Otago Regional Council

ORC NOTIFICATION RECOMMENDATION REPORT

Application No:	RM24.098
Prepared for:	Staff Consents Panel
Prepared by:	Brittany Watson, Consents Planner
Date:	3 November 2025

Subject: **Application RM24.098 by Waste Management Limited to replace various consents for the purpose of aftercare of a closed landfill, Fairfield.**

1. Purpose

To report and make recommendations under sections 95A-G of the Resource Management Act 1991 (the Act) on the notification decision for the above application.

2. Background Information

Applicant:	Waste Management NZ Limited
Applicant's Agent:	Carmen Taylor from Planz Consultants Limited
Site address or location:	125/127 Old Brighton Road, Fairfield, Dunedin
Legal description(s) of the site:	Lot 2 Deposited Plan 566541, Part Lot B Deposited Plan 685 and Part Section 41 Block VII Dunedin & East Taieri Survey District and Deposited Plan 7227
Record of title number and owner:	OT352/110, OT8D/1045 and 1021375 Owned by Tartan Industries Limited
Map reference (NZTM2000) of approximate mid-point:	Eastern landfill: E1398718 N4913050 Western Landfill: E139833 N4912851

Consent(s) sought:

- Discharge Permit RM24.098.01: To discharge landfill gas, odour, and products of combustion to air
- Discharge Permit RM24.098.02: To discharge leachate onto land in a manner that may result in contaminants entering groundwater
- Discharge Permit RM24.098.03: To discharge water from two retention ponds to the Kaikorai Stream
- Water Permit RM24.098.04: Water Permit to take and use groundwater and connected surface water from the Kaikorai Stream through a leachate collection trench
- Land Use Consent RM24.098.05: To alter an existing defence against water
- Water Permit 24.098.06: To permanently divert surface water flows via a defence against water
- Land Use Consent 24.098.07: To drill over a contaminated site

Purpose:	After care of a closed landfill.
Current consents:	• Discharge Permit 92540: The discharge of landfill gas and odour to air • Discharge Permit 93540: The discharge of landfill leachate to groundwater • Water Permit 93541: To take leachate containing groundwater • Discharge Permit 93542: To discharge treated stormwater to Kaikorai Stream and Kaikorai Lagoon Swamp.
Section 124 timeframes:	Application was lodged at least six months before the expiry date and therefore s124 rights apply.

2.1 Key issues/risks

The key issues/risks with the application are:

- Kaikorai Lagoon Swamp, Kaikorai Lagoon Estuary and Kaikorai Stream adjacent to the landfill.
- Uncertainty about the magnitude of adverse water quality effects.

2.2 Summary

I recommend the application is processed on a publicly notified basis. This is because:

- The Applicant has requested the application to be publicly notified, therefore public notification is mandatory as per section 95A (3)(a) of the RMA;
- The Applicant has refused to provide further information, therefore public notification is mandatory in accordance with 95C2(b) of the RMA; and
- There is uncertainty about the extent to which leachate may impact the groundwater and surface water receiving environments; therefore, it cannot conclusively be said that effects are minor or less.

3. Description of Activity

Carmen Taylor of Planz Consultants Limited (Planz) has provided a description of the proposal on pages 7-18 of the Application titled: *Waste Management NZ Limited Fairfield-Closed Landfill – Renewal of Regional Resource Consents*, dated February 2024. This description is adopted for this report. The key points of the proposal are explained below.

- The Fairfield Landfill comprises two closed landfill operations. These are the "Western Landfill' located on the west site of the site, and the 'Eastern Landfill' located on the east side. These two separate landfills can be seen in Figure 1.
- Waste Management NZ Limited (the 'Applicant'), currently hold a number of consents related to the on-going closure activities occurring on site. These include the below resource consents:
  - Discharge Permit 92540: The discharge of landfill gas and odour to air
  - Discharge Permit 93540: The discharge of landfill leachate to groundwater

- Water Permit 93541: To take leachate containing groundwater
- Discharge Permit 93542: To discharge treated stormwater to Kaikorai Stream and Kaikorai Lagoon Swamp.

These consents expired on 1 September 2024; however, the Applicant lodged an application to replace these contents 6 months prior to this expiry date and therefore s124 continuation rights apply.

- The Applicant has applied to replace the above resource consents to facilitate the on-going management of the closed landfill.

The site history, ongoing maintenance activities and consents sought for this application are discussed further below.

3.1 Site History and Ownership

The Applicant has provided a summary of past landfill activities and ownership of the site. The main points are summarised below:

- Landfill operations at the site commenced in 1967 on Western Landfill by Walton Park Sand Company, a subsidiary of Fulton Hogan.
- In 1985 operations were taken over by the Maxwell Brothers (subsidiary of Fulton Hogan).
- In 1996 ownership transferred to Tartan Industries Limited (subsidiary of Fulton Hogan), and operations were taken over by Envirowaste Services Limited. The Western Landfill also closed in 1996, and within the same year the Eastern Landfill commenced operations.
- In 2006 ownership of Tartan Industries Limited transferred to Envirowaste Services Limited.
- In 2008 ownership of Envirowaste Services Limited transferred to Transpacific Industries Group (NZ) Limited (now known as Waste Management NZ Limited).
- In July 2017 the Eastern Landfill stopped accepting material for disposal at the Eastern Landfill and landfill closure activities commenced. This included capping, gas flare installation completion and revegetating the landfill etc. These activities were completed in August 2022.

Figure 1: Extent of the Eastern and Western Landfill (source: resource application RM24.098).

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3.2 Landfill Information

The landfill filling, cap, and management of the site has been described by the Applicant. This information has been summarised below.

Fill and capping

- The Western Landfill area appears to have been progressively filled through an active landfill tipping face, to a depth of approximately 4 metres **(m)**, with fill material placed directly over the original estuary land surface. This estimation has been based on the existing ground surface levels of around 5 m reduced level **(RL)** across the landfill areas, compared with the estuary water level of approximately 1 m RL, which is considered to represent the likely original ground surface.

- Capping material has been placed above the waste on the Western Landfill and is currently surfaced with grass, however, the nature and thickness of the cover was not officially recorded at the time of the landfill closure.

- A potholing exercise has been undertaken by the Applicant over the Western Landfill to investigate the cap. This exercise identified a capping depth ranging between 0.5m to 0.7m, and a topsoil depth ranging from 0.1. to 0.2m. During this exercise, the Applicant also observed that the entire Western Landfill has good grass cover.

- The Eastern Landfill area was formed using a different process and was progressively filled in layers to form a landfill mound/dome above the original estuary surface with the maximum height of this landfill area reaching 31.5 m RL (approximately 30.5 m above the original ground surface). The cap of the landfill is comprised of at least 0.8 metres of compacted clay and at least 0.2 metres of topsoil with grass cover.

Leachate interception drain

- A leachate interception drain was constructed in 1996 to control landfill leachate and maintain groundwater within the landfill area at a lower level than the surrounding land. The purpose of this leachate drainage system is to create a hydraulic depression to prevent the outward flow of groundwater from the landfill towards the adjacent waterbodies. The location of the leachate interception drain is presented in Figure 2.

- Groundwater, that is taken via the leachate interception system, is hydraulically connected to surface water given the distance from the Kaikorai Stream and wetland- estuary complex.

- Groundwater containing leachate is taken from the landfill by a gravity fed 1 kilometre **(km)** long leachate interception drain located at ‘toe’ of the landfill. The drain runs along the eastern and southern sides of the Eastern and Western Landfills.

- The interception drainage system comprises a trench system installed downgradient of the landfill which is backfilled with a permeable material and lateral drainage pipes. The drainage pipes consist of perforated Megaflo pipe wrapped in filter cloth. The lateral pipes extend from each side of a series of manhole sumps.

- Groundwater containing landfill leachate enters the lateral pipes and flows via gravity towards each respective sump before being directed via a separate gravity pipeline towards a large sump at the pumping station.

- The groundwater/leachate collected in the system is pumped to the Dunedin City Council **(DCC)** Green Island wastewater treatment plant in accordance with a trade waste consent. This plant is located on the opposite site of the Kaikorai Lagoon Swamp and Kaikorai Lagoon Estuary.

- Resource consent is required for the take and use of groundwater and hydraulically connected surface water.

Management of the leachate interception system

- A pump, controlled by level switches, automatically maintains a low water level in the pumping station sump. This ensures that the pipe network continues to flow by gravity and that the hydraulic depression is maintained.

- The pumping system has an alarm system in place which should trigger an alert during times of pump failure. In addition, the leachate pump system is set to automatically shut down ('high-high' alarm) when flooding/inundation of the pump station sump occurs, to avoid the pumping of estuary water.

- The Applicant notes that regular inspections and monthly maintenance of the pump is carried out to minimise the likelihood of the pump switching off.

- If the mouth of the Estuary is not regularly opened (naturally or mechanically by ORC, the backwater effect causes water levels in the estuary to rise. This has occasionally resulted in water levels to overtop the perimeter access track around the base of the landfill, which allows water to enter the permeable material in the top of the interception drainage system. During extreme events this can overtop the leachate pump chamber and flood the interception drainage system activating the 'high -high' alarm shutting the leachate pump down. If the ocean mouth is not opened, this can result in high water levels for long periods of time, whereas extreme rainfall events can result in intermittent flooding, but for a short time period only.

- The Applicant is required under their existing resource consents to provide an Annual Monitoring Report to Council which includes monitoring data and interpretations of the data. The most recent Annual Monitoring Report (2024) notes that there were two occasions in January and October 2024 that the pump was found to be not operating when the site inspection took place. Additionally, records show that the pump was not operating for the entire month of February. The Monitoring Report additionally notes that the pumping system does have a number of alarm systems in place to notify them of when a fault occurs, however, recently they have not been effective.

- The Applicant has proposed a number of changes to the existing system to prevent future pump failures and improve the monitoring of the system. These include:

  - Installation of a new monitoring system to improve the reliability of the system i.e SCADA system or a similar technology;
  - Addition of telemetry to enable continuous monitoring and data collection; and
  - Remedial works on the lateral flow pipes on a as required basis to prevent blockages.

  These proposed measures have not been volunteered as consent conditions at this time.

Gas flares

- Landfill gas **(LFG)** from the Eastern Landfill is captured using three landfill gas wells and a conveyance pipeline system.

- The pipeline system operates in a ring main. Three candlestick-style flares control the discharge of the captured the landfill gas.

- The gas collection flares will continue to be operated throughout the aftercare period, for as long as it can sustain the operation of a single flare. The Applicant intends to move to a passive management regime when landfill gas generation at the site reduces to levels where there are no effective flaring options.

- The draft After Care Management Plan recommends that a smaller LFG flare can be installed if considered necessary, which would enable flaring down to 2 Cubic Feet per Minute **(CFM)**. This lower flow rate will then be the basis for the threshold below which flaring of gas would cease and passive venting of LFG would occur.

- There is no gas extraction in the Western Landfill area based on its age and insufficient landfill gas generation to enable flaring. Any landfill gas generated from the Western Landfill is discharged passively to air.

- Resource consent is required for discharge of odour and products of combustion from the LFG flares and for the passive discharge of landfill gas from both landfills that isn't flared.

Stormwater

- Stormwater from the northern and eastern sides of the Eastern Landfill area is directed to a stormwater retention pond on the northern side of the landfill referred to as the 'North Pond'. Overflow from the pond is discharged to a small drain that discharges to Kaikorai Stream. The location of this pond can be seen in Figure 2.

- Stormwater from the southern side of the Eastern Landfill is directed to a separate retention pond on the south-western corner of the landfill referred to as the 'Weighbridge Pond'. This pond has an overflow structure that discharges into Kaikorai Lagoon Swamp. The location of this pond can be seen in Figure 2.

- There is no stormwater control on the Western Landfill area. 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.

- Resource consent is required for the discharge of water and contaminants from the North and Weighbridge ponds into the Kaikorai Lagoon Swamp.

  Note: The definition of "stormwater" under the Regional Plan: Water for Otago refers to "*the running off from any impervious surface such as roads, carparks, roofs, and sealed runways".* The landfill is not an impervious surface as it is a grassed site and not considered to be impervious, and therefore surface run off from rain events does not meet this definition of stormwater. However, for the purposes of this report and

for consistency with the application documents, surface run off is referred to as stormwater.

3.3 After care activities and adaptive management

After Care Management Plan

A draft Aftercare Management Plan **(ACMP)** dated 27 February 2024 was prepared by the Applicant which covers the management of the landfill during the post-closure care, or 'aftercare', period of the Fairfield Landfill over at least a 30-year period. Below is a summary of the aftercare activities, as outlined in the ACMP, which will be incorporated into the new replacement consents.

- **Leachate Management:** The landfill will continue to produce leachate which will require ongoing pumping to the existing point of disposal to the DCC sewer. The annual quantity and strength of leachate is expected to reduce during the aftercare period as the waste material in the landfills continue to decompose. Should this reduce to the point the leachate becomes innocuous, the current pumping regime will be reviewed with the intention to switch to a passive leachate management system, where the leachate is no longer intercepted and removed from the site. Timing for the transfer to a passive treatment system will occur based on an assessment of monitoring data. Key criteria for transferring to a passive system will revolve around the volume of leachate being generated (i.e., minimal to none) and any off-site effects that may result if leachate interception is ceased.

- **Stormwater:** The site's existing stormwater drainage system (as described above) will be retained during the aftercare period and will be regularly inspected and maintained.

- **Gas flares:** The gas collection flares will continue to be operated throughout the aftercare period, for as long as it can sustain the operation of a single flare. The Applicant may install a smaller LFG flare due to the continued reduction in landfill gas. Passive landfill gas management using a vent system instead may also be an option in the future if there is no longer any viable options to flare the LFG.

The ACMP also includes a set of monitoring requirements. This briefly includes:

- **Surface water Monitoring:** The quarterly (January, April, July and October) monitoring, at sampling locations SW1 to SW7, or relocated sampling locations confirmed by suitably qualified persons, are analysed for:

  - Salinity
  - Dissolved Oxygen
  - Biochemical Oxygen Demand
  - Total Ammoniacal Nitrogen
  - Temperature
  - Conductivity
  - pH
  - Calcium
  - Magnesium
  - Sodium
  - Potassium
  - Chloride
  - Alkalinity

- Sulphate
- Nitrate
- Phosphorus
- Dissolved Reactive Phosphorus
- Iron
- Zinc
- Lead

During each monitoring round, the following observations shall also be undertaken:

- Estimate of flow in the Kaikorai Stream
- Water level
- Tidal stage
- Previous 7 days rainfall
- Whether the estuary mouth is open or not

- **Ground water Monitoring:** The discrete water/level quarterly (January, April, July and October) monitoring at LGS1, LS2, LS6, LS9, LS14, LD5, LGS7, LS10, LS13, LS15, LS19, LS21A, LS22, LD8, LD11, LD17 and LD20. Six monthly, in January and July from groundwater collected from sampling locations LGS1, LGS7, LS10, LS13, LS15, LS19, LS22, LD8, LD11, LD17 and LD20 are to be analysed for:

  - pH
  - Conductivity
  - Temperature
  - Total Ammoniacal Nitrogen
  - Phosphorus
  - Dissolved Reactive Phosphorus
  - Chloride

  Annually, in July, deep groundwater collected from sampling locations LD5, LD8, LD11, LD17 and LD20 are to be analysed for:

  - Chemical Oxygen Demand
  - Biochemical Oxygen Demand
  - Total Ammoniacal Nitrogen
  - Temperature
  - Conductivity
  - pH
  - Calcium
  - Magnesium
  - Sodium
  - Potassium
  - Chloride
  - Alkalinity
  - Sulphate
  - Nitrate
  - Phosphorus
  - Dissolved Reactive Phosphorus
  - Iron
  - Zinc
  - Lead

- **Leachate quantity:** A system to monitor and record the instantaneous abstraction rate of take, and water/leachate levels at EPS42, at 15-minute intervals are in place. Three monthly level monitoring, in Jan, Apr, Jul and Oct, is to be carried out at LS23, LS24, LS25, LS26, LGS27, LS28, LGS29, LS30, LS31, LS32, LS33 and EPS42.

- **Leachate quality:** Six monthly, in January and July, leachate collected from sampling locations LS24, LS26, LS28, LS30 and LS32 are to be analysed for:

  - pH
  - Conductivity
  - Temperature
  - Total Ammoniacal Nitrogen
  - Phosphorus
  - Dissolved Reactive Phosphorus
  - Chloride

  Annually, in July, leachate collected from sampling location EPS42 are to be analysed for:

  - Chemical Oxygen Demand
  - Biochemical Oxygen Demand
  - Total Ammoniacal Nitrogen
  - Temperature
  - Conductivity
  - pH
  - Calcium
  - Magnesium
  - Sodium
  - Potassium
  - Chloride
  - Alkalinity
  - Sulphate
  - Nitrate
  - Phosphorus
  - Dissolved Reactive Phosphorus
  - United States Environmental Protection Agency (USEPA) priority pollutants
  - Whole effluent toxicity screening test

- **Gas quantity:** Monthly (at a minimum) measuring and recording of the flow rate of the landfill gas being flared.

- **Gas quality/composition:** Monthly, while gas is being flared, monitoring from landfill gas flare/s and passive vent/s are to be analysed for:

  - Methane
  - Carbon dioxide
  - Oxygen
  - Carbon monoxide
  - Hydrogen sulphide

  Quarterly (January, April, July and October) monitoring, at sampling locations SW1 to SW7, from sampling locations LGS1, LD5, LGS7, LS21A, LGS27, LGS29, LS31, LS32, G34, G37, G38, MW1, MW2 and MW3, are to be analysed for:

- Methane
- Carbon dioxide
- Oxygen
- Carbon Monoxide
- Hydrogen Sulphide

Throughout the application process the Applicant amended their application to add an additional monitoring location and the northern site boundary of the Eastern Landfill. At the time of writing this report the additional well has not been drilled nor labelled. Updated volunteered conditions have added three additional monitoring locations (G35, G36 and the new well that is yet to be drilled).

- **Ecological Monitoring:** An ecological monitoring programme is to be carried out by an independent suitably qualified and experienced person. Monitoring will include the collection and analysis of sediment, benthic infauna and macroinvertebrate samples annually between the months of October to March, for the first three years of the commencement of consent and once every five years thereafter.

- **Other monitoring requirements:** in addition to the above, frequent inspections are also proposed for the structural integrity of the landfill, the slope stability, the leachate system, land fill gas flared and stormwater system.

A summary of the monitoring results and inspections will be provided to Council each year in the form of an annual Monitoring Report.

Note: The draft ACMP set out above has yet to be updated to reflect the amendments proposed in the updated volunteered conditions of consent (Appendix 8, updated 13 June 2025). Amendments included different monitoring groundwater and surface water locations (depending on whether or not the estuary mouth is open or closed), initial monthly monitoring, and the addition of nitrate-nitrogen and total nitrogen to the suite of parameters to be monitored.

Figure 2: Location of the leachate interception drain annotated as a dashed red line (source: resource application RM24.098)

Figure 3: sampling locations (source: Fairfield After Management Plan (DRAFT) dated 27 February 2024)

Figure 4: sampling locations (source: Fairfield After Management Plan (DRAFT) dated 27 February 2024)

Adaptive Management

The Draft ACMP requires the Applicant to undertake corrective actions to investigate and remedy or mitigate any adverse changes to groundwater or surface water. Since the drafting of the ACMP, the Applicant has proposed a set of 'trigger levels' which will trigger a set of 'response actions' to address any monitored adverse changes. These trigger levels and response actions are set out below.

Groundwater: Given the complexity of the environment, the already degraded state of groundwater quality, and the presence of multiple contaminant sources across the broader

catchment, trigger levels have been established for both short-term spikes and long-term trends. According to the Applicant, this dual approach will allow for the identification of both immediate changes and gradual shifts in water quality, ensuring timely and appropriate management responses. Shallow groundwater, deep groundwater, and surface water monitoring sites were grouped based on their existing level of leachate impact, as indicated by Total Ammoniacal Nitrogen. The trigger levels for each grouping are listed in Table 1.

This will include:

- **Short-term leachate contaminant spikes**: Total ammoniacal nitrogen **(TAN)** concentrations will be monitored, and if levels exceed the modelled 95% tolerance intervals, a management response will be triggered.
- **Medium-term leachate contaminant trends:** NIWA TimeTends software will be used to determine temporal change in TAN concentrations in groundwater over two time-periods (five-and ten-years to present). Statistically significant degrading trends in TAN concentrations over either of these periods will trigger the response action below.

Table 1: Groundwater TAN trigger levels by grouped sampling location (source: Letter titled: Waste Management NN Limited – Fairfield Closed Landfill Application (RM24.098) Response to Technical Reviews and dated 1 October 2025).

Group	Trigger (mg/L)
Group A: LD11, LD17	35.9
Group B: LD20, LGS7	1.6
Group C: LD8, LS10, LS15, LS19, LS22	5.4

Surface water: Due to natural variability in estuarine environments and multiple contamination sources, trigger levels for surface water will focus only on short-term spikes in TAN concentrations. Longer-term trends are not considered a reliable basis for triggering responses, given the natural variability of the system. 95% tolerance intervals for TAN were modelled with 95% confidence at two key monitoring sites downgradient of the Fairfield Closed Landfill. Exceeding these upper limits will trigger the response action below. The trigger levels for each sampling location are listed in Table 2.

Table 2: Groundwater TAN trigger levels by grouped sampling location (source: Letter titled: Waste Management NN Limited – Fairfield Closed Landfill Application (RM24.098) Response to Technical Reviews and dated 1 October 2025).

Sampling Locations	Trigger (mg/L)
FH39 (SW3B)	3.6
FH40 (SW5)	2.2
Notes: Proposed sampling locations in brackets)	

Trigger Response Actions:

If routine monitoring results show frequent, unexplained exceedances of the established trigger levels, and these exceedances are determined to be unlikely linked to landfill leachate.

If any trigger level is exceeded, the following steps will be undertaken:

1. **Initial Assessment:** An investigation will be carried out to determine whether the exceedance falls within the range of historical values (2015–2025 for groundwater sites and 2014–2024 for the wetland / estuary sites). If it does, no further action is required. If it exceeds historical levels, steps 2 and 3 below will be initiated.

2. **Follow-up Sampling:** An additional sample will be collected within 15 working days of receiving the laboratory report from the location where the exceedance occurred. Additional samples may also be taken from other relevant sites if deemed necessary. All samples will be analysed for the same suite of parameters to confirm the exceedance.

3. **Investigation and Reporting:** If follow-up testing confirms the exceedance, an investigation will be carried out to identify the potential causes. Based on the findings, further actions may be taken or proposed to better understand the reason for the exceedance. If landfill leachate is determined to be the likely cause, the report must outline any additional monitoring or remedial measures to be implemented, along with timeframes for their completion, to mitigate any identified adverse environmental effects. A report detailing the investigation and its outcomes must then be provided to the Council within 30 working days of receiving the investigation results, where the exceedance has been attributed to landfill leachate.

The Applicant notes that revising the trigger levels may be considered as part of the two-yearly review process. The potential for establishing trigger levels at additional surface water monitoring locations will also be assessed.

3.4 Application documents

The Applicant has provided the following documentation with the application:

- Application titled: *Waste Management NZ Limited Fairfield-Closed Landfill – Renewal of Regional Resource Consents*, prepared by Planz Consultants Limited and dated February 2024, including:
  - Appendix 1: Existing Resource Consents;
  - Appendix 2: Fairfield Aftercare Management Plan (draft) dated 27 February 2024
  - Appendix 3: Letter from Aukaha dated 20 February 2024;
  - Appendix 4: Air Quality Assessment, prepared by Tokin & Taylor and dated February 2024;
  - Appendix 5: Technical Assessment of Effects on Groundwater, Surface Water and Ecology, prepared by PDP and dated February 2024;
  - Appendix 6: Natural Hazard and Climate Risk Assessment and Management Plan, prepared by PDP and dated February 2024;
  - Appendix 7: Record of Consultation;
  - Appendix 8: Proposed Consent condition; and
  - Appendix 9: Record of Title.

- Cultural Impact Assessment Fairfield Landfill Aftercare, prepared by Aukaha and dated 4 November 2024;

- Memorandum titled: *Cultural Impact Assessment Recommendations – Proposed Approach / Response (FINAL – 31 January 2025)*, dated 31 January 2025;

- Letter from Applicant titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to the section 91 Deferral Pending Application for Additional Resource Consents*, prepared by Planz Consultants Limited and dated 10 March 2025, including:
  - Attachment A: Updated Resource Consent Application Form.

- Fairfield Landfill Ecological Assessment prepared by PDP and dated March 2025;

- Letter from Applicant titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to the section 92 Request for Further Information,* prepared by Planz Limited and dated 6 June 2025, including:
  - Attachment A-Updated (v2) Resource Consent Application Form;
  - Attachment B – Landfill Monitoring Results (post February 2024).

- Updated proposed Consent Conditions (Appendix 8), dated 13 June 2025;

- Letter from Applicant titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to Technical Reviews*, prepared by PDP and dated 1 October 2025, including:
  - Appendix 1: Aftercare Management Plan - Proposed Adaptive Monitoring and Response Action Procedure;

4. Description of the Environment

The site and the surrounding environment are adequately described within the application and this description is not duplicated here. The description in the application is adopted for this report. The key features of the site and surrounding environment are outlined below.

4.1 Site visit

A site visit was undertaken of the site on the 2 May 2024 to confirm the description of the site. In attendance was Greg Nel (Waste Management), Carmen Taylor (Planz), Brittany Watson (Consents Planner, Otago Regional Council **(ORC)**) and John Iseli (Specialist Environmental Services Limited).

During the site visit a walk over of the site and site perimeter was completed. Specific note was made of the LPG gas flares, groundwater monitoring wells, and stormwater ponds.

4.2 General

A description of the site and surrounding environment is provided in the application and is adopted for the purposes of this report. Key details are as follows:

- The site is located approximately 1.2 kilometres **(km)** northeast of the intersection of Old Brighton Road and Jeffcoats Road, Fairfield.

- North of the Western landfill is Walton Park, which is an area of residential development that lies on the southern side of State Highway 1 **(SH1)**.

- Immediately to the north of the Eastern Landfill, on the southern side of SH1 is an area of land, that is currently vacant, which is zoned General Residential 1 under the Second-Generation District Plan **(2GP)**. The Applicant understands that the owner of this vacant section intends to subdivide the land for residential development.

- The Kaikorai Stream is located to the east of the landfill with the southern extent of the site adjoining a Regionally Significant Wetland **(RSW)** known as the Kaikorai Lagoon Swamp.

- Christies Creek and Coal Creek both pass through the site before entering the Kaikorai Lagoon Swamp and then the Kaikorai Lagoon Estuary.

- The Kaikorai Lagoon Swamp adjoins and flows into the Kaikorai Lagoon Estuary.

- There are no known downstream abstractive uses of water within the Kaikorai Stream, Lagoon, or Estuary.

- The site is located over an unnamed aquifer.

- The Green Island Landfill is located on the eastern side of the Kaikorai Stream and to the southeast of the site. This is approximately 150 m away at the nearest point.

- The ORC Natural Hazard Maps indicate that the Eastern and Western Landfill area, the wetland and estuary, and parts of the Kaikorai Stream, Christies Creek and Coal Creek are subject to inundation risk associated with flooding from the Kaikorai Stream and from storm surges. The DCC 2GP identified the low-lying areas around the stream and estuary as being within a Hazard 2 Flood overlay at moderate risk of flooding.

- Nearby Resource Consents include:

    - RM23.185.01-RM23.185.08 which authorise a range of activities relating to the operation, management and closure of the Green Island Landfill. These are located on the opposite site of the Kaikorai Stream and slightly downstream from the landfill.
    - Discharge Permit 2000.369 which authorises the discharge of contaminants to water associated with the construction of a bridge and associated protection and channel works and ongoing waterway maintenance and ancillary activities at Abbotts Creek, Kaikorai Stream and Kaikorai Lagoon for the purpose of motorway construction. This is located approximately 600 m northeast of the northern boundary of the Eastern Landfill and is upstream of the landfill.
    - Discharge Permit RM25.322.01 which authorises the discharges of dust to air for the purpose of sand extraction, stockpiling and crushing of materials. This activity is located approximately 800 m from the northwest of the northern boundary of the Eastern Landfill.

Further information on the site and surrounding environment is set out below.

4.3 Geology and groundwater

Geology

The Applicant has provided a description of the geology of the site. This was based on existing geological mapping, geological boreholes and test pit investigation completed on the site. This is summarised below:

- The majority of the wetland and downstream estuary area is mapped as Holocene aged river deposits consisting of well sorted sandstone, schist and volcanic derived gravel and sand with minor mud and peat.

- The estuary is mainly surrounded by marine deposits of the Onekakara Group. These marine deposits are common in the coastal areas of Otago and were deposited in a range of shallow marine environments ranging from shore-face to outer shelf and offshore bars.

- The main rock in this group is sandstone, with some conglomerates, siltstone, mudstone limestone and shell beds. This unit is mapped both immediately north of the site, as well as flanking the estuary downstream of the site.

- Well logs drilled within the estuary suggest that the mapped Onekakara Group deposits are more likely to consist of the Abbotsford mudstone, which is an innermost shelf marine deposit.

- The strata interpreted as Abbotsford Mudstone that flanks the wetland appears to converge around 1.2 km downstream of the site and it is expected that this constriction would cause groundwater within the shallow estuarine sediments to upwell at this location, if this does not already occur at a more upstream location.

- Late Pleistocene shoreline deposits are present to the south-west of the Western Landfill area. This deposit is primarily mapped as sand and is therefore likely to be a reasonably permeable unit.

- Further west of the site within the Christies Creek catchment, the geology is mapped as the Taratu Formation which is a sub-group and non-marine deposit of the Onekakara Group. This unit consists of quartz sand and conglomerate, lignite seams and carbonaceous mudstone.

- Geological logs from borehole and test pit investigations have been undertaken at the site since the 1990s. While many of the current landfill monitoring wells do not have available logs, the lithology beneath the wetland has been inferred based on the results of hydraulic conductivity testing undertaken in two deep and two shallow monitoring wells installed on the wetland side of the landfill.

- The inferred geology indicates that the sediments beneath the wetland are variable and are likely to consist of interbedded layers of low permeability marine silts and higher permeability sands of varying grainsizes.

Groundwater

The Applicant has provided a description on groundwater flow direction and behaviours both within the landfill and outside the landfill. This interpretation was based on data from monitoring wells and is summarised below:

- Most wells within the landfill show consistent long-term water levels, indicating a natural equilibrium influenced by rainfall and seepage.
- Groundwater levels at the Western Landfill are consistently approximately 1.5 m above nearby surface water, suggesting a natural gradient toward surface water.
- The Eastern Landfill historically showed higher groundwater levels (suggesting mounding from rainfall at the time).
- Overall, water levels and leachate behaviour under the landfill are complex, with areas of limited mobility and potential preferential pathways for leachate migration.
- Groundwater levels are generally higher within the landfill and are lower outside the landfill. This supports the interpretation that groundwater direction is flowing outward from the landfill, particularly towards the south and east direction.
- Groundwater flow is expected to be influenced by the mounding effect, surface water levels and the leachate interception and pumping system which creates a localised drawdown.

4.4 Surface Water

Kaikorai Stream

- The Kaikorai Stream flows from the Chain Hills upstream of the landfill to the northeast, flowing through Green Island, and discharges into the Kaikorai Estuary in the general vicinity of the landfill, downstream of the confluence of Kaikorai Stream and Abbotts Creek.
- The Kaikorai Catchment has been heavily altered by residential, industrial, and agricultural development. This has impacted water quality and sediment quality in the catchment.
- The total contributing catchment to the Kaikorai Estuary above the Brighton Road bridge is 49 km^2.
- Water quality data for Kaikorai Stream is categorised by Land and Water Aotearoa [1] **(LAWA)** as very likely degrading.
- The Kaikorai Stream is listed with the Regional Plan: Water for Otago **(RPW)** as having Scheduled1D Kāi Tahu values. These are listed below in section 4.7 of this report.

Kaikorai Lagoon Swamp

[1] https://www.lawa.org.nz/

- The Kaikorai Lagoon Swamp is a RSW listed in Schedule 9 of the RPW and is considered a natural inland wetland as per the definition under the National Policy Statement for Freshwater 2020 **(NPS-FW)**.

- Natural discharge paths of the Kaikorai Stream Catchment connect to the Kaikorai Lagoon Swamp. This includes tributaries of the Kaikorai Stream, Abbotts Creek, Christies Creek, and Coal Creek. which drain through the site from Old Brighton Road into the north-western part of Kaikorai Lagoon Swamp.

- Water levels in the Kaikorai Lagoon Swamp fluctuate between dry and flooded depending on conditions in the wider environment. The water level variability is dependent on rainfall patterns and whether the ocean mouth of the Kaikorai Estuary is open or not. The mouth of the estuary is mechanically controlled by ORC.

Kaikorai Lagoon Estuary

- The Kaikorai Lagoon Estuary constitutes the parts of the broader waterbody that is located below mean high water springs and is therefore within the Coastal Marine Area **(CMA)**.

- The estuary is part of the Te Tai o Arai Te Uru Statutory Acknowledgement Area under the Ngai Tahu Claims Settlement Act 1988. The estuary is therefore a Statutory Acknowledgement Area **(SAA)**.

- Schedule 2 of the Regional Plan: Coast for Otago, classifies the estuary as a Coastal Protection Area (CPA 22). The values associated with CPA22 are described as:

  Kāi Tahu cultural and spiritual values. *Estuarine values such as a diversity of species and communities which support a diverse bird population. Up to 50 bird species have been identified in the estuary. There is a wide variety of estuarine plants such as tall rushland and saltmarsh ribbonwood. Juvenile rearing area for whitebait and breeding area for yellow belly flounder.*

Christies Creek and Coal Creek

- Christies Creek flows across the site entering near the northern boundary at the site's western end, before traversing the site at the western end of the Western Landfill prior to entering the Kaikorai Lagoon Swamp.

- As there is currently no stormwater control on the Western Landfill, any stormwater from this area flows into the Christies Creek and subsequently the Kaikorai Lagoon Swamp.

- Coal Creek runs along the southern boundary of the site prior to entering the Kaikorai Lagoon Swamp.

- Christies Creek and Coal Creek are not identified in any schedule within the RPW.

- The catchment size of these creeks is not known.

Note: for purposes of this report and for consistency with the application documents, the Kaikorai Lagoon Swamp and the Kaikorai Lagoon Estuary are referred to as the 'wetland-estuary complex'.

4.5 Terrestrial and Aquatic Ecology and Ecological Values

The Applicant has provided a description of the existing ecology of the site and surrounding environment in the ecological assessment titled: *Fairfield Landfill Ecological Assessment,* prepared by PDP and dated March 2025.

A summary of this description is adopted below.

- The wetland-estuary complex is a moderately-sized coastal lagoon with extensive adjacent swamp and marsh area. The area has been found to provide habitat supporting a diverse array of bird species, particularly waterfowl and wading birds.

- Over eleven bird species with a conservation status of 'at risk' or worse have been found to utilise the wetland-estuary complex. The estuary's saltmarsh habitats provide essential feeding and nesting grounds for the bird species.

- According to EBird[2] records, bird species surveyed from January 2024 to January 2025, and LAWA 'commonly observed species' in the estuary area include:

    - **Threatened- Nationally Critical** - Caspian Tern (*Hydroprogne caspia*) and White-fronted Tern (*Sterna striata*);
    - **Threatened-Nationally Vulnerable** - Stewart Island Shag(*Leucocarbo chalconotus),* Royal Spoonbill (*Platalea regia*), Little Black Cormorant (*Phalacrocorax sulcirostris*), Little Pied Cormorant (*Microcarbo melanoleucos*), South Island Oystercatcher (*Haematopus finschi*), Australasian Bittern (*Botaurus poiciloptilus*); and
    - **At Risk- Naturally Uncommon and Declining** - White Heron (*Ardea alba Linnaeus*) Great Crested Grebe (*Podiceps cristatus*), as well as the declining Banded Dotterel (*Charadrius bicinctus).*
    - Note: the threat status of certain birds appears to be incorrect. For example, the White Heron is actually 'nationally critical' according to the New Zealand Threat Classification System **(NZTCS)**.

Aquatic

- The estuary has been found to support a range of native fish, including 'At-Risk' species such as longfin eel and inanga, and the 'Threatened- Nationally Vulnerable' lamprey. Habitat degradation may be affecting the abundance of these species.

- No fish records are present in New Zealand Freshwater Fish Database (NZFFD) for Coal and Christies creeks.

Ecological Values

The Ecological values of the tributaries, Kaikorai Swamp wetland and the Kaikorai Lagoon Estuary have been assessed by the Applicant in accordance with the matters and attributes

[2] https://ebird.org/home

outlined in the Environment Institute of Australia and New Zealand Guidelines [3] **(EIANZ)**. A summary of these values is provided below.

- The Kaikorai Stream and tributaries has been assessed by the Applicant to have **high** ecological value. This is based on the below points:
  - The Kaikorai catchment is a highly modified environment with degraded water quality.
  - Habitat for 'Threatened- Nationally vulnerable' lamprey and 'At Risk-Declining' longfin eel.
  - High diversity of native fish in the Kaikorai Stream and Abbotts Creek.
  - Low macroinvertebrate diversity.
  - Tributaries are degraded with poor water quality and significant loss of natural character.
  - Kaikorai Stream supports threatened freshwater fish species.

- The Kaikorai Swamp Wetland has been assessed by the Applicant to have **Very high** ecological value. This is based on the below points:
  - The swamp has experienced substantial habitat modification, with an estimated 100 hectares of saltmarsh lost or altered. Despite these changes, extensive herbfields remain, forming a distinctive swamp ecosystem.
  - Elevated contaminant levels for TAN, zinc, and boron.
  - The swamp is recognised as being a RSW.
  - The wetland is a habitat for the 'Threatened- Nationally Critical' Australasian Bittern and the 'Threatened- Nationally Vulnerable' Banded Dotterel.
  - The swamp supports a high taxonomic richness of birdlife

- The Kaikorai Estuary has been assessed by the Applicant to have **Very high** ecological value. This is based on the below points:
  - Major alterations due to causeway construction, habitat loss, and reduced terrestrial buffers.
  - NZFFD records indicate that Kaikorai Estuary supports a diverse fresh and marine fish population, with a total of five freshwater and five marine species recorded.
  - The estuary provides habitat and food for the 'Threatened' Australasian Bittern and the Banded Dotterel.
  - Provides habitat, passage, lifecycle and feeding of a number of native fish including the 'At Risk-Declining' longfin eel and ' At Risk-Declining' inanga.
  - There is a high taxonomic richness of native fish and birds that utilise the estuary.
  - The estuary plays a significant role in ecological connection and function of a RSW.
  - The estuary is vulnerable to nutrient loading, macroalgal growth and phytoplankton blooms.

4.6 Air

- There are 22 gazetted airsheds within the Otago Region. The site is located within the Otago Airshed 2 as per the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 **(NES-AQ)**.

[3] https://www.eianz.org/document/item/4447

- Airshed 2 includes Mosgiel, Milton, South Dunedin, Green Island, and Palmerston. Where an Airshed includes more than one town or region, all towns/regions within the airshed are assumed to have the air quality of the worst reading within that airshed. Monitoring for Airshed 2 is done in Mosgiel. Therefore, air quality within Airshed 2 is as per Mosgiel air quality.

- The NES-AQ sets out ambient air quality standards for contaminants within Airsheds. These regulations require Council to monitor air quality for contaminant concentrations within airsheds if it is likely that an ambient air quality standard will be breached.

- The Applicant has engaged with the Tokin and Taylor Limited who has provided a description on the sensitivity of the receiving environment and a description of the existing air quality. This is summarised below:

    - The 'General Residential 1' zone is located immediately west and north of the landfill (although land to the north is not at this time developed).

    - The nearest sensitive locations to discharges from the landfill are the surrounding residences. These are located on the western boundary of the site and are located approximately 120 m away at the nearest point. There are also dwellings situated in the Rural zone with the nearest rural residential dwelling located approximately 450 m to the southeast of the site boundary. Residential zones and rural dwellings surrounding the site are considered to have a high sensitivity to air discharges from the landfill.

    - The 'Recreation' zone is located to the immediate west-southwest of the site. These areas are considered to have a moderate to high sensitivity to discharges to air from the landfill

    - 'Rural' zones are located to the south (including the Kaikorai Lagoon) and east (including the Green Island Landfill and Green Island wastewater treatment plant). Rural land (with the exception of rural dwellings) is considered to have a low to moderate sensitivity to air discharges from the landfill.

    - The 'Industrial' zone is located to the west and to the east of the landfill. The Industrial zoned land to the east includes part of the Green Island Landfill. The sensitivity to odour impacts in the industrial area near the landfill in general is considered to be moderate to low. The above zones are mapped in Figure 5 below.

    - The topography of an area influences wind and air flow and therefore the dispersion of air discharges from the landfill. The landfill is in a valley that slopes down from north to south. Localised drainage air flows down this valley are expected in cool calm conditions. Elevated terrain can cause katabatic drainage winds in cool calm conditions as air flows down from the valley, from higher elevation to lower elevation.

    - Based on monitoring undertaken in Mosgiel over the last five years, Airshed 2 is deemed to be polluted.

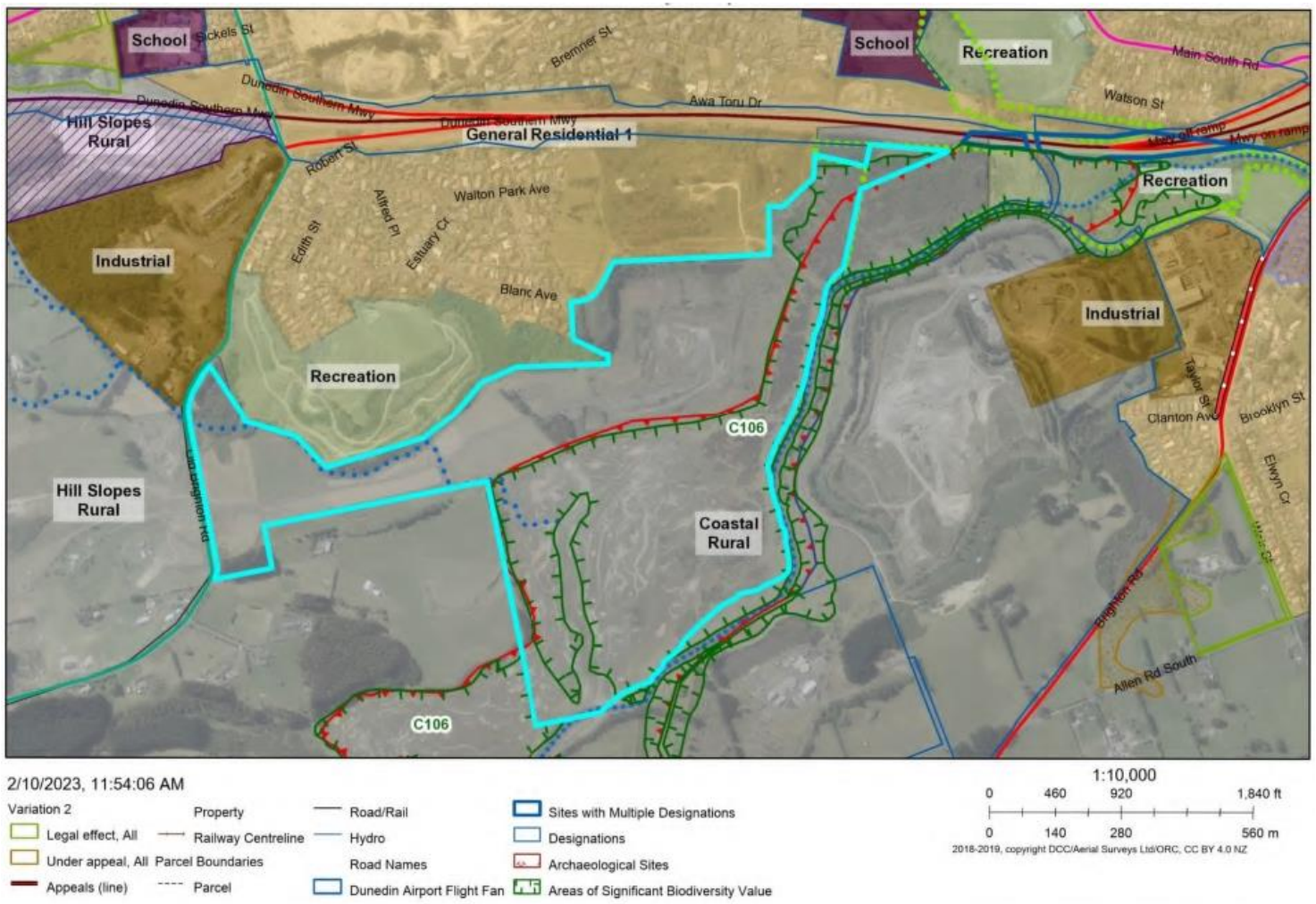

Figure 5: 2GP Planning map (DCC) with the landholding associated with the Fairfield Closed Landfill site boundary outlined in blue (source: Air quality assessment prepared by Tonkin & Taylor)

4.7 Cultural landscape and Mana Whenua Values

The Kaikorai Stream is listed in the RPW for having the below Scheduled 1D Kāi Tahu values:

- ***Kaitiakitanga:*** The role of Kāi Tahu as guardians and caretakers of land and water, following tikanga Māori.
- ***Mauri:*** The life force and wellbeing of a water body, reflected in its health and vitality.
- ***Wāhi tapu / Waiwhakaheke*:** Sacred or spiritually significant places connected to water.
- ***Wāhi taoka:*** Treasured sites or resources that hold cultural importance to Kāi Tahu.
- ***Mahika kai:*** Traditional food gathering areas and practices.
- ***Kōhanga:*** Breeding or nursery areas for native species.
- ***Trails:*** Waterways and sites associated with traditional travel routes.
- ***Cultural materials:*** Water bodies that provide materials for cultural use and traditional practices.

In addition, the Applicant had consulted with Aukaha on behalf of mana whenua prior to lodging resource consent, and a Cultural Impact Assessment **(CIA)** has been prepared by Aukaha to supplement the application. A brief summary of the CIA is provided below.

<u>Cultural Assessment Values</u>

- **Mana**-often loosely translated to mean the authority or prestige that manawhenua hold over their takiwā. Through the recognition of mana, manawhenua have the authority to make decisions over the whenua and waterways (both wai māori and wai tai) within their takiwā. Mana will be recognised through working relationships where manawhenua values, concepts, tikaka, pūrākau and visual identity are appropriately expressed throughout all aspects of the project.

- **Tapu**- Mana whenua should guide discussions and lead the appropriate procedures and protocols regarding wāhi tapu sites, archaeological material, and the treatment of, and knowledge relating to, taoka. Tapu provides an element of safety and direction where there are restrictions. The Māori world is guided completely by tapu and noa.

- **Whakapapa-** Everything in existence is acknowledged and connected through whakapapa. Whakapapa establishes the ancestral rights which give mana whenua the mana and kaitiaki responsibilities over their takiwā. It is important that opportunities to uncover, reference and share the whakapapa of place and people be explored through this project to enhance a collective sense of place and identity.

- **Mauri-** Mauri is a life-giving force that flows from our living world and down through whakapapa, connecting and binding together all aspects of our world. Mauri is an observable measure of environmental health and well-being.

- **Rakatirataka and Kaitiakitaka-** Rakatirataka refers the exercise of mana to give effect to manawhenua culture and traditions. In the management of the natural world, rakatirataka is underpinned by the obligations placed on manawhenua as

kaitiaki. Kaitiakitaka is an expression of rakatirataka. Wai māori is a taoka that is governed under the domain of rakatirataka, in accordance with tikaka and the principles of kaitiakitaka.

- **Mātauraka-** The body of Māori knowledge and understanding which encompasses (among other things) the Māori world view and perspectives, traditional knowledge, and practices.

- **Tikaka-** Tikaka is derived from the word 'tika' meaning right or correct, and therefore in this context references behaviour and design outcomes that are culturally appropriate. In this context we have applied tikaka as a core value as it fits with the values and general aspirations for a well thought-out and executed project. Manawhenua engagement throughout all phases of the aftercare of the landfill site will allow them to guide culturally appropriate actions at the correct times.

- **Utu-** Utu in this context is about an intent to redress historical and current imbalances in ecological and built forms through design. The landfill was progressively built on the Kaikarae Estuary resulting in a significant loss of ecological and cultural values. The closure and aftercare of the site provides an opportunity to restore ecological balance to the degraded estuary, wetland and tributaries.

- **Maumaharataka-** Historical events regarding Māori are often excluded from the public narrative, or not fairly or correctly recorded. Maumaharataka emphasizes the importance of upholding memories of the past and communicating manawhenua pūrākau of place, including place names, cultural heritage, and narratives. This strengthens intergenerational knowledge, community, and place-based identity. The staged closure and aftercare of each part of the landfill creates opportunities for interpretation of pūrākau of place, including place names, cultural heritage and narratives associated with the Kaikarae Wetland and Estuary.

- **Tapatapa-** Tapatapa is a manifestation of mana through the naming of landscapes by our tūpuna. The placenames Rākaihautū left behind as he laid claim to many areas in the South Island are an example of tapatapa. Placenames are important as they are from the earliest migrations and people. These placenames must always be referred to and never replaced with others if the original name is available. Tapatapa provides opportunities for strengthening intergenerational memory, and cultural and place-based identity.

- **Oraka-** Oraka represents the act of resting or an area of rest. The environmental regeneration of the Kaikarae Wetland and Estuary provides an opportunity to express this value at appropriate stages during the closure and aftercare of the landfill.

- **Taoka-** Indigenous species are valued as taoka by manawhenua, as are the habitats in which taoka species survive and thrive. The ecosystems provided by wai māori in lakes, rivers, wetlands, estuaries, and on the coast offer lifegiving habitats for indigenous species. Whanaukataka is at the heart of this relationship. Thus, when the health of a waterway or estuary is degraded, the impacts are far-reaching, for the waterway, for the ecosystems, habitats, and species it supports, and for the people.

Otago Regional Council

Manawhenua associations with the Kaikarae Estuary

- **Wāhi Tūpuna-** There are several Wāhi Tūpuna sites in the area surrounding the Fairfield Landfill site. These are listed in the table below:

Ikoa Māori	Location/Ikoa Pākehā	Description
Pakaru	Kaikarae Lagoon	Pakaru is the traditional Māori name for the Kaikarae Lagoon, near the mouth of the Kaikarae stream. Along with Kaikarae, Pakaru was an important kāika mahinga kai for local Kāi Tahu. During the 1879 Smith-Nairn Royal Commission of Inquiry into the Ngāi Tahu land claims, local Ngāi Tahu kaumātua recorded Pakaru as a kāika mahika kai where tuna and pātiki were gathered.
Kaikarae	Kaikarae Lagoon and Stream	Kaikarae is associated with the Waitaha explorer Rākaihautū. Upon arriving at Whakatū in the Uruao waka, Rākaihautū divided his people into two groups. His son, Rakihouia, took one party to explore the coastline, and Rākaihautū led the other party through the interior of Te Waipounamu and down to Murihiku, using his kō named Tūwhakaroria to dig out most of the fresh-water lakes of Te Waipounamu. While travelling back up the island, Rākaihautū and his party stopped at the mouth of a stream to eat, and their food was a seabird known as karae. This particular location and stream were named Kaikarae.
Pukemakamaka	Saddle Hill	Matamata was the kaitiaki of Kāti Māmoe chief Te Rakitauneke and is attributed to carving out the Ōtākou harbour and the Taiari river in search of his lost master when they became separated. The taniwha finally resting where Saddle Hill is now, becoming the peaks Turi-makamaka and Pukemakamaka.

Aukaha has identified a number of Recorded Māori archaeological sites on the Kaikarae Estuary. These sites include middens (ovens), Nohoaka / Kaika (sitting place) and artefacts.

- **Ara Tawhito and Ara Hikoi-** Traditional travel routes through the interior and along the coast connected manawhenua to places of importance for gathering and harvesting mahika kai and connected sites of permanent and seasonal occupation. Kāi Tahu rakatira Te Raki provided instructions about kā ara tawhito to early Pākehā officials who sought to traverse Otago by foot. Old tracks followed "along the western hill-tops, the line of Kaikarae Valley, and the seacoast." Other Kāi Tahu trails proceeded from Kaikarae over Whakaari or Whānau-paki, to Waikōuaiti.

- **Mahika kai -** Mahika kai practices underpin the manawhenua relationship with Otago's rivers, lakes, wetlands, and estuaries. Cultural identity as whānau and hapū is tied to resources, which are significant taoka. The restoration of the mauri of Kaikarae estuary to provide healthy habitat for mahika kai and taoka species is a long-term vision for Ōtākou whānau. The closure and aftercare of the Fairfield landfill is significant step towards achieving that vision.

- **The Kāi Tahu history of loss-** Te Tiriti o Waitangi was signed by Kāi Tahu representatives in 1840, followed by a series of land sales with the Crown in 1844 and 1864. The Otago Deed, signed at Kōpūtai (Port Chalmers) in 1844, transferred more than 400,000 acres of Kāi Tahu land to the New Zealand Company and identified Kaikarae as a key boundary, showing its significance within the rohe. Over time, extensive land sales, settlement, and landscape modification restricted access to traditional routes, ancestral places, and mahika kai resources. This loss of land and environmental degradation has caused significant mamae (hurt) for mana whenua and continues to affect their role and responsibilities as kaitiaki within their takiwā.

5. Status of the Application

5.1 To discharge leachate onto or into land in a manner that may result in contaminants entering groundwater, the discharge of water (surface run-off) to water, and the discharge of landfill gas, odour and products of combustion to contaminants to air

Regional Plan: Waste

Rule 7.6.1 states: *New or operating landfills [excluding cleanfill landfills, offal pits, farm landfills and greenwaste landfills.*

1) *The discharge of any contaminant into or onto land; or*
2) *The discharge of any contaminant or water into water; or*
3) *The discharge of any contaminant into air,*

as a result of the operation of any landfill (except for a cleanfill landfill, offal pit, farm landfill, or greenwaste landfill covered by Rules 7.6.3 to 7.6.11) are discretionary activities, provided that no burning of waste is undertaken.

The Applicant has confirmed that the continued operation of the closed landfill will require the resource consent under Part 1,2 and 3 of this rule. This is because landfill gas and odour are to be discharged to air, Landfill leachate to be discharged to land, and because of discharge of stormwater runoff into the Kaikorai Lagoon Swamp, and discharge of leachate into the lagoon.

Regional Plan: Water
Rule 12.B.4.1 states: *The discharge of water (excluding stormwater) or any contaminant from an industrial or trade premises or a consented dam to water or to land is a discretionary activity, unless it is permitted by Rule 12.B.1.6, 12.B.1.7, 12.B.1.10 or 12.B.1.11.*

Resource consent is required under this rule for the discharge of water from the North and Weighbridge ponds, and for the discharge of leachate to land in a manner that may enter groundwater.

National Environmental Standards for Freshwater
Regulation 45B (5) of the NES-FW states: *The discharge of water into water within, or within a 100 m setback from, a natural inland wetland is a discretionary activity if—*

a) the discharge is for the purpose of constructing or operating a landfill or a cleanfill area; and

b) there is a hydrological connection between the discharge and the wetland; and

c) the discharge will enter the wetland; and

d) the discharge will change, or is likely to change, the water level range or hydrological function of the wetland.

The Applicant has applied for resource consent under this rule as the discharge of water from the retention ponds within 100 m of the Kaikorai Lagoon Swamp, and points (a) – (d) are met.

5.3 To take and use groundwater partially allocated as surface water

Regional Plan: Water
The Applicant has applied for resource consent under Rule 10A.3.2.1 of the RPW. This rule applies to groundwater taken within 100 m of the Kaikorai Stream and wetland which are considered to be connected perennial surface water bodies.

Rule 10A.3.2.1 states: *Despite any other rule or rules in this Plan:*

a) Any activity that is the replacement of an activity authorised under a Deemed Permit; or

b) The take and use of surface water (including groundwater considered as surface water under Policy 6.4.1A (a), (b) and (c) of this Plan) that is the replacement of a take and use authorised by an existing water permit where that water permit expires prior to 31 December 2025, that does not meet any one or more of the conditions of:

i. Rule 10A.3.1.1 (excluding Conditions (iv) and (vi));
ii. Rule 10A.3.1A.1;
iii. Rule 10A.3.1B.1,
is a ***non-complying*** *activity*

The Applicant is not able to meet the conditions of Rule 10A.3.1.1- 10A.3.1B.1 as the Applicant has applied for a consent duration for the water take for more than six years, and the existing water permit is not a Deemed Water Permit where the take and use of water is for hydro-electricity generation infrastructure listed in Schedule 10A.5.1.

The Applicant has additionally applied under Rule 12.2.4.1 (i) as not all groundwater taken will be connected surface water.

Rule 12.2.4.1 (i) states: *Except as provided for by Rules 12.2.1.1 to 12.2.3.5 the taking and use of groundwater is a discretionary activity.*

National Environmental Standards for Freshwater
Regulation 45B(4) of the NES-FW states: *The taking, use, damming, or diversion of water within, or within a 100 m setback from, a natural inland wetland is a discretionary activity if—*

a) *the activity is for the purpose of constructing or operating a landfill or a cleanfill area; and*
b) *there is a hydrological connection between the taking, use, damming, or diversion and the wetland; and*
c) *the taking, use, damming, or diversion will change, or is likely to change, the water level range or hydrological function of the wetland.*

The Applicant has applied for resource consent under this rule as there will be the taking of water within 100 m of the Kaikorai Lagoon Swamp. Resource consent is additionally required under this rule for the diversion of water which may be required if the road perimeter is increased.

5.4 To construct a defence against water and the diversion of water

Regional Plan: Water
Rule 14.3.2.1 states: *Except as provided for in Rule 14.3.1.1, the erection, placement, extension, alteration, replacement, reconstruction, demolition or removal, of any defence against water, other than on the bed of any lake or river, is a discretionary activity.*

The raising of the perimeter road is for the purpose of flood mitigation; therefore, the road bund is considered a defence against water under the definition set out in the RPW. The raising of the height of the road perimeter does not meet the permitted activity rule as there will be a permanent change in the scale of the structure. Consent is therefore required under Rule 14.3.2.1.

The increase in the road perimeter will result in the diversion of water and it will not meet the provisions of the relevant permitted activity rule. Consent is therefore required under rule 12.3.4.1 (i), which states.

Rule 12.3.4.1 (i) states: *Except as provided for by Rules 12.3.1.1 to 12.3.3.1 and except in the Waitaki catchment, the damming or diversion of water is a discretionary activity.*

The Applicant has stated that some of the water diverted may be from within the Kaikorai Lagoon and therefore has applied under Rule 12.3.1A.1.

Rule12.3.1A.1 states: *The damming or diversion of water within any Regionally Significant Wetland is a non-complying activity unless:*

(i) It is prohibited by Rules 12.3.1.1 to 12.3.1.4; or
(ii) It is permitted by Rules 12.3.2.1 to 12.3.2.3; or
(iii) It is provided for by Rule 12.3.3.1.

5.5 To disturb a potentially contaminated site

Regional Plan: Waste (RPWaste)
Rule 5.6.1 of the RPWaste states:

5.6.1 Hazardous wastes at contaminated sites

1. *The disturbance of land; or*
2. *The discharge of hazardous waste into water; or*
3. *The discharge of hazardous waste onto or into land in circumstances that may result in that hazardous waste (or any other hazardous waste emanating as a result of natural processes from that hazardous waste) entering water; or*
4. *The deposit of any hazardous waste, in, on or under land; or*
5. *The discharge of hazardous waste into air at or from a contaminated site;*

is a discretionary activity.

The application involves the drilling on a potentially contaminated site to establish an additional gas monitoring well. This is a discretionary activity under part (1) of this rule.

5.6 Overall Activity Status

Applications involving a number of different activity statuses can be bundled together, so that the most restrictive activity classification is applied to the overall proposal. The bundling approach developed from case law is to enable appropriate consideration of the effects of an activity, or group of activities.

In this instance, the activities in which consent is sought for are intrinsically linked and therefore I consider it appropriate to bundle activity status. In this instance the most restrictive status applies. Overall, the proposal has a **non-complying** activity status.

The Council may grant or decline the application and, if granted, may impose conditions under Section 108 of the Act.

6. Assessment of Adverse Environmental Effects

6.1 Permitted Baseline

The Consent Authority may disregard an adverse effect if a rule in a plan or national environmental standard permits an activity with that effect. In this case:

- There is no permitted activity rule for the discharge of contaminants to land, water, or air that occurs as a result of the management of a closed landfill;

- There is no permitted activity rule within the RPW or the NES-FW that provides for the taking of groundwater allocated as surface water from within 100 m of a wetland where the taking of water could change the hydrological functioning or water level range in the wetland;

- There is no permitted activity rule for the diversion of water where that diversion would affect the hydrological function of a RSW or natural inland wetland, nor is there any rule permitting the discharge of surface runoff from a landfill into a wetland. Further, the NES-FW does not provide a permitted activity pathway for diversions and discharges water associated with landfill operations which occur within specified setbacks of natural inland wetlands; and

- There are no permitted activity rules within the RPWaste that provide for the disturbance of a contaminated site.

For the reasons outlined above, the permitted baseline is not considered relevant to this proposal and is not given further consideration in the below assessment of adverse environmental effects.

6.2 Receiving environment

The receiving environment is the environment upon which a proposed activity may have effects. The receiving environment includes the current and reasonably foreseeable future state of the environment as it may be modified by permitted activities and by the implementation of resource consents that have been granted at the time the application is being considered. It does not include the environment as it might be modified by the implementation of future resource consents yet to be granted, nor does it include unlawful activities, even if these are already occurring.

In this case, the receiving environment includes:

- The wider landfill site, including its implemented resource consents (until the expiry of those consents), but not those activities occurring under s124;
- Groundwater, surface water, including artificial and natural watercourses and wetlands as well as their natural, physical, and cultural values;
- Ambient air quality beyond the site and the receptors beyond the site that are sensitive to changes in ambient air quality.

The receiving environment was discussed further in section 4 of this report. It is against this environment that the effects of the activities for which consent is sought for will be assessed.

6.3 General comments

The below assessment of adverse effects is a summary of the relevant findings of the application documents and peer reviews to date. This specifically includes:

- Application documents lodged with the application;
- Two rounds of peer reviews competed by SLR Limited on behalf of Council;
- s91 response: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to the section 91 Deferral Pending Application for Additional Resource Consents*, prepared by Planz Consultants Limited and dated 10 March 2025, including:
  - Attachment A: Updated Resource Consent Application Form.
- A s92 Response titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to the section 92 Request for Further Information,* prepared by Planz Limited and dated 6 June 2025, including:
  - Attachment A: Updated (v2) Resource Consent Application Form.
  - Attachment B: Landfill Monitoring Results (post February 2024).
- Fairfield Landfill Ecological Assessment prepared by PDP and dated March 2025;
- Updated proposed Consent Conditions (Appendix 8), dated 18 June 2025;
- Letter from Applicant titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to Technical Reviews*, prepared by PDP and dated 1 October 2025, including:
  - Appendix 1: Aftercare Management Plan - Proposed Adaptive Monitoring and Response Action Procedure.

The following technical experts were engaged by Council to audit the application:

SLR Consulting:

- Samantha Iles- Technical Director. Ms Iles was responsible for organising the technical reviews.
- Tim Baker- Principal Consultant, Hydrogeology. Mr Baker provided the groundwater and natural hazards assessment.
- Dr. Pete Wilson-Principal Consultant, Ecology and Marine Science. Dr. Wilson provided the surface water assessment.
- Elizabeth Morrison- Principal Ecologist. Ms Morrison provided the ecology assessment.

SES Consulting:

- John Iseli- Managing Director, Principal Air Quality Consultant. Mr Iseli was responsible for the air quality assessment.

Timeline

S91

It has been assessed by Council that additional consents were required for the alteration of a defence against water and the associated diversion of water (required due to the proposed increase in road perimeter height). A letter requesting additional consents was sent to the Applicant on 5 February 2025 under s91(1) of the Act. The Applicant responded to this letter 10 March 2025 and agreed to apply for the additional resource consents.

S92

SLR Consulting undertook an initial review of the application documents, however, the auditors did not have sufficient information to be able to provide a complete assessment. Mr Iseli was able to complete his assessment, on the basis that the Applicant confirmed additional monitoring locations. On this basis, a set of questions were sent through from the auditors on the 7 May 2024. These questions were sent to the Applicant in a letter requesting additional information under s92 (1) of the Act. This was sent to the Applicant on 21 March 2025.

Additional information received since lodging

On the 4 November 2024 the Applicant sent through a Cultural Impact Assessment **(CIA)** and on 31 January 2025 the Applicant sent through a Memorandum titled: *Cultural Impact Assessment Recommendations – Proposed Approach / Response (FINAL – 31 January 2025.* On 3 March 2025 an Ecological Assessment was additionally sent to Council. On 6 June 2025 the Applicant sent through a formal s92 response including the 2024 Annual Monitoring Report. The s92 response, the Ecological Assessment, letter dated 10 March 2025 (s91 response letter), along with an updated set of volunteered conditions (dated 13 June 2025), was sent back to SLR for review.

The SLR auditors completed their assessments by the 15 July 2025. A number of recommendations were made, and the completed reviews were sent to the Applicant for consideration.

On 2 October 2025, the Applicant sent through a Letter titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to Technical.* The letter included comments on the recommendations. Additionally the letter included an update to the ACMP which included trigger levels and follow up trigger response process (described in section 3.3

of this report). The proposed trigger levels and follow up action response was sent to Mr Baker and Dr Wilson for review to comment on the appropriateness of the trigger levels and follow up actions. This review was completed on 17 October 2025. It is noted that the Applicant has refused to provide additional information in relation the defence against water and the associated diversion of water. This is discussed further in section 6.10 of this report.

In general, the sections below are set out as follows:

- Summary of the Applicant's assessment.
- A summary of technical comments provided by SLR, including identification of points of agreement, disagreement, and recommendations where they may act as a mitigation measure.
- Overall conclusions.

At the time of writing this report, not all of the recommendations of the various technical experts have not been adopted by the Applicant. As such, they are not considered to be mitigation measures, and the conclusions of this notification report are based only on what the Applicant has provided to date.

6.4 Effects on groundwater quality

The landfill is a closed landfill and ceased accepting waste in 2017. Leachate is still being generated as a result of waste decomposing, although it is estimated that the amount of leachate being generated is declining overtime.

Applicant's Assessment

The Applicant has acknowledged that some leachate from the landfill is not being captured by the leachate interception system and is antipciated to be migrating into groundwater. The Applicant has undertaken a review of the historical groundwater and leachate monitoring data collected between June 2001 and October 2023 and has undertaken an additional groundwater investigation to quantify the extent of leachate capture and assess any potential adverse effects on groundwater quality. The result of this data is summarised below.

2012 investigation

PDP undertook a groundwater sampling investigation within the wetland in 2012. This investigation included:

- The installation of 10 temporary well points (SP1 – SP10) in the wetland to enable the collection of shallow groundwater samples to determine the extent that key landfill leachate indicators have migrated beyond the interception drain; and
- Slug tests within shallow wells LS10 and LS13 and deep wells LD8 and LD11, to provide an estimation of the hydraulic conductivity and migration rates in the shallow and deep sediments.

A pressure transducer was placed in an open drain in front of the landfill near well LD11, to measure any changes in water level and determine whether there were any tidal influences over the period the investigations were being carried out.

Groundwater quality sampling results from the 2012 investigation are summarised below:

- Groundwater pH ranged from 7.0 to 7.4.

- No Heavy Metals were detected due to the need for dilution caused by high chloride interference.

- Total Ammoniacal Nitrogen Levels **(TAN)** ranged from 1.4 to 9.9 milligrams per litre **(mg/L)**. The highest concentration was reported near the Eastern Landfill, with concentrations decreasing with distance but still elevated overall.

- Nitrate-Nitrogen was not detected (<0.2 milligrams per litre **(mg/L)**) within the six temporary well point locations.

- Dissolved Reactive Phosphorus (**DRP**) concentrations ranged from 0.010 to 0.76 mg/L.

Historical leachate monitoring

The Applicant's current consent 93540 requires sampling of the groundwater/leachate pumped from the leachate collector sumps in October each year. The samples are required to be analysed for calcium, magnesium, potassium, sodium, bicarbonate, chloride, sulphate, pH, conductivity, chemical oxygen demand **(COD)**, biochemical oxygen demand **(BOD_5)**, TAN, nitrate, iron, lead, zinc and cation/anion ratio. In addition, once every two years the leachate is required to be analysed for United States Environmental Protection Agency **(USPA)** priority pollutants and whole effluent toxicity screening using appropriate sensitive marine species.

The following observations has been noted from this data:

- TAN concentrations ranged from 200–340 mg/L, showing a declining trend since 2017. These values fall within the typical landfill leachate range (30–3,000 mg/L).

- Nitrate-nitrogen concentrations showed an overall increasing trend since 2017, with a recent decline. Concentrations remained within the typical landfill leachate range (0.1–50 mg/L).

- Sulphate concentrations appeared steady at between 100 and 160 mg/L.

- The cation/anion ratio had mostly been within the 10 % range as required by conditions of consent.

- The average pH level was lower than the typical range for pH in landfill leachate.

- Zinc concentrations were reasonably consistent within the historical data, with one outlier in 2018.

- BOD_5 and COD concentrations had remained relatively consistent since 2010.

- The remaining compounds were either consistently within the range of historical data or show a slight decreasing trend.

- Additional analysis undertaken every 2 years showed no evidence of any of the toxic compounds in the leachate such as polychlorinated biphenyls **(PCBs)**, organochlorine pesticides, chlorinated solvents, petroleum hydrocarbons or dioxins.

- The whole effluent toxicity screening showed the estimated 'safe' concentration of leachate required to mitigate the potential for chronic effects in the receiving water environment required between 28 and 85-fold dilution.

The Applicant summarised these results as being generally consistent with very little change in composition over the years of testing. Given the landfill has ceased receiving any additional waste and is now capped, significant changes to the toxicity would be unlikely.

Historical groundwater monitoring

The Applicant's current consent 93540 additionally requires the sampling of groundwater once every 3 months from both leachate interception drain wells and groundwater monitoring wells outside of the landfill. The historical laboratory sampling results from these wells date back to 1997 for pH and conductivity and 2002 for temperature, TAN and chloride. The following observations has been noted from this data:

- pH is stable over time across all wells with no significant difference between landfill and off-site locations. Variations are anticipated to be due to calibration and most wells report values were within 0.5 ranges.

- Temperature follows normal seasonal patterns—cooler in winter, warmer in summer.

- TAN concentrations remain elevated (usually over 100 mg/L) in leachate interception drain wells, with a general decreasing trend, especially near the Western Landfill (LS24 and LS26).

- Deep wells outside the landfill show fluctuating TAN levels with no clear trend.

- Shallow wells beyond the interception drain exhibit variable TAN, with LS13 notably higher, likely due to higher permeability at that site.

- Most off-site wells show stable but elevated TAN levels since 2002, indicating leachate impacts extend beyond the landfill and interception drain.

- Chloride & Conductivity is not a key leachate indicator at this site due to natural saltwater influence from the estuarine environment.

Annual sampling has also been required for calcium, conductivity, magnesium, sodium, chloride, potassium, alkalinity, TAN, lead, and BOD_5 in deep monitoring wells in October each year. The following observations has been noted from this data:

- A reduction in leachate indicators has been observed in in LD5 which suggests decreasing leachate impacts beneath the landfill.

- Deep wells (LD8, LD11, LD17 and LD20) showed heavy metal and TAN concentrations are generally within the previous range of values measured, indicating stable conditions.

- Iron concentrations were most elevated within wells LD11 and LD8, compared to other wells, and were typically in the range of 20 to 55 mg/L.

- Since 2015, zinc concentrations have remained relatively stable with concentrations consistently below 0.2 mg/L in all wells.

- Magnesium concentrations were highest in wells LD11, LD8, LD20 and LD17 and have remained relatively stable over time, generally in the range of around 600 to 1,000 mg/L.

- Some minor spikes in lead concentrations have been observed in the past. However, concentrations have remained stable and low (0.0021 mg/L or less) since October 2015, in all wells.

- Persistent TAN in wells LD11 and LD17 shows that leachate-impacted groundwater has moved beyond the interception drain and is present under the wetland. Levels have been stable since 2002, indicating a long-term steady state.

The 2012 investigation and past leachate/ groundwater monitoring results show that the leachate interception drain is mostly effective at capturing leachate, as indicated by high TAN levels in leachate samples compared to downgradient wells. However, the results also indicate that some leachate is reaching groundwater, especially in deeper downgradient wells and the wetland area (as seen in the 2012 survey). The Applicant notes that this was not unexpected due to the landfill being unlined, and higher TAN concentrations in the deeper downgradient wells. This suggests that the interception drain is less effective at capturing the leachate from within the deeper sediments, which is likely passing through underneath the interception drain.

The Applicant states that it is currently unknown where groundwater emerges to surface water in the Kaikorai wetland-estuary complex given the absence of groundwater level information below the wetland-estuary. However, based on the groundwater quality sampling undertaken within the wetland in 2012, it has been identified that leachate is impacting groundwater beneath the wetland at least to a distance of around 300 m south of the site. The Applicant additionally anticipates that some discharge could be migrating towards the east of the landfill towards Kaikorai Stream. An isotopic study undertaken in 2004 confirmed the presence of leachate in the Kaikorai Stream and in plant matter collected below the high-water mark in the estuary which supports the interpretation that leachate is entering the Kaikorai Stream. The Applicant has provided an estimate on the furthest point downstream point where leachate may upwell based on the underlying geology. As the Abbotsford Mudstone outcrops around 1.2 km downgradient of the site, it is expected that groundwater within the shallow wetland-estuary sediments would up well at this point if this has not already occurred further upstream. The Applicant has stated there does not appear to be any evidence of any leachate migration from the landfill northwards into the land that is zoned for future residential development.

The Applicant has estimated the amount of leachate potentially not being captured by the leachate management system through calculating the mass discharge of TAN. This was calculated based on the cross-sectional area, the hydraulic conductivity, hydraulic gradient and contaminant concentration. The average mass discharge of TAN in the pumped leachate has been calculated at 21,102 grams per day **(g/day)**. This was calculated based on the annual total discharge volumes of leachate pumped to the DCC wastewater treatment plant and average TAN concentrations at EPS42. Given these results, the Applicant has estimated between 95.4% and 99.4% of the leachate is being intercepted and removed by the interception drainage system and that between 4.6 to 0.6% of leachate from the landfill

(approximately 121 to 1,007g of TAN per day), is being diffusely discharged into the wetland-estuary complex. The Applicant considers these to be conservative estimates.

The Applicant has stated that groundwater quality is anticipated to improve beneath the landfill overtime as the Eastern Landfill has been capped limiting any further rainfall infiltration reducing the leachate generation potential.

The Applicant has not provided a conclusion on the level of adverse effects that the proposal is having on groundwater. The Applicant has proposed adaptive management to monitor and address any increase in adverse effects that may occur. This was described in section 3.3 of this report. In summary, the Applicant will continue to monitor groundwater and leachate concentrations. A set of trigger levels has been proposed, and should these levels be exceeded; a response action will be required.

The Applicant additionally notes that the Kaikorai Stream and the downstream receiving environment will also be impacted by Green Island Landfill on the opposite side of the stream-estuary, and therefore defining the individual impacts from the Fairfield site is difficult to determine.

Technical audit

Tim Baker of SLR Limited has provided a peer-review of the Applicant's assessment on groundwater. Mr Baker reviewed the below documents:

- Technical Assessment of Effects on Groundwater, Surface Water and Ecology, prepared by PDP and dated February 2024;
- Fairfield Landfill Ecological Assessment prepared by PDP and dated March 2025;
- Letter from Applicant titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to the section 92 Request for Further Information,* prepared by Planz Limited and dated 6 June 2025, including:
  - Attachment A: Updated (v2) Resource Consent Application Form.
  - Attachment B: Landfill Monitoring Results (post February 2024).
- Fairfield Aftercare Management Plan (Draft);
- Updated proposed Consent Conditions (Appendix 8), dated 18 June 2025;
- Letter from Applicant titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to Technical Reviews*, prepared by PDP and dated 1 October 2025, including:
  - Appendix 1: Aftercare Management Plan - Proposed Adaptive Monitoring and Response Action Procedure.

Mr Baker's full comments can be found in the below documents:

- Technical Memorandum titled: *RM24.098 – WM New Zealand, Fairfield Closed Landfill- Groundwater Technical Peer Review,* dated 11 July 2025; and
- Email received from Samantha Iles dated 20 October 2025 RE: Application to be technically reviewed - RM24.098.

General

- Mr Baker notes that while there is limited aquifer property data and testing results on which to base the assessments, the assumptions that have been made with the available data appear valid and founded on accepted hydrogeological practice. The testing that has been done, is well documented and thorough. With regards to

contaminant concentrations, there is a good record of groundwater quality data which provides a more robust basis from which to assess effects.

- Mr Baker agrees with the Applicant's assessment that the furthest downstream upwelling point is at the point of the Abbotsford Mudstone outcropping (~1.2 km downgradient).

Effects on groundwater quality

- Mr Baker noted that the Applicant has not provided a specific conclusion on the effects on groundwater quality, however the Applicant does detail the effects on groundwater quality and provide a reasonably thorough assessment (given the available data) of the current state of the groundwater quality.

- Mr Baker additionally recommended a one-off repeat of the estuary/wetland investigation carried out in 2012 to help conclude the level of effect the leachate is having on groundwater quality. This was recommended because the investigation assisted with the understanding of contaminant transport into the wetland area and a repeat would allow a comparison of the two sets of results.

It is noted that the Applicant did not undertake a repeat of this assessment as recommended by Mr Baker.

- Mr Baker agrees with the Applicant's assessment that monitoring data indicates improved water quality beneath the Western Landfill area compared to historic data.

- Mr Baker notes that the report does not specifically address cumulative effects on groundwater quality, and this is a gap in the information. However, in Mr Baker's opinion the landfill will be having a significantly greater effect on groundwater quality downgradient of the landfill than any of the other surrounding land uses. On this basis he concludes that the cumulative effects of the landfill are not critical to know because the degree of effect from the landfill would be the main contributor. Mr Baker notes that this can be confirmed through comparing the upgradient vs downgradient water quality. But there is only one upgradient monitoring well to compare results to, that is LS22. This well has the lowest or lowest equal concentrations of the major landfill leachate indicators and considerably lower than the downgradient wells. In Mr Baker's opinion, this demonstrates the degree of impact that the landfill has on groundwater, relative to upgradient land uses.

Leachate interception

- Mr Baker considers the method that the Applicant has taken to estimate contaminant flux in groundwater to be appropriate. However, one aspect of the estimate not discussed in detail is the accuracy of leachate volumes (discharged to the DCC reticulated sewer) used in the calculation. As noted in the 2024 Annual Monitoring Report, there have been multiple occasions (including all of February 2024) when the pumpstation (EPS 42) was not operating. If the pump station is not operating, no leachate is pumped from the landfill. Mr Baker notes it is therefore hard to have confidence in the comparison of offsite groundwater discharges to pumped leachate volumes if the pump station is regularly not working as the leachate volume data would be inaccurate.

- Mr Baker summarises that the existing management of the leachate interception system is currently not appropriate, and therefore the operation and maintenance of the leachate pumping system needs a detailed review. Currently, the collection of data is too manual, the systems lack redundancy, and the gaps between checks are too long. Mr Baker has added the below recommendations:

    - A requirement to build redundancy into the pumping system.
    - An upgraded telemetry and alarm system that also has redundancy. Data recorded should include water levels within the pumping sumps, pump operation, flow. This data should be continuous.
    - An investigation into changes to the system that would allow the pumping of leachate to continue when levels in the estuary are high. At present, the leachate pump system is set to automatically shut down ('high-high' alarm) when flooding/inundation of the pump station sump occurs, to avoid pumping estuary water.

The Applicant has responded to these recommendations and has provided the below comments.

"WM acknowledge the critical nature of the pump to the operation of the leachate system to maintain a depression in the phreatic zone. The leachate system is equipped with a single pump; however, a second pump is kept on standby allowing WM to swiftly replace a pump in the event of a critical failure. These pumps can also be exchanged proactively during the six-monthly service checks. Currently, the system includes an alert feature that sends text messages to WM technical staff at the nearby Green Island Landfill. However, this alert system lacks remote real-time monitoring capabilities. WM recognise the limitations of this system without a permanent presence on site and plans to enhance this monitoring and reporting system by upgrading to a proactive solution, such as a SCADA system or a similar technology as part of the closure management and monitoring plan. WM are currently in discussions with a supplier for the design and installation of an appropriate system. These improvements will significantly enhance the reliability of the system. The integration of telemetry enables continuous monitoring and data collection, not only improving operational oversight and reporting, but also providing valuable diagnostic information in the event of a system failure. This data will support faster identification of issues / failures, inform future design improvements, and strengthen the system's overall resilience."

- The Applicant's technical expert (PDP) recommended remedial works on the laterals feeding the leachate interception trench. Mr Baker supports this recommendation. The intent of this is to improve lateral flow to the main gravity trench, and lower leachate head within the landfill. Mr Baker additionally supports the recommendation to raise the access track and pump chamber so that it is not affected by high water levels within the estuary.

The Applicant has responded to these recommendations and has provided the below comments.

"Any remedial works on the laterals would only be undertaken on an 'as required basis'. The effectiveness of the laterals is regularly being assessed as part of the water level monitoring programme and has been effective to date to determine when these laterals require remediation. The methodology adopted has been successful to date. In addition, it is noted that proposed Condition 2 of the water permit requires the leachate management system to be

operated, and maintained, in a manner that ensure effective management of the leachate system, which includes the lateral drainage network.

The author also commented that they supported the recommendation to raise the perimeter access road, and pump chamber, so that the leachate system is not affected by high estuary levels. This will form part of the outcome of the modelling / assessment being proposed to be undertaken as a consent condition."

Aftercare Management Plan and proposed trigger levels/ response actions

- Mr Baker states that the Monitoring Programme has been in place for some time and has provided sufficient data to allow baseline conditions to be determined. Mr Baker recommended a number of minor changes to the monitoring location and the frequency of monitoring at well EPS42.

- Mr Baker considers the proposed trigger responses to be appropriate. The initial response is a review against historical data, and the second level response is follow-up sampling and reporting. Mr Baker is in support of these proposed trigger responses.

- Mr Baker agrees with the Applicant's approach to use TAN as the key indicator of leachate in groundwater and apply trigger values to this parameter.

Conclusions

Based on the comments from Mr Baker, I am able to conclude that the Applicant's methodology for estimating the mass discharge of leachate into groundwater is appropriate, and that the monitoring results indicate that contaminant concentrations in groundwater remain relatively stable. Additionally, the monitoring data suggests a decrease in leachate generation from the Western Landfill. However, confidence in this assessment is substantially reduced by the known failures of the pump station, and hence the unknown accuracy of the pumped leachate volumes used in the calculations.

The Applicant has proposed several improvements to address potential future pump failures, including installation of a new monitoring system, addition of telemetry, remedial works, and increasing the perimeter road height on an as-required basis. The proposed groundwater monitoring programme and adaptive management approach are considered generally appropriate.

Notwithstanding the above, it is recognised that a portion of leachate is not being captured by the leachate interception system and is being diffusely discharged into the wetland–estuary complex. At present, there is insufficient monitoring data for both upgradient and downgradient groundwater to accurately determine the extent of any adverse effects on groundwater quality attributable to the landfill. Furthermore, the Applicant has not provided any conclusions regarding the magnitude of these effects. Consequently, I am unable to draw a conclusion as to the level of impact on groundwater quality.

6.5 Effects on surface water quality

Potential adverse effects on surface water quality of the surrounding waterbodies are affected by stormwater runoff and the passive discharge of leachate via connected groundwater.

Otago Regional Council

Applicant's assessment

Leachate contribution

The Applicant has acknowledged that some leachate is entering the groundwater system and migrating beyond the interception drain and entering the Kaikorai Stream and wetland-estuary complex. The Applicant notes that it is currently not known where groundwater emerges to surface water in the wetland- estuary complex given the absence of groundwater level information below the wetland-estuary. However, based on the groundwater quality sampling undertaken within the wetland in 2012, it has been identified that leachate was impacting groundwater beneath the wetland at least to a distance of around 300 m south of the site. It is also expected that some leakage could be migrating towards the east of the landfill towards Kaikorai Stream. As discussed above in section 6.4, the furthest upwelling point has been estimated at 1.2 km downstream.

Discharge from North Pond and Weighbridge Pond

The site currently has two stormwater ponds for the management of surface runoff on the Eastern Landfill. These are located on the western and northern side of the Eastern Landfill and are known as the "North Pond" and the "Weighbridge Pond". The ponds act as treatment ponds as they allow for any sediment to settle to the bottom of the ponds. The ponds also provide for attenuation of the stormwater. There is no stormwater management for the Western Landfill any stormwater on this side of the site is expected to flow as surface runoff into nearby the nearby waterbodies.

The Applicant has stated that since the closure of the Eastern Landfill in 2017, there has been no visual obvious changes in the water quality of the North Pond, and since 2013 there has been no stormwater present in the Weighbridge Pond when sampling rounds have taken place. The Applicant notes that the landfill cap reduces the likelihood of any stormwater runoff containing leachate.

Historical surface water data

The Applicant has provided an assessment of effects on surface water based on monitoring data of the wetland-estuary complex and tributaries, which has been required by their existing resource consent 93540. Surface water samples have been collected from the following locations since 2001:

- FH38 (additional location) – on the north-western boundary of the landfill site (Christies Creek) intended to represent upgradient conditions,
- FH39 (consented location) - western end of the landfill site, just downstream of the convergence of Coal and Christies Creek's,
- EW43 (consented location) - Kaikorai Stream, to the east of the landfill,
- FH40 (consented location) - main estuary stream flowing through the wetland. It is noted that FH40 is within the designated CMA of the estuary, rather than in the designated wetland.

The National Policy Statement for Freshwater Management 2020 **(NPS-FM, 2020)** establishes a National Objectives Framework guide for the management of freshwater quality in New Zealand. This framework includes a banding system that classifies the state of various water quality attributes into five bands: A, B, C, D, and E. These bands represent different levels of ecological health and suitability for various uses, such as swimming, drinking water, and supporting aquatic life. The NPS-FM has different banding systems for each water quality attribute or contaminant. Each attribute has a national bottom line, which

is the minimum acceptable state for that attribute. If a water body is below this bottom line, it indicates a significant degradation of water quality. This banding frame works has been used by the Applicant to assess the current water quality of the wetland-estuary complex and tributaries.

It is noted that the NPS-FM compares water quality parameters annually, however the Applicant adopted a conservative approach by comparing both the annual values and those measured over the last 5 years to better understand the longer-term water quality trends.

Zinc, boron and pH were assessed against the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018 **(ANZG,2018)**. The NPS-FW does not provide a banding system for Zinc and Boron. 5-year and 20-year datasets were used for these assessments.

Key findings and interpretations of the results are below:

FH38 – Christies Creek (north-western boundary of the landfill site)

- Median and 95th percentile annual and 5-year pH adjusted TAN concentrations were below the national bottom line (NPS-FM, 2020). Note the national bottom line for TAN is set to protect the 20% most sensitive species from toxicity.

- Nitrate-Nitrogen Median and 95th percentile concentrations are within Attribute Band A for both annual and 5-year data (NPS-FM,2020).

- Median 5-year and 20-year pH values were below the ANZG (2018) Default Guideline Value **(DGV)** range of 7.2–7.8), with recorded values as low as 3.8. This sampling location is located upgradient to the landfill where the low pH levels are thought to be influenced by historical coal mines in the catchment. The pH levels increase further downstream to more typical values. The low pH is stated to most likely exclude sensitive aquatic organisms.

- Dissolved Oxygen **(DO)** median concentration is measured at 5.0 mg/L with 44% saturation. This indicates moderate DO stress on aquatic life and therefore likely impacts on fish and invertebrates.

- Median 5-year and 20-year zinc concentrations exceeded the ANZG (2018) hardness corrected 95% protection limits, while the 95th percentile exceeded the hardness corrected 80% protection limits.

- Dissolved boron concentrations exceed the 95% protection limit but remain below the 80% protection threshold (ANZG, 2018).

FH39 – Coal/Christies Creek Convergence (western end of landfill Site)

- Median and 95th percentile annual and 5-year pH adjusted TAN concentrations were below the national bottom line (NPS-FM,2020).

- 5-year and 20-year median pH values were below the acceptable range of 7.2–7.8 (ANZG,2018).

- Median DO concentration is 7.2 mg/L with 64% saturation. This indicates minor DO stress.

- The median 5-year and 20-year zinc concentrations were below the hardness corrected 95% protection limits. The 95th percentile concentrations exceeded hardness corrected 95% protection limits for all sites but not the 80% protection limits (ANZG 2018).

- Dissolved boron concentrations exceed the 95% protection limit but remain below the 80% protection threshold (ANZG,2018).

Figure 6: Map showing the location of surface water sampling points (source: resource application RM24.098).

EW43 – Kaikorai Stream (east of landfill)

- Median concentrations of TAN, DO and Nitrate-Nitrogen are generally within acceptable ranges under the NPS-FM (2020).

- Median 5-year and 20-year zinc concentrations were below hardness corrected 95% protection limits. 95th percentile values exceed the 95% limit but remain under 80% protection thresholds (ANZG, 2018).

- Median 5-year and 20-year dissolved boron concentrations exceeded the 95% protection limits but were below the 80% protection limits (ANZG, 2018).

- The median pH 5-year 95th percentile was within the acceptable range of 7.2–7.8 (ANZG,2018), but the 20-year Median 95th percentile was above this range.

FH40 – Estuary stream through the wetland

- TAN Median annual and 5-year values fall within Attribute Band B. However, the 95th percentile values fall into Attribute Bands C and D, indicating that TAN levels regularly exceed acceptable limits, placing it below the national bottom line.

- The median pH 5-year 95th percentile was within the acceptable range of 7.2–7.8 (ANZG,2018), but the 20-year Median 95th percentile was above this range.

- DO Median concentrations fall within Attributes A and B. This indicates that aquatic organisms are not stressed by oxygen availability (NPS-FM, 2020).

- Median Zinc values are within acceptable limits. 95th percentile values exceed 95% protection but remain under 80% (ANZG, 2018).

- Median 5-year and 20-year boron concentrations exceeded the 95% protection limits but were below the 80% protection limits (ANZG, 2018).

The existing monitoring programme required by the current resource consents do not require the Applicant to sample upstream of the landfill within the Kaikorai Stream (other than FH38 which is directly above the landfill). The Applicant has provided upstream water quality data from external sources and has compared this information to the above monitoring data.

Upper Kaikorai Stream (at Brighton Road)

- The Kaikorai Stream, upstream of the landfill, is a moderately impacted stream, with degrading trends in nutrients (nitrogen and phosphorus), clarity, turbidity and E. Coli.

- The Annual and 5-year 95th percentile concentrations of nitrate-nitrogen and dissolved reactive phosphorus concentrations fall within Attribute Band B (NPS-FM, 2020).

- Upper Kaikorai Stream has the lowest annual and 5-year median pH adjusted TAN concentrations compared to the monitoring sites listed above.

- Median TAN concentrations increased further downstream when compared to the Upper Kaikorai Stream, suggesting that some seepage may be occurring from the landfills (Fairfield and Green Island). However, the annual and 5-year 95th percentile concentrations were higher at Upper Kaikorai Stream at Brighton Road than at EW43 (where the stream adjoins the Fairfield Landfill). The Applicant interprets this as some inputs of TAN occur upstream of the landfills on occasion.

- The 5-year 95th percentile pH adjusted TAN concentration was within Attribute Band C, below the national bottom line (NPS-FW,2020)

- The annual median and 95th percentile pH values at upper Kaikorai exceeded the DGR of 7.2-7.8 (ANZG, 2018). However, the 5-yearly median and 95th percentile pH concentrations in Kaikorai Stream were within the range.

The monitoring data therefore identifies that there is elevated TAN, boron and zinc concentrations in the area's surface water, as well as reduced DO and pH levels. However, the reduced DO and pH levels tend to be associated with Christies Creek (and Coal Creek to a lesser degree) upstream of the landfill and therefore may not be related to the ongoing operation of the landfill. The Applicant concludes that the long-term water quality monitoring shows that the surrounding area's creeks, streams and wetland-estuary complex are degraded, although are relatively stable.

The Applicant additionally notes that the wetland-estuary complex has been negatively affected by a wide range of anthropogenic-derived impacts over the last 100 years, including the Green Island Landfill on the eastern side of the estuary. On this basis, the Applicant has concluded that it is difficult to ascribe the contribution from the Fairfield landfill to the contaminant loading with the existing dataset. Additionally, given the uncertainty on the location of where groundwater emerges as surface water in the wetland-estuary complex and the lack of monitoring data, the Applicant has concluded that the adverse effects on surface water quality cannot be determined with any accuracy.

Technical audit

Dr Pete Wilson of SLR Limited was contracted by ORC to provide technical expertise on the Applicant's assessment on surface water. Dr Wilson reviewed the below documents:

- Technical Assessment of Effects on Groundwater, Surface Water and Ecology, prepared by PDP and dated February 2024;
- Fairfield Landfill Ecological Assessment prepared by PDP and dated March 2025;
- Letter from Applicant titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to the section 92 Request for Further Information,* prepared by Planz Limited and dated 6 June 2025, including:
  - Attachment A: Updated (v2) Resource Consent Application Form.
  - Attachment B: Landfill Monitoring Results (post February 2024).
- Fairfield Aftercare Management Plan (Draft).
- Memorandum titled: Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to Technical Reviews, prepared by PDP and dated 1 October 2025.
- Updated proposed Consent Conditions (Appendix 8), dated 18 June 2025;
- Letter from Applicant titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to Technical Reviews*, prepared by PDP and dated 1 October 2025, including:
  - Appendix 1: Aftercare Management Plan - Proposed Adaptive Monitoring and Response Action Procedure.

Below are summarised comments from Dr Wilson in regard to the Applicant's assessment.

Dr Wilson's full comments can be found in the below documents:

- Technical Memorandum titled: *RM24.098 – WM New Zealand, Fairfield Closed Landfill- Surface water Technical Peer Review,* dated 11 July 2025; and
- Email received from Samantha Isles dated 20 October 2025 RE: Application to be technically reviewed - RM24.098.

General

- In general, the information presented provides a starting point for understanding the effects of stormwater discharges from the landfill on the receiving environment.

- Dr Wilson agrees with the Applicant that the Kaikorai Lagoon Estuary and streams/creeks that feed into the estuary are complex and subject to a number of stressors from the catchment.
- 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.

The Applicant has responded to the above recommendation and provided the below comment:

"The author commented that it would be beneficial to sample for E. Coli and or enterococci for a period of time to assist in determining whether human contact recreation is affected by discharges from the landfill. These are indicators of faecal bacteria, but are found naturally in the environment, particularly in areas in where there are high levels of birds as is the case within the wetland / estuary. Considering the number of other contributing sources of E. Coli and or enterococci into the wetland / estuary, undertaking an assessment of this nature would not provide any reasonable conclusions."

Water quality sampling results

- Dr Wilson considers 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.

- Dr Wilson has generally agreed with the Applicant's statement that long term water quality data of both the wetland swamp and its tributaries showed that while degraded, they are relatively stable.

- According to Dr Wilson, water quality results are indicative of degraded water quality. Time series analysis of the data presented in the s92 Response, generally show few statistically significant long-term trends. Where trends are present, they typically show a decrease in contaminant concentration, with the exception of TAN at location FH39 (discharge from Christies and Coal Creeks). Additionally, sampling results at FH39 shows a long-term increase of 3.1% per annum of TAN, 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 TAN to the receiving environment. Further from the site at FH40, however, the 5-year median TAN concentration is 0.3 mg/L. Dr Wilson states that 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 Lagoon Estuary.

Stormwater management

- Dr Wilson noted that the current management of the stormwater on site is not appropriate. This is on the basis that:
  - That there are no stormwater controls on the Western Landfill; and

  - The cut-off drain on the slope of the Eastern Landfill has either been partially disconnected or is underperforming.

- Dr Wilson noted that the efficacy of the cut off drain should be investigated to ensure the majority of stormwater from the site is diverted to the ponds. If this can be resolved, then Dr Wilson considers the controls for the Eastern landfill to be appropriate.

- It is Dr Wilson's opinion that 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. This would allow an opportunity for mitigation if contaminant concentrations were higher than expected (long-term, not month-by-month).

- Dr Wilson also noted that water quality of all stormwaters from the site should be characterised prior to being discharged to the receiving environment. This should be achieved through diverting all stormwater to ponds and sampling the water routinely. This will allow the quality of stormwater being discharged from the site to be understood over time and allow for more certain assessments of its effects on the receiving environment.

- Dr Wilson considers 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

Note: A meeting was held between the Applicant, ORC and Dr Wilson to clarify aspects of the technical review documents, and to specify what is considered overland flow and what constitutes the discharge of stormwater from the site. Following this meeting, it was agreed by ORC that the Applicant required resource consent for the discharge of water from the North Pond and Weighbridge Pond, and not for the discharge of stormwater or any overland flow path as occurs from the western landfill. On this basis, I have not considered Dr Wilson's comments regarding further stormwater characterisation and suggested controls any further.

Aftercare Management Plan and proposed trigger levels/ response actions

- Dr Wilson is in support of the approach to use total TAN as the key indicator of leachate in surface water and apply trigger values to this parameter.

- Dr Wilson agrees to the Applicant's approach in using the 95% confidence interval of long-term monitoring data to derive trigger values; however, Dr Wilson recommends that such compliance triggers are also applied to monitoring of the North and Weighbridge ponds. In Dr Wilson's opinion, only using FH39 and FH40 as the trigger locations would create high uncertainty, and it would be difficult to link exceedances

of the triggers to the leachate specifically - ultimately making the triggers unhelpful if there is no management response due to uncertainty of the source. Dr Wilson recommends that monitoring of the North and Weighbridges ponds will be beneficial to understand the landfill's effects on the receiving environment

Conclusion

In conclusion, the Applicant finds that the existing water quality of the receiving waterbodies are degraded but relatively stable. The North and Weighbridge Pond are contributors of water into the wetland- estuary complex, however sampling has not been undertaken to characterise this contribution. The Applicant acknowledges that migrating leachate is a contributor of contaminants into the wetland complex but has not been able to quantify what level of effect this may be having on the receiving water bodies. It has been assessed by Dr Wilson that the proposed surface water monitoring programme and adaptive management is generally appropriate.

I acknowledge that leachate contribution into receiving waterbodies will continue to decrease over time, and therefore the adverse effects on surface water quality are expected to also decrease overtime. Additionally, the Applicant has proposed generally suitable adaptive management to address any increase in adverse effects. However, without knowing the existing contribution the landfill is having, either from stormwater or leachate, I am unable to make an informed decision on the level effect on the water quality of the receiving waterbodies.

6.6 Effects on Water Quantity

The leachate interception system abstracts both a component of landfill leachate as well as a component of groundwater. This groundwater is hydraulically connected to the Kaikorai Stream and wetland-estuary complex given the proximity and is therefore also abstracting surface water from these surface water bodies.

Applicant's Assessment

Based on the historical leachate pumping volumes, total annual discharge volumes have fluctuated between approximately 22,000 cubic metres **(m^3)** and 37,500 m^3 between 2004 - 2017 and have been generally declining since 2017. The Applicant anticipates that the reduction in leachate volume is likely related to the closing and progressive capping of the landfill, which is reducing the rainfall entering the landfill generating leachate. Typical average rates of around 2 to 5 m^3/hour have been recorded since 2018, with the exception of the flooding of the wetland area (and pump chamber) which required higher than normal pumping rates to draw water levels back down to normal pumping levels.

A rate of 2 to 5 m^3/hour results in daily volumes of around 48 to 120 m^3/day. The Applicant considers this to be a low volume and has provided an assessment on drawdown effects on neighbouring wells, surface water and saltwater intrusion. This assessment has been summarised below:

Effects on neighbouring well/ water users

The nearest recorded water supply well is located over 1 km southeast of the landfill, and nearby communities (Fairfield, Abbotsford, Green Island, and Waldronville) are connected to a reticulated water supply, making private wells unlikely. Groundwater monitoring data indicates that the leachate interception drain is causing a localised drawdown in shallow monitoring wells. However, the Applicant states that due to the low permeability of the

surrounding marine sediments, this drawdown does not extend far and has minimal effect on deeper monitoring wells. As a result, any groundwater drawdown remains confined to the estuarine sediments near the wetland, and no impact on distant or downstream water supply wells is expected. There are no resource consents to take surface water downstream of the landfill.

Effects on surface water flows

The Applicant states that the abstraction of groundwater is likely to result in a reduction of surface flows within the wetland due to a lower quantity of groundwater discharging to the wetland-estuary complex. The Applicant expects the majority of the groundwater take to comprise groundwater/leachate, but at times when the wetland area is under water, (when the estuary mouth is closed), it is anticipated that a proportion of the take may be sourced from the surface water body because the trench is not lined to prevent ingress of water from areas outside the trench. During high water levels in the wetland, surface water may enter the trench, occasionally overwhelming the system and triggering a pump shutoff.

Given the proximity of the interception drain to the wetland, the groundwater is allocated as a surface water in accordance with Policy 6.4.1A(b) of the RPW. The groundwater take is over the entire 1 km length of the interception drain as opposed to a single point take so its surface water depletion effect would be highly dispersed. The Applicant notes that applying a minimum flow restriction to the water take would be detrimental to the receiving environment given that the purpose of the interception drain is to remove leachate impacted groundwater that would otherwise flow into the estuary.

Effects on saline intrusion

The landfill interception drain is situated approximately 2.4 km inland of the coast. The Applicant predicts that any drawdown effects will be limited to the extent of the shallow estuarine sediments beneath the landfill and downstream estuary. The Applicant does not expect the pumping of the leachate to cause any saline intrusion effects given the very low rate of take, and presence of bedrock outcrop between the site and the coast which is anticipated to act as a barrier to saltwater intrusion. However, the Applicant notes that the estuary can be brackish at times and therefore it is possible that some of this water may be drawn into the drain. The Applicant has assessed that this is not expected to change the saline/freshwater interface near the coast.

The Applicant has summarised these effects and has stated that the effects on groundwater and surface water quantity as a result of the operation of the leachate interception drain during the initial phases of the landfill's aftercare period, are considered to be minimal. As the volume of groundwater (containing leachate) required to be taken reduces over time, as the volume of leachate being generated reduces, then any such effects will also reduce.

Technical audit

- Mr Baker agrees with the Applicant's assessment that effects on groundwater and surface water quantity will be minimal. The volumes diverted by the leachate system are small in comparison to flows within the estuary and Kaikorai Stream. For comparison, the mean flow in the Kaikorai Stream is 368 L/s compared to < 2 L/s for the groundwater/surface water diversion.

Conclusions

I have adopted the Applicant's assessment above and conclude that any adverse effects on water quantity will be less than minor.

6.7 Adverse effects on Ecology

Adverse effects on aquatic ecology are possible through affecting water quality of the nearby receiving waterbodies. As discussed in section 6.5 of this report, the landfill is known to be having an adverse effect on water quality of receiving waterbodies, although the extent of this effect is not conclusively known.

Applicant's Assessment

The Applicant has described the aquatic ecological values of the Kaikorai-Wetland Complex and has provided an assessment of effects on ecological values based off monitoring of sediment, benthic Infauna and water quality. The ecological values associated with the wetland-estuary complex and Kaikorai stream were discussed in section 4 of this report. A summary of the ecological assessment is provided below:

- The estuary exhibits a highly dynamic hydrological state, alternating between open and closed conditions. This results in periodic changes in salinity, which influence the baseline chemistry of the estuary and its tributaries, including the chemical composition of incoming contaminants.

- The discharge of leachate into the estuary may reduce water and sediment quality, as indicated by elevated TAN, boron, and zinc, along with decreased dissolved oxygen and pH. These changes can cause chronic, non-lethal toxicity to aquatic organisms, shift communities toward pollution-tolerant species, and trigger behavioural avoidance of degraded water.

- High nutrient concentrations in waterbodies near the landfill suggest that eutrophication effects could be occurring. The potential effects of eutrophication include the promotion of algal blooms and fine sediment, particularly when the lagoon is closed, or flows are low. However, estuarine assessments have found limited macroalgae and scarce epifauna, which suggests that at least some parts of the estuary are either well flushed, don't have eutrophication issues, or lacks the intertidal space for these flora and fauna to live and grow.

- The most prominent indicator that suggests leachate from the Fairfield Landfill is impacting surface waterbody ecology is the presence of TAN. TAN concentrations were noticeably higher in the upper estuary and in the lower reaches of Christies Creek and Coal Creek. pH levels were also more acidic at sites nearer the landfill, which is another potential indicator of leachate effects. Despite increased TAN concentrations, the slightly acidic conditions reduce the proportion of toxic ammonia and therefore reducing the magnitude of aquatic toxicity effects exhibited by the high TAN. However, even with this mitigating effect, TAN levels still exceed ANZG (2018) and NPS-FM 2020 chronic toxicity thresholds for aquatic fauna with chronic exposure.

- Total and dissolved metal concentrations in water and sediments were more variable across sampling sites. Given the influence of industrial and urban stormwater on streams and Kaikorai Estuary, it is difficult to ascertain the relative

contribution of the landfill to elevated metal concentrations. Iron concentrations in water and sediment tended to be highest nearer the landfill, but there were no distinct upstream-downstream patterns observed.

- Ecological monitoring, and desktop analyses, found that an array of 'at risk' and 'threatened' bird and fish species inhabit the waterways near the landfill. Notable bird species include black stilt (Nationally Critical), black-fronted tern (Nationally Endangered), and red-billed gull (Declining). Fish species identified included shortfin and longfin eel, īnanga, kōaro, banded kōkopu, and pātiki/black flounder. The presence of diverse bird and fish species highlight the estuary's role in supporting habitat for high conservation species, including as feeding, rearing and breeding grounds. Some are also considered as taonga, illustrating the cultural significance of the environment.

- Benthic macroinvertebrate and estuary infauna surveys indicated that the health of aquatic communities is being negatively impacted by catchment land uses. Macroinvertebrate indices reflected communities indicative of 'probable severe pollution', however it is likely that habitat degradation (particularly deposited sediment) is having a major influence on community health. The benthic infauna results indicate a gradient of ecological conditions in the estuary influenced by both freshwater and tidal influences, and sediment composition. The upper estuarine sites were dominated by species tolerant of degraded water quality, whereas the central estuary had a greater saline influence and supported a higher diversity of estuarine and marine species. The presence of pollution tolerant species at upper estuary sites suggests environmental stress likely linked to sediment-bound contaminants.

- On occasions, elevated TAN concentrations may act as a barrier to fish migration. The presence of nationally vulnerable fish and bird species indicate that, at least, parts of the swamp and its tributaries, support high ecological values and high rarity/distinctiveness. Due to the Very High Ecological Value of the wetland swamp, the magnitude of any effects of ongoing leachate seepage (roughly between 0.6% to 4.6% of leachate generated) would be considered to be higher than in the estuary, or the tributaries.

The Applicant summarises by noting that overall, the patterns seen in ecological communities in the vicinity of Fairfield landfill are heavily influenced by a range of catchment land uses and therefore it is difficult to determine the relative contribution of landfill leachate on poor ecosystem health, compared to other activities.

Heavy metal and other contaminant concentrations are variable, however high ammonia levels measured at monitoring sites are indicative of landfill-based leachates entering the environment. Ammonia is highly toxic to aquatic biota and therefore the Applicant concludes that the landfill is likely having at least a localised detrimental effect on stream and estuary ecosystems.

The Applicant has proposed on-going monitoring during the aftercare period, as outlined in the ACMP and updated volunteered conditions, to be able to exam longer-term trends in environmental conditions and to monitor adverse effects. This was discussed in section 3.3 of this report.

Technical audit

Elizabeth Morrison of SLR Limited has provided technical expertise on the Applicant's assessment on ecology. Ms Morrison reviewed the below documents:

- Technical Assessment of Effects on Groundwater, Surface Water and Ecology, prepared by PDP and dated February 2024;
- Fairfield Landfill Ecological Assessment prepared by PDP and dated March 2025;
- Letter from Applicant titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to the section 92 Request for Further Information,* prepared by Planz Limited and dated 6 June 2025, including:
  - Attachment A: Updated (v2) Resource Consent Application Form.
  - Attachment B: Landfill Monitoring Results (post February 2024).
- Proposed Consent Conditions (Appendix 8) (Updated 13 June 2025).
- Fairfield Aftercare Management Plan (Draft).
- Fairfield Landfill Ecological Assessment prepared by PDP and dated March 2025;

Ms Morrison's full comments can be found in the below document:

- Technical Memorandum titled: *RM24.098 – WM New Zealand, Fairfield Closed Landfill- Ecology Technical Peer Review,* dated 11 July 2025.

General

- A thorough assessment has been provided based on a desktop assessment of the Kaikorai Stream, wetland and estuary receiving environment as there is a wealth of information and monitoring data available for these areas, as summarised in the initial technical report. The additional site monitoring undertaken in late 2024 as part of the ecological assessment provides a more detailed assessment of current status of the environment using industry recognised metrics. The ecological assessment clearly indicates the methods used, where data was collected from and how it was analysed. This has been used to better understand the current ecological values, has considered wider catchment influences and those impacts that are more likely to be attributed to the landfill. Ms Morrsion states that the scope and scale of the ecological assessment is considered appropriate for the size and scale of the proposal.

- Ms Morrison notes that the Applicant clearly identified all receiving waterbodies adjacent to the site potentially impacted by the landfill. The assessment provided descriptions of macrofauna, vegetation, fish and birds in these habitats but with strong emphasis on the Kaikorai stream and wetland-estuary complex.

Ecological values and effects assessment

- Ms Morrison agrees with the Applicant's assessment of the ecological values of the Kaikorai wetland-estuary complex and stream tributaries as very high and high, respectively. Ms Morrison additionally notes that there was a lack of information on the Christies and Coal Creeks such that they were unable to ascertain the ecological values of these.

- Ms Morrison notes that ecological effects will mostly be associated with leachate discharge to the receiving freshwater and environments, namely the Christies/Coals Creeks and Kaikorai Stream and Lagoon. This is in agreeance with the Applicant's assessment.

- Cumulative effects have not been discussed from an ecological perspective, however, in Ms Morrison's opinion, given the landfill is closed with no new direct ecological impacts, the cumulative effects are not a significant consideration for flora or fauna. Continued monitoring is proposed and recommended to determine any cumulative impacts on sediments and surface water quality.

Note: I have interpreted Ms Morrison's comments to mean that any ongoing ecological effects are expected to be consistent with those already occurring.

Adaptive Management

- Ms Morrison notes that the Applicant has provided a suitable baseline data to assess flora and fauna in the receiving environment to track any changes over time and whether leachate is having ongoing impact on the species present. This monitoring programme has been expanded to include not just surface water monitoring sites in Kaikorai Stream and Lagoon but also to include the Coal and Christies Creek sites.

- Sediment and water quality results were compared against ANZECC and ANZG (2018) guideline values in the Ecological Assessment, although comparison of results against similar threshold levels for contaminants has not been recommended or referred to in the proposed monitoring conditions. Ms Morrsion notes that it is important to ensure that should impacts be observed as part of monitoring, that appropriate actions are undertaken to manage any observed adverse effects on the receiving environment. Thresholds to protect aquatic fauna need to be incorporated into the aftercare management plan. It is also suggested that a feedback loop is incorporated into the aftercare management plan and that potential corrective actions are outlined should these be required.

- Adaptive management is considered appropriate as the need for potential corrective actions (if any adverse changes are noted in groundwater surface water and leachate) should also reduce to the point that further management actions should not be required in the long term. If a reduction in contaminants is not observed corrective measures (to be determined) should also be integrated into aftercare management. Corrective actions have not been outlined in the proposal.

The Applicant has responded to the above comments on the ACMP and proposed adaptive Management. The Applicant has provided the below comments:

"The proposed AMP does state that corrective action will occur if an 'adverse change' is identified, however, there is uncertainty as to the definition of 'adverse change'. In response to this WM has developed a set of trigger levels and action responses."

"The proposed trigger levels have focused on total ammoniacal nitrogen as the key indicator parameter. This is recognised in the industry as one of the key indicators for leachate and has been shown to be statistically significant in the existing monitoring dataset. It is proposed that the trigger levels are set for short-term spikes and long-term trends for groundwater monitoring results, and short-term spikes are used for surface water monitoring. It is considered that the monitoring programme, and associated trigger levels, will provide effective oversight of potential adverse ecological effects."

Note: Ms Morrison was not asked to review the Applicant's revised trigger levels and proposed trigger actions. This is on the basis that the trigger levels relate to groundwater and surface water only. As discussed in section 6.4 and 6.5 of this report, Mr Baker and Dr Wilson generally agrees that the trigger levels and proposed trigger response actions were appropriate.

Conclusion

The wetland-estuary complex and stream exhibit complex hydrological and ecological conditions influenced by both natural processes and multiple catchment land uses. Elevated total ammonia nitrogen (TAN) concentrations, reduced pH, and variable metal levels indicate that landfill leachate is likely entering the aquatic environment and contributing to localised water quality degradation. These conditions may be causing chronic, non-lethal effects on aquatic organisms and shifts toward pollution-tolerant species. Additionally, the presence of threatened bird and fish species highlights the high ecological value of the area, and therefore even minor leachate discharges may pose significant risks to sensitive habitats.

The Applicant has proposed generally suitable adaptive management measures to address any increase in adverse effects. However, the specific contribution of landfill leachate relative to other sources remains unknown, and the Applicant has not provided a conclusion on the level of ecological effects arising from the continued management of the landfill. Consequently, I am unable to make an informed determination regarding the level of effect on the ecology of the receiving waterbodies.

6.8 Amenity values

Potential adverse effects on landscape and natural character values and visual amenity from the aftercare of the landfill include modification of the character and quality of the landscape, and visual amenity effects manifesting from these changes, as well as changes to the natural elements, patterns, and experiential qualities or naturalness of an area.

Applicant's assessment

The natural character of the wetland-estuary complex as it now exists, will not be affected by the activities associated with this application as landfilling, and thus landform modification and/or reclamation of the Wetland, or Estuary, is not associated with this application. For the same reason, the area's existing visual amenity will not be affected by this proposal.

In the context of other amenity values, there is the potential for odour to be associated with the landfill gas. However, given the present flaring of the gas, and the fact that the generation of landfill gas will diminish during the aftercare period to a level whereby the site transfers to a passive system (when gas levels are minimal), it is considered that the amenity values of the area's air resource will be at least maintained, if not improved during the term of the resource consents being sought. Adverse effects related to odour and gas flaring are discussed in section 6.9 of this report.

Conclusion

The wetland–estuary complex and the Kaikorai Stream at this location are not known to support any significant recreational or amenity values. The majority of the wetland lies on land owned by the Applicant, and no public access or recreational use has been identified. Any existing amenity values associated with the wetland–estuary complex and Kaikorai Stream are unlikely to be further affected beyond the current level of modification, and no

changes are proposed that would alter the existing visual landscape. Adverse effects relating to odour and gas flaring are discussed in Section 6.9 of this report, where it was assessed that such effects will be less than minor.

Overall, I consider that adverse effects on amenity values associated with the site, the wetland–estuary complex, and the stream at this location will be less than minor.

6.9 Effects on air quality

Potential air quality effects from the continued operation, expansion, closure, and aftercare of the landfill include odour, dust, combustion emissions, and lateral migration of LFG from the landfill.

Applicant's assessment

Tonkin & Taylor Limited on behalf of the Applicant has prepared a technical report to assess the potential adverse air quality effects associated with the closed landfill. The relevant information and assessments have been adopted for the purposes of this assessment and has been summarised below.

The Applicant has assessed that the main potential discharge to air from closed landfills is Landfill Gas **(LFG)**. LFG is generated as organic waste decomposes and consists mainly of methane **(CH_4)** and carbon dioxide **(CO_2)** with trace amounts of odorous reduced sulphur compounds (including hydrogen sulphide) and other volatile organic compounds. Odour emissions may also arise from exposed areas of the landfill, although the Applicant has estimated that this to be a rare occurrence associated with possible maintenance of the cap or the LFG collection system. At the time of the preparation of the air quality assessment, no planned maintenance of the cap or the LFG collection system that is expected to expose waste is expected to occur. Based on the environmental setting of the Fairfield Closed Landfill, the Applicant has assessed odour to be the main potential adverse effect from discharges to air beyond the site boundary.

A dispersion modelling assessment has been carried out by the Applicant which specifically focuses on the discharge of PM_{10} emissions that arise from the combustion of LFG at the Eastern Landfill. This assessment was additionally undertaken to demonstrate that the application need not be declined under Regulation 17 of the National Environmental Standards for Air Quality **(NESAQ)**. The dispersion modelling assessment does not consider other combustion products (such as nitrogen oxides, sulphur dioxides and carbon monoxide) due to the very low level of discharge and expected negligible off-site effects.

Effects related to odour

Odorous compounds within LFG are primarily generated from anaerobic decomposition and sulphur reduction processes. The combustion of LFG in a flare controls the odorous compounds and is a primarily means of odour control while LFG generation rates are high. The purpose of installing the LFG collection system and flares is to capture and destroy the methane and odorous components of the LFG.

Potential odour and aerosol spray drift effects associated with the closed landfill have been assessed by the Applicant in accordance with the 'Good Practice Guide for Assessing and Managing Odour'[4] (MfE, 2016). The assessment uses an objective framework for evaluating whether odours are likely to be offensive or objectionable. This involves assessing the

[4] https://environment.govt.nz/assets/Publications/good-practice-guide-odour.pdf

potential odour effects in terms of the frequency, intensity and duration of impacts at sensitive locations, taking into account the offensiveness (or character) of the odour.

Table 3: Description of the FIDOL factors (Source: MFE Guidelines Table 3)

Frequency	How often an individual is exposed to the odour.
Intensity	The strength of the odour.
Duration	The length of exposure.
Offensiveness/character	The character relates to the 'hedonic tone' of the odour, which may be pleasant, neutral or unpleasant.
Location	The type of land use and nature of human activities in the vicinity of an odour source.

The Applicant's FIDOL assessment is provided below:

Frequency

The frequency of odour experienced beyond the boundary of the site depends on the frequency of odour emissions from the site and the frequency of wind conditions that could transport the odour towards sensitive receptor locations.

The most significant potential source of odour is uncontrolled LFG from the Eastern Landfill. During normal operation, odour from LFG emissions is not expected as the flares will be in operation. The nearest current or proposed sensitive receptor is adjacent to the western boundary. However, these locations are not frequently downwind of the landfill. Furthermore, due to the topography, sensitive locations will not be downwind of the landfill under worst case katabatic wind conditions. Upset conditions are expected to be very infrequent due to the landfill being closed and capped.

Three flares have been installed to allow for contingency of flaring operations during the landfill's aftercare period. Flaring of LFG is expected to continue until such time that there is not enough LFG being generated to sustain a single flare, at which time the issue of LFG odour will also be significantly diminished.

The frequency of odour exposure for the nearest sensitive location is considered to be very infrequent due to the infrequent emission of odour.

Intensity

The intensity of odour at a receptor depends on emission strength at the source and the degree of dispersion of the emissions between the source and receptor location. Based on industry knowledge, odour emissions are expected to be negligible beyond the boundary. This is due to the capping of the landfill enabling the extraction and flaring of LFG.

The topography of the site and surrounding area also means that sensitive activities are uphill of the landfill and will therefore not be downwind during worst case meteorological conditions (katabatic winds) when there is poor dispersion and dilution of any odours.

	Therefore, during normal operations, odour emissions are expected to be of very low intensity at the nearest sensitive receptor location. During upset conditions (such as infrequent failure of the extraction system and flare), the intensity of LFG is expected to be very low beyond the boundary of the site due to the distance between the landfill area.
Duration	The duration of odour exposure at a receptor location depends on both the duration of the odour discharge and the duration of persistent weather conditions that carry odour towards sensitive receptors. As discussed in the Intensity section, odour emissions from the site are managed through maintaining the landfill cap and LFG control system. The duration of odour emissions beyond the site is expected to be of very low duration due to the management practices employed on the site.
Offensiveness	Odour from a closed landfill of this age is expected have a hedonic tone of mercaptans (similar to natural gas tracer) and to be of moderately negative hedonic tone. Accordingly, the offensiveness of odour associated with LFG is moderately unpleasant.
Location	The residential receptors immediately surrounding the site are expected to have a high sensitivity to odour emissions. The nearest existing receptor with a high sensitivity is a residential dwelling located adjacent to the western boundary of the site in a residential zone (approximately 225 m from the flares). The undeveloped land immediately to the north of the site is also zoned for residential use (the nearest zone boundary to the north is approximately 150 m from the flares).

Given the above evaluation of the FIDOL factors, the assessment of effects of odour emissions has been summarised below:

- The offensiveness or hedonic tone of uncontrolled LFG emitted from the site is expected to be moderately unpleasant.

- However, the frequency, intensity and duration of odour exposure at receptors with high sensitivity is considered to be very low. This is principally due to the fact that the landfill is closed and the management practice of capping the landfill and collecting and flaring the LFG.

- The design of the gas collection and flaring system also provides for a significant degree of redundancy, meaning one of the three flares can be taken off-line for maintenance or repairs without affecting the ability to adequately flare the gas.

- Cumulative odour effects from the nearby Green Island Landfill and WWTP are not expected due to the odour effects from the Fairfield Closed Landfill being very unlikely.

The Applicant concludes that offensive or objectionable odour effects beyond the boundary of the site is very unlikely to occur. This conclusion is supported by the absence of recorded

complaints relating to the site and industry experience with other closed landfills with similar controls.

Particulate matter and air shed considerations

As discussed above, the main contaminant discharged with the flaring of gas is particulate matter, namely PM_{10} (particulate matter less than 10 microns in diameter). PM_{10} is a combustion product that is generated as a result of the flaring of landfill gas at the site. The dispersion of contaminants from the landfill flaring have been estimated by the Applicant using the CALMET/CALPUFF (Version 7) dispersion model. This is an appropriate methodology for this application as it provides for complex terrain and meteorology.

The modelling showed that the offsite maximum 24-hour average PM_{10} concentration predicted to occur at the site boundary is 0.4 micrograms per cubic metre **($\mu g/m^3$)** for a scenario where all three flares are combusting LFG simultaneously at their maximum design gas flow rate. A contour plot showing the maximum 24-hour average PM_{10} concentration is provided in Figure 7 below.

The modelling results are based on gas flow rates to support the operation of three flares operating at the same time and at their maximum capacity. However, only two flares are expected to operate at the same time. Therefore, the Applicant states that the model scenario is considered to be very conservative. The potential effects of other combustion products are expected to be negligible. This conclusion is supported by the very low predicted PM_{10} concentrations.

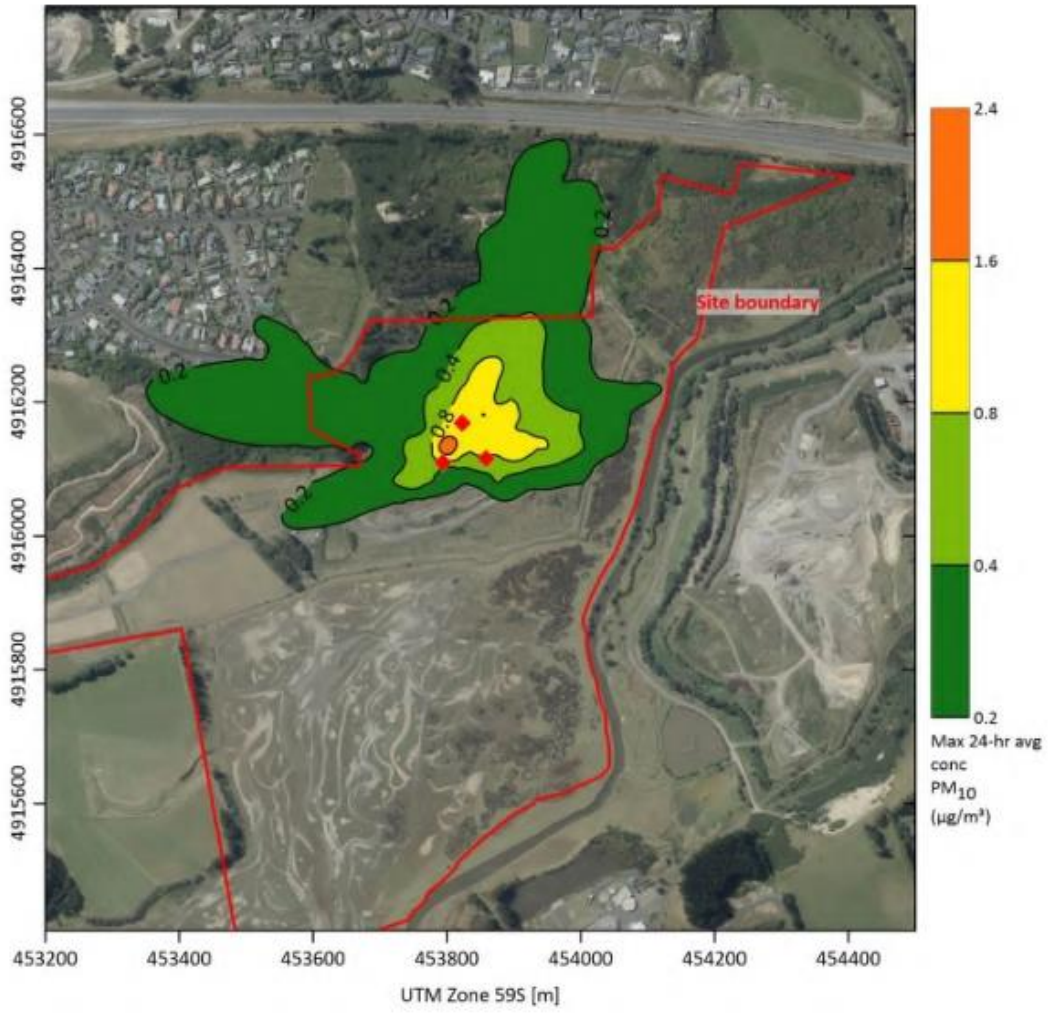

Figure 7: Maximum predicted 24-hour average PM10 ground level concentration (resource application RM24.098).

Migrating landfill gas

Adverse effects related to migrating LFG has been assessed by PDP. Municipal landfills produce appreciable amounts of gas within 1 to 3 years of placement of waste material, with peak gas production occurring around 5 to 10 years. The majority of LFG is produced within 20 years after waste is disposed of, however, small quantities of gas may continue to be emitted from a landfill for 50 or more years. Different portions of the landfill might be in different phases of the decomposition process at the same time, depending on when the waste was originally placed in each area.

The Western Landfill area ceased receiving waste from around 1996 meaning waste in this area is at least 27 years old and near the end of the LFG production cycle. The Eastern Landfill area ceased receiving waste in 2017 and was subsequently capped so this landfill area will be in peak LFG production at the moment and will continue to produce high levels of LFG for the next 3 to 5 years, with LFG production likely for the next 20 years requiring management. As discussed above, the Eastern Landfill area has active an LFG collection and destruction.

The Applicant notes that LFG migration occurs as the gases fill and move through the available pore spaces and will follow the path of least resistance. Low permeability soils and water bodies act good barriers to migration. The natural tendency of LFG that are lighter

than air, such as methane, is to move upward. The shape of the Eastern Landfill (dome) and presence of the LFG collection system will mean the majority of the LFG produced in this part of the landfill will rise through the waste and will be collected/removed. It is only when the upward movement of LFG is inhibited by densely compacted waste or landfill cover material (e.g., by daily soil cover) that the gas tends to migrate horizontally.

The Applicant has assessed that the risk to nearby residents from subsurface LFG migration from the landfill areas is acceptably low.

Cumulative effects

The most notable other source of odour in the receiving environment is the municipal landfill operated at Green Island, which is located opposite the Fairfield Closed Landfill on the eastern side of Kaikorai Stream. The Green Island landfill is understood to have resulted in a number of odour related complaints from the wider community and is likely to dominate any odour impacts in the community surrounding the Fairfield Closed Landfill. The Green Island municipal wastewater treatment plant is also a potential source of odour and is located approximately 550 m to the southeast of the site.

The Applicant has assessed that cumulative odour effects are expected to be negligible due to the very low / negligible odour effect of LFG emissions from the Fairfield Closed Landfill.

With regard to cumulative effects related to particulate matter, the predicted maximum offsite concentration of 0.4 µg/m^3 (24 hour average) is considered to be negligible and is well below the concentration that could be detected using reference standard PM_{10} monitoring instruments. The Applicant therefore considered that any cumulative effects will be negligible.

Technical audit

The Air Quality Assessment as well as relevant sections of other technical reports, were audited by John Iseli, Air Quality Specialist, at Specialist Environmental Services Limited **(SES)**. Full comments can be found in the following memorandum:

- Technical Memorandum titled: *Technical Review of the Assessment of Effects of Discharges to Air: Waste Management Fairfield Closed Landfill*, dated 8 August 2024.

A summary of the audit comments is provided below.

Sensitive receptors

- Mr Iseli notes that the nearest existing sensitive receptors (dwellings at the end of Blanc Avenue) have been appropriately identified. These dwellings are located to the northwest of the Eastern Landfill.

- The land immediately north of the Eastern Landfill has been zoned residential and will likely be developed in future. The southern boundary of this residential zone has similar elevation to the northern extent of the landfill where some LFG monitoring currently occurs to assess potential LFG migration. Mr Iseli considers that this residential land has the highest potential to experience any odour associated with LFG during drainage flow conditions, due to proximity and elevation.

General

- Mr Iseli is satisfied that the technical information is sufficiently robust given the scale and significance of the discharge.

Odour effects

- Mr Iseli agrees that odour emissions from the nearby active Green Island landfill and the wastewater treatment plant are likely to dominate local odour impacts. Complaints have been recorded in relation to the active landfill discharge.

- The assessment of FIDOL factors undertaken by the Applicant is generally appropriate in relation to existing sensitive receptors, however he does not consider it appropriate in relation to the residential area immediately north of the Eastern Landfill that will be developed in future. This area has potential to be affected by drainage flows from the Eastern landfill.

- Based on the available information, Mr Iseli agrees that objectionable or offensive odour effects are unlikely to occur beyond the site boundary. This conclusion is supported by the following:
  - The monitoring to date indicates that lateral migration of LFG is limited.
  - The Eastern Landfill is capped, and LFG capture and flaring occurs in accordance with good practice.
  - The provision of three flares includes a redundancy component to allow maintenance/repairs of a flare if necessary.
  - Complaints have not been received in relation to the existing discharge from the closed landfill.
  - The Eastern Landfill has now been closed for 7 years, and it is expected that LFG production will gradually decline over time, with a change to passive venting in the order of 20 years after closure.
  - Observations during the site visits.

- Given the mitigations proposed (LFG capture and flaring), Mr Iseli considers that the contribution from the closed landfill to cumulative effects of odour is likely to be small.

Dispersion modelling

- Mr Iseli considers that the modelling approach is appropriate in this case, given the complex terrain and proximity to the coast. Standard default assumptions were adopted in the model.

- The maximum off-site PM_{10} concentrations are relatively small at 0.4µg/m^3. This is consistent with expectations given the small scale of the emission sources that are central to the Eastern Landfill site.

- Mr Iseli agrees that modelling indicates that Regulation 17 of the NES-AQ does not restrict granting of consent.

- The modelling assumed that all three flares are operating at maximum capacity continuously. Mr Iseli agrees that this is likely to result in conservative predictions and actual concentrations at neighbouring properties are expected to be less.

- Mr Iseli agrees that dispersion modelling assessment for combustion products such as nitrogen oxides, sulphur dioxides and carbon monoxide is not required due to the very low level of discharge and expected negligible off-site effects.

LFG migration

- The PDP report concludes that "the risk to nearby residents from subsurface LFG migration from the landfill areas is acceptably low". Mr Iseli notes that it is unclear if this conclusion also applies to future residents on the residentially zoned land to the north of the site.

- Mr Iseli notes that limited monitoring has occurred to assess potential lateral migration from the Eastern Landfill to the north, towards the residential zoned land most at risk. Wells MW1-3 are within the northern edge of the landfill so do not provide relevant data for this purpose. Sentinel well G34 is located further north, beyond the landfill, and provides relevant information. PDP note that monitoring at this well since 2006 shows no obvious signs of subsurface migration (maximum 0.3% CH4). Mr Iseli notes that one measurement at this well in January 2019 recorded 4ppm H2S and 180ppm CO, but the corresponding CH4 result was small. Similar, slightly elevated H2S and CO readings were taken at G36 (cesspit) and G36 (basement) on the same date.

- Based on the above, Mr Iseli considers that it would be appropriate to include two additional LFG monitoring wells) screened to at least 3m deep along the northern site boundary of the Eastern Landfill. This recommendation was based off the limited information to date and the likely future development of the residential zone to the north. Suggested monitoring location were provided by Mr Iseli. Mr Iseli noted that the monitoring of these wells would allow further confirmation that the risk of subsurface migration is low, prior to residential development occurring.

The Applicant has adopted the above recommendations from Mr Iseli. The Applicant has advised that the existing well LS21A, which lies to the north of MW3, can be used as a landfilling gas monitoring well given it is screened above the water table. On this basis, the Applicant proposes to install one additional monitoring which will be located to the north of MW1.

- Mr Iseli notes that the monitoring undertaken at sentinel well G34 indicates that lateral migration of LFG towards the residential zone to the north is not significant. Provided that additional LFG monitoring occurs at the northern boundary of the Eastern Landfill, Mr Iseli considers that there will be sufficient information and monitoring to support the conclusion that existing and future sensitive receptors are likely to experience less than minor odour effects.

Conclusions

It has been concluded that the adverse effects on any existing sensitive receptors are less than minor. However, there is uncertainty on the level of adverse effects on any sensitive receptors that may be developed in the future to the north of the landfill. Mr Iseli has recommended additional monitoring locations to monitor the adverse effects on these potential sensitive receptors and it is acknowledged that the Applicant has adopted this recommendation. On this basis, I concur with the Applicant's assessment and consider that adverse effects related to odour, LFG migration and LFG combustion will be less than minor. This assessment is based on the basis that:

- Adverse effects on any existing sensitive receptors are considered to be less than minor;
- No sensitive receptors to the north of the landfill exist at the time of writing this report and therefore I have only considered the existing receiving environment; and
- The Applicant has adopted recommended measures to quantify any adverse effects on these future sensitive receptors.

6.10 Effects due to the diversion of water and the defence against water

PDP has prepared an assessment on natural hazards and climate risk associated for the application. The relevant information and assessments have been adopted for the purposes of this assessment and has been summarised below.

The Applicant has identified a number of potential hazards associated with climate change and rising sea level. The key risks and implications of the landfill have been summarised below

- Temperature increasing, dry periods and strong wind. This may result in:
  - Cracking (desiccation) of the cohesive landfill cap and over time deeper cracks could allow the emission of landfill gas to atmosphere.
  - Cracks could also form migration pathways for stormwater during the rainfall events and potentially increase the levels of leachate generation.
  - Strong winds, when combined with warmer average temperatures, may result in increased drying of the landfill cap.

- Increased mean rainfall, extreme rain events. This may result in:
  - Groundwater levels becoming elevated, with temporary or permanent inundation of the landfill toe possibly threatening the integrity of the foot of the landfill's southern slope and the landfill face above.
  - Increased pumping of leachate from the interception drainage system or possible overwhelming of the capacity of the system.
  - Erosion risk, and threat to slope stability and integrity of landfill cap. Risk of a landfill breach (i.e., leachate release).
  - An increased frequency of low periods of barometric pressure may promote additional landfill gas migration.

- Changes in river flows. This may result in:
  - Flooding of Kaikorai Stream could result in low velocity flood waters. Considered limited potential for erosion of the Eastern Landfill area.
  - Possible inundation of the landfill toe and leachate interception drainage system. Potential increase in frequency of flooding of the pumping chamber resulting in shutdown of the pump (potential for leachate to flow directly into the wetland/estuary).

- Sea level rise. This may result in:
  - Temporary or permanent inundation/ flooding of the toe of the landfill, existing perimeter access road and leachate interception drain system.
  - An increase in the volume of pumping/ discharge from the interception system and possible more frequent flooding of the pumping chamber may result in

shutdown of the pump (potential for leachate to flow directly into the wetland/estuary).
  - Increased sea level may cause regression of Kaikorai Stream leading to higher groundwater levels along the eastern side of the landfill.
  - Increased water levels could threaten the stability of the toe of southern and eastern slopes.

- Storm surges, king tides and waves. This may result in:
  - The implication is that increased rates of overtopping/erosion may occur at the base of the southern landfill slope.
  - Such erosion could at worst result in a landfill breach (i.e., leachate release, exposure of landfill material).

The hazard assessment identified that the primary risks/implications associated with climate change is the risk of changes to the integrity of the cap associated with changes of temperature (cracking), erosion, subsidence, slumping or slope stability resulting in exposure of waste, leachate breach or landfill gas emissions; and increased water levels, flooding and inundation of the leachate interception drain and pumping chamber resulting in shutdown of the pump (potential for leachate to flow directly into the wetland/estuary).

To reduce the risks/implications associated with climate change, the following actions have been recommended by PDP:

- Frequent surveillance including visual inspections, data evaluation, and reporting on the condition of the landfill be undertaken to ensure the integrity of the landfill is maintained. This is reflected in the draft ACMP and proposed conditions.

- Maintenance of the landfill cap, stormwater runoff collection and leachate collection. This is reflected in the draft ACMP and proposed conditions.

- Increasing the height of the perimeter road to minimise inundation of the leachate system and provide further protection of the landfill toe and improve slope stability.

- Placement of armouring/rock on the perimeter road protection to mitigate potential wave generated erosion.

The raising of the perimeter road requires a land use consent for the alteration of a defence against water, and the diversion of flood waters around the raised perimeter road requires a water permit to divert water. It is noted that the Applicant originally did not apply for these resource consents, however, ORC considered that these additional consents were required and a request for these additional consents was requested via section 91 (1) of the RMA.

The Applicant initially did not agree that these additional consents were required, but did respond to the s91 request and apply for the consents.

The risks associated with diversion of water and the construction of a defence against water may include (but are not limited to):

- Flooding of the surrounding environment due to changes in existing flow paths;
- Changes in water levels of the Christies Creek, Coals Creek, Kaikorai Stream/ wetlands complex;

- Loss of river/channel bed of the Christies Creek, Coals Creek, Kaikorai Stream/ wetlands complex; and

Applicant's assessment

The Applicant included a brief assessment of effects for these additional consents. This is summarised below:

- It is feasible that another solution (other than increasing the height of the perimeter road and adding scour protection) may be identified as the best option and therefore it is the Applicant's opinion that resource consent to construct a defence against water and for the division of water may not be required.

- Carrying out the height increase, and armouring will not result in the loss of any channel or bed of the stream/wetland/estuary.

- The 'diversion' of water associated with the potential establishment of the 'defence against water' will not result in any loss of water from the Kaikorai Stream or Kaikorai Lagoon Swamp.

- The intent of the proposed 'defence against water' is to provide for site-specific protection against natural hazard and climate change risks, and therefore given that the proposal does not entail an increase in the footprint of the landfill, but aims to ensure that high water levels and flows are retained within the stream and wetland, it is anticipated that there will be no increase to flooding risk in the broader area. This will be subject to confirmation by way of the modelling / assessment required by volunteered conditions of consent.

The Applicant has volunteered the below conditions of consent and advice note to address any uncertainty in the potential adverse effects as a result of the altered defence against water and diversion of water:

"If this consent is to be given effect to, the design of the 'defence against water', including a description of the construction methodology and timeframes, is to be provided to the ORC, for certification, prior to any construction works commencing."

"Within two years of the grant of this resource consent, the Consent Holder must complete an assessment and/or modelling, and a design, for proposed mitigation works. The purpose of these mitigation works is to minimise the inundation of the leachate management system and to protect the landfill toe and landfill stability from the adverse climate change effects associated with the increased occurrence of high estuary levels and/or wave generated erosion.

***Advice Note:** At the time this resource consent was processed, an identified solution for the mitigation works is to increase the level of the site's perimeter access road and put in place associated protection/armouring works. An alternative solution/s, that achieves the purpose of this condition, maybe identified as part of the assessment and/or modelling required by this condition. For this reason, a specific solution has not been identified within this condition."*

The Applicant did not supply any modelling or other sufficient supporting information to support their assessment, and therefore a request for Further Information under s92 of the RMA was sent to the Applicant. The Further Information Request asked for:

- Modelling of any diverted surface water flows that will occur as a result of the increase in height of the landfill's perimeter access road; and
- An updated assessment of effects using the results of the modelling.

The Applicant did not supply this requested information. The Applicant noted in their s92 response the below:

"*the potential 'defence against water' will only be implemented if, as outlined in the proposed 'Mitigation – Effects from Climate Change' consent condition, the results of the required modelling / assessment recommends that raising the height of the perimeter road is the best practicable option to mitigate future climate change (and natural hazard) risks on the closed landfill. On this basis, being required to undertake modelling to assess the effects of any associated surface diversion, when the activity itself may or may not proceed, and even if it does proceed where it has not been designed, is considered onerous and inappropriate at this point in time.*

However, it is acknowledged that an appropriate assessment of the proposal as a whole, including the effects of the activity (as part of identifying the best practicable option for mitigating the effects of climate change), is required before being able to proceed with the installation of the proposed 'defence against water' (if that is the solution identified). This requirement is reflected in the proposed 'Mitigation – Effects from Climate Change' conditions, as well as the outline of proposed conditions to be attached to the 'defence against water' land use consent. "

I note that the Applicant has applied for these additional resource consents, and therefore ORC cannot consider the possibility of the Applicant not exercising the consent.

<u>Technical audit</u>

Tim Baker of SLR Limited was contracted by Council to provide technical expertise on the Applicant's assessment of effects related to the defence against water and diversion of water. Mr Baker reviewed the below documents:

- Technical Assessment of Natural Hazard & Climate Assessment, prepared by PDP and dated February 2024;
- A s91(1) Further Information Letter titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to the section 91 Deferral Pending Application for Additional Resource Consents*, prepared by Planz Limited and dated 10 March 2025, including:
  - Attachment A: Updated (v2) Resource Consent Application Form.
  - Attachment B: Landfill Monitoring Results (post February 2024).
- Fairfield Landfill Ecological Assessment prepared by PDP and dated March 2025;
- Letter from Applicant titled: *Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098) Response to the section 92 Request for Further Information,* prepared by Planz Limited and dated 6 June 2025, including:
  - 2024 Environmental Monitoring Report, dated 24 April 2025;
- Proposed Consent Conditions (Appendix 8) (Updated 13 June 2025).
- Fairfield Aftercare Management Plan (Draft).
- Updated proposed Consent Conditions (Appendix 8), dated 18 June 2025;

Mr Baker's full comments can be found in the below documents:

- Technical Memorandum titled: *RM24.098 – WM New Zealand, Fairfield Closed Landfill Natural Hazards & Climate Change Technical Peer Review,* dated 15 July 2025.

Below are summarised comments from Mr Baker in regard to the Applicant's assessment.

- The technical information, particularly in relation to the assessment of effects of the proposed defence against water, is not technically robust, and needs to be based on an actual design. This was on the basis that the assessment of effects presented in the s91 Letter is only high level.

- Mr Baker generally agrees with the statement that carrying out the height increase, and armouring will not result in the loss of any channel or bed of the stream/wetland/estuary, but he notes that a map of the full extent of the proposed work has not been provided which is required to be certain.

- Mr Baker generally agrees with the statement that the 'diversion' of water associated with the potential establishment of the 'defence against water' will not result in any loss of water from the Kaikorai Stream or Kaikorai Lagoon Swamp. However, he notes that it is unclear how the proposed works would interact with Christies Creek and Coals Creek and their flood plains.

- Mr Baker notes that raising the height of the perimeter road must decrease the cross-sectional area of the flood plain. The reduction in flood storage (in floods higher than the current perimeter road level) needs to be quantified, which has not been done.

- Mr Baker does not consider the Applicant's current effects assessment to be sufficient.

Conclusions

I have considered the Applicant's assessment and the technical expertise provided by Mr Baker. I conclude that the requested modelling is required to be able to make an informed assessment on the level of effects that the proposed defence against water and diversion of water will have on the receiving environment.

I am therefore unable to support the Applicant's assessment.

6.11 Effects related to the drilling on a potentially contaminated site

The Applicant has proposed to install a new gas monitoring well at the northern site boundary of the Eastern Landfill, located north of existing well MW1. This additional well is being installed to ensure any subsurface migration of landfill gas beyond the site boundary is appropriately monitored and managed. The site is a registered HAIL site given its previous landfill activities. On this basis, resource consent has been applied for drill over a potentially contaminated site.

The well will be constructed in accordance with the below:

- The monitoring well is to be located outside of the footprint of the Eastern Landfill, to the north of well MW1 and on the southern side of the site boundary.

- The monitoring well is to be screened from 1m to at least 3m below ground level or to a depth that intercepts the groundwater table at all times.

- If waste material and / or contaminated soils are encountered during well installation, the materials and /or soil is to be contained and removed from the site for disposal at an approved facility.

- Once the well is installed, the well is to be capped, and thus sealed, so that contaminants cannot enter the well.

The Applicant has volunteered a condition of consent which will require the well to be installed within 12 months of granting consent (should this consent be granted). The Applicant has additionally volunteered a condition of consent which will require the Applicant to advise ORC of the exact location of the well once the well has been drilled.

The Applicant has noted that the proposed well will be drilled outside of the footprint of the Eastern Landfill and therefore it is unlikely that contaminated soils or material will be found. Any potential effects associated with the drilling of the well will be temporary in nature and will be limited to the duration of the drilling. As discussed above, the drill hole will be capped and sealed so that contaminants cannot enter the well and contaminated soils or material that may be encountered throughout the drilling will be removed from the site and disposed at an appropriate facility.

Overall, given the small-scale nature of the land disturbance, and the construction of the well, I consider that any adverse effects associated will be less than minor.

6. 12 Effects on human health

Adverse effects on human health may arise from leachate contamination into the wetland–estuary complex or Kaikorai Stream, degraded water quality, drilling on potentially contaminated land, LFG migration, odour emissions from the landfill, and contaminants from the LFG flaring system.

As assessed earlier in this report, adverse effects on nearby receptors from LFG migration, odour, and emissions from the flaring system are considered to be less than minor. Drilling on potentially contaminated land is not expected to result in adverse effects on human health, given the proposed well location, drilling methodology, and the temporary nature of the activity.

The Applicant has not specifically addressed the potential for adverse effects on human health associated with leachate discharges or degraded water quality within the wetland–estuary complex or stream. In this regard, E. coli is likely to represent the primary potential human health risk. As outlined in Section 6.5 of this report, Dr Wilson noted that the discharges from the landfill do not appear to have adequately considered effects on human health or contact recreation. Dr Wilson further recommended that E. coli and/or enterococci monitoring be undertaken to determine whether discharges from the landfill are affecting contact recreation. As discussed in section 6.5 of this report, the Applicant declined to adopt this recommendation.

Notwithstanding this, the Kaikorai Stream and associated wetland–estuary complex are not known to support contact recreation, nor are there any identified downstream water users.

In addition, water quality monitoring at Brighton Road indicates that upstream of the landfill, the stream is moderately impacted, with degrading trends in nutrients (nitrogen and phosphorus), clarity, turbidity, and E. coli.

TAN is expected to be the primary contaminant from the landfill; however, TAN is not a contaminant known to directly cause adverse effects on human health. On this basis, it is concluded that any adverse effects on human health arising from the proposal are likely to be less than minor.

6. 13 Effects on mana whenua

The CIA prepared by Aukaha on behalf of Te Rūnanga o Ōtākou assessed the cultural impacts of the continued operation, closure, and aftercare of the landfill against the cultural values identified by mana whenua. The findings of the CIA are summarised here.

The Kaikarae Estuary and its associated waterways hold great significance for mana whenua. Mana whenua have longstanding concerns over the degradation of the estuary due to past and current land uses which include landfilling and industrial discharges. The long-term aspiration of mana whenua is to restore the Kaikarae Estuary and surrounding waterways to their traditional state as abundant mahika kai sources and a place where taoka species thrive, and to reflect mana whenua values and pūrākau associated with Kaikarae Estuary in a tangible way through a co-design process.

Wai Māori

Wai māori – impacts on mana, mauri, whakapapa, rakatirataka and kaitiakitaka, tapu, utu, taoka.

To Kāi Tahu, wai is a taoka under their mana and rakatirataka. The Kaikarae Estuary, Wetland and the other associated waterways have immense traditional significance to manawhenua. As stated previously, manawhenua today seek to restore the estuary, wetland and tributaries to their traditional state. Embarking on a journey of restoration is embodied by the manawhenua value, utu. Utu will be realised through the rehabilitation and restoration of the estuary, wetland and tributaries. This starts with ensuring leachate and contaminants are not able to enter the estuary, wetland and tributaries during all phases of the landfill aftercare. The ecological impacts of leachate and other contaminants on taoka species is one of the principal concerns that manawhenua have in relation to the closed landfill site. The construction of landfills on and near the Kaikarae Wetland and Estuary, in combination with other industrial discharges, has degraded the mauri of the Kaikarae Stream and surrounding area across decades and has made the area tapu, so that it cannot be used for mahika kai.

Issues raised in the CIA relating to Wai Māori are:

- The construction of landfills on and near the Kaikarae Wetland and Estuary, in combination with other industrial discharges, has degraded the mauri of the Kaikarae Stream and surrounding area across decades and has made the area tapu, so that it cannot be used for mahika kai.
- Low lying areas adjacent to the landfill site are at risk of flooding and storm surge from the Kaikarae Stream and Estuary. These risks will be further exacerbated by climate change and sea level rise.
- Groundwater monitoring data indicates that the trench more effectively intercepts leachate nearer the surface and appears to be less effective at intercepting leachate

migration at depth (evidenced by the elevated TAN concentrations in the deeper monitoring wells).
- If the potential adverse impacts described above were to occur, this would further degrade waterways which are already currently in poor health. It is the aspiration and duty of manawhenua as kaitiaki to enhance the health and wellbeing of all bodies of water.

Recognising the above issues, the CIA makes the following recommendations regarding Wai Māori:

- That all practicable measures are taken to prevent discharges entering water, including preventing, where possible, leachate from entering groundwater and surface water. The interception trench around the perimeter of the landfill is the primary mitigation measure to prevent the outward flow of leachate, as the landfill is unlined. Waste Management should investigate and implement engineering solutions to improve the effectiveness of the interception trench in preventing the outflow of leachate to the Kaikarae Wetland and Estuary.
- That Waste Management develop and implement a climate change adaptation strategy as part of the landfill closure management plan.
- That effects on mauri and whakapapa from the alteration of the existing hydrology and from contaminants entering water are offset by mitigation measures, including riparian planting, contaminant mitigation and pest management.
- Proposed offsetting or mitigation management plans must be provided to mana whenua for review and consultation prior to implementation. While these measures do not directly address the adverse effects on mauri, they will contribute to enhancement of the mauri of the area.

Mahika Kai and Biodiversity Values

This includes impacts on Mana, whakapapa, wāhi tūpuna, mauri, utu, mahika kai and taoka.

Prior to European settlement, the Kaikarae Stream catchment would have supported large wetland areas surrounding several defined streams, with hillslopes and elevated areas supporting mixed podocarp hardwood forest, with mataī, tōtara, rimu, māhoe and narrow-leaved houhere dominant on coastal hills. In the lower catchment, freshwater wetland and forest areas would have graded to intertidal / saltmarsh areas.

Issues raised in the CIA relating to Mahika Kai and Biodiversity Values are:

- The indigenous vegetation of the saltmarsh comprises of shore leptinella, oioi (jointed wire rush), māakoako (sea primrose) and mākaka (saltmarsh ribbonwood). In the estuary, marine macroalgae (in particular, ulva) dominate.
- Nine native fish species have been recorded in Kaikarae Stream (including inanga, common bullies, upland bullies, koura, shortfin eels, longfin eels and lamprey), and four species are recorded in the wetland (most commonly eels). Freshwater and marine species are recorded in the estuary (including black flounder, inanga, yellow-eye mullet, and banded kōkopu).
- Over 15 bird species are known to use the Wetland-Estuary, which is recognised as an important habitat for Australasian Bittern and Banded Dotterel, and a habitat utilised by white-faced heron, oystercatchers and paradise shelducks.

Recognising the above issues, the CIA makes the following recommendations regarding Mahika Kai and Biodiversity Values:

- The restoration of the biodiversity values of the Kaikarae Estuary, Wetland, and tributaries is sought to provide for the habitats and wider needs of mahika kai and taoka species and to rebalance the mauri of the wetland and estuary.
- An Ecological Impact Assessment should be undertaken to guide the development of a Restoration Plan for the Kaikarae Estuary, Wetland and tributaries.
- The Restoration Plan for the Kaikarae Estuary, Wetland and tributaries should be developed in partnership with manawhenua.
- Collaboration with the DCC on the restoration of the Kaikarae Estuary, Wetland, and tributaries is encouraged to enable holistic management of the effects of the Green Island and Fairfield Landfills.

Wāhi Tūpuna

Associated with values Mana, Whakapapa, Rākaihautu, Matamata, Wāhi Tūpuna, Mauri, Utu, Oraka, Tapu, Tikaka, Tapatapa, Kaika, Ara Hikoi, Ara Tawhito, Mahika Kai and Taoka.

In future there will be opportunities for public recreational use of the site and environmental enhancement, which could include planting restoration projects and new walking and biking tracks beside the Kaikarae Estuary. The aspiration of Te Rūnanga o Ōtākou is to incorporate mana whenua values and pūrākau associated with the Kaikarae Estuary in a tangible way and to restore the values of this wāhi tūpuna.

The CIA makes the following recommendations regarding Wāhi Tūpuna:

- Protecting the full range of landscape features of significance.
- Ensuring that the interpretation of Kāi Tahu histories associated with the Kaikarae.
- Estuary and Pukemakamaka is undertaken by Te Rūnanga o Ōtākou.
- Encouraging the use of traditional place names.
- It is recommended that a co-design process is undertaken with mana whenua to incorporate mana whenua values and pūrākau associated with the Kaikarae Estuary to support the restoration of this wāhi tūpuna landscape when the landfill is returned to an unrestricted (noa) state. This process may be staged reflecting the different stages of landfill closure and aftercare.

The Applicant has reviewed the CIA and had undertaken consultation with Aukaha on behalf Te Rūnanga o Ōtākou (Te Rūnanga) including discussions with Te Rūnanga representatives during the site visit and hui. The Applicant has provided follow up actions to the recommendations in the CIA and based on discussions with Te Rūnanga representatives and Aukaha. Full comments can be found in the Memorandum titled: *Cultural Impact Assessment Recommendations – Proposed Approach / Response (FINAL – 31 January 2025.*

These proposed follow up actions are summarised below.

CIA recommendations (summarised)	**Waste Management's approach/ comments**
Wai Māori That all practicable measures are taken to prevent discharges entering water, including preventing, where possible,	It is understood that the key steps are for Waste Management to: • Initiate and undertake a more robust environmental monitoring programme that

leachate from entering groundwater and surface water.	focuses on the effects on the receiving environment (ecology and water quality). The existing resource consents for the Eastern and Western Landfills required relatively limited monitoring of the effects on the receiving environment. • Undertake an 'effectiveness and technology' review of the leachate management system at the site every 5-years. • Implement any improvements identified during the effectiveness and technology review. The Applicant has volunteered conditions of consent to include the above as requirements. Other approaches, outside of consent conditions, have also been agreed including but not limited to a Memorandum of Understanding (MoU) between Te Rūnanga and the Applicant.
Wai Māori That Waste Management develop and implement a climate change adaptation strategy as part of the landfill closure management plan.	The Applicant has volunteered to include conditions of consent to require the AMP to include a "climate change adaption strategy".
Wai Māori That effects on mauri and whakapapa from the alteration of the existing hydrology and from contaminants entering water are offset by mitigation measures, including riparian planting, contaminant mitigation and pest management.	The Applicant considers that the above approaches will in part address this concern. Other actions include: • Updating the After Care Management Plan to outline procedures for pest management (via site maintenance and inspection procedure requirements). • Riparian planting and the proposed cultural mitigation measures are best to be developed in partnership with Te Rūnanga. The Applicant has acknowledged that the means of addressing this recommendation is to be resolved in partnership with Te Rūnanga (as part of the MoU).
Wai Māori Proposed offsetting or mitigation management plans must be provided to mana whenua for review and consultation prior to implementation. While these	The Applicant considers that the above approaches will in part address this concern. Other actions include: • The application does not propose developing offsetting or mitigation

measures do not directly address the adverse effects on mauri, they will contribute to enhancement of the mauri of the area.	management plans, howvever the Applicant welcome Te Rūnanga input into the AMP. • The Applicant considers any additional mitigation (or offsetting) in relation to cultural effects are best developed in partnership with Te Rūnanga. The Applicant has acknowledged that the means of addressing this recommendation is to be resolved in partnership with Te Rūnanga (as part of the MoU).
Mahika Kai and Biodiversity Values The restoration of the biodiversity values of the Kaikarae Estuary, Wetland, and tributaries is sought to provide for the habitats and wider needs of mahika kai and taoka species and to rebalance the mauri of the wetland and estuary.	• The Applicant has stated they are committed to contributing to the restoration of biodiversity values in these water bodies • A monitoring programme can be used to inform and guide the nature of any such restoration. The Applicant has acknowledged that the means of addressing this recommendation is to be resolved in partnership with Te Rūnanga (as part of the MoU).
Mahika Kai and Biodiversity Values An Ecological Impact Assessment should be undertaken to guide the development of a Restoration Plan for the Kaikarae Estuary, Wetland and tributaries.	An ecological assessment has since been provided by the Applicant. The Applicant has volunteered conditions of consent which will require ongoing ecological monitoring. The Applicant has acknowledged that the means of addressing this recommendation is to be resolved in partnership with Te Rūnanga (as part of the MoU).
Mahika Kai and Biodiversity Values The Restoration Plan for the Kaikarae Estuary, Wetland and tributaries should be developed in partnership with manawhenua.	The Applicant agrees that any proposed Restoration Plan sought be developed in partnership with manawhenua, however, given that many parties have contributed to the degradation of these water bodies, the development and implementation of any such Restoration Plan should be developed with all adjacent activities and landowners. The Applicant has acknowledged that the means of addressing this recommendation is to be resolved in partnership with Te Rūnanga (as part of the MoU).
Mahika Kai and Biodiversity Values	The Applicant is willing to participate in, and contribute to, any such collaborative processes, if established.

Collaboration with the Dunedin City Council on the restoration of the Kaikarae Estuary, Wetland, and tributaries is encouraged to enable holistic management of the effects of the Green Island and Fairfield Landfills	The Applicant has acknowledged that the means of addressing this recommendation is to be resolved in partnership with Te Rūnanga (as part of the MoU).
Wāhi Tūpuna Values The protection of the values of wāhi tūpuna is sought by mana whenua.	The Applicant is willing to work with Te Rūnanga to implement this recommendation, where and if applicable. The Applicant has acknowledged that the means of addressing this recommendation is to be resolved in partnership with Te Rūnanga (as part of the MoU).

Conclusions

The Kaikarae Estuary, Wetland and its associated waterways hold great significance for manawhenua. Manawhenua have longstanding concerns over the degradation of the estuary, wetlands and tributaries due to past and current land uses, which include landfilling and industrial discharges into the Kaikarae Stream. The Applicant has provided a number of follow up actions to the issues and recommendations raised in the CIA which according to the Applicant have been agreed to by Te Rūnanga representatives and Aukaha. However, I note that no written approval has been obtained from Aukaha at this time, nor has any evidence been provided to Council which would indicate that Aukaha has agreed to the follow up actions. In addition, I consider that the recommendations in the CIA have only been partially addressed.

Additionally, I note that technical information on the application suggests that there is some uncertainty as to the effectiveness of the leachate collection system and adverse effects on water quality ad ecology have not been concluded. I therefore defer to the position of mana whenua with respect to adverse effects on cultural values, should any aspects of the CIA be revised in light of these uncertainties. I would also note that Te Rūnanga o Ōtākou have not provided a written approval to the application.

6. 14 Conclusion

Overall, the level of adverse effects of the proposed activity cannot be determined at this time.

7. Notification and Written Approvals

7.1 Section 95A Public Notification

Step 1: Is public notification mandatory as per questions (a) – (c) below?

(a) Has the applicant requested that the application be publicly notified? **Yes**

(b) Is public notification required by Section 95C? **Yes**

Has further information been requested and not provided within the deadline set by Council? **No**

Has the applicant refused to provide further information? **Yes**

Has the Council notified the applicant that it wants to commission a report but the applicant does not respond before the deadline to Council's request? **No**
Has the applicant refused to agree to the Council commissioning a report? **No**

(c) Has the application been made jointly with an application to exchange recreation reserve land under section 15AA of the Reserves Act 1977? **No**

Step 2: Is public notification precluded as per questions (a) – (b) below?

(a) Is public notification precluded by a rule in the plan or a NES? **No**

(b) Is the application for one or more of the following activities but no other activities**:**

(i) A controlled activity? **No**

(ii) *[repealed]*

(iia) A restricted discretionary, discretionary or non-complying activity but only if the activity is a boundary activity? **No**

[repealed]

The Applicant has requested the application to be publicly notified as per section 95A(3)(a) of the RMA. The Applicant has refused to provide information requested under s92(1). On this basis, public notification is mandatory in accordance with section 95A(2)(a) and 95C(1)(b).

Public notification is required by Step 1. There is no need to consider subsequent steps.

7.2 Direct Notifications

As required by Regulation 10 of the Resource Management (Forms, Fees, and Procedure) Regulations 2003, direct notice will be served upon the following persons:

(a) every person who the consent authority decides is an affected person under section 95B of the Act in relation to the activity that is the subject of the application or review:

(b) every person, other than the applicant, who the consent authority knows is an owner or occupier of land to which the application or review relates:

(c) the regional council or territorial authority for the region or district to which the application or review relates:

(d) any other iwi authorities, local authorities, persons with a relevant statutory acknowledgement, persons, or bodies that the consent authority considers should have notice of the application or review:

(e) the Minister of Conservation, if the application or review relates to an activity in a coastal marine area or on land that adjoins a coastal marine area:

(f) the Minister of Fisheries, the Minister of Conservation, and the relevant Fish and Game Council, if an application relates to fish farming (as defined in the Fisheries Act 1996) other than in the coastal marine area:

(g) Heritage New Zealand Pouhere Taonga, if the application or review—

(i) relates to land that is subject to a heritage order or a requirement for a heritage order or that is otherwise identified in the plan or proposed plan as having heritage value; or

(ii) affects any historic place, historic area, wāhi tūpuna, wahi tapu, or wahi tapu area entered on the New Zealand Heritage List/Rārangi Kōrero under the Heritage New Zealand Pouhere Taonga Act 2014:

(h) a protected customary rights group that, in the opinion of the consent authority, may be adversely affected by the grant of a resource consent or the review of consent conditions:

(ha) a customary marine title group that, in the opinion of the consent authority, may be adversely affected by the grant of a resource consent for an accommodated activity:

(i) Transpower New Zealand, if the application or review may affect the national grid.

On this basis, I recommend that the following direct notifications are made:

- Aukaha on behalf of mana whenua
- The Department of Conservation
- Otago Fish and Game Council
- Public Health South

8. NOTIFICATION RECOMMENDATION:

In accordance with the notification steps set out above, it is recommended that the application proceed on a publicly notified basis.

Prepared by:

Brittany Watson
Consents Planner
3 November 2025

Reviewed by:

Shay McDonald
Principal Consents Planner
3 November 2025

Otago Regional Council

DECISION ON NOTIFICATION

Sections 95A to 95G of the Resource Management Act 1991

Date: **4 November 2025**

Application No: **RM24.098**

Subject: ***Decision on notification of resource consent application under delegated authority***

9. Decision under Delegated Authority

The Otago Regional Council decides that this resource consent application is to be processed on a **publicly notified** basis in accordance with sections 95A to 95G of the Resource Management Act 1991.

The above decision adopts the recommendations and reasons outlined in the Notification Recommendation Report above in relation to this application. I have considered the information provided, reasons and recommendations in the above report. I agree with those reasons and adopt them.

This decision is made under delegated authority by:

……..…

Peter Christophers
Team Leader Consents

4 November 2025