

**BEFORE THE HEARINGS COMMISSIONER APPOINTED BY THE
CENTRAL OTAGO DISTRICT COUNCIL**

UNDER the Resource Management Act 1991

IN THE MATTER of Proposed Plan Change 18 to the
Operative Central Otago District Plan

**STATEMENT OF EVIDENCE OF ANDREW DAVID CARR
FOR CERISE ORCHARD LIMITED**

Dated 23 June 2023

INTRODUCTION

Qualifications and Experience

1. My name is Andrew (Andy) Carr.
2. I am a Chartered Professional Engineer and an International Professional Engineer (New Zealand section of the register). I hold a Masters degree in Transport Engineering and Operations and also a Masters degree in Business Administration.
3. I served on the national committee of the Resource Management Law Association between 2013-14 and 2015-17, and I am a past Chair of the Canterbury branch of the organisation. I am also a Chartered Member of Engineering New Zealand (formerly the Institution of Professional Engineers New Zealand), and an Associate Member of the New Zealand Planning Institute.
4. I have more than 34 years' experience in traffic engineering, over which time I have been responsible for investigating and evaluating the traffic and transportation impacts of a wide range of land use developments, both in New Zealand and the United Kingdom.
5. I am presently a director of Carriageway Consulting Ltd, a specialist traffic engineering and transport planning consultancy which I founded in early 2014. My role primarily involves undertaking and reviewing traffic analyses for both resource consent applications and proposed plan changes for a variety of different development types, for both local authorities and private organisations. I have previously been a Hearings Commissioner and acted in that role for Greater Wellington Regional Council, Ashburton District Council, Waimakariri District Council and Christchurch City Council.
6. Prior to forming Carriageway Consulting Ltd I was employed by traffic engineering consultancies where I had senior roles in developing the business, undertaking technical work and supervising project teams primarily within the South Island.
7. I have been involved in a number of proposals which have sought to rezone land through a private plan change. Within Central Otago, I

have provided transportation advice for plan changes 12 (Wooing Tree), 13 (River Terrace), and 14 (Ripponvale). I have also recently provided technical analyses and have given evidence for three submitters seeking the rezoning of their respective land through the council-initiated plan change 19.

8. I have also carried out transportation assessments in and around Cromwell for resource consents, such as the redevelopment of the Top Ten Holiday Park, the NPD on McNulty Road, and the analysis for the water park traffic generation that led to the recent implementation of improved access arrangements off the highway.
9. With regard to industrial and business activities, my experience includes plan changes (including in Kaikoura, Christchurch, Selwyn, Ashburton and Queenstown Lakes districts) as well as resource consents (ranging from milk powder plants to concrete batching plants, breweries to quarries).
10. As a result of my experience, I consider that I am fully familiar with the particular traffic-related issues around Cromwell and also the transportation characteristics of industrial-type activities.

Code of conduct for expert witnesses

11. I confirm I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of evidence

12. I have been engaged by the submitter, Cerise Orchard Limited, to provide expert traffic engineering evidence with respect to transportation analysis undertaken for plan change 18, and attached as Appendix 1 to the s 42A report.

13. The particular matter which I have been asked to address is the comment within the transportation modelling reports that *“it is concluded that the intersection of ... SH6 / Cemetery Road ... requires upgrades in the next ten years to respond to existing planned and zoned growth in Cromwell. The Industrial Plan Change proposal adds traffic to [this] intersection, and this traffic can comfortably be accommodated on the transport network following the implementation of suitable upgrades in response to Business-As-Usual growth.”* (Recommendations section of Abley report, dated 1 June 2023).
14. In considering the intersection, I have firstly described its current geometry to provide context. I then move on to addressing matters of efficiency (queues and delays), for which I have carried out some additional transportation modelling. I am aware however that Waka Kotahi not only considers efficiency but also road safety, and so I also discuss this, before drawing conclusions.
15. Although I have not visited the site as part of this current commission, I am familiar with the intersection due to my involvement with previous projects in the area.

REVIEW OF STATE HIGHWAY 6 / CEMETERY ROAD INTERSECTION

Existing Intersection Layout

16. The SH6 / Cemetery Road intersection is presently constructed as a priority ('give-way') intersection. In this location, the state highway turns through 55 degrees via a large radius curve (in the order of 350m), to transition from an east-west alignment to the west of the intersection, to a northeast-southwest alignment to the east of the intersection.

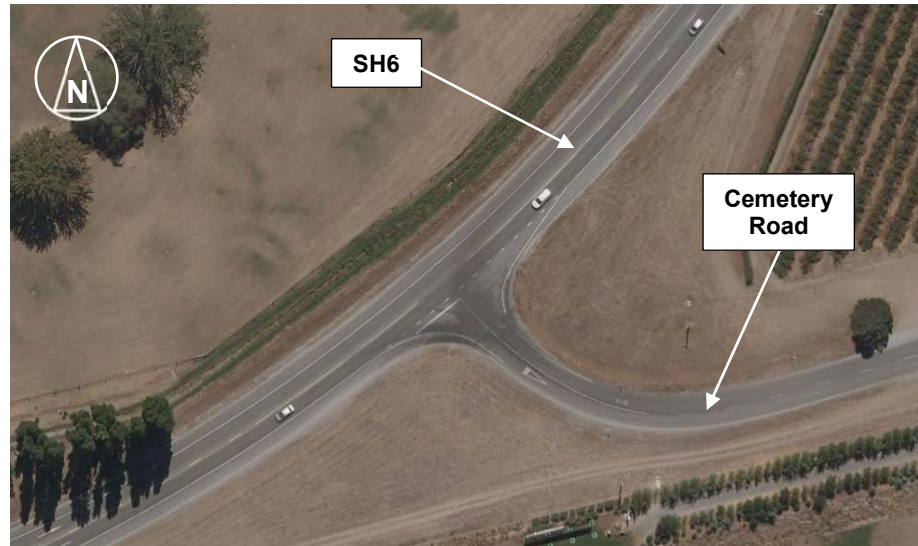


Figure 1: Aerial Photograph of SH6 / Cemetery Road Intersection

17. The speed limit on the highway is 100km/h, and I would expect traffic speeds to be of this magnitude as the large radius of the curve will not slow drivers.
18. Cemetery Road joins the highway on the outside of the curve. Although it also has an east-west alignment over much of its length, it turns towards the northwest over its westernmost 50m so it meets the highway at 90-degrees. It is subject to a speed limit of 70km/h.
19. As Cemetery Road joins on the outside of the curve of the highway, this assists in supporting long sightlines. However in this case, there are two restrictions to sightlines. On the northern side of the highway there is an earthwork which obstructs the sightline and measured at a distance of 7m back from the edgeline of the highway (as required in the Austroads Guide to Road Design Part 4A), the available sight distance is around 200m.



Figure 2: Sightline Towards West

20. Towards the northeast, there is a property boundary on the northern side of the highway, and since sightlines cannot cross private property (unless there is a legal agreement in place), this means that the sight distance is limited to 230m.



Figure 3: Sightline Towards Northeast

21. These sight distances are appropriate for eastbound vehicle speeds of 85km/h and westbound vehicle speeds of 95km/h.
22. However the intersection is somewhat unusual because the extent of the legal road widths is much greater than normal. Both Cemetery Road and SH6 have legal widths of 40m, which encompass the wide grassed verges on either side of Cemetery Road. As a result, the

expected sight distance of 285m is achieved to the west if the sightline is measured at 6m back from the edgeline of the highway, and to the north it is achieved if the sightline is measured at 9m back. In practice, the sightlines are achieved in both directions along the highway from 6m and 9m (respectively) back along Cemetery Road as far as approximately 50m from the edgeline of the highway.

23. In other words, while the sightlines at the expected measurement point are constrained, there is ample ability immediately prior to this for drivers approaching the intersection to look to see if any other vehicles are approaching the intersection. In my view then, the sightlines are appropriate.
24. At a higher-level, the intersection is constructed as a 'Diagram E' type of arrangement. This layout has widened shoulders on all approaches and departures, and so although there are no auxiliary turning lanes as such, the areas of widened seal mean that one vehicle can pass another that is turning. For instance, if a vehicle is turning right onto Cemetery Road, another vehicle that is travelling northeast on the highway can move onto the widened shoulder to pass.

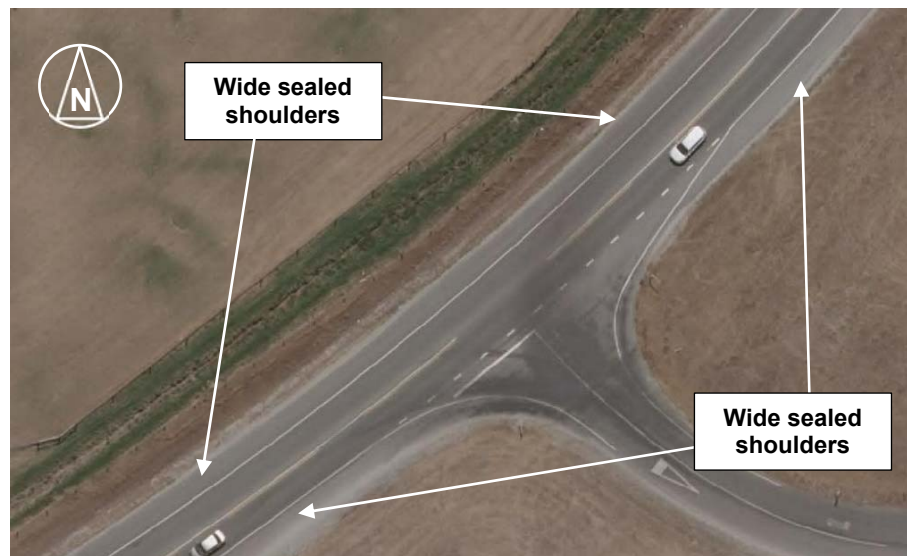


Figure 4: Widened Shoulders at Intersection

25. I have used the Waka Kotahi Crash Analysis System to identify reported crashes within 150m of the intersection. Over the past five years (2018 to 2022) and the partial records for 2023, there has been

only one crash recorded. This occurred to the south of the intersection, when a south/westbound driver struck ice on the highway, lost control, and left the road. The crash did not result in any injuries.

26. Limitations on overseas visitors due to Covid-19 travel restrictions mean that for part of this period, traffic patterns may not have been typical. Consequently, I also reviewed the crash record for the five year period prior to this (2013 to 2017 inclusive). However no crashes were recorded in this time period.
27. On the basis of my assessment, the intersection clearly has an excellent road safety record.

Intersection Efficiency

28. Appendix A of the s 42A report sets out the results of modelling of the intersection carried out by consultants Abley. Traffic flows at the intersection are presented in Appendix A of 'Industrial Plan Change Transport Modelling Technical Note' dated 1 June 2023. For clarity, only the evening peak is considered, and the 'baseline' scenario is 2034. The latter has been developed allowing for additional growth in employment and residences within Cromwell.
29. The modelling presented shows that the SH6 / Cemetery Road intersection operates with an excellent level of service (Level of Service A, the best available) and with low delays. Although queues of vehicles are not presented, I have used the traffic flows provided to re-model the intersection using a more simplistic software package (Sidra Intersection). Because the software used is different, there are slight differences in the results, but my modelling shows that queue lengths are at most 1 vehicle.
30. The modelling presented in the s 42A report also shows the change in capacity with the traffic generated by plan change 18. Summarising and comparing the results presented in the report shows the following:

Approach	Peak Hour Average Delay for Vehicles (secs)		
	Without PC18	With PC18	Difference
SH6 left	1.2	1.3	+0.1
Cemetery Rd left	4.8	5.2	+0.4
Cemetery Rd right	11.6	17.6	+5.0
SH6 right	4.5	4.5	-

Table 1: Comparison of Intersection Delays with and without PC18

31. It can be seen that the difference that PC18 makes to the delays is very small. At any priority intersection, the greatest delays always occur for the right-turn movement out of the minor approach (in this case, Cemetery Road) but even then, the overall resultant delay with PC18 traffic is less than 18 seconds.
32. I note that the modelling of the SH6 / McNulty Road roundabout shows delays of up to 50 seconds without PC18. In their submission, Waka Kotahi notes that they have no confirmed plans to upgrade this intersection. Given that delays of 50 seconds without PC18 are not sufficient for Waka Kotahi to plan any upgrades, I do not consider that it would be reasonable for them to require third parties to upgrade the SH6 / Cemetery Road intersection to create extra capacity, as delays are considerably lower.
33. I remodelled the SH6 / Cemetery Road intersection using Sidra Intersection and this showed that even with the PC18 traffic added, queue lengths remained at most 1 vehicle, little different to the scenario without any PC18 traffic.
34. Overall, in my view, the SH6 / Cemetery Road intersection has sufficient capacity to accommodate the increase in traffic from PC18, and there is no requirement for any substantial upgrade.

Intersection Safety

35. As I noted above, the current intersection has a very good safety record. PC18 will increase the amount of traffic turning to and from Cemetery Road, but given the sightlines are excellent, I do not anticipate that this will give rise to any adverse road safety effects.

36. The Austroads Guide to Traffic Management Part 6 sets out warrants for when auxiliary turning lanes are required at intersections. This is a process that takes into account the volumes of traffic passing through the intersection and the speed environment. This takes into account a balance of efficiency and road safety.
37. Taking into account the volumes of through traffic shown in the s 42A report, a right-turn bay is required when just 10 vehicles turn right off the highway and onto Cemetery Road. The modelling shows that without PC18, 48 vehicles are expected to turn right at the intersection. A right-turn bay is therefore justified irrespective of PC18.
38. As I noted above, the modelling presented in the s 42A report is based on a scenario in 2034. In order to further investigate the matter of the right-turn bay, I have considered the existing traffic scenario. For this I have used data from 2019, being the last full year available before Covid-19 travel restrictions were implemented.
39. Waka Kotahi carried out regular surveys of traffic volumes on the state highway network, and the nearest traffic counter to the SH6 / Cemetery Road intersection lies 2km west of Cemetery Road (id:00600947), just west of the SH6 / Ripponvale Road / Pearson Road intersection. This location means that it will not only record traffic on the highway that has passed Cemetery Road, but also traffic that has turned to and from Ripponvale Road and Pearson Road. Fortunately however, turning volumes at this intersection were observed as part of Plan Change 14.
40. The traffic survey at the SH6 / Ripponvale Road / Pearson Road intersection was carried out in 2019, and showed that traffic flows on Ripponvale Road and Pearson Road were very light. In fact, in the weekday evening peak period, the two-way traffic flow on SH6 west of the intersection was only 5% more than on the highway to the east of the intersection.
41. I have extracted the hourly data for the Waka Kotahi traffic counter and find that in 2019, the average weekday evening peak period had

493 vehicle movements (two-way). Adjusting this for the traffic turning to and from Ripponvale Road and Pearson Road shows that SH6 to the east of the intersection, and therefore to the west of Cemetery Road, presently carries an average of 468 vehicles (two-way).

42. Applying the same criteria for warrants set out in the Austroads Guide shows that a right-turn bay is required when 17 vehicles turn right into Cemetery Road.
43. Although I am not aware of any traffic surveys being carried out in this location, 17 vehicles turning right in the peak hour equates to a very low average of 1 vehicle movement every 3.5 minutes. Since Cemetery Road presently carries 600 vehicles per day (according to the MobileRoad website), and as roads typically carry 10% of their daily traffic flows in the peak hours, I consider it is highly likely that there are already more than 17 vehicles turning right onto Cemetery Road in the evening peak hour. If that was indeed the case, then a right-turn bay is already warranted at this location (but none is provided nor planned by Waka Kotahi).
44. The expected 2034 traffic flows require the provision of a left-turn lane at the intersections when more than 75 vehicles turn left into Cemetery Road from the highway. This threshold is not exceeded even with PC18 in place.
45. In my view, a right-turn bay would be straightforward to implement at this intersection. There is a distance of at least 9m available between the edge of the northbound traffic lane of the highway and the legal road boundary, which is ample to accommodate such a turning bay (which would be no more than 3.5m wide) and in practice it may be possible to simply repurpose the existing widened shoulder.
46. Overall then, I consider that the modelling shows that without PC18 in place, a right-turn bay is warranted at the intersection (with a warrant of 10 vehicles turning right off the highway whereas nearly five times as many are forecast). It is extremely likely in my view that a right-turn bay is already required at this location. Such a turning

bay can easily be implemented given the extent of legal road reserve, and a layout can be implemented that complies with current design guides and standards.

47. One final matter to highlight is that in practice, PC18 does not greatly change the traffic flows turning at this location. The s 42A modelling shows that in the evening peak hour there would be an additional 60 vehicles turning to or from Cemetery Road (equivalent to an average of 1 additional vehicle movement every minute, at the busiest times). In my view this increase does not represent a significant change in the number of turning movements, and given that sight distances are appropriate for the existing speed environment, and coupled with the provision of a right-turn bay, I do not consider that there would be any material change in road safety risk due to turning vehicles.

CONCLUSION

48. Having reviewed the modelling, I consider that in terms of intersection capacity, a priority intersection remains the appropriate layout for the SH6 / Cemetery Road intersection even with the additional traffic from PC18. Delays remain much lower than at the SH6 / McNulty Road intersection without PC18.
49. With regard to road safety, I am of the view that the current traffic volumes at the intersection are likely to mean a right-turn bay is justified. The modelling shows that one is certainly required by 2034, even without PC18.
50. Although there is no evidence of any road safety issues at the intersection, such a turning bay would support a safer roading environment through separating the right-turn movement from the through traffic.
51. More generally, the large legal road widths and good sight distance at the intersection means that a turning bay can be easily implemented, and the subsequent intersection layout is highly likely to fully meet current design guides and standards.

52. Overall then, I am of the view that PC18 in itself does not give rise to the need for any improvements at the SH6 / Cemetery Road intersection, and that a priority intersection remains appropriate. However it is likely in my view that a right-turn bay is already warranted and this can easily be constructed in this location.

Andrew David Carr

23 June 2023