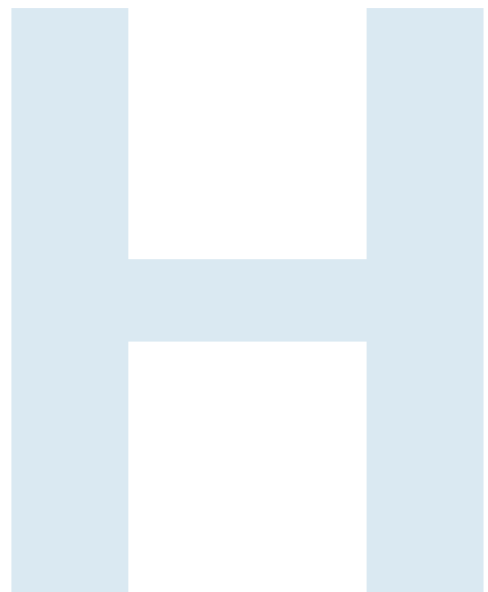


Technical Report H

Waste Acceptance Criteria



Waste Acceptance Criteria

Redvale Landfill Expansion

Prepared for: WM New Zealand

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Job Number: 1092369.8000 v1

Date: July 2026

Document control and review

Title: Waste Acceptance Criteria - Redvale Landfill Expansion					
Date	Version	Description	Prepared by	Reviewed by	Authorised by
July 2026	1	Final for submission to EPA	P. Kneebone	S. Eldridge	S. Eldridge

Distribution:

WM New Zealand	1 electronic copy
Tonkin & Taylor Ltd (FILE)	1 electronic copy
Environmental Protection Authority	1 electronic copy

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1 Introduction

1.1 Background

Tonkin & Taylor Ltd (T+T) has been engaged by WM New Zealand (WMNZ) to undertake a Waste Acceptance Criteria (WAC) Assessment to understand the effects from a proposal to extend the use of Redvale Landfill, north of Auckland (the Project). This report forms part of a suite of technical reports prepared for WMNZ for inclusion in a substantive application for resource consent under the Fast-Track Approvals Act 2024.

The purpose of the WAC is to avoid, minimise or mitigate potential environmental effects arising from placing waste by controlling the type of waste that is accepted, and to ensure compliance with applicable legislation governing acceptance of non-hazardous waste. This report is intended to support the Assessment of Environmental Effects (AEE).

1.2 Scope of work

The scope of this Waste Acceptance Criteria Assessment includes:

- Site description and elements of context that are relevant to selecting the WAC.
- Overall approach to WAC.
- The proposed WAC for the expanded areas, which comprise requirements for:
 - Waste type (relating to sources of waste).
 - Physical characteristics.
 - Limits for contaminants that could leach from the waste, based on the toxicity characteristic leaching procedure (called TCLP limits).
 - Total concentration limits for Class 2 contaminated soils.
 - Other waste acceptance controls to minimise effects.

1.3 Site description

The Redvale Landfill is located in Dairy Flat, to the north of Auckland, approximately 9 km northwest of Albany and 1 km west of State Highway 1. Redvale Landfill, including the existing landfilling area and buffer zones, occupies approximately 88 ha in area. The landfill is divided into five main sub-areas for the purpose of describing the work within this application, known as the Northern, Eastern, Western, South-Western and South-Eastern Property.

The Landfill is accessed from the south-east along Landfill Access Road off Dairy Flat Highway, with Horseshoe Bush Road running along part of the northern boundary of the Landfill area. A tributary of the Rangitopuni Stream runs eastwards along the northern and eastern site boundaries towards the Dairy Flat Highway. A map and full description of the site is provided in the AEE prepared for the project.

1.4 Project description

Redvale Landfill is one of only two landfill sites that can receive >350,000 tonnes of waste annually to service the approximately 1.5 million tonnes of waste that the Auckland Region produces each year. Redvale Landfill is currently scheduled to cease accepting waste in December 2028 and due to a delay in obtaining the resource consents required for the establishment and operation of the replacement Auckland Regional Landfill (ARL), a transition plan is required. To address this potential gap in critical landfill infrastructure for residual waste disposal in the Auckland region, WMNZ is

proposing to extend the operation of Redvale to the end of 2036 and develop 4.56 Mm³ of additional airspace at the existing facility. This includes 3.13 Mm³ in additional Class 1 Landfill expansion on top of the existing Class 1 refuse placement area and 1.43 Mm³ of Class 2 Landfill extension.

The proposed works include the following:

- **Class 1 landfill expansion:** placement of waste within the existing landfill footprint, involving the removal of final cover and steepening of the final cap slope to accommodate additional waste.
- **Class 2 footprint extension:** extension of the existing landfill to the southwest to accommodate disposal of waste meeting Class 2 landfill waste acceptance criteria (WAC).
- **Relocation of ancillary activities:** the relocation of ancillary activities to allow for the placement of waste.
- **Sediment Retention Ponds:** The removal and filling in of Sediment Retention Pond 6 and the Office Pond while enlarging Pond 1 to capture and treat the stormwater from these catchments.

A full description of the proposal is included in the AEE prepared for the project.

1.5 Relevant site features

The **existing landfill** has been operating for over 30 years. It meets the design criteria for a **Class 1 landfill**, as defined in the WasteMINZ Technical Guidelines for Disposal to Land (WasteMINZ Guidelines, April 2016, amended September 2023 v3.1). In particular:

- The site has a median **inward hydraulic gradient** and there is a great depth of naturally very low permeability material underlying the site.
- The **compacted clay liner** provides additional protection against discharge of contaminants. The consented design required a minimum 200 to 300 mm thick layer of recompacted mudstone. In 1997 the liner thickness was increased to 900 mm everywhere. Based on material testing and compaction methods, the hydraulic conductivity of the liner is less than 1×10^{-9} m/s.
- The sides and floor of the landfill are designed so that **leachate flows towards the leachate collector drains**, which convey leachate to the leachate sumps. Leachate will continue to be collected and treated.
- Leachate seepage via the lining system to ground is estimated at approximately 1.5 m³/year or 4 L/day (*Leachate and Mounding Flux Assessment*, September 2025).
- The final cover permeability design standard is 1×10^{-9} m/s.

The WAC that have been used at the existing landfill are consistent with criteria for Class 1 landfills. Groundwater monitoring over 30 years shows there are no impacts from operation of the existing landfill on groundwater quality (refer *Hydrogeological Assessment* report). This indicates the current WAC are appropriate for continued operation of the existing landfill. The landfill will continue to only receive non-hazardous municipal solid waste and will not accept any hazardous waste. Treated hazardous waste that meets the TCLP Limits is acceptable.

The Class 2 expansion area will be upgraded to meet the design criteria for a **Class 2 Landfill** as defined in the WasteMINZ Guidelines. The south lobe will only receive waste meeting Class 2 Landfill WAC. A leachate collection system will be provided for the new Class 2 area.

For both areas, management controls will be implemented to enforce the WAC.

2 Method: approach to develop WAC

The proposed WAC are consistent with the WasteMINZ Guidelines for Class 1 and Class 2 landfills. For the Class 1 area, they are the same as the WAC currently used at Redvale landfill.

The approach to WAC comprises:

- Identify a list of **waste types accepted** (Section 4.1).
- Identify a list of **prohibited wastes** (Section 4.2).
- Identify criteria and controls for **physical characteristics** (e.g., sloppiness) (refer Section 4.3) and **odorous waste** (Section 4.4).
- Provide **TCLP limits** for potentially hazardous waste because **hazardous waste will not be accepted** (Section 4.5). Hazardous waste that has been treated so that it meets the TCLP Limits is acceptable. The basis for the proposed TCLP limits is detailed in Section 3, including a process to develop TCLP limits for new or emerging contaminants at Section 3.5.
- Provide total contaminant concentrations for Class 2 contaminated soil (Section 3.7).
- Establish a **case-by-case process** for waste that contain contaminants for which there are no TCLP limits (Section 4.6).
- Propose **waste control measures**, which are documented in the Landfill Management Plan (LMP) (Section 5.2).

3 Analysis: TCLP limits

3.1 Appropriateness of current TCLP limits

For the Class 1 area, the proposed TCLP limits are the same as those currently used at Redvale Landfill. Groundwater monitoring over 30 years shows there are no impacts from operation of the existing landfill on groundwater quality, leachate quality monitoring shows leachate quality is relatively consistent, and groundwater modelling shows all contaminants are below water quality guidelines at the nearest receptor (Rangitopuni Stream; refer *Hydrogeological Assessment*). These factors confirm the current TCLP limits are appropriate for the proposed expansion in the Class 1 area.

Most of the TCLP limits are consistent with the WasteMINZ Guidelines, which are considered conservative for this site, given the inward hydraulic gradient (details in Section 3.2). Exceptions are limits proposed in other national guidelines for contaminants not covered by the WasteMINZ guidelines (Section 3.3), and limits for specific long-term waste streams received at Redvale Landfill for which long-term leachate and groundwater monitoring data justify higher limits (Sections 3.4 and 3.5). A process is included to develop TCLP limits for other contaminants, should these be needed for future waste streams (Section 3.6).

The current Redvale Landfill TCLP limits for some contaminants (cyanide, sulphide, polychlorinated biphenyls, toluene, tributyltin oxide, and total xylene) are more stringent than the recommended WasteMINZ Guideline TCLP limits. We consider the WasteMINZ Guideline TCLP limits would be appropriate for these compounds, however the current Redvale Landfill criteria are retained.

Some TCLP limits for the current Redvale Landfill are less stringent than the WasteMINZ Guideline Class 1 TCLP limits. For zinc, the TCLP limit is related to a specific waste stream, as detailed in Section 3.4. For other metals (antimony, boron, molybdenum, nickel and vanadium) the WasteMINZ Guidelines are proposed.

Some TCLP limits for the current Redvale Landfill are not in the WasteMINZ Guidelines Class 1 WAC because they are naturally occurring (manganese) or are very rare (cobalt, thallium,

hexachlorobutadiene). The TCLP limits for these have been taken out of the current Redvale TCLP Limit table.

For the new Class 2 area, the proposed TCLP limits are taken directly from the WasteMINZ Guidelines, as set out in Sections 3.2 and 3.7.

3.2 Applicability of the WasteMINZ Guideline TCLP limits

The WasteMINZ Guideline TCLP limits for a **Class 1 landfill** are based on a Conceptual Site Model (CSM) of potentially complete and incomplete pathways.

The pathways assessed to be incomplete in the CSM, due to standard engineered controls and operational/institutional controls expected at a Class 1 landfill, are incomplete at Redvale landfill. In particular, controls for erosion and sediment management mean there is no direct runoff to the environment, and operating procedures (including PPE, daily cover, closed-cab machinery) mean there is no direct contact with waste by people onsite or offsite.

For the complete pathways (inhalation, seepage to groundwater, migration to surface water, ingestion of groundwater and surface water), a dilution attenuation factor (DAF) of 100 was used to derive the WasteMINZ Guidelines. Redvale Landfill meets the factors that are critical to making a DAF of 100 conservatively protective (Table 3.1). In particular, Redvale Landfill has a median inward hydraulic gradient, the estimated leachate seepage (liner leakage to ground) and landfill cover permeability is low, and the distance to the nearest sensitive receptor is greater than 100 m. This confirms that the WasteMINZ Guideline Class 1 TCLP limits are appropriate for the expanded Class 1 area.

Table 3.1: Assumptions in TCLP limits (DAF = 100) and comparison with Redvale landfill

Parameter	Assumed range for DAF = 100	Redvale landfill	Comment
Hydraulic conductivity of primary pathways for leachate migration	$> 10^{-9}$ m/s	10^{-8} m/s, but median hydraulic gradient is inward (<i>ref Hydrogeological Assessment</i>)	Because the site has a median inward hydraulic gradient, a higher DAF could be appropriate
Leachate seepage (liner leakage) to ground	10 to 5,000 L/ha/d	< 0.1 L/ha/d	Recent estimation of total outward flux (refer Hydrogeological Assessment report). Original design estimate was < 6 L/ha/d.
Landfill cover permeability	10^{-9} to 10^{-6} m/s	10^{-9} m/s	Specified in design
Distance to receiving environment or sensitive receptor	< 100 m	> 100 m	~480 m to Rangitopuni Stream

The TCLP limits in the WasteMINZ Guidelines for Class 2 landfills are more stringent than for Class 1.

- The TCLP limits for inorganic constituents are five to ten times more stringent for Class 2 than Class 1, because of the lower level of containment provided by a Class 2 lining system compared to a Class 1 lining system. (Five times for limits based on US toxicity characteristic, ten times for other contaminants).

- The TCLP limits for organics are ten times more stringent for Class 2 than Class 1 both because of the lower level of containment and because there is less organic matter in Class 2 waste to attenuate organic contaminants.

The Class 2 TCLP limits from the WasteMINZ Guidelines are considered appropriate for the proposed Class 2 area.

The WasteMINZ Guidelines also include total concentration limits for contaminated soil which are acceptable in Class 2 landfills. These are included in the WasteMINZ Guidelines as part of the definition of Class 3 managed fill waste, which is a subset of Class 2 waste. Contaminated soil can be accepted in the Class 2 area if it meets either the managed fill total concentration limits or the Class 2 TCLP limits.

3.3 TCLP limits for PFAS

The WasteMINZ Guidelines do not include TCLP limits for polyfluoroalkyl substances (PFAS). In January 2020, the Heads of EPA Australia and New Zealand (HEPA) issued *The PFAS National Environmental Management Plan Version 3.0*,¹ which includes landfill acceptance criteria for various landfill types.

The HEPA waste acceptance criteria for “clay/single composite lined landfill” are considered appropriate for the Class 1 area of Redvale Landfill.

The HEPA waste acceptance criteria are a combination of Australian Standard Leaching Procedure² (ASLP) limits and a total concentration cap to align with the low content limit in the Stockholm Convention. These criteria are considered appropriate for the Class 1 area at Redvale, and are:

- 0.0007 mg/L for the leachable concentration of the sum of perfluorooctane sulfonate (PFOS) and perfluorohexane sulfonate (PFHxS).
- 0.0056 mg/L for the leachable concentration of perfluorooctanoic acid (PFOA).
- 50 mg/kg for the total concentration of PFOS, PFHxS, PFOA (including related substances).

If PFAS that are not PFOS, PFHxS, or PFOA are present at significant concentrations, specific criteria should be developed for those substances. PFAS are long lasting in the environment, mobile in groundwater, and bioaccumulative. The main sources of PFAS to the Class 1 landfill are municipal waste, biosolids, and contaminated soil. PFAS are present in municipal waste and biosolids because they are present in consumer products. There is no practical way to remove PFAS from municipal waste or biosolids. Because of the persistence and mobility of PFAS and the ubiquity of PFAS in municipal waste, the safest way to manage PFAS-containing waste is secure containment in a Class 1 landfill with a leachate capture system. It is not intended to test municipal waste for PFAS. PFAS-contaminated soil and biosolids will be tested to confirm compliance with TCLP limits.

Class 2 waste includes materials such as textiles that may contain PFAS. Like municipal waste, these materials are not readily able to be tested using the TCLP method. The HEPA waste acceptance criteria for “unlined landfill” are 10 times more stringent than the “clay/single composite lined landfill” criteria and are considered appropriate for the Class 2 area, which is lined. The corresponding total concentration caps are 20 mg/kg (PFOS+PFHxS) and 50 mg/kg (PFOA).

¹ *PFAS National Environmental Management Plan Version 3.0* (March 2025) National Chemicals Working Group of the Heads of EPAs Australia and New Zealand.

² The ASLP method is less aggressive than the TCLP. For most PFAS, TCLP will give higher results. HEPA requires ASLP to also include a water extraction step; the acetic acid conditions of TCLP are more representative of the conditions waste will be exposed to in a mature landfill.

3.4 Zinc in auto shredder residue

Redvale landfill receives about 5% by weight of auto shredder residue (ASR). A waste-specific TCLP limit for zinc in ASR of 500 mg/L is currently used at Redvale Landfill, which is substantially higher than the WasteMINZ Guideline TCLP limit for zinc (10 mg/L). Review of leachate quality data shows relatively consistent and low zinc concentrations. The 95% upper confidence limit (UCL) on the mean concentration of zinc in leachate at Redvale Landfill over the past 10 years is 0.4 mg/L. Groundwater fate and transport modelling was done assuming a constant source concentration of 0.4 mg/L, and the (conservative) assumption of an outward hydraulic gradient. The modelling showed the predicted concentration in groundwater at the point of exposure (Rangitopuni Stream) is below stream water quality guidelines (refer *Hydrogeological Assessment* for modelling details). Ongoing use of the current TCLP limit for zinc in ASR is considered appropriate.

3.5 Nickel slag waste

Redvale landfill receives monthly containerised shipments of nickel slag waste from New Caledonia, a total of ~16,000 tonnes per year. Sulphide is elevated in the slag, and Redvale currently applies a more stringent acceptance criteria of 5 mg/L (the WasteMINZ guideline is 50 mg/L). The more stringent limit is proposed to be maintained.

A waste-specific TCLP limit for nickel in the slag waste of 1500 mg/L is currently used at Redvale Landfill, which is substantially higher than the WasteMINZ Guideline TCLP limit for nickel (10 mg/L). Nickel concentrations in TCLP on the slag waste has been consistently below 1 mg/L for the past 10 years, so the WasteMINZ guideline of 10 mg/L is proposed.

3.6 Process to develop TCLP limits for new contaminants (Class 1)

Given the relatively short life of the proposed expansion, it is unlikely that TCLP limits for new contaminants will be needed. However, a process is included to consider new contaminants, in case any arise, which includes the following steps:

- Review New Zealand and international regulations and good practice guidelines, to identify whether there are pre-existing TCLP limits for other sites and jurisdictions. For example, the WasteMINZ Guidelines do contain TCLP limits for several other contaminants which could be applied to assess the suitability of incoming waste if needed (i.e., if those contaminants are in the waste-stream).
- If there are pre-existing TCLP limits, compare the conditions under which they were developed with Redvale Landfill conditions. If the assumptions are conservative, they can be adopted.
- If there are no pre-existing criteria, or if the assumptions are not appropriate for Redvale Landfill, develop Redvale-specific criteria.
- Document the criteria and assumptions and update the Landfill Management Plan.

3.7 WAC for Class 2 area

For the **Class 2 area**, the TCLP limits are more stringent than the WAC for the Class 1 area and are consistent with the WasteMINZ Guidelines and HEPA criteria.

Because of the lower level of containment provided by a Class 2 liner compared to a Class 1 liner, the WasteMINZ Guidelines' TCLP limits for inorganic constituents are five to ten times more stringent for the Class 2 landfill (five times for limits based on US Toxicity characteristic, ten times for others).

Because of the lower level of containment and because there is less organic matter in the waste to attenuate organic contaminants, the WasteMINZ Guidelines' TCLP limits for organics are ten times more stringent for the Class 2 landfill.

For PFAS, the HEPA leachability waste acceptance criteria for “unlined landfill” are ten times more stringent than the “clay lined landfill” criteria. The total concentration caps are 20 mg/kg for sum of PFOS and PFHxS, and 50 mg/kg for PFOA.

Contaminated soil can be accepted as Class 2 waste provided it meets the WasteMINZ Guideline criteria for managed fill. The managed fill criteria include contaminant concentration limits. Contaminated soil can be accepted in the Class 2 area if it meets either the managed fill total concentration limits or the Class 2 TCLP limits.

4 Proposed Waste Acceptance Criteria (WAC)

4.1 Acceptable waste

The acceptable waste types are specified in Table 6-1 of the WasteMINZ Guidelines.

For the Class 1 area, acceptable wastes are non-hazardous Municipal Solid Waste (MSW), which includes mixed municipal waste from residential, commercial and industrial sources, as well as soils, rocks, gravel, sand, clay, road sweepings, construction and demolition waste, and treated hazardous waste that meets the TCLP limits (refer Table 6-1 of the WasteMINZ Guidelines³). Domestic waste may contain residual household hazardous waste, for example, containers with residual amounts of cleaning agents which are a very small proportion of the total waste going to landfill. It is not possible to remove all such items at the landfill, and the WAC do not prohibit domestic waste which ordinarily may contain traces of hazardous waste.

For the Class 2 area, acceptable wastes are construction and demolition (C&D) waste, managed fill, clean fill, and non-putrescible industrial waste. These wastes include plasterboard, Gibraltar board, reinforced concrete, timber, roofing and flooring products, fibreglass, textiles, non-recyclable glass, site clearance and excavation materials, and other materials listed in Table 6-1 of the WasteMINZ Guidelines. The maximum incidental or attached biodegradable material (e.g., vegetation) must be no more than 5% by volume per load. Managed fill includes contaminated soil from earthworks and site remediation that meets the total concentration limits set out in the WasteMINZ Guidelines for Class 3 waste.

4.2 Prohibited wastes

The list of prohibited wastes for Class 1 and Class 2 landfills (Table 4.1) is from Appendix H of the WasteMINZ Guidelines.

Table 4.1: Prohibited waste characteristics

Class	Characteristic
H1	Explosives
H2	Gases
H3	Flammable liquids
H4.1	Flammable solids
H4.2	Substances or wastes liable to spontaneous combustion
H5.1	Oxidising substances
H6.2	Infectious substances

³ We note that Table 6-1 of the WasteMINZ Guidelines does not list individual contaminant types (e.g., asbestos).

Class	Characteristic
H7	Radioactive materials
H8	Corrosives
H10	Liberation of toxic gases in contact with air or water
H13	Capable, by any means after disposal, of yielding another material (i.e., leachate which possesses any of the above characteristics).

4.3 Physical nature of wastes

The landfill will not accept untreated sewage, or bulk liquids.

In accordance with the WasteMINZ Guidelines, the following physical requirements apply:

- All wastes should have an angle of repose of greater than 5 degrees (i.e., “spadeable”) (typically applicable to biosolids); and
- All wastes shall have no free liquid component, which is to be assessed at the point of loading into the truck that delivers it to the tip face.

Additional controls to meet operational requirements include:

- Packaged goods originally intended for domestic use but would be regarded as hazardous if in bulk are acceptable provided that the quantity is less than 0.1% of the daily waste tonnage.
- Some large volume wastes may be monofilled or encapsulated within the waste mass to avoid particular mixing that leads to adverse effects like release of odour or suppression of decomposition, e.g., high sulphate and sulphur wastes.
- Oversize items (e.g., moulds for fibreglass yachts, tree logs, monster truck tyres) will be accepted provided they do not compromise the ability to apply daily cover. For example, WMNZ may choose to apply a time of day restriction to delivery of such wastes.
- Dusty materials will be accepted subject to additional controls to manage safety at the tip face (visibility, dust sticking to compactor windows, inhalation). These controls may include pre-bagging, load covering, dampening at source, or restricting delivery to low-wind days.
- Management controls for asbestos in accordance with WorkSafe’s *Approved Code of Practice for Management and Removal of Asbestos* (November 2016 amended December 2016) and BRANZ’s *New Zealand Guidelines for Assessing and Managing Asbestos in Soil* (October 2024).

4.4 Odorous waste (acceptable in Class 1 area only)

The landfill odour management plan is detailed in section 3.6 of the LMP, with waste acceptance controls at section 3.6.3.1.

In the case of a new special waste stream that is odorous, especially waste from a new source or process, the landfill asks the customer to provide information that allows the landfill to assess the odour potential of the waste. Potentially odorous waste is evaluated on a case-by-case basis, by consideration of:

- The odour potential.
- The total volume, rate of delivery, and timing of delivery, and how these tie in with operations at the landfill at the proposed time of delivery. The landfill may request a small-volume trial.
- Whether any pre-treatment has been done (e.g., mixing with lime). Potentially malodorous waste, such as egg wastes or wool scourings, must be pre-treated by the waste generator to reduce odour before delivery (e.g., mixing with lime).

Odorous waste must be buried as soon as possible. Any excavations required to prepare for rapid burial must consider odour potential from the excavation as well as timing of delivery of the waste.

Hours for delivery of odorous waste may be restricted to middle hours of the day when the working face operations and climatic conditions are most favourable for odorous waste management.

4.5 TCLP limits

Hazardous waste is not acceptable. Waste that is potentially hazardous due to toxicity must meet the TCLP limit. The proposed TCLP limits (mg/L) are in Table 4.2.

For the **Class 1 area**, the proposed TCLP limits are mostly the same as currently used at Redvale Landfill for Class 1 waste, with some adjustments to align with the TCLP limits in the WasteMINZ Guidelines for Class 1 landfills, additional criteria from HEPA for PFAS-containing wastes, and specific values for zinc in ASR and sulphur in nickel slag. The limits for contaminants that have potential to trigger the hazardous waste toxicity characteristic (i.e., the full list of contaminants and TCLP limits included at US 40 CFR §261.24) are mandatory limits which may not be exceeded. The WasteMINZ Guidelines for these contaminants are the same as the limits in 40 CFR §261.24 (except for trichloroethylene, which is likely a transcription error in the WasteMINZ Guidelines). The other limits have typically been applied as guidelines at Redvale Landfill, rather than strict limits. Long term leachate quality data and the median inward hydraulic gradient suggest this practice has not led to adverse leachate quality effects. However, we propose the TCLP limits should be used as limits.

For the **Class 2 area**, the TCLP limits are more stringent and are consistent with the HEPA and WasteMINZ Guidelines.

Table 4.2: TCLP limits for Class 1 and Class 2 areas (mg/L)

	Class 1			Class 2
	Proposed for ARL-TP	Redvale current	WasteMINZ Guidelines	Proposed for ARL-TP
Limits from WasteMINZ and US toxicity characteristic				
Arsenic	5	5	5	1
Barium	100	100	100	20
Cadmium	1	1	1	0.2
Chromium	5	5	5	1
Mercury	0.2	0.2	0.2	0.04
Selenium	1	1	1	0.2
Silver	5	5	5	1
1,1-dichloroethene	0.7	0.7	0.7	0.07
1,2-dichloroethane	0.5	0.5	0.5	0.05
2,4,5-trichlorophenol	400	400	400	40
2,4,5-trichlorophenoxypropionic acid (Silvex)	1	1	1	0.1
2,4,6-trichlorophenol	2	2	2	0.2
2,4-dichlorophenoxyacetic acid	10	10	10	1
2,4-dinitrotoluene	0.13	0.13	0.13	0.013
Carbon tetrachloride	0.5	0.5	0.5	0.05
Chlordane	0.03	0.03	0.03	0.003

	Class 1			Class 2
	Proposed for ARL-TP	Redvale current	WasteMINZ Guidelines	Proposed for ARL-TP
Chlorobenzene	100	100	100	10
Chloroform	6.0	6.0	6.0	0.6
Endrin	0.02	0.02	0.02	0.002
Heptachlor	0.008	0.008	0.008	0.008
Hexachlorobenzene	0.13	0.13	0.13	0.013
Hexachlorobutadiene	0.5	0.5	0.5	0.05
Hexachloroethane	3	3	3	0.3
Lindane	0.4	0.4	0.4	0.08
m-Cresol	200	200	200	20
Methoxychlor	10	10	10	1
Methylethyl ketone	200	200	200	20
Nitrobenzene	2	2	2	0.2
o-Cresol	200	200	200	20
p-Cresol	200	200	200	20
Pentachlorophenol	100	100	100	10
Pyridine	5	5	5	0.5
Tetrachloroethene	0.7	0.7	0.7	0.07
Total cresol	200	200	200	20
Toxaphene	0.5	0.5	0.5	0.05
Trichloroethylene	0.5	0.5	0.7	0.05
Vinyl chloride	0.2	0.2	0.2	0.02
TCLP Limits from WasteMINZ only				
Antimony	0.6	300	0.6	0.06
Boron	20	9000	20	2
Copper	5	25	5	0.5
Cyanide	10	10	50	10
Lead	5	5	5	1
Molybdenum	10	100	10	1
Nickel (incl. slag)	10	1500	10	1
Vanadium	2	1000	2	0.2
1,4-dichlorobenzene	7.5	7.5	7.5	0.75
Benzene	0.5	0.5	0.5	0.05
BTEX total	10	10	-	
DDT	0.02	0.02	-	
Ethylbenzene	5	5	50	5
Polychlorinated biphenyls	0.0001	0.0001	50	5
Toluene	5	5	100	10
Tributyltin oxide	0.02	0.02	3	0.3

	Class 1			Class 2
	Proposed for ARL-TP	Redvale current	WasteMINZ Guidelines	Proposed for ARL-TP
Xylene (m-, o-, p-)	5	5	100	10
Specific waste stream limits				
Sulphide – nickel slag	5	5	50	10
Zinc – ASR	500	500	10 (zinc)	-
PFAS limits²	Proposed limit for ARL-TP	Redvale current	HEPA Guideline	Proposed limit for ARL-TP
PFOS + PFHxS	0.0007	-	0.0007	0.00007
PFOA	0.0056	-	0.0056	0.00056

Notes:

1. Grey shaded cells show where proposed TCLP limit guidelines are different to current Redvale TCLP limit guidelines.
2. The total concentration caps for PFAS are PFOA 50 mg/kg for Class 1 and Class 2; PFOS + PFHxS 50 mg/kg for Class 1 and 20 mg/kg for Class 2.

4.6 Total concentration limits

4.6.1 Relationship between total concentrations (mg/kg) and TCLP concentrations (mg/L)

The total concentration test is particularly useful because it is faster and less expensive than the TCLP, so that more tests can be done to better characterise a waste. The total concentration test involves boiling a soil sample in strong acid and then testing the acid for contaminants. The result is expressed as mg/kg (mg of contaminant per kg of soil).

The TCLP involves shaking a soil sample in weak acid solution for many hours and then testing the acid solution. Results are expressed as mg/L (mg of contaminant per L of weak acid solution).

Because of the specific quantities of soil and liquid used in the TCLP, any sample with total concentrations up to 20x the TCLP limit cannot possibly exceed the TCLP limit. Samples with concentrations higher than 20x the TCLP limit could exceed the limit if a high proportion of the contaminant goes into solution.

Redvale Landfill has used a practice of assuming that for Class 1 waste, total concentrations up to 100x the TCLP limit likely meet the TCLP limit and are therefore acceptable. Data held by Redvale Landfill show that for organic contaminants that adhere to soil and for most metals, this is appropriate for the waste types received. Furthermore, long-term monitoring shows no adverse impacts on leachate quality on waste that have been received to date.

For routine Class 1 waste received at Redvale Landfill, material with total concentrations (in mg/kg) up to 100x the TCLP Limits is acceptable. We recommend TCLP testing is done on any new and different wastes.

4.6.2 Class 2 contaminated soil

Class 2 landfills can accept managed fill, which includes contaminated soil that meets the Class 3 guidelines, as set out below (from Table F-1 WasteMINZ Guidelines). Contaminated soil can be accepted to the Class 2 area if it meets either the TCLP Limits in Table 4.2 or the total concentration limits in Table 4.3.

Table 4.3: Managed fill WAC

Contaminant	Maximum allowable total concentration (mg/kg)	Contaminant	Maximum allowable total concentration (mg/kg)
Arsenic	140	TPH C7-C9	200
Cadmium	10	TPH C10-C14	600
Chromium	150	Benzene	0.11
Copper	280	Ethylbenzene	10
Lead	460	Toluene	19
Mercury	3	Total xylene	25
Nickel	320	Benzo(a)pyrene (equiv) ¹	125
Zinc	1200	Dieldrin	0.10
		Total DDT ²	2.0

Notes:

1. For benzo(a)pyrene, the equivalent BaP concentration is calculated as the sum of each of the detected concentrations of nine carcinogenic PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene and indeno(1,2,3-cd) pyrene), multiplied by their respective potency equivalency factors.
2. Sum of six o,p'- and p,p'- isomers of DDT, DDD and DDE

4.7 Case-by-case assessments

Occasionally, applications may be received for disposal of waste that contains substances for which there are no TCLP limits. This will need case-by-case assessment based on the harmfulness of the chemical, the amount of waste to be disposed, and the potential effect of the waste on leachate quality. Special management procedures may include placement in a logged location, immediate burial, or restrictions on the timing of deliveries of material.

5 Mitigation and monitoring

5.1 Decision tree for waste evaluation process

The waste evaluation decision tree is intended to provide a clear, simple to use, evaluation process that minimises risk of inappropriate wastes being accepted. The flow chart in Figure 5.1 illustrates the overall waste application evaluation process.

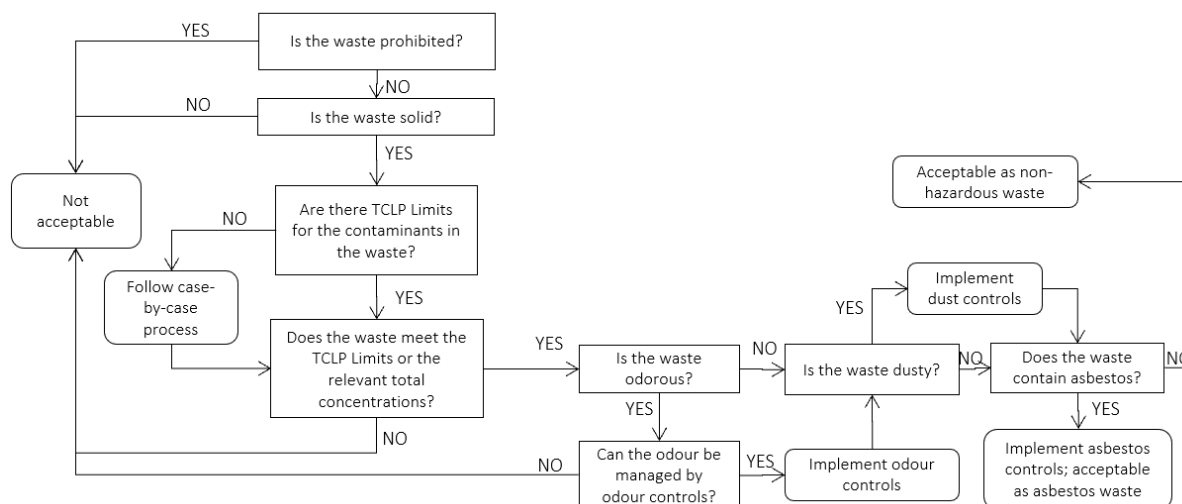


Figure 5.1: Waste pre-acceptance evaluation process

5.2 Elements of waste control

Waste control measures are based on actions and historical performance at other modern landfills. The main elements are:

- Pre-acceptance testing.
- Pre-acceptance agreement.
- Gatehouse controls.
- On-site screen testing.
- Regulatory reporting.

5.2.1 Pre-acceptance testing

Pre-acceptance testing is required for all special wastes and soils whose contaminant concentrations cannot otherwise be fairly assessed e.g. by observation, relevant historical records, or good knowledge of the source.

The landfill must keep sufficient records to show that the waste is not hazardous. In the case of any new special waste with potential ecotoxicity, the landfill will ask the customer to provide test results that show that the waste meets the TCLP Limits or the total concentration limits, prior to accepting the application.

The requirements for testing are:

- The testing must be done by an accredited laboratory.
- The sample size must be sufficient to effectively characterise the material.

- The sampling will typically include worst-case and average concentrations, but this is disposer-specific.

In addition to limits set in the contaminant list (Table 5.1), the landfill operator would use discretion and experience to impose limits on any other contaminants or apply customised disposal methods that they deem necessary.

Occasionally, applications will be received for disposal of waste that contains substances for which there are no TCLP limits. The most effective way to assess these wastes is on a case-by-case basis, which considers the harmfulness of the chemical, the amount of waste to be disposed, and the potential effect of the waste on leachate quality.

5.2.2 Pre-acceptance agreement

The customer's application must include:

- Description of the waste and waste generator contact information.
- For potentially hazardous waste, results of any testing on the waste.

For the Class 2 only area, the application must also include confirmation that each load contains less than 5% by volume attached/residual organic material (e.g., vegetation).

Additional requirements for the Class 1 area:

- For potentially malodorous waste, information to allow the landfill to assess whether the waste is acceptable (i.e., odour potential, rate of delivery, timing of delivery, any pre-treatment carried out on the waste).
- For malodorous waste that requires pre-treatment, confirmation that pre-treatment has occurred.

5.2.3 Gatehouse

Every load of special waste must be accompanied by a manifest corresponding to an approved waste application.

Class 1 only: all loads of odorous waste must be covered for transport to the landfill and remain covered as far as the working face or a dedicated de-tarpping area. The gatehouse must notify operators by site radio when the load has arrived at the site. Odorous wastes shall be rejected at the gate if unacceptable.

5.2.4 On-site screen testing

Random load inspections will be carried out at a frequency of approximately 1 in 50 loads. The frequency may be revised (up or down) depending on previous inspection results.

5.2.5 Regulatory reporting

If any waste load is rejected at the gatehouse or removed because it is hazardous, Auckland Council is to be notified within 48 hours.

Waste tonnage tallies will also be reported to Council in accordance with bylaws.

5.3 Leachate quality monitoring

Leachate quality testing is not required by the current consents, but WMNZ does test leachate quality from the existing landfill quarterly, with a broader suite of contaminants tested annually.

Leachate from the new Class 2 extension area should also be tested quarterly for common and soluble contaminants and ammonia, conductivity and pH. A broader suite of potential contaminants should be tested annually.

The proposed suite of contaminants is set out in Table 5.1.

Table 5.1: Leachate quality monitoring (note: this is not required by current consent)

Contaminant / parameter	Class 1 area	Class 2 extension area
Metals for which there are leachability limits: • Arsenic • Cadmium • Copper • Chromium • Lead • Nickel • Mercury • Selenium • Silver • Zinc	Annual	Quarterly
Other leachate quality parameters: • pH • Ammonia • Conductivity • Potassium • Chloride	Annual	Quarterly
Organic compounds: • Total petroleum hydrocarbons (TPH) • Benzene • Chlorinated solvents • Organochlorine pesticides, including DDT-compounds • PFAS	Annual	Annual

6 Applicability

This report has been prepared for the exclusive use of our client WM New Zealand, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application under the Fast-track Approvals Act 2024 and that an Expert Panel as the consenting authority will use this report for the purpose of assessing that application. We understand and agree that this report will be used by the Expert Panel in undertaking its regulatory functions.

Tonkin & Taylor Ltd
Environmental and Engineering Consultants

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Appendix A Code of Conduct

I confirm that, in my capacity as lead author of this report, I have read and abided by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses contained in the Practice Note 2023.

I am a Technical Director Environmental Science at Tonkin & Taylor Ltd (T+T), where I specialise in environmental management. I have worked at T+T since 2006. In 2021 I was appointed Chief Executive for T+T New Zealand. Prior to joining T+T, I was an environmental consultant at ENVIRON International LLC (now Ramboll).

I have 26 years' experience in assessing and managing the effects of discharges of chemicals into the environment. I have specific experience in environmental management of landfill activities, including development and application of WAC. I hold the following qualifications – PhD Environmental Engineering Science; BSc (Hons 1st) Chemistry.

Recent relevant projects and services that I have been involved with include: developing and applying WAC for Silverstream Landfill and Bluegums Landfill, prepared WAC for Hutt City Council's landfills and advised Wellington City Council on WAC for Southern Landfill. I have developed, reviewed, and revised environmental monitoring programmes for operating and closed landfills, particularly programmes that are designed to identify impacts of landfill leachate on groundwater and surface water.



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Penny Kneebone
Principal Environmental Scientist



Together we create + sustain a better world