

**IN THE HIGH COURT OF NEW ZEALAND  
CHRISTCHURCH REGISTRY**

**CIV 2013-409-000792  
[2014] NZHC 2344**

BETWEEN ANTHONY BRENDON MORRISON and  
GAIL CROSS  
Plaintiffs

AND VERO INSURANCE NEW ZEALAND  
LIMITED  
Defendant

Hearing: 12-16 May 2014  
17 May 2014  
19-22 May 2014  
27-28 May 2014

Counsel: S P Rennie and J E Bayley for Plaintiffs  
M Ring QC and P Hunt for Defendant

Judgment: 25 September 2014

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**JUDGMENT OF WHATA J**

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## **Introduction**

[1] The Tony Morrison Trust (TMT)<sup>1</sup> owns a building in Woolston, Christchurch. It was severely damaged by the Christchurch earthquakes. Vero Insurance New Zealand Limited (Vero) agreed to indemnify for damage to the building, capped at \$3,482,000 per event of loss. TMT claims there were five earthquake events causing loss to the building, namely on 4 September and 26 December 2010, and on 22 February, 6 April and 13 June 2011. If correct, the total amount payable under the policy is estimated by TMT at about \$13,100,000. Vero denies it is liable to indemnify five events of loss. Rather it says it was only liable to indemnify for damage caused by the September and February earthquakes. It says that the total amount payable (and in fact paid) for these events is about \$3,985,000.

[2] TMT employed modelling to identify five major events of loss and then to quantify the extent of the damage caused by those events. Vero rejects this modelling as unreliable. It also contends that most if not all major elements of the building required replacement after the February event so that subsequent damage to the same elements was not material damage for the purpose of an indemnity payment.

[3] The central issue to resolve therefore is whether the indemnity value is limited to the repair cost associated with the damage caused by the September 2010 and February 2011 earthquakes. This then raises the following key questions:

- (a) Is the modelling used by TMT reliable and substantially helpful in allocating damage and repair cost to events of loss?
- (b) What was the nature, scale and type of damage, if any, caused by each of the September, December, February, April and June earthquakes?
- (c) Was any material damage caused by earthquakes after the February earthquake for the purpose of an indemnity payment?

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<sup>1</sup> The plaintiffs are the trustees of TMT.

[4] There are other relatively minor issues relating to the notice requirements, the application of the deductible, and whether the cost of new piles should be included in the indemnity value.

[5] After the close of case, the Supreme Court delivered its judgment in *Ridgecrest NZ Ltd v IAG New Zealand Ltd*<sup>2</sup> and the Court of Appeal delivered its judgment on three related appeals *QBE Insurance (International Ltd) v Wild South Holdings Ltd (and Anor)*, *Marriot v Vero Insurance New Zealand Limited* and *Crystal Imports Limited v Certain Underwriters at Lloyds of London*<sup>3</sup> (*QBE et al* judgment). These judgments provide guidance on various issues of principle. As will become apparent, the full import of the principles established by these cases is ultimately coloured by their application to the specific policy and the facts of this case.<sup>4</sup>

### **Summary of findings**

[6] The modelling is reliable and substantially helpful for the purpose of quantifying the capacity for earthquake events to cause damage to the building and as an input for the assessment of the allocation of damage per event of loss. But I do not adopt the essentially arithmetic approach to allocation used by TMT to quantify the indemnity value (that is to multiply the modelled percentage impacts per event into the scope of total repairs). Rather a judgment is needed based on both qualitative and quantitative evidence as to the likely apportionment of damage and repair cost across the events.

[7] The majority of the damage to the building was caused by the February event and the remainder of the damage was caused by the September and June events. There is insufficient evidence to be able to conclude that material additional damage was caused by the December and April events.

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<sup>2</sup> *Ridgecrest New Zealand Ltd v IAG New Zealand Ltd* [2014] NZSC 117.

<sup>3</sup> *QBE Insurance (International Ltd) v Wild South Holdings Ltd* [2014] NZCA 447.

<sup>4</sup> The parties helpfully filed submissions on the import of these judgments, the last set filed on 23 September 2014. I have not repeated the submissions at length as this judgment is already prolix and long overdue. In any event, my position on them should be clear.

[8] I am unable to apportion the damage or scope of repair in a precise way. But I think that a reasonable allocation of damage and repair cost, in light of the evidence as a whole, should be as follows:

- (a) As per the Vero assessment for the purposes of the September event;
- (b) As per the repair recommendations of the Weidlinger report (March 2014) for the February event;
- (c) As per the repair recommendations of the Weidlinger report (March 2014) for the June event.

[9] Indemnity value is capped at the replacement value of an element, so that subsequent damage to an element that already needs to be replaced will not normally be material damage for the purpose of the policy. But, I find that on the balance of probabilities additional material damage requiring repair was caused by the June earthquake.

[10] Vero has not been materially prejudiced by the delay in receiving notice of the June event.

[11] The application of the “deductible” must be determined in accordance with evidence about the meaning of the term in insurance practice.

[12] The cost of new piles should not be included in the assessment of indemnity value. The cost of the new piles should however be included in the reinstatement value for the purposes of the Reinstatement memorandum.

[13] I propose to make declarations in terms of my findings.

## **Approach to Assessment**

[14] I approach the claim in three parts:

- (a) First, I will describe the context for the assessment;
- (b) Second, I will examine the nature, scale and timing of the damage caused by the earthquakes;
- (c) Third, in light of my factual findings, I will examine the extent of the indemnity liability under the policy to repair the damage.

## **PART 1 - Context**

### **The Building**

[15] The building is located at 23 Heathcote Street, Woolston, Christchurch. It is a two-storey industrial/commercial building constructed in the first half of the 20<sup>th</sup> century.<sup>5</sup> It was originally a wool scouring facility but has since been subdivided into multiple commercial workshop and storage type tenancies. As at November 2012 the building and tenants included among others, Canary Automotive, Affordable LockUp Storage, Furniture Recover Specialists, and InSitu.

[16] The site of the building is a gently sloping one from the front (north) down to the Heathcote River at the rear. The riverbank is approximately 15 metres from the rear of the building. The building is accessed via a downwards sloping driveway on the west side to the lower level ground floor and a relatively new suspended concrete ramp provides vehicular access to the upper floor on the east side. The building consists of cast-in-place concrete reinforced frames with concrete masonry unit infill walls at the perimeter of the structure. The first floor is a composite floor with a reinforced concrete slab supported on either an interspan flooring system which consists of precast concrete ribs and timber infills or in some areas a metal deck spanning between the beams of the concrete frame. The mezzanine floor in the ground storey has metal decks supported on steel frames. The mezzanine floor on the

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<sup>5</sup> There is some debate about the exact date of construction but that is not material for present purposes.

first storey is timber framed. Interior walls are timber framed partition walls with plasterboard. The building is supported on top of cast in-place reinforced concrete slab-on-ground and footings. The sawtooth and gabled roof of the building has corrugated asbestos cement panels or in some areas corrugated metal panels on timber framing.

### **The effects of the earthquakes on use**

[17] Prior to the earthquakes, Mr Morrison divided the building into ten tenancies and several common areas. Each of the tenancies was rented and he regularly collected rent from the tenants up to the beginning of the earthquake sequence. After the earthquake sequence the rear office lean-to portion of the building was no longer able to be used. Other tenancies were vacated by the original tenants due to damages. However, even after the major earthquakes, the vast majority continued to be leased either by the original or a new tenant. Mr Morrison continues to collect rent on behalf of TMT, albeit at reduced rates.

### **The claims process**

[18] Mr Morrison handled the claims process on behalf of TMT, via his broker, Marsh. Initially it appears Vero was prepared to enable Mr Morrison to relocate and to purchase similar properties up to the amount insured as a means of reinstatement. That option was, however, ultimately rejected by Vero. It appears that Risk Worldwide then took up the claims process in 2012 culminating in the submission of a comprehensive claims package to Vero on 17 December 2012. Vero then sought a per event claim analysis. This was provided by Risk Worldwide on 16 August 2013 together with an apportionment statement of loss in the amount of \$10,042,790.83.

[19] Vero did not accept the claim. Vero's initial assessment was an indemnity value payment of \$1,827,637.50 (recorded in an email dated 19 July 2011). Payment was then made upon the basis of assessed indemnity value at a depreciated replacement cost of \$1,630,000 and a payment of \$1,589,250. In the lead-up to trial Vero reviewed the amount it considered payable by way of indemnity value and this resulted in the further payment of \$2,322,626.70. In total therefore Vero has paid the

sum of \$3,904,193<sup>6</sup> in respect of the February event. Vero then reviewed whether a further indemnity value payment was due for September and elected to pay TMT a further \$79,881.

### **The policy**

[20] The policy sets the frame for the debate.

[21] The policy is a material damage and business interruption policy. The total sum insured is \$3,482,000 per event, subject to a deductible for earthquakes of 2.5 percent of the loss. There are other deductibles but these are quantified in dollar terms.

[22] The cover provided by the policy is captured in the following sections, namely:

#### **Material Damage and Business Interruption Policy (gross revenue)**

In consideration of the insured having paid or promised to pay the required premium and subject to the terms of this Policy, the Company agrees to indemnify the Insured as set out in the Sections of this Policy.

Further:

#### **Section 1 - Material Damage, Section 2 - Business Interruption**

Each Section of the Policy is to be interpreted as if issued as a separate policy and, unless the context requires otherwise, the word 'Policy' is to be read accordingly.

In this Policy, 'Event' means an event or series of events arising from any one cause during any period of 72 consecutive hours.

[23] The parties agree that in light of this clause, the policy is an event by event policy, with the amount of cover reinstating at the end of each event period.

[24] Section 1, Material Damage then defines the indemnity in this way:

If any physical loss or damage – unintended and unforeseen by the Insured – happens to any Insured Property during the Period of Insurance, the Company will indemnify the insured for that loss or damage.

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<sup>6</sup> This amount represents an indemnity value of \$4,004,300 less the deductible.

Except where expressly provided to the contrary, the Company's liability will not exceed the Sum Insured and, if more than one Item is included in the Schedule attaching to this Policy, will not exceed in respect of each Item the Sum Insured set against that Item.

[25] The parties also agree that this indemnity is an old for old indemnity, that is the object of the indemnity payment is to restore TMT to its position prior to the event of loss.

[26] Insured property is then defined:

“Insured Property” means tangible property of every description not expressly excluded, the Insured's own or held by the Insured jointly or in trust or on commission and for which the insured is responsible, or while located at any situation or other place anywhere in New Zealand.

[27] The policy also specifies certain exclusions.<sup>7</sup>

[28] While not directly relevant to a material damage claim, Section 2, Business Interruption, indemnifies TMT in the following terms:

... the amount by which the Gross Revenue during the Indemnity Period falls short, in consequence of Damage, of the Gross Revenue that would have been earned during that period had no Damage occurred.

[29] It also provides for claim preparation costs reasonably incurred.

[30] A cancellation condition enables the insured and the company to cancel by written notice. Such cancellations take effect on the 45<sup>th</sup> day after the notice has been delivered.

[31] Section 1 of the claims section states (in short) the insured must on becoming aware of any event giving or likely to give rise to a material damages claim:

(a) take prompt steps to minimise the loss or damage;

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<sup>7</sup> Including consequential economic loss such as loss of market or loss of profit, contract works, defective workmanship or design, deterioration (but this does not include loss or damage directly attributable to fire or other accidental cause), disappearance, interruption or cessation of any process, land movement, machinery damage, money, precious goods, pressure vessels, production process, certain specified property, settlement, shrinkage or expansion, employee theft, transit, vehicles, war confiscation and nuclear risks and weather.

- (b) take reasonable steps to protect the property from further loss or damage;
- (c) immediately notify the company;
- (d) if a criminal act is suspected, inform the police.

[32] The clause then goes on to state:

As soon as practicable after any event from which a claim arises, the Insured must submit full particulars of the claim in writing to the company and, at its own expense, provide the Company with any reasonably required proof and information in respect of that claim.

[33] The deductible is defined as follows:

Each loss or series of losses arising out of one Event will be adjusted separately... From each adjusted loss the amount specified in the Schedule will be deducted...

[34] By comparison, GST is to be accounted for in the following way:

Where the Insured is liable to pay GST on receiving any indemnity payment under this policy, the Company will reimburse the Insured for the cost of that tax. The reimbursement will be made in addition to the indemnity otherwise payable and will not be subject to any sum insured or other limit of the Company's liability.

[35] The terms of the policy are described as "conditions precedent to the Company's liability under this Policy".

[36] The policy also provides that where other insurance is available to the insured:

... this Policy will apply only to the amount of any loss in excess of that recoverable under the other insurance.

[37] The amount of loss excluded will not be cumulative on the amount of loss excluded from the policy by the application of the deductible, other insurance being permitted on loss without the deductible.

[38] Reinforcing its “event by event” character, the policy provides for reinstatement of the insured amount in the following terms:

In the event of loss for which a claim is payable under this Policy, and in the absence of written notice by the Company or the Insured to the contrary, any amount of insurance cancelled by the loss will be automatically reinstated. The Insured agrees to pay such pro rata premium at the applicable rate as may be required for the reinstatement.

[39] The policy states that the company may benefit from salvage, and to the extent that the insured retains salvaged goods, their reasonable salvage value will be deducted from the amount of the claim.

[40] A constructive total loss is defined as follows:

Where the Insured is prevented from reinstating any Insured Property by sole reason of any Law, the Insured Property will be deemed for all purposes of this policy to have been destroyed. For the purpose of this clause, ‘Law’ means any statutory, regulatory or code requirement imposed by the authority of any Act of Parliament or regulation or by-law promulgated by any lawful authority.

[41] The policy cover extends to demolition, damage to dependency property and to the cost of expediting repair or replacement and section 1 of the policy extends to cover all professional fees.

[42] The policy also deals with redundant foundations in this way:

Where the foundations of any building or plant are made redundant by reason of the reason and consequence of insured damage to the property resting on them and, if the value of the foundations is reduced as a result, the loss of value will be deemed to be loss by physical damage for the purposes of the claims under this Policy.

[43] It then provides:

If it is not necessary to demolish the foundations in order to reinstate damaged property, and if the presence of the abandoned foundations increases the market value of the property to which they are fixed, the amount of increase will be treated as salvage in the adjustment of loss for claim settlement purposes.

[44] The policy also includes a memorandum providing for Reinstatement in addition to simple indemnity. The policy provides in this regard:

In the event of any Insured Property to which this Memorandum applies being lost or damaged, the basis on which the amount payable under Section 1 of this Policy is to be calculated will be the cost of Reinstatement of that property. Insurance under this Memorandum is subject to the Special Provisions set out below.

[45] Reinstatement is then defined as follows:

Reinstatement means:

- (1) where property is lost or Destroyed its replacement by an Equivalent Building or by Equivalent Plant as the case may require.
- (2) where Property is damaged but not destroyed, the restoration of the damaged portion of the property to a condition substantially the same as, but not better or more extensive than, its condition when new, and including any alterations that may be necessary to comply with any Law.

[46] The Equivalent Building is then defined as follows:

- (1) a building or structure that is as nearly as practicable the same as the building or structure lost or Destroyed, using currently equivalent materials and techniques and incorporating such alterations as are necessary to comply with any Law.
- (2) where, as a result of any special circumstances, no building or structure that falls within the scope of paragraph (b) (1) can be constructed; a building or structure that is designed to perform a purpose or function the same as or equivalent to (but not more extensive than) that performed by the building or structure lost or Destroyed.
- (3) where, as a result of any special circumstances, no building or structure that falls within the scope of (b) (1) is suitable to the insured's reasonable requirement, a building or structure that is designed to perform a purpose or function suitable to that requirement, but not more extensive than that performed by the building or structure lost or Destroyed.

[47] Destroyed is then defined as follows:

“Destroyed” means so damaged by an insured that the property by reason only of that damage, cannot be repaired.

[48] Reinstatement includes any cost to comply with the law.

[49] There are limitations on the amount payable specified at subclause 3, relevantly:

- 3(b) Where the Insured property is damaged but not Destroyed, the Company's liability will not exceed the amount the Company could have been called upon to pay for Reinstatement if the property had been Destroyed.

[50] There are also express limitations, including that reinstatement on an alternative site must not exceed the cost to reinstate on the original site.

[51] Specifically relevant to the present case, circumstances where this memorandum does not apply include:

- (a) if the Insured elects not to Reinstatement the property;
- (b) if the work of Reinstatement is not commenced and carried out with reasonable despatch.
- (c) until the cost of Reinstatement has been actually incurred.

[52] Note also that where repair cannot occur by reason of any law, the reinstatement aspect does not apply.<sup>8</sup>

[53] I elaborate on the significance of these provisions in Part 3 below.

## **PART 2 – The nature, scale and timing of earthquake damage**

### **The investigations and reports**

[54] Visual inspections of the building were undertaken by Mr Roger Richardson after the September and February earthquakes and by Mr Stuart Preston for Batchelar McDougall Consulting (BMC) after the February earthquake. They produced reports based on their investigations. A further report was also produced by BMC in August 2013 by Mr David Southwick. MWH Recovery Limited (MWHR) priced a scope of the repairs based on the previous reports (including reports under taken on behalf of TMT). I now summarise the key findings of these reports.<sup>9</sup>

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<sup>8</sup> Reinstatement at 4(d).

<sup>9</sup> Knight Frank also produced a valuation report dated 20 May 2011. It provides a pre-loss market indemnity value of improvements on a depreciated cost basis at \$1,630,000. Neither party purported to rely on this valuation for the purpose of fixing an indemnity value of the loss.

*The Richardson reports*

[55] Mr Richardson's first report dated 5 November 2010 made the following observations about the effects of the September earthquake:

The building orientation to recent earthquakes has determined seismic action on or about the longitudinal axis of the structure. The principal damage inflicted is noticeable on the two long outside walls of the building. Principally damage is to masonry infill panels which exhibit boundary separation and diagonal shear cracking.

The concrete frame structure (protected by masonry walls) has behaved well without significant damage. In some cases it may be difficult to separate recent damage – close examination indicates older cracking. Some of which will have been awakened by seismic events.

.... In the event of a future building consent application, this building will require inspection, analysis and probably strengthening.

[56] A reasonably detailed repair schedule is then provided for the units, external walls and repairs to masonry.

[57] Mr Richardson concluded in evidence that a significant portion of observed damage involved cracking to ground floor slabs, beams and masonry walls, that would only need to be repaired through the injection of epoxy, patching mortar and/or other concrete mending products to return the building to the condition it was prior to the September earthquake.

[58] Mr Richardson's second report dated 11 March 2011 recorded the following in relation to the February earthquake:<sup>10</sup>

The recent seismic events have tested the building more severely and in general the building and its structure have survived reasonably well.

The issues reported on previously have further deteriorated, but not to the point where the main building has become dangerous.

[59] Key observations about the building were:

1. Much of the roofing to the main building is old style asbestos cement. (Supersix or similar). Some is on timber sarking. There is reported dust from the roof, this is most likely from on top of the sarking however.

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<sup>10</sup> At 1-2.

The A.C. roofing material has been fractured at corners, vent protrusions etc., and the dust from this (however unpleasant) is short lived and in small quantities only.

Patching and repair may be made to this material in accordance with sound trade practice.

2. Some further distress in masonry infill panels – long side walls. There is column separation at North West (front corner).
3. At N.E. (front) corner a previous crack in the foundation shows significant displacement (see previous photo 9).
4. Some lower external concrete frame elements have additional column cracks or they have been further awakened.
5. A more recent block wall addition adjacent to a column (unit 9) previously reported is more severe.
6. Further loss of support at the upper level of rafters over the single storey section of roof.
7. Significant cracks in the basement floor slab, particularly parallel to the road. Similar tension cracks occur in adjacent asphalt surfaces.
8. Increased separation between the main framed building and the additions front and rear.
9. Signs of local liquefaction with minimal sand/silt ejecta.
10. The concrete floor slab of the front tenant (in-situ concrete products) suffered heave due to liquefaction.

[60] The report then notes:

None of the above signs give immediate cause for concern as to the stability of the building in its present condition.

[61] The report goes on to say:

There are however, indications of subsoil instability on the site with lateral spreading of the ground towards the Heathcote River. This together with consolidation settlement of the sub-soils is a secondary effect of liquefaction experienced during the February 22<sup>nd</sup> event.

The separations between main building and both front and rear additions have increased considerably ie 40 mm at front joint and 75 mm at rear joint.

[62] The report also notes:

The building has also translated up to 100 mm towards the North West as evidenced by the separation distance at the concrete ramp upper level.

[63] Notwithstanding these observations the report records:

The building despite its defects was still serviceable and worthy of repair or at least securing. This is survival mode.

[64] The report says that “the combined aftershocks and especially several close to epicentre event of 22<sup>nd</sup> February, which caused significant city wide damage particularly due to liquefaction has compromised this collection of buildings”.

[65] The following insecure areas of the building are identified:

Street front offices (all single storey) due to insecurity of rafter connection at upper level concrete beam.

Rear block wall building (South corner) due to settlement problems.

[66] The report concludes:

In the short term, the building may continue to be serviceable and tenanted with restrictions noted previously.

The building should be considered to have a very short life and at this stage unlikely to benefit from cosmetic repairs.

Perhaps maintaining the roof weather tightness until applicant can be relocated is justified.

#### *The BMC reports*

[67] The first BMC report dated 13 May 2011 is based on the visual evidence and indications present at the time of inspection and recorded in a “RAPID Assessment Form - LEVEL 2” completed on 9 May 2011. No invasive or destructive investigations were carried out. The report observes:

The structure has been subjected to severe lateral spreading of the underlying soils due primarily to its close proximity to the Heathcote river. This has resulted in estimated overall displacement of the South wall of approximately 300mm towards the river.

This displacement has created separations along various portions of the building with severe cracking to columns, beams, foundations, structural walls and infill panels.

Portions of the ground floor slab on grade have experienced significant tilting and uplift. There is evidence that over 300mm of sand ejected as a

result of liquefaction was deposited in parts of the ground floor. Almost all of this has been removed but we are advised that some tens of cubic metres of sand was trucked away. This gives us some concern that it is possible large voids exist beneath the building.

[68] The report also refers to major cracking of walls and significant distortion of columns. The report observes:

The building has experienced considerable racking actions when subjected to the earthquake induced ground accelerations which has led to significant cracking and spalling in many concrete columns and beams.

[69] It also refers to:

- (a) numerous areas of damage to the roof and a large dislocation of the long-run roofing.
- (b) major cracking and tilting within the concrete frames and numerous flexural and shear cracks to the front concrete frame façade.
- (c) displacement of the façade by approximately 30mm towards the river and that many of the non-structural internal partitioning have experienced racking and associated cracking and distortion of door and window frames.

[70] It then observes:

It is possible that a detailed structural analysis of the building could show that the structure does not meet the minimum threshold of 33% NBS and consequently the building could be classified as earthquake-prone. If this is the case then structural strengthening may be required.

[71] The report concludes that the applied earthquake actions and lateral spreading of the underlying soils has resulted in major distortions and dislocations in most areas of the building. The report observes that when all the necessary remedial works is taken into consideration it is unlikely to be financially feasible to reinstate the building to an acceptable standard.

[72] The scope of works is then recommended including the following items:

Item	Description	Remedial Work
1	Roof Cladding	It is likely this will require complete removal and replacement to ensure a weathertight solution. (Approx 3000m <sup>2</sup> )
2	Internal partitioning and joinery	We anticipate this will all require complete removal and replacement both to ensure adequate repairs and to allow access to carry out the structural repair/reinstatement works.
3	Masonry Infill Panels	We recommend these all be demolished and removed off site and reconstructed in new materials either reinforced masonry or insitu concrete or timber framed. Timber framed elements may require fire-rating depending on their situation.
4	Internal Retaining Walls	These all require demolition and replacement most likely all reinforced masonry complete with new specifically design footings. Allow 40m long x 1.5m high.
5	Slabs on Grade	<p>At least 200m<sup>2</sup> in the lower level workshop area requires demolitions and replacement. Allow 150mm floor thickness.</p> <p>It may be necessary to remove ALL areas of floor slab to allow relevening and re-alignment works and to ensure competence of subgrade material.</p> <p>Any remaining areas of original slab will require significant areas of crack injections, under-slab injection jacking and/or grinding to provide an acceptable level platform.</p>
6	Driveways	Tension cracks in asphalt driveway require filling and patching.
7	Structural Releveling	We believe most columns will require jacking up to varying degrees as well as underpinning (subject to geotech advice). Underpinning may comprise multiple micropiles under each column with pile cap/pads to connect. Depth of piling works is unknown.

8	Structural Realignment	Lateral jacking of columns and pads in some cases by over 300 mm. We are unsure if this is even possible. It is unlikely complete verticality can be achieved as some deformations are likely to be permanent.
9	Concrete structural repairs	Damaged and spalled columns and beams require cleaning off of loose material, and re-establishment of cover concrete. We believe it likely that many elements will have severely corroded reinforcement. If this is the case then we believe there is an obligation to make it good which may involve forming new columns around the existing.
10	Structural Strengthening	Detailed structural analysis is required to determine building capacity relative to New Building Standard. If this is shown to be less than 33% then strengthening works will be required. Such work could be incorporated in the masonry infill panel replacement.

[73] The RAPID Assessment Form also records that the estimated overall building damage is estimated at 31-60%, that the “repairs necessary possibly uneconomical to repair” and “[r]epair unlikely to be economically feasible”.<sup>11</sup>

[74] Further repair recommendations were made in a subsequent report dated 30 August 2013 based on the foregoing reports and subsequent reviews by BMC, including an inspection on 21 May 2013. BMC considered there was no new damage since the May 2011 inspection, but that observed damage had worsened. The report concludes that previous repair scope does not need to be altered, though a potential alteration could be to demolish the lean to section of the building. There is general agreement with the Weidlinger Associates Inc report in terms of the types of repairs required (discussed below at [79]-[93]).

*Dr Ma's review of Weidlinger Associates Inc report*

[75] Dr Quincy Ma was retained by Vero to review a report prepared by Weidlinger Associates Inc (Weidlinger) purporting to model the damage caused by

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<sup>11</sup> The experts for Vero uniformly rejected in their evidence that this percentage was indicative of the overall actual damage caused by the February event caused by the February event.

five specified earthquake events. That assessment and modelling is examined in detail below. For present purposes it is sufficient to observe that Dr Ma concluded:

On a conceptual level, the review finds the WAI's approach is logical for allocating damage potential, provided ground shaking is the primary source of damage. The WAI's approach is underpinned by a technique that is widely accepted among structural engineers for estimating building response. However, as damage potential is not linearly related to the cost to remedy damage, and damage at the site of interest is potentially strongly influenced by soil liquefaction, this raises questions as to the appropriateness of the output in determining damage cost apportionment.

*MWH Recovery Ltd report*

[76] MWHR in a report<sup>12</sup> of 4 April 2014 priced the scope of repair in respect of the property. This followed a site visit on 6 March 2014. The estimate of repair works were detailed as follows:

- (a) September 2010 - \$65,123 (excl GST)
- (b) February 2011 - \$12,672,672.62 (excl GST)

[77] The report also estimates a cost of rebuild at \$11,843,255.62 (excl GST) as at 20 March 2014. The report observes that a "complete rebuild is the only logical approach to the structure" and that it is "impracticable to repair".

[78] These scoping estimates are accepted by TMT in terms of elemental repairs.

*The Weidlinger reports*

[79] TMT's case on the attribution of damage is essentially based on four reports by Weidlinger dated 30 November 2012, a geotechnical report by Davis Ogilvie dated November 2012, a supplemental Weidlinger report dated 13 August 2013, and a per earthquake event report dated 9 March 2014.<sup>13</sup> The first three reports formed part of a comprehensive claims package supplied by Risk Worldwide to Vero.

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<sup>12</sup> MWHR completed a reinstatement recommendation report in December 2011, verified in December 2012. This report refers to a site survey on 9 March 2011, but no evidence was given as to the nature and extent of this survey.

<sup>13</sup> An elemental replacement scope of works was prepared by Canterbury Solutions Project Management Limited dated 9 December 2012 (site visit on 20 August 2012). This has been

[80] The first Weidlinger report provided a detailed review of the nature, scale and type of damage to the building as a consequence of the Christchurch earthquakes. The report is based on a visual investigation of the interior and exterior of the building on 29 June 2012, together with the observations made in the Richardson report dated 5 November 2010, the BMC report dated 9 May 2011 and the geotechnical engineering report by Davis Ogilvie & Partners dated November 2012. The conclusions of this report include:

- (a) Severe and widespread damage to the structural and architectural building components as a result of in-plane and out-of-plane shear and flexural deformations caused by horizontal and vertical components of the intense ground motions as well as soil liquefaction and lateral spreading at the site;
- (b) Severe and widespread damage at the interface of various building components;
- (c) The tension and shear forces induced on the roof fasteners caused pullout and shearing of the fasteners, breakage of the roof deck asbestos cement panels, and splitting and deformations of the roof timber framing;
- (d) Extensive damage to many of the structural and non-structural components of the building;
- (e) The building envelope remains severely compromised and the building interior is exposed to the elements.

[81] The report then makes 19 repair recommendations of which 16 involve the removal and replacement or reconstruction of key elements of the building.

[82] The Davis Ogilvie report of November 2012 addressed geotechnical constraints for the continued commercial land use of the site. It made the following observations:

The fine-grained nature of near surface soils (clays) limits the liquefaction potential, which is reflected in the vertical settlement estimates in Table 7 of < than 5 – 45 mm in a SLS event to 12-140 mm in a ULS design event. These values are considered low in comparison to the damages sustained to the building on site, indicating that liquefaction-induced vertical settlement was not the primary cause of land damage.

[83] The report notes further:

Site observations indicated a cumulus of displacement beneath the building footprint of 180-220 mm. Additional lateral spreading in the order of 100 mm occurred between the building and bank of the Heathcote River. Lateral spreading up to 300 mm is considered realistic for the site based on new ULS design event modelling and site observation.

[84] The report then concludes:

The geotechnical investigation conducted at 23 Heathcote Street has determined that damages sustained to the pre-1950s warehouse building, were sustained primarily as a result of liquefaction-induced lateral spreading towards the Heathcote River.

[85] The second, supplemental Weidlinger report quantifies the sequential earthquake damage, employing hysteretic modelling (described below at [111]-[120]). Based on that modelling event contributions were allocated, namely 4 September 2010 - 22%, 26 December 2010 - 2%, 22 February 2011 - 61%, 16 April 2011 – 1% and 13 June 2011 - 14%.

[86] A final report then combines the two previous exercises to produce repair recommendations per earthquake event. It also draws on observations by Mr Morrison and others of physical damage. The report identifies the following building components were in need of repairs as a consequence of the September 2010 event:

1. Foundations.
2. Concrete slab-on-ground.
3. Hardscape and driveways.

4. Concrete masonry infill walls at the building perimeter.
5. Concrete columns, beams, and the first floor slab.
6. Roof deck, gable wall, and building façade asbestos cement panels.
7. Rooftop fixtures such as vents and cowlings.
8. Roof deck metal panels should be checked for damage and leaks; damaged areas should be repaired to achieve water tightness.
9. Water damaged interiors.
10. Roof timber framing and connections.
11. Partition wall finishes.
12. Windows and window frames.

[87] The following recommendations were made in relation to the December 2010 event:

1. Additional liquefaction damage to the slab-on-ground should be mitigated.
2. Further cracking of the concrete masonry infill walls at the building perimeter should be repaired using injection joint reinforcing.
3. Dislodged roof deck and gable wall asbestos cement panels should be reattached.
4. Roof deck panels and rooftop fixtures should be checked for damage and leaks; damaged areas should be repaired to achieve water tightness.
5. Water damage to the interiors should be mitigated.

[88] In relation to the February 2011 event, the report essentially repeats many of the 19 recommendations made in the previous report, though with some minor modifications for a few of them. In summary the report recommends:

1. New foundations should be installed with deep pile foundations.
2. The slab-on-ground should be removed and replaced.
3. Hardscape and driveways on the building grounds should be patched and repaired (in contrast to the recommendation in the previous report that the hardscape be removed and replaced).
4. All concrete masonry infill walls at the building perimeter should be removed and replaced.

5. Cracked concrete columns, beams, beam-column joints, and the first floor slab should be repaired by injecting epoxy.
6. The retaining wall along the elevation difference in the ground floor should be removed and replaced.
7. Roof deck, gable wall, and building façade asbestos cement panels should be removed and replaced.
8. Rooftop fixtures should be removed and replaced.
9. Roof deck metal panels should be checked for damage and leaks; damaged and sheared off metal roof deck panels and finishes should be removed and replaced.
10. The roof timber framing, trusses, and connections should be removed and replaced.
11. The front lean-to portion of the building should be reconstructed. (I note that this item does not correspond exactly to a similar recommendation in the previous report.)
12. Bent and tilted steel frames should be re-plumbed and realigned. (This compares to the previous recommendation that these items should be removed and replaced together with a further recommendation that the mezzanine floors supported by these frames should also be reconstructed).
13. Suspended ceilings and partition wall finishes should be removed and replaced.
14. Separations between the window and door frames and their surroundings should be re-secured and sealed. Racked, tilted, broken, and otherwise damaged windows and doors should be removed and replaced.
15. Buckled steel diagonal ties between steel girts should be removed and replaced.
16. Displaced and damaged downspouts, conduits, and other utility lines should be removed and replaced.
17. A repair protocol for the leaking well and artesian spring should be established.
18. The separation of the ramp from the building's first floor should be covered for heavy vehicle and equipment access; the broken and cracked ramp curbs should be removed and replaced; the ramp deck should be repaved.
19. The building requires structural strengthening and the new reinforced concrete masonry walls and foundations will be part of the structural strengthening measures. New steel braced frames which are designed per current building standards can be used to replace the existing girts and ties and complement the new walls for structural strengthening.

Portions of concrete beams and columns may also require wrapping fibre reinforced polymer (FRP) sheets as part of structural strengthening.

[89] The report recommends that 1% contribution to damage should be attributed to the April 2011 event, without identifying corresponding repair work.

[90] The repair recommendations for the June 2011 event were as follows:

1. Further cracking of concrete columns and beams should be repaired by injecting epoxy.
2. Blocked off areas of the building deemed unsafe should be reconstructed.
3. The rear addition to the building should be reconstructed.
4. Bent and tilted steel frames should be removed and replaced. The mezzanine floors supported by these frames should also be reconstructed.
5. Roof deck metal panels should be checked for damage and leaks; damaged and sheared off metal roof deck panels and finishes, if any, should be removed and replaced.
6. Displaced and damaged water utility lines should be removed and replaced.
7. Hardscape and driveways on the building grounds should be removed and replaced.

[91] The report also noted:

Damage to various components of the building was exacerbated due to the June 2011 event; however, these components are not listed in the scope of repairs for this event since their replacement has been included in the scope for the February 2011 event.

[92] A report by Senna Consulting then identifies an attribution of repair cost based on the modelled event contribution.<sup>14</sup>

<u>Date of Event</u>	<u>Repair Cost</u>		<u>GST</u>	<u>Totals</u>
	<u>Earthquake</u>	<u>Contribution</u>		
4-Sep-10	22%	\$2,641,716.38	\$396,257.46	\$ 3,037,973.83
26-Dec-10	1%	\$ 120,078.02	\$ 18,011.70	\$ 138,089.72
22-Feb-11	61%	\$7,324,759.04	\$1,098,713.86	\$ 8,423,472.90
16-Apr-11	2%	\$ 240,156.03	\$ 36,023.41	\$ 276,179.44
13-Jun-11	14%	\$1,681,092.24	\$252,163.84	\$ 1,933,256.08
		<u>Total</u>		\$13,808,971.97

<sup>14</sup>

[93] There were no investigations immediately after the June earthquake. But Dr Jain (and his team) for TMT and Messrs Preston, Southwick and Adam Ward for Vero carried out further inspections of the buildings some time later.

### **Pre hearing expert caucusing**

[94] On 13 February Drs Ma, Jain, Simsir and Arya executed a joint expert statement. Dr Ma had by this time undertaken a modelling exercise to assist him evaluate the robustness of the modelling undertaken by Dr Jain's team. The following table sets out the overall relative magnitudes of event allocation:

<b>Event</b>	<b>Weidlinger Results</b>	<b>Dr Ma's Revised Results</b>
4 September 2010	22%	9%
26 December 2010	2%	1%
22 February 2011	61%	57%
16 April 2011	1%	1%
13 June 2011	14%	32%

[95] They reached the following agreements:

- (a) Both Weidlinger Associates, Inc. (WAI) and Dr. Ma's modelling approaches have inherent simplifying assumptions. As such, there is a degree of uncertainty associated with both apportionment results.
  - (b) Depending on the inherent modelling assumptions, both full building analysis and analysis based on single degree of freedom models are capable of producing accurate predictions of a building's global response.
  - (c) The use of computer modelling, in lieu of more detailed information, is a consistent and practical platform to develop estimates of damage allocation between different earthquake events.
  - (d) Both analyses produced damage allocation based on hysteretic energy dissipation. This estimate of damage is not a direct equivalent to per-event cost of repair, but it is suitable as an input parameter by others to make further informed interpretations.
  - (e) Attributing cost to incremental physical damage determined from computer modelling was beyond the scope of this discussions between both parties.
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- (f) The effect of liquefaction was not explicitly included in WAI or Dr Ma's analyses.

[96] They were unable to agree the following matters:

- (a) Whether December 2010 and April 2011 events can be excluded from the damage allocation exercise.
- (b) The numeric allocation for the December 2010 and June 2011 earthquake events.

[97] The reasons for this disagreement were expressed as follows:

- (a) The parties have differing opinions on minimum percentages for which computed damaged predictions translate into physical damage;
- (b) The parties have reservations about certain aspects of the other party's analysis methodology developing the numeric allocation for the September 2010 and June 2011 events.

### **The evidence**

[98] The evidence largely adopts the outcomes of the various investigations and reports, so it is unnecessary to dwell on it at length. There is agreement that the latest MWHL estimates provided for the scope of repairs is suitable for the purposes of quantifying the repair cost (subject to resolution of the depreciation issue).

[99] Mr Morrison and Dr Jain presented the evidence for TMT. Mr Morrison provided a detailed outline of damage observed by him and others after each of the events. He also details the contact he made with his broker about the events. I elaborate on this evidence where necessary when dealing with the issues.

[100] Dr Jain is a highly qualified structural engineer.<sup>15</sup> He defended the approach taken by his firm to the assessment exercise. He also provided a photo essay of the evolution of earthquake related damage that he claims supports the modelling apportionment. He was cross examined at length. I will address the criticisms of his work, where necessary, in my assessment below at [122].

[101] Mr Cherry provided a narrative of events from Vero's perspective. Like Mr Morrison's evidence I will address it where necessary under the relevant issue.

[102] The expert team for Vero included several engineers<sup>16</sup>, a loss adjuster,<sup>17</sup> a project and programme manager<sup>18</sup>, construction manager,<sup>19</sup> and a registered valuer.<sup>20</sup>

[103] As already noted, Mr Richardson undertook visual inspections of the property after the September and February earthquakes and Mr Preston of BMC inspected the property after the February earthquake. Mr Richardson is a very experienced engineer, well familiar with the impacts of the Canterbury earthquakes. He elaborates on his reports as to the types of damage caused by these events. In combination they maintained in evidence that the vast majority of the damage was caused by the February earthquake, though Mr Richardson accepts that the central core of the building was not beyond repair after the February quake. Mr Preston considers that any damage caused by the June event would have been largely inconsequential given the effect of the February quake.

[104] Drs Ma<sup>21</sup> and Brooke<sup>22</sup> (both highly qualified engineers) address the modelling undertaken by Dr Jain's team and, in short reject it as a reliable means by which to apportion actual damage.

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<sup>15</sup> Dr Jain holds a PhD and a MSE in Structural Engineering, both from The John Hopkins University. He also hold a BTech in Civil engineering from the Indian Institute of Technology, Banaras Hindu University. He has performed extensive computer modelling and sophisticated analysis for the evaluation of structural performance failure and seismic hazard mitigation for over 20 years. He has published many works in his expert area and has also given expert evidence in numerous proceedings.

<sup>16</sup> Drs Ma and Brooke; Mr Richardson; Mr Southwick and Mr Preston;

<sup>17</sup> Stephen Frederick Youl.

<sup>18</sup> Gregory Scott Griffin.

<sup>19</sup> Adam Michael Ward.

<sup>20</sup> Malcolm Robert Penny.

<sup>21</sup> Dr Ma holds a BE (Honours) First class and PhD in civil engineering, both from the University of Auckland. He is a lecturer in the department of civil and environmental engineering at the

[105] In caucusing during the hearing Drs Ma, Brooke and Jain could not agree about reliability of the modelling. But it was agreed:<sup>23</sup>

For this building, analytical modelling results can be a reliable guide in determining repairs required at relevant dates, but only in conjunction with consideration of all available building information (quantitative and qualitative) and appropriate consideration of ground damage, such as the effects of liquefaction.

[106] They were also unable to agree as to the appropriate apportionment of damage caused by each earthquake or what the resultant estimated cost of repair might be. They did agree, however:

... the appropriate approach in achieving this would be for appropriately qualified experts to cost repair scopes developed for each event using the process outlined [above].

[107] A further round of caucusing took place with the purpose of determining whether the experts could agree a suitable methodology to apportion cost of repairs. No meaningful agreement was reached.

[108] Messrs Griffin, Keys and Penny also conferred on the issue of depreciation. Agreement was reached as to the general appreciation applicable to categories of damage. They were unable to reach agreement as to the amount of depreciation and/or betterment on foundation repairs and the installation of pilings. They were also unable to agree percentages applicable to preliminaries and general, contractor's margin and professional and consent fees. The primary reason for the disagreement was whether installation of pilings was a matter of betterment.

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University of Auckland with a specialisation in earthquake engineering, including experience in the stimulations of seismic loads on structures.

<sup>22</sup> Dr Brooke holds a Bachelor of Engineering with Honours and a PhD in Civil Engineering from the University of Auckland. He taught in the Department of Civil and Environmental Engineering at the University of Auckland for a four year period primarily in relation to reinforced and prestressed concrete, seismic design, and concrete materials technology. He is currently employed as a structural engineer at Compusoft Engineering Ltd.

<sup>23</sup> They were asked the following questions for the purpose of caucusing:

- (a) Is the WAI and/or Ma analysis/modelling reliable to apportion the damage caused by each earthquake?
- (b) If so, what is the appropriate apportionment of the damage caused by each earthquake?
- (c) What is the resulting estimated cost of repairing the damage caused by each earthquake?

[109] Finally, in terms of caucusing, an effort was made, albeit very late in the hearing, for the experts to agree on the apportionment of damage per earthquake event and what a detailed scope of works might be. Dr Jain, however, refused to engage in caucusing as he was still under cross-examination.

### **Allocation assessment**

[110] I have essayed at length the outcomes of the onsite engineering assessments. Only relatively minor damage was recorded for the September event. Major damage was recorded for the February event, and there is broad consensus about the level of works required to repair the damage caused by this event. There is little by way of expert evidence about the effect of the December and April events. There is some evidence about the effect of the June events, though this is partly supposition, because the building was not inspected immediately after the June event. All of this brings into focus the reliability of the modelling and the extent to which it provides a legitimate guide on the question of apportionment. I therefore turn to consider then the modelling in detail.

### *The modelling*

[111] In order to make proper sense of the value of the modelling it is necessary first to describe its components and then to address the criticisms of it.<sup>24</sup>

[112] The team at Weidlinger identified five large earthquakes for modelling purposes, namely on 4 September 2010, 26 December 2010, 22 February 2011, 16 April 2011 and 13 June 2011. These events resulted in peak ground acceleration (PGA) in excess of 0.10g in close proximity to the site and exceeded M 4.9. Other earthquakes above 4.9 were considered but not included in the evaluation if they produced a PGA of less than 0.10.

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<sup>24</sup> I have endeavoured where possible to simplify the description of the modelling. For an exact description refer to B Ayra, A Jain and C C Simsir “A Simplified Approach to Quantify Damage contribution of Individual Events in Canterbury Earthquake Sequence” (paper presented to Tenth US National Conference on Earthquake Engineering, Anchorage, Alaska, July 2014).

[113] The modelling then involved four key steps:

1. Develop site specific earthquake ground motion corresponding to each of the five large earthquakes in the Canterbury earthquake sequence.
2. Develop a Force-Deformation Curve (Capacity Curve) for the building's lateral load resisting system to represent its response to lateral (earthquake) forces.
3. Perform a nonlinear dynamic time-history analyses to determine the building's lateral force resisting system's response to the sequential application of each of the five large earthquakes in the Canterbury earthquake sequence.
4. Analyse the results of these nonlinear dynamic time-history analyses to compute the contribution of each of the five major earthquakes to the overall damage to the building's lateral load resisting system.

[114] In simple terms, these steps measure the ground shaking intensity of the specified earthquakes and their corresponding relative impact on the resilience of the building over time.

[115] Under Step 1, the ground motion or shaking associated with each event is estimated from the ground motion acceleration history recorded at nearby recording stations. This technique takes into account the different location of the recording stations by using a weighted average approach that assigns higher weights to stations that are located closer to the building site.<sup>25</sup> To determine the contribution of each of the earthquakes to the building's damage, the estimated ground acceleration time histories were combined to produce a single sequential event in the same order as they occurred on 4 September 2010 through to 13 June 2011.

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<sup>25</sup> Weidlinger Associates Inc *Supplemental Report: Quantification of Sequential Earthquake Damage to 23 Heathcote Street, Woolston, Christchurch* (13 August 2013) at 3.

[116] For the purposes of Step 2 and to calculate the building's<sup>26</sup> response to earthquake loading, the building was idealised as a Single Degree of Freedom (SDOF), a mathematical model. This model can be described pictorially as a lollipop on a stick. A capacity curve is then developed to represent the idealised building's ability to withstand shaking. The modellers used a software tool developed by FEMA<sup>27</sup> called HAZUS–MH. Capacity curves for buildings with various types of structural systems and materials have been developed as part of the HAZUS-MH database. These curves describe the pushover displacement of different structure types and seismic design levels as a function of lateral applied earthquake load. The HAZUS-MH capacity curves were however modified to account for buildings with characteristics similar to the building located at 23 Heathcote Street. These curves were then used to represent the building's lateral force resisting system's response to the earthquake loads.

[117] Step 3 involves subjecting the idealised building to the sequential ground motion time history described in Step 1. The interactive interface for incremental dynamic analysis procedure (IIDAP) computer program was used to perform a nonlinear dynamic time-history analysis. This software uses what is called deteriorating hysteretic models that are said to capture all the important deterioration modes of a component and is able to simulate the building (and its parts) reaching a collapsed limit state. This enables the plotting of cyclic force-deformation (hysteresis) response of the building's systems during the earthquake sequence. A hysteresis<sup>28</sup> curve then traces the response of the building during repeated loading and unloading cycles that occurred during earthquakes.

[118] Step 4 involves measuring the hysteretic energy dissipated through these cycles. It assumes that when the earthquake demand or loading exceeds the deformation capacity of the structure, most of the energy is dissipated through the inelastic actions of the structure, resulting in displacement and damage. Conversely an elastic response of the building's lateral force resisting structures occurs when the

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<sup>26</sup> That is, the building's lateral force resisting system.

<sup>27</sup> FEMA is the Federal Emergency Management Agency in the United States.

<sup>28</sup> A hysteresis curve times the response of the building during repeated loading and unloading cycles that occur during earthquakes.

components remain within their force deformation capacity and little or no displacement or damage is expected.

[119] To determine the contributions of each earthquake, the energy dissipated through hysteresis is calculated at the end of each event using the SDOF model in the IIDAP software. A comparison of dissipated energies at the end of each event is said to reveal the relative contribution of each event to the total hysteresis energy dissipated through the earthquakes. This is then said to enable correlation to the level of damage for each event.

[120] Table 2.2 (replicated below) identifies the hysteretic energy dissipated with each earthquake event. This is said to provide a basis for allocation of the energy to each event which then can in turn be related to the percentage contribution to the damage likely caused by each event, also recorded in the table.

	<b>Energy Absorbed</b>	<b>Energy Absorbed</b>	<b>Energy Absorbed</b>	<b>Event Contribution</b>
4-Sep-10	1297	2278	3575	22%
26-Dec-10	218	58	276	2%
22-Feb-11	5402	4498	9900	61%
16-Apr-11	48	40	89	1%
13-Jun-11	498	1803	2301	14%

#### *The criticisms*

[121] In closing, Mr Ring helpfully summarised his expert team's key problems with the modelling. In summary;

- (a) The modelling is so unreliable that it cannot possibly be substantially helpful;
- (b) Dr Jain lacks requisite independence, contrary to the expert code of conduct;

- (c) Hysteretic modelling measures only the capacity to cause damage, not actual damage;
- (d) The modelling is novel and has not been presented to, let alone accepted by the engineering community or the judiciary;
- (e) There are bugs in the software;<sup>29</sup>
- (f) The modelling was rejected in caucusing by Dr's Ma and Brooke as both unnecessary and flawed;
- (h) The modelling involves multiple assumptions that are untested and unsupported by professional literature;
- (i) Various inputs are flawed, including questionable observational 'evidence', arbitrary criteria for including earthquakes, use of weighted averages, modelling based on an erroneous north/south, east/west components when the building is orientated north-east/south-west and north-west/south-east, and use of inapposite values based on US construction standards;
- (j) The outputs assume an unproven relationship between modelled dissipation of energy and actual damage;
- (k) The modelling has not been validated - and Dr Jain's photo essay (said to identify the progression of damage) is highly disputable;
- (l) There is no correlation between the modelled outputs and reality - noting that the modelled output for September is 22% or \$3.2 million

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<sup>29</sup> I do not propose to say more about this because the relevant bug was identified and its insignificance explained by Dr Jain. It should have been dealt with and resolved in caucusing. One of the graphs explaining the relationship between acceleration and displacement suggests a mismatch between input time for acceleration of 170 seconds and an output time for displacement of 185 seconds. But as Dr Jain explained: "if we track the hysteresis energy by itself, the force versus time then it shows exactly the same time as the input time so in terms of the way it's displayed, there is a, a known problem but in terms of the analysis and the algorithm itself we've check for data". There is therefore no underlying error of substance.

in repair cost while the actual cost of repair based on visual inspection is estimated at \$82,381.

[122] I accept that some of these criticisms have merit. The modelling measures the capacity to cause damage or impact rather than actual damage. As stated by Dr Ma, the relationship between the modelling outputs and actual damage is not demonstrably linear and the outputs of the modelling have not yet been validated in any empirical way. Dr Jain's photo essay involves a high level of subjective interpretation and I think cannot be relied upon for validation purposes in a scientific sense (though I accept that it provides support for the basic proposition that the September, February and June earthquakes caused additional damage). The modelling is also novel in the sense that it uses energy dissipation rather than displacement per se to measure relative impact and this has not yet received recognition by the engineering community.<sup>30</sup> Some of the inputs used are questionable, for example the use of a north south axis was erroneous. Furthermore, as Dr Jain conceded, the modelling does not take into account the effects of liquefaction. These effects have to separately factored into the impact and allocation assessment.

[123] But I do not accept that the modelling is so unreliable that it is not substantially helpful to me for the purpose of the assessment of the *relative* impact of the earthquakes and as an input into the evaluation of the allocation of damage across the earthquakes. Dr Ma stated in evidence that:

On a conceptual level, and in lieu of actual observed evidence of damage per-event, this modelling approach is logical for allocating damage potential provided ground shaking is the primary source of damage.

[124] Drs Jain and Ma also agreed in caucusing that:

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<sup>30</sup> I accept however that the use of the core components of the modelling for earthquake impact assessment is not novel: refer S R Uma and Others "Comparison of Main-Shock and Aftershock Fragility Curves Developed for New Zealand and US Buildings" (paper presented to the North Pacific Conference on Earthquake Engineering, Auckland, New Zealand, 14-16 April 2011) for the use of HAZUS capacity curves; and Daecon Kang, Masaki Maeda and Waon-Ho Yi "Post-Earthquake Capacity Evaluation of Reinforced Concrete Buildings based on Seismic Response Analysis" (paper presented to the 13<sup>th</sup> World Conference on Earthquake Engineering, Vancouver, Canada, 1-6 August 2004) and Y Nakaho, H Choi and N Takahashi "Residual Seismic Capacity Estimation of RC Frames with Concrete Block Infill based on their Crack Widths" (paper presented to the International Symposium on Seismic Risk Reduction, Bucharest, Romania, 2007) for use of hysteretic energy dissipation to establish the seismic capacity of a structure.

Both analyses produced damage allocation based on hysteretic energy dissipation. This estimate of damage is not a direct equivalent to per-event cost of repair, but it is suitable as an input parameter by others to make further informed interpretations.

[125] Later Drs Jain, Ma and Brooke also agreed that:

For this building, analytical modelling results can be a reliable guide in determining repairs required at relevant dates, but only in conjunction with consideration of all available building information (quantitative and qualitative) and appropriate consideration of ground damage, such as the effects of liquefaction.

[126] While both Drs Ma and Brooke appeared at times to be retreating from the agreed positions<sup>31</sup>, I consider that their primary objection was to the use of the modelling to literally or arithmetically attribute a precise level of damage to each of the identified events. I do not think they rejected outright the potential use of this modelling or similar modelling as input to what must be an overall engineering evaluation of scale of impact and related damage. Dr Brooke for example has undertaken a number of modelling exercises in the context of the Christchurch earthquakes given the paucity of available and reliable information about the level of damage caused by earthquake events.<sup>32</sup> He also accepted in questioning from me that on the central issue of the probability of damage occurring, the modelling used by him is conceptually similar to Dr Jain's modelling.

[127] Furthermore I reject the fine grained criticisms of the modelling inputs.<sup>33</sup> These inputs were developed by a team of highly qualified experts on modelling earthquake damage. I was not taken to any statistical or empirical analysis that

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<sup>31</sup> For example Dr Ma clarified in supplementary evidence that “[a]t best, hysteretic energy dissipation is only useful as a guide of rough damage potential, to supplement other more direct allocation of approaches based on actual damage and actual cost”. He also added that further probabilistic analysis was required.

<sup>32</sup> Dr Brooke's modelling uses displacement rather than energy dissipation to measure the probability of damage in the absence of detailed onsite information. He has greater confidence in this modelling because it is based on simplified versions of well documented fragility information to make a translation between displacement and the likelihood of the occurrence of damage.

<sup>33</sup> These criticisms included that:

- (a) The structure was unpredictable;
- (b) Displacement is a better measure;
- (c) The modelling did not include large aftershocks;
- (c) The modelling did not use two stations to measure PGA;
- (e) The use of average weighting methodology was flawed.

revealed the materiality of the alleged error or errors specific to this context. To illustrate, Dr Ma criticised the use of HAZUS-MH capacity values because they were not intended for assessment of individual buildings. Dr Ma also cited literature suggesting that nominally similar buildings can have vastly different damage during an earthquake event. He also says that the wrong HAZUS code was used.<sup>34</sup> However, Dr Ma also noted in his independent explanation to the joint expert report when dealing with the use of HAZUS values that “the results [of the modelling] should be view[ed] as an informed estimate rather than an exact solution.” He added that “it would be more sensible to ignore any energy dissipation estimate below 5%”. All of this suggests that the identified error is not a fatal flaw and that the modelling can still be useful.

[128] Relevantly also, unlike Dr Jain’s team, Dr Ma has not undertaken a detailed inspection of the building or its characteristics to inform his view as to the appropriateness or otherwise of the use made by Weidlinger of the HAZUS-MH capacity values.

[129] Moreover, the outputs from the modelling exercises undertaken by Dr Ma and Dr Jain appear to represent a reasonable frame for the assessment of relative ground shaking impact or capacity to cause damage. As Dr Ma recorded in his independent explanation to the caucusing notes:

My view is that the true damage allocation based on energy dissipation may lie between the two sets of estimates.

[130] In short, the modelling provides helpful (though coarse) information about the relative scale of the impact of ground shaking which then may assist in assessing the quantum of the repairable damage associated with each earthquake. For completeness I do not accept Dr Brooke’s belated modelling assessment provided during the course of the hearing. It could not possibly have the rigour required of scientific modelling given the time taken to prepare it. In fairness to him he was responding to a forlorn request from me for the experts to reach some agreement on modelling outcomes.

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<sup>34</sup> The authors of Uma and Others, above n 28 also cautioned against use of the HAZUS parameters outside of the US, but they too could not be definitive about the significance of the difference between US (HAZUS) based models and NZ based models.

[131] Some emphasis was placed by Mr Ring on the difference between the modelled apportionment of damage to the September event (22% - equating to \$3.2 million as compared to the identified scope of repairs of about \$82,831. But this conflates two measures. The modelling measures ground shaking impacts, while the MWH scope of repairs is based on visual inspection (only) of the effects of the impacts. The latter does not necessarily invalidate the former. Systemic or structural damage may not fully reveal itself via a visual inspection. Rather, the two assessments should be combined to arrive at a realistic appraisal of the likely repair required after each event, including among other things structural repair and strengthening.

[132] Furthermore, the differences of opinion about the inputs are matters on which qualified experts might reasonably disagree. Unfortunately however Dr Brooke only spent two to three hours over a few days to prepare his evidence<sup>35</sup> and he did not engage in the court assigned pre-hearing caucusing. Nor did he visit the site to test his assumptions. Dr Ma conceded in cross examination that a site visit would have been helpful. Instead both of them relied wholly on the reports of others. In this context, I prefer the work of a highly qualified team that visually assessed the particular characteristics of the site and the damage and applied a modelling exercise that best fits those characteristics. The axis error is, I accept, problematic and the modelling cannot accommodate the effects of liquefaction. But if the modelling percentages are applied simply as an input in combination with other available information for use by suitably qualified experts (rather than as a mechanism to apportion damage per se), then the significance of these errors is greatly diminished.

[133] I also reject the submission that Dr Jain lacked requisite independence. His evidence appeared to trespass at times into advocacy, for example his tabular breakdown of inconsistencies between the evidence given by the defendant's expert team was a step too far. But he can hardly be singled out for that criticism when Dr Brooke explained that the purpose of his evidence was to outline the weaknesses of Dr Jain's evidence. I also put no store in the fact that Risk Worldwide had the

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<sup>35</sup> Because Dr Davidson who was assigned to give evidence was removed from the expert team after having confronted Dr Jain on the first day of the hearing with the suggestion that he "would be in jail by the end of the day".

temerity to identify Dr Jain as one of their team. I accept his explanation that this was done without his approval. Moreover, his curriculum vitae reveals a depth and breadth of experience that does not support the inference that he or his team have been captured by Risk World Wide. Rather it reveals both strong academic and experiential expertise on the specific issues before me.

[134] Mr Ring also spent some considerable time in cross examination on the number of hours charged by Dr Jain on the modelling exercise. It has to be said that his direct contribution in a charge out sense was modest. But the modelling was plainly a team exercise, exemplified by the fact that all three of the primary experts involved in the modelling caucused with Dr Ma, as was entirely appropriate. It would have been a waste of Court time to call all three experts only to have them comment on the same subject matter.

[135] Finally, the Vero experts maintain that there is sufficient information upon which to assess the relative damage caused by the earthquakes without the use of the modelling. But the inspections involved lower order investigations. There was no invasive testing at all and no visual or other investigation immediately after the June earthquakes. There are also contradicting accounts between the investigating experts as to whether the building was capable of repair or was destroyed after the February earthquake. Mr Preston concluded that the building was effectively destroyed, while Mr Richardson accepted that the central section was capable of repair. Drs Ma and Brooke did not visit the site at all, so their views are at best second hand. In this context, modelling of relative impacts has a role to play in the evaluation as an “informed estimate”.<sup>36</sup>

[136] Accordingly, the modelling undertaken by Dr Jain and his team is substantially helpful for the limited purpose of understanding the relative impact of

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<sup>36</sup> In this regard I endorse the observations of Gross J in *Equitas Ltd v R & Q Reinsurance Company* [2009] EQHC 2787 (Comm) at [208], cited to me by Mr Rennie:

... I am persuaded that the models are both capable of making the transition from the general to the particular and do go on to provide a reasonable representation of reality. Through the use of the conservative 10<sup>th</sup> percentile approach and appropriate discounting, I am satisfied that the models furnish an acceptable, soundly based route to establishing the properly recoverable minimum losses sustained by the syndicates, having regard to the applicable burden and standard of proof. The models therefore assist in doing practical justice in this case – a solution emphatically preferable to leaving the losses to lie crudely where they fall.

ground shaking on the building, especially given the absence of detailed structural or invasive investigations immediately after each earthquake event. Its weaknesses need to be acknowledged, including the inability of the modelling to incorporate the effects of liquefaction. But it is preferable to use modelling outputs that Drs Ma and Jain agreed could be used as an input by others.

*The evidence as a whole*

[137] The evidence suggests that on balance the largest impacts on the building occurred on 22 February 2011. The modelling estimates that between 57-61% of the ground shaking impacts occurred on this day. The visual inspections revealed that very significant lateral displacement (over 300mm in places)<sup>37</sup> was also caused by liquefaction at this time. The 19 repair recommendations in the Weidlinger report provide a detailed resume of both significant structural and non structural damage, with most structural elements requiring replacing or reconstruction after the February event.

[138] I am unable to accept Dr Jain's conclusion that the liquefaction caused only approximately 5% of damage to the structure of the main building when compared to hysteretic energy. The Davis Ogilvie report (adopted by the Weidlinger team) concluded:

The geotechnical investigation concluded at 23 Heathcote Street has determined that damages sustained to the pre-1950s warehouse building, were sustained primarily as a result of liquifaction-induced lateral spreading towards the Heathcote river.

[139] Unfortunately the authors of this report were not called to give evidence to confirm or clarify the provenance of this conclusion. But both parties relied on this report, and it is difficult to reconcile a 5% impact contribution with this conclusion.

[140] I do not accept however that the building was effectively destroyed by this earthquake. Mr Richardson was in the unique position of having inspected the

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<sup>37</sup> This corresponds to the conclusions of the Davis Ogilvie report, namely: Site observations indicated a cumulative displacement beneath the building of 180-220 mm. Additional lateral spreading in the order of 100mm occurred between the building and bank of the Heathcote River. Lateral spreading up to 300 mm is considered realistic for the site based on ULS design event modeling and site observations. This report was not formally produced by its authors, but both parties adopted it.

building shortly after the September and February earthquakes. He presented as a considered and objective witness. His report, from which he did not resile, concluded that “the building and its structure survived reasonably well” and that the “issues reported on previously have further deteriorated, but not to the point where the main building has become dangerous”. He also observed through caucusing<sup>38</sup> and in evidence that the building was capable of repair following the February earthquake. This robust assessment broadly marries with Dr Jain’s assessment that the core building remained intact following the February event. I come to the significance of this below.

[141] The modelling also estimates that 9-22% of the ground shaking impacts occurred with the September earthquake. There is very little probative evidence of any liquefaction damage occurring at this time, with Mr Morrison ultimately conceding that he may have been wrong about the observation of liquefaction related damage after the September event and that he relied on hearsay observations from a tenant about liquefaction inside the building. The inspection by Mr Richardson also revealed only relatively minor observable damage to the building. While it may be that a greater level of structural damage was caused by the September quake than the visual inspection revealed, I am not convinced on the balance of probabilities that the damage requiring repair correlates closely to the modelled percentage of ground shaking impacts. Rather I prefer to adopt Mr Richardson’s assessment overall.

[142] I am also unable to find on the balance of probabilities that the December and April events caused additional damage that would have required further repairs of substance at that time. Dr Jain’s team relied on “eye witness” accounts of additional damage to the building after these events. But only Mr Morrison was called to give evidence about what he observed. He is not an expert, but even if I accept his account, he lists only a handful of items for the purpose of the December event and does not record any specific observed damage for the April event. The modelling estimates 1-2% of the impacts occurred during these events. There is debate about whether these percentages fall within the margin of error. I think they must be close

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<sup>38</sup> Mr Richardson did not complete caucusing. Unfortunately a solicitor for Vero intervened in the caucusing process with the result that Mr Richardson’s caucusing views did not form part of an agreed statement. However, correspondence between Dr Jain and Mr Richardson revealed that Mr Richardson accepted that the building was capable of repair after the February event.

to it given the inherently coarse nature of the modelling. Accordingly, in the absence of firm observational evidence corroborating marginal modelled impacts, I do not consider that there is a sufficient basis for findings about the quantum of damage.

[143] The modelling estimates that 14-32% of the ground shaking impacts occurred with the June 2011 event. No visual inspection was undertaken immediately after this event in order to be able to assess what additional effect, if any, is attributable to this ground shaking. BMC and Messrs Preston and Southwick in particular maintain that no material additional damage was caused by the June earthquake based on inspections in 2012 and 2013. Weidlinger however have identified specific damage they consider can be attributed to the June earthquake, and Dr Ma accepted under cross examination that additional damage was likely to have been caused by the June earthquake.

[144] The scale of the impact and the nature of the damage caused by the June earthquake is, as I have said, something about which reasonable experts can disagree. In reality none of the experts have the benefit of invasive testing at any of the key times by which a fully informed comparative assessment can be made. It is in this context that the modelling has its greatest value as an input. Only the Weidlinger team was prepared to incorporate the modelling outputs directly into their assessment and I consider that this places them in a superior position to the experts for Vero. I also consider that there is qualitative support for their assessment from the photo essay produced by Dr Jain. I have mentioned the limitations of this photo essay. It must be approached with caution. But in my view several of the photos reveal clearly discernible additional damage to the building after the June event. Therefore the Weidlinger assessment of the additional damage attributable to the June event is to be preferred over the evidence of BMC and MWHR.

## **Conclusion**

[145] In the result, I am satisfied on the balance of probabilities that a reasonable allocation of damage and related repair scope, in light of the evidence, should be as follows:

- (a) As per the Vero assessment for the purposes of the September event;

- (b) As per the repair recommendations of the Weidlinger report (March 2014) for the February event ;
- (c) As per the repair recommendations of the Weidlinger report (March 2014) for the June event.

### **PART 3 – The indemnity**

#### *Material Damage*

[146] The remaining issue is whether any "material" damage was caused by earthquakes after the February event. Mr Ring maintained that Vero can never be required to pay more than to replace a damaged item.<sup>39</sup> In light of *Ridgecrest*<sup>40</sup> there can be no dispute about this.<sup>41</sup> Furthermore, the “notional” repair cost caused by successive damaging events can never exceed the actual repair cost.<sup>42</sup> Nevertheless I am satisfied for reasons that I will explain that the policy triggers an indemnity payment for the June repairs.

[147] First, as the Court of Appeal stated in *Arrow International Ltd v QBE Insurance (International) Ltd*, the “trigger for coverage ... must be firmly grounded in the policy wording”.<sup>43</sup> I have essayed the salient provisions of the policy at [20]-[52]. In short, the policy, in plain terms, indemnifies the insured for “any physical loss or damage” to “tangible property” up to the “Sum Insured” on an

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<sup>39</sup> Citing *Arrow International Ltd v QBE Insurance (International) Ltd* [2010] NZCA 408, [2010] 3 NZLR 857 at [32] [*Arrow*].

<sup>40</sup> *Ridgecrest NZ Ltd v IAG New Zealand Ltd* [2014] NZSC 117 at [54].

<sup>41</sup> This logic is expressly employed in the policy insofar as the Reinstatement payment is capped at what could have been paid to reinstate the property had it been destroyed (Reinstatement, Special provisions at cl 3(b)). Destroyed in this context means “so damaged by an insured event that the property by reason only of that damage, cannot be repaired”. This reasoning also appeals to common sense. An insured will not rationally insure something that is a ‘total loss’ and an insurer will not expect to have to pay for damage to an item that is already written off. Refer *Allwright v Queensland Insurance Co Ltd* (1966) 84 WN (Pt 1) 378 (NSWSC); and see *Transfield Shipping Inc v Mercator Shipping Inc (The Achilleas)* [2008] UKHC 48 [2008] 3 WLR 345 as to reasonable expectation.

<sup>42</sup> *QBE et al* at [86] and [91]. In adopting this obiter statement of principle, I should not be taken to accept that it has universal application. It presupposes that the purpose of the indemnity (as opposed to reinstatement) is to achieve complete repair of the damaged item rather than compensate for material loss or damage. There may be circumstances where complete actual repair is not feasible, but partial repair of successive damage has functional value to the insured, thereby justifying ongoing separate indemnity cover.

<sup>43</sup> *Arrow* above n 39, at [18].

“event by event” basis. Therefore, the policy on its face indemnifies the insured for any damage, including cumulative damage to the building caused by each event.<sup>44</sup>

[148] Second, the object of the indemnity payment is to restore the insured to the position it would have been in had no damage occurred.<sup>45</sup> This is the contracted for performance interest that must be achieved by the indemnity payment. Presumptively that performance interest is not discharged unless TMT is restored, in money terms, to the status quo prior to each event of loss.<sup>46</sup>

[149] Third, the parties agreed to notify each other if they did not agree to the sum insured reinstating. The policy states:

In the event of loss for which a claim is payable under this Policy, and in the absence of written notice by the Company or the Insured to the contrary, any amount of insurance cancelled by the loss will be automatically reinstated. The Insured agrees to pay such pro-rata premium at the applicable rate as may be required for the reinstatement.

[150] There is also a right to cancel on 45 days notice.

[151] The February ‘event of loss’ must have been known to Vero. Presumably also by the end of March both parties (and at least Vero) had the Richardson reports and were aware of the extent of the recorded damage to the building. They then had the BMC report by the end of May. I understand all relevant premiums were paid. Objectively assessed therefore, the parties agreed, on an informed basis, to (a) the

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<sup>44</sup> By contrast, in *Arrow* the policy liability was “consequent upon...physical ...damage happening...during the period of insurance”. The Court found that cover for this liability required a definitive finding that Arrow’s liability “was consequent upon damage that was happening during the period of insurance” [at 19]. The court found that the damage “had already happened before QBE came on risk” [at 21]. The Vero policy specifically envisages multiple event by event claims, with each event giving rise to a fresh basis for claim for any additional damage caused by it.

<sup>45</sup> This is expressly contemplated in relation to business interruption to the effect that the insured is indemnified for “the Gross Revenue that would have been earned during [the policy] period had no Damage occurred”. While the Business Interruption section of the policy is to be treated as if issued as a separate policy, it does not make sense for the Material Damage section to adopt a different definition of indemnity. Refer also *TJK/NZ Ltd v Mitsui Sumitomo Insurance Co Ltd* [2013] NZHC 298 at [33] per Miller J: “...in a contract of indemnity the term normally means the actual amount of pecuniary loss that the insured suffered when an insured event happened”.

<sup>46</sup> Refer also to *QBE et al* where a similar conclusion was reached in relation to comparable event by event policies at [55], [88] and [142]. This also aligns with the longstanding principle dealing with a lessee’s obligation to repair. The prima facie rule is that a lessee’s obligation to repair must be discharged (*Joyner v Weeks* [1891] 2 QB 31 (CA)) unless it can be shown by cogent evidence that the lessor would definitely suffer no loss in the short or long term (*Maori Trustee v Rogross Farms Ltd* [1994] 3 NZLR 410 (CA)).

reinstatement of the sum insured after each event, (b) the ongoing indemnity for additional physical loss or damage and (c) that the building was worth insuring after the February event.<sup>47</sup>

[152] Fourth, ongoing insurance against additional or further damage was ostensibly justified in order to maintain the status quo in this case. Parts of the building remained occupied after the February earthquake presumably relying on Mr Richardson's engineering advice that it remained safe to occupy, albeit for the short term.

[153] Fifth, we cannot know with any real surety when a given item or element reached the point where it became unusable without total replacement; that is when ongoing repair and maintenance became pointless for the purpose of indemnity. The following observation made in the Weidlinger report therefore assumes significance:

Damage to various components of the building was exacerbated due to the June 2011 event; however, these components are not listed in the scope of repairs for this event since their replacement has been included in the scope for the February 2011 event.

[154] If this aspect of the report is accepted, the June repair scope relates only to items that have not been included for replacement for the February event. Some of the items appear to partially overlap with repair recommendations for the February event.<sup>48</sup> On closer examination however, each of the additional items of repair relates to cumulative damage on items that did not previously require replacement. Furthermore, when the evidence is approached as a whole, including the modelled relative impact of the June event, providing for those matters in the June scope of repair is plainly justified. Conversely, it is highly improbable that an earthquake of the scale of the June earthquake caused no material damage to the status quo.

[155] I am therefore satisfied, subject to the issue of notice, that Vero is liable to separately indemnify TMT for the repair items associated with the additional damage to the building caused by the June event and as listed in the Weidlinger report

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<sup>47</sup> This accords with the principle established in *QBE et al* at [55], namely that either party may by notice cancel reinstatement, but such notice takes effect prospectively, leaving in place both cover and liability for any additional premium for the period between reinstatement and notice.

<sup>48</sup> Items 3, 5, 9, 12 and 16 for the February repairs (see [88] above) and Items 1, 4, 5, 6 and 7 (see [90] above).

(March 2014).<sup>49</sup> I understand that some of these repair items have been included in the February scope of repairs by MWHR. It should be a simple enough matter to remove them from that scope and separately price the June scope of repairs. I assume for present purposes that the combined indemnity payments do not exceed the total replacement value of the property.

*Economic repair and feasibility / destroyed*

[156] Much emphasis was placed on the economic infeasibility of the full repair so I address it separately. Mr Ring spent some considerable time questioning Mr Morrison on whether he intended to repair the building. Plainly Mr Ring considered that Mr Morrison had no intention of repairing the building given that the indemnity and reinstatement value would fall considerably short of the full repair bill.<sup>50</sup> But the proper starting point for the analysis of what was indemnified is the intentions of the parties, objectively assessed, as expressed in the policy contract. For example, the sum insured provides the agreed cap on indemnity cover and the reinstatement payment is capped at rebuild cost. Issues of feasibility might assist interpretation in cases where it might be said that the parties could not sensibly have considered ongoing indemnity for a building beyond economic repair. But it seems tolerably clear to me that both parties were content to allow the sum insured to reinstate notwithstanding the Richardson and BMC reports, because the building retained some functional value, as proved to be the case. Vero's obligation therefore was and is to pay the indemnity and or reinstatement value of the repair even though it may be that the repair or rebuild is not now "economically" feasible.

[157] In submissions after the hearing, and in light of the *QBE et al* judgment, Mr Ring submitted that I might find that the building was destroyed with the February earthquake. The Court of Appeal emphasized that economic feasibility of repair may be relevant when considering whether a building was destroyed, but ultimately it was a question of fact in each case (at [108]). In the circumstances of this case, I am satisfied that the building was not in fact destroyed as defined by the

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<sup>49</sup> I accept Mr Rennie's submission that this accords with the scenario described at [88] of the *QBE et al* judgment.

<sup>50</sup> By about \$7m. Mr Morrison was steadfast about his intention to repair the building given its historical value. To the extent that it might be relevant I did not detect any lack of sincerity about this.

policy. Destroyed means “so damaged by an insured event that the property by reason only of that damage, cannot be repaired”. As noted, the building retained functional value, and I prefer the evidence of Mr Richardson and Dr Jain that the building was not damaged beyond repair by the February event. While I accept that full repair may not be economically feasible, this should not preclude the contracted for indemnity of the repair cost associated with the June event.

### *Notice*

[158] TMT was obliged under the policy to “immediately notify” Vero on becoming aware of any event giving or likely to give rise to a material damages claim. There is no written record of any notice having been given for the December, April or June events. Mr Morrison maintains that he was advised by his agent at Marsh that he “had already made a claim and that [he] didn’t need to report it any further”. He also said that he telephoned Marsh after the September, December, February and June events. I have no reason to doubt his veracity about this. But the problem is that the policy clearly states that notice must be given to the “company”. Unless it can be shown that Marsh has been held out as having actual or apparent authority to receive notice on behalf of Vero, then proper notice was not given for these events. I was not taken to any written material or evidence of a representation conferring actual or apparent authority on Marsh.

[159] I accept that there may be cases where apparent authority might be inferred from a continuous course of dealing over many years with the same agent about the same policy with the same insurer. This may be one of those cases. But in any event, I prefer to resolve this aspect of the matter by reference to s 9(1)(b) of the Insurance Law Reform Act 1977, namely:

### **9 Time limits on claims under contracts of insurance**

(1) A provision of a contract of insurance prescribing any manner in which or any limit of time within which notice of any claim by the insured under such contract must be given or prescribing any limited of time within which any suit or action by the insured must be brought shall-

...

(b) In any other case, bind the insured only if in the opinion of the arbitrator or court determining the claim the insurer has in the

particular circumstances been so prejudiced by the failure of the insured to comply with such provision that it would be inequitable if such provision were not to bind the insured.

[160] As I am not satisfied on the balance of probabilities that the December and April events caused additional material damage, it is not necessary for me to resolve whether lack of notice is a barrier to a claim. I simply record in case it becomes relevant elsewhere, that the lacuna in the evidence emphasises a problem arising from what appears to be the lack of written notice to the company. No independent investigative steps were taken after these events so that the requisite comparative assessment as between the effects of the events could be made, except by way of the modelling exercise. This is significant because Vero is precluded from rebutting the modelled outcomes by reference to comparative visual assessments. Furthermore, Vero was deprived of the right to give written notice concerning reinstatement of the sum insured (though that is unlikely to have occurred following those events).

[161] I do not have the same concern in relation to the June event. It was the second largest of the events in terms of order of magnitude (M6.4) and ground acceleration.<sup>51</sup> It was not easily missed. It is surprising that no active steps were taken to immediately investigate the effects of this earthquake on the building. Moreover, as it was effectively the last of the major earthquakes upon which a claim is based, Vero has been able to examine whether it caused additional material damage to the building by comparing the observable state of the building after the February earthquake with its observable state after the June event. All the experts agree that the June event caused additional damage. The point of disagreement is how much. As no invasive testing was done at any time, the before and after comparison was always going to be reliant on comparative visual assessment and modelling. The only issue therefore is whether the delay in making the visual assessment after the June event prejudiced the comparative assessment. While there was some evidence of deterioration over time, it must have been only a minor contributor to the systemic damage and no expert suggested otherwise.

[162] Accordingly, in these circumstances, lack of formal notice of the June event, to the extent relevant, did not seriously prejudice Vero.

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<sup>51</sup> The February 22<sup>nd</sup> event was M6.3, but the ground acceleration was substantially greater.

*The deductible*

[163] The policy provides for the following:

**DEDUCTIBLE**

Each loss or series of losses arising out of one Event will be adjusted separately. The adjusted loss will be net of salvage and other recoveries. From each adjusted loss the amount specified in the Schedule will be deducted.

[164] It has been addressed by the High Court on two previous occasions.<sup>52</sup> Both reach the conclusion that the deductible applied to the net sum paid by the insurer; that is after applying the maximum sum insured.

[165] Mr Rennie nevertheless contends that only once the deductible is exceeded does Vero have any liability, and that the deductible applies as a first layer, the risk of which is borne by TMT. Therefore, it is to be “subtracted from the loss before the application of the sum insured”.

[166] I am not attracted to Mr Rennie’s construction. It does not make obvious linguistic sense to me that a “deductible” reduces the amount payable in some cases but not others. Yet, under TMT’s approach no amount is “deducted” from the indemnity payment in cases where the total loss exceeds the combined quantum of the sum insured and the deductible.

[167] But it now seems in light of *QBE* et al, that the application of the deductible must await the meaning of the term in insurance practice. The case was not presented to me on that basis and the resolution of it must now be reserved for another hearing. Mr Rennie rallied against this course on the basis that Vero had the opportunity to present evidence. But I see no prejudice to TMT given where I got to on the interpretation.

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<sup>52</sup> *Wild South Holdings Ltd v QBE Insurance (International) Ltd* [2013] NZHC 2781; *Marriott v Vero Insurance New Zealand Ltd* [2013] NZHC 3120.

### *Depreciation*

[168] Only one issue remains for the purpose of the assessment of depreciation. TMT contends that the cost of the foundations is not subject to depreciation. It says that the piles and foundations system are new and cannot therefore be depreciated, and that they are not betterment because they are a necessary function of the repair.

[169] Vero responds that the indemnity payment is capped at what is required to return the building to a condition as if no damage had occurred. Therefore new piles are not included within the indemnity only cover.

[170] I agree with Vero to the extent that it relates to an indemnity payment as opposed to a reinstatement payment. This reflects an important distinction made in the policy between indemnity for repair costs on an old for old basis and reinstatement on a new for old basis. The former is concerned to restore TMT to the position it would have been had there been no damage (ie, the status quo ante). This notional position is not concerned to achieve the reconstruction of a new building, so does not require provision for piles. The latter, by contrast, expressly contemplates replacement with an as new building or equivalent building. Equivalent building means:

- (b)(1) a building or structure that is as nearly as practicable the same as the building or structure lost or Destroyed, using currently equivalent materials and techniques and incorporating such alterations as are necessary to comply with any Law.
- (b)(2) where, as a result of any special circumstances, no building or structure that falls within the scope of paragraph (b) (1) can be constructed; a building or structure that is designed to perform a purpose or function the same as or equivalent to (but not more extensive than) that performed by the building or structure lost or Destroyed.

[171] The new piles in this case are required to enable an as new building or an equivalent building. Accordingly the policy's reinstatement objective would be defeated if the piles were then treated as betterment and outside the scope of the sum insured.

[172] In any event, for the purpose of an indemnity payment for a notional repair on an old for old basis, the cost of new piles should not be included.

### *Merger*

[173] Vero reserved its position on the application of the merger doctrine to the facts in this case. The doctrine was codified under s 77(2) of the Marine Insurance Act 1908 and provides a useful statement of the merger principle:

- (2) Where under the same policy a partial loss which has not been repaired or otherwise made good is followed by a total loss, the assured can only recover in respect of the total loss.

[174] The Supreme Court in *Ridgecrest* concluded that merger did not apply to the policy in that case. William Young J, writing for the Court observed:<sup>53</sup>

[52] The damage caused by the earlier earthquakes (and the associated diminution in value) does not merge with Ridgecrest's entitlement under cl C2 in relation to the final earthquake. This is simply a consequence of the policy (a) resetting after the earlier earthquakes in relation to the building in its damaged state and (b) providing replacement cover for the building in that state. In this respect the position is analogous to that in *Lidgett*, where depreciation in value resulting from the partial damage to the vessel did not come into play in relation to its later total loss because the vessel had been insured on a valued basis.

[175] Similarly, the confluence of the policy provisions and the facts suggest that the merger doctrine ought not to apply in this case. This is an event by event policy. The insured is indemnified for material additional damage up to the sum insured on each event loss. The sum insured reinstates after each event loss. The September, February and June events each caused additional material damage. The building continued to serve a functional purpose after each event. It seems to me therefore that the application of the merger doctrine in this context would defeat a major objective of the contract namely to indemnify for material damage after each event of loss.

[176] For completeness I am cognisant of the (obiter) amplification of the indemnity principle in the *QBE et al* judgment. As noted, the Court emphasised that the amount recoverable for successive losses can never be more than the final actual

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<sup>53</sup> *Ridgecrest NZ Ltd v IAG New Zealand Ltd*, above n 40 at [52].

repair cost at [86] and [91]. So, if the repair scope for event #1 is covered by the scope of the repair for event #2, then only the sum for the latter event is payable by way of indemnity. The effect of this would appear to require the cost of the September repairs to be subsumed into the February repair scope to the extent that they overlap. However, Vero was content to make a September and February payment and this aspect is not something I have definitively examined as it would involve an inquiry into the evidence that was not explored before me in the usual way. My preliminary view is that it would seem likely that a large portion of the September scope would be covered by the February indemnity payment given the scope of the February repairs.

### **Quantum**

[177] As Mr Ring submitted, the onus of proving loss, including quantum is on the insured. But the quantum could not sensibly be resolved, on the evidence, without the proper basis for liability having been established first. However, now that the primary issues relating to liability are resolved, quantification of loss should be relatively straightforward, especially as the method employed by MWHR to quantify the cost of repairs is not challenged. My expectation is that expert agreement should be able to be reached on the issue of quantum, provided that the problems I will shortly discuss about caucusing are avoided.

### **The problem(s) with caucusing**

[178] This has not been the exemplar of cases insofar as concerns caucusing between the experts. First, it became apparent during the hearing that a solicitor acting for Vero actively managed the drafting exercise. This appeared to affect the completion of a joint statement on a topic of central importance to the resolution of the case. I gave the solicitor an opportunity to explain his position and I am satisfied that he simply wanted to ensure that the expert provided evidence within his area of expertise. I am also satisfied that there was no prejudice to TMT because the relevant evidence was produced in Court under questioning from me. But all of this serves to emphasise that the integrity and value of the caucusing process relies on maintaining the actual and apparent independence of the experts. Intervention by solicitors should be limited to clarifying the duties of the expert and the scope of the

caucusing exercise. Active involvement in the drafting of a joint statement should be avoided other than for formatting, cross referencing, legibility or secretarial purposes.

[179] Second, all relevant experts who are going to be called to give evidence should be involved in the caucusing process. The value of caucusing is undermined by the late addition of an expert who does not agree with a joint statement of experts in the same field. In this case Vero introduced two late post caucusing additions on the critical issue of the reliability of the modelling. The first of them severely blotted his copy book by telling Dr Jain in the men's toilet of the High Court that he would be "in jail" by the end of the first day of the hearing. The second of them (his replacement) had three days to prepare evidence on what was the key area of technical dispute in the case. His evidence had the appearance of a critique only. In fact he said the purpose of his evidence was to undermine Dr Jain's work. I have decided not to make anything of this given the peculiar circumstances, however, a different judge or judges might not be so sanguine about all of this, and these types of issues may have been avoided by proper caucusing well in advance of hearing.

[180] Third, the experts must be given ample opportunity to caucus well in advance of the hearing. The "in hearing" caucusing while undertaken in good faith to assist the Court, ultimately failed because the experts were expected to resolve differences, at short notice, while under the pressure of pending or actual cross examination. The difficulties were exacerbated in this case because, with the late addition of new experts, completely new matters or different interpretations of the same issues had to be grappled with at short notice.

## **Result**

[181] I am satisfied that:

- (a) The modelling used by TMT is reliable and substantially helpful for the purpose of quantifying the capacity of earthquake events to cause damage and as an input to the assessment of the allocation of damage per event of loss;

- (b) The September, February and June earthquake events caused additional material damage to the building; and
- (c) Vero is liable to indemnify the loss caused by those events in terms of the cost of repairs as per:
  - (i) the Vero assessment for the purposes of the September event;
  - (ii) the repair recommendations of the Weidlinger report (March 2014) for the February event ;
  - (iii) the repair recommendations of the Weidlinger report (March 2014) for the June event.

[182] I am not prepared to provide a judgment sum at this stage. Instead I propose to make the following declarations:

- (a) Vero has paid the sum owing in relation to the September earthquake event;
- (b) Vero must pay the repair cost for the repair recommendations of the Weidlinger report at page 5 (March 2014) for the February event (such repair cost to be based on the costing methodology adopted by MWHR);
- (c) Vero must pay the repair cost for the repair recommendations of the Weidlinger report at page 6-7 (March 2014) for the June event (such repair cost to be based on the costing methodology adopted by MWHR);
- (d) The application of the “deductible” is to be determined at a hearing with evidence about its meaning of the term in insurance practice;

- (e) The cost of the new pilings is not to be included for the purpose of calculating the indemnity payment, but must be included for purposes of reinstatement.

[183] I make no orders at this stage in relation to the P&G, contractors' margin, professional & consent fees. This aspect was barely argued before me and I simply invite the parties to consider their position in light of my judgment and revert to me if necessary in the course of making submissions in accordance with my direction at [185].

[184] As to reinstatement, I do not consider it is appropriate to make declarations largely in the abstract, that is without any clear evidence that reinstatement is likely. I have addressed the provisions of the policy dealing with reinstatement at [45]-[52], [156]-[157], and [171]. This should provide sufficient guidance as to their scope and purpose.

*Process from here*

[185] The parties have 20 working days to file submissions on the final form of the declarations, the judgment sum, costs, and the timetable for addressing the issue of the deductible. The submissions must not be greater than 15 pages in length. It may be that the parties would prefer to finalise matters after the deduction issue is finally resolved or on some other basis. I do not foreclose that possibility and leave is reserved to the parties to approach me on that basis.

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