Galt GEOTECHNICS

Report on:

GEOTECHNICAL STUDY
COMPOSTING AREA AT CRAIG MOSTYN WONGAN HILLS
YERECOIN SOUTHEAST ROAD
LAKE NINAN, WESTERN AUSTRALIA

WAG240094-02 002 R Rev0

Submitted to:

Craig Mostyn Group

[redacted]

[redacted]

9 October 2025

CONTENTS

1. INTRODUCTION

This report presents the outcomes of Galt Geotechnics' (Galt's) geotechnical assessment of the composting area at the Craig Mostyn Wongan Hills Farm ("the site") off Yerecoin Southeast Road in Lake Ninan, Western Australia.

The location of the site relative to the surrounding area is shown on Figure 1, Site and Location Plan.

This report is to be read in conjunction with the appended "Understanding Your Report".

2. BACKGROUND

2.1. General

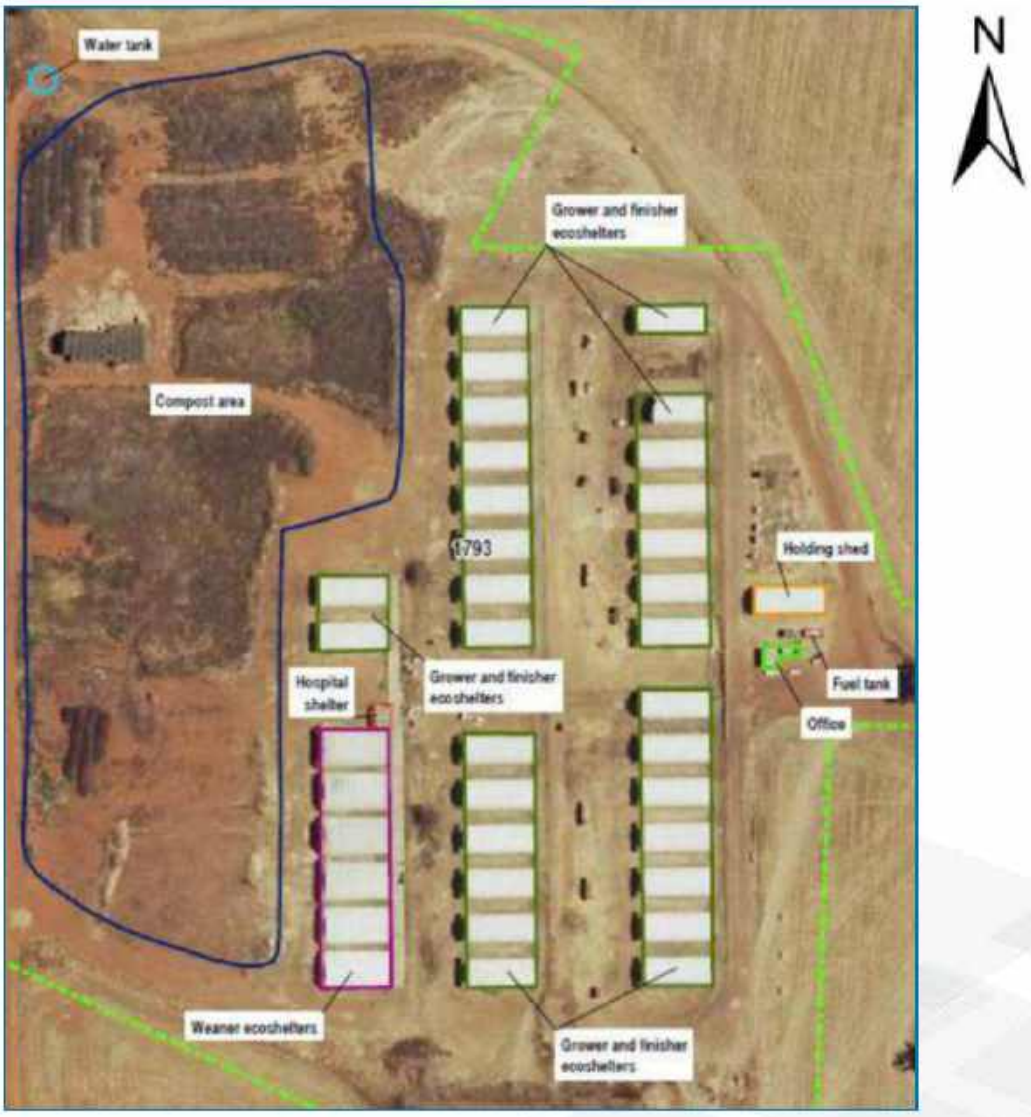
A piggery uses compost and produces waste during processing which is stored in suitable areas on the site.

A suitable area is considered to be one meeting the requirements given in DWER 2022 Guideline, "*Better practice organics recycling*[1]". Relevant excerpts from the reference are presented in Appendix A.

This guideline requires the disposal area to be covered with a hardstand layer to accommodate vehicles and a low permeability layer with a permeability of 10^{-9} m/sec to act as a barrier to prevent leachate seeping into the ground.

The Wongan Hills Farm/Piggery are using an area to the west of the existing shelters for composting, located as shown in Inline Image 1 below.

Inline Image 1: Location of Compost Area (outlined blue) within the Piggery



[1] "Guideline, Better practice organics recycling" Department of Water and Environmental Regulation, Government of Western Australia, December 2022

We understand that Craig Mostyn Farms (CMF) are working with the Department of Water and Environmental Regulation (DWER) to update their environmental licence. As part of this process, CMF require assessment of the composting area against the DWER guidelines,

We further understand that there is no formal liner present in the composting area.

2.2. Requirements for Leachate Barriers on Hardstand Surfaces

DWER guideline requires the following for leachate barriers on hardstand surfaces:

- If unlined: a natural geological barrier that is to provide a homogenous and secure barrier equivalent to the clay liner; or
- If artificially lined with soil:
  - Minimum 300 mm thick compacted clay
  - Coefficient of permeability of $1x10^{-9}$ m/s or less
  - Moisture conditioned and compacted to be at least 95% MMDD in layers not more than 300 mm loose thickness.
  - Lined with a suitable protective layer at least 150 mm thick overlying the leachate barrier to prevent damage and desiccation.

3. SITE DESCRIPTION

Site details are summarised below.

Table 1: Summary of Site

Item	Comment
Site Area	Composting area is approximately 3.2 Ha
Current Site Surface Levels[1]	~RL 252 m AHD in the north to RL 248 m AHD in the south
Vegetation	Open farm paddocks
Existing Infrastructure	Shelters, ecoshelters and associated outbuildings to the east of the composting area. A water tank is located at the northwest corner of the composting area.
Site History[2]	Historical aerial imagery from 2000 onwards shows the farm has remained relatively unchanged.

NOTES: *1. Site levels based on publicly available data (Landgate).*

2. Site history based on aerial imagery (Landgate).

4. OBJECTIVES

The specified objectives of the study were to:

- assess the soil profile under the compost area including its permeability and compaction (**Note**: since there is no artificial barrier present, then this will be an assessment of the in situ soil to act as a barrier); and
- assess the construction design of the compacted gravel hardstand under the compost area. (**Note:** This does not include a pavement thickness design). We assume that this is to assess compliance with Table 5 of the DWER guideline, which notes "suitable protective layer at least 150 mm thick overlying the leachate barrier to prevent damage and desiccation".

5. FIELDWORK

Fieldwork was carried out by representatives from Groundbreaking Investigations (GBI) on 18 September 2025 and comprised:

- a walkover survey of the site, including taking photographs;
- excavation of six test pits (TP01 to TP06), extending to depths ranging from 1.4 m to 1.5 m;
- constant head permeability tests at three locations (G01 to G03), at a depth of 0.5 m in each instance; and
- collection of representative samples for possible inspection and laboratory testing.

Approximate test locations are shown on Figure 1.

Photographs of the site taken during our investigation are presented in Appendix B.

Details of the test pits are presented in Table 2.

Table 2: Summary of Test Pits

Test Location Reference	Depth [m]	Depth to Groundwater [m]	Reason for Termination	Stratigraphy
TP01	1.5	GNE	Target depth	Clayey SAND / Sandy CLAY
TP02	1.5	GNE	Target depth	Clayey SAND / Sandy CLAY
TP03	1.4	GNE	Target depth	Clayey SAND / Sandy CLAY
TP04	1.5	GNE	Target depth	Sandy CLAY
TP05	1.5	GNE	Target depth	Sandy CLAY
TP06	1.4	GNE	Target depth	Gravelly Clayey SAND (to 0.1 m depth) over Clayey SAND / Sandy CLAY

NOTES: *'GNE' – Groundwater not encountered*

TP – Test Pit

Test Pits

Test pits were excavated using a 7-tonne backhoe ("JCB 2CX") equipped with a 0.35 m wide bucket.

Test pit reports are presented in Appendix C: Test Pit Reports, along with a method of soil and rock description and a list of explanatory notes and abbreviations used in the reports.

Constant Head Permeameter Tests

Constant head permeameter testing was carried out in general accordance with AS 1547 (2012), "On-site domestic wastewater management" using a constant head permeameter. The test results are presented in Appendix F and summarised in Table 3.

Table 3: Constant Head Permeability Test Results

Test Location	Test Depth [m]	Pressure Head [m]	Soil Profile	k_{sat}[1] [m/day]	k_{sat}[1] [m/s]
G01	0.5	0.4	Clayey SAND (SC) / Sandy CLAY (CL)	0.03	3.16×10^{-7}
G02	0.5	0.4	Sandy CLAY (CL)	0.10	1.11×10^{-6}
G03	0.5	0.4	Clayey SAND (SC) / Sandy CLAY (CL)	0.16	1.90×10^{-6}

NOTES:
1. *k_{sat} – saturated hydraulic conductivity (note reported decimal places is not indicative of test accuracy)*
2. *Soil profile description provided above is based on the profile observed below the constant head permeability test and inferred from visual-tactile logging of the nearest test pit.*

6. SITE CONDITIONS

6.1. Geology

Geology mapping details are presented in the table below.

Table 4: Summary of Geology Mapping

Map Sheet	Map Scale	Mapped Soils
Wongan Hills	1:250,000	Lateritic colluvium of Wongan Hills

6.2. Subsurface Conditions

The subsurface conditions can be summarised as:

- Clayey SAND (SC) / Sandy CLAY (CL): low plasticity, brown-red, approximately 55-65% fine to medium grained sand, approximately 25-35% low plasticity fines, extending from the ground surface to the maximum depth investigated of 1.5 m.

Note: In test pit TP06 a Gravelly Clayey SAND layer (likely FILL) was present at the surface (0.1 m thick) of the underlying Clayey SAND / Sandy CLAY.

6.3. Groundwater

We are not aware of any information on groundwater available for the site, however we expect true groundwater to be at a significant depth below the ground. Due to the presence of clayey soils we expect that perched water and overland water flows will occur during and following a rain event.

During our investigation (September 2025), groundwater was not encountered to the maximum investigated depth (1.5 m).

7. LABORATORY TESTING

Laboratory testing was conducted by Western Geotechnical and Laboratory Services (WGLS) in their NATA accredited laboratory and comprised determination of:

- particle size distribution on 3 samples;
- Atterberg limits and linear shrinkage on 3 samples;
- Emerson Class Number on 3 samples;
- dry density moisture content relationship using Modified compactive effort on 2 samples; and
- soaked California Bearing Ratio (CBR) on 2 samples; and
- falling head permeability on 2 remoulded samples at 95% Modified Maximum Dry Density.

Laboratory test certificates are presented in Appendix F along with the test methods followed.

Laboratory test results are summarised in Attached Tables 1 and 2 at the end of the text.

8. GEOTECHNICAL ASSESSMENT

8.1. Suitability as Hardstand

The surficial soils present over the surface of the composting area typically comprise Clayey SAND / Sandy CLAY. A suitable protective layer (150 mm thick) was typically not observed above the in situ clayey soils, with the exception of TP06 where a surficial (0.1 m thick) layer of Gravelly Clayey SAND (likely FILL) was present overlying clayey soils.

Laboratory test results show the surficial soils have an Emerson Class Number (ECN) ranging from 3 to 5. The soil ECN number relates to the potential for the soils to slake and disperse. An ECN number of 5 indicates the soil to slake with a low susceptibility for dispersion whereas an ECN number of 3 indicates the soil to slake with dispersion occurring to a greater degree (relative to ECN 5).

The remoulding and breaking down of soil bonds can result in dispersive behaviour, and further breakdown of the soil may occur if high velocity water flow occurs across the material. Under these circumstances these classes of soil may disperse (erode).

California Bearing Ratio (CBR) results are considered typical of the soil types tested.

Given the absence of a suitable protective layer and the potential dispersivity of the in situ clayey soils, we consider the existing surface to be unsuitable for use as a hardstand.

We recommend a hardstand be constructed at the site, primarily to address dispersive behaviour as indicated by the laboratory ECN. Hardstand is typically a gravelly material.

The hardstand is expected to be suitable to support small trucks and light equipment associated with dumping and processing waste, provided it meets the following requirements:

- constructed of soils that possess an ECN of 6 or higher (non-dispersive);
- compacted to a DDR of 95% MMDD at optimum moisture content;
- shaped to drain using a surface gradient of around 1-2%;
- regularly maintained at a suitable density and shape; and
- surrounded by bunds constructed using low permeability material such as compacted clay.

A pavement design should be carried out based on the traffic loads.

8.2. Suitability As Leachate Barrier for Waste

8.2.1. General

The suitability of the composting area for waste disposal has been assessed on the basis of the requirement given in Table 5 of Reference 1 (refer Appendix A). This requires a disposal site to be underlain by a low permeability liner or barrier with a maximum permeability of 1 x 10^{-9} m/sec. In light of this, we have determined the permeability of the in situ soils as follows:

- in the field (using the constant head permeameter test), and
- in the laboratory (using the falling head method) after compacting the soil to a dry density ratio of about 95% MMDD.

The constant head permeameter test, conducted in accordance with the method outlined in Appendix G of AS1547, is a constant head permeability test carried out in nominally "saturated" soil (in that the test is conducted until a "steady state" is reached). However, we note that this test can only be done above the groundwater table and as such, is in an unsaturated zone. Therefore, the hydraulic conductivity derived from this test should be used with caution and evaluated against other test methods such as the saturated, falling head permeability testing from laboratory samples.

We therefore consider the appropriate permeability to assess the suitability of soil for use as low permeability liner or barrier is that determined by way of a saturated, falling head permeability test conducted on a sample compacted to a suitable density in the laboratory.

8.2.2. Permeability Results

Field permeability tests indicate permeabilities that are 3 to 4 orders of magnitude higher than the requirement (refer Section 2.2), for a leachate barrier however we note that the in situ soils may not be compacted to 95% MMDD.

Laboratory permeability tests on remoulded (i.e., compacted to a dry density ratio of about 95% MMDD) samples indicate permeabilities that are typically 1 order of magnitude higher than the requirement (refer Section 2.2) for a leachate barrier.

The permeability of a clayey soil is not only dependent on the soil type but also on the density of the soil. In general, the higher the density, the lower the permeability. It should be noted that the in situ density of the clayey soils, in which the field permeability tests were conducted, was not known. The higher permeability test results recorded in the field tests may in part be due to a lower density condition than that used in the laboratory tested samples.

Notwithstanding the above, all the permeabilities recorded are below the DWER requirement, and on this basis the clayey soils are not suitable for use as a leachate barrier.

8.2.3. Conclusion

To put the above values in context, listed below is the classification of soils, according to their coefficients of permeability as given in Table 19.2 of Lambe and Whitman[2].

Table 5: Classification of Soils According to Their Coefficients of Permeability Test Results

Degree of Permeability	Range of Permeability (m/s)
High	Over 10^{-3}
Medium	10^{-3} to 10^{-5}
Low	10^{-5} to 10^{-7}

[2] *Lambe, T.W. & Whitman, R.V.: Soil Mechanics, Wiley, New York (1979) Figure 19.2, page 287*

Very Low	10^{-7} to 10^{-9}
Practically Impermeable	Less than 10^{-9}

On the basis of this table, the laboratory measured permeabilities can be classified as very low. Given this, we consider there is scope to use this material as a low permeability leachate barrier (below a hardstand layer) as the seepage difference between a very low permeability leachate barrier/liner with a permeability of 10^{-8} m/sec and one with a permeability of 10^{-9} m/sec is negligible.

However, if the permeabilities of clay soils are not deemed as adequate by the Department of Water and Environmental Regulation (DWER), it will be necessary to install a liner/leachate barrier as specified in Table 5 of Reference 1 (Appendix A) or an equivalent. These liner/leachate barrier types comprise concrete, asphalt cement or a bituminous seal.

8.3. Site Preparation

Should the clays underlying the composting area be considered acceptable by DWER, the following site preparation procedures should be followed:

- remove fill (where present, e.g. at location TP06) to expose underlying clay soil
- place fill in stockpiles for later re-use as a protective layer over the clay;
- scarify exposed surface of clay to a depth of about 200 mm;
- adjust moisture content of scarified clay to a moisture content of at or close to optimum moisture content;
- compact the exposed surface using a 10-tonne vibratory padfoot roller or equivalent to achieve a minimum dry density ratio of 98% using Standard compactive effort; Note: In situ permeability tests must be carried out on the compacted clays layer to confirm the permeability of the layer.
- following completion of the compaction slope the clay surface to fall at a grade of about 1 in 100;
- place and compact fill to construct the hardstand (requirements as per Section 8.1), to achieve a minimum dry density ratio of 95% using Modified compactive effort.

9. CLOSURE

GALT GEOTECHNICS

Alex Mathew
Geotechnical Engineer

Fred Davenport MIEAust
Geotechnical Engineer

https://galtgeo.sharepoint.com/sites/wag240094/shared documents/02 craig mostyn si/03 correspondence/wag240094-02 002 r rev0.docx

Attached Table 1: Summary of Geotechnical Index Test Results

Test Location	Sample Depth (m)	Soil Class (AS1726 2017)	Gravel (%)	Sand (%)	Fines (%)	LL (%)	PI (%)	LS (%)	MMDD (t/m^3)	OMC (%)	CBR (%)	CBR Swell	ECN
TP01	0.5 – 1.0	Clayey SAND (SC)	0	66	34	25	12	4.5	1.99	11.0	14	0.0	5
TP02	0.0 – 0.1	Inferred Clayey SAND (SC) or Sandy CLAY (CL)											5
TP04	0.5 – 0.7	Sandy CLAY (CL)	0	62	38	32	15	7.0	1.95	12.5	12	1.0	
TP05	0.0 – 0.2	Sandy CLAY (CL)	0	64	36	25	12	5.5					3

Notes:

1. *Particle size distribution (by mass)*
   Gravel: 2.36 mm – 63 mm *Sand: 0.075 mm – 2.36 mm* *Fines: <0.075 mm*
2. *Atterberg Limits*
   LL: Liquid limit *PI: Plasticity index* *LS: Linear shrinkage*
3. *Modified compaction*
   MMDD: Modified maximum dry density *OMC: Optimum moisture content*
4. *ECN – Emerson Class Number*
5. *Grey shaded cells indicate no testing conducted.*
6. *For sample TP02 0.0-0.1, soil class is inferred from visual-tactile logging conducted on site.*

Attached Table 2: Summary of Laboratory Permeability Test Results

Test Location	Sample Depth (m)	Soil Class (AS1726 2017)	Laboratory Density Ratio (% MMDD)	Falling Head Permeability (m/s)
TP01	0.5 – 1.0	Clayey SAND (SC)	95	2×10^{-8}
TP04	0.5 – 0.7	Sandy CLAY (CL)	95	1×10^{-8}

Note: 1. *MMDD – Modified maximum dry density*

Figure

Legend

- Compost Area
- Constant Head Permeability Test
- Test Pit / Dynamic Cone Penetration Test

N

0 20 40 60 80 100
Meters

NOTES

Aerial Imagery and Cadastre sourced from Landgate/SLIP

SCALE	1:1,500 (A3)
DRAWN	CED
DATE DRAWN	23/9/2025
CHECKED	-
DATE CHECKED	-
PROJECTION	GDA 1994 MGA Zone 50

Galt GEOTECHNICS

Galt Geotechnics Pty Ltd
ACN : 138 400 865
Tel : +61 (0)8 6272-0200
Address : 50 Edward Street
Osborne Park WA 6017

CLIENT	CRAIG MOSTYN GROUP
PROJECT	COMPOSTING AREA
LOCATION	YERECOIN SOUTHEAST ROAD LAKE NINAN
TITLE	SITE & LOCATION PLAN
Job No	WAG240094-02
Fig No	FIGURE 1
Rev	A

Appendices

Appendix A: Excerpts from Guideline: *Better Practice Organics Recycling*

Government of Western Australia
Department of Water and Environmental Regulation

Guideline

Better practice organics recycling

Activities regulated under the:

- *Environmental Protection Act 1986*
- Environmental Protection Regulations 1987

December 2022

Department of Water and Environmental Regulation
8 Davidson Terrace

Joondalup Western Australia 6027
Telephone +61 8 6364 7000
Facsimile +61 8 6364 7001

National Relay Service 13 36 77
www.dwer.wa.gov.au

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Contents

Tables

1. Purpose

The purpose of this *Guideline: Better practice organics recycling* (guideline) is to set environmental performance objectives and identify benchmark controls for the planning, design and operation of organics recycling facilities regulated under Part V (Pt V) Division 3 of the *Environmental Protection Act 1986* (EP Act). The guideline also defines 'better practice' for organics recycling facilities in relation to the *Waste Avoidance and Resource Recovery Strategy 2030* (Waste Strategy 2030).

2. Scope

Guidelines provide direction on how we (the Department of Water and Environmental Regulation) interpret and apply the legislation we are responsible for administering.

This guideline applies to organics recycling facilities that process or compost organic material (including wastes) to produce recycled organic products. These premises are prescribed under categories 61A and 67A in Schedule 1 of the Environmental Protection Regulations 1987 (EP Regulations), as described in Table 1 below.

This guideline applies to the following activities:

- aerobic composting, including windrow, aerated static pile and in-vessel processes
- anaerobic digestion
- vermiculture
- mechanical processing, such as chipping, shredding and grinding.

Table 1: Description of prescribed premises categories

Description of category	**Production or design capacity**
Category 61A: Solid waste facility: premises (other than premises within category 67A) on which solid waste produced on other premises is stored, reprocessed, treated or discharged onto land.	1,000 tonnes or more per year[1]
Category 67A: Compost manufacturing and soil blending: premises on which organic material (excluding silage) or waste is stored pending processing, mixing, drying or composting to produce commercial quantities of compost or blended soils.	1,000 tonnes or more per year[2]

Note 1: 'Production or design capacity' for a Category 61A organics recycling facility is based on the maximum capacity for which the facility is designed to receive and reprocess solid waste per year.

Note 2: 'Production or design capacity' for a Category 67A organics recycling facility is based on the amount of product produced or which can potentially be produced at the facility per year, not the tonnes of material and waste input to the process.

This guideline also applies to organics recycling at other types of prescribed premises as directly related activities (see Glossary). Other prescribed premises that may undertake organics recycling include:

- Category 25 – Alcoholic beverage manufacturing
- Category 61 – Liquid waste facility
- Category 64 or 89 – Putrescible landfill site
- Category 1 or 68 – Cattle feedlot
- Category 2 or 69 – Intensive piggery.

The following activities are not within the scope of this guideline:

- Category 67A soil blending premises where organics recycling is not undertaken
- Category 62 solid waste depots/waste transfer stations
- Category 61A solid waste facilities where organics recycling is not undertaken and activities where discharging of waste to land occurs
- Organics recycling facilities operating below the relevant production and design capacity (see Table 1).

Note that some of this guideline's benchmark controls may be relevant to the activities undertaken at these premises, especially in relation to the transfer and management of high-risk feedstocks (see Section 8.1). The guideline may also support facilities that are not prescribed (e.g. organics recycling facilities below a production and design capacity) and other similar industry types in meeting their obligations under the general provisions of the EP Act.

As detailed in the *Guideline: Risk assessment*, we do not consider employees, visitors or contractors of an operator as receptors when conducting assessments under Pt V Division 3 of the EP Act. Protection of these parties often involves different exposure risks and prevention strategies – which other state legislation provides for. Workers' safety and health at organics recycling facilities is therefore not within the scope of this guideline.

See the Glossary for definitions of the terminology and acronyms used in this document.

3. Context

Our *Guideline: Industry regulation guide to licensing* outlines the legal requirements for occupiers of prescribed premises under the EP Act and the general process and timeframes for assessments.

This guideline builds on that information by providing better practice industry-specific guidance, supported by benchmark controls, for operators (see Glossary) of organics recycling facilities. We recommend using this guideline in conjunction with *Guideline: Industry regulation guide to licensing*.

In February 2019, the Waste Authority published the *Waste Avoidance and Resource Recovery Strategy 2030* (Waste Strategy 2030) in accordance with the *Waste Avoidance and Resource Recovery Act 2007* (WARR Act). It outlines targets and strategies to achieve the objectives of waste avoidance, waste recovery and protection of the environment through responsible waste management.

Objective 3 of Waste Strategy 2030 relates to environmental protection and seeks that '*Western Australians protect the environment by managing waste responsibly'.* Where waste cannot be avoided, the strategy requires protecting the environment from the negative impacts of waste through recycling and disposal facilities adopting better practice.

A key target under Objective 3 is that waste should be managed and disposed of to 'better practice' facilities by 2030. For this target to be achieved, new facilities are expected to meet or exceed the benchmark set out in published better practice guidelines and existing facilities are expected to improve their operations, where necessary, to align with better practice guidelines.

This guideline sets the framework for the regulation of organics recycling facilities under Pt V Division 3 of the EP Act and sets the standard for better practice organics recycling facilities to fulfil the requirements of the Waste Strategy 2030.

4. Legislation

The EP Act provides for the prevention, control and abatement of pollution and environmental harm in Western Australia, in accordance with (s.4A of the EP Act):

- the precautionary principle
- the polluter-pays principle
- the principle of intergenerational equity
- the principle of the conservation of biological diversity and ecological integrity
- the principle of waste minimisation.

In accordance with the above-listed principles and s.51 of the EP Act, operators of facilities must take all reasonable and practicable measures to prevent or minimise emissions. Under s.51 of the EP Act, it is an offence for occupiers of prescribed premises not to take these measures.

Pt V Division 3 of the EP Act provides us with mechanisms to regulate emissions: we can apply conditions on works approvals and licences for prescribed premises. Conditions are for the purposes of the prevention, control, abatement or mitigation of pollution or environmental harm (s.62 of the EP Act).

The WAAR Act's primary objective is to contribute to sustainability and to protect public health and the environment. The Act is also designed to help Western Australia move towards a waste-free society by:

- promoting the most efficient use of resources, including resource recovery and waste avoidance

- reducing environmental harm, including pollution caused by waste
- consideration of resource management through avoidance of unnecessary resource consumption and disposal
- resource recovery that includes re-use, reprocessing, recycling and energy recovery.

The WARR Act also reflects the principles set out in s.4 of the EP Act.

5. Outcome

This guideline will:

- enable better environmental management in the organics recycling industry by preventing impacts to the environment, water resources, public health and amenity
- provide guidance to operators of organics recycling facilities to achieve the Waste Strategy 2030 target for all waste to be managed and/or disposed to better practice facilities by 2030
- support the Waste Strategy vision for Western Australia to become a sustainable, low-waste circular economy in which human health and the environment are protected from the impacts of waste
- increase the industry and community's confidence in the regulatory process
- support innovation and growth in the organics recycling industry by providing a benchmark operators can use to inform the development of alternative approaches to achieve environmental performance objectives.

6. Achieving better practice

Consistent with *Our regulatory approach* and the Waste Strategy 2030, the guideline:

- sets environmental performance objectives (EPOs), which are the outcomes that must be achieved
- identifies benchmark controls as the standard for operators to demonstrate they have achieved the EPOs
- allows for alternative controls to achieve the EPOs, consistent with a risk-based approach and to support effective and innovative site-specific solutions.

We will apply controls to meet the EPOs – whether benchmark or operator-proposed alternatives – as conditions within approvals granted under Pt V Division 3 of the EP Act. To do this, we will follow the approach set out in the *Guideline: Risk assessments* and *Guidance statement: Setting conditions*.

6.1 Environmental performance objectives

We have set EPOs for the aspects of organics recycling facilities with the potential to cause impacts to the environment. Section 3(1) of the EP Act defines the environment as living things, their physical, biological and social surroundings and interactions between all of these. This definition includes factors such as water resources, public health and amenity. EPOs reflect the requirements of the EP Act and provide a link between the governing legislation and regulated organics recycling facilities.

EPOs are outcome-focused objectives that an organics recycling facility must achieve for it to be considered better practice. Operators can achieve the EPOs by taking a prevention-first approach and, where that is not reasonably possible, minimising any potential impacts. The term minimise refers to the 'control, abatement or mitigation' under s.62 of the EP Act.

EPOs are set out in Table 2. The two EPOs highlighted in grey are industry-specific objectives.

Table 2: Environmental performance objectives

Aspect	Environmental performance objective
Feedstocks	Undertake organics recycling using feedstocks that have a beneficial outcome for product quality.
Emissions to land and water	Protect the environment by preventing and, where that is not possible, minimising emissions to land and water that may cause pollution or environmental harm.
Odour	Protect the environment by preventing and, where that is not possible, minimising odour emissions that may cause pollution or environmental harm.
Point source emissions to air	Protect the environment by preventing and, where that is not possible, minimising point source emissions to air that may cause pollution or environmental harm.
Dust	Protect the environment by preventing and, where that is not possible, minimising dust emissions that may cause pollution or environmental harm.
Noise	Protect the environment by preventing emissions of unreasonable noise and maintaining compliance with the assigned levels in the Environmental Protection (Noise) Regulations 1997 to prevent pollution and environmental harm.
Emissions of litter and debris	Protect the environment by preventing and, where that is not possible, minimising emissions of litter and debris that may cause pollution or environmental harm.
Fire prevention and management	Protect the environment by minimising the risk of fires and be sufficiently prepared in the event of a fire to prevent and, where that is not possible, minimise pollution and environmental harm.
Vectors	Protect the environment by minimising the risk of attraction, refuge, growth and spread of vermin and pests to prevent pollution and environmental harm.
Product quality	Contaminants in feedstocks are treated effectively and recycled organic products are fit-for-purpose.

6.2 Benchmark controls

In this guideline we have identified benchmark controls for operators to implement: in most cases, these will demonstrate that the organics recycling facility has achieved the relevant EPO. We have chosen the benchmark controls to protect environmental values and prevent pollution and environmental harm, generally for low to medium-risk organics recycling facilities.

We have based the benchmark controls on our current understanding of the potential risks associated with organics recycling facilities. As this understanding evolves over time, whether through improved science or advances in the organics recycling industry, we may need to adapt the benchmark controls to address these developments.

See the *Environmental siting* section of this guideline (Section 7) for the siting requirements that support achievement of the EPOs by implementing the corresponding benchmark controls for low to medium-risk organics recycling facilities.

We have determined the benchmark controls in this guideline based on common and reasonable requirements for organics recycling facilities to ensure achievement of the EPOs.

At some organics recycling facilities, not all benchmark controls may be necessary to achieve an EPO. Where operators do not implement certain benchmark controls, they may need to use alternatives to achieve the EPO. Conversely, on their own the benchmark controls may not be enough to achieve the relevant EPO at facilities that present a higher risk.

Benchmark controls:

- define the controls that will typically be required at a premises to demonstrate an EPO has been achieved
- provide a link between EPOs and regulatory approvals granted under Pt V Division 3 of the EP Act.

Operators of organics recycling facilities must identify the benchmark controls they will implement at their premises to achieve the relevant EPO.

Benchmark controls are grouped into the following types:

- Planning: these controls refer to what operators are to prepare and act on to effectively implement infrastructure, equipment, process and management requirements.
- Infrastructure and equipment: these controls refer to design and installation specifications.
- Operations: these controls refer to process and management requirements, including maintenance, monitoring and response measures.

In many cases operators can implement suitable alternative controls in place of the benchmark controls.

6.3 Alternative controls

We support the use of new, innovative methods and technology in the organics recycling industry to achieve the EPOs. Operators may demonstrate they can achieve an EPO by implementing suitable alternative controls rather than the benchmarks controls. When proposing alternative controls, they must provide evidence that demonstrates the EPO is still being achieved.

This approach to achieving the EPOs allows for growth and innovation within the industry, encourages practical site-specific solutions suited to local contexts and is consistent with our outcome-focused, risk-based approach and better practice.

7. Environmental siting

We consider environmental siting factors and separation distances to determine the extent to which a receptor may be impacted by activities at an organics recycling facility. Our objective for this section of the guideline is to support operators to choose appropriate locations for new organics recycling facilities and minimise the potential for pollution or environmental harm. We have selected the separation distances and other siting limitations to support the facilities to achieve the EPOs in this guideline, based on the potential impacts associated with low to medium-risk facilities.

Different environmental siting factors and separation distances to those outlined herein may be appropriate based on site-specific conditions. Some of the benchmark controls for specific emissions set out in other sections of this guideline apply only in certain siting situations. Organics recycling facilities that do only mechanical processing may be subject to less stringent environmental siting requirements.

Where operators cannot meet the environmental siting factors and separation distances in this section, additional alternative controls may be required to achieve the EPOs in the guideline.

The following environmental siting factors and separation distances will inform the risk assessment process for all new and existing organics recycling facilities. Operators of organics recycling facilities should select a location that:

- achieves the minimum separation distances specified in Table 3
- follows the screening distances outlined in the relevant DWER emissions guidelines (e.g. *Guideline: Odour emissions*)
  (Operators should measure the separation distance between their facility and sensitive receptors using the methods specified in the relevant emissions guidelines.)
- follows land use compatibility guidance in *Water Quality Protection Note no. 25, Land use compatibility tables for public drinking water source areas (PDWSAs)* (WQPN no. 25) and additional recommendations set out as follows:

  - organics recycling facilities are an incompatible land use[1] within Priority 1 and Priority 2 PDWSAs
  - organics recycling facilities in Priority 3 PDWSAs are compatible with conditions,[2] but other land uses (e.g. piggery, distillery) associated with the premises may not be – as outlined in WQPN no. 25
  - organics recycling facilities are not sited within reservoir protection zones or wellhead protection zones.
- has gently sloping land with grades shallower than 10 per cent (one in 10)
- is not within the following areas specified in the *Guideline: Environmental siting*:
  - Department of Biodiversity, Conservation and Attractions' lands of interest and legislated lands and waters
  - bush forever areas
  - regional parks
  - threatened and priority ecological communities
  - ecological communities of national environmental significance (ECNES)
  - environmentally sensitive areas (see Glossary)
  - one in 100 (1 per cent) annual exceedance probability (AEP) floodplain that comprises the floodway and flood fringe.

Organics recycling facilities sited within the following areas may require controls in addition to the benchmark controls in this guideline; if so, operators will need to demonstrate compliance with the relevant policy objectives and/or requirements:

- Environmental Protection (Peel Inlet – Harvey Estuary) Policy area
- State Environmental (Cockburn Sound) Policy area
- Environmental Protection (Kwinana) (Atmospheric Wastes) Policy area
- Environmental Protection Policy (Goldfields Residential Areas) (Sulfur Dioxide) Policy area
- *Waterways Conservation Act 1976* management areas

[1] Some land uses and activities that are considered incompatible were legally established in a PDWSA before the PDWSA was proclaimed, or before a drinking water source protection report had been prepared and priority areas and protection zones were assigned. In these circumstances, these land uses and activities can continue to operate and should adopt better practice to minimise their impacts to the PDWSA.

[2] We generally do not recommend that organics recycling facilities be sited within Priority 3 PDWSAs.

Table 3: Minimum separation distances for organics recycling facilities

Receptor	**Minimum separation distance**
The following wetlands and habitat that are listed in the *Guideline: Environmental siting*: • Ramsar sites • nationally important wetlands • South Coast significant wetlands • geomorphic wetlands (excluding 'multiple use' wetlands of the Swan Coastal Plain) • western swamp tortoise habitat.	Organics recycling facilities should be at least 1,000 m from a wetland or habitat of this type which is down-hydraulic-gradient[1] of the premises.
Surface water	Organics recycling facilities should be at least 500 m from watercourses (see Glossary) or wetlands (see Glossary) which are down-hydraulic-gradient[1] of the premises.
Estuaries	Organics recycling facilities should be at least 500 m from the high water mark of estuaries, which in relation to tidal waters means ordinary high water mark at spring tides.
Groundwater	A minimum vertical separation distance of 2 m should be maintained between the base of any containment infrastructure and the highest groundwater level (including seasonal perched aquifers).
Private water supply bore	Organics recycling facilities should be at least 100 m and preferably down-hydraulic-gradient[1] from these bores.

Note 1: Where the hydraulic gradient cannot be determined at the time of an assessment, a conservative approach that assumes that the relevant receptor is down-hydraulic-gradient of the organics recycling facility will be followed.

8. Better practice benchmarks

The benchmark controls serve as the standard for operators of organics recycling facilities to demonstrate that the relevant EPO and better practice have been achieved. Sections 8.1 to 8.10 of this guideline:

- set out each EPO
- guide operators on understanding the risks associated with each aspect of organics recycling
- detail the benchmark controls for the EPO.

Operators must demonstrate they have achieved the EPOs by implementing the benchmark controls or suitable alternative controls.

8.1 Feedstocks

Overview and objective

Environmental performance objective: Undertake organics recycling using feedstocks that have a beneficial outcome for product quality.

Different feedstocks pose different risks in terms of emissions (leachate and odour), environmental harm (disease and vectors) and product contamination. We will apply regulatory controls in proportion to the level of risk posed by the type of feedstock. We may apply more prescriptive regulatory controls to organics recycling facilities that accept higher-risk feedstocks.

The EPO for feedstocks is designed to limit the wastes accepted at organics recycling facilities to only those that have a beneficial outcome for product quality. Beneficial outcomes may include improvements in:

- the quality of the finished product, for example from addition of nitrogen and phosphorus for plant nutrition or certain types of organic matter to achieve a specified particle size grading
- the efficiency or effectiveness of the processing method, for example from addition of microbes or moisture to facilitate a composting process.

We will consider a feedstock's overall quality and characteristics when assessing its suitability to meet the EPO. The presence of beneficial ingredients may not be sufficient grounds to accept a feedstock if it also contains contaminants that cannot be effectively bioremediated or otherwise treated during the organics recycling process.

Operators must not accept waste as a means of disposal through absorption and dilution of contaminants as this does not achieve a beneficial outcome and is not an acceptable practice.

The EPOs for feedstocks and product quality are intrinsically linked as product quality is highly dependent on the quality of the feedstocks. Operators must be aware of the potential contaminants associated with each feedstock they accept and have a plan for how to manage and remove or treat these contaminants during the organics recycling process to achieve a fit-for-purpose product. Operators should read this section in conjunction with Product quality (Section 8.10).

The suitability of feedstocks to achieve a beneficial outcome for product quality depends on how the feedstocks are managed at the source, what organics recycling processes are used and the type of product generated. The benchmark controls in this section are designed for products for amending the physical and chemical properties of natural or artificial soils and growing media. These benchmark controls may not be relevant to organics recycling facilities that do not intend to generate these types of products, such as some anaerobic digestion plants.

Operators also need to ensure that the feedstocks they use meet the requirements under the *Biosecurity and Agriculture Management Act 2007*, including the management of declared pests and intrastate movement restrictions under Regulation 8A of the Biosecurity and Agriculture Management Regulations 2013.

Feedstock categories

Table 4 below identifies standard feedstocks that organics recycling facilities commonly accept and groups them into low, moderate and high-risk categories. Some of the benchmark controls for EPOs set out in other sections of this guideline only apply to organics recycling facilities that accept certain categories of feedstocks, as described below.

The risk category for a standard feedstock is based on:

- the potential consequence of emissions arising from each feedstock, with particular focus on odour and emissions to land and water, and
- the likelihood of feedstocks containing physical, chemical or biological contaminants that require treatment or management during the organics recycling process.

Feedstocks not listed as standard feedstocks in Table 4 are considered non-standard feedstocks. As non-standard feedstocks are not widely used in the organics recycling industry, their composition may not be well characterised and their potential impact on product quality may not be well understood. We will take these uncertainties into account in regulating organics recycling facilities that propose to accept non-standard feedstocks.

Table 4: Standard feedstocks and risk categories

Risk	Standard feedstock	Description and examples
Low	Green waste	Lawn clippings, leaves, plants, branches, tree trunks and stumps but excluding timber. This risk category applies to green waste streams expected to have very low levels of contamination. This can include landscaping sources and bulk green waste collections and excludes skip bins, garden organics (GO) bins and food organics and garden organics (FOGO) bins.
	Natural fibrous organics	Seed hulls/husks, straw, bagasse and other natural organic fibrous organics but excluding peat.
	Untreated timber	Untreated timber sawdust, shavings, chips, timber offcuts, crates, pallets and wood packaging. This risk category applies to timber waste that is not an engineered wood product and is not treated with preservatives, pesticides, paint, fire retardants, adhesives or with any non-biodegradable layer.
	Forestry residues	Forestry by-products such as stumps, trunks, mulch, bark or wood chips that have not been treated with preservatives, pesticides, paint, fire retardants, adhesives or with any non-biodegradable layer.
	Inorganic additives	Inorganic materials and wastes including minerals such as bentonite and lime, and clean fill (see Glossary) such as clay, soil, sand and rock dust. This type of standard feedstock applies to inorganic materials and wastes with a known composition and low risk of generating odours or contributing contaminants to emissions to land and water or product quality. This standard feedstock excludes potentially contaminated inorganic waste types such as contaminated soil, ash and drilling muds.
	Neutralised acid sulfate soils	Acid sulfate soils (ASS) and potential acid sulfate soils (PASS) including soils, sediments and peats. This risk category only applies to ASS and PASS that: • has been assessed in accordance with our guideline *Identification and investigation of acid sulfate soils and acidic landscapes* • has undergone neutralisation in accordance with our guideline *Treatment and management of soil and water in acid sulfate soil landscapes*, and • is sourced from a site that is not contaminated.

Risk	Standard feedstock	Description and examples
Moderate	Garden organics (GO)	Garden organics from source-separated kerbside municipal or source-separated commercial collections of designated GO bins and skip bins comprising lawn clippings, leaves, plants and branches. This risk category applies to garden organic waste streams that are expected to contain some contamination.
	Mushroom growing substrate	Spent mushroom compost or growing substrate. The risks associated with this waste type may vary depending on the original feedstocks used to produce the compost or growing substrate. If the compost or growing substrate was produced using high-risk feedstocks, the material is considered a high-risk feedstock.
	Inorganic additives	Inorganic materials and wastes containing nutrients with the potential to generate odour and/or contaminate land and water. Examples include gypsum, nitrogen fertilisers (e.g. urea) and phosphorus fertilisers (e.g. superphosphate and rock phosphate). This type of standard feedstock applies to inorganic materials and wastes with a known composition and low risk of contamination. This standard feedstock excludes potentially contaminated inorganic waste types such as plasterboard.
High	Biosolids (see Glossary) and dewatered sewage sludge	Biosolids is sewage sludge from a wastewater treatment plant that has undergone further treatment to significantly reduce disease-causing pathogens and volatile organic matter. The risks associated with biosolids vary based on the pathogen and contaminant grading as per the *Western Australian guidelines for biosolids management* (biosolids guidelines). Dewatered sewage sludge from a treatment plant that is otherwise untreated has the maximum pathogen grading of P4.
	Manures	Animal manure and mixtures of animal manure and animal bedding organics.
	Food organics and garden organics (FOGO)[1]	Food, kitchen and garden putrescible wastes from source-separated kerbside municipal collections or source-separated commercial collections of designated FOGO bins. May include lawn clippings, leaves, plants, branches, food scraps (vegetables, fruit, meat, bones, seafood, bread and dairy), food-soiled paper and cardboard, paper towel, serviettes, tissues, pet poo and human hair. This feedstock is considered to have a high risk of contamination.

Risk	Standard feedstock	Description and examples
High	Food and food processing wastes	Solid food wastes and food and beverage processing wastes not captured under other standard feedstock types. Food wastes including vegetables and fruits and food and beverage processing wastes including dairy, winery, brewery, distillery and yeast wastes.
	Dead animals and animal remains	Solid abattoir waste, animal carcasses and parts of carcasses, egg waste and seafood processing waste
	Liquid wastes – putrescible and organic	Liquid animal effluent and residues – abattoir effluent (e.g. blood and paunch), animal oils and derivatives, poultry and seafood processing waste and stock truck washes.
		Grease interceptor and grease trap waste.
		Liquid food and beverage processing wastes – dairy, winery, brewery and distillery wastes, vegetable and fruit-processing effluent, vegetable oil and other liquid food waste.
		Treated septage – waste from septic tanks that has undergone primary treatment.

Note 1: The description of the FOGO waste stream in this table is based on common rules for local government waste collections but is not intended to be a definitive waste acceptance specification. There may be differences in rules between local government jurisdictions or changes over time because of evolving organics recycling methods and technologies. Determination of which wastes are acceptable inputs to FOGO collections should be based on which wastes are effectively and reliably broken down and/or treated by the intended organics recycling method (including any pre or post-processing treatments) to produce a product that achieves the EPO for Product quality (Section 8.10).

Benchmark controls

The following benchmark controls establish how an operator can achieve the EPO for feedstocks.

- Reject feedstocks not authorised for acceptance at the facility. Quarantine rejected feedstocks and/or remove them to an appropriately authorised facility Environmental performance objective: Protect the environment by preventing and, where that is not possible, minimising emissions to land and water that may cause pollution or environmental harm. (see Glossary).
- Characterise non-standard feedstocks before authorising them for acceptance at the facility, which include:
  - identify the source and process that produced the waste stream
  - determine contaminant concentration ranges in the waste stream by laboratory analysis of contaminants known or reasonably expected to be present in the waste (see Appendix A for examples of the minimum analytical suites for some non-standard liquid feedstocks)
  - consider the expected degree of variability in composition of the waste stream between loads and over time (where the feedstock is highly variable, operators should focus on the worst-case maximum contaminant concentrations)
  - estimate the maximum proportion of the feedstock in the organics recycling process (by weight)
  - assess how and to what extent the feedstock contributes to the organics recycling process and product quality
  - for all waste streams containing contaminants that do not contribute to the organics recycling process, identify:
    i) the contaminants that are treated during the organics recycling process and their treatment pathway, and
    ii) the contaminants that are not treated during the organics recycling process.
- For non-standard feedstocks, analyse and assess conformance against the characterisation as outlined above. The frequency and parameters for analysis depend on the expected variability in the feedstock composition as follows:
  - highly variable feedstocks require higher-frequency and ongoing analysis on receipt at the premises for contaminants known or reasonably expected to be present in the waste stream
  - changes in the process or generator from which the feedstock is sourced trigger additional analysis to assess conformance with the characterisation
  - consistent and homogeneous feedstocks may only require analysis for the initial characterisation, without the need for ongoing analysis to confirm conformance with the characterisation
- Retain laboratory certificates of analysis for incoming feedstocks, where required, in accordance with recordkeeping requirements.

- Do not accept the following wastes and materials that are unsuitable for recycling into products:
  - waste streams with an unknown origin or composition
  - quarantine waste (see Glossary)
  - waste that includes asbestos or asbestos-containing materials
  - clinical and related waste (see Glossary)
  - wood, wood-derived wastes or engineered wood materials impregnated with preservatives, pesticides, paint, fire retardants, adhesives or with any non-biodegradable layer
  - wastes or materials that are contaminated[3] with persistent organic pollutants (POPs),[4,5] such as perfluoroalkyl and polyfluoroalkyl substances, polychlorinated biphenyls, organochlorine pesticides and polybrominated diphenyl ethers
  - waste originating from diseased animals containing pathogens that may constitute a health or environmental risk and would not be rendered harmless by the organics recycling process
  - any other waste or material that does not achieve a beneficial outcome for product quality.
- For facilities that accept more than one type of liquid feedstock, implement appropriate procedures to segregate non-compatible wastes and avoid adverse chemical reactions. This will require technical oversight from a suitably qualified person (see Glossary).

8.2 Emissions to land and water

Overview and objective

Environmental performance objective: Protect the environment by preventing and, where that is not possible, minimising emissions to land and water that may cause pollution or environmental harm.

The activities at an organics recycling facility have the potential to generate emissions to land and water at the premises in the form of leachate, liquid feedstocks, liquid wastes and liquid products, described as:

[3] 'Contaminated' in this context means having POPs present at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value.

[4] We consider that the standard feedstocks listed in Table 4 are excluded from this description.

[5] Refer to Annexes A, B and C of the *Stockholm Convention on persistent organic pollutants (POPs)* for a list of POPs scheduled under this convention.

- Leachate: liquid generated by decomposing waste material and water that has interacted with feedstocks, materials undergoing processing (i.e. mechanical, pasteurisation or composting), or products
- Liquid feedstocks: materials or wastes that are not solid (see Glossary) and are accepted at an organics recycling facility to add during the processing method, such as treated septage
- Liquid wastes: wastes generated at an organics recycling facility that are not solid, such as digestate from an anaerobic digestion system
- Liquid products: outputs from an organics recycling facility that are not a waste and are not solid (see Section 8.10 for further discussion).

Without effective containment measures, emissions from organics recycling facilities have the potential to adversely impact aquatic and terrestrial ecosystems, environmental values and public health.

A wide range of potential contaminants are associated with leachate, liquid feedstocks, liquid wastes and liquid products at an organics recycling facility. These liquids may contain nutrients, metals, salts and other soluble or suspended components and decomposition products of waste. Leachate also generally has a high biochemical oxygen demand. Additional contaminants such as pathogens, hydrocarbons, POPs and volatile organic compounds (VOCs) could potentially be associated with high-risk and non-standard feedstocks (see Section 8.1).

We consider the main sources of leachate generation at organics recycling facilities are:

- decomposition and breakdown of feedstocks
- addition of liquids during organics recycling including water, liquid feedstocks and re-used leachate, if not managed appropriately
- interaction between rainwater/stormwater and feedstocks, materials undergoing processing, residual physical contaminants or products.

Leachate generation can occur during:

- feedstock acceptance, decontamination, handling, mechanical processing and storage
- organics recycling in windrows or in-vessel systems
- storage of products.

Leachate generated through the mechanisms above, as well as liquid feedstocks, liquid wastes and liquid products, may be released as an emission via the following main pathways:

- seepage and infiltration of leachate when some feedstocks, materials undergoing processing and products are stored on unsealed, non-hardstand surfaces

- seepage and infiltration of leachate through hardstand surfaces in processing and storage areas where the permeability of the hardstand is not low enough or the hardstand integrity has been compromised
- infiltration of leachate, liquid feedstocks or liquid wastes from storage ponds where the permeability of the liner of the pond base is not low enough, the liner integrity has been compromised, no liner is present or the pond has been inadequately constructed to achieve containment
- release of leachate, liquid feedstocks or liquid wastes from storage ponds or tanks because of overtopping because of rainfall, wave action, excess water entering the system (i.e. leachate, process water, bore water, runoff) or damage to/failure of the containment infrastructure
- inappropriate use of leachate, liquid feedstocks or liquid wastes (e.g. for dust suppression on roads or application to land) causing the discharge of these liquids outside of the containment systems on the premises
- spills of leachate, liquid feedstocks, liquid wastes or liquid products including where these materials discharge through clean stormwater management infrastructure.

Benchmark controls

The following benchmark controls establish how an operator can achieve the EPO for emissions to land and water.

Planning

- Design the leachate containment system (see Glossary) based on a quantitative assessment of the potential leachate and stormwater runoff generated from a one in 20 (5 per cent) annual exceedance probability (AEP) 24-hour storm event.[6]
- For facilities that accept liquid feedstocks, ensure the design of the leachate containment system is supported by a month-to-month water balance (see Appendix B for guidance on the preparation of water balances).
- Engage a suitably qualified person (see Glossary) to prepare a construction quality assurance (CQA) plan for infrastructure and equipment to be constructed or installed as part of the leachate containment system. The measures outlined in the CQA plan verify that the infrastructure and equipment comply with design specifications and were constructed using suitable methods. The content of a CQA plan includes but is not limited to the following items:
  - description of construction and installation procedures

[6] The rainfall rate for a 5 per cent AEP, 24-hour rainfall event should be determined for the premises location based on the most recent BOM Design Rainfall System (see Related documents).

- roles and responsibilities of relevant personnel to implement, monitor and record CQA measures
- supervision and inspection requirements before, during and after construction and installation
- material and field testing methods and frequencies with reference to relevant Australian and/or international standards
- recordkeeping and documentation requirements.

Infrastructure and equipment

- Ensure a suitably qualified person (see Glossary) verifies and documents the specifications and construction methods for infrastructure and equipment that form part of the leachate containment system in accordance with the CQA plan.
- Separate uncontaminated stormwater from the area serviced by the leachate containment system by using, for example, surface-grade changes, bunds, interceptor drains, piping and other drainage systems.
- Ensure all hardstand surfaces and pond liners can support the load of the material and machinery to be used on the surface, without compromising integrity.
- Use hardstand surfaces for the receipt, storage and processing of feedstocks, materials undergoing processing (i.e. mechanical, pasteurisation or composting), products and residual physical contaminants that:
  - provide a leachate barrier comprised of low-permeability material such as compacted clay, asphalt or concrete that minimises infiltration of leachate to soil and groundwater (see Table 5 for acceptable leachate barrier designs)
  - achieve a grading that prevents pooling of leachate, provides sufficient fall towards the leachate storage infrastructure, minimises erosion of the hardstand surface or material stored on the hardstand and allows safe and effective use of vehicles and machinery (an average grading of at least 2 per cent across the hardstand may be suitable; however, the grading required to achieve these outcomes depends on the site-specific conditions)
  - are bunded by low-permeability materials such as compacted clay, asphalt or concrete that prevent leachate runoff from the hardstand surface and stormwater from entering the hardstand surface (the interface between bunds and hardstand materials are effectively sealed to prevent leakage).
- Collect and store leachate and liquid wastes in a pond or an above-ground tank.
- Collect and store liquid products in an above-ground tank or sealed vessels such as containers, drums or intermediate bulk containers.
- Store liquid feedstocks that require storage before mixing with other feedstocks in a pond or an above-ground tank.
- Ensure leachate storage infrastructure has sufficient capacity to:

  - contain the runoff from the leachate containment system that would result from a one in 20 (5 per cent) AEP, 24-hour rainfall event
  - be maintained with a minimum top-of-embankment freeboard of 500 mm during operation.
- Line storage ponds for leachate, liquid feedstocks and liquid wastes with a liner that minimises infiltration to soil and groundwater (see Table 6 for acceptable liner designs).
- Design storage tanks for leachate, liquid feedstocks, liquid wastes and liquid products to provide secure containment of the designated liquid. The tank design is informed by the chemical and physical properties of the liquid being contained, along with the requirements of relevant standards, such as:
  - *Australian Standard AS 1692 Steel tanks for flammable and combustible liquids*
  - *Australian Standard AS 1940 The storage and handling of flammable and combustible liquids*
  - *Australian Standard AS 3735 Concrete structures for retaining liquids*
  - *Australian Standard AS 4766 Rotationally moulded buried, partially buried and non-buried storage tanks for water and chemicals.*
- Surround above-ground storage tanks for leachate, liquid feedstocks, liquid wastes and liquid products by a bund with capacity of 110 per cent or greater than that of the tanks within the bund and regularly check any pipe connections associated with a tank.
- Install monitoring equipment (e.g. high-level alarms) for storage ponds or tanks for leachate, liquid feedstocks, liquid wastes and liquid products or implement management practices to ensure they cannot be overfilled.
- Line drainage infrastructure with a liner that minimises infiltration to soil and groundwater (see Table 6 for acceptable liner designs). Concrete pipework is also an acceptable form of drainage infrastructure.
- Design and construct drainage infrastructure to convey the runoff from the leachate containment system that would result from a one in 20 (5 per cent) AEP, 24-hour rainfall event.

Table 5: Benchmark controls for leachate barriers on hardstand surfaces

Leachate barrier type	**Barrier specifications**	**Protective layer**	**Quality assurance requirements**
Compacted clay	Clay or modified soil that: • is at least 300 mm thick • has a coefficient of permeability of $1x10^{-9}$ m/s or less • is moisture conditioned and compacted during installation to at least 95 per cent of modified maximum dry density • is installed in successive layers up to 300 mm uncompacted thickness, with each underlying layer scoured to prevent excessive permeability because of lamination.	Suitable protective layer at least 150 mm thick overlying the leachate barrier to prevent damage and desiccation.	Specifications and construction methods verified and documented in accordance with the CQA plan by a suitably qualified person (see Glossary). Geotechnical testing conducted in accordance with the methods of the *Australian Standard AS 1289 Methods of testing soils for engineering purposes series*.
Natural geological barrier	A natural geological barrier that is proved to provide a homogeneous and secure barrier equivalent to the clay or modified soil liner described above.		Supported by geological or geotechnical investigations that demonstrate a homogeneous leachate barrier is present across the hardstand area. A suitably qualified person (see Glossary) determines the frequency and type of geotechnical testing required, based on the site-specific geological understanding, environmental siting and the level of risk associated with potential emissions from the hardstand. Geotechnical testing conducted in accordance with the methods of AS 1289. Guidance on the frequency of quality assurance testing outlined in *Australian Standard AS 3798 Guidelines on earthworks for commercial and residential developments* may help determine a representative testing frequency for the hardstand area.

Leachate barrier type	Barrier specifications	Protective layer	Quality assurance requirements
Concrete, asphalt or bitumen	A concrete, asphalt cement or bituminous pad that is: • constructed to an adequate thickness to achieve a sealed surface with a coefficient of permeability of $1x10^{-9}$ m/s or less • designed by a suitably qualified person (see Glossary) with reference to Australian and/or international standards relevant to the chosen construction material.	Not required	Specifications and construction methods verified and documented in accordance with the CQA plan by a suitably qualified person (see Glossary).

Table 6: Benchmark controls for liners in ponds or drainage infrastructure

Liner type	**Liner specifications**	**Quality assurance requirements**
Compacted clay	Clay or modified soil that: • is at least 600 mm thick • has a coefficient of permeability of $1x10^{-9}$ m/s or less • is moisture conditioned and compacted during installation to at least 95 per cent of modified maximum dry density • is installed in successive layers up to 300 mm uncompacted thickness, with each underlying layer scoured to prevent excessive permeability because of lamination.	Specifications and construction methods verified and documented in accordance with the CQA plan by a suitably qualified person (see Glossary). Geotechnical testing conducted in accordance with the methods of the AS 1289.
Geosynthetic clay liner (GCL)	A GCL that has an appropriate specification (i.e. material type and properties) based on the site-specific conditions and requirements and as determined by a suitably qualified person (see Glossary). For the minimum specifications for a quality GCL, see the Geosynthetic Institute (GRI) *GCL3 Standard specification for test methods, required properties and testing frequencies of geosynthetic clay liners (GCLs).*	Specifications and installation methods verified and documented in accordance with the CQA plan by a suitably qualified person (see Glossary).
High-density polyethylene (HDPE) geomembrane	An HDPE geomembrane that: • is at least 1 mm thick • has an appropriate specification (i.e. thickness and density) based on the site-specific conditions and requirements and as determined by a suitably qualified person (see Glossary). For the minimum specifications for a quality HDPE geomembrane, see the GRI *GM13 Standard specification for test methods, test properties and testing frequency for high-density polyethylene (HDPE) smooth and textured geomembranes*.	Specifications and installation methods verified and documented in accordance with the CQA plan by a suitably qualified person (see Glossary).

Operations

- Manage stormwater that has come into contact with feedstocks, materials undergoing processing (i.e. mechanical, pasteurisation or composting), products or residual physical contaminants as leachate and collect it in the leachate containment system.
- Immediately recover spills outside the leachate containment system.
- Maintain the moisture content of windrows below 65 per cent to reduce the potential for oversaturation and leachate generation.
- Effectively manage the direct application of liquids onto windrows including leachate, liquid feedstocks and water to avoid excessive leachate generation (i.e. with spraying, mixing and suitable liquid-to-solid ratios).
- Maintain a minimum freeboard of 500 mm on all storage ponds for leachate, liquid feedstocks and liquid wastes to prevent overtopping.
- Monitor the leachate containment system in accordance with the following requirements:
  - Regularly inspect the entire leachate containment system including, but not limited to, hardstand surfaces, bunding, drains, ponds and tanks.
  - Conduct periodic integrity testing of infrastructure (i.e. hardstand surfaces, bunding, ponds) for the storage of high-risk or non-standard feedstocks. The type and frequency of integrity testing will depend on the construction specifications of the storage infrastructure and how it is operated (e.g. if mechanical desludging occurs). Examples include permeability testing of the clay leachate barrier comprising a hardstand, weld testing of an HDPE liner in a pond, or leak testing of a tank.
- Where inspections and/or integrity testing identify damage or deterioration that may affect containment performance, investigate and repair the relevant items as soon as practicable.
- Do not re-use leachate for dust suppression or other purposes outside the leachate containment system. Leachate may be re-used by adding it to the organics recycling process (subject to the limitations specified in Section 8.10),
- Undertake groundwater monitoring of at least three monitoring bores (one up-hydraulic-gradient and two down-hydraulic-gradient bores) at the premises. The monitoring network is to be sufficient to verify the ongoing integrity of key containment infrastructure, including all hardstands and ponds. Large, complex or higher-risk organics recycling facilities will require a more extensive monitoring bore network.
- Monitor the groundwater at least every six months while the premises are operational for potential contaminants associated with the feedstocks received and processed at the premises. Operators may propose a sampling frequency and parameter suite. We will consider this information as part of our assessment Environmental performance objective: Protect the environment by preventing and,

where that is not possible, minimising odour emissions that may cause pollution or environmental harm.process and determine an appropriate monitoring program for the premises based on feedstock types and the proximity and sensitivity of receptors.

- Report groundwater monitoring results to us at least annually. Reports are to include an interpretive summary and assessment of data including:
  - comparison with relevant specific consequence criteria (see Glossary), selected based on the environmental and sensitive receptors near the premises
  - comparison with previous results and identification of any trends
  - discussion of any differences in groundwater quality between up-hydraulic-gradient and down-hydraulic-gradient monitoring bores that may be caused by activities at the organics recycling facility.

8.3 Odour

Overview and objective

Environmental performance objective: Protect the environment by preventing and, where that is not possible, minimising odour emissions that may cause pollution or environmental harm.

Emissions of odour can impact public health and amenity. Different types of feedstocks and organics recycling methods produce varying levels of odour. See Table 4 for the risk categories of standard feedstocks, including their potential to generate odour emissions.

Individual responses to odour may vary depending on a person's particular sensitivity, age, health status and previous patterns of exposure. Consult our *Guideline: Odour emissions* for further information (see Related documents).

We consider the main sources of odour emissions at organics recycling facilities to be:

- Feedstock acceptance and handling: some feedstocks may be highly odorous at acceptance because of anaerobic conditions in bins/trucks before collection and during transport, such as FOGO.
- Storage of feedstock and product: some feedstock types can generate odour emissions if stored inappropriately or for extended periods. For example, FOGO may not initially generate odour but the longer the waste is stored, the more likely that degradation and putrefaction will occur and generate odour emissions.
- Odour-treatment systems (e.g. biofilters, chemical or physical systems): these are installed to manage odorous air extracted from process infrastructure (e.g.

receipt and decontamination halls) but may be an odour source where they are poorly designed or maintained.

- Compost windrows: if not appropriately managed (i.e. through turning or forced aeration), windrows may become anaerobic – causing an increase in odour emissions. Windrows may also become anaerobic from over-wetting or from excessive liquid feedstocks being added.
- Closed-loop systems (such as in-vessel or enclosed aerobic composting and anaerobic digestion): these systems can contain most odour emissions although feeding and emptying can still result in odour emissions.
- Storage and use of outputs from the organics recycling process: for example, digestate produced at anaerobic digestion plants is a highly odorous material.
- Leachate containment systems: nutrient-rich leachate has the potential to generate odours, particularly when the leachate becomes anaerobic. Leachate from the early composting phase is most likely to generate odours.
- Bagging plants: product-packaging areas can generate odours if not appropriately managed.
- Uncovered storage of residual physical contaminants.
- Leachate pond desludging.

Benchmark controls

The following benchmark controls establish how an operator can achieve the EPO for odour.

Infrastructure and equipment

- Carry out aerobic composting and vermiculture (excluding maturation) of high-risk feedstocks and odorous non-standard feedstocks (see Section 8.1) inside an enclosed structure when within 1 km of sensitive receptors.
- Carry out storage and pre-composting screening/picking of high-risk feedstocks and odorous non-standard feedstocks (see Section 8.1) inside an enclosed structure when within 1 km of sensitive receptors.
- Ensure the enclosed structures used for storage, pre-composting screening/picking, aerobic composting or vermiculture of high-risk feedstocks (excluding maturation) are:
  - fitted with air-extraction systems that capture odorous air and direct it to an odour-treatment system
  - operated under negative pressure or with closed-loop systems at all times
  - fitted with fast-action doors that minimise the release of fugitive odour emissions from the enclosed area (operational procedures should facilitate minimal periods of open doors).

- Design odour-treatment systems to effectively treat the odours likely to be associated with the specific feedstocks and organics recycling processes at the premises.
- Effectively manage leachate ponds to maintain aerobic conditions and minimise odour emissions. Achieving this requires measures to manage the aeration, sediment load and biochemical oxygen demand of leachate ponds. These measures may include:
  - carefully managing leachate with a high biochemical oxygen demand from the early composting phase (if early-phase leachate is not appropriately managed it may lead to leachate ponds becoming anaerobic)
  - screening stormwater and leachate entering leachate ponds to prevent accumulation of sediments or sludge within the ponds
  - deploying aeration devices within leachate ponds.
- Ensure leachate hardstand surfaces – for the receipt, storage and processing of feedstocks, materials undergoing processing (i.e. mechanical, pasteurisation or composting), products and residual physical contaminants – have a grading that prevents pooling of leachate under normal operating conditions. Stagnant leachate increases the area from which odours can arise and may become anaerobic, resulting in more odour emissions.
- Position outdoor odour-generating infrastructure (e.g. stockpiles, windrows and leachate ponds) in a part of the premises where its impact on sensitive receptors is minimised. This includes siting in a location furthest away and downwind (based on the prevailing wind direction) from sensitive receptors and using topographical features or buildings to achieve shielding from the wind.
- Ensure anaerobic digestion plants contain, extract and combust all biogas in a generator or flare.

Operations

- Store high-risk feedstocks or odorous non-standard feedstocks (see Section 8.1) in a way that mitigates emissions of odour or add them to the organics recycling process on the same day they are received.
- Maintain materials undergoing aerobic composting in an aerobic state by implementing the following controls:
  - Regularly turn or otherwise aerate stockpiles or windrows (such as forced aeration) in a manner that provides effective aeration throughout the entire mass of the stockpile or windrow.
  - Maintain moisture content between 40 and 65 per cent during the pasteurisation phase to achieve optimal conditions for composting and prevent material becoming saturated and anaerobic.
  - Monitor oxygen and/or carbon dioxide content to inform operational practices and maintain aerobic conditions. Optimal aerobic composting conditions occur at an oxygen content of 10 per cent or higher.

- Manage the addition of feedstocks to the organics recycling process to minimise odour emissions. This includes how feedstocks are delivered and achieving an appropriate nutrient-input balance (carbon-to-nitrogen ratio) to avoid generation of odorous gases such as ammonia and amines.
- Observe wind direction and strength and suspend or limit odour-generating activities, such as windrow turning, when winds are in the direction of nearby sensitive receptors.
- Test, maintain and service odour-treatment systems following manufacturer and design requirements to provide effective ongoing odour treatment, including by:
  - preparing and distributing operational procedures or management plans outlining maintenance and monitoring protocols, process control triggers, corrective actions and contingency actions
  - monitoring key operational parameters relevant to the performance of the treatment systems such as moisture (relative humidity), temperature, pressure and/or pH
  - monitoring odour emissions from treatment systems.

8.4 Point source emissions to air

Overview and objective

Environmental performance objective: Protect the environment by preventing and, where that is not possible, minimising point source emissions to air that may cause pollution or environmental harm.

Air emissions can impact local ambient air quality, public health and amenity. This section addresses point source air emissions that may arise from organics recycling facilities that have anaerobic digestion plants.

Other aspects of air emissions, including fugitive emissions, are not addressed in this section but are considered in Odour (Section 8.3), Dust (Section 8.5) and Fire prevention and management (Section 8.8).

Anaerobic digestion plants are a source of point source emissions to air that may be present at some organics recycling facilities. Point source emissions arise from generator stacks and flares that form part of the biogas management system. Stacks from generators and flares emit waste gases produced during the combustion of the biogas.

Air emissions released during combustion of biogas vary, depending on multiple factors (e.g. feedstock types, biogas composition, pre-combustion treatment processes and flare/generator parameters). Potential air pollutants that may be released from these sources include, but are not limited to, methane (CH_4), carbon dioxide (CO_2), carbon monoxide (CO), nitrous oxide (N_2O), sulfur dioxide (SO_2),

nitrogen oxides (NO_x), VOCs (e.g. formaldehyde, benzene), dioxins/furans and particulate matter.

Benchmark controls

The following benchmark controls establish how an operator can achieve the EPO for point source emissions to air. The benchmark controls apply only to facilities where biogas is combusted.

Infrastructure and equipment

- Ensure anaerobic digestion plants:
  - contain, extract and combust all biogas in a generator or flare
  - prevent the formation of hydrogen sulfide in biogas or treat biogas to minimise hydrogen sulfide concentrations before biogas enters the power generators.
- Ensure the flares:
  - are enclosed
  - provide a sufficient capacity compatible with the operational requirements of the premises
  - permit a homogeneous temperature distribution across the combustion chamber
  - allow the flame to be contained
  - allow the flare to be maintained in an effective condition
  - have an interior that is lined with refractory material.
- Ensure the flares achieve a minimum temperature of 1,000ºC and minimum retention time of 0.3 seconds at this temperature. An alternative flare temperature and retention time relationship is acceptable where it achieves a destruction efficiency for methane and VOCs of 98 per cent or higher.
- Position and size air emission points to minimise the impact to receptors.
- Ensure emission concentrations from the biogas generator exhaust do not exceed the emissions standards in Table 7.

Table 7: Emissions standards for anaerobic digestion plants

Pollutant	Biogas generator exhaust gas concentration[1]
NOx (as NO_2)	500 mg/m^3
CO	1400 mg/m^3
Sulfur dioxide	107 mg/m^3
Total VOCs (as carbon)	1000 mg/m^3

Note 1: Biogas engine exhaust emissions standards are reported under the following conditions: temperature 0ºC (273 K), pressure 101.3 kPA, 5 per cent oxygen and dry gas. Sourced from the United Kingdom Environment Agency *Guidance for monitoring landfill gas engine emissions* LFTGN08 V2 2010 and *Standard rules SR2012 no. 12 – Anaerobic digestion facility including use of the resultant biogas*

Operations

- Operate and maintain biogas flare and electricity-generating equipment in accordance with the manufacturer's recommendations.
- Monitor emission points during normal operating conditions at least annually for potential pollutants (including but not limited to those listed in Table 7) and other parameters (e.g. exit temperature and flow rate).
- Report air emissions monitoring results to us at least annually. Reports are to include an interpretive summary and assessment of data including:
  - comparison with emissions standards (Table 7) and/or site-specific emissions limits
  - comparison with previous results and identification of any trends.

8.5 Dust

Overview and objective

Environmental performance objective: Protect the environment by preventing and, where that is not possible, minimising dust emissions that may cause pollution or environmental harm.

Dust is particulate matter that comprises very small solid particles of earth, organic matter, manufactured products or waste matter that becomes airborne by natural forces (such as wind) and/or by mechanical processes (such as chipping, grinding, conveying and product handling).

Dust can contain bioaerosols that are airborne particulates and/or water droplets containing bacteria, fungi and fungal spores, pathogens or other microorganisms. In most situations the controls for dust emissions and product quality (i.e. pasteurisation) should control bioaerosol emissions.

This section of the guideline focuses on dust emissions, including bioaerosols, that may be generated at organics recycling facilities and does not address potential emissions during the use of recycled organic products. These are considered in Product quality (Section 8.10).

We consider the main sources of dust emissions at organics recycling facilities, including bioaerosols, are:

- feedstock acceptance and handling, particularly dry loads such as straw and sawdust
- dust lift-off from stored feedstock, materials undergoing processing and products
- dust lift-off from materials being turned during aerobic composting
- dust lift-off from roads and other surfaces as a result of vehicle movements
- mechanical feedstock processing (e.g. grinding and screening), particularly for dry materials
- bagging plant.

Some standard feedstocks present a higher risk of bioaerosol generation, such as green waste, biosolids and animal wastes.

Benchmark controls

The following benchmark controls establish how an operator can achieve the EPO for dust.

Infrastructure and equipment

- Maintain water carts or other dust-suppression systems (e.g. sprinklers) and ensure access to sufficient water supply.
- Seal vehicle-moving areas and roads or implement measures on unsealed areas and roads to reduce the generation of dust, including the use of water carts or chemical stabilisers and restrictions to vehicle speed. Limit vehicle speeds to less than 25 km/h on areas of unconsolidated or unsealed road.
- Position outdoor dust-generating materials (e.g. stockpiles and windrows) and equipment (e.g. grinders and screeners) in locations where their impact to sensitive receptors is minimised. This can include siting infrastructure in locations away from sensitive receptors and using topographical features or buildings to achieve shielding from the wind.
- Install sprinkler/misting systems and/or dust curtains on the emission points of outdoor dust-generating equipment such as grinders and screeners. High-pressure misting systems are preferable as the smaller water droplets in these systems have a larger surface area and greater capacity to bind onto and settle dust particles.

- Ensure infrastructure for the odour-treatment system (e.g. biofilters) does not promote the emission of bioaerosols.

Operations

- Prevent visible dust from leaving the premises.
- Cover feedstocks, unbagged products and residual physical contaminants (see Glossary) during transport out of the premises.
- Ensure vehicles leaving the premises are free from loose mud, dirt and sediment to prevent the generation of dust on public roads.
- Cover stockpiles and windrows of feedstocks, materials undergoing pasteurisation or composting and products, or maintain their exterior surface in a damp state to prevent dust lift-off. Where water is used, take care to avoid over-wetting, which may result in other emissions, including odours and leachate production.
- Maintain stockpile and windrow heights at 5 m or less.
- Maintain stockpiles and windrows within 5 m of the perimeter fence or wall below the top of the fence/wall.
- Regularly undertake general housekeeping, such as sweeping down paved roads and other areas prone to dust lift-off.
- Observe wind direction and strength and suspend or limit dust and bioaerosol-generating activities when visible dust is generated by strong winds or blown in the direction of nearby sensitive receptors.

8.6 Noise

Overview and objective

Environmental performance objective: Protect the environment by preventing emissions of unreasonable noise and maintaining compliance with the assigned levels in the Environmental Protection (Noise) Regulations 1997 to prevent pollution and environmental harm.

Emissions of noise can unreasonably impact on environmental values, public health and amenity. Unreasonable noise is defined in s.3(3) of the EP Act. The Environmental Protection (Noise) Regulations 1997 (Noise Regulations) set assigned levels to protect receptors from the impacts of noise emissions.

The assigned levels in the Noise Regulations take into consideration different variables that affect noise sensitivity, including:

- types of receptors present surrounding the premises; for example, noise-sensitive, commercial and industrial and utility premises
- times of day and days of the week

- characteristics of the noise emissions and influencing factors that account for background noise levels from surrounding land uses and transport.

We consider the main sources of noise emissions at organics recycling facilities are:

- vehicle and plant movements during general site operations, turning of windrows, delivery and removal of products and waste materials, including noise from engines and reversing alarms
- feedstock processing and associated plant including grinders, shredders, screeners and bagging plant
- power generators, turbines and air and odour extraction systems.

Benchmark controls

The following benchmark controls establish how an operator can achieve the EPO for noise.

Infrastructure and equipment

- Install mufflers and broadband reversing alarms (croakers/quackers) on all vehicles and machinery. Vehicles and machinery are to use broadband reversing alarms when operating on the premises. Consult the joint DWER and Department of Mines, Industry Regulation and Safety (DMIRS) document *Audible reversing alarms: considerations for use* for further information (see Related documents).
- Operate noise-generating equipment within enclosed buildings where practicable. If this cannot be achieved, position equipment in a part of the premises where its impact to receptors is minimised. This includes siting equipment in a location furthest away from sensitive receptors and using topographical features or buildings to achieve shielding.
- Install noise bunds/screens around the premises or around specific noise-generating equipment where required; for example, when the premises is sited near sensitive receptors.

Operations

- Maintain and operate vehicles, equipment and machinery effectively.
- Limit hours of operation to daytime (7am to 7pm, Monday to Saturday) when emissions of noise are subject to less-stringent assigned levels under the Noise Regulations. Where it is not feasible to restrict whole-of-premises operating hours, consider limiting higher noise-generating sources (e.g. screening and shredding) to daytime hours.
- Where the site has multiple sources of noise-generating activities, stagger operations of higher noise-generating emissions so that only one of these activities occurs at any one time, reducing the potential impacts from cumulative emissions.

8.7 Emissions of litter and debris

Overview and objective

Environmental performance objective: Protect the environment by preventing, and where that is not possible, minimising emissions of litter and debris that may cause pollution or environmental harm.

Emissions of litter and debris have the potential to impact on public health and amenity, as well as air, land and water quality, and pose risks to the health of native fauna. Litter prevention is regulated under the *Litter Act 1979*, while preventing harm to the environment or public health from litter and debris is considered under the EP Act.

We consider that litter and debris may become windblown or moved by animals from the following sources of waste:

- Feedstocks that are physically contaminated; for example, food packaging and household waste in FOGO. Plastic bags may be present onsite, either mixed in with feedstock materials or in separate stockpiles of residual physical contaminants that have been screened or picked out of feedstocks.
- Packaging material for feedstocks and products.
- Open waste bins.

Benchmark controls

The following benchmark controls establish how an operator can achieve the EPO for emissions of litter and debris.

Infrastructure and equipment

- Construct suitable fencing to contain windblown litter within the boundary of the premises or surrounding operational areas where feedstocks and waste are accepted, stored and processed.
- Keep onsite waste bins closed or covered.

Operations

- Cover feedstocks, unbagged products and residual physical contaminants (see Glossary) during transport out of the premises.
- Conduct inspections of the fence line at least weekly and collect and dispose of any accumulated litter.
- Regularly remove residual physical contaminants (see Glossary) from the processing area and dispose of them at an appropriately authorised facility (see Glossary).
- Regularly clean and maintain feedstock storage and processing areas and stormwater containment infrastructure using good housekeeping practices.

8.8 Fire prevention and management

Overview and objective

Environmental performance objective: Protect the environment by minimising the risk of fires occurring and be sufficiently prepared in the event of a fire to prevent and, where that is not possible, minimise pollution and environmental harm.

Fires give rise to emissions and have the potential to damage feedstocks, products and containment infrastructure, resulting in further emissions. Emissions from fires include air emissions (particulates and noxious gases), odour and contaminated firewater generated from firefighting.

Fires can impact air, water and land quality, as well as destroy native vegetation, fauna and property. Fires can also impact on amenity and have severe consequences for public health.

Operators can mitigate adverse impacts from fire by preventing fires and limiting their spread by planning and implementing infrastructure and management controls.

The potential for fire to occur at an organics recycling facility and associated risks will depend on multiple factors including the size of the facility, processing methods and the environmental siting. The main activities at organics recycling facilities that contribute to the risk of fire are:

- pasteurisation or aerobic composting of organic materials
- storage of combustible materials including feedstocks, residual physical contaminants and products
- generation and storage of flammable biogas during anaerobic processes.

The ignition sources of fires at organics recycling facilities include:

- spontaneous combustion (auto ignition) of material stockpiles because of elevated internal temperatures
- equipment and machinery such as conveyors and shredders
- contaminants in feedstocks such as lithium batteries
- arson and vandalism
- bushfires.

Operators also need to consider their obligations under the *Fire and Emergency Services Act 1998*, *Bushfire Act 1954* and development approvals in relation to the prevention and management of fires at organics recycling facilities. Note: these obligations are outside the scope of this guideline.

Benchmark controls

The following benchmark controls establish how an operator can achieve the EPO for fire prevention and management.

Planning

- Prepare and implement a *Fire and emergency management plan* (FEMP). The FEMP is guided by section 3 of *Australian Standard AS 3745 Planning for emergencies in facilities* and prepared by a suitably qualified person (see Glossary), such as a fire safety engineer. As a minimum, the FEMP includes:
  - an assessment of fire safety risk, identification of areas where a fire might occur and factors that might cause a fire
  - identification of whether the premises are in a bushfire-prone area[7]
  - how fires will be prevented, detected, responded to, suppressed, contained and controlled, including how the infrastructure, equipment and operations benchmark controls below, or alternative controls, will be implemented
  - infrastructure and equipment controls including the minimum water supply and capacity of the fire suppression system; for example, hydrants, water carts and sprinklers (note: fire suppression system capabilities are guided by *Australian Standard AS 2419.1 Fire hydrant installations* and *Australian Standard AS 2118.1 Automatic fire sprinkler systems*)
  - operational controls to be implemented to prevent and minimise the potential emissions and impacts resulting from a fire
  - map of the premises that identifies fire risk areas, infrastructure, equipment, and fire safety systems
  - personnel roles and responsibilities
  - a clear emergency communication plan including notification and escalation procedures to internal personnel and external emergency responders and up-to-date contact details
  - a schedule and process for auditing the premises against the content of the FEMP and for reviewing, updating and testing (exercising) the FEMP.
- Design the layout of the premises to allow firefighting trucks to enter and access firefighting water supplies and areas of the premises where a fire might occur, consistent with the FEMP. Safe, efficient and effective access is guided by the Department of Fire and Emergency Services (DFES) *GL-11 Site planning and fire appliance specifications*.

[7] Facilities in bushfire-prone areas may be subject to additional planning requirements in accordance with the Western Australian Planning Commission's *State Planning Policy 3.7 Planning in Bushfire Prone Areas* and the *Guidelines for Planning in Bushfire Prone Areas* (see Related documents).

Infrastructure and equipment

Operators are to implement the controls specified in the FEMP, including:

- Install and maintain appropriate firefighting equipment and minimum water supplies on the premises at all times.
- Ensure machinery on the premises is capable of breaking apart, separating and dividing stockpiles/windrows to stop the spread of fire.
- Maintain a designated area of clear ground or hardstand on the premises where stockpiles/windrows may be relocated and broken apart during a fire.
- Manage outdoor stockpiles/windrows of combustible or organic materials to minimise the potential for fire spreading between stockpiles and provide effective access to respond to fires. Site-specific arrangements for stockpiles and windrows will depend on various matters addressed through the FEMP, including operating methods and fire suppression and response capabilities. Standard stockpile and windrow arrangements are:[8]
  - maintain individual stockpiles/windrows within the maximum dimensions of 50 m long, 10 m wide and 5 m high
  - separate individual stockpiles/windrows using a non-combustible physical barrier or at least 6 m of clear ground
  - separate individual stockpiles/windrows from the premises boundary and any buildings or structures on the premises using a non-combustible physical barrier or at least 6 m of clear ground free from any combustible material
- Maintain indoor stockpiles/windrows of combustible or organic materials at a size appropriate to the building size and layout; install safety systems, process equipment and plant to minimise the potential for fire spreading between stockpiles; and provide effective access to respond to fires.
- Use non-combustible physical barriers to contain stockpiles/windrows, such as masonry or concrete walls that extend at least 1 m above the stockpile height and 2 m beyond the outermost stockpile edge.
- Ensure the premises have effective fire water containment capacity. This may include impermeable bunds, storage lagoons and leachate ponds, isolation tanks and other pollution-control equipment to effectively contain fire water on the premises. Where non-standard feedstocks (see Section 8.1) are used, additional controls may be appropriate.
- Secure the premises with a fence at least 1.8 m high made of non-combustible materials and lock the gates when unattended.

[8] Operators proposing alternative controls for stockpile and windrow arrangements should consider the relevant information for their facility set out in DFES guidance *Information note: Bulk green waste storage fires* and *Guidance note: GN04 Fire prevention and management in a materials recycling facility* (see Related documents).

- Install and maintain warning devices/alarms or pressure-detection systems on critical process infrastructure such as anaerobic digestion tanks and fan-forced blower aeration systems.
- Design and maintain anaerobic digestion systems to minimise fugitive biogas emissions and mitigate potential fire and explosion risk.

Operations

Operators are to implement the controls specified in the FEMP, including:

- Store combustible solid materials away from:
  - powerlines and other ignition sources
  - fuels and flammable solvents used for operational purposes
  - liquid feedstocks that contain flammable components.
- Regularly rotate stockpiles/windrows to disperse heat and minimise the risk of auto ignition.
- Manage and regularly monitor moisture content and temperature to ensure:
  - temperatures within stockpiles/windrows of feedstocks, materials undergoing processing (i.e. mechanical, pasteurisation or composting) and products are maintained below 75°C
  - moisture content within stockpiles/windrows of materials undergoing pasteurisation or composting is maintained between 45 and 65 per cent
  - moisture content within stockpiles of feedstock, materials undergoing mechanical processing and products is maintained at less than 20 per cent or greater than 45 per cent
- Regularly inspect stored combustible materials to identify any smouldering areas or smoke, especially during extreme weather conditions and total fire bans.
- Report fire incidents to us. A fire, for reporting purposes, is a fire or smouldering incident that causes the operator to implement any of the fire response measures in the FEMP, other than for training/exercise activities.

8.9 Vectors

Overview and objective

Environmental performance objective: Protect the environment by minimising the risk of attraction, refuge, growth and spread of vermin and pests to prevent pollution and environmental harm.

Vermin, pests and disease vectors (e.g. mosquitoes) can impact public health and amenity and threaten the integrity of ecological communities.

Operators need to consider their obligations and activities in relation to the *Biosecurity and Agriculture Management Act 2007* that are outside the scope of this guideline.

We consider the main features of organics recycling facilities that may attract and harbour vectors are:

- storage of feedstocks, products and residual physical contaminants, particularly putrescible materials
- ponds, drainage channels and sumps (mosquitoes)
- pooling and ponding of leachate in storage and processing areas (mosquitoes)
- products that have not been appropriately treated and are not fit-for-purpose (see Section 8.10)

Benchmark controls

The following benchmark controls establish how an operator can achieve the EPO for vectors.

Operations

- Manage feedstocks to prevent the presence and spread of vectors. This may include preparing some feedstocks within enclosed infrastructure, applying treatments and/or regularly turning and mixing feedstocks during storage.
- Regularly clean and maintain feedstock storage and processing areas, stormwater and leachate containment infrastructure using good housekeeping practices.
- Regularly remove residual physical contaminants (see Glossary) from the processing area and dispose of them at an appropriately authorised facility (see Glossary).
- Implement measures to prevent pooling of water (e.g. grading of hardstand surfaces and drainage infrastructure) and stagnation of water in storage infrastructure (e.g. deployment of aerators in ponds).

8.10 Product quality

Overview and objective

Environmental performance objective: Contaminants in feedstocks are treated effectively and recycled organic products are fit-for-purpose.

The processes captured within the scope of this guideline can generate a diverse range of outputs. Examples of these outputs include compost, liquid fertiliser produced as a by-product of vermiculture and biogas generated during anaerobic digestion.

Outputs from the different types of organic material processing conducted at organics

recycling facilities can be classified as products or wastes, as discussed in the regulatory context section below. For the purpose of this guideline, a product is an output from an organics recycling facility that is not a waste.

The EPO for product quality applies to both solid and liquid products from organics recycling facilities that are used to amend the physical and chemical properties of natural or artificial soils and growing media. The benchmark controls in this section of the guideline focus on the quality requirements for solid products (i.e. composts, soil conditioners and mulches). We will consider the quality requirements for liquid products on a case-by-case basis.

The EPO for product quality is not relevant to biogas. We address the risks associated with the generation and combustion of biogas in *Point source emissions to air* (Section 8.4), *Odour* (Section 8.3) and *Fire prevention and management* (Section 8.8).

Operators are responsible for ensuring all products are fit-for-purpose for the proposed end use. A fit-for-purpose product provides beneficial qualities to the receiving environment when used and does not contain contaminants at a level that could cause pollution or environmental harm.

Products that include inappropriate feedstocks or are not processed to a safe standard may contain contaminants. The main types of potential contamination include:

- Physical contamination: glass, plastics (including microplastics), metal fragments and a range of other substances that can pollute land and water, impact on amenity and reduce consumer confidence in the product.
- Chemical contamination: a broad range of chemical substances such as metals, inorganic and organic compounds that may contaminate land and water and enter the food chain through uptake by biota.
- Biological contamination: plant and animal pathogens, seeds and plant propagules that may persist in products that have not been effectively processed and pasteurised. These contaminants have the potential to spread diseases and pests such as dieback, weeds and gastrointestinal infection when the products are applied to land or exposed to humans.

The nature and concentration of contaminants in products is highly dependent on the type and quality of feedstocks used in the organics recycling process. Satisfying the EPO for product quality is intrinsically linked with achieving the EPO for feedstocks (Section 8.1). Laboratory analysis can support the assessment of higher-risk and more variable feedstock types.

Organics recycling facility products are used to achieve a variety of outcomes across a range of environmental settings. The appropriate maturity level and beneficial qualities of the products depend on the intended end use. The benchmark controls in this section focus on managing physical, chemical and biological contamination to ensure that products are safe for their intended end use and do not pose a risk to the environment, public health or amenity. The benchmark controls do not address maturation or the beneficial qualities of products (e.g. nutrient content, carbon content and particle size). Operators are responsible for ensuring that the maturity level and beneficial qualities of products are suitable for their intended end use.

Regulatory context

Existing standards and guidance for the specifications that concern Western Australian-produced organics recycling facility products include:

- Standards Australia, *Australian Standard AS 4454 Composts, soil conditioners and mulches*
- *Western Australian guidelines for biosolids management* (biosolids guidelines).

The Environmental Protection (Packaged Fertiliser) Regulations 2010 also set out quality requirements that may apply to some products.

Organics recycling facilities produce a wide range of products for a variety of different end uses. We acknowledge that products may be fit-for-purpose for a specific end use without meeting the specifications in AS 4454 or the biosolids guidelines.

If an output from an organics recycling facility has not been substantially transformed or does not meet a suitable end use standard, it may still be considered a waste and thus additional regulatory controls may apply to its transport, storage and final use or disposal.

Operators are responsible for determining whether the outputs from their organics recycling facility are a waste or not. Our *Factsheet – Assessing whether material is waste* (see Related documents) sets out the key factors for operators to consider. Those who consider a product has ceased to be waste should satisfy themselves they have sufficient recorded evidence to document and support this determination.

When outputs are classified as wastes, operators need to manage these as part of the regulatory framework for waste. This includes tracking waste outputs from the organics recycling facility and tracking of wastes accepted at other prescribed premises for disposal, re-use as a feedstock in a secondary organics recycling process or re-use for another purpose.

Benchmark controls

The following benchmark controls establish how an operator can achieve the EPO for product quality.

Operators may follow two approaches to achieve the EPO for product quality, as follows:

1. Products comply with the minimum requirements set out in AS 4454 and, if relevant, the P1C1 unrestricted-use requirements in the biosolids guidelines.[9] These products are termed **Category A products**.

2. Products comply with a fit-for-purpose product specification that the operator develops and maintains. These products are termed **Category B products**. This approach is required where:

[9] Compliance with the P1C1 unrestricted-use requirements in the biosolids guidelines applies to products wholly or partially derived from biosolids, sewage sludge or treated septage.

- products do not comply with the minimum requirements set out in AS 4454 and are outside the scope of that standard
- products are produced using biosolids, sewage sludge or treated septage, but do not comply with the P1C1 unrestricted use requirements in the biosolids guidelines, or
- products are produced using non-standard feedstocks and contain chemical contaminants that are not listed in Table 9.

The following sections outline benchmark controls that apply to the production of Category A and Category B products, sampling and testing for all products, and product quality recordkeeping requirements.

See *Feedstocks* (Section 8.1) for the feedstock categories referenced in the following sections.

Category A products

- Classify Category A products under one of the product types described in Table 8 and produce them in accordance with the corresponding feedstock or process requirements outlined in that table.
- Ensure contaminant concentrations in Category A products comply with the contaminant upper limits set out in Table 9. These contaminant upper limits are based on product quality requirements specified in AS 4454 and pathogen and contaminant limits for P1C1 unrestricted-use biosolids specified in the biosolids guidelines. Some upper limits apply only to products containing certain feedstocks, as indicated in Table 9.
- Manage Category A products containing biosolids, sewage sludge or treated septage to achieve the additional requirements specified in the biosolids guidelines. These relate to pathogen regrowth potential, vector attraction, reduction and maturation. In certain circumstances operators need to undertake process verification to demonstrate that the treatment process is working effectively, as specified in the biosolids guidelines.
- Implement management measures to prevent Category A product streams that are comprised entirely of low and moderate-risk feedstocks from being cross-contaminated by high-risk or non-standard feedstocks. This may mean that leachate from different product streams is segregated and only re-used over the same product stream from which it was derived.

Table 8: Category A product types and feedstock or process requirements

Product type	Description	Feedstock or process requirements
Raw mulch	Mulch (see Glossary) from a single known plant material type that, by virtue of the nature and source of the material, embodies minimal risk of plant propagules, pathogens and other contaminants.	• Produce raw mulches using a single known plant material type that embodies minimal risk of plant propagules, pathogens and other contaminants and falls under one of the following low-risk feedstock categories (as set out in Table 4): - green waste - natural fibrous organics - untreated timber - forestry residues • Implement management measures to prevent raw mulches from being cross-contaminated by moderate-risk, high-risk or non-standard feedstocks.
Pasteurised product	An organic product that has undergone pasteurisation but is relatively immature and lacking biological stability. Pasteurised products may be soil conditioners (see Glossary) or mulches (see Glossary).	• Subject the whole mass of the product to pasteurisation. Use acceptable pasteurisation process criteria for different processing methods and feedstock categories, as outlined in Table 10. Note: an alternative process that guarantees the same level of pathogen reduction as those in Table 10Table 10 may be acceptable. Operators proposing an alternative process demonstrate that the product will comply with the biological contaminant upper limits set out in Table 9. • Monitor in-field temperature daily during the pasteurisation phase to verify that the core of the mass is at the required temperature. • Implement management measures to prevent recontamination of pasteurised material. As a minimum, this requires that re-use leachate is not applied to material that has already been pasteurised. Additional controls to prevent recontamination may include separation of feedstock and product-handling equipment, vehicles and areas, and washing of machinery between use for untreated feedstocks and products.
Compost	An organic product that has undergone controlled aerobic and thermophilic biological transformation through the composting process to achieve pasteurisation and reduce phytotoxic compounds, and achieve a specified level of maturity required for compost (as set out in AS 4454). Composts are termed composted product or mature compost under AS 4454 depending on the level of maturity achieved during processing.	

Table 9: Upper contaminant limits for Category A products

Contaminant type	Parameter	Upper limits
Chemical contaminants	Arsenic	20 mg/kg
	Cadmium	1 mg/kg
	Boron	100 mg/kg
	Chromium (total)	100 mg/kg
	Chromium (VI)[1]	1 mg/kg
	Copper[2]	100 mg/kg
	Lead	150 mg/kg
	Mercury	1 mg/kg
	Nickel	60 mg/kg
	Selenium[3]	5 mg/kg
	Zinc[2]	200 mg/kg
	DDT/DDD/DDE	0.5 mg/kg
	Aldrin	0.02 mg/kg
	Dieldrin	0.02 mg/kg
	Chlordane	0.02 mg/kg
	Heptachlor	0.02 mg/kg
	HCB	0.02 mg/kg
	Lindane	0.02 mg/kg
	BHC	0.02 mg/kg
	PCBs	Not detectable (detection limit of 0.2 mg/kg)
Physical contaminants	Glass, metal and rigid plastics (>2 mm)	0.5% dry matter w/w
	Plastics – light, flexible or film, including biodegradable and compostable types (>5 mm)	0.05% dry matter w/w
Biological contaminants	*Salmonella* spp.[4]	Absent in 50 g (dry weight)
	Faecal coliforms[4]	1000 MPN or CFU / g (dry weight)
	E. coli[1,4]	100 MPN or CFU / g (dry weight)
	Somatic coliphages[1]	10 PFU / 10 g (dry weight)
	Strongyloides and hookworm (viable ova)[1,5]	1 / 50 g (dry weight)
	Viable plant propagules	Nil germination after 21 days

Note 1: Upper limits only apply to products containing biosolids, sewage sludge or treated septage.

Note 2: Concentrations of copper up to 150 mg/kg and zinc up to 300 mg/kg may be acceptable where appropriate controls are in place to prevent the product being used as a complete soil replacement and manage risks from repeat or very high applications.

Note 3: An alternative upper limit of 3 mg/kg may apply to products containing biosolids, sewage sludge or treated septage.

Note 4: Upper limits only apply to products containing high-risk feedstocks.

Note 5: Strongyloides and hookworm analysis is only required for products processed or containing biosolids, sewage sludge or treated septage sourced north of the 26th parallel.

Table 10: Time/temperature ratio for pasteurisation

Process type	**Feedstock category**	**Time/temperature ratio**
Windrow	Low-risk or moderate-risk	Turn outer material to the inside of the windrow so the whole mass is subjected to a minimum of three turns, with the internal temperature reaching a minimum of 55ºC for three consecutive days before each turn.
	High-risk or non-standard	Maintain the core of the mass at 55ºC or higher for 15 days or longer. During this time turn the windrow a minimum of five times, turning outer material to the inside of the windrow mass so the whole mass is subjected to the required temperature/process.
In-vessel	All feedstocks	Maintain the whole mass at 55ºC or higher for a minimum of three consecutive days. To meet this requirement, the material will need to be in the enclosed vessel for longer to ensure it gets to and maintains temperature for the minimum duration.
Aerated static pile	All feedstocks	Maintain the whole mass at 55ºC or higher for a minimum of three consecutive days. Cover all material in the static pile with a synthetic material or at least 300 mm of insulating material, such as finished product, to ensure the entire mass reaches the specified temperature. To meet this, the material will need to be covered for longer to ensure it gets to and maintains temperature for the minimum duration.

Category B products

- Develop and maintain a fit-for-purpose product specification for each Category B product. Fit-for-purpose product specifications are to include:
    - A statement of whether the product is pasteurised or not, including a description of the method used (with reference to the process criteria in Table 10 or description of an alternative process).
    - Identification of potential contaminants associated with the feedstocks used to produce the product, informed by knowledge of the process that generated the feedstocks. Laboratory analysis is required to characterise non-standard feedstocks (see Glossary).
    - Identification of:
        i) the contaminants that are treated during the organics recycling process and their treatment pathway, and
        ii) the contaminants that are not treated during the organics recycling process.
    - A description of the intended end use of the product including:
        i) suitable product uses; for example, unrestricted, horticulture, forestry or landfill rehabilitation
        ii) limitations on product use; for example, application rates and exclusion periods
        iii) safety instructions for product use; for example, personal protective equipment
        iv) labelling requirements for products.
    - Specification of which contaminant concentration upper limits in Table 9 will be met and which will be exceeded in the product.
    - The concentration upper limits for all identified potential contaminants in the product that exceed or do not have an upper limit specified in Table 9.
    - An assessment of the potential risks to the environment, public health and amenity that may arise from the use of the product (with reference to the product specification). National guidance and guidance from other state and international jurisdictions may be used to support the risk assessment.
    - A quality-assurance sampling and testing plan that will be implemented to ensure ongoing compliance with the product specification. This plan is required to address the full range of contaminants known or reasonably expected to be present in the proposed feedstocks. Refer to the benchmark controls for sampling and testing in the section below for further information.
- Ensure contaminant concentrations in Category B products comply with the contaminant upper limits set out in the fit-for-purpose product specification.

Sampling and testing

Operators organise quality sampling and testing to provide ongoing assurance that products meet the product specification and are fit-for-purpose. The benchmark controls for sampling and testing are as follows:

- Sample products at the relevant frequency specified in Table 11 and based on the feedstock categories used during the organics recycling process.
- Ensure products that contain feedstocks from more than one feedstock category are sampled at the highest relevant frequency.

Table 11: Product sampling frequency

Product category and type	**Feedstock category**	**Sampling frequency**
Category A – raw mulches	Low-risk feedstocks only	Each different product type sampled at a minimum rate of one composite sample per 10,000 tonnes of product.
Category A – pasteurised products and composts and Category B – various types	Low-risk and moderate-risk feedstocks only	Each different product type sampled at a minimum rate of one composite sample per 5,000 tonnes of product.
	Partially or wholly derived from high-risk feedstocks[1]	Each different product type sampled at a minimum rate of one composite sample per 1,000 tonnes of product
	Partially or wholly derived from non-standard feedstocks	Each different product type sampled at a minimum rate of one composite sample per batch, where a batch refers to each distinct quantity of product that has undergone the same processes and is produced at one time. At a minimum, one composite sample is collected per 500 tonnes of product.
	Partially or wholly derived from biosolids or sewage sludge	In accordance with the routine contaminant and pathogen monitoring requirements outlined in the biosolids guideline[2].

Note 1: Excluding biosolids or sewage sludge.

Note 2: Additional monitoring may be required in certain circumstances (e.g. when there is a change in the composition of the influent to the wastewater treatment plant): refer to the biosolids guidelines for further information.

- Collect and prepare product samples in accordance with the sampling protocol in Appendix C of this guideline.
- Keep batches of products that have been sampled on the premises until the laboratory finalises and reports the results and the batch is demonstrated to meet the relevant product specification.
- Operators can seek to reduce the product sampling frequency by demonstrating a consistent product quality and a low risk that contamination in the finished

product would exceed the relevant contaminant upper limits. This may be achieved through the provision of:

  - past product test results to demonstrate consistent compliance with the relevant contaminant upper limits, and
  - evidence that the feedstocks and organics recycling processes used to produce the product are reliably consistent between batches.

    A timeframe of three to six months is appropriate to demonstrate consistency, although in some circumstances seasonal variability may be a relevant factor.

- Ensure product samples are tested for the relevant parameters set out in Table 12.
- For product testing, engage a NATA-accredited laboratory that uses the test methods set out in Table 12 or an equivalent and authorised test method.
- Operators can seek to exclude certain contaminants listed in Table 12 from the analytical suite by demonstrating a low risk the contaminants would exceed the relevant contaminant upper limits in the product. This may be achieved through the provision of:
  - past product test results to demonstrate the product does not contain significant concentrations of the contaminant, compared with the relevant contaminant upper limit, or
  - feedstock test results to demonstrate the feedstock does not contain significant concentrations of the contaminant, compared with the relevant contaminant upper limit.

Table 12: Product testing requirements

Contaminant type	Parameter	Relevant products	Analytical method
Chemical contaminants	Arsenic, cadmium, boron, chromium (total), copper, lead, mercury, nickel, selenium and zinc	All products	AS 4454 – Appendix D
	Chromium (VI)	Products partially or wholly derived from sewage sludge, biosolids or treated septage	*National Environmental Protection (Assessment of Site Contamination) Measure 1999* as amended – Schedule B3 Section 7.5 (or an equivalent NATA-accredited method)
	DDT/DDD/DDE, aldrin, dieldrin, chlordane, heptachlor, HCB, lindane and BHC	All products	AS 4454 – Appendix D
	PCBs		
	Other chemical contaminants identified in the fit-for-purpose product specification	Category B products	Appropriate NATA-accredited analytical methods[1]
Physical contaminants	Glass, metal and rigid plastics >2 mm	All products	AS 4454 – Appendix I
	Plastics – light, flexible or film, including biodegradable and compostable types >5 mm		

Contaminant type	**Parameter**	**Relevant products**	**Analytical method**
Biological contaminants	*Salmonella* spp.	Products partially or wholly derived from high-risk feedstocks	AS 4454 – Appendix D
	Faecal coliforms		
	E. coli		Biosolids guidelines – Appendix 7 (or an equivalent NATA-accredited method)
	Somatic coliphages	Products partially or wholly derived from sewage sludge, biosolids or treated septage	Biosolids guidelines – Appendix 7 (or an equivalent NATA-accredited method)
	Strongyloides and hookworm (viable ova)	Products partially or wholly derived from sewage sludge, biosolids or treated septage, sourced and/or processed north of the 26th parallel	
	Viable plant propagules	All products	AS 4454 – Appendix M

Note 1: Refer to Schedule B3 of the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* as amended for laboratory analytical methods relevant to additional chemical parameters not listed in this table.

Product quality records

Operators are to implement appropriate recordkeeping to provide evidence that products meet the product specification and are fit-for-purpose. We may request access to records within the scope of annual reporting requirements or during compliance investigations and inspections.

The benchmark controls for recordkeeping of product quality are as follows:

- Keep records to demonstrate that each batch of Category A product complies with the minimum requirements in AS 4454.
- Keep records to demonstrate that each batch of Category B product complies with the fit-for-purpose product specification.
- Keep records to show that each batch of product required to undergo pasteurisation (as relevant based on the product specification) has been pasteurised following the criteria in Table 10Table 10 or an alternative authorised process. This includes records of in-field temperature monitoring and time periods for which the pasteurisation temperature was sustained.
- Keep records of product quality testing results, including:
  - a tabulated summary of product concentrations for parameters required to be tested for each batch sampled
  - comparison of parameter concentrations in Category A products with the relevant chemical, physical and biological contaminant upper limits (Table 9)
  - comparison of parameter concentrations in Category B products with the contaminant upper limits in the fit-for-purpose product specification
  - identification of test results that did not comply with the product specification and description of:
    i) how the relevant batch of product was remediated to achieve compliance or otherwise managed, and
    ii) how feedstock acceptance and/or the organics recycling process were changed to prevent future products failing to comply with the product specification
- Keep records of the assessment of the status of each product as a waste.

9. Recordkeeping and reporting

Operators of organics recycling facilities are to maintain records that can be audited for the purpose of demonstrating compliance with all relevant regulatory controls and legislative requirements.

Each licence outlines the specific recordkeeping and reporting requirements for an organics recycling facility. In addition to the recordkeeping and reporting requirements for the specific EPOs in Section 8 above, operators may need to provide the following general information:

- monitoring data for incoming feedstocks and outgoing products and wastes
- ambient environmental monitoring data such as groundwater and ambient odour field monitoring
- process monitoring data such as compost stockpile/windrow in-field temperature levels
- emissions monitoring data such as biogas generator stack emissions or odour monitoring of odour-treatment system emissions
- summary of complaints including the name and contact details of the complainant (if provided), time and date, nature of any concerns or issues raised and the action taken to investigate and/or respond to the complaint
- details of environmental incidents such as fires or failure of pollution control equipment.

10. Additional approvals

Operators may require additional approvals outside the requirements of Pt V Division 3 of the EP Act. Additional approvals may include:

- clearing approvals under Pt V Division 2 of the EP Act or the *Country Areas Water Supply Act 1947* – obtained from our department
- licences to take water under the *Rights in Water and Irrigation Act 1914* – obtained from our department
- approvals relating to the transportation of controlled wastes on public roads under the Environmental Protection (Controlled Waste) Regulations 2004 – controlled waste carrier licences obtained from our department[10]
- planning and building approvals from the relevant local government or responsible authority
- approvals from the Department of Health, particularly regarding the use of biosolids and other sewage treatment-derived wastes
- approvals from the Department of Mines, Industry Regulation and Safety, particularly regarding storage of dangerous goods
- approvals from the Department of Primary Industries and Regional Development.

Any approvals granted under Pt V Division 3 of the EP Act do not limit legal obligations under any other legislation. It is the operator's responsibility to ensure their approvals are valid and all relevant legislative requirements are complied with.

[10]The operator of an organics recycling facility that accepts controlled waste is a waste facility occupier. The operator of an organics recycling facility that removes controlled waste from the premises is a waste holder. Waste facility occupiers and waste holders also have obligations under the Environmental Protection (Controlled Waste) Regulations 2004.

Document implementation

This guideline comes into effect on the day it is published.

This guideline will be implemented for new and existing organics recycling facilities to achieve the regulatory standards required under Pt V Division 3 of the EP Act and the better practice objective of the Waste Strategy 2030.

We will assess applications for new premises that we receive after publication of this guideline against the standards set in it. Operators who are at an advanced stage of planning and preparation at the time the guideline is published should contact us.

We are developing an implementation procedure in accordance with the policy framework. This procedure will detail how the guideline will be implemented at new and existing premises and include templates to support operators. We will engage with industry to help develop the procedure.

Should operators of existing organics recycling facilities wish to start implementation of the guideline in advance of our implementation schedule, they may do so.

We will work with all operators at all stages of the application and assessment process to achieve better practice.

We note that at the time of publication, the Australian Government is exploring opportunities under the *National Waste Policy* for national standards and specifications for organic waste products. We will seek to align the approach set out in the guideline with any national accreditation scheme for recycled organic products.

Related documents

Department documents	
Application form for works approvals, licences and amendments	*Application form*
Department regulatory framework	*Guideline: Industry regulation guide to licensing*
	Guideline: Odour emissions
	Guideline: Risk assessments
	Guideline: Environmental siting
	Guideline: Decision making
	Guidance statement: Environmental standards
	Guidance statement: Setting conditions
	Our regulatory approach
Other publications	*A guideline for managing the impacts of dust and associated contaminants from land development sites remediation and other related activities*
	Air quality modelling guidance notes
	Assessing whether material is waste
	Assessment and management of contaminated sites
	Audible reversing alarms: considerations for use
	Controlled waste
	Closing the loop – Waste reforms for a circular economy
	Consultation summary report: Issues paper – Waste not want not: valuing waste as a resource
	Environmentally sensitive areas
	Identification and investigation of acid sulfate soils and acidic landscapes
	Issues paper: Waste not, want not: valuing waste as a resource
	Landfill waste classification and waste definitions 1996
	Treatment and management of soil and water in acid sulfate soil landscapes
	Water quality protection note no. 25: Land use compatibility tables for public drinking water source areas
	Western Australian guidelines for biosolids management

Legislation and environmental protection policies
Biosecurity and Agriculture Management Act 2007
Biosecurity and Agriculture Management Regulations 2013
Bushfire Act 1954
Contaminated Sites Act 2003
Country Areas Water Supply Act 1947
Environmental Protection Act 1986
Environmental Protection Regulations 1987
Environmental Protection (Controlled Waste) Regulations 2004
Environmental Protection (Goldfields Residential Areas) (Sulfur Dioxide) Policy 2003
Environmental Protection (Goldfields Residential Areas) (Sulfur Dioxide) Regulations 2003
Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999
Environmental Protection (Kwinana) (Atmospheric Wastes) Regulations 1992
Environmental Protection (Noise Regulations) 1997
Environmental Protection (Packaged Fertiliser) Regulations 2010
Environmental Protection (Peel Inlet – Harvey Estuary) Policy 1992
Environmental Protection (Unauthorised Discharges) Regulations 2004
Fire and Emergency Services Act 1988
Freedom of Information Act 1992
Litter Act 1979
Metropolitan Water Supply, Sewerage, and Drainage Act 1909
Planning and Development Act 2005
Rights in Water and Irrigation Act 1914
Waste Avoidance and Resource Recovery Act 2007
Waterways Conservation Act 1976

Databases and mapping tools	
Author	Title
Australian Government Digital Transformation Agency	*National Map*
Bureau of Meteorology	*Climate Data Online*
	Design Rainfall System
Queensland Government	*SILO Database*
WA Department of Fire and Emergency Services	*Map of Bush Fire Prone Areas*
WA Department of Water and Environmental Regulation	*Contaminated Sites*
	Floodplain Mapping Tool
	Perth Groundwater Map
	Public Drinking Water Source Area Mapping Tool
	Water Information Reporting
	Water Register
WA Government	*Data WA*

Non-department documents	
Author	Title
Commonwealth of Australia	*National waste policy: Less waste, more resources*
National Environment Protection Council	*National Environment Protection (Ambient Air Quality) Measure*
	National Environment Protection (Assessment of Site Contamination) Measure
Secretariat of the Stockholm Convention	*Stockholm Convention on persistent organic pollutants (POPs)*
WA Department of Fire and Emergency Services	*Guidance note (GN04) Fire prevention and management in a materials recycling facility*
	Guideline (GL-11) Site planning and fire appliance specifications
	Information note: Bulk green waste storage fires
WA Environmental Protection Authority	*State Environmental (Cockburn Sound) Policy 2015*
WA Planning Commission	*Guidelines for planning in bushfire prone areas*
	State Planning Policy 3.7 Planning in bushfire prone areas
WA Waste Authority	*Waste Avoidance and Resource Recovery Strategy 2030*

Non-department documents	
Author	Title
Technical standards	
Author	Title
Standards Australia	AS 1289 Methods of testing soils for engineering purposes
	AS 1692 Steel tanks for flammable and combustible liquids
	AS 1940 The storage and handling of flammable and combustible liquids
	AS 2118.1 Automatic fire sprinkler systems, Part 1: Genera systems
	AS 2419.1 Fire hydrant installations, Part 1: System design, installation and commissioning
	AS 3735 Concrete structures for retaining liquids
	AS 3745 Planning for emergencies in facilities
	AS 3798 Guidelines on earthworks for commercial and residential developments
	AS 4454 Composts, soil conditioners and mulches
	AS 4766 Rotationally moulded buried, partially buried and non-buried storage tanks for water and chemicals
Geosynthetic Institute	GRI-GCL3 Standard specification for ‘Test methods, required properties, and testing frequencies of geosynthetic clay liners (GCLs)’
	GRI-GM13 Standard specification for ‘Test methods, test properties and testing frequency for high density polyethylene (HDPE) smooth and textured geomembranes’

Custodian and review

The currency of this document will be continuously evaluated and reviewed no later than three years from the date of issue or sooner as required.

Document details	
Lead group (custodian)	Waste Industries, Industry Regulation
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Appendices

Appendix A: Example liquid feedstock analysis

Table A.1 provides an example list of parameters for analysis to assess contaminant concentrations in some non-standard liquid feedstocks. Operators should consider the parameters in Table A.1 to be the minimum analytical suite for adequately characterising the listed waste types. Characterisation of other liquid waste types not listed in Table A.1 will require detailed chemical analysis of all substances known or reasonably expected to be present in the waste type (see Section 8.1).

Table A.1: Minimum analytical suites for some liquid feedstocks

Controlled waste	**Waste types**	**Parameters for analysis**
Waste oil and water, or hydrocarbons and water, mixtures or emulsions	Oil interceptor waste Oil sludge Waste oil and water mixtures or emulsions, and hydrocarbon and water mixtures or emulsions	Benzene, toluene, ethylbenzene and xylenes (BTEX)
		Metals – arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc
		Polycyclic aromatic hydrocarbons (PAHs)
		Semi-volatile organic compounds (SVOCs)
		Total recoverable hydrocarbons (TRHs)
		Volatile organic compounds (VOCs)

Appendix B: Water balances

The benchmark controls for emissions to land and water in Section 8.2 specify that a month-to-month water balance is prepared to support the design of the leachate containment system at organics recycling facilities that accept liquid feedstocks. A water balance may also be required to support the design of the leachate containment system at other higher-risk organics recycling facilities.

The purpose of a water balance is to demonstrate that the leachate containment system will be able to operate in a satisfactory manner throughout the seasons and during the facility's ongoing operations. A month-to-month water balance should account for monthly inputs and outputs to determine cumulative leachate storage requirements over at least two consecutive years.

The following diagram, Figure B.1, presents a simple conceptual water balance for a leachate pond at an organics recycling facility. Additional inputs and outputs to those presented may be relevant at some facilities. Table B.1 summarises the relevant data sources and considerations to help prepare a water balance. Table B.2 presents a simple example of a monthly quantitative water balance for a leachate pond at an organics recycling facility.

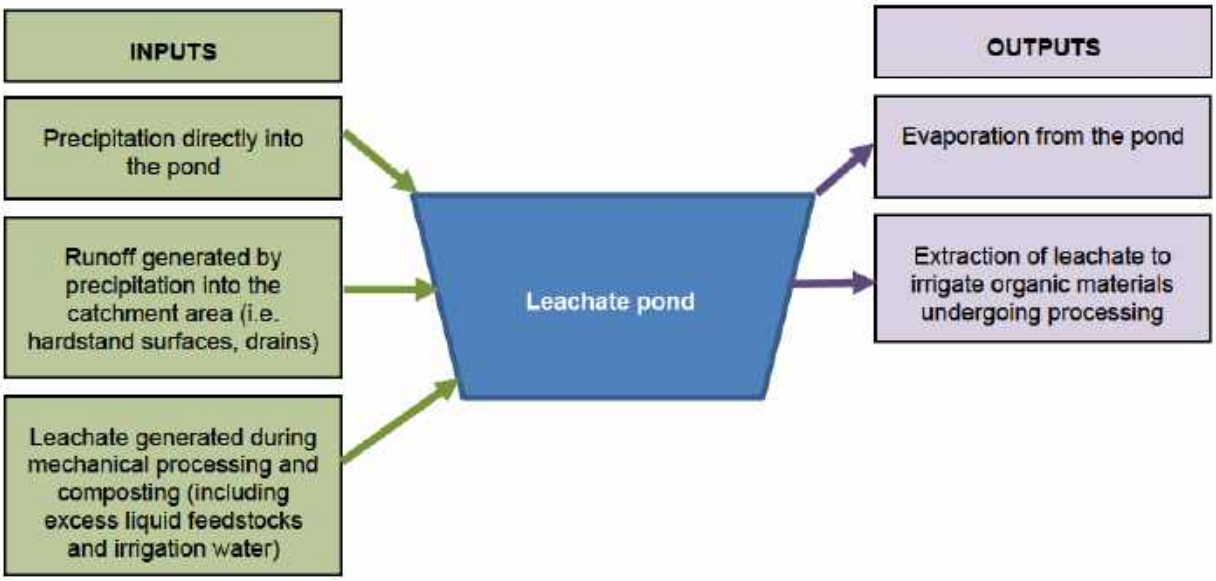

Figure B.1: Example conceptual water balance for a leachate pond at an organics recycling facility

Table B.1: Components of the leachate containment infrastructure water balance

Component	Description	Relevant considerations/variables
Input: Processing	Leachate generated during mechanical and biological processing. This includes liquids generated during the decomposition of waste or from the addition of liquids to the recycling process (i.e. water, re-use leachate and liquid feedstocks).	Feedstocks – moisture content on receipt and expected leachate generation potential. Process conditions – expected rate of liquid addition (re-use leachate, potable water, liquid feedstocks etc) during processing and type of processing method (e.g. pasteurisation/ composting, covered/uncovered, enclosed/outdoors).
Input: Precipitation	Leachate generated from rainwater/stormwater entering the catchment of the leachate containment system (i.e. direct rainfall or runoff into ponds and onto hardstand surfaces).	Surface area of leachate containment system catchment (i.e. hardstand surfaces, drains and open ponds/tanks). Local rainfall rates sourced from the Bureau of Meteorology (BoM) or Scientific Information for Land Owners (SILO) database to determine the 90th percentile wet year rainfall (see Glossary). Monthly rainfall rates are based on those recorded during a 90th percentile wet year or adjusted 90th percentile monthly rainfall data. Amount of rainfall from hardstand areas converted into runoff. A runoff coefficient (see Glossary) is estimated and justified based on site-specific information.
Output: Extraction	Leachate extracted from ponds for application in the recycling process.	Expected rate of leachate extraction for re-use.
Output: Evaporation	Evaporative loss from storage ponds.	Estimation of the evaporative surface area of ponds based on the pond shape and size. Local pan evaporation rates as sourced from BoM or SILO. Pan factor (see Glossary), calculated on a site-specific basis or a default value of 0.7.

Table B.2: Example water balance calculation

Infrastructure			
Catchment area (i.e. hardstand and drainage)	(A_1)	10,000	m^2
Leachate pond area	(A_2)	3,600	m^2

Notes:

Monthly rainfall rates from a 90th percentile wet year (see Glossary)

* Monthly leachate input volumes estimated based on feedstock types and process conditions

Conservative assumptions in this water balance include that 100 per cent of precipitation to the catchment area is converted to runoff into the leachate pond (i.e. runoff coefficient of 1) and negligible seepage occurs from the leachate pond.

Parameter	**Symbol**	**Formula**	**Units**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**TOTAL**
Days in month	(D)	–	days	31	28	31	30	31	30	31	31	30	31	30	31	365
Precipitation rate#	(P_1)	–	mm/month	45	30	24	50	71	88	173	152	77	42	5	41	797
Pan evaporation rate	(E_1)	–	mm/month	316	269	239	150	93	66	65	81	111	167	228	282	2067
Pan factor	(K)	–	(–)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	–
Inputs																
Precipitation	(P_2)	$(A_1+A_2) \times P_1 / 1000$	m^3/month	617	408	321	680	963	1197	2347	2062	1053	571	65	552	10836
Composting process*	(C)	–	m^3/month	2	2	2	2	3	4	4	4	3	2	2	2	32
Total inputs	–	$P_2 + C$	m^3/month	619	410	323	682	966	1201	2351	2066	1056	573	67	554	10868
Outputs																
Evaporation	(E_2)	$E_1 \times K \times A_2 / 1000$	m^3/month	797	677	602	378	234	166	164	203	280	422	575	711	5209
Extraction	(L)	–	m^3/month	30	30	30	25	20	20	20	20	30	30	30	30	315
Total outputs	–	$E_2 + L$	m^3/month	827	707	632	403	254	186	184	223	310	452	605	741	5524
Balance																
Storage	(S)	$(P_2 + C) - (E_2 + L)$	m^3/month	-207	-297	-309	279	712	1014	2167	1843	746	121	-537	-187	–
Cumulative storage year 1	(M_1)	–	m^3	0	0	0	279	991	2005	4172	6015	6761	**6882**	6345	6158	–
Cumulative storage year 2	(M_2)	–	m^3	5951	5653	5345	5624	6335	7350	9517	11360	12106	**12227**	11690	11503	–
Leachate storage capacity required during first two years	(V)	Maximum M_2 value	m^3	**12227**												

Appendix C: Product sampling protocol

This section outlines the sampling protocol for collecting product quality samples. The protocol's purpose is to achieve consistent and representative sampling of products to ensure that the physical, chemical and biological contaminant levels meet the product specification. See Section 8.10 for the benchmark controls for product sampling and testing.

This appendix does not address requirements for sample size, preservation, transportation or preparation for analysis at the laboratory. Operators should refer to AS 4454 (Appendix A Methods for sampling, sample handling and preparation prior to analysis) and the NATA-accredited laboratory they have chosen for further guidance. This appendix does not address sampling procedures to assess the level of maturity or beneficial qualities of products, as these characteristics are outside of the scope of this guideline.

Sampling protocol:

1. Calculate the number of samples and subsamples required

The number of samples required depends on the size of the batch being represented. Use the specifications in Table C.1 to determine the number of subsamples.

Table C.1: Subsample numbers for given batch volume

Batch volume (m^3)	Number of subsamples required
<575	12
1,000	16
2,000	23
3,000	28
>3,600	30

2. Take subsamples from the stockpile/windrow

Using a spade or trowel, take the subsamples from random positions throughout the stockpile or windrow using one of the following methods:

(a) Subsampling method 1

Arrange for the windrow or stockpile to be turned, screened or otherwise completely homogenised in a manner that breaks up and distributes any clumps using a front-end loader, windrow turner and/or screening equipment, on the same day as the sampling occurs. Once the pile has been homogenised, take the subsamples from random positions over the exterior length and height of the pile using the number of locations indicated by Table C.1. Ensure that each subsample is approximately the same size.

(b) Subsampling method 2

For a windrow or stockpile that has not been turned or otherwise completely homogenised within 24 hours, use the front-end loader to dig or back-blade halfway into the pile to expose a near-vertical cross-section face (only where safe to do so and with appropriate safety controls in place to mitigate risks). Take three to five subsamples scattered over the width and height of the cross-section. Repeat for as many cross-sections as required to obtain the relevant number of subsamples from Table C.1, ensuring an approximately equal number of cross-sections from each side of the windrow or from opposite faces of a pile.

3. Prepare specimen for test

Using a plastic bucket, convey the subsamples to a flat area of clean concrete; or using a plastic film or tarpaulin, make a conical pile out of the combined subsamples. Using a riffle box, sample splitter or by mixing, coning and quartering, blend the composited subsamples into an appropriate specimen for test. The specimen for test is the component of the sample submitted to the laboratory for analysis.

Glossary

90th percentile wet year rainfall	This may be calculated using one of two approaches: i) The 90th percentile of the annual rainfall dataset (YR^{90}). ii) The total of the adjusted 90th percentile monthly rainfall values ($\sum MR^{90}_{adj}$). The 90th percentile monthly rainfall (MR^{90}) is determined for each calendar month and totalled ($\sum MR^{90}$). As the total of individual 90th percentile months is much larger than YR^{90}, the 90th percentile monthly rainfall is then adjusted so that $\sum MR^{90}_{adj}$ equals YR^{90} as follows: $$MR^{90}_{adj} = \frac{YR^{90}}{\sum MR^{90}} \times MR^{90}$$
Aerated static pile	An aerobic composting method in which the composting material is placed in piles over an air supply system that can be used to supply oxygen and control temperature.
Aerobic composting	The process whereby organic materials are microbiologically transformed under controlled aerobic conditions to achieve pasteurisation and a specified level of maturity.
Alternative control	A control measure proposed by an operator as an alternative means of achieving the EPO instead of implementing a benchmark control from this guideline.
Anaerobic digestion	The process whereby organic materials are microbiologically transformed under anaerobic conditions into high-energy compounds such as methane, organic acids and alcohols and a solid or liquid residue digestate.
Annual exceedance probability (AEP)	In relation to rainfall, the probability that a given rainfall total accumulated over a given duration will be exceeded in any one year. In relation to flooding, the probability that a flood of a given size will occur in any one year.
Applicant	An individual, company, body corporate or public authority applying to the department for a works approval, licence or amendment under Pt V Division 3 of the EP Act.

Appropriately authorised facility	Premises that hold approval under the EP Act for the acceptance of the relevant waste type as defined in the *Landfill waste classification and waste definitions 1996 (as amended).*
Benchmark control	Controls specified in this guideline which if implemented will generally achieve the relevant EPO at low to medium-risk facilities. For further discussion, see Section 6.2.
Better practice	Refers to practices and approaches the department considers to be outcomes-focused, effective and high performing, and which have been identified based on evidence and benchmarking against comparable jurisdictions. Better practice is synonymous with the term best practice but captures the dynamic nature of best practice.
Biogas	Gas produced during the decomposition of organic material in anaerobic conditions. Biogas is primarily composed of methane and carbon dioxide, with other minor components including nitrogen gas, hydrogen sulfide, water vapour and other gases.
Bioremediation	An accelerated process using microorganisms (indigenous or introduced) and other processes to degrade and detoxify organic substances to less toxic compounds, such as carbon dioxide and water, in a controlled environment.
Biosolids	Sludge from a wastewater treatment plant that has undergone further treatment to reduce disease-causing pathogens and volatile organic matter significantly, resulting in a stabilised material suitable for beneficial use. Does not include industrial and food processing sludges. Where biosolids have been blended with other materials for land application, the blended product is included within the definition of ‘biosolids’.
Category A product	A solid product from an organics recycling facility that complies with the minimum requirements set out in AS 4454 and, if relevant, the biosolids guidelines. See Section 8.10 for further information.
Category B product	A solid product from an organics recycling facility that complies with a fit-for-purpose product specification that is developed and maintained by the operator. See Section 8.10 for further information.

CFU	Colony forming units
Clean fill	Has the same meaning given to that term in the *Landfill waste classification and waste definitions 1996 (as amended).*
Clinical and related waste	Has the same meaning given to those waste types in the Department of Health *Code of practice for clinical and related waste management: Public Health Act 2016*.
Compost	A solid organic material that has undergone controlled aerobic and thermophilic biological transformation through the composting process to achieve pasteurisation and reduce phytotoxic compounds and achieved a specified level of maturity for compost.
Composting	For the purpose of this guideline means the production of composts, soil conditioners, mulches and other products such as mushroom-growing substrate by processes including aerobic composting, anaerobic digestion and vermiculture. Composting does not include shredding, grinding, cutting and milling activities.
Construction phase	A period of time where the proposed infrastructure is constructed, where emissions and discharges are linked to the construction and not operation of the plant.
Contaminants	Contaminants in the context of compost include physical and non-biodegradable materials (e.g. metals, glass, plastic etc.), chemical substances (e.g. metals, pesticides, VOCs etc.) and/or biological agents (e.g. bacteria) that can have a detrimental impact on the quality of compost products.
Contaminated soil	Has the same meaning given to that term in the *Landfill waste classification and waste definitions 1996 (as amended).*
Controlled waste	Has the same meaning given to that term in the Environmental Protection (Controlled Waste) Regulations 2004
CQA	Construction quality assurance

Digestate	Decomposed feedstock generated as a product of anaerobic digestion comprising slow degradable, stable organic components such as lignin, nitrogen and phosphorus in various forms, inorganic salts containing phosphate, ammonium, potassium and other minerals. Digestate may be separated into its liquid and solid components.
Directly related activity	Activities on a prescribed premises which do not fall within the description of the category in Schedule 1 of the EP Regulations, but are activities related to the prescribed premises that occur on the same premises and may give rise to emissions and discharges.
Discharge	Has the same meaning given to that term in the EP Act.
Emission	Has the same meaning given to that term in the EP Act.
Emissions guidelines	A guideline published by our department that addresses a particular emission type (e.g. *Guideline: Odour emissions*)
Environment	As defined under s.3(1) of the EP Act and subject to subsection (2), means living things, their physical, biological and social surroundings, and interactions between all of these.
Environmental harm	Has the same meaning given to that term in the EP Act.
Environmental value	Has the same meaning given to that term in the EP Act.
Environmentally sensitive area	An area that is the subject of a declaration in force under s.51B of the EP Act.
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	Environmental Protection Regulations 1987 *(WA)*
Feedstock	A material that is a suitable ingredient for the production of recycled organic products at an organics recycling facility.
Fire water	Means water that, in the event of a fire, has been used to extinguish a fire and all materials and combustion products dissolved or suspended within such water and includes other fire suppressant substances such as foams.

Flood fringe	The area of land that would be affected by river flooding in a 1 per cent (one in 100) AEP flood event but is not a designated floodway.
Floodplain	The area inundated in a flood event on a waterway, which may include the floodway and flood fringe areas. For land planning purposes, the 1 per cent (one in 100) AEP event is typically adopted.
Floodway	The area of land that would be affected by river flooding in a 1 per cent (one in 100) AEP flood event for a waterway. This area is generally a high flood risk area where floodwaters are flowing fast and deep.
FOGO	Food organics and garden organics waste collected from source-separated kerbside municipal collections or source-separated commercial collections of designated FOGO bins.
Fugitive emissions	Pollutants emitted to the air that are not caught by a capture system and do not originate from a stack, chimney, vent or other functionally equivalent opening designed specifically for the release of emissions. These also include small releases from leaks in plant equipment such as valves, flanges, pump seals and buildings. Emissions from surfaces such as ponds are also considered to be fugitive emissions.
GO	Garden organics waste sourced from source-separated kerbside municipal or source-separated commercial collections.
HDPE	High-density polyethylene
Highest groundwater level	The highest level of the saturated zone in the soil, taking into account the range of seasonal groundwater conditions in the context of long-term variability and possible groundwater rise following development. Where measurement is required, this is represented by the shallowest depth to free water that stands in an unlined borehole or where the soil moisture tension is zero.
In-vessel composting	An aerobic composting method in which the process takes place in a contained reactor vessel (e.g. drum, silo, bin or tunnel) where the operating conditions are carefully controlled and active aeration meets the system’s high oxygen demand.

Leachate	Liquid that has percolated through and/or been generated by the decomposition of waste material, including water that has interacted with feedstocks, materials undergoing processing (i.e. mechanical, pasteurisation or composting) or products.
Leachate containment system	Infrastructure on the premises that is designed to contain, convey or store leachate, liquid feedstocks or liquid wastes. The leachate containment system includes, but is not limited to, hardstand surfaces, tanks, vessels, ponds, bunding and drainage infrastructure.
Licence	A licence granted and in force under Pt V Division 3 of the EP Act.
Licence holder or holder of a licence	Refers to the occupier of a premises, being the person to whom a licence has been granted.
Liquid waste	Means a waste that does not meet the definition of solid as specified in the *Landfill waste classification and waste definitions 1996 (as amended).*
Maturation	The final stage of aerobic composting where the temperature is shown to decline and stabilise to the extent the product can be safely used on land and can come into direct contact with plants without negative effects.
MPN	Most probable number
Mulch	Any organic product (excluding polymers that do not degrade, such as plastics, rubber and coatings) that is suitable for placing on soil surfaces.
NATA-accredited laboratory	A laboratory accredited by the National Association of Testing Authorities for a specific analytical method.
Noise Regulations	Environmental Protection (Noise) Regulations 1997
Non-standard feedstock	A feedstock not listed as a standard feedstock in Table 4 Aof this guideline. Non-standard feedstocks are regulated in a precautionary manner because of uncertainties about their composition and their potential to adversely impact product quality and emissions.
Occupier	Has the same meaning given to that term in the EP Act.

Operator/operators	Is a generic term that collectively refers to: • applicant • licence holder/holder of a licence • works approval holder/holder of a works approval • occupier.
P1C1	Classification for biosolids that are suitable for unrestricted use because they meet the P1 pathogen grade and C1 contaminant grade, as outlined in the biosolids guidelines.
Pan factor	Conversion factor used to estimate the rate of evaporation from a surface waterbody based on measured pan evaporation rates. The pan factor accounts for differences in the characteristics of a pan and actual evaporating surface, such as a leachate pond.
Pasteurisation	A process whereby organic materials are heat-treated to significantly reduce the numbers of plant and animal pathogens and plant propagules.
Pasteurised product	An organic product that has undergone pasteurisation but is relatively immature and lacking biological stability.
PFU	Plaque forming units
Point source	A specified location where a contaminating substance is present that is then emitted from that location into the environment. In relation to air emissions, refers to a source where emissions emanate from a specific opening, such as a stack or vent.
Pollution	Has the same meaning given to that term in the EP Act.
POPs	Persistent organic pollutants
Prescribed premises	A site where an activity listed in Schedule 1 of the EP Regulations is carried out at, or above, the specified production or design capacity.
Product	For the purpose of this guideline, is an output from an organics recycling facility that is not a waste.

Quarantine waste	Means material from a foreign region or country that is capable of being host to insects, helminths or other parasites, diseases, weeds or any other organisms that do not exist or are not prevalent in Australia and pose a potential threat to local ecosystems, people or local plant or animal industries. Quarantine waste may include: • material used to pack and stabilise imported goods • galley food and any other waste from overseas vessels • human, animal or plant waste brought into Australia • refuse or sweepings from a hold of an overseas vessel • any other waste or other material, which comes into contact with quarantine waste • contents of airport amnesty bins • articles seized by quarantine inspectors and/or not collected by clients.
Raw mulch	Mulch from a single known plant material type that, by virtue of the nature and source of the material, embodies minimal risk of plant propagules, pathogens and other contaminants.
Regular or regularly	In relation to the frequency of an action to be undertaken, means the action will recur on a periodic basis. The appropriate frequency depends on the type of action and level of risk posed from the organics recycling facility. Where the term 'regular' or 'regularly' is used in a benchmark control, operators are to specify the proposed frequency of that action and justify why it is considered acceptable. We will determine the appropriate frequency of specific actions as part of our assessment and specify this in conditions on licences and works approvals where appropriate to maintain an acceptable level of risk.
Residual physical contaminants	Physical contaminants such as plastics, glass and metals that have been screened or otherwise removed from feedstocks.
Runoff coefficient	Dimensionless coefficient relating the amount of runoff to the amount of precipitation received. It is larger for areas with low infiltration, low absorption and high runoff.

Sensitive receptors	Places where people live or regularly spend time, and which are therefore sensitive to emissions from industry with implications for public health or amenity. They include, but are not limited to, residences, healthcare establishments, places of accommodation, places of study, childcare facilities, shopping centres, places of recreation, and some public buildings. Commercial, industrial and institutional receptors that require high levels of amenity, or are sensitive to particular emissions, may also be considered sensitive receptors in some circumstances.
Soil conditioner	Any composted or pasteurised organic product, including vermicast, manure and mushroom substrate, that is suitable for adding to soils (excluding polymers that do not degrade, such as plastics, rubber and coatings).
Solid	Has the meaning specified in the *Landfill waste classification and waste definitions 1996 (as amended).*
Specific consequence criteria	Specific criteria for consequences to the environment or public health, which we determine in accordance with our *Guideline: Risk assessments* (see Related documents).
Specimen for test	The blended or composited series of subsamples that is then reduced in size to an appropriate amount for delivery to the testing laboratory.
Standard feedstock	A feedstock that is described and risk-rated in Table 4 of this guideline.
Subsample	An individual sample or incremental sample taken from the bulk mass of product being sampled and composted, which is blended with other such subsamples or increments to form the specimen for test.
Suitably qualified person	A person who has appropriate accreditation, competency and experience in the relevant field for planning, design, validation and/or verification purposes.
Vermiculture	An organics recycling process that uses worms and microorganisms to convert organics into nutrient-rich humus.
VOCs	Volatile organic compounds
Waste	Has the same meaning given to that term under the EP Act.

Watercourse	Has the same meaning given to that term in the *Rights in Water and Irrigation Act 1914.*
Wetland	Has the same meaning given to that term in the *Rights in Water and Irrigation Act 1914.*
Windrow composting	An aerobic composting method in which the composting material is placed in long piles that are periodically turned or agitated to ensure the entire mass experiences the appropriate conditions.
Works approval	An approval required under s.52 and 53 of the EP Act to change a premises to become a prescribed premises or make changes to a licensed premises.
Works approval holder or holder of a works approval	Refers to the occupier of a premises, being the person to whom a works approval has been granted.

References

References which are listed in *Related documents* are not duplicated in the reference list below.

Arcadis 2019, *Critical evaluation of composting operations and feedstock suitability Phase 1 – Odour,* prepared for the Department of Environment and Science Queensland.

Arcadis 2019, *Critical evaluation of composting operations and feedstock suitability Phase 2 – Contamination,* prepared for the Department of Environment and Science Queensland.

Department of Environment and Conservation New South Wales 2004, *Composting and related organics processing facilities,* Sydney.

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Department of Environment and Science Queensland 2021, *Guideline: best practice environmental management – Environmentally relevant activity 53(a) – Organic material processing by composting,* Brisbane.

Department of Health Western Australia 2021, *Code of practice for clinical and related waste management: Public Health Act 2016,* Perth.

Environmental Protection Authority South Australia 2019, *Composting guideline,* Adelaide.

Environmental Protection Authority Victoria 2017, *Designing, constructing and operating composting facilities*, Melbourne.

United Kingdom Environment Agency 2010, *Guidance for monitoring landfill gas engine emissions* LFTGN08 V2, Bristol, United Kingdom.

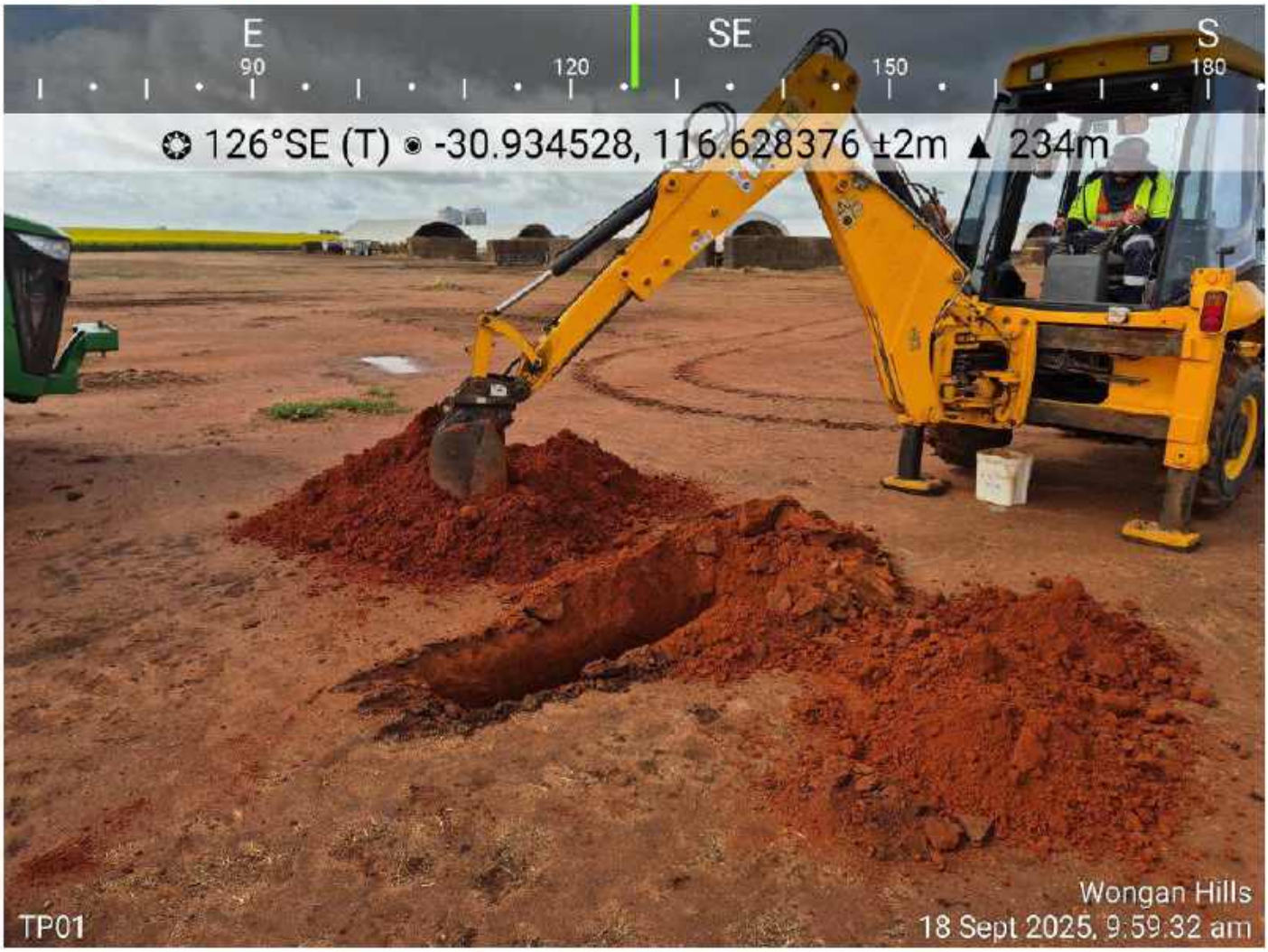
United Kingdom Environment Agency 2002, *Guidance on landfill gas flaring*, Bristol, United Kingdom.

United Kingdom Environment Agency 2012, *Standard rules SR2012 no. 12 V5 – Anaerobic digestion facility including use of the resultant biogas*, United Kingdom.

United States Environmental Protection Agency 2003, *Environmental regulations and technology control of pathogens and vector attraction in sewage sludge,* Cincinnati, United States of America.

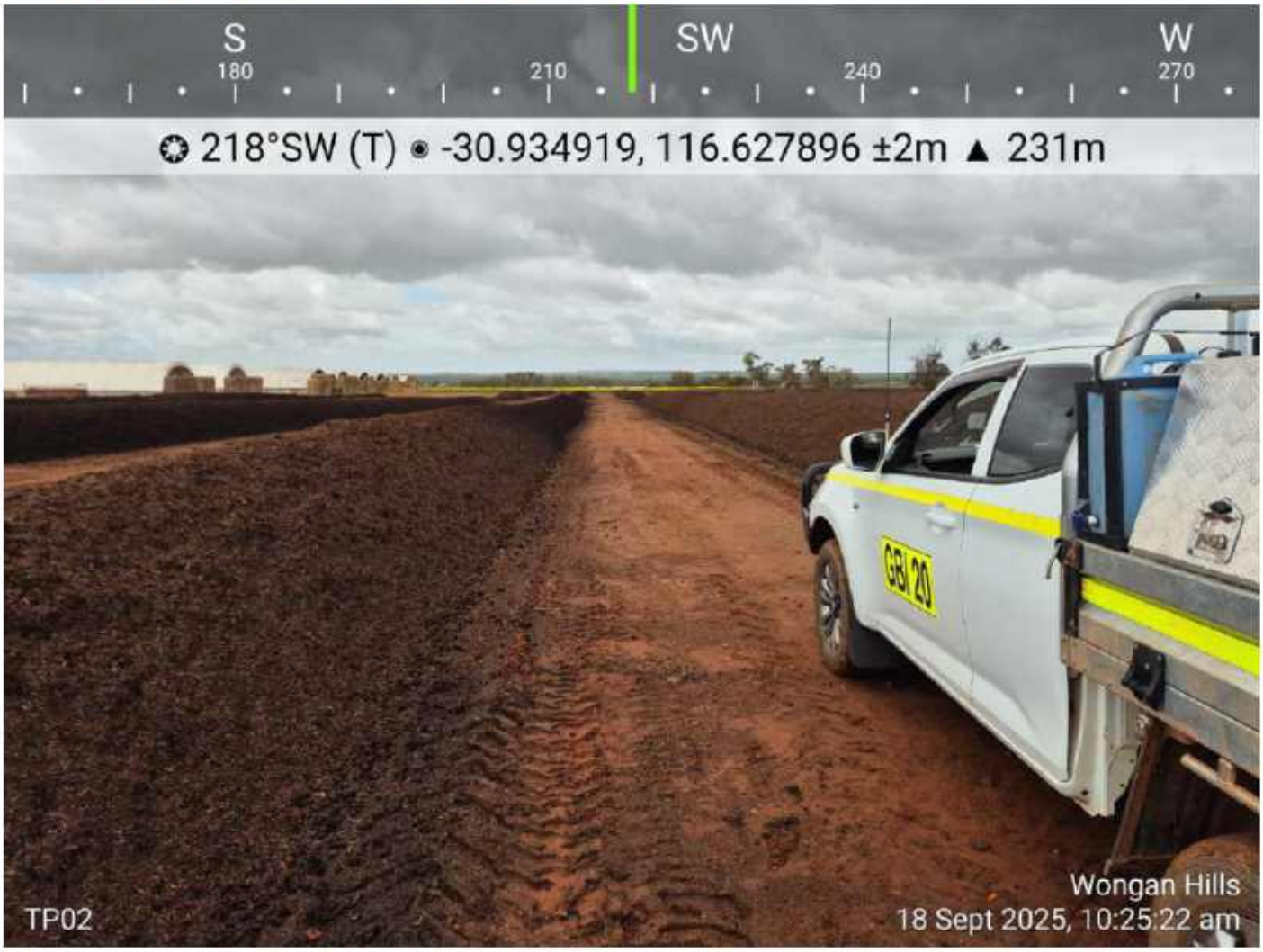
Appendix B: Site Photographs

Photograph 1: Facing southeast toward TP01

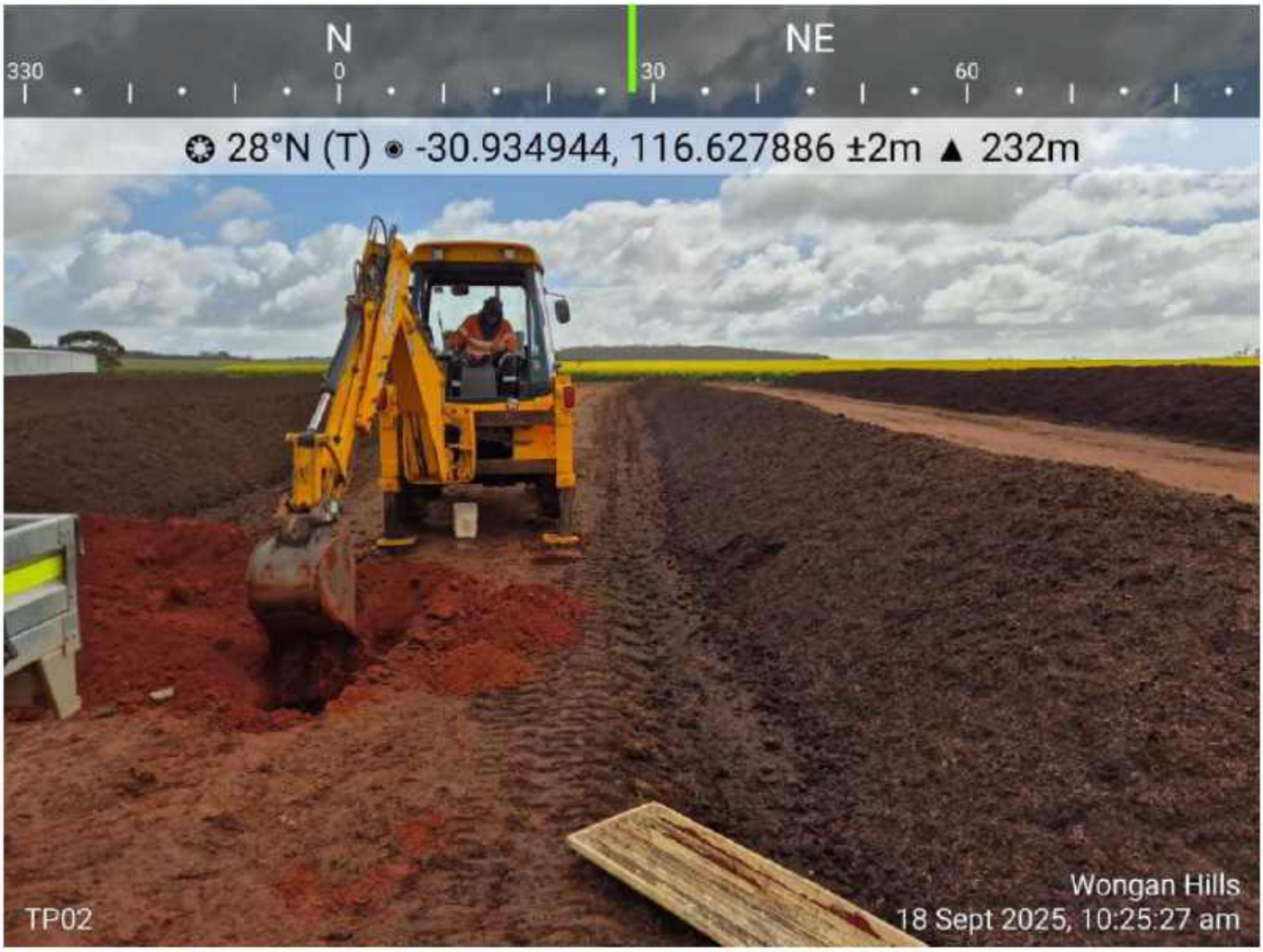


Photograph 2: Facing southwest toward TP02.

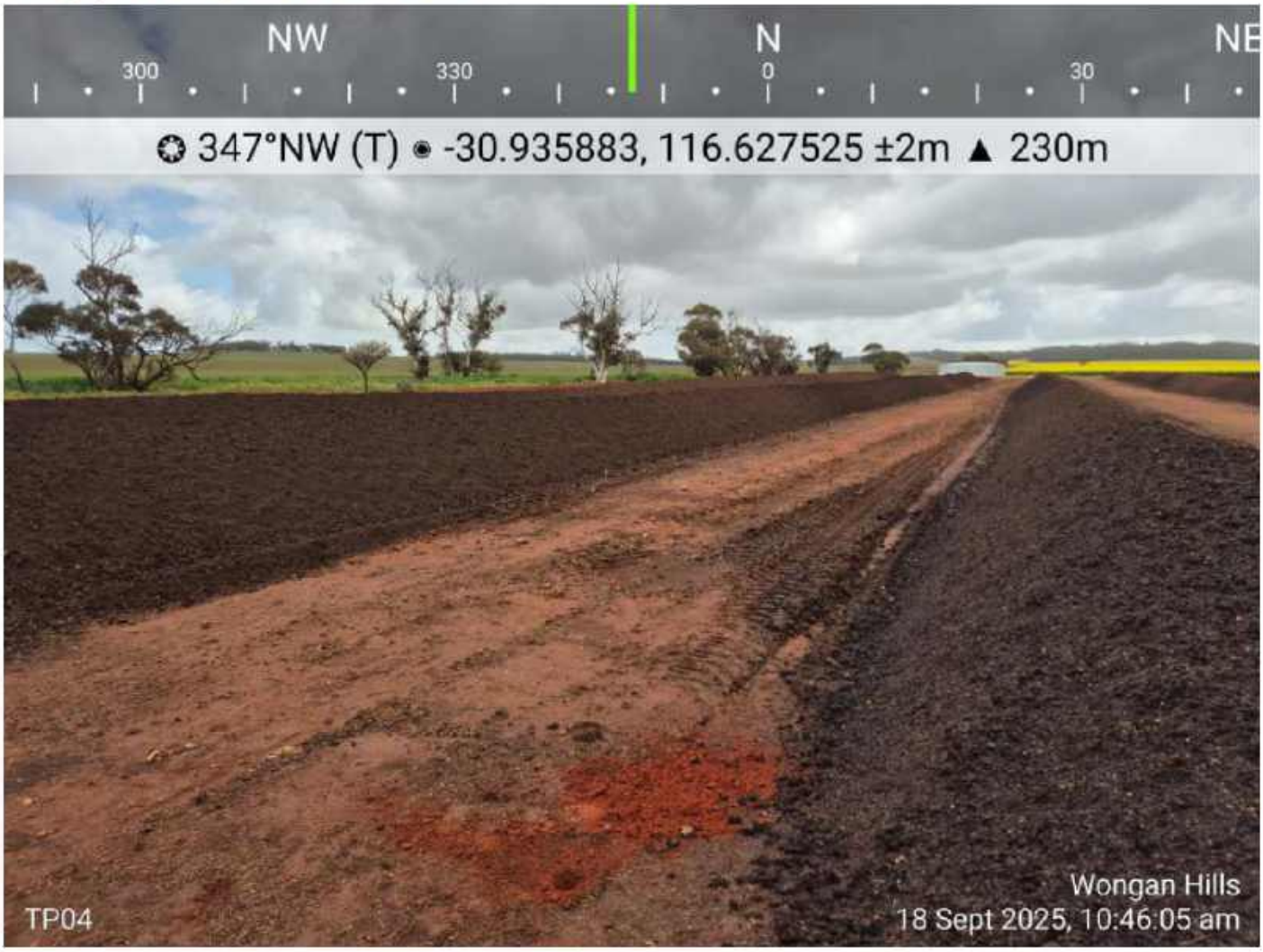
Photograph 3: Facing southwest from near TP02



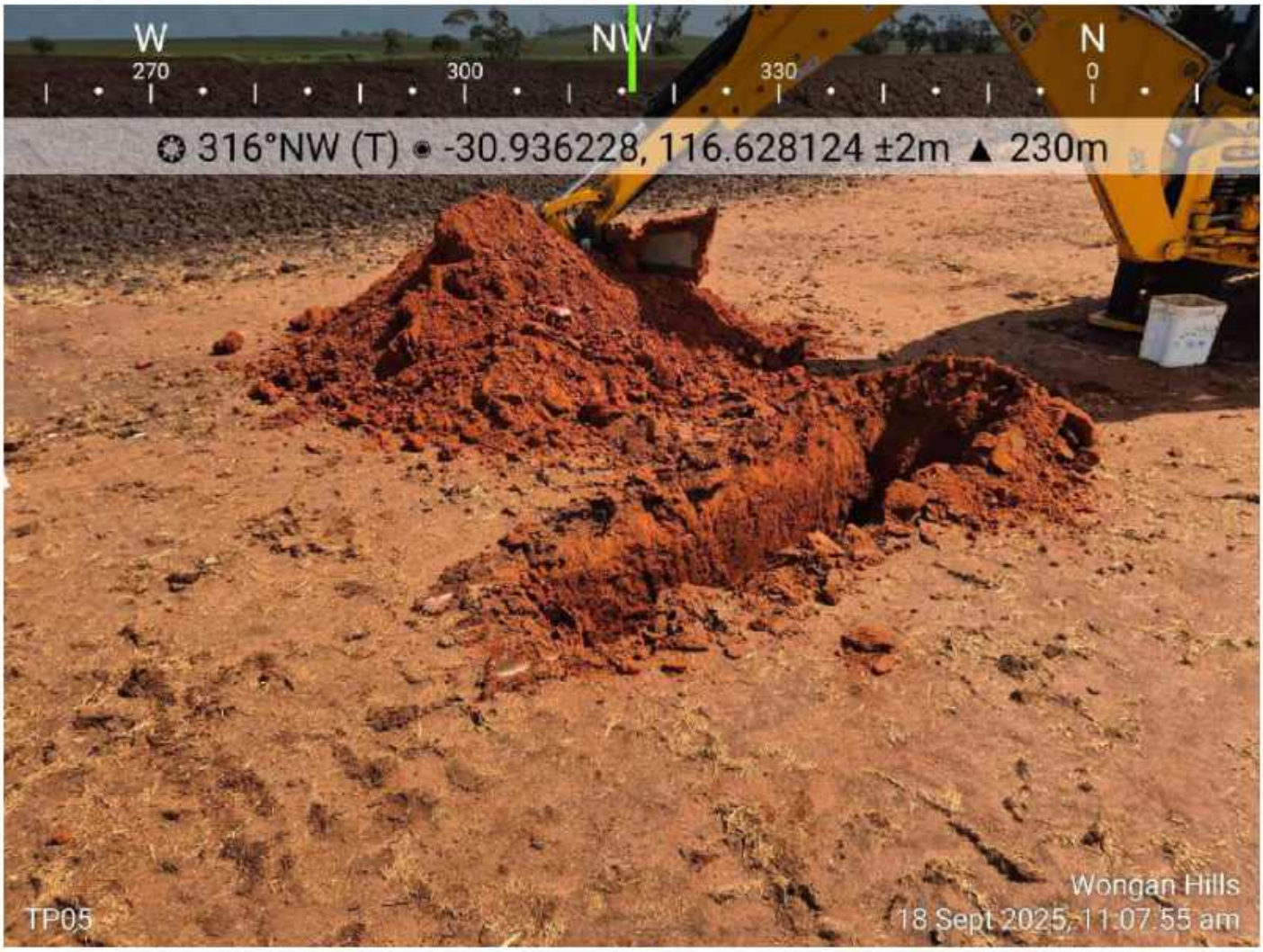
Photograph 4: Facing north from near TP02.



Photograph 5: Facing north from near TP04.



Photograph 6: Facing northwest from near TP05. Test pitting in progress.



Appendix C: Test Pit Reports

TEST PIT: TP01

Project Number: WAG240094-02
Client: Craig Mostyn Group
Project: Composting area at Piggery
Location: Yerecoin S E Road, Lake Ninan

Contractor: GBI
Equipment: JCB 2CX
Operator: Chris
Test Pit Width: 3.50 m
Test Pit Depth: 1.50 m

Date: 18/09/2025
Logged By: JJS
Date Checked: 08/10/2025
Checked By: AM

Drill Method	Depth (m)	Excavation Resistance	Water Level	Samples: Sample Type	Samples: Sample Number	Graphic Log	Soil Class	Soil/Rock Material Description	Moisture Condition	Consistency Density	DCP	Depth (m)	Additional Remarks
Excavator	0.5	F		Bulk	TP01-01		SC/CL	Clayey SAND/Sandy CLAY: low plasticity, brown-red, approximately 55-65 % fine to medium grained sand	M	H	15	0.5	
											13		
										VSt	7		
											5		
										F-St	3		
											2		
	1										2		
											2		
											2		
											2	1	
	1.5	F-											

terminated 5 m, ta epth
ndwater not

Notes: -

Depth Range: 0.0 - 1.5 m

Depth Range: 0.0 - 1.5 m

PROJECT	Composting area at Piggery	**PROJECT NO.**	WAG240094-02
CLIENT	Craig Mostyn Group	**LOG:**	TP01
LOCATION	Lake Ninan, WA	**FIGURE NO.**	Appendix

TEST PIT: TP02

Project Number: WAG240094-02
Client: Craig Mostyn Group
Project: Composting area at Piggery
Location: Yerecoin S E Road, Lake Ninan

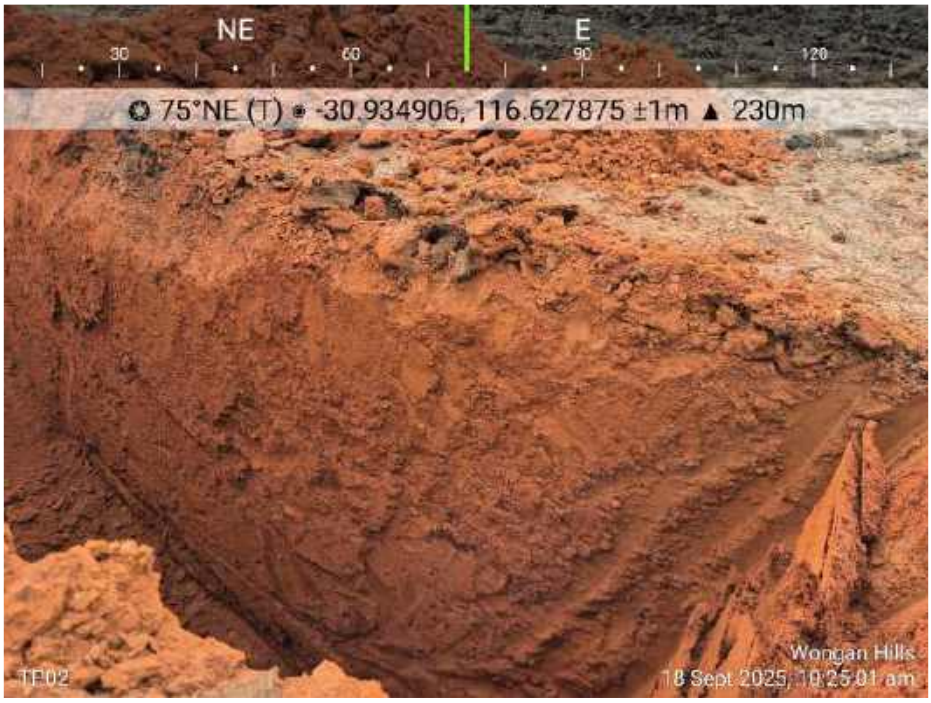
Contractor: GBI
Equipment: JCB 2CX
Operator: Chris
Test Pit Width: 3.50 m
Test Pit Depth: 1.50 m

Date: 18/09/2025
Logged By: JJS
Date Checked: 08/10/2025
Checked By: AM

Drill Method	Depth (m)	Excavation Resistance	Water Level	Samples: Sample Type	Samples: Sample Number	Graphic Log	Soil Class	Soil/Rock Material Description	Moisture Condition	Consistency Density	DCP	Depth (m)	Additional Remarks
Excavator	0.5	F		Bulk	TP02-01		SC/CL	Clayey SAND/Sandy CLAY: low plasticity, brown-red, approximately 55-65 % fine to medium grained sand	M	H	10 7	0.5	
										F-St	3 3 2 3		
	1									VSt	5 8 7 7	1	
	1.5	F-											

terminated 5 m, ta epth
ndwater not

Notes: -



Depth Range: 0.0 - 1.5 m

Depth Range: 0.0 - 1.5 m

PROJECT	Composting area at Piggery	**PROJECT NO.**	WAG240094-02
CLIENT	Craig Mostyn Group	**LOG:**	TP02
LOCATION	Lake Ninan, WA	**FIGURE NO.**	Appendix

TEST PIT: TP03

Project Number: WAG240094-02
Client: Craig Mostyn Group
Project: Composting area at Piggery
Location: Yerecoin S E Road, Lake Ninan

Contractor: GBI
Equipment: JCB 2CX
Operator: Chris
Test Pit Width: 3.50 m
Test Pit Depth: 1.40 m

Date: 18/09/2025
Logged By: JJS
Date Checked: 08/10/2025
Checked By: AM

Drill Method	Depth (m)	Excavation Resistance	Water Level	Samples: Sample Type	Samples: Sample Number	Graphic Log	Soil Class	Soil/Rock Material Description	Moisture Condition	Consistency Density	DCP	Depth (m)	Additional Remarks
Excavator	0.5	F		Bulk	TP03-01		SC/CL	Clayey SAND/Sandy CLAY: low plasticity, brown-red, approximately 55-65 % fine to medium grained sand	M	St-VSt	3 5 6 8 8 5	0.5	
	1	F-								F-St	4 2 2 2	1	

Test G rminated ater not e m, t ntered depth

4

Notes: -

Depth Range: 0.0 - 1.4 m

Depth Range: 0.0 - 1.4 m

PROJECT	Composting area at Piggery	**PROJECT NO.**	WAG240094-02
CLIENT	Craig Mostyn Group	**LOG:**	TP03
LOCATION	Lake Ninan, WA	**FIGURE NO.**	Appendix

TEST PIT: TP04

Project Number: WAG240094-02
Client: Craig Mostyn Group
Project: Composting area at Piggery
Location: Yerecoin S E Road, Lake Ninan

Contractor: GBI
Equipment: JCB 2CX
Operator: Chris
Test Pit Width: 3.50 m
Test Pit Depth: 1.50 m

Date: 18/09/2025
Logged By: JJS
Date Checked: 08/10/2025
Checked By: AM

Drill Method	Depth (m)	Excavation Resistance	Water Level	Samples: Sample Type	Samples: Sample Number	Graphic Log	Soil Class	Soil/Rock Material Description	Moisture Condition	Consistency Density	DCP	Depth (m)	Additional Remarks
Excavator	0.5			Bulk	TP04-01		CL	Sandy CLAY: low plasticity, brown-red, approximately 60-65% fine to medium grained sand	M	VSt	8	0.5	
											5		
											6		
										F-St	4		
											3		
											2		
	1										2		
											2		
											2		
											3	1	
	1.5												

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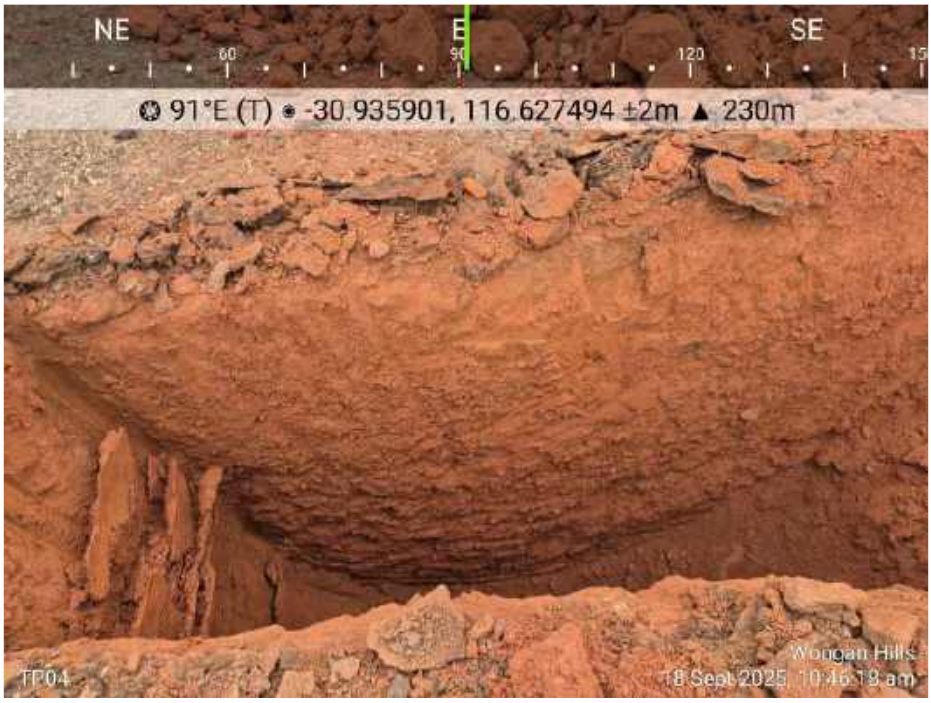

Depth Range: 0.0 - 1.5 m

Depth Range: 0.0 - 1.5 m

PROJECT	Composting area at Piggery	**PROJECT NO.**	WAG240094-02
CLIENT	Craig Mostyn Group	**LOG:**	TP04
LOCATION	Lake Ninan, WA	**FIGURE NO.**	Appendix

TEST PIT: TP05

Project Number: WAG240094-02
Client: Craig Mostyn Group
Project: Composting area at Piggery
Location: Yerecoin S E Road, Lake Ninan

Contractor: GBI
Equipment: JCB 2CX
Operator: Chris
Test Pit Width: 3.50 m
Test Pit Depth: 1.50 m

Date: 18/09/2025
Logged By: JJS
Date Checked: 08/10/2025
Checked By: AM

Drill Method	Depth (m)	Excavation Resistance	Water Level	Samples: Sample Type	Samples: Sample Number	Graphic Log	Soil Class	Soil/Rock Material Description	Moisture Condition	Consistency Density	DCP	Depth (m)	Additional Remarks
Excavator	0			Bulk	TP05-01		CL	Sandy CLAY: low plasticity, brown-red, approximately 60-65% fine to medium grained sand	M	H	13	0	
											10		
										St	5		
											3		
	0.5									F-St	2	0.5	
											2		
											3		
											3		
											2		
	1										5	1	
	1.5												

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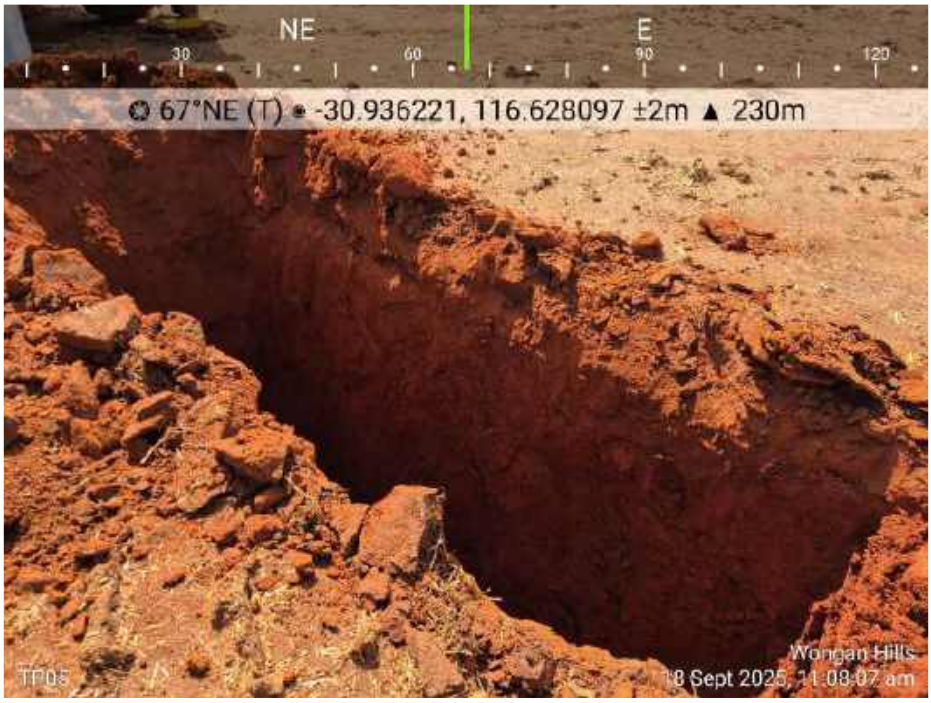
Notes: -



Depth Range: 0.0 - 1.5 m

Depth Range: 0.0 - 1.5 m

PROJECT	Composting area at Piggery	**PROJECT NO.**	WAG240094-02
CLIENT	Craig Mostyn Group	**LOG:**	TP05
LOCATION	Lake Ninan, WA	**FIGURE NO.**	Appendix

TEST PIT: TP06

Project Number: WAG240094-02
Client: Craig Mostyn Group
Project: Composting area at Piggery
Location: Yerecoin S E Road, Lake Ninan

Contractor: GBI
Equipment: JCB 2CX
Operator: Chris
Test Pit Width: 3.50 m
Test Pit Depth: 1.40 m

Date: 18/09/2025
Logged By: JJS
Date Checked: 08/10/2025
Checked By: AM

Drill Method	Depth (m)	Excavation Resistance	Water Level	Samples: Sample Type	Samples: Sample Number	Graphic Log	Soil Class	Soil/Rock Material Description	Moisture Condition	Consistency Density	DCP	Depth (m)	Additional Remarks
Excavator	0.5			Bulk	TP06-01		SC	Gravelly Clayey SAND: fine grained sand, fine to medium grained gravel, low plasticity, brown (likely fill)	D-M	VSt	8	0.5	
							SC/CL	0.1		F-St	3		
								Clayey SAND/Sandy CLAY: low plasticity, brown-red, approximately 55-65 % fine to medium grained sand			2		
										VSt	5		
											6		
											6		
											7		
	1								M	H	13	1	
											18		
								4					

Test rminated m, t depth
G ater not e ntered

Notes: -

Depth Range: 0.0 - 1.4 m

Depth Range: 0.0 - 1.4 m

PROJECT	Composting area at Piggery	**PROJECT NO.**	WAG240094-02
CLIENT	Craig Mostyn Group	**LOG:**	TP06
LOCATION	Lake Ninan, WA	**FIGURE NO.**	Appendix

Appendix D: Dynamic Cone Penetrometer (DCP) Test Results

DYNAMIC CONE PENETROMETER FIELD TEST DATA
(AS 1289.6.3.2)

Client: Craig Mostyn Group
Project: Composting Area at Wongan Hills Piggery
Location: Yerecoin S E Road, Lake Ninan

Job No: WAG240094-02
Date: 18/09/2025
Contractor: Groundbreaking Investigations

Test No:	DCP01	DCP02	DCP03	DCP04	DCP05	DCP06			
Location:	TP01	TP02	TP03	TP04	TP05	TP06			
Depth (mm)	**No of Penetrometer Blows per 100 mm Depth Interval**								
0-100	SET	SET	SET	SET	SET	SET			
100-200	15	10	3	8	13	8			
200-300	13	7	5	5	10	3			
300-400	7	3	6	6	5	2			
400-500	5	3	8	4	3	5			
500-600	3	2	8	3	2	6			
600-700	2	3	5	2	2	6			
700-800	2	5	4	2	3	7			
800-900	2	8	2	2	3	13			
900-1000	2	7	2	2	2	18			
1000-1100	2	7	2	3	5				

Dynamic Cone Penetrometer tests done in accordance with AS 1289.6.3.2
HB: Hammer bounce (refusal)
0 = Penetration due to hammer weight only
R: Refusal

Appendix E: Field Constant Head Permeability Test Results

Hydraulic Conductivity Calculation - Constant Head by Permeameter

Galt Geotechnics

Spreadsheet author:

REFERENCE: AS1547-2012, "On-site domestic wastewater management" - Appendix G

Job No:	WAG240094-02
Client:	Craig Mostyn Group
Project:	Composting Area
Location:	Wongan Hills Piggery
	Yerecoin Southeast Road
	Lake Ninan
Test Name	G01

$$K = \frac{4.4Q[0.5\ \sinh^{-1}\left(\frac{H}{2r}\right) - \sqrt{\left(\frac{r}{H}\right)^2 + 0.25} + \frac{r}{H}]}{2\pi H^2}$$

Spreadsheet Legend

	Required input
	Calculated field
	Comment field
	Field not used
	Fixed field

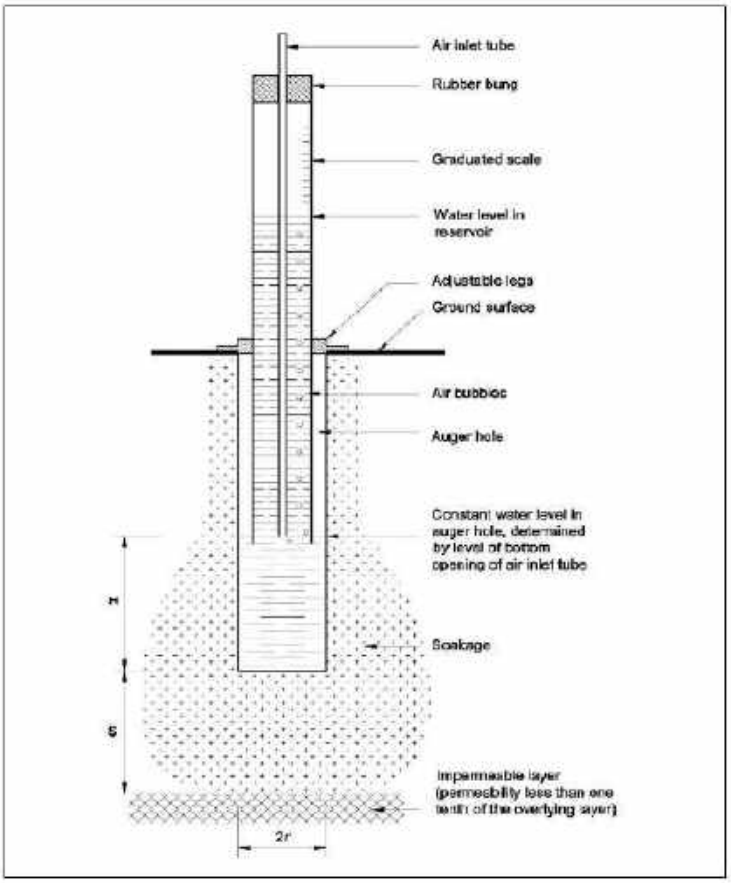
Parameter	Description	Value	Units
K_{sat}	Saturated hydraulic conductivity		cm/min
D	Depth of auger hole	50	cm
H	Head of water above base	40	cm
r	Radius of auger hole	4	cm
S	Depth to impermeable stratum	-	cm
Reservoir	Chosen Guelph reservoir (inner or outer)	**Outer**	
Area	Area of chosen reservoir	36.3	cm^2
F	Reading of water level in reservoir		cm

Test Results

Time (min)	F (cm)	ΔF (cm)	ΔF (cm)/min
0	72		
0.500	72	0.00	0.00
1.000	71.9	0.10	0.20
1.500	71.7	0.20	0.40
2.000	71.7	0.00	0.00
2.500	71.6	0.10	0.20
3.000	71.5	0.10	0.20
3.500	71.4	0.10	0.20
4.000	71.4	0.00	0.00
4.500	71.3	0.10	0.20
5.000	71.2	0.10	0.20
5.500	71.1	0.10	0.20
AVERAGE - LAST 5 READINGS			0.16

Calculation

Steady State Flow	0.16	cm/min
Flow from reservoir (Q)	5.81	cm^3/min
K_{sat}	0.002	cm/min
K_{sat}	3.162E-07	m/s
K_{sat}	**0.03**	**m/day**



where
H = depth of water in test hole
S = the depth to an underlying impermeable layer
r = radius of the test hole

Hydraulic Conductivity Calculation - Constant Head by Permeameter

Galt Geotechnics

Spreadsheet author:

REFERENCE: AS1547-2012, "On-site domestic wastewater management" - Appendix G

Job No:	WAG240094-02
Client:	Craig Mostyn Group
Project:	Composting Area
Location:	Wongan Hills Piggery
	Yerecoin Southeast Road
	Lake Ninan
Test Name	G02

$$K = \frac{4.4Q[0.5\ \sinh^{-1}\left(\frac{H}{2r}\right) - \sqrt{\left(\frac{r}{H}\right)^2 + 0.25} + \frac{r}{H}]}{2\pi H^2}$$

Spreadsheet Legend

	Required input
	Calculated field
	Comment field
	Field not used
	Fixed field

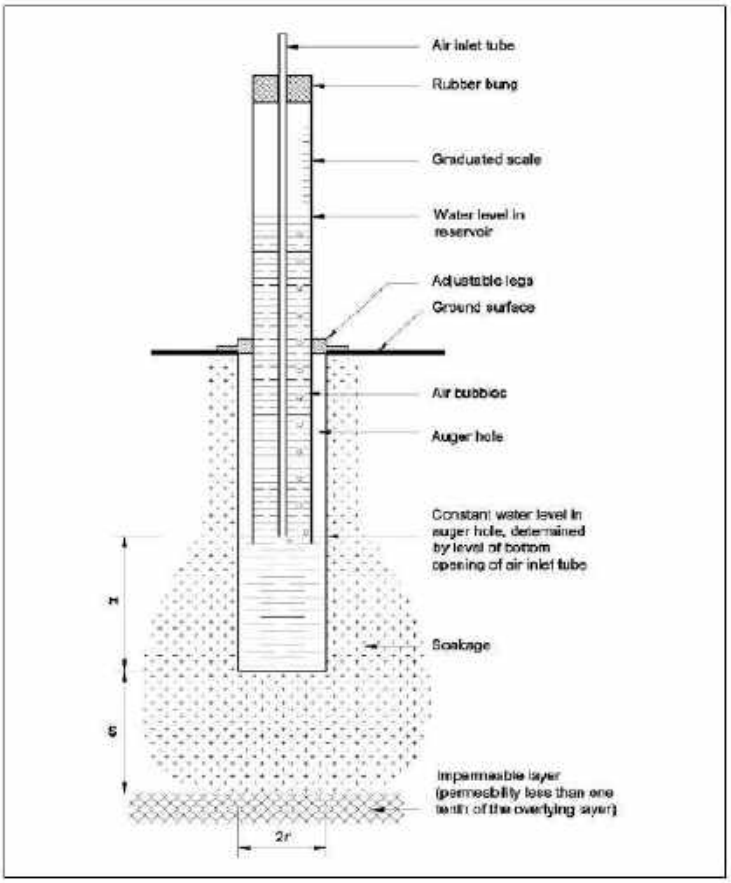
Parameter	Description	Value	Units
K_{sat}	Saturated hydraulic conductivity		cm/min
D	Depth of auger hole	50	cm
H	Head of water above base	40	cm
r	Radius of auger hole	4	cm
S	Depth to impermeable stratum	-	cm
Reservoir	Chosen Guelph reservoir (inner or outer)	**Outer**	
Area	Area of chosen reservoir	36.3	cm^2
F	Reading of water level in reservoir		cm

Test Results

Time (min)	F (cm)	ΔF (cm)	ΔF (cm)/min
0	32.6		
0.500	32.2	0.40	0.80
1.000	32.2	0.00	0.00
1.500	32.2	0.00	0.00
2.000	30.6	1.60	3.20
2.500	30.6	0.00	0.00
3.000	30.6	0.00	0.00
3.500	28.6	2.00	4.00
4.000	28.2	0.40	0.80
4.500	27.6	0.60	1.20
5.000	27	0.60	1.20
5.500	26.9	0.10	0.20
6.000	26.8	0.10	0.20
6.500	26.8	0.00	0.00
AVERAGE - LAST 5 READINGS			0.56

Calculation

Steady State Flow	0.56	cm/min
Flow from reservoir (Q)	20.33	cm^3/min
K_{sat}	0.007	cm/min
K_{sat}	1.107E-06	m/s
K_{sat}	**0.10**	**m/day**



where
H = depth of water in test hole
S = the depth to an underlying impermeable layer
r = radius of the test hole

Hydraulic Conductivity Calculation - Constant Head by Permeameter

Galt Geotechnics

Spreadsheet author:

REFERENCE: AS1547-2012, "On-site domestic wastewater management" - Appendix G

Job No:	WAG240094-02
Client:	Craig Mostyn Group
Project:	Composting Area
Location:	Wongan Hills Piggery
	Yerecoin Southeast Road
	Lake Ninan
Test Name	G03

$$K = \frac{4.4Q[0.5\ \sinh^{-1}\left(\frac{H}{2r}\right) - \sqrt{\left(\frac{r}{H}\right)^2 + 0.25} + \frac{r}{H}]}{2\pi H^2}$$

Spreadsheet Legend

	Required input
	Calculated field
	Comment field
	Field not used
	Fixed field

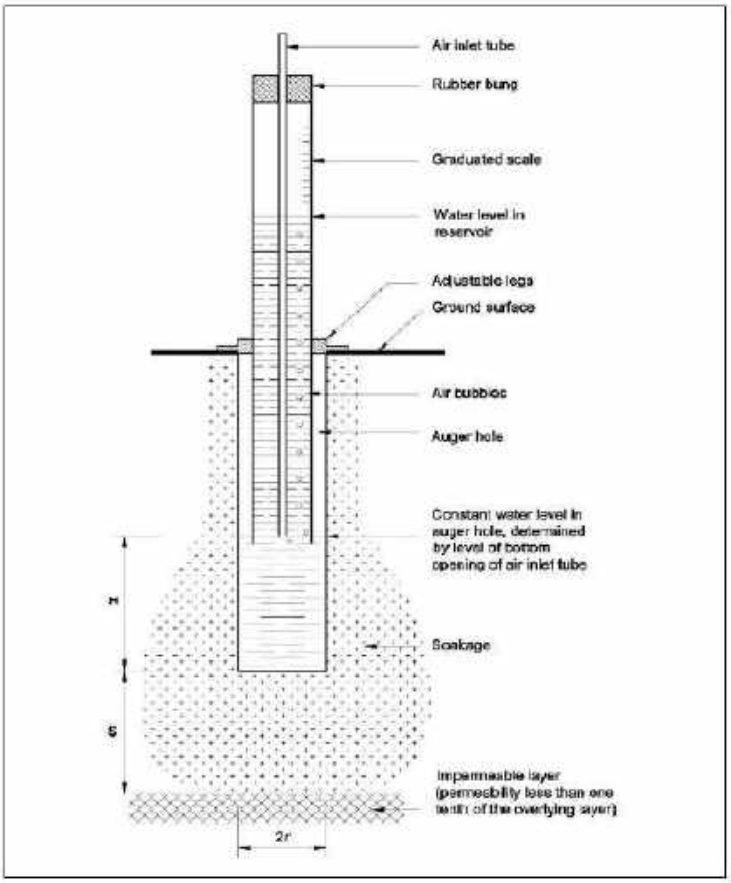
Parameter	Description	Value	Units
K_{sat}	Saturated hydraulic conductivity		cm/min
D	Depth of auger hole	50	cm
H	Head of water above base	40	cm
r	Radius of auger hole	4	cm
S	Depth to impermeable stratum	-	cm
Reservoir	Chosen Guelph reservoir (inner or outer)	**Outer**	
Area	Area of chosen reservoir	36.3	cm^2
F	Reading of water level in reservoir		cm

Test Results

Time (min)	F (cm)	ΔF (cm)	ΔF (cm)/min
0	61.2		
1.000	60.4	0.80	0.80
2.000	59.5	0.90	0.90
3.000	58.4	1.10	1.10
4.000	57.5	0.90	0.90
5.000	56.4	1.10	1.10
AVERAGE - LAST 5 READINGS			0.96

Calculation

Steady State Flow	0.96	cm/min
Flow from reservoir (Q)	34.85	cm^3/min
K_{sat}	0.011	cm/min
K_{sat}	1.897E-06	m/s
K_{sat}	**0.16**	**m/day**



where
H = depth of water in test hole
S = the depth to an underlying impermeable layer
r = radius of the test hole

Appendix F: Laboratory Test Certificates

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

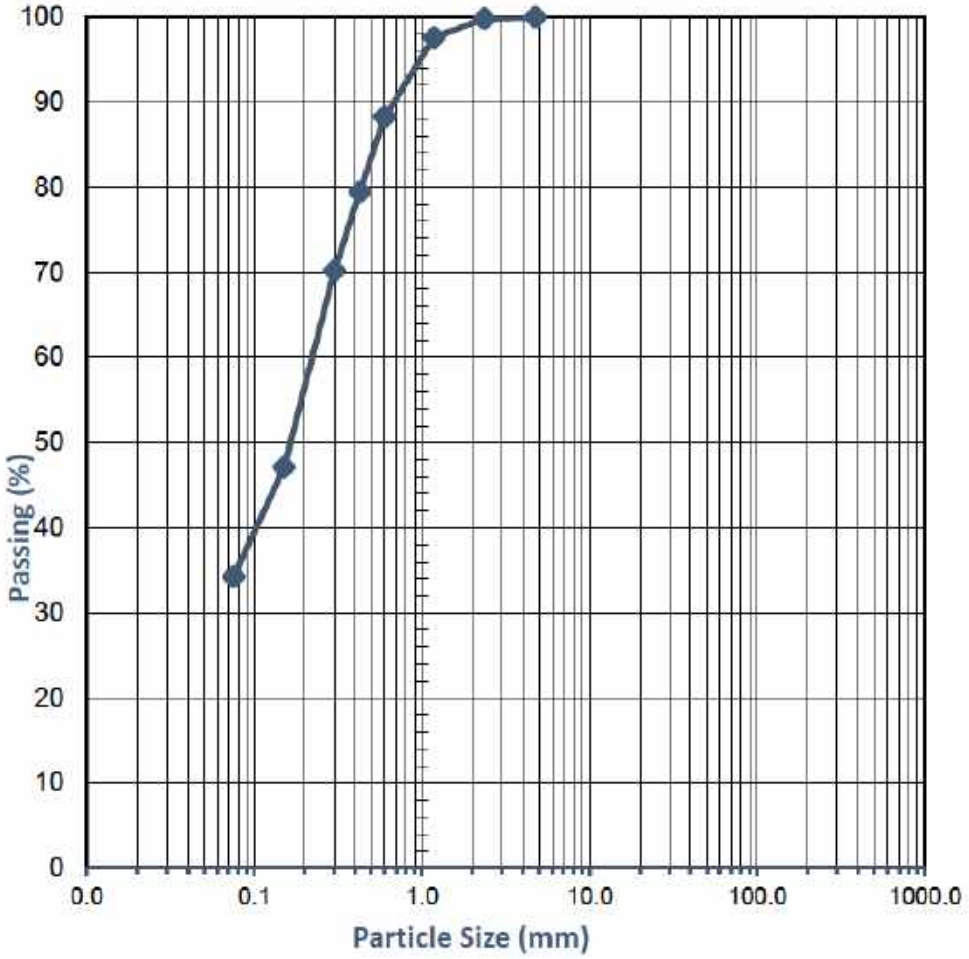
TEST REPORT - AS 1289.3.6.1

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16423_1_PSD
Project:	Composting Area	*Sample No.*	WG25.16423
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP01 (0.5 - 1.0m)	*Date Tested:*	1/10 - 02/10/2025

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	
4.75	100
2.36	100
1.18	98
0.600	88
0.425	79
0.300	70
0.150	47
0.075	34



Comments:

Approved [redacted]

Date: 02/October/2025

NATA Accreditation No. 20599
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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16423_1_PI
Project:	Composting Area	*Sample No.*	WG25.16423
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP01 (0.5 - 1.0m)	*Date Tested:*	6/10/2025

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**25**
AS 1289.3.2.1	**Plastic Limit (%)**	**13**
AS 1289.3.3.1	**Plasticity Index (%)**	**12**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**4.5**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**Cracked, Curled**

Comments:

Approved Sig [redacted]

Date: 07/October/2025

NATA

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16423_1_MMDD
Project:	Composting Area	*Sample No.*	WG25.16423
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP01 (0.5 - 1.0m)	*Date Tested:*	30/09/2025

TEST RESULTS - Modified Maximum Dry Density

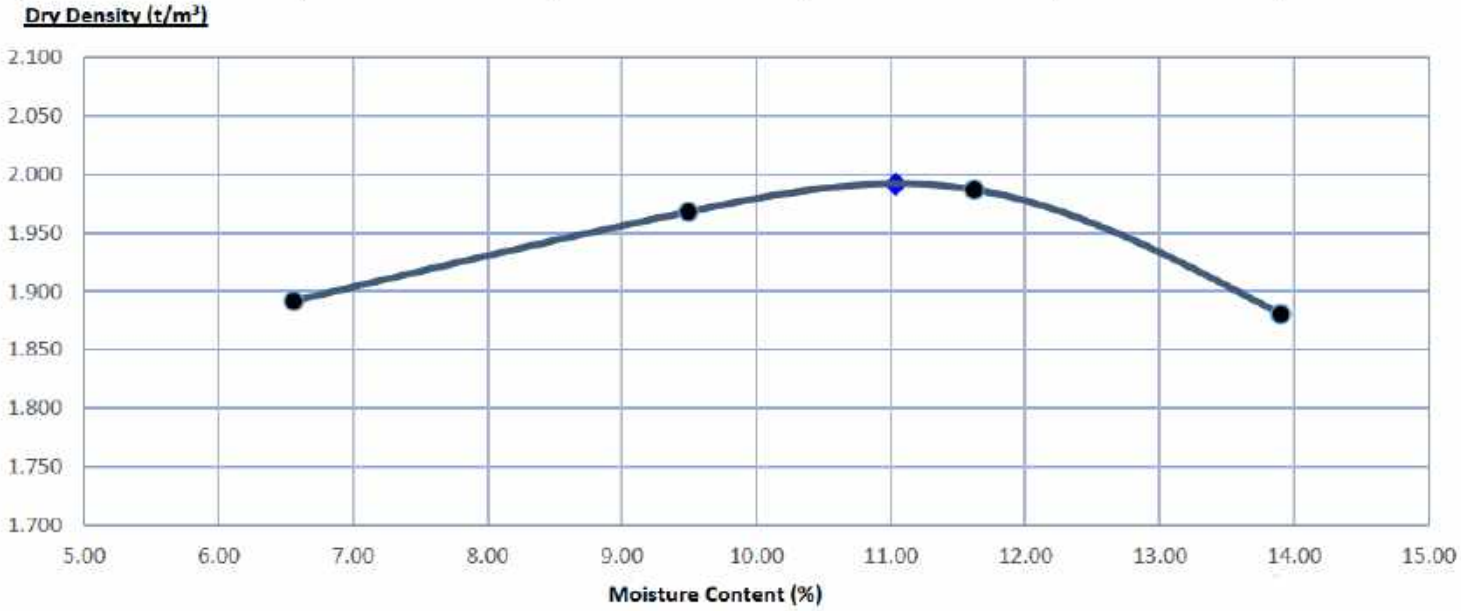
Sampling Method: Sampled by Client, Tested as Received

Sample Curing Time (Hours): >48

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	6.6	9.5	11.6	13.9	
Dry Density (t/m³)	1.892	1.968	1.987	1.880	



Modified Maximum Dry Density (t/m³) **1.99**

Optimum Moisture Content (%) **11.0**

Comments:

Approved [redacted]

Date: 01/October/2025

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

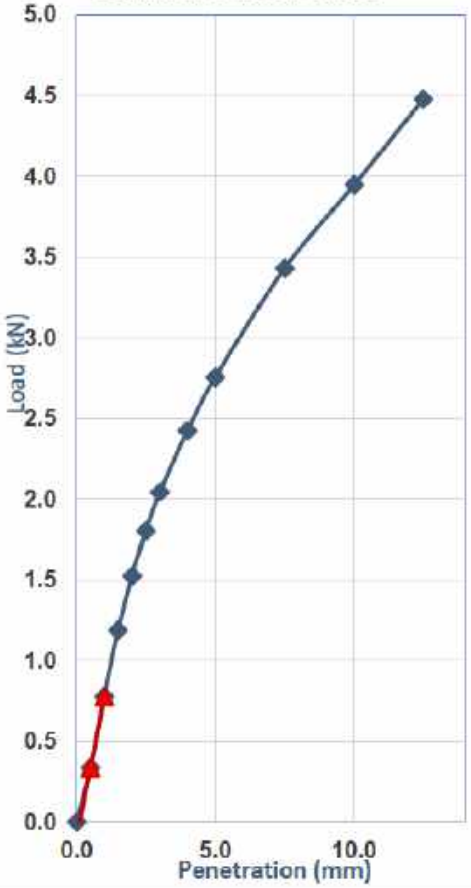
Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16423_1_SCBR
Project:	Composting Area	*Sample No.*	WG25.16423
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP01 (0.5 - 1.0m)	*Date Tested:*	30/09 - 7/10/25

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Silty Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	>24
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.99	Optimum Moisture (%)	11.0
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.90	Moisture Content (%)	10.6
Density Ratio (%)	95.5	Moisture Ratio (%)	96.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	0.0
Dry Density (t/m^3)	1.89	Dry Density Ratio (%)	95.0
Moisture Content (%)	15.2	Moisture Ratio (%)	138.5

Specimen Conditions After Test			
Top 30mm Moisture (%)	13.7	Remaining Depth (%)	14.3

Correction applied to Penetration: 0.1mm

Determined at a Penetration of: 2.5mm

California Bearing Ratio (CBR): 14%

Comments:

Approved [redacted]

Date: 08/October/2025

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.8.1

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16423_1_ECN
Project:	Composting Area	*Sample No.*	WG25.16423
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP01 (0.5 - 1.0m)	*Date Tested:*	1/10/2025

TEST RESULTS - Emerson Class Number

Sampling Method:	**Sampled by Client, Tested as Received**
Source of Material:	**Not Specified**
Soil Description:	**Silty Sand**
Water Used:	**Distilled**

EMERSON CLASS NUMBER

5

Comments:

Approved [redacted]

Date: 08/October/2025

NATA Accreditation No. 20599
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WESTERN GEOTECHNICAL & Laboratory Services

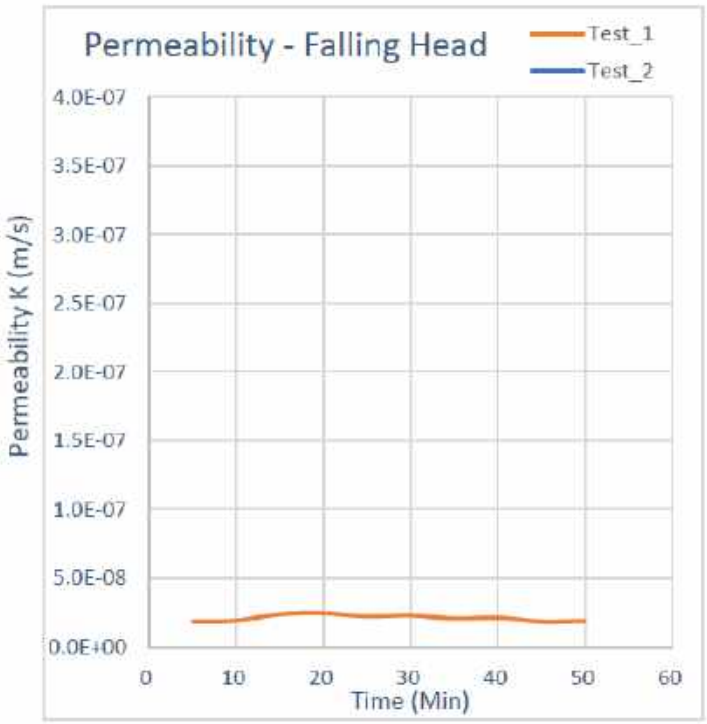
SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT AS 1289.6.7.2

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16423_1_FHPERM
Project:	Composting Area	*Sample No.*	WG25.16423
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification	TP01 (0.5 - 1.0m)	*Date Tested:*	30/09 - 3/10/25

TEST RESULTS - FALLING HEAD PERMEABILITY

Sampling Method: Sampled by Client, Tested as Received



Compaction Details	
Compaction Method	AS 1289.5.2.1
Hammer Type	Modified
Curing Time (Hours)	>24
% Retained on 19.0mm	0
Maximum Dry Density (t/m^3)	1.99
Optimum Moisture (%)	11.0
Target Dry Density Ratio	95
Target Moisture Ratio	100

Specimen Conditions at Compaction	
Laboratory Density Ratio (%)	95.9
Laboratory Moisture Ratio (%)	95.8
Surcharge (kPa)	3

Coefficient of Permeability (m/s) 2.E-08

Comments:

Approved [redacted]

Date: 06/October/2025

NATA Accreditation No. 20599
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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.8.1

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16424_1_ECN
Project:	Composting Area	*Sample No.*	WG25.16424
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP02 (0.0 - 0.1m)	*Date Tested:*	1/10/2025

TEST RESULTS - Emerson Class Number

Sampling Method:	**Sampled by Client, Tested as Received**
Source of Material:	**Not Specified**
Soil Description:	**Clayey Sand**
Water Used:	**Distilled**

EMERSON CLASS NUMBER

5

Comments:

Approved [redacted]

Date: 01/October/2025

NATA **Accreditation No. 20599**
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

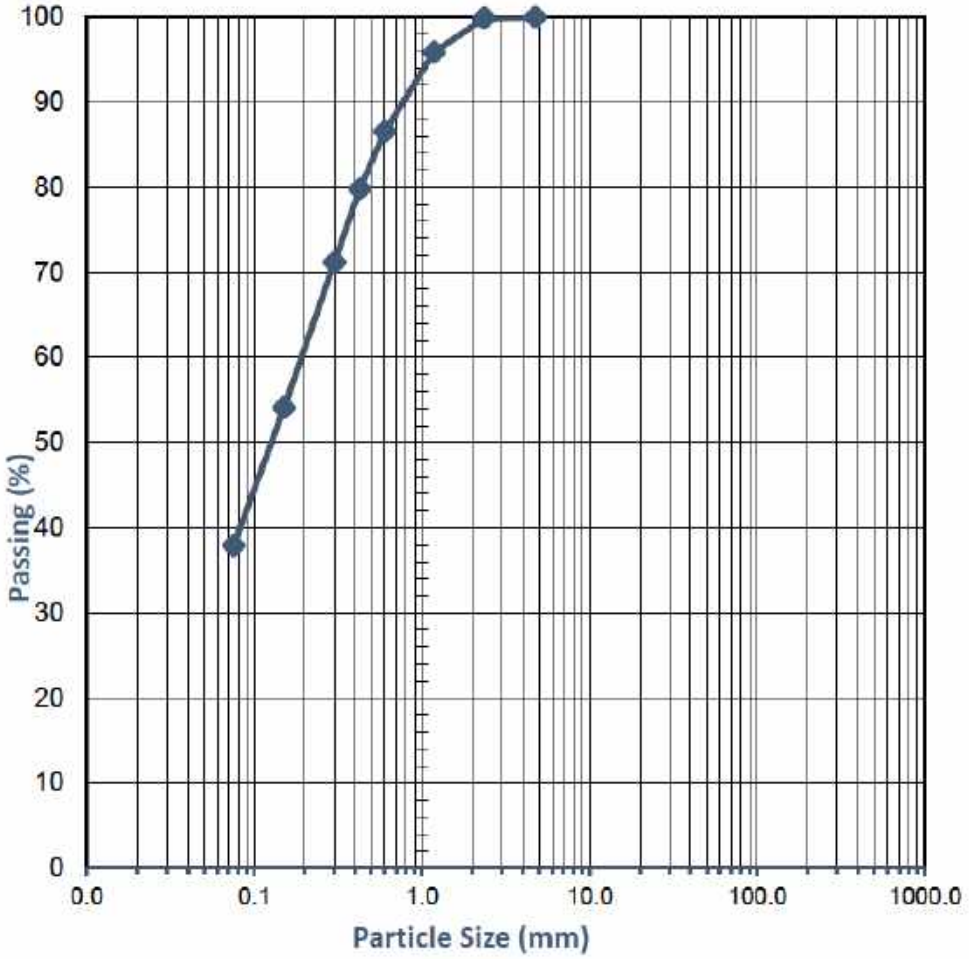
TEST REPORT - AS 1289.3.6.1

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16425_1_PSD
Project:	Composting Area	*Sample No.*	WG25.16425
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP04 (0.5 - 0.7m)	*Date Tested:*	1/10 - 02/10/2025

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	
4.75	100
2.36	100
1.18	96
0.600	87
0.425	80
0.300	71
0.150	54
0.075	38



1/10 - 02/10/2025

Approved [redacted]

Date: 02/October/2025

NATA Accreditation No. 20599
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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16425_1_PI
Project:	Composting Area	*Sample No.*	WG25.16425
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP04 (0.5 - 0.7m)	*Date Tested:*	6/10/2025

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**32**
AS 1289.3.2.1	**Plastic Limit (%)**	**17**
AS 1289.3.3.1	**Plasticity Index (%)**	**15**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**7.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**Curled**

Comments:

Approve [redacted]

Date: 07/October/2025

NATA Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16425_1_MMDD
Project:	Composting Area	*Sample No.*	WG25.16425
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP04 (0.5 - 0.7m)	*Date Tested:*	30/09/2025

TEST RESULTS - Modified Maximum Dry Density

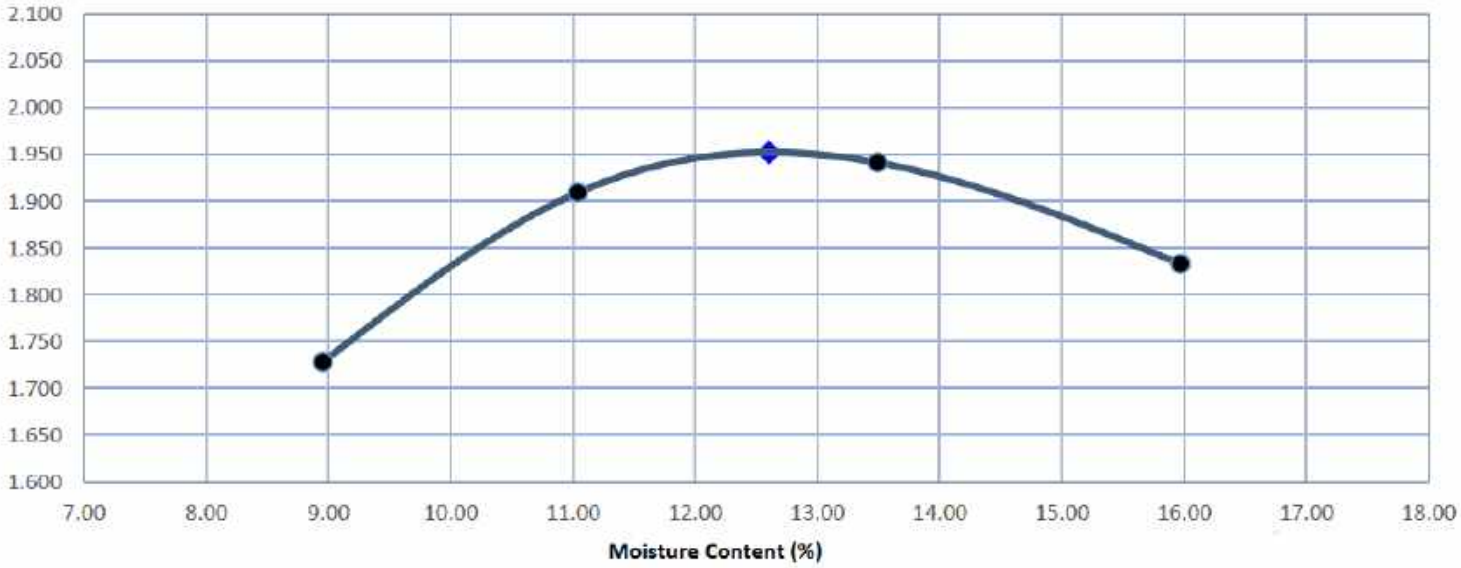
Sampling Method: Sampled by Client, Tested as Received

Sample Curing Time (Hours): >24

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	9.0	11.0	13.5	16.0	
Dry Density (t/m³)	1.728	1.909	1.942	1.833	



Modified Maximum Dry Density (t/m³) **1.95**

Optimum Moisture Content (%) **12.5**

Comments:

Approved [redacted]

Date: 01/October/2025

NATA Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

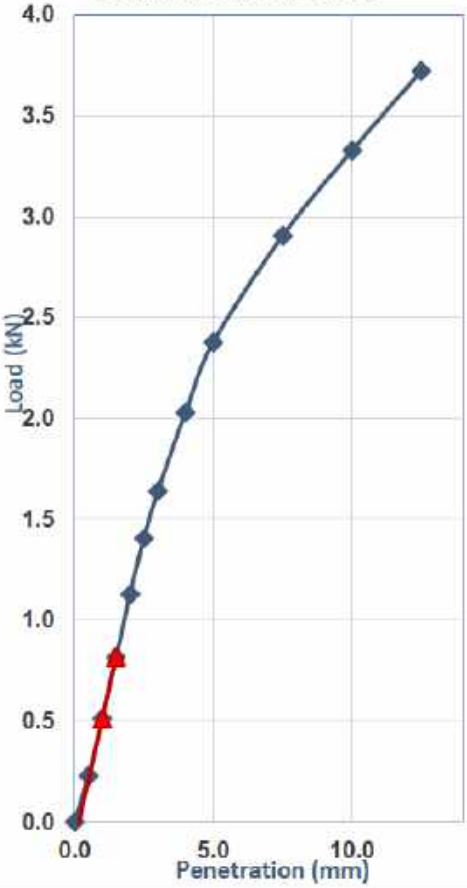
Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16425_1_SCBR
Project:	Composting Area	*Sample No.*	WG25.16425
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP04 (0.5 - 0.7m)	*Date Tested:*	30/09 - 7/10/25

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Clayey Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	>24
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.95	Optimum Moisture (%)	12.5
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.86	Moisture Content (%)	12.7
Density Ratio (%)	95.5	Moisture Ratio (%)	101.0

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	1.0
Dry Density (t/m^3)	1.85	Dry Density Ratio (%)	94.5
Moisture Content (%)	17.8	Moisture Ratio (%)	141.5

Specimen Conditions After Test			
Top 30mm Moisture (%)	17.2	Remaining Depth (%)	16.2

Correction applied to Penetration: 0.2mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 12%

Comments:

Approved [redacted]

Date: 08/October/2025

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WESTERN GEOTECHNICAL & Laboratory Services

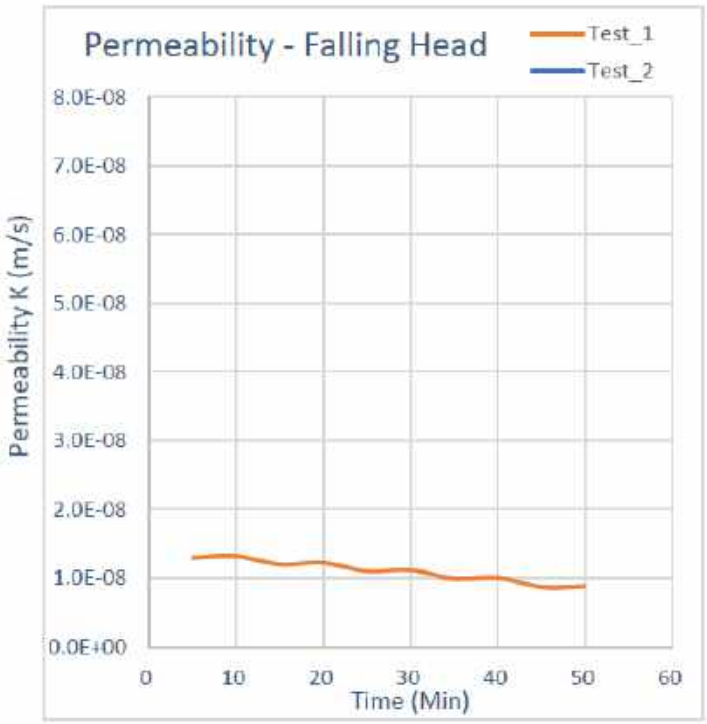
SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT AS 1289.6.7.2

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16425_1_FHPERM
Project:	Composting Area	*Sample No.*	WG25.16425
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification	TP04 (0.5 - 0.7m)	*Date Tested:*	30/09 - 3/10/25

TEST RESULTS - FALLING HEAD PERMEABILITY

Sampling Method: Sampled by Client, Tested as Received



Compaction Details	
Compaction Method	AS 1289.5.2.1
Hammer Type	Modified
Curing Time (Hours)	>24
% Retained on 19.0mm	0
Maximum Dry Density (t/m^3)	1.95
Optimum Moisture (%)	12.5
Target Dry Density Ratio	95
Target Moisture Ratio	100

Specimen Conditions at Compaction	
Laboratory Density Ratio (%)	95.0
Laboratory Moisture Ratio (%)	101.0
Surcharge (kPa)	3

Coefficient of Permeability (m/s) 1.E-08

Comments:

Approved [redacted]

Date: 06/October/2025

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

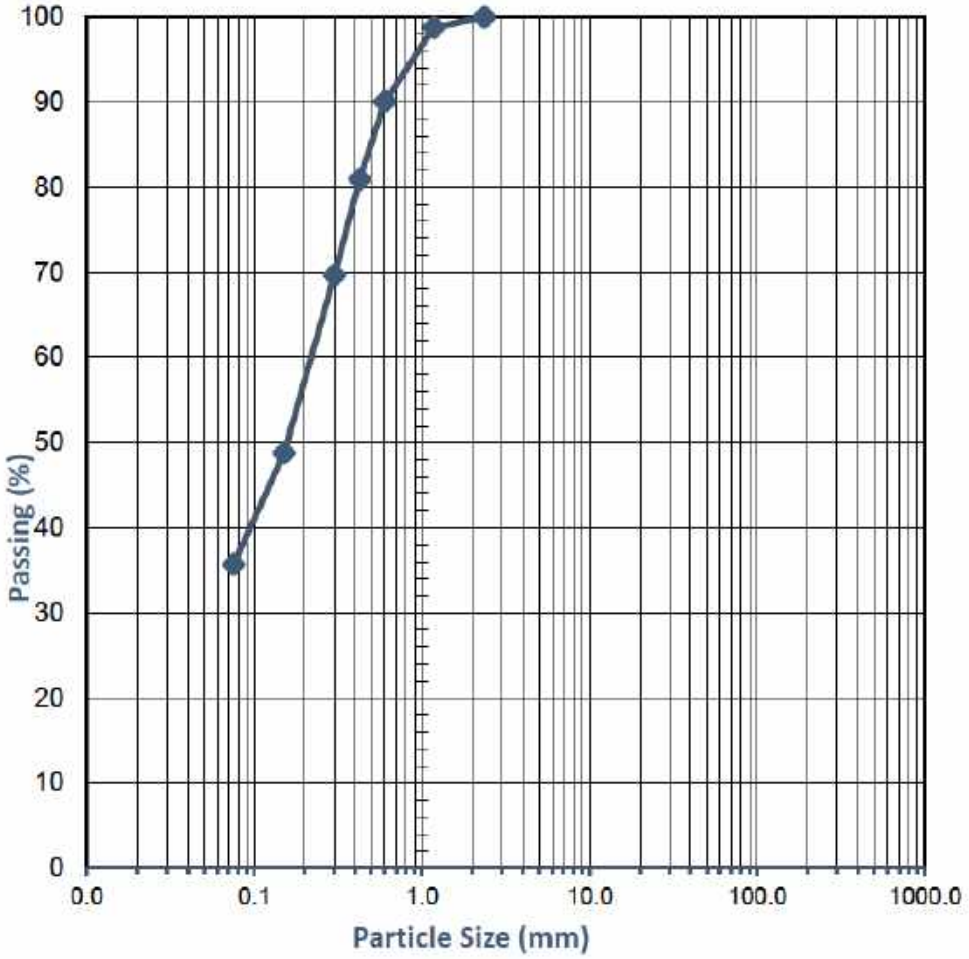
TEST REPORT - AS 1289.3.6.1

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16426_1_PSD
Project:	Composting Area	*Sample No.*	WG25.16426
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP05 (0.0 - 0.2m)	*Date Tested:*	1/10 - 02/10/2025

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	
4.75	
2.36	100
1.18	99
0.600	90
0.425	81
0.300	70
0.150	49
0.075	36



Comments:

Approved [redacted]

Date: 02/October/2025

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16426_1_PI
Project:	Composting Area	*Sample No.*	WG25.16426
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP05 (0.0 - 0.2m)	*Date Tested:*	6/10/2025

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**25**
AS 1289.3.2.1	**Plastic Limit (%)**	**13**
AS 1289.3.3.1	**Plasticity Index (%)**	**12**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**5.5**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**Curled**

Comments:

Approved [redacted]

Date: 07/October/2025

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.8.1

Client:	Craig Mostyn Group	*Ticket No.*	S18803
Client Address:	-	*Report No.*	WG25.16426_1_ECN
Project:	Composting Area	*Sample No.*	WG25.16426
Location:	Yerecoin Southeast road, Lake Ninan	*Date Sampled:*	Not Specified
Sample Identification:	TP05 (0.0 - 0.2m)	*Date Tested:*	1/10/2025

TEST RESULTS - Emerson Class Number

Sampling Method:	**Sampled by Client, Tested as Received**
Source of Material:	**Not Specified**
Soil Description:	**Silty Sand**
Water Used:	**Distilled**

EMERSON CLASS NUMBER

3

Comments:

Approved [redacted]

Date: 08/October/2025

NATA **Accreditation No. 20599**
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Understanding your Report

1. EXPECTATIONS OF THE REPORT

The following sections have been prepared to clarify what is and is not provided in your report. It is intended to inform you of what your realistic expectations of this report should be and how to manage your risks associated with the conditions on site.

Geotechnical engineering and environmental science are less exact than other engineering and scientific disciplines. We include this information to help you understand where our responsibilities begin and end. You should read and understand this information. Please contact us if you do not understand the report or this explanation. We have extensive experience in a wide variety of projects and we can help you to manage your risk.

2. THIS REPORT RELATES TO PROJECT-SPECIFIC CONDITIONS

This report was developed for a unique set of project-specific conditions to meet the needs of the nominated client. It took into account the following:

- the project objectives as we understood them and as described in this report;
- the specific site mentioned in this report; and
- the current and proposed development at the site.

It should not be used for any purpose other than that indicated in the report. You should not rely on this report if any of the following conditions apply:

- the report was not written for you;
- the report was not written for the site specific to your development;
- the report was not written for your project (including a development at the correct site but other than that listed in the report); or
- the report was written before significant changes occurred at the site (such as a development or a change in ground conditions).

You should always inform us of changes in the proposed project (including minor changes) and request an assessment of their impact.

Where we are not informed of developments relevant to your report, we cannot be held responsible or liable for problems that may arise as a consequence.

Where design is to be carried out by others using information provided by us, we recommend that we be involved in the design process by being engaged for consultation with other members of the project team. Furthermore, we recommend that we be able to review work produced by other members of the project team that relies on information provided in our report.

3. DATA PROVIDED BY THIRD PARTIES

Where data is provided by third parties, it will be identified as such in our reports. We necessarily rely on the completeness and accuracy of data provided by third parties in order to draw conclusions presented in our reports. We are not responsible for omissions, incomplete or inaccurate data associated with third party data, including where we have been requested to provide advice in relation to field investigation data provided by third parties.

4. SOIL LOGS

Our reports often include logs of intrusive and non-intrusive investigation techniques prepared by Galt. These logs are based on our interpretation of field data and laboratory results. The logs should only be read in conjunction with the report they were issued with and should not be re-drawn for inclusion in other documents not prepared by us.

5. THIRD PARTY RELIANCE

We have prepared this report for use by the client. This report must be regarded as confidential to the client and the client's professional advisors. We do not accept any responsibility for contents of this document from any party other than the nominated client. We take no responsibility for any damages suffered by a third party because of any decisions or actions they may make based on this report. Any reliance or decisions made by a third party based on this report are the responsibility of the third party and not of us.

6. CHANGE IN SUBSURFACE CONDITIONS

The recommendations in this report are based on the ground conditions that existed at the time when the study was undertaken. Changes in ground conditions can occur in numerous ways including anthropogenic events (such as construction or contaminating activities on or adjacent to the site) or natural events (such as floods, groundwater fluctuations or earthquakes). We should be consulted prior to use of this report so that we can comment on its reliability. It is important to note that where ground conditions have changed, additional sampling, testing or analysis may be required to fully assess the changed conditions.

7. SUBSURFACE CONDITIONS DURING CONSTRUCTION

Practical constraints mean that we cannot know every minute detail about the subsurface conditions at a particular site. We use professional judgement to form an opinion about the subsurface conditions at the site. Some variation to our evaluated conditions is likely and significant variation is possible. Accordingly, our report should not be considered as final as it is developed from professional judgement and opinion.

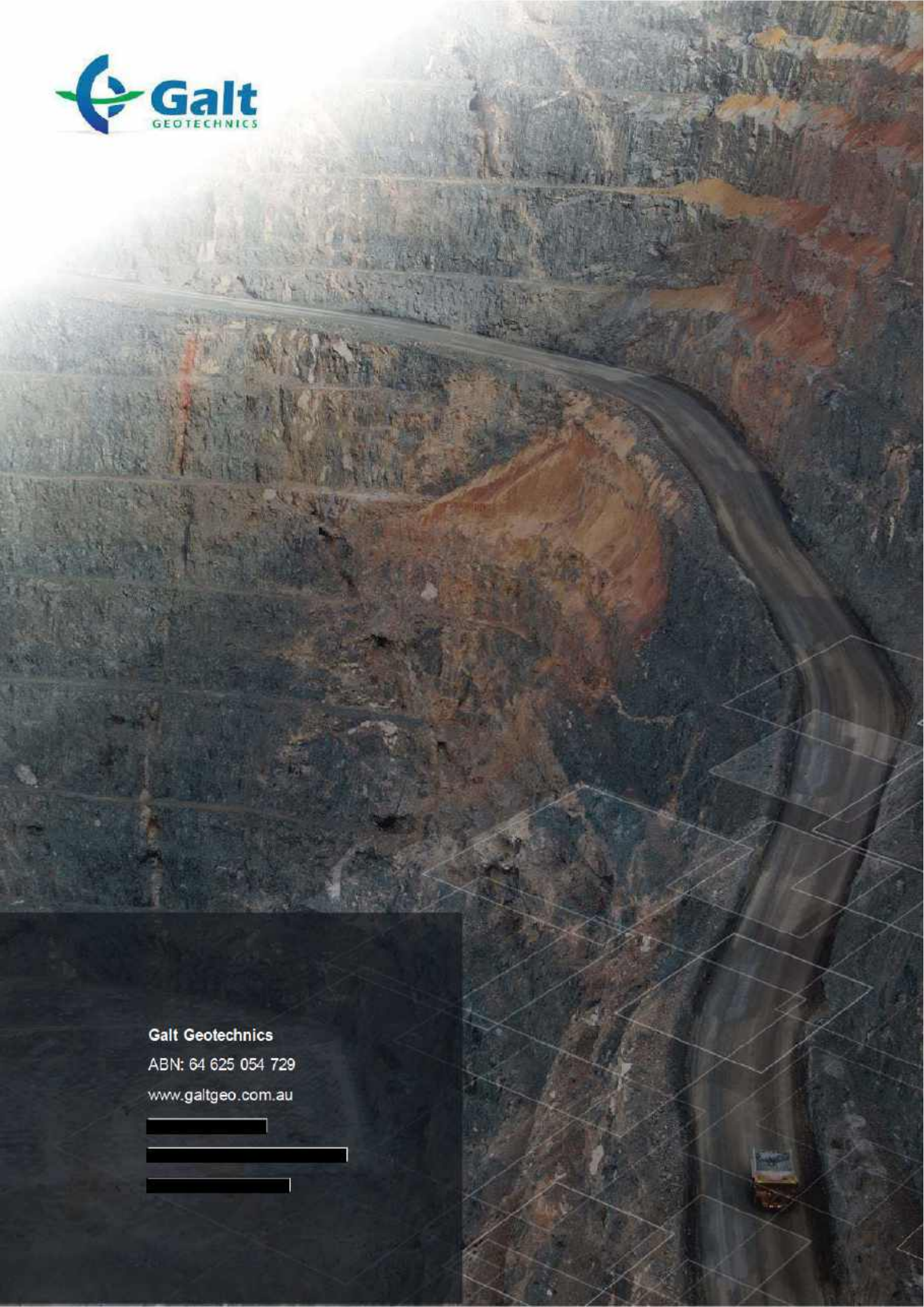
The most effective means of dealing with unanticipated ground conditions is to engage us for construction support. We can only finalise our recommendations by observing actual subsurface conditions encountered during construction. We cannot accept liability for a report's recommendations if we cannot observe construction.

8. ENVIRONMENTAL AND GEOTECHNICAL ISSUES

Unless specifically mentioned otherwise in our report, environmental considerations are not addressed in geotechnical reports. Similarly, geotechnical issues are not addressed in environmental reports. The investigation techniques used for geotechnical investigations can differ from those used for environmental investigations. It is the client's responsibility to satisfy themselves that geotechnical and environmental considerations have been taken into account for the site.

Geotechnical advice presented in a Galt Environmental report has been provided by Galt Geotechnics under a sub-contract agreement. Similarly, environmental advice presented in a Galt Geotechnics report has been provided by Galt Environmental under a sub-contract agreement.

Unless specifically noted otherwise, no parties shall draw any inferences about the applicability of the Western Australian state government landfill levy from the contents of this document.



Galt Geotechnics

ABN: 64 625 054 729

www.galtgeo.com.au

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