
under: the Resource Management Act 1991

in the matter of: Direct referral of notices of requirement to alter designations and applications for resource consents for activities associated with the State Highway 1 / State Highway 29 Intersection Upgrade Project

between: **Waka Kotahi NZ Transport Agency**
Requiring Authority / Applicant

and: **Waikato Regional Council**
Consent Authority

and: **Matamata-Piako District Council**
Territorial Authority

and: **South Waikato District Council**
Territorial Authority

and: **Thistlehurst Dairy Limited**
Section 274 Party

and: **John Hansen**
Section 274 Party

Statement of Rebuttal Evidence of **Nerissa Harrison** (traffic and transportation) for Waka Kotahi NZ Transport Agency

Dated: 25 August 2022

Reference: Paula Brosnahan (paula.brosnahan@chapmantripp.com)
Hadleigh Pedler (hadleigh.pedler@chapmantripp.com)

STATEMENT OF REBUTTAL EVIDENCE OF NERISSA HARRISON FOR WAKA KOTAHI NZ TRANSPORT AGENCY

INTRODUCTION

- 1 My full name is Nerissa Rachael Harrison.
- 2 I have the qualifications and experience set out at paragraph 2 of my statement of evidence in chief (*EIC*) dated 6 July 2022. I repeat confirmation given in my *EIC* regarding the Code of Conduct for Expert Evidence.
- 3 My rebuttal evidence is given in support of Waka Kotahi NZ Transport Agency's (*Waka Kotahi*) notices of requirement and applications for resource consents (*the Application*), for the construction, operation and maintenance of the State Highway 1 / State Highway 29 Intersection Upgrade Project (*the Project*).
- 4 In this statement of evidence, I respond to the evidence of Mr Edwards and Mr Serjeant on behalf of Thistlehurst Dairy Limited (*TDL*), and Mr Gray on behalf of Waikato Regional Council, Matamata-Piako District Council and South Waikato District Council (*the Councils*). I also respond to the statements submitted to the Court by Mr Hansen.
- 5 This rebuttal evidence reconfirms that in my expert opinion:
 - 5.1 The Rural Intersection Active Warning Signs (RIAWS) at the SH1/29 intersection (*the Intersection*) have had a positive effect on safety but the Intersection remains a high-risk intersection.
 - 5.2 A more transformative safety change at the Intersection is required to address the safety risk.
 - 5.3 A roundabout is the most appropriate form of 'safe system transformative' intersection in this rural location given current and forecast traffic volumes.
 - 5.4 A dual lane roundabout, rather than single lane, is the most appropriate intersection form for this nationally strategic state highway and freight route.
 - 5.5 Grade separation for walking and cycling is the most appropriate form of crossing facility given the current and forecast volume and speed of traffic at the Intersection.
 - 5.6 An offline solution with a 'stub' arm reduces traffic construction effects, including traffic delays and safety risk.

SCOPE OF REBUTTAL EVIDENCE

- 6 The scope of this rebuttal evidence includes my expert opinion on:
- 6.1 Traffic volumes and growth. That the 2.3% growth rate I have adopted is appropriate over the short to medium-term assessment period. A 1.1% long term growth rate is reasonable provided the increase in traffic from opening of the Hamilton Section of the Waikato Expressway is added to this rate.
 - 6.2 Safety (crash data, level of safety service, and risk rating) and the need for a more transformative safety change than RIAWS, of which a roundabout is the most appropriate form in this location with current and forecast traffic volumes.
 - 6.3 Efficiency and resilience. That a two-lane roundabout has greater efficiency, reliability, and resilience benefits than a single lane roundabout
 - 6.4 Walking and cycling, and why grade separation is the most appropriate safe system treatment
 - 6.5 Roundabout layout and constructability, and why an offline solution with a fourth 'stub' arm is a better approach than online with no stub.
 - 6.6 Objectives. That the Project aligns with national objectives, including objectives for safety and freight journeys.

EVIDENCE OF WESLEY EDWARDS ON BEHALF OF TDL

Traffic volumes and growth

- 7 Mr Edwards states that Waka Kotahi's analysis "*has assumed a high rate of traffic growth that is not supported by the available information...*".¹
- 8 Mr Edwards makes this statement in relation to the 2.3% growth rate adopted in my assessment. In contrast, Mr Edwards recommends a 1.1% growth rate be adopted.
- 9 I acknowledge the 1.1% growth rate is appropriate for the long-term assessment period (40 years) of the C2P Detailed Business Case, from which Mr Edwards quotes the 1.1% growth. However, I consider a 2.3% growth is a more appropriate rate for a short-medium term assessment (<20years) and is supported by the available information, such as historic traffic volumes at the Karapiro telemetry site.

¹ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 8.

- 10 Additionally, the 1.1% growth rate that Mr Edwards has adopted does not consider the opening of the Hamilton section of the Waikato Expressway, which based on Waikato Regional Transport Model (WRTM) is expected to result in an additional 50-80 vph during weekday peak hours and approximately 30vph during the interpeak. These hourly traffic volumes would equate to a daily increase of approximately 600vpd on SH1 at the Intersection.
- 11 A 1.1% growth rate, plus an additional 600vpd results in approximately the same volume of traffic in the short term as the 2.3% growth rate that I have used. Over the medium term (~10 years), the 2.3% growth rate amounts to an additional 2,000 vehicles per day (over 24 hours) on SH1 north of the Intersection. This traffic is approximately equivalent to the drop in traffic from 2019 pre-COVID to 2020 with COVID travel restrictions. Therefore, the 2.3% growth rate over 10 years, is approximately the equivalent of the 1.1% growth rate with traffic from opening of the Hamilton Section of the Waikato Expressway and with 'bounce back' of traffic with the COVID travel restriction lifted.
- 12 As the effect on traffic volumes of lifting the travel restrictions is uncertain, I have assessed the Intersection with the 1.1% growth rate and the 2.3% growth rate to sensitivity test the results, as discussed further in my rebuttal. This sensitivity test has not changed my opinion on the current or future efficiency of the Intersection.
- 13 Mr Edwards states "*there was little change on an annual average basis, and little change in the overall crash rate. From that analysis, I have concluded the Covid-19 alert levels had very little effect on the number of crashes at this intersection*"² but he goes onto contradict himself by stating that "*Newer data shows a reduction in volume since 2019*".³ I view Mr Edwards' comments as contradictory because crash risk is affected by traffic volumes, so Mr Edwards' acknowledgement that data shows a reduction in volumes since 2019 contradicts his conclusion that the COVID alert levels had very little effect on the number of crashes.
- 14 In my opinion the 9% drop in SH1 (Karapiro telemetry) Annual Average Daily Traffic (AADT) from 2019 to 2020, is likely partially or fully attributable to COVID travel restrictions and travel behaviour change from COVID. However, I acknowledge the exact effect on safety cannot be determined, and the potential for traffic volumes to increase with the lifting of travel restrictions is also uncertain.
- 15 In my expert opinion, the 2.3% growth rate I have adopted over the short to medium term is a reasonable short-medium term growth rate. However, in the interests of sensitivity testing my modelling, I have undertaken a sensitivity test with a 1.1% growth rate, plus an

² Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 83.

³ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 97.

additional 70 vehicles per hour from the Hamilton Section of the Waikato Expressway. This sensitivity test has not changed my opinion on the future efficiency of the Intersection as discussed further in my rebuttal.

Safety and the need for a safe system transformative change

Safety – study period

- 16 Mr Edwards states “A three-year study period is the minimum required to draw reasonable conclusions, but it is unlikely that additional crash data would significantly change this outcome.”⁴
- 17 For the Intersection, the three-year period for which we have crash data after the Rural Intersection Active Warning Sign (RIAWS)⁵ was implemented (ie August 2019 to August 2022) includes periods with COVID travel restrictions. Although I agree with Mr Edwards that a three-year period can be an acceptable minimum analysis period for crash data, in my opinion the effects of COVID travel restrictions means a longer analysis period is preferable to understand the effects of RIAWS on the Intersection. That said, I have assessed the crash data for the three-year period after RIAWS implementation and still conclude that the Intersection is a high-risk intersection because of the number of injury crashes still occurring even with RIAWS in place.

Safety – Crash site area for assessment

- 18 Mr Edwards states the assessment of accidents at the Intersection in the traffic assessment for the Project “over-states the comparative risk and ranking as it includes crashes beyond 50m from the intersection.”⁶
- 19 Mr Edwards implies that only crashes within 50m of the Intersection can be used for the safety assessment, and on this basis has excluded any crashes in his assessment that have been coded within the Crash Analysis System (CAS)⁷ beyond 50m. He has based this 50m limit on guidance within the Waka Kotahi High Risk Intersections Guide (HRIG). I disagree with the 50m limit for the following reasons:

19.1 The HRIG is a guide and still requires professional judgement to be used when selecting an appropriate analysis area. Furthermore, Mr Edwards has not followed the HRIG⁸, which states:

“if it can be demonstrated that a crash occurred more than 50m from an intersection and was associated with the

⁴ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 5.

⁵ Now known as Intersection Speed Zones (ISZ).

⁶ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 54.

⁷ CAS is a data base of police recorded crashes on New Zealand roads.

⁸ HRIG references are from HRIG (2013) Section 4.1.1(c).

intersection, eg a rear-end collision involving queuing back from signals, then that crash may be included in the risk assessment."

- 19.2 Other crash site guidance also recommends use of a wider assessment area than the 50m Mr Edwards has used. For example:
- (a) The Waka Kotahi "Guide to treatment of crash locations" states "*Traditionally 30m and 250m radii have been adopted for urban and rural sites respectively; this may still be an appropriate default*";⁹ and
 - (b) The Austroads Guide to Road Safety states "*For intersection locations, include crashes within 30m (urban) or 100m (rural)*".¹⁰
- 19.3 A 50m radii limit would not cover the full Intersection or take account of crashes on the approaches and exits to the Intersection that are attributable to the Intersection. The Intersection is approximately 150m wide from the SH1 north approach left turn slip lane diverge point to the SH29 left turn. Crash distances coded from the middle of the Intersection will attribute crashes at the left turn diverge point as being over 50m from the Intersection and therefore would be excluded from Mr Edwards' assessment.
- 19.4 The 50m limit also fails to acknowledge that there may be crashes on the fringes of the site that are attributable to the Intersection. The Waka Kotahi "Guide to treatment of crash locations" states "*experience has shown that it is necessary to check crashes near the fringes of these sites and either extend or reduce the boundaries to capture the crashes that relate to the features of the site*".¹¹
- 20 In my opinion, including only crashes coded within CAS as within 50m of the Intersection would exclude crashes that are attributable to the Intersection. Furthermore, the method Mr Edwards has adopted does not align with the HRIG that he states he has followed, or other crash site guidance.
- 21 I have used a 200m radius and then interrogated the injury crashes between August 2019 and August 2022 to determine if they are

⁹ A New Zealand guide to the treatment of crash locations, Part 4, Land Transport NZ (December 2004), at page 12.

¹⁰ Guide to Road Safety Part 2, Safe Roads, Austroads (2021): at Table 4.1.

¹¹ Waka Kotahi Guide to the Treatment of Crash Locations, Section 4.3.2 Crash Sites. <https://www.nzta.govt.nz/assets/resources/guide-to-treatment-of-crash-location/docs/crash-locations.pdf>

attributable to the Intersection. My assessment found five injury crashes attributable to the Intersection, two more than Mr Edwards has accounted for. It appears the crashes Mr Edwards excluded were:

- 21.1 A left turning crash, where the driver lost control while turning left from SH1 to SH29; and
 - 21.2 A head-on crash that occurred when a driver crossed the centre line at the Intersection (either because of confusion about what lane the opposing driver was in and/or because one of the drivers was overtaking traffic at the Intersection¹²).
- 22 In my opinion, the cause and severity of the left turning injury crash Mr Edwards excluded is attributable to the Intersection, and the head-on crash was also affected by the Intersection and therefore should also be included in an assessment of the intersection safety.

Safety – Injury crashes

- 23 In expert witness caucusing, Mr Edwards stated his opinion that there were three injury crashes attributable to the Intersection between August 2019 and August 2022; however, he also acknowledged there was a recent crash yet to be included in CAS that he did not have detail of at the time of his assessment. In my opinion, his assessment still excludes crashes that are attributable to the Intersection because he has used a 50m limit. In my opinion, at least four, and up to five, injury crashes within CAS are attributable to the Intersection in this period.
- 24 I am also aware of one crash at the Intersection that had not yet been input into CAS at the time of my assessment or Mr Edwards' assessment.¹³
- 24.1 A crash occurred on Monday 8 August 2022 that was reported as a serious incident with a Status 2 injury (patients have a potential threat to life).¹⁴
- 25 In my opinion there are at least four injury crashes coded in CAS at the time of my rebuttal attributable to the Intersection between the period 1 August 2019 and 9 August 2022, including one that recently occurred on 25 July 2022.¹⁵ There are two additional crashes that could also be attributable to the Intersection, the head-on crash that is beyond a 50m radius of the centre of the

¹² There is some discrepancy between the Police recorded witness statements.

¹³ One of these crashes has since been input into CAS as an injury crash.

¹⁴ See the Appendix to this evidence for a photo of the 8 August 2022 crash.

¹⁵ See the Appendix to this evidence for a photo of the 25 July 2022 crash.

Intersection and the recent crash on 8 August 2022 not yet input into CAS that I expect will be coded in CAS as an injury crash.

Safety – Level of Safety Service (LoSS)

- 26 Mr Edwards states “*The Intersection is now in the safest 30% of rural priority-controlled T intersections.*”¹⁶
- 27 Mr Edwards’ statement about the Intersection being one of the safest is completely contrary to his statement that the Intersection is a high-risk intersection.¹⁷ In my expert opinion, the reason for Mr Edwards’ contradictory evidence is that he has based his conclusion on a Level of Safety Service (LoSS) assessment that is incorrect, because:
- 27.1 As stated above, in my opinion he has used too few injury crashes in his assessment; and
- 27.2 He has calculated the Product of Flow (PoF) incorrectly according to the HRIG formula. He acknowledged this error during expert conferencing¹⁸.
- 28 The HRIG formula for PoF states “*At a T intersection the same equation is applied but with a Q_{minor1} , set as the side road AADT, and Q_{minor2} defined to be zero*”. Mr Edwards has not set Q_{minor2} to zero resulting in him calculating a higher PoF than is the case if he was to follow the HRIG formula. A higher PoF results in a better level of safety service, which is part of the reason for his conclusion that the Intersection is one of the safest 30% of similar intersections in New Zealand.
- 29 Following the HRIG formula, I have calculated a PoF of approximately 1,300, not the 1,600 used by Mr Edwards in his evidence. Mr Edwards acknowledged during expert conferencing that the PoF is approximately 1,300 not the 1,600 he used in his evidence.¹⁹
- 30 Based on four injury crashes over three years (ie 6.7 over 5 years), and a PoF of 1,273, the LoSS for the Intersection after the RIAWS²⁰ was implemented is LoSS IV (ie worse than 70% of other similar intersections).

¹⁶ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 4.

¹⁷ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 75.

¹⁸ As shown in the agreement of witnesses on safety. Joint Witness Statement – Traffic, 16 August 2022, Issue 1.

¹⁹ As shown in the agreement of witnesses on safety. Joint Witness Statement – Traffic, 16 August 2022, Issue 1.

²⁰ Now known as Intersection Speed Zones (ISZ).

- 31 Based on six injury crashes over 3 years since RIAWS (ie if the two crashes not yet coded into CAS are included), the LoSS is LoSS V (ie worse than 90% of other similar intersections).
- 32 Accordingly, the Intersection is still a high-risk intersection even with RIAWS in place, and is worse than at least 70% to 90% of similar intersections in New Zealand based on six to ten injury crashes every five years; therefore, in my opinion a transformative safety change is needed.
- 33 In my opinion a roundabout and a grade separation are both transformative safety changes. However, I disagree with Mr Edwards that a "seagull" style intersection would be an appropriate safety solution. As stated in the HRIG, channelised priority intersections (such as seagull style intersections) *"theoretically improve safety as traffic islands provide a degree of separation between through and turning traffic, and they enable vehicles turning right to cross one direction of traffic at a time. However, in practice these layouts typically result in an elevated crash record."*²¹
- 34 The formula within the HRIG suggests that a roundabout at the Intersection would have approximately two injury crashes over five years²² with the current traffic volumes. This is a 66% to 80% reduction of injury crashes compared with the existing situation. The results from a Crash Estimation Compendium (CEC) calculation are similar, with a roundabout at the Intersection having an 87% reduction of injury crashes compared with the existing situation.
- 35 The HRIG states that grade separation typically reduces injury crashes by 50% compared with crossroads, this is comparable to a roundabout. Therefore, any additional safety benefits of grade separation over a roundabout (if any) would be very small.

Efficiency, resilience, and the need for a dual lane roundabout

- 36 Mr Edwards states *"the stated need to increase the capacity of the intersection is based on anecdotal evidence of delay on Sunday afternoons and estimated traffic volumes for that period."*²³ He further states a one-lane roundabout would have sufficient capacity for the medium to long term, and would have several advantages over a two-lane roundabout.²⁴
- 37 The need to increase the capacity of the Intersection has not solely been based on capacity on a Sunday. In my opinion, the increased

²¹ High Risk Intersections Guide Section 6.6.1.

²² Based on the 50th percentile of the LoSS band for a rural roundabout.

²³ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 8.

²⁴ Evidence of Wesley Edwards, dated 5 August 2022, at paragraphs 18 to 19.

capacity provided by the dual lane roundabout has benefits over a single lane roundabout including:

- 37.1 Future proofing for traffic growth. In my expert opinion a single lane roundabout will operate at or close to practical capacity on a Sunday and Friday peak period on opening and would be at practical capacity on a Saturday between years 2032 and 2037. Even if a single lane roundabout had a longer design life, I would still recommend future proofing the designation footprint for dual lanes because of the uncertainty with traffic growth post COVID travel restrictions.
 - 37.2 Improving resilience. Two lanes enable partial rather than full closures to take place during maintenance activities and incidents like crashes. SH1 and SH29 are nationally significant freight routes and resilience is an important consideration in option selection.
 - 37.3 Improved accessibility for over-dimension vehicles. The Intersection is on an over-dimension vehicle route. A dual lane approach provides additional width for over-dimension vehicles that a single lane approach does not.
 - 37.4 Improved operation during periods of higher traffic volume, such as events (eg Fieldays) and holiday periods. The two-lane approaches allow for more flexibility in lane control during events and reduced queuing and delays during events and peak holiday periods.
 - 37.5 Maintaining existing number of approach lanes. The existing intersection currently has two lanes on every approach. A single lane roundabout would result in fewer approach lanes than current, effectively a down-grade in approach lanes compared to the existing layout.
- 38 At the time of my AEE assessment, I checked the substantial anecdotal evidence of Sunday queuing against:
- 38.1 TomTom delay data for 2017, which shows average delays on a typical Sunday peak are higher than a typical Saturday peak at the SH29 approach.
 - 38.2 The traffic layer in Google Maps, which shows queue lengths are significantly longer during typical Sunday and Friday peak periods than other days of the week.
 - 38.3 Karapiro telemetry data that shows traffic volumes on Sunday and Friday peak periods are 18% higher than on Thursday peak periods.

- 39 Mr Edwards considers “A two-lane roundabout is not required for the intersection in the absence of the C2P expressway”²⁵ and that “Roundabout B is an at-grade single-lane four-arm roundabout capable of neatly accommodating C2P alignment C2 with sufficient capacity for the medium term”.²⁶
- 40 I have modelled a single lane roundabout with a Saturday peak period using survey data from 2021 undertaken by Team Traffic, a growth rate of 1.1%, and with 70vph from opening of the Waikato Expressway but omitting any potential ‘bounce back’ in traffic from lifting of COVID travel restrictions. This modelling shows a single lane roundabout at the Intersection would be at practical capacity in year 2037 (a 15-year design life) during the Saturday peak period. Practical capacity is the maximum volume an intersection can handle that corresponds to an acceptable level of service.
- 41 Telemetry data at the Karapiro telemetry site shows that currently Friday and Sunday peak periods have approximately 18% more traffic on SH1 than Thursdays.²⁷ On this basis, I have modelled Friday and Sunday peak periods by scaling up the Thursday traffic survey data by 18%²⁸ to approximate the operation during these times. I acknowledge this is only an approximation, and individual movements may have varying percentages of difference across the week. However, my modelling shows a single lane roundabout would be at practical capacity with the existing Sunday volumes²⁹ and would be at practical capacity on a Friday within five years of now.
- 42 TomTom data and GoogleMaps Traffic layer show delays and queues are longer on a typical Sunday and Friday than a typical Saturday and telemetry data shows Friday and Sunday peak periods are higher than the Saturday peak. Therefore, in my opinion at the year the Saturday peak period reaches practical capacity at a single lane roundabout, there are likely to be three days a week (ie Friday, Saturday, and Sunday) that have reached practical capacity, which would create the need for additional capacity to maintain an appropriate level of service for the nationally significant State highway route and freight route.

²⁵ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 19.

²⁶ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 24.

²⁷ See graphs in Appendix. Two-way flow is approximately 18% higher. Some directional flows are 28% higher on Sunday and Friday than Thursday.

²⁸ I have also tested the operation with differing northbound and southbound values of between 1% and 28% additional traffic on Friday and Sunday compared with Thursday based on the telemetry data. See graphs in Appendix.

²⁹ Volumes approximated based on 18% more traffic than a Thursday peak period. Similar results are found using directional flows of 1% more southbound traffic and 28% more northbound traffic on a Sunday compared with Thursday based on directional data from Karapiro telemetry in 2019.

Walking and cycling and the need to grade-separate the roundabout

43 Mr Edwards states "*elevating the roundabout to provide grade-separated crossings is not necessary.*"³⁰

44 Mr Edwards acknowledged at conferencing³¹ that at-grade crossings are not safe on approaches to a dual lane roundabout. He asserts³² grade separated crossings are not necessary, based on his opinion that a single lane roundabout has sufficient capacity, and that at-grade crossings on a single lane roundabout are safe for people walking and cycling.

45 I disagree with Mr Edwards' statement on the basis that, in my opinion:

45.1 An at-grade crossing is not safe in a high speed, high traffic volume rural environment such as the SH1/29 Intersection, regardless of whether the approaches are single lane or dual. This is because the safe system threshold impact speed for pedestrians and cyclists is 30 km/h, which will easily be exceeded at the SH1/29 roundabout regardless of the number of approach lanes.

45.2 A single lane roundabout reaches practical capacity in 2037 (in 15 years' time) during the Saturday peak and is likely to reach practical capacity earlier than this on typical Sundays, Fridays, and public holidays.

46 In my opinion, grade separation for walking and cycling at the Intersection is necessary for safety, especially because the roundabout has dual lane approaches.

Constructability, and the benefits of an offline solution with a fourth 'stub' arm

47 Mr Edwards states "*The fourth arm is not necessary for the Project.*"³³

48 I agree the fourth arm is not necessary for the current traffic flows and routes; however, I concur with the evidence of Ms Wilton³⁴ and Mr Gray³⁵ that the inclusion of a fourth leg on the roundabout is a prudent, low cost intervention. In my opinion the reason it is prudent is that:

³⁰ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 18.

³¹ Joint Witness Statement – Traffic, 16 August 2022, Issue 6a.

³² Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 18.

³³ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 21.

³⁴ Evidence of Joanne Wilton, dated 6 July 2022, at paragraphs 63 to 67.

³⁵ Evidence of Alasdair Gray, dated 5 August 2022, at paragraph 39.

- 48.1 The effect the 'stub' has on operational safety and the efficiency of the intersection is negligible.
- 48.2 Constructing the 'stub' now will reduce safety risk for road users and C2P contractors during construction of C2P, if C2P is constructed. The Project (including the 'stub') will be constructed offline, whereas constructing the C2P connection later would require online construction works that carry a higher safety risk with contractors working closer to live traffic.
- 48.3 Constructing the 'stub' now will reduce traffic delays during construction of C2P if it should go ahead.

Geometrics – island diameter and approach geometry

49 In relation to the diameter of the roundabout, Mr Edwards implies a smaller central island has not been considered as an option, stating *"The Austroads guideline for roundabout design recommends the desirable central island diameter for a four-arm roundabout in high-speed environments is 48m. The guideline notes this may be increased where the design vehicle is larger than a semi-trailer, such as a road-train, which is allowable in some areas in Australia but not New Zealand. The guideline also notes the diameter may be reduced when the roundabout has three arms instead of four."*³⁶ Mr Edwards goes on to state that a 40m diameter island would be appropriate on the basis this is the minimum dimension stated in Austroads.

50 I acknowledge that a 40m island diameter is considered a minimum within Austroads and a 48m island diameter is considered a desirable diameter in Austroads for an intersection with the SH1/29 speed environment. However, I also note Austroads states the minimum should only be considered for constrained brown-fields sites and that the 48m diameter is only the desirable for semi-trailers, not larger vehicles. In my opinion a 60m diameter roundabout is appropriate for the Project because:

- 50.1 The location is also an over-dimension vehicle route, so selection of a larger diameter to accommodate larger vehicles is appropriate.
- 50.2 The location is a nationally strategic freight route, and a larger diameter can improve vehicle tracking and operational performance for freight at the Intersection. It can also reduce the potential roll over risk for turning heavy vehicles. Heavy vehicle roll over on roundabouts is considered when determining a suitable central island radius as there have previously been roll over issues on roundabouts such as the SH1/Otaihanga Road Roundabout (48m central island diameter) and the SH5/33 Hemo Roundabout (50m central

³⁶ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 163.

island diameter). Media reports of these accidents are available through the links in the footnotes below.³⁷

- 50.3 A narrower circulating carriageway of 10m can be provided with a larger central island diameter, as opposed to 12m with a smaller diameter. The narrower carriageway allows better management of swept paths and vehicle speeds.
- 50.4 Larger central island radii enable better entry path geometry, which leads to a reduction in entering vehicle speeds. This is reflected in Austroads guidance,³⁸ which states larger diameters reduce the relative speeds and crash rates between vehicles.
- 50.5 There are numerous other roundabouts of similar diameter on other strategic parts of the State highway network, such as SH33 / SH2 intersection (60m diameter), SH36 / SH29 roundabout (60m diameter), and SH1C / Avalon Drive Hamilton (66m diameter).
- 51 Furthermore, the central island diameter has very minimal effect on land requirement once other design elements, such as circulating lane requirements and approach geometry, is considered. A 48m island diameter would have an overall inscribed roundabout diameter of 72m compared with 80m for the proposed design, because of the need for wider circulating lanes with the small diameter island. The centre point of the roundabout island would not move, as the position is dependent on approach geometry. Once approach geometry and extents are accounted for, the difference in impact on the land required would be minimal (estimated to be only up to 350m²).
- 52 Mr Edwards implies the roundabout island diameter can be reduced because the roundabout has only three approaches; however, in my opinion it is prudent to future proof the design as a four-arm intersection to improve traffic and construction safety and efficiency should the C2P alignment be implemented, as discussed above in paragraph 48.
- 53 Mr Edwards criticises the lack of reverse curves, stating "*In high-speed areas the Austroads guidelines state that reverse curves of*

³⁷ <https://nzta.govt.nz/projects/sh1-otaihangra-rd-intersection-safety-improvements>

<https://www.stuff.co.nz/dominion-post/news/local-papers/kapiti-observer/76729363/fifth-truck-rolls-at-otaihangra-roundabout>

<https://www.nzherald.co.nz/rotorua-daily-post/news/hemo-gorge-roundabout-speed-reviewed/ZLBFU4J5IRQX2SFYQWBO4KDFLM/>

³⁸ *Austroads Guide to Road Design Part 4B page 19.*

gradually decreasing radius should be used on the approaches to progressively slow approaching traffic.”³⁹

54 Austroads Guide to Road Design Part 4B⁴⁰ does not state reverse curves ‘should’ be used, it states that it is important to alert drivers to a change in environment and encourage gradual speed reduction. It states treatment ‘may comprise of one or more’ treatments of which reverse curves are just one option. Other options for encouraging gradual speed reduction and alerting drivers to the change in environment that the Project design incorporates are:

54.1 A long median island and a kerb on the left;

54.2 Dense planting close to the approach;

54.3 Large advance warning signs; and

54.4 Lighting.

Urgency and achieving Objectives

55 Mr Edwards considers an upgrade of the Intersection is not urgent, stating “*For the reasons set out in this evidence I consider that the large scale of the project is not necessary as smaller roundabout options that require less land, or other short term improvements to the existing intersection, which would meet the project objectives are available.*”⁴¹

56 I disagree with Mr Edwards’ statement for the reasons given above.

57 Furthermore, a smaller roundabout such as the 40m diameter single lane roundabout that Mr Edwards suggests, or other short-term improvements, would not align as well with national objectives as the proposed Project design, including:

57.1 The Government Policy Statement on Land Transport (September 2020) strategic priorities of:

- (a) Healthy and safe people – Protecting people from transport-related injuries;
- (b) Economic prosperity – Supporting economic activity via local, regional, and international connections, with efficient movements of people and products; and
- (c) Resilience – recovering effectively from disruptive events.

³⁹ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 159.

⁴⁰ Section 4.5.2 Approach and entry treatments.

⁴¹ Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 265.

57.2 Waka Kotahi's Road to Zero vision of zero deaths and serious injuries on New Zealand Roads.

- 58 Mr Edwards states "*As an upgrade of this intersection is no longer urgent, in my view there is sufficient time for a full and proper selection of the C2P Expressway alignment to be undertaken and for the alignment to be confirmed, which can include consideration of an appropriate treatment of this intersection.*"⁴²
- 59 The SH1/29 intersection currently has 6-10 injury crashes occurring every 5 years, with a predicted DSI rate of approximately 2-4 deaths and serious injuries every 5 years without taking into account increases in traffic volume. In my opinion, no DSIs are acceptable, so there is urgency to the implementation of the Project.

EVIDENCE OF DAVID SERJEANT FOR THISTLEHURST DAIRY LIMITED

- 60 Mr Serjeant relies on Mr Edwards' evidence for safety effects, stating "*Mr Edwards advises that the available post-RIAWS crash rate data equates to 0.68 injury crashes per year; and none of the actual crashes were fatal or serious. The intersection now sits within the safest 30% of rural priority-controlled intersections. As a factual basis for making safety a reason for urgently proceeding with the Intersection Upgrade I rely on Mr Edwards' analysis.*"⁴³ He goes on to state "*The reliance on urgency for safety reasons has been comprehensively dispelled by Mr Edwards.*"⁴⁴
- 61 My comments above regarding Mr Edwards' safety evidence also apply to Mr Serjeant's statements regarding safety.
- 62 Mr Serjeant considers the evaluation of the Project is flawed, as it relies on material prepared for C2P, stating "*In other words, despite there being no certainty about the C2P, both the location and design of the upgraded intersection were determined on this basis.*"⁴⁵
- 63 In my expert opinion, the location and design of the Project are appropriate regardless of whether C2P is constructed. I consider a roundabout is the most appropriate safe system intervention at this location as discussed in paragraphs 32 to 37 of this rebuttal.

⁴² Evidence of Wesley Edwards, dated 5 August 2022, at paragraph 267.

⁴³ Evidence of David Serjeant, dated 5 August 2022, at paragraph 17.

⁴⁴ Evidence of David Serjeant, dated 5 August 2022, at paragraph 23.

⁴⁵ Evidence of David Serjeant, dated 5 August 2022, at paragraph 33.

EVIDENCE OF ALASDAIR GRAY FOR THE COUNCILS

- 64 Mr Gray's evidence is generally in support of the Project. His residual points of difference relate to conditions, specifically he would like:
- 64.1 A report with the Outline Plan of Works that "will allow the territorial authorities to ensure that the matters raised by submitters have been considered and addressed in the detailed design".⁴⁶
 - 64.2 An advice note seeking that the safety audit specifically consider truck stability, oversize vehicle, special events, farm vehicles, school buses and short cutting.
- 65 In my opinion Mr Gray's recommended changes to the conditions would be providing additional reassurances rather than being necessary to mitigate traffic effects. However, I understand Waka Kotahi has generally accepted Mr Gray's suggested amendments.

STATEMENTS OF JOHN HANSEN

- 66 Mr Hansen's core issues appear to be:⁴⁷
- 66.1 that a flyover would achieve better traffic flow than a roundabout,
 - 66.2 that traffic numbers are out of date and current figures will show a roundabout is not the best option, and
 - 66.3 improved road markings would make the roundabout unnecessary.
- 67 In my expert opinion:
- 67.1 Based on traffic modelling of the Intersection, a dual lane roundabout will operate within acceptable levels of service for at least the short-medium term and grade separation is not required.
 - 67.2 Sensitivity testing of traffic volumes with a range of growth rates (1.1% and 2.3%) has been undertaken, so I am

⁴⁶ Evidence of Alasdair Gray, dated 5 August 2022, at paragraph 66.

⁴⁷ Statements of John Hansen labelled "Equal equation", and "No up to date turning numbers" dated 2 August 2022.

confident the traffic volumes used in the assessment are appropriate and the assessment robust.

- 67.3 The Intersection is a high-risk intersection and, in my opinion, a transformational change, such as a roundabout is required to address the crash risk.

Nerissa Harrison
25 August 2022

APPENDIX



Figure 1 SH1/29 crash on Monday 25 July 2022



Figure 2 SH1/29 crash on Monday 8 August 2022

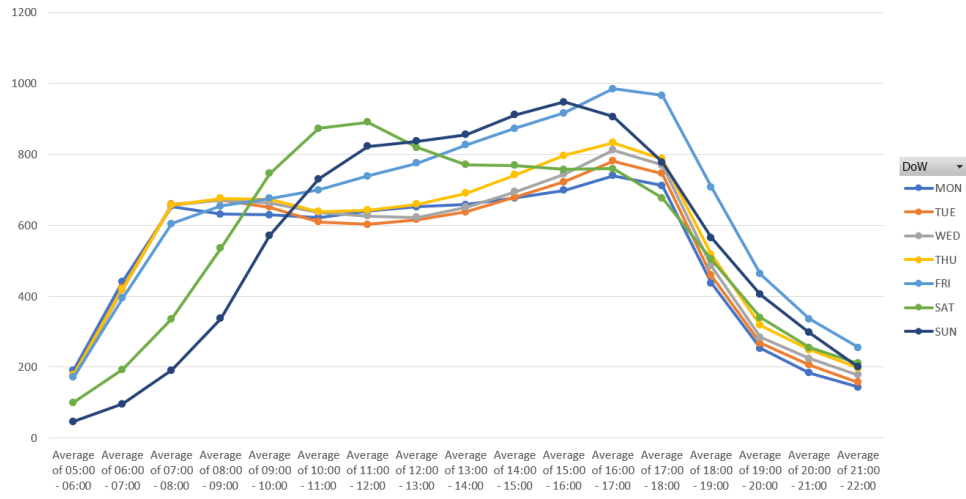


Figure 3 Average two-way hourly traffic volumes across the week (excluding Summer holiday period) (Karapiro telemetry 2019)

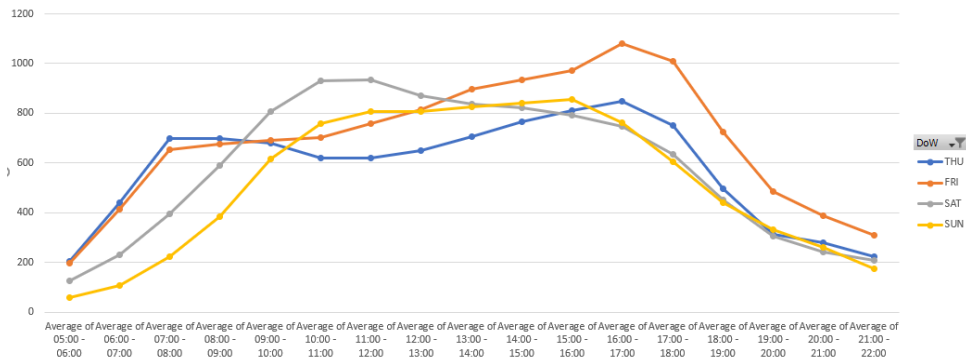


Figure 4 Average Southbound hourly traffic volumes across the week (excluding Summer holiday period) (Karapiro telemetry 2019)

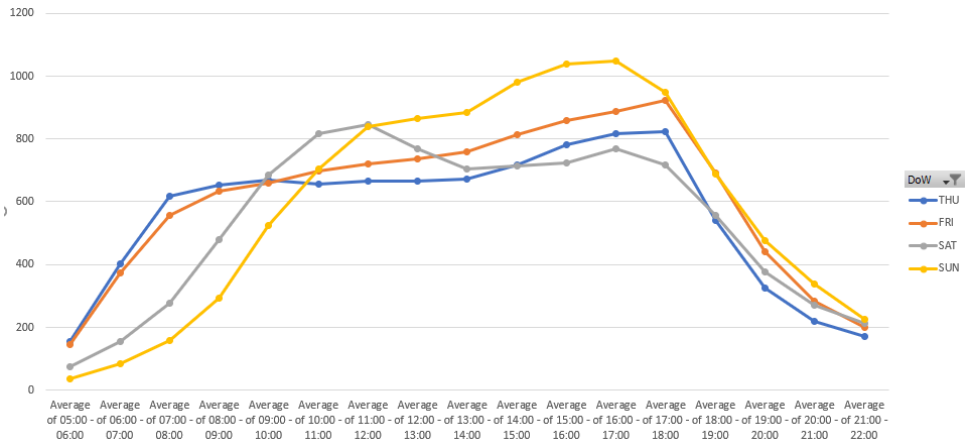


Figure 5 Average Northbound hourly traffic volumes across the week (excluding Summer holiday period) (Karapiro telemetry 2019)