Before the Independent Commissioners appointed by the Waimakakriri District Council

In the matter of	the Resource Management Act 1991 (**the Act**)
and	
In the matter of	Proposed Private Plan Change 31 (PC31) to the Waimakariri Operative District Plan by Rolleston Industrial Developments Limited

Summary of evidence of Andrew Metherell on behalf of Waimakariri District Council (as Submitter) - Transport

Dated: 9 August 2023

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Evidence of Andrew Metherell:

Introduction

1. My name is Andrew Metherell. I am a transportation engineer, employed by Stantec New Zealand. I prepared an expert transportation engineering brief of evidence for Waimakariri District Council as a submitter dated 21 July 2023. My qualifications and experience as a transportation engineer were set out in that evidence. In that evidence I referenced the Code of Conduct for Expert Witnesses, which I continue to confirm I have complied with in preparing this summary statement.

2. The purpose of this summary evidence is to summarise the key points from my evidence in chief, as well as consider the additional material presented at the hearing by the Applicant transportation experts.

Key areas of concern

3. Within my evidence that follows I have identified a range of concerns with PC31 from a transport perspective, that in my opinion will likely lead to outcomes that are not desirable for new urban development of the scale proposed. Many of these relate to the location of development. These issues can be summarised as:

    3.1. **Poor cycling connectivity** with an absence of safe cycle facilities between the development and existing urban areas, or a reasonable plan to provide for a suitable level of service for cyclists;

    3.2. **Poor public transport connectivity** with the absence of public transport routes servicing the site, or reasonable options available to service the site in the future;

    3.3. Low self-sufficiency of the development as a result of low employment in the planned urban area. That will lead to **high travel distances** to access employment and services comparable to distances associated with existing or developing urban centres. This is exacerbated by the lack of choice to use other modes of transport to reduce reliance on private vehicles;

    3.4. **Reliance on District Council high speed rural roads** and intersections for connection to urban centres, which will lead to high severity crashes when crashes occur. The extent of

these issues have not been investigated or addressed by the Applicant;

3.5. Forecast **high delays at intersections** connecting to the arterial road network, and likely leading to further increases in delay at downstream intersections on those intersections. I consider the future performance of intersections has not been adequately considered by the Applicant;

3.6. An **absence of an effective transport infrastructure and development plan** to address foreseeable issues and effects of development.

Suitability of Assessment Undertaken by the Applicant

4. In my opinion the assessment by Mr Fuller supporting the Applicant evaluation of many of these issues is not robust, and has left a high level of uncertainty.

4.1. The assessment was a basic assessment of forecast traffic distribution patterns which my transport modelling indicates is likely to be incorrect;

4.2. The assessment did not address how the transport patterns and performance of the transport network will evolve over time as a result of other planned growth. A network transport model would better inform this, however no attempt was made to utilise such a model;

4.3. No assessment of road safety risk on the transport network, and whether safe system transport measures will be required on the rural road network either locally or on the important roads connecting to urban centres;

4.4. Application of intersection traffic models that include key input parameters at levels that will underestimate the likely delay that will be experienced (as I refer to later in my summary);

4.5. A localised area assessment methodology, rather than the "broad" to "extensive" assessment area that is warranted for a development of this scale. This has led to only a cursory consideration of wider transport network effects on road safety and efficiency, with gaps in consideration of important parts of the transport network;

4.6. Heavy reliance on unfunded changes in Council transport infrastructure plans through development contributions to resolve future issues, without identifying the extent of projects that may be necessary, how feasible those are, and the likely contribution development of the Plan Change area will make to the need for such changes.

5. Based on the information presented and my review, I consider these issues and gaps in robust assessment individually and cumulatively will result in development that is not well integrated with the existing or currently planned transport network. In that respect, and on the basis of the information available I do not consider it will contribute to a well-functioning urban environment from a transport perspective.

Further Evidence of Mr Fuller

6. I have considered the further evidence of Mr Fuller that he presented as a summary statement on 3 August 2023. I have considered the response and additional analysis provided.

Traffic Distribution

7. Mr Fuller has not necessarily accepted that the ITA traffic distribution is incorrect. Instead, he has carried out some limited sensitivity testing of intersection efficiency that I highlighted as being particularly affected by the strategic model traffic distribution. I accept that future traffic distributions can vary, although I prefer my modelled distribution scenario which intuitively seems reasonable and has a basis that considers all trip types. That distribution places greater emphasis on the connections to the Flaxton Road – Skewbridge Road – Ohoka Road corridor for connection to Rangiora and Kaiapoi than previously assessed by Mr Fuller.

8. *Intersection Modelling*

9. Mr Fuller has set out performance for sensitivity tests and the Flaxton Road / Threlkelds Road intersection in several attachments to his summary evidence.

10. Within my **Attachment 1**, I have included a review of a selection of the intersection model outputs. That indicates that some intersections have clearly been modelled with parameters that represent high risk gap acceptance behaviour when turning into the main road from the minor side road. Whereas guidance for a right turn from minor road to a major

road involves a 5.5 second critical gap parameter, I have determined that Mr Fuller's model applies approximately 4.3 seconds for the critical gap parameter.

11. In my experience, short gap acceptance behaviour for turning vehicles at the level as modelled require aggressive driving from those making the turn, and often involve avoidance manoeuvres such as braking by those on the main road approaching the intersection. There is minimal safety margin for error for the driver accepting a gap.

12. To understand the performance with more reasonable gap acceptance parameters for a future scenario where no calibrated model exists, I have applied the models with the default gap acceptance parameters set out in the SIDRA Intersection User Manual.

13. This analysis shows that both the Ohoka Road / Mill Road and Flaxton Road / Threlkelds Road intersections will operate with high delays and level of service F conditions. That is the lowest level of service, and representative of high delays and unstable conditions. The Tram Road intersection analysis already presented by Mr Fuller also have moderate to high delays for very high volumes of side road turning movements.

14. The possible driver response will be increased risk taking, which in a high speed rural road environment with intersections that involve complexity such as location on curves (Ohoka Road and Flaxton Road) or cross road intersections (Tram Road) can lead to high severity outcomes if a turning collision occurs.

15. In my opinion infrastructure upgrades would need to be planned for with the forecast traffic volumes, and these have further constraints related to land availability. The step change in traffic volumes as a result of the Plan Change will either generate the need for the upgrade, or significantly bring forward the intersection upgrade requirement.

Traffic Growth

16. As I set out in my evidence, a wide area network assessment of future transport patterns warrants consideration of traffic model forecast growth. Whilst I highlighted some locations where growth is identified in the models, this is not exhaustive. The point I was making was that the overall methodology applied by Mr Fuller is not necessarily reflective of future traffic conditions.

17. Mr Fuller has carried out further analysis of the Tram Road interchange with consideration of traffic growth from the west based on his assessment of growth potential. Whilst he made some allowance for background traffic growth, this potentially represents less than 10 years of growth (if general traffic growth was at approximately 2%, the increase would represent conditions in approximately 2028). In my opinion, consideration of a longer period would be desirable as 2028 would likely to be the timeframe for initial development from the Plan Change site.

Tram Road Interchange

18. Notwithstanding my concerns about the traffic volumes applied for assessment of the Tram Road interchange, Mr Fuller elaborated on the possible layout for the interchange.

19. Having considered Mr Fuller's response, I have discussed with Waka Kotahi transport planner Haroun Turay the likelihood of an additional lane being implemented on the overbridge to address safety and capacity issues. He indicated the current performance of the interchange is generating queues back across the northbound off ramp, and Waka Kotahi are currently looking at a traffic signals option for the off-ramp intersection with Tram Road.

20. I understand there is currently no plan to provide an additional traffic lane eastbound, and this reflects a general policy response to travel demand management and managing the availability of spare traffic carrying capacity. Additional spare capacity can lead to downstream effects and Waka Kotahi have indicated their preference is to manage demand for travel on the motorway, and seek solutions that are supportive of that preference such as mode shift and higher occupancy use of vehicles.

21. I consider the only feasible solution presented by Mr Fuller is bridge widening, which by its nature is a large project. I understand this would be a last resort outcome from Waka Kotahi, and analysis by Mr Fuller has not made it clear if capacity based changes may not be necessary without the growth on Tram Road as a result of the Plan Change.

Road Hierarchy

22. I acknowledge Mr Fullers comments that the Road Hierarchy for Whites Road is "likely to be recategorised as a Collector Road". In my opinion, the Plan Change needs to make provision for the access connections relevant to a Collector Road frontage, ahead of any recategorisation.

Cycling Connections

23. I disagree with the response from Mr Fuller regarding the formation that would be warranted for cycle connections to Rangiora and Kaiapoi. In my experience comparable connections provided for the purpose of connecting urban areas are sealed, such as the connection from Woodend to Rangiora, and connections between towns within the Selwyn District. I understand Council has not planned for that level of provision and that will require additional investment.

Road Safety Risk Assessment

24. I considered that Mr Fuller had not addressed the influence of changes in traffic patterns on safety upgrades which may be necessary to support the step change in traffic volumes on the surrounding road network.

25. Mr Fuller has responded to my comment about road safety risk assessment by referencing the planned upgrades to Tram Road. Whilst I do not have details of what is proposed, I understand that any changes will likely be planned for a road environment that is more comparable to existing. The Plan Change will lead to large increases in traffic on some intersection turning movements such as at Whites Road, where a high-speed environment exists, and Tram Road itself will increase in traffic volume by more than 25% as a result of the Plan Change. This is a large increase when the existing Tram Road environment has a history of serious crashes at various locations along its length.

26. As I have analysed, the intersections onto Ohoka Road and Flaxton Road will function with high turning traffic volumes with high delays on high speed roads. Intersections on Tram Road will also carry high turning traffic volumes. The safety risk has not been assessed by Mr Fuller.

27. To understand if the future transport environment will carry high risk conditions, I have carried out some indicative safety risk modelling using the methods included in the Waka Kotahi Monetised Benefits and Costs Manual ("MBCM") (Appendix 2: Crash Analysis).

28. This determines a crash risk based on death and serious injury crash calculations using established methods that account for existing crash history, intersection form, and typical crash rates. It is important to understand that the models are indicative of crash risk based on national averages, as they use empirically derived models from intersections throughout New Zealand. Individual intersections can perform better or worse.

29. Crash models adopted are the generalised models for high-speed priority crossroads and priority T-intersections, with adjustment for existing right turn bays. A more detailed investigation would likely consider conflicting flow models.

30. My forecast based on the future traffic volumes included in Mr Fuller's summary statement allowing for growth is that the Tram Road intersections will have a low collective risk[1] and medium high to high personal risk. These are considered high risk intersections. The intersections on Ohoka Road-Skewbridge Road have medium (Flaxton Road / Threlkelds Road) to medium-high (Ohoka Road / Mill Road – High risk) personal risk in the future.

31. Under a "safe system philosophy"[2,] "safety management" of high-risk intersections with these risk characteristics would likely apply measures such as speed management, hazard awareness raising, intelligent signs, and lower cost intersection improvements. If serious crashes occur at a higher frequency than the national average, then it may push the risk band into safe system transformation works, which in this case would likely include a need to consider rural roundabouts.

32. In my opinion, without a more detailed assessment of safety risk and mitigations with consideration of safe system assessment methodologies there is the potential that the increase in traffic generates adverse safety outcomes.

Conclusion

33. In conclusion, I have remaining concerns that the proposed Plan Change 31 development will not integrate with the surrounding transport network in an effective way. Rezoning of the site is likely to lead to a

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[1] Collective risk also known as crash density is measured as the number of fatal and serious crashes per intersection in a crash period.
· Personal risk or crash rate is measured in terms of the number of F&S crashes per 100 million vehicles using an intersection.
[2] Waka Kotahi High Risk Intersection Guide

range of improvements being required to the transport system, that are currently not planned for, and that are unlikely to be required to the same extent without the Plan Change.

Date: 9 August 2023

Andrew Metherell

Attachment 1: Review of SIDRA Intersection Modelling Presented by Mr Fuller

34. As set out in my summary evidence, I have investigated the robustness of the intersection modelling carried out by Mr Fuller.

35. I have not had the opportunity to directly review his model inputs, although as an experienced user of SIDRA Intersection I have attempted to replicate some of the models to closely approximate the model inputs. Unsignalised SIDRA Intersection model outputs are primarily influenced by "Gap Acceptance" parameters. Essentially, that is the spacing between vehicles in time that drivers will accept a gap to turn into.

36. I understand that at least some of the model gap acceptance parameters are not calibrated to existing conditions to reflect observed delays, which is always a preference. In my experience the combination of intersection form and speed, and existing levels of traffic can influence the important input parameters that influence model outputs and calibration assists in establishing valid parameters.

37. Where a model has not been calibrated, a modeller would typically be expected to reference guidance. SIDRA Intersection User Manual sets out at Table 5.10.6 default gap acceptance and "reasonable ranges for user specification". For minor road movements the default and reasonable ranges for side road movements with two lane major roads are as follows:

Road	**Critical Gap**	**Follow-up Headway**
Left turn from side road	4.5s (3s - 6s)	2.5s (2s - 3.5s)
Through movement from side road	5.0s (4.5s - 5.5s)	3.0s (2.5s – 3.5s)
Right Turn from side road	5.5s (5s – 6s)	3.5s (3s – 4s)

Table A1: SIDRA Intersection User Manual Gap Acceptance Recommendations

38. I have then replicated several of the models to identify calculated gap acceptance parameters for the critical right turn as follows:

Intersection Model	Scenario	Calculated Delay		Output SIDRA Gap Acceptance Parameters for Critical Right Turn from Side Road
		Mr Fuller Calculated Right Turn Movement delay	Mr Metherell Replica Model Calculated Right Turn Delay	
Ohoka Road / Mill Road (Mr Fuller Attachment 4)	2023 AM Peak + Dev S-Test & Growth	21.3s/veh	21.8s/veh	4.3s critical gap 2.6s follow up headway
	2023 PM Peak + Dev S-Test & Growth	34.1s/veh	34.9s/veh	4.3s critical gap 2.6s follow up headway
Flaxton Road / Threlkelds Road (Mr Fuller Attachment 4)	2023 AM Peak + Dev S-Test & Growth	18.8 s/ veh	17.5s / veh	4.3s critical gap 2.6s follow up headway
	2023 PM Peak + Dev S-Test & Growth	49.7s/veh	50.8s/veh	5.0s critical gap 3.1s follow up headway
Tram Road / Whites Road (Mr Fuller Attachment 3)	2021 AM Existing + 850 Dev + Sch + Growth	35.9s/veh	34.8s/veh	Whites South Approach 5.6s critical gap 3.5s follow up headway
	2021 AM Existing + 850 Dev + Sch + Growth	30.8s/veh	29.5s/veh	Whites South Approach 5.5s critical gap 3.5s follow up headway

Table A2: Modelled Gap Acceptance Parameters

39. It can be seen that the following models have used gap acceptance parameters well below defaults and "reasonable ranges" that were identified in Table A1:

39.1. Ohoka Road / Mill Road

39.2. Flaxton Road / Threlkelds Road

40. The consequence of this is that the lower gap acceptance applied by Mr Fuller will result in reduced delays compared with default gap acceptance or gaps in a "reasonable range". Essentially by applying lower gap acceptance, a higher level of risk taking than desired has been assumed. In my experience, critical gap for right turns in the order of 4.3 seconds will only be experienced for turns onto very high volume roads, and generally associated with small number of turn movements.

41. I have rerun the models for Ohoka Road / Mill Road and Flaxton Road / Threlkelds Road with the standard default gap acceptance parameters for SIDRA. In my experience these are a reasonable estimate for modelling of unsignalised intersections where calibration has not been completed. The performance for the critical right turn out is set out in the outputs that follow:

Road		**Calculated Delay (s/veh)**	**Level of Service**
Ohoka Road / Mill Road	AM Peak	75 s/veh	**LOS F**
	PM Peak	321 s veh	**LOS F**
Flaxton Road / Threlkelds Road	AM Peak	28 s veh	LOS D
	PM Peak	63 s/veh	**LOS F**

42. The analysis clearly shows that the performance of these intersections will potentially involve poor level of service in peak periods. This indicates that the assessment by Mr Fuller is unlikely to be robust for evaluating future performance of the road network.

43. The performance combined with existing geometric characteristics and rural speeds will in my opinion have the potential to lead to serious road safety concerns, as risk taking and exposure to potential high-speed crashes will substantially increase.

44. An in-depth assessment of road safety at the intersections is warranted, including risk analysis and safe system assessment (or audit) of design changes that may be warranted. Major changes could be required to address capacity and consequential safety issues, and that would likely involve third party land acquisition.

45. I also note that the analysis looks at local intersections focused on access to the arterial road network. There may be other downstream arterial intersections with comparable poor performance that are further exacerbated by increased traffic volumes on the through road.