# Technical Memorandum

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| **To:** | Brittany Watson | **From:** | Pete Wilson |
| **Company:** | Otago Regional Council | | **SLR Consulting New Zealand Limited** |
| **cc:** | | **Date:** | 11 July 2025 |
| | | **Project No.** | 875.V13600.00002 |

**RE: RM24.098 – WM New Zealand, Fairfield Closed Landfill Surface Water Technical Peer Review**



## 1.0 Introduction

SLR Consulting NZ (SLR) has been engaged by Otago Regional Council (ORC) to conduct a technical review of the resource consent application (including subsequent attachments and request for information (RFI) responses submitted by WM New Zealand (WM, the applicant) for discharge and take activities associated with the Fairfield Closed Landfill aftercare.

SLR completed an initial review of the application in April 2024 and identified a number of items requiring further clarification (Section 92). A response to the request for further information was provided by the applicant in June 2025.

## 2.0 Scope of Review

The scope of this review includes **surface water** aspects of the application and responses to questions asked by ORC. The key documents included in this review are:

- PDP (2024) Fairfield Landfill – Technical Assessment of Effects on Groundwater, Surface Water and Ecology. Prepared for Waste Management NZ Limited. (**2024 Assessment**).
- Response to the section 92 Request for Further Information by Carmen Taylor (Planz Consultants) date 6 June 2025 (**s92 Response**).
- PDP (2025) Fairfield Landfill Ecological Assessment (**2025 Assessment**).
- Proposed Consent Conditions (Appendix 8) (Updated 13 June 2025).
- Fairfield Aftercare Management Plan (Draft).

# 3.0 Assessment

ORC asked the following questions, which I respond to below:

**Q18: Do you agree with the statement that long term water quality data of both the wetland swamp and its tributaries showed that while degraded, they are relatively stable?**

In general, yes, I agree.

The water quality results presented in Table H1 are indicative of degraded water quality. Time series analysis of these data, presented in the s92 Response, generally show statistically significant few long-term trends. Where trends are present, they typically show a decrease in contaminant concretion (i.e., improvement), with the exception of total ammoniacal nitrogen (ammonia) at FH39 (discharge from Christies and Coal Creeks).

FH39 shows a long-term increase of 3.1% per annum of ammonia, whereas the upstream site (FH38) shows a long-term decrease of 3.9%. Similarly, the 5-year median concentration at FH39 (1.3 mg/L) is higher than the upstream site (FH38; 0.8 mg/L). This suggests that the site is contributing to elevated levels of ammonia to the receiving environment. Further from the site at FH40, however, the 5-year median ammonia concentration is 0.3 mg/L. This may indicate that discharge from Christies and Coal Creeks are sufficiently mixed in the estuary to avoid higher elevated concentrations in the wider Kaikorai Estuary.

**Q19: Is the proposed stormwater management of the Eastern and Western landfill appropriate?**

In my opinion, no.

Stormwater from the Eastern landfill area is diverted into the North Pond and Weighbridge Pond. This allows for monitoring to be conducted to understand the quality of the water prior to it mixing with the (complex) receiving environment. The s92 Response states that "*a cutoff drain was installed on the slope of the landfill, it is likely that the cut-off drain is either partially disconnected or underperforming. As a result, stormwater runoff will flow, by overland flow, across the landform and enter either the adjacent drains or the wetland / estuary.*" This efficacy of this drain should be investigated to ensure the majority of stormwater from the site is diverted to ponds. If this can be resolved, I consider the controls for the Eastern landfill to be appropriate.

The Western landfill has no stormwater controls and the 2024 Assessment describes that "*Any stormwater from this area would soak into the landfill or be directed by land contouring towards the perimeter surface water bodies (Christies Creek) that discharge into Kaikorai Lagoon Swamp, or runoff would enter Kaikorai Lagoon Swamp directly*." I am not aware of any information on the quality of stormwater runoff from the Western landfill (prior to mixing with the complex receiving environment). As such, I do not consider direct discharge of stormwater from this area of the landfill to be appropriate. In my opinion, stormwater from the Western landfill should be diverted to a pond or ponds prior to discharging into the receiving environment in a similar manner to that occurring for the Eastern landfill.

| **Q20: Has the applicant provided sufficient information to understand the contribution of contaminants from the landfill to the receiving environment?** |
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| Partially.<br>I don't consider that the quality of surface water prior to it being discharged from the site is sufficiently well known to determine its contribution to the state of the receiving environment.<br>Water quality within the North and Weighbridge Ponds is measured quarterly, but for fewer parameters than in the receiving environment. Notably, heavy metals are not included. Zinc is known to be elevated in some sediments in the Kaikorai Estuary, likely due to the contribution from a number current and historical activities in the catchment (including landfills). As such, I don't think it's possible to understand the contribution stormwater from the Eastern landfill has on the receiving environment.<br>As discussed above, there are no stormwater controls for the Western landfill, and so the water quality discharged from the site is unknown.<br>Monitoring is conducted near the site, however, as this is a complex catchment with multiple stressors, this makes it difficult to identify how much the landfill discharges may affect water quality rather than broader catchment influences. |
| **Q21: Have the cumulative effects on water quality as a result of landfill operation and stormwater discharge been adequately addressed?** |
| In my opinion, no.<br>As discussed above, I don't consider that the quality of stormwater prior to leaving the site is known sufficiently to be able to determine its cumulative contribution to the receiving environments.<br>Continued/additional monitoring was offered in the s92 Response to address cumulative effects. Although this may be appropriate, it doesn't provide any further information on the current cumulative effects from the landfill.<br>I do, however, acknowledge that the Kaikorai Estuary is complex and is subject to a range of stressors from the catchment. |
| **Q22: Do you agree with the Applicant assessment and conclusions drawn from the most recent Surface water monitoring results? (2024 Annual Monitoring Results).** |
| With regard to monitoring of the 'silt pond discharge', the report concludes that "*no obvious signs of any leachate impacts in the stormwater collection pond (North Pond) are apparent for the 2024 monitoring period*". I agree with this conclusion based on the parameters monitored (TAN, BOD5, conductivity, total suspended solids, turbidity, conductivity and pH). I consider this to be a limited suite of parameters and consider the inclusion of additional nutrient and metal parameters to be included to better inform the quality of water being discharged from the site (discussed further in Q24). |
| **Q23: The PDP report states that there is uncertainty on the location of where groundwater emerges as surface water in the wetland-estuary complex. In your opinion is there any further investigation or testing which may be able to give insight into this?** |
| Once water emerges in the estuary, I anticipate it would be difficult to identify changes in the water column due to the large volume of water in the estuary and the other contaminant sources in the catchment (i.e., it's complex). Ongoing monitoring of the Kaikorai Estuary water quality may suffice for identifying if any changes were to occur as a result of discharges from the landfill. |

**Q24: The Applicant has not concluded what the effects will be on surface quality. In your opinion, is there any further investigations/ testing that could be completed to be able to conclude the actual and potential effects on surface water quality? Please be specific with your answer.**

I consider that the water quality of all stormwater from the site should be characterised prior to being discharged to the receiving environment. By this, I mean that all stormwater should be diverted to ponds, as it is for the Eastern landfill, and water sampled routinely (not that it should be retained on site until results are received from the lab). Using this approach, the quality of stormwater being discharged from the site will be understood over time and allow for more certain assessments of its effects on the receiving environment. I also consider that all water quality parameters measured in the receiving environments should be measured in the ponds so that appropriate comparisons can be made.

I consider the following water quality parameters to be the minimum to characterise the stormwater quality:

- pH
- dissolved oxygen
- ammoniacal nitrogen
- nitrate nitrogen
- dissolved reactive phosphorus
- copper
- lead
- zinc
- total suspended solids
- BOD5

Ideally, the same suite of parameters is measured in the ponds and receiving environment to enable comparisons to be made.

**Q25: Is the proposed monitoring programme appropriate for establishing baseline conditions for surface water quality? Please include reference to the appropriateness of the location, parameters and frequency. (Groundwater, Surface Water and Landfill Gas Monitoring Plan- Appendix 1)**

The monitoring requirements for surface water have been revised since the Groundwater, Surface Water and Landfill Gas Monitoring Plan- Appendix 1. Here, I comment on the most recent draft consent conditions.

The draft consent conditions require monthly monitoring at locations SW2b, SW3b, SW4, SW5 and SW7, shown in Figure 1 of the 2025 Assessment. Additionally, I recommend that samples are also collected monthly from stormwater ponds on site to understand the quality of the stormwater prior to being discharged into the receiving environment. With the addition of the stormwater ponds (North and Weigh Bridge), I consider the monitoring locations and frequency to be appropriate.

The suite of parameters to be measured is relatively comprehensive; however, I recommend including copper to the list in the consent conditions as there is no information on its concentrations from the landfill and pH as this has historically been measured. These parameters should also be measured in the stormwater ponds.

Each parameter should also include a relevant trigger value / threshold (e.g., ANZG (2018) to be assessed against, where appropriate. The ANZG (2018) guidelines are designed to be applied after reasonable mixing and so may not be applicable directly to the pond samples. They still, however, provide a helpful reference.

I agree with a 2-year review of the monitoring. If contaminant concentrations are shown to be low in stormwater on the site, it may be appropriate to remove them from future monitoring (i.e., start with a comprehensive suite and decrease to key indicators over time as certainty increases.

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| **Q26: Does the monitoring program or after-care plan have clear thresholds for when correction actions are required? If so, are these thresholds appropriate?** |
| There are no triggers proposed in the draft consent conditions that would prompt management actions based on surface water monitoring. |
| **Q27: Should adverse effects be observed through the monitoring programme, are the proposed correction actions appropriate to address adverse effects? (Aftercare Management Plan, Appendix 2).** |
| There are no actions based on surface water monitoring in the Aftercare Management Plan. |
| **Q28: In your opinion, is the residual uncertainty about the contribution of landfill contaminants to the surface water receiving environment able to be managed by consent conditions?** |
| In my opinion, the stormwater discharges from the landfill are unlikely to be solely or predominantly the reason for the degraded state of the Kaikorai Estuary. The proposed monitoring will increase certainty around the quality of stormwater being discharged from the site. |
| **Q29: Has the Applicant proposed appropriate adaptive management and remedial measures to enable adverse effects identified through monitoring to be addressed?** |
| No adaptive management has been proposed based on stormwater monitoring. As the landfill remains closed, surface water quality is not anticipated to change substantially so long as the site is maintained appropriately (e.g., drains are working effectively). So long as stormwater is discharged via holding ponds and not direct to the receiving environment, there would be an opportunity for mitigation if contaminant concentrations were higher than expected (long-term, not month-by-month). |
| **Q30: Is the technical information provided in support of the application robust, including being clear about uncertainties and any assumptions? Yes, or no. If not, what are the flaws?** |
| In general, the information presented provides a starting point for understanding the effects of stormwater discharges from the landfill on the receiving environment. I agree that the Kaikoria Estuary and streams/creeks that feed into the estuary are complex and subject to a number of stressors from the catchment. This is one of the main reasons I consider that water quality on the site needs to be well understood as it can be difficult to identify whether water quality issues in the receiving environment are due to the landfill or wider catchment effects.<br>The reports don't acknowledge the lack of parameters measured in the stormwater ponds and the limited understanding of surface water prior to being discharged. |
| **Q31: Has the Applicant proposed appropriate adaptive management and remedial measures to enable adverse effects identified through monitoring to be addressed?** |
| No. |
| **Q32: Are there any other matters that appear relevant to you that have not been included? Please specify what additional info you require and why. Please explain.** |
| Although the Kaikorai Estuary is not well known as a recreation location, the effects of discharges from the landfill do not appear to have considered the effects on human health/contact recreation. Measurement of E. coli and or enterococci for a period of time may assist in determining whether human contact recreation is affected by discharges from the landfill. |
| **Q33: Are the proposed consent conditions appropriate (updated Appendix 8)? If not, please state why.** |
| With regard to surface water quality monitoring, I consider them to be appropriate with the addition of my recommended changes in Q25 above. |

| **Q34: If granted, are there any specific conditions that you recommend should be included in the consent beyond what the applicant has proposed?** |
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| It may be beneficial to condition the improvement of the drain to ensure stormwater is diverted to the Weigh Bridge Pond to minimise direct discharges to the receiving environment.<br>If it is considered appropriate to divert stormwater from the Western landfill to a pond, this should also be included as a condition. |

Regards,

**SLR Consulting New Zealand Limited**

**Pete Wilson, PhD, CEnvP**
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