

Education Report: Next steps for Redcliffs School (3483)

Executive Summary

- 1 This report seeks your decision on the next steps for Redcliffs School, following the completion of the consultation process about your interim decision that the school should close.
- 2 Following the Christchurch earthquakes and consequent cliff collapse and debris inundation on and above parts of the school property, Redcliffs School was relocated in 2011 to Sumner School and then to Van Asch Deaf Education Centre.
- 3 On 23 March 2015 you met with the Board of Trustees to announce a proposal to close Redcliffs School.
- 4 You received a submission from the Board and a large number of public submissions in response to your proposal. On 25 November 2015 you made an interim decision that Redcliffs School should close. You made this decision because following consideration of expert geotechnical advice, you were concerned about the potential for disruption to education provision in the future. You were also concerned about the uncertainty of the likely timing of the school's proposed return to its original site. You asked the Board to provide you with any further arguments in favour of the school staying open.
- 5 The Board's submission of 31 March 2016 sets out expert technical advice, puts forward a new mitigation strategy to address both safety and disruption risk from rockfall, raises the issues of psychosocial impact and transport considerations, and proposes that if you do not consider the Main Road site to be suitable, Redcliffs School should be relocated rather than closed.
- 6 The submission is accompanied by a technical report prepared by Eliot Sinclair (Appendix 8 of the Board's submission), which proposes a new mitigation solution that it states will reduce the potential for disruption to a negligible level. The solution is to retreat the utilised area of the school site even further from the cliff than had previously been recommended by MWH New Zealand Ltd (MWH), along with an alternative bund design and location. The revised location of the bund would allow access behind it for assessment, maintenance and clearing of debris if required. Eliot Sinclair considers that the alternative solution would also remove the need for ongoing monitoring of the cliff face.
- 7 The Ministry commissioned a peer review of the Eliot Sinclair report by engineering firm Tonkin & Taylor, and also requested expert opinions about the report from technical advisors who have previously advised the Ministry about the Main Road site. The analyses provided by the Ministry's technical experts broadly support the conclusions of the Eliot Sinclair report.

- 8 The Board's submission also provides information about possible negative psychosocial effects of closure of the school on the Redcliffs community. The Board discussed its concerns about this with you at your meeting with them on 9 May 2016. You asked the Board at that meeting whether it had considered the possible psychosocial impact for primary-aged children of ongoing rockfall at the Main Road site.
- 9 To help inform our analysis of the Board's submission, the Ministry requested advice on psychosocial issues from an independent expert. In order to ensure that this facet was fully considered, the Ministry requested that the expert's opinion address both the potential psychosocial effects of closure of the school, as well as the potential psychosocial effects for children of attending school at the Main Road site.
- 10 The expert's opinion about psychosocial matters indicates that, while it is difficult to generalise the results of studies to a specific situation, there may be some negative and positive psychosocial consequences for the community if the school closed. However, the expert's opinion was also that there might be negative psychosocial effects for children attending a school close to the cliffs where there will be further rock falls.
- 11 Having considered the information provided by the Board, as well as further expert advice, the Ministry's view is that the main concerns which led to your interim decision that the school should close have been adequately addressed. We therefore recommend that you do not confirm your interim decision.
- 12 We also consider, however, that the possibility of detrimental psychosocial effects for children attending school at the Main Road site is an issue that warrants further consideration before a decision is made about whether the school should return to its original site.
- 13 The Board's submission has also raised the possibility of relocation of the school. The Ministry has previously advised you that relocation of the school is unlikely to be a good option, due to the low likelihood that a suitable alternative could be found in the Redcliffs area, and the indications that there might be community opposition to a proposal to utilise the one site that was considered a potentially viable alternative, Barnett Park. However, we consider that this should be further explored. Both the community and the Council have been very supportive of Redcliffs School continuing to remain open so they may support this occurring on part of the park site.
- 14 If relocation of the school could be achieved this would potentially be a way to address both the Board's concerns about potential negative psychosocial effects of closure on the community, and the concerns about the possible negative psychosocial effects on children of attending a school on the Main Road site with the mitigation measures in place. While we consider that the concerns about the site relating to potential disruption to education have been adequately addressed at a technical level, we are mindful that the recommended mitigation measures would reduce the usable area of the school site by around 40% and be visually intrusive. An alternative site would remove entirely the need for any rockfall mitigation measures, and also avoid the possible negative effect of those measures on children attending the school, now and in the future.

- 15 The Ministry proposes to undertake the following work;
- a. An in-depth investigation into the potential psychosocial implications for children (both those attending the school now, and children who will attend the school in future years) if the school returns to the Main Road site with the proposed mitigation measures in place.
 - b. A feasibility analysis on whether relocation to another site within the Redcliffs area is likely to be a feasible option within a reasonable timeframe. This will include engagement with the Board of Trustees and Christchurch City Council over the possibility of acquiring part of Barnett Park.
- 16 The Ministry proposes to engage with the school and invite the Board to participate in this work.
- 17 The Ministry will provide you with a report on these two issues by the end of September. The information that will then be available will be used to inform decisions about whether the school can return to the Main Road site, or whether it can relocate to another site in the Redcliffs area.

Recommended Actions

We recommend that you:

- a. **note** that you made an interim decision that Redcliffs School should close because of concerns about potential disruption to education and uncertainty, and you provided the board an opportunity to put forward any arguments in favour of the school's staying open;
- b. **note** the Board of Trustees of Redcliffs School has provided arguments why the school should remain open and put forward a new proposal to mitigate these risks supported by expert technical advice, which shows that the risk of disruption to education can be reduced to acceptable levels;
- c. **note** that the Ministry's expert advisors agree with the Board's expert's technical analysis;
- d. **note** that we have received expert advice that suggests there might be negative psychosocial effects for children attending school at the Main Road site and we intend to investigate this further before a decision is made about whether the school should return to the Main Road site;
- e. **note** that the Board also raised the possibility of relocation of the school. The Ministry considers that the feasibility of relocation should be explored alongside further investigation into the psychosocial implications of a return to the Main Road site;
- f. **note** that the Ministry will undertake:
 - a. A further investigation into the potential psychosocial implications for children attending school at the Main Road site with the proposed mitigation measures in place; and
 - b. A feasibility analysis on whether relocation within a suitable timeframe to another site within the Redcliffs community, most likely Barnett Park, is likely to be a realistic option.

- g. **note** that the Ministry will invite the Board to participate in this work;
- h. **note** that the Ministry will report to you on the results of this work by the end of September 2016.
- i. **agree** to set aside your interim decision under section 154 of the Education Act 1989, on the basis that the Board has addressed the main concerns that led to your interim decision that the school should close;

AGREE / DISAGREE

And either:

OPTION 1 (Ministry's preferred option)

- j. **agree** to the Ministry engaging with the Board of Trustees of Redcliffs School to undertake the work recommended in noting point (f), and to report to you on the outcomes of this work by the end of September 2016;

AGREE / DISAGREE

Or

OPTION 2

- k. **agree** that Redcliffs School should return to the Main Road site with the recommended mitigation measures in place. The Ministry would work with the Board and engineering firms to confirm the details of these measures and the ongoing monitoring and maintenance plan;

AGREE / DISAGREE

And

- l. **note** that a letter will be developed for your signature to the school Board of Trustees once your decision is known; and
- m. **agree** that a copy of this report be released to the Board of Trustees of Redcliffs School, and later released publicly.

AGREE / DISAGREE

Katrina Casey
Deputy Secretary
Sector Enablement and Support

Encs

Hon Hekia Parata
Minister of Education

37/16

Education Report: Next steps for Redcliffs School (3483)

Purpose of Report

1. This report provides information on the submission from the Board of Redcliffs School in response to your interim decision that the school should be closed under section 154 of the Education Act 1989 (the Act), the response of Ministry experts, and details recommendations for next steps.

Background

2. Redcliffs School is a Year 1 – 8 full primary school, originally located in Redcliffs, Christchurch, in the Port Hills electorate. It had a July 2015 roll of 216 students, and a March 2016 roll of 188 students.
3. Following the Christchurch earthquakes and consequent cliff collapse and debris inundation on and above parts of the school property, Redcliffs School was relocated in 2011 to Sumner School and then to Van Asch Deaf Education Centre. School transport is being provided from the Redcliffs area to the Van Asch site in Sumner, which is outside the Redcliffs School catchment area.
4. On 23 March 2015 you announced a proposal to close Redcliffs School, effective from term 3, 2016 (24 July 2016). You made this proposal because, following consideration of expert geotechnical advice, you were not satisfied that a return to the Redcliffs School site would provide uninterrupted education provision in the future.
5. Future slope instability including rockfall, mass movement and cliff collapse could require assessment to determine whether the site remained within an acceptable risk level, and the school could be displaced again while the assessment and any required repairs, removal of rock or other mitigations were carried out.
6. You were also concerned that, if a decision was made to return the school to its site, this could not be completed until complex demolitions on the cliffs above the school site were completed. There was no scheduled timeframe for these demolitions at the time of your proposal.
7. Consultation on your proposal was originally intended to end on 1 May 2015, however following a request from the Board for further time to respond to your proposal, you agreed to extend the timeframe until 1 July 2015.
8. After the consultation period had ended, the Board wrote to you raising concerns about the timeframe for your decision-making in relation to the proposed closure date of term 3, 2016. Subsequent to you proposing term 3, 2016 as the date for closure, your decision-making timeframes had been delayed by the large number of submissions received and the Ministry's need to obtain advice from external parties. You agreed that if your final decision was that Redcliffs School should close, closure would not be implemented until 27 January 2017 (METIS 950370 refers).

9. Following consultation on your proposal, on 25 November 2015 you made an interim decision that Redcliffs School should close. The Education Act requires that the Board is given 28 days for providing any further arguments in favour of the school staying open. The Board was given an extended period of time to put forward its arguments and delivered its submission on 31 March 2016.
10. You met with Board and community representatives on 14 April 2016 to receive a petition against the proposed closure. You also accepted the Board's invitation to meet and discuss its submission, and this meeting took place on 9 May 2016. At that meeting the Board discussed its concerns with you about the negative psychosocial effects of closure of the school on the Redcliffs community. You asked the Board at that meeting whether it had considered the possible psychosocial impact for children of attending school at the Main Road site where there would be ongoing rockfalls from the cliff.
11. The Ministry also met with the Board and its technical experts on 5 May 2016 to view computer modelling and discuss technical aspects of the submission.

Background to cliff collapse and rockfall

12. The cliff in Redcliffs varies in height from approximately 25m to 80m in height. At Redcliffs, about 66,000 m³ of talus mixed with an unknown proportion of dune sand had accumulated at the toe of the slope prior to 4 September 2010. The age of the coastal beach surfaces on which this material was deposited is about 3,500 to 3,700 calibrated radiocarbon years¹, indicating accumulation rates averaging 15 to 20 m³/year.
13. Debris avalanches and cliff-top recession are collectively referred to as cliff collapse. In debris avalanches, the rocks start by sliding, toppling or falling before descending the slope rapidly (typically at greater than five metres a second) by any combination of falling, bouncing and rolling. In cliff-top recession parts of the cliff top collapse, causing the cliff edge to move back up the slope².
14. The original cliff assessment of the cliff face behind Redcliffs treated all debris avalanches as occurring from random locations at any point along the slope. Further investigation has identified three potential mass movement (landslide) source areas, where local much larger volumes of rock may fall from the cliff during a triggering event. The mass movement may occur as a single or multiple failures, and the resultant debris may travel further on the valley floor than occurred in the 2010/11 earthquakes³.

¹ McFadgen, B.G. & Goff, J.R. (2005). An earth systems approach to understanding the tectonic and cultural landscapes of linked marine embayments: Avon-Heathcote Estuary (Ihutai) and Lake Ellesmere (Waihora), New Zealand. *Journal of Quaternary Science* 20(3): 227–237.

² Massey, C.I., Della Pasqua, F., Taig, T., Lukovic, B., Ries, W., Heron, D. & Archibald, G. GNS Science Consultancy Report 2014/78. Canterbury Earthquakes 2010/11 Port Hills Slope Stability: Risk Assessment for Redcliffs, pp. 5 – 6.

³ Massey, C.I., Della Pasqua, F., Taig, T., Lukovic, B., Ries, W., Heron, D. & Archibald, G. GNS Science Consultancy Report 2014/78. Canterbury Earthquakes 2010/11 Port Hills Slope Stability: Risk Assessment for Redcliffs, p. 6.

15. These three assessed cliff collapse source areas are additional to the randomly distributed cliff collapse sources, and debris could fall from anywhere along the cliff during a future earthquake event or in static (non-earthquake) conditions. These areas are shown in Figure 1 below.



⁴ Massey, C.I., Della Pasqua, F., Taig, T., Lukovic, B., Ries, W., Heron, D. & Archibald, G. GNS Science Consultancy Report 2014/78. Canterbury Earthquakes 2010/11 Port Hills Slope Stability: Risk Assessment for Redcliffs, Figure 2, p. 7.

18. The 22 February and 13 June 2011 earthquakes resulted in significant cliff edge recession at Redcliffs. GNS has assessed that further cliff edge recession can be expected in the event of an earthquake with a gravitational acceleration of 1-2g, similar to that of the 22 February and 13 June 2011 earthquakes. The volume of rockfall attributed to previous events is shown in Table 1 below.

Table 1: Debris avalanche volumes, Redcliffs. GNS (2014)⁷

Earthquake Date	Volume leaving cliff (m ³)	Area of cliff face (m ²)	Source
4/09/10	60	22,000	Estimated by consultants
22/02/11	23,800	22,000	2003 – 10 March 2011 (LiDAR)
16/04/11	1,170	22,970	6 March 2011 – 3 May 2011 (TLS)
13/06/11	11,800	22,970	March 2011 – July 2011 (TLS)
23/12/11	1,180	22,870	16 June 2011 – 16 January 2012 (TLS)
No trigger	440	22,870	16 January – 19 December 2012 (TLS)
No trigger	81	22,870	19 December 2012 – 12 November 2013 (TLS)

19. Following the 22 February 2011 earthquake, many cracks were visible in the cliff face after these events⁸. The area behind the rockfall bund, constructed behind the Redcliffs School hall, was completely filled in by debris, and is now incorporated in the debris⁹.
20. Following the 13 June 2011 earthquake, there were some new cracks, and the reactivation (further opening) of existing cracks. The cliff edge locally receded by up to seven metres¹⁰ and many more cracks appeared on the cliff face.
21. A survey of the cliff behind the Main Road site was conducted on 18 February 2016, following the 14 February 2016 earthquake. The Ministry has been advised based on this that approximately 60m³ of debris fell from the cliff behind the school in the eight months since the previous survey. Due to the intervening time between surveys, the later survey could not show whether this rockfall occurred in whole or in part during or subsequent to the 14 February earthquake¹¹.

⁷ Massey, C.I., Della Pasqua, F., Taig, T., Lukovic, B., Ries, W., Heron, D. & Archibald, G. GNS Science Consultancy Report 2014/78. Canterbury Earthquakes 2010/11 Port Hills Slope Stability: Risk Assessment for Redcliffs, Table 9, p. 42.

⁸ Massey, C.I., Yetton, M.D., Lukovic, B., McSaveney, M.J., Heron, D., & Bruce, Z.R.V. GNS Science Consultancy Report 2012/57. Canterbury Earthquakes 2010/11 Port Hills Slope Stability: Pilot study for assessing life-safety risk from cliff collapse.

⁹ Massey, C.I., Della Pasqua, F., Taig, T., Lukovic, B., Ries, W., Heron, D. & Archibald, G. GNS Science Consultancy Report 2014/78. Canterbury Earthquakes 2010/11 Port Hills Slope Stability: Risk Assessment for Redcliffs, p. 28.

¹⁰ Massey, C.I., Yetton, M.D., Lukovic, B., McSaveney, M.J., Heron, D., & Bruce, Z.R.V. GNS Science Consultancy Report 2012/57. Canterbury Earthquakes 2010/11 Port Hills Slope Stability: Pilot study for assessing life-safety risk from cliff collapse.

¹¹ Massey, C.I. and Kupec, J. Personal communication supplied to Ministry, 27 May 2016.

22. The survey identified areas where blocks in the slope have moved but have not fallen, indicating changes including dilation of the rock mass. These results are consistent with visual observations made during the surveys, and mean that there will be more boulders falling in upcoming years as the unstable blocks fall away¹².

The Board's arguments to stay open

23. The Board's arguments in favour of Redcliffs School staying open have been provided in a submission document and 22 supporting appendices (refer to Appendix 1 of this report). The submission contains arguments against closure which are grouped into four areas:
- the framework for your decision;
 - mitigation of the Main Road site;
 - the negative effects of closure on the community; and
 - the negative effects of closure on transport.
24. The Board's submission introduces new information to support the school remaining open. Some information presented relates solely to the two grounds you raised for closure, being the possibility of interruption to future education provision on the Main Road site, and the uncertain timeframe for a return to site.
25. The submission also contains what is referred to as 'new expert opinion confirming the negative transport effects of closure', and a section outlining the community impact of closure, including psychosocial effects. These sections do not directly relate to the reasons you gave for your interim decision, but have been contributed by the Board as further reasons for the school staying open.
26. The following sections of this report contain a detailed analysis of each of the sections of the Board's submission, and the supporting appendices. The two grounds you gave for your interim decision are addressed in the mitigation section of the Board's submission, and so an analysis of that section of the Board's submission is provided first.
27. The Ministry directly received three submissions on this subject from members of the community (attached as Appendix 2). You also received, and responded to, 29 letters about this topic. The Board's postcard campaign resulted in 1,747 postcards in support of the school being forwarded to yourself and other Government MPs. The Board's online petition opposing closure, a copy of which was presented to you in person, received over 6,500 signatures. The postcards and petition have been provided to you for your consideration alongside this report. These indicate that there is still a high level of community support for the school remaining open.

¹² Massey, C.I. and Kupec, J. Personal communication supplied to Ministry, 27 May 2016

New proposal for mitigation of the Main Road site

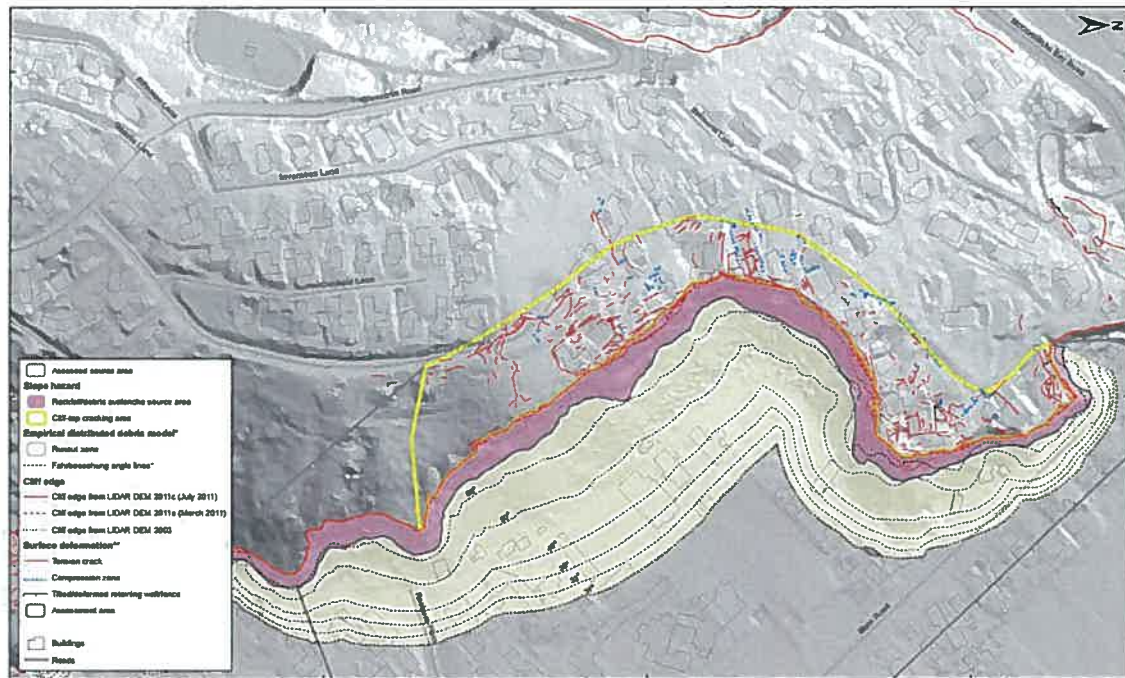
28. The Board's submission summarises previous reports on site safety, and quotes from prior Education Reports on the subject of potential disruption. It states that the original report completed by MWH New Zealand Ltd (MWH) did not consider potential disruption, but rather focussed on whether mitigation measures could make the Main Road site sufficiently safe for use as a school site (*Redcliffs School: Cliff Instability and Hazard Mitigation*, August 2014).
29. The submission is accompanied by a technical report prepared by Eliot Sinclair (Appendix 8 of the Board's submission), which proposes a new mitigation solution to reduce the potential disruption to a negligible level and render the Main Road site suitable for education provision on a long-term basis. The performance objectives set in Eliot Sinclair's report in order to achieve its aims of minimising disruption, maintaining safety, and minimising uncertainty on the site were:
- Risk of fatality within the school grounds shall be nil
 - Establish a revised operational school boundary at a conservatively located set-back
 - No rock shall cross the revised boundary
 - Minimise risk of rock impacting or damaging the bund
 - Minimise risk of rock requiring clearance from behind the bund (in the catch area)
 - Minimise maintenance and monitoring requirements
 - Provide conservatively established ample storage capacity such that in the event of multiple large volume rockfall events, the rock is well contained in the catch area, and there be no need for detailed reassessment of the slope stability
 - Avoid the need for third party land access.¹³
30. The report outlines a definition of safety that concludes that 1×10^{-6} Annual Individual Fatality Risk (AIFR) is the suitable safety threshold for the school. It cites GNS¹⁴ as concluding that the risk beyond the $F = 31^\circ$ line meets the threshold of 1×10^{-6} AIFR, being the maximum observed runout distance for fly-rock.

¹³ Eliot Sinclair, p. 14.

¹⁴ Massey, C.I., Yetton, M.D., Lukovic, B., McSaveney, M.J., Heron, D., & Bruce, Z.R.V. GNS Science Consultancy Report 2012/57. Canterbury Earthquakes 2010/11 Port Hills Slope Stability: Pilot study for assessing life-safety risk from cliff collapse.

31. Figure 2 below shows the location of the $F = 31^\circ$ line.

Figure 2: Cliff Collapse Hazard Map, Redcliffs. GNS (2014)¹⁵.



32. The new proposed mitigation solution developed for the Board by Eliot Sinclair is to retreat the operational boundaries of the school site further from the cliff face than had been recommended by MWH, and to locate a bund (the design of which differs from that proposed by MWH) along this revised boundary. The proposed works are described by Eliot Sinclair as comprising two forms of protection:

- Firstly, horizontal **separation distance** from the rockfall source to the revised school boundary. The revised school boundary is approximately 100 metres from the cliff face at its nearest point. This provides the primary hazard mitigation – physical separation from the rockfall source zone.
- Secondly, a 2m high **bund** provides a physical barrier to prevent runout crossing the revised operational boundary, in the highly unlikely event rocks travel beyond the limits of expected and observed runout. The proposed bund design is a low-tech barrier with high resilience to multiple impacts. It is unlikely the bund would be impacted in rockfall events of similar magnitudes to those experienced in the Canterbury Earthquakes, so the risk of damage warranting repair is accordingly low. In addition, the bund location allows for storage of a large volume of rock debris; the area between the bund and the cliff is more than capable of holding worse-case rockfall events with negligible risk of disruption to the school.¹⁶

¹⁵ Massey, C.I., Della Pasqua, F., Taig, T., Lukovic, B., Ries, W., Heron, D. & Archibald, G. GNS Science Consultancy Report 2014/78. Canterbury Earthquakes 2010/11 Port Hills Slope Stability: Risk Assessment for Redcliffs, Figure 37, p. 89.

¹⁶ Eliot Sinclair, p. 15.

33. In terms of physical safety, Eliot Sinclair states about the revised mitigation plan *"In addition to establishing a highly conservative revised school boundary location at the F=26° contour we recommend the addition of a bund, the design principle being having established a suitably conservative set-back distance we do not accept any risk of rock rolling across the school boundary. With these measures in place the risk of rock fall beyond the revised school boundary is negligible. The risk of fatality is nil."*
34. The report notes that the negligible risk of the revised design allows Eliot Sinclair to provide a professional opinion on the assurance of safety as it is explained in the report, and that the organisation's professional liability insurance providers cover for this advice¹⁷.
35. The revised location for the proposed bund would result in the inability to utilise approximately 40% of the current school site, but would provide access behind the bund for assessment, maintenance and clearing of debris if this was required.
36. The submission notes that the Ministry has not provided or referred to any acceptable disruption threshold or tolerance, and reiterates (in this and other sections), that all schools are subject to disruption by a range of natural and unnatural hazards.
37. The submission notes the absence of a tolerance level for risk of disruption, and recognises that no comparative analysis has been carried out on the risk of disruption between the Mt Pleasant, Sumner and Main Road sites. It summarises the comparative vulnerability of those sites (and some other school sites within Greater Christchurch) to rockfall, tsunami and ground deformation. This is based on a previous MWH report entitled *Relative Risk at Redcliffs School*, the findings of which are summarised in METIS 889496 (para. 28).
38. The submission further outlines that there are instances of disruption that may (and do) occur at any school, such as fire drills, and concludes that closure of the Main Road site may not mitigate future disruption to Redcliffs School students' education, and that the disruption may be worsened if the school were closed and the students were distributed to other schools within the network that are outside the Redcliffs area.

Technical comment

39. The Eliot Sinclair report included notes from meetings it held with three technical advisers who have previously provided advice to the Ministry, Dr Jan Kupec, Dr Ian Wright, and Steven Woods. The meetings were held to discuss the comments the advisers had made previously to the Ministry, and to seek their comment on the revised mitigation strategy.
40. The Ministry requested that these advisers comment on the Eliot Sinclair report and the Board's commentary relating to this report and any other geotechnical commentary in the main submission. The response provided by Dr Jan Kupec is attached as Appendix 3, and Steven Woods's response is attached as Appendix 4.

¹⁷ Eliot Sinclair, p. 23.

41. The Eliot Sinclair report stated that Dr Ian Wright declined to comment on the revised mitigation solution. The Ministry confirmed that the Christchurch City Council (the Council) and Dr Wright as a Council staff member did not intend to comment on the current Board submission.
42. The Ministry also commissioned an independent peer review of the Eliot Sinclair report and the Board's commentary from Tonkin & Taylor (attached as Appendix 5).

Dr Jan Kupec

43. Dr Kupec considered the new mitigation strategy proposed by Eliot Sinclair, and describes it as being a shift from managing the hazard through protection to managing it through retreat, i.e. moving away from the hazard. He concludes that Eliot Sinclair has considered appropriate engineering measures to derive a solution that reduces the risk to Redcliffs School "users" to a minimum.
44. He considers that in engineering terms risk cannot ever be reduced to zero or nil, but the probability of an event occurring or one being affected by an event can be reduced to a very low probability, and in effect one could consider this a zero chance of being impacted.
45. Dr Kupec notes the impact the strategy would have in terms of reducing the operating size of the school site.

Steven Woods

46. Steven Woods agreed with Eliot Sinclair that the risk of disruption due to rockfall under the proposed mitigation strategy is very low, due to the increased distance between the school and the cliff face and greater clarity about the regulatory requirements in the future, and that while disruption due to rockfall cannot ever be ruled out, it should be compared to the other risks of disruption faced by Redcliffs and other schools.
47. He agrees that statement about nil risk of fatality is correct based on the best available risk model prepared by GNS as the proposed barrier is located beyond the point where the model predicts any rock to get to (as was the MWH concept). He notes that rather than 'nil risk', GNS use terminology such as at the background level of risk that all New Zealanders are exposed to.

Tonkin & Taylor

48. Tonkin & Taylor's review stated that:

Overall and from a geotechnical engineering perspective, we find that the technical aspects of the report, including the methodology and conclusions, are consistent with what we consider to be current and appropriate engineering practice associated with rockfall-related risks in the Port Hills area following the Canterbury Earthquake Sequence (CES). The rockfall modelling and evaluation of the runout of boulders and rockfall debris from the cliff faces adjacent to the school site appears to have followed appropriate methods of analysis and the resulting conclusions appear reasonable in light of the study context and analysis parameters.

49. Tonkin & Taylor also comments on Eliot Sinclair's use of 1×10^{-6} as an acceptable individual fatality risk, which is consistent with the guidance from GNS who reported that an acceptable level of risk for a school is 100 times lower than 1×10^{-4} (ie. 1×10^{-6}). Tonkin & Taylor suggests that they do not consider that the Ministry should necessarily require this level of risk as a policy, as there is also guidance suggesting that risk tolerability levels associated with natural hazards may be higher. However, they *agree with the Eliot Sinclair report's conclusion that the level of life risk to school users when considering their proposed mitigation works is sufficiently low that rockfall risk should not preclude occupying the school.*
50. He states that with the measures that Eliot Sinclair set out, the life risk for school users associated with rockfall would be essentially nil and the likelihood of disruption to school operations negligible. He states that the risk is not zero, or completely eliminated, and that there is potentially still a non-zero risk of fatality, but that the likelihood is so small as to be virtually nil.
51. Tonkin & Taylor also note the impact of the mitigation strategy on the existing site layout and size of the school site.

Ministry comment

52. The Board's points about setting a tolerance threshold for disruption, and the presence of risk of disruption on all school sites are relevant. The Ministry acknowledges that it does not have a standard methodology by which it determines or sets a tolerance threshold, nor a methodology for determining likelihood or severity of all sources of potential disruption on alternate school sites. It is therefore appropriate to consider whether the proposed mitigation strategy decreases the risk of disruption to a point considered appropriate for a school site.
53. The Ministry accepts the advice of its technical advisers that the proposed strategy of partially abandoning the site and building a protective bund would mitigate the risk of disruption on the site due to rockfall. 1×10^{-6} AIFR has been previously utilised as the acceptable level of risk for a site of a sensitive nature such as a school, and this was applied by MWH in its initial report on potential hazard mitigation for the Main Road site.
54. The Ministry acknowledges that rockfall will continue to occur, and accepts that the revised mitigation strategy provides a technical solution to the implications of this for the changing conditions and slope of the cliff face. It notes that the Eliot Sinclair report states that the location of the bund provides a degree of certainty that is 'as close to "certainty" as is able to be stated in practical engineering terms'¹⁸ that the bund will contain a series of major rockfalls.

¹⁸ Eliot Sinclair, p. 26.

55. The Ministry notes that abandoning 40% of the site would give a remaining site size of 1.44Ha. Applying the standard Ministry of Education guidelines for a primary school site (being 1Ha plus 14m² per student), this site size would support a roll of up to 314 students. However, this is only a guideline, and there are other sites within Greater Christchurch that have higher site density than this guideline, as well as many other schools around the country (particularly in urban settings) that have a higher site density.
56. The Board has provided plans, commissioned from Skews Architects (Appendix 9), to illustrate how the Redcliffs School property could be redeveloped to take into account the adjusted school boundary. The Ministry has considered these plans and, although it is likely that our preferred reconfiguration would differ in some elements to these plans, we do consider that the site can be suitably (and reasonably) reconfigured within the proposed new boundaries.
57. A partial redevelopment would require additional teaching spaces and a new hall. The Skews Architects plan shows two new blocks in the south west corner of the site, whereas the Ministry suggests it would be preferable to position teaching spaces and a multipurpose space towards the north eastern corner of the site (or the front left if viewed from Main Road), as shown in Figure 3 below for rolls of 300 and additional space up to 400.

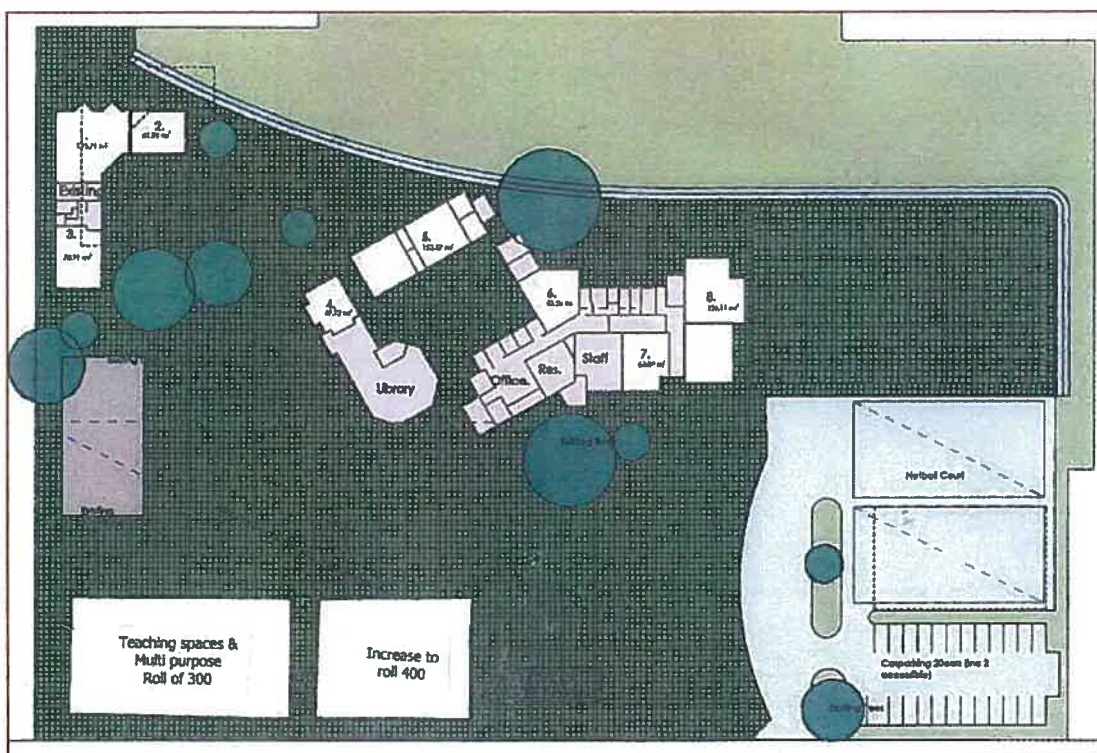
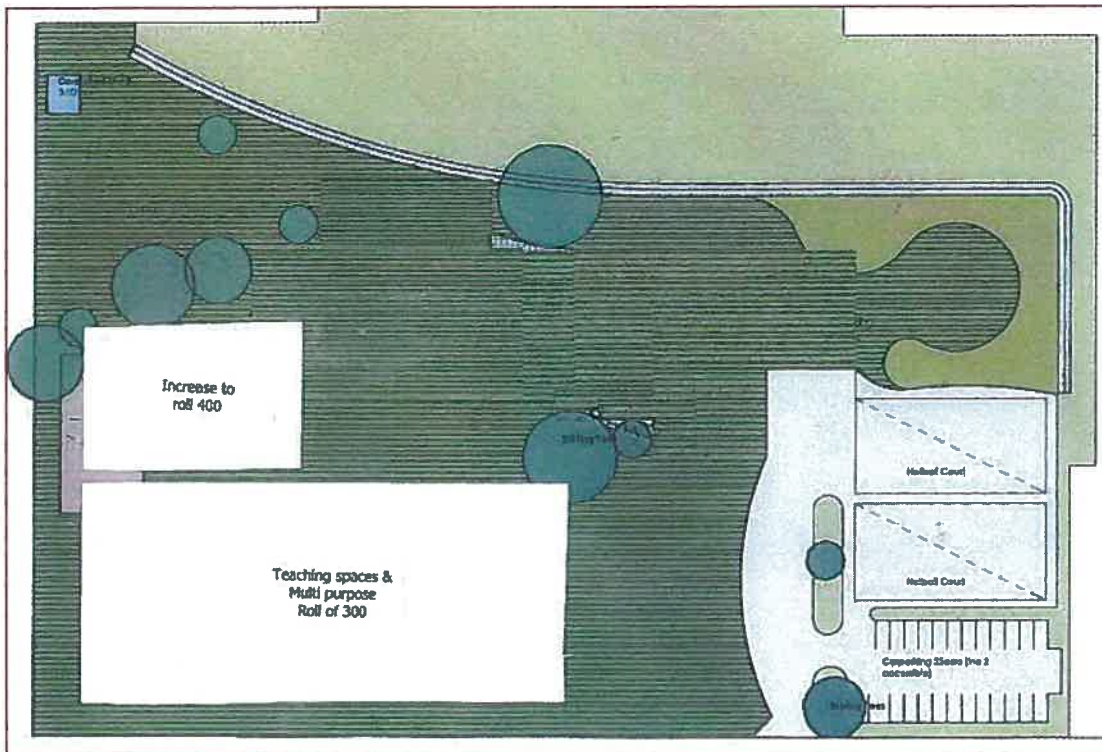


Figure 4: Draft bulk and location plan to show alternative building locations for a rebuild



59. The Eliot Sinclair report also states that the location of the bund could be altered to create additional usable site capacity, with an adjustment made to the size of the bund as appropriate.

Mitigation of the Main Road site: Other sources of uncertainty

60. The Board's submission concludes that the other potential sources of uncertainty stated in the Education Report that informed your interim decision have now been addressed. These are:
- regulatory concerns;
 - ownership of land;
 - demolition of clifftop houses;
 - timeframe for return to site; and
 - responsibility for ongoing monitoring and maintenance and diversion of resources.

Regulatory Concerns

61. The submission summarised the regulatory concerns as relating to whether consents would be required for the construction of the bund. The submission cited a legal opinion that had been obtained by the Board, and two opinions received by the Ministry previously to support its conclusion that the Ministry could submit an outline plan rather than a full resource consent. It further states that the Ministry could apply for a discretionary exemption rather than a building consent.

Technical comment

Steven Woods states that there is further clarity compared to one year ago, that the regulating authority for any hazard mitigation works will be the Christchurch City Council via a Building Consent process.

Ministry comment

62. The Ministry agrees with the Board that it could submit an outline plan rather than a resource consent for the bund, although the Council has confirmed that a building consent will be required.
63. It is important to note that the Ministry also raised regulatory concerns about obtaining consents to clear the bund should this be required (METIS 965825, para. 55 refers). The Board's submission is silent on this issue, although this is likely because the proposed new mitigation strategy allows access for clearing or maintenance without needing to access neighbouring land, and also does not anticipate that rockfall would need to be cleared.
64. In the event that rockfall debris did need clearing from Ministry-owned land behind the bund, this would require a resource consent. If it was cleared from part of the land but not removed from the Ministry-owned land altogether (e.g. moved to a different part of the site), this would not require a consent. If debris required either clearing or removal, the management of this work would sit with the Ministry, and would be funded by the Ministry.

Ownership of land

65. The Board's submission concludes that while the majority of the cliff face is owned by the Crown, the positioning of the new proposed mitigation strategy eliminates concerns about whether the owners of the surrounding land would permit access behind the bund if required for reassessment or repair.

Technical comment

66. Steven Woods notes that the ownership of the cliff face is not a significant issue due to the proposed location of the bund in the new mitigation strategy. He comments that this is unlikely to be a concern for any of the works proposed on school land unless a resource consent for the barrier was required and it impacted on the amenity values of private land owners (refer above for information about consenting requirements). He further remarks that, given the proposed location and scale of the barrier, this does not appear to be a significant issue.

Ministry comment

67. The Ministry agrees that the new proposed location of the bund removes the significance of the ownership of the cliff, and allows for access behind the bund for reassessment or repair.

68. However, the Ministry's prior concerns also related to the ownership of the material that fell from the cliff face, and whether the owners could be compelled to remove it. The Board's submission indicates that it would assume responsibility for future risk assessment, and the Eliot Sinclair report states that clearing of rockfall is unlikely to be required¹⁹.
69. If rockfall debris that was not on Ministry land required clearing, this would require a resource consent. It is likely that the management and cost of this would sit with the Ministry.

Demolition of cliff-top houses

70. Two of the three remaining houses on the cliff above the school have been demolished, and the one remaining house (28 Glendever Terrace) is set further back from the cliff edge. The submission states that demolition of that house is due to 'commence immediately'. In a letter from the Board on 17 May, the Board provided an update to you that the demolition of the remaining house was now scheduled to commence 6 – 8 weeks from 12 May.
71. The Eliot Sinclair report further states that this demolition is "not governing for construction of the revised bund at its distant location from the cliff, or return of the school to the site."²⁰

Ministry comment

72. Since the update from the Board about the scheduled demolition of 28 Glendever Terrace, the insurer has informed LINZ that the demolition is more complex than originally expected. LINZ cannot confirm when the demolition will take place, although it expects it will proceed in the next few months.

Timeframe for return to site

73. In order to address your concerns about the uncertainty of timing of a return to site, the submission includes plans by Skews Architects (Appendix 9) and timelines by Joseph and Associates for a partial redevelopment and full rebuild on the Main Road site (Appendix 10). On the basis of this information, the Board concludes that the school could return to the Main Road site in 2017 with a partial rebuild or in 2018 with a full rebuild.

Ministry comment

74. The Ministry disagrees with timelines provided by the Board. The timelines use a start date of 21 March 2016 for numerous aspects of the project plan, which is clearly unrealistic given that it predates the end of the consultation period and the date of the Board's submission to you.
75. The project plan for the redevelopment has repair work on the existing buildings commencing before construction of the bund is complete, which would need to be considered in more depth due to the potential health and safety implications.

¹⁹ Eliot Sinclair, pp. 18 -19

²⁰ Eliot Sinclair, p. 28

76. It also shows construction of the proposed new teaching spaces (Stage 2) to be ongoing during term 1 2017. The project plan is unclear, but it appears that stage 3 of the project plan gives a timeline for a transportable solution, which the plan shows as being completed before term 1 2017.
77. However, the starting point for the redevelopment project plan is at least five months prior to when the project could actually commence, and therefore it is certain that the school could not reopen on the Main Road site for 2017, even if work commenced prior to the demolition of 28 Glendevere Terrace and construction occurred concurrently with the construction of the bund.
78. The Ministry has similar concerns about the project plan the Board has provided for a rebuild.
79. If the school was to return to its Main Road site, the Ministry would develop a detailed project plan for the property work required. An indicative timeline for this, based on other Christchurch rebuilds, would be approximately 24 months. This would comprise:
- Preparation of Education brief, 3 months
 - master-planning and design, 9 months
 - Construction, 12 months
- This could likely be shortened by a small amount if the school were only partially redeveloped, which could take approximately 18 – 24 months.
80. For either option, the bund could likely be constructed in parallel with the brief and master-planning processes, so is unlikely to extend the indicative timeframe. The timeframe for this work would also not necessarily be affected by the pending demolition of 28 Glendevere Terrace, as design work could start at any time.

Responsibility for ongoing monitoring and maintenance and diversion of resources

81. The Board states that it would assume responsibility for the ongoing monitoring and maintenance of the bund, but that the alternative mitigation solution proposed would make this a less onerous responsibility which would not divert resources from education provision any more than contracting any other expert advisor (with fields such as engineering and fire protection given as examples of experts routinely engaged by Boards of Trustees).
82. The Eliot Sinclair report states that the 'maintenance and monitoring requirements are minimised to a very low level with minimal burden on the Board regarding diversion of resources'²¹.
83. The report further includes an indicative compliance monitoring plan²² outlining requirements in the case of both routine maintenance and in response to specific trigger events.

²¹ Eliot Sinclair, p.1

²² Eliot Sinclair, p.17

Technical comment

- 84. Dr Jan Kupec broadly agrees with the proposed compliance monitoring plan included as part of the Eliot Sinclair report.
- 85. Tonkin & Taylor agree with Eliot Sinclair that monitoring of the cliff face is not required with the proposed mitigation strategy.
- 86. Steven Woods agrees with Eliot Sinclair that monitoring of the cliff face is of little benefit, and notes that no monitoring of the cliff face was proposed as part of the MWH solution either.

Ministry comment

- 87. The Ministry has previously advised you that the Council does not intend to undertake monitoring of the cliff face. GNS Science continues to monitor the cliff for research purposes, but this will not be carried out at regular intervals and so cannot be relied on for managing rockfall risk, as evidenced by the eight month interval between the surveys carried out prior to and following the 14 February 2016 earthquake.
- 88. The Ministry has previously expressed concerns that monitoring the cliff face would require an ongoing reliance on costly external geotechnical advisers, and would divert resources away from education provision.
- 89. The new bund design and placement changes the approach to hazard management from one of hazard protection to hazard avoidance through retreat. The Ministry considers, having considered information provided by Eliot Sinclair and its technical advisers, that ongoing monitoring of the cliff face would not be required, and hence the diversion of resources to cover the cost of this monitoring is no longer a consideration.

Ministry conclusion

- 90. The Ministry's technical advisers confirm that ongoing monitoring of the cliff face may not be required and concur with the broad intentions of the Board's proposed monitoring and compliance plan as stated in the submission, and the more detailed approach outlined in the Eliot Sinclair report.
- 91. Overall the Ministry considers that the concerns about potential disruption to education provision in the future have been adequately addressed by the Board's proposed new mitigation plan, to the extent that these factors should not warrant closure of the school.
- 92. There is some uncertainty remaining due to the fact that if debris needed to be cleared from behind the bund and removed from Ministry land, a resource consent would be required. However the new proposed mitigation strategy makes it unlikely that clearance would be required.
- 93. There is also still an amount of uncertainty about a timeframe for a return to the Main Road site. This is due to uncertainty about a timeframe for the demolition of 28 Glendever Terrace, and the need to develop an agreed project plan for the construction of the bund and any redevelopment or rebuild. However an indicative timeframe for this is 18-24 months.

Effect of closure on the community

94. The board's submission sets out arguments on the potential negative effects that closure may have on the community. The submission states that the *'impact of closing Redcliffs School, both on the school community and on the wider Redcliffs community is a significant consideration in the decision regarding closure, which has not been given enough focus in the advice to the Minister to date.'*
95. The Board states that you should consider the implications of closure in terms of health and wellbeing outcomes, in addition to educational outcomes. It summarises these impacts as:
- the closure of a school in a community that has undergone trauma may cause long term negative effects;
 - schools play a central role in creating and sustaining communities;
 - strong communities provide better health and wellbeing outcomes;
 - strong communities are more resilient when coping with a disaster, or recovering post-disaster; and
 - removing a school from a recovering community may prolong or prevent full recovery.
96. The submission outlines the school's history, and the supporting and coordinating role it provided for the Redcliffs community following the 2011 earthquakes. It explains that the important role the school plays in the community is enhanced due to the naturally occurring geographic boundaries of the Redcliffs area. The Board's submission cites studies on the positive effect of educational outcomes on health and other life outcomes.
97. The Board believes that closure would have a significant negative impact on the community, particularly as the community is still recovering from the effects of the earthquake. The submission cites a range of sources, including the Canterbury District Health Board literature review (2012), and attaches letters supporting its conclusions from Hon Lianne Dalziel, as well as a number of academics and clinical practitioners.
98. The submission discusses the role of schools in promoting social cohesion and social capital, and cites correlations found by Professor Robert Putnam linking social capital with educational outcomes. In one of the readings cited by the board, Putnam defines social capital as being the effects of 'social networks (and the associated norms of reciprocity and trust)²³.
99. The Board's submission quotes from a letter written Dr Rob Gordon (attached to the Board's submission as Appendix 17). Dr Gordon outlines the importance to recovery of minimising disruption post-disaster by maintaining routines and existing social networks. He suggests that the closure of Redcliffs School would interrupt routines and networks, and that closure five years following the earthquake may impose a further disruption or requirement for adaptation.

²³ Putnam, R. (2004). Education, diversity, social cohesion and social capital. Paper Presented at the OECD International Meeting: Raising the Quality of Learning For All, 18–19 March, Dublin.

100. The Board concludes that the closure of the school would have a negative psychosocial impact on the resiliency of the community and the ability for the community to fully recover from the earthquakes and their related effects. It further concludes that there would be a negative impact on the future demographics of the Redcliffs community if the school were closed.

Technical comment

101. The Ministry requested Dr Harith Swadi, Clinical Director of Child, Adolescent and Family Services at the Canterbury District Health Board to review whether the submission is an accurate and appropriate interpretation of the content of the Appendices.
102. The Ministry also asked Dr Swadi to comment on the accuracy of the appendix authors' conclusions, and any comments on the literature cited or included, including whether the experiences of the author of Appendix 17 can generalise his experience in the Australian bushfires as being directly applicable to a New Zealand earthquake.
103. The Ministry further requested that Dr Swadi comment on the psychosocial impact on children of occupying a site where there will be further rockfall. You had raised concerns about this at your meeting with the Board on 9 May 2016.
104. Dr Swadi's commentary is attached as Appendix 6. He spoke about the difficulty of generalising the results of other studies to the experiences of the Redcliffs community, particularly given that the Redcliffs community both considers itself, and is described in the appendices to the submission as, 'unique'.
105. He states that the literature indicates that psychosocial wellbeing may be negatively affected by the loss of a community hub, and that the school should be able to produce evidence of this loss of wellbeing given that the Main Road site has been closed for several years. He agrees that schools are an important community hub/network, and concurs with the appendices that list the potential negative and positive effects that follow a school closure, but whether that applies to Redcliffs would require further investigation.
106. Dr Swadi's view is that the psychological effects of the earthquake are not necessarily the same as more isolated disasters such as bushfires, due to the relative length of time, and the ongoing potential threat. Dr Swadi agrees that the example of a school's role in recovery following bushfires may be applicable to New Zealand in the short term aftermath of a natural disaster (refer to Appendix 17).
107. Dr Swadi outlines the possible psychosocial impacts on children attending a school on a site where rockfall will continue to occur, and states that in a worst case scenario, awareness of the risk of rockfall accompanied by a feeling of helplessness about being able to mitigate the risk could lead to a chronic situation of stress. He states that it is known that exposure to intense acute and chronic stressors during the developmental years has enduring neurobiological and psychological effects with subsequent increased risk of anxiety and mood disorders as well as physical health problems through the impact of chronic stress on the immune system. He says that it may be possible to make the site safe from rockfalls, however it is the perception and understanding of the children (and parents) of how safe the school is that influences their psychological reaction.

108. Dr Swadi concludes that the closure of the school may lead to negative and positive psychosocial effects on the Redcliffs community, but also that a return to the Main Road site may lead to negative psychosocial effects for children attending the school. He notes that the school remaining open on a site other than the Main Road site could address both of these potential sources of negative psychosocial impact.

Ministry comment

109. The Ministry acknowledges the conclusions of the literature cited and quoted in the school's submission, and the potential negative and positive effects of school closures. It notes that there is a broad range of literature dealing with the topics of both post-disaster recovery, and the effects of school closures.
110. The Board's submission cites findings that schools provide physical places and social networks for a community to form or strengthen relationships. While the Ministry does not dispute these findings, there may be other spaces or facilities in the Redcliffs community which support these same functions.
111. Putnam's analysis of the link between social capital and educational outcomes does not suggest a single direction of causality, whether this is social capital increasing educational outcomes, or educational outcomes increasing social capital. Rather, he suggests bi-directionality, and further distinguishes between social capital built 'inside the walls' of a school, and 'outside the walls' of a school.
112. Social capital 'inside the walls' includes the relationships between students and their peers, and building high quality relationships with teachers and support staff. Professor Putnam suggests that family and student engagement with school and education is positively predicted by the strength of community. The examples cited in the text, such as providing mentors to students to increase their social capital²⁴, do not suggest direct applicability to the Redcliffs setting. There is also no indication that strong 'inside the walls' social capital could not be built if students attended a different school.
113. The Board describes Redcliffs as a 'unique' community, and the Ministry echoes Dr Swadi's caution about generalising the results of any of the studies cited in the Board's submission as directly applicable to Redcliffs, either as a school or a community. This is particularly important in the case of the generalisation of specific examples, such as the example of the closure of Surrey Park School in Invercargill (Appendix 18b) or the re-opening of Dunalley Primary School following the Dunalley Bushfire in Tasmania (Appendix 17).
114. It is also unclear from the Board's submission how much of the potential negative psychosocial impact on social capital or cohesion, and any corresponding impact on recovery or resilience, would have already occurred due to the five year absence of the school from the Redcliffs community area.
115. The Ministry is also concerned that returning the school to the Main Road site might result in negative psychosocial impacts on children attending school on that site, where there will be ongoing rockfall and visually intrusive mitigation measures in place.

²⁴ Putnam, R. (2014), p. 5.

116. There is currently literature emerging from studies of Christchurch post-quake, including Dr Kathleen Liberty, Dr Sonja Macfarlane, and Dr Jeffrey Gage's study on the effects of the earthquake on children beginning schools, in which Redcliffs School is a participant. This longitudinal study, the final results of which are yet to be published, has identified increased levels of trauma and PTSD-related symptoms, and a decrease in academic readiness²⁵.
117. Dr Liberty references previous research indicating that the psychosocial effects of natural disasters tend to be more pronounced for children than for adults. She describes earthquakes as differing from other natural disasters, such as floods or bushfires because they are entirely unexpected, while many other natural disasters are accompanied by some degree of advance notice.
118. Dr Liberty also points out that the ongoing aftershocks in Christchurch are likely to have intensified negative psychosocial effects. The Ministry is aware of research on cumulative trauma effect, and specifically the findings that repeated exposure to traumatic events has a more negative, or cumulative, effect than exposure to a single traumatic event. It is noted, however, that the majority of research in this area relates to trauma relating to abuse or assault rather than natural disasters²⁶.
119. This is in part because natural disasters tend to be single incidents rather than ongoing sources of trauma, although some studies consider the ongoing trauma in dealing with the aftermath of a natural disaster. Much of the research occurring in or applied to post-quake Christchurch considers the ongoing and cumulative stress of aftershocks²⁷, and it may be that the same cumulative stress could be caused or exacerbated by ongoing exposure to rockfall.
120. There is a wide body of literature on dose-response effect in relation to natural disasters. Traditionally, dose-response effect as it relates to trauma would consider the severity of the trauma to which a child was exposed. There is a growing body of research, however, which also recognises the psychosocial impact of the duration or persistence of the exposure²⁸, such as in the case of earthquake aftershocks.
121. There is a large degree of consistency in the literature identifying children as one of the groups disproportionately negatively affected by natural disasters, although the majority of these studies consider only the immediate to medium term aftermath of the disaster.

²⁵ McCrone, J. (2014, 1 February). Quake stress hurting our young. *The Press*. Retrieved from <http://www.stuff.co.nz/the-press/news/christchurch-earthquake-2011/9674021/Quake-stress-hurting-our-young>

²⁶ For an example, refer to Cloitre, M., Stolbach, B. C., Herman, J. L., Kolk, B. V. D., Pynoos, R., Wang, J., & Petkova, E. (2009). A developmental approach to complex PTSD: Childhood and adult cumulative trauma as predictors of symptom complexity. *Journal of Traumatic Stress, 22*(5), 399-408.

²⁷ Gluckman, P. (2011). *The psychosocial consequences of the Canterbury earthquakes*. Office of the Prime Minister's Science Advisory Committee.

²⁸ For a summary of some recent studies relating specifically to the effects of disasters on child development, see Masten, A.S. & Osofsky, J.D. (2010). Disasters and their impact on child development: Introduction to the special section. *Child Development, 81*(4), 1029 – 1039.

122. One large scale study considering the long term effects of natural disasters is consistent with findings that young children are one of the groups most negatively impacted by natural disasters. The study also uses the disaster exposure of different birth cohorts to examine longer term effects, and concludes that young children (at the time of the disaster) suffer the most enduring negative impact from natural disasters comparative to other age groups, with negative impacts including lower health and economic outcomes²⁹.
123. One early literature review on the psychosocial impact natural disasters have on children considered a range of effects more prevalent in the literature, such as PTSD, sleep disturbance and hypervigilance. However, the review also considered literature on intrusive traumatic thoughts in children who had experienced a natural disaster, and concluded that an environment or situation that reminded children of the traumatic event could trigger intrusive and traumatic thoughts relating to the event.³⁰
124. It is possible that these concerns may be applicable to students who were on the Main Road site at the time of the February and June earthquakes, although further investigation would be required. It is important to consider that, Redcliffs School returned to its Main Road site, the majority of the students who experienced the quakes on that site would no longer be students at the school by that time.
125. Negative psychosocial effects caused by exposure to ongoing rockfall and the visible mitigation measures would likely impact differently on children and young people who did not experience the 2010 and 2011 earthquakes, whether on the Main Road site or within their lifetimes (the first of the post-quake cohort of children began primary school last year).
126. There is also some evidence that even moderate and relatively non-destructive earthquakes, which are an ongoing reality in a seismically active area such as Christchurch, may cause PTSD-related symptoms, such as trauma-related fears, emotional detachment, and concentration difficulty³¹.
127. The Ministry considers that the concerns raised by Dr Swadi and reflected in the research outlined above warrant further investigation before a decision is made about whether the school should return to its original site. The views and experience of the school community on these issues will also be important.

Transport effects of closure

128. The Board's submission draws from a Joint Statement of Transport Planning Witnesses (attached to the Board's submission as Appendix 22) completed by the Board's and Ministry's transport advisers (Dr Darren Fidler and Andy Carr respectively).

²⁹ Caruso, G.D. (2014). The legacy of natural disasters: The intergenerational impact of 100 years of natural disasters in Latin America. University of Illinois.

³⁰ Williams, S. (1995). *The psychological consequences of earthquakes and other disasters on children and youth*. Special Education Services.

³¹ Gökçen, C., Şahingöz, M. & Annagür, B.B. (2013). Does a non-destructive earthquake cause posttraumatic stress disorder? A cross-sectional study. *European Child and Adolescent Psychiatry*, 22, 295 - 299.

129. It concludes that there would be a negative economic effect of closure in the form of increased travel time and increased vehicle operating costs. It states further economic costs based on the associated health issues of a likely reduction in active transport if Redcliffs School were to close.
130. It states that there would be increased congestion and an increase in the risk of accidents, particularly around the Mt Pleasant and Sumner School sites, and suggests that transport analysis around these sites should be undertaken.
131. The Board then concludes (not based on the Joint Statement) that the proposed changes to the enrolment zones of Mt Pleasant and Sumner Schools, if Redcliffs School were to close would not meet the intention of zones to ensure students can attend a 'reasonably convenient' school. This is because the distance and associated factors mean that these schools are not geographically reasonably convenient for students living in Redcliffs to access. It quotes the definition in section 11B of the Education Act 1989 of what constitutes a reasonably convenient school.

Technical comment

132. Andy Carr has previously provided a technical review to the Ministry of the transport aspects of the Board's submission in response to your initial proposal.
133. The Ministry asked Andy Carr to review the transport section and Appendix 22 of the Board's current submission, and to comment on the accuracy of the Board's interpretation of Appendix 22. His comments are attached as Appendix 7.
134. The Board's submission changes the wording agreed to between the transport advisers in Appendix 22 from 'at' the schools to 'around' the schools. Andy Carr states that he *'had in mind that the review would be limited to what's provided at the school gate whereas the submission could be read as suggesting that it includes the roading network further afield'*.
135. He disagrees with the figures presented as the two transport advisers did not discuss or agree on vehicle operating costs, although operating costs are presented in the Board's submission.

Ministry comment

136. The Ministry has previously considered and advised you on a number of the transport-related issues raised in the Board's submission (METIS 965825, paras. 89 – 110 refer).
137. While the Joint Witness Statement provided by the Board further clarifies some of these aspects, such as the transport-related economic and health impacts of closure, the Ministry does not consider that either Appendix 22 or the Board's commentary relating to this appendix materially alter the information provided to you previously.
138. The Ministry, as it has advised you previously, favours active transport and recognises that the closure of Redcliffs School would be likely to result in a reduction of active transport. However, the Ministry's view is that better access to active transport is not a determinative consideration in the context of your current decision about Redcliffs school.

139. The Ministry's view is that attending Sumner or Mt Pleasant Schools would meet the definition of "reasonably convenient". The Ministry's transport allowance policy provides a useful proxy for what could be considered reasonably accessible distances for transport to school. To access transport assistance, students must live more than a certain distance from their nearest appropriate school, which is defined as being at least 3.2km from their closest appropriate school for students in Years 1 – 8. Presuming a roughly equal geographic split if Redcliffs School were closed, there is an extremely small number of houses which would be at a distance exceeding 3.2km from either Sumner or Mt Pleasant Schools.

Consideration of relocation

140. The Board has raised the possibility of relocation of the school, and the Ministry agrees that the feasibility of relocation should be further explored. If relocation of the school could be achieved this would potentially be a way to address both the Board's concerns about potential negative psychosocial effects of closure on the community, and the concerns about the possible negative psychosocial effects on children of attending a school on the Main Road site. In addition, the recommended mitigation measures would reduce the usable area of the school site by around 40%. An alternative site would remove entirely the need for any rockfall mitigation measures, and also avoid the possible negative effect of those measures on children attending the school, now and in the future.
141. Both the Ministry and Board have previously commissioned high level reports about possible alternative sites for the school (METIS 889496, paras. 55 – 58 refer).
142. Barnett Park, which is owned by the Christchurch City Council, was the possible alternative site identified through this investigation. There is a significant escarpment at the rear of the site which funnels down into the park. Further investigation of the site would be required to assess potential issues and risks.
143. The Board's submission includes reference to an email received to the Ministry from the Council in September 2015, in which the Council informally advised the Ministry that Barnett Park was not an option for relocating Redcliffs School, but that Redcliffs Park may be. The Ministry remains of the opinion that Redcliffs Park is not a viable alternative site as it is within Coastal Inundation Hazard Zones 1 and 2, which indicates that the site could be subject to flooding.
144. Some previous public submissions have suggested that the Van Asch site should be used for the relocation of the school. As previously advised, the Ministry does not consider that it would be appropriate to relocate Redcliffs School so that it was outside its geographic catchment on a permanent basis. The Van Asch site is more distant from Redcliffs than Mt Pleasant and Sumner Schools and it is likely that, over time, Redcliffs families would choose to enrol their children at one of those two schools rather than the relocated Redcliffs School. It is also noted that many of the psychosocial and related benefits the school offers the community that are contained in the Board's submissions and in previous public submissions rely on the school being physically present within the Redcliffs community.

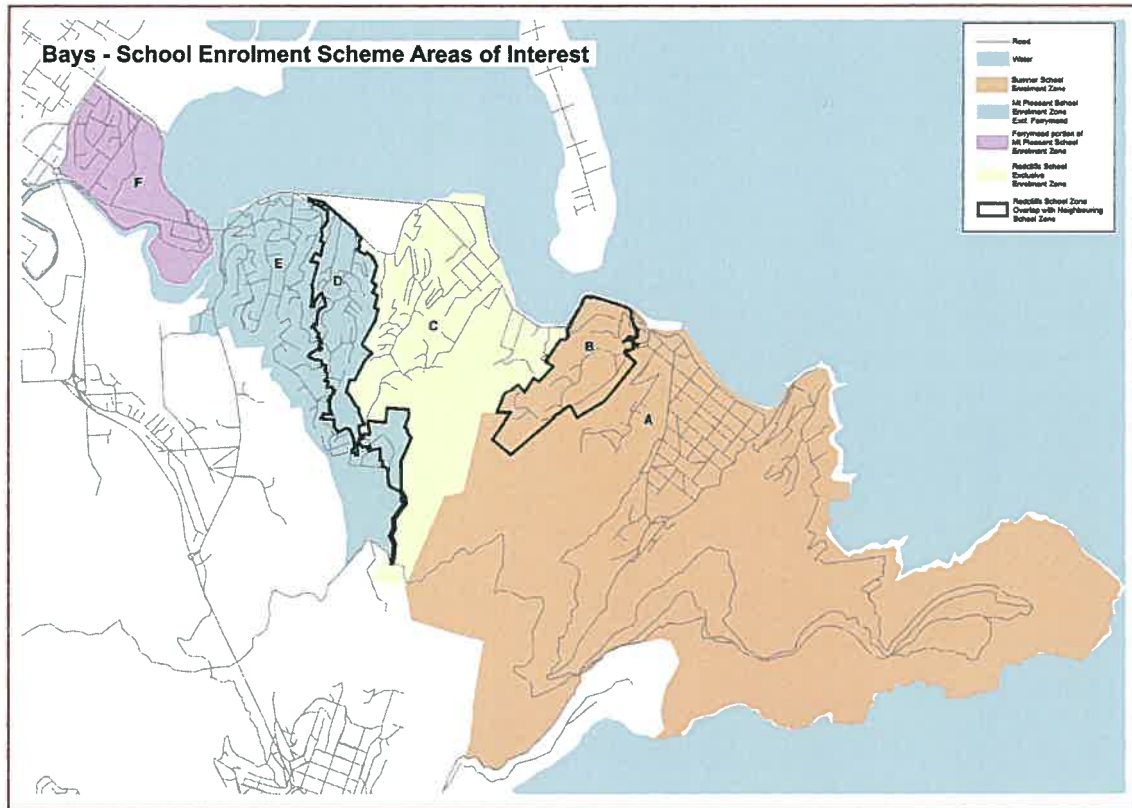
145. The Ministry has previously advised you that relocation of the school will have limited options, due to the low likelihood that a suitable alternative could be found in the Redcliffs area, and likely community opposition expected to result from a proposal to utilise Barnett Park.
146. However, the high level of community support for retaining a school in the Redcliffs area may mean that there could be a lower level of community opposition to the proposed usage for Barnett Park as an alternative site for Redcliffs School.
147. Furthermore, the Board's submission includes a letter of support from Christchurch Mayor Hon Lianne Dalziel about the importance of retaining Redcliffs School (refer to Appendix 16 of the Board's submission).
148. This is consistent with the Council's earlier response to your initial proposal, which stated that *'The Council's position is to support the provision of education in local areas and in this instance support the retention of a primary school in the Redcliffs community'*.
149. Barnett Park consists of six parcels of land held as Recreation Reserve, and ranging in size from 0.077Ha to 32.75Ha, with a total area of 40.36Ha.
150. The Ministry is of the view that a feasibility analysis should be undertaken to assess whether relocation of the school to another site in the Redcliffs area within a reasonable timeframe is a viable option. The feasibility report would include analysis of the possibility of acquiring part of Barnett Park for this purpose, which would include engagement with the Council, as well as in-depth consideration of the suitability of this site. It would also review the availability of other potentially viable alternative sites in case there are any additional options that warrant exploration. We will invite the Board to work closely with us on this. The support and engagement of the school and their wider community is likely to be very important in achieving a viable alternative site for the school.

Network Implications

151. Analysis in 2014 investigated potential school rolls under a scenario where the number of students per household increased to pre-quake levels. That analysis found that under such a scenario, the school roll may return to the pre-quake level of 400. The Education Report which informed your interim decision included two sets of costings, one for a roll of 300 students and one for a roll of 400 students (METIS 965825 refers). This was intended to capture the likely short term roll of Redcliffs School if it re-opened on the Main Road site, as well as a projected 2029 roll.
152. However, projections from Statistics NZ released following this earlier report to you suggest that the number of primary aged students in the local area is likely to decline in the medium term, begin to increase again after 2025, and return to around the current level in the long term, and the Ministry now considers that 300 represents a more realistic roll projection. The Ministry's network analysis is attached as Appendix 8.

153. The estimated Year 1 – 8 state school student count at October 2016 across the Bays area (Mt Pleasant, Redcliffs and Sumner catchments) is 1,065. 206 of these reside in the exclusive portion of the Redcliffs School enrolment zone (refer to Area C in Figure 3 below). There are an additional 120 students in the overlapping areas of the zone (Areas B and D).

Figure 3: School enrolment schemes and scheme overlaps



154. If the local proportion of students per household were to return to pre-quake levels, changes to enrolment schemes could be made to direct students towards Mt Pleasant and Sumner Schools. Removal of the overlapping zone areas from the Redcliffs School zone would significantly reduce the number of students eligible to enrol at Redcliffs.
155. As shown in Table 2 below, each school draws a very high proportion of state students from within their exclusive zone areas, although few students from the overlapping areas currently attend Redcliffs School. If the Redcliffs School enrolment zone was withdrawn from these overlapping areas, current local demand would be reduced to around 200 Year 1 - 8 state school students.

Table 2: State school market shares in exclusive and overlapping enrolment scheme areas

	Year 1-8 Student Counts at March 2016	State School Student Count at March 2016	Market Share attending Redcliffs School	Market Share attending Sumner School	Market Share attending Mt Pleasant School
A	Sumner School exclusive	396	3%	94%	1%
B	Sumner Redcliffs Overlap	47	13%	83%	0%
C	Redcliffs exclusive	187	77%	7%	11%
D	Mt Pleasant Overlap	70	10%	1%	81%
E	Mt Pleasant central	207	1%	0%	91%
F	Ferrymead portion of Mt Pleasant	61	7%	2%	59%
	Total	968	18%	44%	32%

156. While there are only around 200 Year 1-8 state school students in the exclusive portion of the Redcliffs school zone, there are an additional 120 students in the overlapping areas of the zone. Few of these currently attend Redcliffs School, but an increased market share for Redcliffs School would allow the Redcliffs School roll to increase towards 250, while reducing demand for neighbouring schools.
157. Note that there is potential for Mt Pleasant School to reduce demand by around 67 students by withdrawing their enrolment zone from the Ferrymead portion of their enrolment zone (Area F in Figure 3).
158. These updated projections show that it is more appropriate at this time to plan for a projected roll for Redcliffs School of 300 students rather than 400.

Financial Implications

159. The Ministry has used a projected roll of 300 students to give estimated costs for 5 different property scenarios, including the likely costs if you decided to confirm your interim decision to close the school. These are set out below for comparison:

- **Scenario 1** – Redcliffs School stays open and returns to the original Main Road site. The new mitigation strategy proposed by Eliot Sinclair provides options for either a full or partial rebuild of the school (including construction of a protective bund). This scenario assumes a partial rebuild (as per Appendix 9 of the Board's submission).
- **Scenario 2** – Redcliffs School stays open and returns to the original Main Road site with a full rebuild (as per Appendix 9 of the Board's submission).
- **Scenario 3** – Redcliffs School stays open and relocates to Barnett Park.
- **Scenario 4** – Redcliffs School is closed and students are accommodated at Mt Pleasant and Sumner Schools.
- **Scenario 5** – Redcliffs School is closed, and Redcliffs students are accommodated at Mt Pleasant and Sumner Schools. The enrolment zone of Mt Pleasant School is adjusted to exclude the area north of the Heathcote River, which could lead to the need for additional property at Bamford School.

Table 3: Estimated Property Costs assuming a 2029 roll of 300 students

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Mt Pleasant School	\$3.3m	\$3.3m	\$3.3m	\$7.6m	\$6.9m
Redcliffs School	\$6.3m	\$11.7m	\$11.2m	N/A	N/A
Sumner School	\$3.5m	\$3.5m	\$3.5m	\$8.2m	\$8.2m
Bamford School	\$2.7m	\$2.7m	\$2.7m	\$2.7m	\$3.8m
Total	\$15.8m	\$21.2m	\$20.7m	\$18.5m	\$18.9m

160. The costs shown for Bamford, Mt Pleasant and Sumner Schools under Scenarios 1 – 3 are the current budget allocations for property work that will be undertaken at these schools as part of the Christchurch Schools Rebuild (CSR) programme. These are included to give an indication of the proportionate increase in cost for property provision at these three schools if Redcliffs School were to close. The cost estimates for all scenarios fit within the overall amount allocated for these schools through the CSR programme (note however that the estimate for Scenario 3 excludes land purchase, as discussed below).

161. The cost estimates for Scenarios 1 and 2 do not include any provision for ongoing monitoring of the Redcliffs Main Road site, or any reassessment or remediation that may be needed in the future, as the Board has stated that it would assume those costs.
162. The estimate for Redcliffs School for Scenarios 1 and 2 include an estimated \$1.5 million cost for construction of a bund. This is the same estimate as that given for the previous bund design in the earlier MWH report.
163. The Eliot Sinclair report notes that the newly proposed bund would cost less than the MWH design due to being shorter in length and lower in height. Tonkin & Taylor recommended that the Ministry obtain a more robust cost estimate from Eliot Sinclair to justify this claim. The Ministry considers this would be more appropriate when the placement of the new design is finalised, as the Eliot Sinclair report notes that it could be placed closer to the cliff face if required, which would have implications for height, length and cost.
164. The Ministry acknowledges that the newly proposed mitigation strategy would be lower in price than the MWH solution, but the actual cost would not be known until design and timing of construction was finalised, and costs were obtained from the market.
165. The cost for Scenario 3 excludes the price of purchasing land, as the market value and purchase price for this would need to be determined during the negotiation with the Council.

Risks

166. The Ministry's recommendation is that you do not confirm your interim decision to close the school. There is very low risk of opposition to that decision.

Conclusion

167. Having considered the information provided by the Board, as well as further expert advice, the Ministry's view is that the main concerns which led to your interim decision that the school should close have been adequately addressed and recommends that you do not confirm your interim decision.
168. We also consider, however, that the possibility of detrimental psychosocial effects for children attending a school on the Main Road site warrants further consideration before a decision is made about whether the school should return to its original site, and that the feasibility of possible relocation of the school within a reasonable timeframe should also be explored.
169. The Ministry will provide you with a further report on these issues by the end of September. Based on the information that will then be available, decisions will be made on whether the school can return to the Main Road site, or whether it can relocate to another site in the Redcliffs area.