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**OPENING STATEMENT OF SCOTT DAVID KELLY:  
HAZ-NH – NATURAL HAZARDS**

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**Overview**

- 1 This statement sets out my position on key issues within the HAZ-NH – Natural Hazards chapter since I prepared my evidence<sup>1</sup> and following the evidence of other parties on this topic.

**Qualifications and Experience**

- 2 My qualifications and experience are set out in paragraphs 2 – 6 of my statement of evidence dated 3 October 2022. Since producing that statement of evidence, my role at Institute of Geological and Nuclear Sciences Limited (GNS Science) has changed. I currently hold the position of Senior Natural Hazards Planner, and I am the Planning and Policy Team Leader.

**Code of Conduct**

- 3 I have read and agree to comply with the Environment Court’s Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2023. I have complied with the Code in preparing my evidence. Other than where I state that I am relying on the advice of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

**Scope of Evidence**

- 4 This statement of evidence has been prepared in response to points raised the evidence of submitters on APP6: Methodology for *natural hazard risk* assessment. Specifically, Otago Regional have asked that I provide evidence on:
- 4.1 The consideration of Representative Concentration Pathways when determining the likelihood of a hazard;
- 4.2 The application of APP6 for plan changes / reviews and resource consent applications; and

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<sup>1</sup> Statement of evidence of Scott David Kelly (3 October 2022)

4.3 The trigger for a quantitative risk assessment.

5 Where I have recommended additional amendments to provisions, my recommendations are shown in addition to my original section 42A recommendations. The key below sets out how these different recommendations are shown.

**Key to proposed amendments**

<b>Appearance</b>	<b>Explanation</b>
Black text	Text as notified.
Black text with <u>underlining</u> or <del>strikethrough</del>	Amendments recommended in section 42A report.
Red text with <u>underlining</u> or <del>strikethrough</del>	Additional amendments recommended in supplementary evidence where there has been no previous amendment to the ‘as notified’ provision text.
Black text with <u>red underlining</u>	Text that was recommended to be deleted in s42A report but now recommended to be retained (“un-deleted”) by supplementary evidence.
Red <del>strikethrough</del> with <u>black underlining</u> .	Text that was recommended to be inserted in s42A report (black underline) but now recommended to be deleted by supplementary evidence (red strikethrough).
Blue text with <u>blue underlining</u> or <del>blue strikethrough</del>	Text that is recommended to be inserted or deleted as part of this summary statement.

**Representative Concentration Pathways and Shared Socio-Economic Pathways**

6 The submission of Queenstown Lakes District Council sought that APP6 Step 1 include a requirement to account for the effects of climate change by considering Representative Concentration Pathway (RCP) scenarios. The Section 42A Hearing Report of Andrew Maclennan recommends the following amendment:

(3) The likelihood assessment shall include consideration of the effect of climate change and Representative Concentration Pathways (RCP) scenarios.

7 The statement of evidence of Luke Place on behalf of Queenstown Lakes District Council considers that the amended text should “...be directive in regard to which representative concentration pathway (RCP) scenario should be considered...”<sup>2</sup>

8 RCP were developed for the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5), and are projections based on factors that drive emissions.

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<sup>2</sup> Para 4.14.

These factors include population size, economic activity, lifestyle, energy use, land use patterns, technology and climate policy. Shared Socio-Economic Pathways (SSP) were developed for the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6).

9 RCP are expressed as RCP<sub>y</sub>, where ‘y’ refers to the approximate level of radiative forcing (in watts per square metre) resulting from the scenario in the year 2100. There are four RCP: RCP2.6; RCP4.5; RCP6.0; and RCP8.5. The National Climate Change Risk Assessment for New Zealand considers RCP4.5 and RCP8.5, which are described as:

9.1 *“RCP8.5, a high concentration pathway characterised by increasing GHG emissions driven by a lack of policy changes to reduce emissions. This pathway represents increased use of land for agriculture, a heavy reliance on fossil fuels and a high-energy intensity with a low rate of technology development.*

9.2 *RCP4.5, a moderate concentration pathway consistent with low levels of emissions achieved through ambitious emissions reduction strategies. This pathway represents implementation of stringent climate policies, with a lower-energy intensity, strong reforestation and decreased land for agriculture due to improvements in crop yields and dietary changes.”<sup>3</sup>*

10 SSP are expressed as SSP<sub>x-y</sub>, where ‘SSP<sub>x</sub>’ describes socio-economic trends and ‘y’ refers the level of radiative forcing (in watts per square metre) resulting from the scenario in the year 2100. There are five SSP: SSP1-1.9; SSP2-2.6; SSP2-4.5; SSP3-7.0; SSP5-8.5.

11 Clause 61(2)(e), 66(2)(g) and 74(2)(e) of the Resource Management Act 1991 requires regional councils and territorial authorities to have regard to any national adaptation plan when preparing their regional policy statement, regional plan or district plan

12 Chapter 4 of the National Adaptation Plan considers driving climate resilient development in the right locations, and provides the following direction for local government:<sup>4</sup>

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<sup>3</sup> Box 1, Page 23.

<sup>4</sup> Pages 67-69.

When making or changing policy statements or plans under the RMA, including to give effect to the provisions of the NZCPS, councils should use the recommended climate change scenarios outlined below, as a minimum:

- to screen for hazards and risks in coastal areas, use the Shared Socioeconomic Pathway scenario for fossil fuel intensive development (SSP5-8.5) where available, or the Representative Concentration Pathway RCP8.5,<sup>2</sup> to 2130
- for detailed hazard and risk assessments in coastal and non-coastal areas, use both the middle-of-the-road scenario (SSP2-4.5) and the fossil fuel intensive development scenario (SSP5-8.5) where available, RCP4.5 and RCP8.5, to 2130, for areas at high risk of being affected, adding the relevant rate of vertical land movement locally. Where SSP2-4.5 and SSP5-8.5 are not available, use RCP4.5 and RCP8.5 to 2130, adding the relevant rate of vertical land movement locally
- for all other climate hazards and risks, use the most recent downscaled climate projections for Aotearoa.

<sup>2</sup> Representative Concentration Pathways should be used only where climate data is otherwise not reported under Shared Socioeconomic Pathways – for example, downscaled regional climate projections reported in *Climate Change Projections for New Zealand*.

13 In considering the direction sought by Mr Place, I consider the provision of certainty and direction, must be balanced against the ability to utilise the most up to date information and the methodology not being unnecessarily complex.

14 The National Adaptation Plan sets out what scenarios are to be used in what situations. The National Adaptation Plan is subject to change, at least every six years, in response to the National Climate Change Risk Assessment. Therefore, I consider that referencing this document provides the certainty sought by Mr Place, and enables the most up to date information to be utilised whilst not unnecessarily complicating the methodology or repeating the content of the National Adaptation Plan.

15 Limb 3 of APP 6 Step 1 may be amended to:

(3) The likelihood assessment shall include consideration of the effects of climate change, and should use Shared Socio-Economic Pathway (SSP) scenarios or

[Representative Concentration Pathways \(RCP\) scenarios as set out in the National Adaptation Plan.](#)

### **The application of APP6**

- 16 At paragraph 21 of his opening statement, Mr MacLennan sets out the intention of APP6, and particularly *Table 5: Consequence table*. I note that pre-hearing conferencing with submitters sought to clarify the application of APP6 as a tool for both plan change/review processes and consideration of resource consent applications within natural hazards areas. In this regard, Step 2 of APP6 provides two pathways: 1. *Table 5: Consequence table* for when considering plan review or plan changes; and 2. The list of matters (1)-(11) as the primary consideration for resource consent applications. Mr MacLennan recommended the incorporation of notes in this regard at Paragraph 472 of his Section 42a report.
- 17 I agree with Mr MacLennan’s summary of the application of APP6, and support his statement that amendment to APP6 is not required in response to these submission points.

### **The trigger for a quantitative risk assessment**

- 18 The submission of Otago Regional Council (ORC) seeks amendments to *Table 8 – Risk Table* and the trigger for when a quantitative risk assessment (Step 4) would be required.<sup>5</sup>
- 19 The evidence of Mr Place<sup>6</sup> provides a case study example working through the qualitative methodology in APP 6, and considers that the assessment undertaken at Steps 1-3 does not align with the requirement to undertake a quantitative assessment at Step 4. To address this Mr Place has provided alternatives for *Table 8 – Risk Table*.<sup>7</sup>
- 20 A GNS Science letter report I authored (Kelly, 2022)<sup>8</sup> set out previous advice that a quantitative risk assessment should be required if the assessment undertaken at Step 3 resulted in two out of three scenarios having a tolerable or significant risk.

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<sup>5</sup> 0138 QLDC. Page 38.

<sup>6</sup> Para 4.21.

<sup>7</sup> Para 4.39.

<sup>8</sup> Kelly, S.D. 2022. ‘Proposed Otago Regional Policy Statement – Submissions on the Natural Hazard Topic Chapter’ dated 17 March 2022

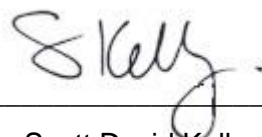
- 21 Following pre-hearing conferencing with the ORC natural hazards team, the below amendment to *Table 8 – Risk Table* was proposed.

*Table 1 – Risk table*

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain					
Likely					
Possible					
Unlikely					
Rare					

Green, Acceptable Risk: Yellow, Tolerable Risk: Red, Significant Risk, [Hatching: Quantitative assessment required](#)<sup>9</sup>

- 22 These changes result in the requirement for a quantitative risk assessment being more closely aligned to the advice provided in Kelly et al., 2021<sup>10</sup> and Kelly, 2022<sup>11</sup> in that some ‘tolerable’ risks will require a quantitative risk assessment.
- 23 In combination with the recommended amendments to *Table 5: Consequence table* in Mr MacLennan’s Section 42a report<sup>12</sup>, I support the changes to *Table 8: Risk table* and the requirement for a quantitative assessment to be undertaken where scenarios are found to be catastrophic, or major and with possible, likely or almost certain likelihood.



Scott David Kelly

25 April 2023

<sup>9</sup> 00415.002 ORC

<sup>10</sup> Kelly, S.D., Saunders, W.S.A., Woods, R.J., Glassey, P.G. 2021. ‘Draft 2021 Otago Regional Policy Statement Natural Hazards Chapter Review’, GNS Science Consultancy Report 2021/38 May 2021.

<sup>11</sup> Kelly, S.D. 2022. ‘Proposed Otago Regional Policy Statement – Submissions on the Natural Hazard Topic Chapter’ dated 17 March 2022.

<sup>12</sup> Para 472.

