WM NEW ZEALAND LANDFILL

LANDFILL MANAGEMENT PLAN

Leachate Monitoring and Contingency Plan

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CONTENTS

1. INTRODUCTION 3
1.1 Scope of this section 3
2. LEACHATE SYSTEM 3
2.1 Overview 3
2.1.1 Leachate sources 3
2.1.2 Collection pipes 3
2.1.3 Sump 3
2.1.4 Pumping 4
2.1.5 Off-site cartage 4
2.1.6 On-site treatment plant 4
2.1.7 Receiving water baseline monitoring 5
2.2 Risks - leachate 5
3. MONITORING 7
3.1 Monitoring parameters and schedule 7
3.2 Monitoring procedures 7
3.3 Reporting 9
4. CONTINGENCY 10
4.1 Trigger Levels - general 10
4.1.1 Trigger Levels 10
4.1.2 Trigger Level 1 (Lower response limit) 10
4.1.3 Trigger Level 2 (Upper response limit) 10
4.1.4 Emergency 10
4.1.5 Definition of leachate contamination 10
4.1.6 Flowchart 11
4.2 Response guidelines 11
5. TASK LISTS 14
5.1 Tasks and scheduled maintenance 14
6. APPENDICES 15
6.1 Leachate monitoring locations site plan 15
6.2 Monitoring parameter lists 16
6.3 Contingency Plan Flowchart 17
6.4 Test methods for leachate chemistry 18
6.5 Trigger Levels report 19

1. INTRODUCTION

1.1 Scope of this section

This Leachate Monitoring and Contingency Plan (LMCP) describes:

- The leachate collection and treatment system.
- Leachate monitoring.
- Contingency responses.

Revision of the LMCP would follow the general procedure for any revision of the Landfill Management Plan (LMP). The LMCP has been prepared in accordance with the requirement of condition 387 of the resource consent (draft February 2025 version)[1].

2. LEACHATE SYSTEM

2.1 Overview

2.1.1 Leachate sources

Leachate is contaminated water coming out of the waste. Leachate is created by:

- Anaerobic decomposition of organic material, which releases gas and leachate.
- Liquids and moisture in the raw waste.
- Rainfall infiltration, which percolates from the surface of the landfill down through the waste to collection pipes, picking up some contaminants from the waste on the way down.

Any water that has contacted waste will be consider to be leachate and will be treated accordingly.

2.1.2 Collection pipes

Leachate will be collected in pipes at the bottom of the waste mass with these features:

- Leachate pipes will be laid within the leachate drainage blanket (drainage gravel) at the top of the lining system, on the landfill basin 'floor' and side slope 'benches'.
- Pipes will be perforated to collect the leachate.
- Pipes will be made from durable material.
- Pipes will be laid with minimum 2% gradient, to reduce risk of siltation, and to convey leachate by gravity to the sump.
- Pipes will be installed progressively as new phases are constructed.
- Pipes will be connected to clean-out risers for access to clear any pipe blockages.

2.1.3 Sump

A leachate sump or sumps and pumping process will have these features:

- Leachate will flow by gravity to the sump.
- The sump will be at the lowest point inside the landfill, but still above the lining system.
- The sump will have more than one in-pipe for redundancy, and a provision for flushing if needed.

[1] The current version of conditions is dated 25 February 2025, all references to conditions and the consent relate to this version.

- The sump will contain a pump to extract leachate and pump leachate up to holding tanks.
- The sump will have a double liner underneath it.
- The level of leachate will be monitored.

2.1.4 Pumping

Leachate will be pumped to tanks on high ground either to load tanker trucks or to await on-site treatment. The installations and process will have the following features.

- Leachate pumps started manually, or checked daily if on high/low level trip switches.
- Staff involved to be familiar with location of emergency stop buttons.
- Spill response plan ready at all times.
- Pre-treatment of leachate may be undertaken at the stage of pumping or tank storage if required for discharge as trade waste.

2.1.5 Off-site cartage

For the first several years of landfilling, leachate will be carted off-site to an approved point of disposal and treatment. The on-site handling will have the following features.

- Holding tanks will be located on higher ground to receive water pumped up from the leachate sump.
- The holding tanks will have spill containment.
- Road-going tanker trucks will be filled direct from the holding tanks.
- The tanker trucks will park on a concrete pad with spill containment.
- An emergency stop system, electrical or mechanical, will be available at the leachate transfer point.
- Leachate will be carted to the point of disposal by tanker truck carrying typically 25 to 30 m^3 per load.
- Tanker truck driver trained and authorised to operate the transfer system from tanks to truck.
- Uninterrupted attendance while transferring leachate from tanks to truck.
- Cartage volumes will be tracked via weighbridge records or flow meters.
- Tanker trucks may be required to weigh in and weigh out to confirm metered leachate volumes.
- Approved off-site point of disposal e.g. WWTP or WM facility.

2.1.6 On-site treatment plant

When the landfill is producing sufficient landfill gas to power a leachate treatment plant then a leachate evaporator will be installed, unless another type of treatment plant is proposed and consented using more advanced technology at that time. The leachate evaporator will have these features.

- The plant will be located on the site.
- Landfill gas will be used to provide heat for the evaporator process.
- The plume from the evaporator may have heat haze and water vapor but not smoke.
- Leachate pumped from the sump can be switched to either the evaporator or the truck-filling tanks.
- The leachate temperature is kept below water boiling point for cleaner emissions.
- Residual concentrated sludge will be put back in the landfill.
- The leachate, in-process liquids, and by-products will be contained inside spill capture bunds.
- Any significant by-product of the on-site leachate treatment process other than evaporator concentrate will be checked for toxicity.
- Treated leachate volumes will be monitored.

2.1.7 Receiving water baseline monitoring

Surface water and groundwater baseline information is available in those sections of this LMP and in baseline monitoring reports provided with the consent applications.

2.2 Risks - leachate

Table 2.2

Risks	**Mitigations**
Groundwater and subsoil drain contamination - Seepage through the lining system into the underlying ground	Design: • Robust lining system. • Redundancy in having multiple liner layers. • Thorough quality control during construction. • Peer Review Panel oversight of anything relating to lining system performance. • Strict limits and controls on waste composition. Process: • Monitoring of groundwater in boreholes and flow from subsoil drains. • Monitoring of the subsoil drain outlet into Pond 2. • Shut-off valve at the outlet to cease flows.
Surface water contamination - Leachate seepage from landfill cover (aka breakout) - Horizontal layering in the waste that blocks leachate percolation, causing leachate to appear through soil cover on lower slopes of the landfill instead of percolated down to the collection pipes - Leachate seepage mixing with stormwater run-off and carrying contaminants to stormwater ponds	Design: • Ponds and adjacent access road designed to enable isolation and diversion of non-contaminated water around the pond. Process: • Cutting “windows” through any hard layers in the waste to allow for leachate percolation. • Installation of sumps within the perimeter drain to enable continuous conductivity monitoring prior to discharge to stormwater ponds. • Stormwater monitoring at inlet of Pond 2 and Pond 3. • Erosion and sediment controls to discourage stormwater infiltration in the first place.
Leachate spill - Spill is a possibility with reference to pipes, tanks and trucks	Design: • Emergency spill response plan. • Bunding around leachate tanks.

Risks	**Mitigations**
	• Differential flowrate sensor cut-offs for pumps. Process: • Attended truck filling.
Leachate treatability - Leachate may contain contaminants that are difficult to treat for some treatment processes e.g. boron, PFAS, Sulphide, etc.	Design: • Evaporator is a technology that is proven to work. Process: • Waste acceptance criteria, including adaptation as more is learnt about emerging contaminants.
Release not identified due to instrument failure - Conductivity monitor failure not identifying leachate discharge.	Design: • Redundancy in monitoring through duplication at inlet to Pond 3 from perimeter drains and outlet from subsoil drain. Process: • Regular maintenance and calibration of all continuous monitors on-site.
Leachate pumping and disposal capacity - Leachate level rising in the sump, putting pressure on the low permeability liner - Flooding of gas wells - Leachate seeping out through cover if the leachate level in the sump rises excessively to a level that is higher than landfill toe bund	Design: • Redundancy in the pumping system e.g. two pumps. • Installed removal and treatment capacity greater than leachate generation rate. Process: • Attention to details around edges of the landfill and at phase construction interfaces to prevent stormwater ingress. • Maintaining target daily leachate pumping rate. • Waste acceptance criteria excludes liquid waste.

3. MONITORING

3.1 Monitoring parameters and schedule

The landfill operator may add parameters for supplementary information at its discretion.

The monitoring programme is summarised in the table below (database extract) and in the list of parameters (Appendix 6.2).

Table 3.1

Location/ Event/ Topic	Parameter	Frequency	TL1	TL2
Leachate removal from site	Leachate amount tinkered off site as measured across weighbridge	Daily	No limit.	No limit. Monitored for information.
Leachate pumping	Leachate volume pumped from sump	Daily	No limit.	No limit. Monitored for information.
Leachate recirculation	Leachate volume injected back into the waste	Daily	Limits tba.	Limits tba in consultation with Council per consent condition 123
Site-generated liquids recirculation	Volume of leachate evaporator sludge, gas condensate, and cesspit suckings put back into the waste	Daily	Limits tba.	Limits tba in consultation with Council per consent condition 123
Leachate chemistry test	Contaminant concentration – parameters listed in consent condition 239	Quarterly	No limit	No limit. Monitored for information
Leachate evaporator	Temperature lodged with time and date	Continuous	90 deg C	95 deg C
Leachate sump	Level	Continuous	Sump full	Sump full level plus 0.3 m.
Groundwater monitoring	GW Levels require by the LMCP	Quarterly	No limit.	No limit. Monitored for information.
Groundwater monitoring	Level difference i.e. comparison between leachate level and groundwater level	Annually	No limit.	No limit. Monitored for information.
Stormwater Pond system inflow	Conductivity	Continuous	Limits tba.	Limits tba.
Perimeter drain sump	Conductivity	Continuous	Limits tba.	Limits tba.
Subsoil drain outlet	Conductivity	Continuous	Limits tba.	Limits tba.

3.2 Monitoring procedures

Separate detailed step-by-step procedures will be used for monitoring events (variously known as work instructions, standard operating procedures, and safe work method statements). Those detailed procedures intended for manual workers will be provided in a separate volume of the LMP. Key features of particular procedures for both the activity process and the related monitoring will be as follows.

LMP Section 3.25

Table 3.2

Procedure	Key steps
Leachate pumping	• Totaliser flow meter reading taken before starting any leachate pump. • Electrical trip systems checked before starting a leachate pump (i) tank-full (ii) differential flow indicating a pipe leak e.g. pump is switched on but leachate is not arriving at the tanks. • Emergency stop button locations known.
Leachate transfer to tanker trucks	• Leachate volume measured either by difference in truck weight recorded at the weighbridge or by calibrated flow meter with totaliser. • Location of emergency stop system known to all involved.
Leachate pumping to on-site treatment	• Calibrated flowmeters with totalisers for in-feed leachate and gas. • Calibrated flowmeters with totalisers for concentrated residual leachate recirculated back into the landfill.
Leachate level measurement in sump	• Level monitored by using a submerged pressure sensitive instrument or device. • Installation designed for instrument servicing, removal for calibration, and replacement. • Data logging. • Reported monthly to the PRP as part of their oversight of lining system matters.
Grab sample of leachate for chemical analysis	• Pre-ordered bottles from independent laboratory. • Field parameter measurements. • Field preservative and handling precautions. • Sampling points designed for safety and capture of any spillage. • At least one sampling point for leachate before exposure to air. • Chain of custody documentation for delivery to the independent laboratory. • Time restriction between sampling and testing.
Laboratory test	• Listed in Appendix 6.4 or as otherwise accepted by Auckland Council.

LMP Section 3.25

Procedure	Key steps
	• Includes detection limits, methods of analysis and units of measurement for all parameters.
Annual Environmental Report	• Leachate level in sump monitoring results. • Leachate chemistry results. • Leachate removal and treatment volumes. • Summary of TL exceedances and responses. • Comparison of leachate level with groundwater level.
Surfacewater sampling	• Refer to the SWMCP.
Continuous monitoring – perimeter drains and subsoil drain	• Calibrated conductivity meter installation designed for instrument servicing, removal for calibration, and replacement.

3.3 Reporting

Table 3.3

Location/ Event/ Topic	Report to	Method	Frequency
Leachate recirculation into the landfill.	In-house	Electronic	Monthly
Leachate Monitoring and Contingency Plan to be submitted prior to Landfill Commencement Date.	Auckland Council	Email	At least 3 months before.
Investigation into stormwater or groundwater contamination by leachate.	Auckland Council/ TWEC	Email	Within 5 days after
Groundwater contamination by leachate.	Auckland Council/ TWEC	Email	Within 5 days after
Surfacewater contamination by leachate.	Auckland Council/ TWEC	Email	Immediately
Perimeter drain contamination by leachate.	Auckland Council/ TWEC	Email	Immediately
Subsoil drain contamination by leachate.	Auckland Council/ TWEC	Email	Immediately

4. CONTINGENCY

4.1 Trigger Levels - general

4.1.1 Trigger Levels

Response limits (or trigger levels) are values for the monitoring parameters which, if exceeded, require a course of action to be taken. Upon completion of a monitoring event, the results will be checked against the pre-specified response limits. If no response limit is exceeded, the monitoring event will be routinely reported in due course. If any response limit is exceeded, action will be taken immediately as described in this contingency plan.

Response guidelines are summarised in the next section below.

The limits are set at two levels (TL1 and TL2) as follows.

4.1.2 Trigger Level 1 (Lower response limit)

Exceedance of TL1 warns of potential adverse effects, warns of potential future non-compliance with the resource consent conditions, requires investigation and reporting, and might require remedial action. For surface water, TL1 is reached if one or more individual parameters exceed the listed TL1 limits (provided in the SCMP and GWMCP).

4.1.3 Trigger Level 2 (Upper response limit)

Exceedance of TL2 will be regarded as an indication that significant environmental harm and breaches of consent conditions either have occurred, are currently occurring, or are about to occur. The upper limits will be set either at the limits (if any) specified in the resource consent, or at limits which if exceeded indicate non-compliance. Exceedance of TL2 usually requires urgent mitigative actions, notification of authorities, calling for or reference to recent relevant independent advice, and prompt investigations and remedies. For surface water, TL2 is reached if one or more individual parameters exceed the listed TL2 limits (provided in the SCMP and GWMCP).

4.1.4 Emergency

Extreme exceedance of TL2 might require reference to the emergency plan.

4.1.5 Definition of leachate contamination

The terms “Leachate contamination”, "contamination" and “contaminant” in the consent conditions refer to surfacewater, groundwater, and flows from subsoil drains.

For the purposes of this LMP these terms are taken to mean:

- TL2 has been exceeded in monitoring, and.
- There is observed or measured evidence of the presence of leachate or site-derived liquid contaminant in a watercourse or pond somewhere outside the landfill footprint, and.
- Independent specialist advice is that a significant change has occurred to the quality of surface water discharging from the site due to leachate.

This definition aims to encompass all events for which the regulator expects notification and liaison in regard to response actions. If investigation of a monitoring result or observation subsequently reaches a different conclusion from the first call, i.e. that leachate either was or was not the cause, then the event may be re-rated retrospectively accordingly.

The sources of the criteria and water quality standards used as a basis for the definition of leachate contamination i.e. the setting of Trigger Levels will be the subject of a separate report prepared by experts in that field and identified in Appendix 6.5.

4.1.6 Flowchart

The procedure to be followed upon receipt of monitoring results is illustrated in Appendix 6.3.

4.2 Response guidelines

Table 4.1

Contingency triggering event	**Response guidelines**
High leachate level in sump	Potential investigative actions (TL1 and TL2): • Verify the level reading if possible by another method. • Compare leachate level to the relevant groundwater well levels. • Review latest groundwater chemistry results to find any sign of leachate contamination. • Review leachate treatment volume data and rainfall data. • Review pumping and removal capacity. • Check that the pump and level switches are both functioning correctly. Potential remedial actions (TL2): • Increase the capacity of leachate treatment via on-site methods and off-site carting. • Temporarily increase leachate reinjection to higher locations in the landfill in tandem with increased pumping. • Review stormwater controls and diversion flow paths to ensure that stormwater runoff is being managed effectively. • Provide temporary extra storage capacity for pumped leachate coupled with increased pumping.
Leachate chemistry (leachate treatability, consistency with leachate character assumed in design of lining system)	• Review suitability of the treatment methods with elevated parameters (i.e. evaporation, trade waste discharge) • Update the pre-consent risk assessment for the elevated parameters. • Review Waste Acceptance Criteria (WAC) limits if a certain parameter of concern is elevated. • Identify trends in leachate chemistry variation to catch early signs of mass loading, seasonal change, etc for the particular parameters.
Leachate collection pipe blockage	• Assess and confirm evidence of blockage by considering all related monitoring. • Arrange for pipe flushing. • Ensure all leachate pumping systems are working properly before flushing starts.

Contingency triggering event	**Response guidelines**
Leachate seepage from soil cover on a side slope of the landfill.	• Follow the repair procedure described in the Site Emergency Management Plan (LMP 3.91) at 5.2.1.
Perimeter drain contamination by leachate	If conductivity trigger is exceeded: • Inspect the monitoring site to check that the instrument is functioning correctly and evidence of leachate. • Undertake a walkover of the perimeter drain to identify potential leachate sources. • Use portable meters to repeat or take parallel readings. • Undertake a visual inspection of the slopes draining to the perimeter drain to identify potential seeps or breakouts. • If evidence of leachate is confirmed, close the perimeter drain outlet. • All leachate and contaminated stormwater shall be pumped to the leachate system.
Stormwater pond contamination by leachate (Ponds 2 and 3)	If conductivity trigger is exceeded: Inspect the monitoring site to check that the instrument is functioning correctly and evidence of leachate. • Undertake a walkover of the perimeter drain upstream of the ponds to identify potential leachate sources. • Use portable meters to repeat or take parallel readings. • If not already done, take a grab sample from the pond discharge flow and analyse it for indicator parameters - Add metals and other parameters considered likely to help identify whether or not the source is leachate. • Close the pond outlet decant valve to cease discharging from the pond and divert water around the isolated pond, if exceedance is confirmed as leachate, investigate treatment or removal options including whether the contaminated water can be pumped back into the landfill, irrigated over the landfill surface or pumped to the leachate treatment system.
Surface water or wetland contamination by leachate	Verification of readings (TL1 and TL2): • Inspect the monitoring site to check that the instrument is functioning correctly. • Inspect the monitoring site to check that there is flow (zero flow means TLs won't apply, but will still be reported with explanations in the annual environmental report). • Check the telemetric monitoring outputs for consistency across the site. • Use portable meters to repeat or take parallel readings. • If not already done, take a grab sample from the pond discharge flow and analyse it for indicator parameters - Add

Contingency triggering event	Response guidelines
	metals and other parameters considered likely to help identify whether or not the source is leachate. Urgent remedial and precautionary action (TL2 only): • Close the pond outlet decant valve to cease discharging from the pond, so that discharge could only be possible to occur over the service spillway after the pond is full i.e. dilution is maximised and impact if any on the stream is minimised, while other emergency treatment is activated. • Turn off (or turn on) leachate extraction pumps according to observations. • Follow emergency procedures as for a spill or a stormwater control structure failure. • Close off any water inputs to the surface water system. • Use site resources to immediately take field measurements at the monitoring site, pond outlet and upstream to find and assess the source of the TL2. • If the source is reasonably assessed as leachate breakout regardless of flow rate, proceed in accordance with the response guidelines in the relevant LMP sections on cover and leachate. • If the source is land management activity (examples below) and the flow rate is very low (less than approximately 2.0 litres/minute), then complete the investigations and sampling for confirmation. • Note: Very low flow rate may be combined with conductivity TL exceedance due to land management activities e.g.: spreading freshly excavated clay as cover; exposing natural ground which initially yields run-off high in soluble ions; placing topsoil; seeding and fertilising; animal grazing; spreading gravel such as limestone on road surfaces; passing of a water truck washing the adjacent road; natural vegetation die-off; stagnation of water in dry weather; groundwater drainage. • Note: The final discharge sluice valves might not be perfectly water-tight when closed. These valves may be closed with the aim of preventing discharge while pond water is being held to allow greater sedimentation to occur within the site, but there may be a residual small “trickle” discharge. If the discharge flow rate from the pond is very low i.e. a trickle, then the impact on the receiving water will likely be too small to measure. • • In all cases, record findings for the regular annual report. Planned corrective and preventative action (TL1 and TL2):

Contingency triggering event	Response guidelines
	• Alter the pond discharge flow rate to allow for dilution into the stream before stream conductivity/ turbidity reaches its TL1. • Close the decant valve to cease discharging from the pond altogether before the pond discharge conductivity/ turbidity reaches its TL1 and determine or confirm whether the contamination event is due to leachate. • Open the decant valve only if or when the stream is in flood, to avoid specific environmental harm, and to provide capacity to increase detention time to reduce sediment load for cleaner discharge during sensitive low flow periods. • Isolate any identified sources of contaminated water.
Groundwater contamination by leachate	• Refer to the GWMCP.

5. TASK LISTS

5.1 Tasks and scheduled maintenance

Table 5.1

Role	Task	Frequency
Gas Technician	Walkover inspection on daily cover, intermediate cover and final cap (for leachate seepage).	Weekly
Landfill Engineer	Obtain an independent report to provide sources of the criteria and water quality standards used as a basis for the definition of leachate	Every 5 years
Landfill Engineer	Review the Leachate Monitoring and Contingency Plan.	Every 3 years
Landfill Engineer	Review the list of parameters for leachate analysis.	Every 3 years
Landfill Gas Manager	Schedule maintenance to ensure that the leachate evaporator remains in good condition free of gas or liquid leaks.	Monthly
Landfill Operations Manager	Flush out leachate collection pipes.	Every 5 years
Landfill Operations Manager	Specifically inspect leachate pipes and leachate systems.	Six-monthly

6. APPENDICES

6.1 Leachate monitoring locations site plan

(to be added - subject to final design)

LMP Section 3.25

6.2 Monitoring parameter lists

(1 page)

Adapted from Decision BUN60339589 Appendix 1 Consent Condition 388.

AUCKLAND REGIONAL LANDFILL
WATER QUALITY ANALYSIS PARAMETER LISTS

Location >	Leachate	Leachate
List >	L1	L2
Frequency >	quarterly	annually
Consent # >	tba	tba
Condition # >	C 388 (14/6/21 set)	C 388 (14/6/21 set)
Alkalinity		
Aluminium dissolved		
Aluminium total		
Ammonia N total	y	y
Antimony	**	y
Arsenic dissolved	y(total)	y(total)
Barium		y
BOD5		y
Boron	y(total)	y(total)
Cadmium dissolved	y(total)	y(total)
Calcium		
Chloride	y	y
Chromium dissolved	y(total)	y(total)
COD		y
Conductivity field	**	**
Conductivity lab	y	y
Conductivity continuous		
Copper dissolved	y(total)	y(total)
Cyanide		y
Hardness		
Iron dissolved		y
Iron total		
Lead dissolved	y(total)	y(total)
Magnesium soluble		
Magnesium total		
Manganese dissolved		y
Mercury	y(total)	y(total)
Molybdenum		y
Nickel dissolved	y(total)	y
Nitrate N		y
Nitrite N		y
Oxygen dissolved field		
pH field	**	**
pH lab	y	y
Phosphorus total		
Potassium	y	y
Selenium	y(total)	y
Silver		y
Sodium	y	y
Sulphate		y
Sulphide	y	y
Suspended solids		
Temperature field	y	y
Temperature continuous		
Turbidity field		
Turbidity continuous		
Zinc dissolved	**	**
Zinc total	y(total)	y(total)
Cation/Anion balance		
Oil & grease		
Volatile Acids		
Phenols total		
Volatile Organic Compounds (Note 1)		y
Semi Volatile Organic Compounds (Note 2)		y
Total Petroleum Hydrocarbons (TPH)	y	y
Polycyclic Aromatic Hydrocarbons (PAH)		y
1,4-dioxane		y
Poly-fluoroalkyl Substances (PFAS suite)		y
Brominated flame retardants		y
Macroinvertebrates		
Periphyton		
Flow rate estimate - field		
Flow rate continuous		
Water depth or level - field		
Results required within	2 weeks	3 weeks
"Field" = measurement by site staff either at the sample site or in the on-site laboratory.		
"Dissolved" = either field-filtered by site staff or filtered by the analytical lab if the sample is delivered in a short time.		
* = Measurement specifically required by conditions of consent		
** = Added at site's discretion to aid interpretation of results		
? = In Baseline Monitoring Report May 2019; not in draft conditions; not scheduled for regular testing.		
Note 1 = VOC includes BTEX and chlorinated solvents		
Note 2 = SVOC includes organochlorine pesticides and DDT compounds		

LMP Section 3.25

6.3 Contingency Plan Flowchart

(1 page)

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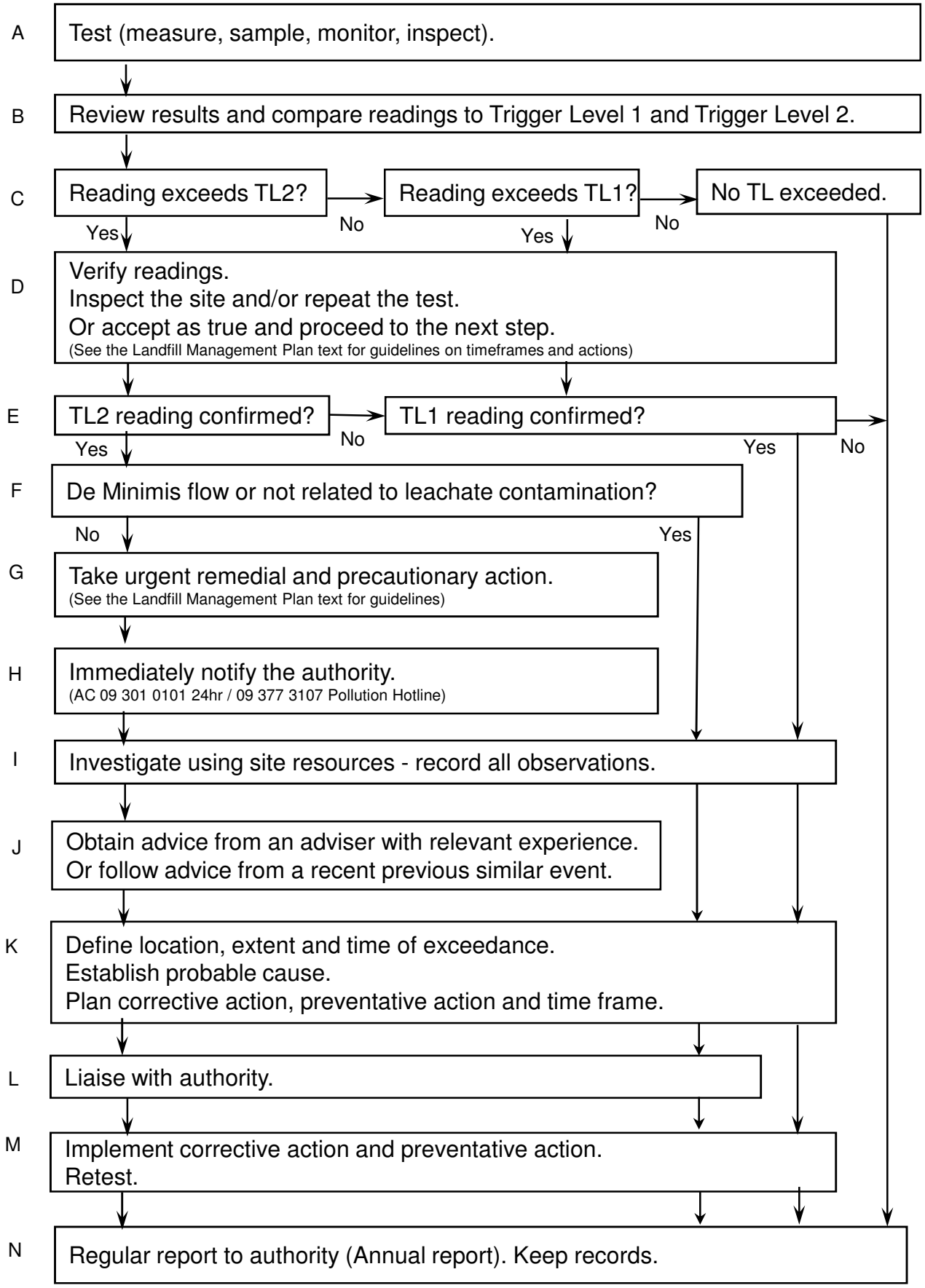
Contingency Plan Flowchart

Leachate contamination of surfacewater or groundwater



LMP Section 3.25

6.4 Test methods for leachate chemistry

(2 pages)

Extract from: R J Hill Laboratories Limited, 31-Jul-2020, Lab No: 2410370.

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Poly- and Perfluorinated Alkyl Substances in Water - High Level	Analysis by LC-MS/MS. Subcontracted to AsureQuality, Lower Hutt.	-	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) 23rd ed. 2017.	-	1-2
Total Digestion	Boiling nitric acid digestion. APHA 3030 E (modified) 23rd ed. 2017.	-	1-2
Total Digestion with HCl	Nitric/hydrochloric acid digestion. APHA 3030 E (modified) 23rd ed. 2017.	-	1-2
Total acid digest for Silver analysis	Boiling nitric / hydrochloric acid digestion (5:1 ratio). APHA 3030 F (modified) 23rd ed. 2017.	-	1-2
pH	pH meter. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Acidity (pH 3.7)	Titration to pH 3.7 with standard sodium hydroxide solution, bromophenol blue indicator. APHA 2310 B 23rd ed. 2017.	1.0 g/m^3 as $CaCO_3$	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (modified for Alkalinity <20) 23rd ed. 2017.	1.0 g/m^3 as $CaCO_3$	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 23rd ed. 2017.	1.0 g/m^3 as $CaCO_3$	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 23rd ed. 2017.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m^3	1-2
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 23rd ed. 2017.	10 g/m^3	1-2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 23rd ed. 2017.	-	1-2
Total Bromine*	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B 23rd ed. 2017.	0.11 g/m^3	1-2
Dissolved Calcium	Filtered sample, ICP-MS, screen level. APHA 3125 B 23rd ed. 2017.	1.0 g/m^3	1-2
Hexavalent Chromium	Diphenylcarbazide colorimetry. Discrete Analyser. APHA 3500 Cr B (modified from manual analysis) 23rd ed. 2017.	0.010 g/m^3	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, screen level. APHA 3125 B 23rd ed. 2017.	0.4 g/m^3	1-2
Total Mercury	Acid digestion, ICP-MS, screen level. APHA 3125 B 23rd ed. 2017.	0.0021 g/m^3	1-2
Sodium Absorption Ratio (Total)*	Calculation; from sodium, calcium and magnesium, as follows; (Na / 23) / [(Ca / 20 + Mg / 12.15)/2]$^{0.5}$ where the concentrations for these ions (Na, Ca and Mg) are expressed as g/m^3.	0.2 $(mmol/L)^{0.5}$	1-2
Total Sulphur	Nitric acid digestion, ICP-OES (method may not fully account for H_2S due to volatilisation during digestion). All forms of oxidised and organic sulphur will be determined by this method. APHA 3120 B 23rd ed. 2017.	0.5 g/m^3	1-2
Total Cyanide Screen	On-line distillation, colorimetry, screen level. ISO 14403:2012(E) (modified).	0.02 g/m^3	1-2
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23rd ed. 2017.	0.5 g/m^3	1-2
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 23rd ed. 2017.	0.05 g/m^3	1-2
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 23rd ed. 2017.	0.010 g/m^3	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser, screen level. APHA 4500-NO_3^- I (modified) 23rd ed. 2017.	0.10 g/m^3	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser, screen level. APHA 4500-NO_3^- I (modified) 23rd ed. 2017.	0.10 g/m^3	1-2
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry, Discrete Analyser, screen level. APHA 4500-N_{org} D (modified) 4500 NH_3 F (modified) 23rd ed. 2017.	5 g/m^3	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) 23rd ed. 2017.	0.004 g/m^3	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis and also modified to include a reductant to reduce interference from any arsenic present in the sample) 23rd ed. 2017. NWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m^3	1-2
Total Sulphide Screen	In-line distillation, segmented flow colorimetry. APHA 4500-S^{2-} E (modified) 23rd ed. 2017.	0.05 g/m^3	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23rd ed. 2017.	0.5 g/m^3	1-2
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, seeded. APHA 5210 B (modified) 23rd ed. 2017.	2 g O_2/m^3	1-2
Chemical Oxygen Demand (COD), screen level	Dichromate/sulphuric acid digestion, colorimetry. Screen Level method. APHA 5220 D 23rd ed. 2017.	25 g O_2/m^3	1-2
Methylene Blue Active Substances*	Subcontracted to Eurofins ELS Ltd, Lower Hutt. APHA 5540 C (modified) (On-line Edition).	0.1 g/m^3	1-2
ICP-MS Extended Total Metals, screen level	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B 23rd ed. 2017.	0.00042 - 1.1 g/m^3	1-2
Ethylene Glycol in Water*	Direct injection, dual column GC-FID.	4 g/m^3	1-2
Formaldehyde in Water by DNPH & LCMSMS	Derivatisation, SPE extraction, LC-MS/MS analysis. In-house based on US EPA 8315A.	0.02 g/m^3	1-2
Polychlorinated Biphenyls Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS analysis. In-house based on US EPA 8270.	0.00010 - 0.005 g/m^3	1-2
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid / liquid extraction, GC-MS analysis. In-house based on US EPA 8270.	-	1-2
Tributyl Tin Trace in Water samples by GCMS	Solvent extraction, derivitisation, GC-MS analysis. In-house.	0.00003 - 0.00005 g/m^3	1-2
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace GC-MS analysis. In-house based on US EPA 8260 and 5021.	0.003 - 0.5 g/m^3	1-2
Total Petroleum Hydrocarbons in Trade Waste Water			
C7 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.3 g/m^3	1-2
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m^3	1-2

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 01-Aug-2020 and 17-Aug-2020. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

6.5 Trigger Levels report

(to be provided prior to landfill commencement)

Reference: TBA (Report prepared independently to set trigger levels for surfacewater and groundwater monitoring)