

SWA INNOVATION HUB

**Food and Garden Organics (FOGO)
derived soil conditioner, mulch and
topsoil**

*Companion Document
and Product Specifications*

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1 Background

Food and Garden Organics (FOGO) as soil conditioner, mulch and topsoil has been identified by the Sustainability Waste Alliance (SWA) Innovation Hub as a priority material for use in major infrastructure projects to increase the use of recycled materials and move “Towards 100”.

TOWARDS 100

The Towards100 approach requires a shift in thinking. Instead of justifying an increase in recycled content, the Towards 100 approach assumes that 100% of materials sourced for a project will be reused or recycled; any departure from this stated objective will have to be justified. Towards 100 drives innovation and reveals new opportunities that have the potential to support the development of a strong waste recovery industry, regional economic development and the creation of jobs.



The Green Deal Alliance (GDA) brings metropolitan and Southwest regional councils with a remit to collect and process FOGO material and the Office of Major Transport Infrastructure Delivery (OMTID) together to facilitate the use of FOGO in transport infrastructure projects.

The GDA identified the need for a material specification for the use of FOGO derived material in the landscaping and rehabilitation elements of infrastructure projects to normalise its use and promote a “new business and usual” approach to the use of this material.

1.1 Scope

The scope of this companion document is to explain the benefits of using FOGO as the primary organic input in the creation of soil amendment products for use in the landscaping and rehabilitation elements of infrastructure projects where these materials need to be imported onto a project site.

1.1.1 Model Specification for FOGO

The model specification for FOGO derived soil conditioner, mulch and topsoil (Appendix A) is intended to sit alongside existing specifications for landscaping products in use by Government Agencies with responsibility for infrastructure development. Where existing specifications require the use of soil amendments, the model specification for FOGO derived products can provide the additional information required to allow for the use of FOGO derived products as “business-as-usual materials”

The model specification is designed for use in Western Australia within the WA legislative framework and with WA landscapes and vegetation requirements in mind. Application of the model specification to other Australian jurisdictions would need to take account of local legislative frameworks and environmental requirements.

1.2 Soil amendments and landscaping in Infrastructure

Landscaping and rehabilitation projects associated with infrastructure projects seek to address the clearing of vegetation and soil disturbance associated with development. Community expectations around amenity and environmental values require that disturbed areas are stabilised, and where possible, blended into the surrounding environment. Cleared areas and buffers around public infrastructure are often required to meet a range of design criteria such as safety, amenity, biodiversity and stormwater management. In WA this is often achieved by revegetation and landscaping in keeping with local vegetation types.

1.2.1 Soil amendment products

Rehabilitation in cleared areas associated with infrastructure development can be challenging. Removal of topsoils and disturbance of the soil profile can create an inhospitable environment for plant growth. The introduction of soil amendments is usually required to stabilise cleared areas, increase water permeability, and create friendly conditions for plant growth.

Table 1. Soil amendments

Material	Description
Topsoil	Upper-most layer of soil or the soil surface. In vegetated environments this is the layer with the most organic matter and microbial activity. It is also the location of the plant root zone. For imported material, topsoil is soil improved with organic matter such as composted soil conditioner.
Mulch	Organic matter that is placed on the soil surface (i.e. on top of the top soil) to protect the layers below from drying out, and to prevent erosion and weed invasion. Mulch can also promote water permeability of soils. Mulch tends to be made from raw or composted plant matter – such as chipped branches and leaves.
Soil conditioner	Organic matter (usually composted) that is incorporated into the topsoil to improve its growing properties.
Compost	Organic matter that has been broken down and transformed into a nutrient rich material suitable for adding to soils using an aerobic (with oxygen) pasteurization process.

Figure 1¹ neatly demonstrates how revegetation and landscaping features in a road reserve.

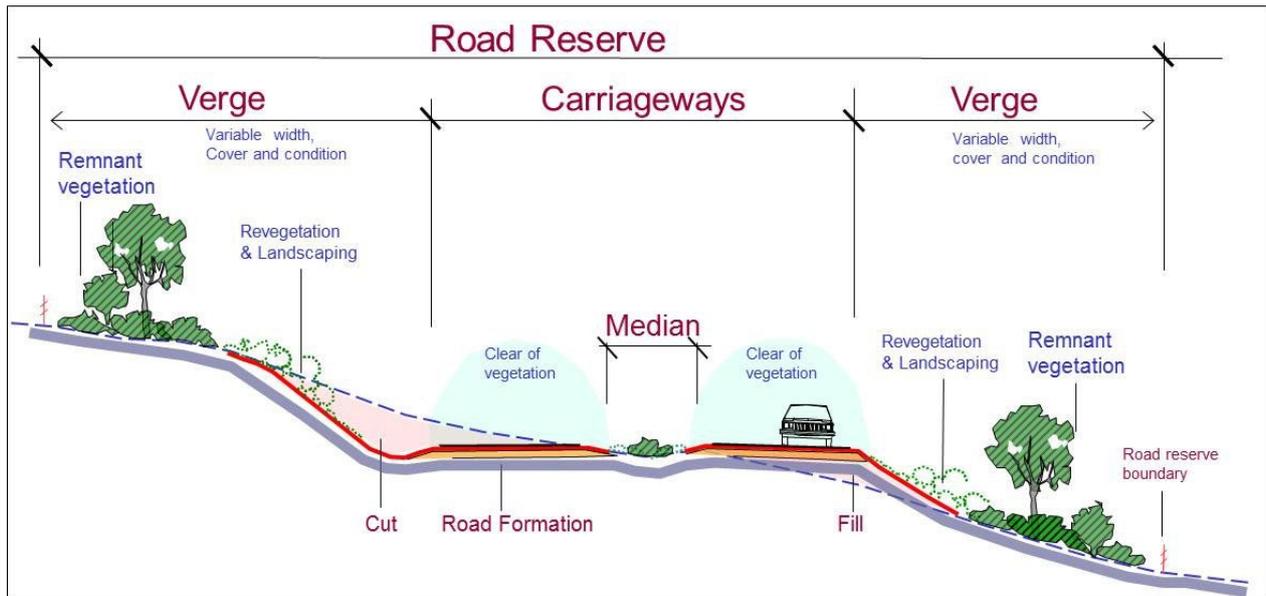


Figure 1. Road reserve cross section

Where possible, the agencies responsible for the development and management of public infrastructure stockpile usable topsoil and chipped vegetation material on site for later use. This material is respread into revegetation zones before planting. In areas where topsoil and vegetation cannot be salvaged and stored, landscaping contractors are required to provide suitable soil amendments in accordance with project specific design guidance and published specifications.

1.3 FOGO as a priority material

The National Food Waste Strategy (2017) aims to halve Australia's food waste by 2030. The WA Waste Avoidance and Resource Recovery Strategy 2030 identifies organic waste as a focus material with the aim of rolling out a three-bin collection system across the Perth and Peel region by 2025. Given the complexity of the three-bin roll out, much emphasis has been placed on marketing the system to WA local governments and the education of householders about the new system. Less emphasis has been placed on the processing of FOGO material into market-ready products and end market development.

The GDA aims to close this gap by:

- Working with member regional governments to improve/expand FOGO processing facilities via applications to the Commonwealth Government Food Waste for Healthy Soils Fund;
- developing a model specification for the use of FOGO derived material; and
- offtake agreements for the purchase of FOGO derived materials for use in transport infrastructure projects.

¹ <https://www.mainroads.wa.gov.au/technical-commercial/technical-library/road-traffic-engineering/roadside-items/revegetation-and-landscaping/>

1.4 FOGO and the Circular Economy

Use of FOGO derived compost products has multiple benefits for the circular economy:

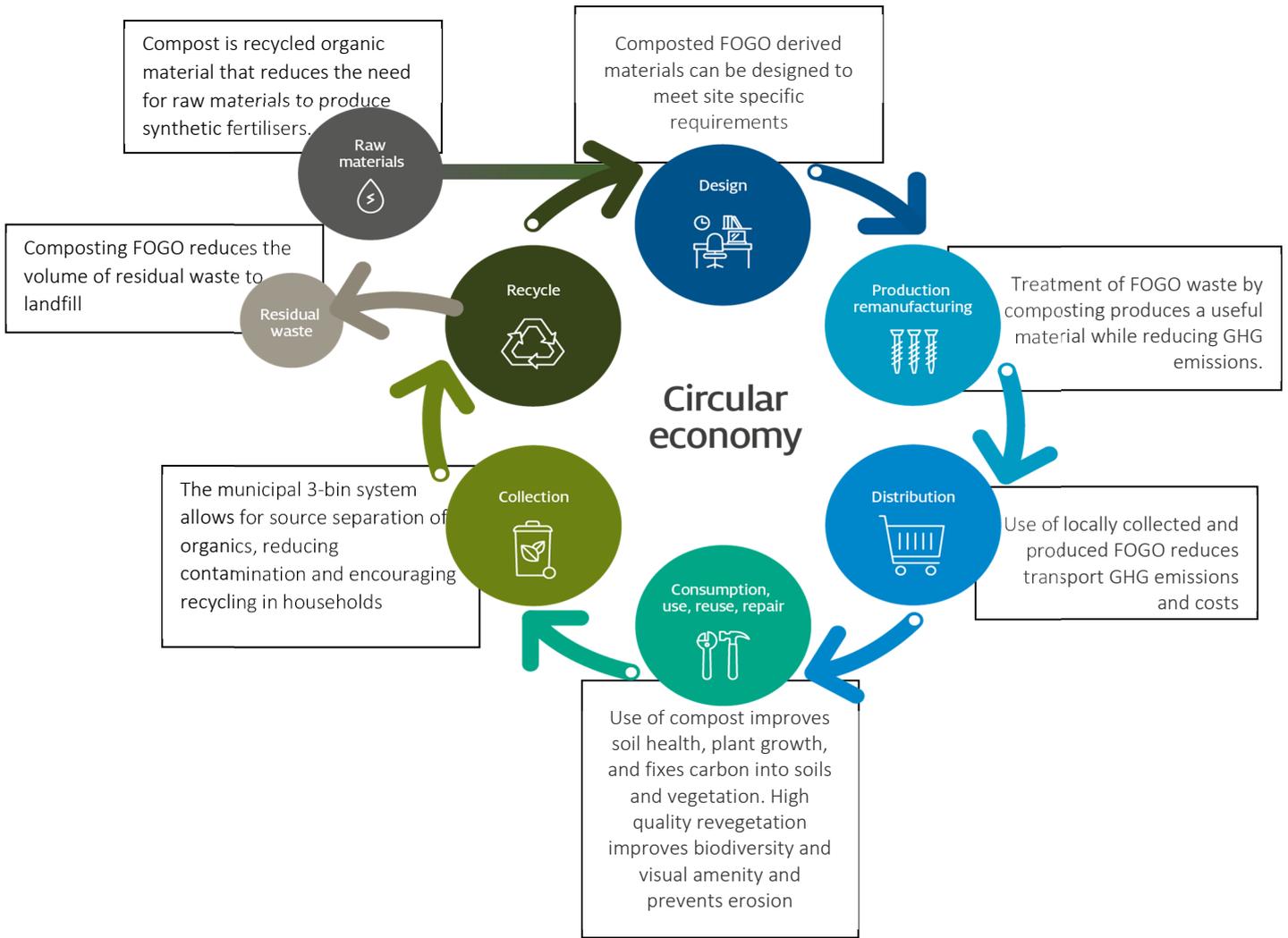


Figure 2. Circular economy and FOGO benefits².

² Circular economy diagram from: Sustainable Procurement Guide – A practical guide for Commonwealth entities. Commonwealth of Australia 2021. Available online: <https://www.awe.gov.au/environment/protection/waste/publications/sustainable-procurement-guide>.

2 Environmental benefits of FOGO recovery

The recent business as usual approach to municipal waste services has been to separate solid recoverable materials from households (metals, plastics, paper and cardboard) from organic and residual (non-recoverable) wastes. Recoverable materials are directed to material recovery facilities and organic/residual materials are sent for disposal at landfill.

The problem with organic waste disposal at landfill is two-fold:

1. Metropolitan landfills (and regional landfills that accept metropolitan waste) are classed as sanitary landfills. Compaction and daily cover requirements result in the breakdown of organic materials in the absence of oxygen – creating anaerobic conditions. The anaerobic breakdown of organic matter creates Methane (CH₄), a greenhouse gas with a global warming potential 28-31 times more potent than Carbon Dioxide (CO₂).
2. The anaerobic breakdown of organics also creates an acidic organic leachate. This leachate accelerates the degradation of otherwise inert materials such as plastics and metals creating a toxic liquid that can leach out of a landfill. In modern and well-engineered landfills, leachate is captured in a leachate management system and removed for treatment. In landfills established before leachate management systems became common, leachate leaks into the environment, polluting land and groundwater.

Recovering organic material from landfill and directing it to a composting facility avoids the creation of greenhouse gasses and leachates. Composting is an aerobic process that generates heat, CO₂ and water vapour to produce an organic material rich in nutrients and beneficial microbial activity.

The heat generated by commercial composting operations effectively pasteurises the organic material, ensuring the final product is low in harmful pathogens, seeds and plant propagules. Commercial compost products are widely available for use in broadscale agriculture, horticulture and domestic garden settings.

Using FOGO as an additional organic feedstock for the production of commercial compost represents a very low risk to the final compost product.

3 Risks to human health and the environment of composts and FOGO

The use of municipal FOGO as a feedstock in the production of compost should be uncontroversial. The composting process ensures the biodegradation of any organic waste material. However, there is a risk that poor separation of waste materials at the household could lead to the contamination of the organic waste stream. Considerable resources are being applied to waste education for householders to encourage the separation of materials, but some level of contamination at this stage is inevitable.

When the FOGO material is received at a composting facility, it is screened mechanically or in some cases by hand picking stations to remove non-organic solid contaminants. After the composting process, the product is screened again to collect residual solid contamination. The composting process itself is effective at reducing pathogens and adverse organic contaminants.

Busting the mixed-waste myth

Myth: We've used FOGO before and we were not happy with the results. The material was contaminated and did not meet specifications.

Fact: Composted mixed waste is not the same as a FOGO derived product.

FOGO derived soil amendment products are new products to the market. FOGO-derived products should not be confused with composted mixed waste that does not meet the requirements of AS 4454 or AS 4419. The last composted mixed waste facility in WA closed in 2021. Unlike FOGO derived products, composted mixed-waste feedstocks were not source-separated. Mixed waste was composted before being screened allowing inorganic materials to contaminate the final product.

FOGO derived products use source-separated organic wastes that are screened before composting. Only separately collected food waste and garden waste are included. This ensures that the final product can meet the requirements of AS 4454 and AS 4419 and is suitable for unrestricted use.

3.1 Risk mitigation

3.1.1 Legislative framework and standards

In WA, composting facilities with a production or design capacity of more than 1000 tonnes must be licensed as a Category 67A Prescribed Premises under the *Environmental Protection Act 1986*. Licensed composting facilities (in addition to adhering to their licensing conditions) must also work within the DWER Guideline "Better practice composting" (2022). The Guideline requires that composters must demonstrate that their products do not present an unacceptable risk to the environment and human health when used for their intended purpose. This can be achieved by implementing one of the following approaches:

1. Compliance with Australian Standard 4454-2012 Composts, soil conditioners and mulches (AS 4454-12) and the Biosolids Guidelines; or
2. Development and maintenance of a fit-for-purpose assessment report.

The proposed model specification for FOGO adopts the following mechanisms to reduce the already low risk of FOGO derived materials to human health and the environment:

1. FOGO derived materials must be produced at a Category 67A prescribed premises.
2. FOGO derived material for general landscaping use must meet the contamination, testing and handling requirements of AS 4454-2012 and AS 4419-2018 for topsoils.

4 Use of FOGO derived products

By the time a composted FOGO derived product is delivered to the installation site it should look, feel and perform as any other composted product that meets the criteria of AS 4454-2012 or AS 4419-2018.

Management of soil conditioner, mulch and topsoil stockpiles should be undertaken in accordance with the relevant material specification of the customer organisations. Incorporation of soil conditioner products into the soil profile should occur as soon as possible after delivery to maintain the beneficial microbial activity in the soil.

5 Assessment of site conditions

The use of any soil amendment material (regardless of its origin) should be assessed as fit for purpose for the physical, chemical and biological conditions at the installation site.

Although a composted FOGO product (mulch or soil conditioner, or topsoil) should be fit for unrestricted use and meet the requirements of AS 4454-2012 and AS 4419-2018, the realities of site conditions may require a more tailored or blended product.

The FOGO derived material specification allows for the blending of non-FOGO derived materials into the final product to meet on site requirements, however, project engineers should be aware that the risk of contamination increases with the use of non-FOGO materials, particularly if the composted material is blended with recycled or manufactured sand, excess fill or spoil materials.

As a minimum, any blending materials should be assessed to meet the contamination criteria in Table 3.1 (C) of AS 4454-2012.

5.1 FOGO derived material contamination criteria

Contamination and quality criteria for composts, soil conditioners and mulches are outlined in AS 4454-2012. However, in Western Australia the Department of Water and Environmental Regulation may require operators of Category 67A Composting Facilities to meet different contaminant limits in their final products.

In the event that the criteria specified in AS 4454-2012 is inconsistent with regulations or guidance established under Part V of the Environmental Protection Act 1986, the requirements of the regulations will take precedence.

5.2 Water quality guidance

Soil conditioners and mulch that meet the requirements of AS 4454-2012 are generally accepted as being suitable for unrestricted use. However, in areas classified as Public Drinking Water Source Areas, project managers should refer to Water Quality Protection Note 25 *Land use compatibility tables for public drinking water source areas (2021)*³. This guidance provides additional conditions for land uses (including the use of soil conditioners) in Public Drinking Water Source Areas.

5.3 Soil Nutrients

WA is home to some of the world's most phosphorus impoverished soils⁴. WA's unique flora has adapted to soils with low phosphorus availability resulting in phosphorus sensitivity in some species. It can be difficult for project managers in WA to reconcile the need to increase organic matter in soils while restricting available phosphorus.

³ WQPN 25 Available Online: https://www.water.wa.gov.au/_data/assets/pdf_file/0014/1733/12441.pdf

⁴ Hans Lambers, Idriss Ahmedi, Oliver Berkowitz, Chris Dunne, Patrick M. Finnegan, Giles E. St J. Hardy, Ricarda Jost, Etienne Laliberté, Stuart J. Pearce, François P. Teste. 2013. *Phosphorus nutrition of phosphorus-sensitive Australian native plants: threats to plant communities in a global biodiversity hotspot*. Conservation Physiology, Volume 1, Issue 1, 2013, cot010, <https://doi.org/10.1093/conphys/cot010>

AS 4454-2012 provides an acceptable range for total and water-soluble phosphorus in composted products that are suitable for unrestricted use.

Consideration of site conditions, design criteria and careful plant selection can ensure that local native plants thrive in soils amended with FOGO derived products. Specifying very-low nutrient levels in soil amendment products can be counterproductive if the plant selection is not particularly sensitive to phosphorus.

5.4 Dieback Risk

Phytophthora cinnamomi or Dieback is a key threatening process for the biodiversity of south-west Western Australia. Phytophthora species live in soil and infested plant material and can be spread by any mechanism in which infested soil, plant material or water is moved into uninfested areas. The movement of any raw material (including soils, plants, mulch and water) increases the risk of dieback spread into uninfested areas⁵.

AS 4454-2012 specifies that composts, soils and mulch must be free of pathogens but does not specifically mention Phytophthora species. In general, it is understood that the heat generated by the composting process kills off most Phytophthora species, but this is unconfirmed and project managers should ensure any soil amendments imported into uninfested areas are certified as being free of dieback.

In sensitive and high-value areas, project managers should refer to the Phytophthora Management Manual published by the Department of Biodiversity Conservation and Attractions Parks and Wildlife Service⁶.

⁵ Phytophthora Dieback Management Manual Available Online:
<https://www.dpaw.wa.gov.au/images/documents/conservation-management/pests-diseases/disease-risk-areas/DBCA%20PDMM%20v1.2%20October%202020.pdf>

⁶ As above.

APPENDIX A: Specification for the use of FOGO derived soil conditioner, mulch and topsoils in revegetation, rehabilitation and landscaping

1. Forward

This specification is to facilitate the use of recovered municipal Food and Garden Organics (FOGO) in the landscaping elements of infrastructure projects in the Perth-Peel and Southwest regions of Western Australia.

The specification assumes that landscaping projects associated with infrastructure are dominated by native vegetation plantings.

The specification adopts contamination and quality criteria from Australian Standard 4454-2012 Composts, soil conditioners and mulches (AS 4454-2012).

In development of the specification, it is assumed that composted FOGO material will provide the base organic material for FOGO derived soil conditioner, mulch and topsoil products. The final FOGO derived product may include other (non-FOGO derived) materials required to ensure the adherence with this specification and or AS 4454-2012.

This specification outlines the procurement and use of FOGO derived products and does not in any way remove or replace the requirement for a FOGO product to meet the chain of custody, labelling, testing or other requirements of AS 4454-2012 or AS 4419-2018.

REVISION RECORD

VERSION No.	REVISION No.	DATE	DETAILS
1	0	February 2022	Original Draft Version
1	2	March 2022	Amended Draft Version
1	3	May 2022	Final Draft Version
1	4	June 2022	Final Version

2. Definitions

FOGO: Municipal Food Organics and Garden Organics collected from households by Local Government Authorities via a source-separated, three-bin system. The source separation of FOGO allows for this material to be diverted from landfill. FOGO waste that is treated by composting is suitable for use as a soil amendment product provided it complies with the criteria in AS 4454-2012.

Composting: The process whereby organic materials are microbiologically transformed under controlled aerobic conditions to achieve pasteurization and a specified level of maturity.

Mulch: Any organic product (excluding polymers that do not degrade, such as plastics, rubber and coatings) that is suitable for placing on soil surfaces.

Composted Mulch: Mulch that has undergone controlled aerobic and thermophilic biological transformation through the composting process and achieved a specified level of maturity and complies with the criteria in AS 4454-2012.

FOGO-Derived Mulch: A composted mulch made from composted FOGO material.

Composted Soil Conditioner: A composted organic product that is suitable for incorporating into soils and complies with the criteria in AS 4454-2012. This also includes products termed soil amendment, soil additive, soil improver and similar.

FOGO-Derived Soil Conditioner: A composted soil conditioner where the organic fraction of the final product consists of composted FOGO material.

FOGO-Derived Topsoil: A FOGO-derived topsoil is made by blending FOGO-derived soil conditioner with other materials to produce a soil medium suitable for plant growth. FOGO derived topsoil must meet the requirements of AS 4419-2018 and the chemical contaminant levels in Table 3.1(C) in AS 4454-2012.

3. Reference Documents

Document No.	Description
AS 4454-2012	Composts, soil conditioners and mulches
AS 4419-2018	Soils for landscaping and garden use
8803-000-009	PTA WA Specification Stations and Buildings Landscape Architecture
Specification 204	Main Roads Western Australia Environmental Management
Specification 301	Main Roads Western Australia Vegetation Clearing and Demolition
Specification 304	Main Roads Western Australia Revegetation and Landscaping
DWER	Guideline: Better Practice Composting
WQPN 25	Land use compatibility tables for public drinking water source areas
DBCA (2020)	Phytophthora Dieback Management Manual
NSW DPI	Guidelines for using compost in Land Rehabilitation and Catchment Management

4. General

This Specification sets out the requirements for the provision and use of Food and Garden Organic material derived composted soil conditioner, mulch and topsoil in landscaping activities associated with infrastructure projects in the Perth, Peel and Southwest region of Western Australia.

4.1 Contractor's responsibilities

Without limiting the Contractor's liabilities, the Contractor is responsible for the following:

- Supply of materials, labour, plant and equipment
- Installation of materials
- Achieving and demonstrating compliance requirements
- Replacement of rejected material

5. Quality Assurance

5.1 Product certification

Prior to material being ordered and delivered to the installation site the contractor must provide documentation to demonstrate that the product meets the requirements of AS 4454-2012, or AS 4419-2018 (as appropriate to the product) from a NATA accredited laboratory. FOGO derived products and blending materials from outside the installation site must be free of Phytophthora dieback and other pathogens, weeds, viable seeds, root particles or other plant propagules.

5.2 Product testing

FOGO derived products shall be tested using the methods outlined in AS 4454-2012 and AS 4419-2018 (as appropriate to the product).

Advice for testing samples for Phytophthora Dieback should be sought from the Department of Biodiversity Conservation and Attractions Vegetation Health Service (VHS).

6. FOGO derived soil conditioner, mulch and topsoils

6.1 Supply

FOGO derived soil conditioner, mulch and topsoils shall be sourced from a premises licensed under Part V of the *Environmental Protection Act 1986* as a Category 67A Composting Facility.

6.2 FOGO point of origin

To reduce transport emissions, transport costs, and demonstrate meaningful reuse of locally generated organic waste, preference should be given to soil conditioners, mulch and topsoils made from FOGO material collected and processed in the same region as the installation site.

6.3 Blended materials

In the event that the Contractor needs to adjust the physical and chemical composition of a FOGO-derived product to respond to in situ soil health and other circumstances at the installation site, non-FOGO derived blending materials shall comply the chemical contaminant levels in Table 3.1(C) in AS 4454-2012.

7. Installation of soil conditioner

To ensure beneficial microbial activity is retained in FOGO derived soil conditioner, the product shall not be allowed to dry out on the surface of the installation site.

7.1 Revegetation planting

For revegetation planting areas the Contractor shall ensure that FOGO derived soil conditioner is incorporated into the top 200 mm of the soil immediately after spreading and within 7 days of being delivered to the installation site. Soil conditioner shall be applied to a minimum depth of 50 mm before being incorporated into the soil profile.

7.2 Garden bed and irrigated areas planting

For garden areas associated with built infrastructure (e.g. public transport facilities), FOGO derived soil conditioner shall be applied to 100 mm and cultivated into existing subsoil or imported topsoil prior to planting and mulching.

7.3 Tree planting

For 100 L, 200 L and 500 L tree planting, the contractor shall provide FOGO derived soil conditioner to the tree at the rate of 30 % of the tree container size, mixed well into the existing soil.



Prepared by: SWA Innovation Hub