



Government of **Western Australia**  
Department of **Water and Environmental Regulation**

Proposed  
estimation/calculation  
methods for non-metropolitan  
landfills receiving more than  
20,000 tonnes of waste per  
annum under proposed  
amendments to the *Waste  
Avoidance and Resource  
Recovery Regulations 2008*

Consultation paper

April 2019

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Month 2019

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## **About Stakeholder Consultation**

This consultation paper sets out proposed approved methods for liable persons to calculate or estimate the information required to be reported annually under the proposed amendments to the Waste Avoidance and Resource Recovery Regulations 2008 (WARR Regulations).

The Department of Water and Environmental Regulation (DWER) is seeking feedback on the methods set out in this consultation paper. DWER will analyse submissions received and, if required, amend the methods accordingly for the purpose of Gazetting these as a CEO notice under the amended WARR Regulations.

By making a submission, you are consenting to the submission being treated as a public document. If you do not consent to your submission being treated as a public document, you should mark it as confidential, specifically identify those parts which you consider should be kept confidential, and include an explanation.

DWER may request that a non-confidential summary of the material is also given. It is important to note that even if your submission is treated as confidential by the Department, it may still be disclosed in accordance with the requirements of the *Freedom of Information Act 1992*, or any other applicable written law.

The Department reserves the right before publishing a submission to delete any content that could be regarded as racially vilifying, derogatory or defamatory to an individual or an organisation.

## **How to Make a Submission**

Written submissions must be received by 5pm (WST) on Friday 27 May 2019. No late submissions will be considered. We look forward to receiving your submission.

Submissions can be lodged by email (preferred) to [waste.data@dwer.wa.gov.au](mailto:waste.data@dwer.wa.gov.au) or hard copies can be mailed to:

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# 1 Introduction

The Department of Water and Environment Regulation (DWER) is amending the *Waste Avoidance and Resource Recovery Regulations 2008* (WARR Regulations) to require annual reporting of waste and recycling data. The intention is that liable persons will be required to submit their first mandatory reports in 2019/20 by 1 October 2020.

Liable persons will be required to estimate amounts of material collected, disposed and recycled, in the manner approved by the CEO.

## 2 Purpose of this paper

Liable persons are licensees, or a person who is the occupier of premises that would, if the person held a licence in respect of the relevant premises, be a licensed landfill that receives 20,000 tonnes or more of reportable waste in a financial year and the relevant premises are outside the Perth metropolitan region.

For the purpose of this consultation paper, these liable persons will be referred to as liable non-metropolitan landfills.

This consultation paper sets out proposed approved methods for liable persons to calculate or estimate the information required to be reported annually under the amended Waste Avoidance and Resource Recovery Regulations 2008 (WARR Regulations).

DWER is seeking feedback on the methods set out in this consultation paper.

Liable non-metropolitan landfills will be required to report the following information annually for the most recently concluded financial year:

- Amount of waste received (tonnes);
- Amount of waste disposed (tonnes);
- Amount of stockpiled waste at the beginning and end of the reporting period (tonnes);
- Amount of material removed from the site (tonnes per annum);
- Destination/fate of material removed from site (recycling, waste-to-energy or disposal to landfill);
- Material category of waste received;
- Source waste stream of waste received (municipal solid waste (MSW), commercial and industrial (C&I) or construction and demolition (C&D)); and
- Geographic source of material received (Perth metropolitan region, Peel region or other regions).

### 3 Reporting period

The reporting period is by financial year (1 July to 30 June) for each year. Reports are due to DWER on or before 1 October after the end of the reporting financial year.

### 4 Reporting format

Under the amended WARR Regulations, liable persons will be required to report using a CEO approved form. DWER is developing an online reporting system for this purpose which will be made available for reports to be submitted by 1 October 2020.

### 5 Data recording format

Information is to be recorded in the following format.

Table 1: Reporting format for reporting material received at the site

Material category	Amount (tonnes per annum)	Waste stream source	Geographical source – Metro, Peel or Other	Destination / fate
<i>e.g. Paper</i>		<i>e.g. MSW</i>	<i>e.g. Metro. Perth</i>	<i>e.g. recycled</i>
<i>e.g. Glass</i>		<i>e.g. C&amp;I</i>	<i>e.g. Other region</i>	<i>e.g. recycled</i>

Table 2: Reporting format for reporting end destination of material received at the site

Material category	Amount (tonnes per annum)	Fate	Geographical destination
<i>e.g. Paper</i>		<i>e.g. Recycling</i>	<i>e.g. exported interstate</i>
<i>e.g. Mixed putrescible</i>		<i>Landfill</i>	<i>On-site</i>
<i>e.g. Garden organics</i>		<i>Stockpile</i>	<i>On-site</i>

### 6 Material categories

The following waste categories are to be reported.

Table 3. List of minimum waste categories for reporting

Material categories	
Paper	Organics – Food organics
Cardboard	Organics – Timber / wood
Plastics	Organics – other organics
Metals – Ferrous	Rubber/tyres
Metals – Non-ferrous	Textiles
Glass	Hazardous – asbestos
Concrete	Hazardous - batteries
Bricks	Hazardous - other
Soil, sand, clean fill	E-waste

Material categories	
Organics – Garden organics	Other / mixed - putrescible
Other /mixed - inert	

Where alternative categories are to be used, the report must clearly show how the waste categories reported align to DWER standard waste material categories in Table 3.

An annual waste composition study will be required where the liable non-metropolitan landfill only receives and records materials in categories that do not align with the material categories in Table 4. The study is to be conducted over a period of at least five days.

**Question 1 - Are the proposed material categories practical and appropriate for the Western Australian landfill industry?**

## 7 Proposed approved methods

The method to be used is based on the information available to the facility. Liable non-metropolitan landfills should use the “highest” preferred method for which the data is available.

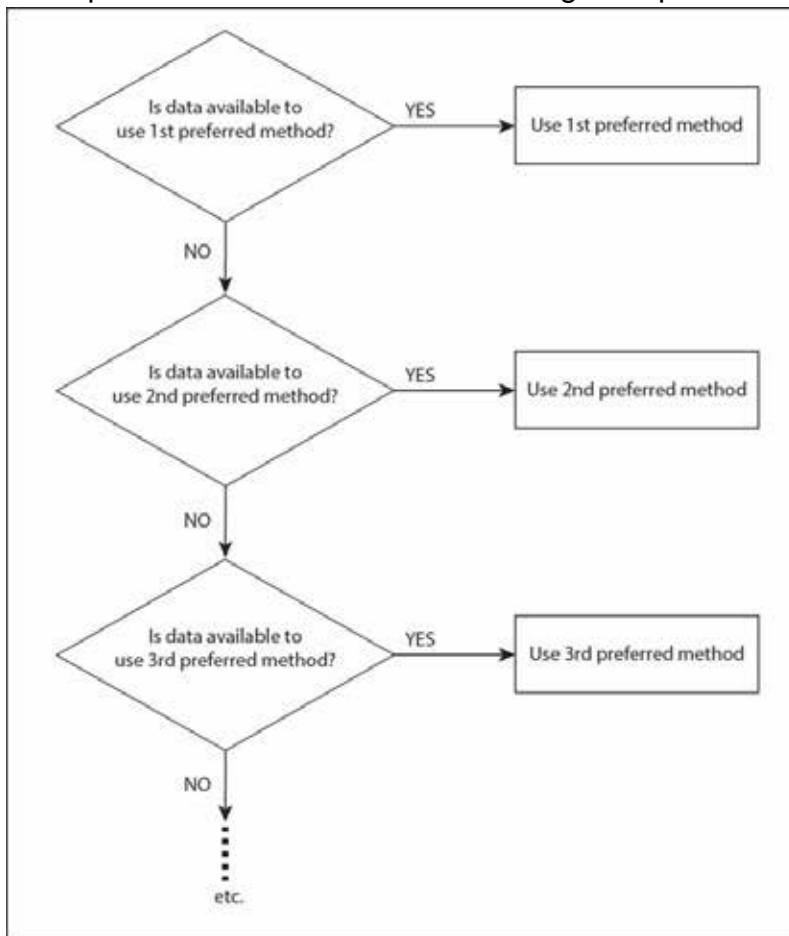


Figure 1: Hierarchy of approved methods

## 7.1 Estimating weight of material received, disposed and leaving the site

Liable non-metropolitan landfills will be required to use the following methods to calculate or estimate the amount of waste entering, stored, disposed at and leaving the site.

### 7.1.1 1st preferred method - Estimation by weight

Where a weighbridge is installed at the site, all loads of waste are to be weighed on the weighbridge at the time that they enter and leave the site.

*Equation 1: Estimating annual weight from weighed waste*

$$\text{Annual waste} = \sum (\text{weight of load})$$

### 7.1.2 2nd preferred method - Estimation by volume

For sites without a weighbridge or where a weighbridge is inoperable, the volume-estimation method may be used for the duration that the weighbridge is not working.

*Equation 2: Estimating annual weight from volume*

$$\text{Annual waste} = \sum (\text{volume of load} \times \text{density of waste})$$

*Table 4: Data to be collected for estimation by volume*

<b>Data required</b>	<b>Data sources</b>
Volume of each vehicle / container	Gatehouse records
% capacity of vehicle / container	Estimated for each load as it arrives - default is 100%
Material category of each load (e.g. mixed waste, green waste)	Determined by gatehouse operator as load arrives

The volume assessment method requires that each waste load entering and leaving the site is assessed for material type and volume. An example of this method is provided in Attachment 2. For landfills without a weighbridge receiving waste subject to the waste levy, the volume or weight must be estimated using the method provided in the waste levy approved manner *Approved manner for estimating the volume or weight of waste received at and disposed of to landfills: Waste Avoidance and Resource Recovery Levy Regulations 2008*, available at [www.der.wa.gov.au/images/documents/your-environment/waste/WARR\\_Landfill/Approved-manner\\_12June2018.pdf](http://www.der.wa.gov.au/images/documents/your-environment/waste/WARR_Landfill/Approved-manner_12June2018.pdf)

## 7.2 Estimating the weight of stockpiles

### 7.2.1 1st approved method - Mass balance

For the purposes of annual reporting, the net weight of the stockpiles for the year is calculated using a mass balance; i.e. the amount at the start of the year and whether the amount of the stockpiled material grew or reduced over the year.



Equation 3: Estimating annual weight of stockpiles

$$Weight_{stockpile} = Weight_{original} + Weight_{received} - Weight_{left\ site} - Weight_{contamination\ removed}$$

This method is preferred for sites with a weighbridge. However, it is only suitable for non-degradable material, such as concrete, dry recyclables, etc. Volume estimation should be used to determine the amount of material in green waste stockpiles at the end of the financial year (see 8.2.2).

### 7.2.2 2<sup>nd</sup> approved method - Volumetric survey

If not all material added to the stockpile or removed and produced from the stockpile has been weighed, a volumetric survey may be used to estimate the amount of waste contained in stockpiles. Volumetric surveys should be used to estimate the amount of green waste stockpiled on-site at the end of the reporting period.

Volumetric surveys should be conducted as close to the end of the reporting period as possible. The volume is converted to weight by multiplying the volume by the bulk density of the waste.

## 7.3 Estimating bulk density of material categories

Sites without a weighbridge, or where the weighbridge is inoperable for six months or more in one year, must conduct a bulk density survey at their premises to determine the bulk density of the various material category loads entering and leaving the site. A detailed report of the bulk density survey, including raw data, must be submitted to DWER with the next annual data report following conducting the survey.

The bulk density survey is to measure the weight and volume of at least five loads of at least three cubic metres for each material category reported.

Where a weighbridge is inoperable for less than six months in one year, DWER default values for waste material bulk densities and vehicle/container volumes should be used.

## 8 Estimating the amount of material disposed at the landfill site

For material received that is disposed directly to landfill on entering the site, the above methods (Section 8) of weight estimation are to be used as relevant.

Where waste is stored for recycling or re-use, with some of the load removed and disposed to landfill (e.g. contamination is removed from green waste), the following methods for estimating waste disposed to landfill may be used

- weighed over the weighbridge (see 8.1.1),
- a mass balance of material entering and leaving the site, or

- volume assessment method (see 8.1.2).

**Question 2 - Are the proposed calculation methods to estimate the weight of waste received, disposed, leaving and stockpiled at your site clear? If not, what further clarification is required?**

**Question 3 - Are there any barriers that would prevent your organisation from using these calculation methods? If so, what are they and how can they be overcome?**

## 9 Source of waste

The source waste stream (MSW, C&I or C&D) and geographic source (Perth metropolitan region, Peel region and other regions) of each load entering or leaving the site is to be recorded.

Where this data is not recorded, the liable non-metropolitan landfill will conduct four surveys over the year, each of one week in length, to determine the proportion of material entering or leaving the site by geographic source and by waste stream.

## 10 Destination / fate of waste

Liable landfill operators are required to report what happens to the waste received at the landfill site. The options for the fate of waste are: landfilled, recycled, stockpiled or waste-to-energy. The categories for geographical destination of the waste are: local, exported interstate or exported overseas.

## 11 Default values

Where key data are not available, a number of “default values” have been approved to be provided in substitution for real world data and are provided in Appendix A. These include default bulk densities to be used to estimate weight from volume, where this information is not estimated by the liable non-metropolitan landfill.

Landfills receiving waste subject to the waste levy (i.e. sourced from or disposed in the metropolitan area), then the default vehicle amounts to be used are those in the waste levy approved manner *Approved manner for estimating the volume or weight of waste received at and disposed of to landfills: Waste Avoidance and Resource Recovery Levy Regulations 2008*, available at [www.der.wa.gov.au/images/documents/your-environment/waste/WARR\\_Landfill/Approved-manner\\_12June2018.pdf](http://www.der.wa.gov.au/images/documents/your-environment/waste/WARR_Landfill/Approved-manner_12June2018.pdf)

Liable landfills that do not receive waste subject to the levy may use the above estimation methods, combined with the simpler default values provided.

**Question 4 - Are the proposed default material densities appropriate for the Western Australian landfill industry?**

## 12 Alternative methods

Liabile non-metropolitan landfills may propose alternative methods for the following if these are more accurate than the methods set out above:

- estimating the amount of material received, removed and disposed
- estimating the bulk density of waste categories
- estimating the waste composition
- estimating the source waste stream

Any alternative methods proposed must be accurate, repeatable and consistent. Liabile non-metropolitan landfills must submit these methods, with relevant substantiating information, to DWER for consideration and approval prior to use.

## 13 Feedback sought

DWER is seeking feedback on the proposed methods set out in this consultation paper, specifically on the following:

1. Are the proposed material categories practical and appropriate for the Western Australian landfill industry?
2. Are the proposed calculation methods to estimate the weight of waste received, disposed, leaving and stockpiled at your site practical?
3. Are there any barriers that would prevent your organisation from using these calculation methods? If so, what are they?
4. Are the proposed default material densities appropriate for the Western Australian landfill industry?

## 14 Glossary

Acronym / symbol	Definition
å	Sum of
t	Tonnes
m <sup>3</sup>	Cubic metres
C&D	Construction and Demolition waste Solid waste from residential, civil and commercial construction and demolition activities
C&I	Commercial and Industrial waste: Solid waste generated by the business sector, State and Federal Government entities, schools and tertiary institutions
DWER	Department of Water and Environmental Regulation
MSW	Municipal Solid waste Solid waste generated from domestic (residential) premises and local government activities
Peel Region	The Peel region is the area defined by the Peel Region Scheme.
Perth Metropolitan Region	The Perth region, or Perth metropolitan region, is the area defined by the Metropolitan Region Scheme.
Reportable waste	Means waste that is solid matter

# Appendices

## Appendix A - Default values

### Default vehicle volumes<sup>1</sup>

<b>Vehicle type</b>	<b>Assumed volume (m<sup>3</sup>)</b>
Small vehicle (car, ute, van, trailer)	1
Open truck - small, 2 axles	3
Open truck - large 2 axles	6
Open truck - 3 axles	10
Open truck - 4 axles	12
Open truck - 5 axles	18
Open truck - 6 axles	20
Open truck - 8 axles	20
Open truck - 9 axles	32
Open truck - 11 axles	40
Compactor truck - volume unknown	10

### Default bulk densities

<b>Material category</b>	<b>Default bulk density (t/m<sup>3</sup>)</b>
Paper <sup>3</sup>	0.2
Cardboard <sup>5</sup>	0.1
Plastics <sup>3</sup>	0.14
Metals – Ferrous <sup>1</sup>	0.5
Metals – Non-ferrous	0.14
Glass <sup>1</sup>	0.347
Concrete <sup>6</sup>	1.5
Bricks <sup>5</sup>	1.2
Soil, sand, clean fill <sup>5</sup>	1
Organics – Garden organics <sup>1</sup>	0.15
Organics – Food organics <sup>3,5</sup>	0.5
Organics – Timber / wood <sup>3</sup>	0.19
Organics – other organics	0.3
Rubber/tyres <sup>1</sup>	0.3
Textiles <sup>1</sup>	0.15
Hazardous – asbestos <sup>3</sup>	0.31
Hazardous – other <sup>5</sup>	0.2
Mixed co-mingled recyclables (uncompacted) <sup>1</sup>	0.063
Other / mixed - putrescible <sup>1</sup>	0.3
Other /mixed - inert <sup>1</sup>	1.3

## Appendix B - Examples of using methods

### Example 1 - Estimation of weight by volume

$$\text{Annual waste} = \sum (\text{volume of load} \times \text{density of waste})$$

Data recorded and calculations

Individual load	Load volume (cubic metres)	% fullness	Source waste stream	Material category	Fate	Material bulk density (t/m <sup>3</sup> )	Weight (tonnes)
Load 1	15	100%	MSW	mixed putrescible waste (compacted)	Landfill	0.425	6.38
Load 2	20	100%	C&I	mixed putrescible waste (compacted)	Landfill	0.425	8.50
Load 3	1	100%	C&I	mixed putrescible waste (uncompacted)	Landfill	0.087	0.09
Load 4	3	80%	MSW	mixed putrescible waste (uncompacted)	Landfill	0.087	0.21
Load 5	15	100%	MSW	mixed putrescible waste (compacted)	Landfill	0.425	6.38

Summary data reported

Summary total tonnes of waste received and disposed by source waste stream to be reported

Source waste stream	Material category	Fate	Total Weight (tonnes)
MSW	mixed putrescible waste	Landfill	12.96
C&I	mixed putrescible waste	Landfill	8.59

## References

1. WA Waste Authority *Converting volumes to tonnes*.  
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