infrastructure west of Madras Street to key activities in the central city such as public transport and hospitality areas. An example is where Nurseryman Lane exits onto Tuam Street, the anticipated changes in volumes using Nurseryman Lane will result in an increased risk of conflicts with pedestrians and cyclists at the Tuam Street interface (further detail is provided in Section 5.1). This includes the pedestrian thoroughfares through to the Bus Interchange (via Lichfield and Tuam Streets) where there are narrow footpaths and signalised intersections on Manchester Street, that require consideration under an event scenario.

There is a significant gap in the design with no improvements proposed for Hereford Street between Madras and Barbadoes Streets. The current configuration does not provide a safe environment for ingress and egress from the off-street parking area designated for mobility parking, as the accesses will become obscured easily when vehicles use the on-street parking as it is currently marked out. This is a particular risk for mobility impaired users who may not have the range of movement required to lean or turn and may result in risky entry and exit behaviours and increase the risk of collisions with through traffic that are obscured by parked vehicles.



Figure 2-1: On-Street parking will potentially obscure visibility from and of the proposed accessways to the on-site mobility parking area.

The proposed reconfiguration of Lichfield Street from one way eastbound to two-way operation is not included in this design package but is likely to have impacts on the wider operation of the network. The reconfiguration of the intersection of Lichfield Street and Fitzgerald Avenue will have a measurable impact on the accessibility of the CMUA from the eastern suburbs. There is a risk that the Lichfield Street design will be even more disjointed if this is undertaken as a separate project because the ability to integrate design elements between the Lichfield Street redesign and the streets around the CMUA design may be hindered by the projects being developed separately.





Figure 2-2: The current (left) and proposed (right) layouts of the Barbadoes/Lichfield intersection

Similarly, separating the vital wayfinding and signage designs into a discrete project introduces the same cohesiveness risks. Wayfinding and signage should integrate seamlessly into an overall design, having wayfinding in a separate project removes the ability to modify the underlying infrastructure design to complement the wayfinding and signage. There is a risk that undertaking the wayfinding and signage plans separately will fail to adequately reflect the intent of the overall transport infrastructure improvements leading to infrastructure and signage that are inconsistent and become confusing for the user.

#### Recommendation(s)

1. Detail measures that will be implemented to the streets west of Madras Street to cater for the expected demand under the "design event" and "maximum event" scenarios.
2. Review the configuration of the Nurseryman Lane exit on to Tuam Street.
3. Reconsider the need for upgrading Hereford Street between Madras and Barbadoes Streets.
4. Include the design for the Lichfield Street conversion from one way eastbound to two-way operation in the main CMUA neighbourhood improvement project (including the Lichfield / Fitzgerald intersection upgrades).
5. Integrate the wayfinding and signage designs into the main CMUA neighbourhood improvements project.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	<ol style="list-style-type: none"> <li>1. These issues are intended to be addressed by the Lichfield Street proposals between (and including) the Madras &amp; Manchester St intersections. It is also anticipated that footpath connections to the Interchange will be completed on Tuam and Lichfield Street (west of Manchester) prior to the Te Kaha opening.</li> <li>2. Nurseryman Lane was created as part of the Innovation Precinct development to provide an exit route from the nearby new parking building. As part of the local wayfinding strategy for Lichfield St, drivers will be signed to avoid Nurseryman Lane. Furthermore, traffic associated with the residential development in the East Frame (north of Lichfield Street) is considered insignificant throughout a 12 hour day. It is expected that access to those residential units is more likely to be via a northbound service lane only. A give way control will be placed on the exit of Nurserymans Lane.</li> <li>3. Some further information as to the likely key safety issues identified would be helpful, as key vehicle entry and exit to this area is likely to be focussed on exclusive mobility parking at event times - and to occur under various event management plans and site marshalling arrangements.</li> </ol>	

Recommendation(s)

	<ol style="list-style-type: none"> <li>4. The proposed layouts now include the latest Lichfield configuration at the Madras intersection and is addressed within the relevant section later in this report. Details of upgrades at the Fitzgerald Ave intersection have yet to be prepared and are outside the scope of this audit.</li> <li>5. Wayfinding and signage designs are not included in the project but a separate central city wayfinding project is underway which will look at this.</li> </ol>
Safety Engineer comment	<p>Generally agree with SAT and Designer responses, however it is unclear which specific issue(s) identified by SAT lead to the Significant rating as many of the issues identified appear to be more design / operation related matters. Additional / specific comments as follow:</p> <ol style="list-style-type: none"> <li>1. Additional improvement works west of Madras noted as indicated in the Designer response. It is also understood that improvement works are proposed on High Street.</li> <li>2. Noted that wayfinding signage will seek to discourage general traffic use of Nurseryman Lane, however a concentrated discharge of the parking building after events at the CMUA may result in significant vehicle movements out to Tuam Street (or out to Madras Street via Ash Street?) at the same time as high numbers of pedestrian movements past these interfaces. Intention to install Give Way control on Nurseryman Lane at Tuam Street noted, but recommend consideration of additional treatments (eg. traffic calming features and/or audio-visual warning systems).</li> <li>3. Agree with SAT concern regarding on-street parking potentially obscuring visibility at mobility parking accesses. Designer response noted that event management plans will seek to address operation of these accesses, however it is understood that TTM (which may provide for removal of parking near the accesses) may not be required for smaller events that might still generate moderate traffic movements on the mobility parking accesses. While an upgrade of Hereford Street as suggested by SAT may not be justified, it is recommended that current on-street parking arrangements around the mobility parking accesses be reviewed.</li> <li>4. Lichfield Street scope inclusions / exclusions and considerations noted as indicated in the Designer response.</li> <li>5. Noted that wayfinding / signage designs are not included in this project scope and consider that these can be developed / progressed as separate packages of works whilst still incorporating an appropriate level of integration and alignment with the CMUA Neighbourhoods project.</li> </ol>
Client decision	Insert comment
Action taken	Insert comment

## 2.3 Consistency of Overall On-Street Design

From the plans supplied to the SAT, there are a number of inconsistencies present in the overall design when it is considered at a network level. Where the design of each road has been undertaken individually, the same design elements have not been applied consistently across the entire project and there are inconsistencies between each individual road section.

The key risk around disjointed network design is that it becomes increasingly difficult for users to interpret, which increases the risk of generalised and specific conflict between users, and between user groups.

### 2.3.1 Operating Speeds and Raised Platforms

Significant

There is a disconnect in the proposed signalised intersection improvements and the intended speed environments particularly along the Madras Street and Barbadoes Street one way pair on the western and eastern extents of the CMUA site. Madras Street is proposed to have a posted speed limit of 30km/h with no raised platforms at the signalised intersections, while Barbadoes Street is proposed to retain the existing 50 km/h posted speed limit together with raised platforms in place at each of the signalised intersections on the CMUA boundary. The inconsistent designs will not reinforce the proposed speed limits, and this increases the potential for poor compliance with posted speed limits and increased severity of crashes.

The design does reduce the carriageway width, providing different flush surfacing at the intersections and remove parking on the eastern side of Madras Street, yet even on a green wave a vehicle can travel in excess of the 30km/h posted speed limit. Therefore, the implementation of raised platforms at the key intersections on Madras Street would assist with creating the self-explaining environment and attenuate speeds, which reduces the risk of high severity crashes. Conversely, Barbadoes Street is to remain at 50km/h but have raised platforms at three intersections which provides a completely different message to drivers. The SAT understand the need to maintain a higher speed for Barbadoes Street, which is supported by the reduced predicted pedestrian flows to the east from the CMUA during events, yet the inclusion of raised platforms on Barbadoes Street is inconsistent with the primary function and speed limits.

The SAT understand that there are stormwater issues on Madras Street that introduce additional complexity to the design of raised platforms at those intersections. However, there is a need for finding engineering solutions to mitigate drainage issues including secondary drainage into neighbouring properties, as this is not an adequate reason for not imposing safety interventions.

A number of other aspects around signal and crossing configurations, including the pedestrian crossing widths and cycle provisions are inconsistent between intersections. There is an expectation that approximately 70% of event attendees will arrive from and leave to the west of the CMUA, but they will be distributed evenly across the grandstand seating and therefore will interact with roading infrastructure at the south, east, or north of the arena as they find their seats or exit the arena after an event. Where signalised intersections are designed differently from place to place it makes it more challenging for users to understand and may lead to misuse and increased conflict between user groups.

#### Recommendation(s)

1. Ensure that all the areas under consideration are treated in a consistent manner to create a cohesive and consistent design that is self-explaining to all users.
2. Review the design so that the carriageway and intersections are designed to support the appropriate speed management measures on each of the streets under consideration.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	1. The standard design for a raised platforms at intersection has not been feasible due to significant stormwater issues that are expected to cause flood to adjacent properties and have therefore not been shown to date. However, the possibility of a raised surface on the approaches to the crossing points will be considered where acceptable surface water drainage can be achieved. We will look to consider during detailed design mid-block and intersection approaches mid-block raised platforms. Since all streets are signal controlled it is envisaged that the SCATS phasing will use offsets that are based on the 30 kmh to discourage speeding.	

07 July 2022 | Status: Draft for Comment | Project No.: 310203418 Child No.: 220.2215 | Our ref: Scheme - Safety Audit - Report - Te Kaha CMUA - Barbadoes Lichfield Madras Tuam - Safety Audit Report - Revision C - SE ~ 09(2).docx



#### Recommendation(s)

	2. In the case of crossing widths, for the majority of time pedestrian flows will be relatively low and only busy immediately before and after major events. During these periods, temporary long ped phases will be configured as well as other extensive temporary traffic management that will aid pedestrian movements. Consequently the permanent crossing designs will be sufficient.
Safety Engineer comment	<p>1. Agree with SAT. Designer response regarding Madras Street storm water / drainage complications on Madras Street and possible use of (smaller) vertical traffic calming features on the crossing point approaches noted and accepted. No Designer response regarding use of raised platforms on Barbadoes Street and appropriateness of these features on the higher speed limit corridor compared to the design approach taken on the lower speed limit Madras Street. Nevertheless, it is still considered that there is merit in providing platforms on the Barbadoes Street intersection in terms of pedestrian safety at those locations.</p> <p>2. Agree with SAT. Designer response regarding crossing widths and operation noted and accepted, but is perhaps not directly related to the SAT recommendation which relates to consideration of speed management measures appropriate to the speed limit and desired speed environment.</p>
Client decision	Insert comment
Action taken	Insert comment

### 2.3.2 Cycleway Infrastructure and Network Design

Significant

The provision of cycle lanes is largely focussed on transporting cyclists past the CMUA in continuous directions of travel, but little consideration has been given to transitioning cycles from the cycle lanes into the CMUA or for allowing cyclists to turn right at intersections. There is no provision on Madras Street or Barbadoes Street to allow cyclists to transition from on-road cycle lanes to the footpath/shared path to cross at the signalised crossing points, and the only intersection with hook turn boxes provided is the Tuam/Barbadoes intersection. There are no right-turn provisions at either of the Hereford Street intersections, and the proposed northbound cycleway detour via Latimer Square West does have a connection for patrons seated on the eastern half of the stadium.





Figure 2-3: And example of poor cycle integration at the intersection of Madras and Cashel Streets; there is no facility for cyclists to move from the on-road cycleway onto the crossing points and into the arena

The lack of adequate access facilities for cyclists increases the risk of conflicts between cycles and vehicles where cyclists may opt to use vehicle lanes instead of cycle lanes to approach the CMUA, and between cycles and pedestrians if cyclists opt to use pedestrian crossings and footpaths to access the CMUA. The lack of intersection right-turn facilities for cyclists increases the potential of collision with vehicles, for which the outcomes for cyclists are particularly severe.

There are a number of practicality and safety issues associated with the proposed on-street cycle parking, proposed to be placed around the CMUA site between the footpaths and carriageways. The SAT appreciates the need for cycle-parking near the entrances and exits, however it is likely that the proposed cycle stands will lead to parked cycles encroaching on the footpaths and creating trip hazards for pedestrians. The locations are likely to be inundated with pedestrians exiting from the CMUA at the end of an event and will be challenging for users to access through crowds, and for them to safely depart on their bikes while crowds linger. There is also a stand of cycle parks proposed across the entranceway that is designated for the heavy vehicle access, refer to Figure 2-4.

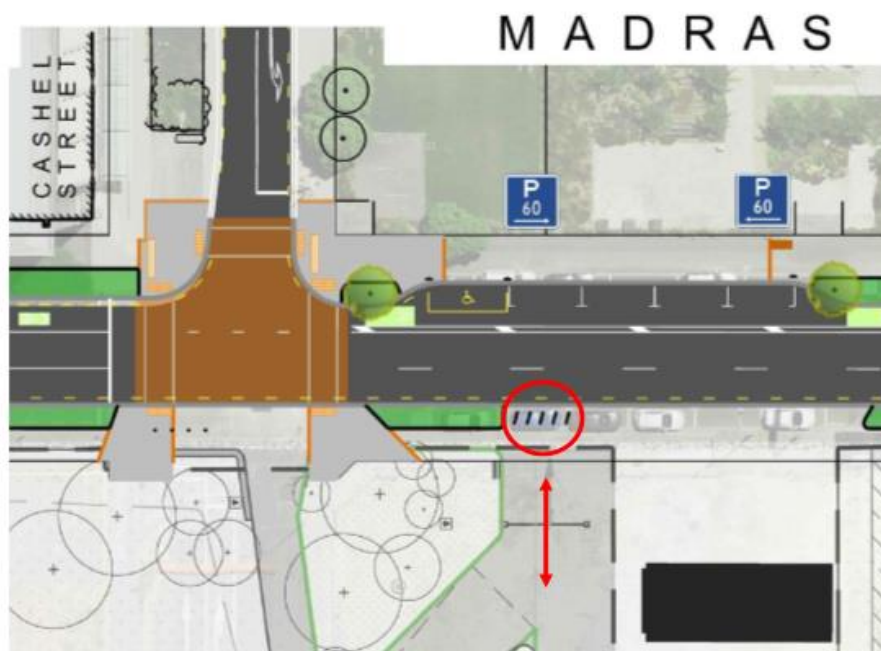


Figure 2-4: Proposed cycle parking across the Madras Street heavy vehicle accessway.

There is also inadequate provision of green cycleway surface treatments across the CMUA on-street improvement design drawings, with discontinuity or complete omission of the green surfacing in key many areas. For example, the green surfacing is missing in cycle lanes on the exit of intersections on Madras Street at Tuam, Lichfield and Cashel Streets. These are explored in depth in the respective roading sections below, at the high level the omissions are inconsistent across the project and there is benefit in considering the cycle provisions at a network level to ensure consistency and comprehensibility.

Where on-street cycle lanes are proposed on Madras Street, Barbadoes Street and Tuam Street, these are adjacent to marked on-street parking spaces. There is a risk that drivers do not check before opening their doors into the path of a cyclist. This would result in a serious injury if not a fatality to the cyclist as they could attempt to avoid the opening door and move into the path of an oncoming vehicle in the adjacent traffic lane.

#### Recommendation(s)

1. Review the overall provision of cycle infrastructure for adequacy and consistency.
2. Establish additional cycle provisions to better link in with the CMUA accesses.
3. Reconsider the provision and locations of on-street cycle parking to separate these positions from the primary paths for patrons arriving and leaving the stadium.
4. Ensure that the green surfacing in the cycle lanes is provided in key conflict points such as at bus stops, car parks, accesses and on the approach to and exit from intersections.
5. Ensure that sufficient width is provided for cyclists in the on-street cycle lanes adjacent to marked parking areas.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	1. Agree that consistent treatment of cycle facilities should be included; these have been reviewed and incorporated in the design throughout the affected street network. 2. The current access strategy discourage cyclists from riding within the site itself. However, cycle access is expected to take place at the intersections and will be	



Recommendation(s)

	confirmed during the detailed design stage and could include hook turns at appropriate locations. 3. Agree. The cycle parking adjacent to Madras Street has been adjusted to enable a clear path for authorised vehicles entering and leaving the stadium concourse. 4. Green surfacing will be provided 5. Agree and this with be provided where possible.
Safety Engineer comment	Agree with SAT recommendations 1-5 and Designer responses. Intention to discourage cycling within the site noted.
Client decision	Insert comment
Action taken	Insert comment

2.3.3 Landscaping and Street Furniture Provisions
 Significant

The CCC drawings have an indicative layout for the CMUA site within the property boundaries. The SAT has considered that this is only indicative and will be subject to change. However, based on what is currently presented, there are concerns regarding the integration of the on-street and CMUA site designs to create a cohesive and integrated environment.

A number of the areas of landscaping are likely to obscure pedestrian desire lines, especially after events when pedestrians will be exiting the arena in large numbers. In several places there is site landscaping and street furniture (bollards, seating, etc) located inside the CMUA boundary that is positioned directly in the way of pedestrian desire lines, and there are landscaping beds proposed in the footpaths directly adjacent to a number of the stadium accessways in several places. These landscaping beds will especially hinder vulnerable users crossing at intersections either heading towards or away from the facility, and will also pose trip hazards to able-bodied pedestrians. Unexpected changes to surface texture or landscaping bed established at different levels to the surrounding footpaths can pose trip hazards to pedestrians, which have especially severe outcomes for vulnerable users. Figure 2-5 demonstrates the expected pedestrian movements between the Madras Street on-street frontage and the CMUA western plaza.

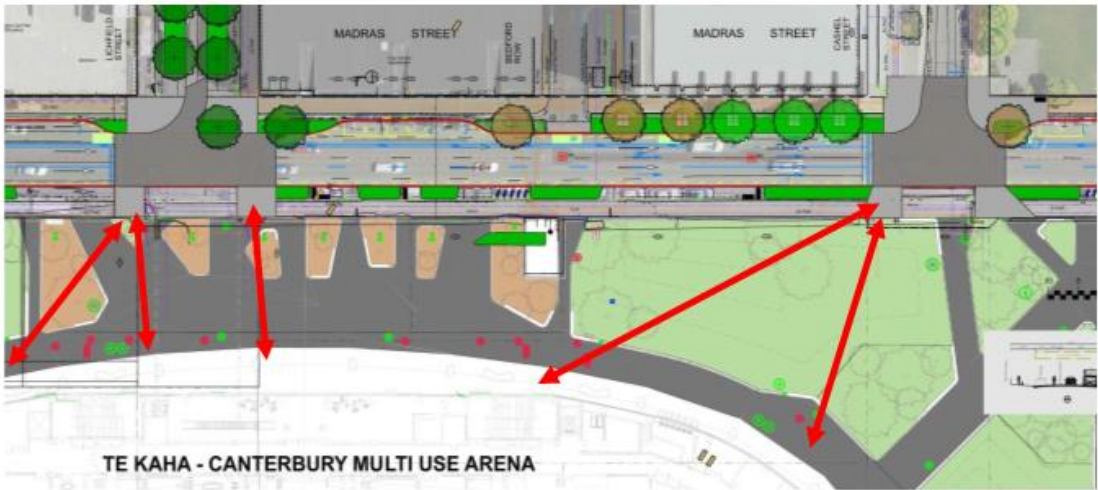


Figure 2-5: Example of expected pedestrian movements between Madras Street and CMUA Western Plaza

As landscaping is increasingly walked over, the soil surface is exposed and compacted, which can become slippery in wet conditions. As the CMUA is proposed to be used year round, the chances of the landscaping beds becoming very slippery from being tracked over are increased during the winter months, increasing the frequency of slips trips and fall for pedestrian users.

Specific examples are provided in subsequent sections, as the SAT found proposed on-street landscaped areas could pose a trip hazard for all footpath users, especially in narrower sections.

Recommendation(s)

- 1. Coordinate the designs between the CMUA on site landscaping and pathways and the on-street designs of the surrounding transport network.
- 2. Establish buffers between footpath areas and landscaped areas to absorb pedestrian overflows without becoming compacted and slippery.
- 3. Reconsider the positions of on-street landscaping beds and street furniture to optimise the usability of the footpaths bordering the CMUA.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Agree with the concerns raised though this is outside the scope of the scheme design for the affected streets. This will be brought to the attention of the landscape designers to ensure these effects are mitigated appropriately.	
Safety Engineer comment	Agree with issue raised by SAT, but disagree with 'likely' severity rating and overall 'significant' safety concern rating. Agree with Designer response.	
Client decision	Insert comment	
Action taken	Insert comment	

2.3.4 Traffic Signals

Moderate

The project encompasses a large number of signalised intersections that will require upgrading of the existing signal infrastructure and potentially the installation of new signal poles, mast arms and detectors.

A review of the Traffic Signal plans revealed an inconsistency between the overall scheme design drawings and the traffic signal drawings, namely at the Barbadoes / Cashel intersection. A snapshot of both drawings is below which shows the cyclists being directed off the Cashel Street approach into the widened shared area in the scheme drawings while the cyclists are to remain in the on-street lane in the traffic signals drawings.

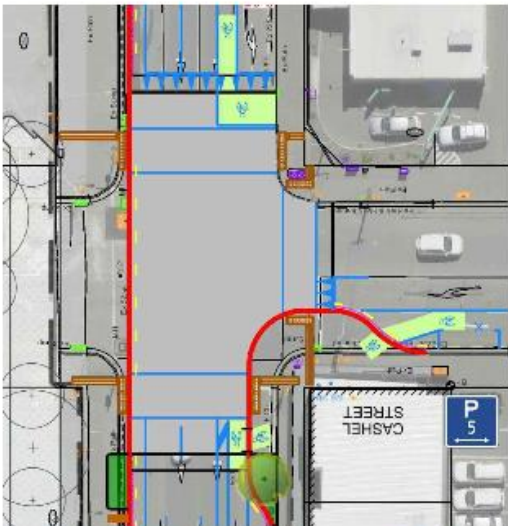


Figure 2-6: Scheme Design Drawings – Barbadoes /Cashel Intersection

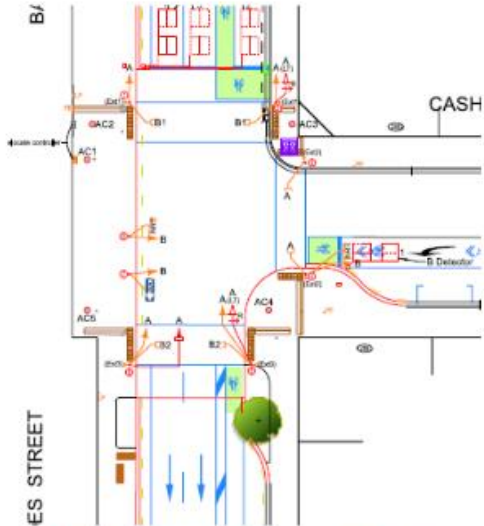


Figure 2-7: Traffic Signals Drawings – Barbadoes /Cashel Intersection



Overall observation from the review of the traffic signals drawings were that some cycle detector loops were not shown on approaches to intersections, an example being the Barbadoes /Cashel Intersection above. Poor or no detection for cyclists, particularly on side roads, may lead to bad decision making and cyclists negotiating the signal on red phases. This places cyclists in hazardous situation where they could conflict with vehicles on the main road that has the green phases.

#### Recommendation(s)

1. Coordinate the traffic signals drawings with the overall scheme design drawings to ensure that there are no discrepancies between the drawings.
2. Review the need for cycle detector loops on side road approaches to signalised intersections.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	<ol style="list-style-type: none"> <li>1. Traffic signal drawings are being prepared for the scheme and will consistent with the proposed layouts.</li> <li>2. Cycle detector loops will be included where appropriate.</li> </ol>	
Safety Engineer comment	Agree with SAT and Designer response.	
Client decision	Insert comment	
Action taken	Insert comment	

## 2.4 Wayfinding and Human Behaviour Factors

Moderate

The SAT's impression of many of the design elements included in the CMUA package is that the designers have not considered the human behaviour elements that impact much of the infrastructure proposed. In particular, further consideration is required of the user behaviours and mode split with respect to the design of pedestrian and active transportation crossing points at nearly all intersections, especially around the widths of pedestrian crossings and the corresponding links into the CMUA site.

Christchurch is not as pedestrianised as most other cities of a similar scale and both pedestrian and driver behaviours differ to those in well pedestrianised cities. The SAT acknowledge that in the last 10 years, more active mode measures have been implemented within the central city and wider urban area through An Accessible City and Major Cycleway Route programmes. Christchurch pedestrians accessing largescale events are used to significant Temporary Traffic Management (TTM) set-ups being in place to accommodate such events and will behave under the expectation that the surrounding roads are available for them to use. If the CMUA will not be utilising road closures and lane drops to accommodate high pedestrian volumes for the "design event" configuration, extra consideration will be needed to prevent pedestrians from straying into carriageways. Similarly, drivers are not used to navigating areas with high pedestrian volumes and better provision needs to be made to reinforce to vehicles when large volumes of pedestrians will be present.

There is no clear explanation of how the active modes will interact with vehicles both on the CMUA site (for example coaches versus vulnerable users in the Western Plaza and heavy vehicles versus vulnerable users in the Northern Plaza) and on the surrounding road network, especially around the expectations for micro mobility and where it is and is not permitted.

The directional changes to Tuam and Lichfield Streets will lead to changes in circulation patterns and rat-running through local streets to the east of Barbadoes Street, particularly Duke and Clarkson Streets that are not designed for the traffic volumes that will begin to use them. This will be particularly disruptive and dangerous if coaches use these routes for circulation, and they very likely will for convenience instead of taking longer routes to negotiate the one-way systems.

A wayfinding strategy is required in the immediate area so that all modes can safely access the CMUA while a wider network wayfinding strategy is required to specifically cater for all modes that will travel to and from the CMUA as follows:

- Coaches dropping teams off in the western plaza

- Coaches dropping patrons off in the designated area on Tuam Street between Barbadoes Street and Fitzgerald Avenue
- Uber and other rideshare providers having a designated drop off/pick up area as there are no limitations on the drawings currently. The SAT understand that provision is proposed on Lichfield Street between Barbadoes Street and Fitzgerald Avenue, but no plans have been provided.
- The only heavy vehicle access is off Madras Street at the northern end of the site immediately north of the Cashel Street intersection.
- Access to the proposed mobility parking is off Hereford Street with an entry and exit arrangement.
- Overall wayfinding to and from the site for vulnerable users (including pedestrians, cyclists, scooters, mobility impaired) from key areas such as the Bus Interchange, taxi and rideshare locations, hospitality areas in the wider CBD.

#### Recommendation(s)

- Ensure that an area wide mitigation strategy is considered to the areas beyond the project to reduce the travel behaviour patterns negatively impacting the wider transportation network, i.e. use of legible wayfinding measures for all modes, traffic calming on side streets and event temporary traffic management.
- Consider contingency plans for unexpected events or incidents.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	This issue is outside the scope of the scheme design for the proposed street layouts. The identified issues and recommendations will be referred to the staff involved with event management and strategic matters.	
Safety Engineer comment	Generally agree with issue raised by SAT, but unclear which aspects of the issue result in a 'likely' severity rating. Agree with Designer response.	
Client decision	Insert comment	
Action taken	Insert comment	

## 2.5 Tactile Ground Surface Indicators

Significant

The location of some of the proposed warning tactile ground surface indicators (TGSIs) in relation to the pedestrian call buttons do not conform to *RTS 14 – Guidelines for facilities for blind and vision impaired pedestrians*. Pedestrian push buttons should be easily accessible by all pedestrians.

The directional TGSIs sometimes do not line up with the signal poles, e.g. at the north-western quadrant of the Barbadoes / Lichfield intersection and at the north western quadrant of the Madras / Cashel intersection. While at some intersections, the TGSIs, the warning TGSIs are provided but are missing the directional TGSIs, e.g. the eastern side of Madras Street at opposite the Cashel Street intersection. There are also other areas where the TGSIs do not cover the full length of the crossing, e.g. the north eastern quadrant at the Madras / Tuam intersection.

Therefore, it is recommended that a full review of all pedestrian crossing points in the Scheme Design is undertaken to ensure that every crossing point is compliant with RTS 14.

#### Recommendation(s)

- Ensure that the TGSIs on all intersection quadrants and mid-block crossings within the project area are compliant with RTS 14 for location of both the warning pavers and implementation of directional pavers.

#### Recommendation(s)

Frequency Crashes are likely to be infrequent	Severity Death or serious injury is very likely	Rating The safety concern is significant
Designer response	Agree with this point. All tactile paving designs/TGSIs will be modified to meet RTS 14.	
Safety Engineer comment	Agree with SAT and Designer response. Presumably the 'likely' severity rating and 'significant' safety concern rating relates mostly to missing warning TGSIs rather than misaligned directional TGSIs.	
Client decision	Insert comment	
Action taken	Insert comment	

## 2.6 Lighting

Significant

The SAT did not undertake a night visit as part of this scheme design safety audit. The on-street drawings do not detail the proposed lighting standards and locations.

Therefore, given the scale and location of the project there are a couple of key points that need to be considered as the project progresses.

- Where the lighting is poor, this reduces the ability for motorists to see signs and markings as well as physical objects such as islands, raised platforms and other road furniture in advance of the hazard. This could result in vehicles colliding with road features due to the poor illumination.
- A full lighting design and drawings need to be prepared for all the intersections, footpaths, shared paths and mid-blocks where improvements and/or changes are proposed as part of this project.

#### Recommendation(s)

- Ensure that all upgraded intersections and new footpath and shared path facilities are well lit (i.e., meet the AS/NZS 1158 Lighting for roads and public spaces standards). Provide full lighting design and plans for all the intersections and areas where improvements are proposed.
- Review the retroreflectivity of all signs in the project area and replace existing signs where they fail to meet the observation standards in the TCDM.
- Ensure that all pavement markings and delineation are provided in accordance with the TCDM.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	<ol style="list-style-type: none"> <li>Agree with the concerns raised. These issues will be brought to the attention of the lighting consultant to include in their proposed design.</li> <li>All proposed signs and markings shall be provided in accordance with the TCDM.</li> <li>See 2.</li> </ol>	
Safety Engineer comment	Agree with SAT and Designer responses. Presumably the 'likely' severity rating and 'significant' safety concern rating relates mostly to lighting of pedestrian crossings.	
Client decision	Insert comment	
Action taken	Insert comment	



### 3. Madras Street Safety Concerns – Moorhouse to St Asaph

#### 3.1 St Asaph Street Intersection

Serious

The proposed changes to the intersection of St Asaph and Madras Streets are significantly more complex than the existing layout and introduces more conflict point between pedestrians, cyclists, and other micro-mobility users. The proposed improvements are to give effect to a separate scheme to extend the key cycle route through High Street between Tuam and St Asaph Streets. The SAT consider that this creates an area where vulnerable users converge into one area with a lack of messaging on how to navigate it which result in the associated loss of amenity for pedestrians.

The south-eastern quadrant of the intersection is proposed to be designated as a shared space, but the cycle desire lines will directly conflict with pedestrians waiting to cross St Asaph Street. Pedestrians wishing to cross St Asaph Street to travel north will need to wait in the path of all the cycle movements originating from High Street. The SAT observed on site that when Ara students are leaving the campus, there can be groups of pedestrians at any one time using this intersection and there is potential for the pedestrians to block the path for cyclists under this arrangement.

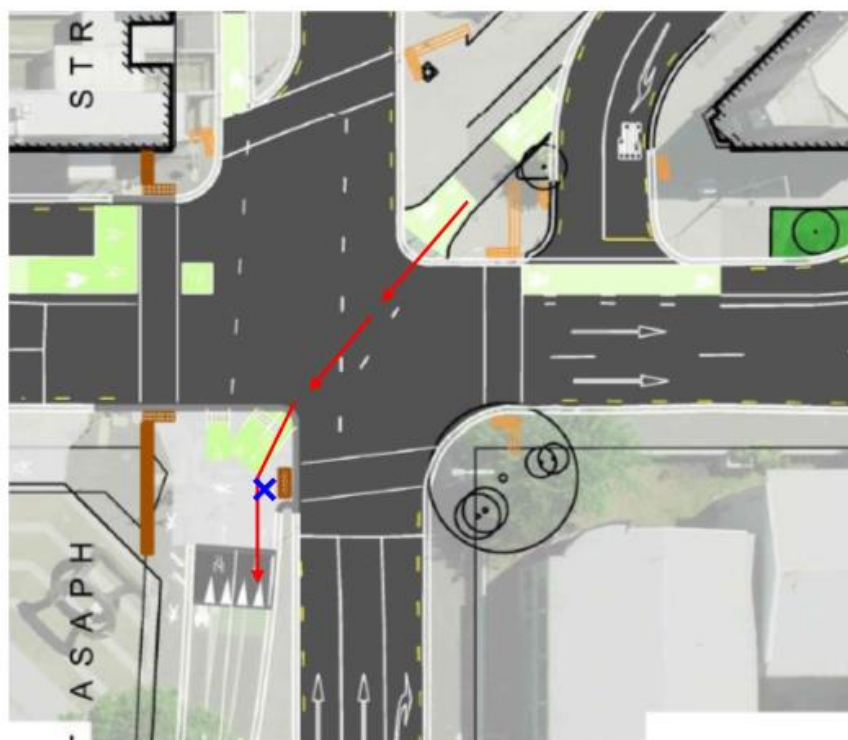


Figure 3-1: Cyclists crossing onto St Asaph Street from High Street will conflict with pedestrians waiting to cross St Asaph Street.

The introduction of the shared area on the east of Madras Street creates a new cycle movement which had previously not been present at the intersection, and there are number of possible conflicts that the new southbound cycle movement will introduce – particularly where cyclists are turning south from St Asaph Street, or from High Street to access the Ara campus and crossing over the pedestrian desire lines in the space. This increases the potential for pedestrians to be hit by cyclists or micro-mobility users as they pass through the spaces, and the relative higher speeds these modes travel at increases the severity of outcomes for all users.



There is a long set of directional pavers proposed to lead into the southern Madras Street pedestrian crossing which poses a slip hazard for cycles turning across it. It may also be confusing for visually impaired users, as it is a non-standard length. There are no directional pavers proposed at all for the eastern St Asaph Street pedestrian crossing, which introduces illegibility for visually impaired users trying to find the crossing point and increases the risk of them crossing away from the designated location.

The intersection plans show a pair of directional arrows at the interface of the St Asaph Street cycleways and the shared space which direct cycles connecting from the shared path to the cycleway to cut across westbound cyclists. This significantly increases the risk of collision between cyclists and micro-mobility users at the interface of the two spaces.

No improvements are proposed for the north-eastern quadrant of the intersection where the footpath widths are constrained between the adjacent student accommodation buildings and fences and the carriageway. Since the eastern side of Madras Street to the south is to be converted to a shared path, there is a risk of cyclists continuing north to avoid joining the on-street cycle lane on the western side of Madras Street.

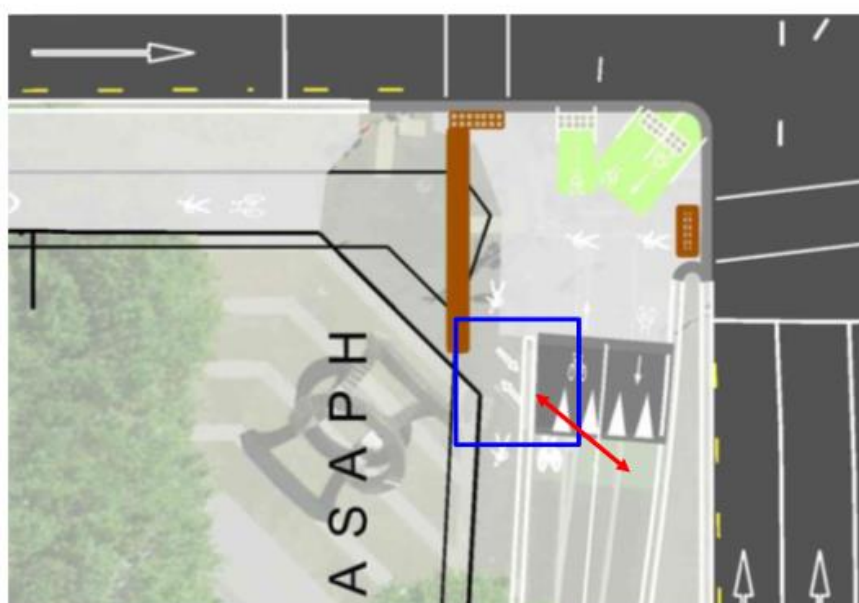



Figure 3-2: Long directional pavers, omitted direction pavers, and conflict between cycle desire lines at the interface of the cycleway and shared pathway area in the St Asaph/Madras intersection.

#### Recommendation(s)

1. Maintain the current separation between cyclists and pedestrians at the south-eastern quadrant of the intersection to reduce conflicts.
2. If the above recommendation is not accepted, review the priorities and desire lines of cyclists, pedestrians and micro-mobility users at the interface of the St Asaph Street cycleway, pedestrian crossing points, the shared path to the south on Madras Street and the shared space to better address the potential clashes between modes through the area. This may require a review of proposed signs and markings to highlight the complex nature of the shared area.
3. Provide a safe interface for cyclists to travel north along Madras Street.

Frequency Crashes are likely to be frequent	Severity Death or serious injury is likely	Rating The safety concern is serious
Designer response	Agree that risks are possible between cyclists pedestrian and scooters. The proposed signs and markings will be reviewed during the detailed design stage to reduce or minimise this risk.	

Recommendation(s)

Safety Engineer comment	Generally agree with issue raised by SAT. Designer response does not specifically address SAT recommendation 1, but this is presumably not supported by the Designer and not feasible anyway due to the shared path proposed on Madras to the south of this location. Designer response with regard to reviewing signage and markings in detailed design noted and accepted. It is also considered that there may be an opportunity to reduce lane widths on the separated St Asaph cycle facility in order to provide more pedestrian space clear of the High to St Asaph cycle movement as below. Also consider signal phase options to manage / alleviate potential conflicts with high numbers of pedestrians waiting for this cross signal and conflicting cycle movements between High Street and St Asaph Street. 
Client decision	Insert comment
Action taken	Insert comment

3.2 Moorhouse Avenue Intersection Threshold

Significant

The proposed parking lane at the southern end of the Madras Street improvements is unprotected and the broken white line marking makes the road appear as if it has three traffic lanes rather than the intended two traffic lanes and one parking lane.

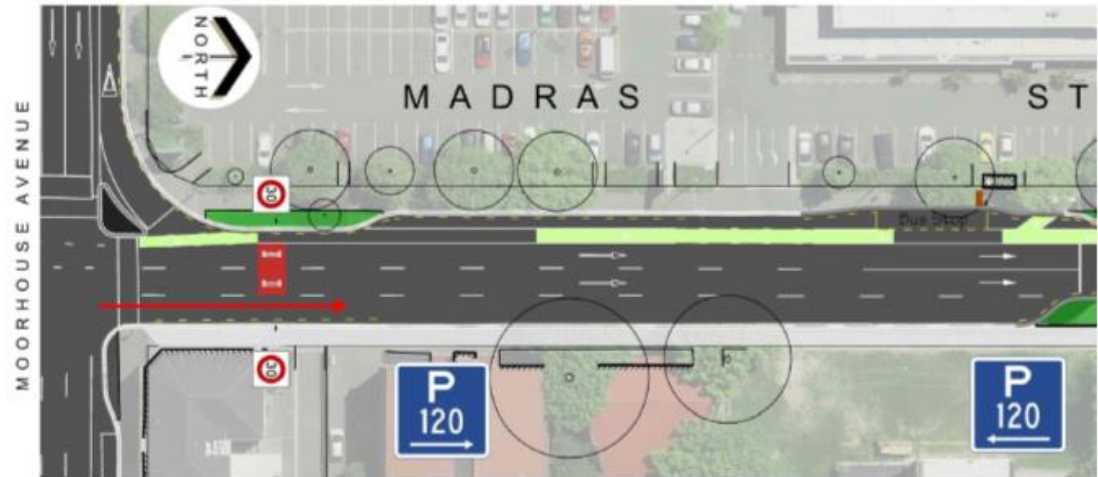


Figure 3-3: Unprotected parking lane on Madras Street with red arrow indicating where the apparent third lane may be misinterpreted

There is a significant risk of this layout being misinterpreted, and that traffic turning from Moorhouse Avenue or proceeding north from Gasson Street will opt to travel north in the parking lane and collide into a parked car. Even travelling at 30 km/h this would be a significant collision.

#### Recommendation(s)

1. Establish kerb buildouts to protect the parking lane and reinforce the 30km/h speed threshold
2. Use solid edge marking on the right-hand side of the right lane to distinguish between the through lane and parking space
3. Use hockey stick markings to define the on-street parks within the proposed parking area.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Agree with the risk identified. The proposed layout plan has been changed to shown solid edge markings and chevrons to define the two live traffic lanes	
Safety Engineer comment	Agree with SAT. Designer response noted (and generally accepted) regarding installation of solid edge line and chevron markings to define the lanes, however it is considered that the buildout suggested by SAT would provide much better reinforcement of the speed limit change point (including positioning the east side speed limit sign closer to the traffic lanes).	
Client decision	Insert comment	
Action taken	Insert comment	

### 3.3 Signalised Mid-Block Crossing

Significant

The proposed signalised mid-block crossing formalising the connection between Ara and the Madras Market has tangible value and is a good addition to the overall design. Small modifications are recommended to the layout to maximise the safety and usability of the formalised crossing point.

It is unlikely that the volumes of cyclists will be significantly higher than pedestrians, and there is likely no safety issue in combining the movements at the signalised crossing. Behaviours are different when crossings are separated compared with when they are combined and as pedestrian volumes are high during the day, pedestrians will likely overflow the smaller designated pedestrian crossing and use the wider cycle crossing space which may lead to conflicts. If the movements are combined and the crossing width is increased, the behaviour adjusts to suit the shared space.

The location of the bus stop at the diverge point of the cycle lane onto the footpath introduces complexity, from the steep departure angle for the buses immediately ahead of the crossing and the buses departing through the cycle lane ramp-off facility to join the signalised crossing. At the proposed location, the bus must depart across the cycle lane and off ramp and the steep angle of departure will make it hard for buses to see cyclists approaching, which vastly increases the possibility of buses and cyclists colliding. The outcomes for cyclists likely to be severe from a collision with a bus. There is an opportunity to relocate the bus stop to the north of the crossing to a position where the bus can take advantage of the crossing stopping traffic and pull out into the traffic lane.

The drawings show some green surfacing for the cycle lane but there are gaps in places including alongside the bus stop which is a key conflict area.



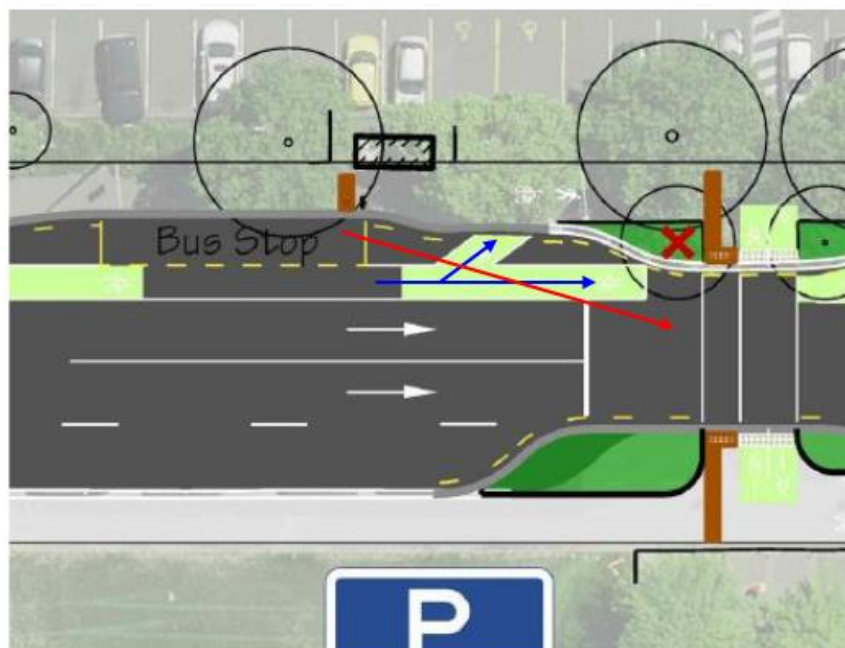


Figure 3-4: Departing buses crossing paths with cyclists using the ramp-off to join the signalised crossing

There may be value in establishing a raised safety platform at the signalised crossing, to reinforce the 30 km/h speed zone, and add additional visual presence at the crossing to make it easier for drivers to identify that they are approaching a crossing. It also may help delineate the space for all vulnerable users and will deter vulnerable users from crossing Madras Street away from the designated crossing point. A raised safety platform in conjunction with the speed limit reduction will reduce speeds of vehicles on Madras Street and hence the severity of impact with vulnerable users.

#### Recommendation(s)

1. Consider combining the pedestrian and cycle movements at the crossing and widening the overall crossing area to cater for the demand.
2. Establish a raised safety platform at the crossing point to reduce vehicle speeds and improve driver awareness to the signalised crossing.
3. Relocate the bus stop to the north of the crossing to remove the departure conflict with cyclists using the off ramp to the signalised crossing.
4. Review the extent of the green surfacing on the on-street cycle lanes so that it is provided in key conflict areas.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	<ol style="list-style-type: none"> <li>1. Agree with the concern; the design has been changed to combine the 2 movements at the crossing with a widening included.</li> <li>2. The possibility of a raised surface on the approaches to the crossing points will be considered where acceptable surface water drainage can be achieved.</li> <li>3. Agree and the design has been adjusted accordingly.</li> <li>4. Appropriate extents of green surfacing are already provided. The gap adjacent to the bus stop is considered fine, since green paint is provided 10m apart so more is unnecessary.</li> </ol>	
Safety Engineer comment	Generally agree with SAT and Designer responses. It is noted that the wider 'combined' crossing technically requires cyclists to dismount before crossing. While it	



Recommendation(s)

	is expected a number of cyclists may illegally ride across the crossing, it is considered that this does not give rise to any significant safety concerns.
Client decision	Insert comment
Action taken	Insert comment

3.4 Eastern Shared Path

Serious

The SAT team has identified two key locations where the proposed shared path on the eastern side of Madras Street has width constraint issues; there is a narrow point at the north end of the broadcasting school building, and there is a narrow section between the mid-block crossing and the Rakaia Centre carpark exit.

The design includes a centreline and "SLOW" pavement markings at the northern shared path pinch point, however there are no additional aids above pavement level to warn users they are entering a constrained space, and there is increased possibility of collisions between users in the constrained space. There appears to be several services under the existing berm at the very northern end of the proposed shared path. When access restrictions are in place during maintenance and repair works the shared path's capacity will be significantly reduced and this will further exacerbate the risks of conflict between users at this end of the shared path. Consideration will also need to be given to the treatment of the service lids to prevent them becoming trip, slip, and fall hazards when they are included in the shared space surface.

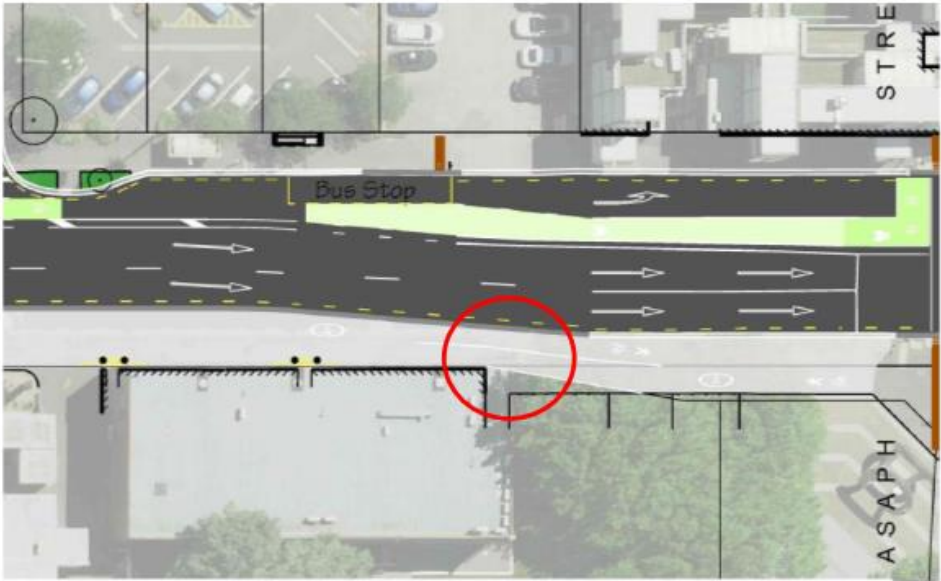


Figure 3-5: Pinch point at the north end of the Broadcasting School building

There is on-street parking proposed adjacent to the southern narrow section of shared pathway. As this pathway is adjacent to the right-hand lane of Madras Street, this places the drivers' side of the car against the footpath, and therefore every car which parks in these parks will open their door out across the shared path. This increases the risk to cyclists and micro-mobility users of colliding with opening car doors, which is known to have severe outcomes for especially cyclists, on top of the additional risks associated with using constrained shared spaces.

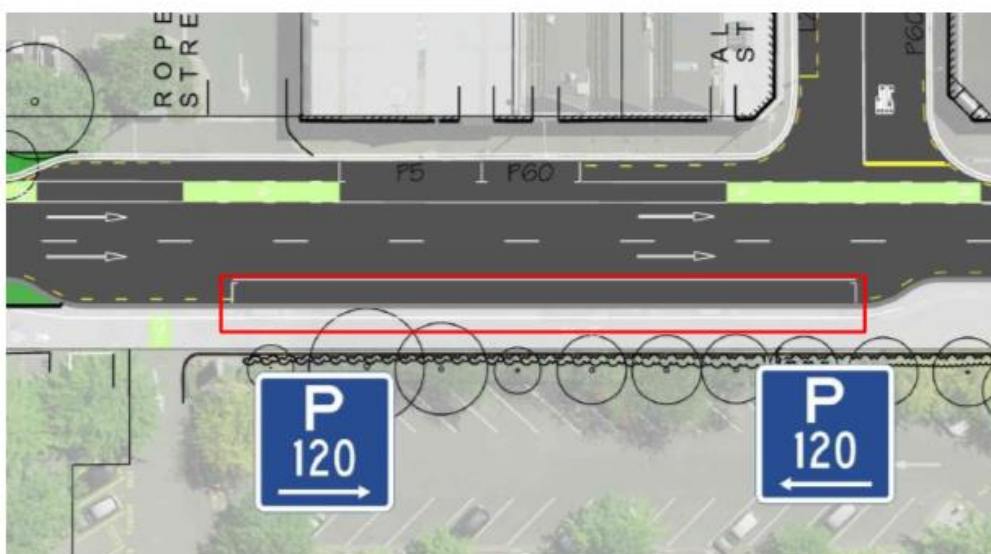


Figure 3-6: Narrow section of shared path with door swing hazard area highlighted

There is a new cycle accessway to Ara proposed between the Kotare Building and the substation, but it is well hidden between both buildings and will be hard for an occasional user of the space to recognise. As visibility of the accessway is poor, it will be hard for users to anticipate other users slowing to turn into or exiting from the accessway, and this will create conflict between users.

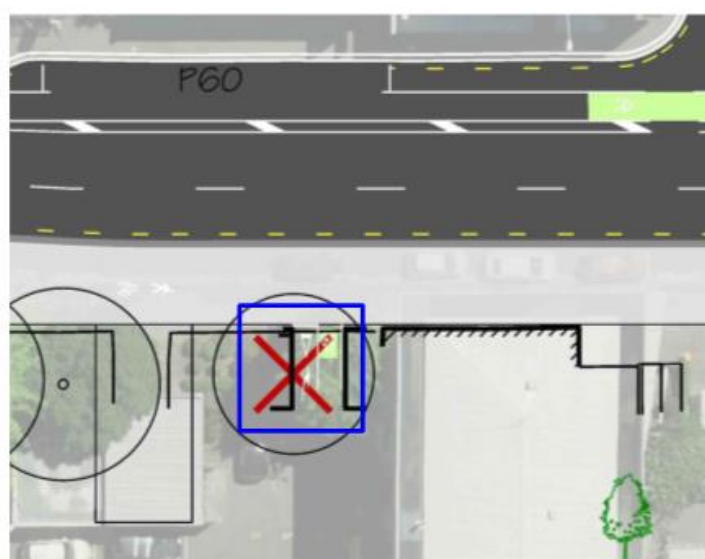


Figure 3-7: Proposed cycle accessway off Madras Street south of Kotare (The red arrow denotes a tree to be removed)

The SAT observed that the cycle provisions are discontinuous between St Asaph and Tuam Streets. The shared path on the eastern side of Madras Street stops at St Asaph Street and cyclists need to cross diagonally to use the on-street cycle lane at Madras Street to continue northbound. However, the diagonal cycle crossing does not connect to the northbound on-road cycle lane on Madras Street so cyclists either need to meander through High Street to return to Madras Street or cut across the High Street intersection which increases the possibility of collisions between cars and cycles.

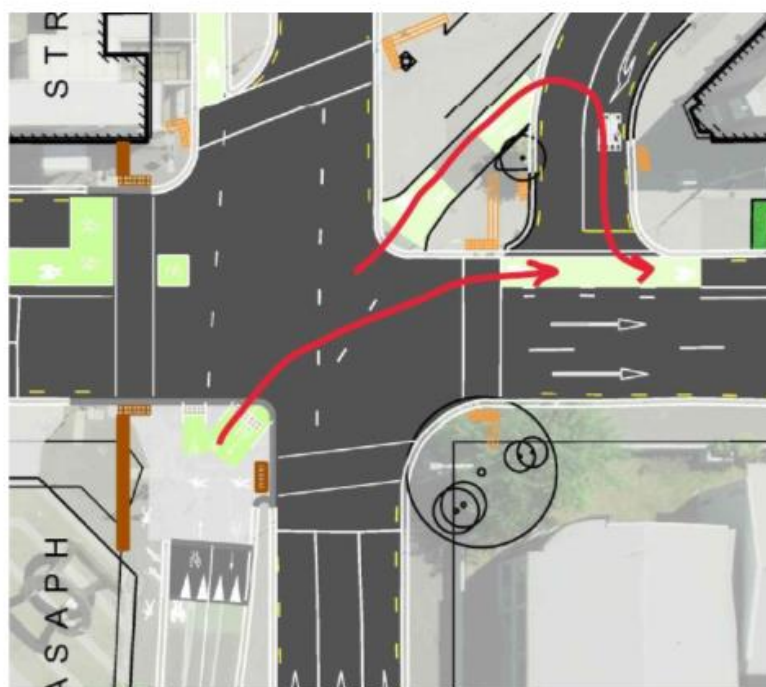


Figure 3-8: Possible desire lines for cyclists turning north from the Madras Street shared path

There is the possibility that cyclists may choose to stay on the eastern footpath for a block between Ara and the CMUA. On the face of it this choice is understandable because this is the side of the road that the CMUA is on and reduces the need for cyclists to cross over Madras Street twice to use the on-street cycle lane for one block. It would also improve connectivity from the south. This creates a significant additional risk of conflict between cyclists and pedestrians as the existing footpath is narrow and is not proposed to be widened through this section.

#### Recommendation(s)

1. Consider additional signage at the broadcasting school pinch point to alert users looking forward of the constrained space.
2. Widen the narrow shared path section between the mid-block crossing and the Rakai Centre carpark exit to avoid cyclists colliding with opening drivers' doors.
3. Add warning signage and markings of the hidden cycle accessway south of Ara's Kotare building.
4. Extend the CMUA neighbourhood improvements project to include a cycleway or shared path improvement between St Asaph Street and Tuam Street for better connectivity to CMUA from the south.

Frequency Crashes are likely to be frequent	Severity Death or serious injury is likely	Rating The safety concern is serious
Designer response	<ol style="list-style-type: none"> <li>1. The shared path has been redesigned to be 4-5m wide throughout so eliminating the pinch point previously referred to.</li> <li>2. See 1.</li> <li>3. Additional green markings are now included that inform passing cyclists and pedestrians of the access location.</li> <li>4. On the east side of Madras Street there is insufficient space to provide an additional cycle lane or shared space. The on-street cycle lane on the west side of Madras Street is expected to meet the needs of northbound cyclists. Opportunities will be available at intersections to turn right safely to access cycle parking areas.</li> </ol>	



Recommendation(s)

Safety Engineer comment	Agree with SAT and Designer responses. Width constraints on the east side of Madras between St Asph and Tuam noted in regard to opportunities for providing a cycleway / shared path. Even if this were possible, there is the potential that such a link would result in some / more people cycling along the footpath beside the CMUA when this area is not designated or intended for that purpose. Recommend reviewing / considering signal phase options to provide for safer right turn cycle movement from St Asaph east approach to Madras St northbound.
Client decision	Insert comment
Action taken	Insert comment



## 4. Madras Street Safety Concerns – Tuam to Hereford

### 4.1 Western Plaza and Coach Access Provisions

Serious

The CMUA drawings supplied to the SAT show that the Western Plaza is accessed from Madras Street. At the time the plans were supplied, the Western Plaza is proposed as a shared area with pedestrians, cyclists, e-scooters, other wheeled modes, and coach drop-off all intermingling. The coaches are proposed to enter the CMUA area via a one-way access immediately south of the Lichfield Street intersection and then exit via an access north of Lichfield Street, just south of the Bedford Row intersection. With approximately 70% of pedestrian access to be via this plaza, this creates significant conflict between user groups and places vulnerable users at higher risk of harm. The SAT recommends establishing a separate area for coach access away from pedestrianised areas.

It is unclear how coaches are proposed to access this area if Madras Street is closed off to provide safe pedestrian access during the larger events. As there is a lack of information on event management and site operation plans for events currently available, the SAT cannot rule this option out. It would be important to consider how coaches will access the plaza when formulating operation plans, then full road closures may not be a viable option and complex temporary traffic management set-ups may be required. CCC advised that any coach access for team will be outside key pedestrian arrival and departure times, however this may not always happen depending on when the venue opens prior to an event/game.

If cycles and micro-mobility options are able to be used in the space there will be an enhanced risk to pedestrians of collisions with fast moving wheeled users, with poor outcomes for all users and especially poor outcomes for vulnerable users such as the mobility impaired or elderly. There would be value in investigating some use restrictions in the spaces, especially during events, to reduce the amount of conflict in the space and ensure better outcomes for all users.

The cycle stands on Madras Street adjacent to the Western Plaza are unlikely to be especially appealing to use at large events, as they are hazardously positioned across entry/exit points and will get swamped when patrons are leaving the venue. It is likely the bike stands, and the bikes attached to them, will get damaged by crowds after events, and this leads to the possibility of stranded guests who cannot use their damaged cycles after events. The cycle stands are also discussed in Section 2.3.2.

There are several bollards shown on the roading plans to prevent vehicles from accessing the Western Plaza. It is likely that these will pose a trip hazard during periods with high pedestrian volumes, and there is value in establishing these are retractable bollards so they can be readily removed at the end of events.

#### Recommendation(s)

1. Reconsider the proposal that the Western Plaza is used as a shared area with coach parking, and establish a separated coach access and drop off – pick up area at another location on the site.
2. Restrict fast moving wheeled transport from the Western Plaza to reduce the risk of high-speed conflict between users.
3. Consider geofencing the CMUA area to restrict e-scooter use in the pedestrianised plazas and circulating path and establish dedicated e-scooter parking areas to ensure they are not left at random to become trip hazards in the space for other users.
4. Relocate the on-street cycle parking to a location within the CMUA boundary for safety and efficiency.
5. Use retractable bollards so that they can be lowered during times with high pedestrian volumes and remove the trip hazards.

Frequency Crashes are likely to be common	Severity Death or serious injury is very likely	Rating The safety concern is serious
Designer response	This issue relates to the design of the site of the Arena itself. Consequently the project team and their transport consultant would provide the response comments.	
Safety Engineer comment	As per the Designer response, some of the SAT comments and recommendations relate to internal design matters within the CMUA site and are therefore outside of this project scope. However, with regards to coach parking and access to/from	

07 July 2022 | Status: Draft for Comment | Project No.: 310203418 Child No.: 220.2215 | Our ref: Scheme - Safety Audit - Report - Te Kaha CMUA - Barbadoes Lichfield Madras Tuam - Safety Audit Report - Revision C - SE ~ 09(2).docx

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#### Recommendation(s)

	Madras Street, the issues raised by SAT in regards to management and integration of coach movements with major event TIM / road closures need to be considered. Partially agree with SAT regarding location of on-street cycle parking. This issue and recommendation is partially a project design matter but is not addressed in the Designer response. It is accepted however, that removal of the on-street cycle parking will require coordination and agreement with the CMUA project team in regard to provision of alternate cycle parking within the site.
Client decision	Insert comment
Action taken	Insert comment

## 4.2 Tuam, Lichfield, and Cashel Street Intersections

Significant

There are several safety concerns at the Tuam, Lichfield, and Cashel Street intersections that are common to all three intersections and can be considered together.

The lack of raised safety platforms in the proposed 30 km/h area was the key concern in this section of the Madras Street corridor, as it fails to reinforce to drivers that the space is intended to be a low-speed zone and may lead to poor speed limit compliance and high severity outcomes from crashes with vulnerable users.

The pedestrian crossing widths for all of the connections between the CMUA and the hospitality area and bus interchange facilities to the west of the CMUA are likely to be insufficient to carry the expected 70% of event attendees, especially at the end of an event when all patrons are exiting the CMUA at once. There is an enhanced risk of crushing incidents in the crowd at the conclusion of events, with particularly severe outcomes for vulnerable mobility impaired and elderly users. There would be value in increasing the widths of the pedestrian crossing paths on Madras Street to be consistent with the wider footpaths on Lichfield and Cashel Streets, and in considering operating the crossings as a Barnes Dance movement during events to meet the additional demand during events and facilitate safer crossing movements for vulnerable users. Refer to the blue arrows denoting the pedestrian desire lines at the intersections in Figure 4-1. The current scheme design proposes to operate the signalised crossings independently at each intersection during events may increase poor compliance and adherence to the crossing signals as large groups will likely cross with groups or with crowds of people.

The parking spaces on the western side of Madras Street do not serve any business frontages directly and could easily be sacrificed in favour of wider crossing points and build-outs, additional accessible parking spaces, or P10 for short stay pick-up/drop-off.

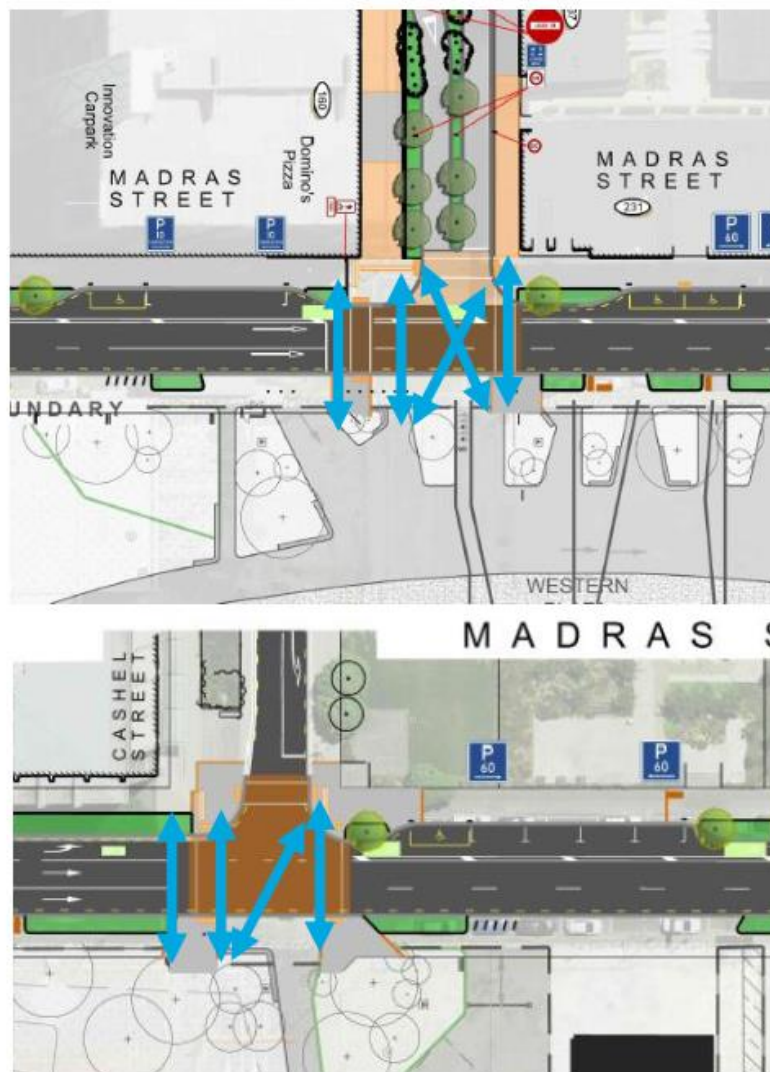


Figure 4-1: Narrow pedestrian crossings and poorly positioned mobility parking at the Lichfield Street and Cashel Street Intersections

The narrow existing footpaths on the north side of Tuam Street leading west from Madras Street will be inadequate to cater for larger groups of people. Tuam Street is likely to be a secondary but still well-used link between the CMUA, the Bus Interchange and hospitality areas – would benefit from some improvements to improve pedestrian provisions. There is no separation between the footpath and the neighbouring buildings, so the only option for pedestrians to avoid each other in high volume events is to move into the road. Depending on the numbers of people this can create risks of collision with cyclists in the adjacent cycle lane or even vehicles in the traffic lane. The SAT observed street lighting columns and traffic signal poles located within the narrow footpath which will create trip hazards for vulnerable users.



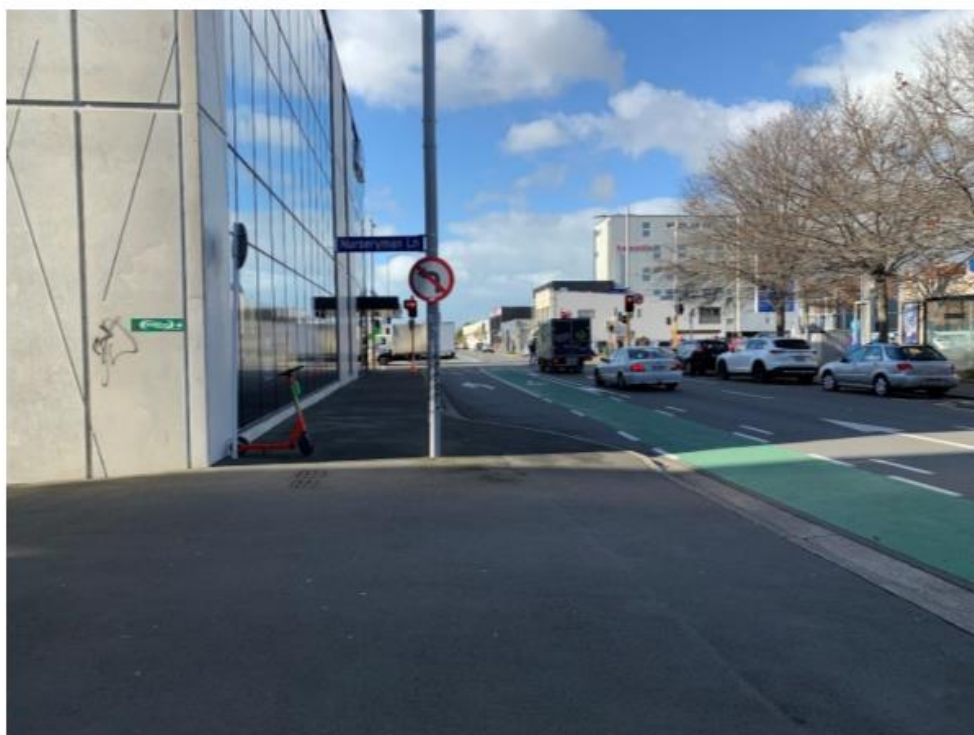


Figure 4-2: Tuam Street looking east towards Madras Street, note narrow footpath with hazards

#### Recommendation(s)

1. Establish raised safety platforms with additional drainage structures to reinforce the 30km/h speed limit and better delineate the pedestrian facilities at the Tuam, Lichfield and Cashel Street intersections, without creating drainage problems for neighbouring properties.
2. Increase the pedestrian crossing widths at the three intersections between the CMUA and the western CBD hospitality and Bus Interchange areas.
3. Operate the crossings as Barnes Dance movements during events to accommodate the significant increase in volumes associated with events.
4. Consider alternative treatments (i.e., raised platform) for the pedestrian crossing at Lichfield Street and operate a Barnes Dance phase for all pedestrian movements.
5. Consider additional measures to improve the Tuam Street crossings and the narrow footpaths to the west of Madras Street.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	<ol style="list-style-type: none"> <li>1. Raised platforms were originally proposed for the reasons identified by the SAT. However due to the severe challenges of stormwater drainage and the effects of water being dammed by new platforms these features were removed from the proposal. It was considered that the reduced vehicle speeds would be achieved by traffic signal progression based on 30 kmh. The possibility of a raised surface on the approaches to the crossing points will be considered where acceptable surface water drainage can be achieved.</li> <li>2. The existing crossing widths are considered adequate for normal conditions for ~90% of the time when major events do not take place.</li> </ol>	



#### Recommendation(s)

	<ol style="list-style-type: none"> <li>3. A conventional Barnes Dance phase is not considered appropriate since it would be potentially called by a single pedestrian when for 90% of the time pedestrian volumes are low. For major event it is proposed to operate long pedestrian phases for a temporary period when a high demand is expected at major events.</li> <li>4. As 1.</li> <li>5. As 2.</li> </ol>
Safety Engineer comment	<p>Generally agree with SAT and Designer responses, however do not necessarily agree with 'likely' severity rating and overall 'significant' safety concern rating. Additional / specific comments as follow:</p> <ol style="list-style-type: none"> <li>1. Designer response regarding storm water / drainage complications on Madras Street and possible use of (smaller) vertical traffic calming features on the crossing point approaches noted and accepted.</li> <li>2. Assumed that 90% figure suggested in Designer response is based on expected numbers of smaller-scale events, and presumed that the other 10% would be addressed through event management plans / TTM.</li> <li>3. Designer response regarding extended pedestrian phases during major events noted and accepted.</li> <li>4. As per 3.</li> <li>5. Designer response to point 2 noted and generally accepted, but no specific response regarding width of Tuam Street footpath west of Madras. Recommend a review of lane configurations on the Tuam St west approach to see if there are any opportunities for an increased footpath width on the north side between Madras Street and Nurseryman Lane.</li> </ol>
Client decision	Insert comment
Action taken	Insert comment

### 4.3 Hereford Street Intersection

**Significant**

The key concerns at the Hereford Street intersection are that the proposed cycle detour using the western side of Latimer Square, and the proposed pedestrian crossing realignment will not be consistent with user desire lines, the detour is not legible and less likely to be used. Cyclists currently cross at the pedestrian crossing and cycle along the central path through Latimer Square.

There are currently no cycle facilities for northbound cyclists, but the SAT is concerned that forcing the cyclists onto a marginally widened footpath at the south-west quadrant of the Hereford Street intersection in an area where there is reduced visibility from buildings and fences will put cyclists in conflict with other footpath users. The other concern is that cyclists will be expected to transition from a marked cycle lane by the CTV memorial site into the left turn lane denoted with sharrows. This places cyclists in direct conflict from following left turning vehicles. Also, there is no ramp provided from the left turn lane onto the footpath for cyclists to transition into the shared path.

The realigned pedestrian crossing across Hereford Street lands in line with a large tree directly adjacent to the traffic signal control box – creating conflict between crossing pedestrians and existing road furniture and vegetation. This also reduces the effective wait area for footpath users on the north side of the crossing and makes it more challenging to negotiate past others who are waiting at the crossing. This is especially problematic for mobility impaired pedestrians who may rely on wider mobility aids to get around.



Figure 4-3: Tree and signal control box adjacent to the proposed realigned pedestrian crossing

The realigned pedestrian crossing is also skewed, which creates challenges to visibility for mobility impaired users who may not have the ability to move easily to see behind them. The SAT note that the consultation drawings show two crossings which is misleading, but the design drawings as shown below was correct. The skewed alignment will create a very wide intersection with all the lane and cycle lane markings pulled back behind the related crossing point.



Figure 4-4: Proposed intersection configuration for the Madras / Hereford intersection

#### Recommendation(s)

1. Reconsider the need for the cycle detour via Latimer Square west.
2. Consider establishing a legible shared path through the reserve inside Latimer Square for cyclists to avoid both bordering roads.
3. Review the combined left turn and cycle lane layout from Madras Street into Hereford Street together with the design of the proposed shared path into Hereford Street.
4. Straighten up the realigned pedestrian crossing to be perpendicular to Hereford Street, and relocate the northern kerb cut down away from the tree and signal control box.
5. Otherwise, consider retaining the existing perpendicular crossing alignment from the splitter island.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	<ol style="list-style-type: none"> <li>1. A cycle path route through Latimer Square has been considered already and ruled out. This is due to the requirement for consents to include this in the layout, which is currently formed as a quiet, walking space and is relatively narrow. It accepted that some cyclists will continue to use the Square though it is not considered appropriate to actively encourage. To convert the paths to shared use involved substantial widening and would alter the character of the Square as a pedestrian space, as well as already being constrained due to large, mature trees. The cycle detour provides a safe route that is only a slight deviation from the direct journey path through the park and is considered an appropriate safe route for northbound cyclists.</li> <li>2. As 1.</li> <li>3. The proposed design is considered to be the optimum design configuration given the layout constraints.</li> <li>4. The skewed crossing enables pedestrians to cross in a single phase and is closer to the expected desire line to and from Latimer Square path.</li> <li>5. As 4.</li> </ol>	
Safety Engineer comment	<p>Generally agree with SAT and Designer responses, however do not necessarily agree with 'likely' severity rating and overall 'significant' safety concern rating. Additional / specific comments as follow:</p> <ol style="list-style-type: none"> <li>1. Designer response noted and accepted regarding consideration and rejection of a shared path / cycle facility through Latimer Square.</li> <li>2. As per 1 above.</li> <li>3. Designer response noted and accepted. Whilst not specifically part of the recommendation or response, it is understood that a cycle ramp to access the shared path on the southwest corner of the intersection has now been added.</li> <li>4. Designer response noted and generally accepted. It is considered that the alignment of the Hereford Street crossing is not significantly skewed, and is skewed towards the nearside approaching traffic lane. Potential conflict with tree, signal control box and signage on the north side of the realigned crossing is not addressed in the Designer response.</li> <li>5. As per 4 above.</li> </ol>	
Client decision	Insert comment	
Action taken	Insert comment	

#### 4.4 Heavy Vehicle Access Location

Significant

The only heavy commercial vehicle (HCV) access to service the CMUA is proposed to be located from Madras Street at the northern end of the site. However, with 70% of pedestrian volumes expected to



access from this side, it could create a significant risk of conflict between pedestrians, cyclists, and micro-mobility users, and large service vehicles.

The design shows bike stands located across the access, and the landscaping may be too close to the access on the southern side. The right-hand lane is directly against the kerb face, and not separated by parking or cycleways, and the turn required to enter the accessway is sharp. This will cause larger service vehicles to end up tracking across landscaping or require both lanes to enter the access.

The location of the proposed barrier within the site is not far enough inside the area to allow an HCV to safely pull off Madras Street and not hang over the traffic lanes and footpath when entering the site. This will increase the risk of rear end conflicts with following vehicles as HCVs slow to enter the site and block the footpath restricting movement for pedestrians. Supporting information provided to the SAT, indicated that the heavy vehicles would turn right into the access through a possible barrier system then they would travel up the diagonal ramp to the Northern Plaza and exit via the east west road back to the same access on Madras Street.



Figure 4-5: The relatively sharp turn required to access the service entrance on Madras Street, and the short holding distance to the barrier arm.

#### Recommendation(s)

1. Raise this concern with the CMUA design team and discuss whether Hereford or Barbadoes Streets could be used for heavy vehicle access as significantly lower vulnerable user volumes expected at eastern and northern edges of the site.
2. Relocate the barrier arm to allow HCVs to completely enter the site before they stop to open the barrier.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	This issue is outside the scope of the scheme design for the street layout and has been referred to the Te Kaha project team for consideration.	
Safety Engineer comment	Agree with issues identified by SAT, however do not necessarily agree with 'likely' severity rating and overall 'significant' safety concern rating. Partial agree with Designer response. It is acknowledged that the location, design and operation of heavy vehicle accesses / loading areas is a matter for the Te Kaha CMUA project team's consideration, however there are elements of the proposed Madras Street design (eg. location of cycle parking and design of landscape areas adjacent the access) that need to be addressed per the issues raised by SAT.	

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Recommendation(s)	
Client decision	Insert comment
Action taken	Insert comment

## 5. Tuam Street Safety Concerns

### 5.1 Nurseryman Lane Intersection

Serious

Although this is outside the area of the scheme design, the SAT are concerned that there has been no consideration of the impacts for this intersection given the proposed changes in the area. On event days, the 350 space Innovation Precinct car park may be used by CMUA patrons which will increase the number of vehicles exiting this lane within a concentrated period of time, while other patrons are walking along Tuam Street on what are constrained footpath widths.

Nurseryman Lane exits onto Tuam Street between the Kathmandu and Vodafone buildings and is currently operating as a one way running from north to south. This operation is proposed to be retained. There is no approaching car warning alarm or lights to warn pedestrians, and drivers do not have visibility of pedestrians until they have nosed out across the footpath from between the buildings. There are no priority controls provided for vehicular traffic.



Figure 5-1: The interface of Nurseryman Lane and Tuam Street looking east (towards the Kathmandu Building)

Nurseryman Lane meets Tuam Street where the Tuam Street separated cycleway transitions back to a standard on-road cycle lane creating additional conflicts for cyclists and this will be exacerbated further with the additional demand on Nurseryman Lane. This is exacerbated further with the location of the access into the Mobil service station and parking for the Ara Jazz School, located directly opposite the Nurseryman Lane exit.



Figure 5-2: The Tuam Street cycleway transitions from separated to on-street at the Nurseryman Lane accessway

The current interface between the laneway and Tuam Street is not appropriate for the proposed volumes of traffic and will create a serious risk of collisions with pedestrians and cycles at the Tuam Street intersection.

#### Recommendation(s)

1. Establish additional signage and pavement markings at Nurseryman Lane to give priority to cyclists and pedestrians and warn motorists that they are approaching a critical crossing point.
2. Consider pavement textural changes or kerbing to change the priority through the space to better define priority to all users.
3. Review the adequacy of the Nurseryman Lane to carry the projected volumes of vehicles.

Frequency Crashes are likely to be common	Severity Death or serious injury is very likely	Rating The safety concern is serious
Designer response	<ol style="list-style-type: none"> <li>1. The proposals do not materially affect the functionality or flows on Nurseryman Lane and its intersection with Tuam Street. It has always functioned from construction as the sole exit from the Innovation Precinct carpark. Changes to Lichfield Street design to allow majority of traffic volumes exit out onto Madras Street. Nevertheless, recommendations to address the limited increase in activity here, especially when coinciding with Te Kaha exit pedestrian flows does raise pertinent recommendations to address in detailed design as to nature of warning devices at the intersection.</li> <li>2. Will be considered during detailed design.</li> <li>3. Modelling has been carried out and changes to Lichfield Street design to allow traffic exit out onto Madras Street.</li> </ol>	
Safety Engineer comment	<p>Generally agree with SAT. Designer responses noted and partially accepted. Additional / specific comments as follow:</p> <ol style="list-style-type: none"> <li>1. While it is accepted that the proposals themselves may not materially affect the functionality of or flows along Nurseryman Lane, a concentrated discharge of the parking building after events at the CMUA may result in</li> </ol>	

Recommendation(s)

	<p>significant vehicle movements out to Tuam Street at the same time as high numbers of pedestrian movements past Nurseryman Lane.</p> <p>2. Designer response noted and accepted. Landscaping features adjacent the boundary either side of Nurseryman Lan could be considered as a measure to shift pedestrian movements away from the boundary (thereby providing better inter-visibility between drivers and pedestrians) but would reduce the useable footpath width and would likely require relocation of the street light pole to the east of Nurseryman Lane.</p> <p>3. The Designer response presumably relates to general network flows / use of Nurseryman Lane as a result of the proposals, but not necessarily peak flows that might occur with a concentrated discharge of the parking building after events at the CMUA.</p>
Client decision	Insert comment
Action taken	Insert comment

5.2 Cycle Facility Treatments

Significant

Tuam Street is the only frontage with on-street cycle lanes adjacent to the CMUA. They appear to be located directly adjacent to the CMUA boundary between Madras and Barbadoes Streets. This cycle lane will interface with the three sets of stairs leading from the CMUA to the footpath and which may encourage pedestrians to walk across the road, but the design omits the green surface treatment across these interfaces. There is enhanced risk that pedestrians will be unaware that they are exiting directly into cycleway and step into the path of on-coming cyclists.



Figure 5-3: No green surface treatments are included on the cycle lanes across the Tuam Street Southern Plaza entry/exit points

Similarly, the green surface treatments are not in place across the Southern Plaza Bus Stop, or the Coach parking established to the east of Barbadoes Street. This increases the risk of conflicts between departing buses and cycle lane users as buses may not be aware they are crossing a cycle lane to re-join the traffic lane.

The hook turn box at the northeast of the Tuam/Barbadoes intersection is exposed to the left turn movement from Barbadoes Street into Tuam Street and should be relocated. The current location of the hook turn box directs cyclists into the extended kerb at the south-eastern quadrant of the intersection and does not line-up with cycle departure lane at Barbadoes Street.





Figure 5-4: Exposed hook turn box in the Tuam/Barbadoes Intersection

#### Recommendation(s)

1. Include green cycle lane surface treatments across the CMUA entrances on Tuam Street, the bus stop outside the CMUA and the coach parking bays located to the east of Barbadoes Street.
2. Relocate the hook turn box in the Barbadoes street intersection to a less exposed position and where it will align with the cycle departure lane.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	<ol style="list-style-type: none"> <li>1. This is not one of the locations where pedestrians are expected to cross. Green surfacing will be added near the bus and coach stops. Will address at subsequent stage of detailed design</li> <li>2. Will address at subsequent stage of detailed design</li> </ol>	
Safety Engineer comment	<ol style="list-style-type: none"> <li>1. Agree with SAT and Designer response regarding cycle lane greening adjacent bus / coach stops. Disagree with SAT recommendation of cycle lane greening past the CMUA pedestrian entrances. Designer response regarding accepted pedestrian crossing locations noted, however the proposals indicate different surface treatment and/or edge delineation extending out to the kerb from the CMUA entrance steps that might</li> </ol>	

Recommendation(s)

	perhaps encourage pedestrians to cross at these locations. Recommend reconsideration of footpath surface treatments at these locations and/or consideration of additional street furniture / landscape treatments adjacent to the kerb at these locations. 2. Agree with SAT and Designer response.
Client decision	Insert comment
Action taken	Insert comment

5.3 Tuam Street Directional Change Impacts

Moderate

The change in the direction on Tuam Street to running eastbound over the entire length, will change circulation patterns between Barbadoes Street and Fitzgerald Avenue, and there is a risk that Duke Street will become a rat-run to circulate within the eastern CBD without exiting onto Fitzgerald Avenue. Duke Street does not exceed 8.5m wide and parking is allowed on both sides, so the route is extremely constrained.

Further improvements are proposed at the Fitzgerald Intersection to reinforce that southbound traffic will no longer be able to turn right into Tuam Street and likewise for northbound vehicles turning left into Tuam Street. The central median island is to be extended south with upgraded crossing facilities while kerb extensions are proposed on the south-western quadrant to prevent these movements, respectively. The pedestrian crossing points on the north side of the Fitzgerald Avenue approach to the intersection are shown in the drawings to be skewed, however there is an opportunity to straighten these up over both the southbound and northbound lanes to reduce the overall crossing distance for pedestrians.

Improvements to Duke Street thresholds to improve comprehensibility may be of value assuming this street will remain two ways. No improvements have been proposed other than marking arrows on the pavement. It is recommended considering kerb buildouts or central splitter islands to direct traffic and reinforce that only eastbound movements are permitted on Tuam Street. The SAT also observed that vehicles park very close to the departure lane on the northern leg of Duke Street because the No Parking lines do not extend far enough from Tuam Street into Duke Street. This is show in Figure 5-5.



Figure 5-5: Duke Street north, looking north-east



Figure 5-6: Duke Street south, looking east

#### Recommendation(s)

1. Include additional improvements to reduce pedestrian crossing distances over Fitzgerald Avenue.
2. Establish kerb buildouts and entry restrictions to discourage drivers using Duke Street as a circulation route.
3. Extend no parking markings along Duke Street to north of Tuam Street.
4. Establish splitter islands in the Duke Street intersections to prevent turning the wrong way into Tuam Street.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	<ol style="list-style-type: none"> <li>1. Understand the benefit of reducing the pedestrian crossing distances, but with limited budget available, we would maintain the location of traffic light poles and crossing point on eastern side of Fitzgerald Avenue for future upgrade.</li> <li>2. Do not see Duke Street as a circulation route an issue.</li> <li>3. Will check if extending no parking is required as we do not want to remove parking unnecessarily.</li> <li>4. Do not see this as necessary as Duke St has low volume traffic. Appropriate signage and marking will be proposed.</li> </ol>	
Safety Engineer comment	<p>Generally agree with SAT and Designer responses. Additional / specific comments as follow:</p> <ol style="list-style-type: none"> <li>1. Agree with SAT and Designer response.</li> <li>2. Constrained width of Duke Street already noted by SAT. Area is also light industrial / commercial, therefore expect that kerb build outs will create separate issues related to medium / heavy commercial vehicle manoeuvring. Designer response noted, but would be helpful to be supported by results of modelling.</li> <li>3. Agree with SAT and Designer response.</li> <li>4. As per 2 above, expect that splitter islands will create separate issues related to medium / heavy commercial vehicle manoeuvring.</li> </ol>	
Client decision	Insert comment	
Action taken	Insert comment	

## 5.4 Coach Stand Location

Significant

It is not clear to the SAT if the coach stand is proposed as pick-up/drop-off point or if it is intended as a storage space. There may be a barrier to accessibility if this is proposed as the pick-up/drop-off point, as passengers need to negotiate narrow footpaths with made narrower with concrete power poles and buildings on the boundaries then they will need to cross Barbadoes Street to access the CMUA. The location of coach stand within wider central city layout is challenging to access directly from any approach to central city and this will likely to lead to buses using complicated circulating routes through the central city.

There is a risk that coaches will may the single bus stop on Tuam Street at the Southern Plaza instead of the Western Plaza, but as it is a single bus box this may will lead to buses queueing on Tuam Street to access the single bay.

There are no footpath improvements proposed adjacent to the coach stands on Tuam Street, and there is a risk that if the location is to be used for pick-up and drop-off, the congregating passengers will obscure footpaths and create obstructions to e-scooter and other micro-mobility users. As identified above, there are concrete power poles and building frontages located on the property boundaries that constrain the footpath widths further.

The interface between the on-street cycle lane and the bus bays is poorly defined and there is a risk of departing buses colliding with cycle lane users because the separation is insufficient, and the presence of the cycle lane infrastructure is not reinforced with green surfacing.

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The bus bays overhang into the cycle lane, so when all bus bays are occupied the effective cycle lane width is reduced and may push users into the traffic lane to negotiate past buses, resulting in rear end conflicts with vehicular traffic.

#### Recommendation(s)

1. Consider widening improvements to the footpath and removing hazards on the northern side of Tuam Street from the coach stops through to the Barbadoes Street intersection.
2. Review the event management plan for coach parking and drop off / pick up activities to ensure that circulation routes and drop off / pick up points are well managed and will not impact other users such as cyclists.
3. As per Section 5.2, include green cycle lane surface treatments across the coach parking bays located to the east of Barbadoes Street.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	<ol style="list-style-type: none"> <li>1. To be addressed in the next stage of detailed design subject to the operation of coach parking plus development of ETMPs as to managing coach activity</li> <li>2. As in 1.</li> <li>3. Agreed and will be added.</li> </ol>	
Safety Engineer comment	Agree with SAT and Designer responses. Presume that 'likely' severity rating and 'significant' overall safety concern rating is related to cycle lane greening adjacent bus / coach stops and is addressed in Designer response.	
Client decision	Insert comment	
Action taken	Insert comment	

## 5.5 Waitomo & McKeown Fuel Entraceways

Moderate

The Tuam Street Waitomo entranceway has not been considered in the design and would benefit from some additional traffic management measures to reinforce the proposed directional changes on Tuam Street.

There is a single carpark space immediately west of the driveway, and when it is unoccupied there is a risk of drivers ducking through this space to rat run down Duke Street, instead of using Fitzgerald Avenue. A kerb build-out at the south-east quadrant of Duke Street intersection will prevent this movement.

Similarly, there is parking established on Fitzgerald Avenue between the Waitomo driveway and Tuam Street intersection. These are not adjacent to businesses and are unlikely to be occupied often, and these spaces may be misinterpreted as a lane leaving drivers trapped by the kerb build-out at the intersection. It would be useful to extend the proposed build-out at the Fitzgerald Avenue intersection back to the Waitomo accessway, to clarify that there is no left turn lane, and this space does not access the intersection.

In heavier traffic conditions where vehicles are queuing back, the lane arrows may be obscured for vehicles exiting the Waitomo onto Tuam Street, which may make it challenging for drivers to make decisions around lane selection and lead to conflict during lane change manoeuvres. Marking extra lane arrows where than can be observed from the driveway will help mitigate this issue.

The configuration of the Tuam Street driveway gives the right of way to pedestrians over other vehicles across the driveway. There is a building on the western side of the access that obscures pedestrians and the current width encourages using the access at speed. Additional treatments are recommended at the access to reinforce that the pedestrians have right of way and to reduce the risk of collisions in the access with the proposed changes in the direction of traffic flow on Tuam Street to eastbound

The McKeown fuel station at Barbadoes St intersection may be used to bypass the signals at the Barbadoes/Tuam intersection. This creates risks of conflict on the constrained forecourt, and to pedestrians



crossing the driveways (particularly where they are walking to and from the CMUA) as the forecourt is on a 45 degree angle and drivers' visibility may be impaired.

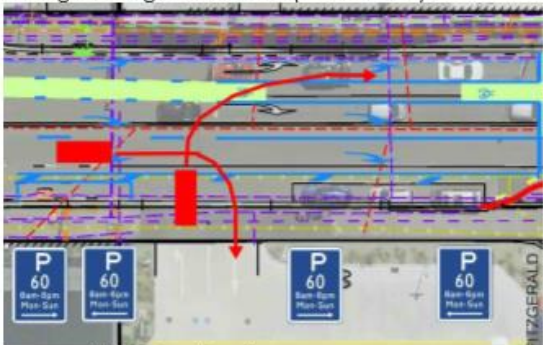


Figure 5-7: Existing access to Waitomo Fuel from Tuam Street

Recommendation(s)

1. Replace the single carpark between the Waitomo driveway and Duke Street with a kerb buildout to stop rat running against the proposed changes in traffic direction.
2. Extend build out at Fitzgerald Avenue intersection back to the Waitomo accessway to clarify that there is no left turn lane and that this movement cannot be made.
3. Consider shifting lane arrows on the Fitzgerald Avenue south approach to the Fitzgerald / Tuam intersection to coincide with the driveway to give better visibility for vehicles exiting to make lane choice decisions.
4. Redesign the Waitomo entrance off Tuam Street to support slower speeds and improve safety for pedestrians.
5. Apply entrance treatments at the McKeown on Barbadoes Street to discourage drivers from bypassing the signals at the Tuam / Barbadoes intersection.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	<ol style="list-style-type: none"> <li>1. It is most likely that the parking will be utilised for most of the time and the direction of the vehicle parking will indicate the direction of travel.</li> <li>2. Vehicles will not be entering through Tuam Street from Fitzgerald Avenue anyway.</li> <li>3. Agreed and is being amended.</li> <li>4. Will be considered during detailed design.</li> <li>5. Will consider treatments at next stage of detailed design.</li> </ol>	
Safety Engineer comment	<ol style="list-style-type: none"> <li>1. Partially agree with SAT and Designer response. Noted that there is currently no parking between the Waitomo access and Duke Street, but this is being introduced in the proposal. This will also impede visibility to the west for</li> </ol>	

Recommendation(s)	
	<p>drivers exiting the Waitomo site, and this issue is exacerbated by the introduction of the eastbound lane(s) closer to the access. Recommend removal of parking in this location, or at least only providing for one space closest to Duke Street.</p> <p>2. Disagree with SAT regarding the need to extend the build out, however Designer response is unclear on this point. There is evidence of moderate-high existing on-street parking demand in this location which suggests that the spaces north of the Waitomo access will typically be occupied during business hours.</p> <p>3. Agree with SAT and Designer response.</p> <p>4. Partial agree with SAT and Designer response. More concerning issue relates to obscured visibility associated with on-street parking introduced west of the access and creation of eastbound lane close to the on-street parking and site access as noted in point 1 above. This is exacerbated by the fact that westbound vehicles entering the site from Tuam Street have to negotiate past / around other vehicles turning right out of the site that might have crept forward to improve visibility past parked vehicles west of the access. Left turn arrow marking on Waitomo access will need to be changed to right turn arrow (or removed).</p>  <p>5. Agree with SAT and Designer response.</p>
Client decision	Insert comment
Action taken	Insert comment

## 6. Barbadoes Street Safety Concerns

### 6.1 Raised Safety Platforms

Significant

The design includes the establishment of raised safety platforms at the Cashel, Lichfield and Tuam intersections on Barbadoes Street. The proposed raised safety platforms are inconsistent with the intent to maintain the existing 50 km/h operating speed. Ideally the raised platforms will assist with defining the area where pedestrians can cross as they travel to and from events at the CMUA, but this only benefits a small proportion of the pedestrians as the main pedestrian flows are on the western interface.

There is a risk of legibility issues with imposing raised platforms across the whole intersection in a 50 km/h area, as these are typically a treatment applied in areas with reduced speed limits. The 50km/h speed limit will lead to vehicles travelling at higher speeds and the desired speed attenuation will not benefit the crossing pedestrians. Consideration could be given to raised platforms in advance of the intersections to slow vehicles prior to entering the intersection.

The platforms may pose a mechanical risk to vehicles if the speed of travel is too high on the approach there is an increased chance of damage to vehicles as they pass over the platforms.

#### Recommendation(s)

1. Reconsider the use of the raised platform treatments at the Cashel, Lichfield, and Tuam intersections and investigate whether raised platforms in advance of the intersections would provide the desired speed reduction effect.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Agreed. All intersections on Barbadoes Street have since been changed to paved intersections with flush surface rather than raised platforms.	
Safety Engineer comment	Agree with SAT and Designer response.	
Client decision	Insert comment	
Action taken	Insert comment	

### 6.2 Dish Channel Depths

Moderate

Deep dish channel is still in use on Barbadoes Street between Lichfield Street and Hereford Street, and in places these have become especially deep where years of reseals have built up effective pavement height above the invert of channel. Dish channel can pose an entrapment hazard for vehicle and cyclists' wheels and is a significant trip / step hazard for pedestrians should they cross the road in that location.





Figure 6-1: Deep dish kerbs retained on Barbadoes Street, looking south toward Cashel Street

On-street parking is retained for approximately half of the length of the existing dish channel, so the dish channel is exposed for significant lengths. Under low-light or night-time conditions it would be easy for pedestrians, cycles, and left-turning vehicles to fail to see the deeper channel profile and slip into the channel.

The hazards to pedestrians are largely mitigated by standard profile kerbs being in place around the intersection quadrants adjacent to pedestrian crossings, but there is an expectation that some pedestrians will cross the road away from designated crossings, and the trip / step hazard remains. Pedestrians are at risk of especially poor outcomes from falls into dish kerb, particularly knee and ankle injuries and scrapes to shins and hands.

#### Recommendation(s)

1. Use the opportunity to upgrade the older drainage infrastructure as part of this project to remove the hazard.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Agreed the deep dish it need to be addressed as part of the future comprehensive Barbadoes st works. However, the upgrade of deep dish is not included in this project. Extra widths have been given to parking and cycle lanes next to the deep dish as mitigation.	
Safety Engineer comment	Agree with SAT and Designer response.	
Client decision	Insert comment	
Action taken	Insert comment	



### 6.3 Non-continuous Green Cycle Lane Markings

Moderate

The Barbadoes Street design shows several gaps in the green surfacing treatment in the cycle lanes approaching the Hereford Street, Cashel Street, Lichfield Street, and Tuam Street intersections. The green treatment is applied only at the intended left-turn lane entry location, and for a short stretch ahead of the advanced stop box.



Figure 6-2: Example of incomplete cycle lane green treatment at Tuam/ Barbadoes intersection

There is a risk that the broken green treatments will be difficult for drivers to interpret, especially during heavier traffic conditions when the pavement markings are obscured by other vehicles. This increases the likelihood of conflict between vehicles and cyclists, from which the outcomes for cyclists tend to be severe.

#### Recommendation(s)

1. Extend the green surface treatments in the cycle lanes on the approaches to all intersections to provide consistent warning to drivers.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Agree design will be updated to reflect this.	
Safety Engineer comment	Agree with SAT and Designer response.	
Client decision	Insert comment	
Action taken	Insert comment	

## 6.4 Lichfield Street and Cashel Street intersection Cyclist Facilities

Moderate

The design includes two proposed shared spaces at the south-eastern quadrants of both the Lichfield Street and Cashel Street intersections. Westbound cyclists on both Lichfield and Cashel Streets are directed to leave the on-street facility and use the proposed shared areas to turn left onto Barbadoes Street or cross over into the CMUA site. It is unclear if the expectation is that cyclists and pedestrians will use the same signalised crossings to access the CMUA at these intersections. The footpath is proposed to be widened in these areas however further consideration is required given the potential for conflicts in the space, especially when using the crossing points to access the CMUA, particularly when patrons are travelling to and from the CMUA for an event.

It is likely to be safer to maintain the existing separation between cyclists and pedestrians at these side road approaches, given the potential for conflicts from criss-crossing desire lines, and the visibility restrictions around the corners.

There are no corresponding eastbound cyclist facilities on either side road leading east from Barbadoes Street and the CMUA. This means that cyclists leaving the CMUA and central city to the east via Hereford, Cashel or Lichfield Streets must ride in the lane with vehicular traffic, increasing the likelihood of conflicts between cyclists and vehicles.

The safety audit team also observed that the proposed cycle ramp-off leads straight into a power-pole at Cashel Street intersection. This is a significant hazard that effectively renders the cycle off-ramp unusable.



Figure 6-3: The Cashel Street cycle ramp-off facility terminates exactly in line with the existing power pole

### Recommendation(s)

1. Maintain existing mode separation at the south-eastern quadrants of the Lichfield and Cashel intersections with Barbadoes Street.
2. Establish eastbound on-street cycle facilities away from the CMUA on Hereford, Cashel, and Lichfield Streets.
3. Review the intersection improvements designs at Cashel and Lichfield Streets to better function around existing infrastructure or consider relocation or removal of the infrastructure.

#### Recommendation(s)

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	<p>1. Because of the ground height difference between Te Kaha and the adjacent footpath on Barbadoes Street, there are no cycle access paths to Te Kaha near Lichfield and Cashel intersections. The cycle facilities at Lichfield and Cashel Streets intersections are by-passes for cyclists to turn left onto Barbadoes Street without waiting at the signals. However, the by-pass on Cashel Street has been removed because there are potential visibility issues around the corner.</p> <p>2. Noted. The cycle volume on Hereford, Cashel, and Lichfield Streets is very low and these streets are out of the project scope.</p> <p>3. Agreed. The intersection improvements will be further reviewed.</p>	
Safety Engineer comment	<p>1. Agree with SAT. Designer response noted regarding removal of bypass facility at Cashel Street due to visibility issues. Noted that current development of the site on the SE corner of the Lichfield intersection provides better visibility through the open on-site parking area, but if future redevelopment of this site results in a building up to the boundary then there would be concerns over visibility and cycle / pedestrian conflict at this location. Required markings and/or signage to establish a shared space will result in clutter and potential confusion with both user groups that increases risk of conflict. Cycle off ramp back to on-street cycle lane south of the intersection appears to be at an angle that may be difficult for some cyclists to negotiate without tracking outside the cycle lane and possibly into the adjacent traffic lane. Recommend maintaining mode separation at the Lichfield intersection in line with SAT recommendation.</p> <p>2. Partial agree with SAT. Designer response regarding scope noted. Indication of low cycle volumes presumably relates to current environment, but consideration should be given to expected future volumes following development of the CMUA.</p> <p>3. Agree with SAT and Designer response.</p>	
Client decision	Insert comment	
Action taken	Insert comment	

### 6.5 Hereford Street intersection

**Moderate**

There are a number of opportunities to improve the safety and efficiency for the Hereford Street intersection. It is still unclear what the future function will be for Hereford Street as there are no improvements proposed at this time in the mid-block between Barbadoes and Madras Streets. However, the SAT observed some improvements that can be made to improve the safety of the intersection, especially for pedestrian users.

The current pedestrian crossing is skewed due to the right turn bay on Barbadoes Street. This right turn bay is very short and provides little tangible value. The skew of the crossing leaves pedestrians exposed while waiting to cross Barbadoes Street in a northbound direction. The skewed crossing has visibility issues whilst the short stacking in the turn bay may lead to queuing back into the through lane. This layout is inconsistent with the other intersections on Barbadoes Street. The right turn bay on Barbadoes Street could be removed and the skewed pedestrian crossing can be corrected to a perpendicular crossing to improve visibility and reduce pedestrian exposure at the south-western quadrant. This would also reduce the crossing width for pedestrians on the northern side of the intersection.





Figure 6-4: Short stack right turn bay and skew crossing at the Hereford Street intersection, the red arrow showing where waiting pedestrians are exposed

#### Recommendation(s)

1. Remove the short-stack right turn bay at the Hereford Street intersection, and correct the skew of the pedestrian crossing to be perpendicular.
2. Better define the proposed use of Hereford Street so the Barbadoes/Hereford intersection improvements can be made in advance of the wider network changes.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	1. Noted. 2. Hereford Street intersection is out of the project scope. Both recommendations will be considered in the future Barbadoes or Hereford Streets project.	
Safety Engineer comment	Agree with SAT. Designer response indicates the intersection is outside the project scope, but the plans indicate proposed improvements at the intersection.	
Client decision	Insert comment	
Action taken	Insert comment	

## 6.6 Western Side Shoulder Treatment

Moderate

A 1.5 metre wide informal shoulder is proposed on the western side of Barbadoes Street for the full length of the CMUA site. CCC have informed the SAT that this is intended as an unmarked cycle lane, with no cycle symbols or green surface treatment proposed for the space. This proposed unmarked shoulder on the western side of Barbadoes Street is likely to be confusing to motorists and cyclists and will lead to misuse.





Figure 6-5: Informal cycleway on the western shoulder of Barbadoes Street between Lichfield and Tuam

It is especially likely that short stay pick-up/drop-off and rideshare vehicles will use this shoulder before and after events. This will affect congestion and have safety issues from vehicles overhanging the under width 1.5 metre wide shoulder and partially occupying the right-hand lane creating accessibility issues for cyclists trying to use this as a cycle lane to access the CMUA and reduce the effective width of the adjacent traffic lane hindering through movements. Having vehicles stopped in the shoulder area will force cyclists to either travel in the traffic lane and increase the risk of conflicts with vehicles or use the footpaths which are not designed as a shared pathway and increase the risk of collisions with pedestrians, landscaping, cycle parking, or signal infrastructure.

Recommendation(s)

- 1. Recommend reconsidering how this area is presented in the design to remove any confusion to cyclists and motorists.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Noted.  The project team has agreed not to add this 1.5 m excess space onto the footpath on Te Kaha side because the footpath is already very wide. Before the full upgrade of the entire length of Barbadoes Street, this 1.5 m excess space is going to be used as a cycle lane to connect the de facto cycle lanes on the west side of Barbadoes Street upstream and downstream Te Kaha section. The reason why it is not marked as a cycle lane is not to encourage more cyclists from riding on the west side of Barbadoes Street. More street furniture will be installed along the kerb to mitigate the misuse of the space.	
Safety Engineer comment	Partial agree with SAT and Designer response. The 1.5m width plus presence of deep dish channel between Hereford and Lichfield makes this unsuitable as a formal cycle lane. Installation of BYL no stopping markings 100-200mm from the dish channel will reduce the shoulder width to around 1.0-1.1m between the no stopping and edge line markings, which should avoid this being mistaken as a formal cycle lane and potentially also discourage short stay parking pick-up/drop-off	

Recommendation(s)

	occurrences anticipated by SAT. While some confident cyclists may still use the narrow shoulder on the west side, it is considered that most cyclists will use the formal cycle lane on the east side. The Designer response refers to the generous footpath width, however sections of the footpath past landscape features appear somewhat constrained. The indication that more street furniture will be installed to mitigate (discourage) short stay parking therefore needs to consider the resultant footpath width past these features.
Client decision	Insert comment
Action taken	Insert comment

6.7 Landscaping and Accessways

Moderate

The proposed landscaped areas indicated on the design plans may constrain the movements of pedestrians on narrow footpaths and lead to safety issues from pedestrians encroaching into the traffic lanes to avoid overcrowding on the footpaths. This a particular issue immediately south of Hereford Street on the western side of Barbadoes Street.



Figure 6-6: The red box shows an area of footpath particularly constrained by a landscaped bed south of the Hereford Street intersection. The yellow arrows show the high volume accesses

There are many existing accessways on the eastern side of Barbadoes Street that are likely to have higher volumes due to the nature of the activities that they service. However, little consideration has been given to mitigating the risks of conflicts at these accesses. Many of the accesses coincide with proposed on-street parking bays, such as outside the City Central Motel increasing the risks associated with poor visibility past parked cars and existing street trees increasing the potential for risky exit behaviours and collisions between through traffic and vehicles pulling out of accesses blindly.

The Subway outlet at the intersection of Cashel and Barbadoes Streets has the drive through exit on to Barbadoes Street within the left turn lane. This could create conflicts between vehicles exiting the drive through with left turning vehicles into Cashel Street and cyclists travelling along the proposed cycle lanes.

Recommendation(s)

1. Reconsider the positions and sizes of landscaping beds on Barbadoes Street to ensure footpaths can accommodate the increased pedestrian volumes expected at events.
2. Use hockey stick markings to delineate the proposed on-street parking and clarify where accessways are positioned

#### Recommendation(s)

3. Establish no-parking markings either side of high-volume accessways to ensure adequate visibility is maintained for exiting vehicles and ensure that existing and proposed landscaping does not obscure visibility.
4. Ensure that the effects of existing accesses, particularly higher volume commercial/industrial accesses, on the proposed design for Barbadoes Street.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	<ol style="list-style-type: none"> <li>1. Agreed. The positions and sizes of landscaping will be reviewed.</li> <li>2. Agreed. Hockey stick markings will be added on the east side of the street</li> <li>3. Agreed. No-parking will be added on the right hand side of high-volume access ways.</li> <li>4. Noted. The accesses on the east side of Barbadoes Street will be upgraded in the future Barbadoes Street project.</li> </ol>	
Safety Engineer comment	<ol style="list-style-type: none"> <li>1. Agree with SAT and Designer response.</li> <li>2. Agree with SAT and Designer response.</li> <li>3. Partial agree with SAT and Designer response. Unclear what constitutes a high volume access in this context, or what defines adequate visibility, and what extent of no stopping will be installed. Agree with Designer that no stopping (if installed) would only be required on the right hand (upstream) side of the access. It is considered that marking of hockey sticks (parking limit lines) at least 1m from accesses may suffice in many locations.</li> <li>4. Wording of SAT recommendation is unclear, but presumably encapsulated in recommendations 1-3 and associated Designer responses in relation to detailed design stage considerations and any future Barbadoes Street upgrade projects.</li> </ol>	
Client decision	Insert comment	
Action taken	Insert comment	



7. Lichfield Street Safety Concerns

7.1 Speed Environment Moderate

The design team had indicated that Lichfield Street between Manchester and Madras Streets would normally operate with a 30km/h posted speed limit and a system of variable message signs (VMS) would be activated during events to reduce the operating speeds to 10 km/h to mitigate hazards during high volumes of pedestrian movements. The SAT consider that a permanent 10km/h speed limit will be more appropriate for the proposed pedestrianisation than the proposed variable speed limits and complex VMS warning system.

The 10km/h speed will better reinforce that the space is designed with pedestrians and vulnerable users in mind and assist in discouraging vehicle use, which in turn will reduce pressure on Nurseryman Lane and the exit onto Tuam Street. The tram tracks have recently been completed with the tram services recently commenced in this area which also creates a slower area. The 10km/h permanent speed limit is also consistent with the neighbouring improvements in High Street and the existing posted speed limits in Nurseryman Lane and Poplar Street, and it makes sense to apply consistent speed management to the streets in this area.

Given the type of the improvements proposed for Lichfield Street with narrowing the trafficable road width with a single lane from Manchester Street to Nurseryman Lane, widened footpath and more landscaping, the SAT believe that these are comparable to the treatments on Oxford Terrace between Durham Street and Antigua Street and therefore create the self-explaining environment for all users in the area.

Recommendation(s)

- 1. Establish permanent 10 km/h speed limits in Lichfield Street between Manchester and Madras Streets for consistency with the neighbouring High Street, Nurseryman Lane and Poplar Street speed limits.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Agreed. The proposed speed limit will be permanent 10 km/h	
Safety Engineer comment	Agree with SAT and Designer response.	
Client decision	Insert comment	
Action taken	Insert comment	

7.2 Speed Management and Through Movements Moderate

With the ability to travel east along Lichfield Street from west of Manchester Street to Madras Street, the route may still be used as a thoroughfare and form part of circulation patterns in the CBD. This is likely to reduce the ability to create optimally pedestrianised space, affect the amenity value of the proposed improvements, and may present a safety hazard to pedestrians. A raised safety platform at the beginning of the bi-directional section (immediately east of Nurseryman Lane outside #137 Lichfield Street) will assist in reinforcing the desired reduced speed through the corridor and deter through movements.

Recommendation(s)

- 1. Establish a raised safety platform immediately east of Nurseryman Lane outside #137 Lichfield Street to reinforce desired speeds and discourage use as thoroughfare.
- 2.



Recommendation(s)

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	1. As the environment being shared space, a raised platform may be a trip hazard. Pavers have been considered here instead. Agree, will look to implement raised platforms.	
Safety Engineer comment	Partial agree with SAT and Designer response. The Designer response appears to initially dismiss the raised platform recommendation of SAT (in favour of pavers), but then agrees and indicates that raised platforms will be considered. Potential trip / stumble hazards associated with grade changes at a raised platform within a pedestrian space noted and agreed, however calming features could potentially be considered east of the shared zone extent. Use of this section of Lichfield Street as an eastbound route for general through traffic can also be discouraged to some extent through design of signal phase times on the Madras Street approach.	
Client decision	Insert comment	
Action taken	Insert comment	

7.3 Lichfield / Madras Intersection Geometry

Moderate

The SAT are unsure if the proposed median island and kerb build out at the Lichfield / Madras intersection will be able to accommodate the turning movements for service vehicles, particularly rubbish removal trucks, that need to access the hospitality outlets in Lichfield Street and the Laneways. The pedestrianisation of the space will increase the numbers of people using the crossing points and therefore the numbers of people waiting at the south-east quadrant, and there is a risk that larger vehicles may encroach into the waiting areas if they cannot adequately turn through the intersection. This will also damage the adjacent landscaping, which creates trip hazards and reduces the amenity value.

The SAT consider that there is value in by including a central splitter island between the crosswalk and green cycle paint on Madras Street, to channelise the left turn movement from Lichfield Street into Madras Street and to provide additional protection for pedestrians in the intersection.

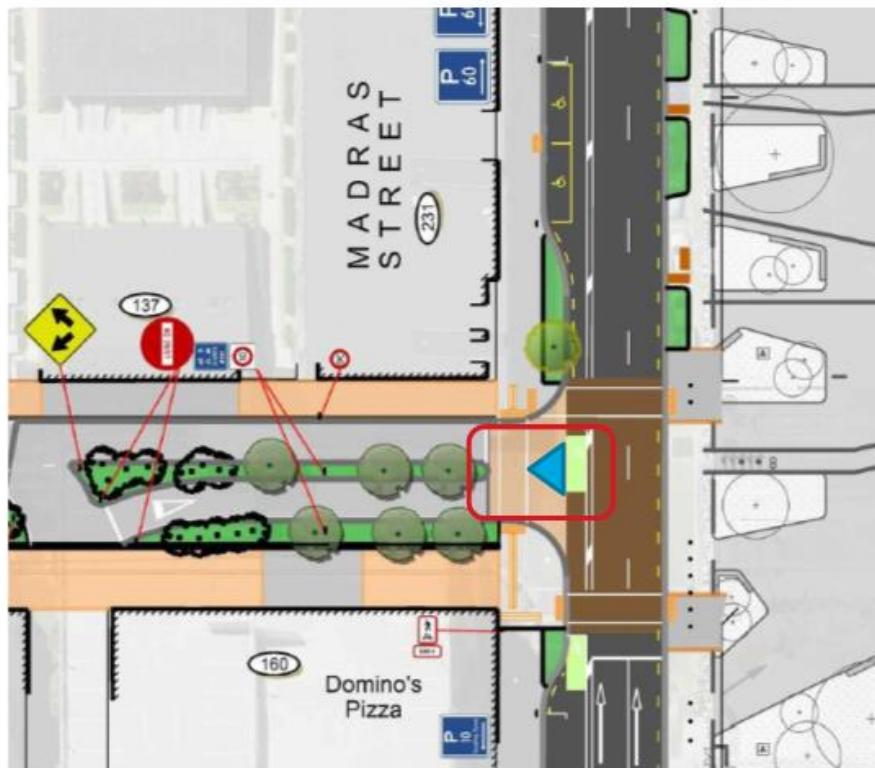


Figure 7-1: Potential splitter island to channelise traffic at Lichfield/Madras intersection

#### Recommendation(s)

1. Confirm the design vehicle for the left turn into Lichfield Street from Madras Street and undertake a tracking path check on the left-turn movement into Lichfield Street.
2. Extend the median island past the pedestrian crossing to better channelise the left turn from Lichfield Street into Madras Street and provide additional protection for pedestrians.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	<ol style="list-style-type: none"> <li>1. Tracking path will be carried out to confirm turning movements for service vehicles.</li> <li>2. The island reduces the available width for large pedestrian congregation to cross and may be a trip hazard at large scale events?</li> </ol>	
Safety Engineer comment	<ol style="list-style-type: none"> <li>1. Agree with SAT and Designer response.</li> <li>2. Disagree with SAT. Agree with Designer response.</li> </ol>	
Client decision	Insert comment	
Action taken	Insert comment	

## 7.4 Pedestrian Holding Capacity & Signal Phasing at Madras Street Intersection


Significant

The proposed design does not increase the overall holding capacity of the footpath on the northern side of the intersection of Lichfield and Madras Streets (North-West quadrant) for pedestrians, when compared to the existing configuration. This is one of the most significant crossing points linking CMUA to the bus interchange and central city hospitality areas. This results in the footpath on the northern side of Lichfield Street being narrow and places pedestrians in conflict with vehicles that may be exiting Lichfield Street on to Madras Street, particularly before and after events. This reinforces comments in Section 4.2 on the need for wider marked crossing areas over Madras Street at the key intersections to ensure the safety of vulnerable users at these crossing points. With the reduced size of the holding areas, a review of the traffic signal phasing at the intersection will be required to enable safe pedestrian crossing movements during the Lichfield Street traffic turn left phase into Madras Street.

Further refinements to the signal phasing will be required to ensure that when the pedestrian crossing phase for the Lichfield Street crossing is activated, it will not introduce significant delays to left-turning vehicles from Madras Street. Noting that no specific left-turn bay facility proposed on the Madras Street approach to the intersection. The lack of a left turn bay combined with a no-left-turn signal to allow pedestrians to cross will create a delay in the left lane on Madras Street that may increase the risk of nose-to-tail collisions or increase the likelihood of lane-change conflicts from evasive manoeuvres to avoid the queues in the left lane.

### Recommendation(s)

1. Increase the footpath width and holding bay area on the north-west quadrant of Lichfield Street to better cater for expected pedestrian numbers.
2. Increase the marked crossing widths across Madras Street to cater for projected demand.
3. Operate pedestrian phase as a Barnes Dance movement to avoid left lane delays on Madras Street during the Lichfield Street pedestrian crossing signal phase.
4. Consider event operation plans with longer pedestrian signal phases to allow greater crossing capacity.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	<ol style="list-style-type: none"> <li>1. Will be considered during detailed design if possible.</li> <li>2. The existing crossing widths are considered adequate for normal conditions for ~90% of the time when major events do not take place</li> <li>3. It will be considered during our signal detailed design stage.</li> <li>4. It will be considered during our signal detailed design stage.</li> </ol>	
Safety Engineer comment	<ol style="list-style-type: none"> <li>1. Agree with SAT and Designer response. Also consider placement of street light poles and street furniture (eg existing bins, if retained) to maximise available space.</li> </ol>  <ol style="list-style-type: none"> <li>2. Assumed that 90% figure suggested in Designer response is based on expected numbers of smaller-scale events, and presumed that the other 10% would be addressed through (major) event management plans / TTM.</li> <li>3. Agree with SAT and Designer response.</li> </ol>	

Recommendation(s)

	4. Agree with SAT and Designer response. Note that Designer response to 4.2(3) suggests it is proposed to operate long pedestrian phases for a temporary period when a high demand is expected at major events.
Client decision	Insert comment
Action taken	Insert comment

7.5 Nurseryman Lane Configuration

Significant

As discussed in Section 5.1, Nurseryman Lane was not designed to accommodate high traffic volumes and currently functions as a service lane, a back entrance to commercial buildings, and the access for the 350 space Innovation Precinct car parking building. It is currently not constructed to a standard that services an increased demand in the car parking building, and no measures have been proposed to upgrade this lane accordingly.

There is a significant risk of conflict between all users in the space if no improvements are made. As can be seen in Figure 7-2 rubbish skips located in the lane together with parked vehicles. This may create conflicts with vehicles, and in turn with pedestrians, cyclists, and micro-mobility users if the trafficable width is constrained or blocked.

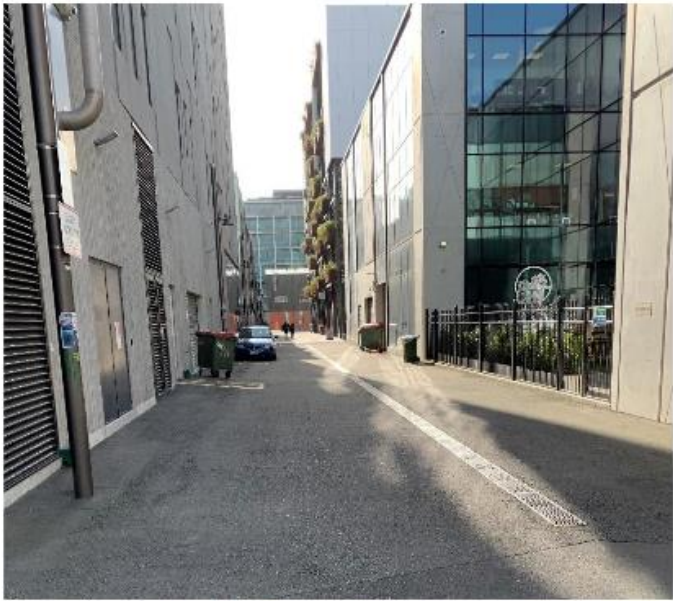


Figure 7-2: Nurseryman Lane looking north from Tuam Street towards Lichfield Street

Recommendation(s)

1. Consider improvements to the Nurseryman Lane space so that the environment can cope with the proposed additional volumes.
2. Restrict stopping and parking in Nurseryman Lane to ensure the lane is not obstructed by service vehicles.



Recommendation(s)

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	1. Noted. Lichfield Street east end has been changed to two-way from the previous one-way option. This will remove the additional traffic added onto Nurseryman Lane in the previous design. The current design should not have much impact on the traffic volume of Nurseryman Lane. 2. Agreed. Parking enforcement will be implemented on Nurseryman Lane to remove the illegal parking	
Safety Engineer comment	1. Agree with issue raised by SAT but disagree with 'likely' severity rating and 'significant' overall safety concern rating as this is a shared zone and 10 km/h environment. Generally agree with Designer response. While the proposals may not result in increased general traffic volumes / patterns on Nurseryman Lane, there could be increased peak flows associated with a concentrated discharge of the parking building after CMUA events. 2. Agree with SAT and Designer response. Noted that stopping restrictions already apply to non-authorised vehicles.	
Client decision	Insert comment	
Action taken	Insert comment	

7.6 Directional Pavement Markings Moderate

The proposed lane arrow pavement markings in advance of the Lichfield Street intersection on Madras Street do not indicate that a left turn movement can be made into Lichfield Street from Madras Street. There is a risk that the through arrow markings may confuse users and cause hesitation in the intersection which may increase the incidence of nose-to-tail crashes on Madras Street, or evasive lane changes which may increase the occurrence of sideswiping.

The through arrow on Lichfield Street for eastbound traffic at the Nurseryman Lane intersection may contribute similar confusion at that junction because the right turn movement into Nurseryman Lane has not been indicated, though the risk is greatly reduced as traffic volumes making that movement and speeds are lower.

A left-turn arrow has not been provided to guide westbound traffic from Madras Street into Nurseryman Lane, which creates a risk that drivers may misunderstand the permitted movements and drive the wrong way along Lichfield Street towards Manchester Street.



Figure 7-3: Proposed lane arrows on Madras Street

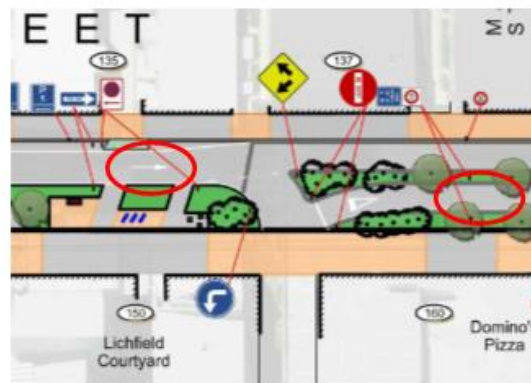


Figure 7-4: Proposed and missing lane arrow markings on Lichfield Street

#### Recommendation(s)

1. Revise pavement arrow markings to better reflect movements and key decision points prior to intersections.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	1. Agreed. Marking will be reviewed in detailed design stage.	
Safety Engineer comment	Agree with SAT and Designer response.	
Client decision	Insert comment	
Action taken	Insert comment	

## 7.7 Cycle/Tram Track Interactions

Significant


There are several cycle stands proposed along Lichfield Street. The stands between Poplar Street and Manchester Street are proposed immediately adjacent to the tram lines, and there is a risk of conflict between the cycle stand users and the trams at these locations, particularly from bikes overhanging tramlines, or cyclists accidentally stepping into the path of on-coming trams while tethering or untethering their cycles.

The proposed design also increases the risk of poor outcomes at the tram tracks, as the road space is narrowed, and the tram line takes up a larger proportion of the defined carriageway width. Tram tracks represent a serious wheel entrapment risk for cycles and are likely to become slippery in wet and frosty conditions. Additional mitigations around these issues will need to be imposed to ensure the space is safe for cyclists and micro-mobility users to use, especially as the northern footpath is narrow and will not be suitable as a fully shared space.

#### Recommendation(s)

1. Reconsider cycle parking positions to ensure there are no conflicts with tram operations.
2. Include additional mitigations on tram tracks to reduce wheel entrapment and slip hazards for cyclists.

Recommendation(s)

Frequency Crashes are likely to be occasional	Severity Death or serious injury is very likely	Rating The safety concern is significant
Designer response	<ol style="list-style-type: none"><li>1. The parked cycle on the stands would not encroach onto tram path. The environment is a 10km/h shared path there should not be visibility issue between oncoming tram and cyclists by their bikes.</li><li>2. It will be considered if any additional mitigations can be done on existing tram track to improve safety of cyclists and micro-mobility users.</li></ol>	
Safety Engineer comment	<ol style="list-style-type: none"><li>1. Partial agree with SAT, but disagree with 'likely' severity rating and 'significant' overall safety concern rating due to the speed environment and tram travel speeds. Agree with Designer response. Noted that positioning of cycle stands adjacent tram tracks is commonplace in other locations around the city with no apparent issues (including when cyclists are parking/unparking as illustrated in High Street example below).</li></ol> 	
	<ol style="list-style-type: none"><li>2. Agree with SAT and Designer response.</li></ol>	
Client decision	Insert comment	
Action taken	Insert comment	

7.8 Poplar Street Access

Moderate

Poplar Street currently provides service access for several hospitality outlets at certain times of the day and restricting this to Tram-only may require service vehicles to park in Lichfield Street itself. This may result in risks around delivery and service vehicles parking inappropriately and creating additional barriers to access and conflicts with vulnerable users.



Figure 7-5: Poplar Street from Lichfield Street, showing time restrictions for service vehicle access

Additional consideration needs to be given to how service vehicles will access Poplar Street to ensure that users of the pedestrianised Lichfield Street space are not hindered or endangered by vital hospitality service deliveries.

Recommendation(s)

- 1. Review the service vehicle access to Poplar Lane to reduce conflicts between all modes on Lichfield Street.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Agreed. Service vehicle access and loading zone etc will be reviewed.	
Safety Engineer comment	Agree with issue raised by SAT, but disagree with 'likely' severity rating due to the speed environment. Agree with Designer response.	
Client decision	Insert comment	
Action taken	Insert comment	



8. Comments

The following comments are either:

- of a general nature; or
- cannot be related to any specific safety concern; or
- relate to previous safety concerns that may have been misinterpreted; or
- relate to subsequent design developments that could become safety concerns in a future safety audit; or
- relate to safety concerns that the designers are already aware of; or
- relate to design elements where the safety implications are not yet clear due to insufficient detail for the stage of the project.

These comments are included for the consideration of the designers and the client. Decision tracking tables are included to record responses, as attention paid to the comments may contribute to improving overall road safety.

8.1 Works Staging

8.1.1 Infrastructure Damage Under Construction Vehicles

The staging of the on-street improvement works should be carefully considered. Completing roading upgrades before the CMUA is constructed risks that construction vehicles will damage the new infrastructure, requiring expensive re-works to ensure the aesthetics and function of the space meet the requirements.

Similarly, construction staging should consider the timing for the proposed 200-unit residential development to be located on the north-east corner at the Manchester/Lichfield intersection. The proposed Lichfield Street improvements cannot accommodate the type of construction plant currently in use on the development north of Cashel Street. Also, constant use by HCVs will damage the proposed paving and pavements, and expensive and unwieldy TTM set-ups may be required to facilitate HCV and specialist plant access to the site during construction, as the roading reconfigurations are not designed with this type of use in mind.

Designer response	This issue will be taken into account during the construction phase.
Safety Engineer comment	Noted.
Client decision	Insert comment
Action taken	Insert comment

8.1.2 Works Staging Around Street Directional Changes

The staging of the roading improvement works also needs to consider the programming of the proposed directional changes on Tuam Street and Lichfield Street to avoid creating of inappropriate or unsafe detour routes and TTM set-ups during temporary works.

Designer response	This issue will be taken into account during the construction phase.
Safety Engineer comment	Noted.
Client decision	Insert comment

Action taken	Insert comment
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## 9. Audit Statement

We declare that we remain independent of the design team, and have not been influenced in any way by any party during this road safety audit.

We certify that we have used the available plans, and have examined the specified roads and their environment, to identify features of the project we have been asked to look at that could be changed, removed or modified in order to improve safety.

We have noted the safety concerns that have been evident in this audit, and have made recommendations that may be used to assist in improving safety.

Signed 

Date 7 July 2022

Dave Aldridge, Senior Technical Director – Civil Engineering, Beca

Signed 

Date 7 July 2022

Alex Lumsdon, Associate – Transportation Engineering, Beca

Signed 

Date 7 July 2022

Melanie Muirson, Senior Principal Transportation Engineer / Road Safety Practice Lead, Stantec

Signed 

Date 7 July 2022

Rebecca Tinga, Transportation Engineering Technologist, Stantec

## 10. Response and Decision Statements

System designers and the people who use the roads must all share responsibility for creating a road system where crash forces do not result in death or serious injury.

### 10.1 Designer's Responses

I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report and I have responded accordingly to each safety concern with the most appropriate and practical solutions and actions, which are to be considered further by the safety engineer (if applicable) and project manager.


Signed 

Date 19 July 2022

[Barry Hayes, Senior Traffic Engineer – Christchurch City Council]

### 10.2 Safety Engineer's Comments (if applicable)

I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report together with the designer's responses. Where appropriate, I have added comments to be taken into consideration by the project manager when deciding on the action to be taken.

Signed 

Date 2 February 2023

[Wayne Gallot, Senior Transport Engineering Contractor, Christchurch City Council]

### 10.3 Project Manager's Decisions

I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report, together with the designer's responses and the comments of the safety engineer (if applicable), and having been guided by the auditor's ranking of concerns have decided the most appropriate and practical action to be taken to address each of the safety concerns.

Signed 

Date

[Project Manager's name, qualification, position, company]

### 10.4 Designer's Statement

I certify that the project manager's decisions and directions for action to be taken to improve safety for each of the safety concerns have been carried out.

Signed 

Date

[Designer's name, qualification, position, company]



### 10.5 Safety Audit Close Out

The project manager is to distribute the audit report incorporating the decisions to the designer, safety audit team leader, safety engineer, and project file.

Date:.....

[\(ClickHereToAddReferenceInfo\)](#)



Appendix A    Supplied Drawings

Drawings and supporting information supplied electronically.

**Christchurch**

Hazeldean Business Park, Level 2, 2 Hazeldean Road  
Addington, Christchurch 8024  
PO Box 13-052, Armagh  
Christchurch 8141  
Tel +64 3 366 7449  
Fax +64 3 366 7780

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## Addendum

To:	Barry Hayes	From:	Mike Smith
	Christchurch City Council		Stantec
Project/File:	310203418	Date:	11 April 2023

### Reference: Lichfield Street - Street Layout Options Safety Review

As instructed, Stantec has undertaken a safety review of the proposed Lichfield Street development options, utilising the Safe System Audit (SSA) and Safe System Assessment Framework (SSAF) process.

## 1 Background

### 1.1 Scope of Works

A Safety Review is required for the options presented for the Lichfield Street upgrade as part of the wider roading upgrade around the Te Kaha Canterbury Multi Use Area (CMUA). This is to be undertaken in process that is generally consistent with the Safe System Audit guidelines. This relates to the section of Lichfield Street between Manchester Street and Madras Street.

The due date for the report is COB 7<sup>th</sup> April.

**Given the relative urgency, a full formal report is not required and should be classified as an addendum or memorandum to the previous Road Safety Audit (RSA) undertaken for this road section.**

In terms of the schemes to be evaluated, three options are to be scored and assessed, namely:

1. Option 0 – The existing road layout.
2. Option 2 – a do minimum improvement (2-way, 30 km/h speed limit, fully kerbed, mostly asphalt pavement and no shared space)
3. Option 3 – a 2-way, shared space scheme, 10 km/h speed limit, mostly without kerb/channel and with various paved areas. This also includes a 'flexible' outdoor dining area on the south side of the street. During busy event times, outdoor dining will be restricted to facilitate a wider walking space, to enhance the route between the bus interchange and Te Kaha.

Note that no signal phasing changes are proposed at the Lichfield/Manchester intersection.

Scheme plans for Options 2 and 3 are supplied. Typical cross sections are included showing Options 1, 2 and 3.

In addition, and to assist with Council's proposed major event controls, there is an overlay plan that shows provision for event traffic management – this shows signage and bollards that will only be activated during significant events. This is purely for information and context and is not assessed within the SSA.

Option 1 was the layout that was originally safety audited by Stantec and Beca (predominantly one-way, 10 km/h, shared space) and is not to be considered for this safe system audit.

In terms of the landscaping and streetscape, the main focus has been on supporting the low-speed environment.

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Reference: Lichfield Street - Street Layout Options

Features to support a low-speed environment are:

- ⌘ A fully paved surface – identifies the street as a 'shared space', colour changes visually define zones and break up the linear street space.
- ⌘ Changes of texture – a combination of slightly different textures will give tactile indication of travelling through a series of discreet spaces rather than along a road.
- ⌘ Trees – tall trees where possible to create a vertical presence along the edge of the traffic lane.
- ⌘ Vertical structures – screens, bollards and tram poles provide vertical elements to give a sense of enclosure.
- ⌘ General street environment – street furniture, garden beds etc are arranged in the activity zone adjacent to the traffic lane. Creates a visually rich environment that signifies to drivers that this is a shared space.





As part of the safety assessment, and in accordance with the SSA framework, Council would appreciate any advice on further measures or treatment that would support and enhance the 10 km/h speed environment.

1.2 Previous Assessments

Stantec had previously undertaken a Road Safety Audit of Option 1 as described above.

1.3 Supplied Material

The Safety Review Team (SRT) have been supplied the following documents:

Name	Date modified	Type	Size
 Lichfield St west option 3 cross sections.PDF	29/03/2023 1:31 p.m.	Adobe Acrobat D...	232 KB
 rd3829s13-Lichfield Option 3.pdf	29/03/2023 1:30 p.m.	Adobe Acrobat D...	1,543 KB
 rd3829s13-Option 3 Event Traffic Management plan.pdf	29/03/2023 1:31 p.m.	Adobe Acrobat D...	1,788 KB
 tp360101-Lichfield St do min consultation plan.PDF	29/03/2023 1:31 p.m.	Adobe Acrobat D...	2,772 KB

1.4 Safety Review Team

The Safety Review Team (SRT) comprised of two very experienced practitioners of the Safe System Assessment Framework, and multi-modal projects.

Table 1-1: Safety Review Team

Name	Position	SRT	Element
Melanie Muirson	Senior Principal Transportation Engineer – Road Safety & Technical Practices Leader – Transportation	Stantec	All
Mike Smith	Senior Principal Transportation Engineer – Road Safety & Practice Leader - Road Safety	Stantec	All

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Reference: Lichfield Street - Street Layout Options

## 2 Safety Review Assessment

Each option has been assessed as presented. A site visit was undertaken on 30 March 2023. This comprised of a daytime inspection of the street, and its current operation.



Figure 2-1. Overview of Lichfield Street and Adjoining Laneways

### 2.1 Project Constraints

#### 2.1.1 TRAM

The existing tram tracks do not allow the use of any vertical treatments that would typically be utilised for a slow speed environment. This limits the selection of appropriate and effective treatments that would normally be utilised for a slow speed environment.

The tram generally has priority movement through the loop track arrangement that traverses eastbound along Lichfield Street, into Poplar Lane, High Street and returning back into High Street northwest to Manchester Street.

#### 2.1.2 DRAINAGE

Discussions with Council staff have highlighted the existing constraint of property levels, and the potential for adverse water intrusion into adjacent properties, should vertical elements be considered as a solution. The SRT have considered this element in their assessment of potential treatment styles for each option under assessment.

### 2.2 Existing Operation – Adverse behaviours

During the site inspection, the SRT observed the general operation and behaviour of users along Lichfield Street, and the surrounding connecting laneways. The SRT detail some of the actions observed, as if not addressed, the continuation of those actions would have an adverse impact on any proposed new street layout. Issues observed are summarised in the following sub-sections.

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Reference: Lichfield Street - Street Layout Options

## 2.2.1 UNSAFE / ILLEGAL VEHICLE MOVEMENT

The SRT observed a higher-than-expected number of illegal movements in laneways. This resulted in drivers travelling opposite to the posted one way system to exit or arrive at their destinations. This creates significant conflict and risk to vulnerable users.

It was observed that access to the parking in and around the Poplar Lane / Tuam Street / High Street corner was gained via following the tram tracks from High Street, turning left into Poplar Lane and entering the parking space. A review of the existing signs on High Street reveals that there is little, if any signs restricting this movement, yet it is in counter direction to the north to south one-way movement in Poplar Lane.

This action by drivers also creates a risk to the tram operation, where the tram has no capacity to avoid an illegal movement.

### Safe System Treatment Actions

1. Install no-entry signs for the movement from High Street towards Poplar Lane
2. Undertake strong enforcement to prevent illegal travel movements in the laneways

In ascertaining the day-to-day operation of the laneway system, the SRT observed that there were locations where vehicles were parked within the lanes, in a direction opposite to the legal direction of travel. Examples are provided below:



Figure 2-2: Trade vehicles parked contra-flow to one way system



Figure 2-3: Delivery truck accessing Nurseryman Lane from Tuam Street – opposing one way system

The SRT noted delivery vehicles access Nurseryman Lane from Tuam Street – this is opposing the one-way system. The vehicle parked in the laneway blocking the exit, and upon completion of its delivery, reversed blind back into the cycle / left turn facility on Tuam Street. This creates a significant hazard to cyclists, and a high risk of reversing into traffic legally travelling on Tuam Street. For cyclists, an impact with a large vehicle will result in serious to fatal injuries. A large vehicle reversing blind out over the footpath and striking a pedestrian will result in serious to fatal injuries.

### Safe System Treatment Actions

1. Undertake strong enforcement to prevent illegal travel movements.
2. Undertake a comprehensive review of sign placement, and location, to ensure that a driver clearly identifies the restricted movements in the laneways.

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Reference: Lichfield Street - Street Layout Options

## 2.2.2 BUSINESS – POOR PARKING BEHAVIOURS

While on site, the SRT observed a number of poor and/or illegal driving behaviours by staff / delivery people working for businesses along Lichfield Street. An example includes:

A fast food outlet (Pizza shop) is located at the intersection of Lichfield Street and Madras Street. Delivery drivers servicing deliveries from this outlet were observed to be parking illegally on street, undertaking reverse movements into live intersections (contrary to signal phases), parallel parking, parking over yellow no stopping lines, low speed minor impact with parked vehicles and driving away. Photos of this behaviour are included below.

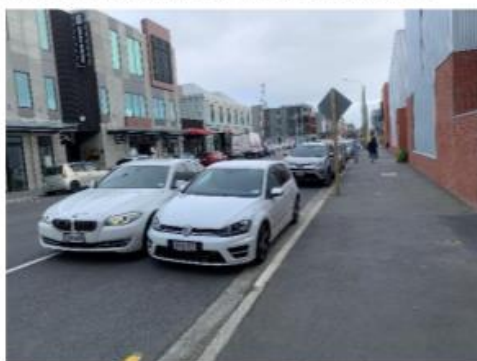


Figure 2-4: Delivery vehicle double parked hard against kerbside vehicle, resulting in vehicle impact.



Figure 2-5: Delivery vehicle illegally parked over footpath in intersection throat



Figure 2-6: Delivery driver illegally reversing into live lanes of Madras Street.



Figure 2-7: Delivery vehicle illegally parked over footpath in intersection throat

This matter was raised with staff at the associated business. Their response to the issues reflected that they just needed to do these actions as it was the fastest and only way for their delivery drivers. There was no recognition of the actions having any impact on the safe movement of all other users.

### Safe System Treatment Actions

1. Undertake immediate discussions with fast food retailers in the area to ensure that unsafe actions are not carried out by their drivers.

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### 2.2.3 REDUNDANT AND CONFLICTING ROAD MARKINGS

The Lichfield Street approach to Madras Street retains the previous intersection markings, and has a lane marked as a through lane (eastbound movement), when there is not a corresponding lane to enter into due to the eastern approach being closed permanently for the Te Kaha site development.

Drivers were observed to arrive at the marked through lane, and then undertake a parallel left turn in the green signal phase. The vehicle on the left of this position is correctly using the left turn lane and would not expect another vehicle to negotiate around them to occupy the right-hand northbound lane, especially where the driver in the correct (left) lane may then undertake a movement into the right-hand northbound lane as required to do so by the traffic regulations.



Figure 2-8: Driver occupying marked through lane.



Figure 2-9: Driver using central through lane to undertake a parallel left turn.

#### Safe System Treatment Actions

1. Install temporary delineation on the central through lane to exclude its use and force all left turn traffic into the existing left turn lane on Lichfield Street.

### 2.2.4 ILLEGAL PARKING

The SRT observed vehicles illegally parked within the Madras / Lichfield intersection and across pedestrian facilities on Madras Street. At the time of the site inspection, there was also a pedestrian detour in place directing northbound pedestrians to cross at the Lichfield Street intersection and traverse northbound on the eastern side of Madras Street.

The illegally parked vehicles obstructed safe pedestrian movement. This illegal parking creates a significant risk to pedestrians at a crossing point and reflects the current behaviour of drivers when there is a high demand for free all-day parking, and a greatly reduced supply.

The SRT undertook direct action by contacting Council Parking Enforcement, resulting in a parking officer coming to site and taking action.

### 2.2.5 EXISTING OPERATION – NEW DEVELOPMENTS

At the entry meeting for this task, Council staff identified potential for new builds along Lichfield Street, in current car park areas. It was identified that at the time of writing this report, there was no detail on the location of vehicle access to the property (if any) for business developments.

There is a well-advertised new residential development within the East Frame that will engage with Lichfield Street. It is understood that this development will generally have no residential on-street parking, will include some form of off-street parking for owners (as detailed in Bedford Row), but will still enable limited visitor parking.

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Reference: Lichfield Street - Street Layout Options

It is further understood that the development of the land east of Huanui Lane will incorporate some form of street level retail / business / commercial engagement with the lane.

The Huanui Laneway is part of the developed East Frame. The current laneway enables two directions of movement, yet other lanes (Poplar Lane / Nurseryman Lane) only enable one way movement.

The current formation of Huanui Lane does not have any facility for a driver to turn safely and proceed in the opposite direction. Parking in the laneway is restricted to isolated pockets on the eastern side of the laneway.

#### **Safe System Treatment Actions**

1. Review the current design intentions for the Huanui Laneway and upgrade signs to reflect the current and proposed operational use of the laneway, e.g., confirm direction of travel.

## **2.3 General Safety Review Assessment**

The following sections outlines elements common to all designs that have an effect on the safe movement of all users.

The SRT are aware of recent changes that removed containers that were installed as a protective barrier from earthquake prone buildings. With their removal and understanding previous agreements on street upgrade requirements from earlier pieces of work for Otakaro, it is assumed that the current footpath and road shoulder restrictions on Lichfield Street (old building) will include restoration of full road cross section prior to any changes to the Lichfield Street (Manchester to Madras) project site.

## **2.4 Option 0 – Existing Road Layout**

The assessment of the existing road layout option revealed a number of illegal and unsafe driver behaviours along the Lichfield Street section, and the connecting side roads / lane ways, as detailed above. The matters raised in this section should be read in conjunction with the findings in Section 2.2



Figure 2-10: Existing Road Cross Section.

Option 0 retains the existing look and feel of Lichfield Street, and the connection to the surrounding network. There are no substantive treatments proposed under this option.

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Reference: Lichfield Street - Street Layout Options

2.4.1 SPEED

SPEED LIMITS

Observations on site indicate that general operating speeds along Lichfield Street remain above the legal speed limit of 30 km/h.

Of note, Huanui Lane is scheduled as being 10 km/h within the National Speed Limit Register (NSLR), yet on the ground there is no legal speed limit signs installed for the restriction, or the de-restriction. In addition, the NSLR schedules the section of High Street between Tuam Street and Manchester Street as being 30 km/h, yet 10 km/h roundels have been installed. This is an inconsistency between the NSLR and on-ground.

The lack of 10 km/h signs on Huanui Lane could result in adverse speed on the shared use facilities constructed.

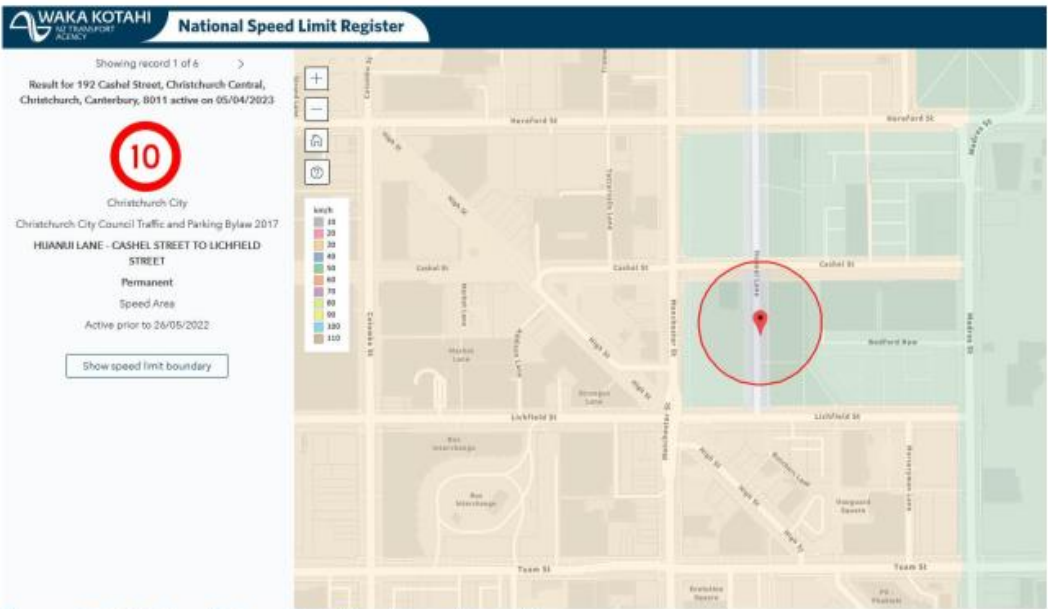


Figure 2-11: National Speed Limit Register – Huanui Lane.

Safe System Treatment Actions

1. Undertake an urgent assessment of legal speed authorisations and compare to the NSLR to ensure that all legal elements for the posted and legal speeds are correct.

SPEED ENVIRONMENT

The wide lanes and shoulders alongside parked vehicles on Lichfield Street have the look and feel of a 50 km/h road. The current road cross section and typology fails to inform of a slow speed environment, and as a result adverse speeds are encountered.

This has an adverse impact on general day-to-day use and will have a significant impact on the slow street environment desired during events at the CMUA. A lack of speed control features, along with wide shoulders that drivers could consider suitable for parallel parking / pick up / drop off will create a

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confused and complex operation during events such as a rugby match, where the street could remain open to traffic, yet there is significant pedestrian and vulnerable user movement.

The safe system framework requires that a street layout should be self-explaining and ensure that the operating speeds reflect the desired use. Failure to slow traffic speeds through suitable treatments will lead to vehicle / vulnerable user crashes that resulting in poor alignment to human tolerance to impact force, as shown below.

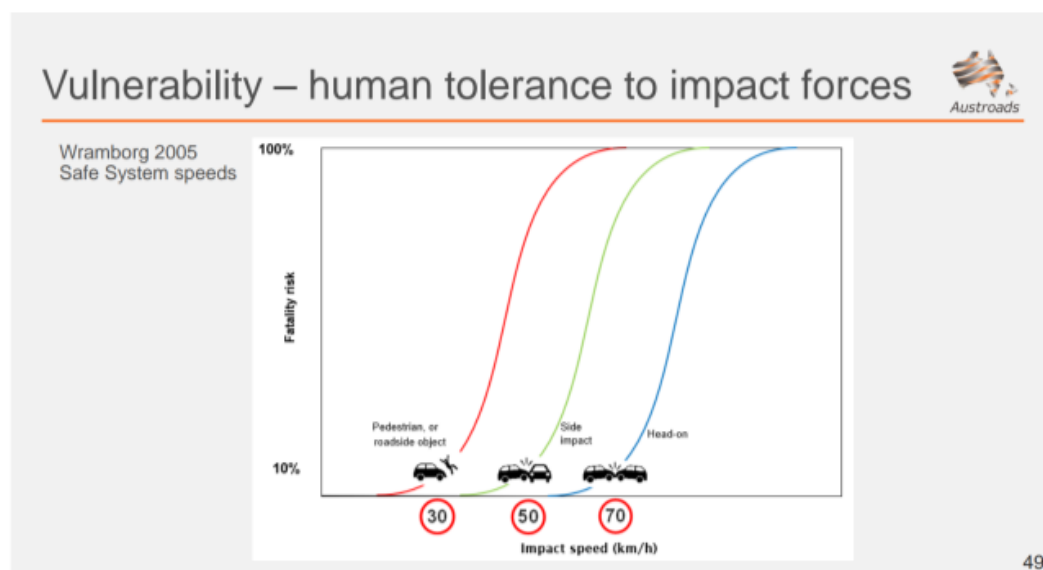


Figure 2-12: Vulnerability – Human Tolerance to impact forces. Wramborg; 2005

Supporting speed threshold treatments that assist in the definition of a slow (30 km/h) speed environment is critical in reinforcing the posted legal speed. A vehicle / vulnerable user crash above 30 km/h would have a significantly greater risk of a serious or fatal injury. At 40 km/h there is a 40% fatality risk, climbing to 80% at 50 km/h.

**The existing road configuration is considered non-complying to the safe system approach, and will significantly impact the safety of vulnerable users, especially during small to moderate events at the CMUA.**

It is the opinion of the SRT that the current road form is inappropriate for the intended use, and if retained will have significant negative impacts on user safety.

#### **Safe System Treatment Actions**

1. Install significant street calming features to ensure that the operating speed is achieved.

### **2.4.2 OPERATING CHARACTERISTICS**

The current lane definition and parking makes the road feel and look like a multi-laned road, especially at times of low parking use. Road is wide at some 14 metres in total width (kerb to kerb)

The current layout fails to define the street as a slow speed environment, leading to adverse behaviours.

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The SRT acknowledge that once developed, the CMUA will be a visual feature at the end of the drivers view path for the eastbound movement, and may assist with some speed reduction, however it is felt that this would not achieve the slow speeds desired for this project.

The current layout of the Lichfield Street section reflects a road cross section more consistent with a 50 km/h operating speed. Of note for the operation of Lichfield Street is the regular running of the Christchurch Tram, and the required movement for the tram to turn over traffic on Lichfield Street, as it enters into Poplar Lane. This turn movement is not defined for who has the priority movement, and as such, with a lack of priority, could result in a driver attempting to pass the tram immediately prior to the turn. The tram has no ability to undertake an evasive movement, and as such, once committed to the turn, there is a poor ability to stop when compared to a conventional vehicle.

The SRT acknowledge that during operation of the Tram, the presence of the tram would modify the operation of most compliant drivers, with the driver yielding to the tram movement.

### 2.4.3 LANEWAY CONNECTION – EAST FRAME

Refer to comments in Section 2.4.1 above for Speed Limit matters identified.

The SRT noted an inconsistent treatment of the adjacent laneways connecting to Lichfield Street. Poplar Lane and Nurseryman Lane are both characterised as being one way, moving from Lichfield Street to Tuam Street. Both have limitations on access and use, through the provisions of regulatory restriction signs.



Figure 2-13: Poplar Lane - access restriction signs



Figure 2-14: Nurseryman Lane - access restriction signs

Huanui Lane does not have any restrictions imposed, and is signed as a shared use lane, users being children, pedestrians, cyclists and vehicles.

Huanui Lane allows two-way movement, and as stated in Section 2.4.1, does not have the required 10 km/h speed limit signs required to support the slow shared use environment. Huanui Lane is narrow at 7.5 metres and incorporates an at grade path system on the west side, and indented P120 parking on the east side.

Opposing vehicle movements require one vehicle to partially cross into the delineation strip (dark cobbles) to achieve the passing movement.

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Reference: Lichfield Street - Street Layout Options



Figure 2-15: Huanui Lane – formation and signs



Figure 2-16: Huanui Lane – formation and signs

The provision of two-way movement on Huanui Lane greatly increases the number of conflict points for intersection movements at the Lichfield Street end, in an area where the desired outcome is a slow speed mixed use environment.

With the proposed development of residential units, along with business / retail engagement on Huanui Lane, the SRT consider that the retention of a two-way system will have adverse effects on safe operation. A change to a one-way formation will enable appropriate threshold and intersection treatments that reinforce the slow speed environment for Lichfield Street.

#### **Safe System Treatment Actions**

1. Install legally required speed limit signs on Huanui Lane, ensuring consistency with other laneways in the immediate vicinity.
2. Change Huanui Lane to a one-way lane system, consistent with Poplar Lane and Nurseryman Lane.

#### **2.4.4 TRAM TRACKS**

It is acknowledged that the current road layout has tram tracks installed as part of the southern tram route.

The location of the tram tracks creates a hazard to cyclists traversing along Lichfield Street (eastbound), with a high risk of wheel entrapment, like Armagh Street where the tram tracks are located. Wheel entrapment could cause a cyclist to fall into path of following vehicle, with resultant high severity injuries.

As the street layout does not support a slow speed environment, impact forces would be higher than those tolerable for humans.

The tram track's location close to the parked vehicles on the northern side of Lichfield Street requires a cyclist wishing to avoid the risk of wheel entrapment to ride on the right of the general through lane. Traversing along here left of the tram tracks places the cyclist at a very high risk of being "doored" by drivers / passengers opening alighting from their vehicle. Any opening of the door prior to a cyclist passing would require the cyclist to negotiate over an indented tram track, with a high risk of wheel entrapment due to the shallow angle of movement. This places the cyclist at risk of fall and impact by following vehicles.

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Reference: Lichfield Street - Street Layout Options

A lack of a suitable alternate path / facility will result in cyclists avoiding the tram tracks and cycling down the footpath, creating a risk for other vulnerable users who are legitimately using the footpath. This risk is amplified when users arrive by e-scooter etc and will avoid the tram tracks.

#### 2.4.5 INTERFACE WITH SURROUNDING ROAD SECTIONS

In considering the proposed layout and operation of Lichfield Street, the SRT have considered the approach from Lichfield Street, for the segment between the bus interchange and Manchester Street.

The SRT noted the removal of the containers which had been installed at 92 – 96 Lichfield Street for some years, this enables the formation of this portion of Lichfield Street to be consistent with the proposed road cross section to the east of Manchester Street. For this report the SRT have assumed that this road reformation will be undertaken prior to changes for the Lichfield Street CMUA project.

The entry from Lichfield Street (west of Manchester Street), into the project section is characterised as being signalled controlled, with a left turn lane, and a combined through / right turn lane. The signal operation has the right turn movement occurring as part of the through movement, with a right turning vehicle having to yield to a westbound through movement vehicle. This occurrence results in a slow speed approach, but with a negative effect of drivers slipping to the left, into the left turn lane, to complete a through movement. This is regarded as an unsafe passing movement as drivers are not expecting to be passed on the left. This movement is referred to as "undertaking". The use of a signed left turn lane is contrary to the traffic regulations, where only the signed movement is permitted from that lane.

The entry into Lichfield Street (project site) from west of Manchester Street lacks definition and reinforces a higher operating speed environment.



Figure 2-17: Lichfield Street approach to Manchester Street



Figure 2-18: Lichfield Street approach to Manchester Street

It is understood that the existing configuration option does not have any threshold treatment. The SRT have significant concerns that this proposal fails to identify a slow speed environment and has a significant risk of high approach speeds into the project site. This greatly increases the risk.

It is the opinion of the auditors that the existing road alignment fails to deliver safe and appropriate treatments that would be required for a street engaging with mass pedestrian movement for events and achieving the Council's desire of a calmed street. Significant remedial works would be required to achieve the desired outcomes.

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Reference: Lichfield Street - Street Layout Options

### **Safe System Treatment Actions**

1. Install suitable threshold treatments that visually and physically restrict the entry into the Lichfield Street project length, particularly from the western direction. Additional calming measures are required along the length at regular intervals to reduce the carriageway width.

### **2.4.6 CONNECTIVITY TO CITY**

The Lichfield Street project length will form a key pedestrian link between the bus interchange, the CBD and the CMUA. Consideration of pedestrian movement from both the bus interchange and the CBD should have a clear and concise route.

The existing road layout of the Manchester Street / Lichfield Street intersection fails to provide a suitable route. Issues include:

#### **Bus Interchange route on southern side of Lichfield Street**

1. Insufficient crossing width over Manchester Street for large volumes of pedestrians when considering mid-sized events.
2. Two staged crossing over Manchester Street / High Street. Undersized divider island, insufficient for moderate volumes of users.
3. Insufficient footpath width (south side) along Lichfield Street – high risk of pedestrian spill into live lanes. Refer to Orangetheory Stadium typical operation.
4. Insufficient crossing width at Madras Street / Lichfield Street crossing points (signalised). Pedestrians massing around crossing and walking into traffic lanes exposed to turning traffic etc.

#### **CBD Route on northern side of Lichfield Street**

1. Generally, well-formed pedestrian routes from CBD to Manchester Street.
2. Insufficient footpath width (north side) along Lichfield Street – high risk of pedestrian spill into live lanes. Refer to Orangetheory Stadium typical operation.
3. High risk of adverse pedestrian movements along Lichfield Street – risk of impact by through vehicle movement as pedestrians emerge out between cars etc.
4. Insufficient crossing width at Madras Street / Lichfield Street crossing points (signalised). Pedestrians massing around crossing and walking into traffic lanes exposed to turning traffic etc.
5. Lack of all red phase to enable high volume of pedestrian crossing movements. Creates massing of pedestrians around intersection and spill onto road. Refer to Orangetheory Stadium typical operation.

The SRT consider when accounting for volumes of pedestrians during moderate sized events, the route and crossing designs are insufficient for safe and appropriate pedestrian movement. The current layout will result in adverse pedestrian behaviour that will have a high risk of exposure to through vehicle movements due to the constrained widths of the existing facilities, and the mass of people travelling to and from the CMUA. The SRT acknowledge that pre-event, the arrival rate will be generally dispersed and may result in smaller groups. It is also acknowledged that should people arrive by bus at the interchange, then there could be high volume platoons of pedestrians moving through the system at the same time.

Post-event the platoons of people movement will be very large in size as the stadium discharges all users in a short space of time. The SRT consider that this would be the highest risk movement time, and vulnerable user safety is significantly decreased due to high volume and adverse behaviour.

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#### **Safe System Treatment Actions**

1. Widen all footpaths to ensure suitable pedestrian capacity, minimising the risk of vulnerable users to through movement of traffic.
2. Widen all pedestrian crossing locations at intersections to ensure high volume of pedestrian movement can be accommodated safely for each phase crossing.
3. Temporarily close two-way movement along Lichfield Street for moderate sized events.

#### **2.4.7 TEMPORARY TRAFFIC MANAGEMENT**

The SRT acknowledge that deploying Temporary Traffic Management (TTM) will be a useful tool in delivering vulnerable user safety during events. The current footpath and crossing layouts are highly restrictive and would require the implementation of TTM at an event that would have moderate level of engagement, such as a rugby match.

The appropriate placement of TTM furniture will be impacted by the existing street typology of Manchester Street, where there are a cospe of trees located on the southbound approach to Lichfield Street (north-east quadrant of the Manchester/Lichfield intersection). The cospe of trees overhang to the kerb line and would highly restrict the placement of signs and control devices, and result in an approaching driver not being able to see critical messages for TTM.

The SRT note that the existing bus lane end sign is hidden from view within the trees.

#### **Safe System Treatment Actions**

1. Develop a comprehensive TTM layout that addresses site constraints and is replicable for events.
2. Install TTM for all events where there is a moderate pedestrian movement volume to the stadium.

#### **2.4.8 SUMMARY**

The SRT has considered the existing road environment, and the operation of the road under normal day-to-day operations, and mass movements and engagement during events such as rugby matches.

The SRT consider that the existing road environment will result in significant safety issues for the safe movement of pedestrians, and normal street operations.

It is the opinion of the SRT that the retention of the existing road layout for operations as the residential and CMUA developments in future years is inappropriate and unsafe. The existing road configuration fails to meet the objectives of a safe system design.

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## 2.5 Option 2 – Two Way 30km/h Street Layout

Option 2 is characterised by a moderate width footpath (north side) kerbside parking (north side), two traffic lanes, tram tracks, kerbside dining / engagement area (south side), mid-path kerb (south side) and footpath (south side). The engagement / dining area and footpath (south side) is 5.65 metres in width but split by a vertical face of the kerb.

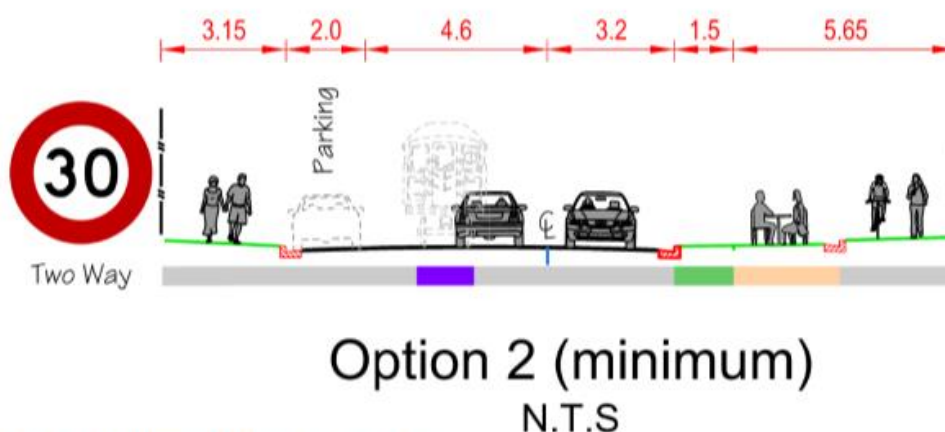


Figure 2-19: Proposed Road Cross Section.



Figure 2-20: Proposed Road layout.

### 2.5.1 OPERATING CHARACTERISTICS

The wide 4.6 metre (eastbound) and typical width 3.2 metre (westbound) lanes result in a wide trafficable cross section. This road layout retains look and feel of the general existing street layout and does not support a slow speed environment.

The eastbound lane (4.6 m) incorporates the tram tracks, and retains the same issues as described in the existing road layout assessment. The wide 4.6 m eastbound lane does not create slow speed environment – higher through speeds will be experienced.

The proposed road layout incorporates some threshold treatments at grade, located at the entry into Lichfield Street (Manchester Street end), east of Poplar Lane, and at the Nurseryman Lane intersection. The spacing of these treatments, and the low profile of the threshold on road lacks a form that would have any significant effect on users. The wide spacing does not influence drivers speeds along the road.

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Reference: Lichfield Street - Street Layout Options

The SRT viewed a similar street layout as formed on High Street, between Manchester Street and Tuam Street. High Street has minimised the use of raised kerb, and favours v-channel formations, resulting in a more user-friendly interface with the footpath. The High Street look and feel follows a similar design, but has highly constrained access either end, and is short in length. The SRT consider that while the design is similar, the operating characteristics are significantly different. Confirming that the design typology on High Street was appropriate when considering the environment that it is formed in.

A key characteristic of the Option 2 design is the formation of a central island at the Lichfield Street approach to the Madras Street intersection.

The SRT commend this inclusion, as it clearly creates a calming environment in what will be a complex operation during CMUA operations.

### **2.5.2 STREET ENGAGEMENT / PEDESTRIAN MOVEMENT**

The engagement of the southern path area will introduce some verticality to the road edge and may influence slower speeds if well done. However, the introduction of verticality will have a negative effect on the intervisibility from any property accessway that allows egress out onto Lichfield Street.

A review of the typical cross section, and the supplied street design plan indicates that there is a level of inconsistency in the intended form. The cross section does not demonstrate the proposed kerbside planting and cycle store arrangement that is detailed on the plan view.

The planting / cycle parking areas are indicated to be some 3 metres in width off the kerb edge. This significantly impacts the safe movement space between the planting / cycle parking, and the mid path vertical kerb.

This will result in a trip fall hazard for users and is considered too narrow for mobility scooter or pram movement. A trip / fall by an elderly person could result in serious injury due to their frailty, and the reduced ability to recover from significant trauma. A trip fall for an elderly person has a high likelihood of fractures that are high trauma.

#### **Safe System Treatment Actions**

1. Modify the design to eliminate the fall / trip hazard created by the narrowing by street furniture and planting.
2. Ensure that all property access points have appropriate intervisibility sight lines for all permitted movements.

The Manchester Street end threshold forms a narrow pedestrian crossing facility and would result in significant overspill of pedestrians during moderate sized events. The design retains the existing kerb edge in this location (See [Figure 2-21](#) below). Modifications to this kerb line, enabling a wide crossing facility to be formed that would be more conducive to mass pedestrian movement.

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Reference: Lichfield Street - Street Layout Options

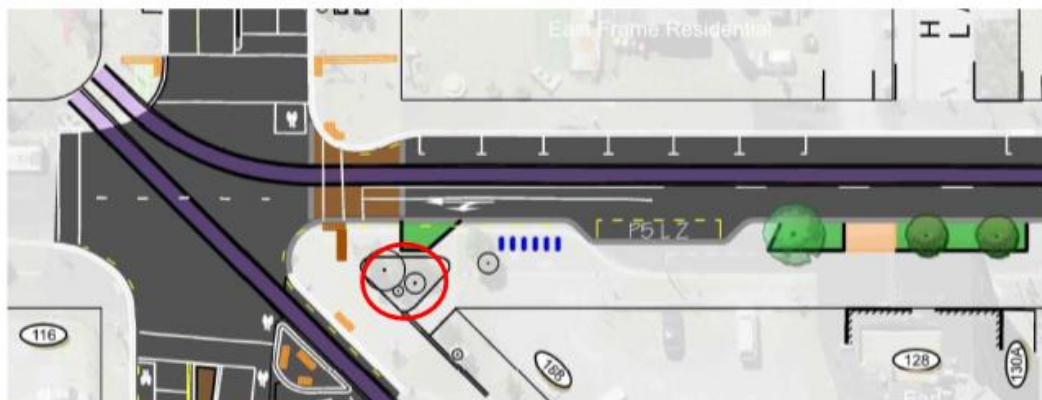


Figure 2-21: Proposed Road layout.

The plan indicates an existing planted area (circled above) on the south side of the Manchester Street intersection that is positioned across the pedestrian path. It is the understanding of the SRT that this will be removed.

It is noted that currently this land area is utilised for parking (suspect illegal parking) and the existing path is interrupted by the lighting poles.



Figure 2-22: Illegal parking on footpath and lighting column location.



Figure 2-23: Illegal parking on footpath.

#### **Safe System Treatment Actions**

1. Remove / relocate the proposed planting area to maximise pedestrian movement space.
2. Apply street engagement features that create a slow speed environment for Lichfield Street.

### **2.5.3 LANEWAY ACCESS**

The proposed design permits left and right turn movements into Nurseryman Lane. Access into Poplar Lane is restricted to a right turn in movement (eastbound) and is reinforced through the formation of kerb buildouts that restrict other movements.

Nurseryman Lane serves access to off-street parking and operates as a one-way system (southbound). Observations of site reveal that users are already traversing contra-flow to the legal one-way system.

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Reference: Lichfield Street - Street Layout Options

The SRT have serious concerns that when events are run at the CMUA, drivers will undertake illegal movements to gain access into the car park and to businesses. As stated, this is already occurring.

Movement into the laneways requires the driver to cross the main pedestrian paths, especially during moderate events such as rugby games etc. The formation of the laneway thresholds, with kerb-lines wrapping into the lane, would portray a dominance of traffic movement over the pedestrian path.

During times of mass pedestrian movement this can lead to significant conflicts between the two user types.

#### **Safe System Treatment Actions**

1. Incorporate a typology design that does not convey significance to only one user type.
2. Apply additional mitigation measures to prevent (as far as reasonably practicable) illegal traffic movement in a one-way system.
3. Apply effective temporary traffic measures to restrict westbound traffic movement past the Nurseryman Lane junction under normal events such as rugby matches.

### **2.5.4 MASS PEDESTRIAN MOVEMENT**

As previously described, the SRT consider that the mass movement of pedestrians to and from events is significantly affected by the current intersection form and capacity at the Manchester Street / Lichfield Street and Lichfield Street / Madras Street intersections. The proposed design incorporates standard crossing width features that will greatly impact on movement, and result in adverse behaviours during times of mass movement.

Reference is made back to the current operation of Lincoln Road and Whiteleigh Avenue under a normal rugby match event, where pedestrians enter into the live lane due to a lack of suitable facilities. This greatly increases the risk of impact by passing / through vehicles. Safety is further impacted with drivers stopping on the shoulder / in-lane to drop off passengers.

The SRT consider that the road formation as presented in Option 2 will result in similar behaviours.

The narrowness of the proposed footpath, either by existing formation, or the reduced formation created by the planters / street furniture, greatly impacts on the safe movement of pedestrians for events. This safety is further compromised by the mid-path vertical kerb.

### **2.5.5 SUMMARY**

The SRT consider that without significant redesign of the path systems, incorporating the consideration of street furniture and amenity planting impacts, the proposed Option 2 is unsafe for pedestrian movement and general user safety.

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## 2.6 Option 3 – Two Way 10km/h Street Layout

Option 3 is characterised by having a consistent street formation level across its cross section, with use of streetside planting and street furniture. Option 3 reduces kerbside parking down to isolated loading / service zones, along with a small number of disability parks.

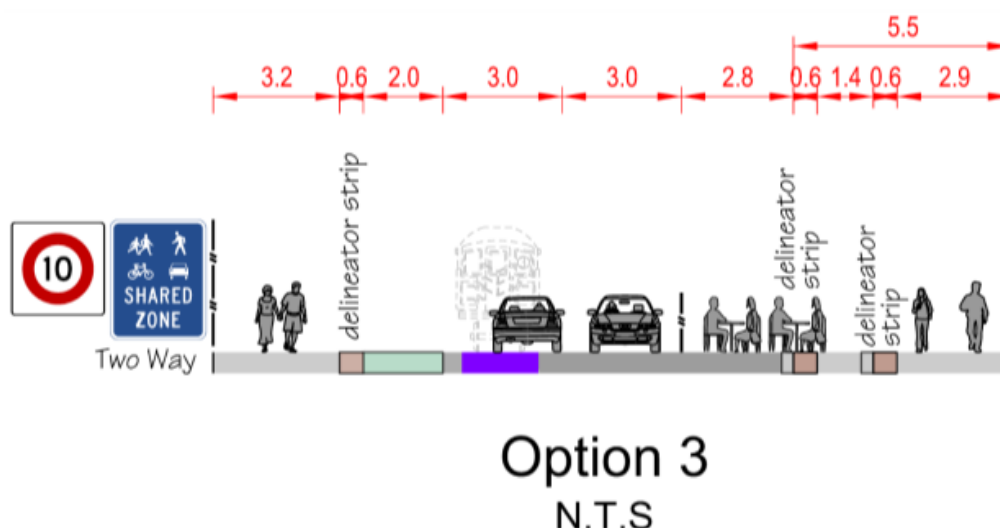


Figure 2-24: Proposed Road Cross Section.

Option 3 has a target operating speed of 10 km/h. Speeds at 10 km/h have a high alignment with the safe system approach and is considered a primary treatment.

It is understood that Council is investigating supportive actions such as street dining licence being suspended at times of significant movement associated with events. The SRT have assumed that this includes rugby matches etc.

### 2.6.1 OPERATING CHARACTERISTICS

Option 3 is more reflective of a slow speed environment. The tight road formation assists with establishing slower speeds. Street engagement is better served with dining / seating to road edge; however, the form and design will need careful attention to typology. Reference Hereford Street layout

Roadside furniture in the proposed scale would be self-supporting of a narrow street typology generally suitable for shared use. It is recognised that with street engagement, and suitable detailed design elements, the two-way movement could be achieved with an acceptable level of safety. The SRT do stress that this would require substantive detailed design input to achieve the desired operating environment.

Areas of widening for delivery / loading zones are included in isolated areas and are generally well defined with bollards alongside on the footpath side. This is supporting of restrictive access to the footpath for vehicles yet retaining a high level of permeability for vulnerable users. The provision of the design that enables a broad cross section all at the same level assists with the permeability for all users.

In assessing the street cross section, we have also considered the level of adjacent development, and the effect that this could have on the look and feel of the street, considering that effect on user safety.



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Reference: Lichfield Street - Street Layout Options

New development around the CBD area provides insight into the effects of engagement with a streetscape, and a visual example of look and feel.

Hereford Street redevelopment enables food outlets to engage out to the road edge. In addition, Hereford Street is two-way, and has a high level of engagement with carparks and other accesses. It is acknowledged that the form of Hereford Street is wider, with cycle lanes, and is 30 km/h.



Figure 2-25: Example: Hereford Street carpark engagement with street.



Figure 2-26: Example: Hereford Street business engagement with street.

The SRT have visited Cashel Street, a calmed street that retains a narrow two-way carriageway, wide footpaths (albeit with kerbs) and a moderate to high level of engagement by buildings / business and other developments. Figure 2-28 below provides an example of the level of impact that buildings and typology have on the look and feel, influencing operations.

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Reference: Lichfield Street - Street Layout Options

The Cashel Street developments, along with the typology provides the appearance of a slow street, with retention of two-way flow. Observations of street operations reveal that speeds are generally in the order of the target 30 km/h posted for the road section.



Figure 2-27: Example of Cashel Street typology.



Figure 2-28: Example of Cashel Street typology with stadium superimposed.



Figure 2-29: Example: Artist render of Lichfield Street with Stadium

Source: CCC Website

The photo montage provided in [Figure 2-27](#) and [Figure 2-28](#) provides an example of the size and mass of the stadium on the street view. [Figure 2-27](#) demonstrates Cashel Street now, with [Figure 2-28](#) demonstrating the new stadium superimposed. [Figure 2-28](#) highlights the large mass of the building, and the impact that it would have on the general street view (example of stadium mass only, incorrect location). [Figure 2-29](#) is an artist rendering of Lichfield Street with new stadium. (source: [Artist impressions and designs](#) : Christchurch City Council ([ccc.govt.nz](http://ccc.govt.nz)))

As mentioned previously, the inclusion of a large stadium at the end of Lichfield Street will visually have an effect on the operation of the street. An example of the effect that a large stadium would have on a street is provided in the image below of Gloucester Street, with Te Pae in the background.

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Reference: Lichfield Street - Street Layout Options



Figure 2-30: Example: Gloucester Street (view west) to Te Pae

2.6.2 CYCLE MOVEMENT

Cycle movement (eastbound) still remains an issue due to the proximity of the tram tracks in the eastbound lane. The widening of footpath / shared spaces alongside the carriageway would result in cyclists avoiding the hazard and cycling along the footpath. At 3.2 metres wide, this mix could occur if there was a suitable environment formed through street typology. There remains a risk in the future with residential / business engagement at Huanui Lane area, and people stepping out into shared path from business / property.

Similar levels of engagement / use have been considered in the Manchester Boulevard project, where the further residential / business engagement is planned. The applied street typology has cyclists on shared path close to property boundaries.

The Lichfield Street design (Option 3) is an extension of this typology and will be consistent for the greater environment.

The design indicates the provision of a delineator strip along Lichfield Street. For this report, the SRT have assumed that this delineator strip will be of a similar form as that installed in Huanui Lane (dark pavers). Should this delineator strip be a drain feature, then there is a risk of trip / fall and wheel entrapment of cycles if not considered appropriately.

The SRT have considered the movement of cyclists during various operation conditions. These are detailed below.

Operation Condition	Use	Potential impacts
General day-to-day	Normal travel for business / work Low to moderate pedestrian volumes Cyclists mix with pedestrians on shared paths, esp. eastbound, to avoid tram tracks.	Cyclists move faster due to minimal restriction / low volume of pedestrians: Potential for higher injury if vulnerable users hit Low likelihood of impact Potential for conflicts in and around residential developments if direct

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Operation Condition	Use	Potential impacts
Rugby Event	Westbound cycle use can retain general traffic lane use	access from residence to Lichfield Street is enabled
	Westbound major cycle route is on St Asaph Street.	Major cycle routes surrounding stadium do not lead cyclist through this area. Only direct access users would potentially use Lichfield Street
	Eastbound major cycle route is on Tuam Street	
	Rapanui cycle route passes through Latimer Square (Worcester Street)	
	Mixed level of access to stadium	High volume of pedestrians would generally restrict cycle use through this zone.
	Moderate to high pedestrian volume	Low proportion of cyclists accessing stadium for events
	Cyclists typically dismount due to inability to progress through crowds.	Cycle access / movement to an event would be more direct to any potential cycle parking zones within the stadium
	Trafficable lanes still available	Low risk of cycle / vehicle impacts due to mass movement of crowds, slow vehicle speeds
	Traffic management option to close / restrict portion of street	Risk of wheel entrapment should a rider remain in eastbound lane. Mitigation through permanent signs will be required.
Major Event	Lichfield Street closed	Low risk of cycle / vehicle impacts due to mass movement of crowds, slow vehicle speeds
	Cyclists typically dismount due to inability to progress through crowds.	
	Very high pedestrian volumes	
	Potential for cycle valet type service at a location away from Lichfield Street.	

Safe System Treatment Actions

- The SRT is of the opinion that with suitable streetscape design, and typology, cyclists could safely traverse through the Option 3 design under general day-to-day use. There will be elements that will require specific consideration in the detailed design to address cycle speed. The presence of the tram tracks will present a hazard under any option considered.

When considering events such as rugby matches, and large events, it is believed that mitigations as presented below would have significant effect on improving cyclist safety. Large crowds travelling to and from events would impact cycle movement due to the massing of people. Confident riders may choose to remain in lane for the eastbound movement. A risk of wheel entrapment remains.

During large events, cyclists will arrive and depart via a route that leads then direct to the cycle storage facilities. The existing major cycle routes surrounding the stadium do not lead day-to-day cyclists through the stadium area.

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Reference: Lichfield Street - Street Layout Options

### 2.6.3 LANEWAY ACCESS

The Option 3 design for access into the laneways is similar to Option 2, with the addition of an additional left turn (westbound) from Lichfield Street into Poplar Lane (authorised vehicle only).

It is noted that access to Poplar Lane is "No Entry" except goods and service vehicles (3am – 10 am & 3pm – 6pm). As stated previously, while this restriction is in place, multiple vehicles were seen accessing the laneway to enable movement to the temporary parking on the adjacent lots. This included illegal direction of travel movement. This condition exists for all options considered and is commented on in other sections.

Nurseryman Lane is posted as a shared zone and enables drivers to access the Innovation Precinct car park, and general use traffic to travel back to Tuam Street.

The Option 3 design has extensive use of at grade treatments and mid-block contrast pavers and gives a visual appearance of a more shared use environment. The Option 3 design lacks treatments at the key parking access intersection (Nurseryman Lane / Lichfield Street), however this could be included into the Option 3 design.

Huanui Lane is currently posted as a shared use laneway, and presently enables two-way flow. The junction to Lichfield Street is poorly formed and appears more like a property access. This junction could be improved through a higher level of interventions that reflected the junction of two shared use spaces.

#### Safe System Treatment Actions

1. The SRT consider that the design could form Huanui Lane as a one-way system, with a modified intersection form at Lichfield Street to reflect the preferred direction of movement.
2. The SRT remain of the opinion that intervisibility issues at accessways and Laneways as described above in Option 2 will be required to be addressed in the detailed design.

### 2.6.4 THRESHOLD TREATMENTS

The Option 3 design has a higher level of restriction at the Manchester Street end of Lichfield Street that is more representative of a slow speed threshold. The final design and typology of this junction will rely heavily on the combination of form, street furniture, signs and markings and typology to reinforce the desired slow speed street environment.

The Madras Street / Lichfield Street junction is characterised through the inclusion of a central island on the Lichfield Street approach to Madras Street. The SRT commend the inclusion of this feature, as it visually and physically defines the slow speed environment. The SRT has been informed that this design has been considered in relation to vehicle path, to form part of an anti-terrorism system for large events.

#### Safe System Treatment Actions

1. The presented design could be improved through the introduction of coloured pavers further into the central splitter island to highlight the threshold.
2. Option 3 lacks any form of treatment for the threshold at Nurseryman Lane. The SRT recommend that a coloured threshold treatment will be required at the Nurseryman Lane intersection, to reinforce the slow speed environment, and to be used as a visual cue to drivers and pedestrians of a shared use space.
3. The Option 3 option includes the provision of active signs, proposed under the major project permanent options presented. These signs were indicated to be only active during large events, and display restriction of access. The use of active signs is a good solution to forming the threshold for the Manchester Street / Lichfield Street junction.

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4. The SRT consider that with the use of full colour active signs (required for the use describe above), then these signs can also assist during normal day-to-day operations and assist with the slow speed environment. The SRT recommend that the active signs be retained full time in two use states:

#### **General Use**

Under the general use state, the active signs will display standard Shared Use Zone messaging, such as the image below.



Figure 2-31: Example of Shared Use Zone sign style.



Figure 2-32: Example of proposed "No Access" sign.

#### **Major events**

Under Major events, the advice given to the SRT, was access into Lichfield Street would be restricted, through the provisions of a road closure. It is further understood that this would incorporate the use of retractable bollards to physically restrict access for vehicles.

The SRT have considered a possible third state of use. This is described further in Section 2.6.7 below. Also refer to Section 2.6.7 below for comments on street enhancements to improve Option 3 design.

### **2.6.5 PEDESTRIAN MOVEMENT – INTERSECTIONS**

The pedestrian movement at the Manchester Street / Lichfield Street still retains the same issues as previously described. Option 3 does not address the matters identified in the assessment of the existing condition, nor Option 2.

The planter identified at the Manchester Street end of Lichfield Street is retained. This significantly constricts pedestrian movement, especially with other existing features already there.

#### **Safe System Treatment Actions**

1. The matters remain in Option 3 and require further design considerations to arrive at a suitable solution.
2. The SRT is of the opinion that the designers are to reconsider the form and nature of the pedestrian crossings at the signalised intersections to ensure that suitable for mass pedestrian movement at events such as rugby matches etc.

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Reference: Lichfield Street - Street Layout Options



Figure 2-33: Existing Street furniture restricting pathways for shared path users.



Figure 2-34: Existing pedestrian crossing position – note narrow width and small capacity.

2.6.6 LARGE EVENT STREET MANAGEMENT

Council has outlined a treatment style for the Lichfield Street area that incorporates the provision of retractable bollards in major events. The indicative design proposes a full closure of Lichfield Street, from Manchester Street through to Madras Street for the specified periods of use (to be confirmed through the Transport Management Plan). The SRT commend this approach. The style and nature of the devices will significantly enhance vulnerable user safety at time of high demand for a major event.

This design has only two states of use, being full access; two-way, or full closure.

2.6.7 STREET ENHANCEMENTS TO IMPROVE SAFETY OF OPTION 3 DESIGN

The following matters relate to safety improvement options that would align with the Safe System approach.

Bollards

In considering the operation of the street and enabling a level of access for business and residents in the surrounding areas, we consider that there is a modification that could be made that enables a third state – limited movement into the area at each end yet closure mid-block. An indicative layout for consideration is presented below.



Figure 2-35: Existing Te Kaha Event Management Plan (indicative only)

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Reference: Lichfield Street - Street Layout Options

Utilising a layout as indicated above, to the west, access is achieved via Manchester Street, turning into Huanui Lane and discharging via Cashel Street. At the Madras Street end, access is gained from Madras Street, turning into Lichfield Street, and discharging via Nurseryman Lane onto Tuam Street. Both of these routes could be run in the opposite direction if that suited the larger network operation and avoidance of impacts on surrounding streets.



Figure 2-36: Modified Te Kaha Event Management Plan (indicative only)

A positive outcome of this style of layout would be that the mid-block section between Huanui Lane and Nurseryman Lane would be a fully engaged pedestrian priority space, conducive to engagement with the local entertainment district.

This style of design would also enable street engagement for isolated events in the entertainment district outside of events at the CMUA.

### Vertical Deflection Measures

The presence of the existing tram tracks does not allow the use of any vertical treatments west of Poplar Lane that would typically be utilised to encourage a slow speed environment. However, in Option 3, there is an opportunity to consider vertical deflection devices such as raised platforms immediately east of Poplar Lane and east of Nurseryman Lane. Vertical deflection in these areas would provide some impact on reducing speeds of vehicles using this section of Lichfield Street.

### Street Art / Engagement design

It is assumed that outside of the indicated cobbled at grade areas (marked brown in Figure 2-35), the remainder of the pavement will be Asphalt Cement (AC). This surface enables the incorporation of street art either as part of the design, or at a later stage to further enhance the slow street / shared use environment.

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Reference: Lichfield Street - Street Layout Options



Figure 2-37: Example of street art installation Image Source: NZHerald©

### Road Linework / Delineation

The SRT consider that given the environment, it is imperative that all applied linework and directional arrows should be fully visible under all operating conditions. As many of the rugby events will be evenings / hours of darkness, it is imperative that markings are fully visible to the driver. Conventional road markings would not achieve this result due to rapid wear and fade. The use of a thermo-plastic or raised profile highly reflective marking system would enhance awareness under all weather conditions, have a high level of impact and have longevity, minimising the need for frequent maintenance intervention.

## 3 Summary

The SRT have considered the safety of all users for the following options for the operation of Lichfield Street:

Option 0 – Existing Road Layout,

Option 2 – Street redevelopment South Side, existing parking north side, two-way traffic flow,

Option 3 – redevelopment of Lichfield Street, two-way flow, calmed street layout.

The SRT has considered the normal operation of Lichfield Street under the existing condition, and the impact of retention of two-way flow under Options 2 & 3. Under existing conditions, the SRT has revealed significant poor driver behaviour and illegal movements that would have a significant effect on the safe movement of pedestrians and cyclists along the road section, along with safe movement of vehicles.

In considering Option 0, the SRT are of the opinion that retention of the existing environment is not suitable for the safe movement of traffic and people. The SRT do not support this option on significant road safety grounds that cannot be overcome with simple solutions.

Considering Option 2, the SRT are of the opinion that without significant redesign of the path systems, incorporating the consideration of street furniture / planting impacts, and reduction in the traffic lane widths, the existing road configuration is considered non-complying to the safe system approach, and will significantly impact the safety of vulnerable users, especially during small to moderate events at the CMUA.

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Reference: Lichfield Street - Street Layout Options

Lastly, considering Option 3, the SRT consider that this option most closely aligns with the safe system principles, and offers a higher level of safety for all users. The SRT have identified a number of improvements to the Option 3 design that would further enhance user safety yet retain two-way flow.

The SRT advise that no design can be perfectly safe when considering the desire to retain some form of traffic flow through a highly pedestrianised area for events.

The design presented in Option 3 has identified the possibility of three user states of operation, being full access, mid-block closure, and full road closure. The SRT consider that this option enables a wide variety of use and restriction, with the mid-block closure retaining a reduced level of access yet providing safe movement spaces for the vulnerable in the mid-block section. A reduced level of access under then modified mid-block option will enable connectivity for the residential and business areas if required.

This option also enables isolated events in the entertainment / food district outside of stadium use.

The SRT recommend that Option 3 be progressed for more detailed design.

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## Addendum

### 4 Safety Review Statement

We declare that we remain independent of the design team and have not been influenced in any way by any party during this road safety review.

We certify that we have used the available plans, and have examined the specified roads and their environment, to identify features of the project we have been asked to look at that could be changed, removed or modified in order to improve safety.

We have noted the safety concerns that have been evident in this road safety and have made recommendations that may be used to assist in improving safety.

Signed

Date 11/04/2023

Mike Smith, MET, NZCE (Civil), FEngNZ, CPEng, IntPE, RPEQ, Senior Principal Transportation Engineer, Stantec

Signed

Date 11/04/2023

Melanie Muirson, MET, BE (Civil), CMEngNZ, CPEng, IntPE, Senior Principal Transportation Engineer, Stantec

Ngā mihi nui,

**Stantec New Zealand**

#### Mike Smith

Senior Principal Transportation Engineer, Road Safety  
Phone: +64 3 343 8768  
Mobile: +64274374963  
mike.a.smith@stantec.com

[stantec.com](https://www.stantec.com)

Attachment: [Attachment]

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