

## Responses to Written Questions for WDC Witnesses – 26 February

### Authors:

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Witness	Paragraph	Question
Alastair Pratt		<p>Are you aware of any peculiarly tangata whenua issues regarding valuation of properties that might perhaps have been overlooked? For example, can we be confident that there are no Ngāti Rangitihi claims settlement matters that could impact on the sort of valuation methodology used by Messrs Gibson and Donovan-Grammer?</p> <p>I am not aware of any particular tangata whenua issues having been overlooked, in respect of any of the properties where I have peer reviewed the valuations,</p> <p>Whakatāne District Council has provided plans of the properties at Matatā which Ngāti Rangitihi is seeking to acquire through their Treaty Settlement claim. See attached plans. None of the properties that I have peer reviewed the valuations of, are in those locations shown on the plans.</p> <p>I have not peer reviewed any valuations of a Mr Gibson.</p> <p>For that matter, do we know how many Māori owned properties there are in the affected area of Matatā and how they might have been consulted throughout this process, including any disputes over market values?</p> <p>None of the valuations that I peer reviewed, involved land under Maori title, however I did note when I peer-reviewed the Mr Donovan-Grammer's valuation of 98 Arawa Street, Matatā, that that property had multiple Māori owners. My brief of engagement was limited to peer-review of Mr Donovan-Grammer's valuations. I am not aware of what consultation has occurred with property owners or the dispute processes that are available.</p> <p>You advise that the methodology used is robust and follows generally accepted principles. Was the methodology applied correctly and what view do you have on the valuations presented by Telfer Young?</p>

Witness	Paragraph	Question
	6.1	In my opinion, all valuations of Mr Donovan Grammar that I peer reviewed, were undertaken correctly in accordance with accepted methodology for residential valuations. Further, the valuations were very fair and liberal to the extent that any bias was more favourable to the property owner.
Amelia Linzey	6.4 (d)	<p>Please elaborate on your statement that the Regional Plan Change is only required if the managed retreat programme is not taken up by any landowner.</p> <p>I consider my evidence wording could have been clearer.</p> <p>I am, in this section, providing an overview of the extent to which social costs were considered in the overall evaluation of the efficiency and effectiveness of the Plan Changes, both District and Regional Plan. My comment refers to the fact that the Section 32 explicitly considers the social costs to residents of the proposed changes to the Regional Plan (that effectively makes residential activity a prohibited activity) and that the timing of the Plan Change has been proposed so that there is the ability for the impact (the financial burden of extinguishing the existing use right) to only take effect at the anticipated completion of the Managed Retreat property acquisition process e.g. (31 March 2021).</p> <p>I meant that in this regard, social consequences of the financial effect of this Plan Change therefore only apply if the programme is not taken up by landowners. I acknowledge my evidence incorrectly implies that I am making a statement of the application of the Plan Change overall and this was not my intention.</p>
	6.13	<p>How do you balance the impacts of the status quo (existing risk remains) with its uncertainty on the timing and impact of a future debris slide against the certainty of impact of the Plan Changes?</p> <p>AND</p>
	7.11	<p>How do you balance the certainty of a current effect against the possibility of a much worse future effect, to arrive at an overall view?</p> <p>The Act requires consideration of potential effects in respect of both the probability of an event occurring and the consequences of that event. In other words, an effect of potentially high impact is a relevant effect consideration (even if it is of low probability). I refer to the evidence of Mr Hind and Ms Saunders (noting the changes and</p>

Witness	Paragraph	Question
		<p>corrections she has made to her evidence) and others in respect of the return period of a rainfall and debris flow event (I understand this is an event (i.e. the 2005 event) with a reoccurrence of around once in 200 – 500 years – which is in the scope of “likely” according to the evidence of Mr Hind, who I understand is referring to the degree of likelihood in the context of the lifetime of an asset, as per to AGS (2007). On the basis of that evidence, I consider that the geological and topographical evidence for previous debris flows, in addition to that which occurred in 2005, indicates that a future event is effectively inevitable at some time in the future (e.g. over the long term)</p> <p>In this case, and when considering the potential social impacts in respect of risk I have considered and rely on the evidence of the experts in particular that of Prof. Davies in respect of the Risk Analysis and the Options Assessment. In particular, in placing this reliance I considered the following:</p> <ul style="list-style-type: none"> <li>• Prof. Davies states (in section 9.1) that the debris-flow processes, hazard and risk distribution at Matatā have been studied to best international standards, on the basis of the sparse data available.</li> <li>• In section 9.3 Prof. Davies states that intensive investigations have established that there are no affordable and reliable engineering options for reducing the risk-to-life on the Awatarariki fan to internationally acceptable levels, either for protecting the whole fan with a detention structure or chute-to-the-sea or for protecting individual dwellings with bunds or elevated building platforms.</li> <li>• In section 9.4 he cites that risk analyses using internationally-accepted practice show that risk-to-life on much of the Awatarariki fan exceeds that categorised as “acceptable” (if a precautionary approach is used to the sparseness of the basic data and the correspondingly wide spread of possible risk distributions).</li> </ul> <p>For this reason, I concluded that the probability of the event (which is uncertain in respect of timing, but not occurrence) and its consequence (potential loss of life) were such that it could have resulting significant adverse effects. Furthermore, I considered the potential that loss of life would occur at a ‘community scale’ (e.g. potentially a number of households and families), as compared to a loss-of-life risk experienced at an individual level. In addition, in respect of social impact, I considered the commentary from Prof. Davies in respect of the ‘responsibility’ for such an occurrence. Particularly here, I refer to his commentary that if the risk is at an unacceptable level (as is the case here), the responsibility for any occurrence would lie with the organisation that permitted the occupation (para 7.35). In this regard, I considered both the social consequences of the loss of life (household and at a community level) and the social impacts arising from the perceived role of organisational failure in allowing that consequence (at the time it was experienced). From this, I concluded that there were therefore potentially significant social impacts arising from the hazard with residential activity in the high-risk area. Finally, I considered the ability for such impacts to be mitigated. I considered that impacts would be difficult to mitigate as an event</p>

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	8.2	<p>resulting in loss of life could not be lessened after its occurrence and, in respect of social impacts in organisational failure I considered that while there might be an acceptance from some individuals that they were 'taking this risk' in choosing to remain, I did not consider this would reduce or lessen the perceived organisational failure following any event in the future.</p> <p>I balanced these factors against the social impacts arising from the Plan Changes. I acknowledge that there are social costs associated with these Plan Changes. However, I consider that these impacts can be mitigated through measures such as the Managed Retreat Programme and the open space development proposed on the affected land. On this basis, I considered that this was an effect of certain timing and more certain probability but of lesser potential social consequence and that the social impacts had the opportunity to be lessened or reduced by appropriate mitigation measures.</p> <p>I note the RMA definition of effect  <i>Meaning of effect</i>  <i>In this Act, unless the context otherwise requires, the term effect includes—</i>  <i>(a) any positive or adverse effect; and</i>  <i>(b) any temporary or permanent effect; and</i>  <i>(c) any past, present, or future effect; and</i>  <i>(d) any cumulative effect which arises over time or in combination with other effects—</i>  <i>regardless of the scale, intensity, duration, or frequency of the effect, and also includes—</i>  <i>(e) any potential effect of high probability; and</i>  <i>(f) any potential effect of low probability which has a high potential impact.</i></p> <p><b>Would you have the same view of temporary use for defence purposes. If not, why not?</b></p> <p>In both the case of reserve / open space and defence purpose use of the area there are some specific characteristics that are different from the residential use of property in a social context:</p> <ol style="list-style-type: none"> <li>1. They are temporary and likely to be in periods of day-light for limited periods of time which affords a higher degree of mobility for those using the area;</li> <li>2. The temporary character of use also provides for some discretion on when such use of the area might occur (e.g. use of the area can be avoided in particular weather conditions)</li> </ol>

Witness	Paragraph	Question
		<p>3. I understand the intention is not for occupation or sleeping in the high risk hazard area on site which again provides for some mobility in use and relocation from the area.</p> <p>4. I defer to others for the specific consideration on the risks associated with such use.</p> <p>Is it common practice to make a distinction between social impacts and cultural impacts in instances like these plan changes? We appreciate that you might not be the appropriate person to put such questions to, but it does concern us that there does not seem to have been more attention given to the particular circumstances of tangata whenua in this process. We'd welcome your views on this.</p> <p>I note that the RMA identifies these matters separately and I consider there are different effects for consideration. I do not consider that it is appropriate for me, as the social impact assessor to consider cultural impacts in this instance as I maintain that Mana Whenua or Tangata Whenua themselves are more appropriately placed to undertake such an assessment.</p> <p>I would defer to the consultation and ongoing communication with Tangata Whenua during this process which is provided in the evidence of Mr Jeff Farrell, and their participation in the proposed future use of the land (recent lagoon restoration planning) as well as the submissions made by local iwi (which I have read).</p> <p>There is no assessment of the social impact to local Māori in your statement. We might have expected there to be some mention of the possible effect that the plan changes might have on a significant sector of the local community, particularly given the whakapapa and tangata whenua traditions that attach to Matatā. Was there consideration given to the preparation of a cultural impact assessment - that you are aware of?</p> <p>I have considered the communications and submissions of local iwi as members of the community. I have noted that they are in general in support of the proposal. I particularly note the comment that the loss of life is too high an impact to be considered as an alternative.</p> <p>I have also reviewed communications that have continued between Ngati Awa and the Council on the proposed plan change. For example, in a letter from Te Runanaga o Ngati Awa November 2017 I note that they are in support of the proposed plan changes and considered that the retreat option would provide the following.</p> <p>Te Runanga o Ngati Awa considers the proposed retreat option will:</p>

Witness	Paragraph	Question
		<ul style="list-style-type: none"> <li>• remove homes and families from a location that is in harm's way</li> <li>• bring certainty to these families and the community</li> <li>• ensure central government agencies contribute financially to the relocation of families into new homes in a safe location</li> <li>• protect people from making future investments in residential subdivision at this location by inserting a prohibited activity rule for residential development at this location which would place people in harms way, at night, when they and their families and any guests are sleeping.</li> <li>• the prohibited activity status will protect people from making future investments in building their homes in this high-risk location</li> <li>• the permitted activities status will allow for people to continue to enjoy appropriate activities at the location</li> </ul> <p>I acknowledge the special relationship Māori have to Mātata and the importance and distinct characteristics of such a relationship. In respect of property impacts, I understand that two land parcels are held in collective Māori ownership. I understand, from my discussions with Mr Farrell, that both landowners (or representatives of these landowners) are working through property 'purchase' processes. In one case, I understand that the proposal is for land to remain in Māori ownership but transferred to Māori reservation. This area will then be integrated with the wider reserve area. I consider this property approach addresses the special relationship in respect of land.</p> <p>With regard to community connectivity, I have noted the potential social impact for residents and landowners' connection to the area and to the local community. From a social perspective, I consider this is applicable to landowners' sense of belonging to the area for local Maori and for other residents. Beyond that, I consider the matter is more relevantly a cultural effects consideration.</p> <p>Finally, in my initial review of the potential social impacts I noted the following:</p> <ul style="list-style-type: none"> <li>- In 2007, a Cultural Impact Assessment was completed for the full suite of regeneration works for Matatā that followed the debris flow events. This was a joint assessment prepared by Ngāti Awa, Ngāti Rangitihi, and Ngāti Tūwharetoa (as cited on pg 15 of the Section 32 report);</li> </ul>

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		<p>Furthermore, I understand work has been done with local iwi on the planning for rehabilitation of the lagoon, which includes how recognition is given to the history of the area (such as the Kaokaoroa Battle). To inform this work, a CIA was completed in particular identifying the site of importance within this area:</p> <p style="padding-left: 40px;">Cultural Impacts Assessment was completed by Tangata Whenua of Te Awa o Te Atua (January 2007) for Resource Consent Applications For Matata Township Recovery Works by Whakatane District Council &amp; Others And Te Awa-o-te Atua (Matata Lagoon) Rehabilitation Works by Department of Conservation which is part of the rehabilitation and mitigation works.</p> <p>I would defer to Mr Batchelar for further comment in respect of cultural assessments undertaken in respect of the Plan Change(s).</p>
Chris Massey	7.9	<p>You refer to the AIFR as being the annual risk (probability) of loss of life (death) of a person from landslides as being the annual individual fatality risk as the product of the probability of the rainfall initiating event x the probability the person is present at the location when the debris reaches/passes x the probability that the person is in the path of the debris x probability that the person is killed.</p> <p>How does this AIFR formula compare with that used by BOPRC in the RPS Appendix L? Are the methods comparable?</p> <p>The methods are comparable, but they do differ based on their calculation routes. The formula used in BOPRC RPS, Appendix L is:</p> <p style="text-align: center;"><b><i>AIFR = (D x P)/N</i></b> <span style="float: right;"><b><i>Equation 1</i></b></span></p> <p>Where:</p> <p style="padding-left: 40px;">D = number of anticipated (modelled) deaths from the event if it occurs;</p> <p style="padding-left: 40px;">N = population (maximum number of people present within the hazard assessment area at any point in time over a 24 hour period), which is the number of people exposed to the hazard;</p>

Witness	Paragraph	Question
		<p>P = the computed annual exceedance probability, which is essentially the annual frequency of the event that could kill the given number of people.</p> <p>The AIFR calculated using Equation 1, is the annual probability of a person being killed by the given event if it were to occur. The AIFR formula given in my evidence, which comes from the AGS (2007c) and JTC-1 (Fell et al., 2008) guidelines is given by the formula:</p> $AIFR = P(h) \times P(sh) \times P(ts) \times V \quad \text{Equation 2}$ <p>Where:</p> <p>P(h) annual frequency of the event occurring;</p> <p>P(sh) is probability of spatial impact – i.e. the probability of a given location being impacted by landslide debris;</p> <p>P(ts) is the probability of a person (the person most at risk) being present and hit by debris at the given location and is nothing to do with the number of people exposed;</p> <p>V is the vulnerability of the person if present and hit by debris.</p> <p>If we were to remove the P(h) part in Equation 2, the result would be the probability of killing an individual if the given event occurred. If we were to multiply this by the number of people exposed to the same level (magnitude of hazard) (N in equation 1) then the result would be the number of anticipated deaths from the event if it occurs (D in Equation 1). If we were to multiply this result by (P(h) in Equation 2; or P in Equation 1), the result would be the same as that from Equation 1. Whether or not the two formulas give a similar result would depend on how D in Equation 1 was calculated. If they were calculated using the same inputs, then the results would be the same.</p> <p>Note that D will also vary spatially at the local scale, for example debris from larger landslides will travel further than smaller ones and as a result, the exposure and vulnerability of a person exposed may also change. Such local-scale spatial variations are not captured in Equation 1 but are by Equation 2.</p>



Witness	Paragraph	Question
		<p>To estimate the true annual individual fatality risk (Equation 2), requires an estimate of the time the person most at risk is within the hazard area. It should also be calculated for the range of events (spanning the range of magnitude from small to large and severity), which could feasibly occur in the area of interest, and then summed. Where the true AIFR (all events) is the sum of the AIFR calculated for each representative event.</p> <p>In summary, the results from the two equations can give similar values if similar inputs are used. Equation 2, however, does not consider the number of people who may be present and exposed to the hazard, it calculates the annual individual fatality risk for the person most exposed, which is the person who spends the most time in the hazard area. Equation 1, calculates the annual frequency of a person being killed as a function of the total population exposed to the hazard, based on estimating the total number of people who may be killed by the given hazard. Equation 1 therefore, is not really a true calculation of the AIFR as set out in Equation 2 and the AGS (2007c) guidelines. Thus, the results could differ.</p> <p>How would you assess the risk of the debris flow that occurred on 2005 looking at the return period of the rainfall event and the fact that no lives were lost or injuries?</p> <p>In the same way as T&amp;T have stated in their two reports, and in line with the evidence of Mauri McSaveney and Tim Davies, people were very lucky not to have been killed or seriously injured. This may have been for several reasons, i.e.: fluid to solid ratio of the debris suggesting that it was more of a hyper-concentrated flood than debris flow; debris height and velocities meant that debris could not penetrate all homes that were hit; of those homes hit and penetrated by debris, people may not have been present, or if they were they managed to get out of the way; people were awake and aware of the situation and thus could take evasive actions? These reasons are currently the topic of future research.</p>
Craig Batchelar		<p>Mr Farrell's programme update letter of 16 December 2019 states that there are 34 properties in the High Debris Flow Risk Policy area. PC 17 identifies 18 properties in Table NH3 that are subject to High Risk Debris Flow. Is the extent of the High Risk Debris Flow area in PC17 the same as the High Debris Flow Risk Policy area referred to in Mr Farrell's letter?</p> <p>The extent of the High Risk Debris Flow area in PC17 is the same as the High Debris Flow Risk Policy Area. However, for the purposes of Plan Change 17 there was felt to be no need to map the full extent of the High Risk Debris Flow area as the provisions will only apply to the specifically listed properties in Table NH3.</p>

Witness	Paragraph	Question
		<p>It is acknowledged that including a map showing the full extent of the High Debris Flow Risk Area may have assisted understanding of the Plan Provisions, but that is more a matter of explanation and not a regulatory purpose. In that regard, reference to the Whakatane District Council's Awatarariki Debris Flow Risk Management Programme will be incorporated into the Regional Natural Resources Plan User Guide. The Programme includes hazard and risk modelling.</p> <p>Does NH3 only refer to those properties with dwellings on them?</p> <p>Regional Natural Resources Plan Change 17 provisions will apply only to those properties with dwellings on them which are those listed in Table NH3. These are the sites where existing use rights apply under Section 10 of the RMA.</p> <p>The reduction in risk on these sites through regulation requires the extinguishing of those rights and the residential use to cease, and this can only be achieved through a Regional Plan rule.</p> <p>Activities that have not been lawfully established will not have existing use rights as they will not comply with Section 10(1)(a)(i) of the RMA.</p> <p>The following properties were included in the PC17 to avoid any doubt on the requirement for the residential activity to cease.</p> <ul style="list-style-type: none"> <li>• Two properties (100 and 104 Arawa St) have unconsented structures with people living in them;</li> <li>• One property (18/18A/16 Clem Elliott) is made up of 3 cross-leases of which 1/3 has a dwelling on it, 1/3 is vacant, and 1/3 contains two buses with people in them.</li> </ul> <p>Could a vacant section be built on within the High Risk area under the District Plan Change 1?</p> <p>District Plan Change 1 will prohibit any activity other than those listed as permitted or restricted discretionary activities within the Awatarariki High Risk Debris Flow Policy Area.</p>

Witness	Paragraph	Question
		Therefore, a new residential building on a vacant section will be prohibited under District Plan Change 1. Minor buildings and structures associated with a passive future recreational use could be erected.
	12.21	You refer to Council's legal advisors stating that there is authority that reasonable use of land as provided for in Section 85 (RMA) does not extend to developing or living on land that is subject to high natural hazard. Can you provide that advice to the Panel?
		This matter will be addressed in legal submissions.
	14.17	With regard to the problems with staged retreat based on individual property risk being technically difficult to achieve, can you please explain that given that the Debris Risk maps have been developed down to an individual property level?
		The risk assessment by Tonkin and Taylor defined the spatial extent of the High Risk Area through modelling, and assessment of the 2005 debris flow event. The risk assessment was peer reviewed and the positions of the risk area limits set taking a precautionary approach. Residential development within the High Risk area has a loss of life risk that is assessed to be at an unacceptable level.
		In my statement I said: <i>"the parameters of future debris-flows on the Awatarariki fan cannot be predicted accurately enough to make the task of property specific risk assessment practicable"</i> and referred to the evidence of Tim Davies and Kevin Hind.
		These risk parameters relate to both the uncertain nature of the hazard and the persons at risk - See Tim Davies Evidence Paragraph 7.53 and Kevin Hind Evidence Paragraphs 6.151, 6.153.
	12.5	Please explain how providing for temporary occupation of identified High Risk areas by Defence Force personnel is consistent with the case advanced by Council and/or the RPS? Do, for instance, Defence Force personnel have a functional need to occupy those areas?
		NZDF have set out their functional need for the requested plan change amendments in the following terms in their letter dated 12 February 2020:

Witness	Paragraph	Question
	12.11	<p><i>“NZDF undertakes TMTA as part of its function of maintaining the nation’s security, maintaining NZDF operational capacity and providing for the well-being, health and safety of communities. TMTA can include a range of activities, from office/classroom based activities to large scale military exercises, and might involve search and rescue operations, infrastructure support (such as deployment of water purification and supply facilities as used in the aftermath of the Canterbury earthquakes), bomb deactivation training, small construction tasks, weapons firing, personnel movement etc. These activities may be undertaken over a period of days or weeks, on an intermittent or continuous basis, and during both day and night. It is vital that NZDF is able to carry out TMTA in different environments in order to ensure that it can respond to a range of scenarios including natural disasters.”</i></p> <p>The NZDF letter also confirmed that TMTA do not include “residential activity” as defined in the District Plan.</p> <p>These are temporary activities that involve national security, maintaining NZDF operational capacity and providing for the well-being, health and safety of communities. In general, these activities are exceptional and for the broad purpose of societal risk reduction. The changes seek to achieve reasonable national consistency and certainty in undertaking their role.</p> <p>Is that correct that the risk assessment evidence of e.g. Mr Hind and Professor Davies is not presented in terms indicating application of the risk assessment methodology in Appendix L of the RPS? If they can be reconciled, please explain how this can be done. If not, what if any significance should we give to that fact?</p> <p>An analysis of the Regional Policy Statement on Natural Hazards for Proposed Debris Flow Hazard Management on the Awatarariki Fanhead is set out in Appendix 6 of the Section 32 Report.</p> <p>Policy NH 8A: Assessment of natural hazard risk at the time of plan development is the relevant policy:</p> <p><i>“Assess natural hazard risk by:</i></p> <ul style="list-style-type: none"> <li><i>(a) Defining natural hazard zones within hazard susceptibility areas; and</i></li> <li><i>(b) Determining the level of natural hazard risk within each natural hazard zone by undertaking a risk analysis using the methodology set out in Appendix L; and</i></li> <li><i>(c) Classifying natural hazard risk within each natural hazard zone as either High, Medium or Low natural hazard risk using the methodology set out in Appendix L.”</i></li> </ul>

Witness	Paragraph	Question
	12.12	<p>The level of natural hazard risk within each natural hazard zone has been determined by undertaking a risk analysis in accordance with Appendix L.</p> <p>Appendix L allows use of a default methodology in the RPS or use of a recognised risk assessment methodology included in a regional, city or district plan or recognised in the consideration of a resource consent application. This may include risk assessment methodologies incorporated in Regulations or industry codes of practice. In this case, the assessment of risk has been undertaken using the Australian Geomechanics Society, 2007. Landslide Risk Management, Australian Geomechanics. This is a recognised risk assessment methodology (RRAM) in the RPS Natural Hazard Risk Assessment User Guide<sup>1</sup>.</p> <p>This methodology is proposed to become part of the regional and district plan policy framework through a Schedule 1 Plan Change process. This provides for transparency and rigour in the proposed use of this methodology.</p> <p>Natural hazard risk has been classified using this methodology as either High, Medium or Low within the natural hazard zone.</p> <p><b>In the context of Objective 31, is the objective correctly read with the word “managing” applying to “the protection of property and lifeline utilities”?</b></p> <p>Paragraph 12.12 does not address this issue per se, rather the “dual focus”: avoidance or mitigation of natural hazards raised by submitters.</p> <p>Objective 31 states:</p> <p style="padding-left: 40px;"><i>“Avoidance or mitigation of natural hazards by managing risk for people’s safety and the protection of property and lifeline utilities”</i></p> <p>I read “managing risk” as a reference to both “people’s safety” and “protection of property and lifeline utilities”.</p>

<sup>1</sup> 4.3 Risk methodologies deemed to comply with Natural Hazard Risk Assessment User Guide Regional Policy Statement for the Bay of Plenty (Undated)

Witness	Paragraph	Question
		<p>This is very clear in Appendix L Methodology for Risk Assessment where consequences of hazard events on buildings, lifelines, and human life and safety must all be evaluated.</p> <p>Policy NH 6B appears to contradict this interpretation where it exempts activities that have <i>“a significant social, economic, environmental or cultural benefit to the community it services or is a lifeline utility”</i> from compliance with the prescribed risk outcomes and planning and development controls (this could include most infrastructure). However, this does not remove the policy requirement for these activities to <i>“reduce risk to life and property to be as low as reasonably practicable”</i>.</p> <p>This recognises that for these types of activities, risk is managed through other measures (including industry standards, guidelines or procedures).</p> <p>Should the first sentence of this paragraph be reframed to say that mitigation is possible, but not to an acceptable standard?</p> <p>Is the issue not so much with achievement of the objective (which does not specify what that standard is) but rather with Policy NH3B?</p> <p>Yes, the first sentence of this paragraph should instead say:</p> <p><u>“While mitigation would be consistent with this objective for the Awatarariki Fanhead, meeting the standard for natural hazard risk outcomes as set out in Policy NH 3B is not achievable in practice.”</u></p> <p>If so, what are we to make of the fact that Policy NH3B says that it is to be achieved (relevantly) by Policy NH12A, which in turn is framed in less directive language- “take into account”, “where practicable”, where necessary”?</p> <p>I agree that the language used in Policy NH12A is less directive than the preceding policies. However, my interpretation is that Policy NH 12A is an implementation or “output” based policy that must be read in the context of the preceding “outcome” based policies, principally Policy NH 3B: Natural hazard risk outcomes.</p>

Witness	Paragraph	Question
		<p>Regionally significant natural hazard issues<sup>2</sup> include the following:</p> <p><i>“Co-ordinating agencies’ roles to avoid and mitigate natural hazards and manage residual risk” and notes that “Integrated management requires many agencies to co-ordinate their roles in avoiding and mitigating existing and potential natural hazards and managing any residual risk”.</i></p> <p>Policy NH 12A addresses this issue.</p> <p>Policy NH 12A is referred to in the first part of Policy NH 3B:</p> <p><i>“By the application of Policies NH 4B and NH 12A, achieve the following natural hazard risk outcomes at the natural hazard zone scale...”</i></p> <p>The explanation to Policy NH 12A includes:</p> <p><i>“Policy NH 12A applies in the context of the development of city, district and regional plans. It seeks to ensure that in planning for new greenfield or infill development regard is had to existing and future natural hazard risk. It also applies to existing land use and existing risk.”</i></p> <p>Table 10a of the RPS lists the associated procedural methods for Policy NH 12A.</p> <ul style="list-style-type: none"> <li>• Method 1A: City and district plan implementation (phased)</li> <li>• Method 2A: Regional plan implementation (phased)</li> <li>• Method 18: Structure plans for land use changes</li> <li>• Method 23B: Investigate and apply measures to reduce natural hazard risk</li> </ul> <p>Policy NH12A covers all kinds of natural hazards and risk levels. The Policy is not directive on the need to employ District Plan Changes to manage risk because District Councils have a range of tools to address natural hazards through subdivision, land use and building controls as well as infrastructure planning and design, protection works and emergency management.</p>

<sup>2</sup> 2.11.1 Regionally significant natural hazard issues

Witness	Paragraph	Question
	12.24	<p>Does the quandary you describe arise, if it is a Controlled Activity, which by definition, must be granted?</p> <p>Council as consent authority would be required to grant consent to a controlled activity that met the standard of having an early warning system present.</p> <p>The evidence is that a debris flow early warning is not a practicable option for this catchment. That would mean that a controlled activity consent could never be achieved in practice because the standard of having an effective warning system could not be met.</p>
	14.14	<p>Does RPS Policy NH3B prescribe how large (or small) the “natural hazard zone” must(may) be?</p> <p>No scale is prescribed for natural hazard zone.</p> <p>Appendix A – Definitions of the RPS includes:</p> <p><i>“A Natural hazard zone means that zone within a hazard susceptibility area defined by the relevant regional, city or district plan, on the basis of existing or proposed land use, as the appropriate geographic scale to assess hazard risk. For the avoidance of doubt, a natural hazard zone may be an entire hazard susceptibility area or such smaller zone as is appropriate taking account of the nature and scale of actual and potential land uses that are exposed to the natural hazard.”</i></p>
	14.47	<p>Is a situation where it is “questionable” whether consent may properly be able to be granted sufficient to justify prohibited activity status?</p> <p>On reflection, the term “questionable” underplays the situation I have described. In my opinion, the evidence on the degree of risk and impracticability of mitigating that risk is such that it is “very unlikely” that a resource consent could be granted by a competent authority.</p>
	14.49	<p>How real is the identified risk given Professor Davies’ evidence that advance warning of a large debris flow is likely to be in the order of minutes at best, and Dr McSaveney’s evidence that the 2005 debris flow took place over a</p>



Witness	Paragraph	Question
	14.21	<p>relatively short time (more than an hour)? On the face of the matter there would be no time for a rescue to be mounted.</p> <p>In paragraphs 9.3-9.7 I summarise the evidence on early warning system and confirm the conclusion in the Section 32 Report that a warning and evacuation system is not a reasonably practicable option in this case. This conclusion is further reinforced by Dr Massey's recently released report<sup>3</sup> on a debris flow early warning system framework for the Awatarariki catchment.</p> <p>Would rebuilding require a Building consent? If so, wouldn't the MBIE determination resolve any uncertainty?</p> <p>Yes, rebuilding following the next debris flow event would require a building consent.</p> <p>The Building Consent process (which could include MBIE determinations) is identified and assessed under District Plan Option 1 "Business as usual"<sup>4</sup>.</p> <p>The evaluation of this option was as follows:</p> <p><i>"Option 1 (Business as Usual) does not reflect the actual natural hazard risk that is present and is inconsistent with the RPS and other District Plan provisions. Successful implementation of hazard risk management outcomes relies on the general requirements of the Building Act and RMA that apply to building and subdivision only and does not deal with risk reduction.</i></p> <p>Because this option does not give effect to risk reduction to the level as prescribed by the RPS Policy NH 3B, it was assessed as being "fatally flawed".</p> <p>Please elaborate on how iwi management plans were incorporated into the proposed plan changes?</p> <p>Iwi management plans are assessed in Section 2.13 of the Section 32 Report.</p> <p>The proposed plan changes are assessed as "generally consistent". Retreat from the Fanhead and the path of future debris and flood flows is a strategy that has been supported by Iwi.</p>

<sup>3</sup> Massey et al (2020), Awatarariki catchment debris flow early warning system design framework, GNS Science report, 2019/77

<sup>4</sup> 9.1 Option1 - Business as Usual; 9.7 Evaluation of District Plan Options

Witness	Paragraph	Question
		<p>Te Runanga o Ngati Awa have made a submission in support of the proposed plan changes on the basis that:</p> <ul style="list-style-type: none"> <li>• The prohibited activities will protect people from making investments in a high risk location.</li> <li>• Permitted activities will allow for appropriate activities in the location.</li> </ul> <p>How are Ngāti Awa concerns over recognition of the cultural significance of the reserve area being addressed going forward?</p> <p>The Te Kaokaoroa Historic Reserve, an urupa located on Kaokaoroa Street, is identified in the Ngāti Awa Settlement Act. This is described in Section 3.5 of the Section 32 Report.</p> <p>The plan change recognises the cultural significance of the site and the continuation of cultural practices associated with the site.</p> <p>A permitted activity is included in the Awatarariki High Risk Debris Flow Policy Area as follows:</p> <p><i>“h) Activities operating in accordance with section 18(2) of the Reserves Act 1977 on the Te Kaokaoroa Historic Reserve (Allotment 373 Town of Richmond)”</i></p> <p>This is seen as a “transitory use” of open space and a low risk activity. Without this provision, the cultural practices would otherwise have been protected by existing use rights. On that basis it was considered appropriate to list this as a permitted activity.</p> <p>As already noted, Te Runanga o Ngati Awa have made a submission in support of the proposed plan changes.</p> <p>Further engagement with Iwi over the recognition of the cultural significance of the reserve area is sought. I understand that this relates primarily to the debris flow risk to the interment site for koiwi on the reserve and a plan to relocate this to another local reserve. This is an issue that falls outside the Plan Change, but I am aware that dialogue has occurred with council to advance this outcome.</p>

Witness	Paragraph	Question
David Stimpson		<p data-bbox="600 236 1928 300">Unless I am missing something there seems to be a crucial gap in the makeup of the CDG - there are no tangata whenua representatives. Why was this?</p> <p data-bbox="600 344 1991 443">The focus of my work was on landowners and their relationship with Council, Regional Council and central government. In addition to the Council owned Historical reserve at 2 Kaokaoroa St providing ancestral burial ground rights to Maori, there were two groups of sites owned by entities with apparent tangata whenua links. These were:</p> <ul data-bbox="647 488 1585 555" style="list-style-type: none"> <li>• 21 – 29 Clem Elliot Drive (10 Sections) owned by the Ngati Hinerangi Trust.</li> <li>• 98 Arawa St. Maori Land.</li> </ul> <p data-bbox="600 600 1939 663">Locating these owners was not complete until after initiation of the CDG process. Discussions with the owners of these two sites are summarised below.</p> <p data-bbox="600 708 1977 880">a) <b>21 – 29 Clem Elliot Drive (10 Sections) owned by the Ngati Hinerangi Trust.</b> My contact with the chair Don Bennett on 2 March 2015 indicated that three sections had been sold prior to the debris flow event. The remaining ten sections continued to be available for sale although this was subject to a challenge by Kawerau interests in the Maori Land Court. Don was in agreement with a smaller group to investigate a way forward and to keep them informed.</p> <p data-bbox="647 925 1977 1203">I subsequently came to understand from discussions with Anthony Olsen, CEO Te Mana o Ngāti Rangitihi Trust, that ownership had been transferred to Colleen Skerett-White. I met with Colleen and Anthony on 9 April 2015 by which time the CDG process was nearing an end and I was unwilling to add new stakeholder representatives late in the process. I wrote to them on 8 May 2015 noting my understanding of their objectives for a Battelfield / Urua protection reserve and that this was consistent with Council’s objectives for the wider site. I also noted my recommendation to Council that at the time a formal proposal might be made to all landowners, Council should enter into discussions with various Iwi with cultural and private property interests at Awatarariki including Colleen.</p> <p data-bbox="600 1248 1939 1382">b) <b>98 Arawa St. Maori Land</b> with total rates remission. Owner Roger Kusabs died approximately 15 years prior. Contact was made with beneficial owners Andrew Kusabs (Junior) of Levin who was amenable to the CDG process and being kept informed and Andrew Kusabs of Rotorua. Andrew offered to be an observer in the process which I declined on the basis that the process required multiple full day active commitment.</p>

Witness	Paragraph	Question
		<p>In para 15 of your evidence you refer to “... continuing to seek engagement with landowners who whakapapa to Ngāti Awa” and that it was agreed that Council officers would do so. Are you able to tell us what transpired?</p> <p>My involvement in the process terminated in June 2015. I have referred this question to Jeff Farrell to respond to.</p> <p>In any event was the CDG aware of any significant issues of concern to Ngāti Awa - and Ngāti Rangitahi in particular - at the time that might perhaps have impacted on CDG deliberations?</p> <p>Plans for urupa protection were noted to the CDG. The presentation to the final meeting of the CDG on 5 May 2015 noted on page 11 that for a Managed retreat process, <i>“Debris fan passive reserve development plans would be developed to fit with proposals for historic battlefield and urupa preservation plans on adjacent Maori owned land”</i></p> <p>Are you able to comment further on the Kaokaoroa Reserve matter - e.g. consultation with Ngāti Hinerangi?</p> <p>My meeting with Colleen Skerrett-White and Anthony Olsen on 9 April 2015 had identified their plans for battlefield / Urupa protection.</p> <p>Are you aware of any other urupā in the area that might also be affected in the same way as the Kaokaoroa Reserve?</p> <p>This is not my area of expertise, and in any case I am not aware of any other <i>urupā</i>.</p>
Ganesh Nana		<p>Are there any specific Māori-related criteria that apply to your model - generally or specifically in this instance? If so, might they not still be applied - even at this stage in the process - because they don't seem to have been applied so far?</p> <p>No specifically Māori criteria were applied in our Multi Criteria Analysis (MCA). However, we note that some of the criteria are consistent with te ao Māori perspectives. For example, the criterion we called “optimal land use” considered the use of the fanhead in terms of cultural and commercial applications. It is also about ensuring opportunities for future generations are considered from the perspective of kaitiakitanga.</p>

Witness	Paragraph	Question
	15.5	<p>Another criterion “keeping the community together” includes the connectedness of the community itself and its relationship with the location, not just keeping all residents living in proximity. This, again, can be seen as consistent with a te ao Maori perspective.</p> <p>It would be possible in principle to add criteria to our analysis. The critical step is that we need to figure out how each proposed option will impact on each criterion. This requires engagement with stakeholders and a repeat of the process.</p> <p>Who were the stakeholders who weighted the factors?</p> <p>The main WDC staff members were Sarah Stewart and Jeff Farrell. Other WDC staff were consulted on some thoughts but the final decisions were made by Sarah and Jeff in consultation with BERL staff. Tom Lucas and Edward Guy of Rationale Ltd also twice reviewed the Indicative Business Case which included the MCA.</p> <p>Their formal review letter is attached to the end of this document.</p> <p>Given that the loss of life criteria has the most weight how is the likelihood of this occurring compared with other factors such as stress levels and keeping community assessed in the MCA approach?</p> <p>We stress that the broad idea of a MCA is to compare options by scoring them against criteria and then adding together the weighted scores. This approach converts non-numerical factors into numbers which can be compared to see which is larger.</p> <p>The loss of life criterion is a bit different from the other criteria in that its description is about likelihoods. The other criteria we assess each option against are in some sense a lot more certain than the loss of life criterion. For example consider the stress levels criterion; it is practically certain that the process of responding to the threat of a significant debris flow over the return period will cause stress. The question is “how much?” stress.</p> <p>Keeping the community together is another criterion that should be explained. Responding to the risk of a debris flow involves moving people off the fanhead. This will undoubtedly have an impact on how “together” the community feels. Again, the question we asked our stakeholders was “how much?” in terms of how much togetherness can be maintained.</p>

Witness	Paragraph	Question
		<p>The loss of life criterion has the highest weighting out of all criteria. Our stakeholders felt that if even a single person loses their life to a debris flow over the return period then that is a worst-case outcome. This does give a high weighting to something that has a low likelihood of occurring. It implies that any option that puts people's lives at risk scores relatively low against this criterion.</p> <p>While we expect at least one event (i.e. a debris flow) over the return period, there is of course no certainty that this will happen. However, MCA must deal with the expectation as we see it at present <i>ex ante</i> (i.e. before the event). We ask a question of the form "what proportion of people would be at risk of death <i>given</i> there is a debris flow over the return period?"</p> <p>Capturing the likelihood of loss of life was enabled by careful wording of the criterion and of the questions we asked stakeholders.</p> <p>We reproduce the table from 20.1 (the Appendix) of our statement of evidence below. This table describes how each option is assessed against the loss of life criterion.</p> <p>Scores for this criterion go from 0 to 100. They were based on a subjective assessment of the proportion of people who are no longer at risk of death under each option.</p> <p>Under the status quo – do nothing option it is almost certain that should a debris flow occur over the return period there would be a fatality. This outcome is undesirable and our score of this option against the criterion of loss of life is set at 0 to reflect a bad outcome.</p> <p>The three managed retreat options imply that if a debris flow happened over the return period there is a likelihood of loss of life, but it is less than certain. A lower likelihood of fatality is a good outcome and so we score these options at 75 against this criterion. This can be interpreted as a subjective assessment that 75 percent of people are no longer at any risk of fatality if a debris flow happens over the return period. Said the other way around, 25 percent of people would be at risk of death if a debris flow happened over the return period.</p> <p>Finally, under a compulsory retreat there is no likelihood anyone would die if a debris flow happened over the return period. We interpret this as 100 percent of people survive which is a very desirable outcome and so this option scores 100 against the criterion of loss of life.</p>

Witness	Paragraph	Question																		
		<table border="1"> <thead> <tr> <th>Impact on loss of life</th><th>Score</th><th>Outcome - interpretation</th></tr> </thead> <tbody> <tr> <td>Status quo</td><td>0</td><td>Worst – certainty of fatality</td></tr> <tr> <td>Managed voluntary retreat – dwellings only</td><td>75</td><td>Good – 75% of people no longer at risk</td></tr> <tr> <td>Managed voluntary retreat – 300,000 m3</td><td>75</td><td>Good – 75% of people no longer at risk</td></tr> <tr> <td>Managed voluntary retreat – 450,000 m3</td><td>75</td><td>Good – 75% of people no longer at risk</td></tr> <tr> <td>Compulsory retreat</td><td>100</td><td>Best – no chance of fatality</td></tr> </tbody> </table> <p>How were the results of the MCA used by the Council in making its decisions?</p> <p>We note that Table 13 of section 4.5 of the Indicative Business Case summarises all the analysis WDC has completed in making the decision. The MCA is included in the 11th row of this table.</p> <p>The MCA resulted in a ranking of a 300m3 managed retreat as the preferred option (equal with a 450,000m3). This is combined with:</p> <ul style="list-style-type: none"> <li>• a standard cost benefit analysis to calculate the NPV of each decision</li> <li>• an analysis of the objectives met</li> <li>• an estimate of the non-monetary benefit and a ranking of these non-monetary benefits</li> <li>• an analysis of risk and a ranking of risk rating</li> </ul> <p>The result of all these analyses is that the 300,000m3 managed retreat is the preferred option.</p> <p>Note the 300,000m3 managed retreat option does not have the highest NPV, nor does it have the highest non-monetary benefit or risk rank.</p> <p>It is apparent that it is the combination of these results that is used to make a decision.</p>	Impact on loss of life	Score	Outcome - interpretation	Status quo	0	Worst – certainty of fatality	Managed voluntary retreat – dwellings only	75	Good – 75% of people no longer at risk	Managed voluntary retreat – 300,000 m3	75	Good – 75% of people no longer at risk	Managed voluntary retreat – 450,000 m3	75	Good – 75% of people no longer at risk	Compulsory retreat	100	Best – no chance of fatality
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Witness	Paragraph	Question
Gerard Willis	6.6	<p>Are the cross references in the first sentence incorrect so that you are referring to the footnote to Policy NH 14C? If the RPS is correctly characterised, as you suggest, as providing “the ability” to over-ride existing use rights, does it follow that it does not require that outcome?</p> <p>Commissioner Robinson is correct in that the reference to ‘Policy NH 4C’ at paragraph 3.6 of my evidence should read ‘Policy NH 14C’. As noted in my statement of evidence, two key BOPRPS provisions are Policies NH 3B and NH 12A. Through the interplay of those provisions, High risk must be reduced to Medium risk (at least). The BOPRPS is not specific as to how that is to be achieved in detail, although Policy NH 12A does refer to “controlling....development .....of land and land use change in city, district and regional plans” and Appendix M sets out some potential risk reduction measures. The footnote to Policy NH 14C is simply a reminder that another tool in the tool box is the use of regional rules to effectively over-ride existing use rights that might otherwise apply. There is no <i>requirement</i> to use that regional rule making ability but there is a requirement to reduce risk in existing developed areas from High to Medium (at least). To the extent that regional land use rules would be the most effective and efficient means to achieve that outcome they <i>should</i> be used consistent with a section 32 evaluation that supports such a conclusion.</p>
	6.7	<p>Is BOPRC under the same obligation as you identify WDC as being under? If so, why?</p> <p>The allocation of responsibility for land use control for natural hazards is governed by Policy NH 14C of the BOPRPS. Table 12a of that policy clearly provides city and district councils with the responsibility for developing <i>rules</i> (with joint territorial and regional council responsibility for methods other than rules). On that basis, it is my opinion that Whakatane District Council has a stronger and more direct obligation to act than does the regional council. The footnote to Table 12a makes clear that while the regional council is not obliged to use its land use rule-making powers, the allocation of responsibility in Table 12a does not preclude it from choosing to do so. I do not see that so much as an ‘obligation’ but simply the reserving of the discretion to use its statutory powers notwithstanding city and district councils have been identified as the ‘first port of call’.</p> <p>Please identify the section of the RPS that creates obligations on the District Council and in particular the requirement to reduce high natural hazard risks?</p>



Witness	Paragraph	Question
	6.12	<p>Policy NH 3B establishes the requirement to achieve a reduction of hazard risk (at the natural hazard zone scale) from High to Medium (and lower if reasonably practicable). It states that such an outcome is to be achieved by the application of Policies NH 4B and NH 12A.</p> <p>Policy NH 4B is not the most relevant policy in the context of the plan changes because it relates only to situations where new development is proposed. Where there is already High risk to existing development (as we have with the Awatarariki Fanhead), Policy NH 12A is the more relevant policy. That policy states that the risk outcomes set out in Policy NH 3B are to be promoted by (amongst other ways) <i>“controlling, the location, scale and density of the subdivision, use, development and protection of land and land use change in city, district and regional plans”</i>.</p> <p>Policy NH 14C further clarifies that it is the city and district councils who have the responsibility for making land use control rules for natural hazards in respect of land outside the coastal marine area.</p> <p><b>What should we make of the fact that RPS Appendix K appears to be related only to land use change?</b></p> <p>Commissioner Robinson is correct that Appendix K only depicts the policy stream as it affects land use <i>change</i>. In my opinion this is an oversight and nothing should be read into it. Appendix K is intended as a guide to the natural hazards policies. It is not itself a policy of the BOPRPS and is not referred to by any policy of the BOPRPS. It is referred to only in the narrative introduction to those policies. Accordingly, to the extent that there might be said to be an inconsistency between the natural hazards policies and Appendix K, the policies should prevail. Those policies affect land use and existing development as previously explained.</p> <p><b>Dr Saunders gives evidence (paragraph 6.5) that risk thresholds should be determined by decision-makers “in consultation with those at risk”.</b>  <b>Do you disagree?</b>  <b>If so why?</b>  <b>Has such consultation occurred?</b></p> <p>I do not disagree with that statement. However, I do not consider that those risk thresholds should be determined on a case-by-case (that is affected-property-owner by affected-property-owner) basis. Risk thresholds should be</p>

Witness	Paragraph	Question
		<p>agreed as part of the policy framework. The risk thresholds that apply are set out in the Bay of Plenty Regional Policy Statement. These were developed through a dedicated community engagement process during the preparation of Change 2. I note that Dr Saunders (later in her paragraph 6.12) makes the same point when she says:</p> <p><i>"This level of engagement was undertaken as part of the development of the RPS, the process of which is documented in Kilvington &amp; Saunders (2015)7, and is a key input into the 2013 risk based approach"</i></p>
Jeff Farrell	1.1	<p>You state there were no fatalities nor we understand serious injuries.  Was this purely good luck?  Are you able to provide a reason for that given that you were astonished that there were no fatalities?</p> <p>In my opinion this was largely a matter of luck. The presence of luck is not to be lightly dismissed. The destroyed house in Photograph 4 of my Evidence in Chief (and shown from a different angle in the first of the photographs below) was transported 150 metres in the 2005 debris flow. At the time it was occupied by a mother and 3 children with one of the children having a physical disability. All escaped injury.</p> <p>In contrast, in 2011 I responded to a landslide from the Ōhope escarpment in my capacity as Building Response Manager where a Pohutukawa branch had punched through a small section of the rear wall of a house. The damage occurred to the wall of a bedroom within which an occupant was sleeping. The bedroom filled with slurry from the landslide and the occupant died. The debris flow damage to many buildings at Matatā was significantly greater than the landslide damage which occurred to the Ōhope house.</p> <p>I have included several additional photographs of damage to buildings that occurred during the 18 May 2005 debris flows at Matatā.</p>

Witness	Paragraph	Question	
			
			
			
			
			
			

Witness	Paragraph	Question	
			
			
		<p>Other photos in my evidence demonstrate the nature of the debris that was deposited on the Awatarariki Fanhead. Although the largest boulder mobilised in the event was 7.0 metres diameter,</p>	



Witness	Paragraph	Question
		<div data-bbox="689 233 1335 721" data-label="Image"> </div> <p data-bbox="689 724 1189 759">Figure 1.3.5 from McSaveney et al (2005).</p> <p data-bbox="607 796 1554 831">many of the boulders deposited on the Fanhead exceeded 1.8 metres diameter.</p> <div data-bbox="689 865 1429 1374" data-label="Image"> </div>

Witness	Paragraph	Question
		<p>In my opinion, if a person had been caught up in the Awatarariki debris flow, their chances of survival, or survival without injury, would have been remote.</p> <p>I also note in paragraph (iii) of Dr McSaveney and Prof. Davies 2015 peer review of Kevin Hind's Supplementary Debris Flow Risk Assessment, the peer reviewers considered luck and/or the timing of the event may have been factors in the lack of fatalities:</p> <p><i>"Although there were no fatalities in the 2005 event, the presence of boulders and trees deposited by that event was a widely recognised serious threat to life. The lack of fatalities in 2005 may simply have been the result of luck, and/or the time of day when the event occurred."</i></p> <p>The debris flows occurred around 5.00pm. At this time, many people were at work or returning from work. If the event had occurred in the middle of the night with the homes fully occupied, the injury/fatality statistics may have been different.</p>
	1.8	<p>Why wasn't the risk management framework using both engineering and planning options pursued in the first instance?</p> <p>Mr Bassett's evidence describes the investigation of options the Council considered in the first instance. In each of the Matatā catchments that debris flows had occurred, options were identified to manage and mitigate future debris flow risk, including an option to retreat from the hazard. The preferred option for each catchment, including the Awatarariki catchment, was identified following public consultation. The Council's decisions were heavily influenced by the community's desire for engineering solutions to enable future occupancy of residential properties affected by the 2005 debris flows.</p>
	5.25	<p>Please explain what is meant by life-risk profile of <math>10^{-2}a^{-1}</math>.</p> <p>The quoted reference is incorrect. I have described the risk profile across the Fanhead in Kevin Hind's Supplementary Debris Flow Risk Assessment as ranging from <math>10^{-2}a^{-1}</math> to <math>10^{-6}a^{-1}</math>. In the context of Kevin's report, this describes an annualised loss of life risk range where the descriptor <math>10^{-x}</math> represents the probability of a fatality and</p>

Witness	Paragraph	Question
		the $a^{-1}$ places this within the context of a year (annum). $10^{-2}a^{-1}$ can also be described as a 1 in 100 or 1 percent chance of occurring in any year.
	5.42	<p>You state that property owners have approached risk perception based on their own personal views whereas the District Council has approached the issue objectively through a structured decision-making process. Given that this information that the Council has used has been discussed with the residents why do you think they have arrived at a different conclusion?</p> <p>I think the differences in risk acceptance between some individuals and the Council is due to a range of factors including:</p> <ul style="list-style-type: none"> <li>• rejection of the risk assessments and other scientific evidence commissioned by the Council;</li> <li>• variability in individuals' willingness to take risk;</li> <li>• lack of acceptance of Council's statutory obligations to manage natural hazard risk;</li> <li>• lack of acceptance of the exercise of the statutory functions associated with those obligations by the Council;</li> <li>• potential impact upon personal and property values caused by the Council's exercise of its statutory functions ;</li> <li>• distrust of the Council.</li> </ul>
	5.52	<p>Figure 1 of the peer review shows dotted and solid black and red lines defining annual loss of life risk extents. How did you take these lines and convert them into closed overlays in the planning maps?</p> <p>Council GIS staff were provided with Figure 1 from the Tonkin &amp; Taylor report as an image, which they geo-referenced. The risk contour lines were then digitised and used to inform the creation of the closed overlays in the planning maps.</p> <p>What annual loss of risk lines define the boundaries to the High, Medium and Low Risk overlays.</p> <p>The modelled <math>10^{-5}</math> risk line defines the High/Medium risk boundary. The modelled <math>10^{-6}</math> risk line defines the Medium/Low risk boundary.</p>
	5.75	<p>In the second sentence, in terms of the Minister's advice, is it correctly stated as plan changes plural?</p>

Witness	Paragraph	Question
	6.1(d)	<p>The Minister's advice was relayed to me by the Mayor and Chief Executive following their meeting with the Minister. The discussion arose as a consequence of the Council's engagement to seek a funding contribution from the Crown. The Council's Indicative Business Case supported a multi-party funding solution and was based on managed retreat from all properties and rezoning of the acquired land. The Minister's advice therefore related to both plan changes proceeding.</p> <p>Is the Government's participation conditional on confirmation of one or both plan changes, or just on initiation of the First Schedule process?</p> <p>The Government's participation was conditional upon the plan changes being initiated.</p> <p>Is the land/ dwellings within the identified High Risk area currently insurable? If so, is a risk premium being required by insurers? If so, of what order?</p> <p>I put these questions to IAG senior managers Brendan McGillicuddy, IAG National Portfolio Manager (Home and Contents) and IAG General Manager Corporate Relations, Bryce Davies, at a meeting they requested on 18 February 2020. I received the following email response on 26 February 2020.</p> <p>"IAG insures a small number of homes in the Matatā Awatarariki Fanhead on our standard terms and pricing and will continue to support them through to the conclusion of the managed retreat and plan change processes that are underway. Due to our assessment of the risk in the area, we have not accepted new insurance on home or contents or increased sums insured on existing policies since 2017."</p> <p>Messrs McGillicuddy and Davies advised at the meeting that IAG wanted to ensure that all of their clients in the High Risk area of the Awatarariki Fanhead were fully informed of IAG's position while the Crown/Council/BOPRC funded managed retreat was still available.</p> <p>Can you please update us on the number of settled properties under the 'voluntary managed retreat' funding package? AND In paragraph 1.24 of your evidence you say there will be an update on the number of properties sold. Can you advise on that?</p>



Witness	Paragraph	Question
		<p>As at 25 February 2020, 13 properties have settled and 4 have unconditional agreements for sale and purchase. Of these 17 properties, 9 contain dwellings.</p> <p>Of the settled properties, how many are Māori owned, and were there any peculiarly Māori-related issues that you were aware of that contributed to how settlements were reached e.g. Treaty claims?</p> <p>In 2016 and 2017, I was nominated by the Council's Chief Executive to assist the Ngāti Rangitihi Treaty Settlement negotiating team prepare their settlement claim. I was therefore aware of the post-Treaty aspirations of Ngāti Rangitihi and the specific land parcels within the environs of Matatā that were being considered as part of any settlement. None of the land parcels associated with Ngāti Rangitihi's Treaty Settlement Claim related to the land parcels that were the subject of the proposed managed retreat programme.</p> <p>Of the 17 properties that have been settled, at least 4 have included owners who are Māori. The flexibility of settlements reflects the specific requirements of the vendors. There have been no peculiarly Māori-related issues that I am aware of that have contributed to how settlements were reached.</p> <p>Why were there no tangata whenua representatives on the CDG?</p> <p>David Stimpson contacted individual property owners and, with the exception of one participant, arranged the composition of the CDG. I refer commissioners to his response to this question. The one exception was Mr Neville Harris (now deceased) whose solicitor wrote to the Council requesting Mr Harris be included. I recommended his inclusion and my recommendation was accepted by Mr Stimpson.</p> <p>Was there direct iwi involvement in the preparation and signing of the 2019 MOU? If so, which iwi (who from each in particular) and if not, why not?</p> <p>The MoU is an agreement between the Crown, Bay of Plenty Regional Council, and the Whakatāne District Council, to fund a managed retreat programme. No iwi are funding partners so direct iwi involvement in the preparation and signing of the MoU was not sought. There have been ongoing discussions with Ngāti Rangitihi, Ngāti Awa, and Ngāti Tūwharetoa ki Kawerau about the managed retreat programme, the plan changes, and their participation in the workstream (just starting) to look at what the geographical area subject to the managed retreat and plan change</p>

Witness	Paragraph	Question
		<p>programmes might look like in the future, including how the cultural significance of the area can be appropriately recognised.</p> <p><b>Referred by David Stimpson</b>  <i>In para 15 of your evidence you refer to “... continuing to seek engagement with landowners who whakapapa to Ngāti Awa” and that it was agreed that Council officers would do so. Are you able to tell us what transpired?</i></p> <p>The CDG workshops occurred in 2015. At the conclusion of those workshops the Council initiated a number of workstreams. Continued engagement on these workstreams occurred with all property owners which by default, included any owner(s) with a whakapapa relationship to Ngāti Awa. In addition to individual property owner engagement, the Council has also engaged at iwi level with Ngāti Rangitihi, Ngāti Awa, and Ngāti Tūwharetoa ki Kawerau.</p>
John Reid	<p>4.5</p> <p>6.2</p>	<p>The evidence of Donovan-Grammer refers to 31 affected property market valuations. Can you please explain why you refer to 34 affected private properties?</p> <p>It is my understanding that the high risk area includes 45 properties, of which 34 are in private ownership. These 34 private properties have been the focus of the Awatarariki Managed Retreat Programme, with 2019 valuations having been completed by Telfer Young (Mr Shayne Donovan Grammar) on most but not all of these properties as some parties did not sign up to participate in this voluntary process.</p> <p>Does the MBIE determination apply to properties in the entire Debris Flow Policy Area or just to those in the High Risk portion?</p> <p>The MBIE determination 2016/034 considers the refusal to grant a waiver from the NZ Building Code for two proposed buildings which are situated on land subject to a debris flow hazard. Specifically the parties included the owners of 6 Clem Elliott Drive and 100 Arawa Street. The decision at page 17 found that Whakatāne District Council (WDC) was correct to refuse to issue a waiver under section 72 of the Act.</p> <p>The Introduction to the Determination application submitted by WDC dated 2 July 2014 included the following:</p>

Witness	Paragraph	Question
		<p>“Although the application relates to two specific properties, the two properties belong to a wider geographical area that has been identified through research as being subject to future debris flow events with a high annualised loss of life risk potential. Because the two specific properties are indicative of a broader geographical situation, the outcome of the determination will therefore be of wider application.”</p> <p>I have interpreted that to mean that the determination relates to the High Risk area.</p> <p>Are you able to elaborate on the “cultural matters” that you refer to in paragraph 4.13 of your evidence - what were they, how significant did you think they were at the time, what was your understanding of the outcome of the sharing of those concerns with Telfer Young and the District Council, etc?</p> <p>Of particular interest are your thoughts on the connections to the Ngāti Hinerangi subdivision and the 1864 Battle of Kaokaoroa.</p> <p>What has been your past experience in working on the sort of cultural matters you uncovered here, and how have they been satisfactorily addressed, if at all?</p> <p><b>A: The Kaokaoroa Battle</b></p> <p>The cultural matters centre on the 1864 battle that occurred on the Awatarariki Fanhead, known as the Kaokaoroa battle. While early NZ history is not my area of expertise I have briefly studied the Ngāti Awa Claims Settlement Act 2005 and in particular schedule 13 statutory acknowledgement for Te Kaokaoroa Historic Reserve. This reserve lies in the centre of the fanhead, bounded by Clem Elliott Drive, Kaokaoroa Street and Arawa Street (State Highway 2). The reserve is sacred to several hapu of Ngāti Awa because it commemorates a great battle. This three day battle involving hundreds of warriors did not just occur on one 3,400 m<sup>2</sup> site, indeed it is my understanding that it likely took place over the entire fanhead and many casualties were buried where they fell. While the reserve is also believed to be the resting place of some who were killed, it is obvious to all that bodies were likely buried on many parts of the fanhead.</p> <p>I also note that Environment Court Decision A035/2009 (Judge Smith presiding) provides commentary on the cultural importance of the Fanhead area (paragraphs 7 – 13). The Environment Court commentary reinforces my</p>

Witness	Paragraph	Question
		<p>understanding of the Battle of Kaokaoroa but also highlights more recent deposition of skeletal remains on a broad area of the Fanhead that occurred during the 2005 debris flow.</p> <p>The Ngāti Hinerangi subdivision involved 1.48 hectares of former Maori Freehold Land located west of Kaokaoroa Drive, that became General Land in 2001. I made enquires with WDC and received a summary as follows:</p> <p>Whakatāne District Council granted resource consent application No. 24.3.01.10 on 14 September 2001 for the “<i>Ngāti Hinerangi subdivision</i>”, being a 15-lot subdivision (actually 14 plus 2 small corner splays to be vested as road) of No. 25 Clem Elliot Drive. Condition 1(f) required:</p> <p><i>That the carriageway along Clem Elliott Drive shall be extended to Tohi Street with a cul-de-sac head being provided at the end thereof having a minimum 12.0 metre radius. The carriageway shall be formed and constructed to have a minimum 7.0 metre wide two-coat chip seal surface, with traffic calming/threshold devices installed and approved stormwater control. Design drawings shall be submitted to Council for approval prior to any work being carried out on site.</i></p> <p>The consent was varied on 6 December 2001 to allow the subdivision to proceed in two stages:</p> <ul style="list-style-type: none"> <li>▪ Stage 1 - being a five lot subdivision creating Nos. 17 &amp; 19 Clem Elliot Drive (Lots 3 &amp; 4 DP 306286), Nos. 102 &amp; 104 Arawa Street (Lots 1 &amp; 2 DP 306286), and, the balance lot being No. 21 Clem Elliot Drive (Lot 20 DP 306286); and,</li> <li>▪ Stage 2 – being subdivision of the balance lot at No. 21 Clem Elliot Drive (Lot 20) into 10 lots. The construction of Clem Elliot Drive into a formed cul-de-sac as per consent Condition 1(f) was to be undertaken as part of Stage 2.</li> </ul> <p>Subsequently, Stage 1 went through RMA section 223 and 224 processes and titles were issued.</p>

Witness	Paragraph	Question
		<p>It appears that Stage 2 of the subdivision did not proceed, potentially on the basis of issues that arose in 2003-4 following the discovery of human remains on the land. A court injunction was sought by Colleen Skerrett-White on 22 October 2003 to prevent the further development of the Ngāti Hinerangi subdivision. Court conferencing minutes record that, as the land was general land and not declared at law to be a waahi tapu, the Court found it had no jurisdiction to issue an injunction or make any orders. Thereafter, the Council's records (Ref: Objective A1593257</p>

Witness	Paragraph	Question
		<p>(pages 1 – 8)) indicates that Environment Court proceedings were lodged by multiple Iwi against the New Zealand Historic Places Trust grant of an authority for the Ngāti Hinerangi Trust to modify/destroy an archaeological site in the process of undertaking the subdivision.</p> <p>On 5 January 2006 the Daily Post (Rotorua) detailed a land dispute that was heading to the Maori Land Court, being Stage 2 of the Ngāti Hinerangi land. Colleen Skerrett-White, a member of Ngāti Pikiao who are part owners of the land, said Kaokaoroa should never have been changed to general land as the land is waahi tapu (sacred)</p> <p>I subsequently made further enquiries including a phone call to Dr Rachel Darmody, Senior Archaeologist, Heritage New Zealand. She supplied me with a May 2005 Investigation report that she co-authored that clearly uncovered evidence of the balance of the Hinerangi Trust land containing items of archaeological interest and human bones. The report concluded that the property was indicative of a formal burial ground possibly used for several generations. There was insufficient evidence to confirm the bones were from the 1864 battle, but this was not completely discounted.</p> <p>This information was shared with WDC. Subsequently Council forwarded this to the Telfer Young valuers acting for Council and other valuers engaged by private owners</p> <p><b>B: Blue Bay Development, Mahia, Northern Hawkes Bay</b></p> <p>Blue Bay at Mahia is another example of cultural and anti-development sentiment. Historically this land was a popular camp ground and home to up to 1,000 campers over summer. The land was purchased by a Wellington developer in 2004, pine trees removed and a full 44 lot subdivision developed. Sales commenced in 2005 with 7 lots sold ranging from \$150,000 to \$615,000 and unconfirmed contracts at \$650,000 for the prime sections. There was local anger over the development occurring, including Maori, who believed culturally significant sites had been bulldozed and opposed the development. In 2008 the first house to be built was destroyed by arson and the original developer was bankrupted after selling the remaining unsold sections to a new developer.</p> <p>Lombard Finance, financed the second purchaser, before the effects of the GFC saw Lombard itself go into receivership. In September 2017 the receivers finally set about to sell their 35 unsold sections, with the sales ranging from \$50,000 to \$213,000 (\$99,500 average sale price). This value reduction is a clear indication of cultural and</p>

Witness	Paragraph	Question																				
		<p>ongoing tensions that have caused value diminution and stigma. Over time this stigma may lessen, particularly if quality homes are built and a locality develops with some permanent residents.</p> <p>We analysed the 2017 sale prices and subsequent sales to show an implied discount of some 60% due to the historical issues (stigma). In the period 2005 to 2007 we observed no residential sections in the Mahia coastal location selling for less than \$100,000, while the 2017 tender sales achieved 4 sales between \$50,000-\$59,999, 2 sales between \$60,000-\$69,999, 8 sales between \$70,000-\$79,999, 5 sales between \$80,000-\$89,999 and 1 sale between \$90,000 and \$99,999. In total the 20 lowest sale prices averaged \$72,400.</p> <p>Other repeat sales in Mahia support limited growth during the period 2005-2017 including:</p> <ul style="list-style-type: none"><li>• 133 Newcastle Street, sold March 2004 for \$200,000, June 2006 for \$280,000, April 2013 for \$237,500 and January 2020 for \$250,000.</li><li>• 104 Newcastle Street sold March 2003 for \$176,000 and December 2017 for \$240,000.</li></ul> <p>As a minimum we might have expected a 5-15% uplift in values since the original 2005-2006 sales, but this did not occur due to stigma.</p> <table><tr><th>Lot</th><th>Original SP &amp; date</th><th>Rating Val 1/8/15</th><th>Indicative Discount</th></tr><tr><td>5</td><td>\$255,000 July 2005</td><td>\$67,000</td><td></td></tr><tr><td>5</td><td>\$127,000 May 2018</td><td>\$67,000</td><td>Say <math>127/(255*1.15 \text{ uplift}) = 57\%</math> discount for an open market sale 8 months post the mortgagee tender sales</td></tr><tr><td>23</td><td>\$615,000 May 2005</td><td>\$114,000</td><td></td></tr><tr><td>19</td><td>\$125,612 September 2017</td><td>\$114,000</td><td>Say <math>126/(600*1.05 \text{ uplift}) = 80\%</math> discount inclusive of mortgagee tender factor, adopt 60% stigma</td></tr></table>	Lot	Original SP & date	Rating Val 1/8/15	Indicative Discount	5	\$255,000 July 2005	\$67,000		5	\$127,000 May 2018	\$67,000	Say $127/(255*1.15 \text{ uplift}) = 57\%$ discount for an open market sale 8 months post the mortgagee tender sales	23	\$615,000 May 2005	\$114,000		19	\$125,612 September 2017	\$114,000	Say $126/(600*1.05 \text{ uplift}) = 80\%$ discount inclusive of mortgagee tender factor, adopt 60% stigma
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Witness	Paragraph	Question			
		19	\$207,000 October 2017	\$114,000	Say $207/600 \times 1.05$ uplift)=67% stigma with no mortgagee sale factor
		20	\$127,050 September 2017	\$114,000	Say $127/(600 \times 1.05)$ uplift) = 80% discount inclusive of mortgagee tender factor, adopt 60% stigma
		20	\$267,000 July 2018	\$114,000	Say $267/600 \times 1.15$ uplift)=61% stigma with no mortgagee sale factor
		<p>While the stigma might decline over time, the above sales and their analysis clearly illustrate the substantial discount showing in the 2017-2018 sales.</p> <p><b>C: Ihumātao, Mangere, Auckland</b></p> <p>The ongoing land saga at Auckland is a current scenario involving Fletchers who acquired this land and had plans to build 480 homes. Save our unique landscape (SOUL) are protesting because of what they believe are historical, cultural and archaeological significance and want the land to be left as open space or returned to mana whenua. These cultural issues have striking similarities with the Awatarariki Fanhead.</p> <p>In 1863 the land at Ihumātao was taken by proclamation during the invasion of the Waikato and acquired by a Crown grant in 1867. In 1869 it was sold to a private owner, whose descendants remained owners for over a century.</p> <p>In 2012 Auckland Council tried unsuccessfully to make the land an open, public space but this was challenged in the Environment Court and the council was directed to rezone the land for business or residential purposes. In 2014, 32 hectares of the block was designated as a Special Housing Area and by 2016 it had been sold to Fletcher Residential, reportedly for some \$30 million. In late 2016 a small group of protestors began to camp on the adjacent road and erected some structures. Fletchers got approval to build in December 2016, but Heritage NZ delayed their plans with protestors later taking their fight to the United Nations.</p> <p>By 2019, Fletchers, who had been through the Waitangi Tribunal, Maori Land Court and the Environment Court, as well as Auckland City consenting process, were starting to question their business case for continuing and publicly said they would sell at the right price. Today the issue still remains unsettled but it seems obvious to me that Fletchers will walk away, either with Government or Auckland Council footing the bill.</p>			



Witness	Paragraph	Question
		<p>Again despite all of the legal support and rights afforded by our planning laws, the owners of this land have been unable to proceed with their legal options.</p> <p><b>D: Waiohiki, Fernhill, Paki Paki, Hawkes Bay</b></p> <p>There are many examples in Hawke's Bay and elsewhere of traditional Maori settlements which have over time evolved from being 100% Iwi owned to mixed ownership. Over time some of the traditional housing has been replaced with more modern stock and undoubtedly today Waiohiki is a more favoured location than it once was, but it still sells at a substantial discount because of affinity to the land which is held by the local people who claim this land as their heritage. By contrast, nearby land on Links Road, Omarunui Road, or even Taradale, is much more highly valued and sought after by prospective owners. One of the fibres of a location is the people who live there and/or their historical connections with the land.</p> <p><b>E: Summary</b></p> <p>During my professional career I have worked in many parts of NZ that have Maori land issues. These include Rotorua, Kawerau, Whakatāne, Ōhope, Gisborne, Wairoa and all of Hawke's Bay. The property market reflects the actions of informed buyers and sellers. I have observed an unwillingness to invest in these locations particularly where the land issues are passionate with Iwi. Many simply don't purchase once they become aware of issues and understand why values are discounted.</p> <p>Locations that have been long settled and modified by modern day developments don't now exhibit the same cultural issues, with the passage of time helping. Beachfront locations such as Coastlands, Ōhope and Mount Maunganui are well sought after as premium locations, without any lingering Iwi issues.</p> <p>Matatā and in particular the Awatarariki Fanhead is a much different situation. My understanding is various local Iwi are anti any new development occurring on the Awatarariki Fanhead and will show this anger if pushed into action. A resource consent application for earthworks to clear a site or for a future on-site wastewater system may provide this opportunity.</p> <p>It is my opinion, based on the analysis of sales over 40 years, that cultural matters are one of the value determining factors. I don't agree that 100% of value will be lost but an informed purchaser would consider the respective risks</p>

Witness	Paragraph	Question
		and price accordingly. The values on the Fanhead are undoubtedly impacted by the past cultural matters and Iwi's current views on any development occurring.
Kevin Hind	6.31	<p>Can you advise why those landowners declined permission? If it had been possible to proceed without that constraint, would that have made a material difference to the technical viability of a debris diversion bund?</p> <p>My understanding (via Tom Bassett) is that the ownership of the land was disputed and therefore permission to use it for the construction of the bund and deposition of diverted debris was not likely to be forthcoming. A RAMMS model including a diversion bund located on the subject land had yet to be completed at the time that this option was removed from consideration. However, based on experience gained from modelling debris flows with the diversion bund located adjacent to SH2, I believe that the additional distance between the bund and the spillway that this land would have provided, would have made a material difference in the viability of the diversion bund design.</p> <p>It is noted however that the independent peer reviewers Professor Tim Davies and Mr Colin Newton expressed concern as to the viability of the diversion bund concept as a whole, because success was reliant, in part, on the spillway remaining unblocked throughout the duration of the debris flow event. This concern, plus the expected poor performance of the diversion bund located immediately adjacent to SH2, resulted in a move to a larger in-stream barrier with no spillway and no fanhead diversion bunds. Had the additional land been available, the project would have still faced the question as to whether the spillway was an acceptable element or not. In the course of events, this question wasn't required to be answered.</p> <p>Can you explain this figure please? What are the axes and how have the projected densities been plotted? What difference would the reduction in density resulting from the agreements Council has reached with landowners (as advised by Mr Farrell) make to it?</p> <p>This figure is taken from AGS (2007). <i>Commentary on Practice Note Guidelines for Landslide Risk Management 2007. Appendix C: Examples of Risk Calculation. Figure 5.</i> The vertical axis is <i>Frequency (F) of N or more fatalities per year</i>. The horizontal axis is <i>Number (N) of fatalities</i>. It is referred to therefore as a F-N chart.</p> <p>Whereas Loss of Life Risk is typically reported with respect to a single fatality (i.e. the <i>Person Most at Risk</i>), the F-N chart defines the annual risk that is Acceptable, ALARP or Unacceptable for an event that could result in multiple</p>

Witness	Paragraph	Question
		<p>fatalities. As the F-N chart includes the potential for a single fatality, the definition of Acceptable, ALARP and Unacceptable risk (as indicated on the vertical axis) is equivalent to those of the Person Most at Risk. In the case of the AGS (2007) chart, a <math>10^{-5}</math> annual probability of a single fatality is considered Acceptable.</p> <p>It is clearly the case that society's tolerance of a multiple fatality event would be lower than for a single fatality. This is reflected on the F-N chart by the risk levels defining Acceptable, ALARP and Unacceptable risk decreasing with increasing numbers of fatalities. An order of magnitude increase in the number of fatalities is associated with an order of magnitude reduction in the annual risk defining Acceptable, ALARP and Unacceptable. For example, an annual risk of <math>10^{-5}</math> is the minimum level for Acceptable for 1 fatality whereas <math>10^{-6}</math> is the minimum level for 10 fatalities.</p> <p>Reducing the occupation density of the fanhead from its current level to some lower value than was assumed for Figure 16 would result in a higher level of acceptable risk as the number of potential fatalities would decrease, however as the <math>10^{-5}</math> risk level is exceeded by the presence of a single person (i.e. the Person Most at Risk), there is no resident density that can result in the societal risk being considered acceptable.</p>
	6.87	<p>Can you explain your statement that based on the return period of the 2005 event being between 200 and 500 years a similar event is seen as "likely", within the context of the expected life of the buildings present on the fan?</p> <p>AGS (2007) presents qualitative measures of likelihood (reproduced as Table 1 in my evidence) that describe "likely" as an event that has a recurrence interval of between 100 years and 1,000 years. Both the 200 and 500 year return periods fall within this range.</p>
	Table 5	<p>Are you able to provide an estimate of the likelihood of a 200 to 500 year return period event occurring in the next 20 and 50 years?</p> <p>Response</p> <ul style="list-style-type: none"> <li>• There is a 10% chance that a 200 year return period event will occur within a 20 year time frame</li> <li>• There is a 25% chance that a 200 year return period event will occur within a 50 year time frame</li> <li>• There is a 4% chance that a 500 year return period event will occur within a 20 year time frame</li> <li>• There is a 10% chance that a 500 year return period event will occur within a 50 year time frame</li> </ul>

Witness	Paragraph	Question
		<p data-bbox="600 272 1458 304">Please explain how you arrived at <math>P_{(T:S-2)}</math> being 0.25 and <math>V_{(D:T)}</math> being 0.75.</p> <p data-bbox="600 347 1984 660">This question appears to refer to the 2013 Quantitative Landslide Risk Assessment report. <math>P_{(T:S-2)}</math> was a subset of <math>P_{(T:S)}</math>, the probability that the Person Most at Risk will be present and therefore subject to impact. <math>P_{(T:S-2)}</math> was used specifically to provide an estimate of whether someone was being able to be physically impacted by debris (rocks or building debris) even if their property was assumed to be impacted. This parameter acknowledges that even if we assume that a person is present and that the property is in the path of the debris flow, protection will be afforded by the dwelling or possibly a vehicle, and therefore they would not be physically impacted. The value of 0.25 assumed that in 75% of cases, the person would be protected from direct physical impact. The <math>V_{(D:T)}</math> factor assumed that if someone was actually physically impacted by either debris or a collapsing building, then there was a high probability (75%) of a fatality being the result.</p> <p data-bbox="600 703 1966 842">It should be noted however that these calculations were superseded by the 2015 supplementary report which was the basis on which the risk contours were generated. The <math>P_{(T:S-2)}</math> was dropped as an independent factor and was rolled into the <math>V_{(D:T)}</math> factor. In this case the vulnerability factor accounts for the potential for protection from a dwelling or vehicle. The mathematics are essentially the same as used in 2013.</p> <p data-bbox="600 885 1984 1166">The actual values used to generate the risk contours are presented in Table 10 of my evidence. In this case the probability that the person most at risk will be home was set at a constant 75% but that the vulnerability of the person to a fatality was varied to account for variations in the intensity of the debris flow across the fanhead and whether the location was within or outside of the main boulder field. <math>V_{(D:T)}</math> varied from 75% in the upper and central parts of the fanhead (effectively assuming burial of people and destruction of buildings) to 1% in lower energy areas outside of the debris field. In the Monte Carlo (probabilistic) assessment that was undertaken to check the validity of the risk contours, the <math>V_{(D:T)}</math> value served as the mean value around which the random probabilistic input value was selected.</p> <p data-bbox="600 1209 1525 1241">Was there any loss of life or serious injury to any of the residents of the area?</p> <p data-bbox="600 1284 1444 1316">No. This in itself does not indicate the absence of an unacceptable risk.</p>

Witness	Paragraph	Question
		<p data-bbox="595 236 1991 300">Please compare the return period of a landslide with that of an earthquake or flood in terms of whether a planning and/or an engineering intervention should be proposed?</p> <p data-bbox="595 344 1991 515">The BoP RPS (Appendix L, Table 20) compares different natural hazards in terms of the Annual Exceedance Probability (AEP) to be considered when evaluating risk. Rainfall-induced landslips (which we can assume includes debris flows) and floods (which debris flows are sometime considered to be) both have a return period of 100 years for initial analysis, whereas earthquakes with the potential to induce liquefaction have a return period of 1,000 years.</p> <p data-bbox="595 560 1991 659">Typically, the return period of the earthquake relevant to design depends upon the importance level of the facility being considered as well as the geological setting. Return periods of 500 to 1,000 years are commonly applicable. It is concluded therefore that:</p> <ul data-bbox="618 703 1991 842" style="list-style-type: none"> <li>• The need for planning or engineering intervention should be evaluated if the return period of landslide and flood hazard is 100 years or less. Debris flows can be included in these hazards</li> <li>• Earthquakes should be considered for return periods of approximately 500 to 1,000 years, depending on the particulars of the situation</li> </ul> <p data-bbox="595 887 1991 986">These return periods indicate when consideration of the consequences of a hazard is needed. The return period of a hazard does not however indicate whether planning or engineering intervention is required as that will depend on the consequences and level of risk.</p> <p data-bbox="595 1031 1991 1094">The question from the Panel also sought comment about at what recurrence interval a planning intervention should be proposed. I am not an expert in the planning discipline so have referred this query to Gerard Willis to respond to.</p> <p data-bbox="595 1139 1451 1166"><i>Additional response from Gerrard Willis in relation to planning matters:</i></p> <p data-bbox="595 1211 1991 1375">In the past there has been a presumption that natural hazards with high likelihood of occurring (such as coastal erosion) are to be managed by planning solutions while hazards with less likelihood of occurring (such as earthquakes) are best managed by engineering solutions. That presumption is not, however, grounded in planning law or in any planning policy or principle applicable either nationally or regionally/locally. Indeed one of the underlying purposes of the BOPRPS was to overturn that presumption by ensuring the planning solutions were</p>

Witness	Paragraph	Question
		<p>considered for low likelihood events with high potential consequences (including, in particular, tsunami risk). That is not to say that engineering solutions ought not be considered and may well prove to be the best option in many cases, only that where such options are not viable and/or not likely to be deployed (due to, for example, cost or technical feasibility) or would otherwise not be effective or efficient, planning interventions may be necessary to keep risk to acceptable levels.</p>
Mauri McSaveney	15.2	<p>You note that it is not the role of the technical expert to conclude that any area is fit or unfit for any particular use. Would you explain this view in line with Dr Massey's statement in para 7.10 of his evidence where he states that Dr McSaveney and Prof Davies identified an area of the fan that was considered unsuitable for residential use?</p> <p>What is your opinion on the accuracy or sensitivity of areal extents of the High, Medium and Low Debris Flow Risk Overlays proposed in PC1 on Map 101A?</p> <p>Allowing that my first visit to the Awatarariki fan was immediately after the entire fan area had been covered by the deposits of an immense debris flow, and I immediately saw convincing evidence that it had experienced previous large debris flows, I have always held the view that it was an inappropriate place for a residential subdivision by virtue of it's being an active debris-flow fan with no signs of mitigation in place. The presence of destroyed homes suggested that the Building Act criteria to apply was that for earthquake, strong wind and other destructive hazards (ie 10% probability of the dwelling lasting 50 years). So it became important to estimate the likely frequency of such a debris flow, and to determine what loading criteria should have applied.</p> <p>Within a short time after the event, a consensus emerged that the return period of the event was somewhere around the 200-500 year return period (ie within the range of 10% probability in 50 years).</p> <p>In 2011, following the Christchurch earthquake, I moved away from the Building Act approach of the fitness of properties and dwellings for particular uses, to adopt a quantitative approach to risk to life and risk to property. It is around this time that we (Chris Massey, Wendy Saunders, and I) worked closely with Mr Tony Taig (a UK-based risk consultant) who firmly believed that while the estimate of risk was a technical matter, the acceptability of that risk estimate was both a personal and political (societal) matter.</p> <p>Kevin Hind identified the high-risk areas on the fan. Prof. Davies and myself reviewed and supported his determination of high risk. Evidence of previous debris flows combined with the recorded damage caused by the</p>

Witness	Paragraph	Question
		<p>2005 debris flow reinforced the fact that another debris flow will occur at some point in the future and if the debris fan was a residential environment, it would be an unsafe residential environment.</p> <p>My opinion on the sensitivity of aerial extents of the risk zone on Map 101A in PC1 is that Kevin Hind has shown that the areal extent of the high-risk zone appears to be insensitive to the known uncertainties. In particular, it is not at all sensitive to just how big this debris flow was, and it is not at all sensitive to what its return period might have been. It is of course very sensitive to the actual area of the fan that experienced the 2005 debris flow and associated debris flood. I find this to be very reassuring. Mr Hind's careful and thorough analysis confirms my original opinion that the fan was an inappropriate place for a residential subdivision and was never a place to bring up a family, form happy memories, or spend one's retirement years</p>
Peter Blackwood	Table Four	<p>What is the shape of a line plotting the reduction in AEPs over the period between 2020 and 2080-2100? What for instance would the predicted probabilities be at say 2030 and 2050?</p> <p>The available information on temperature rise and impacts under the four Representative Concentration Pathways (RCPs) has been presented as follows:</p> <ol style="list-style-type: none"> <li>1. A graph with a wavy line summarising projected New Zealand-average temperatures relative to 1986-2005 for six CMIP5 global climate models downscaled via NIWA's RCM (high resolution Regional Climate Model). These are presented in Figure 7 in the publication: Ministry for the Environment 2016. <i>"Climate Change Projections for New Zealand: Atmospheric projections based on simulations undertaken for the Fifth Assessment"</i>, Ministry for the Environment. The graph is also presented in Figure 4 of the HIRDS V4 publication (referenced in my evidence). The graph is somewhat fuzzy, reflecting the variability of several factors, but the very clear trends are obviously evident for the 4 RCPs. It is reproduced below:</li> </ol>

Witness	Paragraph	Question
		<div data-bbox="831 248 1805 935" data-label="Figure"> </div> <p data-bbox="696 967 1883 1078"><b>Figure 7: Projected New Zealand-average temperatures relative to 1986–2005, for six CMIP5 global climate models, and for the historical simulations (here 1971–2005) and four future simulations (RCPs 2.6, 4.5, 6.0 and 8.5)</b></p> <p data-bbox="696 1102 1839 1166">Individual models are shown by thin dotted or dashed or solid lines (as described in the inset legend), and the six-model ensemble-average by thicker solid lines, all of which are coloured according to the RCP.</p> <p data-bbox="595 1214 1973 1318">2. The impacts of global warming on storm rainfalls are presented in Table 5 of the HIRDS V4 publication and in the site specific data produced by HIRDS V4. However, this data is only presented for changes to the period 2031-2050 and 2081-2100.</p>



Witness	Paragraph	Question																																														
		<p>Reproduced below is Table Three of my evidence presenting details of the changes in the 1% AEP rainfalls to the period 2081-2100 for the one hour and two hour durations for the various future concentration pathways (for the Tarawera at Awakaponga rainfall site).</p> <p><b>Table Three: Forecast changes in the 1% AEP design rainfalls (mm) to the period 2081-2100</b></p> <table> <tr> <th rowspan="2">Climate Change Scenario</th><th colspan="2">Rainfall Duration</th></tr> <tr> <th>1 hour</th><th>2 hours</th></tr> <tr> <td>18 May 2005 Depths</td><td>94.5</td><td>132.5</td></tr> <tr> <td>Current Climate</td><td>84.6</td><td>113</td></tr> <tr> <td>RCP2.6</td><td>91.4</td><td>122</td></tr> <tr> <td>RCP4.5</td><td>98.6</td><td>131</td></tr> <tr> <td>RCP6.0</td><td>103</td><td>137</td></tr> <tr> <td>RCP8.5</td><td>114</td><td>151</td></tr> </table> <p>Added is Table Three-A presenting details of the changes in the 1% AEP rainfalls to the period 2031-2050 for the one hour and two hour durations for the various future concentration pathways (for the Tarawera at Awakaponga rainfall site). [Note there is firstly, no change in the predictions under RCP2.6 for the two time periods (reflecting the “flattish” line under this scenario in Figure 7 preceding); and secondly, predicted rainfall figures in 2031-2050 are higher, to a minor degree, for RCP 4.5 than RCP 6.0 (reflecting the complexity of the climatic factors and their interaction).]</p> <p><b>Table Three-A: Forecast changes in the 1% AEP design rainfalls (mm) to the period 2031-2050</b></p> <table> <tr> <th rowspan="2">Climate Change Scenario</th><th colspan="2">Rainfall Duration</th></tr> <tr> <th>1 hour</th><th>2 hours</th></tr> <tr> <td>18 May 2005 Depths</td><td>94.5</td><td>132.5</td></tr> <tr> <td>Current Climate</td><td>84.6</td><td>113</td></tr> <tr> <td>RCP2.6</td><td>91.4</td><td>122</td></tr> <tr> <td>RCP4.5</td><td>93.2</td><td>124</td></tr> <tr> <td>RCP6.0</td><td>92.5</td><td>123</td></tr> <tr> <td>RCP8.5</td><td>94.4</td><td>126</td></tr> </table>	Climate Change Scenario	Rainfall Duration		1 hour	2 hours	18 May 2005 Depths	94.5	132.5	Current Climate	84.6	113	RCP2.6	91.4	122	RCP4.5	98.6	131	RCP6.0	103	137	RCP8.5	114	151	Climate Change Scenario	Rainfall Duration		1 hour	2 hours	18 May 2005 Depths	94.5	132.5	Current Climate	84.6	113	RCP2.6	91.4	122	RCP4.5	93.2	124	RCP6.0	92.5	123	RCP8.5	94.4	126
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Witness	Paragraph	Question																																						
		<p>Table Four-A presents details of the changes in frequency of the 18 May 2005 rainfalls for both the period 2031-2050 and 2081-2100 for the one hour and two hour durations.</p> <p><b>Table Four-A: Forecast changes in frequency (years) of the 18 May 2005 rainfalls to the periods 2031-2150 and 2081-2100</b></p> <table><tr><th rowspan="3">Climate Change Scenario</th><th colspan="2">Period 2031-2050</th><th colspan="2">Period 2081-2100</th></tr><tr><th colspan="2">Rainfall Duration</th><th colspan="2">Rainfall Duration</th></tr><tr><th>1 hour</th><th>2 hours</th><th>1 hour</th><th>2 hours</th></tr><tr><td>Current Climate</td><td>200-500</td><td>200-500</td><td>200-500</td><td>200-500</td></tr><tr><td>RCP2.6</td><td>100-150</td><td>150-250</td><td>100-150</td><td>150-250</td></tr><tr><td>RCP4.5</td><td>110</td><td>140-150</td><td>80</td><td>100</td></tr><tr><td>RCP6.0</td><td>110-120</td><td>150-160</td><td>60</td><td>80</td></tr><tr><td>RCP8.5</td><td>100</td><td>130-140</td><td>40</td><td>50</td></tr></table> <p>Whilst it would be possible to define the shape of a line plotting the reduction in AEPs over the period between 2020 and 2080-2100, there is insufficient information to accurately present the line for all dates. However, the following three points, in my opinion are most helpful.</p> <ol style="list-style-type: none"><li>1. It is plain that rainfall events of the nature that occurred at Matatā on 18 May 2005 will occur much more frequently.</li><li>2. During the forecast period 2031-2050, under RCP 8.5 scenario these storms could be expected to occur on a 100 to 140 year return period, under RCP 6.0 on a 110-160 year return period.</li><li>3. By the end of this century, under RCP 8.5 scenario these storms could be expected to occur on a 40 to 50 year return period, under RCP 6.0 on a 60 to 80 year return period.</li></ol>	Climate Change Scenario	Period 2031-2050		Period 2081-2100		Rainfall Duration		Rainfall Duration		1 hour	2 hours	1 hour	2 hours	Current Climate	200-500	200-500	200-500	200-500	RCP2.6	100-150	150-250	100-150	150-250	RCP4.5	110	140-150	80	100	RCP6.0	110-120	150-160	60	80	RCP8.5	100	130-140	40	50
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Shayne Donovan-Grammar	General	<p>Putting aside the effect of potential RMA-based constraints on continued/ expanded use of properties in the identified High Risk area, what discount would/is the market apply in recognition of the assessed hazard risk? On the same assumption, would/is the market distinguishing between different levels of risk (a) Within the identified High Risk area or (b) across the broader fanhead?</p>																																						

Witness	Paragraph	Question
		<p>For the valuations the brief was to provide the market value for the properties as if the event didn't occur. Therefore we have not analysed what level of discount there is for being in the High Risk area. Further, there has not been any bona-fide sales occur within the zone in the last few years to compare with sales outside the High Risk area.</p> <p>(a) For properties in the High Risk area there is certainly a stigma attached to the properties. The market for properties in this area is extremely limited with a number of associated professionals; lawyers, valuers etc strongly advising their clients not to purchase a property in this location.</p> <p>(b) For Matata properties that are not in the High Risk zone we have concluded that after 14 years since the event that the saleability / value is no longer noticeably discounted by the events that occurred in 2005. Partly why we have come to this conclusion, is in Tauranga landslips occurred at the same time as the Matata event affecting over 100 properties. Having completed a number of assessments in the affected suburbs of Tauranga there is no evidence of a discount.</p> <p>In his evidence John Reid said he shared his thoughts on "cultural matters" with TelferYoung (not you specifically) at the time of preparing his report. Can you clarify (and if not you then who in TelferYoung) the nature of Mr Reid's concerns on cultural matters and how they were dealt with in the TelferYoung report?</p> <p>Mr Reid, in his capacity as external peer reviewer, has expressed his concerns to me that some of the properties in the High Risk area are impacted by "cultural matters". Specifically properties north-west of Kaokaoroa Street (namely 16 through to 32 Clem Elliott Drive on the waterfront side of the road, 17 and 19 Clem Elliott Drive and both 102 and 104 Arawa Street).</p> <p>For affected iwi this section of Matata has historical importance due to this location being in the same general vicinity as a historic battle field and a urupa. I rang two affected iwi and both said to me informally that if any new buildings were built on the affected land they would strongly object to it.</p> <p>There has been past anguish over the approval of a subdivision block for which 17 and 19 Clem Elliott Drive and 102 and 104 Arawa Street originated from known as the Ngati Hinerangi subdivision.</p>

Witness	Paragraph	Question
		<p>Mr Reid informed me of the Kaokaoroa battle of 1864 and the May 2005 investigation report that was co-authored by Dr Rachel Darmody, Senior Archaeologist, Heritage New Zealand. This information states the affected land contains items of archaeological interest and human bones.</p> <p>Mr Reid has made me aware of the Blue Bay Development, Mahia, Hawkes Bay where land values were substantially affected and properties for many years being almost unsaleable due to the development being in a culturally sensitive location. In this example the first home built was destroyed by a suspected arson in 2008 and no further building occurred for over 10 years. Subsequently the liquidators conducted a mortgagee sale by tender and disposed of the remaining 35 sections at severely discounted values.</p> <p>Further, Ihumatao, Mangere, Auckland involving Fletcher Construction owned land was in sharp national focus during the time of the writing of the reports.</p> <p>Due to the “cultural issues” I have also concluded that there would be reduced demand for the affected properties, with the majority of potential buyers not willing to take on the potential risk or stress that these properties are likely to attract if new construction was planned.</p> <p>In summary, the weight to these factors were part of my value conclusions. The degree of discount is not as severe as it could be given I was adopting a liberal approach to these valuations given their purpose. My valuation adjustment for those vacant land properties most impacted by these cultural factors was in the region of 25% to 30% which I believe is fair and reasonable. Certainly some of the sales evidence would have supported a far higher discount</p>
Tim Davies	1.6 & 7.46	<p>The evidence of Blackwood indicates that as a result of predicted climate change the ARI of the 2005 event might reduce to within a range of 40 to 80 years. Does that affect your analysis and the delineation of the three hazard risk areas?</p> <p>The risk analysis is based on the assumed return periods and deposit extents of debris flows of a range of volumes; these return periods are based on the assumed current return period and volume of the 2005 event (about 200-500 years and about 300,000 m<sup>3</sup> respectively).</p>

Witness	Paragraph	Question
	General	<p>If this (current) return period reduces to 40-80 years this will have the effect of increasing the mapped risks by a factor of 4 to 5; so, for example, the <math>10^{-5}</math> risk contour becomes 4 or 5 x <math>10^{-5}</math>.</p> <p>While this may appear to be within the error band of the risk calculations, it is not a random variation but a definite increase in risk, and will result in a significantly altered risk distribution.</p> <p>Mr Farrell references your 2005 report as concluding that the risk of loss of life was/is <math>1 \times 10^{-2}</math> to <math>1 \times 10^{-3}</math>. Should we read your evidence as indicating a revision of that view, to a lower level of risk than your 2005 assessment?</p>
	7.41	<p>For parts of the fanhead, yes; noting that Mr Hind's work results in a risk profile that decreases across the fanhead but includes areas that have levels of risk of <math>10^{-2}</math> and <math>10^{-3}</math>. My 2005 assessment was a very crude preliminary estimate, taking no account of either the occurrence of debris flows of different sizes at different return periods, or the distribution of risk across the fan, or the probabilities of people being at risk for only part of the time. It is certainly much less rigorous and robust than the assessment carried out by Mr Hind and described in my evidence.</p> <p>You refer to the paucity of data on debris flows at any given location which would appear to include Matata. Numerical debris flows were computer generated to approximate the magnitude-frequency relationship. You early note in paragraph 7.37 that it is necessary to take a precautionary approach where lives are at risk. How do you apply a precautionary approach when the magnitude-frequency analysis is based on a number of assumptions?</p> <p>You need to estimate the range of possible values of risk corresponding to the potential error in the assumed return periods and other data, and apply the highest risk values that the values of return period and other data permit.</p> <p>What is potential for over estimating the likelihood of such an event occurring and then overlaying the limits of acceptable risk as per Figure 3 or those in Table 3 of Mr Hinds evidence?</p> <p>We do not know the real distribution of risk on the fan. Therefore there is the possibility that the precautionary approach will in fact overestimate the risk at any given point. However, the precautionary approach will not underestimate the risk, so where a precautionary approach is followed, there is certainty that the assumed risk is not an underestimate; therefore if fatalities do occur there is certainty that they did so under an acceptable degree of risk.</p>

Witness	Paragraph	Question
	7.48(a)	<p>Please explain the difference in approach and outcome of using your Figure 3 compared with that of Mr Hinds Table 3?</p> <p>Mr Hind's Table 3 corresponds to and agrees with the risk of a <b>single</b> death (<math>N = 1</math>, i.e. the left-hand axis) of my Figure 3. My Figure 3 extends this to show the acceptability of risk of multiple deaths. The increase in risk associated with multiple deaths is proportional to the number of deaths – e.g. the acceptable risk of 10 deaths (<math>10^{-6}</math>) is 1/10 of the acceptable risk of 1 death (<math>10^{-5}</math>) – so there is no difference in outcome between the two methods.</p> <p>Can you clarify why, applying the phrase “As Low as Reasonably Practicable” literally, if there are there are no reasonably practicable measures, ALARP is not the status quo.</p> <p>The status quo (i.e. life-risk shown in Figure 17 of Mr Hind's evidence, with risk of greater than <math>10^{-3}</math> in substantial areas) lies in the unacceptable region of Figure 3 of my evidence. It has been determined that the only “reasonably practicable” measure for reducing this risk is managed retreat, the effect of which will be to reduce life-risk on residential properties on the fan to zero. Thus 7.48(a) of my evidence is incorrect in stating “no measures are feasible to reliably reduce the original risk”. The statement should have read “no measures <b>other than retreat</b> are feasible to reliably reduce the original risk”.</p>
Wendy Saunders		<p>Thank you for the opportunity to clarify and correct details of my evidence. In collating my response, I have identified two errors in my evidence which I would like to rectify. I have grouped my responses to the questions posed by the panel into four sections:</p> <ol style="list-style-type: none"> <li>1. Clarification of area my evidence relates to;</li> <li>2. Clarification of likelihood used in my evidence;</li> <li>3. Table 1 risk assessment; and</li> <li>4. Summary of corrections to my evidence.</li> </ol> <p>1. Clarification of area my evidence relates to</p> <p><b>Does your evidence relate to the entire Debris Flow Policy Area or just to in the High Risk portion?</b></p>

Witness	Paragraph	Question
		<p>The original 2012 assessment used in the risk-based approach documentation pre-dates the 2018 mapped Awatarariki Debris Flow Risk Area (as shown in Figure 1 of the WDC Plan Change Summary document). The example we provided in 2013 was based on a basic hazard extent for the entire debris flow hazard area.</p> <p>The revised assessment in my evidence (i.e. the table in paragraph 6.9, with 34 privately owned land parcels) was based on the <u>high-risk</u> portion of the 2018 Debris Flow Policy Area.</p> <p><b>2. Clarification of likelihood used in my evidence</b></p> <p><b>What is the basis of your interpretation that an event with a 1% change[chance?] of occurrence in a given year is seen as being likely? Can you explain the logic of moving from the Blackwood and Bassett view that the wisest assessment is that the 2005 event was 12 to 18% greater than the 1% AEP to a conclusion that it is appropriate to use a return period of 1/100 years (i.e. a 1% AEP) or less?</b></p> <p>A 1% AEP has a 1 in 100 chance of occurring in any one year. With regard to paragraph 6.15 of my evidence, I mis-interpreted “12 to 18% greater than the 1% AEP” to mean it could occur more than every 100 years, i.e. 50-80 years, which would bring in into the ‘possible’ category of the risk-based planning likelihood table. I have since discussed this further with colleagues, and would like to correct my error with the revised interpretation of being within the 200-250 year return period. This would provide a likelihood (based on the 2013 risk-based likelihood table) of ‘unlikely’.</p> <p>I apologise for any confusion this has caused.</p> <p><b>The return periods you are proposing for the 2005 Matata event appear to be inconsistent with other expert evidence produced. Can you explain any implications of that?</b></p> <p>In paragraph 6.13 and 6.15 I refer to the likelihood assessed in 2012 of ‘unlikely’ (level 3) being elevated to ‘possible’ (level 4), based on the knowledge gained between 2012 and 2019. The likelihood descriptor used in the example from the table developed for the risk-based planning approach, which was informed by timeframes associated with the Building Act (i.e. 50 years building life up to 2,500 years for critical infrastructure with post-event roles); 100 years as referred to in the NZ Coastal Policy Statement; and the Ministry for the Environment’s Active Fault</p>

Witness	Paragraph	Question																								
		<p>Guidelines. The likelihood table developed for the risk-based planning approach (Saunders et al, 2013) is provided below.</p> <p>As detailed on page 34 of the Saunders et al (2013) report, the assumptions regarding the use of the likelihood table included that the likelihoods provided are accepted by key stakeholders.</p> <table><tr><th>Level</th><th>Descriptor</th><th>Description</th><th>Indicative frequency</th></tr><tr><td>5</td><td>Likely</td><td>The event has occurred several times in your lifetime</td><td>Up to once every 50 years</td></tr><tr><td>4</td><td>Possible</td><td>The event might occur once in your lifetime</td><td>Once every 51 – 100 years</td></tr><tr><td>3</td><td>Unlikely</td><td>The event does occur somewhere from time to time</td><td>Once every 101 - 1000 years</td></tr><tr><td>2</td><td>Rare</td><td>Possible but not expected to occur except in exceptional circumstances</td><td>Once every 1001 – 2,500 years</td></tr><tr><td>1</td><td>Very rare</td><td>Possible but not expected to occur except in exceptional circumstances</td><td>2,501 years plus</td></tr></table> <p>As outlined in the previous response, an interpretation error of the return period was made. The implication of this is that the result of the original 2012 assessment would remain; that is, a discretionary activity. As outlined in paragraph 6.7 of my evidence, not all six consent categories would be required within a policy framework; they were provided to show how the approach could be applied, and the assessment was desktop only i.e. it did not include any engagement with the community, which we stress would be required when applying the risk-based approach at a practical level.</p> <p>It was not my intention in 2013 or now to provide a ‘new’ return period for the 2005 event, but to use the best information available at the time (i.e. 2012) to show how the risk-based approach could work in practice.</p>	Level	Descriptor	Description	Indicative frequency	5	Likely	The event has occurred several times in your lifetime	Up to once every 50 years	4	Possible	The event might occur once in your lifetime	Once every 51 – 100 years	3	Unlikely	The event does occur somewhere from time to time	Once every 101 - 1000 years	2	Rare	Possible but not expected to occur except in exceptional circumstances	Once every 1001 – 2,500 years	1	Very rare	Possible but not expected to occur except in exceptional circumstances	2,501 years plus
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Witness	Paragraph	Question
		<p>In my opinion, the implications of this error and inconsistency are very minor – the intent of the assessment was to show how the risk-based approach could be applied; it was not a full assessment that would be required if the approach were to be adopted. For example, no engagement was undertaken as part of the assessment with anyone (e.g. council, key stakeholders, experts, iwi, community representatives, critical lifeline providers); nor was a policy framework developed to support and guide the assessment process – this would now be achieved via the BOPRPS.</p> <p><b>You advise us in 6.13 that the level of likelihood has gone from unlikely - 1:500 (level 3) to possible - 1:100 (level 4). This appears to be a different descriptor used by Mr Hind in his evidence under Qualitative Risk 6.87 where he states that “based on the estimated return period of the 2005 event of between 200 and 500 years, a similar event is considered “likely”. Would you explain the difference in terminology.</b></p> <p>Mr Hind’s evidence paragraph 6.65 presents a modified version of the AGS (2007) qualitative measures of likelihood. “Likely” is described as having a recurrence interval of between 100 years and 1,000 years, and that “The event will probably occur under adverse conditions over the design life”. This description refers to the ‘design life’ only of property; it does not incorporate other measures of risk.</p> <p>The likelihood table that was developed for the risk-based approach was for use beyond just property, it also includes social/cultural, economic, and health and safety risks. The likelihood levels were aimed at land use planning outcomes; the requirements of the Building Act allow for design life criteria. As such, with testing and expert elicitation, the likelihood table was developed to take into account more factors than AGS(2007) covers. Notwithstanding this, the AGS table and framework can be used for risk assessments as part of planning consents and policy making, such as in this case, and in Christchurch’s Port Hills. Another example of the AGS method used to inform risk assessments for planning is provided in the 2007 Landslide Guidelines for Consent and Policy Planners, published by GNS Science (Saunders &amp; Glassey, 2007).</p> <p><b>3. Table 1 risk assessment</b></p> <p><b>What impact on the PCs proposed does your Table 1 comparison have?</b></p> <p>Table 1 should have no impact on the proposed plan change, as the BOPRPS provides the risk assessment framework which should be followed.</p> <p><b>Would you have supported the Proposed Plan Changes based on your 2013 assessment?</b></p>

Witness	Paragraph	Question
		<p>In 2013 we did not have the information we now have on the return period for the rainfall, potential climate change impacts, mapped debris flow risk area, or a risk-based RPS framework. Notwithstanding this, I support any initiatives that reduce future risks to people and property.</p> <p><b>What are the key changes in in the Factors (first column) in your table that are the most significant in your support of the Proposed Plan Changes?</b></p> <p>It is not the factors in the table per se that are significant, but the level of consequence that could result. In this case, that greater or equal to 50% of the buildings remaining in the hazard zone would have their functionality compromised. Please note that there is an explanation of 14 assumptions that were made with the consequence table, outlined on pages 30-31 of the Saunders et al (2013) report. The consequence table outlined in that 2013 report was a framework only; the consequence table included in the BOPRPS is an adapted version, and should be the used as the risk assessment framework for these plan changes.</p> <p><b>Why does the Regional GDP increase by a factor of 4 with less likely number of occupants and less buildings and properties in the hazard zone.</b></p> <p>This is the absolute regional GDP number that was used in the original assessment. The economic consequence using this GDP number was calculated using (building value / RGDP)*100 as follows:</p> <p><math>(\\$28,500,000 / \\$4,318,000,000) \times 100 = 0.66\%</math> of regional GDP</p> <p>When recalculating the economic consequence in 2019 for this exercise, the GDP used was ~\$13 billion, as provided by StatsNZ.</p> <p>Paragraph 6.12 calculates the economic consequence based on a building value of \$4 million and 2019 regional GDP (sourced from StatsNZ) as follows:</p> <p><math>(\\$4,000,000 / \\$13,071,000,000) \times 100 = 0.03522\%</math> of regional GDP</p>

Witness	Paragraph	Question
		<p>In reviewing my submitted evidence, the building value should have been calculated using \$8.1 million, rather than \$4 million. This changes the economic consequence as follows:</p> <p><math>(\\$8,100,000 / 13,071,000,000) \times 100 = 0.06\%</math> of regional GDP, which equates to 'minor' in the consequence table</p> <p>Both GDP figures were sourced from StatsNZ – the link is provided in my evidence (footnote 10). In 13 years the regional GDP has increased by ~\$8.753 billion.</p> <p>The implication of this error is considered minor, as the BOPRPS does not include an economic column in its consequence table (page 377 of the RPS), so this calculation is not relevant for the proposed plan changes.</p> <p><b>4. Summary of corrections to my evidence</b></p> <p>6.11 [Red start denotes change in consequence table assessment].</p>

Witness	Paragraph	Question																																														
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		<p>6.12 The economic consequence is calculated using (building value / RGDP) * 100, i.e. (\$8.14 million / \$13,071 billion) * 100 = 0.06% of regional GDP.</p> <p>6.13 The likelihood has changed from 2012 to 2019, from 1:500 to 1:200-250. This changes in likelihood does not change the overall likelihood assessment i.e. it remains at 'unlikely'. the level of likelihood from 'unlikely' (level 3) to 'possible' (level 4). This likelihood, combined with the catastrophic consequences for the Matatā community (being 50% or more homes have functionality compromised within the hazard zone),</p>																																														

Witness	Paragraph	Question
		<p>equates to the <u>same level of risk outcome in 2012. following level of risk (note the purple star is the 2012 assessment outcome; white star is the 2019 assessment outcome in the below table):</u></p> <p>6.14 This shows the 2019 assessment, taking into account the increased likelihood, would result in activities within the hazard zone, as being <u>discretionary. non-complying or prohibited.</u></p> <p>6.15 <u>Reassessing the likelihood of event (Step 3 of the risk-based approach) does change the outcome of the initial 2013 assessment of a 'tolerable' level of risk, and associated 'discretionary' activity status.</u> Based on the Blackwood &amp; Bassett (2019) assessment that "It is wisest to regard [rainfall] as around 12 to 18 percent greater than the 1% AEP rainfall intensities" (p2), this suggests that at least a <del>100</del> <u>200-250</u> year return period should be used, which <u>does not change the likelihood according to the 2013 risk-based approach, i.e. it remains at Level 3 – unlikely.</u> <del>changes the likelihood to 'Level 4', taking into account the return period may be 100 years or less. If the return period of 200 years were to be used, the original result would remain.</del></p> <p>6.16 Taking into account the <u>revised likelihood level will remain at 'unlikely', and the Level 4 likelihood (at least 100 years), and a change in consequences based on 16 houses, the revised risk-based assessment remains at 'tolerable', be 'intolerable',</u> having a <u>discretionary non-complying/prohibited</u> consent activity status.</p> <p>6.17 As per Blackwood and Bassett (2019, p5), "By the end of this century, under RCP 8.5 scenario these storms could be expected to occur on a 40 to 50 year return period, under RCP 6.0 on a 60 to 80 year return period". <u>Using the Saunders et al (2013) risk-based approach, the RCP 8.5 scenario would change the likelihood level to 5 (up to once every 50 years), resulting in the assessment same result outlined in point 6.15 above: the risk would be being 'intolerable', and have a non-complying/prohibited consent activity status. Similarly, the RCP 6.0 scenario would change the likelihood to Level 4 (possible), resulting in the assessment being 'intolerable', with a non-complying/prohibited consent activity status.</u></p>

**rationale** >

**IMPROVING INFRASTRUCTURE OUTCOMES**

19 October 2017

Jeff Farrell  
Whakatāne District Council  
Commerce Street  
Private Bag 1002  
Whakatāne 3158

Dear Jeff

Re: Awatarariki Fanhead IBC

Following our phone call and in response to your email of 4 September, I am happy to confirm the following in writing:

Edward Guy's and my participation in the review process of the business case covered an initial review of a draft received on 15<sup>th</sup> March 2017 and a revised draft received on 3 April 2017.

Edward and I were relatively early adopters of the Better Business Case framework. We both completed the Foundation, Practitioner 1 & 2, and Reviewers Course with The Treasury in 2013. Since then we have completed numerous business cases ranging from town centre rejuvenation projects through to new road and water infrastructure projects, including the Tauranga Civic Space Options programme business case and the Queenstown Eastern Access Road detailed business case.

The approach taken for the review was that of 'putting on the hat of a potential investor' and asking whether the case presented was sufficient to give us the confidence to invest. I am satisfied that our comments have been appropriately included in the final draft you provided on 4 September 2017.

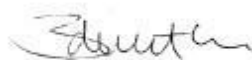
In terms of the quality of the IBC, it is regarded as a thorough and comprehensive investigation of the issues and alternatives.

This IBC presents a compelling case for investment and a clear pathway to move forward with.

Yours sincerely



Tom Lucas  
Director / Principal Infrastructure Advisor  
Rationale Limited



Edward Guy  
Managing Director / Principal Infrastructure Advisor  
Rationale Limited