Before the Independent Commissioners appointed by the Waimakariri District Council

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

Summary of evidence of Nick Keenan on behalf of Oxford-Ōhoka Community Board – Stormwater Management

Dated: 2 July 2024

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Proposed Waimakariri District Plan - Hearing Stream 12

Summary of Evidence of Nick Keenan on behalf of on behalf of Oxford-Ōhoka Community Board – Stormwater Management

Introduction

1. My full name is Nicholas John Keenan. My qualifications and experience are as set out in my evidence dated 13th June 2024.

2. The purpose of my summary evidence is to provide technical advice on the Oxford-Ōhoka Community Boards further submission with regards to stormwater management only, in relation to the submissions by Rolleston Industrial Developments Ltd (submission 160) and Carter Group Property Ltd (submission 237) to the Proposed Waimakariri District Plan (PDP).

Summary of Evidence

3. Seasonal groundwater level data on the site would be useful in understanding the groundwater regime on the site.

4. The principle of flood storage attenuation volumes to offset land development intensification is supported to provide a net discharge-neutral drainage.

5. The principle of over-attenuation in parts of the development to offset non-attenuated areas is supported.

6. The increased runoff volumes from the site may produce adverse downstream effects in areas (properties) that rely on localised storage volumes to manage flooding. Depending on timing of runoff hydrographs from the site and durations of critical event, this cannot be calculated or assessed without a 2D hydraulic flood model and a range (sensitivity) of rainfall scenarios.

7. The level of complexity and level tolerances of engineering design and construction for this site would be higher than normal subdivision development due to the constraints of high groundwater table and freeboard to floor levels. This may impact on the commercial practicality of the site.

8. More engineering and drainage detail, and a description of the stormwater management strategy, is likely needed to allow Council to assess the development risks and downstream effects.

9. Given the shallow surface gradient across the site, a stormwater treatment approach that requires approximately 1.2m head loss to work and relies on an impermeable lining as a barrier to high groundwater table levels, may not be appropriate. Other stormwater treatment approaches could be considered that are shallow or less affected by ground water.

10. I am not clear as to the extent earthworks is proposed to solve hydraulic difference issues, but note that the site does have a 1:200 general gradient to work with

11. Freeboard between design flood levels and floor levels will need to be maintained in the development stages and refer to a dynamic 2D hydraulic model to account for stormwater flowpaths and volumes on site.

Response to Further Supplementary Evidence of Eoghan O'Neill (25 June 2024)

Groundwater Information

12. I understand that piezometers are now installed covering the subdivision to gain understanding of groundwater table levels over a period of time.

13. Given the area covers an historic floodplain, the monitoring should also include identifying potential springs and buried gravel stream-beds that could generate strong ground water flows during or after rainfall.

Flood Storage Attenuation Volumes

14. With regard to the use and function of flood storage basins, my point was that a higher-attention-to-detail would be required to construct and operate them long term. Given they are mainly on the surface and shallow means that the basin footprint areas will be larger, and this loss of developable area will need to be factored into the economics of development.

15. With regard to controlling flows to below pre-development levels, and managing larger runoff volumes due to land use change, the flood volume would need to work its way downstream through existing

systems towards Kaiapoi. This would be calculated from a 2D dynamic model of the wider area and assessed under a range of flood events (return period and duration).

16. The downstream effects will also likely occur on a more frequent basis (for example: 1 in 10 or 1in 50 year return periods) and these events may cause deeper, more frequent and longer ponding volumes, or more wear and tear erosive flows on existing channels or culvert/bridge structures.

17. I confirm that I have not seen modelling evidence of Mr Throssell and only reviewed a summary plan of the 1 in 200 flood elevation differences contained in Eoghan O'Neill, PDP, memo, responses to WDC comments, 17/08/2023. Therefore, I cannot comment further on the modelled effects downstream which are up to 50mm elevation change.

Engineering Design and Construction Control

18. With regards to tolerances and construction controls, my point was that careful control of freeboard to house floor levels, interaction of primary buried drainage with surface storage, and overland flow paths, would be needed.

Suitability of Site for Raingardens

19. With regards to raingardens and biofilters at a depth that intersects with a shallow groundwater table, these devices require a head loss through them to function – if the groundwater table is particularly shallow, this negatively affects the available head loss.

20. With regards to gross pollutant traps – my intention was that they would be used with larger biofilters and not raingarden/tree pits.

Additional Comments and Discussion

21. I confirm that I have not seen modelling evidence of Mr Throssell and only reviewed a summary plan of the 1 in 200 flood elevation differences contained in Eoghan O'Neill, PDP, memo, responses to WDC comments, 17/08/2023.

Date: 02 July 2024

Nick Keenan