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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REBUTTAL STATEMENT OF EVIDENCE OF PETER ROBERT COCHRANE (Flood Hazard – Lakes)

Dated 24 April 2026

TOMPKINS | WAKE

Westpac House
Level 8
430 Victoria Street
PO Box 258
DX GP 20031
Hamilton 3240
New Zealand
Ph: (07) 839 4771
tompkinswake.co.nz

INTRODUCTION

1. My full name is Peter Robert Cochrane. I am a Principal Environmental Scientist at Tonkin & Taylor Limited (T+T).

2. My qualifications and experience were set out in my Statement of Evidence dated 13 March 2026 (Primary Evidence). I repeat the confirmation in my Primary Evidence that I have read and agree to comply with the Code of Conduct for Expert Witnesses.

3. In this statement of rebuttal evidence, I respond to the evidence of:

   (a) Anna Kate McKay on behalf of Bay of Plenty Regional Council (BOPRC)

   (b) Nicole Maree Marshall on behalf of BOPRC

   (c) Mark Ivamy on behalf of BOPRC

4. The fact that this rebuttal statement does not respond to every matter raised in the evidence of a submitter within my area of expertise should not be taken as acceptance of the matters raised. I have focussed this rebuttal statement on the key points of difference that warrant a response.

EXECUTIVE SUMMARY

5. The methodology used in the 2022 Lakes Design Levels Report provides a reasonable and credible basis for planning purposes. However, as outlined in my Primary Evidence, there are other methods that are available. All methods involve assumptions and uncertainty and, while each one will be valid, it may not represent a single point of truth.

6. My Primary Evidence focused on technical matters rather than planning provisions. While I agree that having hazard mapping outside the District Plan offers flexibility to respond to updated information without the need for a plan change, whether flood levels are included in the District Plan or

are referenced to an external document or database is a planning matter rather than a technical one. From a practical perspective, an overlay in a District Plan can provide certainty in applying rules. This approach avoids the situation where alternative assessments of hazard extents end up needing to be considered on a site-by-site (or consent by consent) basis.

7. In my view, the bespoke provisions for Lake Ōkāreka recognise the established development pattern around the lake and manage this risk by limiting new development, thereby assisting in reducing future flood-related consequences. While replacement or extension of existing buildings under the bespoke provisions may increase flood risk, this increase primarily relates to asset value rather than greater exposure of people. By seeking to avoid new development, the bespoke provisions assist to reduce exposure of people to flood-related consequences.

CLARIFICATION OF POSITION ON 1% AEP LAKE LEVEL

8. Ms Marshall refers to my Primary Evidence as stating that the methodology adopted in the 2022 Lakes Design Level Report is an appropriate way to establish a 1%AEP lake level (para 21).

9. As mentioned in my Primary Evidence, it is not the only approach that could be taken to establishment of probabilistic high lake levels. Other approaches include:

   (a) A hydrological water balance as discussed in paragraphs 50 to 54 of my Primary Evidence;

   (b) Other empirical approaches that draw on hydrometric data; or

   (c) The development of a hydraulic model.

10. Each approach will contain uncertainties and assumptions about data used as inputs, and/or physical processes (rainfall, run-off and discharge into lakes, lake levels, and discharges form the lakes) and while some of these can be tested through sensitivity analyses, or the gathering of more

or new data, it is likely that each approach will result in different calculated lake levels.

11. Each approach will also need to predict water levels in the face of uncertainty around the effects of climate change to 2130, or shorter term climate variations.

12. Finally, the management of the outlet from Lake Ōkāreka represents an element of uncertainty. As outlined in paragraph 15 of my Primary Evidence, there will be uncertainty around the effectiveness and timeliness of operational responses, the availability of long-term funding for outlet maintenance and operation, and the ability to maintain current or higher discharge rates under future consenting regimes.

13. Each calculated lake level will contain uncertainty and while each one will be valid, it may not represent a single point of truth.

14. These caveats hold true for the approach taken by the BOPRC in their 2022 Lakes Design Levels Report. However, overall, the 2022 Lakes Design Levels Report provides a reasonable basis for establishing an extreme lake level for planning purposes.

CLARIFICATION OF POSITION ON THE NOTIFIED PC8 APPROACH

15. Ms Marshall suggests that my support for the 2022 Lakes Design Levels Report indicated that the notified flood management framework in PC 8 was supported by [my] independent technical review (para 21).

16. For clarification, I did not consider the detail of the rule framework proposed in PC 8 during the preparation of my Primary Evidence. Rather, my evidence focused on the methodology used to establish high lake levels in the 2022 Lakes Design Levels Report, and the limitations of the water balance approach used to inform the design of the outlet, which was being promoted by some submitters as preferable.

17. I have now considered both the notified framework and the bespoke approach recommended in the Section 42A Report in relation to matters raised in expert evidence and provide my observations below.

Static overlay or hazards maps outside the plan

18. Ms Marshall, Ms McKay and Mr Ivamy all prefer hazard mapping to sit outside the District Plan as proposed in the notified PC 8, as opposed to the static 'overlay' recommended for Lake Ōkāreka in the Section 42A Report.

19. Ms Marshall and Mr Ivamy emphasise the potential to use the best available information (consistent with Policy 5 of the NPS-NH) and respond to evolving best practice through non-static maps (para 22 and para 22). Ms Marshall considers the notified approach the most efficient and effective to achieve the objectives (para 27).

20. Ms McKay explains in para 48 of her evidence that the sensitivity of lake levels to climate change methodology and manual lake outlet management reinforces the need for a dynamic flood level around Lake Ōkāreka rather than a static level included in the district plan. She concludes that the static level could become outdated when climate change predictions or lake level management protocol changes.

21. I agree with the statements made by Ms Marshall, Ms McKay and Mr Ivamy, from a practical point of view, and the flexibility that it provides Rotorua Lake Council to respond to new information. However, whether the rules set out in PC 8 refer to levels in the District Plan or in reference to another source of information is a planning rather than a technical matter.

22. From a plan implementation perspective, a static overlay can also provide practical benefits. As discussed earlier, all approaches to estimating extreme lake levels involve assumptions and uncertainty, and different methods may reasonably produce different results. In that context, a

static overlay can assist by providing a consistent reference point for rule application, avoiding the need for competing interpretations of hazard extents to be resolved on a site-by-site basis.

BESPOKE PLANNING PROVISIONS

23. In para 49 of her evidence Ms McKay draws a conclusion that the rules in the s42A report increase flood risk compared with the original rules in the notified plan change for various reasons that I address below. In doing so, I refer to the flood hazard at Lake Ōkāreka, as this context is important when considering the reasons referred to by Ms McKay.

Nature of the Flood Hazard

24. Flooding from Lake Ōkāreka has characteristics that differ from pluvial (rainfall) or fluvial (river or stream) flooding which is also addressed within the same notified rule package. These characteristics influence both the level of risk and the appropriate planning response.

25. Inundation of land from Lake Ōkāreka is likely to be slow in its onset. Water velocities will be very low and, as a result, it is unlikely that flooding will pose a safety issue to people from the combined effects of depth and velocity.

26. Recession of water levels in the lake will also be slow, which will mean that inundation of land is likely to occur over longer periods than that experienced from high rainfall or high river levels. **Figure 1 attached** to my evidence shows lake levels from ca 1950 to 2025. I have included the 1% AEP lake level from the 2022 Lakes Design Levels Report and freeboard, as well as minimum and maximum operating levels. **Figure 2** also shows lake levels, but over a shorter period of time from 2022 to the end of 2025 (post outlet upgrade).

27. It is apparent from Figure 2 that lake levels rise more quickly than they recede, albeit at very low rates. The average daily rate of lake level rise from 2020 – 2025 is 9 mm per day, whereas the average daily rate of fall

is 5 mm day. This means that there will potentially be extended periods where water levels around the lake remain elevated.

28. The potential consequences of extended periods of elevated water levels include:

    (a) Impractical or unsafe vehicle access to and from habitable buildings.

    (b) Impacts on sanitary services from infiltration of flood waters into reticulated wastewater networks (although design can assist to reduce these risks).

    (c) Damage to buildings from prolonged surface water and moisture.

29. The extent of inundation under a 1% AEP at Ōkāreka is shown in **Figure 3**. This indicates that there are relatively few buildings (including residential buildings) below the mapped 1% AEP lake level extent, with most potentially exposed buildings located at a level between the 1% AEP flood level and +0.7 m of freeboard.

30. The freeboard allows for a range of processes, including lake waves and lake seiche, which will be more important for lake edge properties than those set back from the lake, but is represented in the mapping as a single level using a simplified "bathtub" approach. The likelihood of inundation decreases with increasing elevation but exposure to different processes mean that this is not uniform.

Flood risk assessment and residual risk

31. In para 49(iv) Ms McKay states that the approach does not require flood risk assessment or consideration of residual risk for developments in the High Lake Level Resilience Area. I agree with her statement to a point.

32. The increased risk relates mainly to an increase in asset value to a building that is replaced or extended. With considerations of the matters outlined

in paras 24 to 30 above, it is unlikely to significantly increase the population exposed to flood risk.

33. The rule package does not appear to me to enable new development. In other words, it recognises the established nature of development around the lake, while managing risk primarily through a focus on new development rather than incremental change. In that context, assessment of flood risk and consideration of residual risk can be said to have been undertaken at the rule-development stage, limiting the population exposed to potential access issues, damage to buildings from prolonged exposure to surface water and moisture, and risks to essential services during periods of elevated lake levels.

Perpetuation of Existing Risk

34. Finally, in para 49(vi) Ms McKay suggests that the proposed rule perpetuates existing flood risks of established land uses, through enabling replacement buildings, where these would have otherwise been reduced under the original notified approach after the asset life cycle.

35. Again, while the latter outcome is true from my understanding of the bespoke rule package, it does not appear to me to encourage new development. In other words, it recognises the established nature of development around the lake, while managing risk primarily through avoiding new development.

CONCLUSION

36. I maintain that the lake level adopted by Council for PC 8 is reasonable and provides a suitable basis to inform the relevant rules in PC 8 however they are framed.

37. While having a design lake level outside of the District Plan enables it to be updated (without recourse to a plan change process, which can take some time) this is more a planning matter than a technical issue. Furthermore, there will always be situations where floor levels of

buildings (even if they are recently built) end up being below (or above) a revised or re-calculated design lake level.

38. While the replacement or extension of a building within an area exposed to flooding would result in an increased risk, the increase relates mainly to the increased value of the building that is replaced or extended. By seeking to avoid new development, the bespoke provisions assist to reduce exposure of people to flood-related consequences.

Peter Robert Cochrane
Dated 24 April 2026

Attachment 1 - Figures

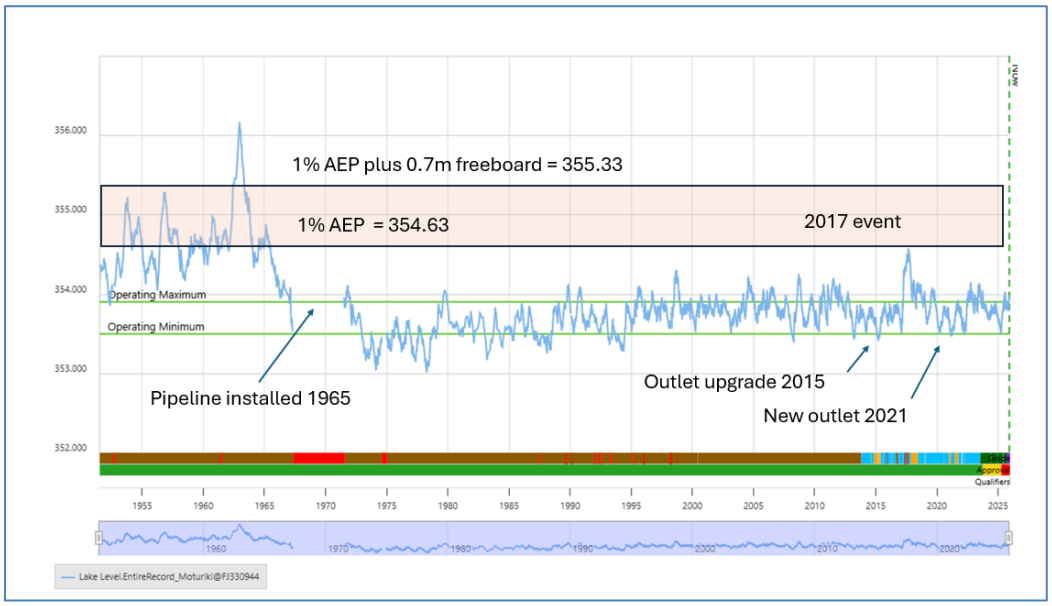

Figure 1: Lake Ōkāreka Levels from 1951 to 2025, showing operating levels, calculated 1% AEP level and 0.7m freeboard (shaded). Also note construction of original pipeline outlet in 1965, outlet upgrade in 2015 and construction of a new outlet in 2021.

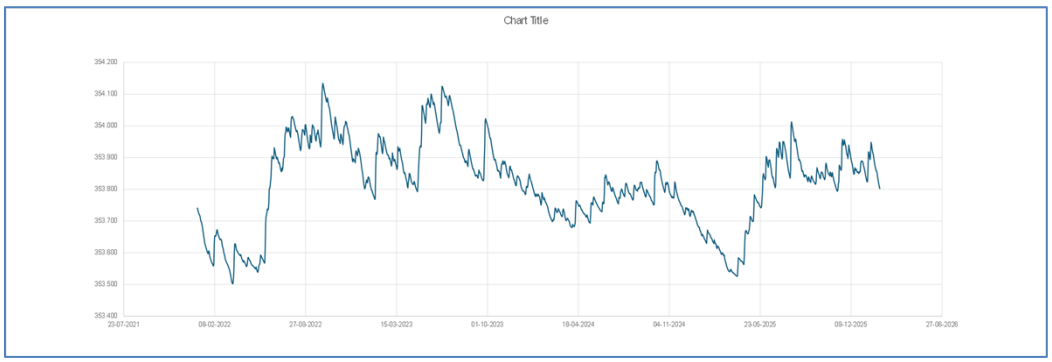

Figure 2: Lake Ōkāreka water levels from 2022 to 2026, showing the rate of increase and decreases in water levels following the completion of outfall upgrades.

Figure 3: Lake Ōkāreka showing the extent of inundation at 354.63m (corresponding to a 1% AEP design lake level) and at 355.33m (1% AEP design lake level plus 0.7m). From RLC 21 April 2026.