

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

Statement of evidence in reply of Jens Haaye Rekker in relation to Hydrology & Water Management

5 October 2026

Applicant's solicitors:

Alex Booker

Anderson Lloyd

Floor 2, The Regent Building, 33 Cathedral Square, Christchurch 8011

PO Box 13831, Christchurch 8141

DX Box WX10009 Christchurch

p [REDACTED]
[REDACTED]

**anderson
lloyd.**

Introduction

- 1 My name is Jens Haaye Rekker.
- 2 I provided a statement of evidence dated 25 March 2026, which outlines my experience at Kōmanawa Solutions Limited in the areas of hydrology and water management.
- 3 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 this reply to comments.

██████████ (#3)

- 4 ██████████ is concerned that the noise bund in vicinity of his family's property on Warren Road and in the zone of passage of Granite Creek will impede or block flood waters of Granite Creek of surface flooding within his lands in same manner as a flood embankment (stop bank).
- 5 For the passage of Granite Creek through the noise bund, the noise bund is offset from the banks of the creek by 20 metres, therefore the floodway of Granite Creek is preserved to either side of the creek's penetration of the line of the noise bund and 40 m or more gap is maintained for the creek to pass. In the main, the noise bund would follow and parallel a natural break in slope in the Warren Creek area that permits Granite Creek to make two right angled turns down gradient from Warren Road.
- 6 The vegetated noise bunds would be gently sloped and if contacted by flood water or surface flooding would allow spreading of surface water until flood gradients follow the Granite Creek alignment.

██████████ (#23)

- 7 ██████████ asked the Panel to require convincing, independently tested evidence demonstrating that the existing wetlands and shallow groundwater system will remain adequately protected throughout the mining period.
- 8 It should be recalled from the application that the sand mining involves a floating dredge for the Southern Block with no requirement to dewater the sand mining void. Instead groundwater will enter the mining void and returning tailings will include the same volume of groundwater sucked and pumped away to the Wet Concentrator Plant.
- 9 The existing water table height will also be maintained through a balance of outflow in slurry lines matched by inflow of water in slurry lines. The water

balance for the pit pond is neutral. The existing water table height is also required to float the dredge

- 10 [REDACTED] asked the Panel to require convincing, independently tested evidence demonstrating that the proposed water-management system can safely cope with the extreme wet weather conditions of the Barrytown Flats.
- 11 The weather extreme of rainfall surplus and rainfall deficit has been planned for and the Applicant considers the sand mining approach to be resilient to climate extremes of this nature.
- 12 During rainfall deficit, resulting in extended dry period or drought, the mining technique and wet processing is inherently preservative of the groundwater circulating to mobilise the mineral sand. Small losses of water would occur to the atmosphere in open water evaporation and transported adherent moisture.
- 13 These losses are to be replenished by abstracting from the Barrytown Flats largest flowing water body, Canoe Creek, optimally and using a gallery well field during periods of rainfall / streamflow surplus.
- 14 During weather extremes of rainfall surplus, resulting in flooding and surface flooding, the mining technique would be resilient to rising pit pond water levels (the dredge would float higher on a higher water table). The already small losses of water through open water evaporation would be lessened with lower evaporative potential and the water circulation would continue to be equilibrated at the pit pond.
- 15 [REDACTED] asked the Panel to require convincing, independently tested evidence demonstrating that contaminants, metals and radionuclides are not inherently, or are prevented, from migrating through the shallow groundwater system.
- 16 In response I have paraphrased Ms. Van Rooyen's request as follows: would contaminants, metals or radionuclides be mobilised with the shallow groundwater system to affect groundwater, surface water or radiological air quality?
- 17 For clarity, contaminants may be defined as suspended solids or agricultural nutrients measured as turbidity or concentrations of nitrogen or phosphorus.
- 18 The groundwater balance of the active pit pond at any time during mining would be relatively neutral; no steepened gradient inwards and no

steepened gradient outwards. Such gradients that would prevail would be equivalent to the background hydraulic gradients of the existing water table.

- 19 Therefore, turbidity from suction dredge disturbance and tailings return deposition would be retained by natural attenuation within minimum offset distances.
- 20 In addition, if elevation of pit pond contaminant or metals concentrations justify it, lime dosing is recommended within the project proposal.
- 21 Lime dosing is an established, validated method for achieving high percentage reductions in dissolved and suspended nutrients and heavy metals.
- 22 Implemented as proposed, the lime dosing of saturated tailings would prevent a large part of the nutrients and heavy metal mass from progressing beyond the perimeter of the pit pond or tailings reception areas by flocculation and long-term incorporation in tailings.
- 23 Radionuclides such as radium or thorium, plus the arising elemental radon isotopes (e.g., Rn²²²) are outside of my discipline boundaries, although I have addressed the groundwater hydrology, dispersion in water & air, and half-life of radon where these are within my field of expertise.
- 24 I concluded that any mining generated radon would migrate west and away from areas of habitation, at low rates of groundwater lateral movement that would extinguish elevated radon water concentrations before dissolved gaseous radon entered the Tasman Sea.
- 25 Any mining generated gaseous radon entering the air at the active sand mine pit pond or tailings reception area would not have an opportunity to accumulate in air due to the open, exposed nature of these zones, with full exposure to wind shear and atmospheric turbidity.
- 26 Mr. David Bougourd for the Applicant is also responding on the question of radioactivity hazard, risk and the various parts of the proposed mining operation within his field of expertise.

WCRC's Principal Scientist – John Horrox (#26a)

- 27 In response to the Panel's Question e) regarding the interference of mining and rehabilitation with natural waterbody hydrology, Mr. Horrox opined that any remedial strategy would have great difficulty in overcoming the increase in vertical hydraulic conductivity (permeability) and consequent stream flow depletion.

- 28 The inference that stream (flow) depletion would occur as a result of sand mining and tailings sand reinstatement, including this being the largest long-term risk to creeks and farm drains, is difficult to reconcile with hydrological assessments contained in the Substantive Application, Hydrology Assessment.
- 29 While indeed some alluvial fan material extends to, and slightly beyond the eastern mining area boundary, the interim and rehabilitated groundwater levels and gradients towards the Tasman Sea are not assessed to be materially altered by the re-working of these alluvial fan materials.
- 30 Previous and more recent hydrogeological investigations of the shallow subsurface to 12 metres depth has not found evidence of any significant stratification, other than some peat layering in the Cargill Road area. There is little in the way of internal low permeability layering within the transgressive beach deposits that currently perches the water table that would be lost in the process of sand mining.
- 31 This is especially, but not exclusively, the case for the previous bucket dredged mined portion of the proposed mining area.
- 32 No amount of change to grain size or sedimentary texture that could occur as a result of proposed sand extraction and replacement to 10 metres maximum depth could materially change groundwater levels or gradients from those existing today in the current and future context.
- 33 The land surface within the proposed mining areas have an altitudinal range from 2 to 10 metres, with all higher elevations being located to the east and outside of the mining area. This leaves the mineral sand mining area as a slender wedge extending westwards from the eastern boundary to 50 metres laterally from MHWS.
- 34 Rehabilitation recontouring of the land surface will have no incentive to raise the land surface appreciably higher than the current land surface. Therefore, rehabilitated land surfaces would fall within similar heights above the ultimate water table.
- 35 All farm drains and creeks, other than Granite Creek and Wasabi Creek are incised into the land surface through subsoils. Therefore, groundwater seepage sustained creek flow may be increased if there is any manifestation of choked surface flows. This adjustment would be a simple process of initial or subsequent channel excavation.

WCRC's Principal Engineer – Peter Blackwood (#26b)

- 36 In response to the Panel's Questions 4) and 8) regarding the
- 4) "what information should be certified and be in place before any waterbody is interfered with to ensure the progressive rehabilitation achieves a final waterbody morphology that is structurally and functionally appropriate and meets the aims of Figure 11 (Substantive Application, Appendix 6)."
 - 8) "Assess the project's potential to materially interfere with natural waterbody hydrology and how any risks can be managed."
- 37 Mr. Blackwood responds with the recommendation for a river engineering survey to cover channel dimensions, bed gradients, and flow carrying capacity . This set of surveys would be followed by post-restoration surveys to ensure essentially conforming dimensions, gradients and carrying capacities had been retained
- 38 I am broadly in agreement with Mr Blackwood's recommended "consent conditions" on page 4 of his invited comments, immediately above his signature.
- 39 In my opinion, a survey of existing channel morphology and channel invert elevations, along with existing channel substrates, should be undertaken so as to define the bed permeability, roughness and surface water hydraulic gradients. This information should be used to define the channel flow carrying capacity of individual elements, at nodes and the capacity of the creek network as a whole.
- 40 In addition, nodes and potential choke points should also be identified and the degree to which these constrain the existing creek network's net capacity to conduct surface water flows from the foothills to the east and to the Tasman Sea.
- 41 The rehabilitation of land, rehabilitation of wetlands, rehabilitation of creeks, and harmonisation of each and all of these rehabilitation efforts would also benefit from three-dimensional projections of ecologically and hydraulically optimal geometry.
- 42 Interim and post-rehabilitation creek network surveys would serve a useful purpose in delineating define the requisite armouring, roughness and surface water hydraulic gradients of the ultimate drain and creek network.

CRRG's Professor Brian McGlynn, wetlands and hydrology (#37.5)

- 43 In paragraph 62. "Groundwater Contamination" of Professor McGlynn's invited comments, he outlines the risks of groundwater contamination due to the disturbance and reworking of sedimentary deposits and the manifestation of the following contaminants:
- Nitrogen
 - Phosphorus
 - Heavy metals
 - Radon gas radioactivity migrating in groundwater.
- 44 Professor McGlynn raises the prospect of shallow groundwater being affected by disproportionate concentrations of nitrogen (nitrate, ammonia/ammonium), phosphorus, heavy metals and radioactivity.
- 45 For the reasons that I expand upon below, these prospects of groundwater contamination are overstated and have either inherent controls or conditioned remedies to ameliorate the potential for such groundwater contamination risks.
- 46 The groundwater balance of the active pit pond at any time during mining would be relatively neutral; no steepened gradient inwards and no steepened gradient outwards. Such gradients that would prevail would be equivalent to the ambient hydraulic gradients of the existing water table.
- 47 Therefore, turbidity from suction dredge disturbance and tailings return deposition would be retained by natural attenuation within minimum offset distances.
- 48 In addition, if pit pond contaminant or metals concentrations justify it, lime dosing is recommended within the project proposal. Lime dosing is an established, validated method for achieving high percentage reductions in dissolved and suspended nutrients and heavy metals.
- 49 Implemented as proposed, the lime dosing would prevent a large part of the nutrients and heavy metal mass from progressing beyond the perimeter of the pit pond and tailings reception areas.
- 50 In paragraph 62. "Groundwater Contamination" in the latter sentences, Professor McGlynn states: *"If the post mining slurry contains radioactive material, this can also be liberated and mobilised. Radon gas is one example that can be problematic for local households and water supplies*

since Radon gas readily dissolves in and moves with groundwater. This can be particularly problematic for household wells and household water use and subsequent human inhalation associated with washing and showers etc.”

- 51 In response I prepared a lengthy explanation, as follows:
- 52 Professor McGlynn raises the prospect of shallow groundwater being affected by disproportionate concentrations of dissolved radon gas with associated radioactivity.
- 53 Dissolved, gaseous radon is a product of the decay emissions of radionuclides within cratonic rocks or crystalline rocks, or in rare instances within mineral sands.
- 54 Radon is harmful at low concentrations in air but has a brief half-life and is heavier than air – tending to dissipate unless retained in low, closed base features or structures.
- 55 In overseas cratonic or crystalline rock areas where radon is known to issue from the ground, gas monitoring of house cellars and other underground spaces is carried out to minimise exposure of humans to radon at concentrations exceeding guidelines for health protection.
- 56 Common accumulation sites for gaseous radon are listed as follow:
- (a) Basements and Cellars: These lowest levels sit directly on or in the ground, allowing gas to seep through foundation cracks, floor-wall joints, and sump pumps.
 - (b) Crawl Spaces: Exposed earth in unsealed crawl spaces lets radon release freely and collect before rising into upper levels.
 - (c) Basement Utility Rooms: Rooms housing furnaces, water heaters, or drains act as hotspots due to gaps around pipes, cables, and floor penetrations.
 - (d) Underground Mines and Caves: Subsurface cavities cut deep into rock formations experience heavy accumulation without robust artificial ventilation.
 - (e) Tightly Sealed Energy-Efficient Homes: Modern insulation traps indoor air, preventing dilution and causing high concentrations on ground floors and living areas above basements.

- (f) Water Systems: Groundwater from drilled wells in uranium-rich geology can hold dissolved radon, releasing it into indoor air during showers or laundry.
- 57 Groundwater wells or bores in areas with radioactivity geologies are correlated with higher emissions of radon gas due to the wells and to a lesser extent bores, being a window to the strata with radionuclide decay.
- 58 However, it is not true to say that radon is readily conveyed long distances by lateral groundwater flow.
- 59 Radon has a brief half-life of approximately 3.8 days while groundwater flow rates under the Barrytown Flats are between 0.15 – 0.45 metres per day.
- 60 Accordingly, groundwater with dissolved radon issuing from say the agitation of mineral sands containing radionuclides and migrating laterally would lose 50% of initial radon content within 1.5 m of edge of the source of radon generation at average groundwater velocity.
- 61 Further reductions would occur over similar such distances until the radon concentration is no more than background concentration.
- 62 Furthermore, we are aware that the population of Barrytown Flats does not make much use of wells or bores, more often roof catchments, creek taps or springs. In addition, the mineral sands mining activities are located to the west of the Barrytown Flats and in a downgradient positions, whereas the Barrytown human population living in dwelling.
- 63 While Professor McGlynn does not explicitly state an opinion that sand mining as proposed would generate radon that migrates against the groundwater flow gradient to wells or bores at Barrytown Flats and exposes inhabitants to harmful radioactivity, the implication in his statement is clear.
- 64 Taiko Critical Minerals' radiation expert will respond to questions of risk from thorium, radium and radon. However, in terms of plausible source, vector and fate pathways for proposed sand mining to induce additional radon gas radioactivity of health significance to Barrytown house dwellers, I am of the clear opinion that such an eventuality is highly unlikely.

CRRG's Dr John Bradley, Radiation geophysicist (#37.2)

- 65 In paragraph 62. "Groundwater Contamination" of Dr Bradley's invited comments, he stated *"Radioactivity can be released into the environment via the atmosphere and water. It has been established that radon is continuously degassing from the deposit into the atmosphere and periodically accumulating in dwellings. To my knowledge, water within and*

around the deposit has never been tested for dissolved radionuclides. The lack of such information makes it difficult to assess the Proposal's effects, and to identify and assess the effectiveness of measures that address those effects. In the absence of neither atmospheric radon data nor groundwater radionuclide (e.g. radium) data before mining even begins, there is simply no way to begin to meaningfully predict the impact of mining the Barrytown deposit."

- 66 The synthesis of Dr Bradley's opinion is that it is not possible to start an assessment of the effect of the Project's impact in terms of radium (or thorium) and radon due to a lack of ambient concentrations in the air or groundwater.
- 67 The implication is that the mining of mineral sands in the west of the southern Barrytown Flats may or may not have an impact of health concern to the population of Barrytown Flats.
- 68 Taiko Critical Minerals' radiation expert, David Bougourd, will address the radiation risk management. The processing of mineral sand is within the Wet Concentrator Plant, which has its own radiation risk management plan, operative consent conditions and is out of scope to the FTAA process.
- 69 However, it is within my own discipline boundaries to respond on the questions of half-life, dispersion in atmosphere or groundwater, travel time and groundwater hydrology.
- 70 **Groundwater Hydrology:** The western dairy farming, low relief portion of the Barrytown Flats has a low elevation water table with estimated groundwater level elevation of 0 to 9 m above mean sea level. This portion of the Flats encompasses the proposed mining area and contains a single dwelling adjacent to a dairy shed.
- 71 The eastern, mixed grazing and lifestyle land use portion of the Barrytown Flats has the remainder of dwellings and has a higher elevation water table with estimated groundwater level elevation of 9 to 20 m above mean sea level. Groundwater flow direction is east to west at a gradient of 0.02 m/m (1 in 50) and an average velocity between 50 and 150 m/year.
- 72 **Dispersion:** Radon diffuses within groundwater and will be subject to advective, dispersive transport in flowing groundwater. In the atmosphere, low molar masses of radon require the protection prevent dispersion in flowing air within breezes or circulating air flows in order to accumulate. Radon's heavier-than-air density in air allows it to collect in low points and depressions.

- 73 **Half-Life:** Radon-222 isotope has a half-life of 3.8 days, which limits its longevity with distance away for the site(s) of radon liberation at radium minerals. Other isotopes of radon have shorter half-life.
- 74 Given the low rate of groundwater flow velocity, advective dispersive flow carrying radon from a site where it is liberated in high concentrations is liable to be substantially reduced in mass and concentration after a few tens of metres.
- 75 Putting these physical constraints on radon transport in groundwater together, Any mining generated radon would migrate west and away from areas of habitation, at low rates of groundwater lateral movement that would extinguish radon elevation before it entered the Tasman Sea.
- 76 In conclusion, I consider that these 'back of the envelope' assessments need to be weighed in any consideration of radon in groundwater health risk. Accordingly, I do not consider the implication of Dr Bradey's statement as they relate to sand mining causing human health effects for the inhabitants of surrounding homes to be credible.

(#40)

- 77 In relation to water resources and water quality, the invited comments for GA and GA Langridge Family Trust state that "Cutting up the deeper layers of any still naturally layered wetlands on the flats, means they will not hold, drain or direct the water in the same way again. The unknown of that is the literal 'flow-on' effects of this disturbance into the future."
- 78 While I acknowledge the perception of the possibility that sand mining would alter the fundamental permeability pattern with consequent shifts in groundwater hydrology, I disagree that the change proposed will disrupt the important groundwater hydrology across the Barrytown Flats.
- 79 These comments in relation to "naturally layered wetlands" partially mirror the opinion of Mr. John Horrox (#26a) and my responses to those comments covered above in paragraphs 27 to 35 of this response.
- 80 Indeed, this perception of altered ground properties misapprehends the proposed actual net impact of long-term sand mining on the groundwater hydrology of the Barrytown Flats. These actualities include:
- (a) The mining method is water level neutral, no dewatering or intentional water table lowering is envisaged,

- (b) The mined strips and rehabilitated tailings remain encapsulated by shallow geological materials of original permeability, porosity and sedimentary texture,
- (c) The majority of the proposed mining areas in the SB will traverse land that had already been bucket dredge mined for alluvial gold during the early part of the Twentieth Century and thus sedimentary structures had previously been altered in the deposition of dredge tailings,
- (d) The fundamental groundwater hydraulic gradient from east to west across the Barrytown Flats will not be altered, therefore external effects are unlikely, and
- (e) The primary rehabilitation objective of establishing a thriving wetlands geomorphology and vegetation over 54 ha as part of wetlands restoration will have a corresponding effect of anchoring the long-term groundwater hydrological pattern and imposing a higher degree of hydrological stability into the future.

Department of Conservation, Dr Richard Storey (#28c)

‘Water Quantity Effects’ Paragraph 35

- 81 A section of the Substantive Application, Hydrological Assessment is quoted and then the following conclusion in his paragraph 35 is drawn by Dr Storey: *“This indicates that when the water level in the dredge pond is below the surrounding water table, the water table will lower and water from the creeks and artificial drains on the SB will drain into the water table. This could have an adverse effect on the ecology of the creeks and artificial drains.”*
- 82 Dr Storey’s inference in paragraph 35 of his invited comment is incorrect. The dredge pond will rest at the same level as the adjoining water table. No dewatering or intentional water table lowering is envisaged.
- 83 The re-balancing referred to in the Hydrological Assessment of the Substantive Application refers to the stability provided by exchanges of surface water and shallow groundwater in close hydrological interconnection. Dr Storey may have interpreted the reference to re-balancing incorrectly.
- 84 In general, surface water depletion consequent to active sand mining is not assessed to occur. Surface water depletion requires a net removal of groundwater volume and the proposed sand mining activity is designed to

be volume neutral, including periodic top-up of any loss to the atmosphere or adherent moisture transport to Rapahoe.

‘Water Quantity Effects’ Paragraph 36

85 A section of the Substantive Application, Hydrological Assessment is quoted and then the following conclusion in his paragraph 36 is drawn by Dr Storey: “. ... *Therefore, the conclusion that “pre-existing groundwater flow patterns would re-establish in the wake of active sand mining” is questioned. These aspects of the hydrological assessment require a review by a hydrologist. The results have implications for restoring flow in the creeks post-mining.*”

86 Dr Storey’s inference in paragraph 35 of his invited comment is incorrect.

87 In view of Dr Storey’s incorrect inference as to the sand mining water management proposals, he has the perception that the water table would drop beyond the depth of the drain and creek beds as a consequence of sand mining and restoration.

88 The proposals are much simpler:

- (h) The suction dredge would float upon the existing water table,
- (i) The slurry line delivery and return of sand with the Wet Concentrator Plant would borrow and repay volumes of groundwater to operate the slurry lines in the same 24 hour period which is volume neutral,
- (j) Periodic top-up of any loss to the atmosphere or adherent moisture transport to Rapahoe would be obtained from the Canoe Creek gallery, and
- (k) The primary anchors setting the water table profile from east to west would be largely unaltered.

‘Water Quantity Effects’ Paragraph 37

89 A section of the Substantive Application, Hydrological Assessment is quoted and then the following conclusion in his paragraph 37 is drawn by Dr Storey: “*Given that “creeks and farm drains on the coastal plain are strongly connected to the underlying shallow groundwater system”, restoration of flow in the reconstructed stream channels must depend strongly on the elevation of the channels. According to Figures 5-8 in the RMP, the land surface topography post mining will be significantly different to pre-mining. Any land recontouring must ensure that the beds of creeks*

and drains intersect the groundwater table, otherwise these creeks and drains will not carry water.”

- 90 Figures 5 to 8 in the RMP do indeed foreshadow a changed land surface profile. Inherently, the rehabilitated land profile from east to west develops greater concavity.
- 91 This change in the land surface profile inherently results in a higher level of future connection between the beds of restored drains and creeks rather than less connection.

‘Canoe Creek Gallery Water Take’ Paragraph 43

- 92 A section of the Substantive Application, Water Management Plan is quoted and then the following conclusion in his paragraph 37 is drawn by Dr Storey:
“The WMMEMP specifies limits to the water take from Canoe Creek. As well as a limit to the instantaneous and daily rate of abstraction, I would expect to see a “cease take” threshold, i.e. a flow level in the creek which, if crossed, would trigger the Project to cease taking water from the creek in order to protect instream ecology.”
- 93 The Canoe Creek gallery intake is established with a series of inherent protections of Canoe Creek water resources and aquatic ecology in mind:
- (h) The intake is not direct to the creek, the intake is instead a gallery well field drawing groundwater that would be augmented by the flow of Canoe Creek,
 - (i) Canoe Creek is the largest flowing water body crossing the Barrytown Flats with an estimated $MALF_{7d}$ of 635 L/s,
 - (j) The maximum pumping rate of the gallery would be restricted to less than 10% of the $MALF_{7d}$, which minimises the potential effect,
 - (k) The hydrological flow characteristics of Canoe Creek is proposed to be monitored at State Highway 6 with a progressive development of actual flow statistics reported within annual reports,
 - (l) The location of the gallery relative to Canoe Creek's longitudinal profile is 150 metres upstream of the creek mouth with the Tasman Sea and immediately downstream of the Canoe Creek Scenic Reserve so as not to affect the hydrology of the reserve,
 - (m) The gallery for use with the Wet Concentrator Plant is intended to operation in three modes:

- (i) At the higher end of the consented pumping range for commissioning or re-commissioning the Plant in filling tanks, chambers and pipelines, over no more than 7 days, no more than twice in a hydrological year,
- (ii) In the lower end of the maximum range averaging 300 cubic metres per day for periodic top-up of evaporative and adherent moisture export losses at the Wet Concentrator Plant, or
- (iii) Dormant for extended periods with no water demand.

94 Due to the following

- (h) diffuse rather than direct water take,
- (i) positioning of the intake and
- (j) avoidance of sensitive creek reaches, setting a maximum rate of take less than the 10% of the $MALF_{7d}$,
- (k) the long-term efforts to monitor the creek flow patterns in order to check for creek low flows prior to commissioning the Plant, and
- (l) the light duty that the gallery would be under for the majority of the mining operation,

the requirement for compliance monitoring and a cease take flow rate of the Canoe Creek water take is considered out of proportion to the scale of the activity and the remaining sensitivity of the environment.

WMP: 'Canoe Creek Gallery Water Take', Condition 22.1.a, b, c, & h

- 95 A section of the Substantive Application, Water Management Plan is quoted and then the following conclusion in his paragraph 55 is drawn by Dr Storey: *"This condition should include all creeks crossing the SB, not only Granite Creek and Canoe Creek. For Canoe Creek it should also include a cease-take level, i.e. a river flow at which the water take must cease in order to reduce the risk of adverse effects on ecological values in Canoe Creek."*
- 96 Minor creeks issuing from the Paparoa Ranges abreast Barrytown present practical difficulties in establishing and maintaining flow gauging effectiveness as indicated should occur by Dr Storey.
- 97 Upstream of the mining boundary, bed mobility of granitic sand and pea gravel courses periodic lateral shifts and base level shifts to the bed profile, requiring re-rating of any flow monitoring site.

- 98 Downstream of the eastern mining area boundary, creeks and farm drains are low in gradient and have benthic vegetation with a floating occupation of the water column.
- 99 Such creek settings are also highly problematic for maintaining flow gauging systems of any reliability. The low creek gradient compress the flow-water level range. The floating vegetation confounds the setting of a relationship between creek stage and flow rate by rising and falling with stem gas buoyancy.
- 100 Additionally, the inflow of creek water in minor creeks from the Paparoa Range would be under the influence of climate and rainfall intensity forcings rather than mining activities.
- 101 Creek flows west of the eastern mining area boundary are more strongly influenced by exchanges with shallow groundwater.
- 102 Thus monitoring of groundwater level is perhaps a more effective means of monitoring creek flow, with all of the inherent practical difficulties in monitoring low gradient, weed infested creeks.

WMP: 'Restoration of Creek Flows', Condition 22.1.d

- 103 A section of the Substantive Application, Water Management Plan is referred to and the following conclusion in his paragraph 58 is drawn by Dr Storey: *"It is not sufficient to restore the catchment areas of the natural watercourses, as changes to surface topography and subsurface hydrology may result in significant changes to water flows in the watercourses. This condition should require water flows (measured in litres per second) in all natural watercourses to be restored to not less than 10 percent below pre-mining flows."*
- 104 I appreciate Dr Storey's point that restoring a creek channel to a standard approaching the original or more natural condition achieves little if the flow rates scaled to sustain the riverine habitat is not also restored.
- 105 It is my own contention that there is no real change to the hydrological conditions operative for minor creek courses crossing the Barrytown Flats upon the passing of the active mine pit and the initiation of interim restoration and ultimate rehabilitation.
- 106 These minor creeks will continue to receive rainfall fed inflows from the Paparoa Range to the east and continue to be bathed in shallow groundwater from beneath.

Conclusion

- 107 I have considered each of the received invited comments relevant to hydrology and responded in the context of my familiarity with the Barrytown minerals sands proposals gained in undertaking fieldwork, reviewing the results of baseline monitoring and assessing effects for the Southern Block sand mining activities.
- 108 My responses to the salient sets of invited comments in relation to hydrology, water quality and water management are set out in the hundred or so paragraphs above.
- 109 I acknowledge the efforts of commenters to provide comments with their ability to view the subject matter with fresh eyes.
- 110 In one case of the suggested creek catchment engineering survey proposed by Mr Blackwood in his role for West Coast Regional Council principal engineer, I had no hesitation in recommending that such a survey should be undertaken if the proposed consent applications are granted.
- 111 In conclusion, I do not consider that the comments advanced in contention to the substantive application have highlighted matters that materially alter the information put before the panel in terms of the scale of the proposed activities and what I perceive to be the sensitivity of the affected hydrological environment.



Jens Rekker
5 October 2026