Before the Hearings Panel
At Waimakariri District Council

Under	Schedule 1 of the Resource Management Act 1991
In the matter of	the Proposed Waimakariri District Plan
Between	**Various**
	Submitters
And	**Waimakariri District Council**
	Respondent

Statement of evidence of Shane Binder (Transport), Christopher Bacon (Servicing, Hazards), Colin Roxburgh (Servicing), Jon Read (Green Space) on behalf of Waimakariri District Council.

Date: 16 May 2024

INTRODUCTION:

Mr Shane Isaac Binder (Transport)

1 My full name is Shane Isaac Binder. I am employed as the Senior Transportation Engineer for Waimakariri District Council.

2 I have prepared this statement of evidence on behalf of the Waimakariri District Council (**District Council**) in respect of technical related matters arising from the submissions and further submissions on the Proposed Waimakariri District Plan (**PDP**).

3 Specifically, this statement of evidence relates to transportation technical advice, identifying any significant constraints.

4 I am authorised to provide this evidence on behalf of the District Council.

Mr Christopher Paul Bacon (Servicing, Hazards)

5 My full name is Christopher Paul Bacon. I am employed as a Network Planning Team Leader at Waimakariri District Council. In this position I am involved with planning for infrastructure growth and flood modelling.

6 I have prepared this statement of evidence on behalf of the Waimakariri District Council (**District Council**) in respect of technical related matters arising from the submissions and further submissions on the Proposed Waimakariri District Plan (**PDP**).

7 Specifically, this statement of evidence relates to servicing and hazards technical advice, identifying any significant constraints.

8 I am authorised to provide this evidence on behalf of the District Council.

Mr Jonathan Spencer Read (Green Space)

9 My full name is Jonathan Spencer Read. I am employed as a Green Space and Community Facilities Planner.

10 I have prepared this statement of evidence on behalf of the Waimakariri District Council (**District Council**) in respect of technical related matters arising from the submissions and further submissions on the Proposed Waimakariri District Plan (**PDP**).

11 Specifically, this statement of evidence relates to Proposed District Plan rezoning requests.

12 I am authorised to provide this evidence on behalf of the District Council.

Mr Colin James Roxburgh (Servicing)

13 My full name is Colin James Roxburgh. I am employed as the Project Delivery Manager for Waimakariri District Council.

14 I have prepared this statement of evidence on behalf of the Waimakariri District Council (**District Council**) in respect of technical related matters arising from the submissions and further submissions on the Proposed Waimakariri District Plan (**PDP**).

15 Specifically, this statement of evidence relates to 3 Waters Servicing technical advice, identifying any significant constraints.

16 I am authorised to provide this evidence on behalf of the District Council.

QUALIFICATIONS AND EXPERIENCE

Mr Shane Isaac Binder (Transport)

17 I hold the qualifications of Bachelor of Science in Civil Engineering from Pennsylvania State University (USA), and a Master of Science degree in Civil Engineering from the University of Colorado (USA), both with specialisations in transport.

18 I have more than 22 years' experience as a professional traffic engineer and road safety specialist, both in New Zealand and abroad. I have had the position of Waimakariri District Council Senior Transportation Engineer for the last three years. In this role I manage the District's transport planning, strategy, and engineering functions, including road safety, traffic modelling, parking, and public transport elements.

19 I am a Chartered Professional Engineer (CPEng), a Professional Engineer (Colorado and Washington State, USA), and a Road Safety Professional (Level 1) certified by the Institute of Transportation Engineers. I am a Chartered Member of Engineering New Zealand. I am also a member of the Transportation Group of Engineering New Zealand and am on the steering committee of the Safety Practitioners Sub-group.

Mr Christopher Paul Bacon (Servicing, Hazards)

20 I am a Chartered Professional Engineer and hold a Batchelor Degree in Civil Engineering. I have over 20 years of experience in civil engineering.

21 My summary statement has predominantly been based on modelling data shown on the Waimakariri District Council's 'Waimaps' geographical information system (GIS), much of which I was responsible for coordinating and managing, and from my discussion with other WDC engineers.

22 Except where I state I rely on the evidence of another person, I confirm that the issues I have reviewed and any brief summary statements that I have made are within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

Mr Jonathan Spencer Read (Green Space)

23 I hold the qualifications of Bachelor Degree in Resource Studies.

24 I have worked for 30 years in the local authority field of parks, recreation and open space planning.

Mr Colin James Roxburgh (Servicing)

25 As the Waimakariri District Council Project Delivery Manager I have responsibility for the Project Delivery Unit which is an internal consultancy responsible for providing professional services relating to infrastructure delivery within the Council, which covers water supply, wastewater and stormwater. I have been in this role since May 2023, prior to this I was the Council's Water Asset Manager from 2016. Prior to this I was a Senior Engineer within the Project Delivery Unit, with design and project management experience in the field of water supply, wastewater and stormwater projects, as well as experience with hydraulic modelling of stormwater infrastructure.

26 Since 2013 I have been recognised as a Charter Professional Engineer

based on the above experience.

Code of conduct

27 I have read the Code of Conduct for Expert Witnesses set out in the Environment Court's Practice Note 2023. I have complied with the Code of Conduct in preparing my evidence and will continue to comply with it while giving oral evidence before the Environment Court. My qualifications as an expert are set out above. Except where I state I rely on the evidence of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

SUMMARY

Mr Shane Isaac Binder (Transport)

28 My name is Shane Isaac Binder.

29 I have been asked by the Council to provide transportation evidence in relation to rezoning requests.

30 My statement of evidence addresses transportation.

Mr Jonathon Spencer Read (Green Space)

31 My name is Jonathan Spencer Read.

32 I have been asked by the Council to provide Green Space evidence in relation to rezoning requests.

33 My statement of evidence addresses various submission and evidence in relation to green space matters, as requested by the Report Writer.

Mr Christopher Paul Bacon (Servicing, Hazards)

34 My name is Christopher Paul Bacon.

35 I have been asked by the Council to provide civil engineering evidence in relation to rezoning requests.

36 The brief summary statements made by Mr Aramowicz and Mr Bacon typically relate to an intention that Council avoid rezoning in areas where;

- The future activity (ie densification or change in land use) is likely to result in a significant increase in the risk of damage from a natural disaster, and/or

- There is insufficient water/wastewater/stormwater capacity and where Council has not planned to provide sufficient services for the proposed land use in its growth planning.

Mr Colin James Roxburgh (Servicing)

37 My name is Colin James Roxburgh.

38 I have been asked to provide 3 Waters servicing engineering evidence in relation to rezoning requests.

INVOLVEMENT WITH THE PROPOSED PLAN

Mr Shane Isaac Binder (Transport)

39 I have been involved in the PDP since March 2021, providing advice when requested on general transport rules and activity standards.

Mr Christopher Paul Bacon (Servicing, Hazards)

40 I have been involved in the PDP since 2021.

Mr Jonanthan Spencer Read (Green Space)

41 I have been involved in the PDP since 2018.

Mr Colin James Roxburgh (Servicing)

42 I have been involved in the PDP since 2018.

SCOPE OF EVIDENCE

43 Attachment A includes expert transportation evidence provided by Shane Binder (WDC).

44 Attachment B includes expert 3 Waters servicing evidence provided by Colin Roxburgh (WDC).

45 Attachment C includes expert flood hazard evidence provided by Christopher Bacon (WDC).

46 Attachment D includes expert Green Space evidence provided by Jon Read (WDC).

Date: 16 May 2024

Attachment A

WAIMAKARIRI DISTRICT COUNCIL

MEMO

FILE NO AND TRIM NO:	DDS-14-13-03 / 240516078774
DATE:	27 May 2024
MEMO TO:	Andrew Willis
FROM:	Shane Binder, Senior Transportation Engineer
SUBJECT:	PDP Stream 12D – Ōhoka transport feedback

Introduction

1. The proposed re-zoning at Ōhoka was previously the subject of Private Plan Change PC31. I provided detailed evidence for the PC31 hearing on policy alignment, transport network operations and capacity, greenhouse gas (GHG) emissions, vehicle-kilometres travelled (VKT), road safety, and public transport. My evidence consisted of:

   - s42A Report, Appendix 7, Transport Evidence, 22 June 2023 – Attachment A
   - s42A Report, Summary Statement (Transport), 8 August 2023 – Attachment B
   - Joint witness statement in relation Public Transport Options, 18 August 2023 – Attachment C
   - Joint witness statement in relation Transport Infrastructure Provision, 22 August 2023 – Attachment D

2. I have reviewed the evidence of N Lauenstein (urban design), J Phillips (planning), T Walsh (planning), P Farrelly (GHG emissions), S Milner (public transport), and N Fuller (general transport) in support of Submissions 160 and 237 on the Proposed District Plan. At a high level, I consider that changes proposed in these submissions do not address the concerns I have raised previously in both evidence in chief and summary of evidence prepared for the PC31 hearings last year.

3. While there have been some minor changes since PC31, I consider that the proposal, in locating a large quantity of "urban" residential development far from established urban centres and "day-to-day" trip destinations, regardless of the activities proposed on-site, has not substantively addressed my overall concerns from PC31 that it fails to:

   - support the local and regional policy directions to make best use of the existing transport network;
   - encourage non-motorised and public transport over private motor vehicles;
   - reduce GHG emissions or VKT;
   - provide a safe roading environment for all users; or
   - mitigate adverse impacts from increased traffic.

Regarding public transport assessment:

4. My unaddressed concerns around viability of public transport services in the new development, as stated in my PC31 evidence[1], are as follows:

   I consider that single-occupant vehicle travel is necessitated for almost all "day-today" trips for employment, education, and shopping. I further consider that most single-occupant vehicle trips generated by the proposed development will continue to the Christchurch CBD (or Rangiora and Kaiapoi town centres) with plentiful parking supply, rather than being used as a "first- and last-km" connection to public transport.

[9] PC31 Evidence of Shane Binder, paragraph 31 (included as Attachment A)

5. At present, there are substantial areas of higher-density residential neighbourhoods lacking public transport service; I consider these areas are more likely to viably support new publicly-funded public transport service[2]. I note much of this existing residential development is also closer to existing Metro services (i.e., will not require substantial additional travel time on top of existing service schedules). I consider providing public transport services to these existing areas to be of higher benefit and potentially lower cost than providing new service to a new development relatively isolated from existing services; this point was also acknowledged by other experts in the public transport JWS[3]. I therefore consider it unlikely that publicly-funded public transport service would be initiated to service the Ōhoka area, with or without the proposed re-zoning.

6. I understand the applicant is proposing funding and operating a new on-demand service to Ōhoka for a ten-year period. As discussed previously, I consider it unlikely that this service will be financially viable based on existing demand coupled with this proposed development. But I also consider this viability is further at risk as I understand the proposed development is unlikely to be fully populated within this ten-year period. I would recommend further consideration of the costs and assumptions underlying this proposed private service; service and funding expectations at the end of private funding; and the amount of housing that will realistically be completed by the time private funding ends.

7. The new public transport service proposed by the applicant will rely on a connection to existing Metro services in Kaiapoi to reach Rangiora and Christchurch. There is ample research both in New Zealand and abroad[4,5,6,7] that adding transfers to a public transport journey decreases rider satisfaction and the overall attractiveness of the public transport mode, in particular on low-frequency routes such as the Waimakariri Metro services. I consider that this perceived disbenefit, coupled with the actual disbenefit of an additional 15 minutes each way, are likely to make any new public transport service to or from the Ōhoka area unattractive when compared with driving a private vehicle. I also note that the joint experts agreed that new fixed service would be "very unlikely to lead to any notable change in private vehicle travel from PC31 across the whole day,"[8] although we did not discuss whether flexible on-demand service would impact private vehicle use.

8. Finally, I do note, however, that Council only supplies the infrastructure to support public transport service and I cannot address any concerns or approval from Environment Canterbury, as the operator of any potential future public transport service (once it is no longer provided by the applicant).

Regarding general transport assessment:

9. I had raised concerns around safe and appropriate non-motorised travel in my PC31 transport evidence[9], which remain unchanged, as follows:

   While the non-motorised network proposed within the Plan Change site appears to be sufficient to enable localised travel, the surrounding roading network used to access "day-to-day" activities has almost no safe separated facilities. Should the proposed development be approved, I consider it appropriate that the developer provide safe non-motorised connections to enable travel to the regional key activity centres, as these connections have no identified Council funding. However, regardless of the state of the surrounding roading network, the distance to reach key activity centres remains far higher

[2] PC31 Summary Statement of Shane Binder, paragraph 41 (included as Attachment B)
[3] PC31 JWS Public Transport, paragraphs 5 and 7 (included as Attachment C)
[4] Chowdhury, Subeh & Ceder, Avishai & Sachdeva. (2014). The effects of planned and unplanned transfers on public transport users' perception of transfer routes. Transportation Planning and Technology. 37.
[5] Grise, Emily & El-Geneidy, Ahmed. (2019). Transferring Matters: Analysis of the Influence of Transfers on Trip Satisfaction. Transportation Research Record: Journal of the Transportation Research Board. 2673.
[6] Susilo, Yusak & Cats, Oded. (2014). Exploring key determinants of travel satisfaction for multi-modal trips by different traveler groups. Transportation Research Part A Policy and Practice. 67. 366-380.
[7] Vaga, K & Shortreed JH. (1981). Impact of Transfers on Transit Ridership. Transportation Association of Canada: Annual Conference Preprints. D3-22.
[8] PC31 JWS Public Transport, paragraph 9 (included as Attachment C)
[9] PC31 Evidence of Shane Binder, paragraph 31 (included as Attachment A)

than the average New Zealand walking or cycling catchment. I do not consider that the proposed development will generate measurable non-motorised mode share and thus will not enable the regional and national policy obligations to reduce private motor vehicle travel.

10. To reiterate my previous comments on proposed cycle improvements in the area[10], no funding has been proposed or secured for any of the links shown in Mr Fuller's evidence[11] and Council is not presently pursuing any of the connections shown in the approved Walking & Cycling Network Plan in this area. I also note that no improvements are proposed for Main Drain Road or Skewbank Lane, which are both unsealed low volume roads proposed for cycling purposes in the applicant's integrated transport assessment (ITA)[12]; I question whether rural unsealed roads are the most appropriate facility for the primary cycle route to Kaiapoi.

11. I also raised concerns in my PC31 evidence[13] around the need to consider the transport network beyond the immediate surrounding roads. This higher-risk environment remains unchanged in the new application, and still concerns me due to:

    …the substantially longer vehicle-based trips that the proposed development will likely require for most daily needs (based on the relative isolation and lack of a non-motorised network, as discussed previously). Multiple independent metrics have identified elevated traffic safety risks on the two primary corridors (Tram Road and Mill Road) used to facilitate the bulk of these vehicular trips. I consider it inappropriate to site the proposed development so that it would substantially increase vehicular trips on these two corridors.

12. I have also previously noted[14] that at present, I consider it highly unlikely that the speed limit reductions proposed by Mr Fuller[15] will be considered by the Council.

Regarding provision of transport network infrastructure:

13. I note that the ITA that was part of the submission includes several traffic counts and modelling of several intersections not previously considered as part of PC31. I understand that some of the underlying data was collected in 2023 but the ITA is unclear as to which traffic data (e.g., volumes, delay, etc.) is new, which data remains unchanged from the PC31 submissions, and what, if any, modifications were undertaken to join the disparate data sets into a cohesive network. As well, the model validation for the new intersections has not been provided in the same detail as that in PC31. Finally, I note that Mr Fuller's PC31 summary of evidence included alternate modelling of the Mill Road / Ōhoka Road and Flaxton Road / Threlkelds Road intersections and concluded that they were predicted to operate satisfactorily[16]. Therefore, I do not have a consistent baseline on which to provide substantive comments on the precision of the modelling in this latest ITA or the conclusions that resulted from them.

14. However, I note that the experts (including Mr Fuller) agreed in the PC31 joint witness statement in relation to transport infrastructure, that the following intersections required some mitigations[17]:

    - Tram Road / Bradleys Road
    - Tram Road / Whites Road
    - Mill Road / Ōhoka Road
    - Flaxton Road / Threlkelds Road

[10] PC31 Evidence of Shane Binder, paragraphs 26-27 (included as Attachment A)
[11] Evidence of Nicholas Fuller, paragraphs 42-47
[12] Evidence of Nicholas Fuller, Attachment 1 (ITA) paragraph 49
[13] PC31 Evidence of Shane Binder, paragraph 40 (included as Attachment A)
[14] PC31 Summary Statement of Shane Binder, paragraph 79 (included as Attachment B)
[15] Evidence of Nicholas Fuller, paragraphs 28, 35
[16] PC31 Summary Statement of Nicholas Fuller, paragraphs 28, 29, and Attachment 4
[17] PC31 JWS Transport Infrastructure Provision, paragraphs 12, 19, 27, 31 (included as Attachment D)

15. I consider that the assumptions that underlie the PC31 joint witness statement remain unchanged, and the conclusions reached are still valid. I note that while there was some disagreement around the nature and magnitude of specific mitigations at these intersections, the underlying motivation was to address road safety risk, not operational issues (e.g., levels of service or delay from traffic modelling). I consider it inappropriate to route a substantial amount of new traffic from the proposed development through intersections that are likely to experience higher road safety risk.

16. Mr Walsh[18] acknowledges that, except for the Tram Road / Bradleys Road roundabout, these improvements have not been proposed in the Long-Term Plan (LTP) or Infrastructure Strategy. But he also expects that "Council would have a strong incentive to include the upgrades" as a new cost, split between ratepayers and the development in the 2027 LTP. Mr Fuller[19] also now expects that Council would need to programme these intersection improvements due to the potential for future side road delay.

17. While Council routinely considers traffic operations across the roading network, I am unaware of intersection-specific level-of-service assessments at the intersections likely to be used by traffic from the new development. Council included the Tram Road / Bradleys Road intersection upgrade in the Long-Term Plan primarily due to traffic safety issues; addressing traffic operation issues like side road delay is a secondary benefit. As such, I do not agree with Mr Walsh's or Mr Fuller's new conclusions that the responsibility for these intersection improvements has shifted from the developer, as concluded previously in PC31.

18. As noted in Mr Fuller's evidence[20], Council evaluated the Tram Road corridor for safety improvements, chiefly at intersections with some consideration for the links between. To be clear, though, the resulting list of intersection improvements[21,22] has committed funding at present for far less than half of the programme of proposed safety improvements. Further, I also note that the corridor study was undertaken without any consideration of the substantial side road traffic generated by this proposed development, and as such I consider that there is a risk the mitigations proposed at the most impacted intersections (Bradleys and Whites Roads) are no longer appropriate.

19. I note that there are improvements along Tram Road which have been identified in the Infrastructure Strategy (i.e., not proposed for funding within the next ten years), based on this corridor study. These improvements could be required sooner if this development is approved and the resulting traffic is added to the Tram Road corridor.

20. I consider it appropriate that the development should be responsible for funding new improvements not presently identified for road safety reasons (e.g., the Whites Road / Tram Road and Threlkelds Road / Flaxton Road roundabouts) in place of relying on a future independent LTP process. Further, I consider the applicant should also lead construction of any previously-identified improvements which are brought forward due to increased traffic generated by the development.

Regarding greenhouse gas (GHG) emissions and vehicle-kilometres travelled (VKT):

21. I have reviewed the relevant submissions in regard to GHG emissions and VKT from Mr Walsh and Mr Farrelly and consider that no new relevant evidence has been provided from what was previously covered in PC31. Thus, I remain concerned, as noted in my PC31 summary statement[23], that:

    … the transport-related GHG emissions from the development, based on present-day evidence, to be far in excess of the existing agricultural GHG emissions from the site, regardless of the assumptions made. I consider that the magnitude of these GHG

[18] Evidence of Tim Walsh, paragraph 69
[19] Evidence of Nicholas Fuller, paragraphs 20 and 25
[20] Evidence of Nicholas Fuller, Attachment 1 (ITA) paragraphs 38-39
[21] Evidence of Nicholas Fuller, Attachment 1 (ITA) paragraph 38
[22] PC31 Summary Statement of Shane Binder, paragraph 59 (included as Attachment B)
[23] PC31 Summary Statement of Shane Binder, paragraph 33 (included as Attachment B)

emissions results directly from the distance between the Plan Change area and major urban destinations, the requirement to travel for services, and opportunities not likely to be available in Ōhoka, and the resulting private motor vehicle generation. I consider it unacceptable to ignore the creation of new GHG emissions (from new construction, energy use, as well as my calculations on transport) and claim minor reductions when evaluating whether the Plan Change will support a reduction in GHG emissions.

22. For reference, I understand the present development at Mandeville Village (which has not changed substantially since 2018) is of a similar scale and composition to that proposed within the submissions for the new commercial area proposed at Ōhoka. I note the evidence of Ms Lauenstein[24] and Mr Walsh[25] both state that the proposed Ōhoka commercial development is meant to service the "day-to-day" needs of area residents. The 2018 Census[26] notes that, even with the existence of the Mandeville Village commercial and its ability to ostensibly serve the "day-to-day" needs of the Mandeville-Ōhoka area, only 4.0% of the residents in that area walked, cycled, or took public transport in their trips. In other words, there is presently a very high reliance on private vehicles in the area in spite of walking and cycling access to an existing commercial development (Mandeville Village) akin to that proposed in this application. I acknowledge that the Census data has its own limitations – it concentrates on trips to work and education – but also note that it was used as a basis for the PC31 integrated transport assessment and is the only area-specific mode split data we have available for the Ōhoka and Mandeville areas at present. I thus continue to consider it unlikely that residents of the proposed development who chose to walk, cycle, or use public transport will have a substantive impact on "day-to-day" GHG emissions and VKT resulting from the development being constructed at Ōhoka as proposed in the submissions.

23. I understand that the development, as part of their GHG emissions and VKT mitigation efforts, is proposing[27] tree planting throughout the development, prohibition of LPG other than for barbeques, a requirement for solar generation in residential units, and a requirement that dwellings are EV charging ready.

24. I note the present farming site appears to have limited LPG, dwellings requiring power (solar or otherwise), and trip generation by EV or ICE-powered vehicles. As stated previously[28], I consider it likely that the proposed land use would create a substantial increase in both GHG emissions and VKT due to the new development. As such I continue to consider it necessary to consider the magnitude of GHG emissions created by the development before crediting any reductions to these new emissions.

Conclusion

25. I had serious concerns around the effects on road safety and emissions and over-dependence on private motor vehicle use necessitated by the location of such substantial development in Ōhoka, in PC31, and I consider that these concerns remain substantively unmitigated. To reiterate from my PC31 evidence:

    At a high level, I consider that the proposed site is not appropriate for this scale of new development due to the paucity of safe non-motorised connections; distance required to travel to "day-to-day" activities (e.g., employment, retail, education, and health); impractical public transport service; and high risk on roads connecting the proposed site with key centres.

    This development is sufficiently far from "day-to-day" destinations that I consider almost all trips to and from the development will be by private motor vehicles. The high dependence on private motor vehicles will likely result in an increase in vehicle-kilometres travelled and potentially greenhouse gas emissions. This distance also means that even

[24] Evidence of Nicole Lauenstein, paragraphs 16, 84, and 114
[25] Evidence of Tim Walsh, paragraphs 97 and 321
[26] Referenced via the website https://commuter.waka.app/
[27] Evidence of Paul Farrelly, paragraph 114
[28] PC31 Summary Statement of Shane Binder, paragraphs 21-34 (included as Attachment B)

should safe non-motorised connections or new public transport service be extended to the proposed development, I do not consider it likely that they can be made attractive or competitive with private motor vehicles as the primary mode to and from the site.

In summary, I do not support a development of this scale in this location due to irreconcilable issues with over-reliance on and effects from increased private motor vehicle use.

26. Overall, I do not support Submissions 160 and 237 from a transport impacts perspective. Contrary to Mr Fuller's conclusion,[29] I do not consider that the transport effects of the proposed rezoning are acceptable as I consider it inappropriate to route the development's new traffic through intersections that are likely to experience higher road safety risk, have not been budgeted for within Council's long-term plans, and are not proposed for any improvements in the foreseeable future. I dispute Mr Farrelly's assessment[30] that "conversion of the proposed land from rural to residential development...will lead to a reduction in emissions" based on my understanding of GHG emissions calculations. I also disagree with Mr Milner's conclusion[31] that the proposed development will be "well-serviced by existing or planned public transport" and do not believe it "will achieve good accessibility for all people…by way [of] public transport" in accordance with the NPS-UD.

27. Rather, I consider that it will be poorly connected for walking and cycling and instead rely very heavily on private vehicles (despite the proposed low-frequency public transport service). Given its relative remoteness from Kaiapoi, Rangiora, and Christchurch, walking, cycling and public transport will not be attractive modes, and thus the proposed development will likely contribute significantly to VKT and GHG emissions in excess of what could be anticipated from additional residential growth collocated with Rangiora, Kaiapoi, or Woodend.

[29] Evidence of Nicholas Fuller, paragraph 49
[30] Evidence of Paul Farrelly, paragraph 112
[31] Evidence of Simon Milner, paragraph 41

Attachment A – PC31 s42A Report, Appendix 7, Transport Evidence

Before an Independent Hearings Panel at Waimakariri District Council

under:	the Resource Management Act 1991
in the matter of:	Proposed Private Plan Change Request 31 (PPCR31) to the Waimakariri District Plan

Evidence in Chief – Shane Binder, Senior Transportation Engineer
Waimakariri District Council
On behalf of Waimakariri District Council
Evidence on Transport and the Roading Network Relating to Private Plan Change PC31 – Rolleston Industrial Developments Ltd

Dated: 22 June 2023

INTRODUCTION

1. My name is Shane Isaac Binder, and I am the Senior Transportation Engineer for Waimakariri District Council, a position I have held since February 2021. In this role I manage the District's transport planning, strategy, and engineering functions, including road safety, traffic modelling, parking, and public transport elements.
2. My qualifications include Bachelors and Master of Science degrees in Civil Engineering. I have licensure as a Professional Engineer (Colorado and Washington State, USA), certification as a Road Safety Professional (Level 1) by the Institute of Transportation Engineers, and Chartered Membership in Engineering New Zealand. I am also a member of the Transportation Group and Safety Practitioners Sub-group of Engineering New Zealand. I have more than 20 years' experience in traffic engineering and road safety.
3. Although this is a Private Plan Change application hearing, I confirm that I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Practice Note dated 1 December 2022. I agree to comply with this Code. 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.
4. I have reviewed:
    a. The Plan Change request
    b. Appendix H – Integrated Transport Assessment accompanying PPCR31
    c. The relevant sections of the Canterbury Regional Policy Statement (2013), operative Waimakariri District Plan (2022), proposed Waimakariri District Plan (2022), and National Policy Statement on Urban Development (2022) as these relate to the transport network
    d. Relevant submissions on PPCR31

ALIGNMENT WITH RELEVANT POLICIES AND OBJECTIVES

5. The operative WDC District Plan (July 2022) came into effect in 2005, during an era when effects on and by the transport network were considered in a very localised manner only. Present practice considers broader network and systemic effects. However, the operative District Plan still provides relevant guidance through Utilities[1] Objectives 11.1.1 and 11.2.1 and accompanying policies, as can be read in Annexure B1. These objectives and policies require that new development should be located to provide safe access for site traffic as

[1] For clarity, note that the operative WDC District Plan defines Utilities as including the construction and operation of roads, cycleways, bridges, pedestrian accessways, street lighting, and other street furniture.

well as the existing network minimise adverse effects caused by use and upgrading of roading links.

6. It is of note that Policy 18.1.1.1(w) in particular requires development proposals to assess the extent to which they will "provide choice in transport mode, particularly modes with low adverse environmental effects." As discussed in depth later, I consider that the transport assessment has included a high-level evaluation of these modes (chiefly, walking, cycling, and using public transport) but has not considered their use to get to most "day-to-day" activities.
7. The Canterbury Regional Policy Statement (October 2020) and proposed Waimakariri District Plan (December 2022), and National Policy Statement on Urban Development (May 2022) all provide more up-to-date objectives and policies to direct transport considerations associated with urban residential development. Relevant excerpts can be found in Annexures B2, B3, and B4.
8. The Canterbury Regional Policy Statement (CRPS) lays out expected outcomes for transport infrastructure in Objective 5.2.3 and Objective 6.2.4. The means for achieving these outcomes are demonstrated in, among others, Policies 5.3.3, 5.3.8, and 6.3.2. These objectives and policies focus on implementing infrastructure and land uses that reduce the adverse effects of transport use and encourage a shift from private motor vehicles to active and public transport modes.
9. The National Policy Statement on Urban Development 2020 (NPS-UD) is the most recent direction from Government to promote more development within urban areas by limiting certain restrictions and promoting "well-functioning urban environments." To further expand on the construct of a "well-functioning urban environment, the Ministry for the Environment released a factsheet[2] that provides more detail on Objective 1 and Policy 1. I have focused this commentary specifically on Policy 1 (c) which also requires "good accessibility" between housing and day-to-day activities such as jobs and community services, "including by way of public or active transport." Consideration should also be given to Policy 1 (e) requiring well-functioning urban environments that support reductions in greenhouse gas emissions.
10. The proposed WDC District Plan enables the excerpted objectives and policies from the CRPS and NPS-UD, by defining Development Areas with new residential and commercial development located within a short distance to employment, retail, education, public

[2] *National Policy Statement on Urban Development 2020 – well-functioning urban environments fact sheet*. July 2020, Ministry for the Environment publication INFO 961.

transport, and community services that enables access by means other than private vehicle (i.e., "by way of public or active transport").

11. I note the proposed Plan Change area is not included in the presently-defined Development Areas in operative or proposed District Plans. I further note that the location of the proposed Plan Change area is a significant distance from employment, retail, education, public transport, and community services and within an area that is not supported by non-vehicular facilities, making access by means other than private vehicle very challenging.
12. I thus consider that the proposed Plan Change, in locating a large residential development in Ohoka, far from established urban centres and "day-to-day" trip destinations, fails to enable the following local and regional policy directions:
    a. integrate development and transport networks to make best use of the existing network
    b. encourage non-motorised and public transport over private motor vehicle transport
    c. reduce greenhouse gas emissions
    d. provide a safe roading environment for all users (due to the higher-speed higher conflict peri-urban environment that has been proposed)
    e. mitigate adverse impacts from the increased traffic (chiefly increases in vehicle-kilometres travelled and crash risk)

INTEGRATED TRANSPORT ASSESSMENT

13. An integrated transport assessment has been prepared by Novo Group for this Plan Change. The Integrated Transport Assessment (ITA) in Appendix H describes the existing transport infrastructure and users, provides an overview of the proposed Plan Change, and assesses the potential transport effects that may result from it.
14. Traffic data collection from 2021 is generally in line with Council's October 2022 weeklong traffic counts. In general, I would consider the intersection delay data collection and validation fit for purpose to evaluate the vehicle-based mobility effects of the proposed Plan Change.
15. The COVID pandemic is too recent to draw definitive conclusions about its long-term effects on traffic volumes. However, shorter-term trends, based on annual traffic counts the Council undertakes at sites on nearby roads, can be considered in the two tables below. The first table shows annual traffic counts from 2019 to 2023 and suggests that the effects of the pandemic and associated lockdowns were limited when considering the five-year trend line.

Site	Location	Date Counted	Avg. Daily Traffic	Peak Hour
241A	Flaxton Road 400 m south of Fernside Road	May 2023	10,165	1,060
		May 2022	9,892	981
		May 2021	10,068	1,030
		June 2020	9,335	923
		May 2019	9,337	962
656B	Tram Road 400m east of Whites Road	April 2023	7,608	706
		May 2022	7,299	689
		May 2021	7,639	722
		June 2020	6,645	625
		May 2019	7,036	675
656A	Tram Road 725m west of SH1 motorway overbridge	May 2023	11,923	1,122
		May 2022	11,624	1,083
		May 2021	11,687	1,110
		June 2020	10,306	1,000
		May 2019	10,930	1,038

Annual Traffic Counts, 2019-2023

16. The second table compares peak hour traffic counts on Tram Road, from the Council's 2021 data collection to the data collection used in the Plan Change transport assessment; I consider these two sets of data to be generally alike and reflective of the natural day-to-day variance in traffic flows.

	Tram Road - East of Bradleys (0656C)			Tram Road – East of Whites (0656B)		
	Eastbound	Westbound	Total	Eastbound	Westbound	Total
Council AM	545	123	668	656	134	790
Applicant AM	552	122	674	640	123	763
Council PM	181	508	689	206	603	809
Applicant PM	216	562	778	198	629	827

Comparison of 2021 Traffic Counts from the Council and the Applicant

17. Trip generation for the transport assessment was carried out based on Waka Kotahi Research Report 453[3], and distribution of the generated trips was based on travel data from the 2018 Census (as summarised on the Commuter Waka website[4]). I consider this use of historical travel behaviour and its specific application to the proposed development to be common industry practice and appropriate for this analysis
18. The transport assessment includes evaluations of intersection and link operations on the surrounding roads (chiefly, Bradleys, Whites, Tram, and Mill Roads). I have the following comments on these evaluations:

[3] Douglass, M and S Abley (2011) *Trips and parking related to land use*. NZ Transport Agency research report 453. 156pp.
[4] Jono Cooper/Stats NZ website, https://commuter.waka.app/, accessed 31 May 2023

a. Given the magnitude of the projected increase in traffic on the two primary roads linking the proposed development with the metro area – a 40% increase on Tram Road and a 95% increase on Mill Road – I consider it necessary to evaluate operational impacts at constrained downstream intersections, as well as funding for required improvements. Chiefly, these would include the following locations:
    i. Mill Road / Ohoka Road intersection (where Mill Road has a give-way control)
    ii. Tram Road / SH1 motorway interchange (which has historical congestion issues and geometric constraints due to the existing overpass width).
b. The Council studied Tram Road in 2020 to evaluate operational and traffic safety issues and mitigations along the entire corridor. A programme of improvements was developed out of this study, including within the portion of the corridor between the proposed development and the SH1 motorway. A new roundabout has been programmed for design and construction by the Council in the next several years at the Tram Road / Bradleys Road / McHughs Road intersection. As the proposed development is expected to substantially increase the traffic at this intersection, I consider it appropriate that the developer contribute towards the roundabout project costs, should the proposal be approved. Financial contributions have not yet been defined by the Council.
c. The intersection of Tram Road / Whites Road was considered for only minor widening as part of the 2020 corridor study, due to the existing low volumes. The proposed development will add a considerable amount of traffic to the southbound left turn (from Whites Road) in the AM peak period and westbound right turn (from Tram Road) in the PM peak period. This substantial increase in traffic from the proposed development is forecast to have adverse effects on traffic operations for existing traffic on the north and south approaches of the intersection. The modelling in the transport assessment indicates that the overall delay on the north approach changes only nominally (AM peak period) or improves (PM peak period) with added traffic. I have reviewed the inputs and outputs at a high level and discussed the model with Council's traffic consultant (WSP) but have not viewed the full model so cannot make a full analysis of the intersection evaluation. I have not been able to confirm the validity of this modelling and have outstanding questions

about this intersection specifically[5] and the conclusions drawn from the model. Regardless, I consider it appropriate that the intersection be upgraded to mitigate for likely effects.

d. The link capacities in Point 91 (Table 24) include a comparison against the Austroads *Guide to Road Design Part 3* to define a "required carriageway" width. I note that, were Tram Road to be constructed as a new roadway in 2023, the carriageway requirements of District Plan Rule 30.1.1.9 / Table 30.1 would apply over any general guidance offered in an Austroads publication. However, as Tram Road is an existing road that is operating in a satisfactory manner without any operational impacts from the existing cross-section, I do not consider that the full "required carriageway" would be prioritised without the Plan Change (as noted in the transport assessment).

e. The Council upgraded Tram Road to full width as far west as Jacksons Road in 2009. No funding has been identified by the Council at present for any further roadway widening to the west of Jacksons Road. Given the magnitude of new traffic generated by the proposed development, I consider it appropriate that the developer contribute towards the cost of widening Tram Road between Jacksons and Bradleys Roads.

19. It is thus considered that the existing roading links have sufficient spare capacity to accommodate additional motor vehicle traffic generated by the proposed development. However, several intersections and road links will likely experience sizable impacts to their traffic operations from the traffic generated by the proposed Plan Change:

    a. Tram Road / Bradleys Road / McHughs Road
    b. Tram Road / Whites Road
    c. Tram Road carriageway between Jacksons Road and Bradleys Road

    As such, I consider financial contributions towards improvements of these intersections and links would be appropriate if the plan change were approved. I also consider that two downstream intersections with existing constraints will see considerable increases in traffic from the proposed development and need to be evaluated for effects and potential mitigation:

    d. Mill Road / Ohoka Road intersection

[5] The intersection appears to be modelled with the north approach having a thru/right lane and a "short" left lane, which could be appropriate under low traffic volumes. However, the modelling software may not account for thru/right turning queues blocking left turning traffic from entering the "short" lane, thus minimising the effects of the increased traffic volumes on the north approach of Whites Road.

e. Tram Road / SH1 motorway interchange

VEHICLE-KILOMETRES TRAVELLED AND EMISSIONS REDUCTION

20. I note that the application only briefly alludes to the effects of greenhouse gases (GHG) emissions in a qualitative manner only. Further, the transport assessment does not include any discussion of vehicle-kilometres travelled (VKT). While GHG emissions are broadly targeted by the multi-agency Emissions Reduction Plan (ERP)[6] to limit global warming, VKT is a specific measure for the transport sector, as noted in Chapter 10 of the ERP. The ERP has called out a 41% reduction in transport-related emissions and a 20% reduction in nationwide VKT (relative to 2019 measurements). The reduction of private vehicle-kilometres travelled plays a critical in transport-related emissions but also relates directly to safety, congestion, and accessibility effects. Private light vehicle usage, regardless of engine type (e.g., internal combustion or battery/hybrid electric), contribute to network congestion and crash risk. Finally, I am aware that it is more expensive to own and operate a private motor vehicle than to use other modes, and a reduction in vehicle-kilometres travelled by this mode would also reduce economic barriers to accessing the transport network.
21. The applicant refers to a trend towards electric vehicle ownership as potential mitigation for the increase in emissions due to the distance from Christchurch and other key destinations (p. 31 of the plan change request s.32 evaluation). I note that as of May 2023, electric vehicles make up 1.7% of the fleet, which has increased from 0.15% over the past five years[7]. I do not consider the trend of uptake of electric vehicles to be at a rate that they could be considered an effective mitigation for transport emissions within the foreseeable future. I further note that any potential uptake of electric vehicles will not impact vehicle-kilometres travelled and the resulting impacts on safety, health, accessibility, and congestion.
22. The Emissions Reduction Plan commits local councils to reduce vehicle-kilometres travelled (VKT) by light vehicles by 2035. A sub-regional VKT reduction target for the Waimakariri District is still being finalised and is not expected to be released until later in 2023; however, it is expected to be near 24%. The location of future development within the District is likely to have a direct correlation on VKT in terms both of distance travelled and attractiveness of modes other than private vehicle, as noted above in point 17. For context I note that the

[6] Ministry for the Environment (2022) *Te hau mārohi ki anamata, Towards a productive, sustainable and inclusive economy*. Publication ME 1639.
[7] Ministry of Transport fleet statistics website, https://www.transport.govt.nz/statistics-and-insights/fleet-statistics/sheet/monthly-mv-fleet, accessed 12 June 2023

identified Development Areas within the proposed District Plan have deliberately been collocated with Rangiora and Kaiapoi and are, at the furthest, about 3.0 km as the crow flies from established key activity centres (which include existing retail, employment, health, and education destinations). The furthest point of the proposed development is almost 4.0 km from the nearest retail (the Mandeville neighbourhood centre) and 8.0 km or more from the nearest key activity centre. This considerable distance would suggest the proposed site is not well-located to existing urban areas and thus, travel distances to key facilities are likely to be higher than those from identified Development Areas (which therefore increases VKT and likely GHG emissions).

23. I consider it highly likely that the proposed development will lead to an increase in VKT, given the distance between it and most "day-to-day" destinations. Given the reliance chiefly on private motor vehicles to cover this distance, and the overall composition of the New Zealand vehicle fleet, I consider it possible that GHG emissions will also increase with the proposed development. However, the transport assessment does not provide sufficient detail to quantify the baseline or proposed GHG emissions, increased VKT, or the effects on Council's obligation to reduce VKT. These effects need to be assessed in more detail in light of the requirements the Council will face shortly to reduce this travel.

NON-MOTORISED TRANSPORT EVALUATION

24. I consider that large-scale urban development (such as this proposal) is required to provide a safe and appropriate roading network that accommodates all users (not just single-occupant vehicle motorists) and encourages modes other than single-occupant vehicular travel for "day-to-day" activities. This is supported by the District Plan, Regional Policy Statement, and National Policy Statement elements found in Annexures B1 to B4.
25. I note the transport assessment lacks an evaluation of the existing non-motorised transport network. At present, the only existing non-motorised facility in the close vicinity to the Plan Change site is a shared-use path from Ohoka Village along Mill Road to Jacksons Road. This path is a narrow gritted path with a number of driveway crossings, which while fit for purpose at the time of construction, falls short of current best practices for shared-use paths. This path provides access to the Ohoka Domain and Ohoka School but no other community facilities, retail, jobs, education, or other "day-to-day" destinations. No other non-motorised facilities are accessible from the proposed Plan Change site.
26. In August 2022, the Council approved a Walking and Cycling Network Plan for the District as well as annual funding for the first several years of its implementation. This plan includes future facilities along Tram Road, Whites Road (Mill to Tram), Bradleys Road (Mandeville to

Rangiora via Easterbrook Road) and Mill Road (extending east from the existing terminus at Jacksons Road), as shown in Annexure A1. In late 2022, the Council was granted Transport Choices funding from Government to fund 2.0 km of shared-use path from No. 10 Road / Tram Road to the Mandeville shopping centre and further to the Mandeville Sports Grounds. When finished, this shared-use path will be no closer than 2 km to the Plan Change site, so will not provide direct access to the development.

27. No other Network Plan routes in the area have been prioritised within the current ten-year period, only limited future funding has been identified, and full Network Plan implementation in this area is not expected within the foreseeable future. In short, the Council does not have plans to construct any non-motorised network connections to enable additional off-site travel.
28. Given the near-total lack of non-motorised infrastructure connecting the proposed development with the rest of the transport network, it is considered that capacity of the existing network to accommodate non-motorised traffic is limited solely to the shared-use path linking to Ohoka School. People who walk or cycle must share the road corridor with vehicles to all other destinations as no other off-road facilities connect to the proposed Plan Change site. I do not consider the existing non-motorised network to be safe or appropriate for a new large-scale urban development as proposed.
29. Two small commercial zones are proposed for the site, although these are expected to be of a “modest scale” (Points 31, 121, Plan Change request) and not substantial enough to draw traffic outside the Plan Change site (Point 52, transport assessment). Based on these descriptors, I consider them unlikely to provide for most “day-to-day” needs for employment, retail, or health. The Plan Change further defines a new “Residential 8” zone which could be a retirement village or school. However, I note the Ministry of Education's submission alludes to insufficient consultation and a request to complete a needs assessment to determine if a school site is required. Further, there has been strong recent demand for retirement village construction within the Waimakariri District, coupled with a long-term demographic trend of an increasing elderly population. Considering a school on this site for purposes of trip generation presents a relatively conservative approach to such an analysis. However, I consider that a retirement village is more likely to be located at this site than a school. Thus, the journey-to-school distance will likely require most secondary school students to travel by private vehicle (or potentially bus) to Rangiora or Christchurch. Overall, based on the Applicant’s assessment of the proposal, I understand that it will not create the functions of a key activity centre or fulfil "day-to-day" requirements within a safe

and easily walkable / cyclable distance from the existing neighbouring or proposed residents.

30. As the proposal does not provide sufficient "day-to-day" activities on-site, the nearest key activity centres are in Kaiapoi (10km) and Rangiora (13km). The New Zealand household travel survey has found that on average, New Zealanders will cycle 4.8 km to work and 2.8 km to shop[8], while 90% of walking trips are 2.0km or less[9]. Thus, even if safe non-motorised connections were to be constructed to the regional key activity centres (e.g., Rangiora, Kaiapoi, and Christchurch), it would not mitigate the substantial distance required to access most "day-to-day" activities.
31. In summary, while the non-motorised network proposed within the Plan Change site appears to be sufficient to enable localised travel, the surrounding roading network used to access "day-to-day" activities has almost no safe separated facilities. Should the proposed development be approved, I consider it appropriate that the developer provide safe non-motorised connections to enable travel to the regional key activity centres, as these connections have no identified Council funding. However, regardless of the state of the surrounding roading network, the distance to reach key activity centres remains far higher than the average New Zealand walking or cycling catchment. I do not consider that the proposed development will generate measurable non-motorised mode share and thus will not enable the regional and national policy obligations to reduce private motor vehicle travel.

ROADING SAFETY EVALUATION

32. The transport assessment considered crash history on the roads immediately surrounding the proposed plan change site. While the timeframe for this history was not included, it would appear to be 2016-2020, based on my review of Crash Analysis System (CAS) records. It is noted that updating this history through 2022 includes a Minor Injury crash on Bradleys Road and two additional crashes along Tram Road (one Non-Injury and one Severe Injury crash).
33. However, while the assessed crash history covers only the immediate surroundings, I consider that it is more appropriate to include a wider assessment of the primary roads that will be required to be travelled to reach employment, education, and shopping, given the relative separation from the proposed development and these key destinations. This wider assessment is further justified by Objective 1 in the NPS-UD requiring a "well-functioning"

[8] Ministry of Transport (Sept 2015) *Cycling New Zealand Household Travel Survey 2011-2014*. 20 pp.
[9] Ministry of Transport (2018) *New Zealand Household Travel Survey 2015–2018*

environment that provides for health and safety. Thus, I have included further commentary on the safety of the two primary access roads to the nearest employment, education, and shopping opportunities in Rangiora and Kaiapoi, chiefly Mill Road and Tram Road from the development site to the SH1 motorway.

34. Tram Road is considered one of the highest-risk roads in the District, due in part to the long straight stretches without interruptions, higher driver speeds, and relatively higher traffic volumes. The risk of crashes increases through the peri-urban Mandeville area, with a higher frequency of side accesses and turning traffic. It is noted that CAS records between 2018 and 2022 show seven serious injury and one fatality crashes in the segment of Tram Road between McHughs Road / Bradleys Road and the SH1 motorway, as shown in Annexure A2. This crash rate is the highest for the corridor and for any other comparable rural Arterial or Strategic Road in the District.
35. Crash history is not considered an effective measure of *potential* risk, because crashes are randomised point-specific events where a confluence of events creates an incident at a specific location. I note the following quote from the Austroads *Guide to Road Safety Part 2 Safe Roads*[10]:

> [A] large proportion of more serious crashes occur at locations where there is no existing crash history. As an example, in New Zealand 56% of fatal and serious crashes occur at locations on roads with no other injury crashes recorded in the previous five years. Particularly on lower volume roads, crash locations tend to be more scattered making it harder to identify the location for future potential crashes. This is especially the case when considering fatal and serious crash locations.

36. The recent crash history is thus a low-confidence metric to use when projecting future safety performance, as considered in Points 82 and 83 in the transport assessment. Whereas the potential risk of infrastructure, driver behaviour, and other crash causal factors could be higher along a much larger portion of the network. Waka Kotahi has developed a potential risk assessment tool, the Infrastructure Risk Rating (IRR)[11], which proactively assesses a road's risk based on geometry and environment (e.g., carriageway width, curvature, roadside hazards, safety infrastructure, etc.) in five 20-percentile bands from High to Low. For example, Medium High-rated roads have injury crash rates more than twice as high as the next 20-percentile band, Medium.
37. As shown in Annexure A3, the two primary roads that new residents from the proposed development will use to reach employment, education, and shopping, have IRR ratings between Low Medium and Medium High. Mill Road has one segment of Low Medium

[10] Beer et al. (2021) *Guide to Road Safety Part 6: Safe Roads*. Austroads Report AGRS02-21. 242 pp
[11] Waka Kotahi (July 2022) *Infrastructure Risk Rating Manual: Road to Zero Edition 2022.* 24 pp

(between Whites and Jacksons Roads), but the rest of the road is rated Medium High. Tram Road is primarily rated Medium with one segment of Medium High (between Bradleys and Whites Roads). These ratings are specific to the quantitative characteristics of each roadway segment but follow the generally higher risk of a peri-urban roading environment, as previously noted.

38. In 2022, Waka Kotahi engaged the specialist transportation consultancy Abley to prepare a predictive model and risk assessment for rural crossroads across New Zealand, as rural crossroads crashes are often at high speed and disproportionately result in fatalities and serious injuries. The as-yet unpublished guidance note (*Application of the Rural Crossroads Analysis*, dated 23 September 2022 from Abley) notes that 1,719 rural priority-controlled intersections were surveyed with the predictive crash model and prioritised for treatment in five 20-percentile bands from High to Low.
39. Waimakariri District, by nature of being on the flat Canterbury plains with a historical gridded rural roadway network, was overrepresented on the prioritised risk (as is also evident in the rate of rural crossroads crashes in Waimakariri being well above the national average). Five of the Tram Road crossroad intersections from McHughs Road / Bradleys Road to the motorway rated as High (i.e., in the highest 20%) while one (Island Road / Griegs Road) rated Medium High (i.e., in the second highest 20%). The Council has prepared a programme of works to upgrade intersections along Tram Road and mitigate the crossroads risk, but at present, this programme has not been fully funded by Waka Kotahi and will likely take several decades to complete.
40. I consider the crash history evaluation used in the transport assessment (i.e., in the immediate vicinity of the Plan Change site) to be inappropriate as crash history does not reflect crash risk. The narrow site-based evaluation also does not cover the substantially longer vehicle-based trips that the proposed development will likely require for most daily needs (based on the relative isolation and lack of a non-motorised network, as discussed previously). Multiple independent metrics have identified elevated traffic safety risks on the two primary corridors (Tram Road and Mill Road) used to facilitate the bulk of these vehicular trips. I consider it inappropriate to site the proposed development so that it would substantially increase vehicular trips on these two corridors.

PASSENGER TRANSPORT EVALUATION

41. As noted in the transport assessment, Environment Canterbury (ECan) does not provide public transport services in the Ohoka area, and no service extensions are presently under

consideration. In the past, very limited service was provided along Tram Rd to Oxford, but this did not serve Ohoka and ultimately was discontinued.

42. Ohoka is located sufficiently far from existing public transport service that any provision of service to the proposed Plan Change site would have to be a dedicated service; deviation of existing service or extension to another terminus beyond Ohoka are not feasible options. I note the ECan submission has identified that the proposed Plan Change site is outside the existing urban public transport rating district, with no planned resources targeted for this area in the future. I further note that the household densities proposed for the site are unlikely to be high enough to fully fund operational expenses of new public transport service.
43. The transport assessment also includes a basic description of existing park and ride facilities in Kaiapoi, which have ECan's Metro bus service and are located 9km or more from the closest points in the proposed development.
44. I note the Council is also considering other future sites for park and ride facilities that would be located off existing Metro bus service but could help facilitate ride-sharing (and school bus service). This could include sites in the Tram Road corridor, but no locations or programme has been finalised. However, at present, no carpooling programme and limited facilities exist within the District and uptake for this mode is considered to be negligible.
45. In assessing the suitability of the existing facilities and network, I rely on the following publications:
    a. Waka Kotahi *Public transport design guidance*[12]
    b. Greater Wellington technical note 2 *When is Park and Ride the appropriate intervention?* [13]
    c. Waka Kotahi / Land Transport New Zealand research report 328 *Park and ride: Characteristics and demand forecasting*[14]
46. The *Public transport design guidance* suggests appropriate walking catchments for low-frequency public transport service (headways of greater than 15 minutes, which describes all existing Metro service in Waimakariri) is 400m. High-frequency service has a greater attraction, with up to 800m walking catchments. Cycling catchments may be up to 2.5 km.

[12] Waka Kotahi website, https://www.nzta.govt.nz/walking-cycling-and-public-transport/public-transport/public-transport-design-guidance/, accessed 25 January 2023
[13] *Technical Note 2: When is Park and Ride the most appropriate intervention?*, June 2018, MRCagney
[14] Vincent, Mike (2007) *Park and ride: Characteristics and demand forecasting*. Land Transport NZ Research Report 328. 131 pp.

47. A technical note from the Greater Wellington Regional Council, suggested anecdotal walking distances to train stations of up to 1.2km and to busway stations of up to 2.7km, ultimately suggesting a walking and cycling catchment of 3km radius around a station. The technical note pointed out that the 2.7km walking distance in Albany (Auckland) was likely an outlier and I would further point out that the peak period 15-minute headway public transport service within the Waimakariri District is far less of an attraction than the services noted in this technical note. Regardless of which value is chosen for an appropriate walking or cycling catchment, the 9km distance between the proposed Plan Change site and the nearest park and ride facility would suggest that walking and cycling is not a reasonable mode to connect to public transport.
48. Waka Kotahi research report 328 found that park and ride facility use correlated best with a "shortage of reasonably priced central area parking." It is considered that the Christchurch CBD, which is the largest destination noted in the ITA traffic distribution in Appendix 7, likely has an oversupply of carparks with occupancy below optimal levels. Christchurch City Council noted in 2020 that off-street parking supply doubled 2016-2020 and that occupancy was at 64%, below the industry target of 85%.
49. Thus, given the relative distance from the proposed development site to existing Metro bus service and Council park and ride facilities, I consider that single-occupant vehicle travel is necessitated for almost all "day-today" trips for employment, education, and shopping. I further consider that most single-occupant vehicle trips generated by the proposed development will continue to the Christchurch CBD (or Rangiora and Kaiapoi town centres) with plentiful parking supply, rather than being used as a "first- and last-km" connection to public transport.

PROPOSED DEVELOPMENT

50. From a transport perspective, the transport network proposed on-site within the ODP (reference figure 12 in the transport assessment) would appear to be generally appropriate to enable internal circulation.
51. I consider that the ODP will need more detail around a network for cycling (noting that only vehicular and walking networks have been called out). As well, the indicative roading connection to the south edge of the ODP area, terminating against 154 Bradleys Road, will need more consideration about how it terminates or interacts with the adjacent properties (which are not included in the ODP) and potentially connects with another road.
52. Points 38 and 67 in the transport assessment provide some indication of the proposed roading network within the development. A "bespoke" set of road cross-sections are

proposed to reflect an unspecified "nature" of the proposed Plan Change site. In reviewing the Plan Change documents, I have not seen any evidence of environment or development that is unique relative to the rest of the District or otherwise justifying "bespoke" roading standards. The roading cross-sections and tree-planting spacing[15] in use on the District's roading network provide a consistent road environment based on widely accepted engineering standards. As such, I would not support a deviation from these standards without substantive justification and further analysis of the impacts of a different standard of roadway.

53. It is of note that the density and section size in the proposed land use across Residential 3[16] and Residential 4a is likely to result in a "peri-urban" road environment, which occupies a space between a rural high-speed environment and an urban low-speed environment. The site's roads will have a higher frequency of residential driveways (when compared with the surrounding rural land), but lower-scale development set back from the road. This style of development combined with a lack of on-road parking, street trees and furniture, results in limited "side friction" (when compared with an urban environment) on the road. "Side friction" is an important factor noted in the Highway Capacity Manual for reducing speeds on urban roads and I would consider that the lack of "side friction" will likely lead to increased speeds on the "peri-urban" roads proposed for the development.
54. Speed limits across the District are in the process of being considered for consistency with the environment around each road. Urban residential environments across the district, with sections of 300-500 m^2 in size, kerbing and footpaths, are typically posted with a 50 km/hr speed limit. National speed setting guidance suggests a 30 or 40 km/hr speed limit is more appropriate in these areas. Given the section sizes in the proposed development and lack of "side friction" noted above, the roads in the development will likely be posted with a 60 or 80 km/hr speed limit. I also note this "peri-urban" road environment is also likely to be created along the site frontages where additional direct property access is proposed. The bulk of this frontage presently has a 100 km/hr legal speed limit.
55. The speed environment will not support a lower speed, as discussed previously, and the higher posted speed will correlate with increased crash severity, increased stopping distance, and reduced driver reaction times. I consider that these peri-urban road

[15] I note that street trees and accompanying berms provide transport-related benefits through traffic calming / speed management effects on urban streets as well as drainage, emissions-capture, and heat island mitigation.
[16] The proposed Outline Development Plan – Ohoka calls for a "minimum net density of 12 households per hectare, which averages 830m^2 per section

environments on site and along the site frontages are likely to lead to higher vehicular speeds and more frequent conflicts than are safe in a well-functioning urban environment.

56. Peri-urban roads in other parts of the District, including Hallfield, Oxford, and Sefton, have seen long-term maintenance issues due to the use of swales and berms in place of kerb and channel used in urban development. The Council has been required to retrofit quadrant kerbing, footpaths, and street lighting at additional cost to ratepayers, to address these maintenance and operational issues following ingoing maintenance concerns and service requests from the adjacent residents. I have not noted any elements of the proposed "bespoke" design that would appear to prevent these issues from occurring in the proposed development.
57. Points 39 and 68 in the transport assessment note that intersection spacing on site may not meet the Council's separation requirements. Minimum intersection spacing achieves separation to minimise overlap between the conflicting movements at adjacent intersections; this separation becomes more critical when road speeds are higher than in a typical urban setting. The transport assessment uses Christchurch District Plan rules to justify this non-compliance; I note these standards are not in-force in Waimakariri District. Further, they are not appropriate to apply within a lower-density higher-speed peri-urban environment.
58. In the event that new Medium Density Residential Standards (MDRS) were to be applied on site, each originally zoned section could hypothetically be split into three dwellings, resulting in a substantial increase to the residential density on site. I note that wholesale intensification of the site would likely result in a level of development and resulting side friction that could address speed concerns raised in point 43. However, intensification to that level would also lead to substantial increases in generated traffic and parking demand; this would result in operational and safety impacts on the "bespoke" site and District roading network (as well as VKT increases) far beyond anything evaluated in the present transport assessment.
59. At a high level, the internal transport network proposed in the ODP appears to meet transport needs for the proposed development. However, I do not consider that appropriate justification has been provided for the internal network to be built to standards other than those applied to the rest of the District roading network. And further, I have serious concerns around the safety and user behaviour (e.g., speeds and conflict avoidance) outcomes of the proposed roading network given the proposed peri-urban land use and household density.

SUBMISSIONS

60. Fifteen submissions have been received which refer to substantive transport matters.
61. Submissions from **Haines**, **D Myall**, and **McKay** raised questions about the accuracy of the modelling used in the transport assessment. I refer back to my commentary comparing the applicant's traffic volumes with the Council's routine data collection on Tram Road in points 15 and 16 and note that I consider the data presented in the transport assessment to reflect the natural variance in daily traffic flows but still fit for purpose for the assessment.
62. Submitters **Haines**, **Gardner**, **A Brantley**, **Waimakariri District Council, D Myall**, **Bascand**, **McKay**, **R Low**, **Stalker**, **Edge**, and **J Docherty** had concerns about the capacity of the local roading network and its ability to accommodate new traffic generated by the development. As discussed in point 19 above, the rural roads in the vicinity of the proposed development generally have sufficient capacity to accommodate new vehicular traffic with limited impacts. However, I consider that the two adjacent Tram Road intersections (Bradleys Road and Whites Road) intersections and Tram Road carriageway east to Jacksons Road will require upgrades to mitigate localised effects. And further, I recommend evaluation of effects from new vehicular traffic on two downstream intersections (Mill Road / Ohoka Road and Tram Road / SH1 motorway interchange) with existing capacity constraints.
63. Submissions from **Gardner**, **A Brantley**, **Foy**, **Waimakariri District Council, D Myall**, **Bascand**, and **R Low** raise concerns around insufficient and unsafe walking/cycling facilities in the area. As noted above in point 29, I agree in general with these concerns and question whether walking and cycling can be safety accommodated from the proposed development to external destinations as would be considered appropriate for a well-functioning urban environment.
64. A submission from **Fire and Emergency New Zealand (FENZ)** supports the Plan Change with the caveat that road cross-sections meet District Plan width requirements. As noted above in point 51, I agree in general with this change, and in principle with FENZ's justification for the relief sought.
65. A submission from **Waka Kotahi** questions whether travel outside the development will be undertaken by modes other than private vehicle, or whether the development can reduce vehicular emissions and vehicle-kilometres travelled. In general, I agree with the concerns raised in this submission.
66. Submissions from **P & M Driver** and the **Waimakariri District Council** brought up the distance to existing public transport services as a barrier to their uptake as a mode to travel to/from the proposed location. As discussed above in point 48, I agree with these concerns.

CONCLUSIONS

67. I conclude that the methodology and motor vehicle-related conclusions of the Plan Change's transport assessment are generally suitable. Based on the traffic-related effects established in this assessment, I believe the developer should be responsible for portions of the cost to improve several intersections and road links.
68. I consider that the proposed on-site transport network in the proposed development is likely appropriate for traffic operations. However, the higher-speed higher-conflict peri-urban environment will result in a poor safety outcome for road network users on site and on the surrounding frontage roads. Additionally, this network should be constructed to Council standards for safety and consistency reasons.
69. However, at a high level, I consider that the proposed site is not appropriate for this scale of new development due to the paucity of safe non-motorised connections; distance required to travel to "day-to-day" activities (e.g., employment, retail, education, and health); impractical public transport service; and high risk on roads connecting the proposed site with key centres.
70. This development is sufficiently far from "day-to-day" destinations that I consider almost all trips to and from the development will be by private motor vehicles. The high dependence on private motor vehicles will likely result in an increase in vehicle-kilometres travelled and potentially greenhouse gas emissions. This distance also means that even should safe non-motorised connections or new public transport service be extended to the proposed development, I do not consider it likely that they can be made attractive or competitive with private motor vehicles as the primary mode to and from the site.
71. In summary, I do not support a development of this scale in this location due to irreconcilable issues with over-reliance on and effects from increased private motor vehicle use. Further, while the on-site transport provisions appear to be appropriate at a network level, I have serious concerns about the proposed standard for individual roads resulting in poor safety and maintenance outcomes.

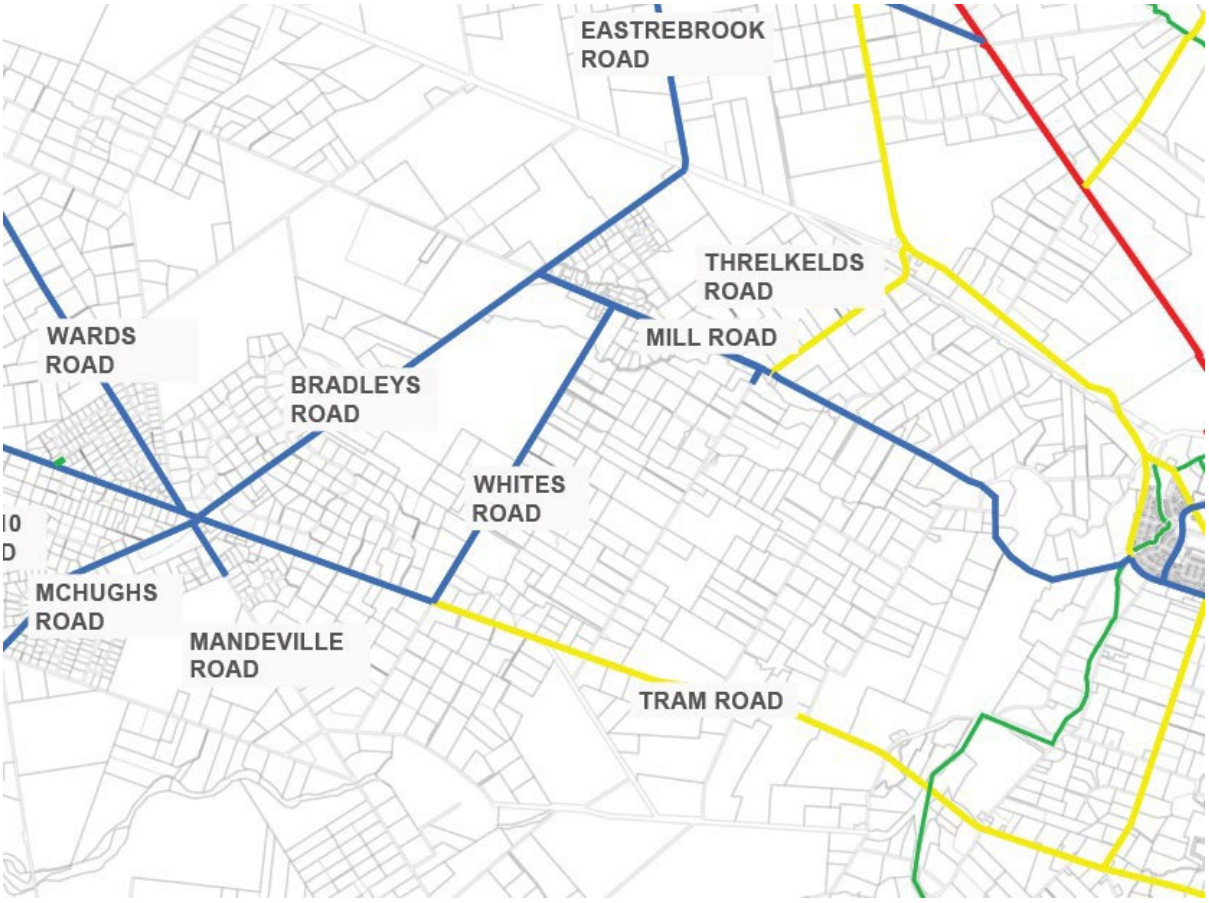
Name: Shane Isaac Binder

Signature: 

Date: 22 June 2023

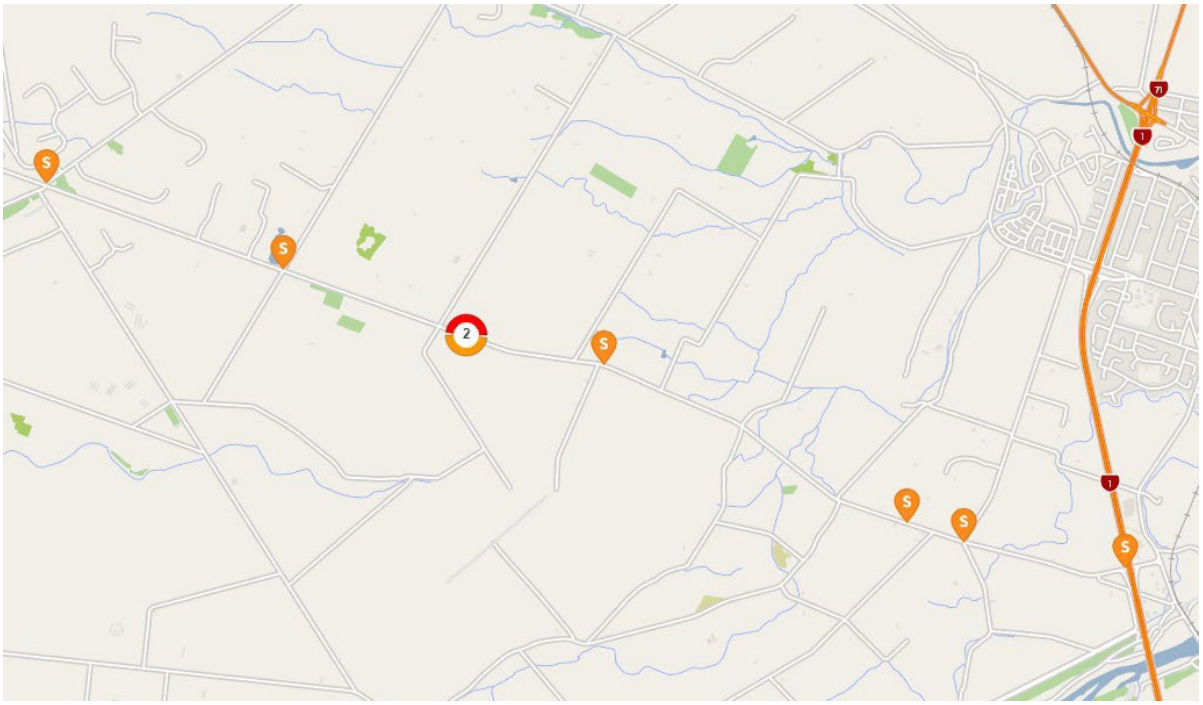
ANNEXURE A1 – WAIMAKARIRI DISTRICT COUNCIL WALKING & CYCLING NETWORK PLAN

(Inset of applicable area in vicinity of proposed development)



ANNEXURE A2 – CRASH ANALYSIS SYSTEM (CAS) OUTPUT

(January 2018 – December 2022, Tram Road between Bradleys / McHughs Roads and SH1 motorway)



ANNEXURE A3 – WAKA KOTAHI MEGAMAPS, INFRASTRUCTURE RISK RATING

(Inset of applicable area in vicinity of proposed development)

Speed Management Framework

Infrastructure Risk Rating

IRR Band

IRR Band

- High
- Medium High
- Medium
- Low Medium
- Low

ANNEXURE B1 – RELEVANT EXCERPTS FROM OPERATIVE WAIMAKARIRI DISTRICT PLAN

Objective 11.1.1

Utilities [*e.g., transport links*] that maintain or enhance the community's social, economic and cultural wellbeing, and its health and safety.

Policy 11.1.1.1

A utility [*e.g., a transport link*] should:

a. contribute to a safe environment;
b. maintain or enhance public health;
e. where it is necessary to service new development, be paid for by the developer, or as a condition of consent for the development; and

Policy 11.1.1.5

New developments and activities in relation to their traffic generation characteristics should:

a. locate on or establish primary access to an appropriate level of road within the road hierarchy;
b. not have vehicular access to an inappropriate level of road in the hierarchy; and
c. provide cycleways along arterial, strategic and collector roads where:
    a. necessary to provide an identified transport or recreation function; and
    b. alternative opportunities do not exist within the road hierarchy.

Policy 11.1.1.6

Every site should have access that provides safe entry and exit for vehicles to and from the site to a road without compromising the safety or efficiency of the road or road network. Where a site has two or more road frontages access should be from the lowest road classification within the road hierarchy.

Objective 11.2.1

Adverse effects on the environment caused by the provision, use, maintenance and upgrading of utilities [*e.g., transport links*] are avoided, remedied or mitigated.

Policy 11.2.1.1

Avoid, remedy or mitigate adverse environmental effects created by the provision, use, maintenance and upgrading of utilities [*e.g., transport links*] by:

c. integration with, and co-siting of, existing utilities where they are accessible and are, or can be, expanded to manage any additional loading and where such loading is technically and operationally feasible;
d. meeting accepted design standards;

Policy 18.1.1.1

In particular, [growth and development] proposals should not be inconsistent with other objectives and policies in the District Plan, and show how and the extent to which they will:

k. provide infrastructure for services and roading in a manner consistent with this District Plan;
v. affect the demand for transport;
w. provide choice in transport mode, particularly modes with low adverse environmental effects;

ANNEXURE B2 – RELEVANT EXCERPTS FROM PROPOSED WAIMAKARIRI DISTRICT PLAN

Objective TRAN-O1

An integrated transport system, including those parts of the transport system that form part of critical infrastructure, strategic infrastructure, regionally significant infrastructure, and strategic transport networks, that **reduces dependency on private motor vehicles, including through public transport and active transport**.

Policy TRAN-P2

Seek more environmentally sustainable outcomes associated with transport, including by promoting ... the use of public transport, active transport and sustainable forms of transport.

Policy TRAN-P4

New activities ... provide facilities for safe active transport, including through marked on-road cycle lanes, separated cycle lane, sealed road shoulders with sufficient width to safely accommodate cyclists, off-road formed cycle paths, cycling end-of-journey facilities for staff, shared use path and footpaths.

Policy TRAN-P5

Manage the adverse effects of high traffic generating activities on the transport system according to the extent that they ...are accessible by a range of transport modes and encourage public and active transport use; ... and provide patterns of development that optimise the use of the transport system.

Policy TRAN-P7

Achieve connections between public transport and new developments in major settlements by requiring ... new residential neighbourhoods to be designed to ensure convenient and safe walking distances from proposed residential allotments to public transport and other amenities; ... and roading design that facilitates the provision of an efficient and convenient public transport system into, out of, and around the development.

ANNEXURE B3 – RELEVANT EXCERPTS FROM CANTERBURY REGIONAL POLICY STATEMENT

Objective 5.2.1 Location, Design and Function of Development (Entire Region)

Development is located and designed so that it functions in a way that:

1. achieves consolidated, well designed and sustainable growth in and around existing urban areas as the primary focus for accommodating the region's growth

Objective 6.2.4 Integration of transport infrastructure and land use

Prioritise the planning of transport infrastructure so that it maximises integration with the priority areas and new settlement patterns and facilitates the movement of people and goods and provision of services in Greater Christchurch, while:

1. managing network congestion;
2. **reducing dependency on private motor vehicles;**
3. **reducing emission of contaminants to air and energy use;**
4. **promoting the use of active and public transport modes;**
5. optimising use of existing capacity within the network; and
6. **enhancing transport safety.**

Policy 5.3.3 Management of development (Wider Region)

Robust development maintains or improves well-being, health and safety. This includes:

3. Implementing traffic demand management measures, as appropriate;
4. Integrating the provision for public passenger transport with development, as appropriate;
5. Enabling people to meet their day-to-day needs within the local area;

Policy 5.3.8 Land use and transport integration (Wider Region)

Integrate land use and transport planning in a way … that promotes:

c. the use of transport modes which have low adverse effects;
d. the safe, efficient and effective use of transport infrastructure, and reduces where appropriate the demand for transport;

Policy 6.3.2 Development form and urban design

Business development, residential development (including rural residential development) and the establishment of public space is to give effect to the principles of good urban design below, and those of the NZ Urban Design Protocol 2005, to the extent appropriate to the context:

3. Connectivity – the provision of efficient and safe high quality, barrier free, multimodal connections within a development, to surrounding areas, and to local facilities and services, with emphasis at a local level placed on walking, cycling and public transport as more sustainable forms of [transport]

ANNEXURE B4 – RELEVANT EXCERPTS FROM NATIONAL POLICY STATEMENT ON URBAN DEVELOPMENT

Objective 3

Regional policy statements and district plans enable more people to live in, and more businesses and community services to be located in, areas of an urban environment in which one or more of the following apply:

a. the area is in or near a centre zone or other area with many employment opportunities
b. the area is well-serviced by existing or planned public transport

Objective 8

New Zealand's urban environments:

a. support reductions in greenhouse gas emissions

Policy 1

Planning decisions contribute to well-functioning urban environments, which are urban environments that, as a minimum:

c. have good accessibility for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport; and
e. support reductions in greenhouse gas emissions;

Attachment B – PC31 s42A Report, Summary Statement (Transport)

Before an Independent Hearings Panel at Waimakariri District Council

under:	the Resource Management Act 1991
in the matter of:	Proposed Private Plan Change Request 31 (PPCR31) to the Waimakariri District Plan

Summary Statement – Shane Binder, Senior Transportation Engineer
Waimakariri District Council
On behalf of Waimakariri District Council

Summary Statement on Transport and the Roading Network Relating to Private Plan Change PC31 – Rolleston Industrial Developments Ltd

Dated: 8 August 2023

INTRODUCTION

1. The purpose of this summary statement is to provide to the Commissioners comment on the Applicant's evidence relating to Private Plan Change PC31 – Mill Road, Ōhoka.
2. My full name is Shane Isaac Binder, and I am the Senior Transportation Engineer for the Waimakariri District Council. My qualifications and experience are set out in full in my evidence-in-chief.
3. My summary statement has predominantly been based on assessing the information presented in the Applicant's Evidence to PC31 as follows:
    a. Mr Tim Walsh – Planning
    b. Mr Gareth Falconer – Urban Design
    c. Mr Nicholas Fuller – Transport
    d. Mr Simon Milner – Public Transport
    e. Mr Paul Farrelly – Greenhouse Gas
4. I have also reviewed evidence from the following submitters:
    a. Mr Leonard Fleete – Canterbury Regional Council
    b. Mr Andrew Metherell – Waimakariri District Council

SUMMARY

5. I remain concerned that the proposed Plan Change locates a large residential development far from established transport corridors and urban centres. I consider that the Plan Change is not "well-connected" or even proximate to "transport corridors" as the NPS-UD requires of new urban development and thus fails to meet the NPS-UD standards for development appropriate for unanticipated areas.
6. I have carried out a high-level calculation of vehicle-kilometres travelled and greenhouse gas emissions from a full build-out of the Plan Change, based on details from the applicant's transport assessment and present-day emissions data. I consider the cumulative impacts of travel and energy from the proposed Plan Change to remain well above the existing use.
7. Further, I also note that while equivalent development adjacent to Woodend or Rangiora may be further from Christchurch than Ōhoka, it would be closer to existing key activity centres, "day-to-day" activities, and existing public transport, so I consider development in these areas will likely generate less private vehicle based GHG emissions and VKT.
8. I consider that because the current Ōhoka community is not of a scale or density that would be able to support viable all-day public transport, it is not suitable to locate new higher-density residential development here, isolated from existing public transport and other urban areas with public transport demand.

9. Based on existing funding commitments, I consider it will be several decades before any transport connections can be constructed to the Plan Change site. Regardless of the quality of links between the Plan Change site and the district's urban centres, I remain concerned that the separation distance is great enough to discourage travel by walking or cycling.
10. I consider that Plan Change-generated traffic will necessitate capacity-based improvements at the Tram Road / Bradleys Road and Tram Road / Whites Road intersections, as well as the Tram Road carriageway west of Jacksons Road. I further note that Council has identified over $17M in unfunded safety improvements along Tram Road, and the additional traffic generated by the Plan Change will exacerbate the safety risks on the roading network unless additional funding is identified or provided by the development.
11. I consider that there are significant varied risks to assuming capacity improvements can be undertaken at the SH1 motorway interchange. If Waka Kotahi, who has jurisdiction over the interchange, does not approve any changes, development within the Plan Change area could be limited to 250 sections.
12. I consider that the roading layout changes in the latest iteration of the urban design report have addressed some safety issues with the proposed layout. However, the overall layout proposed in the Plan Change is still a peri-urban roading environment, which I consider will likely lead to higher speeds, higher conflict frequency, and long-term maintenance issues.

ALIGNMENT WITH RELEVANT POLICIES AND OBJECTIVES

13. In my evidence-in-chief, I raised concerns about transport use from the proposed Plan Change, specifically the location of the proposed site and the effects of its separation from the existing transport network on mode choice, road safety, emissions, and congestion. I remain concerned that the actual and potential effects from this separation prevent the proposed development from contributing to a "well-functioning urban environment."
14. While local and regional policies address transport assessments to varying degrees, the National Policy Statement on Urban Development 2020 (NPS-UD) and its associated guidance documents provide better expectations for transport use and response to new development. Clause 3.8(2) sets three specific considerations when evaluating unforeseen development:

> *Every local authority must have particular regard to the development capacity provided by the plan change if that development capacity:*
>
> *a. would contribute to a well-functioning urban environment; and*
> *b. is well-connected along transport corridors; and*
> c. *meets the criteria [that determine what plan changes will be treated as adding significantly to development capacity].*

15. The NPS-UD fact sheet on responsive planning[1] notes that requirements for a "well-functioning urban environment" in Policy 1 include that a proposed "plan change must also show how the development is well-connected along transport corridors to ensure development is not disconnected or isolated [which] will encourage responsive developments in appropriate, accessible locations."

16. From my perspective, the key phrases are "well-connected" and "transport corridors." I consider that "well-connected" requires safe and appropriate facilities for all users. I further consider the lack of non-motorised facilities, existing or with committed future funding, connecting the Plan Change site to the transport network, as a failure to meet this requirement. Mr Nicholson, in his urban design report[2], concurs with my concerns on the lack of a good connection with Tram Road. Mr Walsh[3] agrees with this statement, noting that it also would apply to consideration of unanticipated development in Waikuku Beach or Tuahiwi. I agree with Mr Walsh's conclusion on connectivity and note that I would not likely consider new development in these areas as meeting the intent of Clause 3.8(2).

17. More importantly, the term "transport corridor" appears to have been deliberately chosen as opposed to "road corridor" (which is commonly used in district plans and other policy documents to refer to road reserve). I consider that a "transport corridor" is one that provides safe and appropriate access for all users (including people who walk, cycle, or bus), whereas a "road corridor" could refer to any link within the roading network, including unformed legal roads (i.e., "paper roads"). I do not agree with Mr Fuller's assumption[4] that a road's District Plan hierarchy classification is related to whether it is a "transport corridor."

18. The two primary roads serving the Plan Change area - Tram Road classified in the District Plan as an Arterial Road and Mill Road classified as a Collector Road - only have vehicular facilities (i.e., no walking or cycling facilities) and no public transport service. I would consider both roads as "road corridors" but not as "transport corridors" in the NPS-UD context. As an alternative example, I consider that Lineside Road (SH71) and Rangiora-Woodend Road both qualify as "transport corridors" given that they accommodate most transport users, not just motor vehicles, through shared-use paths and regular public transport service. Thus, I would generally consider sites utilising these roads as meeting the requirement of sub-point (b).

[1] Ministry for the Environment (July 2020) *National Policy Statement on Urban Development 2020 – responsive planning fact sheet*. Publication INFO 957.
[2] Evidence of Hugh Nicholson, paragraph 7.6
[3] Evidence of Tim Walsh, paragraph 154
[4] Evidence of Mr Fuller, paragraph 85

19. The NPS-UD supporting document "*Understanding and implementing responsive planning policies*"[5] provides detail on, and more pertinently, the policy intent behind the NPS-UD. It notes the following regarding unanticipated development:

> *Plan changes for urban development initiated under this policy should ensure the development is (or has clear and realistic plans to be) well connected to jobs and amenities along transport corridors. These corridors would support a range of transport modes, ideally both public and active transport.*

20. I remain concerned that the proposed Plan Change locates a large residential development far from established transport corridors and urban centres. I consider that this distance cannot contribute to a "well-functioning urban environment" from a transport perspective – it would not be "well-connected" or even proximate to "transport corridors" as the NPS-UD expects of new urban development. To be clear, I consider that this Plan Change does not meet the NPS-UD standards for development appropriate for unanticipated areas.

PRESENT-DAY VEHICLE-KILOMETRES TRAVELLED AND EMISSIONS REDUCTION

21. In my evidence in chief, I was concerned about the lack of quantitative analyses of the effects of the proposed development on greenhouse gas (GHG) emissions and vehicle-kilometres travelled (VKT) from the Waimakariri District. The Council has been committed to reducing both GHG emissions and VKT as part of Government's Emissions Reduction Plan. I have reviewed the evidence of Mr Farrelly on transport-based GHG emissions from the development. Mr Farrelly concludes that the proposed development will give effect to the NPS-UD Policy 1 requirement to "support reductions in greenhouse gas emissions" by:
    a. Providing plugs for resident-procured electric vehicles (EVs);
    b. Prompting ECan to provide new public transport to the plan change area;
    c. Planting trees;
    d. Providing an on-site walking & cycling network for residents to choose to use in place of driving;
    e. Providing space for potential commercial and educational facilities; and
    f. Removing the existing dairy farm operation and its associated emissions.
22. Mr Farrelly has calculated[6] approximate present-day annual GHG emissions from farm activity, not including dairy processing or electricity use, of 1,257 tons CO2-e. He notes this is equivalent of 5.0 million vehicle-kilometres travelled or annual electricity usage for 1,324

[5] Ministry for the Environment (September 2020) *Understanding and implementing responsive planning policies*. Publication INFO 976.
[6] Summary of evidence of Paul Farrelly, paragraphs 26-28

Canterbury homes. I understand that the dairying industry is presently engaged in research on both breeding and fertiliser technology to reduce future GHG emissions, but accept this does not impact a present-day baseline. However, I also note that Mr Farrelly does not provide an equivalent present-day quantitative calculation of GHG emissions from transport, noting that future behaviour and travel could change.

23. I disagree with Mr Farrelly's qualitative assessment on several points, although recognise that projections of future economic and consumer behaviour are outside Mr Farrelly's and my expertise as engineers. However, I am aware that sufficient present-day data exists to be able to inform a quantitative assessment of likely GHG emissions and VKT produced by residents of the proposed development in a present-day context for comparison purposes.
24. Based on the numbers provided in the Plan Change transport assessment and Mr Farrelly's evidence, the present-day transport-related GHG emissions and VKT from the Plan Change can be calculated as follows:
    a. 850 dwellings
    b. 8.2 total daily trips/dwelling (reference Appendix H Transport Assessment, p. 18)
    c. While the Transport Assessment, based on Commuter Waka data, assumed 65% of peak hour trips were destined to Christchurch and 18% of people worked from home, overall daily trips for work, education, shopping, dining, and entertainment take on a slightly different profile. I thus consider the following trip breakdown to be a conservative projection of future all-day travel patterns:

Percent Split	Destination	Distance (km)
10%	Christchurch	28
75%	Rangiora/Kaiapoi	10
15%	Work/Stay at home	0

    d. 365 days / year (made up of a higher number of shorter weekday trips and a smaller number of longer weekend trips, as noted by Mr Farrelly)

2. This calculation results in 26 million vehicle-kilometres travelled and 6,500 tons CO2-e. I note there is a double impact of both GHG emissions and VKT, with its separate set of effects as I outlined in my evidence-in-chief.

25. The above figure does not include travel generated by the businesses and school, electricity use from 850 homes (539 tons CO2-e, using the same calculations provided in Mr Farrelly's evidence), electricity use from the businesses and school, emissions from construction, or the landscaping and maintenance of homes and infrastructure across the 156-hectare site. I thus consider my GHG emissions above to be very conservative.

26. Further, while converting the land from agricultural to residential use will remove GHG emissions at this site, I understand the market for dairy products remains unaffected by the Plan Change and new farmland could be added elsewhere in New Zealand or abroad to meet that demand (which means the reduction in GHG emissions calculated by Mr Farrelly would not be realised).
27. My colleague, WDC principal planner Mark Buckley, has arrived at a present-day GHG emissions calculation through a different approach and assumptions. While I consider his approach to be more conservative than my approach, both of our calculations are appropriate means to estimate GHG emissions and VKT generation. Regardless of which calculation approach is selected, or even the underlying assumptions on trips generated by the development (their number, length, and destination) or uptake of future trends in travel modes or working behaviour, I consider the cumulative impacts of travel and energy from the proposed Plan Change, based on present-day figures, to remain far in excess of the existing land use. Further, I also note that while equivalent development adjacent to Woodend or Rangiora may be further from Christchurch than Ōhoka, it would be closer to existing key activity centres, "day-to-day" activities, and existing public transport, so I consider development in these areas will likely generate less private vehicle VKT. I also note that many submitters from the Ōhoka area noted to the hearing panel that they already primarily utilise services and retail in Rangiora.

FUTURE TRENDS IN TRAVEL BEHAVIOUR AND IMPACT ON VKT AND GHG EMISSIONS

28. I acknowledge that work-from-home is a growing and substantive trend at many workplaces across New Zealand, but I cannot quantify this beyond personal observation (as post-pandemic research is relatively limited). The most recent edition of the University of Sydney's semi-annual Transport Opinion Survey[7] noted that work-from-home in Australia appears to be stabilising, with 27% of respondents reporting working days from home. However, it is important to note that on average workers are only spending 2.14 days working from home per fortnight, and the vast majority of them still travel on work-from-home days (88%), typically by private motor vehicle. I consider these trends to likely be applicable to New Zealand workers as well, suggesting the influence of work-from-home on VKT and GHG emissions may be fairly limited.
29. Carpooling from the Waimakariri District (e.g., Census data for "passengers" travelling to work) has slowly but consistently dropped from the 2001 Census (4.7%) to the 2018 Census

[7] Institute of Transport and Logistics Studies (March 2023) *Transport Opinion Survey*. University of Sydney Business School.

(3.2%). At the same time, annual Council vehicle occupancy counts taken on Tram Road have remained stable between 2013 and 2018, not indicating any historical uptake of carpooling. While there are many factors that could influence the uptake of carpooling in the future, I consider the travel patterns from last two decades would not support a rapid increase in the future necessary to significantly influence GHG emissions or VKT.

30. Mr Farrelly notes[8] the rapid increase in EVs in New Zealand since 2002. I completely agree with Mr Farrelly that electric vehicles and bicycles will likely be attractive to some of the future residents and the uptake will continue to increase. I also support the proposed requirement that all dwellings in the development are EV-charging ready; I do note that cost of an EV plug is on average, about 4% of the cost of the cheapest EVs available in New Zealand so would not expect this to influence EV uptake within the development. I consider the experience of the larger market in Australia to support my original conclusions – while EV sales have effectively doubled each year for the past two years, they still make up less than 0.5% of the Australian light vehicle fleet[9]. While I do not have the background or expertise to project the magnitude of such an uptake, these modes are used by a very small portion of the market at present and would require a massive increase in new sales to *overtake* traditional vehicle use in the market and have any noticeable effect on GHG emissions or VKT.
31. Norway's parliament started active support of EV uptake in 1990 through the first financial incentives. By late last year, after almost 33 years, plug-in electric vehicles made up 25% of the on-road fleet. This is newsworthy because analysts at McKinsey[10] considered it a "critical mass" and Norway is the only country to have achieved this thus far. I note that a 25% reduction in internal-combustion vehicles in Ōhoka, if (or when) we are able to achieve this, still would be far greater than the GHG emissions of the present dairy farm, using any assumptions. It also would represent a substantial increase in VKT, with the wide variety of associated traffic-related effects, as I've noted previously.
32. Finally, as I discuss in later sections, I still do not consider that public transport or active transport will generate sufficient mode share for travel from the proposed development to have any impact on GHG emissions or VKT.

[8] Evidence of Paul Farrelly, paragraphs 101-106
[9] Electric Vehicle Council (February 2023) *Australian Electric Vehicle Industry Recap 2022*.
[10] Hertzke, P. et al (May 2018). "*The global electric-vehicle market is amped up and on the rise*". McKinsey & Company.

33. Mr Farrelly bases his conclusion[11] that the Plan Change "supports a reduction in GHG emissions" on a calculation of existing GHG emissions and a qualitative discussion of the potential measures within the development that could mitigate new emissions arising from the development. As concluded above in my quantitative discussion, I consider that the transport-related GHG emissions from the development, based on present-day evidence, to be far in excess of the existing agricultural GHG emissions from the site, regardless of the assumptions made. I consider that the magnitude of these GHG emissions results directly from the distance between the Plan Change area and major urban destinations, the requirement to travel for services, and opportunities not likely to be available in Ōhoka, and the resulting private motor vehicle generation. I consider it unacceptable to ignore the creation of new GHG emissions (from new construction, energy use, as well as my calculations on transport) and claim minor reductions when evaluating whether the Plan Change will support a reduction in GHG emissions.
34. Finally, I note that while engineers are not futurists; one could consider our long-range modelling, network planning, and input into land use as the profession's best guess for a future we will need to respond to. With that context, I note that the regional traffic models for Christchurch have considered work-from-home trends but do not show any resulting significant decrease in future volumes.

VEHICLE-KILOMETRES TRAVELLED

35. In my evidence-in-chief, I noted that I was concerned about the lack of a quantitative evaluation of new VKT generated by the Plan Change and the effects on Council's obligation to reduce it. In response to my concerns, Mr Fuller[12] "acknowledge[s] that the site is some distance from employment centres, high schools and larger retail areas when compared to locations such as Rangiora and Kaiapoi." Mr Walsh[13] notes "VKT may increase because of the proposal, [but] it is difficult to determine by how much." Mr Milner[14] says that "development of the PC31 site will likely increase VKT, any new development will generate travel, so that is to be expected." Mr Farrelly[15] concludes "reducing VKT is a challenge experienced across New Zealand and is not a challenge that is not unique to this application." I remain concerned about the effects of VKT. The applicant's responses have been uniformly unhelpful in explaining or providing a basis for assessing these effects.

[11] Summary of evidence of Paul Farrelly, paragraph 17, and opening legal submission, paragraph 60
[12] Evidence of Nicholas Fuller, paragraph 76
[13] Evidence of Tim Walsh, paragraph 171
[14] Evidence of Simon Milner, paragraph 97
[15] Summary of evidence of Paul Farrelly, paragraph 21

36. I note that local government must have regard to the effects of climate change[16] and, more specifically the Emissions Reduction Plan[17] when changing a District Plan. To assess the transport effects, I have made certain assumptions around future travel behaviour, and have done so based on the specific details and assumptions made by Mr Fuller in the transport assessment and his evidence. In my experience, standard procedures for a plan change transport assessment include trip generation, which is effectively an assumption of VKT. As noted above in point 24, I have conservatively calculated that the Plan Change would contribute an additional 26 million VKT to the network when it reaches full residential build-out. I acknowledge that the Plan Change includes some minor mitigation measures (as discussed above in point 21, where measures to reduce GHG emissions will, for the most part, also reduce VKT, with the exception of EVs). However, as I have discussed in my evidence-in-chief, I consider that this substantial generation of new private vehicle VKT, in direct opposition to the Emissions Reduction Plan, will result because the Plan Change site is so far removed from urban centres, most "day-to-day" activities, and the existing transport (i.e., by active and public transport as well as private motor vehicle) network. I want to reiterate this last point to note that future development adjacent to Woodend or Rangiora may be further from Christchurch than Ōhoka, but is clearly closer to existing key activity centres, “day-to-day” activities, and existing public transport, so I consider development in these areas will likely generate less private vehicle VKT.
37. In summary, I remain concerned that the proposed Plan Change is likely to generate more GHG emissions than the existing land use. The magnitude of GHG emissions from annual electricity and vehicle use of 850 households using present-day data is far greater than the GHG emissions Mr Farrelly calculated for the existing dairy farm. While I agree with the mitigating factors outlined by Mr Farrelly, I am not convinced that the trends he hypothesised for the future will be great enough to mitigate the high present-day GHG emissions from the transport sector. Finally, the private motor vehicle use of 850 households will generate entirely new VKT that, independent from GHG emissions, contribute to network congestion and crash risk. I am aware that private motor vehicle use is one of the highest-cost means to access the transport network and is an economic barrier for a portion of the region’s population.

[16] Resource Management Act, s.7(i)
[17] Ministry for the Environment (2022) National adaptation plan and emissions reduction plan: Resource Management Act 1991 guidance note. Wellington: Ministry for the Environment.

PUBLIC TRANSPORT

38. I note the hearing panel has instructed the relevant experts to conference on public transport matters and I am scheduled to attend this conference.
39. In my evidence-in-chief, I noted that the proposed site has no existing public transport service and a very limited non-motorised network (just the shared use path to Ōhoka School). I also considered that provision of new public transport service and non-motorised network improvements was not realistic.
40. Mr Milner agrees that existing services are not appropriate given the low demand from the development, distance from existing service, and varied all day demand. Instead, Mr Milner proposes[18] two potential services could be viable to service the Plan Change area - an extension of the existing 92 peak hour express service and a new on-demand service. He also notes that the peak hour express service would not meet the all-day demands of the development so could not be a standalone service offering. For the on-demand service, he proposes combining Ōhoka with the west sides of Rangiora and Kaiapoi to mitigate the lack of "stand alone" demand in Ōhoka.
41. I have mapped out existing urban area bus stops and 400m radius walking catchments in Attachment B to show where the urban areas within the district are lacking public transport service. I acknowledge that the west sides of Rangiora and Kaiapoi are not well served by existing public transport but the larger areas lacking service are on the east side of Rangiora, northeast side of Kaiapoi, and large portions of Woodend / Ravenswood / Pegasus.
42. Regardless, combining Ōhoka with Rangiora and Kaiapoi requires any on-demand service to traverse long distances between isolated suburbs, which does not match any of the recent on-demand trials across NZ. I note recent trials in Auckland (Devonport and Papakura), Hastings, and Wellington (Tawa) had chiefly urban service areas approximately 4-5km across, while the MyWay service in Timaru does cover the urban Timaru area which is about 8km at its longest distance. For reference, a trip from west Rangiora to Kaiapoi via Ōhoka is about 18-20km long (via the Plaskett Road bridge), with more than half of the distance in rural areas with almost no public transport demand.
43. Finally, there is little demand for residents of west Rangiora and west Kaiapoi to go to Ōhoka; rather on-demand service in those towns would likely go to town centres, shopping, and bus stops (i.e., the opposite direction from Ōhoka). Thus, I consider that these residents gain limited benefit from an on-demand service that includes Ōhoka in their service areas, in fact it would be a disbenefit from longer trip times or wait times for distant vehicles.

[18] Evidence of Simon Milner, paragraphs 60-62, 67-72

44. Mr Milner estimates[19] that new development may provide at least $200,000 in passenger transport funding under urban rate subsidies. I note the total based on 850 households and the present Waimakariri urban rate of $197 is $167,450 but acknowledge that there could be additional funding from future businesses within the Plan Change. I understand that operating costs of other recent on-demand service trials in New Zealand range from $650,000 (Devonport) [20] to $743,000 (Tawa) [21] to $2.7M (Timaru)[22].
45. Mr Milner estimates the operating costs of the peak hour service to be around $100,000 annually but does not have an estimate of operating costs for new on-demand service. I understand based on trials in Timaru, Wellington, and Auckland that on-demand public transport service has substantial on-going operating expenses, requiring per-passenger subsidies of 2x to 7x greater than traditional bus services. I also understand that these ongoing operational expenses are based in a large part on the cost of labour (e.g., the bus drivers), so reducing vehicle sizes has a limited effect on reducing operating expenses. Given the operating costs and subsidies required in other New Zealand on-demand trials, and the public transport funding that could potentially be raised through rates in the Plan Change area, I consider that there will likely be substantial unfunded and continuing costs to run an on-demand service.
46. Mr Milner draws the following conclusions:

> *If PC31 is approved, it will require some form of public transport to be present from the outset to provide new residents with this option from the beginning of their occupation – otherwise a car dominated culture is reinforced from the outset and that is hard to change at a later date.*[23]
>
> *If PC31 is approved, it needs to have public transport services to support it. Whilst this is not currently in any plans or future funding programmes, this is because PC31 does not exist and the current Ōhoka community is not of a scale or density that would be able to support any form of viable all-day public transport operation.*[24]

47. I fully agree with Mr Milner and consider that *because the current Ōhoka community is not of a scale or density that would be able to support any form of viable all-day public transport*, it is not suitable to locate new higher-density residential development here, isolated from

[19] Summary of evidence of Simon Milner, paragraph 14
[20] Cost key reason for AT Local axing (10 February 2021). *Devonport Flagstaff*
[21] Greater Wellington (22 June 2023) *Transport Committee Meeting.* Retrieved from https://www.gw.govt.nz/assets/Documents/2023/06/Transport-Committee-22-June-2023-order-paper.pdf
[22] Leask, J. (20 June 2023). Do it MyWay: Mayor advocates on-demand bus. *Otago Daily Times*
[23] Evidence of Simon Milner, paragraph 94
[24] Summary of evidence of Simon Milner, paragraph 29

existing public transport and urban areas with public transport demand. Finally, I also note the development-generated funding and ridership noted above is based on full build-out, which I understand is envisioned to take ten years. I want to reiterate Mr Milner's point above that if the Plan Change is approved, public transport service has to be present from the onset to minimise reinforcing private vehicles as the only means of transport, which may be challenging with limited funding and ridership in the early years of development.

ACTIVE TRANSPORT

48. I have noted that broader cycling connectivity was raised in the hearing as well as by Mr Fuller and Mr Walsh in their evidence. As noted in my evidence-in-chief, I had concerns that no safe walking/cycling links exist between the Plan Change and the rest of the network, and even were such links to be constructed, the distances between the Plan Change site and urban centres was too great for cycling to be a realistic alternative mode to private motor vehicle use.
49. Mr Fuller notes[25] that the Plan Change site is located adjacent to proposed links in the Walking and Cycling Network Plan. While Council has adopted this long-term vision for walking and cycling, all available funds for the next decade have already been committed and no connections to the Plan Change area are included. I have included the adopted long-term full network and committed 10-year programme in Attachment A. The demand for funding is such that I consider it will be several decades before any connections can be constructed to the Plan Change site. Given discussions on development contributions (below in points 62 to 64), the Plan Change will only generate a small amount of additional funding, so it is not realistic to expect Council-funded connections within a reasonable timeframe. Finally, similar to concerns raised by Mr Milner above in point 46, I consider it to be important to have walking and cycling as viable modes from the onset of development to minimise reinforcing a car-dominated culture.
50. I recognise that specific details of cycle path design will be addressed in later stages of any approved development, but the quality of cycling links was raised in the hearing and by Messrs Metherell and Fuller. While Mr Fuller does not expect[26] that cycling links to the Plan Change area should be sealed "given the nature of the area," I note that Waka Kotahi's best practices in *Cycle Network Guidance*[27] call out unsealed trails as not being appropriate for

[25] Evidence of Nicholas Fuller, paragraphs 58 and 60
[26] Summary of evidence of Nicholas Fuller, paragraph 45
[27] NZ Transport Agency, Cycle Network Guidance, Trails, accessed 8 August 2023, https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-standards-and-guidance/cycling-network-guidance/designing-a-cycle-facility/between-intersections/trails/

all-ages-all-abilities (the target audience for general cycling) and also not typically included in urban cycle networks.

51. Regardless of whether future provision of safe walking and cycling connections can be arranged above the Council's existing commitments, my concerns around the distance between the Plan Change site and key activity centres remain the same, and would appear to be in alignment with the applicant's conclusions. Mr Fuller acknowledges[28] that this distance is sufficiently far that "it is unlikely that many residents would choose to cycle for purposes other than recreation," and Mr Farrelly considers[29] that only "some New Zealanders would be prepared to travel further than 2.8km to shop, using motorised forms of non-road transport." Mr Walsh considers[30] that the Plan Change "will benefit relatively few existing/future residents in terms commuter cycling given the distance to the larger centres," with an outcome that "rates of commuter cycling will be lower compared to locations closer to the larger urban centres."
52. I remain concerned that the separation between the Plan Change site and the district's urban centres is great enough to discourage travel by walking or cycling, regardless of the quality of links bridging this separation. If private motor vehicles are left as the only viable mode, I consider that the Plan Change will not be able to give effect to the NPS-UD's policies to provide for good accessibility, health, safety, and reductions in GHG (as discussed in my evidence-in-chief).

CAPACITY ISSUES ON EXISTING ROADING NETWORK

53. I note that appropriate levels of service for traffic operations were discussed at the hearing. Mr Fuller considers[31] that the levels of service (LOS) for the two Tram Road intersections (with approaches operating at LOS E during peak periods) as acceptable. While the Council does not have established traffic LOS targets, I note that the Canterbury Regional Land Transport Plan[32] has set LOS C as the desired minimum level of service on the regional strategic road network. LOS C or D is most commonly used as a threshold for acceptable operations by road controlling authorities in New Zealand and abroad, due in part to the increase in vehicle interactions and unstable flow as volumes approach LOS E. Thus, I do not consider LOS E to be an acceptable level of service and expect that it would create material impacts to the road network users.

[28] Evidence of Nicholas Fuller, paragraphs 61, 71
[29] Evidence of Paul Farrelly, paragraph 153
[30] Evidence of Tim Walsh, paragraphs 160 and 164
[31] Evidence of Nicholas Fuller, paragraphs 22-23
[32] Canterbury Regional Council (July 2021) *Canterbury Regional Land Transport Plan*, p. 81

54. As discussed previously, Council has plans to upgrade the intersection of Tram Road / McHughs Road / Bradleys Road, which will see additional traffic generated by the Plan Change. The intersection of Tram Road / Whites Road was noted by Mr Fuller to have approaches operating at LOS E. My concerns from the evidence-in-chief around the modelling of delay at this intersection remain unaddressed, but regardless of the outputs of intersection modelling, I consider that this intersection will require improvements to address capacity constraints (independent of planned safety-related improvements in the LTP). I also consider that additional traffic from the full build-out of the proposed Plan Change could potentially impact intersection operations to the point that a roundabout is required (which would have significant land and construction costs) as the intersection upgrade.
55. I have reviewed the high-level traffic modelling for the intersection of Mill Road and Ohoka Road; based on this evidence I am now more comfortable that this intersection will operate within a desired level of service. I acknowledge comments from Mr Metherell[33] for the Waimakariri District Council as a submitter that the transport assessment could underestimate the demand going to/from Rangiora via Threlkelds Road and Plaskett Road, based on the potential traffic distribution in the regional traffic model (CTM). I also recognise that Mr Fuller has modelled both Threlkelds Road / Flaxton Road and Mill Road / Ohoka Road intersections. I have not analysed the models behind the results Mr Fuller included in his summary of evidence at this time. However, based on present-day traffic volumes, I consider that the intersections included in these routes likely will not require capacity-based improvements.
56. In summary, as discussed in my evidence-in-chief, I still consider that the additional traffic generated by the Plan Change will necessitate capacity-based improvements at the Tram Road / Bradleys Road and Tram Road / Whites Road intersections, as well as the Tram Road carriageway west of Jacksons Road.

ROADING SAFETY ISSUES ON EXISTING NETWORK

57. While traffic modelling is one way to ascertain effects of new traffic on existing traffic operations (which I group as road or intersection capacity improvements), these models do not consider the effects on road safety (which I group as safety improvements). Traffic operations is evaluated in terms of capacity and has thresholds and quantitative-based levels of service. Road safety is evaluated in terms of risk, so while additional traffic does not push over a quantitative threshold, it increases the risk of a conflict occurring.

[33] Evidence of Andrew Metherell, paragraph 42

58. Mr Fuller has said that he is unaware of specific road safety concerns exacerbated by increased VKT[34]. I note that the Safe System Assessment Framework (developed by Austroads and adopted by Waka Kotahi to achieve the Road to Zero safety strategy) ties road volume directly to road user exposure, one of the three elements that define crash risk. I am also aware of substantial research undertaken by Waka Kotahi to develop rural road crash prediction models[35,36], which also directly link traffic volume with crash risk. In other words, more traffic on a road leads to a higher potential for a crash occurring, or a simple road user error compounding into a crash. In the context of the rural road network in which the Plan Change is proposed, increased VKT would exacerbate this risk along all sections (i.e., intersections and roadways in between).

59. Mr Fuller[37] and Mr Walsh[38] both make reference to partial funding (Council-only) for safety-related intersection improvements along Tram Road. In 2020, a Council report[39] identified $29.3M ($34.2M in 2023 dollars) worth of safety improvements to intersections and carriageway along Tram Road. Of this total, the Council identified funding for $12M ($13.6M in 2023 dollars) worth of improvements in the 2021 Long Term Plan (LTP). No carriageway widening has been funded, but committed improvements include a new roundabout at Bradleys Road / McHughs Road and intersection minor safety upgrades as follows:

Intersection	20-Year Crash Data		Risk Band	Funded Improvement
	All crashes	Fatal + Serious Inj.		
Tram Rd - McHughs Rd - Bradleys Rd	13	3	High	Roundabout
Tram Rd - Whites Rd	4	2	High	Widening‡
Tram Rd - Edmunds Rd - Jacksons Rd	0	0	High	None
Tram Rd - Raddens Rd	1	0	*Not rated*	Widening
Tram Rd - Woods Rd	0	0	*Not rated*	None
Tram Rd - Jeffs Drain Rd	0	0	*Not rated*	None
Tram Rd - Gardiners Rd - Burgesses Rd	1	0	Low	Widening
Tram Rd - South Eyre Rd - Giles Rd	17	4	High	Interim Signs†
Tram Rd - Heywards Rd	4	1	*Not rated*	Widening
Tram Rd - Island Rd - Greigs Rd	12	3	Medium High	Interim Signs†
Note † - This interim improvement is a smaller-scale intervention before a full upgrade can be programmed Note ‡ - The evaluation of the Tram Rd / Whites Rd intersection did not include any effects of the Plan Change; funded widening is for left turn lanes on Tram Rd only				

[34] Evidence of Nicholas Fuller, paragraph 78
[35] Turner, S, R Singh and G Nates (2012) *The next generation of rural road crash prediction models: final report*. NZ Transport Agency research report 509. 98pp.
[36] NZ Transport Agency (June 2018) *Crash Estimation Compendium*. First edition, Amendment 1
[37] Evidence of Nicholas Fuller, paragraphs 35, 66
[38] Evidence of Tim Walsh, paragraph 165
[39] Waimakariri District Council, Utilities and Roading Committee, 17 November 2020 agenda, from p. 49.

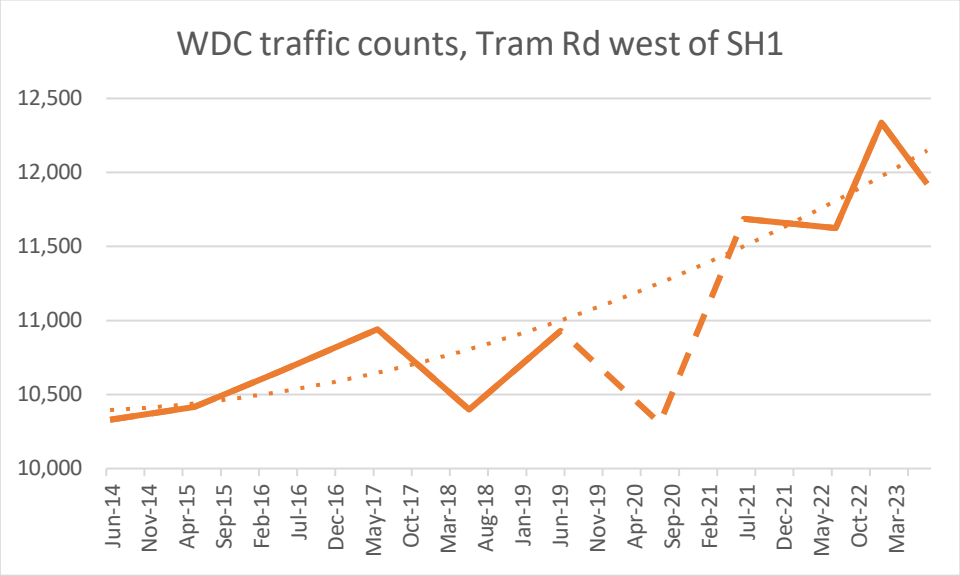
60. Of the five intersections with High or Medium High risk profiles, only one (Tram Road / McHughs Road / Bradleys Road) has committed LTP funding for the full safety mitigation. The Tram Road / Whites Road intersection has committed LTP funding for turn lanes on Tram Road only and does not account for any increased risks from Plan Change-generated traffic. The other three intersections have limited or no safety mitigation funded in the LTP.
61. I note that none of the capacity-based improvements identified in point 56 are in the LTP.
62. Mr Fuller notes[40] that any roading improvements can be accommodated through "the usual development contributions process." While this is true at a conceptual level, in reality actual development contributions are limited to projects identified in the LTP and any such funding is typically limited to the proportion of traffic generated by the development relative to existing traffic.
63. In this instance almost no upgrades have been funded in the LTP for this area (because Council has not previously considered it suitable for development of this magnitude). Should the safety and capacity improvements above be considered for inclusion in the LTP prior to the subdivision resource consent for the site, the Council would still be responsible for finding funding for a substantial portion of the cost.
64. Given the magnitude of unfunded costs for both capacity and safety-related improvements, I consider there to be three likely outcomes moving forward. First, the applicant could offer to pay for the unfunded projects. Second, the unfunded projects could be proposed for addition into the LTP, which would go out to public consultation, giving residents the opportunity to provide feedback before Council makes the ultimate decision. If they choose to add the projects, then ratepayers will be required to pay a substantial portion of the new costs (which would likely be costed in the millions of dollars) to mitigate these effects. The third outcome would be that the safety and capacity projects are not added to the LTP, in which case all drivers (both existing and future Plan Change residents) will have higher exposure to crash risk on a daily basis.

EFFECTS AT TRAM ROAD MOTORWAY INTERCHANGE

65. In response to comments at the hearing on the Tram Road / SH1 motorway interchange, I have considered Mr Fuller's modelling and Mr Metherell's concerns about the assessment.
66. Mr Fuller has considered further growth from future development west of Tram Road in his summary of evidence, based on areas identified in Swannanoa and Oxford[41]. I note that traffic on Tram Rd west of the motorway has been increasing on average at 1.9% per annum

[40] Evidence of Nicholas Fuller, paragraphs 38-39, 68
[41] Summary of evidence of Nicholas Fuller, paragraphs 19-22

over the last decade, a rate that itself has increased over that time period, as shown below. While Mr Fuller has captured some of the future development potential, I note he missed the Mandeville area, which could see reduced lot sizes and increased development[42] if the proposed District Plan is made operative without major changes. As well, several areas within Mandeville are included in submissions on the proposed District Plan for even more intensification. I consider that there is a high likelihood that background traffic volumes on Tram Road will continue to increase beyond Mr Fuller's assumptions.



67. In the hearing, Mr Fuller mentioned that he used a relatively simple intersection model to evaluate the traffic operations at the two Tram Road intersections. As noted by Mr Metherell[43], the challenge in having two intersections close together is modelling overlapping effects from one to the other. Mr Fuller acknowledged that the morning peak hour model showed a 112m AM average queue back up from the east intersection through the west intersection (there is approximately 80m between intersections). While I have not undertaken a substantive review of Mr Fuller's modelling, I was unable to see how queues from the east intersection were accounted for in modelling of the west intersection. The more detailed microsimulation modelling that Mr Metherell referenced would be able to provide a more precise simulation of how the two intersections impact one another.
68. The consequences of a queue blocking the west intersection could be severe as this would block offramp traffic from turning right onto eastbound Tram Road. Noting that the morning peak period on average is expected to have queues blocking the west intersection, I

[42] The proposed District Plan expands Residential 4A zoning across the bulk of Mandeville, reducing minimum section sizes to 2500m^2
[43] Evidence of Andrew Metherell, paragraph 50

would be concerned that any above-average blockage could lead to a queue forming down the off-ramp, which could back stopped traffic onto the high-speed motorway lanes.

69. I note Tram Road is identified on the Council's Walking and Cycling Network Plan and thus would require space for cyclists and pedestrians. Unfortunately, none of the options presented by Mr Fuller in his summary safely provide for pedestrians and cyclists based on current practice. Shared-use paths are a minimum of 2.5m wide to minimise conflicts between users, while on-road cycle lanes are generally not acceptable to accommodate cyclists of all abilities. I would further consider that use of non-separated shoulder space through a motorway interchange for cyclist use leads to unacceptable risks of conflicts with ramp traffic. Thus, I am concerned that any option to put an additional lane onto the Tram Road overpass will require structural changes to widen the deck.
70. As I do not have first-hand knowledge of the condition of the Tram Road overpass, I cannot comment on its ability to accommodate an additional lane or clip-on structure (as Mr Fuller has suggested[44]). I note that the age of the bridge (more than fifty years old) may make any structural works challenging.
71. I consider that the proposed restricted discretionary rule[45] to assess interchange upgrades when more than 250 allotments are proposed has some merit as a trigger. I note that Waka Kotahi has full jurisdiction over the overpass and interchange. I cannot comment on whether they would consider changes to either intersection or the overpass, or the timeframe to commence any construction. Further, Waka Kotahi is not a party to this Plan Change so I do not have their views on the proposed restricted discretionary rule. I note Waka Kotahi is very sensitive to motorway interchange operations and safety.
72. Overall, I consider that there are significant varied risks to assuming capacity improvements can be undertaken at the SH1 motorway interchange, some beyond control of the Plan Change parties (e.g., third party approval and construction). This has the potential consequence of capping development within the Plan Change area to 250 sections.
73. In order to have sufficient certainty that the intersection upgrade could be undertaken, the applicant would need to liaise with Waka Kotahi to get their views on the proposal and potential mitigations.

[44] Evidence of Nicholas Fuller, paragraph 28
[45] Evidence of Tim Walsh, paragraph 103.17

PROPOSED ROADING NETWORK

74. Based on the detail provided in the applicant's evidence (chiefly the indicative walking & cycling network[46] in Mr Falconer's urban design evidence), I accept the Design Report's proposed walking and cycling networks are appropriate for the development as well as the interface (or lack thereof) on the southern boundary of the ODP area.
75. I note that the revised site includes provision for the farmers market to move within the development. This would provide benefit as the existing operation at the Ōhoka Domain has experienced issues with accessibility, parking, and congestion. I am presently involved in a Council-led effort to work with the market and Ōhoka residents to address these issues and continue to allow the market to thrive.
76. I consider that the proposed increase in Residential 2 land use with increased residential density and tighter street grid (as noted in Mr Falconer's urban design report) may help to influence a lower speed environment. Reducing direct access to Bradleys and Whites Road will also reduce the risk of conflicts on the existing road network.
77. However, the site-wide roading cross-sections in the same design report still lack side friction features (e.g., kerbs, on-street parking) that have been shown to moderate speeds in urban areas. I also consider roads in the Residential 4a zoning to still have the higher peri-urban crash risk I discussed in my evidence-in-chief.
78. Mr Fuller suggests[47] speed thresholds to manage excessive speed. I agree that speed thresholds play an important role in communicating *speed changes* and as such, the Council has used them often where the speed limit reduces, such as when entering an urban area. However, their impact on driver speeds is limited to the immediate threshold vicinity and my experience suggests that installing speed thresholds at speed change locations will not result in area-wide speed reductions if the surrounding area still has a high-speed environment.
79. Mr Fuller[48] and Mr Walsh[49] both rely on the Council's future Speed Management Plan, as a means to reduce speeds on the adjacent roads and reduce the adverse safety effects of the development – increased traffic, substandard intersection spacing, and peri-urban roading environment. The Speed Management Plan is a mandated requirement of the Setting of Speed Limits Rule 2022 and has not yet been released for public consultation. I have led the development of the Plan over the past eight months, and I consider it highly unlikely that the speed limits in the Ōhoka area or on the primary roads used to access major urban centres

[46] Evidence of Garth Falconer, page 39
[47] Evidence of Nicholas Fuller, paragraphs 42-43, 91
[48] Evidence of Nicholas Fuller, paragraphs 41, 48, 67
[49] Evidence of Tim Walsh, paragraph 156

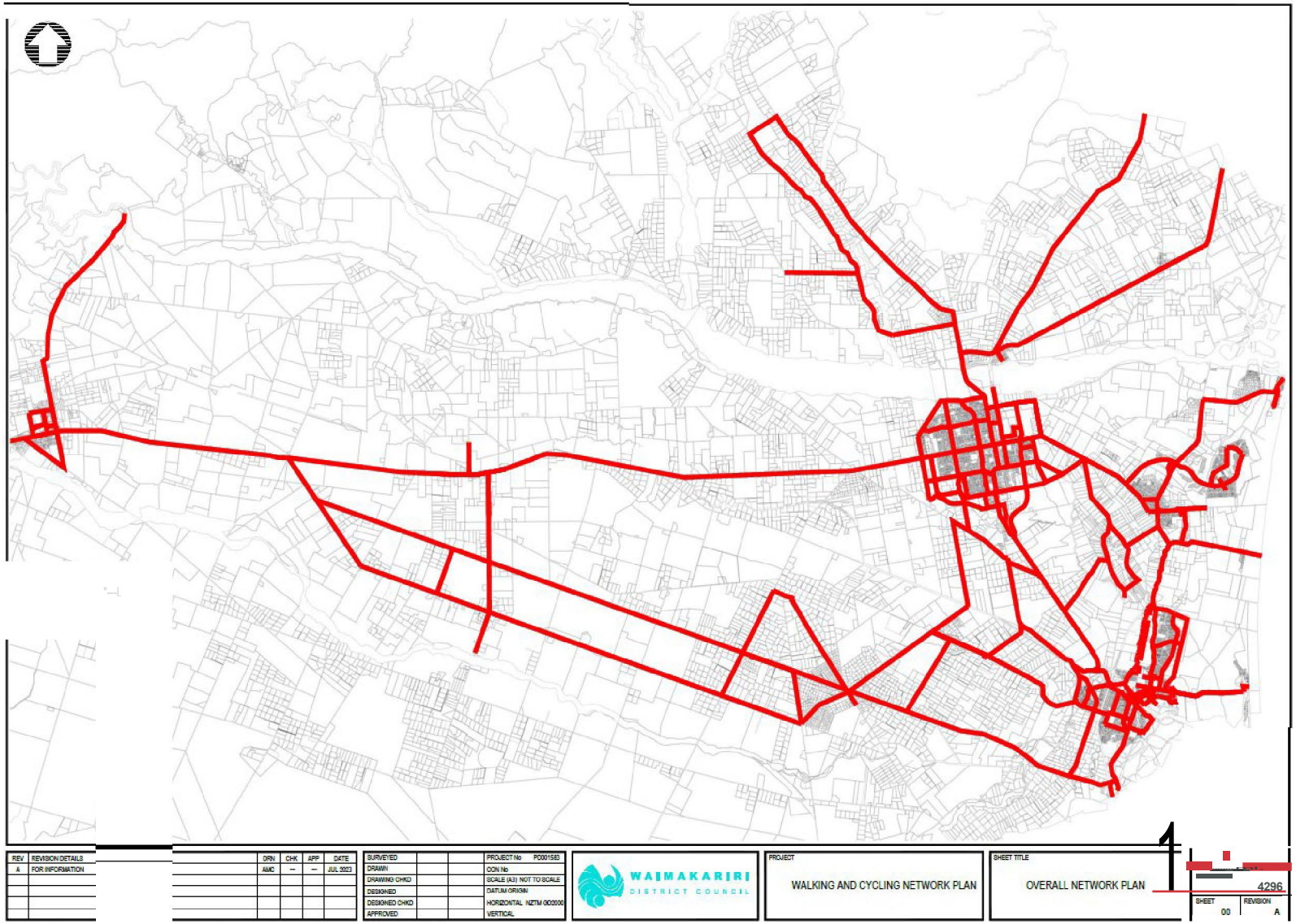
will be modified within the foreseeable future. As such, the safety improvements expected by Mr Fuller and Mr Walsh are not likely to eventuate in the short to medium term.

80. Regardless of any changes that may or may not result from the independent process of the Speed Management Plan, my concerns from my evidence-in-chief remain. The Plan Change is proposing a peri-urban roading environment with a more urban-scale driveway frequency and rural-style road cross-sections lacking "side friction" to slow traffic, which I consider is a combination that will likely lead to higher speeds and higher conflict frequency.

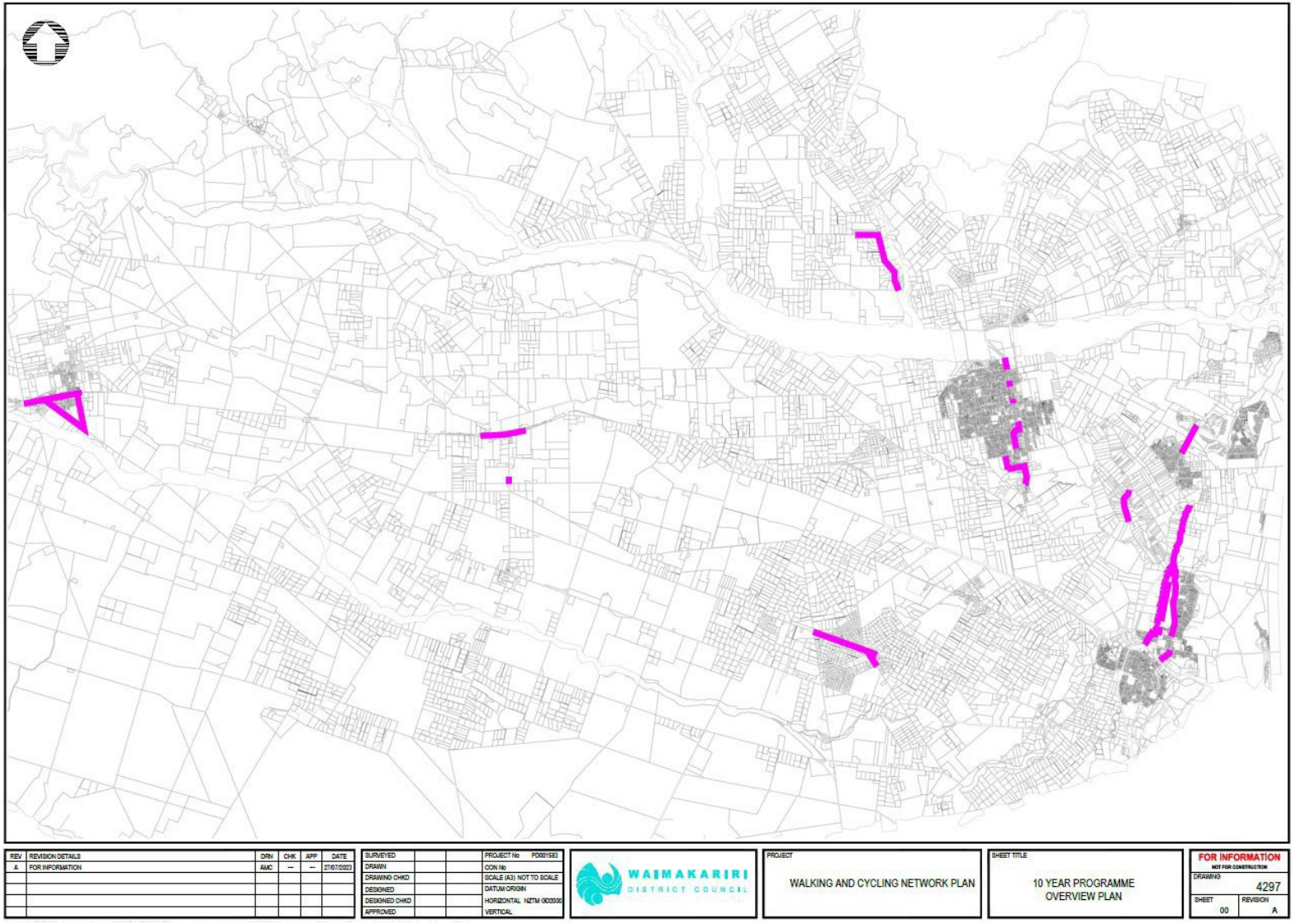
CONCLUSION

81. I have reviewed the evidence from the applicant and submitters and consider that placement of a large urban residential development in the rural environment of Ōhoka will:
    a. Exacerbate congestion and safety risks on the existing roading network;
    b. Result in private motor vehicle-dominated travel patterns due to the lack of appeal of walking, cycling, or public transport;
    c. Likely increase GHG emissions over the life of the development relative to existing land use; and
    d. Certainly increase vehicle-kilometres travelled relative to existing land use.
82. I note that the adverse effects above may not fully eventuate if the proposed Plan Change is stopped at 250 allotments by a lack of Waka Kotahi approval for improvements to the Tram Road interchange.
83. Per Objective 1 of the NPS-UD, "well-functioning urban environments" should " provide for...social, economic, and cultural wellbeing, and for...health and safety, **now** [my emphasis] and into the future." I consider it inappropriate to site this development in an area that does not provide a safe and well-functioning transport network for all users now without sufficient certainty that it may do so in the future.

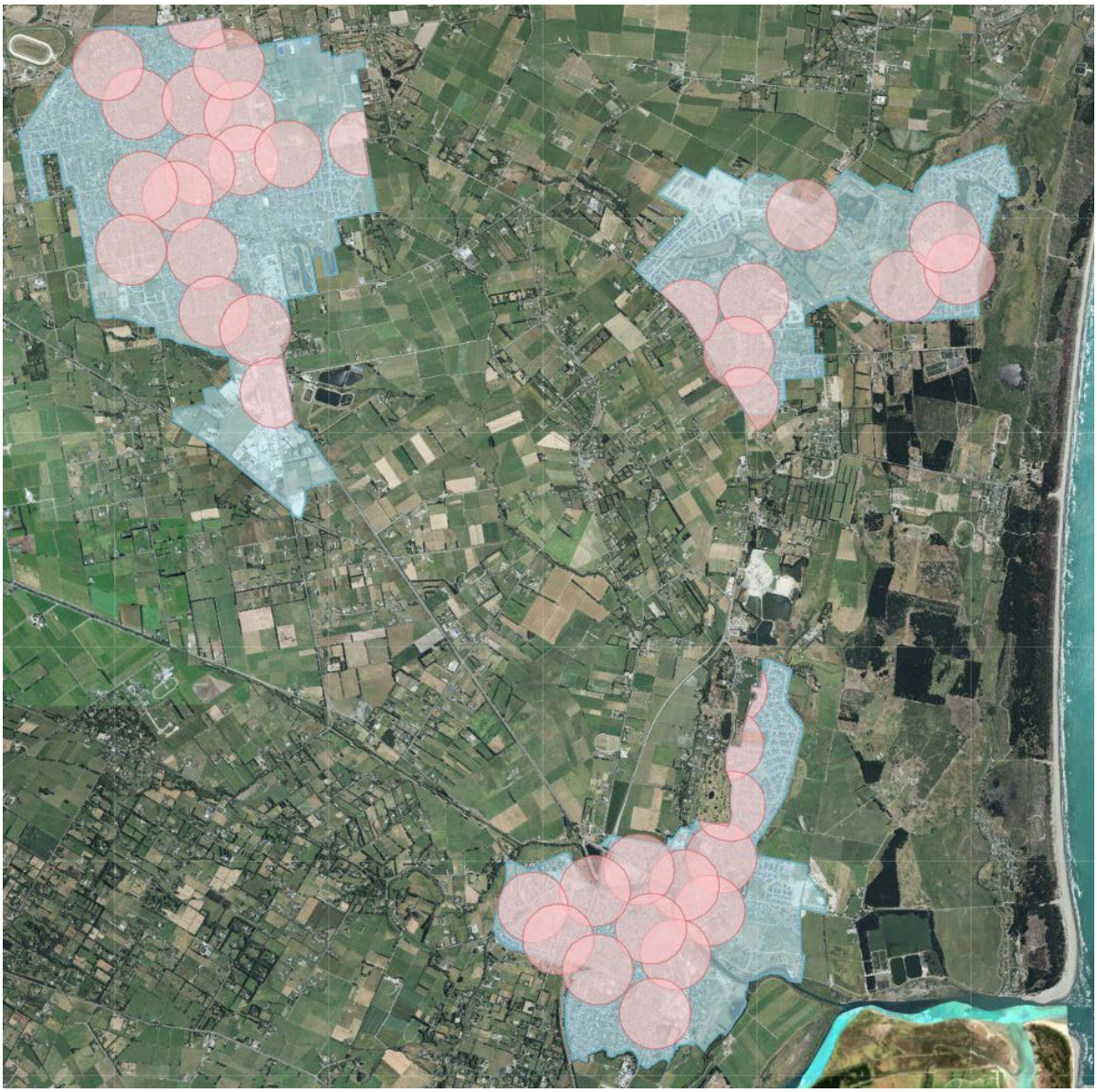
ATTACHMENT A1: ADOPTED WALKING AND CYCLING NETWORK PLAN



ATTACHMENT A2: WALKING AND CYCLING NETWORK 10-YEAR FUNDED PROGRAMME



ATTACHMENT B: EXISTING BUS STOPS AND CATCHMENTS (400m RADII)



Attachment C – PC31 Joint witness statement in relation Public Transport Options

Before an Independent Hearing Commissioner at Waimakariri District Council

under: the Resource Management Act 1991

in the matter of: Proposed Private Plan Change RCP31 to the Operative Waimakariri District Plan

between: **Rolleston Industrial Holdings Ltd**
Applicant

and: **Waimakariri District Council**
Consent Authority

Joint witness statement in relation Public Transport Options

Dated: 18 August 2023

INTRODUCTION

1 This Joint Witness Statement (*JWS*):

1.1 This statement records the consideration Public Transport options by the four transport experts in attendance at the hearing, as follows:

(a) Mr Milner – representing the Applicant

(b) Mr Fleete – representing Canterbury Regional Council

(c) Mr Binder – representing Waimakariri District Council

(d) Mr Metherell – representing the Waimakariri District Council as a submitter.

PUBLIC TRANSPORT OPTIONS

2 The following queries were raised by the Panel. These queries are raised in the context of if Plan Change 31 were approved:

2.1 Whether a connector service between Ōhoka and Kaiapoi or Rangiora is realisable within the short, medium and longer term identifying the degree of uncertainty and/or contingent matters; and

2.2 Whether an on-demand service, like that available in Timaru, is realisable in the short, medium or long term, identifying the degree of uncertainty and/or contingent matters.

Context

3 The experts have approached these questions in the following context:

3.1 Rather than focus on the specific term "connector" – which has a specific frequency aspiration attached to it in the Canterbury Regional Public Transport Plan, we have focused our response on the concept of a "fixed route bus service" with a service frequency that is appropriate to the area. In that way it can service a range of trip types and offer the potential to reliably offer an alternative to private motor vehicle use. It would provide a "cross-town link" to Kaiapoi and/or Rangiora.

3.2 An On-demand service is a flexible public transport service, normally provided where demand is insufficient for a fixed route service. It has a focus on providing access opportunities to key activity centres and places such as shopping, education, employment, entertainment,

recreational and medical facilities. There are no fixed services, and smaller vehicles would be used on an on-demand basis. It would at least provide access to Kaiapoi and possibly Rangiora.

3.3 Short term has been considered as a timeframe within 0-3 years, medium term 3-10 years, and long term 10 years plus.

3.4 "Realisable" is considered in the context of whether a service could be provided, and the experts have treated that similar to if a service is a "possibility" under ideal conditions. The discussion on uncertainty and contingent matters is then provided as a means to address whether it is practicable to provide.

3.5 The experts have assessed "degree of uncertainty" in a risk context, with a range as follows:

(a) Very unlikely

(b) Unlikely

(c) Likely

(d) Very likely

4 The experts agreed that if development is approved, then over time it is likely some public transport solution would need to be found, at least to provide basic levels of access.

5 Not withstanding the point above and without additional funding, it was agreed that as a result of the location and possible patronage, this comes at a higher cost and lower priority than other development areas closer to Key Activity Centres, such that lower levels of service to Ohoka would be achieved than sought by the Canterbury Regional Public Transport Plan 2018.

Fixed Route Bus Service

6 The experts agreed that, if Plan Change 31 were approved, a fixed route bus service connecting to Rangiora and Kaiapoi is not realisable in the short term, but may be realisable in the medium to long-term.

7 This is contingent on:

7.1 Funding availability and priorities for public transport investment.

(a) The experts agreed that the distance from Key Activity Centres will result in services very likely being relatively more expensive to provide than services supporting growth close to Key Activity Centres.

(b) The experts agree that the likely rates funding from the new and existing development in the Ohoka area is very unlikely to be sufficient to cover costs of a service diversion, unless other funding sources are available in the future.

(c) The experts agree that the potential patronage based on current travel patterns is very unlikely to be sufficient to warrant prioritisation of a service (without an additional funding source) connecting Ohoka compared to other growth areas nearer to Key Activity Centres in Waimakariri District.

8 Based on these issues with a fixed route service between Rangiora and Kaiapoi, via Ohoka, the experts discussed whether other options are available for another form of fixed route service.

9 It was agreed that the most likely fixed route service that could be provided would be an extension of Route 92, linking to Kaiapoi in the morning commuter peak, and from Kaiapoi in the afternoon commuter peak. The experts agreed that this:

9.1 Only provides for some peak period commuter trips for which there is demand to use public transport;

9.2 Is still subject to issues of uncertainty around funding availability;

9.3 Is very unlikely to also provide a direct link to Rangiora;

9.4 Is very unlikely to lead to any notable change in private vehicle travel from PC31 across the whole day, with a marginal impact on peak period commuting to Christchurch.

On-Demand Service

10 The experts agreed that an on-demand service could be realised that would serve Ōhoka, western Rangiora and western Kaiapoi.

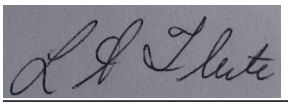
11 The experts discussed contingent matters such as geographic coverage, cost and funding, degree of certainty, and other matters related to service design but could not come to agreement on these matters.

12 Whilst a trial of on-demand public transport has largely replaced fixed route services in Timaru, its wider use in other parts of Canterbury has not been explored.

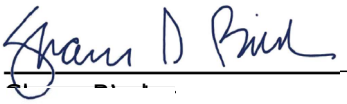
13 The experts cannot agree on whether it is a viable alternative to a fixed route bus service to support southern Waimakariri with local public transport to link residents into the wider Greater Christchurch public transport network in the short, medium or long term. Each of the experts briefs of evidence more fully explore the reasons for this disagreement.

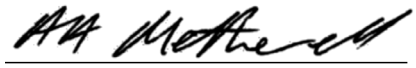
Dated: 18 August 2023

Simon Milner



Leonard Fleete





Andrew Metherell

Attachment D – PC31 Joint witness statement in relation Transport Infrastructure Provision

Before an Independent Hearing Commissioner at Waimakariri District Council

under: the Resource Management Act 1991

in the matter of: Proposed Private Plan Change RCP31 to the Operative Waimakariri District Plan

between: **Rolleston Industrial Holdings Ltd**
Applicant

and: **Waimakariri District Council**
Consent Authority

Joint witness statement in relation Transport Infrastructure Provision

Dated: 22 August 2023

INTRODUCTION

1 This Joint Witness Statement (*JWS*) records the discussion of private motor vehicle transport matters by the three transport experts in attendance at the hearing, as follows:

(a) Mr Nicholas Fuller ☐ representing the Applicant

(b) Mr Shane Binder ☐ representing Waimakariri District Council

(c) Mr Andrew Metherell ☐ representing the Waimakariri District Council as a submitter.

BACKGROUND

2 The witness conferencing and the statement that follows focused on the necessary private motor vehicle transport infrastructure outcomes for the Plan Change.

3 The experts note there is disagreement over the following matters, as recorded in the respective briefs of evidence:

(a) Vehicle-kilometres travelled;

(b) Greenhouse gas emissions;

(c) Viability/provision of non-private car travel;

(d) Upgrades to the SH1 / Tram Road interchange;

(e) Upgrades to surrounding road connections to the roading network[1];

(f) Higher-speed peri-urban roading environment within the proposed development.

4 The above matters have not been included within the experts☐ conferencing. On this basis, Mr Metherell and Mr Binder wish to record that any agreement they express in this JWS with regards to motor vehicle transport infrastructure provision does not indicate they have changed their opinion of these other matters.

[1] Such as the need for upgrades to carriageways and roadside hazards on Whites Road, Bradleys Road, Mill Road, and Threlkelds Road.

INTERSECTION SAFETY & CAPACITY

5 The experts agreed that some of the issues raised in evidence in relation to road capacity and safety for those using private motor vehicle have potential mitigation measures.

6 The experts understand that some potential mitigation measures are already included in the Long Term Plan (LTP) and others have not been considered by Council and could require full funding by the Developer. The experts have not sought to address how costs associated with any required mitigation would be apportioned between parties (such as the Developer and Council).

7 Following the hearing, Mr Fuller has carried out further intersection capacity and intersection safety assessment to determine what a future transport infrastructure plan may need to consider for motor vehicle-based improvements, and at what point in time / development phasing mitigation solutions may be necessary.

8 The following assessment of motor vehicle safety and capacity has been undertaken on the basis of 20% growth on the Tram Road corridor and 35% growth on the Flaxton Road / Skewbridge Road corridor over the next decade. This growth reflects the assessment of potential traffic growth on those corridors as set out by Mr Metherell□s evidence informed by modelled outputs from the Christchurch Transportation Model.

9 Furthermore, this assessment was undertaken on the basis of 65% of traffic accessing the Tram Road corridor (which was set out in the ITA prepared by Mr Fuller), 23% - 25% of traffic heading to Rangiora via Threlkelds Road / Flaxton Road (as per Mr Metherell□s evidence) and 15% - 16% of traffic heading to Kaiapoi via Mill Road / Ohoka Road (also as per Mr Metherell□s evidence).

10 Mr Fuller carried out intersection capacity and safety assessments applying traffic patterns changes associated with staged development, starting at a low staging threshold of 250 households generated by PC31 land development, with increases of 100 households up to full development.

11 The experts acknowledge that different growth rates and/or trip distribution rates could be applied, or could transpire in reality over time. However, the experts consider that the figures above provide a suitable approach to traffic distribution, as it is based upon the higher distributions to these corridors from either Mr Fuller□s or Mr Metherell□s sets of Evidence.

Tram Road / Bradleys Road Intersection

12 The experts agreed that the Tram Road / Bradleys Road intersection would have movements operating at Level of Service E once

development reaches 450 Lots[2] (and no school) at the Plan Change site on the assumption that background traffic growth on Tram Road occurs at 20%.

13 Mr Binder advised that the Bradleys Road / Tram Road roundabout is presently programmed in the LTP for construction in 2025.

14 Mr Fuller considers that the 450 Lots would take approximately six years to be developed (two years for subdivision and primary infrastructure, then 100 Lots developed per year). On that basis, Mr Fuller considers it likely that the roundabout will be constructed by Council prior to 450 Lots being developed.

15 To address funding uncertainty in this case, the experts agree that the District Plan rules should require construction of the roundabout to occur ahead of development above a 450 Lot threshold within the site.

16 On this basis, it is agreed that there should be a development threshold of no more than 450 Lots being developed ahead of the roundabout upgrade to the Bradleys Road / Tram Road intersection and a rule/mechanism to this effect should be prepared by the planners.

17 Mr Metherell considers that development prior to the 450 Lot threshold being reached should be subject to an assessment (likely of Restricted Discretionary status) of the effect on safety at the Tram Road / Bradleys Road intersection. He considers an appropriate assessment matter would be consideration of the extent to which safety management measures or interim safety upgrades are able to address anticipated safety issues ahead of a change to a roundabout intersection. Mr Fuller has no specific concerns regarding the suggested assessment matter, although notes the timing set out in paragraph 13 would likely make this redundant.

Tram Road / Whites Road Intersection

18 The experts agree that this intersection may have movements operating at Level of Service E once 250 Lots have been developed at the Plan Change site plus 20% growth on Tram Road.

19 They also agree that the establishment of 250 Lots would be appropriate so long as some interim safety upgrades are undertaken. The specific nature of such upgrades was not explicitly agreed, but the experts agreed that they would fall under the umbrella of safety management provisions and could potentially include:

[2] For the purpose of this statement a ☐Lot☐ is considered to represent a residential dwelling.

19.1 Visibility splay / sightline improvements;

19.2 Improved signage on the approaches;

19.3 Potentially Rural Intersection Activated Warning Signs (RIAWS).

20 The extent that some of these can be implemented may depend on the availability of land outside the road reserve, and Council□s treatment of the Tram Road corridor. To address this uncertainty, and recognising the high-speed nature of the intersection, Mr Metherell considers that development prior to the 250 Lot threshold being reached should be subject to an assessment (likely of Restricted Discretionary status) of the effect on safety at the Tram Road / Whites Road intersection. He considers an appropriate assessment matter would be consideration of the extent to which safety management measures or interim safety upgrades are able to address anticipated safety issues ahead of a change to a roundabout intersection.

21 The experts agreed that a roundabout at this location would address the safety and capacity concerns above a development of 250 dwellings. The experts noted that this will require land that is not in the road reserve.

22 Mr Binder notes that minor safety upgrades are presently programmed in the LTP, but these do not include any of the mitigations discussed in points 19 or 21. Therefore, Council has not allocated any further funding and the cost may need to be funded by the Developer.

23 The experts agreed that the planners should prepare a rule/mechanism requiring safety and capacity matters to be assessed and resolved prior to the development of any more than 250 lots.

24 In terms of the particulars of such a rule, Mr Fuller prefers that the rule to focus on the outcomes sought, rather than the specific method, on the basis that this would provide scope for different design solutions that account for the traffic distribution associated with Plan Change traffic, as well as accounting for the traffic growth occurring on the Tram Road corridor. This would also allow for consideration of further road safety measures should these be appropriate, rather than necessarily prescribing a roundabout (or other specific design solutions).

25 In contrast, Mr Metherell and Mr Binder prefer that the rule explicitly requires provision of the roundabout, given that a roundabout is highly likely to be required to safely address traffic generated by the proposed development before full build-out.

26 Having set out the contrasting views on the matter above, the experts agree that the drafting of the rule (and its specificity with respect to a roundabout or other design solutions) is best determined by the planners.

Mill Road / Ohoka Road Intersection & Flaxton Road / Threlkelds Road Intersection

27 The experts agreed that a road safety intervention is required at the Mill Road / Ohoka Road intersection to accommodate development at the Plan Change site. This was discussed in the context of road safety requirements, which is a critical matter.

28 Mr Fuller and Mr Binder agreed that reducing the speed limit at the intersection to 60km/h would be an acceptable solution in terms of road safety. This would require a change to the roadside environment, such as the inclusion of a shared path on the western side of Ohoka Road that links between the Silverstream subdivision and Mill Road, and this would be to the south of the Mill Road / Ohoka Road intersection.

29 Mr Binder identified that this connection is currently under consideration by Council. In addition, Mr Binder noted that changes to speed limits require approval from the full Council. Accordingly, these solutions rely on decisions of the Council and are therefore uncertain and cannot be relied upon to mitigate effects of the development.

30 Mr Metherell agreed that the change in speed limit would support a safer intersection environment, but remains concerned that the specific form and location of the intersection, and the high forecast traffic volumes passing and turning, could still result in poor safety outcomes that are difficult to be certain about from the assessments carried out.

31 The experts agreed that an alternative would be provision of a roundabout at the Flaxton Road / Threlkelds Road intersection and a reconfiguration of the Mill Road / Threlkelds Road intersection to support a shift of some traffic from Mill Road to Threlkelds Road. This could address safety and efficiency concerns at both the Flaxton Road / Threlkelds Road intersection as well as the Mill Road / Ohoka Road intersection.

32 Mr Binder notes that no upgrades are presently programmed in the LTP for either intersection. Therefore, the cost may need to be funded by the Developer.

33 The experts agreed that the required upgrade would need to be provided before occupation of dwellings and/or commercial buildings at the Plan Change site, and a rule/mechanism to this effect should be prepared by the planners. In terms of the required provisions:

33.1 Mr Fuller considers the upgrade could be either the roundabout or speed reduction in the short-term, although on-going assessments of safety and capacity at the Mill Road / Ohoka Road and Flaxton Road / Threlkelds Road intersections would be required to confirm safe and efficient operation at each stage of development;

33.2 Mr Metherell and Mr Binder consider the rule should require a roundabout at the Flaxton Road / Threlkelds Road intersection. If that is not proposed, it would then trigger assessment referencing suitable assessment matters (at Restricted Discretionary status) of both intersections to investigate the extent to which safety management/upgrade measures and/or intersection efficiency upgrades are needed to address potential safety and efficiency issues at the two intersections.

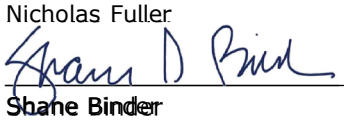
Tram Road Upgrades

34 Mr Metherell and Mr Binder are of the opinion that consideration needs to be given to the programmed safety works to the Tram Road corridor (beyond those intersections discussed previously[3]) and whether these remain adequate in the context of the proposed Plan Change.

35 Mr Fuller considers this is a matter that the Council can readily address with development contributions should the Plan Change become operative. This is because the Council would obtain additional funding through development contributions from the developer where these contribute a fair share of the costs of providing any additional works required on Tram Road in response to the growth.

Dated: 22 August 2023

Nicholas Fuller



Shane Binder

Andrew Metherell

[3] Such as the need for upgrades to the Tram Road intersections with South Eyre / Giles Roads and Island / Greigs Roads

Attachment B

WAIMAKARIRI DISTRICT COUNCIL

MEMO

FILE NO AND TRIM NO:	DDS-14-13-02 / 240510075086
DATE:	14 May 2024
MEMO TO:	Andrew Willis, Contract Planner
FROM:	Colin Roxburgh, Project Delivery Manager
SUBJECT:	Proposed District Plan Rezoning Requests Stream 12D – 3 Waters Servicing Advice

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Executive Summary

1. For drinking water, I am satisfied that the site can be adequately serviced by way of deep groundwater sources;
2. For wastewater, while in general I agree with the overall conclusion that the site can be serviced for wastewater, I note there are some inherent challenges and compromises that need to be made in terms of either accepting a higher risk of inflow and infiltration into the gravity system (and the resulting downstream impacts that are noted in the evidence of the applicant), or accepting a lower than normal level of service for residents by accepting a pressure sewer system;
3. For stormwater, I have reservations at this time about whether this can be appropriately managed. Given the evidence presented from the downstream and surrounding community on flooding issues, as well as knowledge of these issues from the Council's asset management and operational staff, this matter warrants significant investigation to address this risk. In my opinion, given the significance of this matter further consideration is warranted prior to the subdivision consent or engineering approval stage.
4. The stormwater management solution includes rain gardens / bioscapes which I do not think is suitable for the site given its high-water table.

Introduction

5. I have reviewed the evidence presented for 3 waters, infrastructure servicing and hydrology by Mr. McLeod, Mr. O'Neill, Mr. Veendrick and Mr. Steffens.
6. I note that the concept presented has not materially differed from that presented as part of the Private Plan Change 31 Proposal, which I have previously presented evidence on, however I have prepared this evidence to be considered primarily in its own right. I have however attached the Joint Witness Statement (18 August 2023) from this process, as I have referred to it at times (refer Attachment A).

Drinking Water

7. I am satisfied that the site can be adequately serviced for Drinking Water, through the utilisation of deep groundwater bores, with UV treatment and chlorine disinfection provided (as proposed in the submission's supporting evidence from Mr Steffens).

8. There is some uncertainty as to the number of bores that will be required to achieve the required yield, what separation would be required between them, and what the effects on any neighbouring bore owners would be. However, this would be unlikely to be prohibitive to the proposal being feasible entirely.
9. I note that within Paragraph 30 of the evidence of Mr. Steffens it is suggested that the existing shallow bore (M35/5609) could possibly be used with additional treatment. What is not discussed is that the bore has nitrate levels greater than 50% of the maximum acceptable value, which are higher than any other primary bore used on a community supply within the district, and therefore presents a higher level of risk due to the nitrates, regardless of the level of treatment for bacterial / protozoal contamination that would be provided by UV and chlorine treatment.
10. Treating for nitrates can be cost prohibitive and is rarely done at a community supply level within New Zealand that I am aware of, yet accepting the water to be delivered without treatment for nitrates would present a higher level of risk from a health perspective than any other community supply within the district. I acknowledge that it is not actually proposed that shallow groundwater be used as part of the proposal, however it was suggested that it could be used with further treatment both within Paragraph 30, and within Paragraph 86. I do not believe the concept of utilising shallow groundwater at this site should be considered a viable option under any circumstance, given the levels of nitrate present in the shallow groundwater within this area, and conclude that this would be entirely unacceptable to the Council. The Council has invested millions of dollars improving water supplies to avoid insecure shallow groundwater with high risk of nitrates, and utilisation of shallow groundwater with high nitrates would represent a significant backwards step.
11. During the Plan Change 31 process I considered whether the interference effects between deep bores had been adequately considered, and as a result were discussed at the time the joint witness statement was being prepared, such that the aquifer as a whole could sustain the full yield of the development. I note further analysis has been conducted on the likely drawdown effects between bores to consider the wider aquifer performance, rather than just considering the likely performance of any given new bore in isolation (refer Attachment A; Joint Witness Statement, Memorandum from Carl Steffens, 18/08/2023).
12. I note as part of this assessment, there are some scenarios of interference such as those noted in Paragraph 49 of the evidence of Mr. Steffens where I believe the drawdown induced on the existing community supply well (BW24/0262) at 5.4m would be considered a significant impact on this well. I also believe this level of drawdown may exceed the maximum available drawdown that would be permitted as part of the resource consent application to take water from the proposed new bores that would be required, however I am unclear if this was considered within paragraph 61 where interference effects are considered. I accept however the assumptions made that led to this possible outcome were conservative, and they could likely be resolved by increasing the separation between bores, rather than concluding that the site cannot be adequately serviced for drinking water.
13. I note also that the possibility of an off-site option is mentioned (paragraph 52), however without supporting evidence. It should be noted that while this could be possible, it is difficult to assess or comment on further without any detail or evidence to support this proposal. It should also be acknowledged that where solutions such as this are technically feasible, they can introduce increased operating costs associated with pumping relative to sites where a source can be established within the site. Therefore, while off-site sources are necessary in some areas where suitable sources cannot be obtained on site, they are less desirable.

Wastewater

14. I note in the evidence provided that either a gravity or pressure system is proposed by the applicant, with pressure sewer favoured.
15. It has been acknowledged that the high groundwater table at the site, combined with the lack of fall, could introduce challenges to a gravity sewer system (Mr. McLeod, Paragraph 18 notes relatively flat topography and high groundwater levels). These are valid challenges to highlight, however it is important to also note the downsides to the alternative of pressure sewer before coming to a conclusion on which type of system should be favoured.
16. In particular, pressure sewer presents a lower level of service to residents, who are then responsible for the ongoing operation and maintenance of a private pumpstation. This can mean that while the up-front costs can be less for the developer, the ongoing cost for residents can be increased.
17. While a pressure system is necessary for developments of lower density where fall required for a gravity system is not achievable, it is not common for residents living in a residential area within the District to have this lower level of service offered by a pressure system.
18. While in general I agree with the overall conclusion that the site can be serviced for wastewater, I note there are some inherent challenges and compromises that need to be made in terms of either accepting a higher risk of inflow and infiltration into the gravity system and the resulting downstream impacts that are noted in the evidence of the applicant (refer Mr. McLeod, Paragraph 17 which notes avoiding overloading of downstream infrastructure), or accepting a lower than normal level of service for residents by accepting a pressure sewer system.
19. I note also there has been some analysis of the available capacity in the rising main to allow a short-term connection to the rising main, before the dedicated trunk main from the site is constructed (refer evidence of Mr. O'Neil, paragraph 45 onwards). While I can accept the concept of a temporary connection being made on a short-term basis, this would be dependent on any excess capacity deemed to be available at the point in time the connection is requested, and would be reliant on the required level of assurances and protections that the dedicated trunk main will be built in due course. It would also have to consider the latest available information in terms of any other rezoning request that have been approved, or subdivision consents or connection applications that had been granted.
20. The mechanics of any such arrangement do not need to be determined at this point in time, and my recommendation is that the available capacity be assessed and agreed at a later stage, rather than assessed in detail as part of the rezoning request process. For that reason, I have not considered in detail the calculations provided by Mr. O'Neil in terms of what level of available spare capacity there is.

Stormwater

21. There are several matters to consider with respect to the proposed method to treat and attenuate stormwater for the proposed site.

Challenges

22. In considering the stormwater proposal for the site, there are several inherent challenges with the site that must be considered. These are;

    a. The site has relatively flat topography and high groundwater levels, as noted in the evidence of Mr. McLeod (paragraph 18).

b. There are potential challenges in gaining a consent from the Regional Council for stormwater systems that intercept the groundwater table[1], resulting in a proposal to avoid any interception of groundwater (refer evidence of Mr. McLeod, paragraph 27.1) by constructing the stormwater basins almost entirely above ground, which is an unusual concept.
c. The sensitivity of the surrounding community to any increase in flood risk, due to the challenges that already exist within this area. As evidenced through a number of submissions from community members as part of the Plan Change 31 process, there are currently a number of properties and community members who have been negatively impacted by flood events in the past. Therefore, the consequences of any increase in flood risk at this site has the potential to be significant.
d. There are numerous overland flowpaths crossing the site which need to be adequately allowed for (including the most southerly flow path through the proposed LLRZ area).

23. There are three key matters to be discussed, taking into account the inherent challenges with the site, outlined above.

<u>Above Ground Basins and Assessment of Changes to Downstream Flows</u>

24. As noted under item c. above, the stormwater attenuation system that has been proposed involves constructing above ground storage basins, to avoid intercepting the groundwater table, which has been measured to be up to within 0.14m of the surface.
25. Conventionally storage basins are constructed at least partially below ground, to allow runoff to fall into the basins. In this case, with the basins proposed to be above ground, but within the site, there are some areas of the site that cannot fall into the basins. This has resulted in approximately 20% of the site (26.4 hectares out of the total site area of 126.4 hectares) proposed to have no attenuation before the runoff is discharged to the receiving environment.
26. The above methodology of using above ground basins that parts of the site cannot fall into is very uncommon in my experience, and one I have not seen before. I am aware that above ground basins have been constructed downstream of developments such that the full development area can fall into them, however I am not aware of the concept of above ground basins being constructed within a development site.
27. The way in which this risk of unattenuated runoff is proposed to be managed is to allow for 'compensatory storage' for the upstream part of the site. The philosophy is to allow increased runoff from the downstream part of the site, but to then retain an increased amount of stormwater from the remainder of the site such that the peak flow from the site for the 50-year ARI event is no greater than the pre-development scenario. Evidence has been provided by the applicant to demonstrate the pre and post development 50-year ARI flow being equivalent. My reservations with this proposal, however, are outlined below.
28. While efforts have been made to demonstrate that the 50-year ARI flow will be no greater in the post development scenario, it is unclear whether the downstream and surrounding environment can adequately convey the full 50-year ARI flow, without some properties being negatively impacted. While the risk of the 50-year ARI flow having a negative impact is a risk with or without development, the development will mean that the amount of runoff increases, and that

[1] ECan are understood to interpret interception of groundwater and resulting evaporation of the water / uptake by plants to be a groundwater take, which in an over-allocated groundwater zone is considered to be a prohibited activity.

the frequency of events with flows that may impact the downstream environment may increase, or the duration of events that cause negative downstream impacts may increase. These impacts have not been assessed.

29. When the downstream environment can adequately convey the full 50-year ARI flow, then it can be sufficient to simply demonstrating that the 50-year ARI flow will not increase as a result of development. However, when the immediate downstream and surrounding environment is known to have a susceptibility to flooding, it is expected that there will need to be further assessment of the receiving system. These expectations are outlined in the Waimakariri District Council Engineering Code of Practice Section 5.4.5;

    a. An evaluation of stormwater run-off changes on upstream and downstream properties;
    b. Investigate downstream impacts including changes in flow peaks and patterns.

30. In the case of this proposal, I believe further consideration must be given to the ability of the downstream system to accommodate flow from the development up to the 50-year ARI event, and any changes in frequency or duration of flows that may negatively impact downstream properties if/when the downstream system cannot convey the flow from the site before being able to reach a conclusion as to whether there would be negative impacts associated with the proposal.
31. Ultimately, it may be that the downstream system (which may already be negatively impacted by events up to the 50-year ARI flow rate) would suffer these negative impacts for longer or more often than they otherwise would in the post development scenario relative to the pre-development scenario. Given the weight of evidence presented from the downstream and surrounding community on flooding issues, as well as knowledge of these issues from asset management and operational staff at Council, this matter warrants significant investigation before the concept can be considered as acceptable.
32. It may be argued that this detail can be worked through at either the subdivision consent or engineering approval stage. My view is that given the significance of the issues experienced in the wider area, further reassurance that these already negative effects will not be exacerbated is required at this stage, to confirm the viability of the proposal. If the current proposal is shown to have the potential to worsen the effects in the wider community, the amount of attenuation required may need to be greater, or there may need to be upgrades to the downstream system. Without knowing what additional mitigations may or may not be required, and at what scale, I cannot be confident in the overall viability based on the information available.

<u>Suitability of Site for Rain Gardens</u>

33. Rain gardens and bioscapes have been proposed as a primary method of treating runoff from the site. Given the height of the water table having been measured within 0.14m of ground level, the rain gardens are likely to be within the water table. This creates a risk of the rain gardens providing a point where the water table is intercepted. This could negatively impact on the treatment performance of the rain gardens, could introduce consenting challenges (as the design philosophy for the site proposes to avoid interception of groundwater), and could create downstream maintenance challenges if areas that are designed to be wet only when it is raining end up being frequently wet due to a constant flow of the intercepted groundwater passing through the downstream system.
34. The May 2016 Rain Garden Design, Construction and Maintenance Manual published by the Christchurch City Council (CCC) makes the following notes, which are relevant to this proposal;

> *"they are best avoided where available head is low (<300mm), groundwater is high….", and;*
>
> *"Rain gardens are not suited to areas with high groundwater as they may become waterlogged for long periods which could result in drowning of the plants and leaching nutrients into receiving waterways. Without specific design, the base of the rain garden (i.e. the bottom of the transition layer) for the non-submerged case should be at least 300 mm above the seasonally high groundwater level. For submerged rain gardens, the bottom of the transition layer should be above the seasonally high groundwater level. Typically, the seasonally high groundwater level needs to be at least 800 mm below ground for a site to be suitable for a rain garden"*
>
> *"Non permeable lining – lining is best avoided if possible. It reduces ground adsorption, increases risk of poor plant health if pockets of water above liner do not drain and increases risk of mature trees blowing over in wind if roots cannot anchor adequately".*

35. It has been acknowledged within the evidence provided (Mr. O'Neill, paragraph 10.1) that the Rain gardens may intercept the groundwater table, despite the CCC guidance provided recommending against this. To mitigate this, it has been proposed that they be fully lined, and constructed during the summer months (Mr. O'Neill, paragraph 28). This proposed mitigation is however reliant upon the lining remaining intact for the full design life of the systems and is not consistent with CCC's guidance.
36. My concern with this proposal is that there is a track record within the district of systems that are designed within the water table but planned to exclude groundwater not functioning as planned, with groundwater ultimately finding a way to enter the system during the design life of the system being constructed, therefore design intents that are reliant on this assumption are not being achieved.
37. This risk associated with designing gravity based drainage systems being susceptible to ingress of groundwater when constructed within the water table has been highlighted by Mr. McLeod (paragraph 17) within his evidence with respect to gravity wastewater systems. However, the same factors that present a risk of groundwater ingress for a gravity wastewater system, are also relevant for a gravity stormwater system, including for rain gardens and their associated pipework.
38. Reference has been made to the use of bioscapes by Christchurch City Council (Mr. O'Neill, paragraph 27). It was however unclear whether the examples referenced were installed with the same challenges as the proposed site in Ohoka, in particular with a high water table.
39. To understand this further, I enquired with Christchurch City Council engineering staff (Team Leader 3 Waters Asset Management[2]). The staff member I contacted was not aware of rain gardens that have already been installed within the water table, and raised some concerns. These concerns mirror mine and I have summarised them below:
    - The CCC staff member was not aware of rain gardens being installed within the water table. Without a track record of this method of treatment in similar ground conditions operating successfully, I consider this to represent a risk.
    - Uncertainty as to the practicality of the liner, due to the need to resist the hydrostatic forces of the groundwater from outside, in addition to the difficulties in

[2] Name can be provided upon request

not puncturing the liner when carrying out maintenance, including filter media replacement. This matches the guidance referenced earlier, where liners are not recommended.

- It was been noted that some Stormwater 360 Bioscape devices are being designed within the water table within the city (as also noted by Mr. O'Neill in paragraph 27), that are housed within concrete chambers. These are however not completed nor operating, so I do not consider this to provide satisfactory reassurance that this concept has a successful track record.

40. Based on the above, I do not think the rain garden / bioscape concept at a site with a high-water table is suitable, for the following reasons;

    a. The most applicable available guidance document recommends against them;
    b. The level of treatment achieved by the rain gardens may be compromised;
    c. This may provide a path for groundwater interception, which is intended to be avoided by this design proposal;
    d. Downstream infrastructure designed to be dry most of the time may instead have a constant flow of water through it, potentially creating maintenance issues;
    e. While the above could *theoretically* be avoided if groundwater can successfully be excluded as intended, there are numerous cases within our district where systems are designed within the water table with the intention of excluding groundwater, that later fail. Examples include lined stormwater basins within the groundwater table that are now operated as wet basins, and septic tank effluent pumping systems that let in high volumes of groundwater when levels are high, even though they are designed in concrete chambers designed to exclude groundwater getting in, or sewerage getting out. I note evidence has been provided by the applicant stating a challenge with a gravity sewer system is Inflow and Infiltration; it is not clear to me why this same concern does not apply to a concrete sealed stormwater system, which would be vulnerable to the same issues.
    f. A lack of clear evidence of systems such as these being successfully operated within the groundwater table (only in the process of being designed), hence assurances that they will function as intended appear to be theoretical only, rather than based on real world examples.

<u>Suitability of Outline Development Plan</u>

41. I have reviewed the Outline Development Plan (ODP) provided with this proposal, and have some concerns. These are primarily that;
    a. The Indicative Stormwater Management Areas (SMAs) are indicative only, with size and location to be confirmed later, and;
    b. There appears to be a Stormwater Conveyance Flow Path through private property.
    c. I cannot see any provision for a water supply headworks, or water supply bores.
42. With respect to the first point (SMAs indicative only), there are several concerns. My experience is that once ODPs are adopted, if the land set aside for SMAs is insufficient, and the applicant is then struggling to design an acceptable stormwater attenuation and treatment system that can operate within the SMA, compromises can end up being made on the final design to try to squeeze it in. This can occur in order to be consistent with the ODP, rather than potentially extending the area set aside for the SMA beyond that shown on the ODP, in order to have a final design that meets the required design expectations.

43. My concern with the ODP presented to support this proposal is that it does not appear that any efforts have been made to have the SMAs shown to the geometry or dimensions that would be required in reality. While I accept some degree of flexibility is required on the ODP (to allow for refinement at subdivision consent and engineering approval stage), efforts should still be made to have them reasonably accurate at the ODP stage. Therefore my view is that;
    a. The comment 'size and location to be confirmed' should remain, to allow refinement at a later stage, but;
    b. The areas shown currently should still be to the correct scale and geometry based on the concept design completed to support the current proposal, with an appropriate factor of safety allowance.
44. I make the following further comments with respect to point (b) in Paragraph 41 above. To the south end of the site, within the Large Lot Residential Zone (LLRZ), a Stormwater Conveyance Flow Path is shown throughout proposed residential lots, without any land proposed to be set aside for this path within the control of Council. I note that this is a significant flow path, with a medium flood hazard shown within the Council's Flood Hazard Model for the 1:200 year event.
45. Our experience is that where significant flow paths are directed through residential zones, the following can occur;
    a. Residents do not believe level of service expectations are being met when this water flows through their properties. Often they have activities on their properties that are negatively impacted by the overland flows, and they have an expectation that the Council remedy the situation. This is an existing issue within the wider area where many residents feel that their expectations of level of service are not being met, and one that cannot be easily addressed without setting aside the land for the overland flows at the subdivision stage. This would however ideally need to be supported by the ODP. It appears that this has been done for the two northern flow paths, but not for the southern one.
    b. Residents may inadvertently impede the flow paths within their land. This is far more common within residential zoning (including large lot residential) than with the current zoning than for rural zoned land. Residents may construct fences, sheds, landscaping or other impediments to the flowpath without understanding the consequences of doing so, which can have a significant impact upon themselves and the wider area. Inevitably this can result in service requests to the Council to remedy the situation, if flooding results. This can be extremely difficult when the issues are caused by activities within private property, however can be largely avoided by setting aside this land for the flowpath at the time of subdivision (supported by the ODP), such that residents do not have the ability to block significant flow paths within their land.

Attachment B

Attachment A – Joint Witness Statement from Plan Change 31 Process; Topic Groundwater and surface water issues and implications for stormwater management.

BEFORE THE HEARINGS PANEL
FOR PROPOSED PRIVATE PLAN CHANGE 31 TO THE WAIMAKARIRI DISTRICT PLAN

UNDER the Resource Management Act 1991 (RMA)

AND

IN THE MATTER of an Application by Rolleston Industrial Developments Limited for a private plan change to the Waimakariri District Plan pursuant to Part 2 of Schedule 1 of the Resource Management Act 1991

JOINT WITNESS STATEMENT

18 August 2023

Joint Witness Statement of Experts – Plan Change 31 to the Waimakariri District Plan

Topic: Groundwater and surface water issues and implications for stormwater management

Conferencing Dates: 10 August 2023 and 17 August 2023

Location: Waimakariri District Council, except Shane Bishop by remote video link

Scribe: Eoghan O'Neill of PDP Ltd.

Introduction

1. The following witnesses attended conferencing:
    a. Ben Wilkins (on behalf of Canterbury Regional Council).
    b. Callum Margetts (on behalf of Canterbury Regional Council).
    c. Ben Throssell (on behalf of Rolleston Industrial Developments Limited).
    d. Eoghan O'Neill (on behalf of Rolleston Industrial Developments Limited).
    e. Tim McLeod (on behalf of Rolleston Industrial Developments Limited).
    f. Carl Steffens (on behalf of Rolleston Industrial Developments Limited).
    g. Bas Veendrick (on behalf of Rolleston Industrial Developments Limited).
    h. Colin Roxburgh (on behalf of the Waimakariri District Council).
    i. Christopher Bacon (on behalf of the Waimakariri District Council).
    j. Shane Bishop (on behalf of the Waimakariri District Council).

Note that Mr Bishop attended the initial conferencing session on the 10th August via video conference on MS Teams but was unable to participate in the final conferencing session of the 17th August where the statement was drafted.

Environment Court Practice Note

2. It is confirmed that the signatories to this Joint Witness Statement (JWS) have read the Environment Court Practice Note 2023 Code of Conduct for expert witnesses and in particular Section 9 (Code of Conduct, Duty to the Court and Evidence of an expert witness) agreed to abide by them in the production of this Statement.

Experts' qualifications and experience

3. The qualifications of the experts are set out in their respective statements of evidence.

Key information sources relied on

4. The key information sources informing this JWS are:

    a. Evidence prepared by the experts who attended this conferenced with respect to the Plan Change 31 application.

    b. Appendix 1 - Supplementary Stormwater Information for Conferencing (provided to the expert panel on 17th August 2023).

    c. Appendix 2 - Additional modelling outputs provided to the expert panel on 17th August 2023

    d. Appendix 3 – Supplementary Water Supply Information for Conferencing.

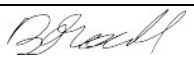
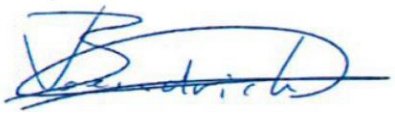
Questions for consideration

Agreed Statements of Conferencing Experts.			
Issues	**Key facts and Assumptions**	**Agreed Position**	**Disagreements**
Wastewater	Capacity existing for PC31 at Rangiora WWTP Site can be serviced with conventional gravity reticulation or pressure sewer reticulation, to be agreed with Council at subdivision stage. There is some temporary capacity available in the existing wastewater pressure main to service initial development stages of PC31. This number of lots is approximately 219 to 250 lots.	All experts agree that viable wastewater options are available for the site. There is some short-term capacity in the wastewater rising main from Bradleys Road to Rangiora WWTP. It is agreed that the plan change area could utilise this spare capacity for the initial stage(s), subject to agreement on the exact number of lots and timing of when the new rising main would need to be built. There would need to be a mechanism to ensure that the new rising main still gets built by the developer at an agreed time even if the full development area is never built out. This mechanism to be agreed by the Planners for Council and Applicant.	
Tidal Effect	The potential issue of tidal effects on flooding in Ohoka was raised by a number of submitters.	All experts agree that there is no tidal effect at the PC31 site	
Interception of Groundwater by Infrastructure and potential effects	Proposed infrastructure e.g. wastewater and stormwater pipe trenches, swales, raingardens/bioscapes, road subbase, have the potential to intercept seasonal high groundwater levels in parts of the site. This has the potential to divert groundwater via the trenches which could cause localised wet areas or ponding in low areas and divert water away from springs. There are mitigations, as described in evidence e.g. detailed groundwater investigation, low permeability trench material, water stops, buffer distance to springs etc, which will reduce the risk associated with interception of groundwater. In parts of the site swales may have the potential to intercept high groundwater, this could result in the base of the swale being wet which could create maintenance difficulties. In parts of the site the roading subbase may intercept the high groundwater table, which could affect the structural performance of the road. However, pavement construction methodologies are available such as stabilised pavements that can mitigate the effect of high groundwater. There is the potential for the raingardens and associated pipework to leak over the course of its operational life given installation is likely to be within the water table in parts of the development. Pipes are tested for water tightness at the time of construction however over years of operational life the seals can deteriorate and begin to leak. If this creates a baseflow to the detention basins there is the potential for them to become wet and boggy leading to maintenance issues. There are design solutions available which will be investigated and detailed at subdivision consent stage, e.g. linking basins bubble up inlet structure to the basin outlet structure, which are designed to manage flows associated with infiltration. Such flows, if they eventuate, would be extremely small relative to the design flows of the system.	All relevant experts (BW, BV) agree that the potential decrease in groundwater recharge contributing flow to springs due to an increase in impervious area is unlikely to be an issue. All relevant experts agree that the mitigation proposed in the ODP will reduce the risk for re-directing shallow groundwater. This includes the proposed detailed groundwater investigation, alternative design options of kerb and channel versus swale as appropriate, construction methodologies, buffer distances for springs and the groundwater seep, groundwater level monitoring and monitoring of spring flow and spring water levels. See disagreements column for clarification of expert's position on level of risk reduction. All relevant experts agree that the potential for re-directing shallow groundwater flow away from springs can be mitigated through appropriate design and construction of underground services trenches and roads where they may intercept shallow groundwater. See disagreements column for clarification of expert's position on level of risk reduction. All relevant experts agree that infiltration of groundwater into wastewater and stormwater pipe networks is endemic to all such networks and is not something that is managed by ECan as a water take requiring consent. .	In the view of some relevant experts (BV, TM) appropriate mitigation measures are available to ensure spring flows and water levels are not adversely affected. Measures can be further detailed when comprehensive groundwater level monitoring information across the site becomes available at subdivision consent stage. Other relevant experts (CR, CB) do not believe there is sufficient certainty that all risks are adequately mitigated and that the success of the mitigations will not be verified until after construction after which time negative impacts may be difficult to address or reverse. This applies to the concerns raised in the Summary Evidence of Mr. Roxburgh with respect to the rain gardens and downstream stormwater basins, the roadside swales, the road subbase, and infrastructure trenches intercepting shallow groundwater, with the original concerns remaining unchanged in the view of Mr. Roxburgh. Despite the disagreement above, all four relevant experts agree that, if a consenting pathway provides for the installation and operation of subsoil drainage at the site prior to subdivision consent approval and development, this would provide greater certainty as to the effectiveness of the mitigations. Mr Roxburgh notes that subsoil drainage is not part of the current proposal due to the potential consenting barrier associated with systems designed to intercept shallow groundwater.

Stormwater Attenuation and ensure no increase in downstream stormwater flows.	Stormwater detention can be provided at the site with basins being constructed at existing ground level to ensure no interception of groundwater. It is likely that, in parts of the site, basins could be excavated 200mm or more below existing ground level. There is a portion of the PC31 site that cannot flow into attenuation ponds, the developable area which cannot drain to a pond is approximately 26 Ha. Assuming this area is developed and not attenuated, in order to achieve hydraulic neutrality across the site the outflow from the other basins is proposed to be managed/reduced to compensate for the increased runoff from the unattenuated area. The total detention volume required to facilitate this has been calculated at 26,464 m^3 but would be considered to be generally within a range of approximately 15,000 to 30,000 m^3 of storage.	All experts agree that 126 Ha of the PC31 site can be managed for stormwater with treatment and detention able to be achieved. All experts agree the approximately 26 Ha of the site, generally along the Whites Rd boundary, can be adequately treated but cannot drain to an attenuation basin, subject to fall being achieved from treatment outlets into the Whites Road drain. All experts, except for Mr Roxburgh, agree that the outflow from the attenuated area basins can be managed to ensure hydraulic neutrality is achieved across the site. All experts agree that the total detention volumes estimated for the site are with a reasonable range of certainty that would be expected at Plan Change Stage. All experts agree that subdivision stage is appropriate for demonstrating a detailed development plan for the site with associated stormwater management solutions. If some areas of the site cannot be demonstrated to be able to be appropriately mitigated to ensure hydraulic neutrality up to the 50-year event, they will not get approval to process at subdivision stage, and development in these unattenuated areas would need to be reduced until it can be demonstrated that neutrality can be achieved.	Mr. Roxburgh maintained the position stated in summary evidence that the concept of unattenuated areas of the development discharging into a receiving environment that is vulnerable to any increase in flood risk introduces an unacceptable level of risk , and would only find the above ground basin concept acceptable if there was assurance that if it cannot be adequately demonstrated at a later stage that there is no increase in flood risk as a result of the unattenuated areas for all scenarios, the unattenuated areas either wouldn't be developed, or that the level of development would be reduced to a point that neutrality can be demonstrated to the satisfaction of Council. Mr Roxburgh is not satisfied at this point that all runoff from the unattenuated area would be able to be adequately treated by rain gardens, as further work is required to show that there is sufficient fall from the design level of the rain garden outlet into the Whites Road drain for the 26 Ha at the bottom end of the site, and similar to the above would only be satisfied from a treatment perspective if there were similar assurances that if at subdivision stage there are some areas of the site where treatment cannot be achieved, that the level of development would be reduced such that all areas could receive treatment. Some experts (EON, TM, BT) disagree with Mr Roxburgh that the concept of having a small area of the site being unattenuated (26.4 Ha) presents an unacceptable level of risk. The proposed unattenuated area is relatively small, approximately 17% of the overall site, the stormwater design will seek to achieve hydraulic neutrality through management of the outflow from the other basins to compensate for the increased runoff from the unattenuated area At subdivision stage, the stormwater concept will be developed and tested in detail to ensure the risk of increasing downstream flows in minor events is adequately mitigated. If the effects of development of some smaller portions of the unattenuated area cannot be appropriately mitigated, these can be developed to a lower density, or not at all, so that overall hydraulic neutrality is ensured.
Water Supply	The preferred source of water for the PC31 site is an onsite deep supply. Additional modelling has demonstrated that this is likely to be a viable option with a reasonable spaced well field. The proposed supply may provide additional redundancy for the existing Ohoka township supply.	All relevant experts agree that there is an adequate solution available to supply the PC31 site with potable water from deep onsite groundwater.	Mr Roxburgh believes there has been insufficient analysis of the shallow groundwater or offsite deep groundwater options for these options to be accepted by WDC without further analysis.
Flooding	Proposed residential dwellings and detention basin locations have the potential to influence flow of flood water across the site and affect flood levels off site.	All relevant experts agree that it is possible to develop PC31 to limit offsite effects from the 0.5% AEP flood event to increases in flooding of less than 20 mm for habitable dwellings. Waimakariri District Council staff consider this increase to be less than minor.	CM Considers that there is some residual uncertainty regarding offsite effects for smaller, more frequent flood events, however there is an

	The proposed detention basins and residential areas have been modelled to capture any changes in off-site effects.		appropriate level of confidence that the Plan Chage can proceed and that there are controls available through subdivision consenting phase to address these uncertainties.
Groundwater Flow (called groundwater resurgence by submitters)	Concerns have been raised that groundwater changes as a result of PC31 development could influence groundwater levels locally or could increase spring flows and impact on flooding.	All relevant experts agree that the baseflow component (groundwater component) of flow to streams is a very small percentage of flow during flood events and therefore won't have a significant impact on flooding. Groundwater emerges in stream channels and local springs but there are natural limits on the extent to which groundwater will rise because of natural discharges to these features. All relevant experts (CS, TM, BT, BW, CM, BV) agree that if the mitigations proposed for management of intercepted groundwater by infrastructure are successful then it is unlikely there will be offsite effects due to changes in groundwater flows. All relevant experts agree that in a 200-year flood event ground water flows are unlikely to have a significant impact on the difference of flood levels pre and post development.	CM and BW consider there is still some residual uncertainty regarding the offsite effects, however there is an appropriate level of confidence that the Plan Chage can proceed and that there are controls available through the subdivision consenting phase to address these uncertainties.

Signed

Witness	**Signature**	**Date**
Ben Throssell		**18/Aug/2023**
Callum Margetts		**18/Aug/2023**
Eoghan O'Neill		**18/08/2023**
Christopher Bacon		**18/08/2023**
Tim McLeod		**18/08/2023**
Ben Wilkins		**18/08/2023**
Shane Bishop		**18/08/2023**
Carl Steffens		**18/08/2023**
Colin Roxburgh		**18/08/2023**
Bas Veendrick		**18/08/2023**

Appendices

Appendix 1 - Supplementary Stormwater Information for Conferencing (provided to the expert panel on 17th August 2023).

Appendix 2 - Additional modelling outputs provided to the expert panel on 17th August 2023

Appendix 3 – Supplementary Water Supply Information for Conferencing.

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Christchurch Invercargill

memorandum

TO	PC31 Conferencing Experts	FROM	Eoghan O'Neill
		DATE	17/08/2023
RE	Proposed Private Land Plan Change Request 31 – Responses to WDC Comments		

The purpose of this memo is to document initial responses to the *Summary Statement on Water, Wastewater, and Stormwater Relating to Private Plan Change Request PPCR31 – 535 Mill Road, Ohoka Plan Change Application (08 August 2023*) as received from Waimakiriri District Council (WDC). This memo only addresses concerns and queries raised by WDC for the stormwater component.

Paragraph 46,47 & 48 – concern raised about difference in attenuation calculated and the areas needed. The second part of the concern raised regarding the attenuation volume required for longer events and if PDP considered a range of duration (i.e., the 18hr duration).

Response:

The attenuation volume of 55,950 m^3 as reported in the Stormwater Management Report has been updated and the 2% AEP attenuation volume of 21,990 m^3 quoted in the evidence is correct. The change is as a result of:

- The 21,990 m^3 is the combined attenuation required for the individual catchment (4 off) for their respective catchment peak event (2% EAP rainfall event).
- The 55,980 m^3 was determined using the rational method for a time of concentration of 6 hrs for the pre-development catchment which was used to represent the total contributing catchment critical duration which is 6hrs. The post-development catchment time of concentration was much quicker (approx. 1.5hrs) for the catchment. This resulted in a very low pre-development flow to be attenuated for resulting in the overly conservative attenuation volume of 55,980 m^3.The critical duration for attenuation using this approach would be approx. 12 hrs.

The method used to calculate the 55,980 m^3 is further not applicable in this instance as the infiltration rate within the catchment changes (i.e., the initial abstraction rate reduces from 6 mm/hr to 1 mm/hr during long events) and results in larger pre-development flows during long duration storms (i.e., 6 hrs event). The rational method does not account for this as the runoff coefficient is assumed to remain constant (i.e., the run-off coefficient did not increase due to a reduction in soil infiltration rates).

The WDC District Model was used to test what the 2% AEP volume difference at the outflow from the site would be during a 6-hr event. The estimated change in volume was approximately 10,000 m^3. This is less than the 21,900 m^3 calculated at when the concept was revised and therefor the basins were sized based on the 21,990 m^3 attenuation volume requirement which is still considered to be conservative.

Paragraph 41, 42 & 43 – concerns were raised about areas of the development that will not be serviced by proposed basins and whether the basins are appropriately sized and located.

Response:

Approach to answer this was to consider the existing site contours, the proposed site (road) layout, and where flows would be reasonably expected to be able to divert towards the proposed basins. See **Attachment 1 and Attachment 2** which provide proof of concept long sections for the lower basins in Catchments C1 and C2.

The total area that can drain to basins is approx. 126.4 ha and the area which cannot drain to a basin is approx. 26.4 ha. The area that cannot feasibly drain towards the proposed basins is along Whites Road and the corridor width ranges from 150 m in the south to 220 m towards the north (Ohoka end). It should be noted that a significant proportion, approx. 10 Ha, of this 26.4 Ha will not be subject to increased impervious development due to the protection of key flow paths, the allowance for a large riparian strip along Whites Rd and the presence of stormwater detention basins. For the sake of conservatism, the full 26.4 Ha has been used as unattenuated area in this assessment.

The second part of the concern raised was the potential impact of the unattenuated flows on the downstream catchment. Based on the areas identified above which cannot drain to the basins, the expected post-development peak runoff has been calculated using the rational method. See Table 2 below. These flows have been subtracted from the pre-development flows (Table 1) to provide an allowable attenuated outflow for each catchment. Based on this outflow, revised basin attenuation volumes have been calculated Table 3. Based on topographic information, this volume has been distributed across a number of basins, See **Attachment 3**. These basin locations have been run through the flood model and the outputs are within the parameters discussed in the evidence of Ben Throssell.

Table 1: Pre-Development Catchment Flows

Catchment	C-Coeff	Area (Ha)	Tc (min)	2% AEP Flows (m^3/s)
1	0.35	30.68	85	0.88
2	0.35	54.16	43	2.27
3	0.35	51.1925	36	2.41
4	0.35	16.7678	40	0.74
Total		**152.8**		**6.29**

Table 2: Post-Development Catchment Flows					
Catchment	**C-Coeff**	**Total Catchment Area (Ha)**	**Unattenuated Area (Ha)**	**Catchment Tc (min)**	**Unattenuated 2% AEP Flows (m^3/s)**
1	0.69	40.9	4.4	33	0.44
2	0.70	43.6	4.9	30	0.50
3	0.50	61.7	16.2	26	1.16
4	0.78	6.6	0.9	10	0.19
Total		**152.8**	**26.4**		**2.29**

Table 3: Attenuation Volumes				
Catchment	**C-Coeff**	**Attenuated Area (Ha)**	**Max Outflow (m^3/s)**	**Catchment Attenuation Volume (m^3)**
1	0.69	36.52	0.44	16,547
2	0.70	38.75	1.78	4,527
3	0.50	45.43	1.24	4,861
4	0.78	5.70	0.55	530
Total		**126.4**	**4.0**	**26,464**

Prepared by

Eoghan O'Neill
Technical Director – Water Infrastructure

Attachments

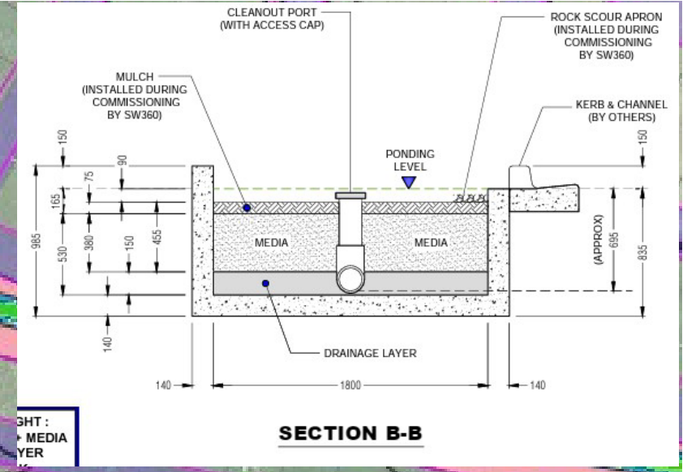
Attachment 1 - Long section_Example 1

Attachment 2 - Long section_Example 2

Attachment 3 - Catchment & Basin Layout

Catchment Attenuation Volume Calculations

Catchment C1 Example



Attenuation capturing upstream (volume - 2,800m3)

150m

60m

Attenuation capturing upstream (volume - 7,350 m3)

Larger attenuation extending towards White Road shown.

1836

Attenuation capturing upstream (volume - 3,600m3)

90 m

220 m

Length of road that will not be treated by raingarden, can be treated by Swale

Attenuation 2,200m3

100 m

6087

100 m

Last raingarden location

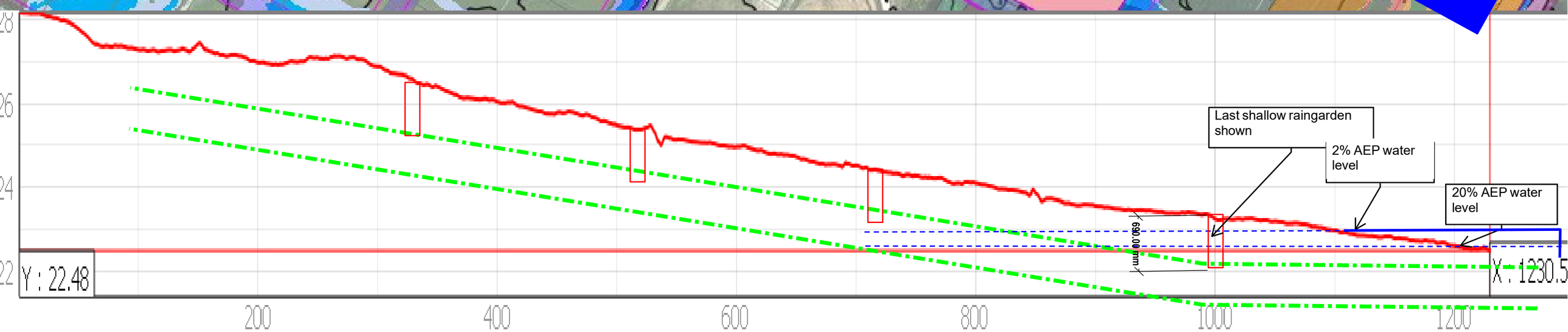
2966

2990

90 m

135 m

5788



Catchment C2 Example

Area draining towards upstream attenuation basin

Attenuation upstream shown including area that will drain to attenuation (approx. 2,000 m3)

Attenuation upstream shown including area that will drain to attenuation (approx. 1,900 m3)

Furtherest downstream basin (approx. 700 m3)

Furtherest downstream basin (approx. 900 m3)

Last raingarden location

Length of road that will not be treated by rain garden- can be treated by swale

40m

250m

40m

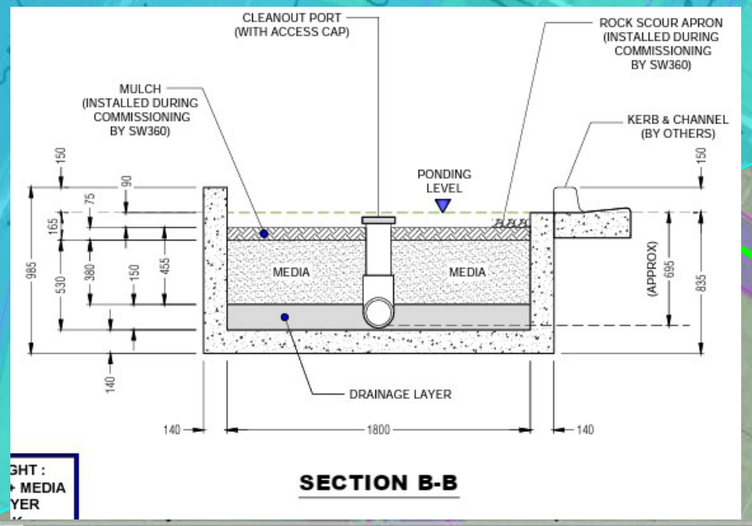
250m

130m

40m

45m

150m



SECTION B-B

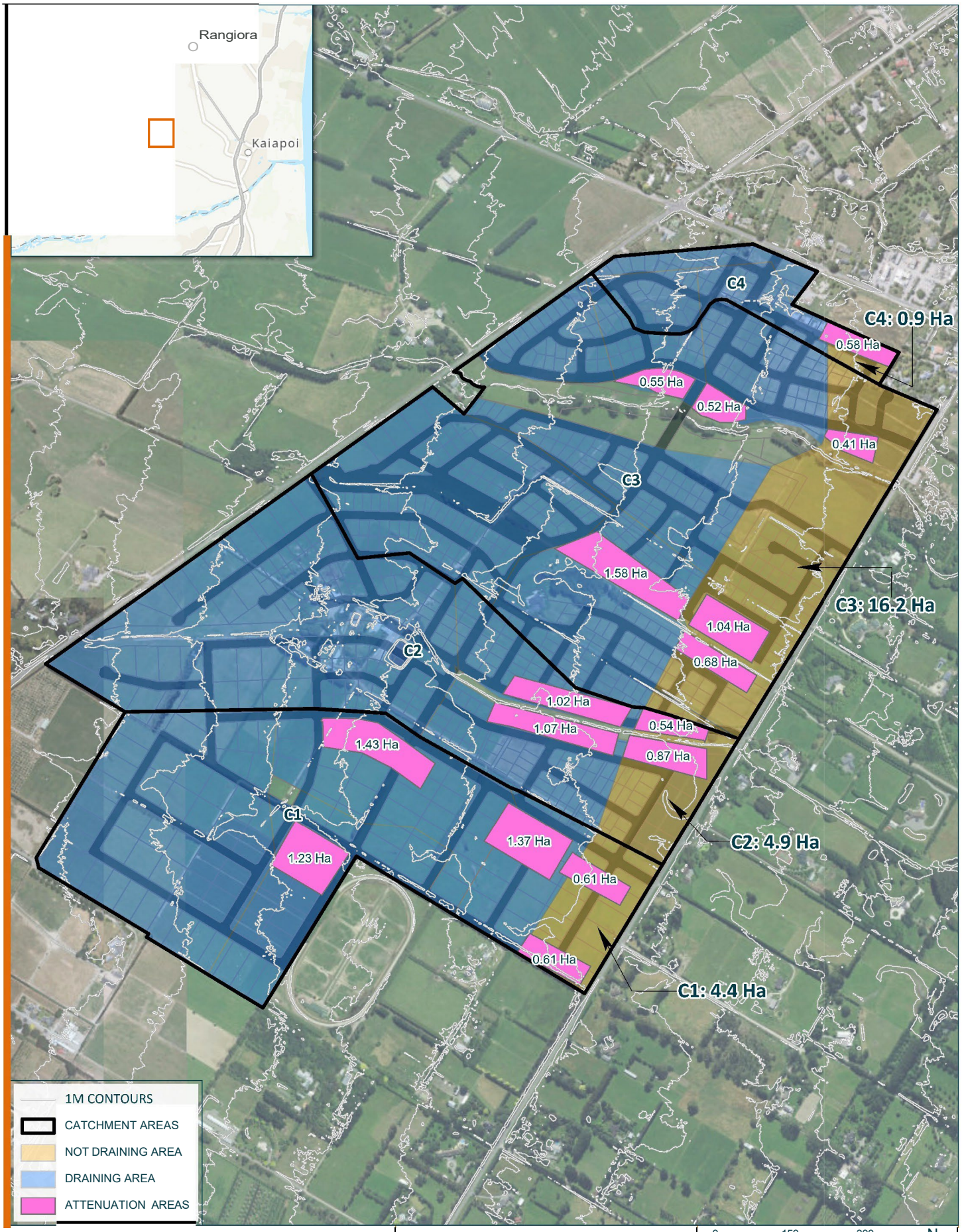


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FIGURE 1: ATTENUATION AREAS AND BASIN LOCATIONS

OHOKA STORMWATER INVESTIGATION

SOURCE:
1. AERIAL IMAGERY: EAGLE TECHNOLOGY, LINZ, STATSNZ, NIWA, NATURAL EARTH,© OPENSTREETMAP CONTRIBUTORS., EAGLE TECHNOLOGY, LAND INFORMATION NEW ZEALAND, EAGLE TECHNOLOGY, LAND INFORMATION NEW ZEALAND, GEBCO, COMMUNITY MAPS CONTRIBUTORS.

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REVISION: 001 | DATE: AUG 23 | BY:CB
CLIENT: ROLLESTON INDUSTRIAL DEVELOPMENTS LTD

Figure1

Orbite Drive
Keetly Place
Mill Road
Bradleys Road
Kintyre Lane
Wilson Drive
Threlkelds Road
Whites Road
Birchdale Place
Jacksons Road

MODEL EXTENT
REVISED PROPOSED DEVELOPMENT LAYOUT
STORMWATER BASINS
LINZ BUILDING FOOTPRINTS

DIFFERENCES IN FLOOD ELEVATION

≤ -500 mm
-500 mm to -300 mm
-300 mm to -10 mm
-10 mm to 10 mm
10 mm to 20 mm
20 mm to 30 mm
30 mm to 50 mm
50 mm to 100 mm
> 100 mm

AREAS BETWEEN -10 mm AND 10 mm ARE TRANSPARENT (NOT SHOWN)

pdp

FIGURE 1: DIFFERENCES IN FLOOD ELEVATION FOR THE 200YR EVENT

OHOKA PLAN CHANGE

SOURCE:
1. AERIAL IMAGERY: EAGLE TECHNOLOGY, LAND INFORMATION NEW ZEALAND, GEBCO, COMMUNITY MAPS CONTRIBUTORS.
2. ROAD INFORMATION DERIVED FROM LINZ.
3. BUILDING FOOTPRINTS DERIVED FROM LINZ.

0 250 500
Meters
SCALE : 1:10,000 (A3)

N

REVISION: 01 | DATE: AUG 23 | BY: JR
CLIENT: ROLLESTON INDUSTRIAL DEVELOPMENTS LIMITED

C04518300_GIS006

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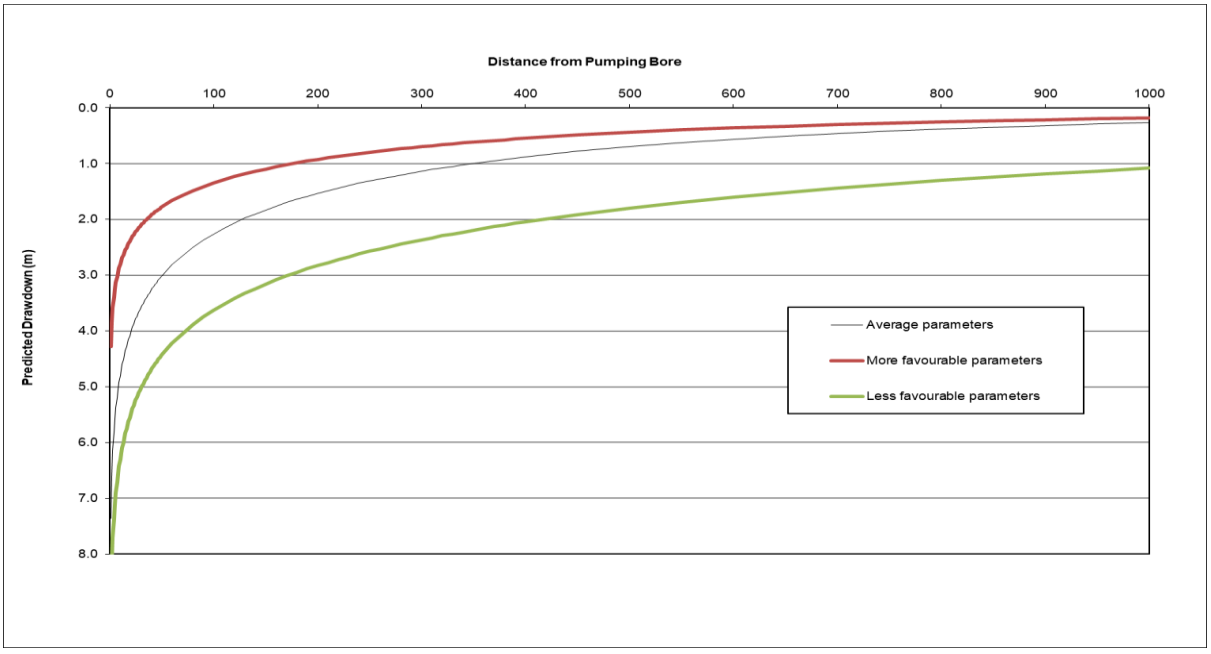
memorandum

TO	PC31 Conferencing Experts	FROM	Carl Steffens
	Client Company Name	DATE	18/08/2023
RE	Proposed Private Plan Change Request 31 – Response to WDC		

The purpose of this memo is to address potential Water Supply issues raised by Mr Colin Roxburgh (WDC) at the PC31 expert conferencing session held at WDC on 10 August 2023.

With regard to the preferred deep onsite water supply option, Mr Roxburgh had potential concerns regarding uncertainty in the number of bores that may be required, and how spaced out they may need to be if aquifer parameters proved be different (larger predicted drawdown effects) than the parameters used by PDP for preliminary well interference modelling. The specific concern of Mr Roxburgh is that if there is an excessive number of bores required, or they were excessively far apart, the supply may be uneconomic for the council to take over and operate.

Based on Mr Roxburgh's concerns, Mr Steffens has carried out further work to clarify these issues. The drawdown interference modelling described in Mr Steffens evidence was based on adopting the average aquifer parameters from previous constant rate pump testing (December 2015) in existing Ohoka deep supply bore BW24/0262. Based on those adopted values (in addition to more favourable and less favourable aquifer parameter scenarios), Mr Steffens has carried out further assessment to show the potential drawdown profile in the deep aquifer with distance from a single individual proposed pumping bore. The resulting figure is shown below and was presented at the meeting of the experts on 17/08/2023.



The drawdown profiles presented are based on abstraction from a single bore continuously at 9.3 L/s for a 150 day period. This rate represents a third of the proposed daily volume limit (2,412 m^3/day, equivalent to continuous pumping for 24 hours at 27.9 L/s). Therefore, the full daily volume limit under this scenario would be provided by 3 bores as per the evidence previously presented by Mr Steffens at the hearing (with an additional bore required to be drilled for redundancy).

To estimate the total potential drawdown effect in an individual neighbouring bore based on this assessment firstly requires determination of the distance between the neighbouring bore and each of the three proposed pumping bores, secondly, reading off the calculated drawdown based on the distance between the neighbouring bore and each individual proposed supply bore, and thirdly, summing of the three separate predicted drawdown values.

For example, if one proposed supply bore was located 400 m from existing supply bore **B**X24/0262, one supply bore was 500 m from BX24/0262 and the remaining bore was 600 m distant, the drawdown interference in BX24/0262 based on the average pump test parameters (black profile line in the figure) would be the sum of 0.88 m (400 m distant), 0.7 m (500 m distant) and 0.56 (600 m distant). That results in a total drawdown effect in BX24/0262 of 2.14 m. Based on that spacing from BX24/0262, it should be possible to position all three proposed bores north of the Ohoka River within the proposed PC31 area, while also maintaining similar spacing between all three of the proposed bores.

The analysis of the step-drawdown testing previously carried out in BX24/0262 (June 2015) predicts self-induced drawdown of 61.4 m in the bore based on 150 days of continuous operation at 12.8 L/s. Under summer groundwater level conditions previously predicted by PDP, this leaves around 10 m of available drawdown in the bore which is more than sufficient to accommodate the 2.14 m drawdown interference effect predicted from the operation of three proposed supply bores. This assessment is conservative in terms of pumping rates because in reality it is not expected that the proposed supply will use the required daily volume limit continuously for 150 days, or that the existing bore will operate at it's consented maximum rate for the same period.

Therefore, if the average aquifer parameters adopted from the previous constant rate testing prove to be applicable, a potential average bore spacing of around 500 m is considered appropriate for a total of three supply bores, while ensuring no adverse operational drawdown interference effects in BX24/0262 (or the new supply bores).

If more favourable parameters (such as those indicated by the red profile shown in the figure) were to be derived during testing of the proposed bores, the effects would be less and therefore three supply bores would still be viable with similar or less spacing between bores.

The green profile line shown in the figure shows less favourable aquifer parameters. This level of effect is based on the most conservative representation of the results from the previous constant rate pump testing in BX24/0262. The total drawdown interference in BX24/0262 from three proposed bores operating under the same conditions as the previous assessment (same separation distances, rates and pumping duration) would be 5.4 m. This is a considerable amount of drawdown interference, however there would still be around 4 m of available drawdown remaining in BX24/0262 under this scenario during predicted summer groundwater level conditions (even considering the overly conservative pumping rates and duration adopted for the assessment). If testing of new bores showed this scale of interference, then consideration could be given to additional supply bores and/or spacing to manage the potential effects.

If four or more supply bores ended up being required (+ 1 for redundancy), then a larger area would be required, although it should be feasible that all supply bores could be sited within less than half of the total subdivision area.

In summary, at this stage it can't be confirmed how many bores will be required, however the initial and additional assessments carried out by PDP confirm that a deep supply option is viable. If a greater number of bores were required than anticipated it is important to note that the applicant will be covering all costs related to the drilling and infrastructure construction relating to the proposed water supply.

Prepared by

Carl Steffens
Technical Director – Water Resources

WAIMAKARIRI DISTRICT COUNCIL

MEMO

FILE NO AND TRIM NO:	DDS-14-13-02 / 240510075250
DATE:	10 May 2024
MEMO TO:	Andrew Willis, Contract Planner
FROM:	Chris Bacon, Network Planning Team Leader
SUBJECT:	Proposed District Plan Rezoning Requests Stream 12D – Flooding Advice

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Introduction

1. I have reviewed the evidence presented for Flooding by Mr Throssell.
2. I note that the concept presented has not materially differed from that presented as part of the Private Plan Change 31 (PC31) Proposal, and I refer to my evidence submitted as part of that process for a detailed assessment of the proposal.
3. I have provided a summary of the PC31 evidence in the following paragraphs including additional comments where new evidence has been provided.

Methodology and Modelling

4. I have reviewed the methodology and assumptions used to create the PDP flood model. I had previously raised concerns during the PC31 hearings process that the proposed raised flood attenuation areas had not been adequately accounted for in the model. These concerns were subsequently allayed as part of the expert witnessing process and I am now satisfied that the PDP model is fit for purpose.

WDC District Wide Model

5. I have reservations regarding the model validation undertaken by Mr Throssell using a flood frequency analysis of the Ohoka Stream undertaken by Tonkin and Taylor in 2017. The model validation does not account for spill over from the Cust river in extreme flood events and is covered in more detail in my PC31 evidence.
6. I do however agree with Mr Throssell that the WDC Model is likely conservative for the 200 year and 500 year events and I consider the model outputs from the WDC Model to be suitable for use as inputs into the PDP model.

Model Results

7. I agree with Mr Throssell that conveyance of floodwaters through the site is the main issue with regards to flood management and mitigating effects from flooding during large flood events.

Effects on Freeboard

8. I agree with Mr Throssell's assessment that there is likely to be no change or impact on the compliance with recommended freeboard requirements for existing dwellings downstream of

the proposed development. However, I note that further work may be required as part of a Resource Consent process to confirm this.

Effects on Flood Levels

9. I note that the PDP model shows the flood effects from the development in the 200 year ARI event to be less than 20mm across all habitable dwellings with only two non-habitable sheds showing an increase greater than 20mm (24mm and 28mm).
10. I agree with Mr Throssell that these effects are less than minor.
11. I note that further modelling will be required at the detailed design phase to confirm these effects are still less than minor with the final subdivision surface.

Development in the Waimakariri District from a Flood Risk Perspective

12. I generally agree with the statements made by Mr Throssell regarding the need to avoid development in high hazard areas.
13. I note that the recently released guidance from the Ministry for the Environment (MfE) has updated sea level rise predictions for the country and this is now much greater than the previous recommended values. I note that for the Waimakariri District the relative sea level rise is in the order of 2.0m for the SSP-8.5H+ scenario which is the scenario MfE recommends is used for greenfield developments.
14. I note that current planning assessments in the coastal area of the Waimakariri District have adopted a 1.0m sea level rise based on the Coastal Inundation work undertaken by Jacobs in 2020.
15. I also note that Jacobs did consider a 1.88m sea level rise scenario based on the RCP8.5+ 130 year scenario for the purpose of sensitivity testing.
16. I consider the updated guidance may have an impact on new infill development in the coastal areas of the Waimakariri District however without undertaking an updated Coastal Inundation Assessment it is unclear what impact the new guidance will have on proposed greenfield development in the coastal areas of the district.

Attachment D

WAIMAKARIRI DISTRICT COUNCIL

MEMO

FILE NO AND TRIM NO:	DDS-14-13-03 / 240509074220
DATE:	9 May 2024
MEMO TO:	Andrew Willis, Contract Planner
FROM:	Jon Read, Greenspace & Community Facilities Planner
SUBJECT:	Proposed District Plan Rezoning Requests Stream 12D – Green Space – 535 Mill Road, Ohoka

I write to summarise the issues that relate to green space that in my professional opinion, affect the ability for 535 Mill Road to be rezoned. I note that this requested re-zoning is very similar to that requested through PC31. For completeness, I did not provide evidence on PC31 (no Council Greenspace evidence was provided).

Neighbourhood Park Provision

The Waimakariri District Council *Park Categories and Levels of Service* document guides the provision of community green space. The proposed number of residential lots (850) and associated population increase (approx. 2125) triggers a requirement to provide community neighbourhood parks. These deliver green open space designed to serve as a destination for community recreation, interaction, and well-being. Provision of these key sites is additional to any green linkage and esplanade reserve provision. Stormwater Management Areas are also separate from this.

Council's guideline requirement is that most residents be within a 500m radius or 10-minute walk of a neighbourhood park, with no significant barriers to impede this access. To account for density, the guideline also specifies one hectare of neighbourhood park land per 1000 residents. This equates to approximately two hectares of this category of park space within the proposed ODP area. This is more than double the combined size (0.9188ha) of the three pocket parks currently proposed. One of these parks also appears to incorporate a stormwater management function. Under Council levels of service, stormwater facilities should not occupy part of the predominantly flat well-drained land required for a neighbourhood park. Considering the above points, the size and location of required neighbourhood park land should be re-evaluated. Where feasible, the differing sites (Parks, SMAs, Linkages) should still be sympathetically aligned and connected to support the wider design and amenity objectives of the plan change.

Overall, the provision of three neighbourhood parks is sufficient to fully meet community access requirements for residents within the proposed ODP area. Their precise size and location should account for any variations in the layout and density of the surrounding residential catchments. This suggests that the central and northern portions of the development are more critical; with the proviso that all residential lots should be within or at the margin of accessibility requirements. The park proposed to be located under transmission lines at the Bradleys Road boundary is not well positioned for wider community access and use. Increasing its size and locating it closer to the spine road, stream corridor and primary walking and cycling route, will improve its accessibility and amenity. Pylon and transmission line constraints can be mitigated by other means.

If the extensive private polo facilities do not go ahead, the alternative version of the ODP indicates this will add another 100 lots (approx. 250 residents). The requisite increase in neighbourhood

park space should be accounted for and shown on this version of the ODP. The polo associated public horse trail is an activity that Waimakariri District Council could support if it can be recreated in a viable form.

Ohoka Domain is a well-established community reserve catering primarily for residents of the surrounding village, approved semi-rural growth areas, and the wider rural area. It will be a destination of value to potential future residents of the proposed plan change site, but it has no role in offsetting local neighbourhood park requirements triggered within the plan change area. This principle also applies to any school playing fields developed.

Recreation and Ecological Linkages

The proposed off-road green linkage network can add significant value to community connectivity and integration via non-motorised movement corridors. Associated benefits include riparian stream enhancements and the potential for wider network integration with the development's neighbourhood parks. The central branch of the Ohoka Stream has a District Plan requirement for full 20 metre esplanade reserve provision in the event of residential subdivision.

Waimakariri District Council's *Draft Natural Environment Strategy* advocates indigenous restoration and revegetation of waterways and other habitats within both rural and residential zones.

Proposed Commercial Area – Village Square / Civic Space

The proposal to create a village square or civic space as part of the commercial area exceeds Council levels of service for assets to be vested in Council. There is scope for amenity trees and landscaping within a pedestrianised road corridor or green linkage. Alternatively, additional amenity can be created via privately owned assets such as frontages, courtyards, entrances and parking areas.

Street Trees

Waimakariri District Council levels of service require street trees to be provided in residential areas, but not in Rural Lifestyle zones or most Large Lot Residential zones. The final mix of Council and resident landscape treatments along road boundaries will need to be formally confirmed at subdivision stage if the proposed plan change rezoning is ultimately approved.

Conclusion

In my opinion, should the rezoning proceed, an amended ODP is required that responds to my concerns raised in this memo.