**BEFORE THE HEARING PANEL**

**IN THE MATTER** of the Resource Management Act 1991

**AND**

**IN THE MATTER** of Proposed Plan Change 8 to the Operative Rotorua District Plan

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**STATEMENT OF EVIDENCE OF PAULA CATHERINE MEREDITH**
**ON BEHALF OF ROTORUA LAKES COUNCIL**
**(Flood Hazard Information for Rule Implementation)**
**Dated 13 March 2026**

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## INTRODUCTION

1. My full name is Paula Catherine Meredith and I am the Land Development Engineering Manager at Rotorua Lakes Council (RLC). I have held this position for the last 7 years.

### Qualifications and experience

2. I hold a Bachelor of Engineering Technology (Highways) and a New Zealand Certificate in Civil Engineering (NZCE). I am a member of Engineering New Zealand. I have over 20 years of professional experience in the Land Development field and five years experience in the operation and maintenance of wastewater and stormwater infrastructure.

3. I am responsible for ensuring that the infrastructure required to support development is constructed to appropriate standards and vested in Council. My role covers the management of the land development process from consenting to construction to final sign off.

4. My team reviews the majority of resource consents and building consent applications, considers the adequacy of information in relation to natural hazards and provides feedback on potential conditions and decisions.

### Involvement in PC 8

5. I have been involved in the development of Plan Change 8 (Natural Hazards) (PC 8) since the scoping stage, attending interviews with staff and providing feedback on an options paper developed for technical experts and key stakeholders, which informed the development of the Section 32 Report and proposed changes. I was also involved in workshops to discuss the draft Section 32 Report.

6. In addition to assisting in the development of PC 8, I have also assisted RLC to develop related policy, as detailed below:

(a) I was a member of the working group to assist in preparing RLC's guidance document *Identifying and Designing for Geothermal Hazards, Guidelines for Buildings and Associated Site Works in Rotorua District* (Rotorua Lakes Council, 2024), which supports the implementation of geothermal rules in the District Plan.

(b) Alongside my participation in the scoping of PC 8, I was also involved in internal Council workshops to identify priorities for hazard research and mapping.

**Code of conduct**

7. I have read the Environment Court Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023 and agree to comply with it. I confirm that the opinions expressed in this statement 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 materials or facts known to us that might alter or detract from the opinions I have expressed.

**Scope of evidence**

8. The purpose of my evidence is to provide information regarding the implementation of flood hazard provisions in the District Plan and updates to associated hazard mapping. My evidence describes:

(a) The flood hazard modelling and other information used to implement Rule NH-R4 (to determine whether a flood risk assessment is required and floor levels meet the performance standards). This includes discussion of:

(i) Flood hazard mapping commissioned by Bay of Plenty Regional Council (BOPRC) and RLC and published on the Council's online map viewer 'Geyserview'.

(ii) The relevance of the recently published national flood model by Earth Sciences New Zealand (previously NIWA) to implementation of the above rules.

(iii) How the emerging Waikato Regional Council (WRC) flood model may be used in implementation of these rules.

(b) Processes available for reviewing the accuracy of flood hazard modelling published on Geyserview.

(c) How overland flowpaths can be identified for implementation of proposed Rule NH-R5 and earthworks performance standard EW-S1(g)

**EXECUTIVE SUMMARY**

9. My evidence explains how flood hazard information is used to implement the flood risk provisions proposed under PC 8, particularly Rules NH-R4 and NH-R5. PC 8 retains the flood risk management framework introduced through Plan Change 9 and extends it to the Lakes A Zone. The framework manages flood risk from rivers, lakes and overland flow using a tiered, risk-based approach based on a 1% Annual Exceedance Probability (AEP) flood event with climate change allowances to the year 2130.

10. Implementation of Rule NH-R4 relies on flood hazard information held outside the District Plan, primarily through Geographic Information Systems (GIS) mapping commissioned by BOPRC and RLC, supplemented by local knowledge, historical records and site-specific investigations. Where anticipated flood depths are less than 300mm, minimum floor levels with freeboard are generally sufficient. Where flood depths exceed 300mm, resource consent is required to assess whether flood risk is acceptable. Retaining hazard maps outside the District Plan enables the use of the most up-to-date modelling and allows refinements as new information becomes available.

11. My evidence also addresses the role of national and regional flood models. The national flood model developed by NIWA (now Earth Sciences New Zealand) is a screening tool that can flag potential flood susceptibility but is not intended for site-specific implementation of District Plan rules. Locally produced and emerging regional models, including the WRC flood model, are expected to provide more reliable information for consent assessment.

12. PC 8 also introduces provisions to manage overland flowpaths under Rule NH-R5 and related earthworks standards. Although overland flowpaths are not mapped in the District Plan, they can be identified using topographic data, flood modelling outputs, GIS tools, site observations and local knowledge.

13. Processes are in place to review flood hazard information where concerns are raised, with investigations undertaken proportionate to the significance of the issue.

14. Overall, I support a flexible, information-led approach to flood risk management that can be implemented effectively without fixed hazard maps in the District Plan.

**FLOOD HAZARD INFORMATION FOR IMPLEMENTATION OF RULE NH-R4**

**PC 8 Provisions**

15. PC 8 proposes to retain the approach to manage flood risk (from rivers, overland flow or lake inundation) at land use in the main part of the District Plan, which was adopted under Plan Change 9, and extend this approach to the Lakes A Zone. This involves a tiered approach, depending on the anticipated depth of flood waters in a reference scenario of a 1% AEP event with climate change based on RCP8.5 to the year 2130 (or the most recent national or regional guidance).

16. In areas where flood depths are anticipated to be lower than 300mm in this scenario, the minimum floor level of any habitable dwelling shall be

above the anticipated flood level and include freeboard to allow for any imprecision in the flood estimate. In areas where flood depths are anticipated to be higher, most buildings will require resource consent (excluding minor additions, buildings of low importance as defined and specific buildings associated with infrastructure). The associated matters of discretion require consideration of the flood risk and whether the risk is acceptable (Rule NH-R4(4)).

17. It is noted that flood risks are also considered at subdivision for land susceptible to flooding in the reference scenario of a 1% AEP event with climate change based on RCP8.5 to the year 2130 (or the most recent national or regional guidance) (Rule SUB-R43).

18. These rules are not accompanied by maps in the District Plan for the 1%AEP with climate change scenario but rely, instead, on the description of the event. PC 8 proposes to retain this approach.

**Submissions**

19. A number of submitters, including the Natural Hazards Commission, Rotorua Planning Consultants Group and R&B Property Group, raise concerns about the lack of natural hazard maps in the District Plan, both generally and specifically in relation to flood hazards. Their reasons include a lack of certainty for stakeholders and consistent implementation (39.2, 54.2).

20. Other submitters, such as Kāinga Ora Homes and Communities (Kāinga Ora), BOPRC, WRC and Te Rūnanga o Ngāti Kearoa Ngāti Tuara, support the approach of retaining hazard maps outside the District Plan to enable the use of the best available information (42.2, 15.2, 45.3, 58.2).

21. My evidence provides background to this issue by discussing the information that is currently used to determine the 1% AEP event with climate change and how recently published and emerging national and regional flood modelling is anticipated to be used.

**Current Approach**

22. The information available about flood hazards in the urban areas has improved dramatically with the development of modelling software and computing technology and now allows the creation of models and the information they can generate to be made more readily available via GIS. Both BOPRC and RLC haveGIS which have flood mapping available.

23. The flood depth maps outputted from these models is a key source of information for identifying whether minimum floor levels or risk assessments are required under NH-R4 for fluvial or pluvial flooding in the urban area. This information acts as a flag for council staff and developers to identify that compliance with Rule NH-R4 needs to be considered in relation to a building project and the land development team reviews all applications flagged through consideration of the flood models.

24. However, the accuracy of the flood depths suggested by the flood models needs to be considered on a site-by-site basis as the model information is based on aerial imagery available at a certain date and the landforms may have changed since the modelling was undertaken. There may also be factors not adequately represented in the model such as walls and fences that redirect flows. In some cases, the applicant will also provide further information in this regard. Local knowledge also plays a part in considering the information and whether it is reasonable or needs further investigation. Council's historical property records can also include information about past issues on a site.

25. My team always undertakes a site visit when the need for a resource consent under Rule NH-R4 is identified and this provides opportunity to check against expert advice provided by applicants that may differ from the catchment models.

26. Where there is a discrepancy between the BOPRC Greater Utuhina Catchment model and the RLC Western Urban Flood Model, the higher flood level has been used to establish minimum floor levels.

27. Flood information in rural areas is often not modelled. Knowledge about flooding in rural areas is generally from historical information contained within RLC's property files. In addition, assessment of the site's contours and ground conditions can give indications of potential overland flowpaths or low-lying wet areas. When reviewing building consents, if my team considers there may be a risk of flooding that raises an issue of compliance with NH-R4, then the applicant is asked to provide a flooding assessment. The natural hazard assessments submitted in geotechnical reports for most building consents may also highlight a flooding issue.

28. NZ Standards and regional council guidance is used to identify appropriate allowances for freeboard where these have not been identified in the modelling.

29. Where depth and velocity information is available from models, the Australian Disaster Resilience Handbook Collection Guideline 7-3 (2017) is used to assist with understanding the significance of the hazard. These guidelines give a general flood hazard classification based on depth and velocity.

**Recent and Emerging National and Regional Models**

30. The recently published national flood model by Earth Sciences New Zealand (previously NIWA), is identified as not suitable for use at the property level by the developers. Nonetheless, it provides a useful flag of where areas could be prone to flooding and that additional information may need to be requested to ensure compliance with NH-R4.

31. The WRC is in the process of developing a regional flood model. RLC has had preliminary discussions with WRC and it is our understanding that WRC intends that the model will provide greater confidence than the

national model for use at a site-specific scale, provided appropriate checks have been undertaken of relevant inputs in the vicinity.

**PROCESSES AVAILABLE FOR REVIEW OF FLOOD HAZARD INFORMATION**

**Submissions**

32. Submitters opposing natural hazard maps sitting outside the District Plan, such as Summerset Group Holdings Limited, also raised concerns about participation and scrutiny.

33. BOPRC, which supported hazard maps being retained outside the District Plan, also recommends that RLC develop a process to enable regular review and updates that consider community feedback where relevant. (FS 45.30)

34. Being able to provide the most up to date modelling is a benefit of removing the maps from within the District Plan. Site-specific complaints about the hazard mapping have not been common but any complaint is investigated and a response provided. In my experience, this response is generally sufficient to address concerns. The level of investigation and detail of response will depend on the significance of the issue. If the need to update flood modelling were identified, this would be included for consideration in the next update of the model.

**IDENTIFICATION OF OVERLAND FLOWPATHS – RULE NH-R5**

**PC 8 Provisions**

35. PC 8 proposes new performance standards for earthworks, building and structures to protect neighbouring property in urban areas from changes to overland flowpaths (Rules EW-S1, NH-R5). Overland flowpaths are not mapped in the District Plan but defined as follows:

> *The land overflown by a concentrated flow of water in an intense rainfall event, as it flows towards the stormwater network, streams, rivers, or lakes. Overland flowpath includes a secondary flowpath which is activated when the primary (often piped) stormwater system*

*gets blocked or when the capacity of the piped system is exceeded. For the purposes of this definition, an overland flowpath includes, but is not limited to, an artificially designed route using formed or hard surfaces. Overland flowpaths referred to in rules and performance standards shall be limited to those with a catchment of 4000m2 or more.*

36. Rule NH-R5 will apply to the urban zones, including the city centre, commercial zones, industrial and business and innovation zones, as well as Lakes A settlement management area and bush settlement zones.

37. The section 32 report noted that RLC was in the process of mapping the indicative location of overland flowpaths using a digital terrain model but that this mapping was not considered critical to the implementation of the proposed rule and earthworks performance standard, since overland flowpaths can be determined from topography and existing mapping tools. It further stated that this tool would assist to identify their location but would need to be checked on site to determine how structures and changes in terrain not included in the model may alter the location of flow paths.

**Submissions**

38. The Rotorua Planning Consultants Group states that Rule NH-R5 is open to interpretation and disagrees with the Section 32 Report that overland flowpaths can be determined by topography (39.5).

**How overland flowpaths can be identified by stakeholders and Council**

39. Where urban flood modelling is available, this gives a good indication of the location of many overland flowpaths as well as flood areas, particularly when climate change results are viewed. See Figure 1 and Figure 2 below for examples of RLC GIS flood hazard maps.

40. Where urban flood modelling is not available, topography information generally provides a reliable indication of the likely location of overland flowpaths. Readily available contour information can be used to identify

low points and flow paths and this can be reasonably supplemented by a site visit to observe ground conditions and existing drainage features.

*Figure 1: Example Results - Western Urban Flood Model Current Climate – Example Results (RLC GIS)*

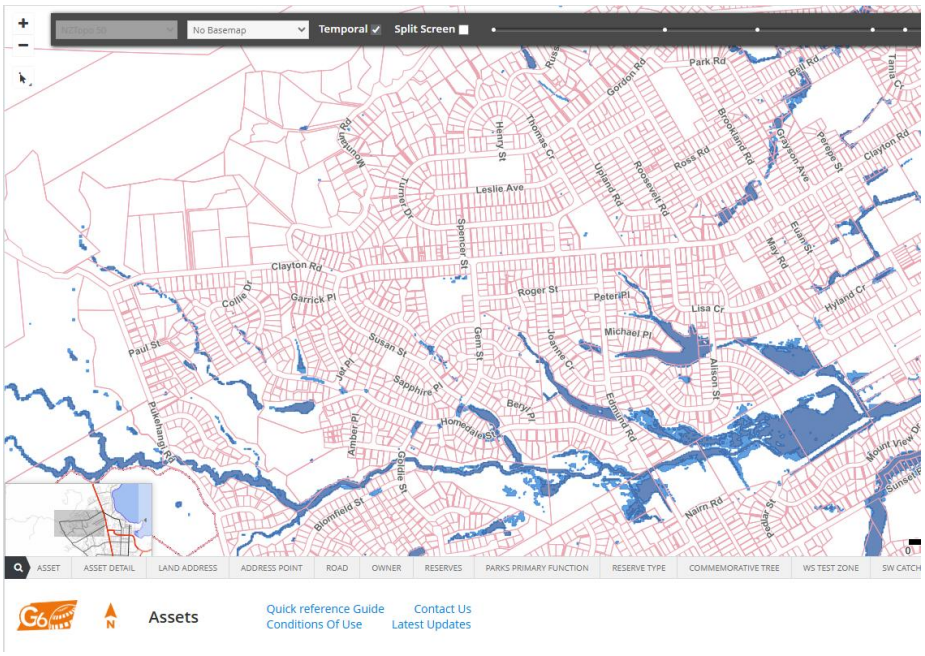
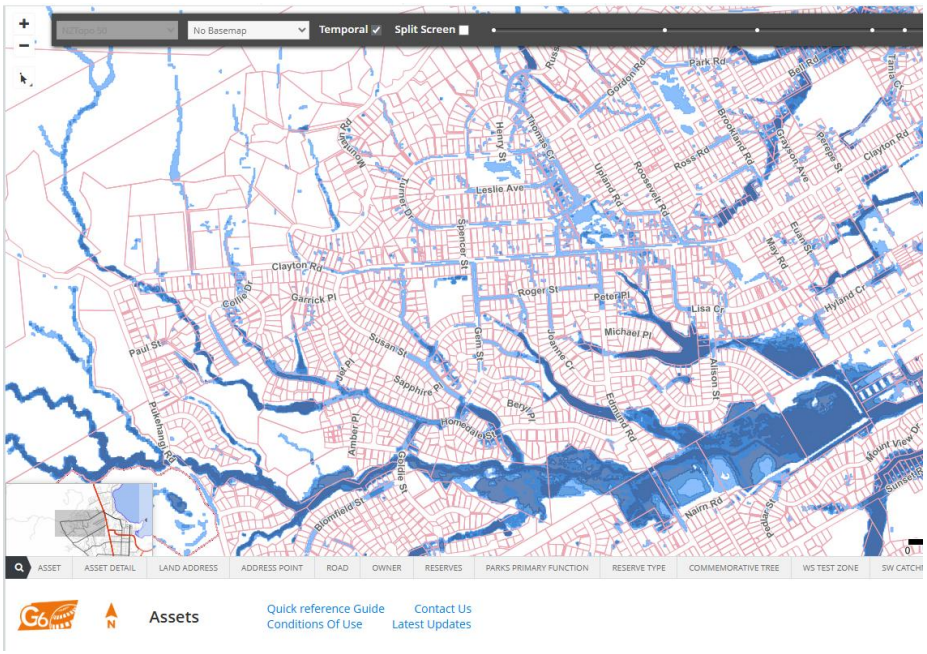



*Figure 2: Western Urban Flood Model 2130 RCP_8_5 – Example Results (RLC GIS)*



**CONCLUSION**

41. I support the PC 8 approach of managing flood risk through rules that enable consideration of the most up to date information rather than fixed hazard maps embedded in the District Plan. This process has been successfully implemented to date, following the rules introduced by Plan Change 9, particularly NH-R4.

**Paula Catherine Meredith**
**Dated 13 March 2026**