BEFORE INDEPENDENT HEARING COMMISSIONERS APPOINTED BY THE WAIMAKARIRI DISTRICT COUNCIL

IN THE MATTER OF	The Resource Management Act 1991 (**RMA** or **the Act**)
AND	
IN THE MATTER OF	Hearing of Submissions and Further Submissions on the Proposed Waimakariri District Plan (**pWDP** or **the Proposed Plan**)
AND	
IN THE MATTER OF	Hearing of Submissions and Further Submissions on Variations 1 and 2 to the Proposed Waimakariri District Plan
AND	
IN THE MATTER OF	Submissions and Further Submissions on the Proposed Waimakariri District Plan by **Mike Greer Homes NZ Limited**

SUPPLEMENTARY EVIDENCE OF GREGORY MARK WHYTE
ON BEHALF OF MIKE GREER HOMES NZ LIMITED
REGARDING HEARING STREAM 12E
DATED: 7 August 2024

Presented for filing by:
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INTRODUCTION

1 My name is Gregory Mark Whyte.

2 I have prepared a statement of evidence regarding hearing Stream 12E dated 5 March 2024 in support of Mike Greer Homes NZ Limited's submission on the Proposed Waimakariri District Plan (**pWDP**) and Variation 1 to rezone approximately 14.20 ha at South Kaiapoi (**Site**) from Rural Lifestyle Zone (**RLZ**) to Medium Density Residential Zone (**MDRZ**). My qualifications and experience are set out in that statement. I confirm that this supplementary statement of evidence is also prepared in accordance with the Environment Court's Code of Conduct.

3 In paragraph 20 of my statement of evidence I noted that refined earthworks design would likely enable the proposed rezoning to be acceptable from a flood hazard perspective and that further modelling investigation would be undertaken using refined earthworks design. This work has now been completed and the results are recorded in my evidence below.

SCOPE OF SUPPLEMENTARY EVIDENCE

4 In this supplementary evidence I revisit my assessment of flood hazard considerations affecting the Mike Greer Homes rezoning proposal following further earthworks design and modelling investigation.

5 In preparing my supplementary evidence I have received improved earthworks surface design(s) from Jamie Verstappen and using those designs I have undertaken further modelling investigation of the pre-development and post development flood hazard scenario under the 0.5% AEP (1 in 200 year) flood event (**0.5% event**) and under the 0.2% AEP (1 in 500 year) flood event (**0.2% event**).

6 The commentary, images, and conclusions in this supplementary evidence are in addition to and elaborate on the material in my statement of evidence of 5 March because they are based on revised and improved earthworks surface design and further modelling investigation completed since the filing of my statement of evidence.

SUMMARY OF MY SUPPLEMENTARY EVIDENCE

7 The further modelling investigation using the revised earthworks surface design confirms the findings summarised in my statement of evidence dated 5 March 2024.

8 In addition, the further modelling investigation demonstrates that:

(a) maximum water levels for the 0.5% flood event on the Site (where properties will be developed), will either remain the same or be reduced to RL 3.05-3.10 metres;

(b) maximum flood depth for the 0.5% flood event on the Site (where properties will be developed), is less than 0.2 metre. This flooding is located on the very edge of a small number of properties;

(c) the pre-development high hazard areas on the Site have been reduced considerably when modelled with the proposed development surface. High hazard areas surrounding the Site have not changed between pre and post development; and

(d) there is no measurable change in maximum flood levels for the 0.2% flood event for the Site and surrounding area due to the proposed earthworks.

FURTHER FLOOD RISK INVESTIGATIONS

9 My evidence in chief demonstrated that filling the Site using the initial earthworks surface design provided by Mr Verstappen resulted in most of the land to be used for housing on the Site[1] is above the 0.5% event.

10 However, the modelling results using the initial earthworks design also showed that:

(a) there are sporadic, and isolated areas of increased water level of up to 170 mm on small parts of the land to be used for housing;[2] and

(b) The offsite consequence of raising the Site is an increase in flood extent along the Main North Road (**MNR**) with a maximum increase in water level of 65 mm.[3]

11 Mitigating the increases in flood extent and water level along MNR due to the filling of the Site required further earthworks design and modelling. These further investigations have been undertaken and inform the conclusions below.

Pre-Development Modelling – 0.5% event

12 Before modelling the new earthworks design the mesh structure of the hydraulic model was updated to better match the mesh structure of the earthworks model so mapping of the flood results would be more aligned. The mesh structure was updated in both the pre-development hydraulic model and the post-development hydraulic model.

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[1] Shown as Medium Density Residential Area on the ODP at Appendix A of my statement of evidence

[2] As mentioned at paragraphs 16 and 44 of my statement of evidence

[3] As mentioned at paragraphs 18 and 46 of my statement of evidence

13 A flap gated outlet at the bottom of Courtney Stream that controls the outflow from Courtney Stream to the Kaiapoi River is built into the model.

14 Figure 1 and Figure 2 below show updated pre-development flooding for 0.5% event on the Site (where properties will be developed) for both maximum water level and maximum flood depth. The maximum water level for the 0.5% flood event is between RL 3.05 and 3.10 metres. The maximum flood depth for the 0.5% flood event varies from 0 metres to 1.5 metres.

Figure 1 - Maximum Water Level for 0.5% event for Pre-Development

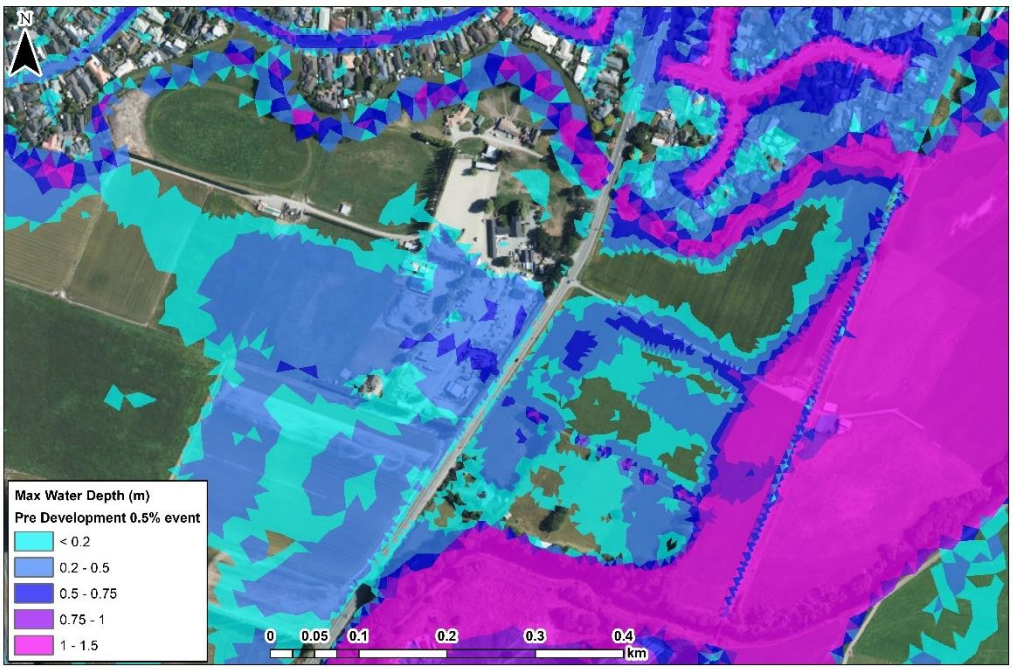

Figure 2 - Maximum Depth for 0.5% event for Pre-Development

Post-Development Modelling – 0.5% event

15 Figure 3 and Figure 4 below show updated post-development flooding for a 0.5% event applying a refined proposed development surface for the Site. This proposed development surface has been incorporated into the South Ashley District wide model and a model simulation has been completed.

16 Maximum water levels on the Site (where properties will be developed) have either stayed the same or reduced to between RL 3.05 and 3.10 metres. Maximum flood depths are less than 0.2 metre.

17 Along Main North Road (**MNR**), for the new modelling, there is no increase in flood water levels.

Figure 3 - Maximum Water Level for 0.5% event for Post-Development

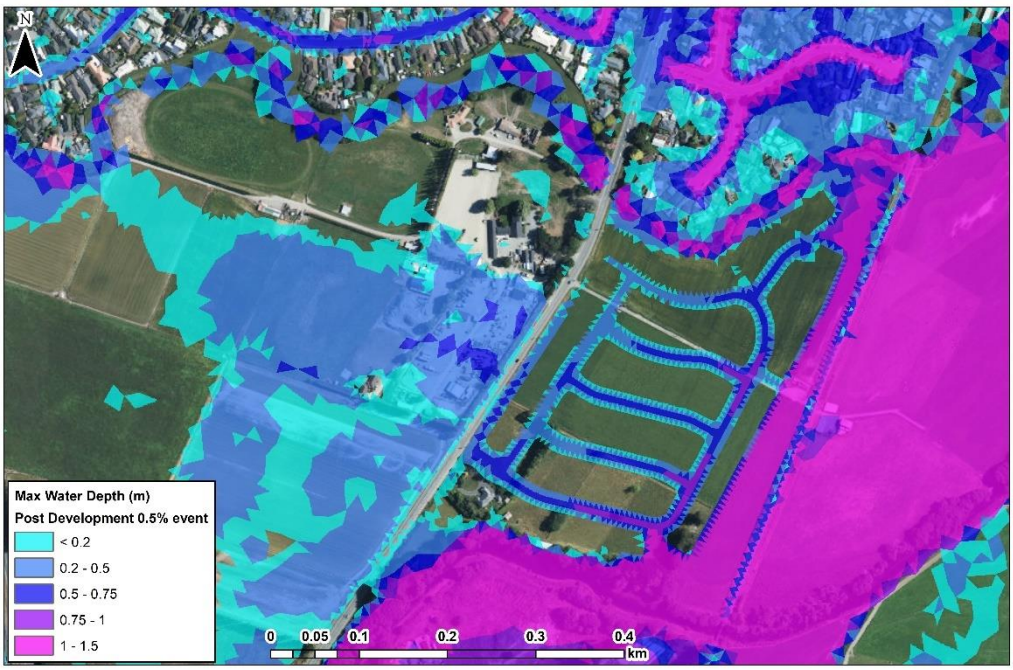

Figure 4 - Maximum Depth for 0.5% event for Post-Development

Water Level Difference between Pre & Post Development Modelling – O.5% event

18 Figure 5 below is a water level difference map that has been created by subtracting the pre-development maximum water levels from the post-development surface maximum water levels. If the resulting water level difference in some areas or cells is negative this means there has been a reduction in maximum water levels.

19 Downstream of the Site (to the East) there is no change in water level due to the development, within +/- 10 millimetres, as per the legend on Figure 5.

Figure 5 – Water Level Difference between Pre & Post Development for a 0.5% flood event

Pre and post development modelling – 0.2% event

20 High hazard as defined in the Canterbury Regional Policy Statement, July 2021, as flood hazard areas subject to inundation events where the water depth (metres) x velocity (metres per second) is greater than or equal to 1, or where depths are greater than 1 metre, in a 0.2% AEP flood event.

21 Figure 6 shows the high hazard parts of the Site and surrounding area. At least three-quarters of the Site is categorised as High Hazard for the 0.2% event for the Pre-Development or current situation.

Figure 6 – High Hazard areas for a 0.2% event for Pre-Development

22 Figure 7 shows the high hazards areas on the Site and surrounding areas for the Post Development scenario. The majority of the Site (where properties will be developed) is no longer high hazard areas. The high hazard areas a generally confined to the roads or other parts of the Site, that will not be used for housing.

23 High hazard areas surrounding the Site do not change due to the proposed development.

Figure 7 – High Hazard areas for a 0.2% event for Post-Development

24 When considering maximum water levels for the 0.2% flood event both within and outside the Site area, there is no measurable change between Pre and Post Development scenarios. This is due to the huge amount of flooding for the 0.2% flood event, where the whole area is inundated, and consequently a relatively small localised change in land levels does not change the maximum flood levels on the Site and surrounding area.

Assessment of effects of the proposal on flood risk following further investigations

25 In light of the further modelling investigations discussed above and based on my experience, I consider that the refined earthworks design enables the proposed rezoning to be acceptable from a flood hazard perspective.

CONCLUSION

26 Overall, I consider the requested rezoning appropriate from a flood hazard perspective.

27 My supplementary evidence addresses surface flooding and proposed mitigation associated with submissions by Mike Greer Homes on the pPWP and Variation 1 using revised earthworks surface design.

28 My conclusions are provided in my Summary section above.

29 Thank you for the opportunity to present my evidence.

Gregory Whyte

7 August 2024