Earthquake Commission

20 February 2018

Insurance Liability Valuation as at 31 December 2017

Final Report

MELVILLE JESSUP WEAVER

Willis Towers Watson Alliance Partner

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1 Executive Summary

1.1 Valuation results

1.1.1 Canterbury earthquake claims

The gross estimated ultimate claims costs from the Canterbury earthquake events are $10,772 million. This is an increase of $39 million since 30 June 2017.

Canterbury earthquakes only
Ultimate claims costs, central estimate, undiscounted, including CHE - 31 December 2017 valuation

	EQ1 $m	EQ2 $m	EQ3 $m	EQ4 $m	AS $m	Total $m
Claims paid to date (excl. CHE)*	2,484	5,419	440	120	195	8,657
Estimated future (excl. CHE)	186	304	31	5	9	535
Gross estimated ultimate incurred claims	2,670	5,723	471	125	204	9,193
Claims handling expenses (CHE)						
Paid to date	476	820	116	39	50	1,502
Estimated future	19	40	15	2	1	78
Total	495	860	131	41	52	1,580
Gross ultimate incurred claims including CHE	3,165	6,584	602	166	256	10,772
Reinsurance recoveries	(1,632)	(2,478)	(0)	(0)	(0)	(4,109)
Net ultimate incurred claims including CHE	1,533	4,106	602	166	256	6,663
30 June 2017 comparatives						
Gross ult incurred claims including CHE	3,134	6,591	591	164	253	10,733

*Includes Fletcher PMO direct costs of repair (excludes margin and infrastructure costs - included in CHE)

For a description of the EQ1 – EQ4 and AS events, please refer to Section 2.9.1.

The majority of Canterbury earthquake claims have been resolved. There is however, considerable uncertainty in regard to those which are yet to be resolved or are in dispute.

1.1.2 Kaikoura earthquake claims

The gross estimated ultimate claims costs from the Kaikoura earthquake event are $610 million. This has increased from our previous estimate ($544 million) primarily as a result of the change to the estimated ultimate CHE and to a lesser extent to the building claims.

For the purposes of this valuation, the Kaikoura earthquake event does not include the storm damage that occurred on 15 November 2016. The 15 November 2016 storm is included in the BAU provision.

Kaikoura earthquakes only
Estimated ultimate claims costs (undiscounted) - 31 Dec 2017

	31 Dec 2017 $m	30 Jun 2017
Claims costs paid to date		
Land	9	3
Building	296	84
Contents	8	0
CHE	61	24
Total	374	112
Estimated future		
Land	15	7
Building	167	359
Contents	15	23
CHE	40	43
Total	236	432
Gross ultimate incurred claims cost - central estimate		
Land	24	11
Building	463	443
Contents	22	23
CHE	101	67
Total	610	544

1.1.3 All EQC claims

The table below shows the gross ultimate claims costs (Canterbury earthquakes and Kaikoura earthquake) and how the net outstanding claims liabilities (all EQC claims) are derived.

All EQC claims
Gross ultimate claims costs to net outstanding claims liabilities - 31 December 2017 valuation

	EQ1 $m	EQ2 $m	EQ3 $m	EQ4 $m	AS $m	BAU $m	KEQ $m	Total $m
Gross ultimate claims excl CHE, undisc - central est	2,670	5,723	471	125	204		509	9,702
Claims handling expenses (CHE)	495	860	131	41	52		101	1,681
Gross ult claims incl CHE, undisc - central est	3,165	6,584	602	166	256	n.a.	610	11,382
Reinsurance recoveries, undiscounted - central estimate	(1,632)	(2,478)	(0)	(0)	0	-	0	(4,109)
Net ult inc claims incl CHE, undisc - central est	1,533	4,106	602	166	256	n.a.	610	7,273
Net claims costs paid to date	(1,053)	(2,942)	(440)	(120)	(195)		(313)	(5,062)
CHE paid to date	(476)	(820)	(116)	(39)	(50)		(61)	(1,563)
Discounting	(0)	(5)	(1)	(0)	(0)	(1)	(1)	(7)
Net OS including CHE, disc - central est	4	339	45	7	10	40	235	680
Net risk margin, diversified, 85% PoA	3	215	28	4	7	11	94	362
Net OS including CHE, disc - 85% PoA	7	554	73	11	17	51	329	1,042

The table above shows the Kaikoura event ('KEQ') with a gross ultimate claims costs of $610 million. Payments to date are $374 million (including $313 million claims costs).

The diversified risk margin (85% PoA) is $362 million. This has decreased since the previous valuation, due to the further LINZ payment and Kaikoura claims being settled. Refer Section 8.2.2 for details.

1.2 Current insurance activities

1.2.1 Canterbury earthquake building claims

EQC has been managing its pool of reopened claims. These are generally likely to be more complicated than average and therefore take longer than average to settle.

1.2.2 Canterbury earthquake land claims

EQC is continuing to settle its land claims. EQC has made a final settlement payment to LINZ for Red Zone properties for all forms of land damage except for those properties with known severe lateral spreading vulnerability ('SLS').

In CMS there are around 9,200 properties with open land exposures. Around 6,300 of these relate to LINZ properties captured within the T+T model. A further 1,500 relate to non-LINZ properties in the T+T model. The rest relate to properties not captured within the T+T model (which includes LINZ and non-LINZ properties, located in the Port Hills and elsewhere).

We understand that the non-LINZ open claims have largely been settled (with the exception of those related to land litigation), but the land exposure may remain open in CMS for a number of reasons. Further detail is included in Section 5.3.

The land litigation cases from insurers are ongoing. It is expected that they will begin to be heard in the first quarter of 2019.

1.2.3 Memorandum of Understanding with Southern Response

A Memorandum of Understanding has been signed with Southern Response ('SRES'). EQC and Southern Response have agreed to share resources in an effort to more quickly settle customers' residential building claims arising out of the Canterbury Earthquake Sequence in applicable cases.

The two organisations apply agreed processes to assess which of them is best placed to manage open EQC residential building claims made by SRES Customers. SRES may accordingly manage some EQC claims on EQC's behalf.

SRES would act as EQC's agent in these applicable cases, completing the assessment and settling the EQC claim in accordance with the EQC Act, along with any entitlements the customer may have under their insurance policy.

1.2.4 Kaikoura earthquake event

As at 31 December 2017, EQC had assessed 99% of its building claims with 97% having been settled. In respect of insurer managed building claims, 95% have been assessed and 74% have been settled.

As at 31 December 2017, total payments made by EQC sum to $374 million, which includes claims costs and CHE costs incurred by EQC and by the insurers.

1.2.5 Other claims

There have been several natural disaster events over the past year, other than the Kaikoura earthquake. These have primarily related to weather events. Section 7 details the breakdown of the notable events.

1.3 Canterbury earthquakes

1.3.1 Developments since prior valuation

Since the previous valuation, there have been developments in respect of Red Zone land settlements, land litigation, and reopened building provisions.

Below is a brief note on these developments and what has been implemented as a consequence.

Land: payments and legal challenge

EQC had intended to complete settlement of all Green Zone properties by 30 June 2017 although there is still a residual number to complete. Most of these are subject to claims in the land litigation.

For Red Zone properties, a final settlement payment was made to LINZ in December 2017 which covered all land damage for all properties except for those properties with severe lateral spreading vulnerability. This is expected to be fully settled early in 2018.

In respect of estimating a provision, we have retained our approach from the previous valuation and have explicit provisions for;

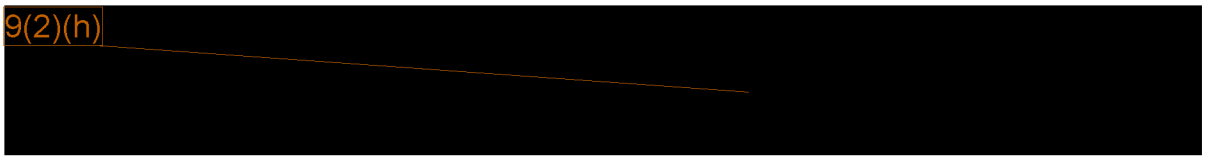
- land costs assuming the remaining properties are settled according to EQC policy, and
- litigation risk.

These developments have resulted in a reduction of the estimated ultimate land claims costs of $19 million since June 2017. Section 1.3.4 has more detail on this.

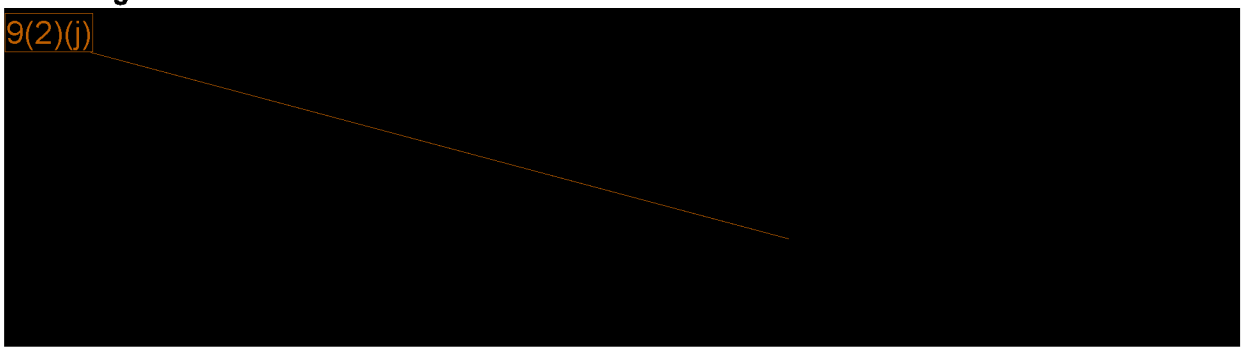
Legal challenge - individual

Individual legal challenges form a relatively small sum within the overall EQC provision although there are a large number of cases to be heard. The number of cases reported to us by EQC has continued to grow, to the extent that we have had to revise our estimate of total litigation cases.

We would highlight the difficulties in estimating the number of legal cases which may arise in the future, especially due to the nature of some of the issues. We are liaising with EQC Legal to attempt to better understand the reasons for the newly reported cases and the potential for this trend to continue.



Building financial close - insurers



Building reopened claims

The valuation as at 30 June 2017 included reopened provisions for a variety of outstanding claims issues. These reopened provisions fall into one of the following categories.

- Remedial work carried out as a result of the EQR programme. This can be further broken down into:
  - CEDAR. Properties that require remediation as a result of the CEDAR review.
  - General remediation. Other properties.
- Drainage claims.
- Reopened Opt-out /Cash settled claims. Challenges on previously cash settled amounts as to their adequacy.
- Individual legal challenges – mentioned above
- Financial close – insurers – mentioned above.
- Unreported remedial and secondary repair issues. In addition to the identified issues above, it is expected there will be further reported remedial and secondary repair work to undertake.

We have updated these provisions as experience has emerged. The table below summarises the provisions held in respect of the various categories as at 30 June 2017 and those held for this valuation.

	31 December 17 $m	30 June 17 $m
CEDAR	9(2)(j)	
Remedials		
Drainage		
Complaints / Disputes		
Individual litigation		
Financial close - insurer		
Unreported		
Total	322	447

Further detail on these provisions is provided in Section 1.3.3.

Canterbury CHE

Based on a greater understanding of the complexity and the forecast time required to complete all outstanding claims and finalise all completion activities, it has been recognised that there will be further pressure on claims handling expenses and as a result, there has been an increase in the estimated ultimate CHE of $51 million.

1.3.2 Key areas of judgement

In undertaking the valuation there are some areas of judgement required that materially affect the results. These are briefly discussed below.

Canterbury building claims

In respect of building claims, a key area of judgement in the provision is understanding how claims are being reopened, the expected quantum per claim and how systemic this might be.

9(2)(j)

Canterbury land claims

9(2)(h)

1.3.3 *Canterbury building claims – key assumptions*

Remedial – CEDAR

Remedial – CEDAR refers to properties with issues relating to the sub floor area. As at the valuation date, there are 342 properties in this group. They have been triaged by EQC staff into the following groups:

- Complex red (11 properties). Estimated to cost 9(2)(j)
- Moderate red (78). Estimated to cost 9(2)(j)
- Simple red (124). Estimated to cost 9(2)(j)
- Green (5). Estimated to cost 9(2)(j)

	31 December 2017			30 June 2017		
	Number	Avg Cost ($000s)	Total cost ($000s)	Number	Avg Cost ($000s)	Total cost ($000s)
Complex red	11	9(2)(j)	9(2)(j)	64	9(2)(j)	9(2)(j)
Moderate red	78			443		
Simple red	124			463		
Amber/green	5			47		
Total	218			1,017		73,630

We have been given a data set showing the costs incurred for CEDAR properties over the past year and this suggests that our previous cost assumptions were too high. We have updated our cost assumptions to reflect this analysis and these are shown below, with the calculations from the previous valuation for comparison.

9(2)(j)

Remedial - general

In addition to the above there are a number of non-CEDAR related properties requiring remediation work. There are some 1,182 general remedial claims outstanding. We have been informed that there are still a sizable number of new properties requesting a review each month for a variety of reasons. The EQC operational team have recently begun triaging these new properties to better understand the reasons for the flow. This should help inform the future costs and the unreported provision.

Recent experience indicates an average repair cost of 9(2)(j) This is the same as our previous assumption of 9(2)(j) and this has been left unchanged.

Therefore, the total provision for this category is 9(2)(j) This compares with the previous provision of 9(2)(j).

Drainage claims

There are around 206 remaining drainage claims. EQC's position is to continue to accept drainage claims, albeit with the burden of proof shifting onto the claimant. The flow of new claims has since dropped off, and we have made no additional future provision for future inflow claims.

The costs to date over the period since 30 June have averaged 9(2)(j) (including inspection and reinstatement fees both of 9(2)(j) Consequently, we have allowed a total provision of 9(2)(j).

Reopened Opt-out /Cash settled claims

As at 31 December 2017 there were around 1,278 complaints / cash settlement challenges. These are predominantly 'opt out' and cash settled claims.

An analysis of the non-EQR building payments made since 30 June 2017 shows an average payment of 9(2)(j)

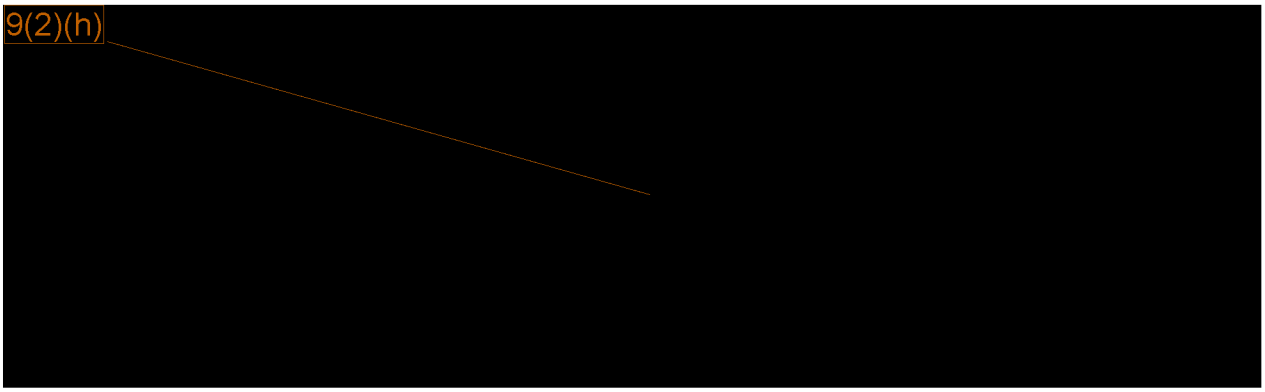
We have therefore decreased our provision to allow an average settlement cost of 9(2)(j) with the total provision being 9(2)(j)

Individual legal challenges

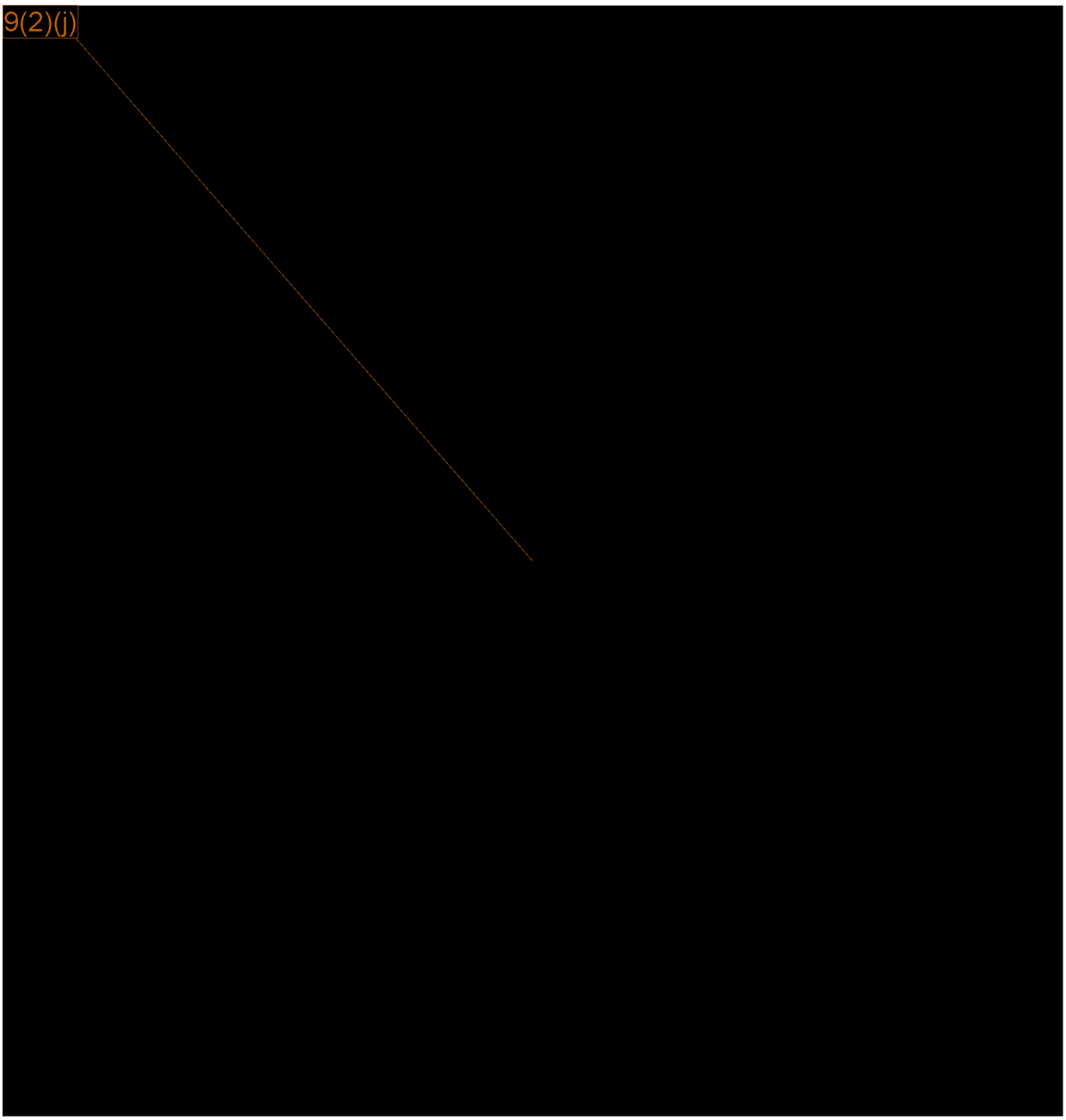
In respect of the number of legal challenges, as at 31 December 2016, we had assumed a total of 680 ultimate cases. There are 480 reported to us by EQC to date of which 280 were resolved and 200 cases open. We assumed a further 200 cases would be lodged.

Since then, the total number of cases reported to us by EQC has increased to 622 as at 31 December 2017. Based on this increase, and the recent of new cases (40-50 per quarter) we have increased the estimated ultimate number of cases and will monitor ahead of the financial year end. We have corresponded with EQC Legal on this assumption to ensure it was not unreasonable.

9(2)(h)



Financial close – insurers



9(2)(j)

Unreported remedial and secondary repair issues

The unreported remedial and secondary repair issues provision was set in December 2016. It has been reduced in line with the assumptions determined at that time.

The provision as at this valuation is $67 million and is expected to be completely released at the end of 2018.

Summary of Canterbury building claim provisions

	31 December 2017			30 June 2017		
	Number	Avg Cost ($000s)	Total cost ($000s)	Number	Avg Cost ($000s)	Total cost ($000s)
CEDAR	218	9(2)(j)		1,017	9(2)(j)	
Remedials	1,182			2,793		
Drainage	206			759		
Opt-out/Cash disputes	1,278			743		
Individual litigation*	9(2)(h)					
Financial close - insurer						
Unreported	n.a.	n.a.	9(2)(j)	n.a.	n.a.	9(2)(j)
Total	3,395	95	322,422	5,690	79	446,940

9(2)(h)

1.3.4 *Canterbury land claims – key assumptions*

The estimated ultimate land claims costs as at 31 December 2017 are $696 million. This is a reduction of $19 million from the previous valuation ($715 million). The reduction can be broken down into the following components:

- 9(2)(j) Red Zone
- Green Zone
- Port Hills (Red and Green)
- Litigation risk

Land payments to date are $488 million, which means the outstanding land provision is $208 million. This can be broken down into:

- 9(2)(j) Open Green Zone and Port Hills properties.
- Red Zone properties with known severe lateral spreading vulnerability.
- Litigation related to ILV DoV settlements.

Red Zone

Following the LINZ payment in December 2017, the only remaining Red Zone issue is in respect of properties with known severe lateral spreading vulnerability.

There is no policy yet on how EQC will settle properties that have known severe lateral spreading vulnerability. The ILV modelling used for this valuation weights two possible outcomes, depending on whether LINZ was going to carry out perimeter wide remediation prior to the February 2011 earthquake.

Green Zone

The remaining Green Zone properties were modelled as receiving repair cost (if cleared site) or DoV (if in-situ).

Litigation risk

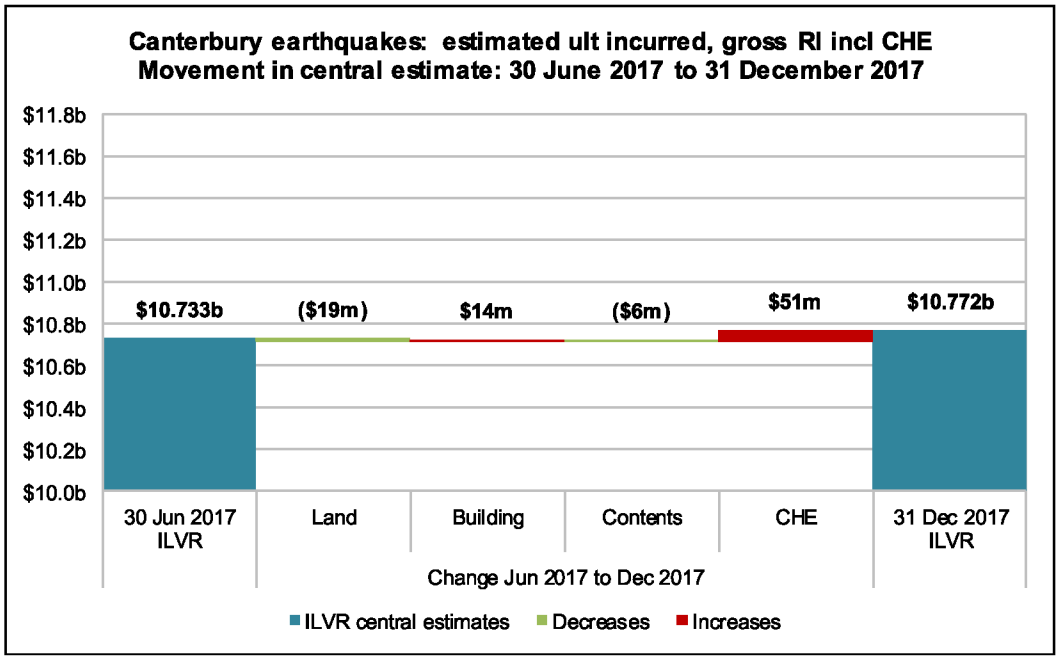
9(2)(h)

1.3.5 *Canterbury CHE – key assumptions*

Based on a greater understanding of the complexity and the forecast time required to complete all outstanding claims and finalise all completion activities, it has been recognised that there will be further pressure on claims handling expenses and as a result, there has been an increase in the estimated ultimate CHE of $51 million.

1.3.6 *Estimated ultimate claims costs – movement since 30 June 2017 - Canterbury only*

The estimated ultimate gross claims cost for Canterbury earthquake events has moved from $10.733b as at 30 June 2017 to $10.772b as at 31 December 2017. Shown below is a graphical representation of the change in estimated ultimate incurred liabilities.



1.4 Kaikoura earthquake

Development

The 2016 Kaikoura earthquake was a magnitude 7.8 earthquake in the South Island of New Zealand that occurred two minutes after midnight on 14 November 2016.

Memorandum of Understanding

A Memorandum of Understanding (MoU) was signed between EQC and eight insurers to allow insurers to directly settle their customers' EQC claims on behalf of EQC. In summary, almost all building and contents claims are managed by the relevant insurer on behalf of EQC, who then invoices EQC for their share of claims costs and claims handling expenses.

Building and contents claims that are managed by EQC include:

- Claims relating to properties where there is still an open or otherwise unresolved prior EQC claim.
- Claims where the insurer is not party to the MoU.

EQC also manages all land claims.

Information developments

In respect of claims costs, over $285 million has been invoiced or alerted by insurers. Assessments are 95% complete and settlement progress is close to 75% complete.

In comparison, EQC has assessed 99% of the claims it manages and has paid out $27 million, equating to 97% settled.

The expected ultimate CHE costs are considerably higher than initially assumed and are currently at $101 million. More details are provided in Section 1.4.2.

1.4.1 Kaikoura claims costs - judgement

In respect of Kaikoura earthquake claims, it has been observed that the average costs incurred at the higher shaking zones are lower than we had originally estimated. Conversely, the average costs at the lower shaking zones are higher than we had estimated. We have reflected this experience in our model for this valuation.

We have also increased the average cost assumptions by 5% to allow for additional remedial and litigation costs. It may be challenging to measure whether this is sufficient without more detailed data from the insurers.

1.4.2 Kaikoura claims – key assumption

As at 31 December 2016 an exposure-based model was constructed to estimate the total claims costs arising from the Kaikoura earthquake event. We divided the damage zones according to the nature of the land movement and/or damage in the different areas affected. The zones are:

- The Land Damage Likely ('LDL') zones:
  - Fault rupture: LDL-F
  - Slope instability: LDL-S
  - Both fault rupture and slope instability: LDL-FS
  - Liquefaction: LDL-L
- The Land Damage Unlikely ('LDU') zones:
  - High shaking: LDU-H
  - Moderate shaking: LDU-M
  - Low shaking: LDU-L
- Apartments in the Wellington region: WGN-A

Number of claims

At 30 June 2017 we estimated that there would ultimately be around 53,000 unique dwelling exposures lodged with 40,000 of these being in respect of building damage. As at 31 December 2017 there have been around 47,000 exposures opened to date with around 35,400 of these being in respect of building damage. The table below illustrates how these figures vary by zone.

Kaikoura: actual vs expected
Number of dwelling claim exposures*

	Assumed ultimate as at 30 June 2017			Reported to 31 December 2017			Assumed ultimate as at 31 December 2017		
	Land	Building	Contents	Land	Building	Contents	Land	Building	Contents
LDL-FS	90	95	32	43	81	80	50	90	90
LDL-F	11	12	3	8	13	12	10	13	13
LDL-S	702	747	231	184	696	493	200	750	550
LDL-L	1,064	1,179	585	185	886	475	200	850	525
LDU-H	707	2,294	712	355	2,341	1,505	375	2,300	1,600
LDU-M	583	3,781	1,016	282	3,906	1,361	425	4,000	1,500
LDU-L	0	27,761	4,091	2,303	27,026	3,688	2,500	27,500	4,000
WGN-A	886	4,221	2,181	4	447	703	500	4,000	2,000
Total	4,043	40,090	8,850	3,364	35,396	8,317	4,260	39,503	10,278

*Each individual dwelling associated with each land, building or contents exposure is counted as a single unit

In respect of the *Land Damage Likely* (LDL) zones we are generally seeing fewer land and building claim exposures being opened than previously assumed. We have therefore revised our estimated ultimate costs downward. We are seeing higher numbers of contents claims than expected for these zones, although the amounts are small.

In respect of the *Land Damage Unlikely* (LDU) zones we have revised our estimates up slightly for the high and medium damage zones and down slightly for the low damage zone in respect of building damage. We have seen a number of land exposures opened in the LDU-L zone where we previously expected materially none. Although the quantum of these is expected to be low. Discussions with T+T suggest that these are likely to be structure damage (e.g. retaining walls) rather than geotechnical land damage (e.g. liquefaction).

For Wellington apartments we have still seen very few dwelling exposures opened in CMS, although we understand that in many cases there will be multiple dwellings associated with a single claim. Discussions with EQC staff suggest that our previous estimates for Wellington apartments still appear reasonable and we have not made significant changes to the assumed number of dwellings.

Average claims costs

Progress has been made on Kaikoura settlements with the total paid to date of $313 million, excluding CHE costs. Of this, $27 million were payments for claims which are EQC managed and the rest are in respect of payments made by insurers under the MOU.

Building claims

The key building assumptions from the Kaikoura model run as at 31 December 2017 are shown below. These have been adjusted for experience since 30 June 2017.

Components of Kaikoura building claim costs

	Number of dwellings exposed	Number of dwellings expected to claim	Expected number of non-nil dwelling claims	Mean expected cost to EQC	Mean cost per dwelling claim
Land damage likely					
fault rupture and slope instability	140	90	86	$6.9m	$81k
fault rupture	13	13	12	$0.9m	$76k
slope instability	1,006	750	712	$43.5m	$61k
liquefaction	2,800	851	808	$33.2m	$41k
Land damage unlikely					
high shaking	3,179	2,305	2,074	$85.4m	$41k
moderate shaking	18,086	4,015	3,011	$62.9m	$21k
low shaking	n.a.	27,546	16,528	$171.5m	$10k
Wellington apartments	8,144	4,001	2,800	$58.2m	$21k
Total	**33,368**	**39,571**	**26,033**	**$462.6m**	**$18k**

The large difference in reported claims in the *Land Damage Likely* zones has resulted in a reduction in estimated building claims for these areas. The estimated claims for the *Land Damage Unlikely – high and moderate shaking* zones have also decreased for similar reasons. Conversely, there have been a higher number of claims reported in the *Land Damage Unlikely – low shaking* zone than previously expected.

We have also updated the average cost assumptions in light of the increasing claims experience now available and to allow for potential cost escalation as discussed in Section 6.2.2. The net result of these changes is an increase in estimated building claims from $443 million to $463 million.

Land claims

The land assumptions as at 31 December 2017 are shown below. Overall, the impact of the changes in assumptions is an increase from $11 million to $23 million. Similarly to building claims, the increase is largely driven by higher numbers of claims than expected in the low shaking zones.

Components of Kaikoura land claim costs

	Number of dwellings exposed	Expected number of land claim notifications	Expected number of non-nil land claims	Mean expected cost to EQC	Mean cost per claim
Land damage likely					
fault rupture and slope instability	140	50	45	$0.9m	$20k
fault rupture	13	5	5	$0.1m	$20k
slope instability	1,006	200	180	$3.6m	$20k
liquefaction	2,800	200	180	$3.6m	$20k
Land damage unlikely					
high shaking	3,179	376	338	$3.4m	$10k
moderate shaking	18,086	426	171	$1.7m	$10k
low shaking	n.a.	2,504	1,002	$10.0m	$10k
Wellington apartments	8,144	496	74	$0.2m	$2k
Total	**33,368**	**4,258**	**1,995**	**$23.5m**	**$12k**

Claims handling expenses

During 2017 a budgeting exercise was carried out by EQC which indicated that the likely ultimate CHE costs for Kaikoura would be $67 million.

In respect of the MoU, this included costs relating to claims management and also to professional fees incurred by the insurers.

Since that exercise, EQC has been in discussions with insurers as to the adequacy of these claims management allowances. Following these discussions, it has been established that for some insurers the allowances were not adequate. A revision to these rates has increased the estimated ultimate CHE by $12 million.

In addition to this, it has been established that the allowance for professional fees has not been adequate and this has led to an increase in the estimated ultimate CHE by $22 million.

In aggregate, these changes have increased the estimated overall CHE for Kaikoura to $101 million.

Cost escalation and litigation

The estimated ultimate claims costs for Kaikoura are based on historical events and experience to date. It is recognised however, that the cash settlements that have been paid may be insufficient in some cases – for example, mis-scoping. Alternatively, it is possible that some cases could result in in litigation. [redacted] 9(2)(h)

1.5 Implications of above

In respect of Canterbury earthquake claims only, the implications of the above are that the estimated ultimate claims costs have been reduced. The estimated ultimate CHE costs have been strengthened.

In respect of the Kaikoura earthquake claims, the estimated ultimate building costs have been strengthened slightly along with the estimated ultimate CHE costs.

1.6 Limitations

In this report, we provide the results of our investigations together with an outline of the matters considered and the methods and assumptions applied to obtain these results. Opinions and estimates contained in this report constitute our judgement as at the date of the report.

There is considerable uncertainty regarding the estimate for the Kaikoura earthquake. Care should be taken in relying on this estimate at this stage. Refer to Section 9.3.3 for more detail.

This report must be read in its entirety. Individual sections of the report, including the Executive Summary, could be misleading if considered in isolation from each other.

1.7 Key Challenges

There are a number of key challenges facing EQC in respect of settling and reporting its Canterbury and Kaikoura earthquake claims. These are discussed briefly below.

1.7.1 *Land litigation*

9(2)(h)

1.7.2 *Insurer close*

9(2)(h)

1.7.3 *Data*

EQC has amassed a considerable body of data in settling Canterbury and Kaikoura earthquake claims. This has not always been recorded in a single format which has allowed robust analysis. This has impacted negatively on the organisation's ability to report, measure, track and communicate effectively.

In respect of this valuation, many sources of data are used to produce the expected ultimate claims costs and while we are comfortable that the overall figures produced are adequate, there are limitations on our ability to analyse and justify some of the components.

This has not been a material issue so far, as the overall provision has been large relative to the various components. However, it is an increasing risk.

1.7.4 *Kaikoura claims management*

The Kaikoura earthquake event has unique characteristics with challenges.

It is being almost wholly managed by third parties who will handle claims according to their own procedures and policies, within the terms of the MoU. EQC has less visibility over the status of the claims and the nature of the settlements than would be the case for internally managed claims.

In addition, the claims are typically being settled by way of cash payment. It will be up to the claimant to manage their repair. Some of the claimants live in smaller communities with limited resources available to remediate damage. With limited alternative accommodation and limited labour resource, it may take some time for the repairs to be carried out. There is therefore the risk of economic inflationary impacts resulting in the original cash settlement being ultimately insufficient.

9(2)(j)

1.8 Key recommendations

1.8.1 *Progress against previous recommendations*

Several recommendations were set out in the previous ILVR. The progress against these recommendations is as follows:

- In respect of settling the remaining land claims
  - Record the properties that have been sold. *Ongoing*
  - Improve the quality of the link between properties in the land model and properties in the ADE. *Stage 1 complete*

- Collect timely and accurate information in respect of the Kaikoura earthquake claims managed under the MoU. *Ongoing*

1.8.2 *Current Recommendations*

The key recommendations, from an actuarial estimate perspective, arising from this investigation is:

- In respect of settling the remaining Canterbury earthquake claims
  - Improve the quality of the link between properties in the land model and properties in the ADE.
  - Continue engaging with insurers in respect of Insurer Close.
- Collect timely and accurate information in respect of the Kaikoura earthquake claims managed under the MoU.
- In respect of Data. Undertake a review of the data capture process to ensure that as much data as possible may be effectively utilised.
- In respect of Kaikoura management. Continue communicating with insurers to be able to manage risks as they emerge.

1.9 Authors

Craig Lough

Fellow of the NZ Society of Actuaries

Jeremy Holmes

Fellow of the NZ Society of Actuaries

2 Report description

2.1 Addressee

This report is addressed to Sid Miller, Chief Executive of the Earthquake Commission ('EQC').

2.2 Report commissioned by

This report was commissioned by Hugh Cowan, EQC's GM Reinsurance, Research and Education.

2.3 Purpose

This report was commissioned to provide information with regards to:

- EQC's insurance liabilities and reinsurance recoveries for use in the financial statements as at 31 December 2017.
- The development of EQC's Canterbury earthquakes claims costs since 30 June 2017.
- An estimate of the claims costs arising from the Kaikoura earthquake.

2.4 Scope

2.4.1 Insurance liabilities components

The insurance liabilities include:

- Outstanding (OS) claims liabilities – which relate to the future direct and indirect claims costs and reinsurance recoveries for claims incurred up to 31 December 2017.
- Premium liabilities – which relate to the future net claims costs and administration and reinsurance expenses for future claims arising from unexpired risks as at 31 December 2017.

The liabilities calculated include a risk margin and are discounted for the time value of money.

Premium liabilities are not included directly on the balance sheet but are used for the Liability Adequacy Test of the unearned premium liability provision.

A more detailed description of the nature and components of the insurance liabilities is set out in Section 8.

2.5 Effective valuation date

The effective date of the valuation is 31 December 2017.

2.6 This report

Although this report includes considerable detail on all aspects of the actuarial investigations, in order to keep it to a manageable size a lot of the information has been summarised. Further details regarding the data, methods, assumptions, calculations and results underlying this report are available from the authors on request.

Unless otherwise indicated, all amounts in this report are stated in New Zealand dollars and are net of GST (i.e. they exclude GST).

2.7 Previous valuations

Melville Jessup Weaver ('MJW') has prepared valuations for EQC at six monthly intervals since 2010, when the Canterbury Earthquake Sequence began.

The most recent valuation for EQC, which is referenced in this report, is the Insurance Liability Valuation Report ('ILVR') as at 30 June 2017 (dated 2 August 2017).

2.8 Definitions of technical terms

Whilst we have tried to avoid unnecessary insurance jargon where possible, to help understand the technical terms which were used in this report we have included a glossary in Appendix H.

2.9 Event groups

2.9.1 Canterbury earthquake claim events

A series of damaging earthquakes has affected the Canterbury region in general, and the city of Christchurch in particular, since the first event on 4 September 2010. These earthquakes have resulted in injury, loss of life, and billions of dollars of damage to infrastructure, commercial property and residential buildings.

For the purposes of valuing the outstanding claims, the Canterbury earthquake claims have been split into the following event groups:

- EQ1 – 4 September 2010 event – Darfield event
- EQ2 – 22 February 2011 event – Lyttelton event
- EQ3 – 13 June 2011 event (including 21 June 2011 event)* - Sumner event
- EQ4 – 23 December 2011 event
- Aftershocks ('AS') – the ten other events shown on the Business Information Unit ('BIU') Daily Report as well as 'Other Canterbury claims' included in the Daily Report totals. The logic used to identify these claims is based on the claim's Territorial Local Authority and loss cause and is consistent with the BIU's definition It does not include claims from the 14 February 2016 event.

*EQC's reinsurance programme covers all incurred losses arising within 720 hours from an event. Consequently, losses arising from the 21 June 2011 aftershock are included in the EQ3 event definition.

2.9.2 Kaikoura earthquake claim events

At 12:02am on 14 November 2016, an earthquake occurred near Culverden (approximately 100km north of Christchurch). This caused other faults to rupture in a domino effect, and other earthquakes occurred in a North-East direction towards Seddon. This earthquake event group has been named the Kaikoura earthquake. For the purposes of this report, it has the three-letter code KEQ.

2.9.3 *Other claim events*

Other outstanding EQC claims, including those arising from landslips, hydrothermal events, and from earthquakes outside Canterbury are categorised as 'BAU' (Business As Usual) claims. This includes the 14 February 2016 earthquake event.

2.9.4 *Components of premium liabilities*

For the purposes of valuing the premium liabilities, the following event categories were used:

- Business as Usual ('BAU') claims.
- Minerva claims - catastrophe event claims arising from earthquakes in NZ outside Canterbury.
- Enhanced seismicity in respect of Canterbury earthquake claims and Kaikoura earthquake claims.

2.10 Professional standards

This report has been written to comply with Professional Standard No. 30 (Valuations of General Insurance Claims) of the New Zealand Society of Actuaries.

2.11 MJW staff involved in the investigation

The following MJW staff members were involved in some capacity during the course of the investigation:

- Craig Lough Principal
- Jeremy Holmes Principal
- 9(2)(a) [redacted]
- [redacted]

3 Canterbury Event Key Assumptions

	BUILDING CLAIMS as at 31 December 2017			
Assumption	**Explanation**	**31 Dec 2017 provision**	**30 Jun 2017 provision**	**Informed by**
Resolution	• Resolution of properties is now materially completed so key assumptions now relate to reopened claims, litigation and Financial Close with Insurers (see below)			• EQC data on resolved claims
Remedial - CEDAR	• 342 claims with identified subfloor issues triaged into Green (no work required), Simple, Moderate and Complex each with estimated cost to repair. • Assumed total costs all fall on EQC and that for 17 complex properties this is 9(2)(j) Estimates for other groups made on repair costs	9(2)(j)	$74m	• EQR/EQC triage process (full reports yet to be completed)
Remedial - general	• Non-CEDAR remediation work. Based on 1,182 claims at avg cost of 9(2)(j)	9(2)(j)	$51m	• EQC data on remedial enquiries
Drainage claims	• 206 remaining properties to be resolved as at 31 December 2017 at average cost of $9(2)(j)	9(2)(j)	$15m	• EQC data on drainage claims
Reopened Opt-out /Cash settled claims	• Current JART report has 1,278 open cash complaints. Assume average cost of 9(2)(j)	9(2)(j)	$37m	• Sense checked against EQC data (not formally reviewed) • Some better tracking of Building claim payments
Individual legal challenges	• 9(2)(h)			

	BUILDING CLAIMS as at 31 December 2017			
Assumption	**Explanation**	**31 Dec 2017 provision**	**30 Jun 2017 provision**	**Informed by**
	• 9(2)(h) [redacted]			
Financial Close-Insurers	9(2)(j) [redacted]			

	BUILDING CLAIMS as at 31 December 2017			
Assumption	**Explanation**	**31 Dec 2017 provision**	**30 Jun 2017 provision**	**Informed by**
	9(2)(j) [redacted]			
Unreported remedial & secondary repair issues	• Provision of 9(2)(j) as at Dec 16. Assume that provision will not be required as at Dec 18 – as material issues will be resolved. Amortise this provision down linearly over four quarters. • Amortisation schedule will be reviewed for 30 June 2018 depending on flow of reopened claims.	9(2)(j) [redacted]	9(2)(j) [redacted]	

	LAND CLAIMS as at 31 December 2017			
Assumption	**Explanation**	**31 Dec 2017 provision**	**30 Jun 2017 provision**	**Informed by**
Land model outcome as per policy	Green Zone: estimated future settlements based on estimates of: • Cat 1-7 damage for all properties • ILV DoV payments for in situ properties, ILV repair cost for cleared sites. NB that this is modelled approach and may differ from actual settlement. • IFV DoV payments for all affected properties Red Zone: • Non-SLS properties settled according to T+T settlement calculation. • SLS properties settled as a weighted average of two possible outcomes calculated by T+T	Ultimates approx 9(2)(j) for Green Zone and 9(2)(j) for Red Zone (Figures exclude Port Hills)	Ultimates approx 9(2)(j) for Green Zone and 9(2)(j) for Red Zone (Figures exclude Port Hills)	• CMS extract showing which claims are open/closed T+T advice on: • lists of properties in Green/Red Zones qualifying for ILV and/or IFV damage • DoV rates as per EQC policy and calculated by T+T (where known) • IFV DoV rates where not already known are based on information supplied by T+T • Repair cost estimate based on ground improvement land trials • LINZ payment and accompanying documentation
9(2)(h) [redacted]				

4 Kaikoura Event Key Assumptions

	KAIKOURA CLAIMS as at 31 December 2017			
Assumption	**Explanation**	**31 Dec 2017 provision**	**30 Jun 2017 provision**	**Informed by**
• Claim numbers	• Based on exposure list of all properties, subdivided by 'building damage' zones. • Building damage zones were based on land damage characteristics and shaking intensity: ▪ Land damage likely (Fault rupture, Slope instability, Liquefaction) ▪ Land damage unlikely (High, Medium and Low shaking) ▪ Wellington apartments • Assumptions on reporting rates and non-zero claim rates were based on prior earthquakes (e.g. EQ1) and emerging experience for KEQ.	Around 40,000 unique dwelling claims for building damage	Around 39,500 unique dwelling claims for building damage	Claims lodged in CMS plus T&T ground observations from GNS, previous earthquake events, initial discussions with insurers' actuaries.
• Claim severity	• Assumptions on building damage ratios (severity) were based on discussions with T+T, ground observations from GNS and general reasoning. • Further informed through claim payments to date. • Experience suggests that initial estimates were too high in high shaking zones and too low in low shaking zones.	Around 9(2)(j) average (higher due to low damage zones causing more damage)	9(2)(j)	T&T ground observations from GNS, previous earthquake events, initial discussions with insurers' actuaries. Claim payments made by EQC and insurers.
• CHE	• Based on initial budget carried out by EQC. • Cost pressures incurred by insurers, above that assumed in budget.	$101m	$67m	EQC Budget Discussions with insurers

5 Canterbury earthquake claim liabilities

There have been a number of developments that have occurred over the six months from 30 June 2017 that have affected the estimation of EQC's Canterbury claims costs. These relate to:

- Land model
  - Actual settlements – Red Zone
- Building model
  - Resolved and reopened claims
- Claims Handling Expenses (CHE)

These have been discussed earlier in Section 1.3.

5.1 Valuation results – Canterbury earthquakes

5.1.1 Estimated ultimate claims costs – Canterbury earthquakes only

The table below summarises the main components involved in estimating the ultimate cost of claims to EQC arising from the Canterbury earthquakes only as at 31 December 2017.

Canterbury earthquakes only
Ultimate claims costs, central estimate, undiscounted, including CHE - 31 December 2017 valuation

	EQ1 $m	EQ2 $m	EQ3 $m	EQ4 $m	AS $m	Total $m
Claims paid to date (excl. CHE)*	2,484	5,419	440	120	195	8,657
Estimated future (excl. CHE)	186	304	31	5	9	535
Gross estimated ultimate incurred claims	2,670	5,723	471	125	204	9,193
Claims handling expenses (CHE)						
Paid to date	476	820	116	39	50	1,502
Estimated future	19	40	15	2	1	78
Total	495	860	131	41	52	1,580
Gross ultimate incurred claims including CHE	3,165	6,584	602	166	256	10,772
Reinsurance recoveries	(1,632)	(2,478)	(0)	(0)	(0)	(4,109)
Net ultimate incurred claims including CHE	1,533	4,106	602	166	256	6,663
30 June 2017 comparatives						
Gross ult incurred claims including CHE	3,134	6,591	591	164	253	10,733

*Includes Fletcher PMO direct costs of repair (excludes margin and infrastructure costs - included in CHE)

The table below shows the components split by exposure.

Canterbury earthquakes only
Estimated ultimate claims costs (undiscounted) - 31 December 2017 valuation

	EQ1 $m	EQ2 $m	EQ3 $m	EQ4 $m	AS $m	Total $m
Claims costs paid to date *						
Land	50	385	48	4	1	488
Building	2,308	4,733	363	104	187	7,694
Contents	125	302	29	12	7	476
CHE	476	820	116	39	50	1,502
Total	2,960	6,239	556	159	245	10,160
Estimated future						
Land	49	152	7	0	(0)	208
Building	136	151	24	5	9	325
Contents	0	1	0	0	(0)	2
CHE	19	40	15	2	1	78
Total	205	344	46	7	10	613
Gross ultimate incurred claims cost - central estimate						
Land	100	537	55	4	1	696
Building	2,445	4,884	387	109	196	8,020
Contents	126	303	29	12	7	477
CHE	495	860	131	41	52	1,580
Total	3,165	6,584	602	166	256	10,772
30 June 2017 comparative						
Gross ult inc claims cost - cent est	3,134	6,591	591	164	253	10,733

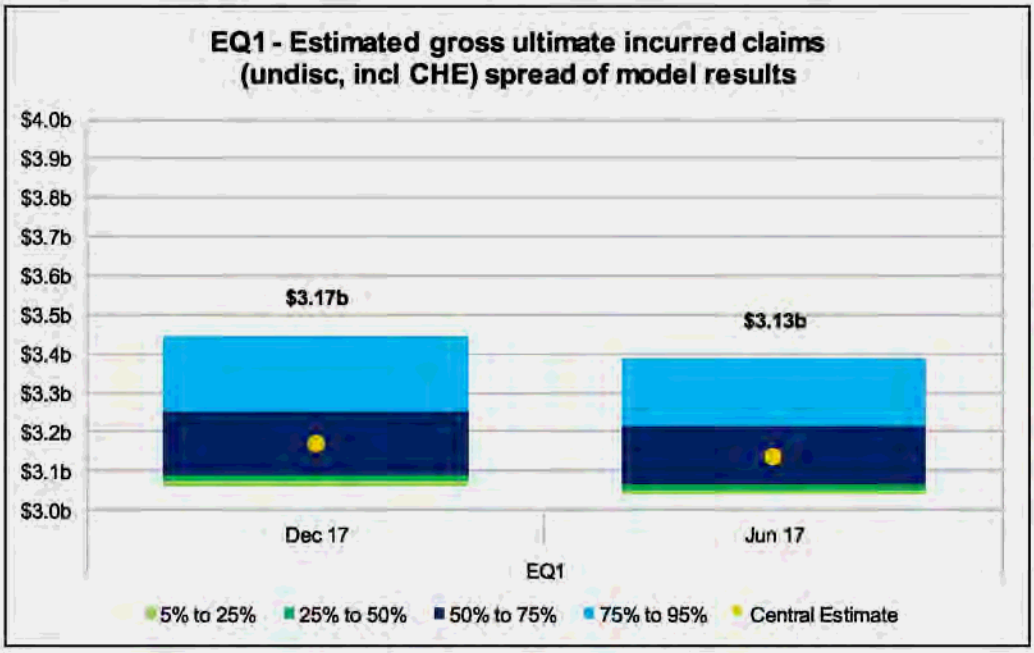
*Includes Fletcher PMO direct costs of repair (excludes margin and infrastructure costs)

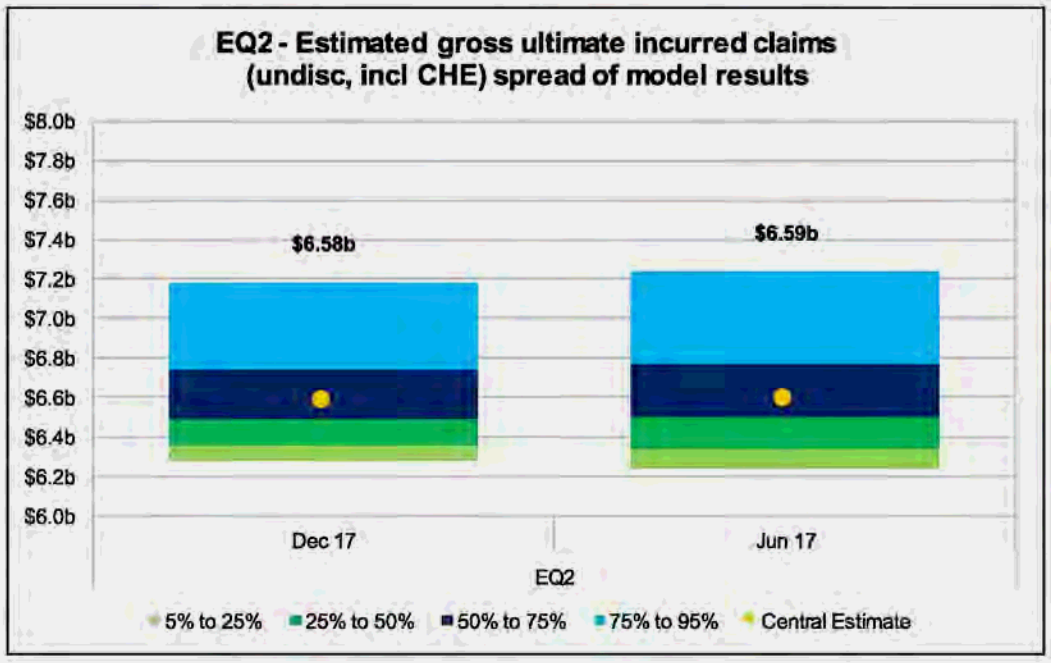
5.1.2 *Estimated ultimate claims costs – variability in modelled results*

The actual ultimate incurred claim costs arising from the Canterbury earthquake events will not be known until the last claim is settled. The figures shown in Section 5.1.1 are the central estimate (mean) of a distribution of modelled outcomes.

The charts below illustrate the variability in the ultimate claims liabilities for EQ1 and EQ2 according to our valuation model, split by Canterbury earthquake event. The numbers shown correspond to the central estimates.

Canterbury Earthquakes only



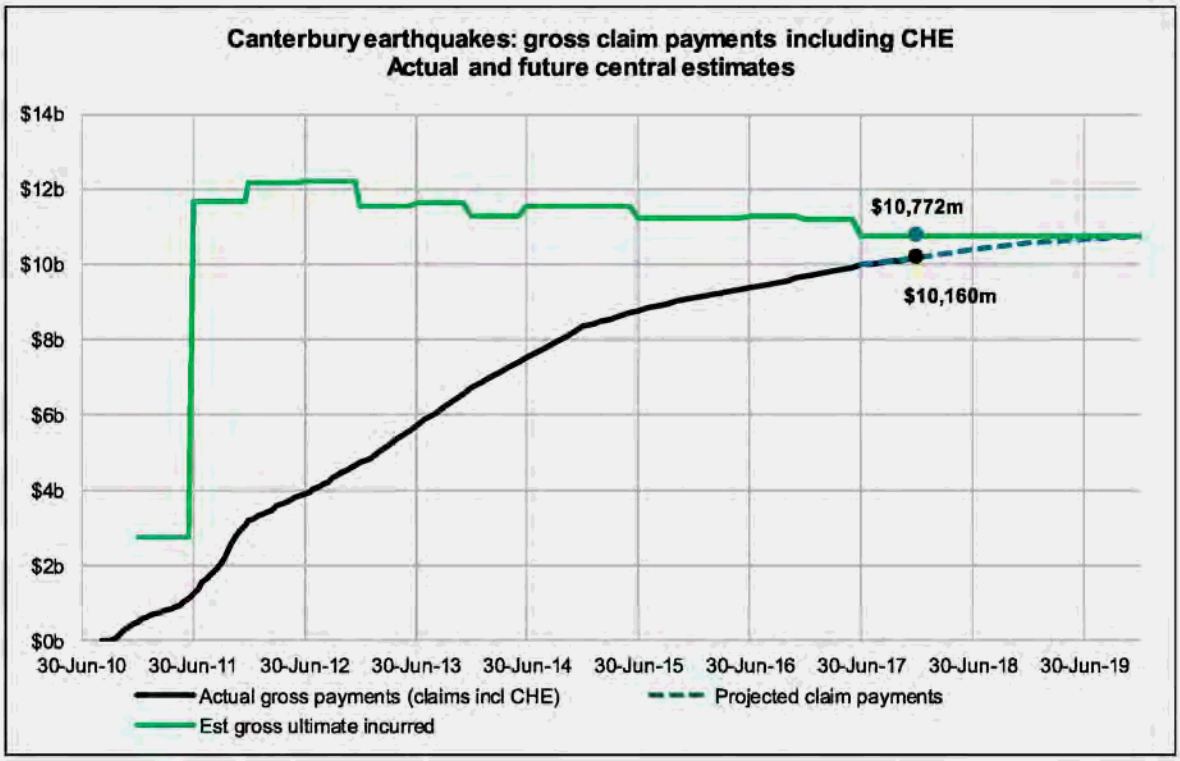


Estimated gross ultimate incurred cost incl CHE

	EQ1	EQ2	EQ3	EQ4	AS
31 December 2017 ILVR					
5%	$3.060b	$6.275b	$0.568b	$0.162b	$0.249b
25%	$3.075b	$6.353b	$0.589b	$0.164b	$0.253b
50%	$3.090b	$6.486b	$0.604b	$0.166b	$0.256b
75%	$3.254b	$6.739b	$0.615b	$0.168b	$0.259b
95%	$3.446b	$7.182b	$0.629b	$0.170b	$0.263b
Central Est	$3.165b	$6.584b	$0.602b	$0.166b	$0.256b
30 June 2017 ILVR					
5%	$3.039b	$6.244b	$0.555b	$0.159b	$0.246b
25%	$3.052b	$6.340b	$0.578b	$0.162b	$0.251b
50%	$3.066b	$6.495b	$0.593b	$0.164b	$0.254b
75%	$3.212b	$6.765b	$0.605b	$0.166b	$0.256b
95%	$3.387b	$7.236b	$0.622b	$0.168b	$0.261b
Central Est	$3.134b	$6.591b	$0.591b	$0.164b	$0.253b

5.1.3 *Gross claim payments – comparison to previous estimates*

The following chart shows actual gross claim payments for Canterbury earthquakes to 31 December 2017 (including EQR payments and CHE) as the solid black line. Projected payments are shown as the blue broken line.



The valuation reflects our understanding of anticipated future cashflows. CHE payments are assumed to continue until 31 December 2020. The final two years of CHE payments are assumed to be small and will be required for a variety of tail issues including managing warranty / rework and litigation.

5.1.4 *Movement in Canterbury earthquake claims costs*

Movement in ultimate incurred claims costs

	Building $m	Contents $m	Land $m	CHE $m	Total $m
30 June 2017 ILVR					
Paid to date	7,559	475	472	1,473	9,978
Estimated future payments	447	9	243	56	756
Gross ultimate incurred claims	8,006	484	715	1,529	10,733
Movements over period					
Payments	136	1	16	29	182
Estimated future payments	(122)	(7)	(35)	22	(143)
Gross ultimate incurred claims	14	(6)	(19)	51	39
31 December 2017 ILVR					
Payments	7,694	476	488	1,502	10,160
Estimated future payments	325	2	208	78	613
Gross ultimate incurred claims	8,020	477	696	1,580	10,772

Canterbury earthquakes only
Comparison to 30 June 2017 ILVR Results

	EQ1			EQ2			EQ3			EQ4			AS			Total		
	Dec 17 $m	Jun 17 $m	Change $m	Dec 17 $m	Jun 17 $m	Change $m	Dec 17 $m	Jun 17 $m	Change $m	Dec 17 $m	Jun 17 $m	Change $m	Dec 17 $m	Jun 17 $m	Change $m	Dec 17 $m	Jun 17 $m	Change $m
Gross ultimate claims excl CHE, undiscounted - central estimate																		
Land	100	100	+0	537	554	-18	55	56	-1	4	4	-0	1	1	+0	696	715	-19
Building	2,445	2,426	+18	4,884	4,896	-12	387	381	+5	109	108	+1	196	195	+1	8,020	8,006	+14
Contents	126	129	-3	303	305	-3	29	30	-0	12	13	-0	7	8	-0	477	484	-6
Total	2,670	2,655	+15	5,723	5,755	-32	471	467	+3	125	124	+0	204	203	+1	9,193	9,205	-12
Claims handling expenses (CHE)																		
Paid	476	466	+10	820	806	+14	116	113	+3	39	38	+1	50	49	+1	1,502	1,473	+29
Future	19	14	+5	40	29	+11	15	11	+4	2	1	+1	1	1	+0	78	56	+22
Total	495	480	+15	860	835	+25	131	124	+7	41	39	+2	52	50	+1	1,580	1,529	+51
Gross ult claims incl CHE, undisc - central est	3,165	3,134	+31	6,584	6,591	-7	602	591	+10	166	164	+2	256	253	+2	10,772	10,733	+39
Reconciliation to gross outstanding (OS)																		
Gross ult cost incl CHE, undisc - central est	3,165	3,134	+31	6,584	6,591	-7	602	591	+10	166	164	+2	256	253	+2	10,772	10,733	+39
Paid claims costs excl CHE	(2,484)	(2,445)	-39	(5,419)	(5,322)	-97	(440)	(430)	-10	(120)	(117)	-3	(195)	(191)	-3	(8,657)	(8,505)	-152
Paid CHE	(476)	(466)	-10	(820)	(806)	-14	(116)	(113)	-3	(39)	(38)	-1	(50)	(49)	-1	(1,502)	(1,473)	-29
Gross OS incl CHE, undisc - central est	205	224	-18	344	462	-118	46	48	-3	7	8	-1	10	13	-2	613	756	-143
Reinsurance recoveries, undiscounted - central estimate																		
Past payments recoveries	(1,431)	(1,383)	-48	(2,478)	(2,478)	+0	-	-	-	-	-	-	-	-	-	(3,908)	(3,861)	-48
Future payments recoveries	(201)	(219)	+18	(0)	(0)	-0	(0)	0	-0	(0)	(0)	(0)	-	-	-	(201)	(219)	+18
Total expected recoveries	(1,632)	(1,602)	-30	(2,478)	(2,478)	-0	(0)	0	-0	(0)	(0)	(0)	-	-	-	(4,109)	(4,080)	-30
Net ult inc claims incl CHE, undisc - central est	1,533	1,532	+1	4,106	4,113	-7	602	591	+10	166	164	+2	256	253	+2	6,663	6,654	+9
Reconciliation to net outstanding																		
Gross OS incl CHE, undisc - central est	205	224	-18	344	462	-118	46	48	-3	7	8	-1	10	13	-2	613	756	-143
Future payments recoveries	(201)	(219)	+18	(0)	(0)	-0	(0)	0	-0	(0)	(0)	-0	-	-	+0	(201)	(219)	+18
Net OS including CHE, undisc - central est	4	5	-0	344	462	-118	46	48	-3	7	8	-1	10	13	-2	412	536	-125
Discounting	(0)	(0)	+0	(5)	(6)	+2	(1)	(1)	-0	(0)	(0)	-0	(0)	(0)	-0	(6)	(7)	+2
Net OS including CHE, disc - central est	4	5	-0	339	456	-117	45	48	-3	7	8	-1	10	13	-2	406	529	-123
Net risk margin, diversified, 85% PoA	3	1	+1	215	255	-39	28	27	+2	4	5	-0	7	7	-0	257	295	-38
Net OS including CHE, disc - 85% PoA	7	6	+1	554	710	-156	73	74	-1	11	13	-2	17	19	-3	663	824	-162

5.1.5 *Movement in results*

The principal area of judgement for this valuation will revolve around whether a sufficient provision has been made for the risk of insurer challenge. There is considerable uncertainty in this.

It will take some time for the likely outcome of these insurer challenges to evolve.

5.1.6 *Drivers of results*

The key drivers of the result are:

- how the litigation unfolds over 2018 and future years.
- how financial close eventuates.

5.1.7 *Implications of results*

The implication of these issues is that the slight reduction in the ultimate land claims costs has been more than offset by the increase in estimated CHE costs.

5.2 Claims handling expenses (CHE)

5.2.1 *Canterbury earthquakes*

Based on a greater understanding of the complexity and the forecast time required to complete all outstanding claims and finalise all completion activities, it has been recognised that there will be further pressure on claims handling expenses and as a result, there has been an increase in the estimated ultimate CHE of $51 million. This cost is expected to be incurred in the 2018 calendar year.

5.2.2 *CHE rates*

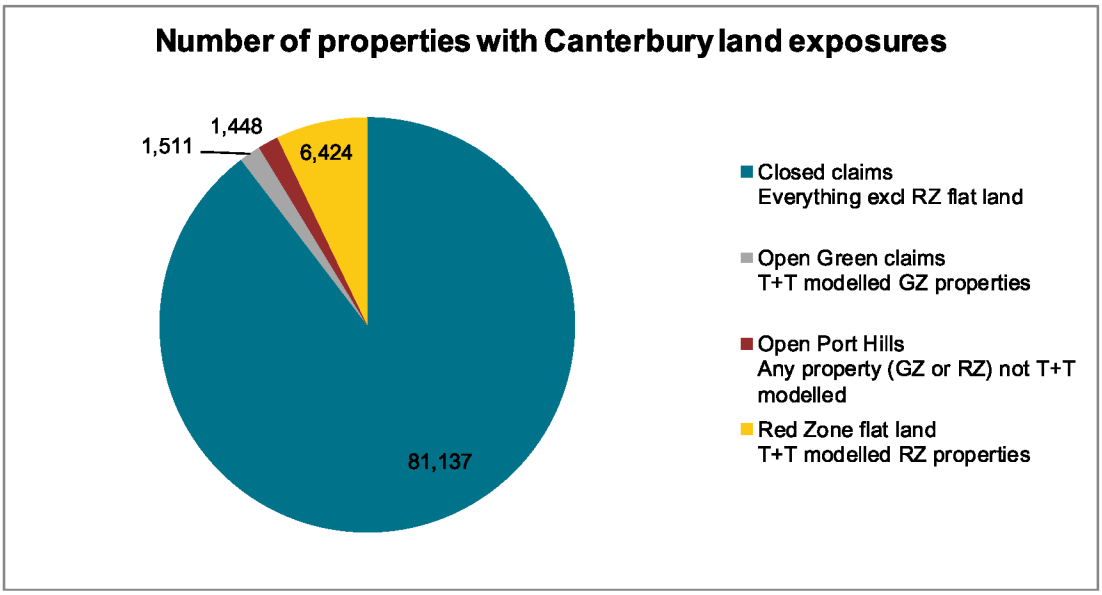
The table below illustrates the estimated ultimate CHE for the Canterbury earthquakes and also illustrates this as a percent of the gross ultimate claims costs.

Canterbury earthquakes only
CHE - 31 December 2017 valuation

	EQ1	EQ2	EQ3	EQ4	AS	Total
Total CHE $m	495.2	860.5	131.1	41.2	51.8	1,579.7
CHE % of gross ultimate	15.6%	13.1%	21.8%	24.8%	20.3%	14.7%

5.3 Breakdown of properties with land exposure

The chart below illustrates the split of all properties with an open or closed Canterbury land exposure.



Since the Canterbury earthquake sequence began land exposures have been opened in respect of 90,520 properties. The state of these properties as at 31 December 2017 is:

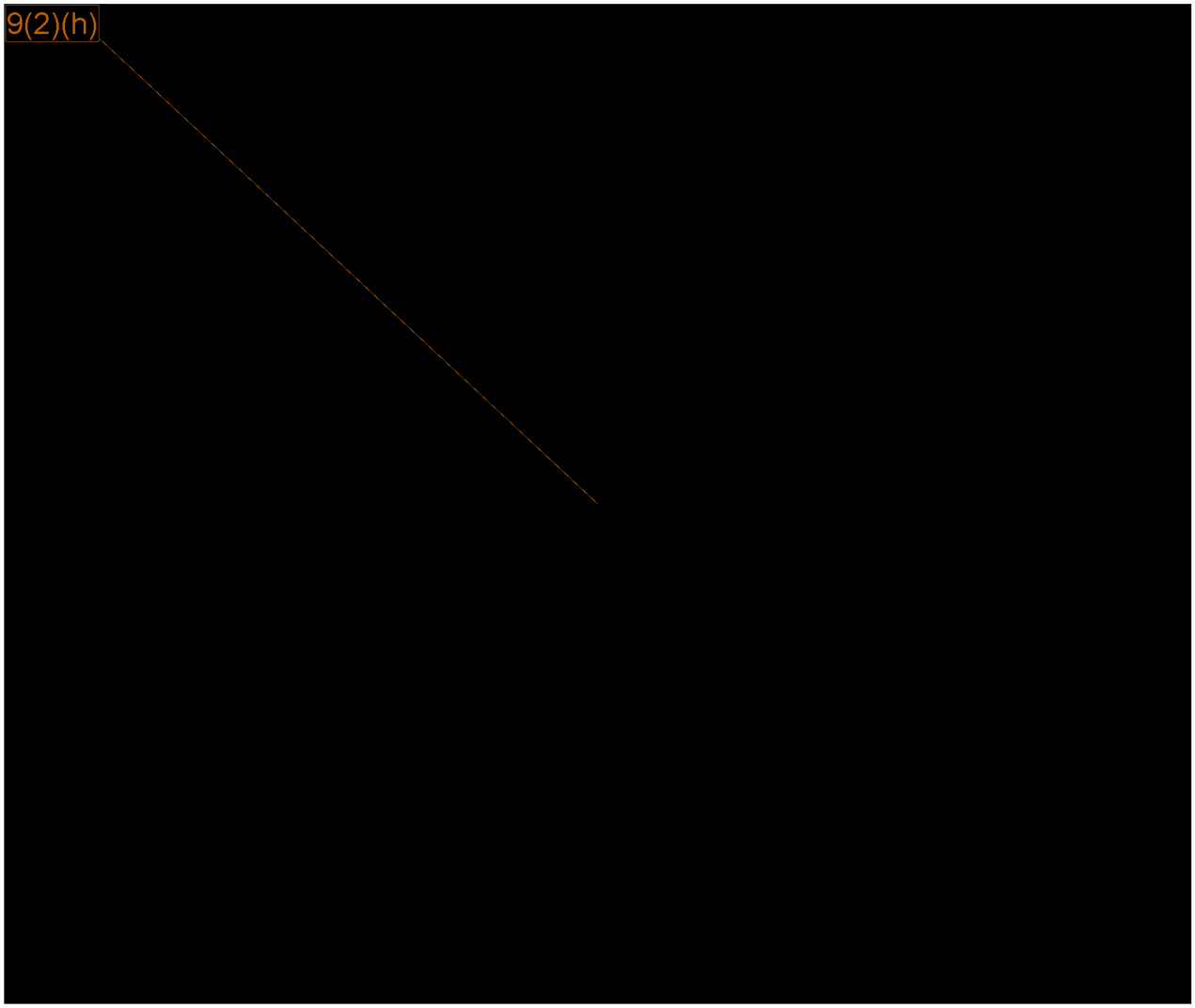
- 81,137 have closed all land exposures related to the property. This includes all Green Zone properties (flat land, Port Hills or other) and any Red Zone properties not on the T+T list of LINZ flat land properties where the land exposure(s) have been closed.
- 6,424 properties are on the T+T list of flat land Red Zone properties. For most of these the land exposure(s) remain open in CMS.
- There are 1,511 properties are on the T+T list of Green Zone flat land properties where the land exposure(s) remain open. This includes a small number of Red Zone properties which did not accept the LINZ offer.
- There are 1,448 properties not on either the T+T list of Green Zone or Red Zone properties where the land exposure(s) remain open. Many of these are identified as Port Hills properties, although there are a large number not on EQC's list of Port Hills properties. Spot checks indicate that some of these are on the border between Christchurch flat land and Port Hills, whilst others are in the greater Canterbury region. This figure also includes any Port Hills LINZ properties.

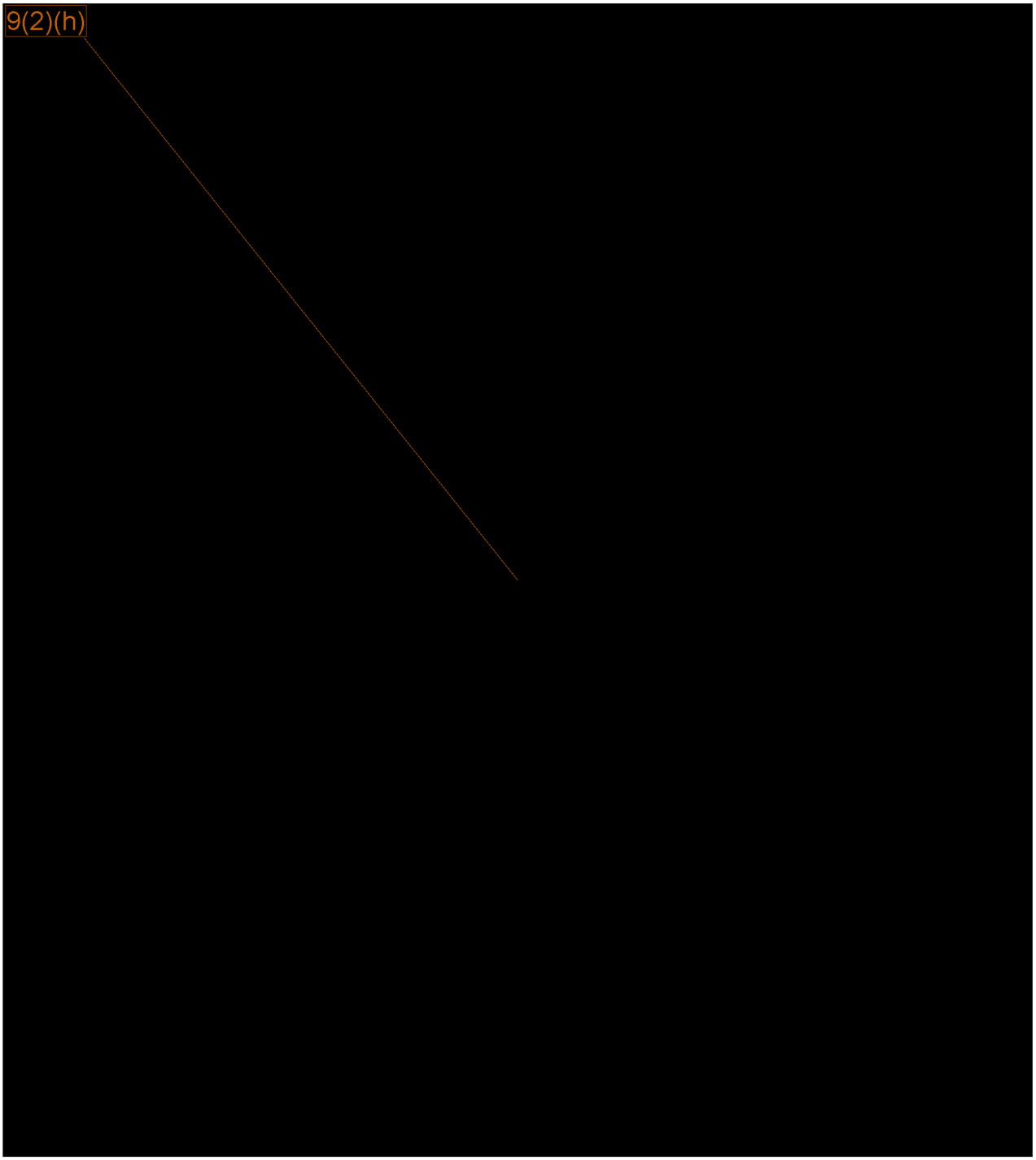
Although a large number of properties have open land exposures remaining, we understand that many of these claims are indeed settled. There are a number of reasons why a land exposure may not yet be closed, and we are working with EQC to identify those claims which are settled but not yet closed. Our understanding is that the claims remaining to be settled (regardless of the status of the exposure in CMS) are:

- LINZ properties subject to severe lateral spreading.
- Properties listed in the IAG / TOWER litigation.
- A very small number of non-litigation Green Zone properties.

5.4 Scenario Analysis

5.4.1 Scenario descriptions





5.4.2 Scenario results

We have isolated three particular scenarios to illustrate the potential change to the land claims costs under various outcomes. The results are displayed below.

Estimated land liabilities as at 31 December 2017

9(2)(h)

[redacted]

5.5 Breakdown of land claims costs

The table below shows the decomposition of the ultimate land claims costs both, with and without allowance for the weighted litigation scenarios described above.

We have also illustrated the net impact of the litigation allowance on the risk margin.

9(2)(h)

[redacted]

The central estimate ultimate cost of land claims is $696 million. [redacted]

9(2)(h)

[redacted]

6 Kaikoura earthquake claim liabilities

With the implementation of the MoU there will necessarily be a lag in claims information finding its way into EQC's claim management system. This has the effect of delaying any informational changes to the Kaikoura earthquake model.

6.1 Valuation results – Kaikoura earthquake

6.1.1 *Estimated claims costs – Kaikoura earthquake*

The results from our simplified model are shown below. Note that not all dwellings will make a claim, and of those that do, not all will result in a valid claim.

Central estimate ultimate cost of Kaikoura claims

Land damage grouping	Number of dwellings	Land $m	Building $m	Contents $m	Total $m	c.f. June 2017 $m
Land damage likely						
fault rupture and slope instability	140	0.9	6.9	0.3	8.1	9.6
fault rupture	13	0.1	0.9	0.0	1.1	1.1
slope instability	1,006	3.6	43.5	1.6	48.8	46.3
liquefaction	2,800	3.6	33.2	1.5	38.4	71.3
Land damage unlikely						
high shaking	3,179	3.4	85.3	4.7	93.4	113.9
moderate shaking	18,086	1.7	62.8	2.2	66.7	151.5
low shaking	n.a.	10.0	172.4	6.0	188.4	19.0
Wellington apartments	8,144	0.2	58.1	6.1	64.3	64.6
Central estimate claims excluding	**33,368**	**23.5**	**463.1**	**22.5**	**509.2**	**477.3**
Claims handling expenses					100.6	66.7
Central estimate claims including CHE					**609.8**	**544.0**

The most significant cost is assumed to relate to building claims. The table below details some key parameters of the Kaikoura building cost. NB that the costs shown below are before stochastic modelling and therefore differ slightly from the table above.

Components of Kaikoura building claim costs

	Number of dwellings exposed	Number of dwellings expected to claim	Expected number of non-nil dwelling claims	Mean expected cost to EQC	Mean cost per dwelling claim
Land damage likely					
fault rupture and slope instability	140	90	86	$6.9m	$81k
fault rupture	13	13	12	$0.9m	$76k
slope instability	1,006	750	712	$43.5m	$61k
liquefaction	2,800	851	808	$33.2m	$41k
Land damage unlikely					
high shaking	3,179	2,305	2,074	$85.4m	$41k
moderate shaking	18,086	4,015	3,011	$62.9m	$21k
low shaking	n.a.	27,546	16,528	$171.5m	$10k
Wellington apartments	8,144	4,001	2,800	$58.2m	$21k
Total	**33,368**	**39,571**	**26,033**	**$462.6m**	**$18k**

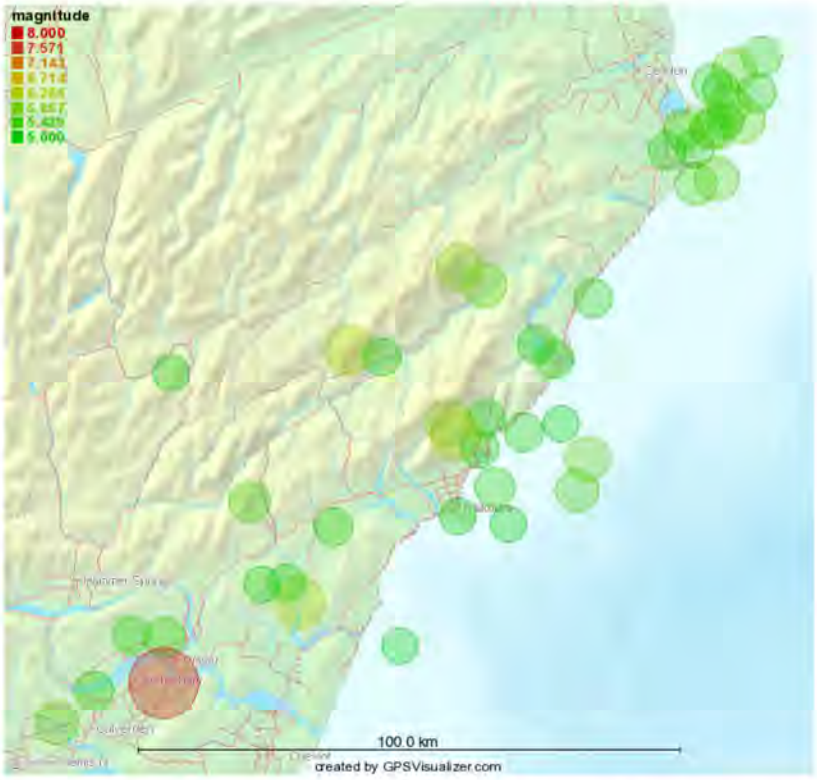
From the table above, it can be seen that of the 140 dwellings that resided on a fault rupture & slope instability zone, we have assumed that 90 will result in a claim with 86 receiving a non-nil payment. The average payment for these dwellings is assumed to be $81k (note that some dwellings have building values less than $100k).

6.2 Background

The 2016 Kaikoura earthquake was a magnitude 7.8 earthquake in the South Island of New Zealand that occurred two minutes after midnight on 14 November 2016. The earthquake started at about 15 kilometres north-east of Culverden and 60 kilometres south-west of the tourist town of Kaikoura and at a depth of approximately 15 kilometres. Ruptures occurred on multiple fault lines in a complex sequence that lasted for about two minutes. The cumulative magnitude of the ruptures was 7.8, with the largest amount of that energy released far to the north of the epicentre.

The shaking caused significant damage for areas immediately around the fault lines that ruptured, including a number of very large land slips. It also caused significant shaking in Wellington although this most affected medium rise buildings which had natural shaking frequencies similar to that produced by the earthquake.

The chart below illustrates the quakes greater than magnitude 5.0 that occurred on 14 November 2016. The size and colour of the circles represent the magnitude of the quakes.



Source: GeoNet project, sponsored by EQC, GNS Science and LINZ

6.2.1 *Valuation developments*

Previously we have used an exposure-based model to determine the ultimate claims costs. This was primarily due to the lack of claims data with which to create a claims-based model.

There is now a significant number of claim payments that have been invoiced to EQC, although much of the assessment information is still to be received.

As a consequence, we have continued using an exposure-based approach, with the assumptions being influenced by experience to date.

The approach that we have used combines:

- An exposure / damage ratio model. It may be referred to as a simplified catastrophe model although it is only in respect of one event and the damage ratios are applied in a fairly broad fashion.
- An average cost per claims model. This is the traditional method for estimating BAU events and was used to help inform the exposure model.

6.2.2 *Modelling approach*

For building claims, we have modelled the cost to EQC as being a function of four elements:

- The number of dwellings exposed to potential damage
- The probability that each of these which will report a claim (where a claim has not already been reported for that dwelling)
- The probability that a reported claim will result in some non-zero cost to EQC
- The distribution of the cost of each non-zero claim to EQC.

The methodology is applied in a stochastic manner. That is, each element is simulated as a random process and the distribution of results is analysed.

For land and contents claims we used a similar methodology though with some exceptions. The building claims are by far the most significant component of the cost; these are discussed in this Executive Summary.

Exposure base

We obtained a dataset of housing stock based on that used for the Minerva model. The number of dwellings in each zone is given below.

Number of dwelling exposures

Zone	Number of dwellings
LDL-FS	140
LDL-F	13
LDL-S	1,006
LDL-L	2,800
LDU-H	3,179
LDU-M	18,086
LDU-L	rest of the country
WGN-A	8,144

Reporting percentage

For the valuation model, we allowed for those properties in each zone where there was already a claim associated with that dwelling and then applied probabilities that the remaining dwellings would lodge a claim. The table below summarises the assumptions.

Reporting percentage assumptions - building claims

Zone	Proportion having already notified a claim	Assumed probability of future notification	Implied ultimate proportion notified	Implied ultimate proportion Jun-17
LDL-FS	30.6%	43.8%	61.0%	65.3%
LDL-F	85.7%	100.0%	100.0%	92.9%
LDL-S	49.2%	48.5%	73.8%	73.4%
LDL-L	25.1%	7.3%	30.6%	42.3%
LDU-H	61.4%	29.5%	72.7%	72.5%
LDU-M	18.1%	4.9%	22.2%	21.0%
LDU-L	n.a.	n.a.	n.a.	n.a.
WGN-A	2.2%	46.8%	48.0%	51.1%

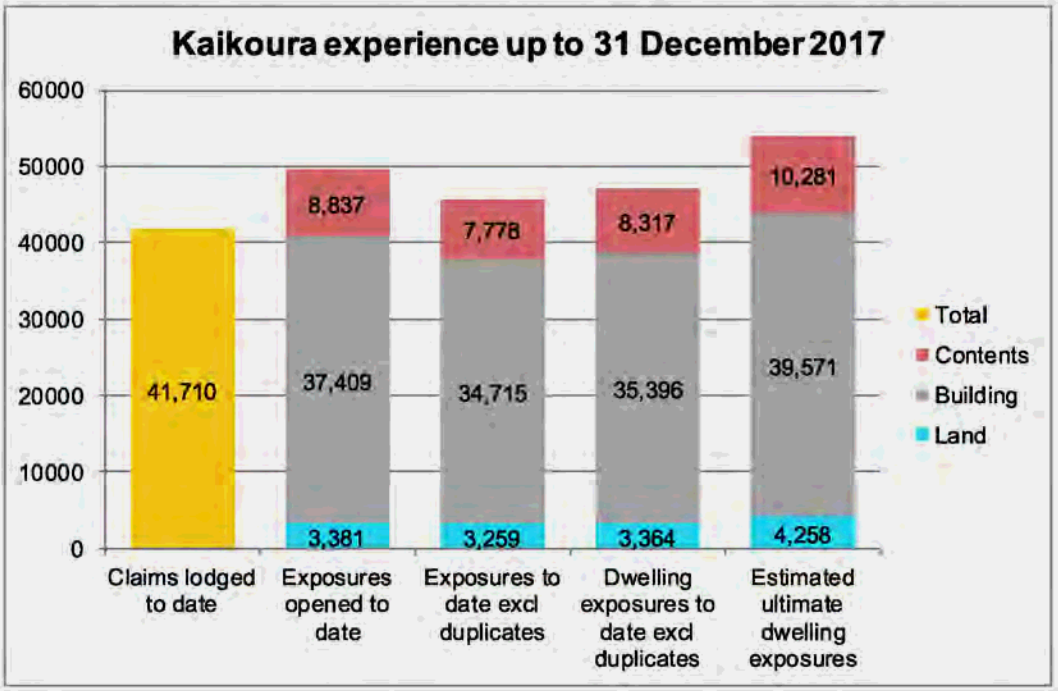
n.a. - not applicable

For the WGN-A zone, we used a reporting percentage for new claims of 46.8% which implies an ultimate reporting rate of 48% for Wellington apartments.

Claim and exposure numbers

We are aware that there a number of management reports being produced in respect of Kaikoura earthquake claims. The various reports may quote claim numbers, exposures, numbers of buildings or numbers of dwellings.

In an effort to clarify which figures we use the chart below illustrates the numbers of claims and exposures lodged to date and our ultimate assumptions around these figures.



- To date there have been 41,710 claims lodged in regard to the Kaikoura events. Many of these claims include multiple exposures (land and/or building and/or contents).
- The claims lodged to date include 37,409 building exposures.

- Removing identifiable duplicates from the list reduces the number of building exposures to 34,715.
- Allowing for exposures where there is more than one dwelling attached to a single QPID increases this number to 35,396. Note this does not address the issue wherein apartment blocks have separate QIPDs for each apartment but only one claim has been lodged in regard to the entire block.
- We have estimated that ultimately the number of non-duplicate building exposures (counting each dwelling individually) will increase to 39,571. A large component of the increase relates to Wellington apartments.

Non-zero percentage

High level analysis of other events suggests that around 70% of building claims reported will result in some non-zero cost to EQC. The other 30% are closed without cost to EQC. This however is likely to vary by zone i.e. the more damaged zones will have fewer zero claims. The table below shows the assumptions we have used.

Non-zero probability assumptions - building claims

Zone	Assumed probability that a notification will result in a non-zero cost	Assumed probability Jun-17
LDL-FS	95%	99%
LDL-F	95%	99%
LDL-S	95%	99%
LDL-L	95%	95%
LDU-H	90%	90%
LDU-M	75%	90%
LDU-L	60%	60%
WGN-A	70%	70%

Taking the weighted average non-zero percentage over all zones results in an overall non-zero percentage for the Kaikoura event of around 70%.

Combining our reporting and non-zero assumptions gives implied proportions of exposures resulting in non-zero damage by zone. These implied figures are reasonably consistent with the T+T assumptions.

Claim size

In the valuation model, we have used a lognormal distribution to model Building Damage Ratios ('BDRs') for each zone and capped the results at 100%. The lognormal distributions are scaled to achieve the intended mean and proportion capping at 100% based on our discussions with T+T, observed experience from settlements and allowing for a 5% cost escalation allowance.

For the LDU-L and WGN-A zones we have used a lognormal distribution to model the actual damage amount in dollar terms (rather than the BDR). The parameters of the lognormal distributions are such that:

- In the LDU-L zone the average building damage is $9(2)(j)
- In the WGN-A zone the average building damage is [redacted]

Cost escalation & litigation allowance

The Canterbury earthquake building model allows for at least 9(2)(j) of the ultimate claims costs due to remedials and other cost escalation factors. It is difficult to quantify exactly with the available data.

In respect of Kaikoura claims, we would expect a lower rate of claims with cost escalation as there will be a higher proportion of claims that are cash settled and insurers are managing claims which may limit EQC's liability in some cases.

As a consequence, we have increased our average building damage assumptions by 9(2)(j). The impact on the estimated ultimate claims is slightly lower than this due to the $100k cap on building claims for EQC.

Claims handling expenses

The previously assumed CHE costs of $67 million have been increased by $34 million as a result of cost pressures facing insurers under the MoU.

6.2.3 *Areas of judgement*

The estimation of the losses arising from the Kaikoura event is clearly the area with the most judgement. We have taken the view for this valuation that the use of a simplified model will enable us to create an estimate for the valuation while also conveying the inherent uncertainty in it.

6.2.4 *Drivers of results*

Key drivers of the result are:

- The number and severity of damaged buildings in rural areas in the South Island
- The extent of damage in South Island towns, especially Kaikoura, Waiau, and Culverden.
- The extent of damage in apartment blocks in Wellington.

6.2.5 *Implications of results*

The most material implication of the Kaikoura event is that there will be significant costs for EQC.

6.3 Claims handling expenses (CHE)

6.3.1 *CHE rates*

The table below illustrates the estimated ultimate CHE for the Kaikoura earthquake and also illustrates this as a percent of the gross ultimate claims costs.

Kaikoura earthquakes only
CHE - 31 December 2017 valuation

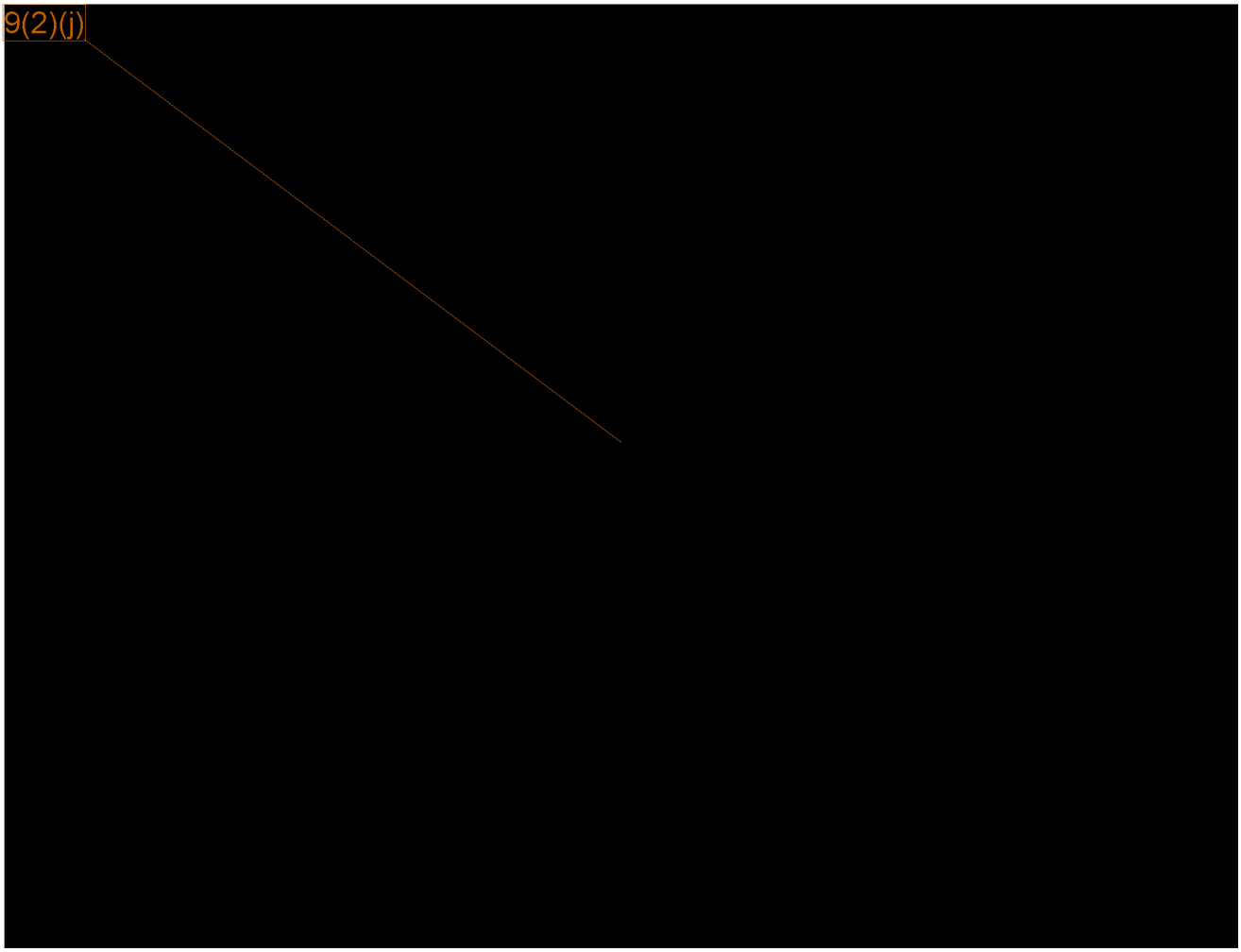
	KEQ
Total CHE $	100.8
CHE % of gross ultin	16.5%

The previous CHE assumption was $67 million. The increase is due to two factors, both related to insurer cost pressure. Note that under the MoU, insurers are paid a management fee relating to the claims management costs, and a reimbursement of any professional fees incurred by the insurer relating to the assessment / remediation of damage.

- A review of the claims management fees paid to insurers has resulted in an increase in the expected ultimate CHE of $12 million.
- In respect of professional fees, experience and information from insurers suggests that the budgeted amount for professional fees is not sufficient. This has increased the expected ultimate CHE by $22 million.

6.4 Scenario analysis

The chart below shows the impact of varying the cost escalation assumptions for the Kaikoura event.



7 BAU claim liabilities

The central estimate outstanding claims for BAU events is $34 million as at 31 December 2017. The tables below summarise the quantum as at the valuation date.

BAU outstanding claims as at 31 December 2017

Undiscounted central estimate excluding CHE

	Land $000s	Building $000s	Contents $000s	Total $000s
BAU				
Open claims	13,717	3,065	43	16,825
IBNR	374	601	8	983
Total	14,092	3,665	51	17,808
BAU PP				
Open claims	9,584	5,322	94	14,999
IBNR	479	268	10	757
Total	10,063	5,590	103	15,756
All loss periods				
Open claims	23,301	8,386	136	31,824
IBNR	854	869	17	1,740
Total	24,155	9,255	154	33,563

7.1 Large events

Over the past several years, there have been a number of significant BAU events. These are shown in the table below.

It is worth noting that the reliability of the figures is heavily dependent on the correct classification of each BAU claim to the correct event.

BAU results by event as at 31 December 2017

	Land	Building	Contents	Total
Paid to date ($000s)				
May 2012 Earthquake - EVT/201205/0003	1	4,290	117	4,408
April 2017 Landslip/Storm/Flood	12,689	2,893	52	15,633
Christchurch 15km E, 15km, 5.7 - EVT/201602/0011	380	48,502	1,704	50,586
January 2013 Earthquake - EVT/201301/0001	0	1,574	38	1,612
December 2016 Earthquake - EVT/201612/0001	0	211	0	211
January 2017 Earthquake - EVT/201701/0001	0	89	1	90
Auckland/Coromandel Storm Event (LSF, Mar - EVT/201703/0011	6,931	1,133	10	8,074
February 2017 Earthquake - EVT/201702/0001	0	199	0	199
Wellington (LSF, Nov 2016) - EVT/201612/0011	4,156	1,693	8	5,857
Edgecumbe Flood (LSF, April 2017) - EVT/201704/0011	1,250	0	0	1,250
Undiscounted central estimate excl CHE ($000s)				
May 2012 Earthquake - EVT/201205/0003	18	372	0	390
April 2017 Landslip/Storm/Flood	4,208	1,045	1	5,254
Christchurch 15km E, 15km, 5.7 - EVT/201602/0011	2	171	2	176
January 2013 Earthquake - EVT/201301/0001	11	144	0	155
December 2016 Earthquake - EVT/201612/0001	0	168	6	173
January 2017 Earthquake - EVT/201701/0001	1	124	6	130
Auckland/Coromandel Storm Event (LSF, Mar - EVT/201703/0011	1,300	406	7	1,712
February 2017 Earthquake - EVT/201702/0001	1	87	2	91
Wellington (LSF, Nov 2016) - EVT/201612/0011	767	317	14	1,098
Edgecumbe Flood (LSF, April 2017) - EVT/201704/0011	151	34	5	190
Other	17,696	6,385	112	24,194
Total	24,155	9,255	154	33,563
Estimated ultimate ($000s)				
May 2012 Earthquake - EVT/201205/0003	18	4,663	117	4,798
April 2017 Landslip/Storm/Flood	16,897	3,937	53	20,887
Christchurch 15km E, 15km, 5.7 - EVT/201602/0011	383	48,673	1,706	50,762
January 2013 Earthquake - EVT/201301/0001	11	1,718	38	1,767
December 2016 Earthquake - EVT/201612/0001	0	378	6	384
January 2017 Earthquake - EVT/201701/0001	1	213	7	220
Auckland/Coromandel Storm Event (LSF, Mar - EVT/201703/0011	8,231	1,538	17	9,786
February 2017 Earthquake - EVT/201702/0001	1	286	2	290
Wellington (LSF, Nov 2016) - EVT/201612/0011	4,923	2,011	22	6,955
Edgecumbe Flood (LSF, April 2017) - EVT/201704/0011	1,401	34	5	1,440

7.2 CHE rates

The provision for BAU Claims Handling Expenses is $7 million.

The table below illustrates the estimated outstanding CHE for BAU claims and also illustrates this as a percent of the net central outstanding claims costs. Note that while the measurement for this is outstanding costs (rather than ultimate costs for Canterbury and Kaikoura), the CHE % is comparable to the percentages shown for the Canterbury and Kaikoura events.

BAU claims only
CHE - 31 December 2017 valuation

	BAU
CHE provision $	$6.5m
CHE % of net OS claims	19.5%

8 Overall results

8.1 Claims incurred

The gross incurred claims costs for all Canterbury and Kaikoura EQ events, incurred to 31 December 2017, include:

- Claims costs paid to date
- Claims costs expected to be paid in future (the OS claims liability).

Claims costs paid to date are known, but those to be paid in the future are unknown and so must be estimated. The approach that we have taken is to estimate the ultimate incurred claims costs and then deduct payments made to 31 December 2017 in order to determine the estimated OS claims liability.

The ultimate incurred claims costs are calculated in respect of Canterbury and Kaikoura earthquake events only.

It is not useful (or practical) to include ultimate incurred claims costs from BAU events as this would include a vast number of smaller events which may have been materially settled. This makes comparisons of BAU claims costs between valuations meaningless.

No risk margins have been calculated and no discounting has been applied to the estimated ultimate incurred claims costs.

The outstanding claims liabilities are in respect of all outstanding EQC claims (Canterbury and Kaikoura earthquakes plus BAU) and are discounted for the time value of money and include risk margins at the 85th percentile.

8.2 All outstanding claims

8.2.1 Ultimate and outstanding claims liabilities – all claims

The table below summarises the key components of the gross ultimate claims costs and the derivation of the outstanding claims liabilities ('OSCL') as at 31 December 2017

The net discounted OSCL at a probability of adequacy of 85% is $1,042m. The largest component of the liabilities is in respect of the EQ2 event, followed by the Kaikoura earthquake claims.

All EQC claims
Gross ultimate claims costs to net outstanding claims liabilities - 31 December 2017 valuation

	EQ1 $m	EQ2 $m	EQ3 $m	EQ4 $m	AS $m	BAU $m	KEQ $m	Total $m
Gross ultimate claims excl CHE, undisc - central est	2,670	5,723	471	125	204		509	9,702
Claims handling expenses (CHE)	495	860	131	41	52		101	1,681
Gross ult claims incl CHE, undisc - central est	3,165	6,584	602	166	256	n.a.	610	11,382
Reinsurance recoveries, undiscounted - central estimate	(1,632)	(2,478)	(0)	(0)	0	-	0	(4,109)
Net ult inc claims incl CHE, undisc - central est	1,533	4,106	602	166	256	n.a.	610	7,273
Net claims costs paid to date	(1,053)	(2,942)	(440)	(120)	(195)		(313)	(5,062)
CHE paid to date	(476)	(820)	(116)	(39)	(50)		(61)	(1,563)
Discounting	(0)	(5)	(1)	(0)	(0)	(1)	(1)	(7)
Net OS including CHE, disc - central est	4	339	45	7	10	40	235	680
Net risk margin, diversified, 85% PoA	3	215	28	4	7	11	94	362
Net OS including CHE, disc - 85% PoA	7	554	73	11	17	51	329	1,042

8.2.2 Movement in net outstanding claims liabilities – all claims

The table below shows the movement in the net outstanding claims liabilities since 30 June 2017.

The net OSCL (85% probability of adequacy, discounted) has decreased from $1.412b as at 30 June 2017 to $1.042b as at 31 December 2017.

The principal drivers of the change in total claims liabilities in decreasing order of impact are:

- Claim payments; $432m of net payments since 30 June 2017.
- Risk margin has decreased by $54m.
- Discounting has decreased by $7m.
- Actuarial determination; this has increased by $110m on a net of reinsurance basis.
  - +$66m as a result of the Kaikoura earthquake.
  - +$35m for new storm events.

The following table provides a reconciliation and explanation of the movement in outstanding claims liabilities, by event.

All EQC claims
Reconciliation of change in outstanding claims liability from 30 June 2017 ILVR

	Prior Periods (to 30 Jun 2017)							Current		All Periods			
	EQ1 $m	EQ2 $m	EQ3 $m	EQ4 $m	AS $m	BAU $m	Subtotal $m	KEQ	BAU $m	CEQ $m	KEQ	BAU $m	Total $m
Net OSCL (85% PoA, discounted) as at 30 June 2017	7	710	74	13	19	10	n.a	522	55	824	522	65	1,412
Remove net risk margin (85% PoA)	(3)	(255)	(27)	(5)	(7)	(3)	n.a	(96)	(22)	(295)	(96)	(25)	(416)
Net OSCL (central estimate, discounted) as at 30 June 2017	5	456	48	8	13	7	536	426	33	529	426	41	996
Remove discounting	0	6	1	0	0	0	8	6	0	7	6	1	14
Net OSCL (central estimate, undiscounted) as at 30 June 2017	5	462	48	8	13	7	544	432	34	536	432	41	1,010
Estimated net paid over period	(2)	(111)	(13)	(4)	(4)	(6)	(141)	(262)	(30)	(134)	(262)	(36)	(432)
Change in net actuarial determination	1	(7)	10	2	2	18	263	66	17	9	66	35	110
Net OSCL (central estimate, undiscounted) as at 31 Dec 2017	4	344	46	7	10	19	667	236	21	412	236	40	688
Add discounting	(0)	(5)	(1)	(0)	(0)	(0)	(7)	(1)	(0)	(6)	(1)	(1)	(7)
Net OSCL (central estimate, discounted) as at 31 December 2017	4	339	45	7	10	19	424	235	21	406	235	40	680
Net diversified risk margin (85% PoA, discounted)	3	215	28	4	7	5	n.a	94	6	257	94	11	362
Net OSCL (85% PoA, discounted) as at 31 December 2017	7	554	73	11	17	24	n.a	329	27	663	329	51	1,042

8.3 Premium liabilities

The table below summarises the key results of the estimation of EQC's premium liabilities as at 31 December 2017. The premium liabilities will be used in the liability adequacy test.

The total value at 75% probability of adequacy is $238 million. This is greater than the $164 million unearned premium reserve. This means that an additional unexpired risk reserve will be required in the accounts as at 31 December 2017.

The largest component ($102 million) relates to projected costs of future claims arising from major events (other than those related to Canterbury earthquakes) during the period of the runoff of risks on the books as at 31 December 2017. These claims are modelled by Minerva.

The next largest component ($69 million, as compared to $60 million as at 30 June 2017) relates to projected costs of future claims arising from Canterbury earthquakes during the period of the runoff of existing risks as at 31 December 2017.

The component relating to the enhanced seismicity following the Kaikoura earthquake ($43 million) is unchanged since 30 June 2017. Although the Kaikoura event is more recent, it is expected that the future costs will be smaller than the Canterbury component due to the relative lack of exposure around Kaikoura.

The other claims costs relate to future BAU (small) claims and the associated reinsurance and administration expenses.

The cost to EQC of reinsurance has increased considerably for cover negotiated since the Canterbury events. The future reinsurance costs for unexpired risks are $83 million.

Estimated Premium Liabilities - 31 December 2017

	BAU $m	Minerva $m	Cant EQ $m	KEQ $m	Total $m
Unearned premium reserve					164
Cost of future claims from unexpired risks					
Gross claims, undiscounted - central estimate	17	47	52	37	152
Administration and reinsurance costs for unexpired risks					
Claims administration expenses	2	5	5	4	16
Policy (non-claims) admin expenses for unexpired	5	0	0	0	5
Future reinsurance costs for unexpired risks	0	63	15	4	83
Reinsurance recoveries					
Reinsurance recoveries, undiscounted	0	(11)	(3)	(1)	(15)
Net premium liabilities, undiscounted - central estimate	24	104	70	44	241
Discounting	(0)	(1)	(1)	(0)	(3)
Net premium liabilities, discounted - central estimate	24	102	69	43	238
Diversified risk margin, discounted - 75% PoA					0
Net premium liabilities, discounted - 75% PoA					238

Note that the reason that the risk margin is $0 is because the distribution of potential claims is very skewed. The central estimate is the average of all possible outcomes; this includes some very low probability but high severity events. As a consequence, the central estimate (mean) outcome is greater than the 75th percentile.

The outcome of the liability adequacy test is often taken as a proxy for the adequacy of the levies (premium rates) that are charged. Consequently, the outcome above suggests that the current levy rates are less than sufficient to cover the expected costs of claims. However:

- The expected claims costs are currently inflated due to the heightened seismic conditions in Canterbury.
- The central estimate claims costs may not be the best decision-making tool for setting levy rates for such a highly-skewed distribution.

- EQC's considerations differ from insurers and will include such factors as the Crown's appetite for managing earthquake risk including pre and post-funding.

8.3.1 Material implications of the results

As the net discounted premium liability at 75% probability of adequacy ($238 million) exceeds the unearned premium reserve ($164 million) it will be necessary to hold an additional unexpired risk reserve.

8.3.2 Quality control processes

The valuation was subject to internal peer review and the results were compared to those from previous ILVRs.

Actual vs. expected experience

The current data does not support an exact analysis of actual claims experience against that expected from the 30 June 2017 premium liabilities calculations. This is because there is no way of identifying incurred claims costs arising from unexpired risks as at the previous valuation. However, it is still interesting to compare the estimated cost of claims incurred in the current period with the undiscounted central estimate future claims costs from 30 June 2017.

8.4 Quality control processes

The valuation was subject to internal peer review. In addition, all results were compared to those of the previous valuations.

9 Uncertainty, Limitations and Reliances

9.1 General comment

There is inherent uncertainty in any estimation of insurance liabilities – estimates of liabilities are based on assumptions and deviations from estimates are normal and to be expected. The estimates are therefore a probability statement rather than an absolute judgement.

The actual ultimate incurred claim costs arising from the Canterbury earthquake events will not be known until the last claim is settled.

The actual ultimate incurred claim costs arising from the Kaikoura earthquake will take some time to estimate accurately. There is very little data with which to form an estimate.

9.2 General sources of valuation uncertainty

The general sources of error in the estimation of liabilities include:

- Normal variation that is inherent in any random process.
- The valuation model being a poor representation of reality.
- Incorrect valuation assumptions arising from:
  - Assumptions being derived from an unrepresentative sample.
  - Underlying experience drifting over time and chosen assumptions failing to accurately follow the 'drift' – this could be due to internal factors such as changes in the claims process or external factors such as changes in the legal environment, cost inflation etc.
- Incomplete or poor-quality data.
- Errors in calculations.

All of these sources of error are potentially present in this investigation.

9.3 Key uncertainties

9.3.1 Exceptional uncertainties arising from the Canterbury earthquakes

The Canterbury earthquakes have resulted in a high level of uncertainty. Some of the key sources of uncertainty are:

- The impact of multiple events on the allocation of damage, EQC coverage and EQC's reinsurance coverage.
- Severe land damage and a very complex land claims environment from engineering, valuation and legal perspectives.
- Claims development. There has been considerable progress within EQC in regard to the operational aspects of assessing and settling claims, especially in trying to process land claims. However, for a number of reasons, outcomes of that progress cannot be fully reflected in the information available for the valuation, and so there remains residual uncertainty in the valuation results.
- 9(2)(h) [redacted]

Consequently, at this stage of claims development, there is still a degree of unavoidable uncertainty regarding the future claims costs.

As noted in our previous reports, as the claims are settled and as the reasonableness of the model and its assumptions are refined and tested against the emerging claims experience, the level of uncertainty will reduce.

9.3.2 *Land valuation uncertainties*

The list below sets out some specific sources of uncertainty regarding the estimation of EQC's land liabilities. These sources include, but are not limited to:

- The impact of the 'diminution of value' cover interpretation.
- The assumed market value cap for a number of properties in Canterbury.
- Legal, valuation and engineering challenge and different interpretation of the land cover provisions in the EQC Act.

Some practical outcomes of the uncertainty associated with the valuation are:

- The actual claims outcome will differ to some degree from the estimates.
- There are confidence ranges in the estimated liabilities for each event.
- Different practitioners could legitimately arrive at quite different estimates of claims cost.

9.3.3 *Uncertainties arising from the Kaikoura earthquake*

The Kaikoura earthquake has resulted in a high level of uncertainty. In a similar manner to the Canterbury earthquake sequence, it will take some time to identify, quality and settle all earthquake damage. Specific sources of uncertainty include:

- The Memorandum of Understanding ('MoU') places claims handling in the hands of insurers.
    - This necessarily delays the receipt of information surrounding each claim.
    - There is not perfect consistency in how claims are managed across all insurers, affecting the claims outcome.
- There is little information as to the extent of residential building damage in the South Island. Many properties will be rural and access to these will be limited. While EQC will now be aware of the settlements that have been made, it will not know whether these are sufficient in the light of future demand surge.
- There is little detailed and quantifiable information on the extent of damage to residential apartment buildings in Wellington that are managed by insurers. This would facilitate some assurance that settlements are sufficient.

9.4 Limitations

In this report, we provide the results of our investigations together with an outline of the matters considered and the methods and assumptions applied to obtain these results. Opinions and estimates contained in this report constitute our judgement as at the date of the report.

This report must be read in its entirety. Individual sections of the report, including the Executive Summary, could be misleading if considered in isolation from each other.

This report is addressed to the management and Board of EQC and should not be provided to or used by any other party (except as specified below) without the express written permission of MJW. This limitation has been provided with the intention of preventing the use of the report for purposes for which the analysis was not intended. MJW will not be liable for the consequences of any third party acting upon or relying upon any information or conclusions contained within this report.

MJW has agreed to a request from EQC that this report may be provided to EQC's auditor, reinsurance broker (AON Benfield), reinsurers, legal counsel (Chapman Tripp), geotechnical engineers (Tonkin + Taylor) and the New Zealand Treasury. In agreeing to this request, we point out in particular that this report is addressed to EQC, and therefore we do not warrant or represent that any information, analysis or results set out in it are sufficient or appropriate for any other parties' purposes. This report cannot substitute for any investigations that any other party may wish to carry out for its own purposes, and the authors of this report and MJW will not accept any liability to any other party arising from the use of this report.

9.4.1 Official Information Act (OIA)

It is also recognised that this report will be covered by the OIA and therefore may be released (subject to any redactions) to the public. It is noted however that we are advised that there are grounds for EQC to withhold the ILVR under the OIA.

The limitations above also apply to any other reader of this report.

9.5 Key reliances

In completing this report, considerable reliance has been placed on data and information supplied to MJW by EQC and its external advisors. The most important reliances were placed on the data sources listed in Section D.1.

More details regarding data, information and reliances are set out throughout Section D.

9.6 Quality control and risk management processes

The estimation of EQCs liabilities, particularly the building component, involves constructing multiple complex statistical models.

The data, methodology and results that drive, and are output from, these models undergo a variety of quality control and audit processes.

We undertake to ensure the robustness of these by:

- Internal peer review, including:
  - Detailed review of data, assumptions, methodology and results.
  - Periodic rotation of staff which allows, over time, a 'fresh set of eyes' over aspects of the valuation process.
- Data validation where possible to independent sources (e.g. management accounts, daily reports)
- Analysis of change in assumptions for reasonableness.
- Comparison of results to previous models and valuations.
- Comparing results to alternative models.
- External review, including

- Discussions with EQC staff
- Discussions with external auditors at year ends.

Earthquake Commission

20 February 2018

Insurance Liability Valuation as at 31 December 2017

Appendices

MELVILLE JESSUP WEAVER

Willis Towers Watson Alliance Partner

A EQC – Background

A.1 EQC structure and role

EQC is a NZ Government-owned Crown entity whose origins stretch back to 1945 and is currently established under the Earthquake Commission Act 1993 ('the Act') and associated schedules and regulations.

EQC's role may be summarised as follows:

- To provide insurance against insured perils.
- To administer the Natural Disaster Fund (NDF), including investments, and obtain reinsurance.
- To facilitate research and education about matters relevant to natural disaster damage and its mitigation.
- To undertake other functions as required by the Minister of Finance or the Minister Responsible for the Earthquake Commission.

A Government Guarantee ensures that EQC will be able to meet its financial obligations in all circumstances.

Details on EQC's operations including what is covered under EQC insurance, can be found on its website www.eqc.govt.nz or in previous ILVRs.

A.1.1 Reinstatement of cover limits

Following the High Court's declaratory judgment on 2 September 2011 (EQC v the Insurance Council / Vero / IAG; and Tower Insurance v EQC) the issue of the reinstatement of EQC's cover after an event has now been clarified.

In summary, EQC is generally liable for up to $100k plus GST for each building claim and $20k plus GST for each contents claim; i.e. there is immediate reinstatement of cover after each natural disaster event as long as the contract of fire insurance is in force.

B Canterbury land settlement

B.1.1 Ministerial Direction - Unclaimed damage

Given the need to apportion the costs of the claims between the various earthquake events, there is the issue that damage is deemed to have occurred to events where no valid claim has been lodged.

In these cases, there is therefore a possibility that the insured may not be covered for all of the damage that has occurred due to a lack of claim lodgement for a particular event. As a consequence, there have been a number of Ministerial Directions to clarify the issue.

For the purposes of this ILVR, the relevant directions were given on:

- 19 December 2012. Relates to residential building and states that all apportioned residential building damage will be covered by EQC, so long as at least one valid claim has been made for that residential building.
- 19 December 2013. An amendment to the previous residential building direction stating that no excess shall apply to apportioned damage where no valid claim was made.
- 29 October 2015. Relates to residential land and states that all apportioned residential land damage will be covered by EQC (subject to the land cap), so long as at least one valid claim has been made. Excesses will be deducted from all apportioned damage claim payments

These directions have consequences for the gross and net exposure of EQC in that all damage is covered by EQC (subject to there being at least one claim) but not necessarily the reinsurers.

B.1.2 Remediation of land claim damage

Canterbury land suffered visible and other forms of land damage. Other land damage includes ILV and IFV. Visible flat land damage is broken into 7 categories, descriptions of which can be found on the EQC website www.eqc.govt.nz.

Shown below is the manner in which EQC is settling the various land claim categories. The land damage may be broken down into 4 broad groups as discussed below.

- Repair of damage categories 1 – 7 on the flat.
- Repair of, or compensation for, ILV damage on the flat (formerly known as category 8 damage).
- Repair of, or compensation for, IFV damage on the flat (formerly known as category 9 damage).
- Repair of damage on the Port Hills.

Damage categories 1 – 7 on the flat

The land damage reinstatement costs have been calculated for each property on an individual property basis.

Diminution of value

Diminution of Value ('DoV') measures the reduction in a property's market value which has been caused by IFV or ILV land damage.

This is consistent with the indemnity principle of insurance and is being used by EQC (amongst other options) to settle land claims.

ILV damage on the flat

EQC's policy in respect of ILV damaged land considers

- Whether the property qualifies for settlement
- The costs and ability to repair the land and the DoV that has been incurred.

IFV damage on the flat

Flooding encompasses both flooding from rivers which exceed their capacity during prolonged rainfall and also overflowed flow path stormwater run-off during shorter, more intense rainfall events.

EQC's policy in respect of IFV damaged land considers

- Whether the property qualifies for settlement
- The costs and ability to repair the land and the DoV that has been incurred.

Repair of damage on the Port Hills

Port Hills land damage is more conventional as there is no liquefaction. Compared to damage on the flat, it is more straightforward to assess on a case by case basis. However, it is more difficult to assess, estimate and/or reinstate on a grouped basis.

Further details can be found on EQC's website www.eqc.govt.nz.

C Kaikoura Earthquake – Methodology and Assumptions

This appendix summarises the methodology used to estimate the cost of the Kaikoura earthquake of 14th November 2016. The Kaikoura model only deals with damage from the earthquakes, not damage from the storms in Wellington shortly afterward (which are addressed using the standard BAU model).

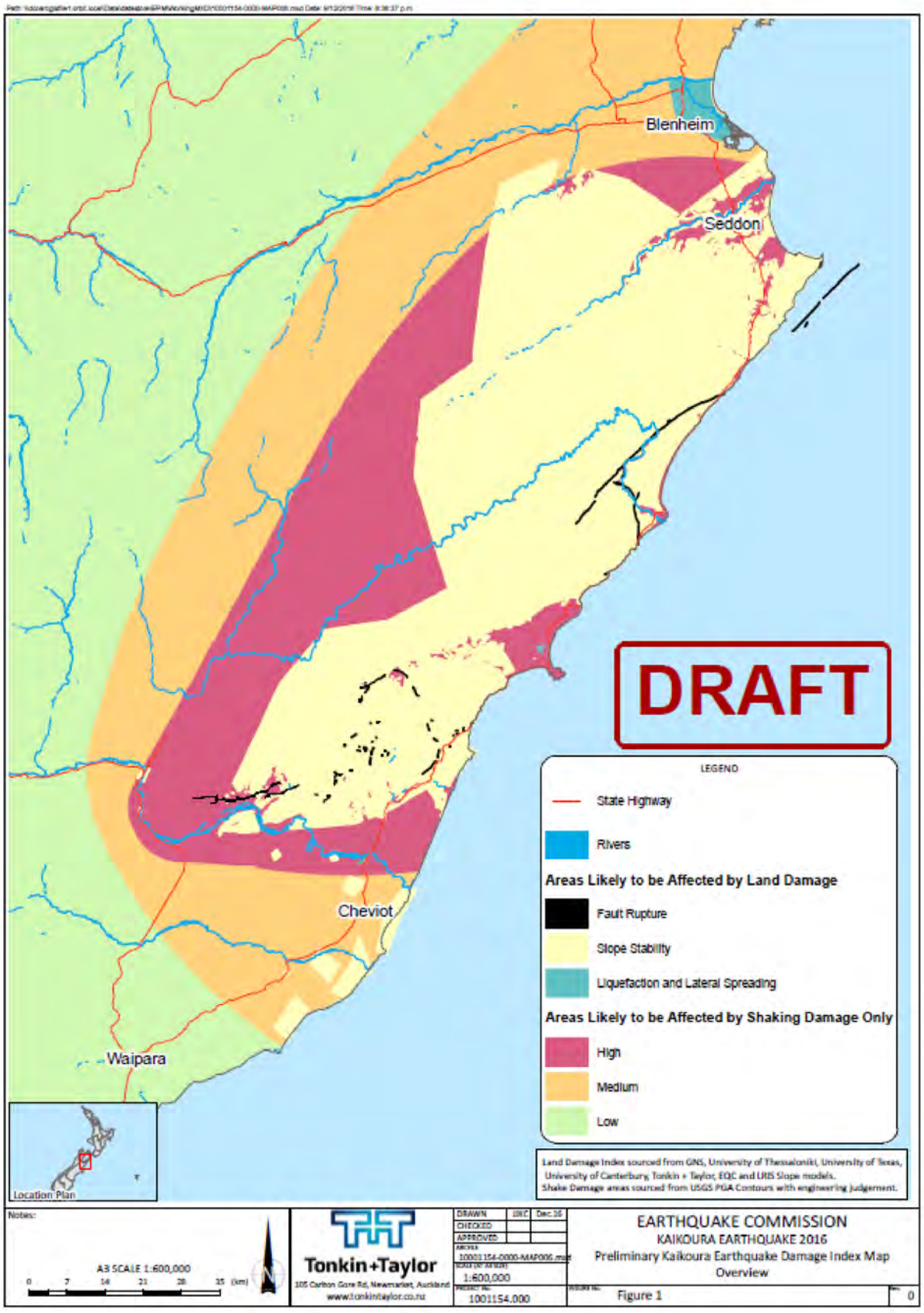
As at 4 December 2017 there were 41,603 claims loaded into CMS (including 37,253 building claims) relating to the Kaikoura earthquake. Very few claims have been lodged in regard to Wellington apartments, however, we understand that in many cases only one claim has been lodged by the body corporate representing a number of units. We have estimated that there will be a total of 39,503 building claims for the Kaikoura earthquake.

C.1 Zone classification

The methodology described below is applied to eight distinct zones, based on discussions with T+T. The zones are:

- The Land Damage Likely ('LDL') zones:
  - Fault rupture: LDL-F
  - Slope instability: LDL-S
  - Both fault rupture and slope instability: LDL-FS
  - Liquefaction: LDL-L
- The Land Damage Unlikely ('LDU') zones:
  - High shaking: LDU-H
  - Moderate shaking: LDU-M
  - Low shaking: LDU-L
- Apartments in the Wellington region: WGN-A

The picture on the following page illustrates the various zones. The LDU-L zone is effectively the rest of New Zealand.



C.2 Methodology overview

For building claims, we have modelled the cost to EQC as being a function of four elements:

- The number of dwellings exposed to potential damage[1]
- The probability that each of these will report a claim (where a claim has not already been reported for that dwelling)[1]
- The probability that a reported claim will result in some non-zero cost to EQC
- The distribution of the cost of each non-zero claim to EQC. This is specified as:
    - For claims other than those in the LDU-L zone and WNG-A zones, the percentage of the building which is damaged by the earthquakes i.e. a Building Damage Ratio ('BDR')
    - For claims in the LDU-L and WNG-A zones, the cost of the claim in dollars.

[1]Except for the LDU-L zone.

For the LDU-L zone we directly modelled the number of claims reported, rather than modelling the exposure and reporting percentage.

For land and contents claims we used a similar methodology with some exceptions:

- The likelihood of a claim notification was modelled as a function of whether or not a building claim is notified
- The claim amounts were modelled as dollar costs rather than BDRs.

C.2.1 Stochastic modelling

The methodology above is applied in a random, stochastic manner. That is, for each dwelling in each zone we randomly simulate:

- Whether or not a claim will be notified
- Whether or not a notified claim will result in some non-zero cost to EQC
- The amount of that non-zero cost to EQC.

The results are aggregated for each zone and for each type of claim i.e. land, building and contents. This is done 10,000 times and the distribution of results is analysed.

C.3 Exposure base

We obtained a dataset of housing stock from T+T, based on data from Minerva, detailing the residential dwellings categorised by zone. We also obtained a dataset directly from Minerva from which we extracted dwellings in the Wellington region which were categorised as residential apartments. The number of dwellings in each zone are given below.

Number of dwelling exposures

Zone	Number of dwellings
LDL-FS	140
LDL-F	13
LDL-S	1,006
LDL-L	2,800
LDU-H	3,179
LDU-M	18,086
LDU-L	rest of the country
WGN-A	8,144

C.4 Building claims

C.4.1 Reporting percentage

For the valuation model, we allowed for those properties in each zone where there was already a claim associated with that dwelling and then applied probabilities that the remaining dwellings would lodge a claim. The table below summarises the assumptions.

Reporting percentage assumptions - building claims

Zone	Proportion having already notified a claim	Assumed probability of future notification	Implied ultimate proportion notified	Implied ultimate proportion Jun-17
LDL-FS	30.6%	43.8%	61.0%	65.3%
LDL-F	85.7%	100.0%	100.0%	92.9%
LDL-S	49.2%	48.5%	73.8%	73.4%
LDL-L	25.1%	7.3%	30.6%	42.3%
LDU-H	61.4%	29.5%	72.7%	72.5%
LDU-M	18.1%	4.9%	22.2%	21.0%
LDU-L	n.a.	n.a.	n.a.	n.a.
WGN-A	2.2%	46.8%	48.0%	51.1%

n.a. - not applicable

For the WGN-A zone, which was not addressed in the T+T model, we conducted some random sampling to test whether those dwellings in the exposure data labelled as apartments were genuinely mid-high-rise apartments (as opposed to townhouses or 1-2 level terraced housing which might possibly be referred to as apartments). Our sampling found that the majority were genuine mid-high-rise apartments, and we understand that these were fairly susceptible to the long, slow rocking of the Kaikoura event. We have seen far fewer reported claims to date for Wellington apartments than we have estimated as at 31 December 2016. However, it is possible that there are still some claims (particularly body corporate claims) that have been notified to the relevant insurer but have not been reconciled and loaded into CMS.

For the LDU-L zone, which was also not addressed in the T+T model, we identified approximately 28,604 building claims to date that appear to be related to properties in the LDU-L zone. We have assumed that some 1,000 claims are duplicates, resulting in around 27,500 claims. This compares to an estimate of around 29,000 claims as at 30 June 2017.

C.4.2 *Non-zero percentage*

High level analysis of other events suggests that around 70% of building claims reported will result in some non-zero cost to EQC. The other 30% are closed without cost to EQC. This however is likely to vary by zone i.e. the more damaged zones will have fewer zero claims. The table below shows the assumptions we have used.

Non-zero probability assumptions - building claims

Zone	Assumed probability that a notification will result in a non-zero cost	Assumed probability Jun-17
LDL-FS	95%	99%
LDL-F	95%	99%
LDL-S	95%	99%
LDL-L	95%	95%
LDU-H	90%	90%
LDU-M	75%	90%
LDU-L	60%	60%
WGN-A	70%	70%

Taking the weighted average non-zero percentage over all zones results in an overall non-zero percentage for the Kaikoura event of around 66%.

Combining our reporting and non-zero assumptions gives implied proportions of exposures resulting in non-zero damage by zone. These implied figures are reasonably consistent with the T+T assumptions.

C.4.3 *Claim size*

In the valuation model, we have used a lognormal distribution to model BDRs for each zone and capped the results at 100%. The lognormal distributions are scaled to achieve the intended mean and proportion capping at 100% based on our discussions with T+T. The assumptions are:

BDR distribution assumptions

Zone	BDR lognormal parameter - mu	BDR lognormal parameter - sigma	Probability that claim will be total loss (where claim is non-zero)	Average non-zero BDR where not total loss
LDL-FS	-0.1030	1.4075	47%	42%
LDL-F	-0.1030	1.4075	47%	42%
LDL-S	-1.1942	1.4075	20%	29%
LDL-L	-2.1387	1.4075	6%	18%
LDU-H	-2.0754	1.2686	5%	19%
LDU-M	-2.8437	0.8326	0%	8%
LDU-L	n.a.	n.a.	n.a.	n.a.
WGN-A	n.a.	n.a.	n.a.	n.a.

n.a. - not applicable

For the LDU-L and WGN-A zones we have used a lognormal distribution to model the actual damage amount in dollar terms (rather than the BDR). The parameters of the lognormal distributions are such that:

- In the LDU-L zone the average building damage is $11,779 and the CoV[1] is 250%
- In the WGN-A zone the average building damage is $27,073 and the CoV[1] is 200%

[1]CoV – coefficient of variation i.e. the standard deviation of a distribution divided by the mean of that distribution.

C.5 Land and Contents claims

For details on our contents and land claims assumptions, please contact the authors.

D Data and Information

D.1 Sources of data – Canterbury earthquake claims

The most important sources of data for the Canterbury earthquake investigations were:

- Actuarial Data Extracts from the Claim Centre Claims Information Management System ('ADE'). Data as at 31 December 2017 was used to inform the ultimate incurred claims costs and net outstanding claims liabilities.
- ACE apportionment data from the Business Intelligence Unit ('BIU') – see below.
- Small PAT results - see below.
- EQR paid data.
- Claim-to-address mapping data from the BIU.
- Land cost calculations from EQC & T+T.
- Fletcher Construction completion cost data.
- Trial Balances as at 30 November 2017 and 31 December 2017.
- A Minerva model run generated in January 2011.
- Discussions with EQC employees and contractors.

D.1.1 ACE & Small PAT

Properties with building damage are managed either by EQC or by the relevant insurer. Generally, all properties with building damage less than the EQC cap ($100,000 +GST) per claim will be managed by EQC with the remainder ('overcap properties') managed by the insurer.

To assess whether a property is overcap, a manual Apportioned Cost Estimates ('ACE') process is carried out. This will indicate whether any claim has expected damage of more than the cap and therefore whether it should be handed over to the insurer. All overcap properties, and some undercap properties, will have ACE data.

Undercap properties were not, as a rule, manually apportioned. For the purposes of the valuation and for reinsurance, undercap properties have been apportioned using a statistical model, developed by the statistician, Dr David Baird. The statistical apportionment method is referred to as Small PAT (Proxy Apportionment Tool).

D.1.2 Actuarial Data Extract from ClaimCentre

Weekly Actuarial Data Extracts (ADE) were taken from ClaimCentre and the key extracts used were dated 4 December 2017 (for the Canterbury earthquake claims costs).

The extract is structured as a single database table. Each record relates to a single claim (itself relating to up to three sub-claims) with many fields describing the claim's details.

D.1.3 ACE damage data

The ACE damage data (as at 4 December 2017) consisted of a table, provided by the BIU, showing apportioned damage estimates for a number of Christchurch properties. There were approximately 130,000 properties in the table although many of these had yet to be populated with apportionment information. There were 50,484 approved properties from this data set that were used in the building model. The table below details how the usable properties were derived from the total data set. It is in respect of all review statuses.

ACE data cleaning process

	Number of Properties	Sum of Raw ACE Estimates EQ1 $m	EQ2 $m	EQ3 $m	EQ4 $m	AS $m	Total $m
Raw ACE Data	129,788	1,649	5,137	237	28	48	7,100
Remove:							
NAs	(75,988)	-	-	-	-	-	-
Duplicates	(37)	-	-	-	-	-	-
Property ID errors & non-approved	(3,279)	(91)	(195)	(9)	(1)	(4)	(300)
Extremely large estimates (>$100m)	0	-	-	-	-	-	-
Data used in model	50,484	1,559	4,942	228	27	45	6,800

D.1.4 EQR paid data

The EQR paid data (as at 31 December 2017) consisted of a table, provided by the BIU, showing the amounts paid to substantively completed properties. There were approximately 68,000 properties from this data set used in the model.

D.1.5 Tonkin + Taylor land data and assumptions

The land valuation model has been constructed using information from T+T and supplemented with information from EQC and their advisors.

D.1.6 Output from the Minerva loss model

Output from the Minerva model was the same as that used for the 30 June 2012 valuation. This output was provided by EQC in July 2011. No more recent outputs have been provided as there has been no input of revised parameters following the Christchurch events.

D.2 Sources of data – Kaikoura earthquake claims

D.2.1 Actuarial Data Extract from ClaimCentre

The ADE was also used to assist in the Kaikoura earthquake claims costs.

In addition to the data above, to assist in assessing the ultimate claims costs from the Kaikoura event we have also received:

- Exposure data from the Minerva model
- List of properties grouped by land movement information from T+T.

D.3 Sources of information

The additional sources of information used for the investigation were:

- Draft accounts for the period ending 31 December 2017.
- Trial balance for the period ending 31 December 2017.
- Small PAT results.
- Daily reports supplied by the BIU.

- Reports supplied by the Fletcher Construction EQR.
- T+T land claims cost model.
- Information from the Treasury website.
- Discussions and correspondence with various relevant EQC staff, contractors and advisors.

D.4 Validation of data

D.4.1 Actuarial data extract

The table below illustrates a reconciliation of the 31 December 2017 Actuarial Data Extract system against the BIU's Daily Report for 31 December 2017.

Canterbury earthquakes only
Reconciliation of ADE to Daily Summary Data & Daily Report

Event	Event Date	ADE - 31 Dec 2(Number of Claims	Total Paid $m	DSD - 31 Dec 2(Number of Claims	Total Paid $m	Daily Report - 31 Dec 17 Number of Claims	Paid $m	Difference Number of Claims	DR $m	DSD $m
EQ1	4-Sep-10	156,632	2,079	108,773	2,078	156,631	2,079	(1)	0	(1)
AS	19-Oct-10	3,628	17	1,795	17	3,628	17	0	0	(0)
AS	14-Nov-10	2,608	12	1,164	12	2,608	12	0	(0)	(0)
AS	26-Dec-10	19,039	85	8,598	85	19,039	85	0	0	(0)
AS	20-Jan-11	2,854	15	1,326	15	2,854	15	0	0	(0)
AS	4-Feb-11	632	6	306	6	632	6	0	0	(0)
EQ2	22-Feb-11	157,318	5,172	125,119	5,170	157,318	5,177	0	5	(2)
AS	16-Apr-11	3,646	33	2,004	33	3,646	33	0	0	(0)
AS	30-Apr-11	192	2	116	2	192	2	0	0	(0)
AS	10-May-11	974	9	562	9	974	9	0	0	(0)
AS	6-Jun-11	2,292	22	1,411	22	2,292	22	0	0	(0)
EQ3	13-Jun-11	54,211	863	37,429	862	54,211	866	0	3	(1)
EQ3	21-Jun-11	2,236	31	1,600	31	2,236	31	0	0	(0)
AS	9-Oct-11	5,634	26	2,900	26	5,634	26	0	0	(0)
EQ4	23-Dec-11	48,796	173	22,301	173	48,796	174	0	1	(0)
Other Canterbury event*		1,217	6	620	6	8,792	22	7,575	16	(0)
Not in MJW definition				3,090	16					16
Total		461,909	8,550	319,114	8,562	469,483	8,575	7,574	25	11

Note that for BAU claims the information from the data extract is calculated on a loss date basis and so does not agree exactly with the accounting data. Overall the level of agreement is satisfactory for our purposes.

D.4.2 Other data

The other data sources were not able to be reconciled against the accounts but were reconciled against other sources where relevant and possible.

D.5 Reliances

The key data and information upon which we have placed reliance are described in Sections D.1 to D.3 above.

D.6 Concerns and qualifications

D.6.1 General comments regarding the data held by EQC

The main area of concern with respect to the use of the data for actuarial purposes is that the claim payment information is held in many different systems which makes it challenging to capture all payments.

This is exacerbated with the introduction of the new claims management system and retirement of the existing system.

In addition to this, it is making it increasingly more difficult to analyse trends and justify the assumptions that are chosen.

D.7 Recommendations

D.7.1 Progress against previous recommendations

Several data-related recommendations were set out in Section 3.6 of the 30 June 2016 report. The progress against these recommendations is as follows:

- Rationalise sources of claims information. *Not started*

D.7.2 Current Recommendations

The recommendations that were noted in the previous ILVR are outstanding. We would repeat these recommendations so that the information that EQC has acquired from Canterbury and Kaikoura can be used for reporting, research and analysis.

D.8 Adequacy and Appropriateness

The quality of the results in this report relies on the accuracy and completeness of the data and information supplied. Overall, and subject to the significant but unavoidable issues identified in Sections D.6, we consider that the information provided to us was adequate and appropriate for the purposes of this valuation.

E Outstanding Claims Liabilities – Valuation Methodologies

E.1 Liability components

EQC's outstanding (OS) claims liabilities to be included in its accounts for 31 December 2017 are, in summary, an estimate of the total value of liabilities arising from all claims incurred up to the valuation date of 31 December 2017.

Claims incurred will include both reported and unreported claims as at the valuation date. Liabilities are calculated both net and gross of reinsurance.

The OS claims liabilities include both claim payments that will be made after the valuation date and the associated claims handling expenses.

The direct claims payments have been calculated to include the valid claims costs payable to insureds, as defined by the Earthquake Commission Act 1993 ('the Act'). The claims handling costs include the administration costs and allocated overheads associated with the management of those claims.

Insurance accounting standards also require the OS claims liabilities to be discounted for the time value of money and to include the addition of a risk margin to increase the probability of adequacy of the provision.

Based on the comments above the key liability components are:

- Direct claims costs of reported, open claims; this part of the liability comprises:
  - Case estimates held within ClaimCentre.
  - An allowance for IBNER (incurred but not enough reported) claims costs where the case estimates are considered to be insufficient.
- Direct claims costs of reported, closed claims that reopen (Reopened).
- Non-reinsurance recoveries.
- Claims handling expenses.
- Reinsurance recoveries.
- Risk margins.
- Discounting for the time value of money.

E.2 Valuation groupings

The OS claims liabilities are subdivided by:

- Event (EQ1 – EQ4, BAU, KEQ).
- Sub-claim (land, building and contents).

This subdivision is necessary because different cover and reinsurance rules apply to the different valuation groupings and the underlying data for the creation of assumptions also varies.

E.3 Valuation methodology

In summary, the valuation model selected may be described as an aggregate stochastic frequency / severity model. The model itself runs in an MS-Excel spreadsheet and the R statistical package.

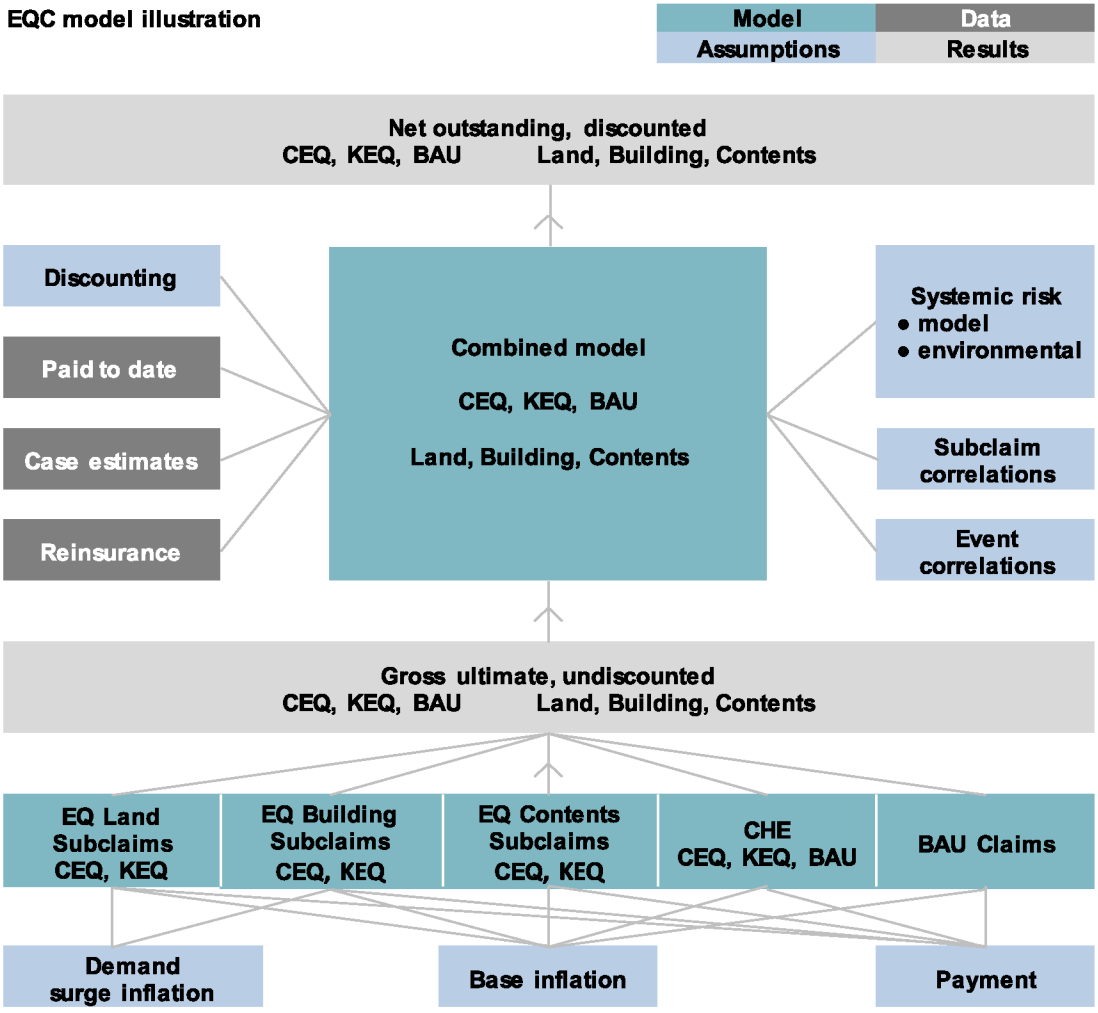
E.4 Gross incurred claims costs

The costs paid to date are known with certainty, but those to be paid in the future are unknown and so must be estimated. The approach that we have taken is to first estimate the projected ultimate claims costs and then to deduct payments made to 31 December 2017 in order to determine the estimated OS claims liability.

E.4.1 Diagrammatic illustration of the valuation model

The diagram below illustrates the components and overall structure of the valuation model.

The structure represents the process for a single run of the model. Each event will have its own unique set of assumptions but needs to be run in parallel in the model as it is the aggregate claims position across the whole entity that must be captured.



The model is run 10,000 times and the output (which is subdivided by the valuation groups described earlier) from each run is collected to form an aggregate gross claims distribution. The central estimate claims cost is found by taking the mean value of the distribution and the 85% probability of adequacy estimate is found by taking the 85th percentile of the distribution.

E.5 Changes since previous valuation

There have been no material changes in methodology since the previous valuation.

E.6 Assumptions required

The assumptions required are driven by the structure of the valuation model. The key assumptions are shown in Section 3 and 4. For a full set of assumptions, please contact the authors.

F Premium Liabilities – Methodology and Assumptions

F.1 Liability components

In summary, EQC's premium liabilities are an estimate of the total value of net liabilities associated with the run-off of EQC's unexpired risks as at 31 December 2017. The focus is therefore on claims incurred as a result of events after the 31 December 2017 valuation date, i.e. future claims. This is in contrast to the OS claims liabilities, which relate to claims incurred up to 31 December 2017, i.e. past claims.

The premium liabilities comprise several components:

- The cost of future claims (net of reinsurance) arising from the unexpired risks.
- The claims handling expenses for the future claims arising from the unexpired risks.
- The cost of policy administration for the run-off of the unexpired risks.
- The cost of the reinsurance cover for the unexpired risks.

The estimate is set at a 75% probability of adequacy and discounted for the time value of money.

The premium liabilities are not included in EQC's balance sheet but will be used for the Liability Adequacy Test (LAT) of the unearned premium reserves (UPR). If the premium liabilities exceed the unearned premium reserves, then an additional unexpired risk reserve is required to make up the extent of shortfall. If the premium liabilities are less than the UPR then the UPR remains unchanged.

F.2 Valuation groupings

Because the focus of the premium liabilities is on future claims – for which, by definition, there can be no claims data held by EQC - the valuation groupings used for the premium liabilities are very different from those used for the OS claims liabilities.

F.2.1 Event valuation groupings

As we are now dealing with future claims it is not possible to categorise claims by event dates, however we must consider the sources from which future claims may arise. At the time of writing this report these are:

- 'BAU' (Business As Usual) claims
- Minerva claims - catastrophe event claims arising from earthquakes in NZ outside Canterbury
- Enhanced seismicity claims – claims arising from future earthquakes in the Canterbury or Kaikoura earthquake sequence.

The first two event groups above are traditional ones for the estimation of EQC's premium liabilities. The last item reflects the fact that the first two items were based on a 'stable' environment whereas the seismic conditions are more uncertain now. It is expected that this component will reduce over time as seismic conditions stabilise.

F.3 Valuation methodologies

We have decided to use a stochastic approach as it facilitated the determination of the risk margin and allowed us to directly model the effects of the catastrophe reinsurance.

This is consistent with the approach used for components of the OS claims liabilities so some of the assumptions developed for that work have been used.

F.4 Changes in methodology

The methodology has not materially changed from the previous valuation.

F.5 Assumptions required

The assumptions are driven by the valuation methodology. In the following sections, we set out the assumptions for each event group and provide some background to the assumption and how it was derived.

F.5.1 Minerva

The Minerva component is based on output from the Minerva model in 2011. The only assumption used here is the inflation rate, which is 2.5% p.a.

F.5.2 BAU

The assumptions used for the BAU component are frequency and severity based. Please see the authors for details on these assumptions.

F.5.3 Enhanced seismicity claims

The Enhanced seismicity claims component is based on the probabilities of aftershocks in the Canterbury and Kaikoura region. The table below illustrates the assumptions currently used.

Geonet forecasts - Canterbury region long-term probabilities
One year: 1 September 2017 - 31 August 2018

Magnitude lower	Magnitude upper	Midpoint	Expected Avge (yr)	Expected max events
5.0	6.0	5.50	0.6	2
6.0	7.0	6.50	0.05	1
7.0	8.0	7.50	0.005	1

Source: http://www.geonet.org.nz/earthquake/forecast/canterbury

Geonet forecasts - Kaikoura region long-term probabilities
One year: 14 November 2017 - 13 November 2018

Magnitude lower	Magnitude upper	Midpoint	Expected Avge (yr)	Expected max events
5.0	6.0	5.50	8.5	18
6.0	7.0	6.50	0.7	3
7.0	8.0	7.50	0.06	1

Source: http://www.geonet.org.nz/earthquake/forecast/kaikoura

F.5.4 Non-acquisition expenses

The premium liabilities require assumptions on the policy administration costs and the costs to manage and settle claims. It is assumed that:

- The average annual policy administration costs for unexpired risk is $5m

- The average claims handling cost per claim is $1,495.

F.6 Changes in assumptions

Given the underlying claims process and the valuation methodology, the assumptions are largely based on those used for the 30 June 2017 valuation. The latest GeoNet Canterbury forecasts were released on 1 September 2017. The latest GeoNet Kaikoura forecasts were released on 14 November 2017.

G EQC Reinsurance

G.1 EQC reinsurance

G.1.1 Historical Cover

EQC utilises catastrophe reinsurance to reduce net claims volatility.

As from 1 June 2010, and effective for EQ1, EQC reinsurance programme was made up of three layers, providing a total of NZD 2.4775b* cover excess of NZD 1.5b first loss deductible:

- Layer 1: NZD $500m xs NZD $1,500m
- Layer 2: NZD $1,500m xs NZD $2,000m
- Layer 3: NZD $500m xs NZD $3,500m

*Note that EQC co-insured 1.5% or NZD 22,500,000 of Layer 2 (on the 2009 3-year placement).

This cover was placed in tranches and layers subject to different terms.

This reinsurance structure was the same for the 2011/12 year.

Current cover

From 1 June 2017, the reinsurance programme has three layers, beginning at NZD $1,750m and finishing at $6,250m. The top layer, which is $1,750m xs $4,500m, is 83% placed.

In addition to this, there is a three-year aggregate layer which provides $500m cover for contributing losses, with a $1,000m deductible.

H Glossary

Accounting standard

In New Zealand, the accounting standards of the NZ Institute of Chartered Accountants apply. The standard most relevant to **insurance entities** is *NZ IFRS4 Insurance Contracts*.

Actuarial Data Extract (ADE)

A data extract used to facilitate an actuarial valuation. The data is typically sourced from the claims and policy administration systems.

Actuary

In general, in New Zealand an actuary is a Fellow or Accredited Member of the New Zealand Society of Actuaries or equivalent body.

Aggregate excess of loss reinsurance

See **catastrophe reinsurance.**

Apportioned Cost Estimate (ACE) data

A number of properties have had their building damage apportioned between events in a manual fashion. This process uses all available information on that property (quantity surveyor reports, land damage information, neighbourhood damage, customer reports etc.) to inform the apportionment. These apportionments are called Apportioned Cost Estimates and will be included the ACE data set. The ACE data set includes all overcap properties and a number of undercap properties too.

Attachment date

See **inception date**.

Best estimate

In the context of scenarios, a best estimate means a realistic future scenario, rather than a deliberately pessimistic or optimistic one. Also, see **central estimate**.

Brokerage

An alternative term for commission paid to a **broker**.

Broker

An intermediary who acts for an insured in negotiating their insurance. The broker usually receives payment by way of commission from the insurer with whom the business is placed.

Business as Usual (BAU)

A distinction has been drawn between claims that are related to the Canterbury Earthquake Sequence or the Kaikoura earthquake and those that are from other events (earthquake or other). These other events are referred to as Business as Usual (BAU) events.

Canterbury Earthquake Sequence ('CES')

The sequence of earthquakes and aftershocks in the Canterbury area from 4 September 2010 to the end of 2011. This included four main earthquakes on 4 September 2010, 22 February 2011, 13 June 2011 and 23 December 2011.

Case estimate

The amount recorded by the insurer's claims personnel (including external claims assessors) as being the amount required to settle an open claim, based on the information available on that particular case. When a claim is first reported and recorded, a nominal placeholder estimate may be entered into the system. Estimates should be updated as extra information comes to light and adjusted to reflect any partial payments that may be made prior to final settlement.

Catastrophe

A catastrophe event for an insurer is generally considered to be a single event that results in one or more claims for very large amounts or in an aggregation of many claims collectively costing an extremely large amount. The nature and impact of potential catastrophe events will vary by insurer according to their business, amount of capital and risk management arrangements. Examples include earthquakes and terrorism.

Catastrophe reinsurance

Usually an excess of loss reinsurance arrangement providing cover to an insurer against very high losses arising from a **catastrophe** event, which meets the definition of 'catastrophe' as specified in the reinsurance policy. The nature and extent of the cover available / provided depends on the nature of the underlying insurer's business and the terms available for such protection. For some events, such as storm or earthquake, the reinsurer may impose a specified time limit on when claims may be covered under the catastrophe treaty.

Cedant or ceding insurer

An insurer who has ceded (passed on) all or part of the risks it has underwritten by way of reinsurance. Analogous to an insured who cedes risk to an insurer.

CEDAR

Canterbury Earthquake Defect And Repair review. MBIE commissioned an independent survey of the repairs of a sample (101 properties) of the earthquake-damaged Canterbury homes selected from more than 2,700 addresses provided by the Earthquake Commission (EQC), Housing New Zealand, and insurers Southern Response and IAG. The survey also included a small sample of houses where homeowners had opted out of an insurer-led home repair programme.

The aim was to assess the Building Code compliance of structural repairs that were exempt from a building consent under Schedule 1 (repairs and maintenance) of the Building Act.

Central Estimate

An estimate that contains no deliberate or conscious over- or under-estimation. NZ Accounting standards define this to be the mean of the probability distribution of future outcomes. Also, see **probability of adequacy**.

Claim frequency

The number of claims divided by exposure over a given time period. This could apply to **reported** or **incurred** claims.

Claims handling expenses (CHE)

The expenses involved in the processing and settlement of claims. Note that this term usually relates only to indirect claims expenses such as internal general administration claims costs. Expenses such as assessors' fees or legal costs, that arise in relation to specific claims, are termed direct expenses and are usually treated as part of the cost of those claims.

Claims paid

The amount paid in respect of claims.

Claims provision and claims reserve

These are both terms used to refer to the amount held or required to provide for future payments on outstanding claims. These terms are sometimes seen as being interchangeable. However, there are variations in the precise usage of both terms according to the context in which they appear.

A claims provision is often used to refer to the amount held in an insurer's accounts. In management accounts, claims reserve may refer to the total **case estimates**, possibly with an additional amount for **IBNR** claims. In actuarial contexts, the technical terms are, respectively, **incurred claims liability** and **outstanding claims liability**. These amounts might also include allowances for **CHE**, **discounting**, **claims paid**, and a **risk margin**. Figures may be given **net** or **gross of reinsurance**.

Closed claims

Those claims for which records have been closed, because settlement has been made and no recoveries are expected. However, see **reopened** claims.

Cover

The extent and nature of protection provided by an insurance policy. This will be defined in the policy documentation.

Deductible

See **excess.**

Demand surge

The increase in the cost of insurance claims following a major loss event. The event puts pressure on the demand for labour and materials to pay for repairs which, in the absence of increased supply, increases the price of these costs.

Diminution of Value (DoV)

Diminution of Value, in the context of IFV or ILV is the loss in value suffered by the homeowner, as a result of the land damage that caused the loss. In assessing the DOV, it does not include any change in value resulting from matters other than the land damage (e.g. a change in the building regulations and practices after the 2010-2011 Canterbury earthquakes).

Discounting

Discounting refers to the (absolute) reduction, for the time value of money, of any future cashflows. The extent of discounting is a consequence of two factors: length of time until payment and the discount rate with an increase in either of these increasing the impact of discounting. Cashflows which have been discounted are said to be *present values*.

Actuarial **professional standards** state that **risk-free discount rates** must be used to calculate present values.

Effective date

The effective date of an **ILVR** is the date to which the valuation calculations apply.

Excess

The amount of an insured loss that must be borne by the policyholder before the insurer becomes liable to make a claim payment. The amount of the excess will be set out in the policy documentation.

Excess of loss reinsurance

A non-proportional form of reinsurance whereby the insurer pays the cost of a claim up to a specified point (their **retention**) and the reinsurer pays the remainder of the cost. The amount payable by the reinsurer is usually subject to a specified maximum amount which may apply per claim or to the total amount. Also, see **catastrophe reinsurance**.

Experience

The term used to describe the results of blocks of insurance business, particularly when the results are the subject of detailed analysis.

Future Claim Liability (FCL)

A term sometimes used to refer to the **premium liability** arising from unearned policies. It is the value of future claim payments and related **CHE**, arising from future events for which the insurer is liable.

Green Zone

Canterbury land areas such that land repair / rebuild can begin. The Green Zone was further divided into commercial zoned land, Port Hills land, rural land, and three residential flat land categories. The three residential flat land categories describe how the land is expected to perform in future earthquakes, and also describe the foundation systems most likely to be required in the corresponding areas. Also, see Red Zone, TC1, TC2, and TC3.

Gross

Refers to the amounts of premiums, claims and expenses before allowing for the costs or income (including commission as well as claim recoveries) from reinsurance and other non-reinsurance recoveries.

Inception date

Inception date is the date on which cover commences.

Increased Flooding Vulnerability (IFV)

The physical change to land as a result of an earthquake which adversely affects the use and amenity that could otherwise be associated with the land by increasing the vulnerability of that land to flooding events.

Increased Liquefaction Vulnerability (ILV)

The physical change to land as a result of ground subsidence from an earthquake which materially increases the vulnerability of that land to liquefaction damage in future earthquakes.

Incurred

A term relating to claims arising from events that occurring in a specified period.

There are differences in the precise usage of the term according to the context in which it appears. In some contexts, it may refer to the group of claims *occurring* in the period (whether **reported** to the insurer or not) and their eventual cost. In accounting contexts, the term may refer to the amount of *claims payments made plus the change in outstanding claims provisions* from the start to the end of the period.

In an actuarial context, 'incurred' costs are taken to mean the claim costs cost which arise or come to light) during the period. An alternative expression of this is: claim payments made plus outstanding estimates (inclusive of **IBNR** and **IBNER**).

Further differences may also apply in regard to the inclusion (or not) of **CHE** and **risk margins.** Clarification should be provided in the actuarial commentary as to the precise meaning applied. It should also be stated whether there has been allowance for **discounting** in the quantification of future payments to be made on these claims. Also see **discounting** and **ultimate cost**.

Incurred but not reported (IBNR)

Any claim or claim amount for which, at a particular point in time, the loss event has occurred, but the insurer has not yet been notified and/or the claim entered into the claims system. Any **outstanding claims liability** must include an allowance for these claims.

Incurred but not enough reported (IBNER)

A monetary amount relating to **reported** claims. IBNER is defined as the ultimate cost of the claim less the current **case estimate** and could be positive or negative. The **outstanding claims liability** must include an allowance for this.

Incurred claims

Claims that were **incurred** during a specified time period.

Incurred claims liability

See **Outstanding Claims Liability**.

Indirect claims handling expenses

See **claims handling expenses**

Insurance liability valuation report (ILVR)

A report detailing a valuation by the **actuary** of the **insurance liabilities** of an insurer.

Joint Assessment and Review Team (JART)

The process whereby EQC and the relevant insurer would review building claims to assess whether it was likely to go overcap and if so, how it should be apportioned and settled. The JART report is a summary of the properties that had open building issues, categorised by the reason for the issue.

Kaikoura Earthquake ('KEQ')

The earthquake and related aftershocks that occurred on 14 November 2016, beginning 15 km north-east of Culverden and proceeded north-east through Kaikoura to Seddon.

Liability adequacy test (LAT)

A test applied under the **accounting standard** which consists of a comparison of the **unearned premium**, less deferred acquisition costs (DAC), against the **premium liability**. If the test indicates a deficiency, the DAC must be written down by an appropriate amount in the entity's income statement. If the deficiency is greater than the DAC, a premium deficiency reserve must be set up.

Material

In the context of an actuarial report, an item is deemed material if it is significant in the professional judgement of the actuary. This may not necessarily correspond exactly with 'material' as applied in an accounting context.

Net

Refers to the amounts of premiums, claims and expenses after allowing for the costs or income (including commission as well as claim recoveries) from reinsurance and other non-reinsurance recoveries.

Net outstanding claims liability

See **outstanding claims liability.**

Non-reinsurance recoveries

Non-reinsurance recoveries refer to the recoveries against claim payments that come from entities other than reinsurers. It includes amounts in respect of salvage and third parties. It doesn't refer to excesses and deductibles that are deducted from the claim.

Open claims

Those claims that have been **reported** to the insurer but are not regarded as finally settled as claim payments and/or recoveries associated with the claim, may occur in future.

Outstanding Claims Liability (OCL)

The expected value of future payments on claims that were **incurred** on or before the **effective valuation date**. This usually includes future **CHE** associated with those claims, allows for **discounting**, and includes a specified **risk margin**. It may be calculated **gross** or **net of reinsurance** and **non-reinsurance recoveries**.

Outstanding Claims Provisions

The amount in the insurer's accounts providing for **outstanding claims liabilities** at the accounting date.

Premium Liabilities

The value of future claim payments and related **CHE**, arising from future events for which the insurer is liable at the date of calculation.

Probability of adequacy

The statistical probability that a reserve or provision will ultimately prove to be adequate to provide for all relevant payments to be made.

Professional Standard

The form of professional guidance as issued by the New Zealand Society of Actuaries, or such other professional body as may be stated.

Red Zone

Canterbury land areas such that land repair would be prolonged and uneconomic. This includes flat land areas, which sustained significant crustal thinning and Port Hills areas which were at imminent risk of cliff collapse or rockfall. Also see Green Zone, TC1, TC2, and TC3.

Reinstatement premiums

Premiums that become payable under reinsurance treaties, particularly catastrophe reinsurances, when all or part of a layer of cover has been 'used' by the insurer making a claim, but the insurer wishes to reinstate full coverage for the remaining term of the treaty. A 'free reinstatement' may sometimes be included in the original terms of a treaty.

Reopened claims

Claims that had been regarded as settled (i.e. no further claim payments or recoveries) but for which claims records have since been reopened because an additional payment or receipt has been made or is now expected to be made. The **Outstanding Claims Liability** must take the possibility of claims reopening in future into account.

Reported

Claims are said to be reported if the insurer has been notified of their existence. This is in contrast to **IBNR** claims.

Resolved

For exposures settled by cash payment, the valid building, contents or land exposure is recorded as resolved when the claimant has been paid for that exposure. In the case where the building exposure is settled by managed repair, building exposures are only recorded as resolved when all planned repairs are complete (but the 90-day defect liability and warranty period may not have expired) and the customer has received a full cash payment from EQC for all contents and land exposures. Exposures are also considered resolved if the exposure has not been accepted and the customer informed.

Retention

The amount of risk retained by the direct insurer above which an excess of loss reinsurance will be triggered. Also see **excess**.

Risk-free discount rates

These are the rates of interest that would be available on a theoretical, riskless investment. In practice, they are the rates available on very secure investments, such as government bonds of suitable durations, which may be assumed to be free of default risk.

Risk Margin

The amount of extra provision over and above the **central estimate** which is intended to allow for the inherent uncertainty of insurance liabilities. The relevant **probability of adequacy** associated with the increased amount should be stated.

Sensitivity

The uncertainty in the calculation of insurance liabilities due to the assumptions involved. Accounting and **professional standards** require statements of the effects on the results to be illustrated by sensitivity tests. These involve reviewing the calculations after varying key assumptions.

Technical Category 1 – TC1

TC1 refers to Green Zone land where it was assessed that future land damage from liquefaction was unlikely. Residential buildings on TC1 land required no special foundation systems, relative to most flat land throughout New Zealand.

Technical Category 2 – TC2

TC2 refers to Green Zone land where it was assessed that minor to moderate land damage from liquefaction was possible in future large earthquakes. Residential buildings on TC2 land require face some restrictions on the type of foundation that is permitted, subject to the house design.

Technical Category 3 – TC3

TC3 refers to Green Zone land where it was assessed that moderate to significant land damage from liquefaction is possible in future large earthquakes. Residential buildings on TC3 land require a site specific geotechnical investigation and a specific engineering foundation design.

Uncertainty

Where full, known information is not available, uncertainty exists as to the exact nature and extent of the ultimate outcome. In particular, there is inherent uncertainty in any estimation of insurance liabilities, which are necessarily based on assumptions, usually derived from analyses of past experience. Deviations from estimates are normal and are to be expected. See also **central estimate, probability of adequacy** and **sensitivity**.

Unearned Premium

The proportion of written premium that relates to the risk still to be covered after the balance date or effective date of the valuation. The calculation usually assumes that premium is earned evenly over the term of a policy, except for unusual types of risk where this is clearly not the case (for example, Contractors All Risks). Should a policy be cancelled, the unearned premium as at the cancellation date may be refunded to the policyholder, possibly after allowance for expenses incurred.

Unearned Premium Reserve (UPR)

The total amount of **unearned premiums** held, reflecting the periods of future cover to be provided under policies in force at the balance date or effective date of the valuation.

Valuation date

The **effective date** as at which a valuation has been made.