

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of a hearing for the Proposed Private Plan Change
37: Nukuhau to the Taupō District Plan

STATEMENT OF EVIDENCE OF JON PALMER
For the Waikato Regional Council
DATED 27 OCTOBER 2021

Introduction

1. My name is Jon Palmer. I am a Senior Technical Advisor in the Integrated Catchment Services and the Farming Services Sections at the Waikato Regional Council (WRC). I have been in this role since July 2018.
2. I hold a degree in Parks and Recreation Management majoring in Soils, Ecology and Biology. I also hold an Honours Degree in Applied Science majoring in Natural Resources Management. I have professional training in Soil Conservation and Gully Erosion Control, Land Use Capability Assessment, as well as formal training through Massey University on all aspects of farm system and nutrient management.
3. I was Soil Conservator and a Senior Land Management Officer for Waikato Regional Council for four years based at the Taupō Office. During this time, I specialised in the control and management of erosion within pumice gullies and managed the ongoing maintenance of the Lake Taupō, Reporoa, and Paeroa Range Soil Conservation Schemes. All of these schemes were built to control erosion of pumice soils. I was also involved in:
 - Erosion control projects on the Loch Views and Loch Eagles subdivisions
 - Construction of the East Taupō Arterial Road
 - Managing the construction of detention dams, flumes, and bunds
 - Implementing numerous riparian and gully restoration projects.
4. I have continued to advise on specific erosion management projects in the intervening years.
5. As a Senior Technical Advisor in the Integrated Catchment Services and the Farming Services Sections for WRC, I am involved in providing advice on catchment management and nutrient management and farm planning for policy development and implementation management. I also contribute to national level projects in the above fields. Typically, I work closely with central and local government, iwi, farming sector groups and industry organisations such as Beef and Lamb, Dairy NZ, and with other regional councils to assist in the development of consistent integrated regional policy and provide nutrient and land management implementation advice.
6. Before my role at WRC, I was employed by the Department of Conservation where part of my role was involvement in managing the impacts of erosion caused by use of conservation lands

for recreation. I also previously worked for the Christchurch City Council as a Park Ranger involved in habitat management and was involved in managing gully erosion issues on the Port Hills of Christchurch.

7. I confirm that I am familiar with the Code of Conduct for Expert Witnesses as set out in the Environment Court Practice Note 2014. I have read and agree to comply with the Code. Except where I state that I am relying upon the specified evidence or advice of another person, my statement is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

Scope of evidence

8. My statement is given on behalf of the WRC. My statement is provided in support of the WRC submission and reflects my professional opinions as a Senior Technical Advisor.
9. I, along with other WRC policy, engineering and consenting staff, have engaged in multiple discussions with WSP planners and engineers on behalf of the proponent (virtual meetings on 30 July and 10 September 2021 and a site visit on 4 August 2021), seeking to explain and resolve the submission point relating to gully realignment and seeking amendment to the plan provisions to protect the natural gully systems.
10. My evidence focuses on:
 - The Lake Taupō catchment soil types and erosion processes and the Lake Taupō catchment control scheme.
 - Previous gully erosion events in and around Taupō.
 - The Nukuhau gully systems and potential effects of gully realignments or modification.
 - Methods and tools for gully management.
11. My assessment is based on information supplied in the plan change documents, discussions with the applicant, a site visit to the structure plan area, and my significant local knowledge of events and experience in soil conservation, erosion control and gully management.
12. It is my view that there is the potential for significant adverse effects to arise from any realignment or mismanagement of the Nukuhau natural gully systems.

Summary of evidence

13. I do not support the notion of realignment of the natural gully systems running through the Nukuhau Plan Change area and consider these should be protected through high level policy in the plan provisions.
14. I do support the use of the natural gullies for the purposes of stormwater reserve if robust erosion and sediment control practices are used and the Taupō District Council (TDC) adopts a formalised Gully Management Plan.
15. Taupō has unique soil types and erosion processes necessitating careful management and has a history of significant erosion events as a result of urban development and increased stormwater runoff.
16. The Nukuhau gullies, although currently benign, have relatively large catchments and the potential to erode if careful management practices are not implemented.

Lake Taupō Catchment Soil Types and erosion processes

17. The soils of the Taupō Catchment are pumice derived that are formed from airfall, flow or alluvial tephra from the Taupō Caldera. Most of the visible soils present today originate from the Taupō eruption that occurred approximately 1,800 years ago.
18. A notable and definitive feature of pumice soils is that both large and small fragments of pumice (present solely or mixed with ash and lapilli) float. Pumice soils are particularly erodible because of this characteristic. Additionally, pumice soils often become hydrophobic during the summer months, limiting water infiltration during rain events – resulting in increased runoff.
19. A natural gully system is originally formed by natural geomorphic processes (erosion and/or sedimentation caused by historic stormwater overland flows creating a naturally formed channel). Regardless of any modification that has occurred, a natural gully system still provides some natural hydrological function. The sizes and geometry of gullies are a reflection of the scale of events that shaped them over the years.

20. Gullies tend to develop in clearly identified stages. When overland flow occurs during or following rainfall, stormwater runoff is concentrated into channels. Channel erosion is initiated when there is downward scour of the topsoil and sub-soil – deepening and undermining the floor of the existing gully. The head of the gully also becomes undermined due to waterfall action and scouring at the base of the fall, resulting in undercutting of the subsoil and then collapse of the topsoil.
21. Gullies can also form through and under pumice layers as underground tunnels or tomos collapse.
22. The potential for gully erosion is dependent on the runoff characteristics of the catchment, the catchment area, soil characteristics and the slope of the channel.
23. Typically, increased water flows and runoff are a result of catchment size, increasing proportion of hard surfaces (through urban development) or by pasture (instead of tall vegetation). Coupled with increased rates of rainfall during heavy rain events, erosion events become far more likely and severe.

The Lake Taupō Catchment Control Scheme

24. Development of land in the Taupō catchment started in earnest in the 1950s – both the development of farmland by Lands and Survey and also the expansion of Taupō and other townships.
25. During the 1960s and 1970s erosion became pronounced due to the removal of vegetative cover and the increase in pasture, particularly during the summer months when soils become hydrophobic (unable to soak up water), combined with intense rainfall events from thunderstorms. The scale of erosion was exacerbated by the erodibility of pumice soils.
26. Soon after this period, the Lake Taupō Soil Conservation Scheme was drafted and implemented. The scheme sought to protect gully systems and reduce erosion by planting and retiring gully systems. Today, over 5,000 hectares of land is protected under the scheme, including most perennial and ephemeral waterways.

27. Despite success of the scheme, WRC staff still see new and worsening erosion, typically following heavy rain events. This is particularly pronounced in areas of urban development where runoff or catchment character is changed.

Gully erosion in and around Taupō

28. All gullies, including shallow gullies in benign landscapes and those that are planted, in and around Taupō are at risk. In recent years, heavy rainfall events have caused significant overland flows resulting in erosion events in the Wharewaka subdivision, the Brentwood gully systems, and at Acacia Bay.

29. Many of these events were significant in terms of damage to infrastructure, stormwater services, earthworks, gullies and the foreshore.

30. Example photos of recent erosion in and around Taupō can be viewed in Appendix 1 to this statement.

The Nukuhau Gully Systems

31. The Nukuhau catchment size is approximately 240ha. Having visited the site, I can confirm the Nukuhau gullies are natural, having been formed by historic stormwater flows acting on the unstable pumice geology (as opposed to being formed by earthmoving equipment or other engineered techniques or other geological processes). I acknowledge that the lower reaches of the gullies have been modified by contouring.

32. As the gullies have conveyed water flows in the past, it is likely significant flows will also be conveyed by these gullies in the future, during and following storm events. This is also suggested by modelling (see Appendix 2). The volume of flow is likely to be exacerbated by an increase in hard surfaces in the area after urban development, particularly in instances where on-site water retention and other stormwater mitigation measures are compromised. This creates risk of flooding and erosion.

33. The gullies are at particular risk of scouring and erosion from flows because the underlying geology is pumice based volcanic tephra. These risks are extended further to the gullies and

existing development further downstream of the easternmost gully (upstream of the gullies natural convergence point).

34. It is my opinion that any realignment of the gully systems will increase stormwater flows and expose large areas of soil that may result in new and unanticipated erosion of the gully sides and floor. Present gully alignment should be maintained to protect future development in the structure plan area and the existing development downstream (which is currently protected through established planting and engineered mitigations but may require further remedial works as part of this development).
35. I consider it is fortunate, given the catchment size and history of damaging stormwater events around Taupō, that previous earthworks and contouring activities in the structure plan area gully systems have not resulted in damage to the established housing in the floor of the easternmost gully.

Methods and tools for gully management

36. I recommend a Gully Management Plan should be adopted by the Taupō District Council in combination with this plan change to manage and mitigate the effects of stormwater within the Nukuhau natural gully systems, and other gully systems throughout the Taupō township. This Gully Management Plan should be prepared by Taupō District Council (as the storm water management body), collaboratively with Waikato Regional Council staff and local communities and recreational groups.
37. The Gully Management Plan should include specific actions as follows¹:
- Robust plantings on the sides to protect the gully walls,
 - Avoid developing/modifying areas of bare ground, particularly in the floor of the gullies,
 - Maintain ground cover on the gully floors,
 - Reinforce any stormwater outfall areas with rock riprap or concrete areas to disperse the water flows,
 - Use of detention structures (as have been successfully incorporated into other gullies around Taupō),

¹ Source: Soil Conservation Technical Handbook, 2001.

- Any culverts installed must be large enough to convey maximum envisaged rainfall events (1:100 year) and any additional “overflow” from on-site water retention and other stormwater retention mitigations. Culvert entrances and exits should be protected by concrete aprons and side walls and surrounded on the gully floor with gabion baskets,
- Methods for quick remedy to any new areas of erosion, using soft or hard engineering practices (depending on the location and severity of the erosion),
- Methods for managing recreational and amenity uses of the gullies.

38. The above actions in a Gully Management Plan will ensure the ongoing protection of these natural features and reduce the risk of damage to property and infrastructure in the future.

39. Further, I recommend any works within the gullies should follow the Waikato Regional Council Erosion and Sediment Control Guidelines and for stormwater management to follow the WRC Stormwater Management Guideline.

Position on S42A officer report recommendations

40. I agree with the statement of Mr Farquhar (6 October 2021), section 7.7 (c), in which he notes the existence of tomos and need to manage stormwater. ‘Present indications are that tomos are not pervasive to the extent that they would constrain or preclude overall residential development of the land. However, they will need further assessment at subdivision consent stage to determine what measures should be undertaken with stormwater to avoid creation of tomos and what measures should be taken with building and land development to mitigate their effects.’ The need to manage stormwater infiltration with respect to the risk of tomos is also identified in Section 8.3 of the Stormwater Report accompanying the plan change.

Position on applicant’s recommendations

41. I support the amendments recommended by Ms Cleary (for the applicant) in regards to the WRC submission point of gully management. I consider it is important to highlight the risks of gully modification in the plan so developers are aware from the outset of the issues at hand.

42. I consider it is problematic that the Nukuhau Structure Plan map indicates the position of gullies in a realigned form and that the plan provisions refer to the natural gully systems as a ‘stormwater reserve network’.

Support for other submissions

43. I support submitter 34 (Tukairangi Trust - Peter Marshall) and their position on gullies. The trust seeks amendment so that large planted soil conservation areas should be set aside using existing gullies and overland water flow patterns to cope with increased run off from hard surfaces and stormwater.

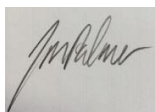
44. I support submitter 53 (Lakes & Waterways Action Group Trust - Jane Penton) and their position on proposed gully realignment. The trust recommends that the gullies not be modified as pumice soils are prone to erosion and are valuable stormwater management assets in their natural form.

Conclusion

45. I am of the view that the natural gullies in Nukuhau should not be realigned. Management of these gullies needs to be appropriate in order to avoid exacerbation of hazard risk and stormwater damage.

46. I support the plan provisions as set out in Ms Cleary's evidence and the recommendation of Mr Bird to require a gully management plan.

47. I seek that the remainder of WRC's recommended amendments are also considered by the hearings panel to ensure effective management of the Nukuhau gullies.



Jon Palmer

**Senior Technical Advisor
Integrate Catchment and Farming Services
Waikato Regional Council**

27 October 2021

Appendix 1: Photos of recent erosion events in and around Taupō

Loch Views Subdivision, blowout of drop structure. Catchment of 2 hectares. 2013.



Loch Views Subdivision, damage to soil conservation gully following inappropriate stormwater control, 2013.



Wharewaka Subdivision, May 2013. Runoff from the subdivision into Lake Taupō at Wharewaka Point. Catchment size less than 50 hectares in a catchment with no defined gullies.



Paenoa Road, Acacia Bay, May 2017. Cyclone Debbie. Overland flows and gully erosion of geotechnically protected area.



Wharewaka East, post storm event, December 2017. Debris from flows through gullies adjacent to Maunganamu Drive into Secombe Park (soil conservation areas protected by Land Improvement Agreement). The gullies hadn't flowed for many years. Upper catchments (200ha) planted in *Pinus radiata*.



Wharewaka east subdivision. A “dry” gully carrying water after a short heavy rain event. September 2021.



Upper Nukuhau erosion caused by stormwater within a gully system with no vegetative protection, 2012.



Loch Eagles Subdivision, 2013. Large volume of pumice debris following a downpour during subdivision development.



Rakanui Road TH2, Gully erosion of a benign landscape after a heavy rain event in the early 2000s.



Farmland near Taupō, gully erosion of benign landscape in a catchment with previous gully erosion. Catchment size approximately 100 ha.

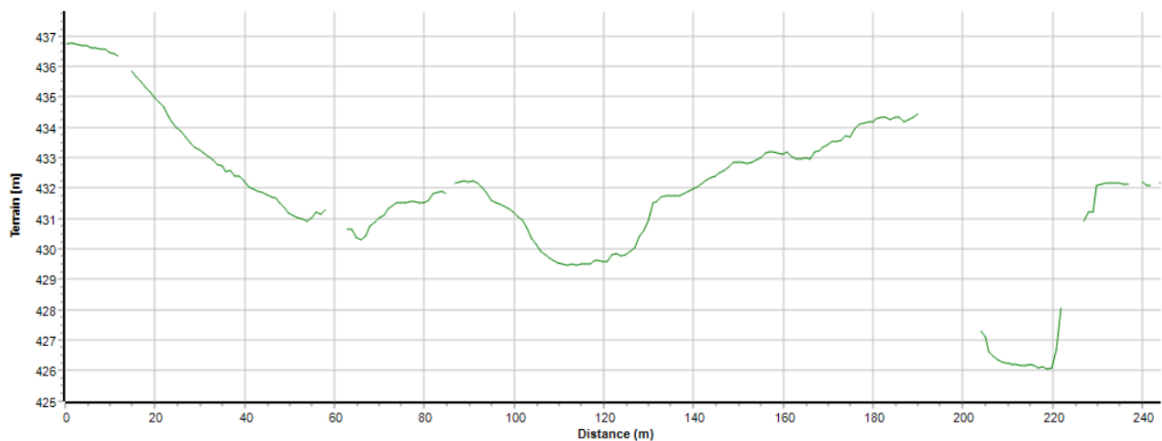


Appendix 2: Catchment and flow modelling data provided by Waikato Regional Council.

3 main catchments to northern property boundary							
East	111.4 2 ha	40minT C	100y42.4m m	C=0.1_Qp1. 97	C=0.3_Qp5. 91	C=0.9_Qp17. 73	NZFloodSta ts Qp0.41
Mid	127.4 6 ha	40min TC	100y42.4m m	C=0.1_Qp2. 25	C=0.3_Qp6. 74	C=0.9_Qp20. 21	NZFloodSta ts Qp0.64
West (and mid- old)	21.95 + 1.1 ha	20min TC	100y31.2m m	C=0.1_Qp0. 60	C=0.3_Qp1. 79	C=0.9_Qp5.3 8	NZFloodSta ts n/a

The east and mid catchments join naturally, with a total catchment area of 239ha. Addition of the west catchment brings the total area to 262ha, which is an increase of around 9%.

Graph of Nukuhau gully terrain



Maps of Nukuhau gully terrain

