



Decision Document

Environmental Protection Act 1986, Part V

Proponent: Shire of Waroona

Licence: L6756/1996/11

Registered office: Shire of Waroona
Administration Building
52 Hesse Street
WAROONA WA 6215

ACN: Not applicable

Premises address: Buller Road Refuse Disposal Site
702 Buller Rd
WAROONA WA 6215
Being Lot 1701 on Plan 214632

Issue date: Thursday, 1 September 2011

Commencement date: Friday, 9 September 2011

Expiry date: Sunday, 8 September 2030

Decision

Based on the assessment detailed in this document, an amended licence has been issued. It is considered that in reaching this decision, all relevant considerations have been taken into account.

Decision Document prepared by: Cassie Bell
Licensing Officer

Decision Document authorised by: Steve Checker
Delegated Officer



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1 Purpose of this Document

This decision document explains how the application has been assessed and determined and provides a record of the decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to assessment and decision making under Part V of the *Environmental Protection Act 1986*. Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.

2 Administrative summary

Administrative details		
Application type	Works Approval <input type="checkbox"/> New Licence <input type="checkbox"/> Licence amendment <input checked="" type="checkbox"/> Works Approval amendment <input type="checkbox"/>	
Activities that cause the premises to become prescribed premises	Category number(s)	Assessed design capacity
	61 Liquid waste facility	850 tonnes per year
	64 Class II putrescible landfill site	8,000 tonnes per year
Application verified	Date: Not applicable	
Application fee paid	Date: Not applicable	
Works Approval has been complied with	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	
Compliance Certificate received	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	
Commercial-in-confidence claim	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Commercial-in-confidence claim outcome		
Is the proposal a Major Resource Project?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Referral decision No:



<i>Environmental Protection Act 1986?</i>		Managed under Part V <input type="checkbox"/> Assessed under Part IV <input type="checkbox"/>
Is the proposal subject to Ministerial Conditions?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Ministerial statement No: EPA Report No:
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the <i>Environmental Protection Act 1986</i>)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Discharge of waste to land over Murray Groundwater Area (26B of <i>Rights in Water and Irrigation Act 1914</i>) Department of Water consulted Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Is the Premises within an Environmental Protection Policy (EPP) Area Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> <i>Environmental Protection Peel Inlet - Harvey Estuary Policy 1992</i>		
Is the Premises subject to any EPP requirements? Yes <input type="checkbox"/> No <input type="checkbox"/> <i>The EPP Peel Inlet sets water quality objectives for the entire Peel Inlet and Harvey Estuary. Subsidiary management documents make suggestions as to on-ground nutrient targets based on modelling. This Premises is an unlined landfill that accepts materials of a putrescible nature which may result in nutrient loading to the catchment; however the extent is difficult to quantify. The Premises is subject to groundwater monitoring for environmental parameters to detect potential contamination from the activities.</i>		

3 Executive summary of proposal and assessment

Buller Road Refuse Disposal Site (the Premises) is currently licenced under Part V of the EP Act located in and operated by the Shire of Waroona. The Premises provides a local landfill facility and liquid waste disposal to a population of 4,000 people. The landfill accepts mostly Putrescible Waste, Asbestos Waste, and recycling material averaging between 20-80m³ a week.

Existing operations

The Premises includes an unlined Class II landfill that accepts inert and putrescible waste from Waroona and the surrounding areas. There is no record of the Premises accepting waste from the metropolitan area. The Premises is currently open to the public six days per week and fully secured and locked when closed.

The majority of the existing landfill area included backfilling of a historic yellow sand mine with waste. The original approval for the landfill activities was for a capacity of up to 2,000 tonnes per year; however it is noted that the volume of waste accepted has increased over time. The approved capacity for landfilling at the site is 5,000 tonnes per year. It is estimated (as at 2016) that there is in excess of 20 years of void space remaining in the landfill (being the active landfilling area).

Landfilling operations are undertaken using a Caterpillar 816F landfill compactor for positioning and compaction of the waste, and a Volvo L150 front end loader for general materials handling and daily cover activities.

The liquid waste facility (LWF) on the Premises provides treatment of liquid waste for the Waroona district and surrounding areas (being septage waste and greasetrap waste only). The lined interconnected pond system has a design capacity of 850 kL/year. The pond system incorporates three ponds facilitating anaerobic, facultative and aerobic processes, respectively to breakdown liquid



wastes, from which liquid waste is pumped to a large storage (polishing) pond. Treated liquid waste from the storage pond is then pumped to a HDPE lined (at a depth of three metres) vegetated 'biofilter' area which contains all treated water for evaporation and use by the vegetation (vetiver grass). Excess water from the biofilter can be pumped to the large storage pond in the case that it reaches capacity, to be pumped back to the biofilter in summer periods to sustain the vetiver grass during drier periods.

The Premises also has a shed which is used for recyclable materials recovery and the storage of machinery.

Location and residential and sensitive land uses

The Premises is located at Lot 1701 on Plan 214632, Buller Rd, and is surrounded with forested private land immediately to the north, the Buller Nature Reserve immediately to the south, and private rural land to the east and west. The entire area (with the exception of the Buller Nature Reserve managed by the Department of Parks and Wildlife) is zoned as 'Rural – General Farming' under the Town Planning Scheme.

Where landfills or liquid waste facilities are within 1000 metres of sensitive receptors there is a higher risk posed to those receptors from noise, odour, dust and gaseous emissions. The distances to residential and sensitive receptors are set out in **Table 1** as follows:

Table 1: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Residential premises	~450m southeast of the Premises boundary ~600m southwest of the Premises boundary
Waroona town site	~8.5km northeast of the Premises boundary

Environmental siting

Specified ecosystems

The site is located on the Swan Coastal Plain, and in the *Environmental Protection Peel Inlet - Harvey Estuary Policy 1992* area. Historically, liquid waste was also disposed of on the Premises in unlined septage ponds; however a new lined facility was constructed under works approval W4513/2008/1 (compliance certificate for completion received 11 June 2012). The distances to specified ecosystems are shown in **Table 2**.

Table 2: Specified ecosystems

Specified ecosystems	Distance from the Premises
Conservation category sumpland	~250m north of the Premises boundary
Multiple use category palusplain	~90m east of the Premises boundary
Peel Harvey Environmental Protection Policy (EPP)	Premises is located within the EPP area
Designated areas	Distance from the Premises
Murray Groundwater Area (proclaimed under the <i>Rights in Water Irrigation Act 1914</i>)	Premises is located within the groundwater area

Soil type

Soils are sandy and have a high permeability. The Premises is underlain by superficial sediments of predominantly Quaternary age. Information provided on the Lake Clifton-Hamel 1:50 000 Environmental Geology map published by the Geological Survey of WA (GSWA, 1987) indicates that the site is immediately underlain by sandy dunal sediments (Bassendean Sand) which are about 30 m thick beneath the site. There is an indistinct, interfingering contact between Bassendean Sand and



silty and clayey sediments of the Guildford Formation about 2 km to the west of the landfill site. Both the Bassendean Sand and Guildford Formations are immediately underlain by the Jandakot Beds which are comprised of limestone. The Jandakot Beds form the base of a regionally extensive superficial aquifer which is unconformably underlain by Mesozoic sediments.

Groundwater and water sources

Groundwater levels measured by the Licensee from five groundwater monitoring bores in May 2015 indicate that standing water level occurs anywhere between 6 – 19 m(AHD); however it is noted that the corresponding water levels in m(BGL) are not on record. Data from both the regional geological map (GSWA, 1987) and from monitoring bores at the landfill site indicate that groundwater flows in a west to south-westerly direction from the site in the superficial aquifer. The majority of contaminants (i.e. nitrogen constituents, physical parameters and some heavy metals) appear significantly higher in monitoring bore MB5 compared with any of the other bores. MB5 is just to the east (up gradient) of the active landfill area and to the west (downgradient) of the historic/ decommissioned unlined septage treatment ponds, the current septage treatment facility and the biofilter in which treated effluent is discharged. Monitoring bores downgradient of the landfilling area are very shallow and may not be intercepting any of the contamination plume.

There are several perennial swamps on adjacent land, within 700m of the landfill, as well as a major agricultural drain approximately 500m to the west of the landfilling activities (130m from the Premises boundary). The estimated groundwater flow direction is towards this drain. Regional contours and hydrological data indicate that the major drain heads northwest through agricultural land and eventually discharges to a minor perennial tributary to the Harvey River approximately 6km west of the Premises. The closest natural watercourse to the Premises itself is a short minor perennial watercourse and an associated swamp approximately 1km northwest of the Premises.

Meteorology

The Waroona area is characterised by cool wet winters and warm dry summers. Rainfall occurs predominantly over the months of May through to September. The Bureau of Meteorology provides the mean rainfall and maximum temperatures for Dwellingup (approximately 20km away) as depicted in Figure 1 (mean maximum temperature 1935 to 2017 and mean rainfall 1934 to 2017).

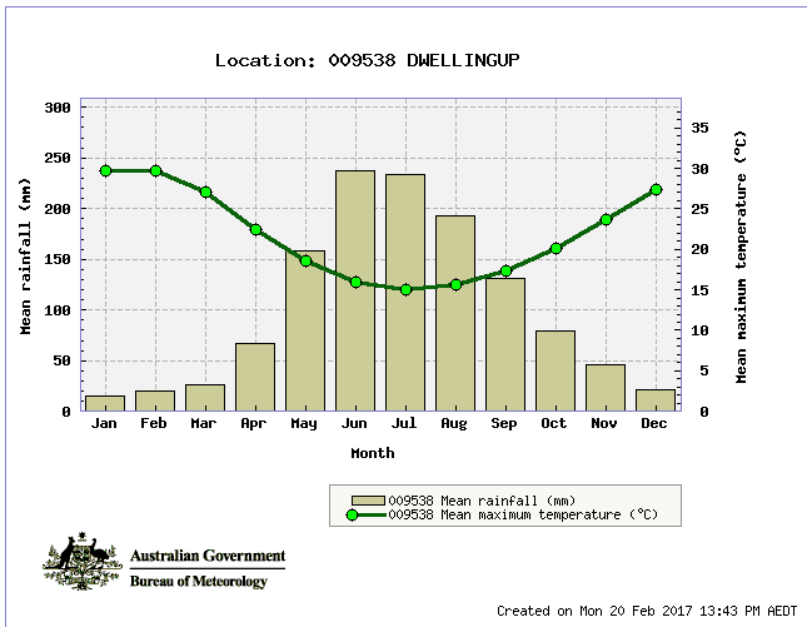


Figure 1: Mean maximum temperature and mean rainfall for Dwellingup



The Bureau of Meteorology also provides the 9am and 3pm wind speed and direction for Dwellingup, see Figure 2 and Figure 3 below. It is important to note that these wind roses shows historical wind speed and wind direction data for Dwellingup and should not be used to predict future data.

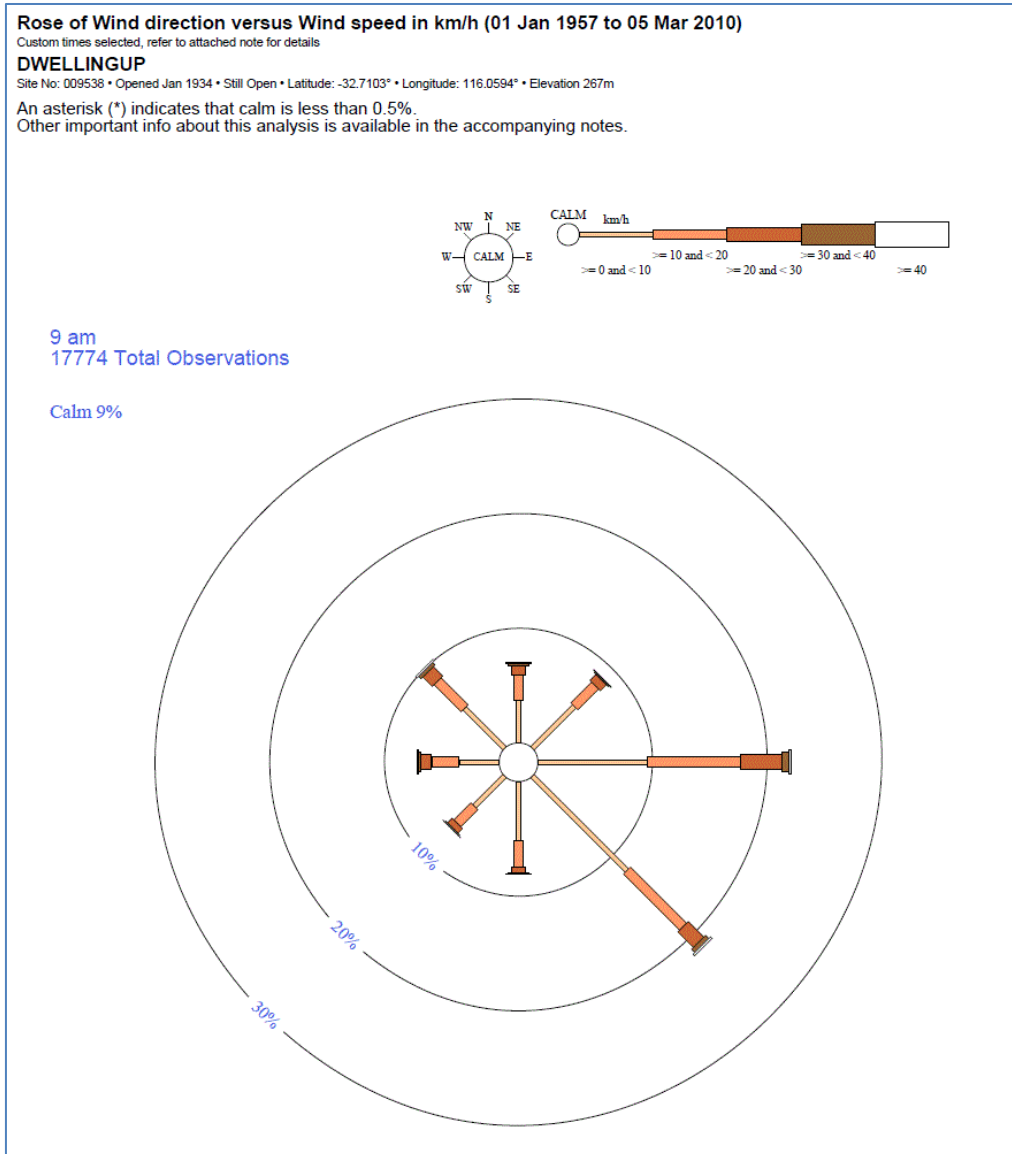


Figure 2: Dwellingup 9am average wind speed and direction



Rose of Wind direction versus Wind speed in km/h (01 Jan 1957 to 05 Mar 2010)

Custom times selected, refer to attached note for details

DWELLINGUP

Site No: 009538 • Opened Jan 1934 • Still Open • Latitude: -32.7103° • Longitude: 116.0594° • Elevation 267m

An asterisk (*) indicates that calm is less than 0.5%.

Other important info about this analysis is available in the accompanying notes.

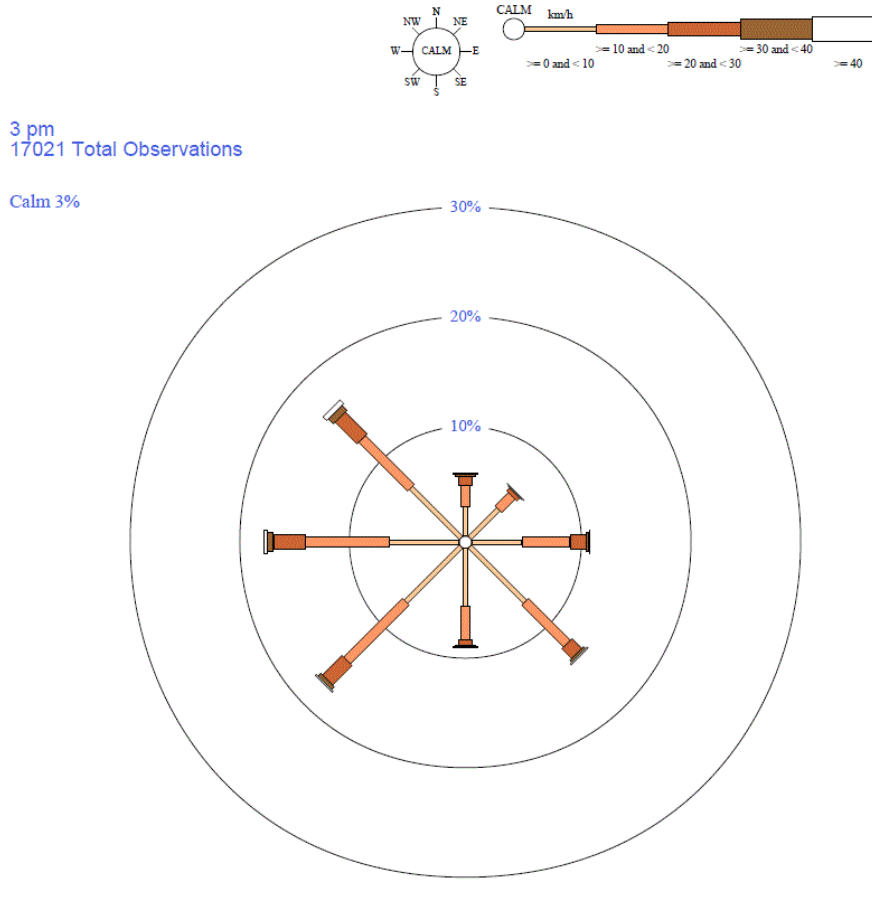


Figure 3: Dwellingup 3pm average wind speed and direction

Licence review and environmental risk summary

The Delegated Officer has determined there is a need for a review of Licence L6756/1996/11 issued 1 September 2011 (Existing Licence), with consideration to the time that has passed since the licence was granted and the intent to bring the licence and its conditions in line with DWER's most current *Guidance Statement: Risk Assessments* (February 2017) and other current Guidance Statements listed in Section 4 of this Decision Document.

The review of environmental risks as detailed in the Decision Table in Section 4 and Appendices of this document has determined that the key emission risks associated with current operations at the Premises include the potential for fugitive emissions of noise and dust (including asbestos), contamination of soil groundwater with leachate from landfilling activities, and contamination of soil, groundwater and surface water from the LWF. Amendments to licence conditions determined for the Revised Licence as a result of the environmental risk assessment are also detailed in the Decision Table in Section 4.



This Decision Document also assesses the risks associated with two other changes initiated by the Licensee, as follows:

(1) Amendment – Liquid Waste Facility (LWF) infrastructure constructed under W4513/2008/1

The compliance documentation for works approval W4513/2008/1 was received on 11 June 2012; however the Existing Licence was not amended at this time to reflect the new LWF infrastructure for the treatment and containment of liquid waste on the Premises. In response to the compliance document and as part of this amendment, the Delegated Officer is initiating changes to reflect the infrastructure and appropriate controls adopted in accordance with the assessment undertaken for W4513/2008/1 and the assessment undertaken for the Revised Licence.

The main emission risks that exist from the operation of the LWF include odour from the ponds and the potential for the contamination of land and/or groundwater from emergency/unintended discharge of liquid waste (such as through an overflow or pond leakage/failure). These are assessed in detail in the Decision Table in Section 4 and Appendices of this document.

(2) Amendment application – Proposed use of evaporative sprinklers on LWF

An amendment application from the licensee was received 16 December 2015 for the use of evaporation sprinklers in the LWF, which is intended to help reduce the volumes of water in the ponds, which are nearing capacity. The amendment application stated that the sprinklers were already installed and being trialled (no approval was sought or provided by DWER (then-DER) for this trial). The infrastructure includes 16 low height floating aerators across 4 ponds in the system (all ponds except the anaerobic pond, and the biofilter area), and 'wobbler' sprinklers which discharge in a droplet form (rather than fine spray/mist) in conjunction with a flow pump to ensure that spray discharge cannot occur over the boundaries of the ponds.

The potential emission risks from the operation of evaporative sprinklers on the LWF are odour and spray drift carrying liquid waste outside the ponds and onto nearby soil. These are assessed in detail in the Decision Table in Section 4 and Appendices of this document.

The resulting amended licence (Revised Licence) has changed in format, numbering and presentation from the Existing Licence, and incorporates a number of changes to the intent of licence conditions as a result of the environmental assessment.

Where conditions have been significantly changed or are no longer included in this version of the licence, this is detailed in the Decision Table below, Appendix A – Environmental Risk Assessment and/or Appendix B – Licence Conversion Table. The previous version of the licence is attached (Appendix C) for reference.

Similarly, any new conditions which have been added as part of this amendment and were not on the previous version of the licence have also been justified in the Decision Table below and/or Appendix A – Environmental Risk Assessment.



4 Decision table

The overarching legislative framework of this assessment is the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection Regulations 1987* (EP Regulations). DWER Guidance Statements which inform the assessment in accordance with the legislation include:

- DER 2015, *Guidance Statement: Regulatory Principles*; and
- DER 2015, *Guidance Statement: Setting Conditions*; and
- DER 2017, *Guidance Statement: Decision Making*; and
- DER 2017, *Guidance Statement: Risk Assessments*; and
- DER 2016, *Guidance Statement: Environmental Siting*; and
- DER 2016, *Guidance Statement: Publication of Annual Audit Compliance Reports*.

Where other references have been used in making the decision they are detailed in the decision document.

DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
Interpretation	L1.1.1 – L1.1.3	<p>Operation</p> <p>Conditions L1.1.1 – L1.1.2 have been included to set the definitions of the licence, and as a result of the update to the licence format. Definitions have been added into the licence. Some existing definitions have been amended for clarity and/or consistency with recently granted instruments. Some definitions have been removed due to no longer being relevant or being superseded with new terminology.</p> <p>Condition L1.1.3 has also been added to the licence clarifying that any standards mentioned in the licence (e.g. monitoring standards) refer to the relevant parts of the standard in force at the time. This is added to ensure that the licensee does not refer to superseded standards or their parts in complying with licence conditions.</p>	
Premises operation	L1.2.1 – L1.2.2	<p>Operation</p> <p>Condition 1.2.1 and Table 1.2.1 have been added to the licence to specify the approved waste types (solid and liquid), as equivalent to conditions G1 and W5 of the previous version of the licence but with some changes as follows:</p> <ul style="list-style-type: none"> • Addition of limits to the volumes of wastes able to be accepted (see Fugitive emissions and Emissions to land sections for details on relevant risk assessments). A maximum of 5,000 tpa of solid wastes (excluding clean fill) has 	<i>Environmental Protection (Controlled Waste) Regulations 2004;</i>



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Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>been set, based on the maximum for which the Shire of Waroona have paid annual licence fees on in the past. Clean fill has been excluded due to being required for cover and having no direct link with environmental risk. A maximum of 850 tonnes of liquid waste has also been set (as per the design capacity of the liquid waste facility under works approval W4513/2008/1).</p> <ul style="list-style-type: none"> • Removal of requirement for asbestos received to be double-lined and labelled "CAUTION ASBESTOS". These requirements have not been retained as this is a requirement of the <i>Environmental Protection (Controlled Waste) Regulations 2004</i> (see Fugitive emissions sections for relevant risk assessments). • Addition of controlled waste codes related to septage waste and greasetrap waste for clarity. These waste types have also been defined in condition 1.1.2. <p>Condition 1.2.2 has also been added as part of this amendment to specify the requirement to quarantine non-conforming wastes to a dedicated area prior to transfer off-site (see Emissions to land and Fugitive emissions sections for the relevant risk assessments).</p>	<p>Landfill Waste Classification and Waste Definitions 1996 (as amended);</p>
Premises operation	L1.2.3	<p>Operation Condition 1.2.3 and Table 1.2.1 have been included on the licence to combine the various processes and process limits (controls) that were set out under various conditions of the previous licence (conditions G2, G3, A1, A2(a)-(b), W2(a) and W6); relating to the management of storage and landfilling activities, the burning of greenwaste and the management of the septage treatment ponds. The environmental risk assessments which support these conditions can be found in the Emissions to air, Fugitive emissions and Emissions to land sections.</p> <p>Some changes and additions have been made as compared with the previous conditions as part of this amendment, including:</p> <ul style="list-style-type: none"> • Adding a requirement to only landfill waste in the active landfill area, as marked in the Premises map (see Fugitive emissions and Emissions to land sections for details on the accompanying risk assessments); 	<p><i>Environmental Protection (Controlled Waste) Regulations 2004</i></p>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<ul style="list-style-type: none"> • Waste disposal to achieve final height of 42.5m AHD and contours of 5 – 20%; • Weekly covering of waste has been set, without carrying over Table 1 from the previous licence which set cover frequencies based on volume received (see Fugitive emissions sections for details on the accompanying risk assessments); • The removal of the requirement to maintain a 35m buffer between the premises boundary and any waste placement, due to this contradicting the active landfill area as defined in the Map of the Premises in Schedule 1. • The removal of the requirement to maintain a 100m distance to surface water bodies, as it is known that this distance is already maintained at the outer Premises boundary (see Emissions to land sections for details on the accompanying risk assessment). • The requirement for the record of locations of asbestos disposed to be kept specifically as “grid references on a site plan” has been removed, as the Delegated Officer considers it to be prescriptive and not directly linked to risk and the overall outcome required is that locations are kept on record. • The requirement for asbestos cover to be witnessed and signed off by a staff representative within 2 hours has also not been retained, as it is an administrative procedure that is not directly related to environmental risk (see Fugitive emissions section for details on associated risk assessment). • A requirement for the minimum cover over Asbestos to be maintained. This has been added to control the risk of asbestos becoming exposed after burial, as observed by DWER Officers at a previous compliance inspection (see Fugitive emissions section for details on associated risk assessment). • Greenwaste burning requirements have been reduced from those under conditions A2 (a)-(d) of the previous version of the licence, which mirrored the requirements of the <i>Environmental Protection (Rural Landfill) Regulations 2002</i>. The Delegated Officer considered that not all previous requirements were in accordance with DWER’s <i>Guidance Statement: Regulatory Principles</i> or DWER’s <i>Guidance Statement: Setting Conditions</i> in that they were not all site specific, risk-based or (in some cases) enforceable. 	



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<ul style="list-style-type: none"> • A requirement to ensure that there is no overspray from the use of aerators or sprinklers past the walls of the ponds has been added (see Emissions to land sections for more detail on the accompanying risk assessments). • The requirement for “no discernible seepage loss from outer pond embankments” has been removed, due to condition 1.2.4 which already requires ponds to have a low permeability liner (see Emissions to land sections for details on the accompanying risk assessments). • Management controls for the liquid waste biofilter area have been added, including preventing the ingress of stormwater, maintenance of a 300mm freeboard (as per the other ponds), maintenance of vegetation in the biofilter, and the requirement for overflows to be prevented (through transfer of water to the final effluent storage pond, as required) (see Emissions to land sections for details on the accompanying risk assessments). <p>During consultation with the Licence Holder the requirements of Condition 1.2.3, Table 1.2.2 were amended (see Section 5 of this Decision Report for details).</p> <p>The Controlled Waste regulations also include requirements for the acceptance and landfilling of asbestos and tyres, and this is added as a footnote to the condition for clarity.</p>	
Premises operation	L1.2.4	<p>Operation</p> <p>Condition 1.2.4 has been added setting containment requirements related to the liquid waste facility. The liquid waste facility infrastructure was not reflected on the previous version of the licence despite its construction in 2012. Some requirements from condition W6 of the previous version of the licence are incorporated in Table 1.2.3 (no overtopping, anaerobic pond to be at least 3m in depth and trapped overflows to be maintained) as well as a requirement for the septage treatment ponds and final effluent storage pond to have a low permeability liner (in accordance with their original design). Additionally, a set of requirements has been added for the liquid waste biofilter area in accordance with the recommendations within the Environmental Assessment Report for works approval W4513/2008/1, including a requirement for the area to include an</p>	Works Approval W4513/2008/1 Buller Rd Refuse Disposal Site (issued by Department of Environment and Conservation 2 nd July 2009)



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Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		underlying low permeability liner to prevent the discharge of liquid waste from the area (see Emissions to land section for details of the accompanying risk assessment).	
Premises operation	L1.2.5 – L1.2.8	<p>Operation Conditions 1.2.5 – 1.2.8 have been included on the licence, as equivalent to various conditions on the previous version of the licence (conditions G4(a-c), G5(a-c), A2(c-d), W1(a-c) and S1) with minor administrative modifications. See the Emissions to air, Fugitive emissions and Emissions to land sections for details on the risk assessments relating to retaining these conditions.</p> <p>During consultation with the Licence Holder the requirements of Condition 1.2.5 were amended (see Section 5 of this Decision Report for details).</p> <p>See the Emissions to air, Fugitive emissions and Emissions to land sections for details on the risk assessments relating to retaining these conditions.</p>	
Premises operation	L1.2.9 – 1.2.12	<p>Operation Condition 1.2.9 has been added as part of this amendment for additional management requirements for landfilling in the active landfill area to ensure it is undertaken in a staged approach with three stages, in accordance with the Buller Road Landfill Closure Management Plan.</p> <p>Condition 1.2.10 has been added to require the provisioning of passive venting infrastructure for landfill gas within 6 months of the completion of disposal in a phase.</p> <p>Condition 1.2.11 has been added to require the placement of waste to ensure all faces are stable and capable of retaining capping and rehabilitation material.</p> <p>Condition 1.2.12 has been added to require that capping occurs within 6 months of disposal being completed within a phase and to specify the capping requirements. The capping layers have been set based on the capping commitments in the Buller Road Landfill Closure Management Plan.</p> <p>See Emissions to air, Fugitive emissions and Emissions to land sections for details on the risk assessments which support the inclusion of these conditions.</p>	'Buller Road Landfill Closure Management Plan' (ASK Waste Management, May 2016).



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		During consultation with the Licence Holder the requirements of Conditions 1.2.9, 1.2.10 and 1.2.12 were amended (see Section 5 of this Decision Report for details).	
Emissions to air including monitoring (Burning of greenwaste)	L1.2.3 L1.2.5 L1.2.6	Refer to Appendix A - Environmental Risk Assessment for details of assessment and related licence conditions	
Emissions to air including monitoring (Landfill gas)	L1.2.10 L1.2.12	Refer to Appendix A - Environmental Risk Assessment for details of assessment and related licence conditions	
Emissions to land including monitoring (landfilling operations)	L1.2.1 – L1.2.3 L1.2.7 L1.2.9 - L1.2.12 L3.3.1 L4.1.1 L5.2.1	Refer to Appendix A - Environmental Risk Assessment for details of assessment and related licence conditions. During consultation with the Licence Holder the requirements of Conditions 3.3.1 and 4.1.1 were amended (see Section 5 of this Decision Report for details).	
Emissions to land including monitoring (Liquid waste facility)	L1.2.1 L1.2.3 - L1.2.4 L1.2.8 L3.3.1 L4.1.1 L5.1.3	Refer to Appendix A - Environmental Risk Assessment for details of assessment and related licence conditions	
Emissions to land including monitoring (Evaporative sprinklers)	L1.2.3	Operation <u>Emission Description</u> <i>Emission:</i> Potential fugitive emissions of liquid waste as a result of spray drift from the introduction of evaporative sprinklers in ponds. <i>Impact:</i> Contamination of surrounding soil with nutrients and heavy metals over time, resulting in potential secondary leachate generation and movement from rain falling on contaminated soils. The potential addition of nutrients into the system is of key concern	



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		<p>with the Premises being located in the <i>Environmental Protection Peel Inlet - Harvey Estuary Policy 1992</i> area.</p> <p><i>Controls:</i> Spray drift from sprinklers will be minimised with the use of 'Wobbler' sprinklers with a 4.76mm nozzle that discharges in a heavy droplet rather than a fine spray. A flow pump is proposed to be used rather than a pressure pump which will handle suspended solids and prevent discharge past the boundaries of the ponds. Solenoids operate the sprinklers in each pond so all sprinklers cannot operate at once.</p> <p><u>Risk Assessment</u> <i>Consequence:</i> Slight, emission from spray drift would be minimal if it occurred <i>Likelihood:</i> Unlikely, use of droplet sprinklers and moderation of number in operation at any one time means the consequence will probably not occur in most circumstances. <i>Risk Rating:</i> Low</p> <p><u>Regulatory Controls</u> Condition 1.2.3 (Premises operation section) has had a requirement added to ensure that the operation of sprinklers does not result in overspray past the boundary of the ponds. This captures the commitment made in the Application which has been an assumption in the assessment.</p> <p><u>Residual Risk</u> <i>Consequence:</i> Slight <i>Likelihood:</i> Unlikely <i>Risk Rating:</i> Low</p>	
Fugitive emissions	L1.2.1 L1.2.3 L1.2.5 L1.2.9 - L1.2.12 L2.1.1	Refer to Appendix A - Environmental Risk Assessment for details of assessment and related licence conditions	



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
	L5.1.3		
Odour	L1.2.3 - L1.2.4 L5.1.3	Refer to Appendix A - Environmental Risk Assessment for details of assessment and related licence conditions	
Odour (Evaporative sprinklers)	L5.1.3	<p>Operation</p> <p><u>Emission Description</u> <i>Emission:</i> Odour emissions from the operation of the proposed aerators and associated evaporative sprinklers on the liquid waste facility ponds. <i>Impact:</i> Potential amenity impacts for nearby land users or visitors to the Premises. The nearest single residence to the Premises boundary is approximately 450m to the southeast. Potential reversible public health impacts in the case of extreme or persistent odour emissions. <i>Controls:</i> A droplet system is installed (instead of mist) with a flow pump (instead of a pressure pump) to ensure that spray-drift does not occur. Solenoids ensure that the aerators and sprinklers only operate on 1 – 2 ponds at any one time.</p> <p><u>Risk Assessment</u> <i>Consequence:</i> Slight, the amenity impact of odour from sprinklers would be minimal at the local level. <i>Likelihood:</i> Unlikely, the likelihood of odour from sprinklers Causing amenity impacts will probably not occur in most circumstances <i>Risk Rating:</i> Low</p> <p><u>Regulatory Controls</u> Given the low risk of odour from the addition of aerators and sprinklers, specific odour control conditions are not recommended at this stage. Unreasonable odour can be regulated using the general provisions of the <i>Environmental Protection Act 1986</i>. In any case, condition 5.1.3 (Records section) is included for the maintenance of records regarding any complaints received and actions taken. This will ensure that any offsite impacts of odour are detected and therefore able to be addressed in real time.</p>	General provisions of the <i>Environmental Protection Act 1986</i>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<u>Residual Risk</u> <i>Consequence:</i> Slight <i>Likelihood:</i> Unlikely <i>Risk Rating:</i> Low	
Noise	L5.1.3	<p>Operation</p> <p><u>Emission Description</u> <i>Emission:</i> Noise emissions from operational landfilling activities in the current landfilling area and asbestos disposal area. Noise is generated from machinery and vehicle movements associated with the handling and disposal of waste. <i>Impact:</i> Amenity impacts to nearby land users (nearest residence is 450 m from Premises boundary) from unreasonable noise emissions. <i>Controls:</i> The current landfilling area is surrounded by a buffer of native vegetation. According to the licence amendment application, noise is minimised through limiting the hours of work to weekdays between 8:00am and 3:00pm which are within the day time hours set out in the Noise Regulations.</p> <p><u>Risk Assessment</u> <i>Consequence:</i> Slight. Noise emissions from vehicles and machinery in daytime hours could have a minimal impact to amenity but are unlikely to result in exceedances of specific consequence criteria for public health (assigned levels in the Noise Regulations). <i>Likelihood:</i> Possible, a low level impact to amenity could occur at some time <i>Risk Rating:</i> Low</p> <p><u>Regulatory Controls</u> Noise emissions from existing landfill operations can be regulated using the <i>Environmental Protection (Noise) Regulations 1997</i>. In any case, condition 5.1.3 (Records section) is included for the maintenance of records</p>	<i>Environmental Protection (Noise) Regulations 1997;</i>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>regarding any complaints received and actions taken. This will ensure that any offsite impacts of noise are detected and therefore able to be addressed in real time.</p> <p><u>Residual Risk</u> <i>Consequence:</i> Slight <i>Likelihood:</i> Possible <i>Risk Rating:</i> Low</p>	
Monitoring general	L3.1.1	<p>Operation Condition 3.1.1 has been included specifying the relevant Australian Standards relating to the monitoring required by the licence (see Emissions to land and Ambient quality monitoring sections for more detail). These correspond to definitions under condition 1.1.1 of the licence. The condition is translated from previous condition W4(a) and (c) which required monitoring in accordance with AS 5667.1, AS 5667.11 and monitoring by a NATA accredited laboratory; however AS 5667.10 and AS/NZS 2031 have also been added as part of the amendment as these are also relevant to the monitoring specified in the licence.</p>	AS/NZS 5667.1 AS/NZS 5667.10 AS/NZS 5667.11 AS/NZS 2031
Monitoring of inputs and outputs	L3.2.1	<p>Operation Condition 3.2.1 / Table 3.2.1 have been included requiring the monitoring of waste inputs and wastes rejected and sent off-site. This includes both solid wastes and liquid wastes, despite the previous version of the licence only requiring the monitoring of liquid wastes received. This is a new requirement and has been added to enable the operations of the Premises to be compared against the acceptance limits set in condition 1.2.1.</p>	
Ambient quality monitoring	L3.3.1	<p>Operation Condition 3.3.1 / Table 3.3.1 requires the monitoring of the existing five groundwater monitoring bores, to assist in the detection of groundwater impacts over time. The intent of the condition is transferred over from previous condition W4(a); however has had parameters added as part of this amendment to enable the data produced by the bores to be of more value in detecting contamination. Additional parameters include standing water level m(BGL), dissolved oxygen, oxidation/reduction potential, BOD, fluoride, sulfate, aluminium, arsenic, iron, mercury and nitrite-nitrogen in accordance with the</p>	'Buller Road Landfill Site, Waroona; Additional advice on environmental risks and potential



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>recommendations made in the Technical Expert Report (Appendix D). <i>E. coli</i> has also been added due to nearby surface water bodies as it is known to persist in groundwater and is often present in high levels in landfill leachate and septage waste. In addition, the Delegated Officer has added two monitoring bore locations (clustered bores of varying depths) in accordance with the recommendations within the Technical Expert Report which will enable detection of contamination and the mapping the groundwater plume. These bores are required to be installed under condition 4.1.1 (IR2) of the Improvements section of the licence, and monitoring of these bores is therefore only applicable subject to compliance with this condition.</p> <p>During consultation with the Licence Holder the requirements of Condition 3.3.1 was amended (see Section 5 of this Decision Report).</p>	<p>mitigation measures for the proposed expansion of the landfill site' (DER Technical Expert Report, S. Appleyard, 17 October 2016);</p>
Improvements	L4.1.1	<p>Operation Condition 4.1.1 / Table 4.1.1 have been included on the licence setting improvement requirements as follows:</p> <ul style="list-style-type: none"> - (IR1) the installation of groundwater monitoring bores in two locations (being clustered bores of varying depths, at the current MB2 position and in the southwest extent of the landfill area) in accordance with the recommendations within the Technical Expert Report. The new bores will enable detection of contamination and the mapping the groundwater plume. See the Emissions to land sections for further details on accompanying risk assessments. - (IR2) the preparation of a groundwater monitoring verification report to be submitted late 2018 which draws on existing and new data from the bores to explain the hydrogeological setting of the site. This has been added to enable a better understanding of the extent and direction of the contamination plume and therefore the likely impacts. There is no record of such a study having been done at this Premises, unlike comparable landfill sites. See the Emissions to land sections for further details on accompanying risk assessments. <p>During consultation with the Licence Holder the requirements of Condition 4.1.1 was amended (see Section 5 of this Decision Report).</p>	



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
Records	L5.1.1 – L5.1.5	<p>Operation</p> <p>Conditions 5.1.1 - 5.1.5 have been added onto the licence as part of this amendment relating to the maintenance of records on the Premises.</p> <p>Condition 5.1.1 contains the blanket requirements for all records required by the licence to be legible, trackable and retained for a suitable period of time, to ensure their integrity and ability to be used by DWER and the Licensee.</p> <p>Condition 5.1.2 requires the completion of an annual audit compliance report (AACR) as a record of the extent of compliance with the licence conditions. This condition is the equivalent to condition G7 of the previous licence; however a form is no longer attached to the licence. The <i>Guideline: Annual Audit Compliance Reports</i> (DER August 2016) provides assistance to licence holders for Compliance Reports.</p> <p>Condition 5.1.3 requires the maintenance of a record of all complaints received relating to the Premises. While there is no significant history of complaints on the Premises this is considered an appropriate condition for the responsible operation of a landfill site which does have the ability to generate complaints (see Fugitive emissions, Odour and Noise sections for more detail on the environmental risk assessments relevant to this requirement).</p>	DER August 2016, <i>Guideline: Annual Audit Compliance Reports</i>
Reporting	L6.2.1	<p>Operation</p> <p>Condition 5.2.1 / Table 5.2.1 has been added to set the requirement for the submission of the Annual Environmental Report. This is the equivalent to condition G6 of the previous licence; however also includes the additional monitoring (monitoring of emissions to land and monitoring of inputs and outputs) that has been added in this licence amendment, a requirement to demonstrate how sampling standards have been met, and a requirement to provide a summary of any failure/malfunction of pollution control equipment or environmental incidents that occurred during the annual period. In addition to the graphical comparison of monitoring data which was required under condition G6, the condition now also specifies the requirement for an assessment of this data (see the Emissions to land section for more detail on the environmental assessment that supports this). It is noted that previous AER's submitted by the Shire of Waroona have basically complied with this requirement.</p>	



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
Notification	L5.3.1	Operation Condition 5.3.1 has been included on the licence to require notification to DWER of any unauthorised landfill fire (i.e. not including greenwaste burning under condition 1.2.3). This is the equivalent to condition A2(e) of the previous licence; however condition 5.3.1 requires initial notification within ~1 working day of the fire occurring, and a more detailed report to follow as soon as practicable afterwards. A form (N1) has been provided in attachment to the licence to clearly set the detail of the notification. Condition 5.3.1 also requires notification to the CEO in advance of any proposed desludging of liquid waste ponds. This has been added to ensure that DWER has notice and details of the management measures that will be employed during desludging for both odour and leachate emissions (see Emissions to land and Odour sections for the associated risk assessments supporting this condition).	
Licence Duration	-	The licence, which was originally issued in 2011 for a duration of 5 years (expiry 8 September 2016), had its duration extended to 2030 by Amendment notice issued 29 April 2016. No change to the licence duration has been made as a result of this licence amendment.	



5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
28/03/2017	Proponent sent a copy of draft instrument (response received 27 April 2017)	(1) Section 'Premises description and Licence summary': (a) Insert 'is' fully secured.	(1) Description amended and 'is' inserted.
		(2) Table 1.2.2: (a) Clarification is requested regarding the application of 0.3 m and 1 m of cover material respectively and if a total 1.3m cover material is required over asbestos at the end of the disposal day.	(2) The specification for additional 1m of cover at the end of the working day was added to manage the risk of asbestos being uncovered inadvertently, which had been noted at a previous compliance inspection. The risk of this occurring has been reviewed and the following alternative changes have been made in reponse: (i) The requirement for an additional 1m of cover has been deleted . (ii) The requirement for asbestos not being uncovered or disturbed has been amended to include the text ' <i>and maintained with a minimum cover of 300 mm Cover Material</i> '.
		(3) Table 1.2.3 regarding the 'Liquid Waste Biofilter, the Licensee confirmed that the pond was constructed with a permeability no greater than 1×10^{-9} metres per second.	(3) Noted, request for confirmation deleted.



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>(4) Condition 1.2.5 regarding windblown waste:</p> <p>(a) Item (i) <i>'Litter screens are not required. The tipping face is below ground level in the landfill void. Any windblown waste would be caught by the perimeter fence, and can be removed from there'.</i></p> <p>(b) Item (ii) <i>'Given the size and staffing at the premises, fortnightly formal inspections are reasonable and are currently undertaken as part of operating procedure. The small size of the premises means that any serious breach in windblown waste is likely to be detected during the normal operations at the site'.</i></p> <p>(5) Condition 1.2.8 regarding sludge management requirements, the Licensee requests to change the wording to the following: <i>The Licensee must ensure that sludge and solid waste removed from the septage treatment ponds is stored on-site in a manner that prevents:</i></p> <p><i>(i) Contamination of soil by leachate or sludge;</i> <i>(ii) Surface run-off of leachate or sludge; or</i> <i>(iii) Infiltration of leachate more than 10 cm below the ground surface.</i></p> <p>The Licensee states: <i>'The removal of sludge from the septage ponds will be a rare event, due to the low throughput and low solids content of the received liquid waste. Although the requirement for a hardstand exists on the current licence, it is considered that this is unnecessary and restrictive. The requested change would provide alternative options to be utilised, such as to dry the sludge in-situ or in a lined skip bin, both of which would be preferable to drying the sludge on a hardstand area'.</i></p>	<p>(4) The requirement for litter screens on the existing licence is noted and the request to remove the requirement for litter screens is understood to mean no litter screens were previously used at the premises. The discharge of windblown waste from the Premises is not approved and may be considered with regards to Section 23 of the Litter Act 1979 and/ or Section 49A of the EP Act.</p> <p>(a) The requirement to maintain litter screens has been deleted.</p> <p>(b) The frequency of collection has been amended from weekly to fortnightly.</p> <p>(5) The proposed condition is not considered to be clear or certain particularly compared to the methods of containment proposed as examples. The existing condition 1.2.8(ii) has been amended to include the term <i>'contains or returns sludge Leachate ...'</i>. This is considered consistent with the methods of containment proposed as examples by the Licence Holder.</p>



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>(6) Condition 1.2.9 regarding the management of phased landfilling activities, the Licensee states:</p> <p><i>'It is requested that the current active area is given the timeframe of the life of the landfill as one phase (30 years). Currently as stated in the closure plan, this is 30-45 years. Phase 1 and phase 2 are already in operation and have been for many years. These two phases will be filled consecutively, with phase 1 being filled and capped first. The 3rd phase is currently being mined for cover material. The current Closure Plan does not explain the operation of the cell in its entirety. The reason for this style of operation, is it keeps landfill trucks/ mobile equipment, separate from the general public emptying trailers. There MUST be a delineation between these activates. We are working with a legacy operational design flaw which is very difficult and expensive to overcome. Providing a timeframe of life of operations, or at the very least, until the expiry date of this licence (2030) will not see the need for a licence amendment to be submitted at the time'.</i></p>	<p>(6) The Active Landfill Area defined in the Licence covers the land area incorporating landfill phases 1, 2 and 3 as defined in the document '<i>Buller Road Landfill Closure Management Plan</i>' (CMP) dated May 2016. The CMP states '<i>the cell will be filled progressively capped in a west to east direction with each stage being filled from the north to south</i>'. The Delegated Officer understands that the nominal 7-15 year lifespan per stage is based on waste capacity and not on actual time the stage will be operating. The control of the active landfill area to reduce the risk of leachate emissions to groundwater is primarily achieved through cover, capping and restricting the size of the active landfill area. The CMP and information provided by the Licensee do not adequately convey how this is proposed to be achieved. Subsequently:</p> <ul style="list-style-type: none">(a) Condition 1.2.3 has been amended to include the new requirements (b) and (c) that limit the final height and profile of the Active Landfill Area;(b) Condition 1.2.9 has been amended to allow for the operation of two phases concurrently without a time limitation while requiring sufficient cover of waste to help control the volume of leachate emissions.



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>(7) Condition 1.2.10 regarding the timeframe for landfill gas passive venting, the Licensee requests to change the wording to the following: <i>The Licensee must ensure that passive venting of landfill gas is a key component of the final landfill cap design and closure plan for the landfill.</i></p> <p>The Licensee states: <i>'The relatively low landfilling rate, the open landfilling operations and high permeability of the surrounding soil means that build-up of landfill gas is unlikely to be an issue at this site during operations'.</i></p> <p>(8) Table 3.3.1 regarding groundwater monitoring bores, the Licensee requests:</p> <p>(a) The monitoring parameters PFOS and PFOA are removed from the requirements; and</p> <p>(b) Clarification is provided for the inclusion of the additional parameters: dissolved oxygen; redox potential; E. coli; BOD; fluoride; sulphate; nitrite; phosphorus; and phosphate.</p> <p>The Licensee raises concerns regarding the cost and need for additional sampling requirements, likelihood of contaminants arising from the premises being present, lack of consistency between other landfill monitoring requirements and need for indicators to justify more comprehensive monitoring requirements.</p>	<p>(7) Condition 1.2.10 has been amended to clarify that infrastructure for the passive venting of landfill gas is not required prior to the installation of the low permeability final Capping layer. The Delegated Officer considers that the wording recommended by the Licensee is not consistent with DWER's Guidance Statements, specifically being clear and enforceable.</p> <p>(8) The Delegated Officer considers that due to the risk of emissions of leachate to groundwater and the uncertainty regarding the construction specifications of the existing groundwater monitoring bore network that additional hydrogeological information is appropriate.</p> <p>(a) The requirement to monitor PFOS and PFOA has been deleted in consideration that no known contaminated material has been disposed of at the Premises and that the existing groundwater monitoring bore arrangement may not be located appropriately to collect representative samples. The requirement for monitoring to screen for the potential presence of PFOS and PFOA in groundwater may be considered in the future.</p> <p>(b) All additional parameters that have been included within Table 3.3.1 are maintained and are considered appropriate to facilitate the interpretation of groundwater data. The parameters are contaminants themselves and/ or indicators of changes in groundwater chemistry as a result of contaminants being present.</p>



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>(9) Condition 4.1.1, the Licensee requests the requirement to install new groundwater monitoring bores MB6(s), MB2(D) and MB6(D) is removed.</p> <p>The Licensee refers to the justification under item 10 below.</p> <p>(10) Condition 4.1.1 regarding Table 4.1.1 improvement reference IR1 and IR2 the Licensee considers that the completion timeframes are unreasonable and the cost is estimated to be too high. The Licensee states:</p> <p>(a) <i>'The Shire of Waroona does not have the geological profile logs for the existing bores'.</i></p> <p>(b) <i>'In addition, LG is required to go out to tender with works of this scale. The timeframe is too tight'.</i></p> <p>(c) <i>'... the Shire cannot Tender projects, estimated \$80K to undertake this work, in one financial year. It is proposed that the Shire continue its GW monitoring program (currently bores are sampled quarterly) over the next 5 years, provide DER with substantial and meaningful GW analysis of current bores annually and that a financial reserve is accumulated over this time to undertake the hydrogeological review requested in IR2'.</i></p>	<p>(9) Noted, see response to item (10) and (11) below.</p> <p>(10) Noted and considered as follows:</p> <p>(a) Noted, this uncertainty is addressed in part by item 11 below and informs the need for additional hydrogeological investigation.</p> <p>(b) Noted, the 'Dates of completion' in Table 4.1.1 have been extended 1 year to accommodate these local government process requirements;</p> <p>(c) The Delegated Officer considers that due to:</p> <p>(i) the lack geological information in the form of bore logs for existing groundwater monitoring bores; and</p> <p>(ii) existing groundwater monitoring bore data indicating that some level of groundwater contamination is occurring from leachate emissions; and</p> <p>(iii) the paucity of data within the hydrogeological profile to the west/ southwest (assumed down hydraulic gradient) of the landfill;</p> <p>that the installation of new nested groundwater monitoring bores is appropriate and commensurate to the risk of leachate emissions.</p>



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>(11) Condition 4.1.2, the Licensee requests the requirement to install new groundwater monitoring bores MB6(S), MB2(D) and MB6(D) is removed. The Licensee states:</p> <p>(a) <i>'A shallow bore at MB6 was previously installed and maintained. However, the groundwater level is below the bottom of the bore, as such it is dry. Therefore, no samples can be taken from a shallow bore at this location'.</i></p> <p>(b) <i>'The deep bores are considered unnecessary for identifying whether it is likely that groundwater pollution has occurred at the site as a result of the landfill operations. If a leachate plume is emanating from the site, then the results of samples taken from the shallow and intermediate bores should be sufficient to provide an indication that further investigation is needed'.</i></p> <p>(c) <i>'DER has asserted that the landfill leachate would be denser than the surrounding uncontaminated groundwater in the area. As such, leachate would sink below the level of the shallow bores, and be undetected. The main indicator of the presence of a leachate plume is elevated levels of nitrogen, particularly ammonia. Nitrogen salts are soluble, and would disperse through advection and diffusion in the plume in the direction of groundwater flow. It is unlikely all components of the leachate would sink below 15m (the depth of intermediate bores) in a leachate plume. Further, the landfill is surrounded by agricultural land, to which large amounts of different chemicals have been applied over decades. As such, it is unlikely that the groundwater is uncontaminated'.</i></p>	<p>(11) The Delegated Officer considers that the installation of new nested bores is appropriate and commensurate to the risk of leachate emissions.</p> <p>(a) The drilling of a new nested bore at the location MB6 (now named MB7 – see further comments below) to depths of approximately 8, 15 and 30 mBGL is considered appropriate and commensurate to the risk of leachate emissions.</p> <p>(b) & (c) Based on the Expert Technical Advice in Appendix D of this Decision Document, risk of leachate emissions and footprint of landfilling activities, the Delegated Officer considers that the nested bores are appropriate at all depths.</p> <p>Note: Should the Licensee find that the hydrogeological profile differs from the assumptions made by the Delegated Officer, the Licensee should contact DWER to consider the specifications of Condition 4.1.2, Table 4.1.2 and ensure that the installation of new groundwater monitoring bores is done based on the most accurate site specific information. Future groundwater monitoring requirements need to ensure consistency with:</p> <ul style="list-style-type: none"> • ASTM D5092-04(2010)e1 <i>Standard Practice for Design and Installation of Groundwater Monitoring Wells;</i> • Australian Standard AS/NZS 5667.1 <i>Water Quality – Sampling – Guidance of the Design of sampling programs, sampling techniques and the preservation and handling of samples</i> • Australian Standard AS/NZS 5667.11 <i>Water Quality – Sampling – Guidance on sampling of groundwaters;</i> and • <i>National Environment Protection (Assessment of Site Contamination) Measure 1999.</i>



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>(12) Regarding the Premises map the Licensee has stated that the locations for MB1, MB3 and MB4 are not exact and suggests that <i>'these be updated to reflect true location'</i>.</p>	<p>(12) The locations for MB1, MB3 and MB4 were the same locations depicted in the Existing Licence. The Licensee was asked to provide a map of the locations for MB1, MB3 and MB4 including GPS coordinates. The Premises map has been updated based on the locations provided on email 14/08/2017.</p>
		<p>(13) Regarding the new bore location map the Licensee has stated that the installation location of MB6 <i>'... has been placed in the middle of the bush'</i>, where there are no access track. The Licensee states: <i>'The installation of MB6 needs to be in an easily accessible area to avoid further clearing. MB6(l) can be reinstated at the western side of the active landfill on the current fence line. Currently this is dry, so a depth may have to be ascertained at the time of drilling'</i>.</p>	<p>(13) The area demarcated within the map in the Licence has been expanded to provide the Licensee with some flexibility to ensure installation can be undertaken with a minimal disturbance to native vegetation while ensuring the nested bores can intercept groundwater that is understood to be flowing in a west to southwest direction. The new bore location has also been renamed as MB7 so as not to confuse it with the previously installed MB6, which is considered to be too far north.</p>
11/08/2017	Proponent sent a revised copy of draft	<p>(14) Premises description states the facility has approximately 10 years lifespan. This is incorrect, and it is requested that it is revised to "in excess of 20 years".</p>	<p>(14) Amended as requested.</p>



Date	Event	Comments received/Notes	How comments were taken into consideration
	instrument (response received 16 August 2017)	<p>(15) The Map of Premises in Schedule 1 defines the approved Landfill area by a blue outline. Concerns with this boundary are as follows:</p> <ul style="list-style-type: none"> (a) The northern boundary of the facility has a square section of land (managed under the Shire also) that indents, so waste disposal will not be 35m (Condition table 1.2.2) from the boundary once we open stage 3 of the active cell. (b) The site has a dedicated ACM disposal area that is outside this blue boundary. (c) Also, we are currently working on the old inactive cell (between the WWTP and active cell) in an attempt to clean it up and start the first stage of facility closure as per Closure Plan. There maybe a need in future to use waste to fill certain sections to achieve profiles. <p>It is requested that either the requirement to maintain 35m buffer from the boundary is removed, or the blue line around the active landfill area is extended to encapsulate the entire cleared working area of the facility.</p>	<p>(15) The requirement to maintain a 35m buffer from the Premises boundary has been removed. The Delegated Officer considers that this condition is not site-specific and contradicts the active landfill area boundary which is based on the Buller Road Landfill Closure Management Plan for the site.</p> <ul style="list-style-type: none"> (a) The removal of the 35m buffer requirement addresses this concern. (b) Table 1.2.2 does not require ACM (Special Waste Type 1) burial to be restricted to the active landfill area (blue boundary), as long as it is buried in a dedicated area. (c) The Buller Road Landfill Closure Management Plan states that the historic cells are already capped and there is no intention to bury any more waste in this area. The approved landfill area cannot be extended without further risk assessment. The active landfill area has not been changed. The Delegated Officer considers that an application for a licence amendment is required from the Licence Holder for DWER to consider the extension of the area currently approved.
		<p>(16) The Shire has previously installed an MB6 bore that is now dry. The Licence Holder requests bores referred to as MB6 (s)(l)(d) in the current draft licence be named MB7 (s) (l) (d)</p>	<p>(16) Noted and amended as requested.</p>



6 Risk Assessment

Note: This matrix is taken from the DER Guidance Statement: Risk Assessments

Table 1: Emissions Risk Matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost Certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High



Appendix A - Environmental Risk Assessment

Emissions to air including monitoring (*Burning of greenwaste*)

The Licensee burns greenwaste on the Premises in a dedicated area. The Delegated Officer considers that the burning of greenwaste could foreseeably have an amenity impact on nearby sensitive receptors via air/wind dispersion if not managed appropriately. There are no previous risk assessments on DWER record for the activity of greenwaste burning.

Operation

Emission Description

Emission: Smoke from the burning of greenwaste on site will cause emissions of particulates and may have noxious gas emission risks where fires get out of control and spread to the greater landfill, or where greenwaste is burnt which is contaminated with other materials (e.g. plastics).

Impact: Interference with the health, welfare, convenience, comfort or amenity of sensitive receptors off the Premises. The nearest residential receptor is 450m southeast of the Premises boundary. The Bureau of Meteorology data (Figure 2) indicates that a high proportion (>20%) of 9am winds occur in a south-easterly direction, as well as strong (20 – 30km/hr) easterly winds.

Controls: In accordance with the Existing Licence conditions, greenwaste is burnt in a dedicated area at least 500m from the nearest residential receptor, at least 50m from the Premises boundary and does not occur in any area which has had waste deposited historically. Additionally, green waste is only burnt when it is seasoned (dry) and if it has no flammable material in it. An adequate supply of water is kept on site to prevent fire from escaping beyond the greenwaste burning area, and burning is undertaken under the supervision of a Fire Control Officer. The Premises is fenced and locked when unattended to minimise the risk of arson.

Risk Assessment

Consequence: Moderate, the emissions from the burning of greenwaste could low level health effects or occasional medical treatment in the case of contaminated waste being burned inadvertently.

Likelihood: Possible, could occur at some time due to regular burning activities and prevailing south-easterly winds.

Risk Rating: Medium

Regulatory Controls

Licence conditions are appropriate to minimise the potential of losing control of planned greenwaste burns and in advertently burning other waste materials. Licence condition 1.2.3 (Table 1.2.2) includes a subset of requirements for greenwaste burning, including:

- the requirement for greenwaste to be seasoned for at least 2 months prior to burning (for smoke reduction);
- the requirement to burn greenwaste in a designated burning area (defined as having no flammable material other than greenwaste for 50m, in an area where other waste has not been deposited and at least 500m from any residence), to minimise the risk of fire spread and/or the burning of wastes other than greenwaste; and
- the requirement for greenwaste to only be burned in wind speeds of less than 20km/hr, to minimise the risk of fire spread.

These requirements are reduced from those under conditions A2 (a)-(d) of the previous version of the licence, which mirrored the requirements of the *Environmental Protection (Rural Landfill) Regulations 2002*. The Delegated Officer considered that not all previous requirements were in accordance with DWER's *Guidance Statement: Regulatory Principles* or DWER's *Guidance Statement: Setting Conditions* in that they were not all site specific, risk-based or (in some cases) enforceable.



Licence condition 1.2.6 requires there to be procedures in place to enable any unauthorised fire on the Premises to be promptly extinguished. This condition is carried over from previous conditions A2(c) and (d).

In addition to the conditions, the potential occurrence and any impacts arising from any fire at the Premises can also be considered with regards to Section 49 of the general provisions of the *Environmental Protection Act 1986* including the provisions of the *Environmental Protection (Unauthorised Discharge) Regulations 2004*.

Residual Risk

Consequence: Moderate

Likelihood: Unlikely

Risk Rating: Medium

Reference documents

- General provisions of the *Environmental Protection Act 1986*;
- *Environmental Protection (Unauthorised Discharge) Regulations 2004*;
- DWER's *Guidance Statement: Regulatory Principles*;
- DWER's *Guidance Statement: Setting Conditions*.

Emissions to air including monitoring (*Landfill gas*)

The decomposition of up to 5,000 tonnes per annum of putrescible waste in the unlined, uncapped landfill will result in the production and fugitive emissions of landfill gas. The nearest residential receptor is approximately 450m away from the Premises; however there are no known preferential subterranean pathways for landfill gas and it is assumed that emissions will be diffuse and relatively uniform given the sandy soils. The volumes of landfill gas will be limited by the volume of waste deposited on the Premises.

Operation

Emission Description

Emission: Methane, carbon dioxide and other trace gases emissions due to co-mingling and degradation of putrescible waste during and following acceptance and disposal into the existing approved landfill area. Landfilling of putrescible waste is a heterogeneous process and the generation of landfill gas is not linear. Landfill gas is primarily comprised of methane and carbon dioxide; small amounts of volatile organic compounds can also occur. Higher levels of moisture within the landfill can increase the rate of landfill gas generation. Dissolved phase transport, gas mixed within groundwater and leachate, can also occur.

Impact: Environmental harm can occur through asphyxiation and explosion at sensitive receptors via atmospheric and sub-surface migration pathways. Landfill gas may pass through preferential hydrological and geological pathways if they are present; however there are no known such pathways at the Premises due to the sandy soils. Vertical movements of landfill gas through sub-soil have the potential to contaminate shallow sub-surface groundwater flows. The groundwater is likely to be shallow under the Premises (mBGL is unknown; however monitoring at an adjacent prescribed premises indicates that groundwater is shallow (0 – 5m BGL). Sub-surface groundwater flows may recharge surface water bodies. There are several perennial swamps on adjacent land, within 700m of the landfill, as well as a major agricultural drain approximately 500m to the west of the landfilling activities and understood to be down-hydraulic gradient. Landfill gas such as hydrogen sulphide can also have toxic effects on the health and wellbeing of flora, fauna and human receptors. The nearest residential receptor is 450m away.



Controls: The licensee does not have any active landfill gas management in place and no monitoring has been undertaken to inform the rate of landfill gas being emitted from the waste mass. Less than 5,000 tonnes of putrescible waste is accepted per annum into the existing approved landfilling area. Historically landfilled areas have been capped; however the permeability of this capping is unknown and if using in-situ soil it is likely to be high permeability. Modelling undertaken on the existing active landfill area within the Buller Road Landfill Closure Management Plan indicates that the generation of landfill gas is likely to be less than 103m³/hr and suggests that passive landfill gas management will be required after capping at most. The current active landfill area will be subject to a low permeability capping design in line with the Environmental Protection Authority Victoria guidelines, under the Buller Road Landfill Closure Management Plan. A conceptual landfill gas management (vent) system layout is provided in the Buller Road Landfill Closure Management Plan intended for the current active landfill area.

Risk Assessment

Consequence: Moderate. Landfill gas emissions may result in specific consequence criteria not being met for public health (NEPM ambient air quality standards).

Likelihood: Possible. Landfilling is in a highly permeable environment with nearest receptor within 500m of Premises boundary; however the intention to use a landfill gas management system (vents) and the existence of high permeability sandy soils lower the likelihood of any concentrated emissions of landfill gas.

Risk Rating: Medium

Regulatory Controls

Condition 1.2.10 formalises a requirement for phases to include provisioning for any necessary infrastructure for the management of landfill gas.

Condition 1.2.12 (capping requirements) also requires passive landfill gas management infrastructure to be installed on capped cells. The requirement for provisioning of infrastructure is added to maximise the potential effectiveness of the landfill gas management system, which may be impeded if installation is left until after the completion of capping.

The requirement to install passive landfill gas management is consistent with the commitment made in the Buller Road Landfill Closure Management Plan and ensures that the risk posed by landfill gas emissions remains low.

The Delegated Officer considers that based on the moderate risk associated with landfill gas emissions and the low quantities of landfill gas modelling in the Buller Road Landfill Closure Management Plan together with the separation distances at the Premises that monitoring of landfill gas around the boundary of the landfill area is not necessary.

Residual Risk

Consequence: Moderate.

Likelihood: Possible

Risk Rating: Medium

Reference documents

- *Environmental Protection Act 1986*;
- 'Siting, design, operation and rehabilitation of landfills' (Environment Protection Authority Victoria, August 2015);
- 'Buller Road Landfill Closure Management Plan' (ASK Waste Management, May 2016).
- National Environment Protection Measure for Ambient Air Quality (NEPM)
(<https://www.environment.gov.au/protection/air-quality/air-quality-standards#air>)



Emissions to land including monitoring (*landfilling operations*)

The burial of up to 5,000 tonnes per annum of putrescible waste in an unlined landfill will foreseeably result in the production of landfill leachate as a result of rainfall or stormwater ingress. The soil at the Premises is high permeability and superficial groundwater level is understood to be shallow (mBGL is unknown; however monitoring at an adjacent prescribed premises indicates that groundwater is shallow (0 – 5m BGL). Sub-surface groundwater flows may re-charge surface water bodies. There are several perennial swamps on adjacent land, within 700m of the landfill, as well as a major agricultural drain approximately 500m to the west of the landfilling activities and understood to be down-hydraulic gradient. The Delegated Officer considers there to be a foreseeable risk of leachate causing an impact on the receiving environment.

Operation

Emission Description

Emission: Emission of leachate from the burial of putrescible waste in the current landfilling area (or from the inadvertent burial of hazardous wastes in the area if they are not detected), or the release of stormwater which has become contaminated with waste to the environment. The current landfilling area does not have engineered or synthetic cell lining or a leachate control system, with all solid waste disposal occurring directly on the sand floor of the excavation. Historic areas of the landfill are understood to be capped; however the permeability of the capping is unknown. If in-situ soils were used for capping, it can be assumed that the capping is of a high permeability allowing rainfall and stormwater to easily percolate into the waste mass.

Impact: Contamination of surrounding land, underlying groundwater (groundwater monitoring at an adjacent premises indicates this is likely to be shallow) and potential secondary contamination of surface water drainage systems through groundwater recharge to nearby surface water systems (within 700m). The Technical Expert Report (see Appendix D) identifies that groundwater investigations undertaken on unlined landfill sites in the Perth metropolitan region have indicated groundwater contamination plumes typically range between 500 and 1000 metres in length. Impacts are on ecology of surface water where addition of high BOD water that also contains nutrients, heavy metals, chemicals (e.g. pesticides or other residual constituents of waste feedstocks) and/or hydrocarbons are likely. The potential addition of nutrients into the system is of key concern with the Premises being located in the *Environmental Protection Peel Inlet - Harvey Estuary Policy 1992* area. Eutrophication of nearby surface water (algal blooms) and anoxic events may result. The Premises is in a *Rights in Water Irrigation Act 1914* proclaimed groundwater area, from which downgradient land users abstract groundwater for multiple uses. The Technical Expert Report also estimates that approximately 120L/m² of leachate is likely to be produced at the Premises annually assuming a daily cover of 1m of sandy soils over wastes.

Controls: The landfill accepts not more than 5,000 tonnes of putrescible waste per annum. Cover (in situ sand) is applied on a minimum weekly basis to waste. The Licensee advises they maintain a minimum separation distance of 3m to groundwater in the landfilling area. Clean stormwater from the peripheral areas of the site is directed to two stormwater basins. The Licensee advises that the stormwater system is kept clear of waste and prevents ingress of stormwater into waste-impacted areas which could otherwise cause the unnecessary generation of additional leachate. The Licensee operates in accordance with their Buller Road Landfill Closure Management Plan which divides the active landfill area into three separate stages running from east to west of 100,000m³ – 130,000m³ each, which are progressively filled and capped from the north to the south. Collectively, the stages are estimated to offer 20 – 45 years capacity (7 - 15 years per stage). There are five groundwater monitoring bores on the Premises for the detection of nutrients and other contaminants reaching the groundwater; however it is noted that the absence of clusters of bores that monitor different depths



within the aquifer at specific locations indicates the current monitoring bore network is unlikely to be effective in intercepting the groundwater contamination plume¹.

Risk Assessment

Consequence: Moderate, addition of nutrients and other contaminants to groundwater may result in low-level impacts off-site at a local scale (nearby wetlands), and specific consequence criteria at the risk of not being met for both environment and public health (*Environmental Protection Peel Inlet - Harvey Estuary Policy 1992* and Department of Health *Contaminated sites ground and surface water chemical screening guidelines*, respectively).

Likelihood: Likely, landfill is unlined, in sandy soils and does not have any leachate collection system.

Risk Rating: Medium

Regulatory Controls

A number of conditions have been set on the licence as follows to alleviate the risk of leachate contamination from the existing landfill.

Condition 1.2.1 (Premises operation section) specifies the allowable waste types as per conditions G1 and W5 of the previous version of the licence. This includes the requirement for contaminated solid waste to meet the acceptance criteria for a Class II landfill. Condition 1.2.1 differs from G1 and W5 in that it is in tabular format and it has additional detail added to set quantity limits on wastes received, with the exception of clean fill which can be used as cover and has no direct relation to environmental risk.

Condition 1.2.2 (Premises operation section) has been included on the licence for the special management (quarantine storage) of any waste received which does not conform to the allowable waste types in 1.2.1. The acceptance of non-conforming waste types and/or their inappropriate storage could have potential impacts on the nature of leachate generated and resulting contamination and should not occur. This is a new condition which did not appear on the previous version of the licence.

Condition 1.2.3 (Premises operation section) sets out all process requirements for the receipt, handling and disposal of wastes and includes a range of controls which are relevant to managing leachate, including:

- Restricting disposal of waste to the active landfill area and spatially defining the Active Landfill Area footprint (to minimise leachate footprint). This is a new condition but in keeping with the intent of the previous version of the licence.
- Prohibiting the burning of waste (other than greenwaste), which could otherwise result in generation of toxic leachate. This condition is carried over from the previous licence condition A2(a).
- Maintaining undisturbed groundwater separation of 3m between base of waste disposal area and highest groundwater level. This condition is carried over from the previous licence condition W2(a).
- Liquid wastes only to be placed in the anaerobic/disposal pond. This condition is carried over from previous licence condition W5.

The requirement to maintain a minimum distance of at least 100m from the landfill to the nearest surface water body (previous condition W2(b)) has not been carried over as part of this amendment, due to no natural surface water bodies occurring within this distance.

Condition 1.2.7 (Premises operation section) for the management of uncontaminated stormwater on the Premises has been included to ensure clean stormwater is directed away from any areas where waste is present. This condition is carried over from previous conditions W1(a)-(c).

¹ The contamination plume is likely to increase in depth in the superficial aquifer with increasing distance downgradient due to the higher density of contaminated groundwater than natural uncontaminated groundwater.



Condition 1.2.9 (Premises operation section) has been added for landfilling in distinct stages, to reduce the potential size of the open/active waste body and therefore leachate generation potential. The condition limits the landfilling in stage 3 to after capping of stage 1 has commenced and intermediate cover has been applied, to reduce the volume of leachate generated. This is basically congruent with the Buller Road Landfill Closure Management Plan which divides the active landfill area into three distinct phases with operational capacities of 7 – 15 years each.

Condition 1.2.11 (Premises operation section) has been added for the placement and compaction of waste to be in a manner that ensures faces are stable and capable of retaining capping and rehabilitation material.

Condition 1.2.12 (Premises operation section) has been added to require progressive capping of phases within 6 months of completion of each phase. Capping layer requirements are specified in this condition in accordance with the specifications given in the Licensee's Buller Road Landfill Closure Management Plan. With consideration to the risk of leachate generation and the Technical Expert Report (Appendix D), the Delegated Officer has determined that landfill stages should be distinct from one another to facilitate progressive capping of the Active Landfill Area and thereby minimise potential leachate production. . This control is added with acknowledgement that it will not achieve the same minimisation of leachate as the more stringent option to require the Licensee to utilise clay loam soils as daily cover material, suggested by the Technical Expert Report. Under this scenario, it was modelled that leachate could be reduced to 22 L/m² from 120 L/m² if daily cover was completed with 1m of thick clayey loam soil with a field capacity of 375 mm/m and a wilting point of 125 mm/m. It is noted that the availability of soils meeting this specification may be limited, and the Delegated Officer considers that the immediate commencement of progressive capping is a suitable control which should reduce leachate generation from the landfill mass over it's limited life than capping the entire site after the completion of landfilling.

The Delegated Officer notes that during consultation with the Licence Holder the requirements of Condition 1.2.9 were amended (see Section 5 of this Decision Report). Together the amended Conditions 1.2.9 seek a reasonable balance between:

- ***the operational restrictions faced by the Licensee;***
- ***the uncertainty regarding the methodology, timeframes and interim waste profiles that inform the progressive filling of the Active Landfill Area; and***
- ***the available information on the hydrogeological profile of the Premises; commensurate to the risk from emissions of leachate.***

Following the provision of additional information via Conditions 3.3.1 and 4.1.1 the risk from emissions of leachate may be subject to a review and the regulatory controls specific to the control of leachate emissions may be amended.

Condition 3.3.1 (Monitoring of ambient quality section) requires the monitoring of the existing five groundwater monitoring bores, to assist in the detection of groundwater impacts over time. The condition is transferred over from previous condition W4(a); however has had some parameters added as part of this amendment to enable the data produced by the bores to be of more value in detecting contamination. Additional parameters include standing water level m(BGL), dissolved oxygen, oxidation/reduction potential, BOD, fluoride, sulfate, aluminium, arsenic, iron, mercury and nitrite-nitrogen , , in accordance with the recommendations made in the Technical Expert Report (Appendix D). *E. coli* has also been added as it is known to persist in groundwater and is often present in high levels in landfill leachate and septage waste. In addition, the Delegated Officer has added two monitoring bore locations (clustered bores of varying depths) in accordance with the recommendations within the Technical Expert Report which will enable detection of contamination and the mapping the groundwater plume.



Condition 4.1.1 (Improvements section) has been added as part of the licence amendment, which includes requirements for the monitoring bores mentioned above to be installed and for a groundwater monitoring verification report to be prepared providing data from the bores to explain the hydrogeological setting of the site. This has been added to enable a better understanding of the extent and direction of the contamination plume and therefore the likely impacts. Subject to the results of monitoring over the coming two years, the Delegated Officer may consider the tightening of regulatory controls on the licence further if it is apparent that unacceptable impacts are occurring. This may include a restriction to the burial of inert waste only in the future, or the use of lower permeability daily cover material, if it is apparent that unacceptable impacts to the environment are occurring.

Condition 5.2.1 (Information section) has been included for the annual reporting of all monitoring, including the monitoring of ambient environmental quality under condition 4.3.1. The annual reporting condition is adapted from previous licence conditions G6 (a)-(b).

Residual Risk

Consequence: Moderate

Likelihood: Possible. The likelihood of impact occurring is lowered by regulatory controls, particularly phased landfilling and progressive capping with low-permeability material.

Risk Rating: Moderate

Reference documents

- 'Contaminated sites ground and surface water chemical screening guidelines' (Department of Health, December 2014);
- *Environmental Protection Peel Inlet - Harvey Estuary Policy 1992*
- *Landfill Waste Classification and Waste Definitions 1996* (as amended)
- 'Siting, design, operation and rehabilitation of landfills' (Environment Protection Authority Victoria, August 2015);
- 'Buller Road Landfill Site, Waroona; Additional advice on environmental risks and potential mitigation measures for the proposed expansion of the landfill site' (DER Technical Expert Report, S. Appleyard, 17 October 2016);
- 'Buller Road Landfill Closure Management Plan' (ASK Waste Management, May 2016).

Emissions to land including monitoring (*Liquid waste facility*)

Operation

Emission Description

Emission: Potential emissions of raw or treated liquid waste or liquid waste sludge from ponds or the liquid waste biofilter area, due to unintended leakage, overflow or through the inappropriate storage and dewatering of sludge after pond-cleaning events. There is uncertainty around the extent of the HDPE lining (i.e. lining of the sides as well as the base) that has been incorporated into the liquid waste biofilter area, due to details not being described in the works approval W4513/2008/1 compliance document submitted in 2012. Therefore there is assumed to be an emission to land risk of lateral movement of liquid waste from the biofilter to surrounding soils and groundwater.

Impact: Contamination of surrounding land, underlying groundwater (groundwater monitoring at an adjacent premises indicates this is likely to be shallow) and potential secondary contamination of surface water drainage systems through groundwater recharge to nearby surface water systems (within 700m). Potential impacts on ecology of surface water where addition of high BOD water that also contains nutrients, heavy metals, chemicals (e.g. pesticides or other residual constituents of waste feedstocks) and/or hydrocarbons. The potential addition of nutrients into the system, such as through pond liner failure or overflow is of key concern with the Premises being located in the *Environmental Protection Peel Inlet - Harvey Estuary Policy 1992* area.



Controls: The liquid waste facility is designed to receive no more than 850tpa and is sized to be a contained system (no direct discharge) at this level of operation. The liquid waste biofilter disposal area is underlain with a HDPE liner at a depth of 3m, and is located over the previous clay-lined septage facility which is saturated with nutrients and therefore sustains the vegetation cover that the biofilter relies on all-year round. It is noted that the Delegated Officer is uncertain whether the HDPE lining installed under the biofilter was also installed on its sides to prevent lateral movement. Prior to being disposed of in the biofilter, liquid waste undergoes treatment via four successive ponds including anaerobic, facultative, aerobic and final polishing/storage. Liquid waste facility ponds and the biofilter were constructed under works approval W4513/2008/1 and are all HDPE-lined (or equivalent). A minimum freeboard of 300mm is maintained in all ponds at all times. The facility has been designed such that uncontaminated stormwater doesn't enter the area and unnecessarily overload the ponds, through the installation of stormwater diversion bunds on the upslope sides of the ponds. The liquid waste biofilter is designed to be the last containment point in the treatment chain; however should the area unexpectedly approach capacity (i.e. in Winter months) the licensee has the contingency of pumping water from the biofilter area back to the large final storage pond for temporary holding until the summer months when it can be pumped back and used to sustain the vegetation. During an inspection in 2015, the licensee advised DWER (then-DER) Officers that the ponds have a design life of 10 years before they are likely to require desludging. The licensee has requested an amendment to allow the use of floating aerators incorporating evaporative sprinklers in the ponds to further minimise volumes in the ponds and avoid overtopping (see Emissions to Land (evaporative sprinklers) section below for details). There are also five groundwater monitoring bores on the Premises for the measurement of nutrients and other contaminants.

Risk Assessment

Consequence: Moderate; addition of nutrients may result in low-level impacts off-site at a local scale (nearby wetlands), and specific consequence criteria at the risk of not being met for both environment and public health (*Environmental Protection Peel Inlet - Harvey Estuary Policy 1992* and Department of Health *Contaminated sites ground and surface water chemical screening guidelines*, respectively).

Likelihood: Possible; the lined facility has four stages of treatment to reduce nutrients, and is lined; however there is uncertainty around the extent of lining on the sides of the biofilter and resulting connectivity with surrounding soils. It is considered therefore that the consequence could occur at some time.

Risk Rating: Medium

Regulatory Controls

Condition 1.2.1 (Premises operation section) specifies the allowable liquid waste types as per conditions W5 of the previous version of the licence. Condition 1.2.1 has additional detail added to set the quantity limit on liquid wastes received, being 850 tonnes per annum. This quantity is the maximum assessed and approved capacity as approved under the cover page of the previous version of the licence.

Condition 1.2.3 (Premises operation section) sets out all process requirements for the receipt, handling and disposal of wastes and includes a range of controls which are relevant to managing leachate including:

- Liquid wastes only to be placed in the anaerobic/disposal pond. This condition is carried over from previous licence condition W5;
- Management of the septage treatment ponds (as carried over from condition W6 from the previous version of the licence), including the requirement for uncontaminated stormwater not entering the ponds, maintenance of a 300mm freeboard, and the minimisation of vegetation and floating debris in the ponds. As part of this amendment, the condition requiring there to be no 'discernible seepage loss from ponds has been deleted, due to the requirement in condition 1.2.4 for the ponds to include a low permeability liner; and



- Management of the liquid waste biofilter (new requirements which were not on the previous version of the licence), including the requirement to prevent the incursion of uncontaminated stormwater into the area, maintenance of 300mm freeboard in accordance with the other ponds, maintenance of vegetation across the area and prevention of overflow/freeboard breach through the pumping of excess water back to the final storage pond as required. These controls are added to minimise the risk of overflow and maximise the effectiveness of transpiration by vegetation in the area.

Condition 1.2.4 (Premises operation section) has been added setting requirements for liquid waste containment infrastructure. The condition contains some requirements from previous condition W6 (anaerobic pond at least 3m deep for effective treatment, maintenance of trapped overflows, no overtopping to occur); however the provision for overtopping in an extreme rainfall event has been removed, as this may be addressed under the emergency defence provisions of the *Environmental Protection Act 1986*. A set of requirements have been added for the liquid waste biofilter area in accordance with the recommendations in the original Environmental Assessment Report for works approval W4513/2008/1, including a requirement for the area to incorporate a low permeability liner to prevent any discharge from the area. It is specified in this condition that the liner in the area is to incorporate the sides as well as the base of the area. This control is added to address the uncertainty around the extent of lining of the biofilter area and reduce the overall risk from leachate.

Condition 1.2.8 has been carried over from previous licence condition S1 for the requirement to store sludge from the septage ponds on a lined hardstand area which directs leachate back to the septage treatment ponds. As a result of consultation with the Licence Holder, the condition has been slightly amended to allow the containment of leachate within the sludge storage area.

Condition 3.3.1 (Monitoring of ambient quality section) requires the monitoring of the existing five groundwater monitoring bores, to assist in the detection of groundwater impacts over time. The condition is transferred over from previous condition W4(a); however has had some parameters and bores added as a result of the assessment of risk related to landfilling activities (see Emissions to land (*landfill operations*) for details).

Condition 4.1.1 (Improvements section) has been added as part of the licence amendment, which includes requirements for the monitoring bores mentioned above to be installed, and for a groundwater monitoring verification report to be prepared (see Emissions to land (*landfill operations*) for details).

Condition 5.3.1 (Information section) has been added and includes the requirement to notify the CEO in advance of any desludging of liquid waste ponds. This has been added to ensure that DWER has notice and details of the management measures that will be employed during desludging for both odour and leachate emissions.

Residual Risk

Consequence: Moderate

Likelihood: Unlikely

Risk Rating: Moderate

Reference documents

- 'Contaminated sites ground and surface water chemical screening guidelines' (Department of Health, December 2014);
- *Environmental Protection Peel Inlet - Harvey Estuary Policy 1992*
- s. 75 of the *Environmental Protection Act 1986*
- Works Approval W4513/2008/1 Buller Rd Refuse Disposal Site (issued by Department of Environment and Conservation 2nd July 2009)



Fugitive emissions

Operation

Emission Description

Emission: Fugitive emissions of dust and/or windblown waste from operational landfilling activities in the current landfilling area and the separate asbestos disposal area. Dust and windblown waste emissions may be generated from machinery and vehicle movements associated with the handling and disposal of waste. There is also potential for emissions of asbestos fibres (worst-case scenario) where they are not adequately contained during handling and unloading into the asbestos disposal area, or not adequately covered. DWER (then-DER) Officers observed exposed asbestos at the Premises at a compliance inspection in 2016.

Impact: Reduced local air quality and potential amenity impacts for nearby land users and visitors to the Premises in the case of general dust, potential smothering of vegetation where dust is extreme. Potential for long-term health impacts on nearby land users where asbestos fibres are released (from inappropriate handling or being inadvertently received unwrapped).

Controls: The volume of waste being received into the existing approved landfilling area is limited to 5,000 tonnes per annum. According to information given during a compliance inspection in March 2015, waste is covered on a daily basis in the dry summer period. Litter screens have been installed in the past but were found less effective than regular covering. The active landfill area is surrounded on at least three sides by a buffer of native vegetation which is likely to minimise dust emissions to the north, west and south as a minimum. The Licensee manages a separate asbestos disposal cell and is only accepted wrapped and labelled, and is wrapped and labelled on the Premises if required. Asbestos is covered immediately upon receipt with at least 300mm of material.

Risk Assessment

Consequence: Severe, due to potential release of asbestos fibres which can cause irreversible health impacts

Likelihood: Rare, discrete location, asbestos receipt requirements and immediate cover.

Consequence could only occur in exceptional circumstances.

Risk Rating: High

Regulatory Controls

Condition 1.2.1 (Premises operation section) has been included which specifies what waste types and volumes are allowed and their acceptance criteria. This condition includes the requirement for asbestos to be accepted either wrapped or in a manner that prevents the release of fibres during receipt. This condition is derived from previous condition G2, but has been modified to remove the requirement for the material to be double-wrapped and labelled, and allows the material to be wrapped on the Premises or otherwise contained, if appropriate. This is a transport requirement under the Controlled Waste regulations and as long as the risk of fibre release is managed, the Delegated Officer has determined that there is no express need to have the material labelled and subject to prescriptive wrapping requirements. The requirement for asbestos cover to be witnessed and signed off by a staff representative within 2 hours has also not been retained, as it is an administrative procedure that is not directly related to environmental risk.

Condition 1.2.3 (Premises operation section) includes requirements for the burial of waste including the placing of waste in a defined trench or area enclosed in a bund, restriction on tipping height and area and minimum weekly and thoroughly covering of waste, all of which assist in managing the risk of fugitive emissions of dust and windblown waste. These requirements are converted from previous condition G3; however an additional requirement has been added cover to be *maintained* over buried asbestos.



Condition 1.2.5 (Premises operation section) sets requirements for the containment and management of windblown waste from the active landfill area. This condition is carried over from previous conditions G5(a)-(c) with changes to remove the specification of litter screens and reduce windblown waste collection from weekly to fortnightly. The Licence Holder is required to contain windblown waste within the boundaries of the Active Landfill Area. This is outcome-based and does not require further specification as to how the Licence Holder achieves this. The frequency of windblown waste collection has been reduced at the request of the Licensee during consultation. The Premises does not have a known history of windblown waste issues.

Condition 1.2.9 has been added for staged landfilling, including the requirement to undertake landfilling in the active landfilling area in distinct stages where stage 3 disposal cannot occur until the capping of stage 1 has commenced, which should minimise the footprint of the active landfill area from which fugitive emissions will occur. The requirement for phased landfilling in the active landfill area was not required under the previous version of the licence; however has been determined by the Delegated Officer to be a necessary control given the risk of leachate (see emissions to land sections for further details) and is in accordance with the Buller Road Landfill Closure Management Plan.

Condition 1.2.11 has also been added to require waste to be placed and compacted in a manner to ensure all faces remain stable and capable of retaining future capping and rehabilitation material.

Condition 1.2.12 has been added to require capping to commence within 6 months of the completion of each phase and sets the specific requirements for capping in accordance with the Buller Road Landfill Closure Management Plan. This will prevent extensive areas of non-vegetated, uncapped area from which fugitive emissions might occur.

Condition 2.1.1 has been included on the licence for the suppression of dust emissions using a water cart, irrigation system or equivalent. The condition is adapted from previous condition A1; however has been modified to specify the use of a water cart/irrigation, rather than the general requirement for dust not to cross the boundary of the Premises which had issues with enforceability.

Condition 5.1.3 (Records section) is included for the maintenance of records regarding any complaints received and actions taken. This is a new condition which will ensure that any offsite impacts of fugitive emissions are detected and therefore able to be addressed in real time.

Residual Risk

Consequence: Severe

Likelihood: Rare

Risk Rating: High

Reference documents:

- *Environmental Protection (Controlled Waste) Regulation 2004;*
- 'Buller Road Landfill Closure Management Plan' (ASK Waste Management, May 2016).

Odour

Operation

Emission Description

Emission: Odour emissions from the receipt and handling of putrescible wastes prior to landfilling, releases of odourous landfill gas and the receipt of odourous liquid wastes (septage and grease trap waste) and their storage and treatment in the liquid waste ponds. Odour emissions from the periodic cleanout of sludge in liquid waste ponds.



Impact: Potential amenity impacts for nearby land users or visitors to the Premises. The nearest single residence to the Premises boundary is approximately 450m to the southeast. Potential reversible public health impacts in the case of extreme or persistent odour emissions.

Controls: According to information given by the Licensee during a compliance inspection in March 2015, wastes are covered on a daily basis in the summer period and weekly in winter. A buffer of 35m is maintained between the landfilling area and the Premises boundary, and additionally the majority of surrounding land is rural or native vegetation. The liquid waste pond treatment system includes four stages to maximise wastewater treatment potential prior to discharge to the biofilter.

Risk Assessment

Consequence: Minor, likely to be transient depending on weather and may not reach external receptors (minimal off-site impacts at the local scale).

Likelihood: Possible, could occur at some time

Risk Rating: Medium

Regulatory Controls

Condition 1.2.3 (Premises operation section) includes the requirement for waste to be buried within a defined trench or area enclosed by earthen bunds, restrictions on the length and height of the tipping face and minimum weekly cover requirements. The condition also sets the minimum 35m boundary between the landfilling area and the Premises boundary. These requirements are carried over from previous condition G3. Condition 1.2.3 also requires liquid waste to be deposited in the anaerobic pond of the liquid waste system only, to minimise odour.

Condition 1.2.4 (Premises operation section) includes requirement for liquid waste to be passed through the pond system prior to discharge, to maximise the level of treatment. The condition contains some of the requirements from previous condition W6.

Condition 5.1.3 (Records section) is included for the maintenance of records regarding any complaints received and actions taken. This is a new condition which will ensure that any offsite impacts of odour are detected and therefore able to be addressed in real time. Condition 5.3.1 also includes the requirement to notify the CEO in advance of any desludging of liquid waste ponds. This has been added to ensure that DWER has notice and details of the management measures that will be employed during desludging for both odour and leachate emissions.

Residual Risk

Consequence: Minor

Likelihood: Possible

Risk Rating: Medium



Appendix B - Licence Conversion Table

Summary of the Licence amendment condition conversion process.

L6756/1996/11 conditions - issued 1 September 2011 ²		Summary of how condition has been managed in current amendment
G1	Waste acceptance and management	Modified into condition 1.2.1 with some additional detail (see Decision Table)
G2	Disposal of asbestos	Inserted into condition 1.2.3 with some changes (see Decision Table)
G3	Management of landfill activities	Inserted into condition 1.2.3 with some changes (see Decision Table)
G4 (a)-(c)	Fencing	Not retained (not directly related to environmental risk). Conditions already exist which prohibit unauthorised fire.
G5 (a)-(c)	Windblown waste	Transferred to condition 1.2.5 with some changes (see Decision Table), with exception to G5(b) as it is inherently addressed by 'maintenance' under G5(a).
G6 (a)-(b)	AER	Transferred to condition 5.2.1, with some additional requirements (see Decision Table)
G7	AACR	Transferred to condition 5.1.2, with some modification (see Decision Table)
A1	Dust - general	Transferred to condition 2.1.1 with some modifications to include excavation/earthworks and specify the use of a water cart (see Decision Table)
A2 (a)-(e)	Burning of waste	A2(a)-(b) transferred into condition 1.2.3; Table 1.2.2. Some parts of A2(b) have not been retained (see Decision Table and Appendix A) A2(c) and (d) have been combined and transferred into condition 1.2.6. A2(e) transferred into condition 5.3.1, with additional detail and form (Schedule 1) added for notification
W1 (a)-(c)	Stormwater management	Transferred to condition 1.2.7.
W2 (a)-(b)	Buffers to ground and surface waters	W2(a) transferred into condition 1.2.3; Table 1.2.2. W2(b) not carried over due to being n/a to the Premises.
W3	Groundwater bores	Condition not carried over due to being already implied within condition 3.3.1.
W4 (a),(c)	Groundwater monitoring	W4(a) transferred to condition 3.3.1, with some additional parameters added (see Decision Table); W4(c) transferred to condition 3.1.1 which states the applicable Australian standards and the need for NATA accreditation.
W5	Acceptance of Liquid waste	W5 transferred into condition 1.2.1; Table 1.2.1; and condition 1.2.3; Table 1.2.2.
W6	Maintenance of WWT ponds	Transferred to condition 1.2.3; Table 1.2.2; and condition 1.2.4; Table 1.2.3, with some minor amendments (see Decision Table)
S1	Biosolids management	Transferred to condition 1.2.8

² See Appendix C for full version of previous licence L6756/1996/11



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CONDITIONS OF LICENCE

DEFINITIONS

In these conditions of licence, unless inconsistent with the text or subject matter:

'Asbestos' means as defined in the Environmental Protection (Controlled Waste) Regulations 2004;

'APHA-AWWA-WEF' means American Public Health Association (APHA), the American Water Works Association (AWWA) and the Water Environment Federation (WEF);

'Asbestos Waste' means Special Waste Type 1 as defined in the current version of the "Landfill Waste Classification and Waste Definitions 1996 (As amended December 2009)";

'AS/NZS 5667.1' means the current version of Australian Standard AS/NZS 5667.1 *Water Quality – Sampling – Guidance of the Design of sampling programs, sampling techniques and the preservation and handling of sample*;

'AS/NZS 5667.11' means the current version of Australian Standard AS/NZS 5667.11 *Water Quality – Sampling – Guidance on sampling of groundwaters*;

'Authorised Person or Inspector' means an authorised person or inspector as defined in sections 87 and 88 respectively of the *Environmental Protection Act 1986*;

'Clean Fill', 'Inert Waste Type 1', 'Inert Waste Type 2', 'Putrescible Waste' and 'Special Waste Type 1' means those material as defined in the current version of '*Landfill Waste Classifications and Waste Definitions 1996*' (As amended), Department of Environment;

'Cover Material' means subsoil or other inert soil or sand material used for covering of waste;

'Director' means Director, Environmental Regulation Division of the Department of Environment and Conservation for and on behalf of the Chief Executive Officer as delegated under Section 20 of the *Environmental Protection Act 1986*;

'Director' for the purposes of correspondence means:

Regional Leader, Swan Region
Department of Environment and Conservation
PO Box 454 Telephone: (08) 9411 1777
KWINANA WA 6966 Facsimile: (08) 9419 5897;

'Designated Burning Area' means an area of the premises that has been designated by the occupier of the premises as a Designated Burning Area and which:

- (a) is at least 50 metres from the boundary of the premises;
- (b) has no flammable material on it, other than the Greenwaste and live trees, for a radius of 50 metres;
- (c) is positioned in the area of the site where waste (other than the Greenwaste to be burnt) has not been deposited; and
- (d) is at least 500 metres from any person's residence or place of employment (other than the landfill site) or an educational institution, hospital or other public place;



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'Fire Control Officer' means a person who holds current and recognised qualifications in fire fighting and fire control as are specified in the licence and that person is appointed to the position of Fire Control Officer by the licensee;

'Grease Trap Waste' means the organic waste generated at food manufacturing and preparation premises which typically contains 2% to 5% grease (which includes fats, oils waxes and soaps) and 20 to 30% sludge with a high organic content and which is collected by a grease trap that separates the greases and sludges from the wastewater stream;

'Greenwaste' means biodegradable waste comprising plants and their component parts such as flower cuttings, hedge trimmings, branches, grass, leaves, plants, seeds, shrub and tree loppings, tree trunks, tree stumps and similar materials and includes any mixture of those materials;

'Hardstand' means an area with a prepared (sealed) or natural surface which has a low permeability (i.e. having a hydraulic conductivity of less than 10^{-9} metres per second at unity hydraulic gradient) which prevents escape of any liquids from the surface into the subsoil and groundwater;

'material containing asbestos' means as defined in the Environmental Protection (Controlled Waste) Regulations 2004;

'mAHD' means metres above (or below) the Australian Height Datum;

'mg/L' means milligrams per litre;

' μ S/cm' means microSiemens per centimetre;

'NATA' means the Australian National Association of Testing Authorities;

'Septage Treatment Ponds' means the ponds depicted in Attachment 1;

'Septage Waste' means material pumped out from a septic tank during desludging comprising partially decomposed scum, sludge and liquid;

'Surface Water Body' means any natural or artificial water course or wetland (as those terms are defined in the *Rights in Water Irrigation Act 1914*) dam or other impoundment and any other surface water exposed to the atmosphere; and

'Tipping Area' means the area of the premises where waste currently being brought to the premises is being deposited;



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GENERAL CONDITIONS

WASTE ACCEPTANCE AND MANAGEMENT

- G1 The licensee shall accept and bury only the following types of waste at the premises:
- (i) clean gill;
 - (ii) inert waste type 1;
 - (iii) inert waste type 2;
 - (iv) putrescible wastes;
 - (v) special waste type 1; and
 - (vi) other wastes that comply with Class II criteria in the current version of the document entitled 'Landfill Waste Classification and Waste Definitions 1996' (As amended), Department of Environment.

DISPOSAL OF ASBESTOS WASTE

- G2 The licensee shall ensure that asbestos waste or material containing asbestos is deposited at the premises according to the following requirements:
- (i) accept only asbestos waste or material containing asbestos which is sealed in double-lined or double bagged, heavy duty plastic sheeting of at least 0.2 millimetres thickness;
 - (ii) accept only asbestos waste or material containing asbestos, which is labelled or marked with the words "CAUTION – ASBESTOS" in letters not less than 50 millimetres high;
 - (iii) as soon as practicable and before compaction, cover the asbestos waste or material containing asbestos with a layer of soil at least 300 millimetres thick or with a layer of dense, inert and incombustible material at least 1 metre thick;
 - (iv) record as grid references on a premises plan all locations used for the disposal of asbestos waste or material containing asbestos and keep this plan as a permanent record;
 - (v) keep a permanent register of each load of asbestos waste or material containing asbestos deposited at the premises, including the date, the name of person that deposited the asbestos or material containing asbestos and the vehicle registration number;
 - (vi) witness the covering of the asbestos waste or material containing asbestos and sign the register referred to above within two hours of the covering taking place;
 - (vii) not deposit any asbestos waste or material containing asbestos within two metres of the final tipping surface of the landfill;
 - (viii) operate the landfill such that any existing asbestos waste or material containing asbestos deposited at the premises remains undisturbed; and
 - (ix) make all records available for viewing or copying by an authorised person or inspector upon request.

MANAGEMENT OF LANDFILL ACTIVITIES

- G3 The licensee shall ensure that:
- (i) no waste is placed closer than 35 metres to the premises boundary;
 - (ii) waste is placed in a defined trench or within an area enclosed by earthen bunds;
 - (iii) the tipping area is restricted to a maximum linear length of 30 metres;
 - (iv) waste in the tipping area is covered in accordance with Table 1;



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- (v) there is enough cover material to cover waste in accordance with Condition G3(iv), at least twice;
- (vi) waste is covered with cover material;
- (vii) waste is totally covered so that no waste is left exposed; and
- (viii) the tipping area is no greater than two metres in height.

Table 1: Frequency of covering waste

Tonnes of waste received per year	Frequency waste is to be covered
Less than 500 tonnes	Monthly
Between 500 and 2 000 tonnes	Fortnightly
Between 2 000 and 5 000 tonnes	Weekly

FENCING

- G4(a) The licensee shall erect and maintain a security mesh fence around the whole of the perimeter of the premises of the active landfill area, except where there is a lockable gate.
- G4(b) The licensee shall ensure that any entrance to the premises is securely locked when the premises are unattended.
- G4(c) The licensee shall ensure that weekly inspections of the fence and gates referred to in condition G4(a) are undertaken and that any damage to the fence is repaired within two (2) working days of its discovery.

WIND BLOWN WASTE

- G5(a) The licensee shall ensure wind blown waste is contained within the boundaries of the active landfill area by maintaining litter screens and regularly covering and compacting waste.
- G5(b) The licensee shall inspect litter screens no less than once per week to ensure their integrity and if damaged, repair them within two (2) working days.
- G5(c) The licensee shall ensure that any wind blown waste is removed from the premises fences and roads, and any wind blown waste emanating from the premises is collected and removed on a weekly basis or more frequently when directed in writing by the Director.

MONITORING AND REPORTING

- G6(a) The licensee shall provide to the Director by **31 March each year**, an Annual Environmental Report for the **period beginning 1 January the previous year and ending on 31 December in that year.**
- G6(b) The licensee shall ensure that the Annual Environmental report require by condition G6(a) includes, but is not necessarily limited to:
 - (i) results of the groundwater monitoring program obtained in accordance with Table 2 of condition W4(a);
 - (ii) a graphical comparison of data reported in condition G6(b)(i) against historical data obtained under this licence;
 - (iii) a summary of any fires at the premises;



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- (iv) a summary of measures taken to suppress dust and control windblown waste at the premises; and
 - (v) the total volumes of each of grease trap waste and septage waste disposed at the premises in accordance with condition W5.
- G7 The licensee shall by **31 March in each year**, provide to the Director an annual audit compliance report in the form in attachment 2 to this licence, signed and certified in the manner required by Section C of the form, indicating the extent to which the licensee has complied with the conditions of this licence, and any previous licence issued under Part V of the Act for the Premises, during the **period beginning 1 January the previous year and ending on 31 December in that year.**

AIR POLLUTION CONTROL CONDITIONS

DUST – GENERAL REQUIREMENT

- A1 The licensee shall suppress dust from the open landfill face or trench, stockpiled areas and transport activities, to ensure that no visible dust crosses the boundary of the premises.

BURNING OF WASTE

- A2(a) The licensee shall not burn or allow the burning of waste that is not greenwaste on the premises.
- A2(b) If greenwaste is burnt on the premises, the licensee, or a person nominated by the licensee, shall:
- (i) ensure the greenwaste is dry and seasoned for at least two months before being burnt;
 - (ii) ensure the greenwaste is burnt in a designated burning area;
 - (iii) provide an adequate water supply and distribution system to prevent fires from escaping beyond the greenwaste area;
 - (iv) burn greenwaste in a manner to minimise the generation of smoke;
 - (v) burn greenwaste in windrows or trenches;
 - (vi) burning does not commence before 8 a.m. and the Fire Control Officer for the landfill site declares the area safe by 12 noon on the same day; and
 - (vii) ensure that, from the time burning commences until the Fire Control Officer for the premises declares the area safe:
 - (a) a fire fighting vehicle carrying at least 500 litres of water, fitted with at least 30 metres of 19 millimetres diameter rubber hose and with a pump capacity capable of delivering a minimum of 250 litres of water per minute at a minimum of 700 kPA through a nozzle capable of projecting water by spray or by jet; and
 - (b) 2 persons, who have such qualifications in fire fighting as are approved.
- A2(c) The licensee shall ensure that there are appropriate procedures in place at the premises so that any unauthorised fire is promptly extinguished.
- A2(d) The licensee shall ensure that an unauthorised fire on the premises is extinguished as soon as possible.



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- A2(e) The licensee shall provide the Director with a report on an unauthorised fire within 14 days of the fire and include:
- (i) details of the date, time and location of the fire;
 - (ii) the time the fire was declared safe by the Fire Control Officer for the premises; and
 - (iii) the cause, or suspected cause, of the fire.

WATER POLLUTION CONTROL CONDITIONS

STORMWATER MANAGEMENT

- W1(a) The licensee shall direct uncontaminated stormwater run-off, such as water from roofs and site drainage, away from the filled and peripheral areas and associated sumps or drains into dedicated stormwater drains.
- W1(b) The licensee shall ensure stormwater drains on the premises are kept clear of waste to allow for their effective use.
- W1(c) The licensee shall direct all stormwater run-off into an infiltration basin on the premises.

BUFFERS TO GROUND AND SURFACE WATERS

- W2(a) The licensee shall maintain an undisturbed separation distance of at least three (3) metres between the base of the current and future waste disposal areas and the highest level of the groundwater.
- W2(b) The licensee shall maintain a minimum distance of at least 100 metres between the waste disposal site and any surface water body.

GROUNDWATER BORES

- W3 The licensee shall maintain monitoring bores at the premises, designated MB 1, MB 2, MB 3, MB 4 and MB 5 at the locations depicted in Attachment 1.

GROUNDWATER MONITORING

- W4(a) The licensee shall collect and have analysed representative groundwater samples from the monitoring sites specified in Column 1 of Table 2, at the frequencies specified in Column 2 of Table 2, for the parameters specified in Column 3 of Table 2, using the methods specified in Column 4 of Table 2 and reported in the units specified in Column 5 of Table 2.



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Table 2 – Groundwater monitoring

Column 1	Column 2	Column 3	Column 4	Column 5
Monitoring Site	Sampling frequency	Parameters to be measured	Methods	Units
Monitoring Bores MB 1 & MB 2 (as depicted in Attachment 1)	Annually (April to May)	pH, Conductivity, Nitrate-nitrogen, Ammonia-nitrogen, Total Nitrogen, Total Potassium, Chloride, Total Dissolved Solids, Lead, Manganese, Copper, Chromium, Nickel, Zinc, Cadmium and Standing Water Level.	AS/NZS 5667.1 and AS/NZS 5667.11	All in mg/L except pH (pH units), conductivity (µS/cm) and Standing Water Level (mAHD)
Monitoring Bores MB 3, MB 4 & MB 5 (as depicted in Attachment 1)	Biannually (April to May and September to October)	pH, Conductivity, Nitrate-nitrogen, Ammonia-nitrogen, Total Nitrogen, Total Potassium, Chloride, Total Dissolved Solids, Lead, Manganese, Copper, Chromium, Nickel, Zinc, Cadmium and Standing Water Level.		

W4(c) The licensee shall ensure that all water samples are analysed in a laboratory with NATA accreditation for the analyses specified. The samples shall be analysed in accordance with the current "Standard Methods for Examination of Water and wastewater, APHA-AWWA-WEF".

ACCEPTANCE OF LIQUID WASTE

W5 The licensee shall only dispose of the following liquid wastes to the septage treatment ponds at the premises:
(i) septage waste; and
(ii) grease trap waste.

MAINTENANCE OF WASTEWATER TREATMENT PONDS

W6 The licensee shall manage the septage treatment ponds in a manner such that:
(i) uncontaminated stormwater runoff shall not enter the septage treatment ponds or cause erosion of the outer pond embankments;
(ii) extreme rainfall events [1 in 10 year, 72 hour duration events] do not cause overtopping of the ponds;
(iii) the minimum depth of the anaerobic septage treatment ponds is three (3) metres;
(iv) trapped overflows shall be maintained on the discharge from the septage treatment ponds to prevent carry over of surface floating matter to subsequent septage treatment ponds;
(v) a minimum freeboard of 300 millimetres is maintained;
(vi) there is no discernible seepage loss from the outer septage treatment pond embankments; and
(vii) appropriate measures are taken to minimise floating debris in the septage treatment ponds and prevent vegetation (emergent or otherwise) from growing in the pond wastewater, or on the pond embankments.



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SOLID WASTE CONDITIONS

BIOSOLIDS MANAGEMENT

- S1 The licensee shall ensure that sludge and solid waste removed from the septage treatment ponds is stored on-site on a Hardstand area or Hardstand drying bed which:
- (i) is adequately bunded to prevent surface runoff of leachate or sludge from crossing the boundary of the premises; and
 - (ii) returns sludge leachate from the storage area back to the septage treatment ponds.

.....
Officer delegated under Section 20
of the *Environmental Protection Act 1986*

Date of Issue: Thursday, 1 September 2011



ATTACHMENT 1- PLAN OF PREMISES

LICENCE NUMBER: L6756/1996/10

FILE NUMBER: 2010/002299



LEGEND

- Red outline: Premises Boundary
- Blue grid: Landfill Area
- Blue outline: Septage Treatment Ponds
- Black outline: Lot 1701 (Crown reserve 36315)

Scale 1:5000
 Information abstracted from aerial photography
 Geocentric Datum Australia 1994
 Note: This data is for reference only and has not been projected. This may result in geometric distortion or measurement inaccuracies.
 Prepared by: shern
 Prepared on:
 Date: 18/08/2011 10:20:44 AM

Information derived from this map should be confirmed with the data custodian and/or verified by the agency through its systems.

Department of Environment and Conservation
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www.de.wa.gov.au



SECTION A

LICENCE DETAILS

Licence Number:	Licence File Number:
Company Name:	ABN:
Trading as:	
Reporting period: _____ to _____	

STATEMENT OF COMPLIANCE WITH LICENCE CONDITIONS

1. Were all conditions of licence complied with within the reporting period? (please tick the appropriate box)

Yes Please proceed to Section C

No Please proceed to Section B

Each page must be initialed by the person(s) who signs Section C of this annual audit compliance report

INITIAL: _____



SECTION B - DETAILS OF NON-COMPLIANCE WITH LICENCE CONDITION.

Please use a separate page for each licence condition that was not complied with.

a) Licence condition not complied with?	
b) Date(s) when the non compliance occurred, if applicable?	
c) Was this non compliance reported to DEC?	
<input type="checkbox"/> Yes <input type="checkbox"/> Reported to DEC verbally Date _____	<input type="checkbox"/> No
<input type="checkbox"/> Reported to DEC in writing Date _____	
d) Has DEC taken, or finalised any action in relation to the non compliance?	
e) Summary of particulars of non compliance, and what was the environmental impact?	
f) If relevant, the precise location where the non compliance occurred (attach map or diagram)	
g) Cause of non compliance	
h) Action taken or that will be taken to mitigate any adverse effects of the non compliance	
i) Action taken or that will be taken to prevent recurrence of the non compliance	

Each page must be initialed by the person(s) who signs Section C of this annual audit compliance report

INITIAL: _____



SECTION C - SIGNATURE AND CERTIFICATION

This Annual Audit Compliance Report may only be signed by a person(s) with legal authority to sign it. The ways in which the Annual Audit Compliance Report must be signed and certified, and the people who may sign the statement, are set out below.

Please tick the box next to the category that describes how this Annual Audit Compliance Report is being signed. If you are uncertain about who is entitled to sign or which category to tick, please contact the licensing officer for your premises.

If the licence holder is		The Annual Audit Compliance Report must be signed and certified:
An individual	<input type="checkbox"/> <input type="checkbox"/>	by the individual licence holder, or by a person approved in writing by the Chief Executive Officer of the Department of Environment and Conservation to sign on the licensee's behalf.
A firm or other unincorporated company	<input type="checkbox"/> <input type="checkbox"/>	by the principal executive officer of the licensee; or by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
A corporation	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	by affixing the common seal of the licensee in accordance with the Corporations Act 2001; or by two directors of the licensee; or by a director and a company secretary of the licensee, or if the licensee is a proprietary company that has a sole director who is also the sole company secretary – by that director, or by the principal executive officer of the licensee; or by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
A public authority (other than a local government)	<input type="checkbox"/> <input type="checkbox"/>	by the principal executive officer of the licensee; or by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
a local government	<input type="checkbox"/> <input type="checkbox"/>	by the chief executive officer of the licensee; or by affixing the seal of the local government.

It is an offence under section 112 of the Environmental Protection Act 1986 for a person to give information on this form that to their knowledge is false or misleading in a material particular. There is a maximum penalty of \$50,000 for an individual or body corporate.

I/We declare that the information in this annual audit compliance report is correct and not false or misleading in a material particular.

SIGNATURE: _____

SIGNATURE: _____

NAME:
(printed) _____

NAME:
(printed) _____

POSITION: _____

POSITION: _____

DATE: ____/____/____

DATE: ____/____/____

SEAL (If signing under seal)



Appendix D – Technical Expert Report



Buller Road Landfill Site, Waroona

Additional advice on environmental risks and potential mitigation measures for the proposed expansion of the landfill site

Version: Final

October 2016





Department of Environment Regulation

Document control

Document version history

Date	Name	Role
3/11/16	Dr Steve Appleyard	Author
3/11/16	Andrew Miller	Reviewer

Corporate file information

File number and/or name	File owner or custodian	File location
02010/002299	Industry Regulation	

Risk assessment and mitigation measures, proposed Buller Rd landfill expansion





Department of Environment Regulation

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Web: www.der.wa.gov.au

Accessibility This document is available in alternative formats and languages upon request.



Department of Environment Regulation

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Department of Environment Regulation

1. Purpose

This report has been prepared to a request from Waste Industries that was received on 12 October 2016 for further advice on the proposed expansion of the Buller Road landfill site in Waroona. Specifically, Waste Industries is seeking advice on the following issues associated with the management of both the existing landfill site and the proposed expanded waste disposal area:

1. What would be the cumulative impact from emissions of leachate from the existing landfill area and the proposed new cell if approved?
2. What impact would progressive capping of both the existing and proposed landfill areas have on the amount of leachate produced and therefore on the potential environmental risks?
3. Further comment on actual and/or potential environmental impacts to sensitive receptors.
4. A critique of the suitability of the current groundwater monitoring on the licence, specifically the number, location and depth of existing groundwater monitoring bores, when they are sampled, and how this can (or cannot) serve to effectively detect groundwater contamination issues from both the current and proposed expansion areas.
5. Any suggestions for additional monitoring to be added to the licence, including additional bores (locations, depths), change to frequencies and any additional parameters, including the justification for this.

Information about these issues is provided below and specific responses to each of the queries from Waste Industries are provided at the end of this report.

2. Assessment of the potential cumulative impacts of leachate discharge to groundwater

Previous advice provided on the proposed extension to the Buller Road landfill site (Appleyard, 2016) did not consider the likelihood that groundwater near the facility has already been contaminated by leachate from historical waste disposal at the site. It is understood that about 4500 tonnes of Class II wastes have been disposed of in unlined cells at the site since 1996.

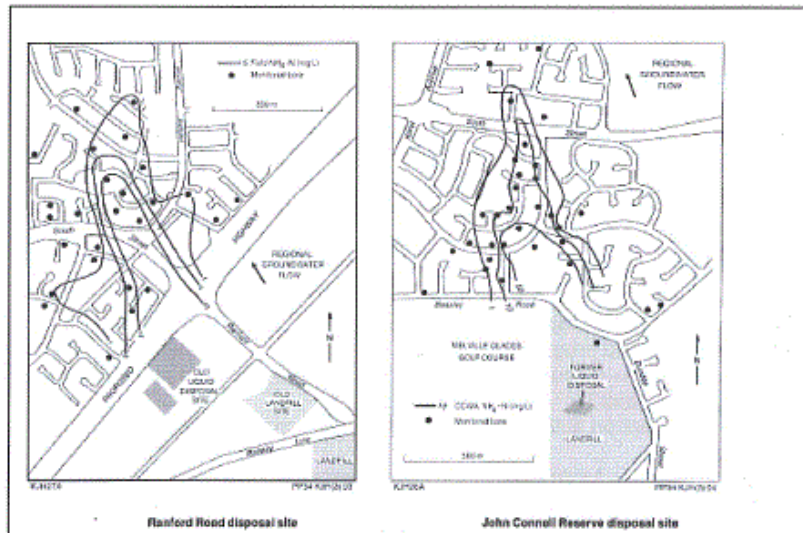
The potential effects of historical waste disposal on groundwater quality can be assessed by comparing the Buller Road site with the effects that have been observed at other similar sized unlined landfill sites on the Swan Coastal Plain. Groundwater investigations undertaken on unlined landfill sites in the Perth metropolitan region (Hirschberg, 1993; Appleyard, 1996) have indicated that groundwater contamination plumes from unlined landfill sites in the region typically range between 500 and 1000 metres in length (Figure 1). Similarly, Christensen *et al.* (2001) has indicated that leachate plumes in sandy aquifers from unlined landfill sites generally do not exceed 1000 metres in length because biodegradation of chemical constituents on the fringes of the plume prevents plumes growing much larger than this.

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Mapped groundwater contamination plumes (determined by ammonium concentration measurements) from unlined landfill sites in the Perth metropolitan area (adapted from Hirschberg, 1993).

These factors suggest that although groundwater near the Buller Road landfill site is likely to be already contaminated by leachate from historical operations at the site, the plume is unlikely to exceed a length of about 1000 metres or approximately the length predicted by modelling for a plume from the proposed new waste disposal area at the site (Appleyard, 2016). They also suggest that increasing the area of waste disposal at the site is unlikely to significantly change the length of the plume due to the effects of biodegradation within the superficial aquifer. However, the concentrations of some chemical constituents may be increased within the core of the plume and the length of time the plume persists in groundwater after site closure may be increased due to the effects of leachate from the proposed landfill extension.

3. Assessment of the potential impacts of leachate contamination on sensitive receptors

A previous assessment (Appleyard, 2016) has suggested that nearby groundwater-dependent wetlands are likely to be the receptors at most risk from the adverse impacts from contaminants from landfill leachate from the Buller Road landfill site. These potential impacts can also be assessed by comparison with other wetlands on the Swan Coastal Plain that have been affected by landfill leachate.

Historically, waste disposal in the Perth metropolitan region took place in low-lying, seasonally-wet areas to control the spread of mosquito-borne diseases. As a consequence of this, many of the known (approximately 100) unlined landfill sites in the region are located next to wetlands (Hirschberg, 1993). The chemical analysis of groundwater from these sites suggests that the dominant contaminant of environmental concern that is discharged to



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wetlands is nitrogen (predominantly in the chemical form of ammonium ions) which is generally present in leachate-contaminated groundwater at concentrations in the range of 5-100 mg/L (Hirschberg, 1993).

Although many freshwater wetlands in urban and agricultural regions are highly eutrophic because of nutrient contamination, this is generally considered to be due to phosphorus inputs to these systems from runoff from fertiliser use rather than from groundwater inputs of nitrogen. Additionally, regional groundwater investigations on the Swan Coastal Plain (Appleyard and Hirschberg, 1996) have indicated that there is widespread nitrogen contamination in the region due to urban and agricultural land uses, and consequently in some areas it would be difficult to distinguish between environmental impacts caused by landfill leachate from other sources of nitrogen like fertiliser use.

As a result of these factors it is considered likely that wetlands near the Buller Road site will already be eutrophic due to the effects of nutrient contamination. However, it is more likely that the environmental degradation of these systems would be due to the discharge of phosphorus from nearby agricultural land uses than from the effects of landfill leachate.

As indicated in the previous assessment of the Buller Road site (Appleyard, 2016), I am unable to comment on the potential effects of other contaminants including perfluorinated alkyl substances (PFAS) and endocrine disrupting compounds that could be in landfill leachate from the Buller Road site due to a lack of groundwater monitoring data on these chemical constituents. However, I consider it unlikely that the proposed landfill extension would significantly change the current level of risks to receptors posed by these substances at the Buller Road site.

4. Potential management measures for reducing leachate production in the proposed unlined landfill extension

There are a number of management measures that could be considered for the proposed new waste disposal area on the Buller Road site that could significantly reduce the rate of production of leachate and the consequent impacts on groundwater quality.

One of the simplest measures that could be implemented would be to ensure that the natural soil or recycled waste materials that are used for daily cover on the landfill are carefully selected to reduce the infiltration of water into wastes in each landfill cell. For instance, a previous assessment of leachate generation at the site (Appleyard, 2016) using a Thornthwaite-Mather water-balance approach (Fenn *et al.*, 1975; Pastor and Post, 1984; Qasim and Chiang, 1994) indicated that about 120 L/m² of leachate would be produced annually at the Buller Road site if a one metre thick layer of sandy soil with a field capacity of 200 mm/m and a wilting point of 50 mm/m was used as daily cover on putrescible wastes. Modelling suggests that the annual rate of leachate production at this site could be reduced to 22 L/m² if sandy daily cover were to be replaced with a one metre thick clayey-loam soil with a field capacity of 375 mm/m and a wilting point of 125 mm/m.

As the amount of leachate discharged to groundwater from an unlined landfill cell is directly proportional to the size of the cell, leachate production in the new waste disposal area at the



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Buller Road site could also be reduced by sub-dividing the area into a number of smaller cells and by progressively capping each cell on completion of waste disposal. Leachate production at the Buller Road site could be further reduced by ensuring that historical waste disposal areas at the site are capped.

5. Groundwater monitoring at the Buller Road site

5.1. Construction and locations of existing monitoring bores

Information provided by Waste Industries indicates that there are five monitoring bores at the Buller Road site. However, the site plan provided suggests that only two of these bores are constructed downgradient in the direction of groundwater flow from waste disposal areas and are therefore located in a suitable area to detect groundwater contamination from the facility. No information has been provided about how bores at the site were constructed or about their screened monitoring intervals, so it is not possible to assess their suitability for monitoring purposes.

The absence of clusters of bores that monitor different depths within the aquifer at specific monitoring locations suggests that the managers of the landfill site have not considered the likelihood that a groundwater contamination plume from waste disposal facility will increase in depth in the superficial aquifer with increasing distance downgradient of the site (Fig. 2) because of the higher density of contaminated groundwater than natural uncontaminated groundwater.

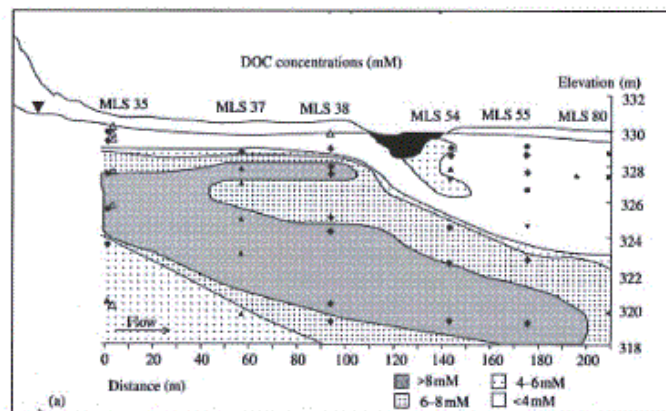


Figure 2. Vertical cross-section in the direction of groundwater flow showing how a landfill leachate plume (as measured here by dissolved organic carbon concentrations) sinks in an unconfined aquifer due to density differences with natural background groundwater. The investigations shown were carried out at the Norman landfill site in the USA by Cozzarelli et al. (2000).



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This means that there is a significant risk that bores constructed at shallow depth downgradient of a landfill site would not detect the presence of groundwater contamination from waste disposal at the site. For instance, a bore constructed at site MLS 55 in Figure 2 with a screened-interval from the water table to a depth of 3 metres below the water table (a typical method of construction for many monitoring bores) would not detect contamination from the illustrated landfill site.

5.2. Existing groundwater sampling program

Insufficient information has been provided to indicate whether groundwater sampling at the Buller Road site has been undertaken in accordance with methodologies recommended in Schedule B2 of the *National Environmental Protection (Contaminated Sites Investigation) Measure*. Inconsistencies in the concentrations of nitrogen species measured in groundwater at the site (total nitrogen (TN) concentrations are commonly less than nitrate and ammonium concentrations) suggest that there are some problems at the site with either the sampling or chemical analysis of groundwater samples.

Concentrations of potassium and chloride measured in monitoring bores at the site are at levels observed at other unlined landfill sites on the Swan Coastal Plain. The observed trend of increasing chloride concentrations measured at groundwater monitoring bore MB4, located immediately downgradient of the existing waste disposal areas at the Buller Road site, suggests that a leachate contamination plume is moving in the direction of groundwater flow from the landfill site.

5.3. Potential changes to groundwater monitoring at the site

Information presented in Sections 5.1 and 5.2 in this report suggests that changes to the current groundwater monitoring program would be required to ensure that potential impacts of discharges from the site on groundwater quality are being adequately measured. This would involve ensuring that bores are located in suitable locations and have screened-intervals at appropriate depths in the superficial aquifer to detect groundwater contamination from the site. This would also involve ensuring that a suitable suite of chemical parameters is measured in groundwater samples to enable potential risks to downgradient groundwater users and environmental receptors to be adequately determined.

The installation of new monitoring bores is usually carried out in a staged manner with new bore locations and monitoring depths being selected on the basis of existing monitoring data and on the level of risk that groundwater contamination may pose to downgradient receptors.

The current absence of information about the distribution of landfill contaminants at depth in the superficial aquifer near the Buller Road site would suggest that a cluster of at least three bores is required at monitoring site MB2 to ensure that groundwater quality is measured near the water table, at an intermediate depth in the superficial aquifer (*i.e.* at a depth of about 15 metres below the water table) and near the base of the superficial aquifer (*i.e.* at a depth of about 30 metres below the water table). A similar bore cluster may be considered near the southwestern corner of the proposed new waste disposal area at the site. Sampling from such a bore cluster prior to waste disposal taking place in the proposed new disposal area

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would indicate whether groundwater beneath this area has already been contaminated by leachate from historical waste disposal at the Buller Road site, and would provide a baseline to assess future impacts on groundwater quality that might be caused by waste disposal in the new area.

The suite of groundwater quality parameters that is measured in the monitoring program for the Buller Road site is also quite limited and does not provide sufficient information to clearly indicate when groundwater quality has been altered by the presence of landfill leachate or to provide an early warning of adverse changes in groundwater quality that may lead to impacts on nearby groundwater users or on groundwater-dependent environmental receptors. Consequently, Waste Industries may wish to consider whether the suite of chemical parameters that is set in licence conditions for the site should be amended.

Chemical parameters that are measured in groundwater sampling programs at landfill sites fall into two groups: a suite of "major" parameters which are either present in groundwater at high concentrations or which are measured in the field, and a suite of "trace" constituents such as heavy metals and pesticides which have the potential to cause environmental harm when present at very low (part per billion or less) concentrations. Although the current licensed monitoring suite at Buller Road contains a number of metals of environmental concern, it only includes a limited number of major parameters that could be used to clearly identify the effects of leachate on groundwater quality.

An example of a comprehensive suite of major parameters for use on groundwater monitoring programs is shown in Table 1 and Waste Industries may wish to consider whether some or all of the parameters shown in this Table are included in the groundwater monitoring program at the Buller Road site.

There are also a number of trace constituents of environmental concern that are often present in groundwater near unlined landfill sites and which have yet to be monitored at the Buller Road facility. As arsenic and mercury may be present in groundwater at levels of environmental concern at landfill sites due to chemical reactions between aquifer sediments and leachate (Barringer and Szabo, 2006; Wang *et al.*, 2012), Waste Industries may also wish to consider including these elements in the monitoring suite at the site. The PFAS compounds perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) may be present in leachate from unlined landfill sites and therefore may also be considered for inclusion in the groundwater monitoring suite for the Buller Road facility.



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Determinand	Symbol	Units	Minimum reporting value ¹		Field/ Lab ²	Major ion balance ³	Tolerable uncertainty ⁴
			A	B			
Temperature	Temp	°C	±1 ⁵	±5 ⁵	F		4
pH	pH	pH units ⁶	±0.1 ⁵	±0.5 ⁵	F and L		4
Electrical conductivity	EC	µS/cm ⁶	10	50	F and L		4
Dissolved oxygen ⁷	DO	mg/l	±1 ⁵	±1 ⁵	F		4
Redox potential ⁷	Eh	mV	±1 ⁵	±5 ⁵	F		4
Total suspended solids	TSS	mg/l	5	5	L		4
Total dissolved solids (gravimetric)	TDS	mg/l	10	20	L		4
Ammoniacal nitrogen (as N)	NH ₄ -N	mg/l	0.05	1	L	(+)	4
Total oxidised nitrogen (as N) ⁸	TON	mg/l	0.2	0.2	L	(-)	4
Volatile fatty acids (C ₂ -C ₆)	VFA	mg/l	0.1	0.1	L	(+) ⁹	4
Total organic carbon (filtered)	TOC	mg/l	0.2	1	L		4
Biochemical oxygen demand	BOD	mg/l	1	10	L		4
Chemical oxygen demand	COD	mg/l	5	20	L		4
Calcium ¹⁰	Ca	mg/l	1	20	L	+	4
Magnesium ¹⁰	Mg	mg/l	1	20	L	+	4
Sodium ¹⁰	Na	mg/l	1	10	L	+	4
Potassium ¹⁰	K	mg/l	1	10	L	+	4
Total alkalinity (as CaCO ₃)	Alk	mg/l	5	10	F or L	-	4
Sulphate	SO ₄	mg/l	3	10	L	-	4
Chloride	Cl	mg/l	1	10	L	-	4
Iron ¹⁰	Fe	µg/l	20	50	L	(+)	4
Manganese ¹⁰	Mn	µg/l	10	10	L	(+)	4

¹ Actual reporting values should be determined in consultation with the analytical laboratory. 'A' reporting values or better should always be used if attainable. Reporting values 'A' are for 'clean' waters, 'B' values are for leachates. Values for brackish waters should be agreed with the analytical laboratory and the Agency.

² Measurements designated 'L' would normally be determined at a laboratory, though selected field measurements of indicator parameters may be acceptable to the Agency subject to agreement of calibration procedures.

³ Determinands marked '+' are cations and '-' are anions used for major ion balance calculation. Bracketed values are those frequently at sufficiently low concentration in natural waters to omit from calculation, but that would normally be included in a major ion balance for leachates.

⁴ The tolerable uncertainty is determined following completion of the initial characterisation monitoring and may not necessarily be applied to all measurements. It may be expressed as a percentage or a fixed value. It is site, location and measurement specific (see Section 6.3.5).

⁵ Typical instrumentation accuracy required, rather than reporting value.

⁶ Calibration temperature should be stated. Normally, this is 20°C.

⁷ Where DO and Eh measurements are required, these should only be determined in the field. Analyses on groundwater samples should only be taken in flow-through cells. Measurements would not normally be carried out on leachate samples.

⁸ Total oxidised nitrogen may be expressed as the sum of nitrate (NO₃) and nitrite (NO₂) analyses.

⁹ If volatile fatty acids are included in a major ion balance, a correction is required for the effect of these acids on the alkalinity value (see Appendix 13).

¹⁰ All metals should be dissolved metals unless conditions require total metals (e.g. for surface water or groundwaters that are fast flowing, or where precipitation of Fe/Mn is occurring in otherwise clear water).

Table 1. Typical suite of "major" groundwater quality parameters that are measured in groundwater at landfill sites (UK Environment Agency, 2003)



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6. Responses to queries from Waste Industries

Query 1: Cumulative Impacts of Waste Disposal

Waste disposal in the proposed extension to the Buller Road facility is unlikely to increase either the current extent of groundwater contamination near the facility or the discharge of nutrients to nearby wetlands. Although there are currently a number of unquantified environmental risks from chemical constituents that have yet to be measured in groundwater at the facility (e.g. arsenic, mercury and perfluorinated alkyl substances), it is unlikely that waste disposal in the proposed landfill extension would significantly change the magnitude of the risks that already exist from historical waste disposal at the Buller Road site.

Query 2: Measures to reduce the discharge of leachate to groundwater

Leachate production and the consequent discharge of contaminants to groundwater in the proposed landfill extension could be greatly reduced through the use of a suitable daily cover on putrescible wastes, and through the progressive capping of landfilled areas. More information about these issues is provided in Section 4 of this report.

Query 3: Potential impacts on sensitive receptors

The most significant environmental receptors near the Buller Road facility are considered to be seasonal groundwater-dependent wetlands. The trophic status of these wetlands is likely to have been largely affected by inputs of nutrients from agricultural land uses in the area rather than by discharges from the waste disposal facility. More information about these issues is provided in Section 3 of this report.

Query 4: Issues associated with the current groundwater monitoring program

The limited information that was provided for review suggests that there are insufficient monitoring bores located downgradient of the waste disposal facility to detect changes in groundwater quality associated with the discharge of landfill leachate from the site. The current network of monitoring bores has not been designed to detect changes in groundwater quality at various depths in the superficial aquifer and the current sampling analytical suite does not include key chemical parameters that would allow changes in groundwater quality to be clearly associated with contamination by landfill leachate. More information about these issues is provided in Sections 5.1 and 5.2 of this report.

Query 5: Potential changes to the groundwater monitoring program

Additional monitoring bores constructed at monitoring site MB2 would enable groundwater contamination by landfill leachate to be detected at various depths in the superficial aquifer. A similar bore-cluster near the southwestern corner of the proposed new waste disposal area would provide baseline groundwater quality data for this area. The addition of a number of chemical parameters to the current analytical suite for the sampling program would enable changes in groundwater quality to be associated with contamination by landfill leachate and would allow environmental risks associated with trace chemical constituents to be determined. These issues are discussed in more detail in Section 5.3 of this report.

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8. Limitations

1. The information provided by the Shire of Waroona about management of the Buller Road landfill sites is assumed to be correct, and it is assumed that groundwater samples from the site have been sampled and analysed in an appropriate manner.

Signatures

Author Name STEVE APPLISYARD	Signature
Position PRINCIPAL HYDROGEOLOGIST	Date 3/4/2016
Reviewer Name Andrew Miller	Signature
Position Senior Manager	Date 3/11/2016