



# INFORMATION REGARDING ENVIRONMENTAL AUDIT REPORTS

August 2007

## VICTORIA'S AUDIT SYSTEM

An environmental audit system has operated in Victoria since 1989. The *Environment Protection Act 1970* (the Act) provides for the appointment by the Environment Protection Authority (EPA Victoria) of environmental auditors and the conduct of independent, high quality and rigorous environmental audits.

An environmental audit is an assessment of the condition of the environment, or the nature and extent of harm (or risk of harm) posed by an industrial process or activity, waste, substance or noise. Environmental audit reports are prepared by EPA-appointed environmental auditors who are highly qualified and skilled individuals.

Under the Act, the function of an environmental auditor is to conduct environmental audits and prepare environmental audit reports. Where an environmental audit is conducted to determine the condition of a site or its suitability for certain uses, an environmental auditor may issue either a certificate or statement of environmental audit.

A certificate indicates that the auditor is of the opinion that the site is suitable for any beneficial use defined in the Act, whilst a statement indicates that there is some restriction on the use of the site.

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

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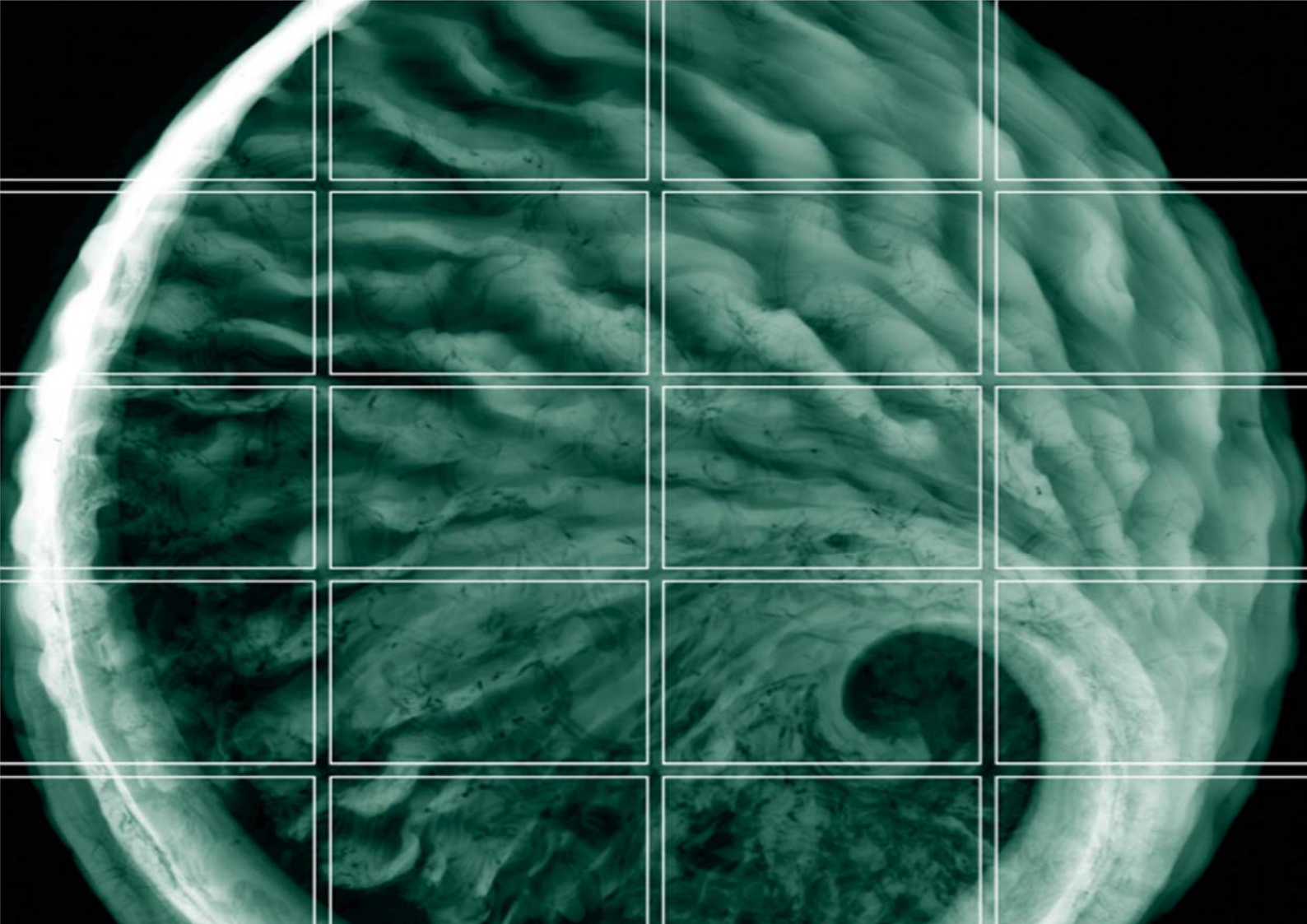
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Web: [www.epa.vic.gov.au/envaudit](http://www.epa.vic.gov.au/envaudit)

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City of Greater Bendigo

# **Section 53V Audit of Risk of Harm - Landfill Buffer Eaglehawk Landfill 191 – 193 Upper California Gully Road, Eaglehawk Victoria**

Service Order: 8005693

CARMS Reference: 60409-9  
Service Order Number: 8005693

16 December 2019

Project No.: 0448421

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Signature Page

**Section 53V Audit of Risk of Harm - Landfill  
Buffer  
Eaglehawk Landfill  
191 – 193 Upper California Gully Road,  
Eaglehawk Victoria**



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Paul Fridell  
Environmental Auditor  
(Appointed pursuant to the  
Environmental Protection Act 1970)

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## EXECUTIVE SUMMARY

Paul Fridell (the Auditor) of Environmental Resources Management Australia Pty Ltd (ERM) was engaged in his capacity as an Environmental Auditor (a person appointed as an Environmental Auditor, pursuant to the Environment Protection Act 1970) to conduct a voluntary environmental audit of risk of possible harm or detriment to the land, noise and air environment within 500 metres of the Eaglehawk landfill (the site) located at 191-193 Upper California Gully Road, Eaglehawk. The audit was conducted in accordance with Section 53V of the Environment Protection Act 1970.

The purpose of the audit is to satisfy the requirements of EPA, Best Practice Environmental Management: Siting, Design, Operation and Rehabilitation of Landfills (the Landfill BPEM) (EPA Publication 788.3, August 2015) and Assessing planning proposals within the buffer of a landfill (EPA Publication 1642, October 2017).

The overall audit objective is limited to an assessment of the risk of possible harm or detriment to the land, noise and air environment within 500 metres of the landfill posed by potential subsurface migration of uncontrolled landfill gas in the subsurface and amenity impacts, including offensive odour, noise, dust and litter emissions. Specifically:

- Review the landfill gas risk assessment and amenity risks (in particular odour, dust and noise) to determine the likely risks posed to any existing or proposed developments within the standard 500 metre buffer distance established in the Landfill BPEM guidelines for putrescible waste landfills;
- Assess the likely direction and extent of any landfill gas subsurface migration and amenity impacts that may be generated in the event of a reasonable worst case scenario, such as an abnormal weather event or failure of a landfill operations risk mitigation measure;
- Determine any appropriate on-site landfill operations risk mitigation measures or measures to be adopted by any future developments within the standard 500 metre buffer distance considering the likely direction and extent of any subsurface landfill gas migration or amenity impacts; and
- Determine, and recommend (if necessary), appropriate landfill management measures required if a change in the buffer distance is made as a result of this audit.

It is intended that the risk mitigation measures identified within this audit will inform changes, if any, to the Greater Bendigo Planning Scheme.

The environmental auditor is of the opinion that the assessment methodologies of the reports prepared by the assessors was adequate for the purpose of this audit and confirm that the assessments were undertaken in accordance with applicable EPA Victorian guidelines, in particular the Landfill BPEM, as well as EPA Publication 1642 Assessing planning proposals within the buffer of a landfill. The table below summarises the auditor's findings:

**Table E.1 Audit Findings**

<b>Audit Objectives</b>	<b>Summary of Audit Findings</b>
<p>Review landfill gas risk assessments and amenity risks (in particular odour, dust and noise) to determine the likely risks posed to any existing or proposed developments within the standard 500 metre buffer distance established in the Landfill BPEM guidelines for putrescible waste landfills</p>	<p><b><u>Subsurface Landfill Gas</u></b>                      The risk assessment considered analysis of existing monitoring data and desk top analysis of various potential preferential pathways, and determined that the risk to receptors within the nominal landfill buffer of 500 metres due to landfill gas migration under existing and proposed developments is considered to be low within 250 m of the landfill and very low between 250 – 500 m. Commensurate with the current risk profile and in anticipation of any potential changes in the future risk, three levels of control (control areas) have been recommended within</p>

<b>Audit Objectives</b>	<b>Summary of Audit Findings</b>
	<p>the existing buffer distance for new developments and to protect existing developments.</p> <p><b><u>Odour</u></b>                      Odour emission sampling of the existing operations identified the main sources of odour emissions are from the landfill tipping face (40%), green/food waste transfer facility (organics shed) (20%) and green waste mulch area (15%). Modelling indicates that sensitive receptors to the north and east of the site, as well as farming zoned land to the west, within the 500 metre buffer are likely to experience elevated odour levels from these current sources. Odour modelling indicated that areas to the south and south west were unlikely to be affected.</p> <p>Validation of the modelling results was not undertaken according to European Standard 'EN16841-2-2016: determination of odour in ambient air by using field inspection – Part 2: Plume method', or a suitable equivalent by the air quality consultant. This standard requires field validation to be undertaken by a person with a calibrated nose at various field meteorological conditions and at various potential positional patterns in the predicted plume footprint. To strictly comply with this standard it would require rapid deployment of appropriately trained persons in odour detection with permission to enter private property and buildings within the plume footprint. Without right of access and trained persons immediately available, it was deemed that strict compliance would not be practicable for a rural small landfill where the surrounding area is largely developed thus limiting movement of trained odour detectors. However the odour consultant did undertake an informal survey of residents in the predicted plume footprint and presented this anecdotal field evidence of validation of the plume. While this is not a categorical survey it does suggest some odour impact has historically occurred off-site as a result of current on-site activities. Without this validation work, it is assumed the modelling results are conservative and potentially overestimate the extent of impact.</p> <p>The odour from the future aftercare onsite activities (i.e. no operational landfill), is expected to be sourced from the continued operation of the food and organics transfer station and green waste storage and mulching area. In addition it has been advised by Council that the food and green transfer operation will now occur outside the shed on the concrete slab west of the building and shed will be used to transfer putrescible waste. These future sources have only been recent advised and therefore have not been considered in the odour modelling or in isolation from the landfill source (post closure). Considering the contribution of these activities to the overall odour emission source, it is likely that odour from these activities will continue to generate potential odour impacts.</p> <p><b><u>Noise</u></b>                      The risk from noise emissions have been predicted to comply with the respective daytime and evening noise limits for the site based on existing conditions. Proposed activities in the future were not assessed,</p>



<b>Audit Objectives</b>	<b>Summary of Audit Findings</b>
	<p>however they were not predicted to intensify and therefore are unlikely to significantly alter the current noise impact findings.</p> <p><b><u>Dust and Particulates</u></b></p> <p>The risk from dust and particulate matter impacts at the nearest sensitive receptors is negligible under existing and proposed activities.</p>
<p>Assess the likely direction and extent of any landfill gas subsurface migration and amenity impacts that may be generated in the event of a reasonable worst case scenario, such as an abnormal weather event or failure of a landfill operations risk mitigation measure</p>	<p>For landfill gas, under assumed upset conditions, the assessment of risk scores for current normal operations and proposed site activities remains the same. Figure 8A of the AECOM report provides the risk scores within the Landfill BPEM buffer. The risk scores are higher closer to the landfill boundary, i.e. closer to the source, with the level of risk reducing as the distance to the landfill boundary increases.</p> <p>For odour, under a number of upset conditions, the 4 OU contour of likely odour impacts, generally extends beyond the Landfill BPEM buffer to the north and west of the site. The modelling extends beyond the Transfer Station buffer of 250 m in all directions, although the modelling has not been field validated.</p> <p>For dust, the assessment of upset conditions for both existing and proposed operations predicts compliance at sensitive receptors.</p> <p>For noise, no upset conditions were assessed as part of the assessment.</p>
<p>Recommended Buffer</p>	<p>The default amenity buffers applied to these land uses include:</p> <ul style="list-style-type: none"> <li>■ 500 metre buffer from the edges of the current cell (Cell 5);</li> <li>■ 250 metres buffer from the green/food waste transfer station building and the observed green waste processing area; and,</li> <li>■ 100 metres from general refuse transfer station.</li> </ul> <p>The landfill will close in the near future leaving the food/green waste facility and the green waste mulching as ongoing activities in the medium term future. The public general waste transfer station will move to a hard stand area to immediately adjacent and south west of the off-site Eaglehawk Eco-Centre near the entrance.</p> <p>The odour assessment modelling results identify potential elevated odour concentrations are likely to be experienced by sensitive receptors within the buffer areas to the north east of the site (south of Violet Street) during the operation of the landfill, green waste mulching and food/green waste transfer station operation, both under normal and upset conditions.</p> <p>After the closure of the landfill, the green waste mulching and food/green waste transfer station will continue to be a significant odour sources during the landfill aftercare period. In addition the future use scenario will see the food/green move outdoors and putrescible be stored in the shed prior to transfer.</p> <p>Considering the results of the odour assessment and the limited survey of the surrounding receptors, the auditor cannot justify any reduction of the existing default buffers during current or future operations. It is noted</p>

<i>Audit Objectives</i>	<i>Summary of Audit Findings</i>
	<p><i>the current existing green/food waste transfer buffer extends over the majority of properties south of Violet Street.</i></p> <p><i>The Auditor therefore recommends that appropriate planning controls be implemented within the default amenity buffer distance for a transfer station (i.e. 250 metres) to reduce intensification of sensitive uses until such time as the odour impacts are removed due to closure of the transfer station (food and green and putrescible), or a reassessment of odour impacts post closure of the landfill, demonstrates that odour impacts are reduced such that the amenity buffer can be reduced (refer to recommendation 1912-R2). The reassessment is to include revised modelling and a field validation program using a method based on 'European Standard EN16841-2-2016: Determination of odour in ambient air by using field inspection – Part 2: Plume method', adapted for Australian conditions, and subject to endorsement by an EPA appointed Environmental Auditor (refer to recommendation 1912-R1).</i></p> <p><i>No change is proposed to the 500 metre landfill amenity buffer (measured from the edge of the active cell). The only properties likely to be impacted based on odour modelling results and within the 500 metre buffer are south of Violet Street, which are also within the 250 metre food and green transfer station buffer. Given the imminent closure of the landfill active cell (approximately 2 years) and continued operation of the food and green facility, to avoid the administrative burden of implementing planning controls based on two overlapping buffers, it is deemed appropriate that the food/green transfer station buffer is adequate to address both sources now and into the future and thus no further action is recommended for the properties within the 500 metre landfill amenity buffer.</i></p> <p><i>Notwithstanding the recommendations above related to non-landfill activities, considering the subsurface landfill gas risk assessment, it is the auditor's opinion that the 500 metre Landfill BPEM buffer related to subsurface landfill gas migration remain with the implementation of the specified mitigation measures for future developments and additional off-site monitoring as recommended (1912-R3 and 1912-R4)).</i></p>
<p><i>Determine any appropriate on-site landfill operations risk mitigation measures or measures to be adopted by any future developments within the standard 500 metre buffer distance considering the likely direction and extent of any subsurface landfill gas migration or amenity impacts</i></p>	<p><i>As discussed above, it is recommended that the green waste mulching area and/or the food/green/putrescible waste transfer area be relocated by Council on-site to be more than 250 metres (nominal transfer station buffer distance) from any sensitive receptors where practicable. Where relocation is not practicable, then additional odour mitigation measures (e.g. ventilated structures, automated closing doors) are to be considered by Council and modelled to demonstrate reduced odour impacts to sensitive receptors within the 250 metre transfer station buffer distance (refer to recommendation 1912-R1).</i></p> <p><i>There has been no change made to the standard 500 metre landfill buffer distance, however, considering the presence of existing developments within the buffer and the potential for new developments, the recommendations are made within the standard 500 metre landfill gas buffer (1912-R3 and 1912-R4).</i></p>

<i>Audit Objectives</i>	<i>Summary of Audit Findings</i>
<i>Determine, and recommend (if necessary), appropriate landfill management measures required if a change in the buffer distance is made as a result of this audit</i>	<i>No change in the buffer distance has been proposed therefore no additional recommendations have been made against this objective.</i>

All audit recommendations are included in the table below which includes:

- a unique reference identification number consisting of year, month and the recommendation number to allow tracking of the recommendation through subsequent audits;
- the priority ranking as per the table above; and
- a description of the recommendation.

**Table E.2 Auditor Recommendations**

<b>ID</b>	<b>Recommendations</b>
1912-R1	<p><i>The City of Greater Bendigo is to relocate on-site (where practicable) the greenwaste mulching area and the food/green transfer facility to maintain 250 metre separation to existing sensitive receptors and areas zoned for residential development. Where this is not practicable, Council are to investigate the installation of odour mitigation measures.</i></p> <p><i>In both instances (relocation or additional mitigation measures) the Council is required to undertake odour, noise and dust modelling to demonstrate the ongoing operation of the onsite organic waste operations will not pose an unacceptable risk to sensitive receptors in the aftercare period.</i></p> <p><i>The reassessment of odour is to include revised modelling and a field validation program using a method based on ‘European Standard EN16841-2-2016: Determination of odour in ambient air by using field inspection – Part 2: Plume method’, adapted for Australian conditions, and subject to endorsement by an EPA appointed Environmental Auditor.</i></p>
1912–R2	<p><i>Planning controls are recommended for land within the 250 metre default amenity buffer for transfer station to limit intensification of sensitive uses within the buffer.</i></p>
1912-R3	<p><i>For land within 500 metres of waste placement on the site (effectively the boundary of the site), it is recommended that a Design and Development Overlay (DDO) be developed to ensure the following controls are implemented for new developments:</i></p> <ul style="list-style-type: none"> <li>■ <i>For new developments within Control Area 1 (residential) and Control Area 3 (industrial) (typically within approximately 250m of landfill) the developer will require LFG mitigation measures (membrane barriers and/or slab venting) to be incorporated into the design of the new structures as per British Standard 8485:2015.</i></li> <li>■ <i>Risk in Control Area 2 (existing and new residential developments) (typically 250-500m from landfill) will be addressed by increased monitoring by the landfill operator (Council). The Council planning department is obligated to obtain advice from the landfill operator</i></li> </ul>



ID	Recommendations
	<i>(Council) on current LFG risk when considering new developments in this area.</i>
1912-R4	<i>Specifically for control area 2, it is recommended that underground services and a number of new LFG monitoring bores be installed and monitored by the City of Greater Bendigo, as per Figure F9 of the AECOM report, to provide an early warning of the migration of LFG off-site. These additional bores and monitoring requirements are to be incorporated into the next revision of the current Environmental Monitoring Program for the site and verified by an EPA appointed Environmental Auditor as required by the current licence condition LI_L1. The EMP is to include contingency actions should LFG be encountered at levels that present a greater level of risk (as determined using British Standard 8485 (as amended)) as previously assessed in control area 2.</i>

The summary information related to this audit is presented in the table below in accordance with EPA Publication 1147, Environmental Auditor Guidelines – Provision of Environmental Audit Reports, Certificates and Statements.

**Table E.3 Summary of Audit Information**

<i>Auditor</i>	Paul Fridell
<i>Auditor account number</i>	75638
<i>Auditor appointment end date</i>	23 May 2011 to 19 November 2023
<i>Audit type</i>	S53V Audit of Risk of Harm within proposed landfill buffer zone
<i>Date EPA Notified of Audit</i>	15/02/2018
<i>Audit service order number</i>	8005693 (CARMs 60409-9)
<i>Name of person requesting the Audit</i>	Kylie Douglas
<i>Relationship to premises/ location</i>	Senior Landfill Engineer
<i>Name of premises owner</i>	City of Greater Bendigo
<i>Date of auditor engagement</i>	10/02/2018
<i>Completion date of the audit</i>	13 December 2019
<i>Reasons for audit</i>	<i>Determine an appropriate buffer distance in consideration of EPA, Best Practice Environmental Management: Siting, Design, Operation and Rehabilitation of Landfills (the Landfill BPEM) (EPA Publication 788.3, August 2015) and Assessing planning proposals within the buffer of a landfill (EPA Publication 1642, October 2017).</i>
<i>Audit Categorisation</i>	<i>Risk of any possible harm or detriment to a segment to the land, noise and air environment within 500 m of the landfill posed by the landfill.</i>
<i>Environmental Segments</i>	<i>The Landfill BPEM buffer area (500 metres) surrounding the site – land defined by the premises boundary of the site on 191-193 Upper California Gully Road Eaglehawk as detailed in EPA licence 46490 – which the facility may pose a risk..</i>
<i>If the audit was required by an EPA notice, licence or other, please provide EPA reference number</i>	Not applicable

<i>Current land use zoning</i>	<i>Public Use Zone – Local Government (PUZ6)</i>
<i>EPA Region</i>	<i>North West</i>
<i>Municipality</i>	
<i>Dominant – Lot on plan</i>	<i>Lot 2 / PS326959</i>
<i>Additional – Lot on Plan (s)</i>	
<i>Site/ Premises Name</i>	<i>Eaglehawk Landfill</i>
<i>Building/complex sub-unit No.</i>	
<i>Street/Lot – Lower No.</i>	<i>191</i>
<i>Street/ Lot – Upper No.</i>	<i>193</i>
<i>Street Name</i>	<i>Upper California Gully</i>
<i>Street Type (Road, Court, etc.)</i>	<i>Road</i>
<i>Street Suffix (north, south, etc.)</i>	
<i>Suburb</i>	<i>Bendigo</i>
<i>Postcode</i>	<i>3556</i>
<i>GIS coordinate of site centroid</i>	
<i>Longitude/ Northing</i>	<i>144.241992</i>
<i>Latitude / Easting</i>	<i>-36.729838</i>
<i>Member and Categories of Support Team Utilised</i>	<i>Iain Cowan (odour and dust) Nathan Lynch (noise)</i>
<i>Further work or requirements</i>	<i>Refer to the audit findings in Table E.2</i>
<i>Nature and extent of continuing risk</i>	<i>Refer to the audit findings in Table E.1</i>
<i>Outcomes of the Audit</i>	<i>Refer to the audit findings in Table E.1</i>

**Table E.4 Physical site information**

<i>Historical land use</i>	<i>Disposal of mine tailings waste and used by local residents as a waste dump prior to landfilling.</i>
<i>Current land use</i>	<i>Landfill</i>
<i>Surrounding land use - north</i>	<i>Residential, native bushland</i>
<i>Surrounding land use - south</i>	<i>Native bushland, industrial zoned land</i>
<i>Surrounding land use - east</i>	<i>Industrial zoned land, residential</i>
<i>Surrounding land use - west</i>	<i>Native bushland, agricultural land use</i>
<i>Proposed land use zoning</i>	<i>-</i>
<i>Nearest surface water receptor – name</i>	<i>Devonshire Gully</i>
<i>Nearest surface water receptor – direction</i>	<i>Onsite, south</i>
<i>Groundwater Segment</i>	<i>Segment C (as per previous operational audit ERM, 2017)</i>

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