
Diminution of Value Methodology for
properties with both Increased Flooding Vulnerability and
Increased Liquefaction Vulnerability

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(A) EXECUTIVE SUMMARY

- 1 This paper describes the methodology developed by the professional valuation advisors to the Earthquake Commission (**EQC**) to determine what, if any, reduction or diminution of value (**DoV**) of residential property has resulted from both Increased Flooding Vulnerability (**IFV**) and Increased Liquefaction Vulnerability (**ILV**). IFV and ILV are forms of natural disaster damage caused by the Canterbury earthquake sequence, to insured residential land under the Earthquake Commission Act 1993.
- 2 The methodology described in this paper applies, with differences, to where:
 - 2.1 the main residential building (the **house**) on land with both IFV and ILV damage remains in place; and to where
 - 2.2 the house has been or will be removed or rebuilt.
- 3 The methodology has been developed in conjunction with legal and engineering advice for the purpose of enabling EQC to settle residential land claims on the basis of a payment of the DoV for properties with both IFV and ILV damage. The methodology will be utilised in circumstances where DoV is the most appropriate measure of the insured's loss as a result of the damage, rather than the cost of repairing all or part of that damage.
- 4 For these purposes, the methodology must assess the DoV caused by both IFV and ILV damage – that is, the change in vulnerability to flooding and liquefaction as a result of subsidence to the insured land caused by the Canterbury earthquake sequence.
- 5 Other matters that may affect the value of insured property as a direct or indirect result of the Canterbury earthquake sequence are to be excluded from the assessment of the DoV. Accordingly, the DoV must exclude any value reduction as a result of:
 - 5.1 other earthquake-related natural disaster damage or effects, such as general changes in seismicity in the Canterbury region;
 - 5.2 decisions by regulatory authorities regarding building regulations, or services; and
 - 5.3 general market uncertainty and stigma following the earthquakes.
- 6 The methodology described in this paper enables expert valuers to assess the DoV, in absolute dollar terms, that the insured property (both land and buildings, relevant in situations where the house remains in place) or the insured land (the land as a bare site, also referred to as a parcel of land, relevant where the house has been or will be removed or rebuilt) has suffered from its value immediately prior to the first earthquake of 4 September 2010 as a result of both IFV and ILV damage caused by the 2010-2011 Canterbury earthquake sequence. It does so by building on the DoV methodologies already developed by EQC's valuers to assess the valuation impact of IFV and ILV land damage separately both in situations where the house remains on the land, and where the house has been or will be rebuilt.

- 7 The methodology involves:
 - 7.1 Determination of the pre-earthquake (September 2010) value for the insured property or land, using conventional valuation techniques, in accordance with the relevant IFV DoV Methodology;
 - 7.2 Identification of the valuation impact of the practical implications for the IFV and ILV damage using the relevant methodologies for IFV and ILV damage (the **IFV DoV Methodologies** and **ILV DoV Methodologies** respectively);
 - 7.3 Adjustment of those valuation impacts to arrive at the appropriate total percentage adjustment for the combined IFV and ILV land damage to the property or land, using the Combination Matrix described in this report;
 - 7.4 Application of the total percentage adjustment to the pre-earthquake value of the insured property to produce the DoV; and
 - 7.5 Review of the DoV produced to assess whether, in all the circumstances and having regard to all information about the property, the resulting DoV is reasonable.
- 8 The use of the Combination Matrix reflects EQC's valuers' judgement that a simple addition of the percentage adjustments set out in the IFV and ILV DoV Methodologies for properties with both forms of damage would produce discounts that would over-compensate for that damage, given that it is unlikely that these two forms of natural hazard would be treated independently by buyers and sellers.
- 9 The Combination Matrix involves the categorisation of each form of land damage into one of three categories – "significant", "moderate" or "low" – depending on the DoV adjustment percentage given to the land damage in accordance with the IFV and ILV DoV Methodologies. The combined IFV and ILV total percentage adjustment is the sum of:
 - 9.1 the higher of the IFV or ILV total percentage adjustment (i.e., no discount is made to the adjustments for the more severe form of damage); and
 - 9.2 the proportion of the total percentage adjustment for the less severe form of damage indicated by the Combination Matrix, which reflects that, depending on the relative severity of the two related forms of damage, less weight is likely to be given to the less severe form of damage.
- 10 The valuers have tested and considered the cumulative adjustments produced by the methodology having regard to the range and distribution of adjustments assessed for IFV and ILV damage. The valuers are satisfied overall that, subject to the need to make adjustments on a case-by-case basis and as a matter of valuation judgement, the methodology produces appropriate results for assessing the DoV attributable to both IFV and ILV damage.
- 11 To implement this methodology, EQC's valuers have determined that it is appropriate to adopt, as a base for the assessment of DoV due to both IFV and ILV land damage, valuations of the DoV associated with IFV land damage which were completed as part of the implementation of the IFV DoV Methodologies. These

valuations have been carried out in accordance with the relevant IFV DoV Methodology (valuers were instructed to value these properties as if no ILV land damage had occurred to the property).

- 12 Accordingly, the following approach to the assessment of the DoV for a property or land with both IFV and ILV damage has been adopted:
- 12.1 **Phase 1:** Identification of the pre-earthquake value of the property or land. This is done by adopting the pre-earthquake value of the insured property or land determined by the EQC valuer assessing the IFV land damage on the property;
- 12.2 **Phase 2:** Identification of the effective percentage adjustments for IFV and ILV land damage. This is done by:
- (a) completing a separate valuation of the DoV figures for both IFV land damage and ILV land damage as if each form of land damage was the only form of land damage, in accordance with the respective DoV Methodologies. This will be done by:
 - (i) adoption of the DoV assessed for IFV land damage in accordance with the relevant IFV DoV Methodology;
 - (ii) assessment of the DoV for ILV land damage in accordance with the relevant ILV DoV Methodology, using the pre-earthquake value of the insured property or land determined by the EQC valuer who assessed the IFV land damage on the property; and
 - (b) dividing each of the separately assessed DoV for IFV and ILV land damage by the pre-earthquake valuation;
- 12.3 **Phase 3:** Application of the Combination Matrix described in this report to the percentage adjustments to arrive at the appropriate total percentage adjustment for the IFV and ILV damage to the property;
- 12.4 **Phase 4:** Application of the total percentage adjustment to the pre-earthquake value of the insured property or land, determined by the EQC valuer who assessed the IFV land damage on the property, to produce the DoV. The valuers will review the DoV produced by this calculation to assess whether, in all the circumstances and having regard to all information about the property or land, the resulting DoV is appropriate.
- 13 In addition to the substantial valuation judgement inherent in the design of the IFV and ILV DoV Methodologies as well as the methodology described in this report, valuation judgement will be exercised concerning the impact of IFV and ILV damage on each particular property or parcel of land in both the separate valuations conducted in accordance with the IFV and ILV DoV Methodologies in Phase 2, and in respect of the overall DoV for both forms of damage in Phase 4.
- 14 In applying this approach, care will be taken to ensure that a consistent approach is taken to the application of valuation judgement, and that there is no "double

counting” in the various exercises of valuation judgement throughout the methodology.

15 EQC’s valuers principally responsible for this report, and the development of the DoV methodology for IFV and ILV damage, are:

15.1 Dave Townsend FNZIV, FPINZ, a registered valuer who works for his own company and has been involved in the valuation and property consultancy industry for the past 35 years. Dave is a contractor to, and advises, EQC on a range of valuation matters. Working as a contracted Lead Valuer with EQC often involves working with and advising local valuers in the event of specific land value issues that arise throughout New Zealand;

15.2 Ken Blucher, a registered valuer and Fellow of the New Zealand Property Institute (FPINZ) who has over 35 years’ valuing experience. Based in Wellington, he is a Director at Darroch Limited and has a wealth of experience with respect to EQC claims, compensation work, disposal of surplus Crown properties and Treaty settlements acting on behalf of the Crown. Ken also advises clients on various legislative matters, specifically relating to rating. Ken has been a key member of the valuation team assisting EQC with property and valuation policy advice in Christchurch since September 2010 through to the current day. He is currently Valuation team leader with respect to the assessment of properties with IFV and ILV; and

15.3 Chris Bridges ANZIV, SPINZ, a Christchurch-based Registered Valuer with 34 years’ experience in valuation and property advice. Chris manages his own company, and provides valuation advice to EQC on a range of matters. He is a key member of the team that has developed the methodology for DoV valuation.

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(B) BACKGROUND

(B1) Purpose

- 16 The purpose of this paper is to explain the development of a methodology to determine what, if any, reduction or diminution of value (**DoV**) of residential property has resulted from a combination of what is defined as Increased Flooding Vulnerability (**IFV**) and Increased Liquefaction Vulnerability (**ILV**) damage. This methodology is to be used as an alternative basis of settlement for IFV and ILV damage claims, rather than the cost of repairing that damage.
- 17 This paper and methodology address only properties with both IFV and ILV damage. As IFV and ILV damage only affects the flat lands of Canterbury (rather than the Port Hills), this paper is confined to the assessment of DoV for flat land properties.
- 18 The methodology and this paper reflect a combination of valuation, legal and engineering advice provided to EQC.

(B2) Increased vulnerability damage

- 19 The 2010-2011 Canterbury earthquake sequence has resulted in certain types of land damage that may not severely impact the owner's present ability to use the land, but which have made the land more vulnerable to certain future natural disaster events.
- 20 These types of land damage result largely from the lowering of ground levels. This change in turn has increased the land's vulnerability to future natural disasters, namely flooding and liquefaction damage in the event of another significant earthquake. These types of land damage have been classified as:
- 20.1 Increased Flooding Vulnerability (**IFV**); and
- 20.2 Increased Liquefaction Vulnerability (**ILV**).
- 21 IFV and ILV damage are each discussed in more detail in section (G) of the IFV DoV Methodology and section (F) of the ILV DoV Methodology respectively.

(B3) Diminution of value methodologies

- 22 Ordinarily, EQC does not settle land claims by reference to any DoV of land damaged by a natural disaster. Rather, it settles such claims based on the estimated cost of repair. However, IFV and ILV damage have led to the need to consider settling claims by reference to the DoV to the property caused by the damage to the land resulting from the earthquakes.
- 23 Methodologies for assessing DoV resulting from each of IFV and ILV damage where they occur separately have already been developed. These are as set out in the reports:
- 23.1 For IFV land damage:
- (a) *Diminution of Value Methodology for Increased Flooding Vulnerability* (updated March 2015), which is used in circumstances where the pre-earthquake house remains in place; and

- (b) *Diminution of Value Methodology for Increased Flooding Vulnerability (for where the residential building has been or will be rebuilt) (October 2016);*

(together the **IFV DoV Methodologies**);

23.2 For ILV land damage:

- (a) *Diminution of Value Methodology for Increased Liquefaction Vulnerability (for properties with residential building in place) (May 2016); and*

- (b) *Diminution of Value Methodology for Increased Liquefaction Vulnerability (for where with residential building has been or will be rebuilt) (November 2016):*

together the **ILV DoV Methodologies**);

(together, the **IFV and ILV DoV Methodologies**).

24 In the context of EQC's settlement policy for IFV land damage, the High Court confirmed that DoV is an available basis of settlement in appropriate circumstances. Accordingly, the IFV DoV Methodologies and ILV DoV Methodologies are being used by EQC in appropriate circumstances as the basis of settlement of IFV and ILV damage claims.

25 Consistent with its approach to IFV and ILV damage where they occur separately, EQC has decided to develop a methodology to provide a consistent framework for the assessment of any DoV to property resulting from the combination of IFV and ILV damage occurring together caused by the Canterbury earthquake sequence.

(B4) Statutory context – Earthquake Commission Act 1993

26 EQC provides statutory insurance for residential buildings and land (where the buildings have private fire insurance), for damage resulting from a natural disaster. The scope of the cover is set out in the Earthquake Commission Act 1993 (the **EQC Act**).

27 As regards land, EQC covers the land on which the house is situated, 8m around the house (and any appurtenant structures such as sheds), the main access way (up to 60m from the house) and land supporting that access way.

28 EQC provides building cover, in general, up to \$100,000 (plus GST) for each earthquake event. There is no equivalent fixed cap for land cover. Instead, EQC insures the land up to a maximum amount, being the value of the smaller of certain areas, which will typically be the area of the land damaged or lost, or the minimum lot size for an equivalent residential purpose under the District Plan applicable to the property.

29 EQC may settle both land and building claims, up to the maximum amount, by way of payment, replacement or reinstatement at its discretion. In the past, EQC has settled land claims either by payment or reinstatement. Where it settles by payment, the payment has been calculated by reference to the cost of reinstatement

or repair (subject to that amount not exceeding the maximum amount). Where land has been “lost”, for example by landslip, EQC has paid the maximum amount, being generally the value of the area of land lost.

- 30 In the case of IFV and ILV, rather than paying the cost of repairing the land, another option is for EQC to pay a claimant DoV of the property resulting from the land damage. The High Court has confirmed that DoV may be a more appropriate measure of the claimant’s true loss.

(B5) Background to Canterbury earthquakes and residential property market

- 31 The IFV and ILV DoV Methodologies also set out detail about other matters relevant to the context of this methodology. These are not repeated in this paper, but include:

31.1 the Canterbury earthquake sequence;

31.2 post-earthquake land classifications; and

31.3 the nature of the Canterbury market before and after the earthquakes.

(C) DEFINING THE VALUATION OUTCOMES SOUGHT

32 The objective of this methodology is to provide, for each parcel of insured land that has both IFV and ILV damage, a dollar value for the DoV of the property resulting from that damage.

33 More specifically, the objective is to assess the **discount** from the price that would have been paid for a **property or land** on **the day prior to the earthquake** that would be agreed between a **willing buyer and willing seller** because of the **specified physical change** to the land, with **full knowledge** about that change and its impact on the vulnerability of the land to flooding and liquefaction, the costs of repair options, and advice from competent and **reasonable advisors** recommending any course of action.

34 The key elements of this objective can be broken down as follows:

34.1 **Discount:** EQC is not attempting to assess the value of the property, or all changes in value after the earthquake; EQC is only assessing the change in value resulting from certain physical land changes. The total change to the property value may reflect impacts for uncertainty, stigma, externalities, etc. which need to be disregarded.

34.2 **Property or Land :**

- (a) *Where the pre-earthquake house remains on the land:* The DoV is that of the **property** (insured land and relevant improvements, including chattels), to the extent that it arises from the combined effect of IFV and ILV damage to land insured by EQC. While in this context EQC is assessing the DoV in order to settle claims of damage to land only (the insurance of residential buildings and personal property being separate), the damage to the land affects the value of both the land and the relevant buildings on it, including the chattels normally included in the sale of the relevant buildings. This is because they are also directly affected by the increased vulnerability represented by the combined effect of IFV and ILV damage. Accordingly, the financial loss to an insured person as a result of the land damage includes the impact of that damage on both the value of the land itself and the relevant improvements on the land;
- (b) *Where the pre-earthquake house has been or will be rebuilt:* The DoV is that of the insured **land**, to the extent that it arises from the combined effect of IFV and ILV damage to land insured by EQC. Where the house that existed prior to the earthquake is either not capable of being, or will not be, repaired as a result of the earthquakes, damage to the land does not affect the value of that building, but only the value of the land as a platform for a residential building. However, to the extent that the damage to the land will also affect the value of any potential residential building situated on the land, this will be reflected in the discount of the value of the land.

- 34.3 **The day prior to the earthquake:** The DoV is the discount from the value of the property immediately prior to the 4 September 2010 earthquake. That value reflects the value of the property when the damage occurred.
- 34.4 **Willing buyer and willing seller:** The objective is still to determine, as much as possible, what value would be attributed to the physical damage in an open market transaction.
- 34.5 **Specified physical change:** EQC is assessing the DoV that results from physical changes to the land, specifically the combined effect of IFV and ILV damage. The engineering assessment of the physical change and, in the case of the ILV damage, the practical implications of that physical change, is being carried out by EQC's engineers, Tonkin + Taylor.
- 34.6 **Full knowledge:** While the details of the physical changes were not ascertained immediately after the earthquake (and were not for some time), those physical changes (including increases to vulnerability) had already occurred. The market participants are taken to have full knowledge of those changes and their impacts (other than on value), including therefore the pre-earthquake vulnerability of the land to flooding and liquefaction damage. This does not entail full knowledge of every detail regarding the land, changes, repair options and costs etc., but rather the level of detail a reasonable buyer and seller would obtain from relevant experts.
- 34.7 **Reasonable advisors:** EQC compensates for loss as a direct result of land damage; it does not compensate for regulatory changes made following the earthquakes (e.g. decisions regarding the maintenance of services in the Red Zone). However, an assessment of the DoV may reflect future steps that a property owner may reasonably wish to take as a result of the change to the land.
- 35 Aspects of the above are elaborated on in the assumptions section, below.
- One DoV assessed for the 2010-2011 earthquake series*
- 36 The EQC Act responds to damage caused by each natural disaster event separately. However, as the valuation of a DoV for the combined effect of IFV and ILV damage is a difficult exercise, involving the application of valuation judgement based on limited market information, EQC's valuers consider that it is necessary to value the effect of all IFV and ILV damage caused by the entire Canterbury earthquake sequence. Due to the variable and often insignificant change from one event to another, this provides a truer measure of the loss of amenity and value from before to after the 2010-2011 earthquake series. This is because, in general, the change across the sequence will be larger and the loss of value more confidently and accurately identified.
- 37 Further, in the context of ILV damage, an assessment of DoV across the entire earthquake sequence is necessary because the engineering assessment of ILV is also based on the changes across the entire sequence. This is predominantly because the engineering assessment of ILV damage is based on a manual application of engineering judgement taking into account highly complex information, which is not feasible to undertake separately for each earthquake.

- 38 Accordingly, the valuation of DoV for the combination of IFV and ILV damage will be undertaken for each property or parcel of land to reflect the discount in value arising from all IFV and ILV damage caused over the full Canterbury earthquake sequence. The apportionment of the DoV to specific earthquake events is a matter being considered by EQC, and does not form part of this paper.

(D) ASSUMPTIONS (LEGAL AND VALUATION)

39 This methodology is based on a range of legal and valuation assumptions. EQC's legal advisors and valuers currently consider that assumptions will need to be made in relation to matters listed below. These assumptions are likely to be valid and appropriate at the time that valuations for Canterbury earthquake damage are completed, and given the nature of the land insurance provided under the EQC Act. The assumptions are as follows.

Date of valuation

40 The DoV is to be assessed as the reduction from the property value immediately before the earthquake on 4 September 2010. In practice, the value on 3 September 2010 is used.

Willing buyer and willing seller

41 The DoV is based on the standard valuation assumption that the value is the exchange value between a willing, but not anxious, seller and a willing, but not anxious, buyer.

Basis of valuation

42 The value immediately before the September earthquake will be the market value of the insured property or land where reasonable comparable market indicators are available.

43 The DoV will be based on a market value that uses a set of assumptions as to what is to be valued. This assumptions-based market value is unable to draw on directly comparable market sales given the absence of information regarding IFV and ILV damage in the Canterbury market to date, and the difficulties in isolating the impact of IFV and ILV damage from other earthquake damage suffered by the property or land. Instead, the assumptions-based market value will draw from the market evidence available and information considered in the IFV and ILV DoV Methodologies, which included:

43.1 evidence of market sales in Canterbury following the earthquakes;

43.2 international literature concerning the impact of vulnerability to natural disasters on property values;

43.3 in relation to IFV, evidence of market sales in flood-prone areas in Christchurch and elsewhere in New Zealand; and

43.4 in relation to ILV, hedonic modelling and other statistical analysis concerning the impact of liquefaction vulnerability on property values in Christchurch and elsewhere in New Zealand.

44 It will also take into account the information provided by Tonkin + Taylor regarding the impact of flooding and liquefaction vulnerability on properties.

45 The assumptions-based market value will not take into account any short-term stigma which may temporarily affect property or land values.

Insurance

- 46 This methodology proceeds on the assumption that insurance will be generally available to properties affected by IFV and ILV damage (in the case of land where the pre-earthquake house has been or will be rebuilt, this assumption applies once any new residential building is built on the land). If the assumption is incorrect in relation to a specific property, this will be considered further.

Finance

- 47 It is also assumed that finance to purchase a residential property (including a rebuilt residential building) or residential land will be available on normal terms for any property for which insurance is available.

Public availability of information regarding flooding and liquefaction vulnerability

- 48 Flooding vulnerability of each property or land, as assessed by Christchurch City Council, will be disclosed to buyers and sellers through Council-published flood maps that will also be used by the Council for the purposes of Land Information Memoranda (**LIMs**) and Project Information Memoranda (**PIMs**).
- 49 Liquefaction vulnerability of each property or land will be disclosed to buyers and sellers through their assumed advisors, who have access to the Canterbury Geotechnical Database (**CGD**), and potentially through LIMs.
- 50 These flood maps differ to those used by EQC to determine which properties have suffered IFV damage for the purposes of the EQC Act. The reasons for these differences are discussed in section (C) of the IFV DoV methodology (Residential Building in Place). EQC has considered whether the effect of flood vulnerability on the value of properties ought to be determined by both the change in actual flood vulnerability and any change in the status of land in Council flood maps. However, the valuation evidence, discussed in sections (K) and (L) of the IFV DoV Methodology (Residential Building in Place), showed that the market value of a property is not materially affected by it being in a flood mapped area, but rather by knowledge of its actual flood vulnerability. Accordingly, the DoV attributable to IFV damage is to be assessed solely on the basis of the actual increase in flooding vulnerability on each insured property.

DoV to only reflect IFV and ILV damage

- 51 One of the most important assumptions is that the DoV will be the reduction in value resulting only from physical changes to that residential land assessed by EQC as having caused IFV and ILV damage. This assumption is made to ensure that EQC is compensating customers for only natural disaster damage that is covered under the EQC Act.
- 52 The DoV will not therefore reflect any changes in vulnerability to flooding or liquefaction resulting from external changes or effects, whether as a result of the earthquakes or otherwise. Equally it will not reflect changes in value due to increased knowledge of pre-existing vulnerability as against increased vulnerability due to the earthquake damage. For example:
- 52.1 *Operational services:* It will not consider whether the property or land has, and will continue to have, operational services such as roading, telephone, sewerage etc. For example, the fact that the Council has decided that it will

not maintain services in the residential Red Zone to the same level as before the earthquakes, is not something that EQC will be compensating for.

- 52.2 *Neighbouring properties:* Any effect from the earthquakes on neighbouring properties will be disregarded.
- 52.3 *Short term temporary stigma:* Any short to medium-term stigma arising from the earthquakes that may temporarily affect property or land values will be disregarded.
- 52.4 *Non-insured land:* EQC is making an insurance payment to claimants for loss in value of the property or land resulting from damage to the insured land. To the extent the property or land includes land that is not insured, the DoV EQC is assessing will not include any DoV resulting from the damage to that uninsured land.
- 52.5 *Vulnerability not caused by physical changes to the insured land:* Natural disaster damage under the EQC Act is limited to physical damage to the insured residential land. Accordingly, any increase in flooding or liquefaction vulnerability resulting from other changes – such as changes in seismicity – which are unrelated to a physical change to the land are not included.
- 52.6 *Damage which will be separately compensated for by EQC:* Other forms of land damage, such as deep lateral spreading cracks, may also result in an increase in vulnerability to liquefaction damage. However, these are compensated for by EQC paying the remediation costs for those cracks, and therefore they are not included in any assessment of DoV for IFV and ILV damage.
- 52.7 *Changes in regulatory and building practice:* In relation to ILV damage, EQC understands that, since the Canterbury earthquake sequence, the increased seismicity in the region and increased awareness of the vulnerability to liquefaction have led to changes in building regulations and practices. These changes have resulted in more extensive geotechnical testing and more robust foundation designs being required in areas that are vulnerable to liquefaction. These are not changes that arise from the physical damage to the land, and therefore will not be compensated for. However, the practical implications of the ILV damage to the land will be assessed in light of current regulation and practice. Accordingly, an increase in foundation costs under current regulation and practice that directly results from the physical change to the land will be taken into account. Further information on this issue can be found in Section (D) of the ILV DoV Methodology.

Land to be used as a residential site

- 53 The EQC Act provides cover for natural disaster damage (being a physical change resulting from a natural disaster that affects the use and amenity of the property) to residential land and buildings. In this context, the Act is primarily concerned with a physical change caused by the earthquakes that affects the use and amenity of residential land as a building platform for a residential building, and its associated uses.

- 54 Consistent with the scheme and purpose of the EQC Act, for the purposes of assessing DoV, it is assumed that land will continue to be used as a residential site. This assumption is primarily relevant to properties where the pre-earthquake house has been or will be rebuilt.

Rebuilding to be funded by building insurance

- 55 Residential buildings are separately insured under the EQC Act and are generally also insured for earthquake damage under private insurance policies. In relation to properties where the pre-earthquake house has been or will be rebuilt as a result of the Canterbury earthquakes, it is assumed that the insured will receive sufficient funds from EQC and the private insurer to enable the insured to rebuild the residential building in compliance with current regulatory requirements.

(E) RELEVANT VALUATION PRINCIPLES AND STANDARDS

56 The relevant valuation principles and standards are set out in the IFV and ILV DoV Methodologies. The key points that are of particular relevance to the assessment of DoV for properties or land with both IFV and ILV damage are discussed below.

(E1) Basis of valuation – market value

57 As in the IFV and ILV DoV methodologies, the basis of valuation of the DoV is an assumption-based market value – the objective is to estimate what DoV would be made for the combined effect of increased vulnerability to flooding and liquefaction on the open market.

(E2) Methods of assessing market value

58 Market value for residential properties or residential land is generally assessed by reference to market evidence in the form of comparable sales. Where, as is the case here, there is a lack of comparable sales or other market evidence, there is an increased reliance on valuation judgement and use of normative approaches to consider how the market would respond to particular information about a property.

59 The need to rely on valuation judgement in the absence of market sales is explained in the International Valuation Standards 2007 Framework at 4.2.6.4, which states:

Market valuations are generally based on information regarding comparable properties. The Valuation Process requires a Valuer to conduct adequate and relevant research, to perform competent analyses, and to draw informed and supportable judgments. In this process, Valuers do not accept data without question but should consider all pertinent market evidence, trends, comparable transactions, and other information. **Where market data are limited, or essentially non-existent** (as for example with certain specialised properties), **the Valuer must make proper disclosure of the situation and must state whether the estimate is in any way limited by the inadequacy of data.** All valuations require exercise of a Valuer's judgment, but reports should disclose whether the Valuer bases the Market Value estimate on market evidence, or whether the estimate is more heavily based upon the Valuer's judgment because of the nature of the property and lack of comparable market data.

60 This commentary makes it clear that a market value may still be achieved in the absence of sufficient, informed, comparable market sales, but the valuer must make it clear how the market valuation has been reached.

61 The valuation text, *Property Valuation and Analysis*,¹ provides guidance on selecting a method of valuation in these circumstances. The author suggests that, where market information is not available, the valuer must perforce fall back on a normative method of predicting price.²

62 The normative approach requires the valuer to make "a series of assumptions which collectively assert that the market should behave in the manner hypothesised." The author states:³

The assumptions would concern the type of buyer likely to be interested in the property, their decision criteria, outlook on the future, the range of alternatives

¹ R T M Whipple *Property Valuation and Analysis* (2nd ed, 2006, Law Book Co, Sydney).

² At 68.

³ At 68.

open to them, the information available and which they choose to use and so on. They may culminate in the assertion that the pricing model will be based on the cost of building a substitute, for example. Or the applicable model is a discounted cash flow approach given certain assumptions about interest rates, holding periods, rental levels and the like.

- 63 As a normative approach unavoidably takes account of the valuer's own perceptions, it is important for the valuer to strive to impose a framework which is internally consistent and which takes note of any relevant external factors.⁴

⁴ At 68.

(F) INPUTS TO VALUATION METHODOLOGY

64 The key inputs to the methodology are:

64.1 engineering advice regarding the impacts to the residential property or land resulting from the natural hazards, flooding and liquefaction vulnerability; and

64.2 market sales evidence of the appropriate reduction in value for IFV and ILV damage where they occur separately.

65 Each of these is outlined below.

(F1) Engineering advice regarding the impact of flooding and liquefaction vulnerability

66 EQC has requested engineering advice regarding the impact of increases in flooding and liquefaction vulnerability caused by the Canterbury earthquake sequence from its engineering advisors, Tonkin + Taylor.

IFV

67 At a high level, the practical implications of IFV damage are:

67.1 **Increased likelihood of land and building damage:** IFV properties are likely to have a significant increase in flood depth in a future flood event, potentially over a greater proportion of the property, which may also affect the house;

67.2 **Increased frequency of land and building damage:** IFV properties may also have more frequent flooding than they had prior to the Canterbury earthquake sequence.

68 The practical implications of IFV damage for each property or land are represented in flood maps produced by EQC's engineering advisors, Tonkin + Taylor, for the purposes of the valuation assessment. The flood maps are produced using models developed or adapted by Tonkin + Taylor for the purposes of IFV assessment. Further information on the engineering assessment for IFV land damage can be found in the Tonkin + Taylor report *Canterbury Earthquake Sequence: Increased Flooding Vulnerability Assessment Methodology* (April 2014).

69 The flood maps produced for valuation purposes are superimposed on an aerial photo of the property or land and show:

69.1 the location (including in relation to the house, other buildings and access-way) and depth of flooding expected on a property before and after the Canterbury earthquake sequence in 1%, 2% and 10% Annual Exceedance Probability events (**AEP**); and

69.2 the location and depth of exacerbated flooding on a property resulting from the subsidence caused by the Canterbury earthquake sequence.

70 For properties where the pre-earthquake residential house remains in place, EQC's engineers also provide the estimated height of the house's floor levels above ground

(where visible) to provide an indication of whether the predicted flood depths would enter the house.

- 71 For properties where the house has been or will be rebuilt, EQC's engineers also provide:
- 71.1 for land where the house has not yet been rebuilt (and for which there are no building consent plans approved by the relevant local authority), information regarding the relevant floor level requirements of the local authority; and
- 71.2 for land where the house has been rebuilt (or for which building consent plans have been approved) any available information regarding the finished floor levels and ground levels of the property, and aerial photos or site plans showing the location of the house.
- 72 In assessing the DoV attributable to IFV damage using the IFV DoV Methodologies, EQC's expert valuers rely on the flood maps produced by Tonkin + Taylor as an accurate (accepting the limitations documented in the Tonkin + Taylor reports) visual representation of the practical implications of IFV damage.

ILV

- 73 Tonkin + Taylor has prepared a report on the practical implications of liquefaction vulnerability, which is discussed in the ILV DoV Methodologies. This identifies the likely advice that an engineer could be expected to give a property owner about the practical implications that result from the land having experienced a material increase in liquefaction vulnerability due to the Canterbury earthquake sequence.
- 74 At a high level, the practical implications of a material increase in liquefaction vulnerability are:
- 74.1 **Increased likelihood of land and building damage:** Properties with ILV land damage are likely to experience increased liquefaction-related damage in a future earthquake event at a particular shaking level than they would have prior to the Canterbury earthquake sequence. In particular, in a future event it is expected that the ground surface subsidence will result in:
- (a) increased likelihood of moderate-to-severe land damage; and
 - (b) increased likelihood of significant building damage (the extent of which is reduced for houses built with foundations in accordance with the MBIE Guidance).
- 74.2 **Increased frequency of land and building damage:** Properties with ILV land damage are likely to experience material damage to land and buildings in less severe (more frequent) earthquakes than they would have prior to the Canterbury earthquake sequence.
- 75 These implications are discussed in more detail in Section (I) of the ILV DoV Methodology (Residential Building in Place) and Section (E1) of the ILV DoV Methodology (Residential Building Rebuilt)

Practical implications where properties have both IFV and ILV damage

- 76 In addition to the above, EQC requested advice from Tonkin + Taylor regarding the implications for a property or land with both IFV and ILV damage.
- 77 EQC's engineers advised that the subsidence of land in the Canterbury earthquake sequence had the potential to, and did, result in both forms of damage in specific locations and circumstances. However, the practical implications of the increased vulnerabilities to flooding and liquefaction associated with that subsidence are independent of each other. That is, a property or parcel of land with IFV damage will have the practical implications represented by the flood maps produced by Tonkin + Taylor, irrespective of whether it also has ILV damage. Equally, a property or parcel of land with ILV damage will have the practical implications set out in Tonkin +Taylor's report on the practical implications of liquefaction vulnerability, irrespective of whether it has IFV damage.
- 78 Further, given that an ILV repair involves improving the ground below the surface, this is not considered to repair the IFV land damage on the same property. That is because the IFV repair is an above-ground repair as described in the report titled *Increased Flooding Vulnerability: Observed Land Damage and Repair Methodology* (Tonkin +Taylor, 2014). Similarly an IFV repair is not expected or intended to repair ILV land damage on the same property.

(F2) Market sales evidence

- 79 The relevant market evidence, including the literature reviewed, for each of IFV and ILV is considered in the IFV and ILV DoV Methodologies respectively.
- 80 That market evidence is integral to the assessment of the loss in value resulting from IFV and ILV damage separately and is therefore also relevant to the assessment of loss in value for properties with both IFV and ILV damage. However, the studies and literature reviewed in developing each of the IFV and ILV DoV methodologies did not consider the impact of other forms of natural hazard and therefore do not provide direct guidance about the loss in value for properties with multiple forms of damage.
- 81 EQC's valuers, and other advisors, have conducted a literature search regarding the impact of multiple hazards on property value but have not found anything of relevance to an assessment of DoV for properties with both IFV and ILV damage.
- 82 For the purposes of the development of the ILV DoV Methodology (Residential Building in Place), Professor Basil Sharp and Wei Yang of the University of Auckland Department of Economics were engaged to undertake hedonic modelling of recent Christchurch residential property sales in order to identify any impact on values from liquefaction vulnerability. This analysis is described in more detail in Section (G2) of the ILV DoV Methodology (Residential Building in Place).
- 83 EQC requested that Professor Sharp and Ms Yang also investigate whether the sales data sample used for the hedonic modelling of ILV also indicated a discount for properties with flooding vulnerability. The inclusion of a separate flooding parameter in the hedonic models did not affect the discounts associated with liquefaction vulnerability. A statistically significant but low discount was predicted for properties with flooding vulnerability. However, the number of properties with IFV and ILV damage in the sales data gathered for the ILV hedonic modelling was

limited, and in particular did not include all properties with IFV or flooding vulnerability for which sales data was available. Accordingly, EQC's valuers have placed less weight on the hedonic modelling results in developing the methodology for assessing DoV where properties have suffered both IFV and ILV damage.

(G) THE METHODOLOGY

(G1) Introduction

- 85 Where reliable market information is not available, valuers must fall back on a normative method of predicting price. Given the absence of reliable data to predict the combined impact of IFV and ILV damage, EQC's valuers have therefore taken a normative approach to exercising valuation judgement as to the appropriate percentage adjustment to reflect both forms of damage.
- 86 In particular, EQC's valuers have considered:
- 86.1 whether it is appropriate to use the percentage adjustments produced by the IFV and ILV DoV Methodologies for IFV and ILV damage respectively as inputs for the assessment of the appropriate percentage adjustment for a property or parcel of land with both IFV and ILV damage;
 - 86.2 if so, how the adjustments produced by the IFV and ILV DoV Methodologies should be combined and, in particular, whether any reduction in the discount from the sum of the adjustments produced by the methodologies is appropriate; and
 - 86.3 how any reduction should be implemented.
- 87 In considering these questions, EQC's valuers have had regard to valuation principles as well as the legal and practical requirements on EQC to settle claims involving both IFV and ILV damage in a consistent manner, while not producing settlements for individual claims that fail to take account of particular circumstances relevant to that property.

(G2) Use of the IFV and ILV DoV Methodologies

- 88 As discussed in section (F1) above, EQC's engineering advice is that the future risks of flooding and liquefaction damage are independent, and that the practical implications of having both IFV and ILV damage are the various practical implications of each form of damage as if they had occurred separately.
- 89 The impact of the practical implications of each of IFV and ILV damage on the market value of residential properties or residential land were considered in the IFV and ILV DoV Methodologies respectively.
- 90 Each of the Methodologies provides a matrix and subsequent adjustments (or, in the case of the ILV Methodologies, a series of matrices) which enable the consistent identification of percentage adjustments for the extent of the particular practical implications of those types of damage. The percentage adjustments are added together to produce a total percentage adjustment. That total percentage is then applied to the pre-earthquake value of the property or land to produce a resulting DoV, which is then reviewed to ensure that, as a matter of valuation judgement, it is an appropriate figure for the property.
- 91 Given the engineering advice that where land has both IFV and ILV damage, the property experiences all of the practical implications of each form of damage and the risks are independent, EQC's valuers consider that it is appropriate to use the

percentage adjustments identified in the IFV and ILV DoV Methodologies as a starting point when assessing the DoV for both forms of damage together.

(G3) Combination of the IFV and ILV adjustment percentages

An adjustment is required to the IFV and ILV adjustment percentages

- 92 Although both the IFV and ILV DoV Methodologies are made up of adjustments based on specific incremental impacts on the use and amenity of the property, both Methodologies are clear that it is the outcomes of the addition of these incremental adjustments that must be considered, as a matter of valuation judgement, to be the appropriate total percentage adjustment for the damage to the property or land.
- 93 Accordingly, EQC's valuers have considered whether the addition of the incremental percentage adjustments from each of the IFV and ILV DoV Methodologies will produce an overall total percentage adjustment that is appropriate to reflect the loss of value caused by IFV and ILV land damage to the property or land.
- 94 While the engineering advice is that the practical implications of IFV and ILV land damage are independent, it does not necessarily follow that a willing buyer and a willing seller would treat an increase in vulnerability to two forms of natural hazard independently.
- 95 In the absence of market evidence, EQC's valuers considered how a willing buyer and willing seller, and therefore the market, would approach properties with both IFV and ILV damage.
- 96 When buying a residential property (including residential land), people consider a range of property attributes and make decisions about which of those attributes are more important. These attributes may include the size of the house and section, number of bedrooms and style of house and its location and distance to natural and social amenities, such as schools. As buyers prioritise attributes differently, this results in the attributes each having a different weight in purchase and sale decisions, and therefore a different impact on the market price of the property.
- 97 The same is true of attributes associated with natural hazards. When considering a hazard, buyers and sellers need to decide – whether consciously, or as part of a more intuitive decision making process – how important it is to them to have a property that is not vulnerable, or is less vulnerable than, the preferred property being considered, taking into account the other attributes of that property.
- 98 The presence or absence of attributes that are related, in the sense that they are likely to be regarded as relating to a similar use or amenity, and afforded similar priorities by buyers and sellers, may together therefore be attributed less weight than if the weight accorded to the presence or absence of each attribute individually were summed together.
- 99 For example, the fact that a property is located in an area where there is a significant distance to quality childcare may result in a discount for some buyers, but not for others, as may the absence of playgrounds. However, the buyers who are likely to place weight on the absence of childcare are likely to be the same as those who place weight on the absence of playgrounds: i.e., buyers who value amenities associated with children. Accordingly, a buyer who places little weight on the

presence or absence of childcare is unlikely to place material weight on the presence or absence of a playground. Therefore, a buyer who has already discounted a property to reflect the absence of childcare may not discount the property materially further because it lacks access to playgrounds: if it has a lower amenity for children for one reason, it is unlikely that a second reason for that lower amenity will matter as much as if that reason were the only reason why the property lacked amenity for children.

- 100 To take another example, the presence of infrastructure, such as cell phone towers and high voltage electricity wires, which is perceived by some people as associated with increased health risks, may result in a discount for some buyers. Although the perceived risks are independent, both relate to the same amenity (long term health risk). Therefore, buyers who are likely to place significant weight on the presence of a cell phone tower are also those likely to place weight on the presence of high voltage electricity wires.
- 101 Accordingly, a buyer who places little weight on the presence or absence of a cell phone tower is unlikely to place weight on the presence or absence of high voltage lines. That is, a buyer who has already discounted a property to reflect the presence of a cell phone tower may not discount the property materially further because it has high voltage lines: if the property is perceived to have health risks for one reason, it is unlikely that a second reason for the perceived risk to health will matter as much as if that reason were the only reason why the property has such a risk.
- 102 EQC's valuers consider that buyers and sellers are likely to regard flooding vulnerability and liquefaction vulnerability as related to a similar amenity: that is, the vulnerability of the property to future natural hazards. While the future occurrences of those hazards are independent, they are similar in that they do not affect the day to day use of the property but rather the risk that the property will suffer damage in a future, unpredictable natural event.
- 103 A buyer who places little weight on the presence of vulnerability to natural hazards is unlikely to distinguish between one form of hazard over the other. Conversely, a buyer who is adverse to the risk of natural hazards and who has already discounted a property to reflect, say, the presence of flooding vulnerability may not discount the property materially further because it is also moderately vulnerable to liquefaction. If the property is vulnerable to a natural hazard for one reason, it is unlikely that a second hazard will matter as much as if that hazard were the only reason that the property was vulnerable to a natural hazard.
- 104 Accordingly, EQC's valuers consider that a simple addition of the percentage adjustments set out in the IFV and ILV DoV Methodologies for properties with both forms of damage would produce discounts that would over-compensate for that damage. It is therefore necessary to reduce the sum of the individual percentage adjustments produced by the separate methodologies to reflect the lower impact of an increase in vulnerability to a second natural hazard in the case of a property that already has increased vulnerability to one natural hazard.

Normative trends relating to weighting of multiple forms of related damage

- 105 Taking a normative approach, EQC's valuers would expect the market to give more weight to the form of damage or vulnerability that is most significant for a particular property. However, each property being considered will have a different

combination of IFV and ILV damage, reflecting different levels of vulnerability before the earthquakes, and different impacts from the increases in vulnerability that have occurred as a result of the earthquakes.

- 106 Given this factual complexity, a number of different approaches could be taken to the assessment of the appropriate reduction to the sum of the IFV and ILV percentage adjustments. The approach that EQC's valuers consider most robust is to place different weights on the adjustments associated with the different forms of damage, depending on the relative severity of each of the forms of damage.
- 107 As noted above, EQC's valuers would expect the market to give more weight to the form of damage or vulnerability that is most significant for a particular property, but would expect the relative weight to vary depending on the severity of each form of damage. For example, where one form of damage is clearly more significant than the other, the market may make the total percentage adjustment attributable to the more significant hazard, but only make a small additional discount to reflect the second hazard.
- 108 In principle, it is therefore sensible to attempt to account for different interactions between forms of hazard that may occur depending on the relative severity of each hazard.
- 109 EQC's valuers do not consider that, based on the market evidence available, it is possible to identify either flooding vulnerability or liquefaction vulnerability as the more severe form of land damage. Perceptions of the significance of the different hazards will vary between different segments of the market, depending on personal preference and the particular impacts of IFV and ILV damage on the property.
- 110 However, the existing IFV and ILV DoV methodologies give percentage reductions in property and land values which can be used as a neutral metric of the severity of increase in vulnerability to the relevant hazard. That is, it is implicit in the methodologies that where IFV damage has implications that receive percentage adjustments that total, for example, 5%, this is assessed as being of the same severity as ILV damage that has adjustments that total 5%. Similarly, IFV damage that attracts a 10% total percentage adjustment is more severe than ILV damage that attracts a 5% total percentage adjustment, and so forth. The example percentages referred to in this and the below paragraphs relate to a property where the pre-earthquake house remains in place, but EQC's valuers consider that the same principles should apply equally in the case of land values.
- 111 While it would not be realistic to consider how the market would respond to each possible combination of the percentage adjustments that could be assessed under the IFV and ILV DoV Methodologies, it is possible to consider trends that could be expected given EQC's valuers' views on how the market would respond to a property with both IFV and ILV land damage. These trends can be developed into different rules for combining the IFV and ILV DoV Methodology discounts depending on the relative severity of each form of land damage.

Significant damage combined with low level damage

- 112 If very significant damage has occurred in relation to one form of vulnerability (e.g., a total percentage adjustment of 15%), and only low level damage has occurred for the other form of damage (e.g., a total percentage adjustment of 4%), it can be

expected that the significant form of damage will predominate in the mind of a buyer. In these circumstances, comparably less weight is likely to be given to the low level damage.

- 113 Put another way, if the effect of IFV is that a house is now liable to have water enter the dwelling and flood in frequent events, a minor increase in the prospect of liquefaction damage in a 1 in 100 year level of shaking to a property that was already vulnerable to liquefaction is likely to be of less concern to a buyer than if the ILV damage existed without the IFV damage.

Significant damage combined with moderate damage

- 114 The greater the significance of the less severe form of damage, the more weight should be given to that damage. So, for example, if very significant damage has occurred in relation to one form of vulnerability (e.g., a total percentage adjustment of 15%), and a moderate level of damage has occurred for the other form of damage (e.g., a total percentage adjustment adjustment of 6%), while it can be expected that the significant form of damage will predominate in the mind of a buyer, it is likely that more weight will be given to the moderate form of damage than if that damage were only low level.

Similarly significant damage

- 115 Conversely, where both forms of damage are similar in significance, it is not appropriate to assess one form of damage as predominating over the other as this is unlikely to be the approach taken by potential buyers and sellers of the property. However, given that both forms of increased vulnerability to natural hazards are likely to be treated as related forms of amenity, some discount of the total combined IFV and ILV adjustments is appropriate.
- 116 Where both forms of damage are significant in terms of their practical implications, EQC's valuers' judgement is that only a small discount would be applied to reflect the second less severe form of damage. That is, while recognising that the increased vulnerability to the hazards is likely to affect the interest of similar buyers and sellers in the property, the practical implications of both forms of damage are such that each form of damage will have nearly their full independent weight in deterring buyers, and therefore the price that a seller can achieve. Put another way, where the practical implications of each form of damage are significant, it cannot be assumed that buyers who are willing to accept one form of increased vulnerability to one hazard will also accept the other.

Summary of normative trends

- 117 Summarising the above trends:

117.1 in all cases, the combination of the practical implications of IFV damage and ILV damage should reflect that the increases in vulnerability to the hazards are likely to be regarded as related to a similar amenity and therefore be of less weight than if each had occurred separately;

117.2 the greater the difference in severity of the two increases in vulnerability, the less weight should be given to the less significant form of increased vulnerability; and

117.3 the greater the severity of a form of damage, the more weight should be given to it (or, put another way, the less it should be discounted).

- 118 These trends are shown in the figure below. As it is not realistic to reflect each possible combination of the percentage adjustments for IFV and ILV damage, the matrix below has been created by categorising the two total percentage adjustments for IFV and ILV damage into "significant", "moderate" and "low" discounts. The arrows reflect the trends discussed above and, in each case, the direction of the arrow reflects an increasing discount from the less significant of the IFV or ILV percentage adjustments.

| | | | | |
|-----------------------------|-------------|----------------------------|----------|-------------|
| Highest DoV Discount | Significant | | | |
| | Moderate | | | N/A |
| | Low | | N/A | N/A |
| | | Low | Moderate | Significant |
| | | Lowest DoV Discount | | |

Table 1: Matrix depicting normative trend discount levels for IFV and ILV damage

Practical application of the normative trends

- 119 In order to develop the above trends into rules that reflect and guide valuation judgement when combining the IFV and ILV DoV Methodology discounts depending on the relative severity for each form of land damage, it is necessary to:

119.1 determine, as a matter of valuation judgement, what total percentage adjustment for IFV and ILV damage should be regarded as equivalent to "low level", "moderate" and "significant" damage for the purposes of the classification discussed above for each of the methodologies for where the house remains in place (where the DoV percentage is applied to the property value) and where the house has been or will be rebuilt (where the DoV percentage is applied to the land value); and

119.2 decide, again as a matter of valuation judgement, the discount to be applied to the adjustments associated with the less severe form of land damage in each case.

- 120 In considering these questions, the valuers have been assisted by the results of the application of the IFV and ILV DoV (Residential Building in Place) Methodologies to properties with both IFV and ILV damage in the Green Zone.

Classification of percentage adjustments for IFV and ILV damage

- 121 On the first issue, the valuers have carefully considered the IFV and ILV DoV Methodologies, in terms of the practical implications of each form of damage that give rise to different total percentage adjustments in each Methodology. While in both Methodologies, and in particular the IFV DoV Methodologies, there are multiple combinations of practical implications – and therefore incremental adjustments – that give rise to the same total percentage adjustment, EQC's valuers sought to consider

the most common combinations, taking into account that there will be other combinations that are assessed as having an equivalent overall impact.

122 The valuers consider that, in respect of both forms of land damage, “**low**” level can generally be regarded as:

122.1 in the case of percentage adjustments to property values (applicable where the pre-earthquake house remains in place), a total percentage adjustment less than or equal to 5% . In terms of the practical implications which an adjustment at this level represents:

(a) for IFV damage, it reflects low level increases in flood depth (mostly less than 0.3 m) that do not affect the building platform (or, alternatively, the building platform was previously affected). An increase in frequency of flooding is possible, but only from a 1% to a 2% AEP event; and

(b) for ILV damage, it reflects a Minor change in vulnerability to liquefaction in a 1 in 100 year level of shaking and a likely change in vulnerability in levels of shaking with frequencies up to, potentially, 1 in 25 year levels of shaking. Put another way, any property with “Minor or Major” change in a 1 in 100 year level of shaking or a confirmed Minor change in a 1 in 25 year level of shaking will have a DoV percentage adjustment of 6% or more; and

122.2 in the case of percentage adjustments to land values (applicable where the pre-earthquake house has been or will be rebuilt), a total percentage adjustment less than or equal to 8%. In terms of the practical implications which an adjustment at this level represents:

(a) for IFV damage, the same practicable implications outlined above; and

(b) for ILV damage, it reflects a “Minor or Major” change in vulnerability to liquefaction in a 1 in 100 year level of shaking and a likely change in vulnerability in levels of shaking with frequencies up to 1 in 25 year levels of shaking. Put another way, any property with Major change in a 1 in 100 year level of shaking or “Minor or Major” change in a 1 in 25 year level of shaking will have a DoV percentage adjustment of over 8%. The extents of change in vulnerability set out here are greater than what is considered “low” impact for properties where the pre-earthquake house remains in place outlined above, because of the different practical implications that result from ILV land damage for properties where the pre-earthquake house has been or will be rebuilt in accordance with MBIE Guidance.

123 Conversely, “**significant**” can generally be regarded as:

123.1 in the case of percentage adjustments to property values (applicable where the pre-earthquake house remains in place), a total percentage adjustment

greater than or equal to 12%. In terms of the practical implications which an adjustment at this level represents:

- (a) for IFV damage, it reflects an impact similar or greater to a flood profile at a 1% AEP where the water is likely to now enter the dwelling, when it did not previously, together with an increase in the frequency of flooding from at least a 2% to a 10% AEP event for low flood depth changes (less than 0.3 m); and
- (b) for ILV damage, it reflects a Major change in liquefaction vulnerability at a 1 in 100 year level of shaking with a potentially Major change in liquefaction vulnerability at a 1 in 25 year level of shaking (that is, a "Minor or Major" change at 1 in 25 year levels of shaking).

123.2 in the case of percentage adjustments to land values (applicable where the pre-earthquake house has been or will be rebuilt), a total percentage adjustment greater than or equal to 19%. In terms of the practical implications which an adjustment at this level represents:

- (a) for IFV damage, the same practicable implications outlined above; and
- (b) for ILV damage, no practical implications have been assessed that would be considered significant. Again, this is different from what is outlined above for ILV damage in relation to properties where the pre-earthquake house remains in place because of the different practical implications that result from ILV land damage for properties where the pre-earthquake house has been or will be rebuilt in accordance with MBIE Guidance.

124 EQC's valuers consider that IFV and ILV damage which would receive a total adjustment percentage between the figures outlined above can be categorised as "**moderate**". That is, the impact of IFV damage and ILV damage on both DoV Methodologies is greater than "low level":

124.1 in the case of percentage adjustments to property values (applicable where the pre-earthquake house remains in place), greater than 5% but less than 12%):

- (a) IFV damage is likely to affect the building platform to some degree but less than the more significant impacts associated with increased vulnerability in more frequent events; and
- (b) ILV damage may have potential Major change at 1 in 100 year levels of shaking or confirmed Minor change at 1 in 25 year levels of shaking.

124.2 in the case of percentage adjustments to land values (applicable where the pre-earthquake house has been or will be rebuilt), greater than 8% but less than 19%:

- (a) IFV damage as outlined above; and
- (b) ILV damage may have Major change at 1 in 100 year levels of shaking or “Minor or Major” change at 1 in 25 year levels of shaking.

125 EQC’s valuers acknowledge that, in drawing these lines, there is necessarily a strong element of valuation judgement. However, the valuers consider that the distinctions drawn reflect appropriate boundaries in each of the IFV and ILV DoV methodologies for these purposes. In addition, the valuers have had regard to ensuring that the relationship between the total adjustment percentages applied to property and land values reflects the relationship identified as appropriate between these discounts in the ILV and IFV DoV Methodologies (for where the residential building has been or will be rebuilt).

Appropriate discounts

126 To reflect the normative trends discussed earlier, EQC’s valuers have selected appropriate percentage discounts for the different combinations of levels of IFV and ILV damage referred to above. The examples discussed below relate to a property where the pre-earthquake house remains in place.

(a) *Significant damage combined with low level damage*

127 EQC’s valuers’ assessment is that, after full weight is given to the total percentage adjustment associated with the more significant damage, it is appropriate to give 60% weight to the adjustment associated with the substantially less severe damage. For example:

127.1 the assessed total percentage adjustment for IFV damage using the IFV DoV Methodology (Residential Building in Place) is 15%; and

127.2 the assessed total percentage adjustment for ILV damage using the ILV DoV Methodology (Residential Building in Place) is 4%.

128 In this example, full weight should be given to the IFV total percentage adjustment of 15%, however only 60% weight should be given to the ILV total percentage adjustment. This results in a total percentage adjustment for IFV and ILV damage of 17.4%, or 1.6 percentage points less than if all adjustments were summed together.

(b) *Significant damage combined with moderate damage*

129 EQC’s valuers’ assessment is that, after full weight is given to the total percentage adjustment associated with the more significant damage, it is appropriate to give 75% weight to the adjustment associated with the relatively less severe, but still moderate (in absolute terms), damage. For example, :

129.1 the assessed total percentage adjustment for IFV damage using the IFV DoV Methodology (Residential Building in Place) is 15%; and

129.2 the assessed total percentage adjustment for ILV damage using the ILV DoV Methodology (Residential Building in Place) is 6%.

130 In this example, full weight should be given to the IFV total percentage adjustment of 15%, however only 75% weight should be given to the ILV damage adjustment. This results in a total percentage adjustment for IFV and ILV damage of 19.5%, or 1.5% percentage points less than if all adjustments were summed together.

(c) *Similarly significant damage*

131 EQC's valuers' assessment is that, after full weight is given to the total percentage adjustment for the more significant damage, it is appropriate to give 90% weight to the adjustment associated with the less severe but still significant form of damage. For consistency, where the two forms of damage are assessed as being equally severe, the final percentage adjustment reached should be the same as that reached under this approach, though the discount should be divided equally between the percentage adjustments for the two forms of damage.

132 In contrast, where the forms of damage are of similar severity but more modest in terms of their practical implications, it is more likely that those who are prepared to accept one modest increase in vulnerability to a natural hazard will also be prepared to accept another modest increase in vulnerability to another natural hazard when considering the purchase of the property. Accordingly, in such cases, a larger discount to the adjustments associated with the second form of damage (of 85%) should be applied than if the increases in vulnerability to both hazards were more significant.

Total percentage adjustment

133 Using the classifications and percentage discounts above, matrices of combinations of IFV and ILV adjustment percentages can be developed for where the pre-earthquake house remains in place and for where it has been or will be rebuilt. In accordance with the normative trends identified above, in each case the combined IFV and ILV total percentage adjustment is the sum of:

133.1 the higher of the IFV or ILV total percentage adjustment (i.e., no discount is made to the adjustments for more severe form of damage); and

133.2 the proportion of the total percentage adjustment for the less severe form of damage indicated by the percentage set out in the matrix below.

134 Where the IFV and ILV total percentage adjustments are numerically equal, the methodology may be applied by taking a proportion of each at the mid-point of the percentages set out in the Combination Matrix below of the Highest and Lowest DoV.

135 The two resulting matrices depicting total percentage adjustments for properties with IFV and ILV damage are as follows:

135.1 For where the pre-earthquake house remains in place:

| | | | | |
|-------------------------------|---------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Highest DoV Adjustment | Significant ($\geq 12\%$) | 100% Highest DOV + 60% Lowest DOV | 100% Highest DOV + 75% Lowest DOV | 100% Highest DOV + 90% Lowest DOV |
| | Moderate ($>5\%$ and $<12\%$) | 100% Highest DOV + 70% Lowest DOV | 100% Highest DOV + 85% Lowest DOV | N/A |
| | Low ($\leq 5\%$) | 100% Highest DOV + 75% Lowest DOV | N/A | N/A |
| | | Low ($\leq 5\%$) | Moderate ($>5\%$ and $<12\%$) | Significant ($\geq 12\%$) |
| Lowest DoV Adjustment | | | | |

Table 2: Combination Matrix (Residential Building in Place)

136 For where the pre-earthquake house has been or will be rebuilt:

| | | | | |
|-------------------------------|---------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Highest DoV Adjustment | Significant ($\geq 19\%$) | 100% Highest DOV + 60% Lowest DOV | 100% Highest DOV + 75% Lowest DOV | 100% Highest DOV + 90% Lowest DOV |
| | Moderate ($>8\%$ and $<19\%$) | 100% Highest DOV + 70% Lowest DOV | 100% Highest DOV + 85% Lowest DOV | N/A |
| | Low ($\leq 8\%$) | 100% Highest DOV + 75% Lowest DOV | N/A | N/A |
| | | Low ($\leq 8\%$) | Moderate ($>8\%$ and $<19\%$) | Significant ($\geq 19\%$) |
| Lowest DoV Adjustment | | | | |

Table 3: Combination Matrix (Residential Building Rebuilt)

137 The valuers have tested and considered the cumulative adjustments produced by the above steps having regard to the range and distribution of adjustments assessed for IFV and ILV damage. The valuers are satisfied overall that, subject to the need to make adjustments on a case-by-case basis and as a matter of valuation judgement, the methodology produces appropriate results for assessing the DoV attributable to IFV and ILV damage in accordance with the assumptions set out in Section (D) of this methodology.

(G4) Implementation of the IFV and ILV DoV methodology

138 Using the Combination Matrix described above, the assessment of the DoV for a property with both IFV and ILV damage therefore involves the following steps:

138.1 Determination of the pre-earthquake (September 2010) value for the insured property or land, using conventional valuation techniques;

138.2 Identification of the percentage adjustments for:

- (a) the IFV land damage using the relevant IFV DoV Methodology; and
- (b) the ILV land damage using the relevant ILV DoV Methodology;

138.3 Application of the relevant Combination Matrix described in this report to the percentage adjustments to arrive at the appropriate total percentage adjustment for the IFV and ILV damage to the property;

- 138.4 Application of the total percentage adjustment to the pre-earthquake value of the insured property or land to produce the DoV; and
- 138.5 Review of the DoV produced by Phase 4 to assess whether, in all the circumstances and having regard to all information about the property, the resulting DoV is appropriate.
- 139 A number of ways of operationalising the IFV and ILV DoV methodology were considered by EQC's valuers. One possibility was for a single valuer to assess both the pre-earthquake value of the property, the percentage adjustments for both IFV and ILV land damage using the respective methodologies, and then apply valuation judgement to the resulting numerical DoV figure produced by the application of the Combination Matrix.
- 140 However, at the time that this methodology was finalised, valuers engaged by EQC had completed independent valuations of DoV caused by IFV land damage. These valuations, which are based on information provided by Tonkin + Taylor as well as kerb side inspections, involve:
- 140.1 determination of the pre-earthquake (September 2010) value for the insured property or land;
- 140.2 identification of the appropriate percentage adjustments for the IFV land damage using the relevant IFV DoV Methodology; and
- 140.3 application of that percentage adjustment to the pre-earthquake value and assessment of whether, as a matter of valuation judgement, the resulting DoV amount reflects the DoV caused by the IFV land damage to the property.
- 141 Where a property has been identified as having both IFV and ILV land damage, EQC's valuers have been instructed to value the DoV associated with IFV land damage as if no ILV land damage had occurred to the property. The result is that there are now a complete set of assessments of pre-earthquake valuations and the valuation implications of IFV land damage for properties with IFV and ILV land damage.
- 142 EQC's valuers consider that use of these valuations as a base for the assessment of DoV due to both IFV and ILV land damage will best ensure that the overall assessment is robust and consistent with the assessment of the impact of IFV land damage alone. These valuations have been carried out in accordance with the relevant IFV DoV Methodology by registered valuers as part of, and at the same time as, the assessment programme of properties with IFV land damage, and have been subject to an extensive peer review.
- 143 Accordingly, the following approach to assessment of the DoV for a property with both IFV and ILV damage has been adopted:
- 143.1 **Phase 1:** Identification of the pre-earthquake value of the property or land. This is done by adopting the pre-earthquake value of the insured property or land determined by the EQC valuer assessing the IFV land damage on the property;

143.2 **Phase 2:** Identification of the effective percentage adjustments for IFV and ILV land damage. This is done by:

- (a) completing a separate valuation of the DoV figures for both IFV land damage and ILV land damage as if each form of land damage was the only form of land damage, in accordance with the respective DoV Methodologies. This will be done by:
 - (i) adoption of the DoV assessed for IFV land damage in accordance with the relevant IFV DoV Methodology;
 - (ii) assessment of the DoV for ILV land damage in accordance with the relevant ILV DoV Methodology, using the pre-earthquake value of the insured property or land determined by the EQC valuer who assessed the IFV land damage on the property; and
- (b) dividing each of the separately assessed DoV for IFV and ILV land damage by the pre-earthquake valuation;

143.3 **Phase 3:** Application of the relevant Combination Matrix described in this report to the percentage adjustments to arrive at the appropriate total percentage adjustment for the IFV and ILV damage to the property;

143.4 **Phase 4:** Application of the total percentage adjustment to the pre-earthquake value of the insured property or land, determined by the EQC valuer who assessed the IFV land damage on the property, to produce the DoV. The valuers will review of the DoV produced by this calculation to assess whether, in all the circumstances and having regard to all information about the property, the resulting DoV is appropriate.

144 As the separate valuation of the DoV figures for both IFV land damage and ILV land damage are in practice rounded, it is possible in some cases that the effective percentage adjustments may be marginally higher or lower than if the unrounded figure was used. (For example, considering a property where the pre-earthquake house remains in place, if the percentage adjustment for ILV land damage is 5%, the effective percentage discount may be 5.1% if the DoV figure for ILV land damage is rounded upwards to the nearest \$100.) EQC's valuers do not consider that it is appropriate that the application of the Combination Matrix should depend on the rounding applied to the DoV figures for IFV land damage and ILV land damage. Accordingly, where this occurs, the Combination Matrix will be applied based on the valuation impact ("low", "moderate" or "severe") as if the DoV figure had not been rounded.

145 More significantly, a result of this approach to the valuation of the DoV caused by both IFV and ILV land damage is that, in addition to the substantial valuation judgement inherent in the design of the IFV and ILV DoV methodologies, valuation judgement will be exercised concerning the impact of IFV and ILV damage on each property at three stages of the methodology:

145.1 In the assessment of the appropriate increased flooding profiles in accordance with the relevant IFV DoV Methodology, and whether the resulting DoV for IFV

land damage would be appropriate for the property if it was the only form of damage to the property;

- 145.2 In the assessment of whether the DoV resulting from application of the relevant ILV DoV Methodology is appropriate for the property if ILV land damage was the only form of land damage;
- 145.3 In the assessment of whether the DoV resulting from the application of this methodology appropriately represents the loss of value due to both forms of land damage: IFV and ILV land damage.
- 146 In the case of most properties, it is expected that the exercise of this valuation judgement will confirm that the percentage adjustments associated with the identified flood profiles and liquefaction severity and change in severity classifications, set out in the IFV and ILV DoV Methodologies, do not require further modification. In this case, there is no difference between the approaches set out in paragraphs [133] and [138], above.
- 147 However, both the IFV and ILV DoV Methodologies require the valuer to exercise valuation judgement in reaching the final numerical DoV figure for each form of land damage. Where this has occurred, division of the final figure by the pre-earthquake valuation to reach an effective percentage adjustment for each form of land damage will necessarily reflect this judgement, rather than simply the percentage adjustments specified for certain flood profiles or liquefaction severity and change in severity classifications in each of the IFV and ILV DoV Methodologies.
- 148 For example, the valuers are required to consider whether the application of standard percentage adjustments to particularly high-value properties produces final DoV figures which, when considered as a matter of valuation judgement, are too high given the intrinsic features of the property. Both the IFV and ILV DoV Methodologies provide that it may be that a lower percentage adjustment for these forms of land damage is appropriate for properties with particularly high intrinsic value. In the IFV DoV Methodology, this may be achieved by use of the "over-riding positive attributes" adjustment, or adjustment of the final DoV figure.
- 149 EQC's valuers consider that it is appropriate to apply the relevant Combination Matrix (Phase 3 in the methodology) to the effective percentage adjustments that take account of this exercise of valuation judgement in relation to each form of land damage. The significance of a form of damage should reflect the impact of the form of damage on the property, taking account of all the features of the property that inform that valuation judgement. So, for example, if a property has high intrinsic value which means that its value is more resilient to increases in vulnerability to natural hazards, then the fact that the vulnerability is less significant than it might be for other properties should be taken into account in assessing the combined impact on value of increases in vulnerability to two natural hazards.
- 150 In applying this approach, care will be taken to ensure that a consistent approach is taken to the application of valuation judgement, and that there is no "double counting" in the various exercises of valuation judgement throughout the methodology. That is, in considering what, if any, adjustment is required to the separate valuation of ILV land damage EQC's valuers will have regard to whether the separate valuation of IFV land damage has required an adjustment. Once these

adjustments are made, it may be unnecessary to make any further adjustment in the final exercise of valuation judgement (in Phase 4). However, this will depend on all the circumstances of the property.

- 151 In the final assessment of whether the DoV resulting from the application of this methodology appropriately represents the loss of value due to both forms of land damage (in Phase 4), EQC's valuers will also have particular regard to high combined total adjustment percentages (e.g., for properties where the pre-earthquake house remains in place, those over 20 percent and for properties where the pre-earthquake house has been or will be rebuilt, those over 30%).
- 152 In all cases where an adjustment is made, either as part of the valuation of the impacts of IFV or ILV land damage or in the final valuation assessment, this will be recorded together with the reasons for the adjustment in the valuation working documents.

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