BEFORE THE INDEPENDENT HEARINGS PANELS APPOINTED TO HEAR AND MAKE RECOMMENDATIONS ON SUBMISSIONS AND FURTHER SUBMISSIONS ON PROPOSED PLAN CHANGE 1 TO THE NATURAL RESOURCES PLAN FOR THE WELLINGTON REGION

UNDER	the Resource Management Act 1991 (the Act)
AND	
IN THE MATTER	of Hearing of Submissions and Further Submissions on Proposed Plan Change 1 to the Natural Resources Plan for the Wellington Region under Schedule 1 of the Act

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STATEMENT OF REBUTTAL EVIDENCE OF JAMES MITCHELL BLYTH

ON BEHALF OF GREATER WELLINGTON REGIONAL COUNCIL

HEARING STREAM 3 – RURAL LAND USE ACTIVITIES, FORESTRY INCLUDING VEGETATION CLEARANCE AND EARTHWORKS

15 May 2025

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INTRODUCTION

1 My full name is James Mitchell Blyth. I am a Director and Water Scientist at Collaborations.

2 I have read the evidence of Dr Leslie Robert Basher on behalf of Wairarapa Federated Farmers – Submitter 193

3 In preparing this rebuttal evidence, I have considered Dr Bashers evidence against a range of literature, including hearing stream 2 and 3 primary evidence and technical reports relative to erosion mapping and landsliding.

QUALIFICATIONS, EXPERIENCE AND CODE OF CONDUCT

4 My qualifications and experience are set out in paragraphs 5 to 10 of my primary evidence[i] for HS3 on sediment from pasture and forestry. I repeat the confirmation given in that report that I have read and agree to comply with the Code of Conduct for Expert Witnesses.

RESPONSES TO SUBMITTER EVIDENCE

5 My evidence addresses;

5.1 The appropriateness of the erosion risk maps, Revised Universal Soil Loss Equation (RUSLE) and contributions from different erosion sources (landsliding, surficial and streambank) for informing PC1 revised provisions.

5.2 The consideration of landsliding risk, the 26 degrees slope threshold and relative erosion risk within PC1.

APPROPRIATENESS OF REVISED EROSION RISK MAPS AND RUSLE

6 Mr Nation[ii] provides an overview of the notified PC1 erosion risk mapping (ERM), and summarises the updates requested by the Council to align with the revised provisions presented in the rural land use and forestry S42a reports.

7 Of particular significance to this rebuttal is that the ERM for hillslope erosion in the S42a revised provisions reflects the top 10th percentile of surficial (surface) erosion as mapped using the Revised Universal Soil Loss Equation (RUSLE) in each Whaitua, which is then intersected with areas at risk of shallow landsliding (>26° with no woody vegetation cover). This is presented as a single layer per Whaitua, deemed 'potential erosion risk' and for pastoral properties >20 ha, would require an Erosion Risk Treatment Plan (ERTP) as part of the Farm Environment Plan (FEP). Those properties would then have a field

assessment as per revised provisions (i.e. WH.P21) to assess the priority erosion treatment land, to help resolve uncertainties that may exist in the ERM[iii]. I do not agree with Dr Basher's statement that the ERM is 'deeply flawed', for reasons discussed in this rebuttal evidence.

8 Dr Basher generally does not support the use of the RUSLE based modelling approach, stating in paragraph 41 of his evidence that the "*Revised Universal Soil Loss Equation (RUSLE) on steep pasture and forested slopes is problematical, considering that the model has never been well calibrated for these conditions.*"

9 The RUSLE has been widely used within New Zealand, including being nationally mapped using a 15m Digital Elevation Model in 2022[iv] and globally has been applied to predict erosion on varied terrains. The method has even been applied to predict erosion for all of the European Union[v].

10 The basis of the surficial erosion component of SedNetNZ is the NZUSLE (Universal Soil Loss Equation) which uses similar factors, and the RUSLE is the basis for dSedNet (daily time-step sediment modelling) which has been successfully applied and calibrated in Te Awarua-o-Porirua Whaitua (TAoP) and Te Whanganui-a-Tara Whaitu (TWT), as described in my primary modelling evidence in Hearing Stream 2 and in other technical reports[vi, vii].

11 The dSedNet model, which predicts erosion from surficial, shallow landsliding, and streambank sources was calibrated at three sites in TAoP to ~3 years of continuous (15 minute) turbidity and flow records correlated with suspended sediment data from autosamplers. From my understanding, this was the first time this comprehensive amount of monitoring data had been utilised to calibrate a daily sediment model in New Zealand. Paragraph 62 of my primary modelling evidence shows the good model performance to observed data, and has also been compared against other national annual sediment load models, such as SedNetNZ, CLUES and SSYE[vi].

12 Dr Basher's statements in paragraph 43 do not take into account this extensive amount of technical work conducted in PC1 or the calibrated dSedNet modelling, which has been used to inform the technical work presented in Appendix A of my HS3 primary evidence[viii]. Particularly, this calibration helped to identify that the proportions of surficial, shallow landsliding and streambank erosions to total sediment loads, averaging 47%, 36% and 17%, respectively. His footnote reference (26) to a Manawatu study identifying landsliding as contributing 59% and surficial as only 16% is interesting, but *relative* to the geological

and climatic settings of that region – reinforced by his Figure 1 showing the varieties of rock in Manawatu that are prone to greater landsliding than in PC1.

13 I consider the RUSLE approach applied in the ERM to reflect the best available information at the time of the mapping (2023) and is appropriate to identify surficial erosion risks within PC1, noting it could be improved over time as previously detailed[ix,viii].

14 I am aware of the importance of mitigating loads from landslides, which can deliver significant sediment loads. Monitoring (and calibration) of the TAoP dSedNet model captured a landsliding event in Porirua Stream that delivered more sediment over a week than what was delivered in the previous two years[vii]. However, the long term (1975 to 2016) simulations[vii] highlight the importance of mitigating sediment from a range of sediment sources, particularly to help achieve the visual clarity targets set for the year 2040 (only 15 years away).

RELATIVE RISK, SHALLOW LANDSLIDING AND SLOPE

15 I have considered the importance of relative erosion risk, shallow landsliding and Dr Basher's statements relating to slope thresholds (>26 degrees) applied in the ERM in the following sections.

16 Dr Basher's[x] evidence (paragraph 36, 40 and 61) suggests the ERM should not present relative risk, but absolute risk, that would allow comparison across the region or nationally. The Council requested the mapping be presented relative to the Whaitua, which would allow for identification of erosion prone land, while aligning with the Whaitua (catchment) based community approaches that developed distinct values, objectives, limits, targets and recommendations specific to that location. As an example, the sediment loads in TAoP are likely of little interest to those in Eastern Wairarapa, except for perhaps scientific purposes. The focus on the top 10th percentile (as part of the revised and notified provisions) relative to each Whaitua provides a useful and straightforward mechanism to identify where the greatest risk is.

17 Dr Basher compares erosion risk to other parts of the country, where in paragraphs 30 and 31 he compares the rock strength and landslide susceptibility of underlying geology. However, this national context has little applicability to the local (and relative) scale of PC1 ERM as per paragraph 7 and 16, which is focussed on initial identification of hillslope areas where sediment load could be mitigated to help achieve the Whaitua Committees recommendations on water quality. Dr Basher's evidence does not consider the ~eight

years of Whaitua community processes that were run by the Council to set these water quality targets and timeframes, or the numerous technical reports that were compiled, but did not form part of his background reading material.

18 My primary evidence in HS2[xi] details the estimated load reductions to achieve visual clarity targets (a proxy measurement for suspended fine sediment as per the NPS-FM 2020) at six Target Attribute State Sites (TASs) within PC1. Five of these TASs were below the national bottom line ('D attribute state') for visual clarity for the 2012–2017 baseline, with a target set *at the national bottom line* ('C attribute state').

18.1 Regardless of the lower frequency of landsliding in PC1s *underlying* geology compared to other regions (as per paragraph 30 and 31 of Dr Basher's evidence), monitoring and the Whaitua processes has clearly shown a sediment problem exists that requires a level of mitigation to reach targets (as proposed through revised provisions). This is by no means a return to 'natural state' as suggested frequently throughout Dr Basher's evidence (see his paragraph's 50 to 60), and addressed in more detail by my colleague Dr Greer[xii].

19 Dr Basher highlights the relative rock strength of *unweathered* rock types, pointing out that greywacke is very strong and one of the least erodible rock types (paragraph 30 of his evidence). I do not disagree with this statement, but would like to point out:

19.1 While there are significant amounts of *unweathered* greywacke in PC1 hills, this does not reflect the erosion potential of weathered and fractured material that often sits above the bedrock or may have weathered over time into gullies and valleys. The Porirua Region (and broadly, the PC1 area) could generally be described as undifferentiated weathered, poorly sorted silty loess-covered alluvial deposits comprising grey sandstone and mudstone sequences and poorly bedded Sandstone, commonly known as Wellington Greywacke[xiii, xiv].

19.2 The strength (or lack of) of weathered Wellington Greywacke (near the surface) is not unusual[xv], being described in this paper as '*closely jointed and faulted, and subsequently weakened to depths of many metres by weathering*'.

19.3 Weathered greywacke would be familiar to most people in PC1 Region as brown/orange soil, commonly having relict joints and fracturing with black deposits of manganese oxide. Depending on the stage of weathering, it can be crushed often by hand to sand and silt sizes with little pressure[xvi].

19.4 This weathered material (in various states) is commonly seen during landslides in PC1, as expressed in a Radio New Zealand (RNZ) 2022 article that detailed 670 landslides reported in the urban PC1 environment over a period of seven weeks, following prolonged rainfall[xvii].

20 The importance of rock strength, and the risk of shallow landsliding described above has been further assessed relative to slope angles and the Wellington Region in paragraph 31 of my primary evidence on the differences in sediment generation from farming and forestry[i], which appears not to have been read by Dr Basher. In paragraph 40 of Dr Basher's evidence, he states that 'the threshold slope angle of 26° based on the data presented in DeRose (2013) and Dymond et al. (2016) is inappropriate'. I do not agree with this statement.

21 The Highly Erodible Land (HEL) mapping update[xviii] is based on slope thresholds for different geologies. In hill country, for 'un-weathered to moderately weathered greywacke/argillite' the threshold is 28 degrees. For 'residual weathered to highly (often deeply) weathered greywacke/argillite', the threshold is 24 degrees.

21.1 Upper Hutt City Council (UHCC) introduced a 'High Slope Hazard' overlay in their Plan Change 47 – Natural Hazards, which became fully operative on 17 December 2024.

21.2 Specifically, Coffeys adopted a 'Low' and 'High' hazard threshold of 26 degrees, as per the statement in the executive summary "*After careful consideration and in the interests of a simple, readily applicable classification, the slope stability hazard was assessed using just two categories, low and high. Low hazard is assigned for slopes less than and including 26 degrees and high hazard for those slopes greater than 26 degrees*"[xix]. The high threshold is considered to be generally conservative and can be refined following site specific geotechnical assessments; a similar approach applied in revised PC1 provisions (see paragraph 7).

21.3 Recently, Hutt City Council (HCC) has also announced a proposed High Slope Risk overlay as part of their 2025 proposed district plan change, mapped using a 1m Digital Elevation Model. This identifies moderate landsliding risk thresholds from 25° depending on landcover and other factors[xx]. Specifically, for high and very high risk they stated '*where materials such as alluvium, colluvium and K-*

surface cover beds (loess and soil) are mapped as the underlying geology, slopes greater than 35° generally fall into the very high and high susceptibility zones, due to the lower strength of these materials.

22 When considering forestry, the National 'Forestry Slash Management Handbook' developed in 2024 by MPI[xxi] also details that slopes >30 degrees result in a 'high' risk of slash mobilisation. The ability to mobilise slash (woody debris) through either overland flow, or landsliding events, would also correlate with the ability to mobilise sediment.

23 When considering the weathered and fractured geological conditions in PC1 described in paragraphs 13.1 to 13.4, my primary evidence paragraph 31[i] and the various supporting information from district councils risk layers presented in paragraph 21 to 22, I believe this provides sound reasoning for the >26 degrees threshold applied in the ERM, which is utilised in PC1 as a precursor for identifying a sites potential risk of shallow landsliding. This is supported by maps presented in my colleague Mr Nation's rebuttal evidence[xxii], showing landslide scars present even on 'low' and 'moderate' ESC land. While there will be areas where this method may be conservative in regards to landsliding risk (for example, where unweathered greywacke outcrops are present), the revised rural provisions requiring a field inspection to identify priority erosion treatment areas should resolve these issues.

24 Dr Basher suggests in paragraph 40 of his evidence that '*Advanced quantitative methods of characterising landslide susceptibility are now available in New Zealand and would provide a far better basis for determining the susceptibility to landslides*'. This recommendation is suggesting a revised approach to mapping of landslide risk in greater detail.

24.1 I recognise that the method for identifying landslide risk is simplistic, as covered in Appendix A, section 3.3.2 of my primary evidence[viii]. However, as stated in my primary evidence on farming versus forestry sediment loads, paragraph 30.4[i] it is recognised (in a recent 2024 paper) that *landslide science is not advanced enough to predict with certainty where in the landscape a landslide will occur, under what specific rainfall conditions, and when*[xxiii]. I do not believe the significant additional expense (and time) of further quantitative modelling would significantly improve the mapping, particularly when revised provisions are suggesting a field assessment to identify priority erosion areas. This also could not be completed prior to the completion of PC1, and thus, the mapping is the best available aligning with Clause 1.6 of the NPS-FM (2020).

CONCLUSIONS

25 I believe the erosion risk mapping adopts a straightforward, albeit potentially conservative approach to identify hillslope erosion risk areas. The utilisation of the RUSLE method is backed by national and international applications, and the intersect with slopes >26 degrees with no woody vegetation cover aligns with a range of district council geotechnical slope hazard overlays in PC1, and is supported by national papers detailing the risk of landsliding for PC1 geology may fall between 24 and 28 degrees when considering the highly weathered and fractured surface material (rather than unweathered greywacke as identified by Dr Basher).

26 I also believe the focus on the relative risk within each Whaitua aligns with the local scale of the Whaitua processes and setting of water quality targets at specific locations. The revised rural provisions are practical, as the potential erosion risk land on hillslopes will help identify properties that may be contributing greater sediment loads, but will require a field inspection to prioritise areas. This approach is similar to district councils requiring a geotechnical inspection for any development activities triggered on high slope hazard overlays.

DATE: **14 May 2025**

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