

Key Points

- Fires in green waste storage piles can be internal or external.
- To avoid spontaneous combustion, storage pile temperatures should be below 70°C and the moisture content should be <20% or >45%.
- DFES recommends a maximum storage pile size of: L: 50 m x W: 10 m x H: 5 m
- Leachates can cause odour problems and have the potential to contaminate ground and nearby surface waters.

Definitions

- **Green waste** comprises organic material (e.g. grass clippings, weeds, flowers, branches and twigs, fruit and vegetables, and food scraps).
- **Spontaneous combustion** is a self-ignited fire with no apparent cause.
- **Microbial activity** is the chemical and physical changes caused by the activities of microorganisms in different environments.

Types of green waste storage fires

Fire involving bulk green waste storage can be divided into external and internal fires.

Internal fires

Spontaneous combustion in decomposing piles of vegetation causes internal fires. These fires ignite deep within the pile and are often, at first, difficult to detect.

Spontaneous combustion occurs when more heat is generated in the pile by decomposition than is lost to the surrounding environment, heating to a temperature high enough to cause ignition. Composting materials typically ignite at a temperature between 150° and 200° Celsius.

Composting microbial activity within a pile can cause temperatures to rise to between 50°C and 90°C. At this temperature, microorganisms can die or become dormant and heat-releasing chemical reactions (associated with chemical oxidation and gas adsorption) take over. These chemical reactions can increase the temperature of the pile to ignition point. If materials reach their ignition temperature, but oxygen is limited, they will burn as a smouldering fire. If more oxygen is introduced, a flaming fire can develop.

Moisture content is a critical factor in spontaneous combustion. The critical moisture range that supports spontaneous combustion is 20% to 45%. If moisture levels are above 45%, there is enough moisture available for evaporation to reduce pile temperatures. If the moisture is below 20%, there isn't enough moisture to sustain biological activity and therefore generate heat.

Normally, the composting process operates with a moisture content range of between 40% and 70%. Heat generation and the possibility of spontaneous combustion may be increased through moisture being absorbed by the pile and the addition of green waste with a high sap content.



Above: Spontaneous combustion.

Disclaimer

Literature available regarding the storage of green waste and fire risk is limited. This Information Note applies existing fire behaviour literature and existing green waste storage practices to the management of green waste.

Storage conditions

Bulk green waste storage conditions that contribute towards spontaneous combustion are:

- Relatively dry or pockets of dry material.
- Significant proportions of bark, soil and leaves.
- Large piles trapping more generated heat through their low surface area to volume ratio.
- Piles well insulated and undisturbed.
- Limited pile aeration due to highly compacted material.
- Prolonged storage time enabling excessive heat accumulation.

Preventing fires

Internal bulk green waste storage fires can be prevented by:

- Reduce pile size to create a larger surface area to volume ratio.
- Aerating piles by regular turning and/or providing internal ventilation.
- Monitoring the temperature and moisture levels within piles stored for periods greater than 3 months.
- Monitoring piles for venting hot gases or smoke.
- Separating piles with no fuel zones to help contain fire to individual piles.

Managing green waste fires

Internal bulk green waste storage fires should be managed by:

- Isolating the affected section or pile.
- Thoroughly wetting vegetation with low pressure water. High pressure water can cause aeration therefore providing oxygen, resulting in more rapid combustion.
- Gradually spreading the material while saturating with water.

External fires

External bulk green waste storage fires are caused by ignition sources such as arson, lightning, adjacent bushfire, discarded cigarette butts, and heat or sparks from equipment or vehicles. External fires are more readily detected. Dry and aerated piles with fine fuels will be more susceptible to external ignition and burn at higher intensities.

To prevent external bulk green waste storage fires:

- Provide a 100 m buffer zone containing a fuel load below 4 tonnes per hectare.
- Locate piles away from powerlines and other ignition sources.
- Restrict the use of welding or other heat generating devices.
- Monitor piles during extreme weather conditions and total fire ban days.
- Maintain pile separation with no fuel zones to help contain fire to individual piles.

External bulk green waste storage fires should be managed by:

- Bulk water storage facilities and/or access to bulk water appliances.
- For mulch piles—the application of 4 litres of water per cubic metre within 30 minutes of ignition.
- For non-mulch piles—the application of 2.5 litres of water per cubic metre within 30 minutes of ignition.
- Where practical, separate the burning material from the non-burning material using a loader, excavator or bulldozer. This will contain the fire to a smaller area, reducing the radiant heat and allowing the more effective use of water.



Fire appliance and firefighters suppressing bulk green waste fire.

Leachates from green waste

Leachate is the liquid that has percolated through the green waste and contains dissolved or suspended contaminants. Leachate has the potential to cause odour problems and contaminate ground or nearby surface waters.

Leachate generation usually occurs as a result of:

- Excess moisture within storage materials.
- The release of water during the composting process.
- The infiltration of excessive rainwater.
- Over-irrigation of storage piles.

All green waste sites should be monitored to ensure that leachates do not become an environmental issue. Fire suppression activities using large volumes of water may increase leachate production in the short term. If leachates are a concern, management options include; rainwater collection, run off diversion, collection ponds and drainage beds. To help prevent contamination from leachates, ensure that piles are not stored on wetlands, riparian zones, flood plains or steeply graded surfaces.

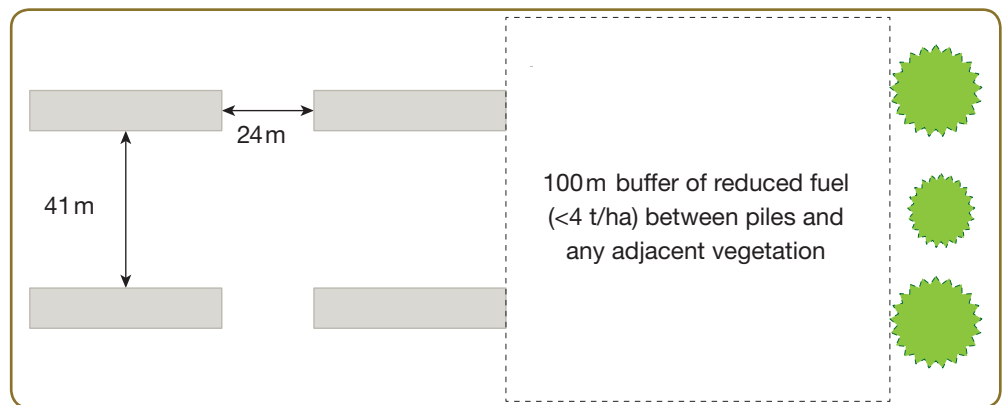


Recommended pile size and separation

The most significant factors in the management of fires in green waste storage facilities are the size of the pile and the distance separating the piles. Pile size affects fire and radiant heat generation. The separation distance influences the ability of fire to spread between piles.

Recommended maximum pile dimensions have been identified by DFES based upon best practice and practicality for the safe storage of green waste. The management options and separation distances in this Information Note are based upon these recommended dimensions.

Recommended pile separation

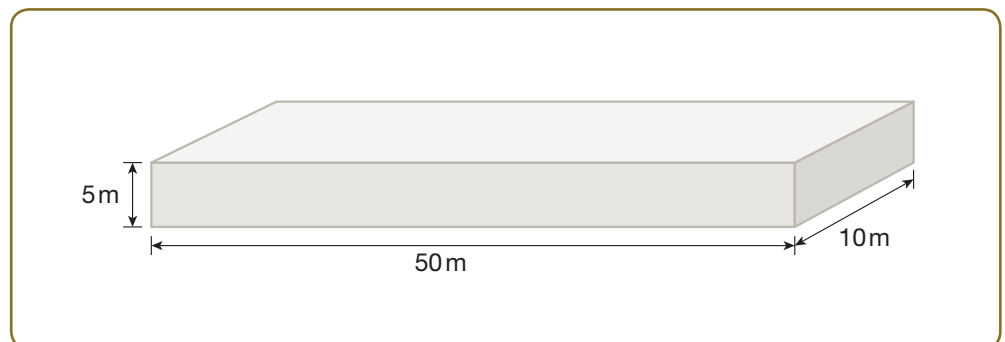


Pile separation distance.

Recommended pile dimensions


DFES recommends the following as a maximum pile dimensions:

- length 50 m
- width 10 m
- height 5 m.



Maximum pile dimensions.

Site specific factors such as buffers from surrounding vegetation, soil type, boundary fences, response times and availability of resources need to be taken into account when considering alternative pile dimensions at bulk green waste storage facilities.

 **For more information contact the Environmental Protection Branch on 9395 9300, email: environment@dfes.wa.gov.au or visit www.dfes.wa.gov.au**