

**IN THE ENVIRONMENT COURT
WELLINGTON REGISTRY**

**I TE KŌTI TAIAO O AOTEAROA
TE WHANGANUI-A-TARA ROHE**

ENV-2023-WLG-000005

UNDER the Resource Management Act 1991

IN THE MATTER the direct referral of applications for resource consents and notices of requirement under sections 87G and 198E of the Act for the Ōtaki to North of Levin Project

BY **WAKA KOTAHĪ NEW ZEALAND TRANSPORT AGENCY**
Applicant

**STATEMENT OF EVIDENCE OF JOHN McARTHUR ON BEHALF OF HOROWHENUA
DISTRICT COUNCIL AND KĀPITI COAST DISTRICT COUNCIL**

HYDROLOGY AND FLOODING

Dated: 26 September 2023

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A. INTRODUCTION

- [1] My name is John Michael McArthur. I am a Senior Surface Water Planning Engineer at GHD. I have been in that position since 2015.
- [2] I prepared a report (required by section 198D of the Resource Management Act 1991) on the Notices of Requirement (“**NoRs**”) lodged with Horowhenua District Council and the Kāpiti Coast District Council (the “**District Councils**”) relating to the Ōtaki to North of Levin Highway Project (the “**Ō2NL Project**” or “**Project**”). My report was dated 28 April 2023 (“**s198D Report**”).
- [3] In the s198D Report, I reviewed the NoRs. My s198D Report addressed the hydrology and flooding aspects of the NoRs.
- [4] I confirm I have the qualifications and experience set out at paragraphs 8 - 11 of my s198D Report.
- [5] Since filing my s198D Report I have reviewed the evidence of Waka Kotahi and participated in expert conferencing on hydrology and flooding. The output of that conferencing was a joint witness statement dated 9 August 2023 (the “**Hydrology and Flooding JWS**”). I confirm the contents of the Hydrology and Flooding JWS. I discuss any remaining issues and/or related conditions below.

B. CODE OF CONDUCT

- [6] I repeat the confirmation provided in my s198D Report that I have read and agree to comply with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023. This evidence has been prepared in accordance with that Code. Statements expressed in this evidence are within my area of expertise, except where I state I am relying on the opinion or evidence of other witnesses (for example, at paragraph 17 below).

C. SCOPE OF EVIDENCE

[7] My evidence addresses:

- (a) The extent to which issues identified in my s198D Report have been resolved through Waka Kotahi evidence, expert conferencing and mediation.
- (b) A response to section 274 party evidence.
- (c) Conditions.

[8] In preparing this evidence I have reviewed the following information:

- (a) The Hydrology and Flooding Technical Assessment by Andrew Craig attached as Technical Assessment F to the Assessment of Effects on the Environment for the Project.
- (b) The s87F Hydrology and Flooding Assessment of Peter Kinley (for the Regional Councils) dated 28 April 2023.
- (c) The statement of evidence of John (Jack) Allen McConchie on behalf of Waka Kotahi NZ Transport Agency associated with hydrology and flooding dated 4 July 2023.
- (d) The version of the draft conditions proposed by Waka Kotahi following mediation, as lodged with the Court and provided to the parties on 4 September 2023 (“**Final Draft Proposed Conditions**”).
- (e) Statement of Primary Evidence of Phil Jaggard on behalf of Kāinga Ora (section 274 party) dated 12 September 2023.
- (f) Statement of Evidence of Karen Prouse (section 274 party) dated 12 September 2023.
- (g) Statement of Planning Evidence of Anna Carter (for Karen and Stephen Prouse) dated 15 September 2023.

- (h) Additional flood modelling information provided by Andrew Sherson/Andrew Craig on behalf of Waka Kotahi, including explanatory memorandum dated 28 July 2023.
- (i) Statement of Evidence of Peter Kinley for Horizons Regional Council and Greater Wellington Regional Council (“**the Regional Councils**”).

D. OUTSTANDING ISSUES

[9] There are some outstanding issues arising from my s198D Report, which were not resolved through the Hydrology and Flooding JWS, and have not been addressed in the Final Draft Proposed Conditions. I am of the view that the following issues remain outstanding for hydrology and flooding:

- (a) Acceptable scale of effects on existing flooding.
- (b) Adequacy of conditions.

[10] I address these issues in turn below.

E. ACCEPTABLE SCALE OF FLOODING EFFECTS

[11] Following a review of the additional flood modelling information provided by Waka Kotahi, I consider the information to be sufficient to support claims that changes in velocity outside the Project designation boundaries will be less than minor and that increases in the duration of flooding will be short (generally less than an hour or two). On this basis I am of the opinion that acceptable velocity and flood duration impacts outside of the designation boundaries can be achieved during the detailed design of the Project under 1% AEP design storm conditions incorporating current climate change estimates out to 2130.

[12] Acceptable flood level increases outside designation boundaries were not resolved through the Hydrology and Flooding JWS, with Waka Kotahi preferring acceptance based on, at worst, maintaining the current flood modelling results.

- [13] The additional flood modelling information provided confirms that there are a number of locations where flood level increases in the 1% AEP design storm event modelled are in excess of 0.1 m (100 mm) outside the designation.
- [14] This has the potential to increase the frequency of ponding and nuisance flooding at these locations, and therefore I do not consider that overall, current modelling results provide an acceptable scale of flood level increases.
- [15] As stated in the Hydrology and Flooding JWS, both Peter Kinley and I prefer an approach based on thresholds applied to planning zones (i.e. whether the land is rural or residentially zoned) and separately, buildings that are currently subject to flooding. That is still my preferred approach.
- [16] Table F.4 in Technical Assessment F (paragraph 117) provides a guide for the assessment of 10% AEP and 1% AEP flood level increases. For both design storm scenarios, the table indicates a distance beyond the designation that the tabulated thresholds apply to. These are 'Upstream 50m provided no buildings impacted' and 'Downstream 100m', with the thresholds being <0.1 m (100mm) and < 0.05 m (50 mm) respectively.
- [17] The s87F Hydrology and Flooding Assessment of Peter Kinley provides examples (at paragraph 42) of previous roading projects where thresholds apply at the designation boundary and not at a distance beyond the boundary.
- [18] I consider the flood level increase threshold values of <0.05 m (50 mm) and < 0.1 m (100 mm) to be acceptable, but they should apply at the designation boundary rather than at set distances beyond either upstream or downstream boundaries.
- [19] In addition, rather than these values applying downstream and upstream of the designation boundary respectively, they should apply to properties based on their District Plan zoning, with the < 0.05 m (50 mm) effect applying to properties with a Residential zoning and the < 0.1 m (100 mm) effect applying to properties with a Rural zoning, except where existing buildings are already subject to flooding. These threshold values are used as a

guideline (albeit informally) by Greater Wellington Regional Council (“GWRC”) when assessing flood effects, as discussed in both Technical Assessment F and Jack McConchie’s statement of evidence. In both documents, the authors consider the values to be an appropriate threshold for testing the Ō2NL Project.

[20] Buildings already subject to flooding (as demonstrated through flood modelling of the existing environment) should have an increase in flood level < 0.01 m (10 mm). This value reflects the computational accuracy expected in the type of model to be used in the detailed design of the Project and therefore can be considered to be equivalent to demonstrating no increase in flood level.

F. ADEQUACY OF CONDITIONS

[21] The Hydrology and Flooding JWS stated that:

(a) *‘All agree that the conditions currently don’t provide any provision for design standards for flood effects and these standards should be added to the conditions.’*

(b) *‘All agree that a condition relating to habitable floor levels would be appropriate.’*

[22] My review of the Final Draft Proposed Conditions (provided by Waka Kotahi on 4 September 2023 following mediation) notes that no design standards for flood effects, or a habitable floor level condition, have been included.

[23] Without conditions quantifying an acceptable scale of flood effects, there is the risk the Project will have an adverse impact and there is no mechanism for the District Councils to determine whether or not the final detailed design meets acceptable standards relating to flooding.

[24] Recommended conditions are provided in Section H below.

G. RESPONSE TO SECTION 274 PARTY EVIDENCE

- [25] I have reviewed the section 274 party evidence of Phil Jaggard.
- [26] Mr Jaggard's evidence addresses the lack of flood hazard conditions and I agree with his opinion stated in paragraph 4.7 that *'there are insufficient controls to ensure that buildings and people are appropriately protected from changes to flood hazards arising from the construction and operation of the proposed road'*.
- [27] Paragraph 4.8 of his evidence recommends a number of conditions. These conditions primarily address the agreed position arising out of the Hydrology and Flooding JWS relating to habitable floors, but also address other building types and urban zoned land. I agree with the objectives of his conditions, of which some form the basis of the conditions I present in Section H below.
- [28] I have also reviewed the section 274 party evidence of Karen Prouse.
- [29] Paragraph 34 of her evidence describes a proposal by Waka Kotahi to install two additional culverts under the Project expressway to reduce flood level increases on the Prouse property.
- [30] Based on the additional flooding information provided by Waka Kotahi in July this year, flood level increases in a 1% AEP storm event incorporating climate change are up to 0.5m along the western boundary of the Prouse property abutting the Project's designation boundary, and up to 1.0m at the northwest corner of the Prouse property.
- [31] Neither the details (e.g. size) or the flooding outcomes of the proposed stormwater infrastructure improvement have been provided by Waka Kotahi as part of July's additional flooding information package. However Appendix 1 to Karen Prouse's evidence appears to indicate the extent of the flood level increase is significantly reduced when compared with the information provided in July.
- [32] Paragraph 34 of her evidence also indicates that Waka Kotahi *'anticipate further possible improvements...'*

- [33] Paragraph 35 of her evidence confirms acceptance of an increase in flood level that does not exceed 0.05 m (50 mm). Planning evidence provided by Anna Carter confirms the Prouse property is zoned Residential and located in the Tara-Ika Multi-Zone Precinct of Horowhenua's Operative District Plan. Based on this current zoning, I agree that this accepted flood level increase is appropriate as it is consistent with values presented in paragraphs 18 and 19 of this evidence.
- [34] Based on what appears to be a significantly improved flooding outcome as shown in Appendix 1 of Karen Prouse's evidence, and the anticipation by Waka Kotahi that further improvements could be possible, I consider it extremely likely that a flood increase < 0.05m can be achieved within the Prouse property in a 1% AEP event modelled during the detailed design phase of the Project.

H. CONDITIONS

- [35] I have reviewed the Final Draft Proposed Conditions updated by Waka Kotahi following mediation and circulated to the parties on 4 September 2023. The conditions relating to flooding do not address flood effects on the environment outside the Project designation boundaries and therefore in my opinion additional conditions need to be included which provide performance criteria to be met during the detailed design phase of the Project.
- [36] The flood modelling result information provided in July reflects outcomes presented in Technical Assessment F. There are areas where flood level increases are in my view excessive, including the Prouse property, and therefore I am of the opinion that consideration should not be given to flood effect conditions or performance criteria that are based on the flood modelling results presented in Technical Assessment F.
- [37] I recommend the following conditions be considered relating to both flood level increases and flood hazard. These could be included as a separate section of the designation conditions, and could also be included in the regional consents:

- (a) *The Project must be designed to achieve the following flooding outcomes outside the designation footprint (except where noted below) and main waterway boundaries:*
- (i) *No increase of more than 0.01m in flood level for existing floors that are already subject to flooding and no existing floors to be newly flooded by the post-Project floodplain.*
 - (ii) *No increase of more than 0.05m in flood level on land zoned urban.*
 - (iii) *No increase of more than 0.10m in flood level on land zoned non-urban.*
 - (iv) *No more than a 10% increase in flood hazard (defined as the product of flow depth and velocity) at all Council road locations (within and outside the designation boundary) where existing depth is greater than 0.3 m or existing velocity is greater than 2.0 m/s or the product of existing velocity and depth is greater than 0.5 m²/s.*
- (b) *Compliance with clauses (a)(i) to (iv) must be demonstrated prior to the commencement of construction activities through existing (pre-Project) and Project detailed design flood modelling of the critical 1% AEP design storm event incorporating a climate change scenario in accordance with the Waka Kotahi NZ Transport Agency's Bridge Manual current at the time of the detailed design.*
- (c) *A copy of a report confirming compliance with (b), prepared by a suitably qualified person must be provided to the District Council, and must be included in the material submitted to the District Council as part of any outline plan. Where more than one outline plan is prepared and submitted to the District Council, there shall be no requirement to provide repeat reports that address the same Project elements.*
- (d) *An independent peer review and certification of the flood modelling is required. This must be undertaken by a suitably qualified person who is different to the suitably qualified person preparing the report in (c) and independent to the detailed design, who must be required to certify whether there is compliance with clauses (a)(i) to (iv), in the manner described in clause (b). The independent peer review and the certification must be included in the material submitted to the District Council as part of any outline plan.*

[38] Peter Kinley's statement of evidence proposes amendments to condition RWB2(g) of the Final Draft Proposed Conditions (updated by Waka Kotahi following mediation). I support his proposed changes to this condition.

I. CONCLUSIONS

- [39] The concept design modelling outcomes presented in Technical Assessment F, and subsequently provided in a digital format following requests for additional information, show flood level increases in areas outside the designation boundaries which I consider to be significant and in excess of increases that both District Councils would consider acceptable.
- [40] It is recognised that the current concept design and associated flood modelling set-up and results will be different to the final design, and on that basis the hydraulic performance presented in Technical Assessment F has not been optimised and could be improved. I consider the best way to ensure the detailed design of the Project and associated flood modelling outcomes are improved to an acceptable level is to provide achievable performance criteria which are specified in the conditions.
- [41] The Final Draft Proposed Conditions (updated by Waka Kotahi following mediation) do not address flood effects on the environment outside the Project designation boundaries and therefore I have recommended additional conditions in relation to those effects. The threshold values used for the conditioned flood level increases reflect an informal guideline used by GWRC as well as minor changes to the assessment guide included as Table F.4 in Technical Assessment F. I consider that these threshold values are achievable from a modelling perspective.

John Michael McArthur

26 September 2023