IN THE MATTER OF THE INQUIRIES ACT 2014

AND IN THE MATTER OF A BOARD OF INQUIRY INTO THE MCCRAE LANDSLIDE

ENTITY: SOUTH EAST WATER CORPORATION

SOUTH EAST WATER'S REPLY SUBMISSIONS ON THE CAUSE(S) OF THE MCCRAE LANDSLIDE

1. South East Water (**SEW**) maintains its earlier submission as to causation.

General – Oversimplification of a complex situation in the submissions

2. The tendency of other parties to simplify the landslide event, or to focus primarily on triggers rather than preparatory factors, is to ignore the fact the entire escarpment has faced the same triggers over time, and yet four landslide events have occurred at the same location, *and nowhere else*, over a 3 year period. To reason from 'assumed' (rather than proven) pathways of water significantly raises the likelihood of wrong conclusions and recommendations being determined. It also underplays the complexity of the impact of the topography, geology, anthropogenic action, physics and chemistry on the landslide event.
3. The systems of physics and chemistry that underly the landslides are complex, as illustrated by the findings of the investigation, laboratory and in-situ tests caried out by SMEC. For example, WSP and PSM have concluded that water can travel from Bayview Road to 10-12 View Point Road. This conclusion is adopted as "'a given", without detailed examination and testing of associated questions such as, "is there evidence that the leaked water travelled to other parts of the escarpment and, if not, why not?" and "what are the ground conditions of the other flow paths?". This simplification masks the complex nature of ground conditions upslope of the landslide, and the significance of the different factors and actions that contributed to the landslide event.

Submissions of Mr and Mrs Borghesi

4. As to the written submissions made by Mr and Mrs Borghesi (**Borghesi Submissions**) dated 11 August 2025, SEW states as follows.
5. In relation to the November 2022 landslide:
    a. the proposition that the 2022 burst water main was in Prospect Hill Road, rather than Coburn Avenue, was not substantiated by settled evidence.[1] Montage record SEW.0001.0001.4933 at page 13 shows the burst pipe was in Coburn Avenue towards the intersection with Prospect Hill Road;[2]
    b. the submission that it is unknown for which period the burst had been flowing prior to repair is not supported by the evidence, as Mr Julian Tully's evidence was:

[1] T1130.L3-25, T1130.L43 to T1132.L38 (4 August 2025).
[2] Exhibit 1 of CA41.

i. he calculated, from water flow, that the leak commenced at 5.40am on 14 November 2022 and ceased at 6.45pm that day; and

ii. his measurement of 0.9ML of water was an over-estimate that included customer usage;[3]

c. SEW maintains its submission in relation to the inability of the water from the 2022 water main leak to have flowed to the escarpment within an hour so as to trigger the 14 November 2022 landslide.

6. The most probable conclusion open on the evidence is that rainfall was the cause of the November 2022 landslides, which illustrates the fragility of the escarpment in this area.[4]

7. As to the January 2025 landslides, the Borghesi Submissions are based upon a mistaken assumption that 17ML of water from the Bayview Road burst reached 7 Prospect Hill Road. This proposition is unsupported by the evidence. It also seems to be based upon an assumption that all water from the Bayview Road burst would take a single path, which again is unsupported by the evidence. The dye tracer tests also tell against there being a pathway from 7 Prospect Hill Road to the escarpment.[5]

8. In the Borghesi Submissions there are references to soil being dry. However, it is important to maintain the distinction between "seepage" and "groundwater". A lack of seepage does not mean there is no groundwater flow. Measurements of seepage are not measurements of groundwater flow. Therefore, references to surface soil being dry does not mean there was no significant sub-surface groundwater flow.[6] Insofar as the Borghesi Submissions state that "the current and previous owners of 3 Penny Lane advise that the area under their house was dry", this is contradicted by the complaint to the Council in 2023 that runoff was occurring at Penny Lane from View Point Road above.[7]

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[3] Exhibit CA41.

[4] Mr Borghesi gave evidence about groundwater constantly flowing in View Point Road from before December 2020 until mid-2023. Given the limited investigation into the contribution of groundwater at the time, and the occurrence of the rainfall event, it is uncertain what, if any, extent groundwater contributed to the 2022 landslides. Mr Pope also gave evidence about the broken irrigation pipe at 10-12 View Point Road, that flowed from 14 November 2022 to 15 November 2022, and which he estimated exceeded the volume of water from the rainfall event (1 - 2 times the rainfall event: PSM.5000.0004.4044).

[5] The reference to 40ML also ignores the variation in leakage volume over time. Eg. a fortnight before 5 January 2025, the volume of water from the Bayview Road burst was approximately half the final volume of water from the Bayview Road burst and emanating at a lower flow rate. The variation in volume and flow rate are key factors in assessing possible transmission paths and potential storage of underground water in the area between Bayview Road and View Point Road. Moreover, the reference to water flow of 17kl/day does not correlate with WSPs report (Exhibit CA67 at 0276) that, as at 10 January 2025, seepage was reduced to 5L/minute (7.2kl/day).

[6] See evidence as to removal of the skin at T1336L29-L35 (5 August 2025).

[7] See email to the Council at MSC.5003.0001.7170.

9. There is evidence that casts doubt on the Borghesi Submission that the retaining wall at 10-12 View Point Road was "properly designed and constructed". Mr Borghesi did not provide design and construction documentation in support of that contention. There was no building permit for the 2024 retaining wall. There was a question as to whether the founding depth of piles / piers correlated with recommended depth.[8] There was evidence that showed at least localised instability and settlement / consolidation of fill behind the wall, which would increase the risk of a landslide.[9] Mr Pope assessed that the ground profile, without the retaining wall but with an elevated water level, would not have been guaranteed to fail.[10] That is to say, his evidence is "if the 2022 and 2024 RWs were never built it is possible that the 2025 Landslides do not occur".[11]
10. The Borghesi Submissions contend that irrigation was not a contributory factor on the basis of a comparison of water usage volumes of irrigation and the volume of water from the Bayview Road burst. This fails to consider the proximity of irrigation, compared with the Bayview Road burst, providing a significantly shorter flow path. In terms of volume, Mr Pope concluded that irrigation could have contributed up to 1200L per day to groundwater at the site.[12] The daily usage at 10-12 View Point Road was estimated to be 3358L per day.[13] Even at 1200L per day, within 5 days, there would be sufficient water to cause the landslide, given the low volume of water required to cause the 5 January 2025 landslide and the proximity of the property to the landslide site.[14]
11. When Mr Paul's upper and lower bands for porosity and increases in moisture content are considered for the 300m³ of soil that moved in the 14 January 2025 landslide, the amount of water required to move that soil is between 6,000L and 36,000L, with the lower band, 6,000L being of the same order of magnitude as SMEC's estimate of 2,000L- 2,300L.

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[8] See T1202.L4-T1204.L2 (5 August 2025) and Exhibit CA71 at 0212 to 0221.
[9] See CA71 at 0462.
[10] This is illustrated by Mr Pope's analysis in Table 13 of Exhibit CA71 at bates page number 0221. The results of modelling without the retaining wall and an elevated water level at site (Run 2), has a Factor of Safety rating of greater than 1.0. Therefore, not causing a landslide.
[11] Exhibit CA71 at 0221.
[12] On an assumption irrigation was evenly distributed over the landscaped footprint of the property. See CA71 at bates page numbers 0222 to 0223.
[13] CA71 at bates page number 0222.
[14] As to volume of water, see paragraphs 11 to 12 of these submissions. Exhibit CA69 at bates page number 0063; even if one were to use WSPs lower bound figures of porosity (para 103 of WSPs report – 20%) and moisture content change (para 170 of WSP report – 10%) for a landslide volume of 300 cubic metres: 10% x 20% x 300 cubic meters = 6 cubic meters. That is 6000L On SMEC's calculation of 2000L-2300L, only 2 days would be necessary. See also T1348.L23-L34; T1336.L29-35; T1336.L47 to T1337.L37; Exhibit CA69 at 0046 and 0063.

12. Further, when Mr Paul's estimate of 36,000L of water required to move the 300m³ of material that moved in the 14 January 2025 landslide, is considered, and extrapolated back to the 20m³ that moved in the 5 January 2025 landslide, the result is about 2,400L of water was required to move the 20m³ in the 5 January landslide. That is to say, even on an extrapolation of Mr Paul's figures, the amount of water required to trigger the 5 January 2025 landslide is very low and comparative to SMEC's estimate.
13. Mr Bolton gave evidence that "*there is this skin of fill material which has been holding back the aquifer water as a preparatory factor. The landslide has occurred, and that's caused that material to - the Band-Aid, so to speak, to be ripped off. And, as a result, the water [ground water and irrigation] that was building up behind that has now been able to release itself*".[15] This evidence explains the volume of water exiting from the escarpment after the landslide, and is consistent with the multiple water sources identified by Mr Jewell. This evidence also explains why this water peaked, and significantly subsided, on and from 10 January 2025.[16]
14. Accordingly, only a very small volume of water was necessary as a trigger for the landslide. Irrigation is the most proximate water source for this required volume. It is not sound reasoning to suggest there is an unidentified 465m pathway from the site of the Bayview Road burst to the landslide site, yet to say there cannot be a pathway from the site of localised irrigation (e.g. from as little as 1m away) to the landslide site. This is particularly so, when dye testing provides a pathway from NDT01 to the escarpment.

Submissions of Mornington Shire Council

15. In response to the submissions filed by Mornington Shire Council, dated 13 August 2025 (**Council Submissions**), SEW states as follows.
16. In broad terms, the Council contends that the evidence of their experts, and Mr Paul, should be preferred on the basis that (a) Mr Jewell conceded that water from the Bayview Road burst exited the scarp following the 5 January 2025 landslide; (b) Mr Hartley and Mr Bolton of SMEC made concessions; and (c) the opinions expressed by Mr Hartley and Mr Bolton were uncertain and speculative. This contention should be rejected.

(a) Mr Jewell's evidence

[15] T1336L29-L35 (5 August 2025).
[16] CA67 at page 0276.

17. The Council, in paragraphs 24 to 26 of its submissions, proceeds on the mistaken premise that "mains water" and water from the Bayview Road burst are synonymous. Contrary to the Council's Submissions, at no time did Mr Jewell state that mains water was water from the Bayview Road burst. Mr Jewell's evidence is that the water exiting the scarp after the 5 January 2025 landslide was a mixture of mains water and "other water". He states that there was "a significant amount of other water" to raise the salinity level at the scarp.[17] Mr Jewell's opinion is that there was a 1 to 4 mixing ratio, with four parts being ground water and one part being mains water.[18] He expresses a "high degree of confidence" in this view.[19] Further, Mr Jewell opines mains water that exited the Bayview Road burst could not have picked up the chemical composition of groundwater. In his report, Mr Jewell concludes that is "*unlikely that this flow originated form [sic] the Bayview Road mains leak*."[20] There is no inconsistency between that conclusion and his oral evidence.
18. The Council's assertion, in paragraph 24 of its submissions, that Mr Bolton must have also held the opinion that water from the Bayview Road burst exited the escarpment[21] is wrong and compounds one error upon another.[22] Mr Bolton was directly asked whether he agreed with Mr Jewell's conclusion[23] [namely the conclusion at T1333.L34 to T1334. L15 that there was a 1:4 mixing ratio of mains water to other water] and Mr Bolton stated that although it could not be ruled out, he maintained his opinion that the water exiting the escarpment did not have the chemical footprint of mains water.[24]
19. As to paragraphs 17 and 18 of the Council's Submissions, Mr Pope, Mr Hitchcock and Mr Paul state that colluvium is very permeable over a continuous subsurface pathway that leads from the Bayview Road burst to the landslide site. On that basis, Mr Paul concluded, at paragraph 169 of his report,[25] that water from the Bayview Road burst could have reached the landslide site within 60 days. However, SMECs in-situ testing does not indicate a continuous high permeable material.[26] SMEC's testing of the colluvium material shows it has been classified as a mixture of sand, clay or silt, and a small quantity of the presence of the clay and silt has a significant reduction in

[17] T1333. L34-39 (5 August 2025).
[18] T1333.L34-45 (5 August 2025).
[19] T1334.L13 to L26 (5 August 2025).
[20] Geochemistry report of CM Jewell & Associates, dated 8 August 2025 (**Jewell Report**).
[21] Paragraph 24 of the Council Submissions.
[22] The initial error being that mains water means the same as water from the Bayview Road burst.
[23] T1335.L12-L14 (5 August 2025).
[24] T1335.L12-L38 (5 August 2025).
[25] Exhibit CA67.
[26] Similarly, Mr Paul's evidence was to the effect that there was a mixture of soils transported through the landslide processes, typically classified as clayey or silty sand - paragraph 89 of Exhibit CA67.

permeability, when compared to sand alone. Further, Geo-physical testing undertaken by MNG Subspatial indicated the location of service trenches but did not indicate widespread gully features.[27] The estimate of 60 days also fails to take into account the time period over which the Bayview Road burst developed, including the fact that a fortnight before 5 January 2025, the volume of water that leaked from the Bayview Road burst was approximately *half* the final volume of water that leaked from the Bayview Road burst and was emanating at a lower flow rate.[28]

20. In paragraph 21 of the Council's submissions, three reasons are posited as to why Mr Bolton's theory about water testing should not be accepted. However, the second and third reasons posited are completely inconsistent. That is to say, if Dr Vu were correct in saying that more salts would be dissolved the longer mains water had to travel, the EC and chloride concentration of the landslide seepage would not be similar to the EC and chloride concentration taken from the water in the upwelling of the pothole at the junction of Waller Place and Charlesworth street. This is because that pothole is far closer to the Bayview Road burst site than the landslide is to the Bayview Road burst site.

21. Whilst the Council relies upon the evidence of Dr Vu, as noted in SEW's causation submissions dated 8 August 2025, Dr Vu's opinion rests upon an assumption that 70% of the water reached Testing Site A,[29] which is not supported by the evidence. Water from the Bayview Road burst that flowed into service trenches and to Testing Site A was significantly less than 70% of the total volume of water from the Bayview Road burst on the University of Auckland's uncontested evidence.

(b) Alleged concessions

22. The assertion that Mr Hartley and Mr Bolton made specified concessions cannot be sustained when their evidence is considered in full and in context.

23. Contrary to the Council's Submissions, Mr Hartley never accepted there are credible flow paths from the site of the Bayview Road burst to the landslide. Rather, when the credibility of such flow paths was put to Mr Hartley, he corrected the proposition to accept it is merely <u>possible</u> there are credible flow paths.[30] SEW reiterates its earlier submission that, despite extensive investigative field-work, neither Mr Paul, Mr Pope

[27] Multidisciplinary Expert Supplementary Report of SMEC, dated 30 July 2025 at bates page number 0353.
[28] See footnote 5.
[29] T1344.L34-39 (5 August 2025).
[30] T1272L32-L33 (5 August 2025).

nor SMEC has been able to identify the actual flow path of water from the Bayview Road burst.[31] To reason from assumed paths is to mistake hypothesis or assumption for proof.

24. The assertion, in paragraph 16 of the Council Submissions, that Mr Bolton conceded that a travel rate of 2m per day was within a range that extended out to 5m a day, is factually incorrect. Mr Bolton gave evidence that the 2m per day was within a range – but it was the faster end of the range.[32] That is to say, Mr Bolton used the worst-case scenario. If the slower end of the range had been used, the travel time would be in excess of 1000 days (to reach the landslide site from the site of the Bayview Road burst).[33] Mr Hitchcock's criticism, that Mr Bolton did not report a range, lacks substance in circumstances where Mr Bolton relied upon the faster end of the range, being the calculation that would, in effect, produce an outcome least favourable to SEW. In so far as the Council submits, in paragraph 18 of its submissions, that Mr Hitchcock's estimate of 157 days is in the same "ball park" or "in the range", that is incorrect. Mr Hitchcock's estimate falls outside the range of 230-1000 days calculated by SMEC. The submission, in paragraph 15 of the Council's Submissions, to the effect that "the experts agreed that water from the Bayview Leak was capable of reaching near the McCrae Landslide Site before 5 January 2025", does not grapple with the evidence that if the water had gone down service trenches it would have arrived "too early"; well before 5 January 2025,[34] the evidence by SMEC that if it went through natural soils it would take 230 to in excess of 1000 days, and they have not identified a pathway that would result in water from the Bayview Road burst arriving at the landslide site at the relevant time. In fact, they have not located a specific pathway that would result in water from the Bayview Road burst arriving at the landslide site at all. Further, the dye tests and geophysical tests point to the lack of a flow path from the sewerage trench, or storm water pit in Prospect Hill Road, to the escarpment.
25. In paragraph 25 of its submissions, the Council states that Mr Hartley accepted that SMEC's salinity theory was no longer "*a viable position to take*". However, Mr Hartley did not say it was unviable; his evidence was that "*we can still stand by [our salinity theory]*."[35]
26. The contention, in paragraph 26 of the Council Submissions, that Mr Jewell's analysis should be given little weight because it does not consider the ability of water to gain

[31] South East Water's *Submissions on the Cause(s) of the McCrae Landslide* dated 8 August 2025 at [9].
[32] T1287.L22 to T1288.L3 (5 August 2025).
[33] T1288.L3 (5 August 2025).
[34] T1288.L19-L44 (5 August 2025).
[35] T1350.L30-31 (5 August 2025).

salts along the flow path from aeolian sand, is incorrect. Mr Jewell confirmed that he had regard to the relevance of aeolian soils and the question of changes to chemical composition of water.[36]

(c) Alleged uncertainty and speculation

27. The Council Submissions state that SMEC's velocity theory was discredited. However, that submission is without substance.
28. Paragraphs 3 and 16 of the Council Submissions conflate "average linear velocity" with "permeability" (also known as hydraulic conductivity).[37] Both average linear velocity and permeability use the same units of meters per day. As Mr Bolton stated in his evidence, the average linear velocity of 2m/day was calculated using the upper range of permeability testing results (i.e. slug testing). The permeability test results were in the order of 5m/day. That is to say permeability (in this case 5m/day) is a value used to calculate average linear velocity (i.e. 2m/day). In so far as the Council states that Mr Bolton's range was up to 5m/day, this is incorrect. The Council's contention that SMECs data as to velocity should be discredited, is based upon a misunderstanding of the difference between "average linear velocity" and "permeability".
29. Paragraph 29 of the Council Submissions states that Mr Hartley and Mr Bolton conceded that SMEC's alternative irrigation theory was speculative, and states that a finding that irrigation triggered the landslide cannot be supported. However, the contention that irrigation was a trigger is feasible[38] and it is no more 'speculative' than the theory as to potential pathways that water from the Bayview Road burst allegedly took from Bayview Road to the escarpment. When questioned about the facts to back up the theory, Mr Hartley replied "[i]t's more about the facts that make it difficult to link the Bayview Road leak with the landslide". He continued at [T1349.L19] as follows:

> *"well, look, I don't – I'm not going to be cruel to my other colleagues. But, in effect, it is speculation that you've got a lump of water 400 meters away, but you don't have a direct line, but you have a geological theory – which is reasonable; I'm not going to go the other way, you have geological theory –*

[36] T1305.L20-L26 (5 August 2025).
[37] Permeability is the ability of water to flow through a medium such as soil. It is a property of soil related to the sand and clay content of soil. Linear velocity is the speed of water flowing through a medium such as soil, which is dependent on things like pressure head, hydraulic gradient and permeability.
[38] See SEW.0001.0002.4187 at page 64, and paragraph 10-14 above and the references referred to therein.

> *and you have a landslide that occurred five days and then another nine days after that. After the repair was done you need to assess how is it happening, and we've tried to do that…we are being scientific. We are robustly testing the theories."*

30. The Council has assumed a continuous subsurface pathway from the Bayview Road burst to the landslide site. This assumption has not been proven using any scientific method. SMEC's investigations has been more comprehensive than the other experts, by the use of geophysics and deeper / more extensive boreholes, and has also not proved such a pathway exists from Bayview Road to the landslide site. Moreover, as noted in SEWs earlier submissions, the dye testing results tells against there being a plausible pathway from 7 Prospect Hill Road, or even the sewer trench in View Point Road, to the escarpment. The Council relies upon 'assumption' as proof of a single factor causing the landslide. SEW maintains that irrigation is a plausible trigger factor.

Preparatory factors and omissions

31. The conclave and experts documented the preparatory and trigger factors in their Joint Conclave report. However, preparatory and causal factors cannot be viewed in isolation. Preparatory factors make a significant contribution to the cause of a landslide; without the preparatory factors, the landslide would not have occurred. As Mr Pope observed, for example, in the absence of the 2022 and 2024 retaining walls, it is possible that the 2025 landslides would not have occurred.[39]
32. In paragraph 37 of the Council Submissions, the severity of the impact of the removal of vegetation is underplayed, despite their expert, Mr Pope, suggesting it was a 'medium' preparatory impact. Removal of larger trees and vegetation reduces the soil suction impact, impacts the ground water level and the binding of the soil by its root mass.
33. As noted in paragraph 31 of the Council Submissions, all experts agreed that erosion was a preparatory factor for the 5 January 2025 landslide, with Mr Pope and Mr Hartley assessing it as significant. The significance of a slope, which has known historic, related landslides occurring nearby, should not be underestimated or discounted.

[39] Exhibit CA71 at 0221.

34. Paragraph 43 of the Council Submissions does not acknowledge or address the ground water aquifer, which was considered to be 'medium' or 'major' in row 19 of the Joint Conclave report.[40]
35. Mr Pope carried out tests, which suggested leaking from the View Point Road storm water drain occurs. Paragraph 44 of the Council Submissions states that there is no evidence of how much water from the Bayview Road burst entered the storm water network. However, Mr Tully's calculations of how much water entered the stormwater network was unchallenged, and there are numerous observations that water from the Bayview Road burst was being collected in the stormwater system.[41] On that basis, the experts considered it to be a medium to minor preparatory factor in the Joint Conclave report.[42]
36. With assessments of 'significant' for the impact of erosion for the 5 January 2025 landslide, 'medium' impact for vegetation, 'medium' impact of the ground water aquifer and 'minor to medium' impact of stormwater drainage, the site conditions are such that a landslide was very likely to occur, even with only a limited volume of groundwater or irrigation at the site. As assessed by PSM, the landform had a Factor of Safety that was very close to 1.0.[43] Several historic landslides have occurred within, and in close proximity to, the 5 January 2025 site. SMEC assessed that only approximately 2000L-2300L of extra water was needed to be introduced at the landslide site to reduce the Factor of Safety to less than 1.0. As such, the area was on a "knife's edge", and a landslide was likely to happen.[44]

Other

37. SEW seeks an opportunity to respond to any proposed findings by the Board as to causation.

18 August 2025

[40] Exhibit CA74 at 0004.
[41] For example, photographic evidence from 30 December 2024 (Exhibit 10 of CA41) shows water from the Bayview Road burst entered the stormwater system, which supports the fact the stormwater system was carrying water at the time of the failure. See also evidence of Brett Cooper in relation to the stormwater 'roaring' in the vicinity of Waller Place and outflowing at the beach, and at T343.L9-29.
[42] Exhibit CA74 at 0004-0005.
[43] A factor of safety less than 1.0 means the slope is unstable with the driving forces exceeding resisting forces, such that a landslide is likely. Exhibit CA71 at 0214-0215.
[44] T1294.L6-L37 (5 August 2025). See also Exhibit CA69 at 0012.