

In the matter of

an application for approvals under the Fast Track Approvals Act 2024 for the Barrytown Minerals Project – Southern Block [FTAA-2605-1238]

By

Tāiko Critical Minerals Limited

Applicant

Reply Statement of Evidence of Andrew Hurley (Geotechnical)

5 October 2026

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Introduction

- 1 My name is Andrew James Cornelius Hurley.
- 2 I am a Chartered Professional Engineer (CPEng) with a geotechnical practice area. I have a Bachelor of Engineering degree from Canterbury University, awarded in 1983. I have worked in various engineering roles for over 40 years, including 17 years of geotechnical practice.
- 3 I am currently a director of Geotech Consulting (NZ) Ltd and have held that position since March 2021.
- 4 My previous work experience includes:
 - (a) Geotechnical engineer for Geotech Consulting from 2016 to 2021.
 - (b) Design and Consenting Manager for renewable energy developments at MainPower New Zealand, 2004 to 2016.
 - (c) Senior geotechnical engineer at MWH (now Stantec), 1998 to 2004, including three years on construction sites for a Northland water supply dam, and geo-hazard protection works at Aoraki/Mt Cook Village.
- 5 My role in relation to the Fast-track Barrytown Minerals Project is to provide geotechnical advice in response to a request from the Panel. I have previously provided advice for a comparable sand mine dredging operation in Mananui, Hokitika.
- 6 In preparing this evidence, I have considered the Application documents, including:
 - (a) Statement of evidence, and in reply, of Pier Federici in relation to Mine Planning;
 - (b) Barrytown South Mineral Sand Project – Hydrological Effects Assessment, Komanawa Solutions Ltd, 25 May 2026.

Code of Conduct for Expert Witnesses

- 7 While this is not a hearing before the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of

expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of evidence

- 8 This reply evidence responds to the query from the Panel regarding the expected performance of mine batters under seismic loading and the associated risk of lateral spread.
- 9 I consider the ground conditions; regional seismicity; site performance in previous large earthquakes; mine slope geometry and; the potential effects if lateral spread occurs in critical periods of the mine life.

Ground conditions

- 10 The relevant ground conditions affecting batter stability are well described in the Komanawa hydrological assessment (Section 2.6.2 Holocene Sedimentology). I understand these are marine sands deposited by longshore drift and elevated above current sea level by repeated earthquakes.
- 11 The sands themselves are typically coarsely graded with some fine gravels and heavy minerals, concentrated in black sand leads.
- 12 Groundwater is expected to be very shallow, approximately 1 m depth has been assumed by the mine planners.
- 13 Although there has been extensive drilling and sampling of the mineral sands for the purpose of resource assessment, I have been advised that there are no specific geotechnical test results available and therefore the specific geotechnical properties are not known at this time.
- 14 Importantly I understand that much of the area has been previously mined for gold, in the early 20th century, a process which will have disrupted the light cementation that builds up in undisturbed soil deposits and leaves the area more vulnerable to seismic liquefaction.

Seismic loading and associated risk of lateral spread

- 15 Conditions that influence mine batters under seismic loading include the intensity and duration of shaking, the batter slope and the strength properties of the soil.
- 16 In this case it is not intended to cut the pit slope to a prescribed angle but rather it is assumed that the cut faces will collapse into the pit and come to rest at a slope of 17° in the water. This method means that the batter is

effectively at the angle of repose of the material, which is a function of these strength properties. Accordingly, any amount of earthquake shaking is likely to result in some failure of the batters, however in the absence of liquefaction, this is expected to only result in a minor regression of the batter crest, in the order of 10 m.

- 17 For liquefaction assessment the latest seismic load parameters are provided in TS1170:2025. These are not yet fully incorporated into the Building Code but represent the 'state of the art' in terms of seismic loading being derived from the most recent update of the National Seismic Hazard Model.
- 18 Assessments for structures (in this case a cut batter) with 'normal' occupancy typically assess two seismic load scenarios: A serviceability limit state (SLS) scenario using a 1-in-25-year event; and an ultimate limit state (ULS) scenario using a 1-in-500-year event.
- 19 Parameters for the SLS event, with an assumed Class 4 site, are magnitude 6.7 (M6.7) and peak ground acceleration (PGA) of 0.07g. For ULS the figures are M7.4 and 0.38g.
- 20 The Alpine Fault is approximately 50 km to the south-east of the site and is estimated to have a probability of rupture of 75% within the next 50 years (Howarth, et al., 2021). A Magnitude 8.2 (AF8) event (Orchiston, et al., 2016) with PGA of 0.24g (Holden & Kaiser, 2016) is possible at the site. I note that this is a longer-duration but lower-intensity event than the ULS scenario. This is a result of the distance from site to source.
- 21 The Canoe Fault has a mapped ground expression approximately 7.5 km long, with the southwest end impinging on the mine site. The fault is recorded in the ESNZ active fault database but there is very little information other than that the last movement is interpreted to be in the Holocene period (post glaciation). This is a relatively small fault that might be expected to produce earthquake shaking equivalent to an SLS, or a 1-in-100 year event.

Past site performance

- 22 We do not have any geotechnical data that would allow us to predict liquefaction by conventional analysis methods. However, there are observations of surface liquefaction effects throughout the west coast from previous large earthquakes (Carr, 2004)
- 23 Major earthquakes investigated by Carr include the M7.3, 1929 Murchison earthquake and the M7.1, 1968 Inangahua earthquake. Respectively 92

km and 78 km from site¹. Estimated shaking intensity at the site was around MMVII² for both events which would have exceeded the PGA expected in an SLS earthquake.

- 24 Liquefaction effects were recorded in Greymouth (primarily in the Murchison earthquake) but neither event has reports of liquefaction in the Barrytown area suggesting the sands have some resistance to liquefaction at low levels of ground shaking.

Assessment of effects

- 25 In larger earthquakes we can expect both localised collapse of batters in the mine pond and, in the event of liquefaction on the Barrytown Flats, these failures could be expected to propagate back from the face by many tens of metres.
- 26 I understand that there are considerable buffers on private land around the proposed mining area. However, there are a few critical locations where the mine path runs parallel to a waterway, for example at Granite Creek and Little Granite Creek. The mine path has a 20 m buffer adjacent to these waterways but if there is a 'flow liquefaction' failure into the pit this is likely to have the effect of undermining the creek and diverting it into the pond.
- 27 The mine pond contains a large volume of turbid water which is likely to have been made more turbid as a result of liquefaction. Equally, the effects of liquefaction won't be limited to the mine pond and liquefaction ejecta is very likely to have greatly increased the turbidity of the waterway upstream of the mine.
- 28 At the downstream end of the mine pond, turbid water can be expected to overflow back into the channel of the creek and have temporary effects on the downstream creek course, down to the beach.
- 29 I understand from Mr. Rekker (pers. comm) that these are fixed and could be readily mitigated in the response phase to any major seismic event by such measures as:
- (a) The intervening bund between the creek and pit pond would be re-built, including suitable armouring for the creek margin,
 - (b) The creek bed would be re-graded to establish a gradient and depth close to the original,

¹ Epicentral distance, with magnitude and epicentre location obtained from www.geonet.org.nz

² Modified Mercalli Intensity

- (c) The pit would be back-filled with tailings or other suitable inert material to stabilise the immediate area, and;
 - (d) Surplus aggregate in the downstream creek bed would be dredged with an excavator to restore the creek bed profile close to its original state and alleviate clogging of the floodway.
- 30 I also note that the period of exposure, when the mine is actually traversing beside the creeks, means that the probability of a liquefaction event occurring at the same time is very low.
- 31 For example the Alpine Fault has a 75% chance of occurring in the next 50 years, or <3% chance in any one year. The mine is expected to be traversing parallel to Granite Creek, or Little Granite Creek, for 1 year in total so there is only a 3% likelihood that an Alpine fault earthquake will occur while the Creeks are vulnerable.

Conclusion

- 32 The location is in a seismically active region and is close to known active faults such as the Canoe Fault, which intersects the southern end of the site; the Big River and Maimai Faults, about 20 km to the east and the Alpine Fault, 50 km to the south-east.
- 33 The proposed mine batters are expected to lie at the 'angle of repose' for the submerged mineral sands and as such any level of earthquake shaking is likely to cause disturbance and some degree of failure of the batter.
- 34 In the absence of liquefaction such failures are not expected to progress very far but in earthquakes larger than SLS, liquefaction and 'flow failure' is possible.
- 35 This will mostly be contained on private land owned by TCM and therefore have negligible off-site effects.
- 36 Effects within the Site could arise where the mine pit is traversing close to Granite Creek and Little Granite Creek. However any diversion of these creeks into the mine pond as a result of liquefaction is not anticipated to have any long-term negative effects and can be remedied through restoration.

Andrew James Cornelius Hurley

5 October 2026

References

Carr, K. M. (2004) Liquefaction Case Histories from the West Coast of the South Island, New Zealand. University of Canterbury, Masters Thesis.

Holden, C., & Kaiser, A. (2016). Ground motion modelling of a large Alpine Fault (New Zealand) earthquake. *NZSEE*

Howarth, J. D., Barth, N. C., Fitzsimons, S. J., Richards-Dinger, K., Clark, K. J., Biasi, G. P., . . . Sutherland, R. (2021, April 19). Spatiotemporal clustering of great earthquakes on a transform fault controlled by geometry. *Nature Geoscience*, pp. 314-320.

Orchiston, C., Davies, T., Langridge, R., Wilson, T., Mitchell, J., & Hughes, M. (2016). *Alpine Fault Magnitude 8 Hazard Scenario*.

Technical Specification TS 1170.5:2025 Structural design actions – Part 5: Earthquake actions