Before an Independent Hearings Panel
Appointed by Waimakariri District Council

under: the Resource Management Act 1991

in the matter of: Submissions and further submissions on the Proposed Waimakariri District Plan

and: Hearing Stream 12D: Ōhoka rezoning request

and: **Carter Group Property Limited**
(Submitter 237)

and: **Rolleston Industrial Developments Limited**
(Submitter 160)

Further supplementary statement of evidence of Eoghan O'Neill (Stormwater)

Dated: 25 June 2024

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FURTHER SUPPLEMENTARY STATEMENT OF EVIDENCE OF EOGHAN O'NEILL

INTRODUCTION

1 My full name is Eoghan Michael O'Neill.

2 My area of expertise, experience, and qualifications are set out in my statement of evidence dated 5 March 2024 for this hearing stream.

3 I also provided evidence in my supplementary statement of evidence dated 13 June 2024.

4 The purpose of this further supplementary statement of evidence is to respond to matters relevant to my evidence raised in other submitter evidence dated 13 June 2024.

CODE OF CONDUCT

5 Although this is not an Environment Court hearing, I note that in preparing my evidence I have reviewed the Code of Conduct for Expert Witnesses contained in Part 9 of the Environment Court Practice Note 2023. I have complied with it in preparing my evidence. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where relying on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

RESPONSE TO EVIDENCE OF NICK KEENAN

6 My evidence below will address the points raised by Mr Keenans evidence under the headings used by Mr Keenan.

Groundwater Information

7 I concur with the evidence of Mr Keenan that accurate groundwater information will be useful to inform the design of the subdivision. It is my understanding that approximately 30 Piezometers have been installed at the site by the developer and will be monitored for an extended period to measure the variability of groundwater depth across the site and to inform the detailed design for the development.

Flood Storage Attenuation Volumes

8 I acknowledge Mr Keenan's support of the proposed stormwater attenuation approach, in particular, his support in principle of the over-attenuation of the upstream part of the development to compensate for the unattenuated lower parts of the development.

9 I agree with Mr Keenan that the flows being discharged from the development will be higher for a period of time following a large

storm, as the storage basins empty. This is a standard practice and a key feature of stormwater detention for flood prevention. Flood flows are stored for an extended period during the storm, to ensure that the pre-development flow from the site is not exceeded, and these flows are then released in a controlled fashion over a period of time following the event. A key design criterion will be to ensure that the outflow from the attenuation basins is managed so as to ensure that downstream effects are not exacerbated by the development.

10 I note that Mr Keenan does not indicate in his evidence that he has read the flood modelling related evidence of Mr Throssell. His comments with respect to hydraulic modelling would also suggest that he has not seen or read this evidence. The evidence of Mr Throssell, both his evidence in chief and supplementary evidence, describes in some detail the extensive 2D hydraulic modelling work which has been undertaken to date regarding the site. This modelling indicates that, from the work completed to date, there are no significant increases to the downstream flood levels for the 200-year event. Any differences between pre and post development flows in the modelling are largely restricted to the rising limb of the hydrograph, over a duration of around five hours. As noted by Mr Throssell, the detentions storage proposed within the site has not been incorporated into the model. Once this storage is also incorporated, the small pre and post development difference will decrease even further.

11 As noted in paragraph 8 of my supplementary evidence, additional modelling will need to be undertaken once a detailed site concept has been developed. This modelling will look at the proposed development concept, across a range of event magnitudes and duration. The outputs of this will be used to inform the detailed design sufficiently to ensure that proposed development scenario will not exacerbate peak flows and peak water levels downstream of the development. As noted in my supplementary evidence, it is appropriate that this work is undertaken at resource consent stage when a development plan with accurate proposed roadway locations has been sufficiently developed. At this stage, the modelling more accurately reflects the stormwater runoff and drainage pathways within the development, compared to the conservative high-level runoff and storage calculations that have been used to size the preliminary basin volumes.

Engineering Design and Construction Control

12 I note the opinion of Mr Keenan that the proposed approach to develop the attenuation storage is feasible. I agree that careful focus will be required during the detailed design stage to match the road layout to the appropriate basin locations and ensure that the system will work as intended form a hydraulic perspective. I would also comment that all stormwater designs require the same checks and balances to ensure that the proposed design will work hydraulically. This proposed design is no different in that regard,

but I agree that the tolerances against which those checks and balances are assessed will be tighter than the average subdivision design. Saying that, this would not be a particularly unusual circumstance for a competent designer.

13 As noted in paragraphs 19 to 21 of my supplementary evidence, Outline Development Plans are typically very high level and indicative plans. I agree that the detail to which Mr Keenan refers will be an important consideration for the development of the detailed design of the stormwater system. However, I would disagree that such detail is required at this stage, particularly as such engineering detail is highly dependent on the proposed development layout which is typically not available until resource consent stage for a subdivision.

Suitability of Site for Raingardens

14 With regard to paragraph 21 of Mr Keenans evidence, I agree that the potential for, and regularity for, media to be flooded is an important design consideration. However, I would disagree that a design requirement is that it is never flooded. The nature of a stormwater system is that in larger events the capacity of the pipe network is overwhelmed. The Waimakariri District Council design code of practice requires that all primary reticulation is designed to convey a 20% AEP design storm (i.e. a 1 in 5 year storm event). This is reasonably consistent with other New Zealand Local Authority design standard. Therefore, in circumstances where a 20%AEP event is exceeded, the collecting stormwater network will be surcharged to road level and the media within the raingarden will become fully saturated or flooded, thus limiting its treatment performance. This is not an unusual circumstance and once the system drains out the treatment capacity of the media is unaffected.

15 Stormwater treatment design is targeted at treating either the first flush volume (i.e. typically first 15 to 25mm of rainfall in a catchment) in the case of a treatment basin/wetland or alternatively a water quality flow in the case of a filtration device such as a raingarden or proprietary filter. The water quality flow is generally derived from a flow for a catchment which is equivalent to the runoff triggered by approximately 90% of all expected rainfall intensities. In the case of Canterbury, this is typically the catchment flow associated with approximately 6 mm/hr of rainfall. The proposed raingardens will be designed to treat the water quality flow for each catchment and will be suitably located such that they will have the required driving head, above appropriate flood levels in the attenuation basins, to ensure treatment performance is not impaired in less than a 1 in 5 year event. The developed catchment example, referenced by Mr Keenan in paragraph 16 of his evidence and appended within Appendix A of Mr Roxburgh's evidence, shows that the invert level of the lowest raingarden in the catchment is above the 20% AEP water level within the associated attenuation basin.

16 Mr Keenan notes that he has recent design experience of Filterra raingardens/bioscapes for use within the State Highway network. He notes that a minimum driving head of 1m is required for the system to function. The driving head for a Filterra raingarden is directly related to the depth of engineering media used within the raingarden. I would agree that this is the approximate driving head for a standard depth Filterra raingarden, however, I would note that these products are also supplied as a shallow depth system. The Shallow Depth Filterra system has a reduced driving head requirement of 695mm, with a consequent reduction in treated catchment size for the same raingarden footprint. This is the design value which has been used in the feasibility example noted by Mr Keenan. This rain garden will provide the appropriate level of treatment for the design rainfall and will not become drowned in less than a 20% AEP event.

17 Mr Keenan also states in paragraph 22 that a Gross Pollutant Trap (*GPT*) will be required upstream of each proposed raingarden. I agree with Mr Keenan that, in a state highway environment, a GPT would be an advisable installation upstream of a raingarden or bioscape. This is because the pollutant load expected in stormwater runoff from a state highway would be very high due to the large number of vehicle movements, the high average speed of vehicles and the potential for heavy braking of vehicles. None of these factors exist in a residential environment where the expected pollutant load entrained within stormwater runoff is very low in comparison to a state highway. In my opinion, it would not be expected, nor typical, for a raingarden in a residential area to have a requirement for pre-treatment via a device such as a GPT.

18 In paragraph 25 of his evidence, Mr Keenan states that the stormwater treatment strategy may need to consider other approaches such as grass filters or wetland treatment swales. It should be noted that a significant factor in the development of the current stormwater treatment and attenuation strategy is the Court of Appeal's (and now the Supreme Court's) decision in *Aotearoa Water Action Inc v Canterbury Regional Council* and Environment Canterbury's subsequent interpretation of its rules for the 'take' and 'use' of groundwater which is intercepted by stormwater swales, basins and wetlands.[1] As a result of this, workarounds which include unconventional solutions have to be found to avoid a potential prohibited consenting pathway if groundwater is intercepted. It is my understanding that a plan change to the Canterbury Land and Water Regional Plan is in preparation which will resolve the above situation. If this were to be operative prior to the construction of this development (or the Environment Canterbury's interpretation changed prior to this), then more conventional stormwater conveyancing and treatment options, such

[1] I understand Environment Canterbury's interpretation in light of the Court's decision is covered in detail in the legal submissions of the Submitters.

as those noted by Mr Keenan, would be viable options to be considered at this site.

19 In summary, the example shown in Appendix A of Mr Roxburgh's evidence, developed as part of expert conferencing for the previous PC31 hearing, demonstrates that the proposed treatment and attenuation system is appropriate in the context of the challenges at the Ōhoka site.

Additional Comments and Discussion

20 In paragraph 30 of his evidence, Mr Keenan states "*With reference to Mr O'Neill, (PDP memo, responses to WDC comments, 17 August 2023) the WDC District Model was used to test the volume difference at the outflow from the site*". This comment seems to misunderstand my comments in that memo. The modelling undertaken by Mr Throssell used the WDC 200-year District Model as a boundary condition to the PDP model to assess the downstream effects of the proposed development. Mr Throssell also derived a 50-year hydrograph from the WDC as an input to the PDP model to look at the effects of the development in a 50-year event and estimate the difference in pre and post-development runoff volume. This is the volume that I reference in paragraph 37 of my evidence in chief and how this was derived is described in detail in paragraphs 12 to 22 of the supplementary evidence of Mr Throssell.

Dated: 25 June 2024

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Eoghan O'Neill