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18 December 2024
Our ref: OB/C14191v2

Kosciuszko Thredbo Pty Ltd

Via email: Andrew_Harrigan@evt.com

Attention: Mr Andrew Harrigan

Proposed Demolition of Sonnblick Lodge
10 Bobuck Lane, Thredbo, NSW
Comments on Report Review

1 INTRODUCTION

This letter outlines our response to the independent technical review of the Fortify Geotech report (dated 20.08.2024, Ref OB/C14191 v2) conducted by GHD (Ref PO4100062086, dated 15.10.2024). The review indicates that the Fortify Geotech report does not fully meet the requirements outlined in the Geotechnical Policy and provides comments suggestions on the report improvements to meet the Geotechnical Policy requirements. This letter aims to address the discussion points in the GHD review (dated 15 October 2024) of our geotechnical report. This letter may be shared with other stakeholders and decision-makers involved in the Sonnblick Lodge demolition approval process.

We have carefully reviewed the comments and updated the reports in response to constructive feedback. However, we have also identified certain inaccuracies, omitted details and potentially misleading statements in the GHD review, which we have addressed in this letter.

2 COMMENTS

A summary of the updates in the revised report (Ref OB/C14191 v3, dated XX) along with our comments is provided in Table 1.

Table 1: Summary and comments

#	Section/ Page (Review Letter)	Reviewer`s Comment (Quotation)	Action implemented in the updated report or our comment/ explanation (Location within the updated report)
1	Section 1	This letter presents our independent technical review of additional geotechnical documentation submitted by the applicant (Kosciusko Thredbo Pty Ltd) for the demolition and ***future development*** Sonnblick Lodge, located at 10 Bobuck Lane, Thredbo, NSW 2625.	Please note that our report only provides risk assessment for the proposed demolition of the existing Sonnblick Lodge, no future development was assessed within the current investigation. This was stated in project description, Section 1.1.
2	Section 3.2	The interpretive cross section (Cross Section A-A') presented in the Fortify Geotech report does not show / annotate the location of the hazards discussed in the report.	The hazards were shown and/or annotated in Cross-Section A-A" (Appendix B)
3	Section 3.2	There are many errors and inconsistencies with the likelihood values used in some of the risk calculations. For example, in Sections 5.2.3, 5.2.4, 5.2.5 and 5.2.6 the likelihood values are stated to be 10^{-4}, 10^{-4}, 10^{-3}, and 10^{-3} respectively however in Table 5-2, all the likelihood values used to calculate risks are stated to be 10-5: Furthermore, the likelihood values used in the risk to property assessment (Table 5-1 of the Fortify Geotech report) are different to those used in Table 5-2, despite the hazards being the same. Likelihood estimation is a crucial part of the risk assessment process and needs to be transparent and defensible.	As it was stated in the original report, the risk was calculated using the value of likelihood **after all the control measures are implemented** (Table 5-1 – Residual Risk Level), which was estimated to be Rare (10^{-5}) for all hazards. In the updated version of the report, we included additional clauses in Sections 5.3.1 and Table 5-3 title aiming to clarifying the above. In the updated report, we also included an additional Table for risk to loss of life calculation **for the existing conditions**, where we used the current likelihood values. The construction phase was not included in the existing conditions calculations.
4	Section 3.2	The Fortify Geotech report states that an earlier Arup report 1 postulated a "Deep seated landslide with scarp located upslope in lot 720. The rupture surface of that landslide was assumed running beneath existing retaining walls and Bobuck Lane embankment". As such this seems inconsistent with the Fortify assumption/observation that the tension cracks on the inner lane of Bobuck Lane are associated with this slide. This implies that there may be another hazard mode that has not been recognised.	There are some inaccuracies in the first statement. The discussed tension cracks are located on the lower or outer line of Bobuck Lane (Table 4-4). A possible back scarp was originally documented by Arup report and our mapping in August 2024 confirmed that. Please see Table 4-4 for the photographs and Appendix B for the location. **No tension cracks were noted on the inner Bobuck Lane during the site visits**. The report provides observations of the tension cracks as signs of the ground

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			movement. Outer Bobuck Lane is supported by retaining wall RW4 (Shown on Cross-Section AA' and Site photographs Table 4-4). Therefore, *'another hazard mode'* consideration for this location was included and described in Section 5.2.4 Failure of the Retaining Walls. This would consider shallow-seated slide through the embankment fill. In the updated report, we discussed this hazard (Hazard 4) in more details.
5	Section 3.2	The previous ACT Geotech report discussed "signs of soil movements below Bobuck Lane" that could be evidence of a large-scale landslide feature. This included a series of tension cracks in the asphalt road pavement on the outer lane of Bobuck Lane. The updated Fortify Geotech report states that "No further progress of the existing cracking was noted over the 1.5 years". The report also mentions that "Two inclinometers (with a 12-month monitoring period) were installed on Bobuck Lane, including URS02 (~15m SW) and KTB25 (~32m SW), which were monitored by TfNSW. The authors did not have access to the monitoring data on the inclinometers." The report goes on to say that this landslide feature is "inactive". Without monitoring data at the site there is no basis to make this assumption. The observation that the tension cracks appear unchanged over the relatively short period 1.5 years is irrelevant as the presence of such cracks indicates past subsurface movement of an as yet undetermined nature.	Corrected (Section 5.2.3)
6	Section 3.2	The Fortify Geotech report states that "The initial inspection in April 2023 revealed signs of possible distress of retaining walls and soil movement underneath Bobuck Lane and the rear batter", however these observations are dismissed in later discussion regarding retaining wall conditions and the estimation of likelihood of failure of these walls: "The inspected retaining walls are in good condition with no signs of failure". This does not correlate with observations only a year ago and suggest such implications for movement have been discounted in the latest report.	Corrected (Section 5.2.4, 5.3.1, Table 5-1). The deterioration signs of retaining walls were included in the description and the analysis. The likelihood (Unlikely - 10^{-4}) of the retaining walls failure were estimated with consideration of the signs of the mortar deterioration such as cracking via mortar and loose blocks. The proposed control measures comprising horizontal drainage and buttressing stabilisation will further decrease the likelihood to Rare 10^{-5}.
7	Section 3.2	Some of the likelihood values used in the risk assessment appear to be based on the slope stability analysis presented in the report. For example, "slope stability modelling for existing slope indicated FOS>1.5". However, this stability analysis is based on presumed geotechnical parameters	Corrected. The more conservative parameters (Table 4-5) have been used in the new slope stability analysis Section 4.4.

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		which have no immediate justification through previous testing. In addition, some of the parameters (in particular the drained cohesion c') are considered to be significantly non-conservative with values of c' =25 kPa for residual soils and colluvium having unrealistic implications on the factor of safety. As such, the presented stability analysis and the subsequent modes of failure cannot be justified nor considered to be reliable.	Provision of an additional Plate – for rear fill batter.
8	Section 3.2	The quantitative risk assessment has introduced a conditional probability factor called "The probability of being Trapped". This is not used in AGS (2007) and appears to be used by the authors to further downgrade the vulnerability values. The basis for the numbers used is not supported / described in the text of the Fortify Geotech report.	Corrected. The vulnerability values used in the updated are based on the examples and recommendations given in Appendix E of AGS (2007c).
9	Section 3.2	The Fortify Geotech report has summed all the calculated individual risks to produce a so called "total risk" and stated in the introduction of the report that "the level of total risk to be proposed for neighbouring dwellings is "Very Low " and "Low". It is not appropriate to sum probabilities because the resulting number ceases to a probability (i.e. it is not a risk, but rather an arbitrary number). There are no risk criteria to compare this number against and the statement regarding total risk has no meaning.	This statement in the review is incorrect. The total annual risk / individual risk for a person most at risk across different locations has been calculated according to as per Section 7.4a) (AGS 2007c): *"The annual probability of loss of life for the person most at risk from the landslide(s) should be estimated using the equations in Section 7.1. The person most at risk will often but not always be the person with the greatest spatial temporal probability.* ***The individual risk, as determined by summing the risk,*** *for the person most at risk,* ***from all the landslide hazards, is used for comparison with the tolerable risk criteria****"* The term 'total risk' was corrected to "individual risk' in the updated report.
10	Section 3.2	The calculations for societal risk presented in Table 5-2 and Plate 3 of the Fortify Geotech report are incorrect. Societal risk is the risk of multiple fatalities or injuries in society as a whole: one where society would have to carry the burden of a landslide causing a number of deaths (NPWS 2023). The assessment of societal risk requires the calculation of F, and N (F-N pair), where: – F is the annual probability of N or more fatalities and; – N is the expected number of fatalities. Table 5-2 in the Fortify Geotech report states that F is equal to (i.e. the same) as the calculated risk for person most at risk. This is not correct. As stated	Corrected. The societal risk has been re-calculated and new N-F diagrams are included for the updated report. Those include a separate diagram for the existing and for new slope (Section 5.5 Significance of the Risks).

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		above, F is the annual probability of N or more fatalities, which in this scenario is the likelihood (P(H)) x Probability of Spatial Impact (P(S: H)). N is calculated by multiplying the average number of people exposed to the hazard by the vulnerability. The Fortify Geotech report has done this however they have also multiplied it by the conditional probability factor they introduced called "The probability of being Trapped". This is incorrect.	
11	Section 3.5	For reasons unknown the updated report does not have a heading titled "Geological Model". However, the report does include most of the report themes and sections that would usually form part of a geological model. The report provides a reasonable description of subsurface conditions based on the historical information available. The interpretive cross section (Cross Section A-A') has improved significantly since the previous report. We recommend the report heading(s) be updated in the next version of the Fortify Geotech report to better align with The Geotechnical Policy.	Corrected. The heading of Section 4.1 has been updated.
12	Section 3.6	Table 5-1 of the Fortify Geotech states that "The existing retaining walls will be buttressed by caged gabion walls/ mass concrete or rock /recycled concrete buttress" and that the proposed buttressing design is provided in Section 6.3 of the report. However, Section 6.3 doesn't have a buttressing design. Instead, this section of the report contains general recommendations for permanent batter slopes. It is also noted that Figure 5 attached to the report contains a conceptual sketch of the proposed stabilisation measures however there are no design drawings.	Corrected. Table 5-1 and Section 6.3 have been corrected. Sub-Section 6.3.2Permanent Batters (Post-Demolition) provides specific stabilisation advice for the retaining walls and batters on site, including buttressing advice and stages of the construction.
13	Section 3.6	The placement of fill buttresses on the slope will impose a substantial surcharge on the slope, which may already be at a marginal level of stability. The Fortify Geotech report has not presented any geotechnical analyses for this proposed design. Geotechnical analyses need to be undertaken to ensure that the design can achieve an acceptable Factor of Safety.	Corrected. Slope stability analysis that includes surcharge is provided in Section 4.4 (Plate 4).
14	Section 3.6	Section 6.3 and Figure 5 of the report state that *"permanent unsupported cut and fill soil batters should be formed at no steeper than 2(H): 1(V)."* Given that the existing slope is currently steeper than 2(H): 1(V) it would appear this recommendation is not achievable. This issue will need to be addressed in the next version of the Fortify Geotech report.	This statement is for permanent unsupported cut and fill soil batters. Lot 802 is ~20m long from north to south, along the slope and elevation drop is 12m. Provided that four retaining walls (vertical) with total hight at least 5m will remain on site, the new formed batters of 2(H): 1(V) are achievable.

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15	Section 3.6	During and following the demolition works there will be a need for ongoing engineering assessments at the site to ensure risks remain at tolerable levels. The Fortify Geotech report provides some recommendations to address risk management. The Department will need to ensure these assessments are implemented via an appropriate mechanism such as a condition of consent or similar. Some of these assessments are further discussed below: – It is conceivable that the existing retaining walls may be damaged by the demolition works and their function is compromised. A structural engineer should inspect the walls following demolition to carry out a condition assessment and provide recommendations for stabilisation treatments.	Corrected - Included in the report (Section 6.3.2).
16	Section 3.6	– A Trigger Action Response Plan (TARP) is presented in the Fortify Geotech report. It is unclear which stakeholder is responsible for implementing the plan and ensuring the appropriate actions / responses are taken.	The original report indicated a responsible stakeholder, and wording was changed to provide further clarity (Section 5.4.1).
17	Section 3.6	– The 'displacement' triggers in the TARP state: "Displacement is detected visually or by an inclinometer." Displacement is not defined in the report so it is unclear what is meant by the term or where / how it should be measured. Furthermore, there is no inclinometer at the site.	As stated in the original report (Section 5.4.1), TARP was written for the new slope post-demolition, and the controlled measure includes inclinometer installation. Definition of the displacement is provided in the updated version.
18	Section 3.6	Given that the site could remain vacant for a number of years it is suggested that the site be inspected by a competent geotechnical practitioner at least every six months, or more frequently should a trigger level be met.	This was already stated in the original report in Section 5.4.2. The wording was corrected.
19	Section 3.6	It is also recommended that monitoring of the two existing inclinometers installed on Bobuck Lane recommence. This may require liaising with Transport for NSW for permission. Even if historical data was not available, monitoring of the inclinometers, which are likely to still be functional, would obtain useful data. A baseline reading of the inclinometers would need to be undertaken prior to demolition works.	This recommendation was added to the updated report (Section 5.4.1).
20	Section 3.6	Survey monitoring of the retaining walls should be carried out throughout the period the site remains undeveloped. The monitoring should be carried out by a register surveyor at least every six months.	This recommendation was added to the updated report (Section 5.4.1).

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		Movement triggers should be incorporated into the TARP.	

3 CLOSURE

Should you require any further information regarding this report, please do not hesitate to contact our office.

Yours faithfully,

Fortify Geotech Pty Ltd

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