



Determination 2015/041

Regarding the failure to issue a section 124 Building Act notice (relating to geotechnical hazards) on the property at 2 Rockcrest Lane, Christchurch



1. The matter to be determined

1.1 This is a determination under Part 3 of the Building Act 2004¹ (“the Act”) made under due authorisation by me, John Gardiner, Manager Determinations and Assurance, Ministry of Business, Innovation and Employment (“the Ministry”), for and on behalf of the Chief Executive of the Ministry.

1.2 The parties to this determination are

- J Armitage, C King and P Gillaly, the owners of 2 Rockcrest Lane, Christchurch (“the applicants”) acting through an agent (“the agent”)
- Christchurch City Council, carrying out its duties and functions as a territorial authority (“the authority”).

¹ The Building Act, Building Code, compliance documents, past determinations and guidance documents issued by the Ministry are available at www.building.govt.nz or by contacting the Ministry on 0800 242 243

- 1.3 The applicants have applied for a determination regarding the authority's refusal to issue a dangerous building notice on their house under section 124(2)(b) of the Act ("a section 124 notice").
- 1.4 The applicants' property is located in the Port Hills area of Christchurch and was 'red zoned'² by the Canterbury Earthquake Recovery Authority ("CERA") after the 2010 - 2011 Canterbury earthquakes and aftershocks ("the Canterbury earthquakes"). The applicants approached the authority in June 2013 and again in June 2014 requesting the authority apply a section 124 notice to their house, as they considered there was a risk that rocks from the hillside above could fall and cause death or injury to occupants.
- 1.5 I consider that the matter to be determined³ is whether the authority correctly exercised its powers in refusing to issue a section 124 notice for the applicants' house.
- 1.6 When considering this matter and arriving at my decision I considered all the information provided to me by the applicants and the authority. I also engaged the services of a chartered professional engineer with a specialisation in geotechnical engineering, and a professional engineer with experience in the quantitative modelling of risk. These experts provided advice and analysis in terms of the technical material provided.

2. Context

- 2.1 This determination relates to a property in the Port Hills, an area already at risk of rockfall which experienced significant damage as a result of the Canterbury earthquakes. The area is now understood to lie over an earthquake fault line.
- 2.2 A number of the dwellings in this area had section 124 notices applied under the definition of dangerous building modified by the Canterbury Earthquake (Building Act) Order 2010⁴ ("the modified definition"⁵). That Order was superseded on 17 September 2011 by the Canterbury Earthquake (Building Act) Order 2011 ("the 2011 Order"), which was superseded in turn by the Canterbury Earthquake (Building Act) Order 2013 ("the 2013 Order") on 17 September 2013.
- 2.3 The modified definition and relevant legislation are described further in the discussion section. A more detailed description of the Port Hills and associated rockfall hazards as well as background to the issue of section 124 notices under the modified definition is included in previous determinations.⁶

² CERA Red Zone: Port Hills – affected by cliff collapse and there are immediate risks to life, land remediation is not considered viable and infrastructure would be difficult and costly to maintain, or affected by rock roll and the risk to life is considered unacceptable, is unlikely to reach an acceptable level in a reasonable timeframe, and protective works to mitigate the life safety risk are not considered practicable

³ Under sections 177(1)(b) and 177(3)(f) of the Act

⁴ Canterbury Earthquake (Building Order) 2010 clause 7

⁵ 121 Meaning of dangerous building

(1) A building is dangerous for the purposes of this Act if:...

(d) there is a risk that adjacent, adjoining or nearby buildings or land could collapse (including collapse by way of rock fall, landslip, cliff collapse, or subsidence) or otherwise cause injury or death to any person in the building

⁶ Eg 2013/33 and 2013/37, available at www.building.govt.nz/determinations

3. The house and site

- 3.1 The applicants' property is located on the east side of Bowenvale Valley and on the lower slopes of Huntsbury Spur. The house on the property was built in 2009 and is cut into the hillside.
- 3.2 There is a small garden on the house's uphill side, and above that again lies Rockcrest Lane. The dwelling at 4 Rockcrest Lane is directly upslope from the applicants' house and is flanked by number 3 to the north and number 5 to the south. The hillside rises steeply behind these houses for about 200m up to Major Aitken Drive.
- 3.3 I understand that the area of the applicants' house is underlain with loess (fine sand soils) while the slope further up the hillside is exposed rock or rock at very shallow depth. Boulders and rock outcrops are scattered across this upper area, while some bluffs are visible below.⁷
- 3.4 There is also a shallow gully down to Rockcrest Lane which exits between house numbers 4 and 5. This is above the southern end of the applicants' house.

4. Background

- 4.1 As noted earlier, the applicants' property is in an area affected by rockfall during the Canterbury earthquakes and later designated a red zone by CERA.

4.2 PHGG assessment June 2012

- 4.2.1 On 1 June 2012 the Port Hills Geotechnical Group (PHGG)⁸ undertook a site assessment at the property. This was part of the suburb-wide field testing of GNS Science's⁹ rockfall risk model¹⁰ which was carried out at all Port Hill properties.
- 4.2.2 This assessment noted:
- the GNS_{LOL} (loss of life) risk at the property was between 10^{-3} and 10^{-4}
 - the suburb average rockfall source was "discontinuous major" and the rockfall source at the site did not vary significantly from the suburb average
 - the profile of the slope above the dwelling was "sloping run-out"
 - whether the 'F' angle¹¹ at the dwelling was less than the GNS shadow angle¹² (which it said was 28° at the dwelling) was not measurable
 - boulders did not pass or land within 10m of the house
 - there was a significant topographic feature, described as a gully between 4 and 5 Rockcrest Lane that channelled rockfall, that increased risk to the dwelling

⁷ From a geotechnical engineering firm's report for the applicants of 7 June 2013, which in turn refers to geological mapping carried out by GNS Science and includes a figure to show geomorphology mapping for rockfall risk assessment (Map C2 Sept 2012: Townsend, 2012)

⁸ A consortium of geotechnical engineers contracted to the Christchurch City Council

⁹ GNS Science is a Government-owned research institute that specialises in earth, geosciences and isotope research and consultancy

¹⁰ Reported in GNS Science Consultancy Reports; 2011/311 (March 2012) "Canterbury Earthquakes 2010/11 Port Hills Slope Stability: Pilot study for assessing life-safety risk from rockfalls (boulder rolls)" and 2012/123 (March 2012) "Canterbury Earthquakes 2010/11 Port Hills Slope Stability: Life-safety risk from rockfalls (boulder rolls) in the Port Hills"

¹¹ F angle, or Fahrboeschung angle: the angle formed between the horizontal and a line drawn from the actual rock fall source location to the stopping point for a given boulder or to a particular given point on the slope below the source

¹² S angle, or shadow angle: the angle between the horizontal and a line drawn from the base of the rock fall source to the stopping point for a given boulder or to a particular given point on the slope below the source

- the risk at the site was the same as the GNS suburb-scale value
- a section 124 notice was not required.

4.3 **Reports for the applicants May - June 2013**

4.3.1 The applicants' agent commissioned a site report from a firm of consulting engineers ("engineer A") and an opinion from a firm of geological and engineering consultants ("engineer B").

4.3.2 Engineer A's site report dated 30 May 2013 included the following:

- The report's purpose was to assess whether it was safe for the house to be occupied from an engineering perspective, and to consider the risk if the house above the applicants' property was removed.
- Engineer A carried out a visual inspection of the property and uphill slope with engineer B, who he said would provide an independent report without reference to his own assessment.
- Engineer A met the owner of a utility vehicle parked between two upslope houses (numbers 3 and 4 Rockcrest Lane) at the time of the Canterbury earthquakes. This vehicle was hit and damaged by a large rock which he considered would otherwise have hit the northern end of the applicants' property.
- There were some rock fragments on the dwelling roof, other loose rocks nearby and some rocks at the southern end of the upslope house which had been restrained by a retaining wall above the roadway, but that wall had rotated.
- Engineer A believed there were two pathways (either side of the upslope house) down which rocks could fall and strike the applicants' home, and said "in my opinion there is a real danger to the [applicants'] house from rockfall".

4.3.3 Engineer B's opinion dated 7 June 2013 included the following:

- A number of properties on Rockcrest Lane including the applicants' had been red zoned by CERA. While such assessments assumed bare ground, the section 124 notices pertaining to dangerous buildings were placed with consideration of uphill houses.
- Therefore, the applicants' dwelling did not receive a section 124 notice as the upslope property provided it with "significant protection". If this house (which had a section 124 notice) was demolished, such protection would be removed and the applicants' dwelling "should inevitably" receive a section 124 notice.
- Engineer B noted boulders nearby and resulting damage around the upslope house as a result of the earthquakes, referred to the vehicle hit by boulder during the earthquakes, and said "the risk of rockroll is therefore a real one".
- Even with the upslope dwelling in place the southern third of the applicants' dwelling remained unprotected and was "currently exposed to a rockroll hazard that the GNS study demonstrates is unacceptably high".
- This was also in line with the shallow gully and therefore a large boulder could potentially pass into the applicants' dwelling.

4.4 **The authority's assessment July 2013**

- 4.4.1 On 28 June 2013 the agent sent both of these reports to the authority and asked it to apply a section 124 notice to the applicants' dwelling.
- 4.4.2 The authority replied on 12 July 2013 that its senior geotechnical engineer and geotechnical advisor ("geotechnical advisors") had reviewed the geotechnical hazards affecting the dwelling, taking these reports into consideration.
- 4.4.3 As part of this review, they had visited the property and adjacent area on 3 July 2013 and completed the standard flowchart used by the authority to help assess whether a building was dangerous under the modified definition.
- 4.4.4 The authority said its geotechnical advisors:
- agreed there was a large rock against the wall of the upslope property (4 Rockcrest Lane) that may have fallen after one of the Canterbury earthquakes and been moved
 - noted there were no other obvious fallen boulders downslope from numbers 3, 4 or 5 Rockcrest Lane but there were many stable boulders beside the lane/driveway that appeared to have been placed as part of landscaping
 - noted that there were boulders in the gully exit between 4 and 5 Rockcrest Lane that had "clearly been placed for landscaping or runoff control reasons" and that this gully was well vegetated such that no rocks had exited from it as a result of the earthquakes
 - found it difficult to understand how what engineer A referred to as "fist-sized rocks" and observed on the applicants' roof had got there, and said their inspection had shown these were mostly clods of earth
 - commented that the reports' authors appeared to have been unaware of the authority's criteria for issuing section 124 notices, which were shown on the flowchart.
- 4.4.5 The authority said there was not necessarily a correlation between the GNS life risk zones and the assessment required under section 121 of the Act. It noted that the life risk models were not property-specific, whereas the assessment of risk under section 121 and the need or otherwise for a section 124 notice was based on site-specific conditions at the time of the assessment.
- For example, the presence and effectiveness of a natural or man-made barrier (such as a house or vegetation) is taken into account whereas the life-risk model does not directly consider such factors but instead assumes a 'bare slope' condition (ie that there is no natural or man-made protection).
- 4.4.6 The authority considered the applicants' dwelling did not meet the test in section 121(1)(d) of the Act as rocks did not reach, impact or pass it and, on that basis, would not issue a section 124 notice. It said that assessment could be reviewed if 4 Rockcrest Lane was demolished and not rebuilt.
- 4.4.7 The authority also provided a copy of the flowchart assessment ('Section 124 (geo) Notice Application Decision Process – Boulder Roll') completed by its geotechnical advisors following their site visit.

4.4.8 The assessment concluded:

- rocks fell on this or an adjacent property (noted on the flowchart as “upslope properties”)
- rocks did not reach or pass the house
- there were obvious sources for further rockfall
- there was effective natural or man-made protection, and
- therefore, a section 124 (geo) notice was not required, although it was noted that this “should be reassessed when dwellings above are demolished”.

4.4.9 Comments made on the assessment form were:

Dwelling is protected by upslope dwellings and vegetation. Gap between upslope dwellings exposes part of dwelling but no boulders have passed through.

The property was visited on 03/07/13 by [PHGG and the authority]. The majority of ‘small rocks’ reported on the roof were mostly clods of dirt and could not have been emplaced by rockfall.

The potential conduit for rocks between the two upper houses was choked with thick [vegetation] and had a rock wall at its base and would therefore not likely to be a rock chute.

4.5 **Report for the applicants May 2014**

4.5.1 The applicants asked engineer A to review the authority's letter. The engineer replied on 31 May 2014, reiterating some points from his earlier report and also responding to the authority’s flowchart assessment.

4.5.2 In engineer A’s view:

- The only reason rocks did not “reach or pass” the house was because a vehicle stopped a large rock.
- There was not “effective natural or man-made protection (rock fence, houses, bund, trees)”.
- The authority’s rockfall data listed a rock with a volume of 4m³ as having come to rest near the retaining wall above the southern end of the property. This wall was damaged and broken vegetation above this suggested a possible rock path.

4.5.3 He concluded:

... it is clear that the home at 2 Rockcrest Lane is in a significant rockfall hazard zone. The true nature of this risk has been somewhat dismissed in the current assessment because of the fortunate placement of a motor vehicle, the presence of the house above that is soon to be demolished, and a retaining wall that has now been damaged and any freeboard filled up to the point where it [sic] further rock falls will go beyond that location.

In my opinion the robustness in protection for the [applicants’ property] has now gone.

5. The applicants' submission

- 5.1 On 9 June 2014 I received an application for determination and the applicants' request for a hearing.
- 5.2 The application included a covering letter from the agent and copies of:
- the reports from engineers A and B outlined in the previous section
 - the correspondence between the agent and the authority described in paragraphs 4.4 to 4.4.5 plus the accompanying flowchart and photographs
 - an email to the authority of 21 February 2014 requesting further information relating to rocks that fell near the applicants' property in the Canterbury earthquakes
 - the authority's response of 25 February 2014 including a diagram of nearby bluff and boulder locations (dated 24 February 2014) and referring to a spreadsheet summarising boulder information
 - a legal opinion dated 9 June 2014 commissioned by the applicants and addressed to the Ministry
 - an aerial photo of the applicants' property and surrounding houses, and a CERA hazard line diagram
 - signed statements and photographs from two occupants of Rockcrest Lane at the time of the Canterbury earthquakes.
- 5.3 In his covering letter, the agent said at the time he contacted the authority to consider applying a section 124 notice (ie June 2013) the definition of "dangerous building" contained in section 124 of the Act had been modified by clause 7 of the 2011 Order. Therefore, the applicants submitted that I was entitled to determine that the authority's prior decision not to issue a section 124 notice should be reversed, even though the 2011 Order expired on 16 September 2013. The legal opinion included with the application was to this effect.
- 5.4 The first signed statement (dated 2 August 2013) was from an occupant of the applicants' dwelling at the time of the 22 February 2011 earthquake, who said she had built 4 Rockcrest Lane with her then husband. She said she heard rocks rolling down in an aftershock later that day and identified two boulders near the house at number 4 she said were not there before the Canterbury earthquakes.
- 5.5 The second statement (dated 30 August 2013) was from the occupant of 4 Rockcrest Lane at the time of the 22 February 2011 earthquake. He said his vehicle was in the driveway of number 3, uphill from the northern end of the applicants' property. It was hit by, and stopped, a large rock which he estimated to be about "600 x 800 cm". He said two other large rocks rolled down the hill and stopped against a concrete retaining wall immediately below the deck on the southern end of his house.
- 5.6 The agent submitted that the authority's assessment of July 2013 was flawed.
- The flowchart clearly records in respect of the question 'Are there obvious sources for further rock roll?' the answer 'Yes'. The conclusion that nevertheless there is 'effective natural or man-made protection' is clearly incorrect.

5.7 He said that the outcome of the determination was of “considerable importance” as the applicants had a deadline¹³ for deciding whether or not to accept the Crown's buy-out offer (as the property was red zoned) and it was their insurer’s policy to make a payment on a total loss basis if a section 124 notice had been issued in respect of the house.

5.8 Further material from the applicants

5.8.1 On 9 July 2014 I received a letter from the agent enclosing a rockfall risk desk study dated 4 July 2014 which was commissioned by engineer B from another engineering consultancy firm (“Engineer C”).

5.8.2 Engineer C’s desk study calculated the rockfall risk at the applicants’ property and said this was done following the basis presented in GNS 2011/311 for Bowenvale Valley with site-specific modifications for local sources, rockfall observed and topography. However, it also noted that it was “standard practice” to assume that upslope properties were not present and therefore did not reduce the assessed risk by acting as a rock barrier.

5.8.3 The study noted that the applicants’ property was at a shadow line of approximately 29°. Following GNS 2011/311, the number of boulders passing this shadow line in Bowenvale Valley was ~13% while the mean for all suburbs was ~42%.

5.8.4 The study said that, in the immediate area of the applicants’ property, no boulders were observed to reach this shadow line.

Field mapping and aerial photo interpretation suggests that the heavy vegetation on the slope is providing significant rockfall attenuation proximal to [the applicants’ property].

5.8.5 In his letter, the agent quoted the desk study’s conclusions that:

The annual probability of loss of life for both the 50 year earthquake and the 1 year earthquake recurrence frequencies both exceed 10^{-4} , and are therefore above the tolerable risk level. The risk to 2 Rockcrest Lane is therefore considered to be unacceptable without mitigation.

It should be noted that the risk calculation does not account for any mitigation provided by the building at 4 Rockcrest Lane.

5.8.6 However, he noted the study’s references to particular boulders that came to rest near upslope houses and its comment that ‘at present, 4 Rockcrest Lane is therefore considered to at least partially protect 2 Rockcrest Lane’. He said the upslope house provided no protection against either of the boulders referred to ‘and accordingly the protection is only partial’.

6. The authority’s response

6.1 The authority responded on 15 July 2014 that it did not believe any of the information provided by the agent changed its decision not to apply a section 124 notice.

¹³ 31 August 2014 at the time of the application; later extended by CERA to 27 February 2015

- 6.2 The authority’s senior geotechnical engineer had reviewed this information, agreed with the findings in the rockfall risk assessment report, and considered that this independently established the AIFR¹⁴ for the property as lying within the 10⁻³ to 10⁻⁴ band for both the 1 year and 50 year earthquake risk. The authority said this aligned with the GNS model (2016) used for red zoning purposes by CERA and for its own district plan review.
- 6.3 However, the authority said:
- Like many properties in the Port Hills, this property is in the ‘red zone’ due to an intolerable life risk from rockfall, but that does not mean the buildings on this (and other) properties were (or are) dangerous buildings under the Building Act.
- 6.4 It said its geotechnical engineer confirmed that the situation at the applicants’ property would not have supported a finding that the building was dangerous under the modified definition.
- 6.5 The authority also said previous determinations by the Ministry¹⁵ had confirmed the approach it was to take to an assessment under the amended section 121, and that the relevant factors required were whether there was:
- a credible risk of a triggering event that would generate a rockfall
 - a source of rocks above the property
 - a risk that rocks from these sources would reach the building
 - a risk that rocks from these sources will reach the building with sufficient energy to injure an occupant
 - sufficient mitigation that would offset this risk.
- 6.6 From the information currently available, the authority said there was likely to be a credible triggering event and a source of rocks. However, it appeared unlikely rocks would reach the building or, if they did so, those rocks would not reach the building with sufficient energy to injure an occupant.
- 6.7 The authority said that there was some mitigation that offset risk – the building at 4 Rockcrest Lane – at the time the 2011 Order was in force (ie when the modified definition could be considered).
- 6.8 It also said it was “even less likely” that the building was dangerous under the current wording of section 121(1)(a)¹⁶, and:
- That means the [authority] cannot now, and could not have under the previous Order in Council [the 2011 Order], exercised any enforcement powers under section 124 of the Building Act.

¹⁴ Annual individual fatality risk: used in GNS work for the authority and CERA to express the likelihood that a particular person occupying a dwelling will be killed by an event such as rockfall in any one year. This is expressed as logarithmic numbers such as 10⁻⁴ per year.

¹⁵ Determinations 2013/033, 2013/037 and 2013/074, available at www.building.govt.nz

¹⁶ 121 Meaning of dangerous building

(1) A building is dangerous for the purposes of this Act if,—

(a) in the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause—

- (i) injury or death (whether by collapse or otherwise) to any persons in it or to persons on other property; or
- (ii) damage to other property; ...

6.9 The authority also said its geotechnical engineer commented that, during his earlier site visit of the property with a PHGG geotechnical advisor, they had assessed the “boulders” reportedly located on the property but had not found any they could attribute to rockfall.

Whilst there were a number of small (pebble sized) rocks and mud clods located on the roof, it was their professional opinion that these rocks and clods did not originate from rockfall.

7. Further responses from the parties

7.1 On 23 July 2014 the agent emailed me to address points raised in the authority’s response. While accepting that CERA’s red zoning was a separate issue from its application of section 124 notices, he questioned the authority’s conclusions regarding three of the relevant factors for determining the building was dangerous under the 2011 Order.

7.2 These were whether or not there was:

- **a risk that rocks from these sources would reach the building:** the agent again referred to the engineer A’s view that a rock would have struck the northern end of the property if it had not hit and substantially damaged a utility vehicle instead; he noted that the retaining wall at the southern end of the house appeared to have stopped rocks dislodged in the earthquakes, but this no longer provided protection; and said that future rockfalls could either overrun this wall or cause it to fail downslope, allowing rocks to fall on the applicants’ property
- **a risk that rocks would reach the building with sufficient energy to injure an occupant:** he said this must be “viewed as likely” given the size of the rocks stopped by the vehicle and retaining wall
- **sufficient mitigation that would offset this risk:** he said it was evident there was insufficient mitigation as the vehicle no longer provided protection and neither did the retaining wall.

7.3 The agent also attached an email sent to him 23 July 2014 by engineer C which included the following points:

- The results of both CERA/the authority’s and engineer C’s generic rockfall flowpath analysis showed rock paths entering into and passing through the property.
- While no boulders were recorded on the property from previous events, engineer C understood that large (<1 m³) boulders were blocked from approaching by a retaining wall and vehicle, and these boulder locations were consistent with the rockfall flowpaths.

7.4 The authority responded on 23 July 2014, saying that:

- there was “considerable doubt” whether the rock that struck the vehicle had sufficient energy and the correct orientation to reach the property
- the effects of the retaining wall were not quantified, and ‘we believe the gully above the retaining wall caused most of the energy to be dissipated due to its clogged nature with vegetation’.

7.5 The authority later clarified (by email 28 July 2014) that these comments were based on the earlier site visit by its geotechnical advisors (refer to paragraph 4.4.6) and said:

It was professional judgement that has not been verified by any rockfall modelling that may have been carried out in the vicinity.

7.6 The agent responded to this on 4 August 2014 to the effect that:

- The professional judgement of engineer A, contained in his May 2013 site report, was that the rock which hit the vehicle would otherwise have hit the northern end of the property. This view was to be preferred to the views of the authority's geotechnical advisors as it was based on evidence given to engineer A on site (by the vehicle owner).
- Regarding the retaining wall, he referred again to the engineer A's site report, the dwelling occupant's statement relating to boulders that fell in the Canterbury earthquakes and the photographs supplied. He said there was evidence of significant damage to vegetation in the gully 'likely caused by rockfall', the ability of the vegetation to dissipate energy had not been measured, and that engineer A's professional judgement (partly based on information from the dwelling occupant) was that future rock rolls could either go over the retaining wall or cause it to fail. Either of these events could allow rocks to fall onto the applicants' property.

7.7 The agent said the issue was whether or not there was a relevant risk, again referred to previous similar determinations, and included an email he received on 28 July 2014 from engineer A which said there was "clear evidence" of the amount of energy carried by the rock that hit the vehicle.

7.8 Engineer A also said:

The vehicle suffered substantial (we were advised \$15 000) damage. The modelling located this path and the run out went thru the property. Both are clear evidence that rock fall down that pathway IS a major risk.

The second path to the south of the house also shows that the rocks had substantial energy. The retaining wall has significant impact damage as the rocks fell into the gully and filled up behind the wall. Any rocks now will go over the wall as the space behind is full. There is also the chance of a retaining wall failure.

It is clear to me that we have better information than those making the initial decision. That information confirms that a 124 notice should be issued for this site.

7.9 On 4 August 2014 I asked the authority whether it had considered undertaking 2D rockfall analyses at the time of its assessment in mid 2013 noting that, by this time, such analyses had been undertaken at some properties where those owners had previously applied for a determination.

7.10 The authority replied on 5 August that it had not previously considered this rockfall modelling as it had relied on the site observations and professional judgement of two geotechnical experts. The authority's understanding was that engineer A's field of expertise was as a structural engineer and also noted that his comments provided the view that rocks might hit the northern end of the property; not that they would actually hit the dwelling with sufficient energy to penetrate it.

We know the property is at an increased risk from rockfall as provided by observations and GNS modelling, but the [authority] did not consider the risk at this property met the dangerous building test as it existed prior to September 2013.

7.11 The agent replied to me on 10 August 2014 to the effect that:

- Engineer A advised he held CPEng¹⁷ Geotech as well as structural engineering qualifications, and considered he was uniquely qualified to comment in this circumstance; generally, his views were justified and supported by Engineer C's July 2014 study; and his original report had correctly identified the two rockfall pathways to the north and south of the upslope house.
- Regarding the risk of rocks reaching the building with sufficient energy to injure an occupant, Engineer C's study had shown rockfall pathways extending beyond the building line and Engineer A considered that 'to roll that far a rock would definitely strike the building with sufficient energy to damage it or cause injury'.
- Regarding the difference between the parties' experts, he had tried to arrange a meeting between the two groups in August 2014 but said the authority would not agree to a meeting. 'Any doubt arising as a result of the failure of the [authority] to have the experts confer and clarify matters between them accordingly cannot be used against [the applicants]...'
- The test introduced into section 121 by the 2011 Order (ie the modified definition) was relevant at the time of the authority's decision and the determination review of the authority's decision must be based on the law at that time.

7.12 The draft determination and submissions in response

7.12.1 On 29 October 2014 a draft determination was issued to the parties for comment.

7.12.2 By email on 5 November 2014 the authority accepted the findings of the draft and requested minor amendment to the wording in paragraph 6.6.

7.12.3 By email on 14 May 2015 the agent responded on behalf of the applicants, stating that the applicants did not accept the conclusion in the draft determination but did not intend to make any further submission.

8. Discussion

8.1 In order to arrive at a view on whether the authority correctly exercised its powers in refusing to issue a section 124 notice for the applicants' house, I must consider the meaning of dangerous building and the issuing of section 124 notices in terms of the relevant legislation.

8.2 This legislation includes:

- the Act
- the 2011 Order, which expired on 16 September 2013, and
- the 2013 Order, which took effect from 17 September 2013 and will be revoked on 18 April 2016.

8.3 The relevant sections and clauses are discussed further below.

¹⁷ Chartered Professional Engineer

8.4 **Meaning of dangerous building**

8.4.1 The relevant sections of the Act are:

- section 121 Meaning of dangerous building
- section 124 Powers of territorial authorities in respect of dangerous, earthquake-prone or insanitary buildings

8.4.2 While section 124 was replaced on 28 November 2013¹⁸ with section 124 Dangerous, affected, earthquake-prone, or insanitary buildings: powers of territorial authority, I refer to the version noted in paragraph 8.4.1 as this was in force during the period the determination is concerned with and is the version referenced by the 2011 and 2013 Orders.

8.4.3 As the applicants approached the authority in June 2013; that is, before the expiry of the 2011 Order on 16 September 2013, the following clauses of that Order are also relevant:

- Clause 7 Modification of meaning of dangerous building and extent to which territorial authority can apply modified provision
- Clause 9 Modification of powers of territorial authorities in respect of dangerous, earthquake-prone, or insanitary buildings under section 124 of Act

8.4.4 The authority had the power at that time to issue a section 124 notice by relying on the definition of dangerous building as modified by clause 7 of the 2011 Order. This modified definition is as follows:

121 Meaning of dangerous building

- (1) A building is dangerous for the purposes of this Act if: ...
- (d) there is a risk that adjacent, adjoining or nearby buildings or land could collapse (including collapse by way of rock fall, landslip, cliff collapse, or subsidence) or otherwise cause injury or death to any person in the building

8.4.5 In considering whether the authority should have issued a section 124 notice based on the modified definition, I note that this definition established a very low threshold before a building would be considered dangerous.

8.4.6 In respect of the risk at the applicants' property, the only requirement is "there is a risk" that adjacent land could collapse by way of landslip, cliff collapse or subsidence and cause injury or death to any person in the building.

8.4.7 A "risk" that something could happen is simply a possibility of that event happening. This is in contrast to the definition of a dangerous building in section 121(a) where a building must be "likely", in the ordinary course of events, to cause injury or death.

8.4.8 The modified definition also required that the risk of injury or death must be "to any person in the building". This meant that the defined hazard must reach the building itself, not just the property boundary, with sufficient force to injure the occupants.

¹⁸ By section 30 of the Building Amendment Act

8.4.9 The extent to which the authority could have applied this modified definition was as follows¹⁹:

7 Modification of meaning of dangerous building and extent to which the authority can apply modified provision

(3) Section 121(1)(d) or (e) of the Act as modified by this clause applies only for the purposes of a territorial authority exercising its powers under section 124(1)(a), (b) or (d) of the Act as modified by clause 9.

8.4.10 I note that, as the 2011 Order has expired, the authority no longer has the power to apply new section 124 notices using the modified definition.

8.4.11 Furthermore, the 2013 Order only provides for some of the section 124 notices issued by the authority relying on the modified definition to remain in force²⁰; namely, those issued:

- under section 124(1)(b)²¹ of the Act (warning a person not to approach a building), and
- before the 2011 Order expired.

8.4.12 All other section 124 notices relying on the modified definition expired with the 2011 Order²².

8.5 Whether “there was a risk”

8.5.1 To arrive at my decision on whether or not this house was a dangerous building under the Act while the modified definition applied, I have to consider whether there was a “risk” for the purposes of section 121.

8.5.2 In previous determinations relating to the application of section 124 notices for rockfall²³, I have set out the decision-making approach noted in paragraph 6.5.

8.5.3 Following this approach, and based on the evidence supplied and my own expert advice, I accept there was:

- a credible risk of a triggering event that would generate a rock fall, and
- sources of rocks above the property.

8.5.4 I also note that the parties are agreed on these two points.

8.5.5 I now need to consider whether there is sufficient evidence to allow me to conclude there was:

- a risk that rocks from these sources would reach the building
- a risk that they would do so with sufficient energy to injure an occupant
- sufficient mitigation that would offset this risk.

8.5.6 My independent geotechnical expert has reviewed the technical evidence made available to me including Engineer B’s opinion of June 2013 and also Engineer C’s rockfall risk desk study of July 2014 (after the 2013 Order expired).

¹⁹ Clause 7 of the 2011 Order

²⁰ Under clause 5(1)(a) of the 2013 Order

²¹ The 2013 Order refers to section 124(1)(b) of the Act but these provisions are currently contained in section 124(2)(b) following the enactment of the Building Amendment Act 2013.

²² Under clause 6 of the 2013 Order

²³ Eg determination 2013/074, available at www.building.govt.nz/determinations

- 8.5.7 He notes that the modelling in the latter report is based on the absence of any upslope properties and does not appear to take account of the vegetation (even though the report notes that ‘field mapping and aerial photo interpretation suggests that the heavy vegetation on the slope is providing significant rockfall attenuation proximal to 2 Rockcrest Lane’). However, both of these are valid considerations for a section 124 assessment.
- 8.5.8 Likewise, he notes that the AIFR analysis in this report does not appear to take account of the protection provided by the upslope house although this too should be considered for a section 124 assessment.
- 8.5.9 My expert also says that there is heavy vegetation behind the upslope house (4 Rockcrest Lane) which would still provide protection to the applicants’ dwelling even if this house was removed. However, demolition of this house is not relevant as the section 124 assessment is based on the situation prevailing at the time.
- 8.5.10 As the authority has already pointed out to the applicants, the test for applying a section 124 notice at the time the modified definition applied was different to the CERA zoning process. Therefore, I agree that the authority was correct to take into account mitigating factors such as the upslope house, existing vegetation and the rockwall at the base of the gully when making its assessment.
- 8.5.11 Accordingly, I have only considered possible rockfall pathways past either side of the upslope house. I will discuss each of these in turn.

8.6 Northern side

- 8.6.1 I will first consider the risk that rocks could pass the northern side of the upslope house and reach the applicants’ dwelling with sufficient energy to injure an occupant. This is the region where a boulder hit a vehicle during the February 2011 earthquake; a boulder that Engineer A believes would otherwise have hit the applicants’ house.
- 8.6.2 I note that the risk of rocks passing the northern side was not identified by PHGG in its field test (June 2012), nor by Engineer B in his report (June 2013), nor by the authority in its section 124 assessment (July 2013). The authority also said that in its geotechnical advisors’ view that there was “considerable doubt” whether the boulder that hit the vehicle would have had the correct orientation to reach the applicants’ house.
- 8.6.3 In my expert’s view and based on his past experience with other Port Hills sites, this boulder’s recorded size (at 1.0m³) is likely to have been over-estimated in the authority’s database as he says this value appears to have been the default used either if boulder dimensions were not recorded or if boulder volumes were less than 1.0m³. Further, given that this boulder was stopped by the parked vehicle, he says ‘it seems likely that it would not have penetrated the dwelling at No 2, had the vehicle not intercepted it.
- 8.6.4 My expert also noted one of the boulders referred to in Engineer B’s report which came down during the Canterbury earthquakes and bent the hand rail at the north-eastern corner of the upslope house.

The foregoing “large” boulder of about 0.5 tonne corresponds to a volume of approximately 0.2 m³, which would have had a relatively small kinetic energy value when it reached and only bent the hand rail, and in my opinion would have been likely to be arrested by the heavy vegetation on the slope beside the house at No 4 if it had reached that location.

8.6.5 Accordingly, I do not consider this to be a credible rockfall pathway for rocks to reach the applicant's dwelling with sufficient energy to injure an occupant.

8.7 Southern side

8.7.1 In considering the risk of rocks passing the southern side of the upslope house, I note that Engineer B considered that the southern third of the applicants' property was in line with the shallow gully on this side and that a large boulder could potentially pass into the applicants' dwelling. Engineer A said there was broken vegetation in the gully, the rockwall was damaged and its freeboard was filled up and, in his view, rocks would 'definitely strike with sufficient energy to injure' based on Engineer C's report showing pathways extending beyond the building line.

8.7.2 On the other hand, the authority's section 124 assessment of July 2013 considered that the existing vegetation and rock wall provided sufficient mitigation. The authority considered that most of the energy of any rockfall would be dissipated due to the gully's 'clogged nature with vegetation'.

8.7.3 My expert notes that in the PHGG s124 (geo) flow chart form dated 1 July 2013 for the authority's assessment, PHGG said in relation to the gully along the southern side of the upslope house (as quoted in paragraph 4.4.9) that no boulders had passed through this gap and the potential conduit for rocks was 'choked with thick vege [sic] and had a rock wall at its base and would therefore not likely to be a rock chute'.

8.7.4 In my expert's view:

It is therefore apparent that the heavy vegetation in the gully above the southern part of No 2 should mitigate the rock fall risk to that part of the house and a s124 notice was therefore not required.

8.7.5 My expert also notes that Engineer C's AIFR analysis included a factor of 2 for topographic forcing by a gully but its flow analysis showed that the likely travel paths only intercepted the ends of the uphill wall of the applicants' dwelling, indicating that topographic forcing may not be significant.

8.7.6 Moreover, he says Figure 11 of Engineer C's report indicated that boulders following the path intercepting the southern end of the dwelling may originate predominantly from the upper rock source adjacent to Major Aitken Drive. This rock source comprised a tabular rock type which the report itself stated was less likely to produce rockfall boulders that reached the applicants' dwelling.

8.7.7 He also notes that Figure 12 of Engineer C's report shows the CERA 3D rockfall pathways which indicate some focussing of rocks through the gap between Nos 4 and 5 Rockcrest Lane to the uphill wall of the applicants' property. However, he says that the CERA analysis assumes the tabular rock source (described in the previous paragraph) would generate rolling boulders, but [Engineer C's] report stated this was less likely.

8.7.8 In my expert's view:

The CERA 3D output is therefore inconclusive with respect to topographic forcing. The CERA output does indicate, however, that the rolling boulders would barely reach No 2.

This is consistent with the CERA M line (AIFR = 10^{-4}) passing through the dwelling at No 2 (refer attachment to [Engineer A's] letter of 31 May 2014), which indicates a relatively low risk of fatality to occupants of No 2.

8.7.9 Accordingly, in reviewing the available evidence and based on my experts' advice, I do not consider that at the time the modified definition of dangerous building could be considered there was sufficient evidence to conclude there was a risk rocks could arrive at the applicants' dwelling with sufficient energy to cause injury to an occupant.

8.8 The authority's section 124 review process

8.8.1 I have considered whether the authority's decision-making process and assessment methodology was adequate; in particular, given that the applicants supplied engineers' reports to the authority in support of their view that their house was a dangerous building.

8.8.2 With respect to the authority's assessments, it is my view that the authority correctly completed its review checklist by considering no rocks had reached or passed the dwelling, even though Engineer A said there were rock fragments on the dwelling roof.

8.8.3 I note that by this time (mid 2013) the authority had conducted some site-specific 2D rockfall modelling in relation to a number of properties where section 124 notices had been applied. This could potentially have generated more specific data regarding rockfall pathways and energy levels at the applicants' dwelling.

8.8.4 However, as noted in previous determinations²⁴, the outputs of this modelling are considerably less reliable where they need to account for vegetation – as would be the case for site-specific modelling at this property.

8.8.5 On balance, I consider it reasonable for the authority to have relied on the professional judgement of its geotechnical advisers which was, in turn, based on their review of the available data and a site assessment. Therefore, I conclude that the authority responded appropriately to the reports supplied by the agent in conducting its assessment.

8.8.6 It is also my view that the authority correctly took into consideration:

- site-specific features including the presence of vegetation – unlike the suburb-wide modelling process used to determine CERA zoning, which was based on bare slope analysis
- the presence of upslope properties which also provided mitigation – unlike the rockfall risk assessment completed more recently (July 2014) for the applicants – while noting that their removal at any point would prompt a reassessment.

9. Conclusion

9.1 In considering whether or not the authority exercised its powers correctly I have considered its process in terms of whether this was carried out in accordance with the requirements of the Act.

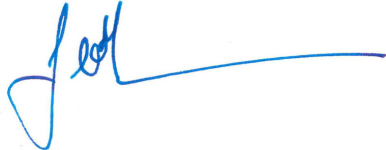
9.2 For the reasons given above, I consider that the authority exercised its powers correctly in deciding not to issue a section 124 notice.

²⁴ For example, determination 2013/074, available at www.building.govt.nz/determinations

10. The decision

- 10.1 In accordance with section 188 of the Act, I hereby determine that the authority correctly exercised its powers of decision by not issuing a notice under section 124 of the Act; and accordingly I confirm that decision.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 6 July 2015.



John Gardiner
Manager Determinations and Assurance