BEFORE THE INDEPENDENT HEARINGS PANEL

UNDER	the Resource Management Act 1991 (RMA)
IN THE MATTER	of the Far North Proposed District Plan - Hearing 15D: Rezoning Kerikeri-Waipapa

STATEMENT OF EVIDENCE OF ROBERT MATTHEW WILLIAM (LADDIE) KUTA ON BEHALF OF KIWI FRESH ORANGE COMPANY LIMITED

FLOOD MITIGATION

16 June 2025

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WYNN WILLIAMS

INTRODUCTION

1 My full name is Robert Matthew William (Laddie) Kuta.

2 I have been asked by Kiwi Fresh Orange Company Limited (**KFO**) to provide independent expert advice on the Proposed Far North District Plan (**FNPDP**).

3 This evidence relates to KFO's submission on Hearing 15D: Rezoning Kerikeri-Waipapa. KFO owns 197 ha of land between Kerikeri and Waipapa (**Site**), which is proposed to be zoned for Rural Production. KFO's submission seeks a live urban zoning of the Site, comprising a mix of general residential, mixed urban and natural open space.

QUALIFICATIONS AND EXPERIENCE

4 I am a chartered Professional Engineer and International Professional Engineer with Engineering New Zealand (ENZ Charter No. 1015386) in the practice fields of Civil Engineering and Environmental Engineering with a specialised focus in River Environment Management and Engineering. I hold the qualifications of a Bachelor of Engineering (Civil) from Dalhousie University in Halifax, Nova Scotia Canada, and a Master of Science (Civil/River Engineering) from the University of Waterloo in Waterloo, Ontario Canada. I have authored scientific publication in the Journal of Hydraulic Engineering with works related to river engineering and numerical modelling.

5 I have been practicing in the field of River Engineering in New Zealand since 2008 for district and regional authorities both as an employee and as a consultant. The nature of my work has spanned conceptual planning, technical investigation (i.e., proven hydrology/hydraulic modelling) and design, project management, and long-term strategic planning for river environments. I also served several years as a committee member and vice-chair of Engineering New Zealand's technical interest Rivers Group.

6 I am the founding director of kastorworks Ltd., a full service civil and environmental engineering firm that focuses on river environments in New Zealand. As part of my current role, I have been and am currently involved with flood management planning, flood hazard assessment (hydrology and hydraulic modelling) using specialised modelling and investigation technologies, technical civil design, and overseeing construction / works.

I have validated experience with industry standard integrated catchment and 2D modelling packages including InfoWorks ICM, DHI MIKE Flood, and HEC-RAS. My expertise is backed by a career that includes both academic theory and on-the-ground experience with many large flood events which enables me to understand confidence levels around modelled and estimated forces at work in real river and flood environments. This foundation over time has allowed me to design and oversee many built river-works here in New Zealand.

7 In relation to this evidence, I have assisted with (i.e., investigated and undertaken design modifications, construction monitoring, performance reviews during large floods) many of the large floodways and flood schemes throughout New Zealand, including the Wairau Plains Flood Protection Scheme in Marlborough, the Moutoa Floodway in Horowhenua, the Heretaunga Plains Flood Protection Scheme in Hawkes Bay, Upper/Lower Valley Scheme in Wairarapa, Motueka and Tākaka Floodway Management in Tasman District. Working with both large scale and small-scale floodways has provided me with the insight to understand the practical aspects of constructing flood infrastructure, how they behave, and the risks involved during large flood events.

CODE OF CONDUCT

8 Although this is not a hearing before the Environment Court, I record that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023 and agree to comply with it.

9 I confirm that the issues addressed in this brief of evidence are within my area of expertise, except where I state that I have relied on the evidence of other persons. I have not omitted to consider material facts known to me that might alter or detract from the opinions I have expressed.

SCOPE OF EVIDENCE

10 The focus of my evidence is on the existing and potential future flood risk to KFO's land and the management of the existing floodway across the Site. I address the conceptual design of the proposed floodway modifications, and whether the floodway will appropriately manage flood risk (post modification) and thereby unlock land for the proposed development.

11 I have reviewed the studies and information to date, which have been provided as part of this submission, and provide my independent professional opinion on this information as evidence based on my qualifications noted above.

12 My evidence is structured as follows:

(a) Assessment of hydrology and key hydraulic features in the area and their impact on flood hazard;

(b) Review of, and comment on, the 'foundational' Northland Regional Council (**NRC**) flood modelling;

(c) Review of, and comment on, refined flood hazard modelling and floodway management proof-of-concept by e2Environmental Ltd. (**e2**);

(d) Review of, and comment on, NRC's comments dated 7 May 2025 on KFO's proposed floodway management proof-of-concept;

(e) Review of, and comment on, the high-level review 42A reporting by Tonkin+Taylor (**T&T**) dated 21 May 2025;

(f) Lack of information and further investigation requirements; and

(g) Opinion on overall impact of works and potential impact for the Kerikeri and Waipapa area.

KEY HYDROLOGY & HYDRAULIC FEATURES IN THE AREA

13 The Site is immediately bordered to the north by the Waipekakoura River / Kerikeri River,[1] which can breach its banks during large flood events and spill overland flood waters to both the true-right-bank (**TRB**) across the Site and the true-left-bank (**TLB**).

14 The Puketotara Stream, south of the Site, can breach its TLB during large flood events and combine floodwaters with the Kerikeri River along State Highway 10's drainage paths located at the upstream extent of the Site.

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[1] Depending on the map, the river is named Waipekakoura River or Kerikeri River, I refer to it as the Kerikeri River in this evidence.

15 The combined flow at State Highway 10 is estimated to exceed 400 cumec during large design flood events (e.g., 1% Annual Exceedance Probability (**AEP**).

16 During times of extreme flooding, the combined flow at State Highway 10 (**SH10**) is forced to split with a portion of the flow continuing down the Kerikeri River and a near equal portion flowing down an existing natural floodway that passes across the Site (refer to Map D1 in Appendix D of e2 report).

17 Flood flow continuing down the Kerikeri River eventually loses energy when it is discharged over Rainbow Falls on the north-eastern extent of the Site.

18 The natural floodway across the Site consists of broad depressed swales in the topography with the primary swale leading to a waterfall near the downstream end of the Site (refer to Image A5 in Appendix A and Map D1 in Appendix D of e2 report).

19 KFO proposes to introduce modification/enhancements to the natural floodway on the Site to ensure floodwaters can continue to pass over the Site but in a managed manner with greater certainty of flood extent / dynamics so that the existing flood hazard is not adversely changed in the area surrounding the Site.

20 Floodwater flowing through the Site's natural floodway eventually loses energy (i.e., hydraulic head) when discharged over on-Site waterfalls, with majority of flow discharging over the central waterfall and down into an on-Site pond and wetland.

21 Floodwaters exiting the wetland combine with floodwaters in the Kerikeri river downstream of Rainbow Falls and the combined flow continues downstream towards the coast (as indicated near Golf View Road in Map D1 in Appendix D of the e2 report).

22 The Site consists of several other minor depression swales that are ephemeral and hydraulically activate only during extreme flood events (i.e., rarer than 2% AEP), with minor flow portions in contrast to the main floodway on the Site.

23 The natural floodway across the Site divides the Site into two portions of dry land during times of extreme flooding (e.g., 1% AEP).

24 The Site in its existing condition results in approximately 51ha of dry land on the northern side of the floodway and approximately 57ha of dry land on the southern side of the floodway during the peak of a 1% AEP event.

25 Proposed modification to the natural floodway would result in more certainty on flood hazard and increase the above dry land numbers to approximately 54ha of dry land on the northern side of a modified floodway and approximately 68ha of dry land on the southern side of a modified floodway.

26 The modification to the natural floodway on the Site could involve further enhancements to the natural depressions in the Site's topography (i.e., practical excavation and recessing that is aligned with the natural topography), energy dissipation and riprap features in locations of high hydraulic energy to mitigate potential erosion, a naturalised designed control weir at the upstream end of the Site to ensure flow splits to the Site and Kerikeri River continue to work as they currently do (this could be independent of SH10 or worked into potential NZTA modifications to assist in mitigating the existing hazard on this important lifeline), appropriate crossing infrastructure to secure access on and off the Site during all times, as well as other possible amenity modifications that could add value to open space (i.e., potential low flow water take from Kerikeri River).

NRC FOUNDATIONAL FLOOD MODELLING

27 NRC conducted catchment wide 2D flood modelling for the Kerikeri River prior to 2022.

28 The NRC model included a classic grid style representation of topography with a 5m x 5m grid.

29 This modelling, being a catchment wide approach, did not focus on localised hydraulics (e.g., localised velocities and refined flows across the Site or SH10) but rather provided an acceptable understanding of large-scale hydraulics and flood hazard extent and flood hydrographs at various locations within the catchment.

30 The model results produced by NRC's modelling are considered an acceptable and accurate representation of flood hazard extent and flowrates for the conditions modelled on the Site and its surroundings.

REFINED SITE FLOOD INVESTIGATION, HYDRAULIC MODELLING, AND PROPOSED WORKS ON THE SITE

31 KFO engaged e2 to review the existing flood hazard on the Site in order to determine its existing development potential, and to develop proof-of-concept engineering modifications to the existing floodway to determine the extent of additional land that could safely be included in the development potential of the Site.

32 Detailed interrogation of the NRC model provided insight into the existing development potential of the Site. The NRC model indicated there would be an island of dry land on the northern side of the Site equal to approximately 51ha in area, and an island of dry land on the southern side of the Site equal to approximately 57ha.

33 e2 developed a model that replicated the flood hazard conditions produced by the NRC model but with refined localised topography (e.g., SH10, on-Site spillway, etc).This assisted with creating a more refined understanding of the flood hydrodynamics on and around the Site.

34 Proof-of-concept modifications to the e2 model revealed that potential development land could be increased to approximately 54ha on the northern side of the Site and approximately 68ha on the southern side of the Site.

35 Development of land on the northern side of the Site would require connectivity infrastructure for both the existing natural floodway condition as well as under the proof-of-concept modified floodway condition, due to it being an island between the Kerikeri River and the existing or modified floodway which intersects the Site.

36 The refined modelling produced by e2 is considered acceptable for proof-of-concept and for determining the impact of modifications to the existing spillway and the impact this would have on other areas around the Site including upstream and downstream of the Site.

37 Although the proof-of-concept modelling illustrates a fortified modified floodway, the topography of the Site would allow for detailed design to recess the modified floodway in a practical manner to a lower depth into the land through low impact excavation (i.e., depth in the order of approximately 1.0-1.5m), which would strategically control flood velocities

and forces and mitigate risk of issues such as stopbank failures. The design would therefore not be reliant on hard structures and engineered fortifications.

38 Additional modelling could be done at the detailed design stage to best optimise, or minimise, flood velocities and hydraulic forces in a finished Site.

NRC COMMENTS DATED 7 MAY 2025

39 Through KFO's legal counsel I was made aware of a memorandum from the NRC Rivers Team to FNDC staff regarding Scenario F to the draft Spatial Plan. FNDC staff had asked for the Rivers Team's comments on flood mitigation.[2]

40 NRC made note that the foundational modelling used by e2 was based on a 2007 topographical survey, and that landforms may have changed since that time, and that NRC were working on a replacement catchment flood model with an up-to-date LiDAR topographical survey (2018-2020).

41 The refined e2 model and proof-of-concept are primarily focussed on pre vs. post flood modelling conditions and ensuring hydraulic and flood impacts around the Site are mitigated. Therefore, although a revised topographical survey will provide a more up-to-date understanding of flood hydraulics, the impact on the noted extent of difference between the pre vs post flood modelling could be expected to be less than minor and the existing proof-of-concept modelling can still be considered fit for purpose for understanding the impact of modifying the existing floodway on the Site.

42 Design flood discharge rates over Wharepoke Falls (Figure 5 in e2 report) downstream of the Site indicate less than minor changes between the existing and proposed conditions. NRC made comment that these changes could present consenting risks. Although a change of approximately +10 cumec is noted in Table 5 of the e2 report and an increase of 50-60mm in flood depth is also noted downstream of the Site in section 6.3 of the e2 report, these changes in the context of scale could be considered less than minor when compared to any margin of error in

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[2] I note that the NRC Rivers Team qualified that their responses did not constitute a peer review.

total flow (i.e., approximately 235 cumec) and flood depth for design events upwards of the 1% AEP.

43 The receiving environment at the downstream end of On-site waterfall #2 (Figure A5 and A6 in e2 report) has formed over a paleo-period through exposure to extreme overflow floods across the Site during that period. The extent of change in flood hydraulics indicated in Table 5 of the e2 report suggests the receiving environment would be capable of, and conditioned to manage over time, any received flood waters post the proposed works on the Site.

44 Figure A 5 in Appendix A of the e2 report illustrates armoured lining that has formed beneath the On-site waterfall #2 over time, which supports the previous note.

45 NRC also commented on the increase to the risk to people using SH10 during a flood event and the fact that KFO's proposed flood scheme may reduce options for increasing the resilience of SH10 to flooding in the future. Any future changes that NZTA perform to add resilience to SH10 must ensure flood hazard is not increased to other properties both upstream and downstream of the highway (including the Site). The potential hazard to vehicles and people over SH10 during times of extreme flooding currently exists, with the proposed modifications to the Site having only minor effects on the hazard (velocity x depth). Modifications to the land around the upstream end of the Site could result in this hazard being more certain and controlled with potential to minimise this hazard and possibly reduce the existing hazard through detailed design.

46 The depth of peak floodwaters across the Site under existing conditions, as well as with the proposed proof-of-concept works in place, are shown to be in the order of 1m deep during the 1% AEP design event. NRC commented on the residual risk associated with stopbanking flood waters. The estimated depths under proposed conditions favour practical recess modifications to the existing floodway across the Site rather than the addition and inclusion of stopbanks. This extent of depth also suggests that any shallow bedrock could potentially be incorporated as features into the proposed floodway modifications and mitigate any need for erosion protection in these areas.

TONKIN + TAYLOR REVIEW DATED 21 MAY 2025

47 Appended to the Natural Hazards section 42A report for Hearing 13 is a technical review of the proposed flood scheme prepared by Tonkin + Taylor.

48 The T+T report highlighted the need for hydraulic assessment under conditions greater than the 1% AEP design storm.

49 With the proposed modified floodway on the Site having a width of approximately 100m and flood velocities within the floodway averaging approximately 2m/sec (largely influenced by slope and not flow increases), deduction from the modelled results in the e2 report and a conservative additional 200 cumec flowing through the Site during a super-design event suggest a conservative increase to flood levels in the modified floodway could be in the order of 1m for such an event.

50 The above estimated additional 1m in depth requirement for a super design event is within reason for recessing of the modified floodway into the land or raising of the land adjacent to the floodway.

51 The recessing of the modified floodway deeper into the land is a method of removing the need for hard protection structures, which would align with the Northland Regional Policy Statement (**RPS**).

52 It is expected that the runoff from the Site in its existing condition would have been included in the overall NRC hydrology model for the greater Kerikeri River catchment area as part of good modelling practice. Any change in land use will require an appropriately designed stormwater reticulation network to treat and attenuate any increase in flows resulting from the change in land use and the land's runoff conditions so that the runoff impact of pre vs. post are less than minor.

53 In relation to the T+T report's comment that a site-specific assessment of the wetland is required, I consider that increased flood flows to the wetland area (i.e., discharged over on-site waterfall #2) should be considered in proportional context to the existing situation and what this waterfall and receiving environment has been, and will continue to be, exposed to. The natural armouring of the receiving environment illustrated in Figure A 5 in Appendix A of the e2 report illustrates this natural armouring that was formed over a paleo-period.

54 In relation to the T+T report's comment about NZTA being an important stakeholder, I note that the existing flood hazard across SH10 lacks design and certainty – a common occurrence with many developing and evolving roads throughout New Zealand. The modification to the existing floodway across the Site could be collaborated with NZTA works to include SH10 in a manner that provides more certainty around the flood hazard of SH10 and the ability to manage and minimise this hazard. This would of course require inclusion of NZTA as a participating party.

NORTHLAND REGIONAL POLICY STATEMENT

55 Policy 7.2.2 of the RPS gives priority to the "use of non-structural measures over the use / construction of hard protection structures when managing hazard risk". The policy refers to a range of circumstances when hard protection structures may be considered appropriate. An explanation to the policy states:

> It should be noted that this policy does not say 'no' to hard protection structures, but rather establishes criteria, including looking at long-term costs and benefits, to assist decision-makers to determine when such structures may be considered an appropriate option to mitigate natural hazard risk.

56 The RPS does not define "hard protection structures". In my opinion, it means flood conveyance structures (e.g., stopbanks, etc.) that divert flood flows through conveyance paths, and at flow depths and velocities, that are not native to that conveyance path.

57 As I have discussed in this evidence, the use of a natural flood paths means that the floodway does not rely on engineered elements. To that extent, the floodway is not likely to need hard protection structures and is therefore not contrary to Policy 7.2.2.

INFORMATION & FURTHER INVESTIGATION REQUIREMENTS

58 The information I have reviewed to date is considered acceptable in terms of flood hydraulics and provides proof-of-concept that a modified floodway across the Site could match existing flood hazard conditions whilst protecting more land on the Site from flooding.

59 Modifications to the existing floodway across the Site should be focused on excavation and recess of the floodway into the land rather than hard protection and fortifying assets (e.g., stopbanks), which carry higher risk.

60 Flood depths presented in the modelled information favour practical excavation for recess of a modified floodway on the Site.

61 Identification of possible shallow bedrock along the alignment of the proposed modified floodway should be identified to understand its impact on proposed floodway modifications.

62 NRC have noted that a revised topographical survey (i.e., current LiDAR) is being included in revised flood modelling of the greater catchment. I expect the results from this revised NRC greater catchment modelling will not affect the reviewed assessment of pre vs. post floodway modifications. Any increase or decrease in flood flow at SH10 and across the Site will be reflected in both the existing floodway conditions and the proposed modified conditions on the Site if revised results from an NRC update are utilised.

63 To provide additional context and understanding to the previous item, a review of the difference in input flood hydrographs could be done following the completion of the said NRC revised flood modelling for the greater catchment to understand the extent of change required for any potential detailed design works.

64 The existing floodway through the Site is controlled by the existing topography and would continue this flood path with increased flood flows such as a super-design event (i.e., +100yr ARI). Further hydraulic flood modelling could be conducted at a detailed design stage to determine any additional factor of safety that should be included into any final design modifications to the existing floodway on the Site.

65 Joint design should be done at technical design stage with NZTA to minimise, and mitigate, the existing flood hazard across SH10.

OPINION OF OVERALL IMPACT OF PROPOSED MODIFIED FLOODWAY WORKS

66 As I have shown in this evidence, a floodway on the Site is not being created but rather modified and enhanced to manage flood risk and thus unlocking additional area available for potential development. NRC modelling illustrates the Site currently includes a natural floodway that provides relief to an overwhelmed Kerikeri River corridor during times of extreme runoff.

67 By designing the floodway to existing flood paths, the design only uses engineered and built elements to assist with maintaining this flood path. This means flood flows that overwhelm the Kerikeri River will still be allowed to flow through the Site but in a more controlled and certain manner.

68 Under the existing conditions the Site consists of an estimated 51ha of non-flooded land on the northern side of the existing floodway and an estimated 57ha of non-flooded land on the southern side of the existing floodway during a 1% AEP flood event. This land is unlocked for potential future development.

69 Proposed modifications to the natural floodway on the Site would increase non-flooded and unlocked land to an estimated 54ha on the northern side of the modified floodway and an estimated 68ha on the southern side of a modified on-site floodway.

70 The information reviewed to date indicates that quality detailed design could ensure that any changes to the already existing flood-hazard surrounding the Site would be less than minor following on-Site modifications to the floodway; however, opportunity to address the existing flood hazard on SH10 should be considered with NZTA as a collaborating party to provide security around this regional lifeline.

71 The modified floodway on the Site would need to be designated for flood relief purpose; however, its activation would be infrequent and therefore the floodway could be developed as an open space to offer controlled amenity to the surrounding area.

72 The opportunity to include a low flow water take from the Kerikeri River should be explored, and if possible, could enhance the above-mentioned amenity value of the area by creating a continuous low-flowing waterway within the modified on-site floodway.

73 The on-site floodway includes an approximate 20m headloss over a waterfall. Energy from any water discharging over this waterfall, normal flow or flood flow, should be recovered and recirculated to the grid through renewable hydro-electric infrastructure.

CONCLUSION

74 The greater Kerikeri Waipapa area is under pressure to meet urban and commercial land needs for future housing and development requirements.

75 The Site currently includes a floodway that activates during times of extreme runoff but also includes non-flooded land that could help fulfil future regional land requirements with appropriate access developments.

76 The investigation results that I have reviewed show the quantity of non-flooded land could be increased to unlock more land through modifications to the on-site floodway whilst causing less than minor changes to the greater flood hazard surrounding the Site.

77 The natural topography of the Site favours a recessed floodway that would mitigate failure risks that are associated with flood protection assets such as stopbanks.

78 The presented works could provide an opportunity to manage the existing flood hazard at SH10 to help protect this regional lifeline.

79 The Site includes natural features (i.e., waterfalls, wetlands) that could remain protected under the reviewed works and could offer amenity to a developed environment.

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RMW (Laddie) Kuta

16 June 2025