Information sheet for environmental audits and preliminary risk screen assessments (PRSAs)

Publication 2009 June 2021

Victoria's audit system

An environmental audit system has operated in Victoria since 1989. The *Environment Protection Act 2017* (the Act) provides for the appointment of environmental auditors. It also provides for Environment Protection Authority (EPA or the Authority) to have a system of preliminary risk screen assessments (PRSAs) and environmental audits. These are used in the planning, approval, regulation and management of activities, and in protection of human health and the environment.

Under the Act, the functions of an environmental auditor include to:

- conduct PRSAs and environmental audits
- prepare and issue PRSA statements and reports, and environmental audit statements and reports.

The purpose of a PRSA is to:

- assess the likelihood of the presence of contaminated land
- determine if an environmental audit is required
- recommend a scope for the environmental audit if an environmental audit is required.

The purpose of an environmental audit is to:

- assess the nature and extent of the risk of harm to human health or the environment from contaminated land, waste, pollution, or any activity
- recommend measures to manage the risk of harm to human health or the environment from contaminated land, waste, pollution, or any activity
- make recommendations to manage any contaminated land, waste, pollution or activity.

Upon completion, all PRSAs and environmental audits require preparation of either a PRSA statement, accompanied by a PRSA report, or an environmental audit statement, accompanied by an environmental audit report.

A person may engage an environmental auditor to conduct a PRSA or an environmental audit.

EPA administers the environmental audit system and ensures an acceptable quality of environmental auditing is maintained. This is achieved by assessing auditor applications and conducting a quality assurance program. These measures ensure that PRSAs and environmental audits that environmental auditors undertake are completed in accordance with the relevant sections of the Act or any other Act, and with the guidelines the Authority or other government agencies have published.

Environment Protection Authority Victoria
GPO BOX 4395 Melbourne VIC 3001
1300 372 842 (1300 EPA VIC) **epa.vic.gov.au**

File structures

EPA stores digital statements and reports from PRSAs and environmental audits in three parts:

- Part A, the PRSA or environmental audit report
- Part B, report appendices
- Part C, the PRSA statement and executive summary or environmental audit statement and executive summary.

Report executive summaries, findings and recommendations should be read and relied upon only in the context of the whole document, including any appendices and the PRSA statement or environmental audit statement.

Currency of PRSAs and environmental audits

PRSAs and environmental audits are based on the conditions encountered and information reviewed at the time of preparation. They don't represent any changes that may have occurred since the completion date. As it's not possible for the PRSA or audit report to present all data that could be of interest to all readers, consideration should be made to any appendices or referenced documentation for further information.

When information about the site changes from what was available at the time the PRSA or environmental audit was completed, or where an administrative error is identified, an environmental auditor may amend or withdraw PRSA or environmental audit statements and/or reports. Users are advised to check EPA's website to ensure documents' currency.

PDF searchability and printing

EPA can only provide PRSAs and environmental audit statements, reports and appendices that the environmental auditor provided to EPA via the EPA portal on the EPA website.

All statements and reports should be in a Portable Document Format (PDF) and searchable; however at times some appendices may be provided as image-only PDFs, which can affect searchability.

The PDF is compatible with Adobe Acrobat Reader, which is downloadable free from Adobe's Website (www.adobe.com).

Further information

For more information on Victoria's environmental audit system, visit EPA's website or contact EPA's Environmental Audit Unit.

Web: www.epa.vic.gov.au

Email: environmental.audit@epa.vic.gov.au

EPA VICTORIA

Nolan Consulting Pty Ltd

Section 208 Audit - Audit of Landfill Operation

Hyland Highway Landfill - Hyland Highway, Loy Yang

Environmental Audit ID No. EA00001520

Latrobe City Council

September 2023

A165-01

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D: Ground Consulting (2023b) "*2023 Annual Environmental Monitoring Report - Hyland Highway Landfill",* 4 September 2023.
E: Bajwa EnviroConsult (2023) "*Hyland Highway Landfill – Risk Management and Monitoring Program*", 15 September 2023.

Executive Summary

The Latrobe City Council operates the Hyland Highway landfill at Hyland Highway, Loy Yang. The landfill is licensed to operate under the Environment Protection Authority (EPA) licence OL000025565 as amended on 24 November 2022.

Condition OL_L2 of the operating licence states:

> You must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 2017 to conduct environmental audits of the nature and extent of the risk of harm to human health or the environment arising from landfill operation under Section 208 of the Act at the frequency specified in the monitoring program.

The Monitoring Program referred to was provided in Section 10 of Nolan Consulting (2021) "*Section 53V Audit of Landfill Operation Hyland Highway, Loy Yang*". It was verified in September 2021 by John Nolan as the appointed Environmental Auditor. The verified Monitoring Program specified that the next landfill operation audit (LOA) is required for the period up to 30 June 2023 by 30 September 2023.

Background

The audit report has been prepared in accordance with:

- Section 208 of the Environment Protection Act 2017
- Appendix 6 of EPA (2016) "*Landfill Licensing Guidelines*", EPA Publication 1323.3
- EPA (2022a) "*Guidelines for conducting environmental audits*", EPA Publication 2041
- Condition OL_L2 of EPA Licence OL000025565.

Purpose

The purpose of this LOA is to:

(a) assess the nature and extent of the risk of harm to human health or the environment from the landfill operation

(b) recommend measures to manage the risk of harm to human health or the environment from the landfill operation

(c) make recommendations to manage the landfill operation.

It also verifies the risk management and monitoring program in accordance with Condition OL_L1 of the operating licence.

Audit details and audit site

Details of the LOA and audit site are presented in Tables E-1 and E-2.

Table E-1: Audit report summary

Item	Description
Auditor	John Nolan
Auditor account number	EXT001055
Date EPA notified of audit	28/06/2023
Auditor appointment end date	07/02/2024
Environment audit reference	EA001520
Name of person requesting audit	Chandana Vidanaarachchi
Relationship of person requesting audit to site	Co-ordinator Landfill Services Latrobe City Council
Name of site owner	Latrobe City Council
Date of auditor engagement	23/06/2023
Completion date of the audit	25/09/2023
Reason for audit	EPA operating licence OL000025565 Condition OL_L2 and auditor verified Risk Management and Monitoring Program (RMMP) requires audits of landfill operation.
Environments of environment assessed	Ambient air, ambient noise, land and water
Planning permit number or requirement detail if applicable	Not applicable
EPA region	Gippsland
Municipality	City of Latrobe
Dominant – Lot on plan	Crown Allotment 2005, TP 800057W, Parish of Loy Yang (PS601784)
Additional – Lot on plan	NA
Site/activity site name	Hyland Highway Landfill
Street / Lot – Lower No.	64
Street Name	Hyland
Street type (road, court, etc.)	Highway
Suburb	Loy Yang
Postcode	3844
Site area (in square metres)	82,000 m^2 (footprint of completed and active cells) 148,000 m^2 (licenced area)
Members and categories of support team utilised	Alexis Valenza (Hydrogeology and Auditor's Assistant)
Further work or requirements	Recommendations for further work and requirements are included in Table E-4 below.

Item	Description
Nature and extent of continuing risk	The Auditor has reviewed the RMMP's risk assessment. The nature and extent of continuing risks were identified in the RMMP and the Auditor formed an opinion as to whether the risks were tolerable or intolerable. Residual risks were considered tolerable if all practicable risk mitigation measures had been implemented. No residual risks above medium were identified. Identified medium residual risks, for which further mitigation measures are required to reduce the risk to tolerable levels are listed below: ▪ acceptance of non-conforming waste resulting in air impacts (including odour) ▪ combustible material/ ignition sources within landfilled waste resulting in land and air impacts (fire) ▪ water used to suppress fire increasing leachate generation and resulting in groundwater impacts ▪ overfilling resulting in air impacts (including odour, dust and volatile gases) ▪ leachate seepage(dissolved contaminants) resulting in groundwater and surface water impacts ▪ leachate pond overtopping resulting in land and surface water impacts ▪ discharge of volatiles from leachate or contaminated groundwater resulting in land impacts ▪ runoff from areas with intermediate cover resulting in surface water impacts ▪ leachate sourced RO permeate used for irrigation resulting in surface water impacts ▪ inadequate segregation and management of stormwater resulting in surface water and land impacts ▪ anaerobic conditions in leachate pond(s) resulting in air impacts (odour) ▪ direct release of LFG from landfill surface to the atmosphere resulting in air impacts ▪ direct release of LFG from landfill surface to the atmosphere, moving beyond site boundary resulting in air impacts ▪ sub-surface LFG migration and accumulation in onsite buildings and structures resulting in air impacts ▪ long-term LFG emissions and sub-surface migration (onsite and offsite) resulting in air impacts The Auditor has provided recommendations to mitigate these risks.

Outcome of the audit	The outcomes of the audit are presented below. Implementation of the Environmental Monitoring Program LCC is responsible for the environmental monitoring. ALS Water undertakes groundwater, surface water, leachate and LFG physical monitoring. LCC undertakes visual and olfactory, leachate level, leachate flow and odour (H_2S) monitoring or has implemented a telemetry system to record this information. The verified monitoring program has been largely implemented (see Section 8) and in most cases steps have been taken to address the outstanding actions. Interpretation of groundwater monitoring results The groundwater has Segment A1 Environmental values. The lowest landfill floor, 116.8 m AHD within Cell 3, is at least 20 m above the regional groundwater level. The only two groundwater monitoring bores with sufficient water to sample are BH03R and BH05. Both bores are north of the landfill. Monitoring bore BH06 was installed over 100 m to the east of the landfill. It is reported as dry. Monitoring bore BH05 is screened at a deeper level than monitoring bore BH03R within the Traralgon Formation aquifer system. It is considered to be hydraulically down-gradient of the landfill. The water intersected at monitoring bore BH03R is inferred to be perched within the Traralgon Formation's T1 coal seam and hence may not be hydraulically connected to the regional water table. The analytical results indicate that environmental value water quality objectives at these bores are being met except for pH total iron and possibly total ammonia. The water quality at monitoring bore BH03R has been consistent since it was first monitored. There is no evidence of perched groundwater behind the Cell 3B northern side liner. This follows groundwater extraction from this perched system up to 2021. Interpretation of surface water monitoring results Exceedances of surface water objectives at Stormwater Pond 2 were limited to ammonia and nitrate. The RO permeate is unlikely to be the source of TOC to this pond. The Traralgon Creek water quality is similar in the upstream and downstream monitoring sites. The only parameter for which water quality objective exceedances have occurred along Traralgon Creek is iron. As the RO permeate and the Stormwater Pond iron concentration is typically less than that of both Traralgon Creek monitoring sites landfill leachate is not considered to be a significant iron source to the creek. Interpretation of LFG monitoring results The methane concentrations have been below the EPA (2015) *Landfill BPEM* action level of 1% v/v at all LFG monitoring bores over the audit period except for monitoring bores LFG03, LFG04 and LFG07. The first two bores are north of cell 3 and 4 and may be impacted by LFG up the aggregate within the soil protection layers. Monitoring bore LFG07 is 20 m south of leachate pond LP2 and about 90 m south of Cell 3.

Item	Description
	The CO_2 concentrations at most LFG monitoring bores have been above the EPA (2015) *Landfill BPEM* action level. Its presence may be due to the underlying coal. The risk at off-site sensitive receptors associated with these exceedances is very low to low except for at LFG07 for which a moderate risk was determined four years ago. Monitoring bore LFG12 is approximately 900 m west of the Stage 1 cap within the road reserve on Traralgon Creek Road. The CO_2 concentration measured at this bore fluctuates with its maximum concentration ranging up to 7.5 %v/v. There have been a few methane action level exceedances within the intermediate cover for which LCC advised it mitigates. The education centre has not been monitored for LFG. No exceedances of the subsurface service LFG action levels were detected
Land use suitability	The land is suitable subject to compliance with the recommendations.
Has groundwater clean-up been undertaken as far as reasonably practicable?	Not applicable.
Does groundwater contamination remain at the site and is the site the source?	Yes.
If groundwater contamination remains, does it extend off-site?	No.
Is a GQRUZ recommended?	No.
If applicable, please indicate any threatened environmental values of groundwater	Nil
Is ongoing groundwater monitoring required?	Yes, as per the Auditor verified monitoring program.
Is ongoing vapour/gas monitoring required	Yes, gas monitoring as per the Auditor verified monitoring program.
Are vapour/gas mitigation measures required	No.
List any other ongoing management requirements if applicable	See recommendations in Table E-4.

Table E-2: Physical site information

Item	Description
Current EPA Permission/s and related Permission ID if applicable	EPA operating licence OL000025565
Historic land use	Blue gum plantation
Current land use	Landfill
Proposed land use	Public Open Space
Current land use zoning	Farming Zone 1 (FZ1)

Item	Description
Proposed land use zoning	No change proposed
Surrounding land use – north	Special Use (SUZ1)
Surrounding land use – south	Farming (FZ)
Surrounding land use – east	Farming (FZ)
Surrounding land use – west	Farming (FZ)
Nearest surface water receptor - name	Traralgon Creek
Nearest surface water receptor – direction	Traralgon Creek is west of the site and flows in a northerly direction towards the Latrobe River. Aits nearest location is about 1,100 m west of the landfill
Likely point of groundwater discharge	Coal mine
Site aquifer formation	Traralgon Formation
Groundwater flow direction	North-north-west
Groundwater TDS range (mg/L)	<600 mg/L
Groundwater segment	Segment A1
Are there multiple aquifers impacted by pollution at the site	No
Perched groundwater depth – upper (metres below ground level (mbgl))	Not applicable
Perched groundwater depth – lower (mbgl)	Not applicable
Regional groundwater depth – upper (mbgl)	60
Regional groundwater depth – lower (mbgl)	90
Number of bores within 2 km	Nil with groundwater uses
Closest extractive use (distance in m)	>2,000 m
Zone of groundwater plume influence (m from site boundary)	Nil
Year groundwater last monitored	2023

Audit Recommendations

The LOA recommendations are risk based and prioritised. The priorities, risks and descriptors are presented in Table E-3.

Table E-3: Definition of priorities of LOA recommendations

Priority	Risk level	Description
1	Very High – High	Requires immediate action (within three months of audit report submission to EPA) to manage risk or mitigate impact.
2	Medium	Requires prompt action to manage risk or mitigate impact (within six months of audit report submission to EPA unless the recommendation is dependent upon another action which will not allow the recommended activity to commence within this timeframe).
3A	Low	Requires action prior to the next LOA to manage risk or mitigate impact.
3B	Residual Risk Monitoring	Prior to next annual monitoring report.

Priority 3B recommendations support the Priority 1, 2 and 3B recommended actions.

Table E-4 present recommendations with risk priorities and risk identifiers. No priority 1 and priority 3A recommendations were identified.

Table E-4: LOA recommendations

No		Recommendation	Priority (Table 12-1) and Risk No (Tables 6-9 & 6-10)
Monitoring program			
1	Implement RMMP including:		
	(a)	Ensure monitoring bores are locked after each monitoring event.	3B Priority
	(b)	Undertake in-situ metals filtering of samples from groundwater bores.	3B Priority
	(c)	Prepare declaration in annual monitoring report that the monitoring program was completely in accordance with the verified monitoring program and explains any non-conformances.	3B Priority
	(d)	Prepare annual graphical plots of leachate levels against compliance levels and flows.	3B Priority
2	Prepare an up to date monitoring location plan with all monitoring sites including leachate sumps once the four LFG monitoring bore have been installed. Plan to include up to date cells and caps.		3B Priority
3	Prepare an up to date LFG monitoring location plan for education centre (with building and subsurface service sampling points).		3B Priority
4	Address verified monitoring program requirements, included in verified RMMP, that have been identified as not fully compliant in Section 8.		3B Priority
5	Undertake continuous LFG monitoring with flow at two LFG monitoring bores with methane action level exceedances. Continuous monitoring to include two low pressure periods.		2 Priority, M7, M8 & M11
Monitoring infrastructure			
6	Install LFG monitoring bores LFG15 to LFG18 east of the future cells at locations shown in the RMMP.		2 Priority M7, M8 & M11

No	Recommendation	Priority (Table 12-1) and Risk No (Tables 6-9 & 6-10)
7	Install a groundwater monitoring bore to south-east of future leachate pond LP3 and in the second coal seam of Traralgon Formation) prior to the commissioning of future leachate pond LP3. This bore is expected to be about 100 m in depth. Ensure groundwater is intersected and add to the RMMP. The timing is dependent on when future leachate pond LP3 may be commissioned rather than the standard 6 months requirement from the date of this audit report.	2 Priority M4 & M5
Site Infrastructure		
8	Install sign at weighbridge entrance with list of acceptable materials	2 Priority, M1
9	Inspect Stormwater Pond 1 on a quarterly basis and after major storm events and clean out as required. Ongoing	2 Priority M9 & M10
10	Review Stormwater Pond 2 water quality after monitoring events and modify RO plant discharge arrangements if ammonia and phosphorus loads are likely to impact environment between Stormwater Pond 2 and Traralgon Creek environmental values. This is an ongoing requirement, As such the timing is dependent on future determinations rather than the standard 6 months requirement from the date of this audit report.	2 Priority M9 & M10
11	Dewater leachate (with tankering to a licenced facility), remove sludge from the base of the pond (with transport to a licenced facility) and undertake integrity testing of the geomembrane liner from leachate pond LP2 after the proposed leachate pond LP3 is constructed and commissioned.	2 Priority M4, M5 & M6
Hydrogeological assessment		
12	Undertake hydrogeological assessment after installation of groundwater monitoring bore to south-east of future leachate pond LP3 and following two monitoring events.	2 Priority M4 & M5
LFG and odour management		
13	Propose background CO_2 concentration and seek EPA approval.	2 Priority, M7, M8 & M11
14	Update PLC (2017) Landfill Gas Risk Assessment after: ▪ LFG monitoring bores LFG15 to LFG18 installed and monitored in at least two monitoring events ▪ continuous LFG monitoring with flow at two LFG monitoring bores has been completed ▪ background CO_2 concentration has been approved by the EPA	2 Priority, M7, M8 & M11
15	Optimise and upgrade LFG collection and treatment system to address subsurface LFG action level exceedances where practicable.	2 Priority, M7, M8 & M11
16	Implement the pDs Consultancy (2023) "Model review of odour impact assessment for Hyland Hwy Landfill" recommendations	2 Priority, M6
Capping		
17	Subject the EPA design approval construct Stage 3 cap in accordance with rehabilitation plan schedule.	2 Priority, M4 & M7

No	Recommendation	Priority (Table 12-1) and Risk No (Tables 6-9 & 6-10)
Landfill operations and procedures		
18	Develop and implement management procedure to prevent, identify and control any hotspots within the waste mass. These should include, but not be limited, to: ▪ Installation and maintenance of firefighting equipment and water supply appropriate for the size and activities at the site ▪ Fire response training for employees ▪ Site emergency procedures ▪ Identification of incoming hot loads of waste (at the weighbridge and tipping face) ▪ Identification of potential hot loads (criteria based on the waste types accepted at the site) ▪ Refusal of hot loads ▪ Isolation (in a suitable quarantine area) and cooling of hot loads prior to burial ▪ Good compaction of the waste to remove as much air as possible during burial ▪ Containment and disposal of firefighting run-off water ▪ Management of heat generating wastes (e.g. shredder floc, green waste etc.) i.e. no stockpiling of these types of wastes outside of the landfill cell, disposal of these wastes in thin layers in the landfill cell or mixing with non-combustible wastes during disposal ▪ Regular inspection and maintenance of the site surface, and penetrations through it, to ensure that cap integrity is maintained to prevent air ingress as far as practicable ▪ Regular inspection of the site for signs of hotspots within the waste mass, such as: visible smoke; burning odours; surface cracking, rapid localised subsidence; landfill gas balance indicators (CH_4:CO_2 ratio, O_2 % v/v, CO ppm, H ppm, N_2 % v/v); landfill gas or leachate temperatures.	2 Priority, M2
19	Develop and implement stormwater management procedure.	3B Priority
20	Update the "Description of the irrigation system at Hyland Highway Landfill" into a procedure that provides a methodology to determine crop demand and irrigation application rates and requires metering of the irrigation application rate.	2, Priority M4
21	Extend stormwater discharge pipe from Cell 6 excavation to stormwater ponds.	3B Priority
22	Repair final cap and intermediate cover where methane action level exceedances have been identified in landfill surface walkovers. These should be documented with photographs, co-ordinates and a description of works undertaken. Final cap repairs to be in accordance with cap technical specifications. Ongoing.	2 Priority M7
23	Maintain the health of the final cap vegetation by weeding and watering during dry periods. Ongoing	3B Priority
Auditing		
24	Initiate the next LOA to cover the period up to 30 June 2025.	3B Priority, 30 September 2023

Environmental audit statement

Under Part 8.3 of the *Environment Protection Act 2017*

Publication F1032 published September 2021

The purpose of an environmental audit is:

a) to assess the nature and extent of the risk of harm to human health or the environment any activity; and
b) to recommend measures to manage the risk of harm to human health or the environment any activity; and
c) to make recommendations to manage the activity.

This statement is a summary of the findings of an environmental audit conducted under Part 8.3 of the *Environment Protection Act 2017* for:

64 Hyland Highway, Loy Yang 3844, Landfill Operation

Further details are provided in the environmental audit report that accompanies this statement.

Section 1: Environmental audit overview

Environmental audit ID number:	EA001520

Environmental auditor details

Name:	John Nolan
Company:	Nolan Consulting
Address:	31 Knox Drive, Barwon Heads, VIC3227
Phone:	(0410) 099-314
Email:	john.nolan@nolan-consulting.com.au

Site owner or occupant

Name:	Chandana Vidanaarachchi
Company:	Latrobe City Council

Environmental auditor engaged by

Name:	Chandana Vidanaarachchi
Company:	Latrobe City Council
Relationship to site owner:	Co-ordinator Landfill Services

Reason for the environmental audit

☒ Requirement under the *Environment Protection Act 2017* (e.g. remedial notice or licence)
OL000025565

Section 2: Environmental audit scope

Details of the activity in respect of which the environmental audit was conducted

Activity:	Landfill Operation
Components of the activity:	Review of risk management and monitoring program (RMMP), progressive rehabilitation and ability of RMMP to generate sufficient information to enable compliance with operating licence conditions to be determined.
Site/premises name:	Hyland Highway Landfill
Address where activity is undertaken:	64 Hyland Highway< Loy Yang, Vic 3844
Geographical extent considered in relation to the activity:	Landfill activity plan area and surrounding land

Elements of the environment assessed in the environmental audit

☒ Ambient air
- ☐ all environmental values were considered
- ☐ all environmental values other than the following were considered:

☒ Ambient sound
- ☐ all environmental values were considered
- ☐ all environmental values other than the following were considered:

☒ Land
- ☐ all environmental values that apply to the land use category were considered
- ☐ all environmental values that apply to the land use category, other than the following, were considered:

☒ Water
- ☒ Surface water
  - ☒ all environmental values that apply to the applicable segment were considered OR
  - ☐ all environmental values that apply to the applicable segment, other than the following, were considered:
- ☒ Groundwater
  - ☒ all environmental values that apply to the applicable segment were considered OR
  - ☐ all environmental values that apply to the applicable segment, other than the following, were considered:

Standards and reference documents considered

Environment Reference Standard 2021
National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended from time to time
Environment Protection Act 2017
Environment Regulations 2021
EPA Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788)
Nolan Consulting (2021) 'Section 53V Audit – Audit of Landfill Operation –Hyland Highway, Loy Yang', Service Order No. 8005592, September 2021.
Monitoring records for audited period

Assumptions made during the environmental audit or any limitations

Determined during the audit

Exclusions from the environmental audit and the rationale for these

Consideration of future cells
Activities beyond 30 June 2023.
Cultural heritage search
Community involvement (LCC to communicate audit findings to community)
Review of haul road management plan records
Staff training
Greenhouse gas emissions to the atmosphere as a result of LFG fugitive emissions
Consideration of plans required by Reporting Conditions listed in Works Approval 214663 for the landfill extension dated 30 December 2019,

This statement is accompanied by the following environmental audit report:

Title:	Nolan Consulting (2023) 'S208 Environmental Audit – Audit of Landfill Operation – Hyland Highway, Loy Yang', Reference ID. EA 001520, September 2023
Report no:	EA001520
Date:	25 September 2023

Section 3: Results and recommendations of the environmental audit

Results of the environmental audit

Based on my assessment of the risk of harm to human health or the environment from the landfill operation, I conclude that monitoring was generally undertaken in accordance with the verified monitoring program, while the ammonia and nitrate concentrations at Stormwater Pond 2 are elevated no adverse impact has been identified on Traralgon Creek, steps have been taken to reduce LFG and odour risks and the RMMP is verified as adequate to determine compliance with the operating licence.

Recommendations

Implement RMMP.
Prepare an up to date monitoring location plan with all monitoring sites including leachate sumps once the four LFG monitoring bore have been installed. Plan to include up to date cells and caps.
Prepare an up to date LFG monitoring location plan for education centre (with building and subsurface service sampling points).
Address verified monitoring program requirements, included in verified RMMP, that have been identified as not fully compliant.
Undertake continuous LFG monitoring with flow at two LFG monitoring bores with methane action level exceedances. Continuous monitoring to include two low pressure periods.
Install LFG monitoring bores LFG15 to LFG18 east of the future cells at locations shown in the RMMP.
Install a groundwater monitoring bore to south-east of future leachate pond LP3 and in the second coal seam of Traralgon Formation) prior to the commissioning of future leachate pond LP3. This bore is expected to be about 100 m in depth. Ensure groundwater is intersected and add to the RMMP. The timing is dependent on when future leachate pond LP3 may be commissioned rather than the standard 6 months requirement from the date of this audit report.
Install sign at weighbridge entrance with list of acceptable materials.
Inspect Stormwater Pond 1 on a quarterly basis and after major storm events and clean out as required.
Review Stormwater Pond 2 water quality after monitoring events and modify RO plant discharge arrangements if ammonia and phosphorus loads are likely to impact environment between Stormwater Pond 2 and Traralgon Creek environmental values.

Dewater leachate (with tankering to a licenced facility), remove sludge from the base of the pond (with transport to a licenced facility) and undertake integrity testing of the geomembrane liner from leachate pond LP2 after the proposed leachate pond LP3 is constructed and commissioned.
Undertake hydrogeological assessment after installation of groundwater monitoring bore to south-east of future leachate pond LP3 and following two monitoring events.
Propose background CO2 concentration and seek EPA approval.
Update PLC (2017) Landfill Gas Risk Assessment.
Optimise and upgrade LFG collection and treatment system to address subsurface LFG action level exceedances where practicable.
Implement the pDs Consultancy (2023) "Model review of odour impact assessment for Hyland Hwy Landfill" recommendations.
Subject to EPA design approval construct Stage 3 cap in accordance with rehabilitation plan schedule.
Develop and implement management procedure to prevent, identify and control any hotspots within the waste mass.
Update the "Description of the irrigation system at Hyland Highway Landfill" into a procedure that provides a methodology to determine crop demand and irrigation application rates and requires metering of the irrigation application rate.
Extend stormwater discharge pipe from Cell 6 excavation to stormwater ponds.
Repair final cap and intermediate cover where methane action level exceedances have been identified in landfill surface walkovers. These should be documented with photographs, co-ordinates and a description of works undertaken. Final cap repairs to be in accordance with cap technical specifications.
Maintain the health of the final cap vegetation by weeding and watering during dry periods.

Other related information

Nil

Section 4: Environmental auditor's declaration

I state that:

- I am appointed as an environmental auditor by the Environment Protection Authority Victoria under the *Environment Protection Act 2017*.
- The information contained in this statement represents a true and accurate summary of the findings of the environmental audit that I have completed.

Date:	25 September 2023
Signed:	
Name:	John Nolan
	Environmental Auditor

1. Introduction

The Latrobe City Council operates the Hyland Highway landfill at 64 Hyland Highway, Loy Yang. The landfill is licensed to operate under the Environment Protection Authority (EPA) operating licence OL000025565 as amended on 24 November 2022. The amended operating licence is attached as Appendix A.

1.1 Requirement for LOA

Condition OL_L2 of the operating licence states:

> You must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 2017 to conduct environmental audits of the nature and extent of the risk of harm to human health or the environment arising from landfill operation under Section 208 of the Act at the frequency specified in the monitoring program.

The Monitoring Program referred to was provided in Section 10 of Nolan Consulting (2021) "*Section 53V Audit of Landfill Operation Hyland Highway, Loy Yang*". It was verified in September 2021 by John Nolan as the appointed Environmental Auditor. The verified Monitoring Program specified that the next landfill operation audit (LOA) is required for the period up to 30 June 2023 by 30 September 2023.

1.2 Auditor

John Nolan, an Environmental Auditor appointed under the *Environment Protection Act 2017* (the 'Auditor'), has been engaged by the LCC to undertake this LOA.

1.3 Background

The audit report has been prepared in accordance with:

- Section 208 of the Environment Protection Act 2017
- Appendix 6 of EPA (2016) "*Landfill Licensing Guidelines*", EPA Publication 1323.3
- EPA (2022a) "*Guidelines for conducting environmental audits*", EPA Publication 2041
- Condition OL_L2 of EPA Licence OL000025565.

1.4 Purpose

The purpose of this landfill operation audit (LOA) is to:

(a) assess the nature and extent of the risk of harm to human health or the environment from the landfill operation

(b) recommend measures to manage the risk of harm to human health or the environment from the landfill operation

(c) make recommendations to manage the landfill operation.

It also verifies the risk management and monitoring program in accordance with Condition OL_L1 of the operating licence.

1.5 Definitions

The term "site" is used within this report. It refers to the activity plan area (Appendix 2 of the operating licence).

1.6 Location of LOA findings

The location of the findings within the body of this LOA report are listed in **Table 1-1**.

Table 1-1: Location of findings within this LOA report

Audit findings	Location in LOA report (section)
Risk of landfill operations to environmental values identified by the environmental auditor	Section 7.1
Comment on the risk assessments (site operation and landfill gas) prepared by landfill operator	Section 7.1
Comment on the completeness of the RMMP including comment on the audit frequency	Section 11
Assessment of the adequacy of the RMMP to determine compliance with licence conditions	Section 11.2
Assessment of implementation of the monitoring program	Section 8
Interpretation of monitoring results	Section 9
Verification of the RMMP	Section 11.2
Implementation of progressive rehabilitation	Section 5
Recommendations (including prioritisation)	Section 13
Implementation of recommendations made in previous audit reports	Section 10

2. Audit scope and method

The scope of the audit is that submitted to the EPA on 8 May 2023 as the proposed scope as per Section 208(3) of the Environment Protection Act 2017 (Appendix B). The audit status on the EPA portal as of 1 August 2023 was 'Scope Accepted'.

The scope is consistent with Appendix 6 of the EPA (2016) "*Landfill Licensing Guidelines*" and Section 8 of the EPA (2022a) "*Guidelines for conducting environmental audits*", EPA Publication 2041

2.1 LOA purpose

The purpose of the LOA is to:

a) assess the nature and extent of the risk of harm to human health or the environment from an activity; and

(b) recommend measures to manage the risk of harm to human health or the environment from an activity; and

(c) make recommendations to manage the activity.

2.2 LOA scope

2.2.1 Activity to be audited

The activity to be audited is the operation of the Hyland Highway Landfill.

2.2.2 Current use

The current use of the site is "landfill".

2.2.3 Component of the activity to be considered

The LOA:

- assesses the landfill operation
- reviews the completeness of the risk assessment
- comments on the risk assessment
- comments on the progressive rehabilitation of landfill
- comments on the ability of the risk management and monitoring program (RMMP) to generate sufficient information to enable compliance with the permission
- verifies the RMMP.

2.2.4 Segments of the environment to be considered

The segment of the environment is the area of land on which the landfill cells are located, including the atmosphere at the site, groundwater beneath the site and any surface water on the site, and the environment surrounding the landfill to which the activity may pose a risk.

2.2.5 Elements of the environment to be considered

The LOA elements are ambient air, ambient sound, land and water (groundwater and surface water).

2.2.6 Environmental values

An environmental value is a use, an attribute or a function of the environment.

Environmental values for the elements considered are specified in the Environment Reference Standard 2021. This standard identifies indicators to be employed when measuring environmental quality objectives that are necessary to sustain environmental values.

The environmental values to be considered are identified in Section 7.2 of this report.

2.2.7 Standards and reference documents

- Environment Protection Act 2017
- Environment Regulations 2021
- Environment Reference Standard 2021
- EPA (2015) "*Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills*", EPA Publication 788 [EPA (2015) *Landfill BPEM*]
- Nolan Consulting (2021) "*Section 53V Audit of Landfill Operation Hyland Highway, Loy Yang*", Service Order Reference No. 8005592, September 2021.
- monitoring records – July 2021 to June 2023.

2.2.8 Assumptions or limitations

Documented in this LOA.

2.2.9 Exclusions

This audit applies to the landfill as of 30 June 2023.

This audit excludes:

- consideration of future cells
- activities beyond 30 June 2023.
- cultural heritage search
- community involvement (LCC to communicate audit findings to community)
- review of haul road management plan records
- staff training
- greenhouse gas emissions to the atmosphere as a result of LFG fugitive emissions
- consideration of plans required by Reporting Conditions listed in Works Approval 214663 for the landfill extension dated 30 December 2019,

2.2.10 Risk assessment

Bajwa EnviroConsult (2023) "*Hyland Highway Landfill – Risk Management and Monitoring Program*" of September 2023 was prepared after the Nolan Consulting (2021) "*Section 53V Audit of Landfill Operation Hyland Highway, Loy Yang*".

A qualitative assessment of risks associated with the landfill has been undertaken as an integral part of this LOA. This qualitative assessment considers Bajwa EnviroConsult (2023).

2.2.11 Period of time over which the audit is to be conducted

The audit consider monitoring from 1 July 2021 to 30 June 2023 and LCC responses to Auditor questions up to the completion of this audit report.

2.2.12 Audit criteria

Audit criteria is drawn from the following legislation, regulations and documents:

- Environment Protection Act 2017
- Environment Regulations
- Environment Reference Standard 2021
- the verified environmental monitoring program
- progressive rehabilitation requirements

and any other publications deemed relevant by the environmental auditor.

2.3 Audit tasks

The LOA included the following tasks:

1. **Confirm the scope and criteria of the audit:** At commencement of the LOA, the Auditor submitted the proposed scope to the EPA. This included the criteria to be applied.

2. **Familiarisation and preliminary document review:** This task involved the familiarisation with the reports and documents (See Section 15) provided by LCC, including operating licence and notices, and/or other advice relevant to the LOA.

3. **Site visit:** The Auditor conducted a site visit on 18 August 2023.

4. **Review quality assurance/quality control:** Complete a review of the actions, procedures, checks and decisions undertaken to ensure sample integrity and representativeness, and the reliability and accuracy of analysis results.

5. **Review of risk management and monitoring program:** Including examination of the available data to verify its reliability, discussion with the Assessor and LCC representatives where required. The documentation, data and reports reviewed are listed in Section 15.

6. **Assess risk to environmental values:** Complete an assessment of risk, to determine the acceptability of the risk to environmental values as defined in the ERS.

7. **Assess progressive rehabilitation:** Assess whether the site is being progressively rehabilitated (Section 5)

8. **Make recommendations:** Make recommendations for measures (indicating priorities) to reduce and manage risks to environmental values to acceptable levels (Section13).

9. **Verify the RMMP:** The RMMP is Bajwa EnviroConsult (2023) *"Hyland Highway Landfill – Risk Management and Monitoring Program"*. This RMMP has been reviewed and verified by the Auditor.

10. **Issue audit report:** Upon receipt of the LCC's matter of fact comments on the draft, this audit report was finalised and issued.

2.4 Site inspection

The Auditor and his assistant undertook a site inspection on 18 August 2023 in the company of LCC's Co-ordinator Landfill Services, Team Leader Landfill Services, Native Vegetation Officer and Acting Coordinator Infrastructure Maintenance and the Aquaklenz Leachate Management Plan facilitator.

The Auditor and his assistant inspected landfill cells, surrounds and key monitoring infrastructure. Photographs from the inspection are presented in Appendix C.

The inspection was conducted from 12.0 pm to 2.30 pm on 18 August 2023.

At the BOM Latrobe Valley Airport (Meteorological Station No. 85280):

- rainfall for the 24 hours up to 9.00 am - 18 August (2.8 mm), 15 August (0.0 mm), 16 August (0.0 mm) and 17 August 2023 (0.0 mm)
- wind – 20 km at 9.00 am from the west and 30 km/hr from the south-west at 3.00 pm on 18 August 2023
- temperature – 8.5°C at 9.00 am and 10.6°C at 3.00 pm on18 August 2023.

Prior to the site visit the Auditor inspected documents sought by the Auditor and provided by LCC.

After the site inspection the Auditor interviewed LCC's Co-ordinator Landfill Services.

2.5 Environmental audit report and statement

The LOA report is consistent with Section 212 of the Environment Protection Act 2017 and Section 11.5 of EPA (2022a) "*Guidelines for conducting environmental audits*" Publication 2041, February 2022 the report. As well as being consistent with these documents, the LOA:

- states the auditor's opinion on the risks posed to the human health and environmental values of the segments
- includes the location of the various audit findings in Table 1-1.
- includes comments on whether the risks to the environment are being adequately identified, managed and monitored

has the reference number displayed on the report cover.

The environmental audit statement is consistent with Sections 11.2 and 11.3 of the EPA (2022a) and therefore Section 211 of Environment Protection Act 2017.

2.6 Response to previous environmental audits

Progress with the recommendations from Nolan Consulting (2021) "*Section 53V Audit of Landfill Operation Hyland Highway, Loy Yang*" are discussed in Section 10.

2.7 Sequence of assessment and audit

Table 2-1 summarises the sequences of events undertaken during this LOA.

Table 2-1: Site assessment and LOA tasks – sequence of events

Date	Activity
23 June 2023	Auditor appointed by LCC.
28 June 2023	EPA notified of the LOA.
18 August 2023	Site Inspection by the Auditor.
23 June 2023 to 31 August 2023	Information received from LCC by the Auditor.
17 September 2023	Draft LOA report issued to LCC
22 September 2023	Received LCC's comments on the draft LOA report.
25 September 2023	LOA report submitted to the EPA.

Companies engaged by LCC in regard to landfill operations which involves monitoring are presented in Table 2-2.

Table 2-2: Companies engaged by LCC for landfill operations involving monitoring

2.8 Reports relied upon

The last three Landfill Operation Audits are:

- Nolan Consulting (2017) "*Section 53V Audit - Landfill Operation Hyland Highway Landfill - Hyland Highway, Loy Yang*", Service Order Reference No. 8005486, November 2017.
- Nolan Consulting (2019) "*Section 53V Audit - Landfill Operation Hyland Highway Landfill - Hyland Highway, Loy Yang*", Service Order Reference No. 8006077, December 2019.
- Nolan Consulting (2021) "*Section 53V Audit of Landfill Operation Hyland Highway, Loy Yang*", Service Order Reference No. 8005592, September 2021.

The reports listed in Table 2-3 were relied upon.

Table 2-3: Reports relied upon

Report Title	Author	Date
Nolan Consulting (2021) "*Section 53V Audit of Landfill Operation Hyland Highway, Loy Yang*", Service Order Reference No. 8005592.	Nolan Consulting	September 2021
Operating licence OL000025565, amended 24 November 2022 (Appendix A)	EPA	November 2022
2023 Annual Environmental Monitoring Report - Hyland Highway Landfill (Appendix D)	Ground Consulting	September 2023
Hyland Highway Landfill – Risk Management and Monitoring Program" (Appendix E)	Bajwa EnviroConsult	September 2023

Other reference documents considered during the LOA are listed in Section 15.

3. Landfill development and operations

3.1 Location and area

3.1.1 Location

The site address is 64 Hyland Highway, Loy Yang. It is located approximately 9 km south of the Traralgon CBD and 2 km north-east of the Traralgon South township.

The "site" is situated in the north-east portion of a larger LCC owned property (see Figure 1). Landfill surroundings are listed in Table 3-1.

Table 3-1 Landfill surroundings

Surroundings	Direction from landfill
Traralgon Creek Road	West
Callignee South Road	South
Motocross track	North-west
Native Flora and Fauna Reserve	
Loy Yang power station	North
Overburden dump	
Mine	
Plantation forest	South

A large section of the plantation forest to the south has been harvested.

The site is accessed from a 3 km long road from the Hyland Highway to the north. The gatehouse and weighbridge is located on the access road about 150 m south of the highway.

3.1.2 Area

The property dominant lot is Crown Allotment 2005, TP 800057W, Parish of Loy Yang. The approximate areas are:

- property – 140 ha
- premises boundary - 21 ha
- cells 1 to 6 – 8.6 ha.

3.2 Land use

3.2.1 Ownership

The licensed area, excluding the transfer centre for storing of asbestos, is owned by LCC.

3.2.2 Zoning

The premises is zoned Special Use Zone (SUZ1) under the LCC's Planning Scheme and is bounded by SUZ1 to the north and by the Farming Zone (FZ) to the west, south and east. The premise (and surrounding area to the south and east) is subject to a Wildfire Management Overlay (WMO).

3.2.3 Former land use

The site was formerly managed a Blue Gum plantation forest.

3.2.4 End use

The likely after use of the scheduled premise is public open space (LCC; 2019).

3.3 Site activities

The site, excluding the asbestos consolidation bin, is used for landfilling purposes. Recycling activities are undertaken by LCC at other sites within the municipality.

3.4 Licensing

The EPA first licensed the site on 4 June 2009. The licence was last amended on 24 November 2022. The landfill is classified as a Type 2 facility [EPA (2015) "*Best Practice Environmental Management Siting, Design, Operation and Rehabilitation of Landfills*"].

3.5 Key landfill features

The landfill's key features are summarised in Table 3-2 and the locations of cells are shown in Figure 2.

Table 3-2: Key Hyland Highway landfill features

Feature	Description
Landfill type	Below ground with above ground mounding of the final landfill surface. The depth below ground surface ranges from 6 m in the south to 20 m in the north.
Completed	<u>Cells 1 and 2</u> Cell 1and 2 were constructed as a single cell. Cell 2 is located to the north of Cell 1. Fouad Abo undertook the Cell 1/2 construction audit (GHD; 2009). Filling of Cell 1/2 ceased on 3 July 2012.
	<u>Cells 3A-1, 3A-2, Cell 3B, and Cell 3 retaining wall extension</u> Cell 3 is located to the east of Cell 1/2. Cell 3B is located north of Cells 3A-1 and 3A-2. Cell 3A-2 is the connection area between Cell 1/2 and Cell 3A-1. The Cell 3 retaining wall with geosynthetics was constructed at the toe of Cell 1/2 extending through to Cell 3 to improve the waste mass stability. The following construction audits were conducted: ▪ Cell 3B – Wajahat Bajwa ▪ Cell 3 retaining wall extension– Wajahat Bajwa ▪ Cells 3A-1 & 3A-2 – Wayne Drew
Current cells	<u>Cell 4</u> Cell 4 is east of Cell 3. Milestones are: ▪ GHD (2014) Wajahat Bajwa – Auditor design review – June 2014 ▪ EPA approved the design on 23 June 2014 ▪ RTL Mining and Earthmoving constructed the cell which included a liner for which the clay did not meet the permeability criteria (and hence was subject to a major variation). ▪ GHD (2015), "*Construction Verification Auditor Cell 4 Hyland Highway Landfill, Major variation – Cell lining system amendment*", March 2015.

Feature	Description
	▪ GHD (2016) Wajahat Bajwa - Auditor construction audit - February 2016. ▪ EPA approved - 15 March 2016 The EPA approval advised that the placement of the sidewall drainage lifts should be verified by an auditor, an addendum report should be submitted to the EPA at the completion of all lifts, and the drainage material should be approved by an auditor, and that a filling plan be prepared. LCC has advised that it has implemented the following sidewall drainage lift procedure which was verbally agreed to by the construction auditor: ▪ clayey sand soil from the onsite stockpile to be used (collected from the excavation of cells) ▪ place in 300 mm thick layers with LCC surveyor checking and recording ▪ photograph the soil placement and provide to the Auditor ▪ auditor release the hold point ▪ when the placement on the entire cell is complete the Auditor will provide the Addendum Report to the EPA. At the 29 June 2023 Consultative Committee meeting LCC advised that Cell 4 had been filled to the design height.
	<u>Cell 5</u> Cell 5 is east of Cell 4. The design documents are: ▪ Latrobe City Council (2017a) "*Hyland Highway Landfill - Cell 5 Construction Technical Specifications*" ▪ Latrobe City Council (2017b) "*Hyland Highway Landfill - Cell 5 Construction - Construction Quality Assurance Plan*" ▪ Latrobe City Council (2017c) "*Hyland Highway Landfill - Cell 5 Construction – Design Drawings*" and ▪ Latrobe City Council (2017d) "*Hyland Highway Landfill - Cell 5 Construction Design Report*". Milestones are: ▪ GHD (2017) Wajahat Bajwa – Auditor design review – August 2017 ▪ RTL Mining and Earthmoving constructed the cell ▪ GHD (2018) Wajahat Bajwa - *Construction audit – July 2018* ▪ licenced - 24 November 2022 ▪ waste placement commenced - 24 August 2018. The construction audit recommendations with LCC's response in italics are provided below: ▪ inspection of the exposed sacrificial geotextile shall be included within the landfill operational plan, with repairs to be undertaken as necessary *(Sacrificial geotextile is inspected and no damage has been observed)* ▪ connection of the Cell 5 and Cell 6 swale drain shall be connected to the discharge swale drain *(All water collected in Cell 5 goes to leachate. Stormwater collected in Cell 6 is pumped out into the main drain).*

Feature	Description
	▪ monitoring of the stormwater drainage system shall be undertaken during cell operation, particularly during high rainfall events, and if the drains are noticed to be of insufficient capacity, they shall be upgraded accordingly *(The drains have sufficient capacity and currently there is no need to upgrade)* ▪ council shall regularly inspect the stormwater drain as part of the site operational plan, and clean the drain as required to ensure flow is not inhibited *(The stormwater drains are cleaned at regular intervals and they function without interruption)*. ▪ all subsequent lifts of sidewall drainage material shall be subject to an Auditor hold point, with an addendum audit report for construction of the sidewall drainage layer provided to EPA at the completion of the final lift. *(Sidewall drainage material placement is undertaken under the supervision of GITA and the thickness of the drainage layer is surveyed by council surveyor)*. At the 29 June 2023 Consultative Committee meeting LCC advised that Cell 5 had been filled to the design height.
	<u>Cell 6</u> Cell 6 is east of Cell 5. The design documents are: ▪ Senversa (2021) "*Technical Specification*", 10 March 2021 ▪ Senversa (2021) "*Construction Quality Assurance Plan*", 10 March 2021 ▪ Senversa (2021) "*Detailed Design Drawings",* 10 March 2021 ▪ Senversa (2021) "*Design Report*", 10 March 2021 Milestones are: ▪ GHD (2021)– Auditor design review (Wajahat Bajwa) – August 2021 ▪ EPA design approval - 28 May 2021 ▪ Winslow Constructors constructed the cell on behalf of LCC ▪ GHD (2022) "*Cell 6 Construction Environmental Audit Hyland Highway Landfill, Loy Yang*", EA001015 (Wajahat Bajwa) – 16 June 2022. The EPA design approval was subject to: ▪ the waste being placed at 1V:3H or flatter to comply with BPEM requirements ▪ prior to construction of engineered fill, the excavated area of Cell 6 footprint is assessed for any sign of perched groundwater. Should perched groundwater be encountered, the GITA shall consult with the Designer and construction verification Auditor, whether any groundwater relief infrastructure will be required to manage groundwater ▪ the clay liner on the southern sidewall and the bunds is also constructed in 250 mm thick lifts ▪ a work method statement is prepared by the lining installer detailing joining of the geomembrane between the new and existing cell, following an assessment of the in-situ conditions. The WMS should be reviewed and approved by the construction verification auditor, prior to the commencement of works ▪ the geomembrane is anchored in the anchor trenches as soon as practicable and additional loading is applied on the exposed edges of geomembrane for when high winds are forecasted

Feature	Description
	▪ Cell 6 conveyancing system comprising of a pump with automatic startup/shut down switch to maintain leachate levels should be installed ▪ following the installation of the Leachate Collection System, to reduce the risk of UV exposure it is recommended the Filter Geotextile is covered with waste as soon as practicable. During waste placement, no plant shall travel on less than an initial 1 m thick layer of waste over the filter geotextile ▪ the results of compression testing are provided to the construction verification Auditor for review and approval of the aggregate and proposed cushion geotextile ▪ each subsequent lift of soil protection layer is subject to an Auditor hold point, with an addendum audit report to be submitted to EPA following construction of the final lift ▪ stormwater is pumped out of the cell as clean water before any waste is placed within the cell. The Construction audit [GHD (2022) "*Cell 6 Construction Environmental Audit Hyland Highway Landfill, Loy Yang*"] recommended: ▪ Inspection of the exposed sacrificial geotextile shall be included within the landfill operational plan, with repairs to be undertaken as necessary (During operation) ▪ Waste is placed at 1V:3H or flatter to comply with BPEM requirements (During operation) ▪ Cell 6 conveyancing system, comprising of a pump with automatic startup/shut down switch to maintain leachate levels, should be installed and subject to an addendum audit (Prior to cell commissioning) ▪ Following the installation of the Leachate Collection System, to reduce the risk of UV exposure the Filter Geotextile is covered with waste as soon as practicable. During waste placement, no plant shall travel on less than an initial 1 m thick layer of waste over the Filter Geotextile (During operation) ▪ Stormwater is pumped out of the cell as clean water before any waste is placed within the cell (Prior to cell commissioning) ▪ Installation of Filter Geotextile and Sacrificial Geotextile shall be subject to addendum audit report(s) (Prior to cell commissioning) ▪ Each lift of sideliner protection soil shall be subject to an Auditor hold point with an addendum audit report for construction of the sidewall drainage layer provided to EPA at the completion of the final lift (During operation) Cell 6 was included in the 24 November 2022 Operating Licence amendment. LCC advised filling commenced after the access road to the cell was completed in December 2022. Continuous monitoring of the leachate sump commenced on 2 January 2023. LCC does not have a Cell 6 operational plan. The exposed sacrificial geotextile that was observed along the western batter during the 18 August 2023 inspection appeared to be intact.
Future cells	Works Approval 214663 allows LCC to extend the landfill across the site to a maximum top of cap level of 170 mAHD. The extension area will comprise Cells 7, 8 and 9 with an estimated lowest basal elevation of 128.5 mAHD.
Waste placement method	Deposited in layers between daily cover.
Fill depth	Variable.

Feature	Description
Floor	Cell 1 and Cell 2 [GHD (2007a&b) Works Approval] ▪ 1.0 m compacted clay liner ▪ HDPE geomembrane ▪ geosynthetic drainage grid ▪ geosynthetic clay liner ▪ geotextile ▪ 0.3 m drainage aggregate filter blanket geotextile Cell 3 [GHD (2011) Auditor Design Review] ▪ 1.0 m compacted clay liner ▪ geosynthetic clay liner ▪ HDPE geomembrane liner (1.5 mm) ▪ cushion geotextile ▪ 0.3 m aggregate drainage layer and ▪ filter geotextile. Cell 4 [GHD (2016) Construction Audit] The Cell 4 floor design features, following the major design variation, are: ▪ 0.5 m compacted clay liner (CCL) ▪ two geosynthetic clay liners (GCL) ▪ HDPE geomembrane liner (1.5 mm) ▪ cushion geotextile ▪ 0.3 m aggregate drainage layer and ▪ filter geotextile. The sideliner has a 1.0m CCL, a HDPE geomembrane and a GCL. Cell 5 [GHD (2018) Construction Audit] The Cell 5 floor features are: ▪ 1.0 m compacted clay liner ▪ geosynthetic clay liner ▪ HDPE geomembrane liner (2.0mm) ▪ cushion geotextile ▪ 0.3 m aggregate drainage layer and ▪ filter geotextile. Cell 6 [Senversa (2021a, b and c) Design] The Cell 6 floor design features are: ▪ 1.0 m compacted clay liner ▪ geosynthetic clay liner ▪ HDPE geomembrane liner ▪ cushion geotextile ▪ 0.3 m aggregate drainage layer and ▪ filter geotextile.
Capping	See Section 5.1
Gas collection	See Section 5.3. Sacrificial horizontal LFG bores The EPA's Cell 4 design approval required a sacrificial LFG collection system to be installed in the early stages of cell operation.

Feature	Description
	LCC advised that horizontal LFG wells were placed at approximately 20 m horizontal spacings (east west) at three levels and were connected to the western Cell 3 (Phase 1) well head. The 27 July 2015 'as built' survey plan shows the sacrificial lower, mid-level and upper level Cell 3 and lower level cell 4 horizontal sacrificial installations connected to the well stations. The Cell 5 design states "*Similar to Cell 4 horizontal gas wells will be installed in Cell 5 during waste filing and vertical gas wells will be installed once the waste filling is completed and ready for rehabilitation*". Sacrificial horizontal LFG wells, installed at 30 m spacings, are directed to Manifold G. The sacrificial horizontal LFG bores designed for Cell 6 had not been installed as of 18 August 2023. <u>Vertical wells</u> Vertical wells have been installed in Cells 1 to 5. The bore log of well G033 showed it to be drilled at a diameter of 160 mm with the upper 1.5 m being sealed with clay/bentonite.
Groundwater collection	<u>Cell 3</u> As perched water was observed in the north-west corner of the Cell 3B northern batter during construction a groundwater interception system, including the Cell 3B Interception Bore, was installed. A Grundfos SQ1-50 pump is installed in the bore. The pump was powered by a generator from 27 August 2019 to 20 August 2021. The pumped volumes were 4.6 kL on 18 August 2021 and 2.2 kL on 20 August 2021. No liquid was detected after 20 August 2021. The level is monitored quarterly. <u>Cells 4 and 5</u> LCC advised that groundwater seepage was not been observed during Cell 4 and Cell 5 construction. <u>Cell 6</u> The design review auditor recommend that, prior to construction of engineered fill, the excavated area of Cell 6 footprint be assessed for perched groundwater and if encountered, the GITA should consult with the designer and construction verification auditor as to whether any groundwater relief infrastructure will be required. LCC advised that drainage of the Cell 6 subgrade was provided via trenches during construction.
Leachate management	<u>Overview</u> The leachate management system includes: ▪ 'in cell' leachate collection systems ▪ transfers from sumps to leachate pond LP2 ▪ leachate treatment from via reverse osmosis (RO) plant ▪ discharge of permeate from the RO plant. Aquaklenz designed, installed and commissioned the RO plant and operates the leachate management system. <u>Cell 1/2 Leachate collection system</u> Cell 1/2 was constructed as a single cell with a primary and secondary leachate collection system. The *primary leachate collection system* comprises interconnected perforated 150 mm dia. HDPE pipes within the drainage aggregate filter blanket. The pipes converge at the cell's south-east corner low point.

Feature	Description
	The *secondary leachate collection system* includes a geosynthetic drainage grid. Leachate from the drainage layer is captured in a collection pipe located along the eastern edge of Cell 1 and 2. It grades to a low point in the south-east corner of the cell. Leachate from the primary and secondary leachate collection system in Cell 1/2 flows via gravity through penetrations in the side liner of the cell's southern bund wall to the primary 2,000 L inspection pit. This pit is covered. There are isolation valves in the leachate collection system pipe and leachate detection system pipe connected to the primary 2,000 L inspection pit that can be shut to hold the leachate in the cell if required. Leachate from this primary inspection pit is pumped to leachate pond LP2 with excess leachate overflow to LP1 when the capacity of leachate pond LP2 is reached. The pump starts when the pit level reaches 800 L leaving 1,200 L of free board. The average flow from Cell 1/2 to leachate pond LP2 over the last 6 months has been 400 L/day. LCC has advised it intends to: ▪ disconnect the overflow pipe from the primary inspection pit to leachate ponds LP1. ▪ install a secondary inspection pit for leachate overflow with 2,000 L capacity in the event of pump failure in the primary inspection pit (this would provide approximately 7 days of storage volume before any spillage occurs). ▪ install a leachate level alarm system in the primary inspection pit that will send a message to Aquaklenz and the LCC Landfill Team Leader if the pump in the primary pit fails. ▪ in the event of a pump failure, Aquaklenz will attend to repairs before the overflow capacity is reached, ▪ transfer all the leachate from leachate pond LP1 to leachate pond LP2, remove the sludge from leachate pond LP1 and clean the HDPE liner in leachate pond LP1. Once these works are completed LCC intends to transfer RO plant permeate to leachate pond LP1. The Auditor accepts LCC's intention on the basis that: ▪ the overflow from the primary inspection pit to the secondary inspection pit allows for gravity flow only and 1,000 L/day and is set immediately below the top of the primary inspection pit ▪ the pump is permanently located within the primary inspection pit, is operated such that the maximum volume held within the primary inspection pit is 1,200 and is maintained ▪ the pump is repaired within 5 days of the alarm being received and daily inspections are conducted and reported to determine that overflows have not occurred. <u>Cell 3 (3A and 3B) leachate collection system</u> The Cell 3 leachate collection system is comprised of interconnected perforated 110 mm diameter HDPE pipes within the drainage aggregate layer. These pipes converge at a sump in the south-west corner of the Cell 3. The sump base is 1.0 m below the lowest point of the floor liner. Leachate is pumped from the sump via a 600 mm dia. riser pipe over the southern wall of Cell 3 into leachate pond LP2.

Feature	Description
	An automatic start-up/shut down switch has been set up on the sump pump. The sensor is set at 800 mm from the bottom of the sump along the pump (which is approximately 250 mm vertically). The high level alarm is set at 1.3 m (vertically), the start level is 0.9 m (vertically) and the stop is 0.3 m (vertically). Cell 4 leachate collection systems The Cell 4 leachate collection system has a similar design to Cell 3. Leachate Sump Cell 4 is located in the south-west corner of Cell 4. The sump base is 1.0 m below the lowest point of the floor liner. Leachate is pumped from this sump via a 600 mm riser along the batter into leachate pond LP2. An automatic start-up/shut down switch has been set up on the sump pump. The sensor is set at 1,200 mm from the bottom of the sump along the pump (which is approximately 380 mm vertically). The high level alarm is set at 2.0 m (vertically), the start level is 1.3 m (vertically) and the stop level is 0.88 m (vertically). Cell 5 leachate collection system Leachate in Cell 5 drains to Leachate Sump Cell 4. Cell 6 leachate collection system Leachate in Cell 6 drains to Leachate Sump Cell 6 and is then pumped to leachate pond LP2. Level monitoring at this sump commenced on 2 January 2023. Leachate pond LP1 Leachate pond LP1 is lined and has a storage capacity of about 1.2 ML. The pond was designed by GHD (2007d) and its construction was audited by GHD (2009). This pond is used as a contingency for when the pump in the Cell 1/2 primary inspection pit fails. Fluid is transferred from leachate pond LP1 to leachate pond LP2 when its level rises. In the future LCC intends to use this pond for the storage of permeate from the RO plant after upgrading the transfer arrangements for leachate pumping from Cell 1 and Cell 2 to Leachate Pond LP2 (see above). Leachate pond LP2 Leachate pond LP2 was constructed in 2012. It is lined and has a design capacity of approximately 8.4 ML with 1.3 ML of freeboard which is set at 121.5 m AHD (500 mm below the top of the HDPE liner). There is about 300 mm of constructed fill above the top of the liner. The pond was designed to manage leachate flow from cells 1 to 5 without requiring off-site disposal. The water balance assessment associated with this design has not been reviewed as part of this LOA. An 11 kw capacity pump continuously pumps leachate from the bottom of the pond to the surface aerators. The pond has been installed with a level sensor. The sensor's '0' datum has been determined by survey to be 119.37 m AHD. The level over the July 2021 to June 2023 period, with few exceptions, has ranged from 120.5 m AHD to 121.5 m AHD which is below the freeboard level. At the 18 August 2023 site inspection the level was observed to be about 1.0 m below the crest.

Feature	Description
	Leachate pond LP3 (Proposed) A 5,000 kL capacity leachate pond LP3 is proposed to be constructed to the east of leachate pond LP2 and south of Cells 4, 5 and 6. It will be outside the extent of the Works Approval proposed landfill extension boundary. The December 2022 Senversa design of this leachate pond has been submitted to the EPA for approval after Auditor design review. LCC advised that the design did not include a revised water balance as the pond is intended to complement the Leachate Management System by adding extra storage and evaporation capacity. It will also allow emptying of leachate pond LP2 for maintenance. LCC advise that the pond is not required to comply with the 2 wet year capacity as indicated in the Licensing Guidelines as it is not the primary or only method of leachate management at the site. A development licence was issued by the EPA on 2 August 2023 to allow for the expansion of the proposed landfill extension boundary to encompass this proposed pond. The construction of leachate pond LP3 cannot commence until EPA design approval is obtained. Treatment plant The RO treatment plant is adjacent leachate pond LP2. This plant was upgraded during the audit period to increase its capacity. At the 29 June 2023 Consultative Committee meeting LCC advised that the RO plant's capacity had been increased to 2.3 ML/month. Leachate is filtered to remove solids above 30 microns and then clarified. The leachate is then passed through media filters followed by high volume cartridge filtration to further reduce solids to less than 0.35 micron. Pressure boosting pumps then force water through membranes. The RO plant's retentate is recycled back to the pond. Aquaklenz advises that the retentate to permeate ratio is about 3:1. The RO permeate is stored in 11 tanks with a total capacity of 308,000 L. It is discharged to Stormwater Pond 2, used for dust suppression and is available for firefighting. It can now be irrigated on the cap. LCC advised that dust suppression is required on about 1 km of unsealed access tracks within the site.
Stormwater management	Clean stormwater is separated from potentially contaminated water. Stormwater diversion Stormwater is considered free of leachate. West of Cell 1/2 stormwater is collected in the southerly flowing stormwater diversion drain. East of cell 6 and outside the excavation stormwater is collected in the southerly flowing stormwater diversion drain. North of the landfill stormwater is captured in A 300 mm diameter pipe which slopes the west. Swale drains on the surface of the final cap convey stormwater runoff to the north and the south. The west, east and southerly flowing swale drains discharge to Stormwater Pond 1. Stormwater within the Cell 6/7 excavation and east and north of the Cell 6 separating bund wall is pumped over the southern access track. Stormwater ponds Stormwater Pond 1 (1 ML) and Stormwater Pond 2 (4 ML) are south of leachate pond LP1.

Feature	Description
	When at capacity, Stormwater Pond 1 overflows via a weir into the Stormwater Pond 2. These stormwater ponds were designed to hold 1-in-20-year storm events of a 24 hour duration. The purpose of the Stormwater Pond 1 is to reduce the sediment load.

3.6 Leachate flows

The following leachate flows are monitored:

- leachate from Cell 1/2 leachate inspection pit to leachate pond LP2
- leachate to leachate pond LP2 from:
  - Cell 3 sump {LS1]
  - Cell 4 sump (which collects leachate from Cells 4 and 5) [LS2]
  - Cell 6 sump [LS3]
- RO permeate discharge to Stormwater Pond 2.

LCC advised that no leachate spills occurred from either leachate pond over the audit period.

From July 2021 to June 2023 the flow from:

- RO permeate discharge was 15,582 kL (an average of 21.3 kL/day)
- the primary and secondary leachate collection system as recorded in the flow from the Cell 1/2 leachate inspection pit to leachate pond LP2 was 63kL (averaged 86.3 L/day) which over the Cell 1/2 cell area of 2.6 ha is about 33 L/ha/day.

Over the last 6 months LCC advised that the flow from the Cell 1/2 leachate inspection pit to leachate pond LP2 averaged 400 L/day which over the Cell 1/2 cell area of 2.6 ha is about L/ha/day was about 158 l/ha/day.

Using best available technology to control seepage the EPA (2015) Landfill BPEM consider the seepage through the liner should be less than 10 L/ha/day and the seepage through the cap should be less than 75% of the anticipated seepage through the liner.

LCC advised that about 6.7ML of leachate was treated at the RO plant in 2022/23.

Most permeate has been discharged to the Stormwater Pond 2 with a small component used for dust suppression. This discharge has been:

- 8.7 ML/yr 2015/16
- 6.3 ML/yr 2016/17
- 6.7 ML/yr 2017/18
- 7.0 ML/yr 2018/19
- 11.3 ML/yr 2019/20
- 8.4 ML/yr 2020/21
- 7.4 ML/yr 2021/22
- 8.2 ML/yr 2022/23

3.7 Landfill life

With the filling of future cells the landfill may extend to 2033.

3.8 Landfill operations

Key landfill activities are described below.

3.8.1 Contracts

LCC has several landfill related operations and monitoring contracts (see Table 2-2).

3.8.2 Staff

The LCC on-site personnel are:

- Team Leader Landfill Services
- Weighbridge Attendant
- Plant Operators (three fulltime).

Other LCC staff provide support services as required. These include a relief Weighbridge Attendant.

3.8.3 Wastes accepted

Appendix 7 of operating licence OL-000025565 lists the following materials that may be accepted at Cell 4, Cell 5 and Cell 6:

- municipal waste
- commercial food waste, garden and landscaping organics,
- processed organic waste
- industrial waste (C&D and C&I)
- timber treated with hazardous substances
- untreated timber
- tyres shredded into pieces < 250 mm.
- textiles, leather and rubber, concrete, bricks, plaster board and cement sheeting, asphalt, glass, steel, aluminium, non-ferrous metal, cardboard, liquid paperboard, office paper, plastics 1 to 7
- Cat C and Cat D soil
- waste asbestos
- grease trap wastes

Waste asbestos

Asbestos and insulation batts are accepted and placed into a lockable 12m^3 consolidation bin near the weighbridge on Loy Yang land.

The placement of the insulation batts with the asbestos is consistent with the EPA letter of advice of 14 January 2020 that 'insulation batts made from ceramic based fibres with physico-chemical characteristics similar to asbestos can be treated in the same way as asbestos, otherwise they can simply be placed in the landfill'.

LCC's Landfill Asbestos Management Plan describes how the material should be placed in the skip and transported to the landfill to accordance with Operating Licence Condition OL_WA1.5.

It also addresses spill management arrangements.

LCC residents may obtain the *'Asbestos in the home Removal Kit'*. If so they are required to attend a 30 minute information session. The skip disposal dates over the audit period demonstrate that the asbestos/insulation batts are disposed of within 2 to 4 months of receival

LCC has advised that within the landfill:

- asbestos/insulation batts is covered with a layer of waste (not including waste asbestos) at least 1 m thick or a layer of soil of at least 0.3 m thick
- the location of loads is identified through the BOMAG compactor's GPS
- the data for the location of waste asbestos loads has been transferred to the landfill's data management system.

Levied volumes

The breakdown of the waste received since 2008/09, as sourced from the EPA landfill levy statements, is presented in Table 3-3.

Table 3-3: Waste quantities received at Hyland Highway landfill (tonne)

Year	Total	Municipal	Industrial	Fill	Category C soil	Category D	Packaged waste asbestos
2008/09	3,776	2,176	1,600	-	-		
2009/10	47,515	23,393	24,122	-	-		
2010/11	31,994	21,741	10,253	-	-		
2011/12	22,930	20,466	2,464	-	-		
2012/13	40,231	24,225	16,006	-	-		
2013/14	49,125	29,801	19,324	-	-		
2014/15	50,791	30,815	19,976	-	-		
2015/16	50,854	32,480	18,374	-	-		
2016/17	46,768	30,858	15,910	-			
2017/18	39,342	24,800	14,542	-	-		
2018/19	36,164	22,023	14,132	-	-		
2019/20	33,469	23,346	9,523	-	600		
2020/21	32,714	24,299	7,777	-	637		
2021/22	32,575	24,269	8,206	77	-	-	21
2022/23	38,792	25,813	9,486	278	3,160[(1)]	59	21

[(1)] LCC advised this Cat C soil increase was largely due to a Moe construction project which brought in 2,462 tonnes

The Beveridge Williams survey of 3 July 2023 showed an annual fill volume of 46,513 m^3 and available fill volumes of 5,101 m^3 for Cell 5 and 96,461 m^3 for Cell 6.

LCC advised that:

- asbestos of commercial origin is not accepted
- the Category C soil received since 2019/20 has been from LCC's activities.

3.8.4 Operating hours

The landfill is open between 8.30 am to 4.00 pm from Monday to Friday.

Private traffic is not accepted.

3.8.5 Weighbridge

Selected procedures and checklists have been reviewed as part of the LOA (Section 8.4). Several of these are relevant to the weighbridge.

3.8.6 Transfer of waste to landfill

Approximately 30 vehicles dispose of waste at the landfill in a typical day.

3.8.7 Tipping of waste at active landfill cell

The tipping face is attended when vehicles are placing loads.

Observation

During the 18 August 2023 site inspection the Auditor observed:

- two tipping faces
- tipping was occurring at one of the tipping faces and the other tipping face was covered
- at the active tipping face (southern) the tipping area was estimated to be less than 900 m^2 (10 m wide by 25 m long) and the waste height was estimated to be about 1.0 m. The area and height is recorded by the compactor's GPS.
- uncovered waste immediately near the southern tipping face

For this LOA the two tipping faces are termed the northern and southern tipping faces.

3.8.8 Daily cover

LCC advised that at the end of each day a plant operator inspects the daily cover and records the required information. LCC uses soil daily cover and alternative daily cover (ADC).

Soil daily cover

Observation

Soil for daily cover has been stockpiled within Cell 6.

Alternative daily cover

The tarpomatic tarping machine has a deodoriser.

Observation

During the 18 August 2023 site inspection the Auditor observed:

- the northern tipping face was covered by two rolls of tarpaulin rolled out from a Tarpomatic tarping machine
- one standby tarpaulin roll in the laydown area to the north-east.

EPA approval

On 4 April 2022 the EPA approved the use of a tarpomatic cover system as an alternative daily cover (ADC) system. This followed EPA's approval of a 12 month trial on 19 October 2020.

This was based upon the LCC request to extend the use of Tarpomatic Cover System as an alternative daily cover which was accompanied by Landfill Solutions (2020) "*Request to extend the use of Tarpomatic Cover System as an alternative daily cover at the Hyland Highway landfill*".

The approval was subject to LCC:

1. Having a stockpile of soil to use as daily cover as a contingency measure if required.
2. Implementing the Tarpomatic Cover System operation and management plan [Attachment 2 of Landfill Solutions (2020)].
3. Maintaining and providing to EPA records detailing the dates, amounts (tolls, sheets etc.) and the cell(s) that ADC is used.
4. Maintaining and providing to EPA records of the dates and times of any incidents associated with the use of the ADC.
5. Maintaining and providing to EPA records of the dates and times of any community complaints or/and reports, in particular, regarding odour, litter and dust.
6. Reporting on the performance of the ADC system.

These records referenced in Conditions 3, 4 and 5 have not been inspected as part of this LOA,

3.8.9 Protection soil

Observation

During the 18 August 2023 site inspection the Auditor observed soil along southern batter of Cell 6.

LCC advice

LCC advised this was protection soil which was be engineered under GITA supervision.

3.8.10 Odour

Observations

During the 18 August 2023 site inspection the Auditor observed:

- a strong odour on the access road north of Cells 3, 4 and 5
- a mild odour at the Cell 6 active tipping area
- minimal odour elsewhere on site.

LCC advised that the odour detected on the access road north of Cells 4 and 5 is sourced from the aggregate protection layer which will be mitigated by capping. It is also noted that the Cell 6 protection soil is required to be any combination of sand, clay and silt rather than aggregate to reduce the odour risk.

Monitoring

LCC monitors odour at:

- the gate to Traralgon motocross track
- Traralgon South Road
- Callignee South Road
- the Traralgon South CFA.

The name of the person undertaking the monitoring, the time, wind direction, the nature of the odour and comments is recorded at each monitoring event on LCC's Landfill Odour Test report.

Monitoring typically occurs in the early morning. If odour is detected, a second monitoring event is undertaken later that morning.

The frequency of monitoring depends on the weather conditions. LCC advised it varies from daily in cold frosty conditions to about weekly in winter and less frequently in warmer periods.

Complaints

Over the two year audit period 3 odour related complaints were made. Odour typically occur in the mornings.

Sites identified in the odour complaint reports include Callignee South Road/Traralgon South Road and the Traralgon South township. The reported occurrences were on 4 July 2022 (one complaint) and 13 June 2023 (two complaints). The 4 July 2022 complaint related to a four to six week period.

The action taken was not identified in the Landfill Complaints Register.

LCC actions

LCC engaged Ektimo to develop an odour mitigation strategy. The executive summary of Ektimo (2018) "*Odour impact assessment for Hyland Hwy Landfill*" included:

> Very weak odours are predicted beyond the site boundary in the area of the complaints along the Traralgon Creek Road (C483) or the Callignee South Road to the west and south-west of the landfill, respectively. These odours were predicted during light wind conditions in the early hours from when the active face is uncapped. Whilst very weak odours are not often distinguishable from the background ambient palate the field observations, which were also conducted during the morning with light winds, indicated an unpleasant hedonic tone to the emitted odour.
>
> This tone of odour may be more distinguishable at lower concentrations from a background palate with a neutral tone, observed in those areas with grass and pine tree characters.
>
> The dispersion modelling predicted no significant odours for any meteorological conditions at the locations of the nearest rural dwellings when using the highest odour emission rates tested from the landfill. The flare was determined to not be a significant source of odour beyond the landfill boundary at the tested emission rates. The capped and consolidated landfill area and the two leachate ponds combined comprised only 1.3% of the landfill odour emissions.
>
> The most significant source tested was the currently active cell from the time in the morning when an area of this is uncapped for waste to be dumped onto it from attending trucks, spread and then compacted before being re-capped with soil at the end of the day.

Ektimo (2020) "*Ambient H_2S monitoring trial and an initial monitoring plan for Hyland Hwy Landfill*" reported on trials to determine the suitability of hydrogen sulphide (H_2S) monitoring. In mid-2020 Ektimo monitored ambient H_2S concentrations at four locations around the landfill after capping works were completed and the LFG extraction system was functional. The monitors recorded 3-minute average concentrations every 10 minutes. The wind direction was also concurrently monitored.

LCC purchased an Acrulog PPB H_2S monitor to assist with the management of LFG odours at locations along the Calignee South Road. It is programmed to alarm at 13 ppb. The monitor was observed at the south-western corner of the premises on 18 August 2023.

Ektimo provided a work instruction which advises on what action to undertaken when an alarm is received. This work instruction was accepted in the Nolan Consulting (2021) landfill operation audit.

At the 29 June 2023 Community Consultative Committee meeting LCC provided a log of the H_2S concentration for the two week period up to 28 June 2023. Over this period the H_2S concentration ranged from 2 ppb to 22 ppb.

LCC engaged pDs Consultancy to review the Ektimo modelling. The recommendations of pDs Consultancy (2023) "*Model review of odour impact assessment for Hyland Hwy Landfill*" were:

1. It is important to have an odour modelling system. It helps address community odour complaints promptly. This system should comprise AERMOD, EPA Victoria's regulatory model as well as a 3-dimensional model like CALPUFF.
    a. Robust source configuration should be introduced to help LCC or its delegates to incorporate future changes/expansions. This includes emissions as well.
    b. Update the meteorological database every three years.
    c. Update modelling work, and 3-year interval is recommended.
2. Determine the worst meteorological year by exploring 5 years of meteorological data (Recent 5 years should be used). AERMOD can be used for this exercise.
3. Determine the worst meteorological year with the 5-year data window.
4. `Develop 3 dimensional meteorological, data for CALPUFF running its meteorological component CALMET.
5. Update the existing modelling work with robust meteorology, source characterisations and relevant model outputs.
6. Risk analysis should be undertaken in noncompliance situations.
7. The latest (after the year 2020) assessment criteria and other updated information published by EPA, Victoria should be used.
8. Report changes if any to EPA and update license.

The LCC intend to undertake the pDs Consultancy (2023) recommended works. The Auditor accepts these recommendations.

3.8.11 Dust

Observations

During the 18 August 2023 site inspection the Auditor did not observe off-site dust. This is not unexpected considering that 3 mm of rain fell during the previous day.

Operations

The 10,000 L truck mounted water cart supplies water for dust suppression.

3.8.12 Litter management

Observations

During the 18 August 2023 site inspection the Auditor observed:

- 1.8 m high permanent cyclone fence located around boundary
- a 5 m high 100 m long fence along the northern boundary commencing east of Cell 5 with litter inside the this fence
- mobile 'soccer net' fences east of the two Cell 6 tipping faces
- litter emerging from the daily cover within Cell 6
- litter captured in the north-east corner of Cell 6
- negligible litter outside of the permanent cyclone fence.

LCC advice

LCC advised that landfill operational staff and casual staff pick up litter on an as needs basis when it is not wet.

3.8.13 Noise management

The primary site activities that give rise to noise are waste transport vehicles, construction vehicles, leachate pumping, waste compaction and cover placement.

Observations

During the 18 August 2023 site inspection the Auditor did not observe waste compaction and cover placement at the tipping face.

3.8.14 Plant and equipment

The plant and equipment include:

- 750 SCMH flare
- 900 kW generator
- 36 tonne BOMAG compactor
- CAT 963 traxcavator
- 25 tonne Caterpillar excavator with tilt hitch
- 25 tonne dump truck to haul material
- tarpomatic ADC system with spool and three rolls
- truck with a 10,000 L water tank and a 1,000 L diesel tank on its tray.

With the exception of the rented 25 tonne dump truck, this plant and equipment is owned and maintained by LCC.

3.8.15 On-site storage of fuel or other chemicals

The diesel tank is located on the truck tray.

Small volumes of oils and grease are stored undercover in a shipping container adjacent the weighbridge.

3.8.16 Haul road material

LCC accepts coarse material for access track construction.

Section 4.5 of EPA (2021), "*Guideline: Calculating waste levy and allowable rebate claim*" states:

> Materials used for construction of a road inside the permissioned waste disposal area, i.e. as a haul road inside a landfill cell, are subject to levy unless the requirements of section 7.3 are met.

Section 5.3 is:

> Materials used for construction of roads inside the permissioned waste disposal area, i.e. as a haul road inside a landfill cell, are not subject to levy if all requirements of Appendix B are met.

Appendix B requires a Construction haul road management plan (HRMP). A HRMP was prepared by SMEC on behalf of LCC on 31 January 2023. It is titled SMEC (2023) "*Haul Road Management Plan for Cell 6 at Hyland Hwy Landfill*". This applies to materials used for the construction of roads and the tipping pad inside the licensed waste disposal area.

The HRMP requires LCC to retain separate records for construction material used to create permanent long-term haul roads subject to landfill levy. These records were not requested.

3.8.17 Vegetation management

In 2022-23 LCC undertook vegetation management works south of the landfill activity area between the landfill and Callignee South Road. These works are not an operating licence requirement. They include:

- weed control – focussing on re-treatment of English Broom and small outbreaks of ragwort and red-ink weed
- ringbarking of pine trees
- installation of 50 Eucalyptus Strzelecki saplings. [This was a Flora and Fauna Guarantee Act (1988) permit condition for another site owned by LCC in Traralgon South. The permit required the collection and propagation of seed from trees approved for removal. The saplings then had to be planted in sites approved by DEECA. LCC advised that the site was considered appropriate for this purpose]
- site preparation

LCC has advised it plans to undertake further vegetation management to the south of the landfill activity area.

3.9 Off-site activities

On 29 August 2019 LCC sought Auditor advice on AGL's proposal to extend the Loy Yang mine overburden footprint to the south towards the landfill by filling the low-lying area. On 31 August 2021 LCC advised that these works had not commenced and it was understood that any extension was likely to be to the west.

A google maps image from December 2022 indicates that the overburden dump footprint has extended to the south.

3.9.1 Complaints

Landfill related complaints may be received by:

- LCC Team Leader Landfill Services
- LCC Coordinator for Landfill Services

- LCC Customer Services
- EPA.

All complaints are entered into the Landfill Complaints Register managed by the LCC Team Leader Landfill Services.

Complaints to customer services are recorded on LCC's PATHWAY's system. Complaints received on the PATHWAYS system require actioning with review by a responsible officer.

The EPA directs complaints to the LCC Coordinator for Landfill Services. LCC advised that it did not receive complaints from the EPA during the audit period.

The complaints recorded over the audit period have been odour related. These complaints are discussed in Section 3.8.10 above.

4. Regulatory performance

4.1 Notices and enforcement action

LCC advised that the EPA did not issue any notices or enforcement action associated with the landfill during the audit period.

4.2 Entries

LCC advised that the EPA conducted one site entry during the audit period. This was site entry (FAR-00005590) which was conducted by the EPA on 15 September 2022.

The primary purpose of the entry was to check compliance against operating licence OL000025565. The Authorised Officer observed:

- generator and flare
- stockpile of excavated materials used for daily cover and capping of cells
- capped landfill cells 1, 2, 3 with established vegetation cover
- open landfill cells 4 and 5
- LFG odour along northern face of cells 4 and 5 (rocked drainage)
- newly constructed new cell 6
- leachate ponds 1 and 2, RO plant and storm water pond
- loose litter along internal storm water drainage channels and internal fences and along the inner northern boundary fence

The Authorised Officer was informed of the following by the site representative:

- leachate pond 1 collects from cells 1 and 2
- leachate pond LP2 collects from cells 3, 4 & 5.
- cell 4 is proposed to be capped in December 2022
- cell 5 is estimated to have 8-12 month capacity remaining
- intermittent fugitive LFG emissions from cells 4 & 5 occur through the side wall drainage layer, which cannot be physically blocked until the landfill cap is installed
- LFG extraction pipe/wells for cells 4 & 5 have been tendered and construction is planned in December 2022
- landfill capping design for cell 4 and part of cell 5 is in progress, and will include solutions to mitigate landfill gas emissions from the cell 5 drainage layer
- newly constructed cell 6 is landfill ready, and until in use any collected rainfall is treated as stormwater
- LCC is in the process of applying for an amendment to expand the licenced boundary to the south by 10 m to address slope of closed cell boundaries
- approximately 38,000 tonne of waste has been deposited in the last 12 months
- litter management internal of the site has been impacted by available staffing levels
- site leachate storage capacity to is to be increased with a third leachate pond
- LCC has installed a data logger at the southwest corner of the landfill to monitor H_2S concentrations. Odour modelling includes a trigger limit of 13 ppb

- there have been minor LFG exceedances of CO_2 at site boundaries that relate to high LFG gas extraction vacuum rates in supply to generator and flare operation, but has been addressed.

The EPA provided the following compliance advice:

- To comply with the GED (in relation to minimising the risk of harm to human health and the environment from odour impacts), LCC should:
    1. Ensure that odour monitoring equipment is maintained and operational.
    2. Evaluate the effectiveness of existing odour controls.
    3. Continue to investigate additional interim and long-term actions to minimise odour impacts caused by fugitive landfill gas emissions so far as reasonably practicable.
- Review the site's litter resources and controls. Remove loose litter along the internal storm water channels and litter along the internal side perimeter fences to reduce the risk of harm to the environment.

4.3 Performance statements

LCC has not submitted an annual performance statement (APS) for the landfill since 25 September 2020 and it has not been notified of a request for a Permission information and performance statement (PIPS) over the audit period. The EPA's notification to submit a PIPS by 27 September 2023 for the 2022/2023 is outside the scope of this LOA.

The most recent annual performance statement is the 2019/20 APS. This APS identified that LCC has complied with all licence conditions except for four. These four conditions, with a summary of non-compliances and LCC responses, are:

- LI_A1 You must ensure that odours offensive to the senses of human beings are not discharged, emitted or released beyond the boundaries of the premises. *LCC reported that a slight odour was detected on 19/06/20 near Calignee South Road and Traralgon Creek Road around 8.46 am and no odour was detected when inspected at 10.00 am. The cause was considered to be temperature inversion during cold mornings. Actions taken included capping, placement of intermediate cover, horizontal LFG wells in the active tipping face and aerators in leachate ponds.*
- LI_WA1.5 You must not accept any waste for storage pending any licenced operation except asbestos waste of domestic origin stored in a single 12m^3 sized consolidation bin at the site marked, 'Hyland Highway Landfill Part B (Site of Asbestos Bin)' in Schedule 1B, and managed according to the following:
    (A) At all times storage does not exceed a single consolidation bin with a locked lid or locked behind doors or gates with access only allowed to those appropriately trained in asbestos management
    (B) All packages placed in the consolidation bin are appropriately packaged in accordance with the requirements of EPA publication No: IWRG611.1 "Asbestos transport and disposal"
    (C) The consolidation bin is lined with plastic in accordance with requirements of EPA publication No: IWRG611.1 "Asbestos transport and disposal"

(D) The waste stored within the consolidation bin must be disposed of as soon as reasonably practicable and, no longer than 3 months from when the first package was placed in the bin

(E) The tabulated quantity and date of asbestos waste received at the consolidation site and the tabulated quantity and date of asbestos waste collected from the consolidation site for final disposal at a licenced facility must be kept for a period of at least 2 years

(F) transport and disposal of the waste from the consolidation site must be in accordance with regulations EPA Industrial Waste Resource Guidelines, 2009 EPA Publication IWRG611.1 "Asbestos transport and disposal" and all applicable EPA publications (as amended from time to time)

(G) EPA must be notified immediately of any incident or spill of wastes and

(H) Spill Management Plan ("SMP") for transportation of the waste to and from the consolidation site and a SMP for the consolidation site to avoid and safely manage spills must be developed.

This was due to a slight delay in arranging for disposal of the consolidation bin to landfill on 29 October 2019.

- LI_L4.1 You must extract leachate from cell(s) 3 and 4 such that the depth of leachate above the lowest point of the drainage layer does not exceed 300mm. *Non-compliances were reported in eight occasions between August 2019 and May 2020. Reasons included power failure, high flows due to high intensity rainfall, instrument malfunction and disturbances in the internet reporting system. LCC advised the review suggests it is not possible to have an adverse effect from this non-compliance.*
- LI_L13 You must manage each landfill cell so that the surface contour prior to settlement conforms to the surface profile grades in Section 8.1.5 of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015) or otherwise as approved by EPA in writing and so that the top of waste prior to settlement is not higher at any point than the pre-settlement top of waste. *Some areas of the surface within Cell 4 and Cell 5 were about 0.5 m higher than the approved PSCP. Interim level checks were committed to.*

5. Implementation of progressive rehabilitation

The LOA is required to determine if progressive rehabilitation is being suitably implemented. Suitable implementation is deemed to occur if all filled cells are rehabilitated, planned cell rehabilitation is underway, or the landfill operator can demonstrate that rehabilitation works are programmed for timely commencement.

Landfill cell rehabilitation works include:

- capping and revegetation in accordance with regulatory requirements and the EPA approved design
- installation and ongoing maintenance and replacement of gas and leachate collection infrastructure
- decommissioning of infrastructure no longer required.

5.1 Surface level

5.1.1 EPA approved

The approved pre-settlement contour plan (PSCP) is shown in Appendix 3 – Contour Plan of Operating Licence OL000025565. It is sourced from GHD Drawing 31-36742-C003 and is a top of waste contour plan.

This approved PSCP has the following mounds:

- north-west of Cell 1/2 at an elevation of about 152.2 m AHD
- north-east corner of proposed Cell 7A at about 167.5 m AHD.

The primary slope is to the south-south-west. The approved PSCP slope, ranging from 10% to 20%, is within the EPA (2015) Landfill BPEM recommended range.

5.1.2 Actual

The landfill surface was surveyed by Beveridge Williams on 3 July 2023. The top of landfill is shown as being below the PSCP for all cells.

5.2 Capping system

5.2.1 Cell 1/2 cap (west)

This is termed Stage 1 of the cap.

Design

The Cell 1/2 cap (west) design documents are:

- Senversa (2013a) "*Hyland Highway Landfill – Stage 1 Landfill Cap Design, Technical Specification*"
- Senversa (2013b) "*Hyland Highway Landfill – Stage 1 Landfill Design, Construction Quality Assurance Plan*"
- Senversa (2013c) "Hyland Highway Landfill Stage 1 Cap Design Drawings"
- Senversa (2013d) "*Design Assessment Report – Stage 1 Cap, Hyland Highway Landfill, - Callignee South Road, Loy Yang VIC, EPA Licence No: 25565*".

The cap's profile are from top to bottom is:

- 200 mm topsoil
- 700 mm sub-soil
- 300 mm drainage layer
- LLDPE geomembrane
- geosynthetic clay liner
- 300 mm waste cover

The cap's infiltration rate was estimated to be 0.1 L/ha/day.

The EPA approved the design on 16 January 2014. This is less than the Type 2 Landfill requirements of Table 8.1 of the EPA (2015) *Landfill BPEM* of less than 75% of the anticipated liner seepage rate (10 L/ha/day).

Construction

Construction was completed in 2015.

5.2.2 Cell 1/2 cap (east) and Cell 3

This is termed Stage 2 of the cap.

Design

The Cell 1/2 cap (east) and Cell 3 design documents are:

- Golder Associates (2016a) "*Technical Specification for Construction of Parts of Cell 1 & 2 and Cell 3 Composite Cap at Hyland Highway, Loy Yang VIC*"
- Golder Associates (2016b) "*Design Drawings Construction Quality Assurance Plan for Construction of Parts of Cell 1 & 2 and Cell 3 Composite Cap Design - Hyland Highway, Loy Yang VIC*".
- Golder Associates (2016c) "*Design Report for Parts of Cell 1 & 2 and Cell 3 Composite Cap at Hyland Highway, Loy Yang VIC*".
- Golder Associates (2016d) "*Hyland Highway Landfill – Cell 3 and Parts of Cells 1 and 2 Composite Cap Design Assessment*.

The Golder Associates (2016c) design report states that the cap surface is to be vegetated with species nominated by LCC, and that once established is to be maintained to control surface erosion and revegetate any bare area of the surface.

The cap's profile are from top to bottom is:

- 150 mm mulch
- 850 mm sub-soil
- drainage composite with geogrid om steeper slope
- 1.5 mm LLDPE geomembrane
- geosynthetic clay liner
- 300 mm waste cover

The cap's infiltration rate was estimated to be 0.003 L/ha/day. This is less than the Type 2 Landfill requirements of Table 8.1 of the EPA (2015) *Landfill BPEM* of less than 75% of the anticipated liner seepage rate (10 L/ha/day).

The EPA received an email dated 12 September 2016 from the Auditor regarding the composite cap. The email contained revised design documents titled '*Response to EPA Clarifications – Hyland Highway Landfill – Parts of Cells 1 & 2 and 3 composite Cap Design Assessment'*, dated 12 September 2016.

The EPA approved the cap design on 26 September 2016.

Construction

Cell 1/2 east and Cell 3 (west)

Capping of Cell 1/2 (east) and Cell 3 (west) was completed in 2019. The construction audit is GHD (2020) "*Cell 1, 2 and 3 Cap Audit Hyland Hwy Landfill, CARMS 69028-9*", February 2020. The construction auditor recommended:

- LCC shall ensure vegetation establishes on the capping surface, demonstrating the mulch placed as part of the topsoil layer adequately supports vegetation growth
- inspection of the swale drains shall occur as part of the landfill operation plan, to ensure that any washing away of the rock backfill is topped up as required, particularly after large rainfall events and the drains remain free of organic matter.

Cell 3 (east)

Capping of Cell 3 (east) was completed in 2021. The construction audit is GHD (2021) "*Cell 1, 2 and 3 Cap (Phase 2) Construction Audit Hyland Hwy Landfill, CARMS 69028-12*", June 2021. The auditor recommended:

- LCC shall ensure vegetation is maintained across the cap.
- inspection of the swale drains shall occur as part of the landfill operation plan, to ensure that flow velocities are not displacing aggregates and the drains clear following heavy rain. Any washing away or breakdown of the rock backfill should be topped up as required, particularly after large rainfall events.

Observations

During the 18 August 2023 site inspection the Auditor observed the vegetation on the Stage 2 cap was established.

5.2.3 Cell 4 and Cell 5 (west)

This is termed Stage 3 of the cap.

Design

The current design documents are:

- Senversa (2023a) "*Technical Specification – Stage 3 Landfill Cap Hyland Highway Landfill, Hyland Highway, Loy Yang*", draft of 17 January 2023
- Senversa (2023b) "*Design Report – Cell 4 and Cell 5 Landfill Cap, Hyland Highway Landfill, Hyland Highway, Loy Yang*", draft of 15 May 2023

Senversa (2023a) includes the design drawings and construction quality assurance procedures.

The cap's profile are from top to bottom is:

- 150 mm topsoil
- 850 mm sub-soil
- drainage composite
- 2.0 mm LLDPE geomembrane (textured both sides)
- geosynthetic clay liner
- waste cover or engineered fill

The cap's infiltration rate was estimated to be 0.000 L/ha/day. This is less than the Type 2 Landfill requirements of Table 8.1 of the EPA (2015) *Landfill BPEM* of less than 75% of the anticipated liner seepage rate (10 L/ha/day).The Auditor has not witnessed the Auditor's design review.

At the 29 June 2023 Consultative Committee LCC advised that the cap design has been prepared.

Construction

Subjected to EPA approval of the design capping is scheduled to commence in December 2023.

5.3 LFG management

5.3.1 Optimal methane concentration

The Run Energy (2015) "*Landfill Gas Resource Recovery Assessment – Hyland Highway*" estimated the optimal methane concentration to be 52%.

5.3.2 Projected flow rate

GHD (2019a) estimated the peak post closure methane flow to range between 400 m^3/hr and 500 m^3/hr. The following assumptions were adopted:

- 2009 to 2018 waste quantities based on tonnages received at the landfill and are inclusive of municipal waste received from another municipality for the period 2013 to 2016
- the landfill receives municipal waste from 2019 to 2033
- quantities consist of 65% municipal solid waste and 35% Commercial and Industrial waste
- municipal waste is from domestic premises, council collections and other municipal sources where a bin dedicated for garden waste is provided and collected on a regular basis.

5.3.3 LFG management

LFG collection and treatment system

The current LFG collection and treatment system includes:

- vertical wells in Cells 1 to 5
- sacrificial horizontal wells in Cell 4 and Cell 5
- well stations A, B, C, D, E, G, H1 and H2
- Flow lines to from the wells to the well stations
- header lines from the well stations to the flare/gas engine

- a 750 m^3/hr capacity flare
- a 900 kW gas engine.

The current LFG collection system site layout was prepared by Run Energy on 22 February 2023. This shows eleven LFG extraction wells installed in Cells 4 and 5 connected to the generator/flare with flow lines, well stations H1 and H2, header lines and other ancillary infrastructure.

The vertical and sacrificial horizontal wells are piped along main headlines to manifolds at well stations and then to the flare/generator via the underground header pipe lines.

The vertical wells are typically 160 mm casing strings. The casing strings are slotted from the base to about 4 m below the top of cap, gravel packed to 1 m above the slotted section and then sealed to the surface.

Operation

Ennovo operates the LFG collection and treatment system. Up until February 2023 Run Energy had operated the system.

Ennovo submits monthly flare reports to LCC.

The May 2023 monthly flare report advises the flare was off-line for 98.3 % of the time, the average methane was 46.0% v/v and the total methane flared was 7,000 m^3/hr with 37 of the 55 wells functioning. The June 2023 monthly flare report advises the flare was off-line for 97.5 % of the time, the average methane was 48.7% v/v and the total methane flared was 153,000 m^3/hr with 28 of the 55 wells functioning. LCC advised the primary reasons that the flare was offline was because the gas was sent to the turbine for electricity generation, the wells were not functioning as they were generating low gas volumes or the flow lines were blocked.

As indicated in the 29 June 2023 Consultative Committee meeting blockages in flow lines from five LFG wells were rectified by July 2023. Flow lines from the two wells were not replaced as the LFG flow rates and the methane concentrations were expected to be low as the waste in these areas was considered to be old. LCC advised these two wells were to be decommissioned and one was to be replaced.

The Auditor has not witnessed whether other wells/flow lines are blocked. Also the May 2023 Extraction Well LFG Monitoring and Balancing report indicates that well C022 was generating a flow of 11.7 m^3/hr. Several wells in the '*Extraction Well LFG Monitoring and Balancing*' tabulation for 26 June 2023 indicated atmosphere ingress. It is unclear as the source of this atmosphere ingress.

5.3.4 Optimisation plan

The Run Energy (2019) optimisation plan objectives of:

- maintaining flare targets of 50 % v/v (±2) methane and operating vacuum at 3.4 kPa (±1)
- undertaking 6 monthly overhauls of Airwell pump in knockout pot to limit risk of condensate building up and blocking main header line to flare.

have been partially met with the installation of five replacement vertical wells. The methane concentration at the flare is on occasions below 48 % v/v.

5.3.5 Cell 6 sacrificial horizontal gas extraction wells

In the 29 June 2023 Consultative Committee meeting LCC advised it intends to install five horizontal gas extraction wells in Cell 6, once the waste level reached the required height, and to connect them to the generator/flare.

The EPA approval of the Cell 6 notification stated:

> If necessary, a landfill gas collection system to collect and manage landfill gas from early stages of its operation (i.e., horizontal gas collection pipes) included in the design

As of the 18 August 2023 these wells had not been installed.

5.4 Cap irrigation

LCC has recently established an irrigation system on the cap. The system includes:

- a 100 mm diameter HDPE pipe under the cap surface to one of four hydrant points located towards the north of capped cells 1, 2 and 3
- an irrigator, with 50 mm diameter HDPE pipes that can travel from the bottom to the top of the cap. The travel path may vary depending on the area to be covered.

The irrigation system will use RO plant permeate as the primary source and Stormwater Pond 2 water as a contingency source

The system setup has an automatic function to remotely start and stop. It is possible to by-pass this set up to allow a manual start and stop. The system has the facility to install an irrigation controller for time-programmable start and stop with remote operation.

LCC intends to irrigate the cap with this system:

- during dry periods
- when vegetation is establishing
- when large patches of vegetation are repaired.

LCC has a document titled "*Description of the irrigation system at Hyland Highway Landfill*". It is recommended that this document be updated into a procedure that provides a methodology to determine crop demand and irrigation application rates and requires metering of the irrigation application rate.

5.5 Rehabilitation plan

LCC has prepared a LCC (2023) "*Hyland Highway Landfill – Rehabilitation Plan"* in accordance with condition OL_L22 of the operating licence. Table 5-1 presented the tentative timeframe for capping and gas infrastructure installation shown in LCC (2023).

Table 5-1: Landfill capping schedule

Landfill Cell	Estimated time of filling completion	Time of Rehabilitation commencement	Time of Gas Infrastructure Installation
Cell 4	Dec 2022	Dec 2023	Apr 2023
Cell 5 (western part)	Dec 2022	Dec 2023	Apr 2023
Cell 5 (eastern part)	Dec 2025	Dec 2026	Apr 2026
Cell 6 (western part)	Dec 2025	Dec 2026	Apr 2026

When Cell 4 capping is completed, Cells 1, 2, 3, and 4 will be entirely capped.

The Cell 4 and Cell 5 (western part) LFG collection systems have been installed. With the exception of Cell 5, landfill cells have a leachate collection system a sump, a riser pipe and a submersible pump. The Cell 5 main leachate pipe is connected to the Cell 4 leachate sump.

LCC has advised the required funding for these works has been allocated.

6. Conceptual model review

The Conceptual Site Model (CSM) describes the physical conditions as well as the pathways and receptors for key hazards associated with each environmental element.

The CSM was initially developed by Hyder (2011) and revised by BEC (2023).

The CSM has been reviewed as part of this LOA. In undertaking the review the Auditor has considered the description of the landfill and its operations (Section 3) and the rehabilitation status (Section 5). Key outcomes of the review are provided below.

6.1 Weather

Meteorological data has been obtained from the Latrobe Valley Airport Meteorological Station (No 85280). The mean annual rainfall from 1984 to August 2023 is 741 mm with the mean wettest month being 75 mm in September and the mean driest month being 42 mm in February.

6.2 Topography

An east west trending ridgeline is located along the northern boundary of the site. The site slopes from about 152 m AHD in the north to 119 m AHD in the south.

6.3 Soils

The soils are typically silty sands to clayey sands (GHD; 2007b).

6.4 Geology

The description of the hydrogeology presented below is sourced from the various site specific references (Section 15) including GHD (2007c) "*Report for Proposed Callignee Landfill - Hydrogeological Assessment Report*", Birch et al (2003) "*Geology of Victoria*", vandenBerg (1997), the logs of State Electricity Commission Victoria (SECV) exploration bores, and the logs of on-site groundwater monitoring bores.

6.4.1 Regional

Geological investigations within the region commenced with the drilling of the SECV coal exploration bores in the late 1950s.

The geology of the region comprises unconsolidated Quaternary and Tertiary sediments of marine and non-marine origin.

The regional stratigraphy from youngest to oldest summarised as:

Haunted Hills Formation: Interbedded layers and lenses of clayey sand, sand with clay layers, and clayey gravel. It varies in thickness from 14 m in the south-west to over 30 m in more elevated areas to the north and east.

It is of Upper Tertiary (Pliocene) age.

Morwell Formation: Ligneous clay, thin coals and sands, and similar to the overlying Haunted Hills Formation thickens from 7.5 m in the south-west to over 30 m the north and across the top of the site.

It is of Mid Tertiary age.

Traralgon Formation: T1 Coal Seam
The T1 Coal Seam is at the top of the Traralgon Formation.

This coal seam varies in thickness from 23 m in the south of the site to 59 m to the north. GHD (2007c) reports that SECV bore LY453, immediately south of the stormwater ponds, is anomalous as the coal seam is thin (7 m thick) possibly due to faulting.

TR Formation
A thick sequence of interbedded sand, clay and coal, and minor coals underlies the T1 Coal seam to a least 177 m.

It is of Mid-Tertiary age.

Lower Cretaceous: Interbedded non-marine greywackes, mudstones, sandstones, conglomerates, minor coals and volcanics.

The GHD (2007c) "*Hydrogeological Assessment*" shows a topographic low at the top of the T1 coal seam at less than 80 m AHD across the site from south-west to north-east.

The SECV bores variously intersected the Morwell Formation, T1 coals and the underlying TR Formation.

6.4.2 Local

Six groundwater monitoring bores have been installed at the site. The reporting of the drilling, installation and development is found in:

- Meinhardt (2010) - Monitoring bores BH01, BH02 and BH03
- Meinhardt (2011 - Monitoring bore BH04
- ERM (2014) - Monitoring bore BH05
- SMEC (2020) – Monitoring bore BH03R (replacement for BH03)
- Ricardo (2022) - Monitoring bore BH06

The recent monitoring bores installed since 2020 are BH03R and BH06.

Monitoring bore BH03R was installed in March 2020 using sonic drilling. It is adjacent decommissioned monitoring bore BH03. Monitoring bore BH06 was installed in August 2022 [Ricardo (2022), "*Groundwater Well Installation - Hyland Highway Landfill*"]. It is in the south-eastern corner of the site.

The locations of these bores are shown in Figure 3 and their depth, screened interval, top of casing level and lithology are summarised in Table 6-1.

Table 6-1: Within site monitoring bores

Bore	Year	Depth (m bTOC)	Screened interval (m bgl)	ToC (m AHD)	Lithology
BH01	2009	69.23	47-66	112.00	00-22m – Sandy clay & Clayey sand 22-43m – Coal 43-47 m – Clay 47-69m – Sandy clay & Clayey sand
BH02	2009	74.35	59-72	118.53	00-33m – Sandy clay & Clayey sand 33-55m – Coal 55-71m – Sandy clay & Clayey sand

Bore	Year	Depth (m bTOC)	Screened interval (m bgl)	ToC (m AHD)	Lithology
BH03R	2020	71.1	35.0-71.1		0.00-19.4m - Sandy clay to gravelly sand 19.4-21.0m – Sandy clay/coal 21.0-27.0m – Clayey sand – sand 27.0-28.9m - Sandy clay/coal 28.9-31.5m – Sand 31.5-33.0m - Sandy clay/coal 33.0-36.0m - Clayey sand – sand 36.0-69.0m – Coal 69.0 -71.0m – Sand
BH04	2011	20.70	17.0-20.6	120.6	00.0-07.0m –Silty sand , medium to coarse grained 07.0–1.3.0m – Sand medium to coarse grain 13.0-21.0m – Coal/sand, medium coarse grain, coal lumps increasing with depth 21-24.5m – Coal
BH05	2013	101.0	93.0-99.0	142.38	00.0-01.0m –Fill 01.0-20.0m - Silty clayey sand, fine to medium coarse with sand content increasing with depth. 20.0–25.0m – Silty clayey sand , fine to medium coarse, moderately sorted 25.0-65.0m – Sandy silty clay very dark brown with black streaking, with sand content decreasing from 35 m to 50 m, increasing from 50.0m to 60.0m, and decreasing from 60 m to 70 m. Sample lost from 70.0m to 101.0m.
BH06	2022	101.0	90.5-99.5	148.25	0.0-3.5m – Sandy clay with clayey sand. 3.5–8.5m – Sandy gravel with some gravelly clay 8.5-18.2m – Variable: sandy gravels, sands, clayey sand, gravelly sandy clay, sandy clay, clay 18.2-18.7m - Coal 18.7 – 24.2m – Sand, clay and sandy gravelly clay 24.2 – 88.0m – Coal with ligneous clay and minor lenses of sandy gravelly clay and clay 88.0 – 93.0m- Clay and sandy clay 93.0 – 101.0m Sand, sandy gravel and sandy clayey gravel Sample lost from formation from 93 m to 94 m and 97m to 101m

The lithology and screened interval of bore BH03R is similar to bore BH03.

GHD installed LY4202 in November 2006 in the south-west corner of the site. Sand and gravel was intersected below the coal seam from 46 m to 51 m and groundwater was intersected at 46 m and 50 m. This bore cannot be located.

The generalised lithology from the ground surface to depth is:

Haunted Hills Formation underlain by Morwell Group Formation

- 0 m - 45 m Haunted Hills Formation underlain by Morwell Group Formation
  Silty sand, sandstone, sandy clay and clayey sand.

Traralgon Formation

- 40m -65 m T1 Coal Seam
  Coal with minor sands & clay.
- >65 m TR Formation
  Coal with interbedded sands, sandy clay and clayey sands.

6.5 Hydrogeology

The main aquifers are the (i) Haunted Hills Formation underlain by Morwell Group Formation and the (ii) Traralgon Formation as described above.

Monitoring bores BH03R and BH05, to the north of landfill, intersect groundwater. These aquifers intersected at these bores are:

- BH03R - Traralgon Formation within the lower T1 coal seam (monitoring perched water)
- BH05 - Traralgon Formation below the T1 coal seam.

Monitoring bore BH03R is screened from 35 m to the base of the bore. The water intersected is hence may not be hydraulically connected to the regional water table.

Monitoring bore BH05 is screened in the Traralgon Formation. It is inferred to be hydraulically down-gradient of the landfill as the flow direction is considered to be to the north-north-west.

6.5.1 Mine dewatering

Groundwater extraction occurred as follows:

- at the Hazelwood coal mine, to the north-west of the site, with extraction from the Morwell Formation M1 (upper) aquifer and the Morwell Formation M2 (lower)aquifer commencing in 1962 and continuing up until its closure in 2017.
- at the Loy Yang coal mine, to the north of the site, with extraction from the Morwell Formation aquifer and the Traralgon aquifer commencing in 1986 and 1991 respectively.

6.5.2 Groundwater levels

Pre-mining

Near the north-west corner of Cell 2

SECV Bore LY481 was drilled in 1959 near the north-west corner of Cell 2. The bore log shows Morwell Formation sands from 45 m and 51m below ground level (bgl). The bore was screened below the T1 Coal Seam and had a groundwater level of 115 m bgl upon installation.

North-east site boundary

GHD (2007e) reported the 1960 water level within the Morwell Formation at SECV bore LY452, north-east site boundary, was about 68 m bgl (84 m AHD).

South of stormwater ponds

SECV Bore LY453 was drilled immediately south of the stormwater ponds in 1962. The bore log recorded groundwater intersections in wet clayey sands of the basal Morwell Formation at 45 to 50 m bgl, and in the Traralgon Formation at three levels commencing at 62m bgl. The struck water level was about 63 m AHD within the Morwell Formation and about 46 m AHD within the Traralgon Formation.

Regional

GHD (2007c) presented an interpolated 1960 potentiometric surface contour map of the Traralgon Formation. The potentiometric surface in the vicinity of the site is inferred to be in the order of 50 m AHD with a flow direction to the north-west towards the Hazelwood coal mine.

The GHD (2019b) "*Draft Report for AGL Loy Yang - Proposed External Dump Extension*" stated that the Haunted Hill Formation and undifferentiated aquifers at the Tertiary unconformity and the Morwell Formation Aquifer System are expected to be dry with an expected groundwater level of greater than 80 m from the ground surface.

Impact of mining

GHD (2007c) presented a hydrograph of monitoring bore LY2477 which is screened in the Traralgon Formation and located on Traralgon Creek Road to the west of the site. This is also known SOBN 52477. The potentiometric surface fell from 30 m AHD in 1985 to 9 m AHD in 2003 after which it commenced recovery.

GHD (2010) "*Five Year Groundwater Monitoring Review 2010*" reported that he potentiometric surface of the Traralgon Formation aquifer is below the potentiometric surface of the Morwell Formation aquifer in the vicinity of the site.

GHD (2019a) "*Hyland Highway Landfill Extension Works Approval Application*" of August 2019 stated:

> Currently, there is greater than a 30 m difference between the groundwater level and the lowest point of the landfill cell floor for the proposed extension area.
>
> This is based on groundwater monitoring bore BH3, which has a maximum reduced water level of 96.2 mAHD and is screened within perched groundwater in the T1 coal seam beneath the landfill. The required minimum two-metre separation distance between groundwater and the base of the landfill will also be maintained when considering long term undisturbed groundwater levels.
>
> Currently, dewatering operations associated with the Loy Yang open pit coal mine is dewatering the regional watertable. Groundwater level in the regional watertable measured beneath the landfill in monitoring bore BH5 is expected to rebound back to static conditions of approximately 80 to 85 mAHD (currently between 53 - 57 mAHD). Therefore, a greater than 30 m separation distance between groundwater and the lowest point of the cell floor in the landfill extension area (128.5 mAHD) will be maintained. Refer to section 4.6.5 for further discussion and demonstration of compliance with Clause 16(2) of the Landfill WMP.

Within site

The water levels in the within site groundwater monitoring bores as gauged from 2010 to May 2023 are shown in Table 6-2.

Table 6-2: Groundwater water levels in on-site monitoring boreholes

Bore	ToC (m AHD)	Base of Bore (16/05/23)		Standing water level				
				2010	11/13	13/05/19	1/06/21	16/05/23
BH01	112.00	m bTOC	67.30	66.84-67.04	66.9	Dry	66.65	66.60
		m AHD	44.70	44.96-45.16	45.1	Dry	45.28	45.39
BH03R	143.44	m bTOC	72.03	-	-	-	46.89	46.96
		m AHD	71.41	-	-	-	96.55	96.68
BH05	143.90	m bTOC	102.00	NA	84.43	91.07	91.12	91.53
		m AHD	41.90	NA	57.85	52.59	51.31	50.90
Cell 3B	140.50	m bTOC	8.5	-	-	Unknown	Unknown	Dry
		m AHD	132.0					
Monitoring bores BH02, BH04 and BH06 are dry.								

The lowest level of the top of liner in the capped and active cells is 116.8 m AHD at Cell 3.

Local – Perching within Haunted Hills Formation

LCC installed a seepage interception system to prevent seepage through the liner in the north-west corner of Cell 3B. The possible sources of the seepage is discussed in GHD (2012) "*Report for Hyland Highway Landfill Waste Cell 3 Seepage Investigation*". Further details are also provided in the 2013 LOA (Nolan Consulting; 2013). Both assessments suggest that the seepage waters were perched above the regional water table and are isolated in extent.

The Cell 3B construction auditor (GHD; 2013) advised:

1. The seepage interception system is to be monitored and assessed on a regular basis. If excessive seepage is detected in the seepage collection system, additional measures to control the seepage should be implemented.

2. Maintenance of the water level within the seepage collection system should be incorporated into the landfill operational plan to ensure additional pressure and saturation of the subgrade does not occur. In addition, regular inspection of the access road above the seepage affected area must be undertaken, especially after significant rainfall events, to ensure accumulation of rainwater does not occur.

The Cell 3B Interception Bore is behind the liner to the base of the upper batter in the north-west corner of Cell 3B which was 131.92 m AHD at construction. The interception bore is understood to be behind and parallel to the liner valley where the slope is 1V : 3.89H.

The length of the open bore was measured by LCC and Aquaklenz on 8 September 2021 to be 42.50 m. This suggests the bore is open to at least 0.22 m from the base of the upper batter.

A Grundfos SQ1-50 pump powered by a generator is installed in the bore. 11 kL was pumped from this bore from 16 September 2019 to 21 November 2019, 4.6 kL was pumped on 18 August 2021 and 2.2 kL was pumped on 20 August 2021.

The bore is monitored quarterly as part of the verified monitoring program. LCC advised that the water level is measured with a bubble tube from the base of bore. Since February 2016 up until 8 September 2021 the water level has ranged between dry and 7.5 m vertically above its base. Since then it has been dry.

Recommendation 6 of the Nolan Consulting (2021) LOA was:

> Pump out groundwater Cell 3B Interception Bore on a monthly basis until level stabilises at or below 1 m above the base of the upper batter.

The Auditor is satisfied that LCC has pumped the groundwater Cell 3B Interception and the bore was dry when last monitored.

6.5.3 Groundwater movement

Recharge

Traralgon Formation

Regionally recharge is from around the margins of the Gippsland basin to the south-east. Locally recharge is via infiltration through the overlying sediments.

Flow direction - lateral

Haunted Hills Formation and underlying Morwell Formation

The Haunted Hills Formation and underlying Morwell Formation aquifers are unsaturated except for occasional perching (as evidenced in the north-west corner of Cell 3B).

Traralgon Formation

Dewatering of the Loy Yang and Hazelwood coal mines has resulted in significant lowering of the potentiometric surface of this aquifer. As a consequence, the direction of flow within this aquifer system at the site is to the north-north-west (GHD; 2010a).

Flow direction - vertical

Monitoring bores BH03R/BH05 indicate downward groundwater movement at the site.

6.5.4 Salinity

Traralgon Formation

The salinity at Traralgon Formation monitoring bore BH05 ranges from 176 mg/L to 370 mg/L.

6.5.5 Other groundwater quality considerations

The Loy Yang coalmine overburden is disposed of in an overburden stockpile north of the landfill. GHD (2019b) refer to the overburden as consisting of waste material from the mine including weathered coal, regular overburden, interseam sediments and leached ash. GHD (2019b) notes interseam sediments contain iron sulphides, which can undergo oxidation to form sulphate rich acidic leachate. Uncontrolled runoff across the overburden may result in transport of this material into the ponded waterbody.

GHD (2019b) states:

> This leachate has the potential to impact groundwater. Based on previous interpretations of the dump material however, the majority of the material behaves like a clay, but maintains a highly variable nature. Furthermore, if pumping was undertaken (as proposed) to keep the toe dry during construction of the overburden dump, the infiltration of surface water or leachate through the overburden to groundwater would be significantly reduced. Similarly, surface water runoff would also be managed and captured onsite, eliminating potential impacts associated with surface water runoff extending offsite'

The interseam sediments/inferior coal has caused acidic seeps to develop [Meinhardt (2010)].

6.5.6 Groundwater users

Within the site

There is no on-site groundwater supply bores.

Surrounding the site

The *Water Measurement Information System* was interrogated in August 2023 for registered groundwater bore data within 3 km of the site. This search excluded SECV exploration bores. Table 5-3 lists the information obtained from the six bores identified in this search. This finding was confirmed by BEC (2023). The location of these bores are shown in Figure 5.

The groundwater uses of these bores is:

- Groundwater investigation 2
- Urban 1
- Stock and domestic 2
- Stock 1

The *Water Measurement Information System* did not identify any bores with registered groundwater consumptive uses within 2 km of the site.

The two groundwater investigation bores are within the site.

Urban supply bore 76138 is located over 2 km from the site to the south-east. The two stock and domestic and 1one stock bore are located over two km from the site.

Ground Consulting (2023b) reported on a 2023 search of the Visualising Victoria's Groundwater database within a 2 km radius of the site. This identified 88 geological exploration bores and development information system bores which were installed between 1918 and 1985, primarily for coal exploration and 87 *Water Measurement Information System* (WMIS) bores.

Table 6-3: Bores with groundwater related uses within 3 km from the site (from WMIS Search August 2023)

Bore	Drilled	Use	Depth (m)	Screen		Casing dia. (mm)	Elevation (m AHD)
				Top (m bgl)	Bottom (m bgl)		
North-north west (adjacent Traralgon Creek)							
76143 (2.7 km))	1/01/1988	Stock	30.4				74.06
East of site							
76140 (2.4 km).	18/02/1983	Stock & Domestic	31.3				60.33
WRK990131 (S9037320/1) 2.0 km	17/04/2009	Stock & Domestic	200.0				74.05
South-south-west (on Traralgon Creek Road on northern end of Traralgon South)							
76138 (2.4 km decom).	21/03/1980	Urban	76.0	67.5	70.0	152	67.23
On-site monitoring bores (shown as 25 m SW)							
WRK989481 (S9036909/1)	24/06/2009	Investigation	75.0			150	109.83
WRK989482 (S9036909/2)	04/02/2009	Investigation	72.6	67.0	72.6	150	109.83

6.5.7 Groundwater management

The site is located within the Rosedale Groundwater Management Area.

6.5.8 Interpretation

The above hydrogeological information is interpreted as follows:

1. The Haunted Hills Formation and underlying Morwell Formation aquifers are unsaturated within the site except for perching in the north-west corner of Cell 3B which appears to be a result of remnant water remaining after coal mine depressurisation and/or local areas of high infiltration.
2. The floor clay liner at its lowest level of 116.8 m AHD is at least 20 m above the T1 Coal Seam potentiometric surface (maximum of 96.6 m AHD at monitoring bore BH03R).
3. Groundwater at the site is hydraulically disconnected to Traralgon Creek to the west.
4. There is a downward hydraulic gradient from the T1 Coal Seam to the underlying Traralgon Formation aquifer. [In May 2023 the water level at monitoring bore BH03R was 96.68 m AHD and the Traralgon Formation aquifer water level at monitoring bore BH05 was 50.90 m AHD].
5. the water intersected at BH03/BH03R, within the lower T1 coal seam of the Traralgon Formation) is considered to be perched.
6. Coal mine depressurisation has lowered the potentiometric surface of the Traralgon Formation aquifer.
7. The Traralgon Formation aquifer's potentiometric surface under the site is inferred to be below 60 m AHD with a significant downward hydraulic gradient across the full sequence (based upon the SOBN 52477 potentiometric surface).
8. While it is expected that the potentiometric surface of the aquifer systems underlying the site will increase after depressurisation ceases it is expected the Haunted Hills aquifer will remain unsaturated and the regional water table will remain below the landfill floor.
9. Localised areas of perching may occur after depressurisation ceases and as a result of seepage from the Loy Yang overburden stockpile to the north.

6.6 Leachate movement through the unsaturated zone

ERM (2013) "*Draft Hyland Highway Landfill Modelling Assessment*"" used the Landsim model to assess potential impacts of leachate generated at the landfill. The estimated time required for leachate to reach the regional water table was approximately:

- 180 years with an unsaturated pathway length of 75 m
- 120 years with an unsaturated pathway length of 40 m.

6.7 Risk of flooding

The site is not subject to flooding.

6.8 Surface water flows from Stormwater Pond 2

Stormwater Pond 2 when full, overflows in a south-westerly direction into the low lying depressional area north of Callignee South Road which then overflows into a minor ephemeral watercourse that flows in a westerly direction towards Traralgon Creek.

Traralgon Creek is a northward flowing stream about 1.1 km to the west of the site. The creek's headwaters are in in the Strzelecki Ranges. Shingle Creek, a tributary of Traralgon Creek, lies approximately 2.5 km south-west of the site and discharges into Traralgon Creek upstream of the site.

Traralgon Creek flows into the Latrobe River about 12 km north of the site. This river flows into the Gippsland Lakes.

6.9 Landfill gas

LFG monitoring bores LFG01 to LFG12 were installed between 13 and 15 October 2014. The monitoring bore LFG12 is within the road reserve on Traralgon Creek Road, approximately 900 m west of Cell 1/2. It was intended that this bore would be used for background LFG monitoring.

LFG monitoring bores LFG13 and LFG14 were installed between 29 September 2019 and 1 October 2019.

The locations of these existing LFG monitoring bores are presented in Figure 3.

The LFG monitoring bores are typically 20 m from the edge of the landfill/leachate pond at a spacing around the waste mass 100 m to 140 m. The spacings are consistent with EPA (2015) *Landfill BPEM* Appendix B Table B.2 for low permeability (silty sand, sandstone, sandy clay and clayey sand) with some thin sandy zones where there is no development within 250 m.

The drilling and construction logs identify that the bores were installed with 50 mm dia. casing perforated from 1.5 m to depth and fitted with a bottom end cap. Although the top of casing fitting is not described on the logs Run Energy (pers. comm.) advise that they are fitted with a tri-cap which provides a seal. The logs also show a bentonite seal to at least 1 m from the ground surface.

As the perforation size and intensity and the type of the gravel backfill are not provided it is not possible to determine if the typical construction details as listed in the EPA (2015) *Landfill BPEM* Appendix B Table B.3 are met.

LFG monitoring bores depths range from 4.0 m to 29.6 m below the ground surface. The depth reflects the depth to the base of the waste (increasing from south to north) and the leachate pond floor levels.

The RMMP recommends LFG monitoring bores LFG15 to LFG18 be installed around the eastern premises boundary. These locations are shown in Figure 2.

6.10 Cultural heritage sites

A cultural heritage search has not been conducted as part of this audit.

6.11 Flora

Biosis (2006) conducted a flora and fauna assessment of the site and found:

- the plantation to the south to be in poor ecological condition, with negligible significance for nature conservation.
- a small remnant of Swampy Riparian Woodland between leachate pond 1 and leachate pond LP2 which was in a moderate condition and was believed to have high local conservation significance.

LCC partitioned the remnant Swampy Riparian Woodland from the landfill. As shown in Figure 3, this area is termed the frog pond.

6.12 Fauna

A search of the EP&BC Act Protected Matters Search Tool by Biosis (2006) indicated that the site has the potential for species or species habitat to occur for 17 threatened species, 8 migratory species, and 12 listed marine bird species. However, the field survey determined that the site has little potential to support these listed species.

GHD (2019a) advised the site is not a critical habitat of taxa and communities nor a significant spawning, nursery, breeding, roosting and feeding areas.

6.13 Sources, pathways and receptors

6.13.1 Sources

The contamination sources are the waste streams described in Section 0. These can generate leachate and LFG for which the composition is dependent upon the waste and the stage of degradation.

Methane is a key LFG. It is flammable and forms an explosive mixture with air when its concentration lies between the lower explosive limit (LEL) of about 5% and the upper explosive limit (UEL) of about 15%. Methane is also a potent greenhouse gas and can contribute to photochemical pollution.

6.13.2 Migration pathways

Landfill gas in air

LFG can migrate vertically through the active cell, area with intermediate cover, area with final cap, trough penetrations, and via leakage from the LFG collection and extraction system, Capping and cover restricts vertical migration.

Landfill gas in unsaturated zone

LFG can also migrate horizontally through the geology and /or trenches and conduits of underground services within the unsaturated zone above the watertable. As of May 2023 the unsaturated zone below the liner, ignoring perching, was at least 20 m.

Known underground services within the site are listed in Table 6-4.

Table 6-4: Extent and location of services within the site

Service Type	Description
Stormwater	See Table 3-2.
Telephone	Nil (mobile phone is used in gatehouse office).
Electricity	Three phase power enters the site from Traralgon Creek Road to the west. A trenched cable runs along the western side of Cell 1/2 to provide a power supply to both leachate pond aerators, the leachate pumps and the RO plant. The Education Centre is also connected to this power supply. LCC has advised that there are no pits near the two leachate ponds.
On site water	Three rainwater tanks at the Education Centre.
Mains water	Nil.
Fire water supply	Fire hydrants at leachate pond LP2 and stormwater pond. 10,000 L water tank that LCC advises is kept full.

Service Type	Description
Sewerage	Septic tank toilet system at the Education Centre. Pump out toilet system at the gatehouse.
Gas	Bottled LPG at the Education Centre.

Mechanisms for horizontally movement within the unsaturated zone are advective and diffusive flow. Advective flow occurs where a pressure gradient is present. Diffusive flow occurs where a gas moves due to a concentration gradient, in a manner similar to chemicals mixing in a body of water. The diffusive flow rate is much slower than the advective flow rate.

Groundwater

Leachate can mix with groundwater in the event that it infiltrates through the liner or the leachate pond liner, or overflows to the land and then infiltrates.

LFG can migrate by partitioning with leachate or groundwater. This involves methane, as a volatile organic chemical, dissolving into the liquid phase. There is potential for the methane to then partition (evolve) out of the water and into the soil gas above the water table.

Surface Water

Contaminated stormwater can enter the stormwater system via impacted runoff from the cap, leachate pond spills and groundwater discharges.

6.13.3 Receptors

The relevant receptors are considered to be:

- site workers
- occupants of nearby residences, businesses and schools
- flora and fauna on the site and surrounding the site
- the atmosphere
- physical infrastructure on and off site
- land
- groundwater
- surface waters.

The proximity to the landfill of residences, townships, schools and commercial facilities are presented in Table 6-5. The locations of residences are shown in Figure 6.

Table 6-5: Proximity to the landfill of residences, townships, schools and commercial facilities

Type	Proximity to landfill
Residences	1.20 km north- west 1.25 km south-west
Townships	Traralgon South township - about 2 km south-west
Schools	Nil within 1 km
Commercial facilities	Loy Yang motocross track – 600 m to the north-west Loy Yang power stations – about 2.8 km to the north Loy Yang open cut mine – about 3.5 km to the north.

There are no groundwater or surface water dependent ecosystems including flood plains, special conservation, heritage or protected areas within 500 m of the site.

7. Risk of landfill operations

The following risk assessment tasks have been undertaken as part of the LOA:

- identification of environmental values
- site inspection of 18 August 2023
- consideration of:
  - discussions with LCC
  - information provided by LCC
  - updated conceptual site model
  - monitoring data
- review of risk aspects of Bajwa EnviroConsult (2023) "*Hyland Highway Landfill – Risk Management and Monitoring Program*", September 2023 (Appendix E of this LOA)
- summarise the outcomes.

The Bajwa EnviroConsult (2023) "*Hyland Highway Landfill – Risk Management and Monitoring Program*" supersedes all previous risk assessments including the PLC (2017) "*Landfill Gas Risk Assessment Hyland Highway Landfill, Loy Yang*" which was developed at the time that the LFG collection and treatment system had been installed in the Cell 1/2 (west) final cap.

7.1 Risk assessments prepared by landfill operator

LCC, as the landfill operator, has adopted the risk assessment undertaken in Hyder (2011) "*Latrobe City Council Risk Assessment and Environmental Monitoring Program*" and the risk related findings of the most recent audit (Nolan Consulting; 2021).

7.2 Environmental values

The Environment Reference Standard (ERS) identifies environmental values to be achieved or maintained and sets out environmental values for the following elements:

- ambient air
- ambient sound
- land
- waters (groundwater and surface water).

The ambient air, ambient sound and land environmental values, indicators objectives are described below.

7.2.1 Ambient air

Ambient air environmental values are:

- life, health and wellbeing of humans
- life, health and wellbeing of other forms of life, including the protection of ecosystems and biodiversity
- local amenity and aesthetic enjoyment
- visibility
- the useful life and aesthetic appearance of buildings, structures, property and materials

- climate systems that are consistent with human development, the life, health and wellbeing of humans, and the protection of ecosystems and biodiversity.

The indicators and objectives for the ambient air environment are listed in Table 2.2 of the ERS. These indicators include odour.

7.2.2 Ambient sound

Ambient sound environmental values are:

- sleep during the night
- domestic and recreational activities
- normal conversation
- child learning and development
- human tranquillity and enjoyment outdoors in natural areas
- musical entertainment.

Land use categories include Category IV which is for lower density or sparse populations with settlements that include smaller hamlets, villages and small towns that are generally unsuited for further expansion. Land uses include primary industry and farming. This category applies to land around the site.

For category IV the indicators and objectives are:

- 10 pm - 6 am | Outdoor $L_{Aeq.8h}$ – 35 dB(A)
- 6 am - 10 pm | Outdoor $L_{Aeq.16h}$ – 40 dB(A)

The ERS supersedes the EPA (2011b) *"Noise from Industry in Regional Victoria Recommended Maximum Noise Levels from Commerce, Industry and Trade Premises in regional Victoria", Publication 1411.*

7.2.3 Land

Land environmental values are:

- land dependent ecosystems and species
- human health
- buildings and structures
- aesthetics
- production of food, flora and fauna.

The 'land dependent ecosystems and species' environmental values is 'modified ecosystem'.

The indicators and objectives are listed in Table 4.3 of the ERS.

7.3 Waters

The environmental values, indicators and objectives for waters (surface waters and groundwaters) are described in BEC (2023).

The surface waters of the site and its boundaries are located with the Central Foothills and Coastal Plains segment. The environmental values within this segment are described in Section 5.4.4 of BEC (2023).

The Auditor's interpreted use related to these environmental values are listed in Table 7-1

Table 7-1: Interpreted use associated with surface water environmental values

Environmental value	Use
Water dependent ecosystems and species - slightly to moderately modified	Existing
Agriculture and irrigation	Likely
Human consumption of aquatic foods	Excluded
Aquaculture (if quality suitable and an aquaculture licence has been approved in accordance with the Fisheries Act 1995.	Excluded
Industrial and commercial use	Excluded
Water based recreation (primary contact)	Unlikely
Water based recreation (secondary contact)	Unlikely
Water based recreation (aesthetic enjoyment)	Excluded
Traditional owner cultural values	Likely

The ANZG (2018) default guideline values (95%) for toxicants for water dependent ecosystems and species are presented in BEC (2023).

The groundwater within the Traralgon Formation is within Segment A1. The environmental values for groundwater are described in Section 5.2.3 of BEC (2023). Table 17 of BEC (2023) tabulates the relevance of groundwater environmental values and Table 18 presents the groundwater quality objectives.

The Auditor accepts these environmental values.

7.4 Auditor's assessment of risk

Appendix 6 – Scope for audit of landfill operation of the EPA (2016) "*Landfill licencing guideline*" requires the auditor to conduct a qualitative or semi-quantitative assessment of the risks associated with the landfill as an integral part of the audit.

I conducted a qualitative assessment of the risks associated with the landfill as part of the verification of the BEC (2023) "*Hyland Highway Landfill – Risk Management and Monitoring Program*", September 2023. As this RMMP was verified on 12 September 2023, the risk register presented in BEC (2023) is adopted as the Auditor's assessment of the risks.

No residual risks were assessed as high or very high. The medium residual risks (with implementation of existing controls) are listed in Table 7-2. All these risks require additional controls to be considered tolerable. These additional controls are within the LOA recommendations.

The existing controls include:

- waste acceptance procedures for non-conforming load
- waste acceptance and placement procedures for daily waste cover.
- fire controls including:
  - water tanker
  - appropriate staff are provided with first response fire training
  - on-site signage indicating that no fires are to be lit on site
  - a supply of mains water is to be available for firefighting purposes at all times
- waste placement procedures with restrictions on height of lifts

Table 7-2: Summary medium residual risks

No	Environmental Aspect	Potential environmental and/or human health impact	Potential source/pathway	Element of Environment and Environmental value
M1	Acceptance of waste	Acceptance of non-conforming waste, which may increase potential for air emissions (including odour)	Non-conforming wastes not identified prior to tipping highly contaminated waste, putrescible, green waste or asbestos containing materials accepted which may give rise to air emissions (including odour).	Air (including odour)
M2	Tipping of waste at active landfill cell	Fire within landfill cell	Combustible material/ ignition sources within landfilled waste Groundwater impacts associated with increased leachate generation (due to the water used to suppress fire).	Air
M3	Tipping of waste at active landfill cell	Overfilling of cell – increased potential for emissions to air (including odour, dust and volatile gases)	Greater volume of waste than originally assessed/approved by EPA. Handling of waste in dry and or/windy conditions.	Air
M4	Leachate management	Leachate discharge to groundwater Contamination of land (as it applies to indoor/ enclosed spaces) via evolution of volatiles from leachate or contaminated groundwater	Inadequate containment, treatment or disposal of leachate. Chemicals in leachate migrate to water table including ammonia, nitrate, salinity, sodium, chloride, manganese, iron, potassium Flow from intermediate capped areas entering drainage lines which flow offsite. Water from the leachate pond being extracted and used onsite, then flowing offsite.	Groundwater Land

No	Environmental Aspect	Potential environmental and/or human health impact	Potential source/pathway	Element of Environment and Environmental value
M5	Leachate management	Leachate discharge to groundwater and surface waters (dissolved contaminants)	Leachate pond(s) overtops due to high rainfall events Overflow of leachate pond. Inadequate segregation and management of stormwater - contamination of stormwater.	Groundwater Surface water
M6	Leachate management	Odour from leachate	Anaerobic conditions in leachate pond(s). Leachate accumulation within cells or on the surface of the landfill.	Air (including odour)
M7	Landfill gas management	Landfill gas emissions	Direct release of landfill gas from surface of capped and uncapped parts of the cell to the atmosphere	Air
M8	Landfill gas management	Landfill gas emissions	Sub-surface landfill gas migration and accumulation in onsite buildings and structures Direct release of landfill gas from surface of capped and uncapped cells to the atmosphere, moving beyond site boundary Sub-surface landfill gas migration leading to offsite emissions	Air
M9	Stormwater management	Contamination of stormwater run-off	Inadequate segregation and management of stormwater	Surface water
M10	Stormwater management	Contaminated stormwater discharged onto land	Inadequate separation of leachate and stormwater leading to contaminated stormwater discharge onto land.	Land
M11	Land not suitable for future intended use	Long-term landfill gas emissions and subsurface migration (onsite only)	Long-term landfill gas emissions and subsurface migration (onsite and offsite)	Landfill gas

- to manage odour:
  - aeration of leachate ponds LP1 and LP2
  - on and off site odour monitoring RO plant
  - leachate pond DO is monitored
  - continuous on site H_2S monitoring
- pumping of leachate
- groundwater interception system behind northern Cell 3B side liner
- maintenance and testing of leachate, groundwater and surface water
- level in leachate pond LP2 and leachate sumps are monitored and have triggers
- a buffer of over 500 m exists from the leachate pond LP2 to nearby properties
- capping of the landfill
- LFG extraction system
- vertical LFG wells and sacrificial horizontal wells installed
- base and sides of cells have geomembrane and are clay lined
- unwritten stormwater management procedures
- Akuaklenz (2022) "*Leachate Management System Manual*"
- RO permeate is monitored and discharged via Stormwater Pond 2.
- LFG is monitored for the remaining life of the landfill operation and following rehabilitation
- a perimeter LFG monitoring bore network (13 bores) is installed. Quarterly monitoring of the bores is undertaken

7.5 Risks to environmental values

The Environmental values identified in this report are appropriate.

No high risks have been identified. The medium risks of landfill operations to Environmental values are listed in Table 7-2.

The RMMP's risk register will need to be reviewed at the next LOA.

8. Assessment of the Monitoring Program

The verified Monitoring Program documented in Section 10 of Nolan Consulting (2021) "*Section 53V Audit - Landfill Operation Hyland Highway Landfill - Hyland Highway, Loy Yang*".

Groundwater, surface water and leachate monitoring over the audit period was undertaken by ALS. The annual reports over the audit period are:

- Ground Consulting (2023a) "*2022 Annual Environmental Monitoring Report - Hyland Highway Landfill*", 17 August 2023
- Ground Consulting (2023b) "*2023 Annual Environmental Monitoring Report - Hyland Highway Landfill*", 4 September 2023 (Appendix D of this report).

8.1 Monitoring activity

8.1.1 Groundwater, surface water and leachate

Over the audit period the following groundwater (including groundwater interception system), leachate and surface water monitoring events were undertaken:

- 16-25 August 2021
- 9-30 November 2021
- 17 February 2022
- 23-26 May 2022
- 24 August 2022
- 17-23 November 2022
- 28 February 2023
- 16 -25 May 2023.

The date of RO plant monitoring is not shown in the ALS field sheets.

The groundwater and leachate levels and field water quality parameter were monitored at all of the above events. Groundwater, leachate and surface water samples for laboratory analyses were obtained biannually (at every second monitoring event).

Groundwater monitoring bores BH02, BH04 and BH06 were reported as dry at all monitoring events and bore BH01 had insufficient water to sample.

8.1.2 Landfill gas

The LFG monitoring events conducted over the audit period are listed in Table 8-1.

Table 8-1: LFG monitoring events over audit period

Date	Surface	Bores	Buildings & structures	Sub-surface Services
26-27 August 2021	√	√	x	x
22-29 November 2021	√	√	√	√
8 February 2022	√	√	x	x
19-27 May 2022	√	√	√	√
31 August 2022	√	√	x	x

Date	Surface	Bores	Buildings & structures	Sub-surface Services
9 & 29 November 2020	√	√	√	√
7 February 2021	√	√	x	x
19 May & 13 June 2021	√	√	√	√

8.2 Groundwater, surface water and leachate assessment

8.2.1 Groundwater

Table 6-1 describes the aquifer monitored, bore depth, screened interval, top of casing level and lithology for groundwater monitoring bores within the verified monitoring program.

Table 8-2 presents the assessment of the groundwater monitoring activity undertaken in the May 2023 monitoring event against the verified Monitoring Program. The primary information source is ALS Water (2023) "*Hyland Highway Landfill Site Groundwater Report - May 2023*".

Table 8-2: Groundwater monitoring – compliance assessment

Program element	Compliance
Groundwater sampling undertaken in accordance with EPA (2022b) "*Groundwater Sampling Guidelines*", Publication 669.1	Compliant, likely The ALS Groundwater Report – May 2023 states all sampling procedures were conducted according to EPA Publication 669, Groundwater Sampling Guidelines and ALS Procedure EN/67.11.
Inspect condition of groundwater monitoring bores BH01 to BH06.	Compliant ALS Groundwater Report – May 2023 provides groundwater bore condition statement which includes date bores sampled, water level within bores and whether bores locked. The condition report does not provide information on monument condition and extent of sediment in sampled water. This was not requested in the verified monitoring program.
Inspect condition of Cell 3B interception bore	Compliant ALS Groundwater Report – May 2023 provides Cell 3B interception bore condition statement which includes date sampled and notes bore is dry.
Maintain existing groundwater monitoring bores. This involves repairs to return damaged bores to functional status.	Compliant, partially All bores monitored. While not explicitly listed in verified monitoring program EPA (2022b) "*Groundwater Sampling Guidelines*", Publication 669.1, states bores should be assessed to ensure that sampling objectives can be met and a bore inspection is undertaken to establish its physical condition. Bores BH3 and BH5 were reported in the ALS May 2023 monitoring report as not being locked.

Program element	Compliance
	At 18 August 2023 site inspection monitoring bore BH06 had a concrete mound and was locked.
Survey of all groundwater monitoring bores to establish coordinates (easting and northing) and the relative level of the ground surface and top of casing measured to Australian Height Datum (AHD).	Compliant Appendix J of Ground Consulting (2023b).
Groundwater bores shall be gauged (measured for level) prior to each sampling occasion (reported to AHD).	Compliant Appendix E of Ground Consulting (2023b).
Quarterly water level monitoring frequency for (Nov, Feb, May, and Aug) for all bores and the Cell 3B Interception Bore.	Compliant
Field monitoring parameters temperature, EC, pH, redox and dissolved oxygen & physical appearance	Compliant
Laboratory monitoring parameters pH, TDS, ammonia N, nitrate as N, bicarbonate as bicarbonate, chloride, sulphate, sodium, potassium, calcium, magnesium, TOC, total phosphate, TRHs – 2013 NEPM fractions, and BTEXs.	Compliant
Laboratory monitoring parameters Total iron (filtered), manganese (filtered)	Compliant, partially Analysed, however samples would not filtered in the field and would have been filtered upon laboratory receipt. Ground Consulting (2023b) advised that this was due to the moderate turbidity at BH05 and higher turbidity at BH03. This was the same finding as in the 2021 LOA report.

8.2.2 Surface water

The verified Monitoring Program includes monitoring of:

- permeate from the RO plant
- Stormwater pond 2 (SW1)
- Traralgon Creek – Downies Lane- U/S (SW2)
- Traralgon Creek – Jones Road -D/S (SW3).

The locations of the RO plant and SW1 are shown on Figure 3. The locations of the two Traralgon Creek monitoring sites are shown on Figure 4.

Table 8-3 presents the assessment of the surface water monitoring activity undertaken in the May 2023 against the verified Monitoring Program. The primary information source is ALS Water (2023) "*Hyland Highway Landfill Site Groundwater Report - May 2023*".

Table 8-3: Surface water monitoring – compliance assessment

Program element	Compliance
Monitoring sites are identified with markers.	Compliant Not listed in the verified monitoring program. Sampling point at SW2 should be identified.
Sampling monitoring procedures comply with EPA (2009) "*Sampling and Analysis of Waters, Wastewaters, Soils and Wastes*", Publication IWRG701	Compliant, likely See Appendix E of Ground Consulting (2023b).
Weekly level monitoring of Stormwater Pond 2.	Not compliant Not provided in Ground Consulting (2023b).
Biannual water quality sampling frequency.	Compliant
Field monitoring parameters - temperature, EC, pH, redox, dissolved oxygen.	Compliant
Laboratory monitoring parameters – as per groundwater except total iron and total manganese are not filtered.	Compliant, partially The Certificate of Analysis report in the ALS Groundwater Report – May 2023 indicates surface water samples may have been filtered.

8.2.3 Leachate

The verified Monitoring Program includes monitoring at the two leachate ponds and the three leachate sumps within cells 3, 4 and 6

The locations of the two leachate are shown on Figure 3.

Table 8-4 presents the assessment of the leachate monitoring activity undertaken in the May 2021 against the verified Monitoring Program. The primary information source is ALS Water (2023) "*Hyland Highway Landfill Site Groundwater Report - May 2023*".

Table 8-4: Leachate monitoring – compliance assessment

Program element	Compliance
Establish a sample point marker at leachate pond LP1 and leachate pond LP2.	Compliant, partially A level transducer has been installed at leachate pond LP2.
Establish level sensors in Cell 3, Cell 4 and Cell 6 leachate sumps. Survey to m AHD.	Compliant
Monitor flows from: ▪ Cell 3 leachate sump (LS01) to LP2 ▪ Cell 4 leachate sump (LS02) to LP2 ▪ Cell 6 leachate sump (LS03) to LP2 ▪ RO permeate to Stormwater Pond 1 ▪ LP1 to LP2.	Compliant
Weekly level monitoring.	Compliant
Biannual sampling for water quality analysis	Compliant

Program element	Compliance
Field monitoring parameters - temperature, EC, pH, redox, dissolved oxygen.	Compliant
Laboratory monitoring parameters – as per groundwater except total iron and total manganese not filtered.	Compliant, partially The Certificate of Analysis report in the ALS Groundwater Report – May 2023 indicates leachate samples may have been filtered in the laboratory.

8.2.4 QA/QC assessment

Table 8-5 assesses the 2022-23 groundwater, surface water and leachate QA/QC as reported in Section 6 of Ground Consulting (2023b).

Table 8-5: 2020-21 groundwater, surface water and leachate sampling QA/QC assessment

Task	Requirement	Finding
Personnel	Sampling to be undertaken by qualified, experienced personnel.	Compliant Undertaken by ALS Water.
Calibration	All equipment used should be calibrated prior to use.	Compliant, partially Discussed in Section 6.5 of Ground Consulting (2023b). Calibration records provided for water quality meters, but not interface probes.
Recording	All field records and calibrations should be recorded on field data sheets.	Compliant Discussed in Section 6.6 of Ground Consulting (2023b).
Bore gauging	Monitoring bores should be gauged for level prior to purging/sampling.	Compliant Groundwater sampling field sheets provide pre-purge levels.
Bore purging	Monitoring bores should be purged until field parameters (electrical conductivity, pH and temperature) stabilise.	Compliant, generally 16 May 2023 groundwater sampling field sheet for BH03R has been reviewed. Field parameters with the exception of redox have stabilised.
Bore sampling	Sampling should be conducted using a low flow downhole Submersible Pump. Pumping should continue until chemical equilibrium is reached in accordance with the EPA Publication 669 requirements.	Compliance For May 2023 sampling undertaken with micropurge pump at both BH03R and BH05.

Task	Requirement	Finding
QA sample collection	The following QA/QC samples should be collected: ▪ field blank ▪ equipment/rinsate blank ▪ blind replicates (inter and intra laboratory In addition Relative Percent Differences (RPDs) should be calculated. Data validation checks should also be undertaken.	Compliant Samples were analysed by ALS Water (primary laboratory) and Eurofins (secondary laboratory). Section 6.2 of Ground Consulting (2023b) discusses the QA/QC laboratory analysis. QA/QC inter and intra-laboratory duplicates were collected from BH05 at the May 2023 monitoring events. Rinsate samples, trip blank and field blanks were taken at the May 2023 monitoring event. No intra-laboratory blind replicates RPD exceedances were detected in November 2022 monitoring event. The only inter-laboratory blind replicates RPD exceedance detected in November 2022 monitoring event was for TOC (at 107%) No intra-laboratory blind replicates RPD exceedances were detected in the May 2023 monitoring event except for TOC (121%). The only inter-laboratory blind replicates RPD exceedances detected in May 2023 monitoring event were for ammonia (164%), TOC (156%), chloride 164%) and sulphate (176%). The only exceedance of the groundwater quality objectives in a blind replicates (inter laboratory sample and not in the primary sample was for chloride a7 800 mg/L which was above the agriculture and irrigation (irrigation) environmental value objective of 175 mg/L.
Decontamination Procedure	Sampling equipment should be decontaminated and rinsed with deionised water between bores.	Compliant Re-useable sampling equipment was decontaminated and rinsed between sampling sites using deionised water.
Sample Preservation	Samples should be filtered and preserved while on-site and in transit to the laboratory.	Unclear Samples suspected to be filtered in laboratory. Preservation method not described.
Chain of Custody Forms	Each sample designated for analysis should be recorded on a Chain-of-Custody form which details: ▪ name of the person transferring the samples ▪ name of person receiving the samples, e.g. laboratory staff ▪ time and date the samples were taken ▪ time and date the samples were received and ▪ analytes to be determined.	Not compliant Analysis Request Forms are used by ALS, which do not include the name of the person/s receiving the samples, as well as the times and dates that the field samples were received.

Task	Requirement	Finding
Sample Holding Times	Laboratory specified sample holding times should be adhered to.	Compliant Ground Consulting (2023b) did not report significant sample holding time errors.
Laboratory analysis	Should be undertaken by a National Association of Testing Authority (NATA) accredited laboratory. Laboratory analytical limits of reporting (LOR) shall be such that they meet or better the trigger levels used to assess impacts under the ERS.	Compliant Both laboratories are NATA accredited.

8.2.5 Conclusion

The groundwater, surface water and leachate monitoring undertaken over the audit period is generally compliant with the verified Monitoring Program.

8.3 Landfill gas

Compliance with the verified monitoring program's LFG monitoring frequency in 2022-23 is commented on in Table 8-6.

Table 8-6: LFG monitoring activity

Site	Monitoring frequency	Compliance
Cap		
Final cover	Feb, May, Aug, Nov	Compliant
Intermediate cap	Feb, May, Aug, Nov	Compliant
LFG Monitoring bores		
LFG01 – LF14 except LFG06	Feb, May, Aug, Nov	Compliant
LFG06	Feb, May, Aug, Nov	Not compliant Bore decommissioned during construction of Cell 6. LCC advise it was backfilled wit bentonite.
Buildings and services		
As per Ground Consulting (2021) including Education Centre. The ALS May 2021 LFG monitoring report in Ground Consulting (2021) states cupboards, oven, storage style bench seats and the ceiling cavity are identified likely accumulation points and are checked.	May, Nov	Not compliant Education centre building not monitored.
Subsurface services		
As per Ground Consulting 2021. These are: ▪ main power box and cables - eastern side of education centre	May, Nov	Compliant

Site	Monitoring frequency	Compliance
▪ hot water service pipe work - eastern side of education centre ▪ drainage pipe - west side under education centre ▪ sewer pipe - west side under education centre ▪ sewer vent pipe - west side of education centre ▪ stormwater pipe - tank overflow. ▪ stormwater pipe - into tank ▪ downpipe - north side of building ▪ stormwater pit - side of road, opposite compound entrance		

Table 8-7 presents the assessment of the LFG monitoring activity undertaken in 2022/23 against the verified Monitoring Program. The primary information source is ALS Water (2023) "*Hyland Highway Landfill Site Landfill Gas Report - May 2023*".

Table 8-7: LFG monitoring – compliance assessment

Program element	Compliance
Install LFG monitoring bores LFG13 & LFG14	Compliant Installed.
Maintain all LFG bores LFG01 to LFG14	Compliant, generally The LFG monitoring bores inspected on 18 August 2023 were well maintained, clearly marked with ID and had locked monuments. May 2023 monitoring report stated LFG01, 02, 03 and 07 were unlocked and had broken locks or the monument hinge was broken. LFG06 had been decommissioned due to Cell 6 construction and has not been replaced. LCC advise it was backfilled with bentonite.
Survey the locations of all LFG bores using GPS or survey reference.	Compliant
Monitor subsurface LFG bores for atmospheric pressure, relative pressure, peak CH_4, CO_2, O_2, CO, H_2S, flow (L/hr) and comments.	Compliant A GA5000 extractive landfill gas analyser was used.
Monitor the intermediate cover and final cap for atmospheric pressure, relative pressure and CH_4.	Partially compliant Methane measured with LaserOne low concentration methane detector. Atmospheric pressure and relative pressure measured prior to walkover
Monitor LFG in subsurface services, buildings and structures for atmospheric pressure, relative pressure, and CH_4.	Not compliant LFG in subsurface services monitored on one occasion in 2022-23. Methane measured with a LaserOne low concentration methane detector. LFG in buildings and structures not monitored,

Program element	Compliance
Report on atmospheric pressure trends over preceding days at nearest meteorological station to ensure LFG monitoring events occur during falling pressure.	Compliant Atmospheric pressure records provided from Latrobe Valley airport meteorological station 085280 at half hourly intervals from 3.30 pm on 10 June 2023 to 12.30 pm on 1 June 2023.
Undertake intermediate cap methane emissions monitoring at a 25m grid basis parallel to the landfill boundary.	Likely ALS monitoring reports show the walkover path on a figure. Density of walkover in some areas of intermediate cover exceeds EPA (2018) "*Landfill Gas Fugitive Emissions Monitoring Guideline*" of recommended transect spacing of 25 m.
Monitoring should be undertaken by a qualified, experienced personnel, in accordance with appropriate EPA guidelines and standard industry practice.	Compliant Monitoring undertaken by ALS Water.
Undertake LFG monitoring within proximity of the Education Centre, in any pits associated with transferring power to the leachate pumping and treatment system and in RO containers.	Compliant LCC has advised that there are no electrical pits from the transformer to the meter l near to leachate ponds.
Use field recording sheets.	Compliant ALS provides field sheets.
Keep field equipment calibration records.	Compliant

LCC advised that it takes the following rectification works for methane exceedances of action levels at the surface:

- places additional cover material at cracks
- at structures fills gaps with expandable foam
- adds additional cover on intermediate cover.

8.4 Operational procedures, checklists and documents

LCC has several procedures relevant to operating the landfill. The procedures that have been inspected by the Auditor a part of this LOA are:

- daily cover
- landfill operational
- waste acceptance
- traffic management operational
- works
- emergency response
- safe work – (excavator, compactor, front end loader and dump truck)

LCC has a "*Landfill Conditions of Entry*" document and maintains a complaints register. In addition LCC engages a licenced surveyor to undertake an independent annual survey by the end of June each year for each landfill cell.

LCC has the following inspection checklists:

- daily inspection report (which addressed weekly monitoring requirements)
- monthly
- quarterly.

and maintains the following documents:

- Asbestos in the home Removal Kit
- Health and Safety Investigation Form
- Incident/Near Miss/Hazard/Property Damage Form
- Landfill Odour Test report
- Asbestos Management Plan
- Emergency Management Plan

Comments on aspects of these procedures, checklists and documents are presented in Table 8-8.

Table 8-8: Comments on these operational procedures, checklists and documents

Operational procedures, checklists and documents	Comments
Maintain records of complaints	Generally compliant Complaints to customer services are recorded on LCC's PATHWAY's system. Complaints received on the PATHWAYS system require actioning by an actioning officer with review by a responsible officer. The EPA directs complaints through the Coordinator for Landfill Services. LCC has a landfill complaints register. Three complaints were recorded on this register over the audit period all of which were all odour related.
Maintain a consolidated complaints register	Compliant Complaints are consolidated in the landfill complaints register.
Undertake inspections for odour, litter, stormwater, dust, and noise	Compliant Daily inspection report completed and authorised every morning. Litter, dust and noise included. Stormwater is not included. Actions taken not always reported.
Maintain records of weekly inspections for odour litter, stormwater, dust, and noise	Compliant Records maintained. The LCC Co-ordinator of Landfill Services undertakes informal inspections, including boundary checks, which are not documented. Photographs are taken. These inspections are not documented.
Main records of leachate pond and leachate sump levels	Compliant Maintained by Aquaklenz
Works procedures kept on-site	Compliant
Staff training provided	Not subject to review in this LOA. To be addressed in next audit as is a specific GED requirement.

Operational procedures, checklists and documents	Comments
Maintain documented waste acceptance procedure	Compliant Contractors are given a copy of the procedure and are required to provide a signed copy. The acceptance procedure lists unacceptable materials.
Maintain documented waste placement and daily cover procedure	Partially compliant The site has a documented daily cover procedure. It needs to b undated to include ADC.
Maintain completed daily cover inspection sheets	Not compliant Included in daily inspection report for soil, however not adequate for ADC.
Maintain incidents register	Compliant LCC uses MYOSH system across all business units.
Weighbridge and tipping face manned at all times	Compliant
Weighbridge is calibrated every two years	Compliant
Maintain signs advising which wastes may be deposited	Not compliant Require a sign at weighbridge entry.
Maintain record of visual inspections of open loads at the weighbridge	compliant, generally Visual inspection records are not maintained. The Weighbridge Attendant inspects untarped loads into the site. Contractors are required to take back unacceptable materials observed at the weighbridge and the tipping face.
Maintain rejected loads register	Not compliant LCC does not have a document register. LCC advise that the few rejected loads are diarised.
Maintain records of top of waste surveys within active cells	Compliant Beveridge Williams undertook independent survey on 3 July 2023.
Co-ordinator of Landfill Services undertakes site inspections	Compliant Auditor has witnessed reports.
Maintain landfill levy calculations and records	Compliant

All LCC correspondence and communication with the EPA is logged within the LCC data works system.

The LCC has generally implemented the monitoring and the QA/QC measures that for each licence condition as identified in the *Landfill Compliance Risk Register*.

Most annual reporting requirements have been met.

9. Interpretation of monitoring results

The groundwater, surface water, leachate and LFG monitoring results are interpreted in this section.

Table 9-1 presents:

- groundwater quality objectives from the BEC (2023 "*Hyland Highway Landfill – Risk Management and Monitoring Program*"
- the groundwater, surface water, and leachate water quality laboratory analytical results from the June 2013, February 2017, May 2021 and May 2023 monitoring events
- exceedances of the groundwater quality objectives for groundwater and surface water,

Table 9-1: Hyland Highway landfill – Groundwater, leachate and surface water quality analytical results

Parameter	Trigger levels				Date	Analytical results										
	Agriculture and Irrigation (Stock Watering)	Agriculture and Irrigation (Irrigation)	Water dependent ecosystems and species	Australian Drinking Water Guidelines	Water based recreation (Primary contact recreation)		BH03R	BH05[1]	Secondary Stormwater Pond (SW1)	Primary Stormwater Pond	Traralgon Creek Downies Lane (u/s) (SW2)	Traralgon Creek – Jones Road (d/s) (SW3)	Leachate Sump Cell 3	Leachate Sump Cell 4	Leachate pond LP1	Leachate pond LP2	RO Plant permeate
Field Parameters																	
SWL (m AHD)						Nov 13	95.78	57.85			NA	NA	NA	NA	NA	NA	NA
						Feb 17	95.14	52.88			NA	NA	NA	NA	NA	NA	NA
						May 21	96.55	51.31			NA	NA	NA	NA	NA	NA	NA
						May 23	96.68	50.90			NA	NA	NA	NA	NA	NA	NA
pH (Field)	6.0-8.5	6.8-8.5	6.0-8.5[1]	6.0-8.5		Jun 13	4.6	-			7.4	7.23	NA	NA	7.4	8.04	NA
						Feb 17	4.1	5.4	7.8		7.2	7.1	NA	NA	8.1	8.4	6.9
						May 21	5.2	4.4	7.5	8.0	6.8	6.8	Dry	7.3	8.4	8.4	5.5
						May 23	5.4	4.6	8.1	8.1	7.5	7.5	7.3	7.4	7.9	8.5	9.0[3]
Laboratory parameters																	
Bicarbonate as $CaCO_3$						Jun 13	<1	-			29	28	NA	NA	107	936	NA
						Feb 17	<5	45	180		66	66	NA	NA	1700	2700	150
						May 21	58	8	71	89	38	36	NA	4,800	400	3,900	4
						May 23	32	<2	120	94	39	39	8,900	4,000	210	4,100	4
Ammonia as N		0.24	0.41[1]	4.1		Jun 13	0.13	-			0.06	0.07	NA	NA	118	26.1	NA
						Feb 17	0.02	0.22	0.54		0.02	0.02	NA	NA	44	22	0.87
						May 21	0.7	0.8	0.4	1.0	0.3	0.2	NA	720	1.2	2.4	0.4
						May 23	0.2	0.1	0.5	0.9	0.1	0.2	1,600	720	0.2	11	0.3
Chloride	175		250[1]	2500		Jun 13	83				40	39	NA	NA	431	290	NA
						Feb 17	62	56	45		35	43	NA	NA	1000	1400	140

Parameter	Trigger levels					Date	Analytical results										
	Agriculture and Irrigation (Stock Watering)	Agriculture and Irrigation (Irrigation)	Water dependent ecosystems and species	Australian Drinking Water Guidelines	Water based recreation (Primary contact recreation)		BH03R	BH05[1]	Secondary Stormwater Pond (SW1)	Primary Stormwater Pond	Traralgon Creek Downies Lane (u/s) (SW2)	Traralgon Creek – Jones Road (d/s) (SW3)	Leachate Sump Cell 3	Leachate Sump Cell 4	Leachate pond LP1	Leachate pond LP2	RO Plant permeate
						May 21	77	70	140	240	40	39	NA	1,400	760	4,000	5
						May 23	220	80	220	270	42	40	2,800	1,300	480	4,2003	
Sulphate	1,000		2,000	500[2]		Jun 13	4	-			9	9	NA	NA	312	74	NA
						Feb 17	3	16	40		6	2	NA	NA	180	140	2
						May 21	15	24	71	89	5	8	NA	<250	160	850	<1
						May 23	14	20	66	87	6	6	<100	740	750	220	<1
Nitrate (as N)	90.3		2.4	11.3[2]	113	Jun 13	<0.01	-			1.24	1.26	NA	NA	<0.01	<0.01	NA
						Feb 17	<0.005	<0.005	<0.07		0.04	<0.005	NA	NA	27	21	<0.005
						May 21	0.01	<0.01	0.79	2.1	1.1	1.0	NA	720	0.06	200	0.41
						May 23	0.02	<0.01	18	38	0.67	0.68	<0.2	<0.2	2.3	310	4.3
Total nitrogen		5	1.05			May 23	Not required										
TDS	2,500		2,000	600[1]	6,000	Jun 13	204	-	-		160	170	NA	NA	2,140	1,680	NA
						Feb 17	120	220	360		170	180	NA	NA	4,000	6,200	520
						May 21	220	170	380	1,000	120	120	NA	5,110	1,500	12,000	32
						May 23	480	140	830	960	140	130	9,800	7,900	1,700	18,000	38
TOC						Jun 13	3	-			4	4	NA	NA	299	348	NA
						Feb 17	55	5.4	18.0		5.2	4.8	NA	NA	240	220	8.7
						May 21	3.5	1.7	17	27	2.7	2.8	NA	360	46	630	0.6
						May 23	12	33	19	22	3.5	3.8	930	520	25	790	<0.5
Calcium	1,000					Jun 13	<1	-			8	8.0	NA	NA	143	83	NA
						Feb 17	1.1	13	40		14	15	NA	NA	63	59	0.6

Parameter	Trigger levels					Date	Analytical results										
	Agriculture and Irrigation (Stock Watering)	Agriculture and Irrigation (Irrigation)	Water dependent ecosystems and species	Australian Drinking Water Guidelines	Water based recreation (Primary contact recreation)		BH03R	BH05[1]	Secondary Stormwater Pond (SW1)	Primary Stormwater Pond	Traralgon Creek Downies Lane (u/s) (SW2)	Traralgon Creek – Jones Road (d/s) (SW3)	Leachate Sump Cell 3	Leachate Sump Cell 4	Leachate pond LP1	Leachate pond LP2	RO Plant permeate
						May 21	13	3.5	24	34	10	10	NA	99	41	82	<0.01
						May 23	15	3	26	23	11	10	98	120	120	100	<1
Iron (Filtered)[2]		0.2		0.3[1]	0.3	Jun 13	1.26	-			0.72	0.98	NA	NA	2.96	1.55	NA
						Feb 17	0.98	1.7	0.07		0.08	0.28	NA	NA	0.24	0.22	0.04
						May 21	0.02	1.6	0.03	0.07	0.13	0.17	NA	11	<0.01	1.2	<0.01
						May 23	0.01	1.7	0.13	0.09	0.66	0.17	3.8	4.0	<0.01	2.0	<0.01
Manganese (Filtered)[2]		0.2	1.9	0.5[2]	0.1	Jun 13	0.009	-	-		0.054	0.065	NA	NA	0.044	0.51	NA
						Feb 17	0.017	0.061	0.003		0.08	0.05	NA	NA	0.16	0.25	0.009
						May 21	0.019	0.035	0.004	0.018	0.018	0.018	NA	0.9	0.02	0.87	<0.001
						May 23	0.014	0.035	0.002	0.007	0.036	0.023	0.43	1.8	0.026	1.3	<0.001
Magnesium	2,000				2,000	Jun 13	<1	-			5.0	5.0	NA	NA	88	160	NA
						Feb 17	3.9	3.8	13		7.2	7.5	NA	NA	130	320	3.1
						May 21	5.1	4.1	12	18	5.4	5.4	NA	200	56	580	<0.1
						May 23	11	4	21	17	6.2	5.9	190	150	89	750	<1
Potassium						Jun 13	<1	-			2.0	2.0			132	47	NA
						Feb 17	0.2	0.9	12		1.9	1.8			430	580	15
						May 21	1.2	0.7	24	37	1.4	1.4	NA	570	110	1,200	4.0
						May 23	1	<1	46	55	1.4	1.4	690	420	63	1,600	4
Sodium		115		180[1]	180	Jun 13	42	-			23	22			337	192	NA
						Feb 17	29	30	35		23	23			890	1200	180
						May 21	44	39	69	120	24	24	NA	1,110	460	2900	10

Parameter	Trigger levels				Date	Analytical results										
	Agriculture and Irrigation (Stock Watering)	Agriculture and Irrigation (Irrigation)	Water dependent ecosystems and species	Australian Drinking Water Guidelines	Water based recreation (Primary contact recreation)		BH03R	BH05[1]	Secondary Stormwater Pond (SW1)	Primary Stormwater Pond	Traralgon Creek Downies Lane (u/s) (SW2)	Traralgon Creek – Jones Road (d/s) (SW3)	Leachate Sump Cell 3	Leachate Sump Cell 4	Leachate pond LP1	Leachate pond LP2	RO Plant permeate
						May 23	78	32	180	210	22	22	1,700	1,000	270	3,400	23
Phosphorus		0.05	0.055			Jun 13	NA	-			NA	NA			NA	NA	NA
						Feb 17	0.63	<0.05	0.06		0.05	<0.05			2.2	3.2	0.54
Phosphorus (reactive)						May 21	<0.01	<0.01	<0.01	0.24	<0.01	<0.01	NA	8.6	<0.01	5.1	0.06
						May23	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	7.1	7.3	<0.01	6.7	<0.01
E Coli					10	May 2023	Not required										

[1] Australian Drinking Water Guidelines (Aesthetic)

[2] Australian Drinking Water Guidelines (Heath)

[3] Laboratory analysis

[4] Buildings and structures groundwater quality objectives are <5.5 for pH

9.1 Leachate

9.1.1 Levels

Level sensors have been installed in the LS1 (Cell 3), LS2 (Cell 4) and LS3 (Cell 6) leachate sumps. Operating licence condition OL_L4.1 requires the depth of leachate above the lowest point of the drainage layer in Cells 3, 4 and 6 does not exceed 300 mm.

Compliance with the maximum leachate management levels over the audit period is summarised in Table 9-2. This is based upon the OL_L4.1 operating licence condition and the as constructed lowest point of the drainage layers. It is assumed the floor of all sumps is 2 m below the lowest point surrounding the sump and the level senor is set 1.2 m above the sump. Therefore the sensors are assumed to be 1.1 m below the maximum leachate compliance level.

Table 9-2: Maximum leachate compliance level and monitoring records for Cells 3, 4 & 6

Cell leachate sump	Maximum leachate management level	Monitoring records
LS1 (3)	118.02	Compliant Transducer typically 0.40 m ranging from 0.00 to 0.90 m.
LS2 (4)	120.89	Non-compliant Transducer typically 1.2m to 1.3 m with short periods up to 5.4 m.
LS3 (6)	128.15	Compliant Commenced on 10 January and ranged from 0.4 m to 0.8 m above sensor.
Leachate pond LP1	500 mm below crest	Compliant Witnessed records from January 2022 to June 2023. Ground Consulting (2023b) noted the level at leachate pond LP1 ranged from dry to 0.5 m from the top pond-full rim.
Leachate pond LP2	500 mm below crest	Compliant Witnessed records from January 2022 to June 2023. Ground Consulting (2023b) noted the level at leachate pond LP2 ranged from 1.0 m to 1.2 m from the top pond-full rim.

9.1.2 Water quality

RO permeate from leachate pond LP2 and Stormwater Pond 1 overflow is discharged to Stormwater Pond 2. The May 2023 nitrate concentrations from these monitoring points were:

- Leachate pond LP2 310 mg/L
- Permeate 4.3 mg/L
- Stormwater Pond 1 38 mg/L
- Stormwater Pond 2 18 mg/L

The Stormwater Pond 2 nitrate concentration is above the water dependent ecosystems and species objective of 2.4 mg/L.

The salinity of leachate pond LP2 is increasing and is was 18,000 mg/L in May 2023. This is due to retentate return and net evaporation. This should be carefully monitored as an increase in salinity may reduce the efficiency of the RO plant, the evaporative potential of the pond and effect the pond's liner integrity. This issue is likely to be resolved with the dewatering of leachate (with tankering to a licenced facility), removal of sludge from the base of the pond (with transport to a licenced facility) and integrity testing of the geomembrane liner once the proposed leachate pond LP3 is commissioned.

9.2 Groundwater

Monitoring bores BH03R and monitoring bore BH05 had sufficient water to sample during the audit period. Both bores are to the north of the landfill. The analytical results from these bores (Table 9-1) indicate that the groundwater quality objectives are met except for:

- pH at both bores is below groundwater quality objective for all listed environmental values
- total iron concentrations of up to 1.7 mg/l at BH05 exceeds the groundwater quality objective for all listed environmental values
- total ammonia concentrations in May 2021 when the concentrations were 0.7 mg/l at BH03R and 0.8 mg/L at BH05 (Prior to and since then the total ammonia concentration has been below all groundwater quality objectives).

9.3 RO plant permeate

The RO plant's permeate exceeded the following surface water quality objectives:

- pH - below the quality objective for all listed environmental values for the in-situ sample in May 2021 and above the quality objective for all listed environmental values for the May 2023 laboratory analysis
- ammonia – exceeds the water quality objective for the water dependent ecosystems and species environmental value while reducing in concentration over time
- nitrate - exceeds the water quality objective for the water dependent ecosystems and species environmental value of 2.4 mg/L in May 2023.
- phosphorus – exceeds the water quality objective for agriculture and irrigation (irrigation) and water dependent ecosystems and species in February 2017 (0.54 mg/L) and May 2021 (0.06 mg/L) but not in May 2023.

9.4 Surface water

9.4.1 Stormwater Pond 2

Stormwater Pond 2 exceeds the following surface water quality objectives:

- nitrate – significantly exceeded the groundwater quality objective for the water dependent ecosystems and species environmental value of 2.4 mg/L in May 2023.
- ammonia - exceeded the water quality objective for the water dependent ecosystems at all monitoring events
- phosphorus – exceeded the water quality objective for agriculture and irrigation (irrigation) and water dependent ecosystems and species in February 2017 (0.06 mg/L). The reactive P concentration was below all groundwater quality objective values in May 2021 and May 2023.

As the May 2023 RO permeate TOC concentration of <0.5 mg/L was well below the Stormwater Pond 2 concentration of 19 mg/L, the RO permeate is unlikely to be TOC source to this pond.

9.4.2 Traralgon Creek

The creek's salinity at 120 to 180 mg/L TDS indicates the water is near its source.

The Traralgon Creek water quality is similar in the upstream and downstream monitoring sites.

The only parameter for which ecosystem objective exceedances occurred in May 2023 is iron. As the RO permeate and the Stormwater Pond 2 iron concentration is less than that of both Traralgon Creek monitoring sites landfill leachate is not considered to be a significant source of iron to Traralgon Creek.

The evidence deduced from the monitoring suggests that the landfill is unlikely to have contributed to Traralgon Creek water quality.

9.5 Landfill gas

9.5.1 Subsurface

The maximum CH_4 and CO_2, concentrations and flows from the quarterly monitoring events undertaken in 2018/19, 2020/21 and 2022/23 are presented in Table 9-3.

Methane

The methane concentrations at all LFG monitoring bores have been below the EPA (2015) *Landfill BPEM* action level of 1% v/v except for the following LFG monitoring bores:

- LFG03 – maximum concentration of 29.1% v/v in 2019/20, 7.7% in 2020/21 and 46.4%v/v in 2022/23
- LFG04 - maximum concentration of 9.0 % v/v in 2022/23
- LFG07 - maximum concentration of 7.8 % v/v in 2020/21 and 2.5%v/v in 2022/23.

LFG03 is north of Cell 3 (west) and LFG04 is north of Cell 4. LFG07 is about 20 m south of leachate pond LP2 and about 90 m south of Cell 3.

At the 29 June 2023 Consultative Committee meeting LCC advised that actions will be taken to mitigate these action level exceedances. This action is understood to involve blocking the LFG escape path along the aggregate side wall drainage layer.

Carbon dioxide

Monitoring bore LFG12 is approximately 900 m west of Cell 1 and 2 within the road reserve on Traralgon Creek Road. The CO_2 concentration measured at this bore fluctuates. Its maximum CO_2 concentration ranged from 1.7 %v/v in 2018/19 to 7.5 %v/v in 2019/20. In 2020/21 it ranged from 0.2% v/v to 5.1% v/v and in 2022/23 it ranged from 1.1%v/v to 5.5%v/v. In regard to this bore PLC (2017) stated:

> The source of CO_2 is therefore unrelated to the landfill.

Although a maximum CO_2, concentration of 7.5%v/v has been record at this bore the background CO_2 concentration has been maintained at 0.0%v/v.

Table 9-3: Hyland Highway landfill – LFG monitoring bore concentrations and flows

LFG bore	Depth to base of gravel pack	Maximum methane concentration (%v/v)			Maximum $C0_2$ concentration (%v/v)			Maximum flow (L/hr)			Maximum CO_2 gas screening value (L/hr)		
	(m)	18/19	20/21	22/23	18/19	20/21	22/23	18/19	20/21	22/23	18/19	20/21	22/23
LFG01	NA	0	0	0.0	15.1	12.6	8.5	0.8	0.8	0.0	0.121	0.1	0.0
LFG02	8	0	0	0.0	2.4	7.4	9.9	0.6	0.7	0.0	0.014	0.05	0.0
LFG03	26	0	7.7	46.4	2.3	13.3	17.5	0.3	-2.5	0.0	0.007	-0.33	0.0
LFG04	26	0	0	9.0	1	2.1	11.3	0.3	-3.5	0.0	0.003	-0.07	0.0
LFG05	24	0	0	0.0	1.3	2.8	0.1	0.3	-2.1	0.0	0.004	-0.06	0.0
LFG06	17	0	0	Destroyed	1.1	3.6	Destroyed	0	-3.3	Destroyed	0	-0.12	Destroyed
LFG07	4	0	7.8	2.5	0.2	28.7	22.4	0.5	-0.3	0.0	0.001	-0.09	0.0
LFG08	12	0	0	0.0	0.2	0.9	0.3	0.1	-3.5	0.0	0	-0.03	0.0
LFG09	4	0	0	0.0	2	3.1	2.6	0.4	-0.3	0.0	0.008	-0.01	0.0
LFG10	4	0	0	0.0	1.7	1.9	1.8	0.4	-0.3	0.0	0.007	-0.01	0.0
LFG11	9	0	0	0.0	1	3.2	5.4	0.3	-2.2	0.0	0.003	-0.07	0.0
LFG12	14	0	0	0.0	1.7	5.1	5.5	0.5	-0.4	0.0	0.009	-0.02	0.0
LFG13	29.6	-	0	0.0	-	10.9	12.4	-	-2.5	0.0	-	-0.27	0.0
LFG14	14.34	-	0	0.0	-	18.3	18.3	-	-1	0.0	-	-0.18	0.0

	Characteristic situation 2, low risk
	Characteristic situation 3, moderate risk

The LFG monitoring bores with exceedances of EPA (2015) *Landfill BPEM* action level of 1.5% v/v above background based upon an assumed action level of 1.5% above the LFG12 CO_2 concentration recorded at the same monitoring event are presented in Table 9-4. [The exceedances are highlighted].

Table 9-4: LFG monitoring bore CO_2 action level exceedances (%v/v) assuming LFG12 monitors background CO_2 concentration (with shaded as exceedances)

Bore	Location	18/19	20/21	22/23
LFG12	900 m west	1.7	5.1	3.0
Action level		**3.2**	**6.6**	**4.5**
LFG01	NW of Cell 2	15.1	12.6	8.5
LFG02	North of Cell 2	2.4	7.4	9.9
LFG03	North of Cell 3	2.3	13.3	17.5
LFG04	North of Cell 3	1	2.1	11.3
LFG07	South of LP 2	0.2	28.7	22.4
LFG11	West of Cell 1/2	1	3.2	5.4
LFG13	NW of Cell 5	-	10.9	12.4
LFG14	South of Cell 6	-	18.3	18.3

LFG01 is near extraction well LYGW007.

Gas screening values

The risk to residential developments associated with methane and CO_2 action levels exceedances can be assessed through the determination of Gas Screening Values (GSVs). The concept of GSVs has been developed to guide LFG intrusion mitigation measures for new buildings.

GSVs are the concentration, as a percentage, by the maximum bore flow rate in L/hr divided by 100 [British Standards Institution (2015)]. Characteristic situations, risks, GSVs and typical gas protective measures are provided in Table 9-5.

Table 9-5: CS by site characteristic GSV [British Standards Institution (2015)]

Characteristic situation	Hazard potential	GSV	Additional factors	Typical scope of gas protective measures for residential development
CS1	Very low	<0.07	Typically <1% methane concentration and <5% CO_2 concentration (otherwise consider an increase to CS2)	No special precautions
CS2	Low	0.07 to <0.7	Typical measured flow rate <70 L/h (otherwise consider an increase to CS3)	Based upon building type [see Table 4 of British Standards Institution (2015)].
CS3	Moderate	0.7 to <3.5	None	Based upon building type [see Table 4 of British Standards Institution (2015)].

Characteristic situation	Hazard potential	GSV	Additional factors	Typical scope of gas protective measures for residential development
CS4	Moderate to high	3.5 to <15	Quantitative Risk Assessment to evaluate scope of protective measures.	Based upon building type [see Table 4 of British Standards Institution (2015)].
CS5	High	15 to <70	None	Based upon building type [see Table 4 of British Standards Institution (2015)].
CS6	Very high	>70	None	Based upon building type [see Table 4 of British Standards Institution (2015)].

The maximum CO_2 GSVs at the monitoring bores are presented in Table 9-3.

In 2020/21 the maximum GSV hazard potentials were:

- Very low – Bores LFG02, LFG04, LFG05, LFG08, LFG09, LFG10, LFG11, LFG12
- Low – Bores LFG01, LFG03, LFG06, LFG07, LFG13, LFG14
- Moderate – Nil.

The maximum CO_2 GSVs during 2022/23 are very low as the recorded flow rate is zero.

PLC (2017) stated:

> The nearest houses are located over a kilometre from the site along the Traralgon Creek valley. They are all lower in the landscape than the landfill, and since methane rises (in the absence of strong advective flow) it is considered that the methane pathway from the landfill to these houses is incomplete. There is also a valley between the receptors and the landfill which would preclude lateral CO_2 migration. Therefore the only potential source of CH_4 and CO_2 at these locations is the underlying coal seams

The Auditor accepts this opinion.

9.5.2 Landfill surface monitoring

The methane surface emissions monitoring events undertaken over the audit period are listed in Table 8-1. The monitoring undertaken in 2022/23 is summarised below.

August 2022

Methane concentrations of note were not reported. The Auditor has no witnessed field readings.

November 2022

Methane readings across the cap and intermediate cover were below the EPA (2015) *Landfill BPEM* action levels.

February 2023

Methane readings across the cap and intermediate cover were below the EPA (2015*) Landfill BPEM* action levels.

May 2021

Ground Consulting (2023b) reported three EPA (2015) *Landfill BPEM* action levels exceedances of over 200 ppm within the intermediate cover. The locations of exceedances are shown in Ground Consulting (2023b). They are in:

- central area (surface crack)
- along northern edge
- towards western edge.

LCC advised the Auditor that the contractor undertaking the surface methane monitoring reports exceedances with locations on either the day of monitoring or the next day. Mitigation works are then undertaken by LCC.

9.5.3 Buildings and Structures

The verified monitoring program requires methane monitoring within buildings and structures. The min building is the education centre.

Ground Consulting (2023b) did not report any building and structures monitoring being undertaken in 2022/23.

9.5.4 Subsurface services

The verified monitoring program requires methane monitoring at the following subsurface services:

- main power box & cables (east side of Education Centre)
- drain pipe (west side under Education Centre)
- downpipe (north side of Education Centre)
- stormwater pipe into tank
- sewer breather (western side of Education Centre)
- stormwater pit side of road opposite site entrance.

This monitoring was undertaken in 2022/23. No methane action level exceedances were reported by Ground Consulting (2023b).

10. Progress with previous LOA recommendations

John Nolan undertook a LOA of the Hyland Highway landfill in 2021. This is referenced as Nolan Consulting (2021) *"Section 53V Audit - Landfill Operation Hyland Highway Landfill - Hyland Highway, Loy Yang",* Service Order Reference No. 8005592.

Table 10-1 presents progress on the works associated with recommendations from this LOA.

Table 10-1: Progress on works associated with 2021 LOA recommendations

	Recommendation	Risk priority	Statement on implementation progress
Monitoring program			
1	Implement updated monitoring program (Section 11) including:		
	a) Implement visual and olfactory monitoring program.	3B	Compliant, generally
	b) Obtain and review ionic balance calculations from both primary and secondary laboratories.	3B	Compliant, partially Calculations not provided with laboratory reports provided in Ground Consulting (2023b) Ionic balance bar charts provided in Ground Consulting (2023b) *2022-23 Annual Monitoring Report*. Ground Consulting (2023b) considered primary testing results to be acceptable. The secondary testing results for the May 2023 monitoring event were not considered acceptable.
	c) Ensure monitoring bores are locked after each monitoring event.	3B	Compliant, partially Most bores were locked during the audit period except for a few that LCC advise were repaired later.
	d) Undertake in-situ metals filtering of samples from groundwater bores.	3B	Not compliant The field records indicate it is not undertaken.
	e) Prepare declaration in annual monitoring report that the monitoring program was completely in accordance with the verified monitoring program and explains any non-conformances.	3B	Not compliant Not provided in the Ground Consulting (2023b) *2022-23 Annual Monitoring Report*.
	f) Prepare location plan with building and subsurface service sampling points.	3B	Not compliant
	g) Prepare annual graphical plots of leachate levels against compliance levels and flows.	3B	Not compliant While weekly graphical plots were provided, annual graphical plots were not provided.
Monitoring infrastructure			
2	Install new groundwater monitoring bore BH06 in the second coal seam of Traralgon Formation hydraulically up-gradient of landfill (from a groundwater flow perspective).	2	Completed Groundwater monitoring bore BH06 witnessed in 18 August 2023 site inspection.

	Recommendation	Risk priority	Statement on implementation progress
Site Infrastructure			
3	Inspect Stormwater Pond 1 on a quarterly basis and after major storm events and clean out as required.	2	Ongoing Photographs of 2 May 2023 desilting witnessed. LCC advised regularly desilted however records not taken.
4	Review Stormwater Pond 2 water quality after monitoring events and modify RO plant discharge arrangements if ammonia and phosphorus loads are likely to impact Traralgon Creek environmental values.	2	Completed, partially Analytical results discussed in Ground Consulting (2023b), but results have not been reviewed to assess Traralgon Creek impact. The Auditor notes impacts the Traralgon Creek monitoring does not show evidence of adverse impacts.
5	Review salinity trend in leachate pond LP2, assess storage capacity and liner integrity issues and implement long term solution.	2	Addressed LCC advised that once leachate pond LP3 commissioned leachate pond LP2 will be dewatered with effluent tankered to a licenced facility and sludge will be transported to a licenced facility and the liner integrity will be assessed.
Hydrogeological assessment			
6	Pump out groundwater Cell 3B Interception Bore on a monthly basis until level stabilises at or below 1 m above the base of the upper batter.	2	Completed Pump out records witnessed.
LFG management and rehabilitation			
7	Optimise LFG collection and treatment system operation considering Run Energy (2019) optimisation plan and July 2021 Run Energy *Gas Collection System Assessment* recommendations.	2	Completed LCC advised LFG harvesting contract has been awarded to Ennovo (formerly Biogas) and that July 2021 Run Energy Gas Collection System Assessment recommendations have been implemented. LCC advised five flow lines from LFG wells to manifolds have been rectified, 11 new wells have been installed and the two blocked wells are to be replaced with one new well.
8	Upgrade LFG collection and treatment system to address subsurface LFG action level exceedances where practicable.	2	Not completed LCC is considering options including pin wells.
9	Revise and implement rehabilitation plan in accordance with licence condition LI_L22.	3B	Completed LCC 2023 rehabilitation plan.
Licence			
10	Consult with the EPA to revise the licence PSCP to that approved with Work Authority 214663.	3B	Completed

	Recommendation	Risk priority	Statement on implementation progress
			Operating licence OL000025565 top of waste contours are consistent with Work Authority 214663 approved PSCP.
Landfill operations and procedures			
11	Develop and implement management procedure to prevent, identify and control any hotspots within the waste mass. These should include, but not be limited, to: ▪ Installation and maintenance of firefighting equipment and water supply appropriate for the size and activities at the site ▪ Fire response training for employees ▪ Site emergency procedures ▪ Identification of incoming hot loads of waste (at the weighbridge and tipping face) ▪ Identification of potential hot loads (criteria based on the waste types accepted at the site) ▪ Refusal of hot loads ▪ Isolation (in a suitable quarantine area) and cooling of hot loads prior to burial ▪ Good compaction of the waste to remove as much air as possible during burial ▪ Containment and disposal of firefighting run-off water ▪ Management of heat generating wastes (e.g. shredder floc, green waste etc.) i.e. no stockpiling of these types of wastes outside of the landfill cell, disposal of these wastes in thin layers in the landfill cell or mixing with non-combustible wastes during disposal ▪ Regular inspection and maintenance of the site surface, and penetrations through it, to ensure that cap integrity is maintained to prevent air ingress as far as practicable ▪ Regular inspection of the site for signs of hotspots within the waste mass, such as: visible smoke; burning odours; surface cracking, rapid localised subsidence; landfill gas balance indicators (CH_4:CO_2 ratio, O_2 % v/v, CO ppm, H ppm, N_2 % v/v); landfill gas or leachate temperatures.	3B	Not completed LCC has an approach for preventing, identifying and controlling hotspots in waste mass but this is not documented as a procedure.
12	Document Co-ordinator of Landfill Services site inspection outcomes.	3B	Compliant This is an ongoing requirement
13	Repair damaged stormwater pipe near leachate pond LP2.	3B	Completed

	Recommendation	Risk priority	Statement on implementation progress
			LCC advised it has been repaired and discharges to Stormwater Pond 1.
14	Repair final cap and intermediate cover where methane action level exceedances have been identified in landfill surface surveys. These should be documented with photographs, co-ordinates and a description of works undertaken. Final cap repairs to be in accordance with cap technical specifications.	2	Likely Cap walkovers conducted on 31 August 2022, 9 November 2022 and 7 February 2023 did not identify action level exceedances of note. The 13 June 2023 walkover identified three action level exceedances in the intermediate cap. LCC advised areas with exceedances are repaired with clay and mulch. I have witnessed photographs of the repairs of the northern 13 June 2023 exceedance.
15	Maintain the health of the final cap vegetation by weeding and watering during dry periods.	3B	In progress LCC advised there is a weed management plan for the cap and watering with RO permeate during dry periods will commence shortly,
Auditing			
16	Initiate the next LOA to cover the period up to 30 June 2023.	3B	Completed This LOA.

11. Reverification of RMMP

I verified the Bajwa EnviroConsult (2023) "*Hyland Highway Landfill – Risk Management and Monitoring Program*" of 12 September 2023 in my capacity of Environmental Auditor appointed under the Environment Protection Act.

The letter of verification recommended that LCC prepares and implements a procedure which identifies training requirements and the experience level for staff and contractors working at the site.

The current Risk Management and Monitoring Program (RMMP) is Bajwa EnviroConsult (2023) "*Hyland Highway Landfill – Risk Management and Monitoring Program*" of 15 September 2023. Bajwa EnviroConsult (2023) is attached as Appendix E.

The only changes to the current RMMP of 15 September 2023 from the verified RMMP of 12 September 2023 were made at my request. These were specific to water quality monitoring and are accepted.

11.1 Environmental audit program

The RMMP notes that it is to be verified by a person who has been appointed as an environmental auditor under the Environment Protection Act 2017. It also notes

> As per the previous EMP, audits should be conducted every 2 years while the landfill is operational.

The Auditor endorses this frequency.

11.2 Re-verification

The current RMMP of 15 September 2023 is considered to be complete and is verified by an environmental auditor appointed pursuant of the Environment Protection Act as being adequate for LCC and the EPA to determine compliance with the licence.

12. Conclusions

Risk of landfill operations to Environmental values identified by the environmental Auditor

1 The current Risk Management and Monitoring Program (RMMP) is Bajwa EnviroConsult (2023) "*Hyland Highway Landfill – Risk Management and Monitoring Program*".

2 The qualitative risk assessment method used in Bajwa EnviroConsult (2023) is consistent with the EPA (2016) "*Licensing Assessment Guidelines*" and the environmental aspects are comprehensive and appropriate.

3 The Environmental values adopted are appropriate.

4 The current RMMP's risk assessment is considered to be complete for the purpose of developing it's monitoring program.

5 No high risks have been identified.

6 The following are considered to be medium risks:

a) acceptance of non-conforming waste resulting in air impacts (including odour)

b) combustible material/ ignition sources within landfilled waste resulting in land and air impacts (fire)

c) water used to suppress fire increasing leachate generation and resulting in groundwater impacts

d) overfilling resulting in air impacts (including odour, dust and volatile gases)

e) leachate seepage(dissolved contaminants) resulting in groundwater and surface water impacts

f) leachate pond overtopping resulting in land and surface water impacts

g) discharge of volatiles from leachate or contaminated groundwater resulting in land impacts

h) runoff from areas with intermediate cover resulting in surface water impacts

i) leachate sourced RO permeate used for irrigation resulting in surface water impacts

j) inadequate segregation and management of stormwater resulting in surface water and land impacts

k) anaerobic conditions in leachate pond(s) resulting in air impacts (odour)

l) direct release of LFG from landfill surface to the atmosphere resulting in air impacts

m) direct release of LFG from landfill surface to the atmosphere, moving beyond site boundary resulting in air impacts

n) sub-surface LFG migration and accumulation in onsite buildings and structures resulting in air impacts

o) long-term LFG emissions and sub-surface migration (onsite and offsite) resulting in air impacts

Assessment of implementation of the Monitoring Program

7 The verified monitoring program has been implemented with the exception of minor non-compliances.

8 The annual monitoring reporting requirements have been largely met.

Interpretation of groundwater monitoring results

9 The groundwater has Segment A1 Environmental values.

10 The lowest landfill floor, 116.8 m AHD within Cell 3, is at least 20 m above the regional groundwater level.

11 The only two groundwater monitoring bores with sufficient water to sample during the audit period are monitoring bores BH03R and BH05. Both bores are to the north of the landfill.

12 Monitoring bore BH05 is screened at a deeper level than monitoring bore BH03R within the Traralgon Formation aquifer system. As the flow direction is inferred to be to the north-north-west It is considered to be hydraulically down-gradient of the landfill.

13 As the water intersected at monitoring bore BH03R is inferred to be perched within the Traralgon Formation's T1 coal seam it may not be hydraulically connected to the regional water table.

14 The analytical results from monitoring bores BH03R and BH05 indicate that the groundwater quality objectives are met except for:

- pH at both bores is below the groundwater quality objective for applicable environmental values
- total iron concentrations of up to 1.7 mg/l at BH05 exceeds the groundwater quality objective for applicable environmental values
- total ammonia concentrations in May 2021, when the concentrations were 0.7 mg/l at BH03R and 0.8 mg/L at BH05, exceeded applicable environmental values (prior to and since then the total ammonia concentration has been below applicable water quality objectives).

15 Water quality at monitoring bore BH03/BH03R has remained relatively consistent over time except for TOC for which the concentration was 100 mg/L in August 2017 and has fluctuated between 3.5 and 12 mg/L over the past two years. TOC is considered to be associated with the coal seams.

16 The perched groundwater behind the Cell 3B northern sideliner appears to have dissipated.

Interpretation of surface water monitoring results

17 Stormwater Pond 2 exceeded the following surface water quality objectives:

- nitrate – significantly exceeded the groundwater quality objective for the water dependent ecosystems and species environmental value of 2.4 mg/L in May 2023.
- ammonia - exceeded the water quality objective for the water dependent ecosystems at all monitoring events
- phosphorus – exceeded the water quality objective for agriculture and irrigation (irrigation) and water dependent ecosystems and species in February 2017 (0.06 mg/L). The reactive P concentration was below all groundwater quality objective values in May 2021 and May 2023.

18 RO permeate is unlikely to be TOC source to Stormwater Pond 2 as the May 2023 RO permeate TOC concentration of <0.5 mg/L was well below the Stormwater Pond TOC concentration of 19 mg/L.

19 The Traralgon Creek water quality is similar in the upstream and downstream monitoring sites.

20 The evidence deduced from the monitoring suggests that the landfill is unlikely to have contributed to Traralgon Creek water quality.

Interpretation of LFG monitoring results

21 The methane concentrations have been below the EPA (2015) *Landfill BPEM* action level of 1% v/v at all LFG monitoring bores over the audit period except for monitoring bores LFG03, LFG04 and LFG07. The first two bores are north of cell 3 and 4 and may be impacted by LFG up the aggregate within the soil protection layers. Monitoring bore LFG07 is 20 m south of leachate pond LP2 and about 90 m south of Cell 3.

22 The CO_2 concentration at most LFG monitoring bores has been above the EPA (2015) *Landfill BPEM* action level.

23 Monitoring bore LFG12 is approximately 900 m west of Stage 1 cap within the road reserve on Traralgon Creek Road. The CO_2 concentration measured at this bore fluctuates with its maximum concentration ranging up to 7.5 %v/v.

24 The presence of CO_2 in LFG monitoring bores may be due to the underlying coal.

25 The risk associated with CO_2 action levels exceedances at off-site sensitive receptors has been assessed as very low to low except for at LFG07 for which a moderate risk was determined in 2019/20.

26 There have been a few methane action level exceedances within the intermediate cover for which LCC advised it mitigates.

27 The education centre has not been monitored for LFG. LCC has advised this was mainly due to COVD restrictions.

28 No exceedances of the subsurface service LFG action levels were detected.

Verification of the environmental Monitoring Program

29 The current RMMP is verified as being adequate for LCC and the EPA to determine compliance with the operating licence.

Implementation of progressive rehabilitation

30 The pre-settlement contour plan within the operating licence has been approved by the EPA.

31 Progressive rehabilitation is occurring.

32 A rehabilitation plan has been developed.

13. Recommendations including priorities

The LOA recommendations presented in this section are risk based and prioritised as very high to high, medium and low in accordance with Table 1 of EPA (2016) "*Landfill Licensing Guidelines*", Publication 1323.3. These recommendations incorporate the outstanding recommendations from the Nolan Consulting (2021) "*Section 53V Audit - Landfill Operation Hyland Highway Landfill - Hyland Highway, Loy Yang",* Service Order Reference No. 8005592, September 2021.

The Auditor has also adopted an additional priority (3B). The priorities, risks and descriptors are presented in Table 13-1.

Table 13-1: Definition of priorities of Auditor recommendations

Priority	Risk level	Description
1	Very High – High	Requires immediate action (within three months of audit report submission to EPA) to manage risk or mitigate impact.
2	Medium	Requires prompt action to manage risk or mitigate impact (within six months of audit report submission to EPA unless the recommendation is dependent upon another action which will not allow the recommended activity to commence within this timeframe).
3A	Low	Requires action prior to the next LOA to manage risk or mitigate impact.
3B	Residual Risk Monitoring	Prior to next annual monitoring report.

Priority 3B recommendations support the Priority 1, 2 and 3B recommended actions.

Table 13-2 presents recommendations with risk priorities and risk identifiers (from Table 7-2),

No priority 1 and priority 3A recommendations were identified.

Table 13-2: LOA recommendations

No		Recommendation	Priority (Table 12-1) and Risk No (Tables 6-9 & 6-10)
Monitoring program			
1	Implement RMMP including:		
	(e)	Ensure monitoring bores are locked after each monitoring event.	3B Priority
	(f)	Undertake in-situ metals filtering of samples from groundwater bores.	3B Priority
	(g)	Prepare declaration in annual monitoring report that the monitoring program was completely in accordance with the verified monitoring program and explains any non-conformances.	3B Priority
	(h)	Prepare annual graphical plots of leachate levels against compliance levels and flows.	3B Priority
2	Prepare an up to date monitoring location plan with all monitoring sites including leachate sumps once the four LFG monitoring bore have been installed. Plan to include up to date cells and caps.		3B Priority
3	Prepare an up to date LFG monitoring location plan for education centre (with building and subsurface service sampling points).		3B Priority

No	Recommendation	Priority (Table 12-1) and Risk No (Tables 6-9 & 6-10)
4	Address verified monitoring program requirements, included in verified RMMP, that have been identified as not fully compliant in Section 8.	3B Priority
5	Undertake continuous LFG monitoring with flow at two LFG monitoring bores with methane action level exceedances. Continuous monitoring to include two low pressure periods.	2 Priority, M7, M8 & M11
Monitoring infrastructure		
6	Install LFG monitoring bores LFG15 to LFG18 east of the future cells at locations shown in the RMMP.	2 Priority M7, M8 & M11
7	Install a groundwater monitoring bore to south-east of future leachate pond LP3 and in the second coal seam of Traralgon Formation) prior to the commissioning of future leachate pond LP3. This bore is expected to be about 100 m in depth. Ensure groundwater is intersected and add to the RMMP. The timing is dependent on when future leachate pond LP3 may be commissioned rather than the standard 6 months requirement from the date of this audit report.	2 Priority M4 & M5
Site Infrastructure		
8	Install sign at weighbridge entrance with list of acceptable materials	2 Priority, M1
9	Inspect Stormwater Pond 1 on a quarterly basis and after major storm events and clean out as required. Ongoing	2 Priority M9 & M10
10	Review Stormwater Pond 2 water quality after monitoring events and modify RO plant discharge arrangements if ammonia and phosphorus loads are likely to impact environment between Stormwater Pond 2 and Traralgon Creek environmental values. This is an ongoing requirement, As such the timing is dependent on future determinations rather than the standard 6 months requirement from the date of this audit report.	2 Priority M9 & M10
11	Dewater leachate (with tankering to a licenced facility), remove sludge from the base of the pond (with transport to a licenced facility) and undertake integrity testing of the geomembrane liner from leachate pond LP2 after the proposed leachate pond LP3 is constructed and commissioned.	2 Priority M4, M5 & M6
Hydrogeological assessment		
12	Undertake hydrogeological assessment after installation of groundwater monitoring bore to south-east of future leachate pond LP3 and following two monitoring events.	2 Priority M4 & M5
LFG and odour management		
13	Propose background CO_2 concentration and seek EPA approval.	2 Priority, M7, M8 & M11
14	Update PLC (2017) Landfill Gas Risk Assessment after: ▪ LFG monitoring bores LFG15 to LFG18 installed and monitored in at least two monitoring events ▪ continuous LFG monitoring with flow at two LFG monitoring bores has been completed ▪ background CO_2 concentration has been approved by the EPA	2 Priority, M7, M8 & M11
15	Optimise and upgrade LFG collection and treatment system to address subsurface LFG action level exceedances where practicable.	2 Priority, M7, M8 & M11

No	Recommendation	Priority (Table 12-1) and Risk No (Tables 6-9 & 6-10)
16	Implement the pDs Consultancy (2023) "Model review of odour impact assessment for Hyland Hwy Landfill" recommendations	2 Priority, M6
Capping		
17	Subject the EPA design approval construct Stage 3 cap in accordance with rehabilitation plan schedule.	2 Priority, M4 & M7
Landfill operations and procedures		
18	Develop and implement management procedure to prevent, identify and control any hotspots within the waste mass. These should include, but not be limited, to: ▪ Installation and maintenance of firefighting equipment and water supply appropriate for the size and activities at the site ▪ Fire response training for employees ▪ Site emergency procedures ▪ Identification of incoming hot loads of waste (at the weighbridge and tipping face) ▪ Identification of potential hot loads (criteria based on the waste types accepted at the site) ▪ Refusal of hot loads ▪ Isolation (in a suitable quarantine area) and cooling of hot loads prior to burial ▪ Good compaction of the waste to remove as much air as possible during burial ▪ Containment and disposal of firefighting run-off water ▪ Management of heat generating wastes (e.g. shredder floc, green waste etc.) i.e. no stockpiling of these types of wastes outside of the landfill cell, disposal of these wastes in thin layers in the landfill cell or mixing with non-combustible wastes during disposal ▪ Regular inspection and maintenance of the site surface, and penetrations through it, to ensure that cap integrity is maintained to prevent air ingress as far as practicable ▪ Regular inspection of the site for signs of hotspots within the waste mass, such as: visible smoke; burning odours; surface cracking, rapid localised subsidence; landfill gas balance indicators (CH_4:CO_2 ratio, O_2 % v/v, CO ppm, H ppm, N_2 % v/v); landfill gas or leachate temperatures.	2 Priority, M2
19	Develop and implement stormwater management procedure.	3B Priority
20	Update the "Description of the irrigation system at Hyland Highway Landfill" into a procedure that provides a methodology to determine crop demand and irrigation application rates and requires metering of the irrigation application rate.	2, Priority M4
21	Extend stormwater discharge pipe from Cell 6 excavation to stormwater ponds.	3B Priority
22	Repair final cap and intermediate cover where methane action level exceedances have been identified in landfill surface walkovers. These should be documented with photographs, co-ordinates and a description of works undertaken. Final cap repairs to be in accordance with cap technical specifications. Ongoing.	2 Priority M7

No	Recommendation	Priority (Table 12-1) and Risk No (Tables 6-9 & 6-10)
23	Maintain the health of the final cap vegetation by weeding and watering during dry periods. Ongoing	3B Priority
Auditing		
24	Initiate the next LOA to cover the period up to 30 June 2025.	3B Priority, 30 September 2023

It is possible that LCC has partially or fully completed the actions associated with some of these recommendations.

14. Applicability

The report

This LOA report ("Report"):

- has been prepared by John Nolan and his team as indicated in the appropriate sections of this Report ("Nolan Consulting") for the Latrobe City Council ("LCC").
- may be used and relied on by LCC and EPA Victoria.

This Report has been prepared in accordance with Part 8.3 (Section 212) of the *Environmental Protection Act* 2017. The objective of the environmental audit is to identify and, where possible, determine the nature and extent of the risk of harm to human health or the environment arising from Hyland Highway landfill operation under Section 208 of the *Environment Protection Act* 2017.

Services undertaken

The services undertaken by the Auditor, his team and Nolan Consulting in connection with preparing this Report were undertaken in accordance with current professional practice and by reference to relevant environmental regulatory authority and industry standards in accordance with Part 8.3 of the *Environment Protection Act 2017*.

Obligations

Nolan Consulting and its servants, employees and officers (including the Auditor) otherwise expressly disclaim responsibility to any person other than LCC or EPA Victoria arising from or in connection with this Report.

This Report has been prepared on the basis of information provided by LCC, which the Auditor has not independently verified or checked beyond the Audit scope of work. The Auditor accepts responsibility for satisfying himself that the information considered in the preparation of the Audit report is representative of site conditions, but does not warrant the complete accuracy.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by the Auditor. The Auditor disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the assumptions being incorrect.

Subject to paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation of this Report and are relevant until such times as the site conditions or relevant legislations changes.

Auditor independence

The Auditor has not been involved in the design, design verification or construction audit of any cells or cap at the Hyland Highway landfill. This is the second landfill operations audit of the Hyland Highway landfill undertaken by the Auditor since June 2020.

The Auditor considers the current engagement to undertake this audit is appropriate and that there has been no conflict of interest.

Authorised on 25 September 2023 by:

John Nolan
Environmental Auditor
(appointed pursuant to the *Environmental Protection Act 2017*)

15. References

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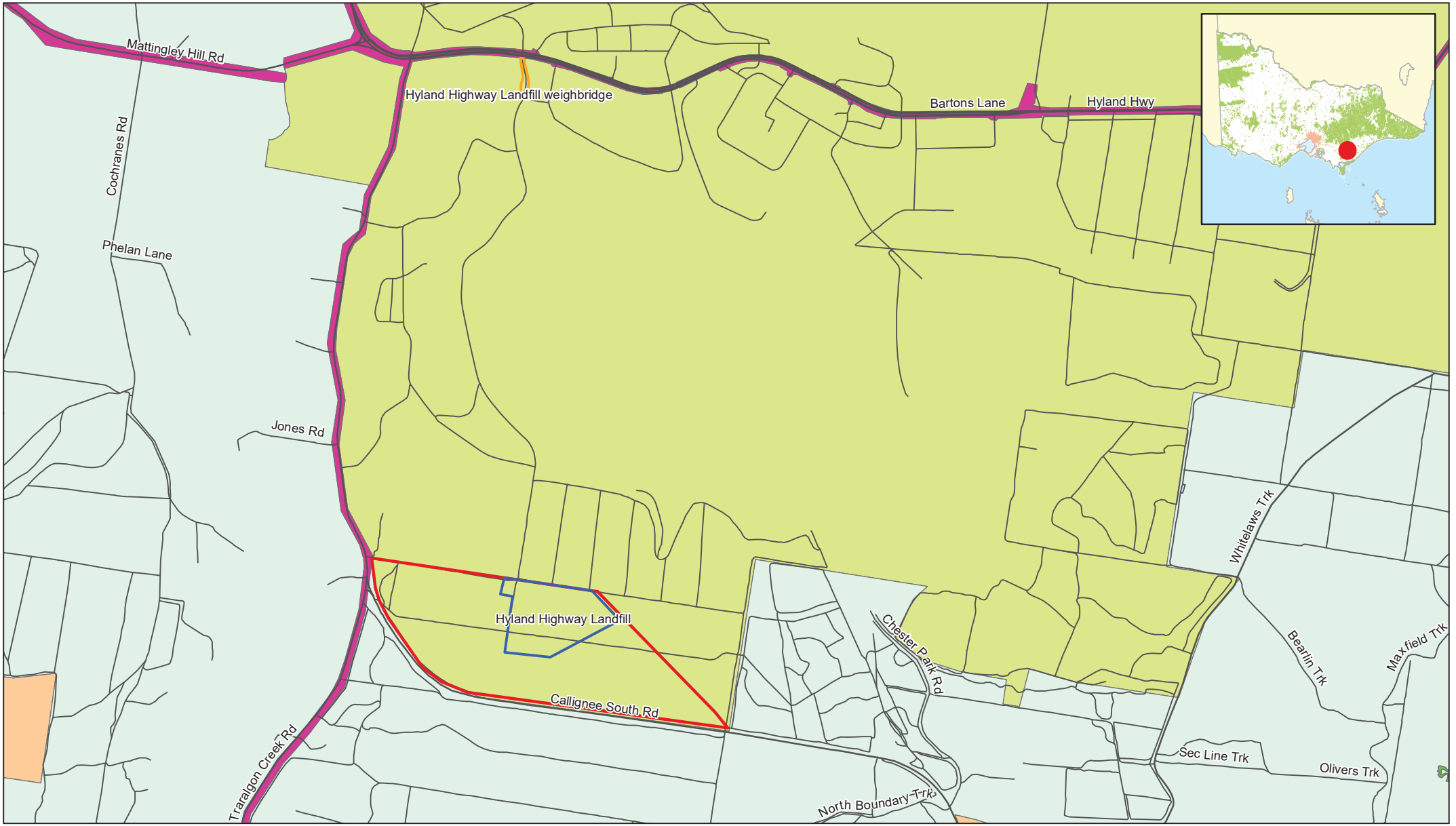


Paper Size A4

0 150 300 600 900

Metres

Map Projection: Lambert Conformal Conic
Horizontal Datum: Australian 1966
Grid: AGD 1966 VICGRID

N

LEGEND

- Weighbridge site boundary
- Landfill boundary
- Site boundary
- Highway
- Arterial
- Collector

Planning zone

- Farming
- Public Conservation & Resource
- Road – Category 1
- Rural Living
- Special Use

Latrobe City Council
Hyland Hwy Landfill WAA

Job Number 31-36742
Revision B
Date 01/07/2019

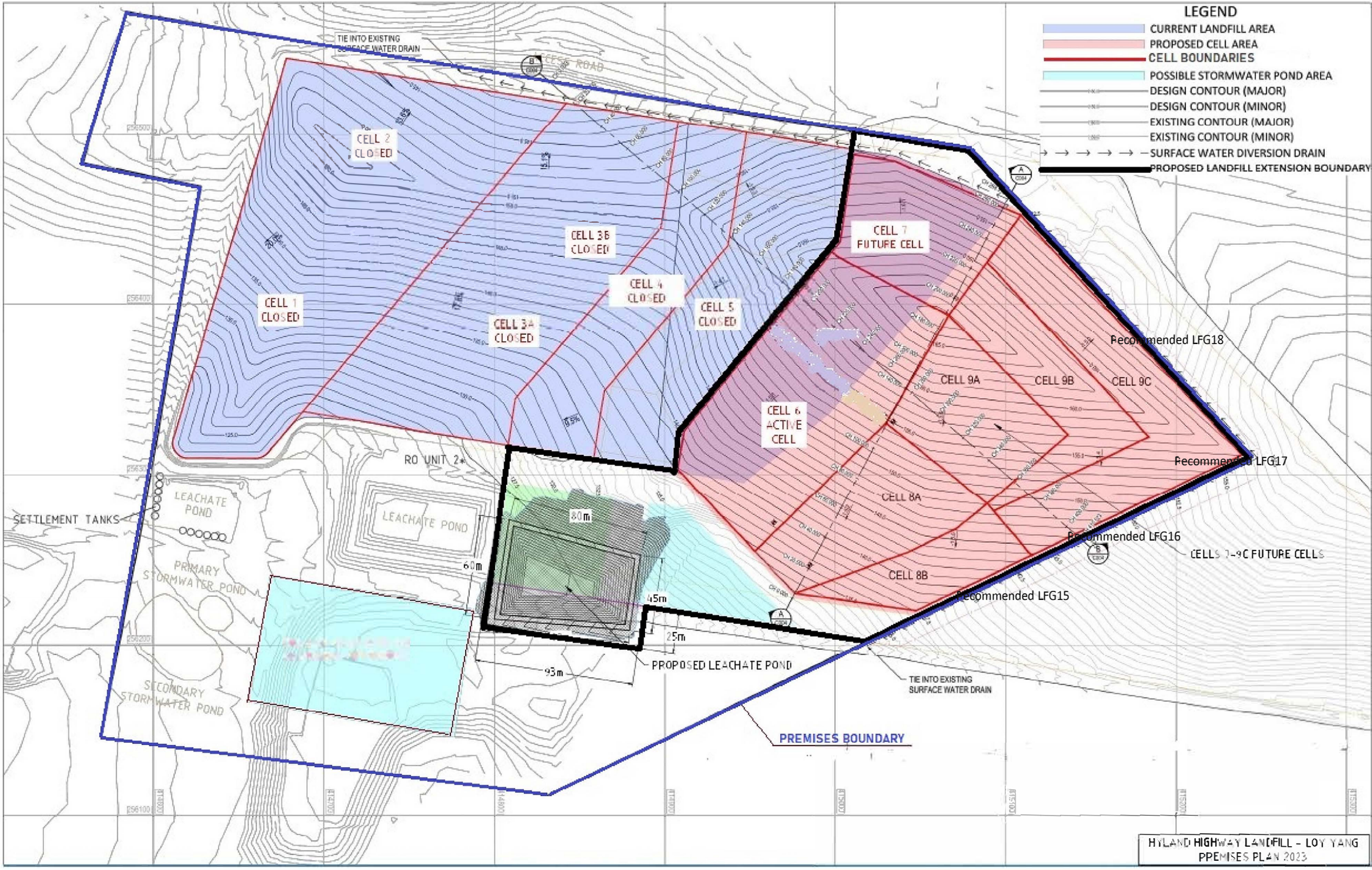
Locality Plan

Figure 1

G:\31\36742\GIS\Maps\Deliverables\3136742_KBM_A4_L.mxd

180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DELWP, VicMap, 2019; GHD, 2019 Created by: kgardner


LEGEND
CURRENT LANDFILL AREA
PROPOSED CELL AREA
CELL BOUNDARIES
POSSIBLE STORMWATER POND AREA
DESIGN CONTOUR (MAJOR)
DESIGN CONTOUR (MINOR)
EXISTING CONTOUR (MAJOR)
EXISTING CONTOUR (MINOR)
SURFACE WATER DIVERSION DRAIN
PROPOSED LANDFILL EXTENSION BOUNDARY
TIE INTO EXISTING SURFACE WATER DRAIN
CELL 1 CLOSED
CELL 2 CLOSED
CELL 3A CLOSED
CELL 3B CLOSED
CELL 4 CLOSED
CELL 5 CLOSED
CELL 6 ACTIVE CELL
CELL 7 FUTURE CELL
CELL 8A
CELL 8B
CELL 9A
CELL 9B
CELL 9C
Recommended LFG18
Recommended LFG17
Recommended LFG16
Recommended LFG15
CELLS 7-9C FUTURE CELLS
RO UNIT 2
SETTLEMENT TANKS
LEACHATE POND
LEACHATE POND
PRIMARY STORMWATER POND
SECONDARY STORMWATER POND
80m
60m
45m
25m
93m
PROPOSED LEACHATE POND
TIE INTO EXISTING SURFACE WATER DRAIN
PREMISES BOUNDARY
HYLAND HIGHWAY LANDFILL - LOY YANG
PREMISES PLAN 2023

LEGEND

- Landfill Premises Boundary
- Groundwater Monitoring Well
- Surface Water Monitoring Point
- Reverse Osmosis Permeate Point
- Leachate Pond Monitoring Point
- Groundwater Interception System Monitoring Point
- Landfill Gas Bore Monitoring Bore

0 50 100 150 200 250

SCALE (Approximate) (m)

N

Note: Aerial photo taken from NearMap Satellite Image: 19 October 2022

SITE	64 Hyland Highway, Loy Yang, VIC
TITLE	Site Monitoring Locations - Figure 3

DRAWN / CHECKED	C. Barker
DATE	04-09-2023
SCALE	As Shown
DRAWING NAME	V2138 - Hyland - Fig 3

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LEGEND

- Landfill Premises Boundary
- Surface Water Monitoring Point
  (DS)= Downstream
  (US)= Upstream

Note: Aerial photo taken from NearMap Satellite Image: 5 May 2020

0 1 2 3 4 5

SCALE (Approximate) (km)

N

SITE	64 Hyland Highway, Loy Yang, VIC
TITLE	General Site Location - Figure 1
DRAWN / CHECKED	M.Nelson / C. Barker
DATE	04-09-2023
SCALE	As Shown
DRAWING NAME	V2138- Hyland - Fig 1

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FIGURE: Loy Yang - WMIS surrounding bore survey

Legend:

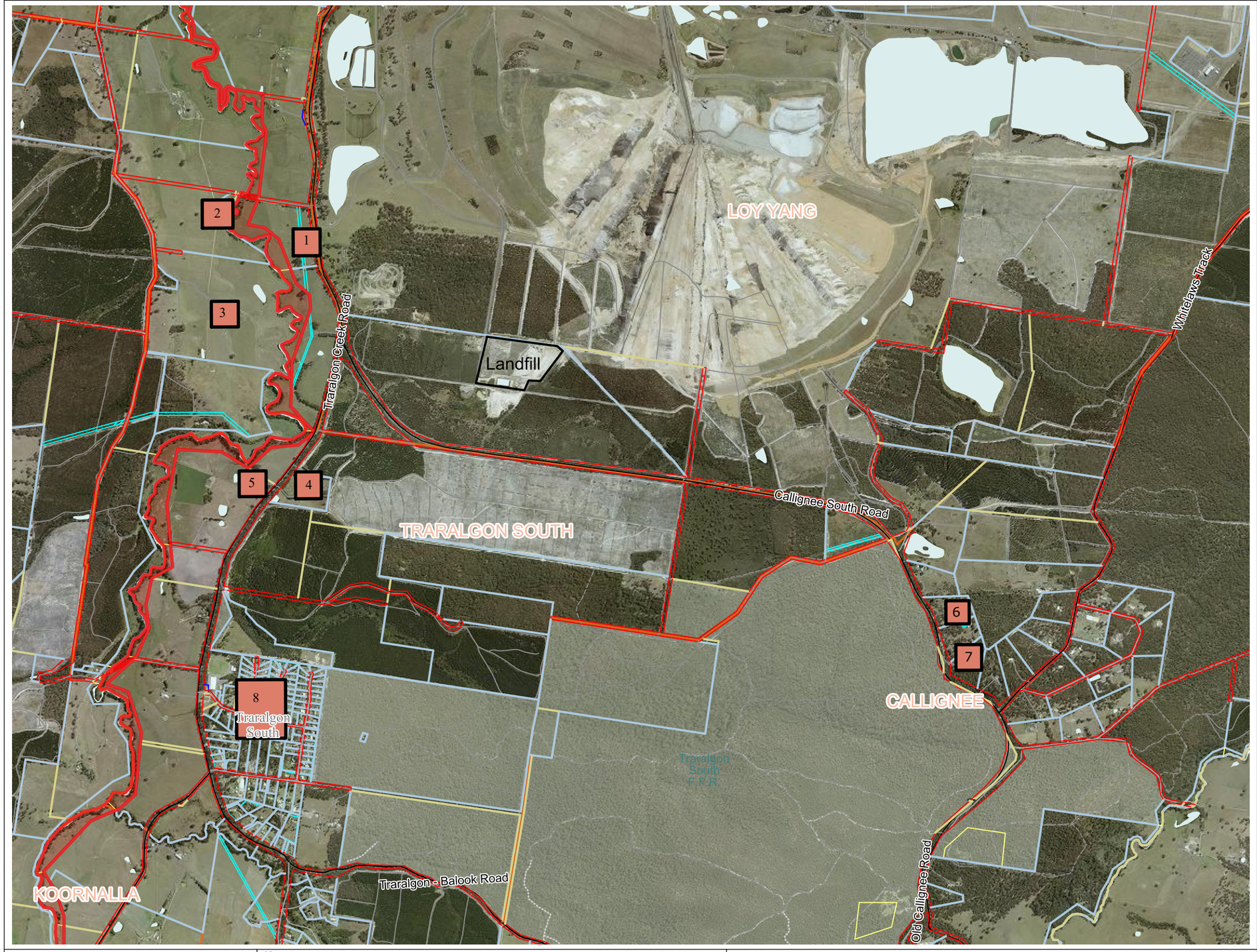
- Site outline
- Boundary radius 2km
- Boundary radius 3km
- DOMESTIC AND STOCK
- STOCK
- URBAN
- GROUNDWATER INVESTIGATION

0 500 1,000 1,500 m

GDA 1994 MGA Z55

Drawn: JOC, 06/09/2021
Checked: AV, 06/09/2021
Project: 261
Google maps image

Nolan Consulting Pty Ltd



Distance From Landfill To the Residences

1. 1200 m
2. 1800 m
3. 1600 m
4. 1250 m
5. 1625 m
6. 3000 m
7. 3250 m
8. 2500 m

Latrobe City
a new energy

Note
The information shown on this map is derived from a variety of sources including, but not limited to, Vicmap Data, other State and Local Government Agencies data and Latrobe City Data.

Disclaimer:
The State of Victoria does not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that the state of Victoria shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.
Latrobe City does not guarantee the accuracy or the currency of the information presented on this map and therefore Latrobe City will not be held liable for any loss or damage arising as a result of using this information.
The location of features shown on this map is indicative only. The underground infrastructure location shown is not to be used as a substitute for **Dial Before You Dig**.

Hyland Highway Landfill
Location of Residences in Proximity

7/09/2021

Scale 1:25000

N