GUIDELINES:
TREATED TIMBER WASTE MANAGEMENT GUIDELINES

South Australian Wine Industry Association

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TREATED TIMBER WASTE MANAGEMENT GUIDELINES

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IMPORTANT INFORMATION

The legislation, policies and scientific understanding of environmental risks referred to in these guidelines is current to July 2009.

The guidelines have been prepared with all reasonable care, however they are not intended to be a substitute for particular legal or technical advice on specific fact situations industry may encounter in undertaking operations in South Australia. It should be recognised that in the case of particular environmental issues, precise legal and/or technical opinion may be required to determine the appropriateness of particular measures.

The guidelines do not address every set of circumstances that may arise in the course of storage or disposal of treated timber waste.

These guidelines were developed by the South Australia Wine Industry Association (SAWIA) with the assistance of Golder Associates and Finlaysons Lawyers. Zero Waste SA are also acknowledged for their role in funding jointly with SAWIA a project to carry out an environmental risk assessment for storage and disposal of treated timber waste generated within the wine industry in South Australia, the results of which were used to develop these guidelines.

1 Purpose

The purpose of these guidelines is to assist the industry to understand its obligations in respect of treated timber waste management and to provide suggested risk management measures that can be implemented on vineyard sites. It has been developed keeping in mind the principles of waste management hierarchy (WALGA 2009) in preferential order: Avoid – Minimise — Reuse — Recycle — Recover — Dispose.

The first part of these guidelines summarises both mandatory requirements and suggested best practice for:

- stockpiling;
- transport;
- landfill containment;
- composting and mulching; and
- burning

of treated timber waste and provides a simple checklist of measures to be adopted by industry.

The second part of these guidelines sets out background information regarding the management of treated timber waste, including information about risks posed by the timber preservatives, current regulatory attitudes and common environmental risks that must be managed when storing or disposing of treated timber.

2 Guideline summary

2.1 Stockpiling

WHAT MUST BE DONE

Stockpiling of treated timber waste must comply with:

- the general environmental duty under the *Environment Protection Act 1993* (SA); and
- obligations under the *Environment Protection (Water Quality) Policy 2003* to not place wastes where they can enter waters.

SUGGESTED BEST PRACTICE

- Prepare and implement a treated timber management plan for the stockpiling area.
- Consider the siting and layout of the treated timber waste storage area.
- Manage on-site handling, storage and treatment of treated timber waste in order to maximise potential for reuse and minimise environmental risk.
- Use appropriate storage methods.
- Implement measures to safeguard the protected environmental values of surface water and groundwater from potential impacts associated with contaminated stormwater and sediment.
- Remove all non-timber components (e.g. plastic clips, staples, ties, soil) at the time of storage.
- Develop a fire mitigation and management strategy.
- Implement a pest control program.
- Include a systematic process for monitoring and review in the management plan for the stockpiling area.

HOW TO DO IT

- Management Plan
  - The plan should consider the hazards, site conditions, site operations, facility layout, handling, treatment and these suggested measures. It should prevent unacceptable activities such as burning, mulching and composting of treated timber waste.
- Siting and layout
  - The management plan should clearly describe the siting and layout of the storage area.
  - The layout should consider regulatory issues, buffer distances to sensitive receptors, fire prevention and management, stormwater management, protection of surface water and groundwater, vehicle access, efficient site operation, treated timber waste handling, stability, vermin management, OHSW and protection of amenity.
  - Site geography should be considered and preferably be gently sloping, downwind (prevailing wind direction) of buildings and sensitive receivers, away from watercourses and drainage lines, with a separation distance of 30 metres maintained from natural vegetation, where possible.

Stockpiling ctd.

HOW TO DO IT ctd.

- Consider securing the site by fencing to control access.
- Non-aged creosote-treated timber is to be stored at an adequate distance from houses and occupied areas to reduce the potential for odour complaints. This will be determined on a site specific basis and in accordance with the *Guidelines for Separation Distances* (EPA 2007).

- Manage on-site handling, storage and treatment
  - Prevent mixing treated timber with other materials to facilitate handling and future options for disposal, re-use and resource recovery.
  - Treated timber posts suitable for potential reuse in their current state should be identified and separated accordingly. In this way, treated timber posts may be actively diverted from entering the waste timber stream.
  - Manage the treated timber waste storage area to promote limiting the quantity, footprint and duration of on-site storage of treated timber waste.
  - Remove non-timber items such as marker tape and wire holders (see Fig 1) from the timber prior to stockpiling as these inclusions may reduce the potential for recovery of the timber resource.

Figure 1

  - Separate creosote-treated timber from CCA-treated timber and sort timber according to post size (diameter and length), timber age (old versus new) and whether or not non-timber materials, such as clips, wires or tape have been removed.
  - Consider bundling and/or retaining systems to assist with handling, management of the stability of treated timber waste stockpiles and off-site transport.
  - Treatment of treated timber waste should be limited to that required for re-use and safe and practicable handling and storage of the treated timber in its current state.
  - Size reduction of the treated timber by cutting, chipping or grinding should not be undertaken, due to potential increased environmental risks and adverse impact on the potential future options for re-use and resource recovery. An exception would apply to trimming posts so that they do not pose an occupational risk, (i.e. removal of jagged post ends). Post trimming should be undertaken in a controlled manner, considering the risk of dust, off-site migration of treated timber waste and fire and leaching hazards.
  - Prohibit burning of any treated timber materials.

Stockpiling ctd.

HOW TO DO IT ctd.

- Install adequate signage to identify correct handling and storage procedures, hazards associated with the timber and the type of material in the stockpile e.g. creosote or CCA.

- Storage methods
  - Avoid leaving posts in unstructured stockpiles that might present hazards and uncontrolled risks to the environment and staff.
  - Stockpile heights should be no more than 3 metres.
  - Elevate stockpiles above the ground surface where possible.
  - Consider utilising the following suggested storage methods:
    1. Creating a stockpile in a regularly shaped pile with the use of supports (such as metal posts (star pickets) or some other device that will prevent the movement of the posts. Ensure that the supports are suitably engineered for the load of timber to prevent instability or collapse.
    2. Storing timber posts vertically in timber bins (example shown in Figure 2) can facilitate movement by forklift. However, this may prevent these bins from being stacked on top of each other. Storage of posts of similar lengths in one bin makes future transport and disposal more efficient. Partially filled bins may be unstable and present a risk to staff and others in the immediate vicinity.

Figure 2

  - In selecting storage methods and bundling procedures consider the following:
    - Broken posts vary in length and can have sharp broken ends; and
    - The cost of transport and storage at a containment facility will be sensitive to the density of treated timber posts per cubic metre.

- Fire Management
  - Develop a fire management plan.
  - Provide and maintain fire suppression equipment, water and other resources for fire fighting at sites where treated timber is stored.

Stockpiling ctd.

HOW TO DO IT ctd.

- Ensure clear fire fighting access to storage areas. Limiting the size of stockpiles whilst an adequate separation distance may assist with fire fighting and reduce the risk of the fire spreading between stockpiles. For example, limit the size of stockpiles to 3m high with a footprint dimension less than 20m long and 8m wide with a minimum separation distance of 8m between stockpiles and from boundary fences
- Avoid locating the treated timber storage area within close proximity of potential ignition sources or activities that may produce an ignition or fire generation risk. This includes grinding, welding, naked flames or burning.
- Clear long grass and other flammable material as a fuel break around the stockpile of treated timber for a distance of 15 metres.
- Train staff in the fire management plan and suppression.
- Instigate fire exclusion zones and general fire prevention measures across the vineyard or winery where stockpiles are held.
- Implement measures to contain fire fighting water runoff. For example, construct a bund around the treated timber storage area (see the EPA *Guidelines for Bunding and Spill Management 2007)*.
- Address the risks associated with contaminated ash and the release of arsenic trioxide in the plan.
- Prepare a contingency plan for the remediation of a stockpile site should a fire occur.

- Protection of Surface Water and Groundwater
  - Locate stockpiles in areas with a low risk of impact on the environmental values of soil, surface water and groundwater — a recommended distance of 50m from watercourses (whether permanent or intermittent), dams and 100 year flood plains.
  - For groundwater protection, preferred conditions include a natural unsaturated attenuation zone for contaminants that may leach from the treated timber. For example, sites with clay soils that have low permeability and natural attenuation properties are preferred to those with sandy soils.
  - Grade the surface of the storage area to promote diversion of surface water around the treated timber storage area and to prevent water pooling and immersing treated timber.
  - Divert stormwater around the treated timber storage area using drainage features and bunds.
  - Keep timber as dry as possible. Storage under cover is preferable.
  - For uncovered storage areas, implement measures to manage runoff and to protect surface water and groundwater. For example, construct a sealed lay down area for treated timber storage, comprising a minimum 200 mm thick compacted layer of quarry rubble or recycled concrete. Surround the treated timber storage area with a perimeter bund and stormwater detention system and/or wetland. Consider the 1 in 10 year recurrence interval storm event for design of drainage features. Consider the 1 in 100 year recurrence interval storm event to assess the risk of major breakdown events such as failure of detention ponds/wetland or flooding of the treated timber storage area.

Stockpiling ctd.

HOW TO DO IT ctd.

- Vermin and Pest Control
  - Implement a pest control program to prevent the treated timber stockpile from becoming infested with vermin. It is likely that this will involve the extension of an existing service.
  - Pest control devices of an incendiary nature are not to be utilised within proximity of the stockpile.
- Monitoring, reporting and review
  - Considerations for monitoring, reporting and review include the handling and storage of treated timber, access control, the performance and integrity of management measures for fire and stormwater, vermin control and additional matters that may be site specific.

CHECKLIST

✓	Stockpile Management Plan prepared.	☐
✓	Appropriate siting and layout of stockpile selected.	☐
✓	Handling, storage and treatment managed to maximise potential for resource recovery and minimise environmental risk.	☐
✓	Appropriate storage methods selected.	☐
✓	Fire management strategy in place.	☐
✓	Fire management plan adopted.	☐
✓	Measures implemented to protect surface and groundwater.	☐
✓	Pest control program implemented.	☐
✓	Program for monitoring, reporting and review adopted.	☐

REFERENCES

- *Environment Protection Act 1993* (SA)
- *Environment Protection (Water Quality) Policy 2003*

GUIDANCE INFORMATION

- Guidelines for CCA Timber Waste Storage and Management (EPA Nov 2004)
- Guidelines for Separation Distances (EPA 2007)

2.2 Transport

WHAT MUST BE DONE

- All reasonable and practicable steps must be taken to cover, contain and secure treated timber waste during transport to ensure it remains on or in the vehicle throughout the course of transportation.
- Transport must be in accordance with the general environmental duty.

HOW TO DO IT

- Cover, contain and secure treated timber waste during transport.

SUGGESTED BEST PRACTICE

- Provide fire suppression equipment on all vehicles transporting treated timber waste and ensure staff are proficient in the use of this equipment.
- Avoid transporting treated timber waste with flammable materials.
- Separate treated timber waste into the different types and clearly identify them i.e. creosote and CCA timber is to be bundled separately, but individual bundles may be transported together.
- Manage the risk of potential pest plants or pest animals.
- Inspect vehicles transporting treated timber waste prior to loading and clean if necessary to remove any flammable material or residue prior to loading treated timber waste.
- Avoid bringing vehicles loaded with treated timber waste into the vicinity of potential ignition sources i.e. loaded vehicles should not be parked near spark generating equipment or activities, such as welding or grinding, and drivers must not smoke near the vehicle.
- Cover loads of treated timber waste with a waterproof material during transport to reduce dispersion of dust or timber particles and to ensure the load is protected from rainfall.
- Ensure loaded treated timber waste is not allowed to sit in pooled water, that is, loads must be covered wherever possible and the vehicle tray must drain freely.
- Inspect timber to be transported for the presence of vermin and if necessary take pest control measures prior to transportation.
- Inspect treated timber waste upon arrival at the destination to ensure that it is free of vermin and refuse delivery for loads that fail to meet this standard.
- Ensure that transported treated timber waste is free from soil and weeds to manage the risk of spreading pest plants or pest animals.
- Consider vehicular access for the safe and efficient unloading and loading of treated timber waste in the layout of treated timber waste storage facilities (vineyard, waste transfer station and landfill).
- Where off-site disposal or resource recovery options are available, set up a schedule for regular transport of treated timber waste from vineyards and waste transfer stations to limit the quantity of material maintained on site and the holding period. Ensure that off-site transport of treated timber waste is carried out by competent operators to approved facilities.

Transport ctd.

CHECKLIST

✓	Treated timber covered and secured during transport.	☐
✓	Fire suppression equipment provided.	☐
✓	No flammable materials.	☐
✓	Timber types separated and identified.	☐
✓	Pests managed.	☐
✓	Vehicles inspected and cleaned.	☐
✓	Vehicles kept away from ignition sources.	☐
✓	Loads covered with waterproof material.	☐
✓	Pooling of water under loads prevented.	☐
✓	Timber inspected for pests prior to transport.	☐
✓	Pests controlled prior to transport.	☐
✓	Timber inspected for pests on delivery. Infested loads refused.	☐
✓	Soil and weeds removed from loads.	☐
✓	Vehicular access requirements considered in layout of storage facilities.	☐
✓	Regular transport off-site scheduled.	☐

REFERENCES

- *Environment Protection (Waste Management) Policy 1994*
- *Environment Protection Act 1993 (SA)*

2.3 Landfill containment

WHAT MUST BE DONE (mandatory requirements)

- Disposal of treated timber waste must only be to suitably engineered and EPA licensed landfills.
- Protect groundwater from leachate contaminated with metals or constituents of preservatives.

HOW TO DO IT

- Ensure that the landfill facility at which you intend to dispose of your treated timber waste is licensed to accept treated timber material.
- Ensure that the landfill at which you dispose of your treated timber waste is suitably engineered in accordance with landfill licensing conditions and the requirements of the *Environment Protection Act 1993*.

CHECKLIST

✓	EPA licence to dispose of timber to an **on-site** landfill obtained.	☐
✓	**Off-site** landfill is appropriately licensed by EPA.	☐

REFERENCES

- Environment Protection Act 1993 (SA), s 36 and Schedule 1

GUIDANCE INFORMATION

- Landfill Guidelines (EPA 2007)

2.4 Compost and mulch

WHAT MUST BE DONE

- **DO NOT COMPOST OR MULCH TREATED TIMBER.**
- Treated timber has a high metal content so mulch made from treated timber could be contaminated to the point where it can not be used for its intended purpose.
- Composting or mulching of treated timber waste, or applying compost or mulch made from treated timber waste is not recommended since it may not comply with:
  - the general environmental duty under the *Environment Protection Act 1993* (SA); and
  - obligations under the *Environment Protection (Water Quality) Policy 2003* to not place wastes where they can enter waters.

HOW TO DO IT

- **Do not make mulch or compost from treated timber waste**.

- **Do not apply mulch or compost made from treated timber waste**.

CHECKLIST

✓	Employees/contractors instructed not to mulch or compost treated timber waste.	☐
✓	Employees/contractors instructed not to apply mulch or compost made from treated timber waste.	☐

REFERENCES

- *Environment Protection Act 1993* (SA)

Environment Protection (Water Quality) Policy 2003

GUIDANCE INFORMATION

- *Environment Protection (Water Quality) Policy 2003*
- Guidelines for Composting Works in South Australia (EPA 2007)

2.5 Burning

WHAT MUST BE DONE

- **DO NOT BURN TREATED TIMBER**.
- The residual ash and burnt timber from treated timber waste that is burnt as a result of arson, accidental ignition or bushfire must be removed and disposed of appropriately if it poses a risk of harm.

HOW TO DO IT

- **Do not deliberately burn treated timber waste**.
- If treated timber waste is burnt as a result of arson, accidental ignition or bushfire, test the soil, residual ash and burnt timber at an approved laboratory.
- If the laboratory results indicate that heavy metals are present in the soil/ash/burnt timber, remove all ash and burnt timber and the top 5-10cm (best practice) of soil and dispose of them to an appropriately licensed landfill.
- Transport burnt material in an enclosed container.

CHECKLIST

✓	Employees/contractors instructed not to burn treated timber waste.	☐
✓	Soil, ash and burnt timber tested for heavy metals.	☐
✓	Contaminated soil/ash/burnt timber disposed of to licensed landfill.	☐
✓	Contaminated soil/ash/burnt timber transported in an enclosed container.	☐

REFERENCES

- *Environment Protection (Burning) Policy 1994*
- *Environment Protection Act 1993 (SA)*

3 Treated timber waste management guidelines

3.1 Background

The preservatives utilised to treat timber include creosote, copper chrome arsenate (CCA), pentachlorophenol, methyl isocyanate (MITC) (Wong 2003), ammoniacal copper quaternary (ACQ) and copper azole.

Treated timber posts are predicted to have a working life time of 30-40 years (Sinclair Knight Merz 1999). The suitable storage, transport and waste management of treated timber are recognised as issues for the wine industry in Australia that must be addressed now and into the future.

While the use of CCA timber in Australia has been restricted for certain purposes, including decking, playground equipment and hand rails, it remains available for use within the viticulture, agricultural and aquaculture industries (AVPMA 2006). Creosote-treated timber is also widely used in agriculture, aquaculture and as railway sleepers.

Management of treated timber at the end of its serviceable life is an issue that has been explored within Australia and overseas. Due to the nature of preservative-treated timber, there is associated environmental and occupational risk with the handling, storage, transport and disposal of this timber. The main contaminants of interest are polycyclic aromatic hydrocarbons (PAH), naphthalene and benz(a)pyrene in creosote-treated timber and copper, chromium and arsenic in CCA-treated timber.

The EPA's Report on CCA Treated Timber in South Australia (EPA, July 2008) presents a discussion of potential solutions for CCA treated timber. In summary:

- The EPA does not regulate the use of CCA-treated timber, however in support of the waste hierarchy, suggests avoiding and reducing use of CCA-treated timber in favour of a range of alternative materials.
- Where possible, CCA timber should be re-used to benefit other applications.
- The potential for resource recovery from CCA-treated timber is well recognised and has attracted significant research and development attention. Recovery technologies, however, carry a potential to impact upon the environment if not suitably managed.
- Although no recovery technologies are currently available in South Australia, they may become available within the foreseeable future. The development of a well-managed recovery technology could ensure an environmentally secure end-of-life disposal of CCA-treated timber. In the meantime, disposal of CCA-treated timber into suitably engineered licensed landfill or storage sites may be the only available option.
- The disposal of CCA-treated timber requires management that reduces the potential of various disposal pathways to impact upon the environment, particularly due to the arsenic and chromium content of the material. Capturing and / or isolating the heavy metals contained in CCA-treated timber from the environment are recognised necessary elements of disposal.
- The EPA will continue to prevent uncontrolled burying, burning, composting and mulching of CCA-treated timber.
- Proposed landfill sites for interim disposal of treated timber will be considered using a site-specific risk assessment approach.

The purpose of these guidelines is to assist the industry to understand its obligations in respect of treated timber storage and disposal and to provide suggested risk management measures that can be implemented on vineyard sites.

3.2 Reuse

Readily available options for reuse at present are somewhat limited, although a range of applications has been identified (APVMA 2005), including fence posts, landscape timber, parking lot bumpers, guardrail posts, shipping crates, and walkway edging.

Preliminary assessments of the quantity of CCA-treated timber waste in the South Australian wine industry suggest that there was a stockpile of about 1 million posts in 2007 (EPA 2008). About 60% of the stockpiled posts are greater than 1.5 m in length and hence have value to other users for purposes such as fence posts. About 40% of the posts are less than 1.5 m in length and are likely to require off-site disposal. The regional distribution of posts indicates that there are about 50% in the Riverland, 20% in the Barossa and about 20% in McLaren Vale.

Wherever possible, appropriate reuse of treated timber should be pursued as a primary means of managing treated timber waste material.

3.3 Stockpiling and landfill disposal

Disposal of treated timber waste to suitably engineered landfills is permitted within South Australia and this is the only currently available disposal option. Temporary stockpiling on-site prior to disposal to landfill may therefore be required.

The South Australian EPA regulates landfills through the licensing system. The EPA has issued Landfill Guidelines 2007 for domestic, commercial and general industrial waste that provides a reference for landfill design. Containment of treated timber waste is not addressed directly in these guidelines and requires site specific risk assessment and design.

The chemical components of CCA-treated timber - arsenic, chromium and copper compounds and solutions, are Listed Wastes within Schedule 1, Part B of the Environment Protection Act 1993.

Landfill sites that are not suitably engineered risk breaching the Environment Protection (Water Quality) Policy 2003, which currently imposes an `obligation not to discharge or deposit specified pollutants including Listed Wastes into any waters or onto any land in a place from which it is reasonably likely to enter any waters', including by processes of seepage, infiltration or by a rising of the water table. Therefore, temporary stockpiling of treated timber waste or containment of treated timber waste into a landfill must protect groundwater from leachate contaminated with metals or constituents of preservatives.

At present, domestic quantities of treated timber waste may be disposed of to a suitably engineered landfill in accordance with landfill licensing conditions and the requirements of the Environment Protection Act 1993. CCA-treated timber and creosote-treated timber are not Listed Wastes in South Australia.

3.4 Compost and Mulch

Treated timber is not well suited to composting and mulching due to the high metal content (Jambeck et al 2006). Mulch produced from the co-mingling of treated and untreated timber may be contaminated to the point where it is unable to be used for the intended purpose (Townsend et al 2003; Solo-Gabriele et al 2004).

There is also evidence that mulching can produce a more concentrated leachate under acidic conditions, due to the increase in surface area to volume ratio (Jacobi et al 2004). The Florida Department of Environmental Protection is in the process of prohibiting the use of CCA-treated timber as mulch, compost, or a soil amendment (Florida Centre for Solid and Hazardous Waste Management).

While the Australian Standard AS 4454: 2003 for Composts, Soil Conditioners and Mulches (Standards Australia 2003) specifies acceptable levels of chemicals, with regard to heavy metals, it defers to the more stringent of either state or national regulations. In South Australia, the level of arsenic, copper and chromium is not regulated for these products. However, the EPA Guidelines for Composting Works in South Australia (2007) proposes limits of Arsenic (20 mg/kg), Chromium (50 mg/kg) and Copper (60 mg/kg) in compost for unrestricted use.

At present, the distribution of mulch or other products that contain treated timber waste could be deemed by the EPA to breach the general environmental duty (Section 25 of the Environment Protection Act 1993) and Environment Protection (Water Quality) Policy 2003 due to the presence of chemicals or metals that could leach from this material.

Therefore, the composting and mulching of treated timber **is not recommended** as a management approach.

DO NOT COMPOST OR MULCH TREATED TIMBER

3.5 Burning

Burning of CCA-treated timber waste releases toxic gases and concentrates the metal components in the remaining ash.

In South Australia, burning outdoors on non-domestic premises is controlled by Section 4 of the Environment Protection (Burning) Policy 1994. The EPA will not issue a permit for the burning of treated timber waste. Section 5 of the Environment Protection (Burning) Policy 1994 specifically prohibits "the burning on any domestic premises of wood treated with copper-chrome-arsenate or other chemical preservatives." Burning of treated timber waste within South Australia, in particular on a large scale, would not be endorsed by the EPA, as it is considered a breach of Section 25 (1) 'General Environmental Duty' under the Environment Protection Act 1993 whereby "a person must not undertake an activity that pollutes, or might pollute, the environment...." The burning of preservative treated timber may be considered by the South Australian EPA to constitute a breach of the general environmental duty.

The burning of treated timber **is not recommended** as a management approach.

DO NOT BURN TREATED TIMBER

If treated timber is burnt as a result of an act of arson, accidental ignition or bushfire, the residual ash and burnt timber containing heavy metals is likely to pose a risk.

Residual ash and the top layer of soil (5 – 10 cm) in the vicinity of the burnt stockpile should be collected and tested by a NATA accredited laboratory. If necessary, it should be treated before disposal to an EPA licensed facility able to receive that waste. Burnt material should be transported in an enclosed container.

3.6 Environmental risk

The following sections outline the nature of the contaminants in treated timber and associated environmental risk. Occupational risk is not considered to be within the scope of these guidelines, although some acknowledgement is provided.

Contaminants:

Creosote

Creosote is a mixture of organic compounds produced from the distillation of coal and blast furnace tar (Sinclair Knight Merz 1999) and when produced has a characteristic diesel-like smell and brown colour both of which reduce in intensity over time.

Polycyclic aromatic hydrocarbons (PAHs) that comprise about 85% of creosote, are a principal contaminant that can leach from this timber. Volatile components such as naphthalene are also released at low temperatures (Baird 1995, EPA 2007). Creosote contains a number of known carcinogens including benz(a)pyrene (Marrs 1995).

Storage of creosote timber can present an odour management issue, in particular for recently treated timber.

Contaminants from creosote-treated timber under certain conditions can leach into the groundwater, contaminate soil and can also be dispersed into the air. (Enviros 2004). An average annual loss of 6.8% for creosote from poles was recorded in one study (Vassou et al 1998 from Enviros 2004).

CCA

There are 3 different formulations of CCA (types A, B & C) but the predominant formulation used throughout the world is type C, composed of 34% arsenic pentoxide, 47.5% chromium trioxide and 18.5% copper oxide by weight (Read 2003).

The national body responsible for the registration of CCA within Australia is the Australian Pesticides and Veterinarian Medicines Authority (APVMA 2005). The Australian Standard AS 1604.1:2005 specifies the composition of the CCA formulations, limiting the permitted percentage of copper (23-25%), hexavalent chromium (38-45%) and pentavalent arsenic (30-37%) in solution. Australian Standard AS 5605–2007, Guide to the safe use of preservative-treated timber (Standards Australia 2007), provides guidance on the safe use of CCA and creosote-treated timber.

When CCA timber is burnt, toxic fumes are released and the ash may contain up to 10% arsenic, copper and chromium by weight (Department of Human Services, Victoria 2007).

The copper, chromium and arsenic utilised in the CCA formulations are non-volatile and therefore these substances become airborne through the generation of dust particulates, such as those generated by cutting this timber.

The contaminants associated with CCA timber are the metal constituents of the preservative. It is important to consider the valence state of these metals. Chromium(VI) used in the manufacturing is a more toxic form that readily converts to the less toxic Chromium(III) when it binds to the timber during the preservation process, although under acidic conditions this reaction can be reversed (Read 2003). Chromium(Vl) is carcinogenic through inhalation (Read 2003). In the community, exposure will predominantly be to the less toxic Chromium(III).

While copper is toxic, the divalent copper that is present in CCA timber binds to soils and has limited mobility (Read 2003). Copper is the least toxic of the three metals that make up the CCA formulation and is of greatest concern when in an aquatic environment. For this reason, CCA timber is not suitable for use in aquatic environments (Enviros 2004), although copper compounds are used as anti fouling agents in the marine environment.

Of the metals, arsenic presents the greatest hazard for the disposal of CCA timber, due to its toxicity and being a known carcinogen. Arsenic can be found in several valence states, subject to the pH and environmental conditions. The hazard posed and mobility of arsenic varies subject to the valence state. Arsenic is tolerated when ingested at rates of less than 2µg/kg of body weight per day (Ensis 2006). The form in which arsenic is used within the CCA formulation, that is, As(V) is five to ten times less toxic than the As(III) (Ensis 2006).

Arsenic occurs naturally within Australian soils within a range of 0.2 to 50 mg/kg (Ensis 2006). Robinson et al (2004) found that CCA constituents leached from treated timber posts within vineyards with 25% of soil samples exceeding the National Environment Protection Council (NEPC) guidelines levels in the soil for arsenic (100mg/kg) and 10% exceeding levels for chromium (100mg/kg) (NEPC 1999).

Read (2003) had the opinion that generally the contamination of soil due to leachate production from CCA timber will be limited to within the immediate vicinity of the timber (that is, immediately around the posts used within the vineyard). This is due to the limited mobility of the metal components within CCA timber that adsorb strongly onto soil (Read 2003). Adsorption appears to be greatest in soils with high organic content and least in sandy soils (Read 2003).

Read (2003) noted that there is evidence within the literature that plants grown within the immediate vicinity of CCA timber had elevated levels of arsenic. It is noted that there are a broad range of factors that may affect these results. Enviros (2004) report that under the European Directive 2003/02/EC, CCA-treated timber is not to be used in any application where the treated timber may come into contact with intermediate or finished products intended for consumption. Creosote-treated timber is similarly restricted in the European Union. It is noted that there is little information available regarding the rate of loss of creosote from treated timber by leaching.

Leachate

Timber treated with creosote or CCA has the potential to generate leachate when stockpiled or when disposed of to landfill. The amount of leachate and potential concentrations and composition of copper, chromium and arsenic in the leachate will be influenced by the formulation of the preservative used, age of the timber, timber particle size, soil pH, weather conditions and groundwater level, amongst other factors (Townsend et al 2004).

The nature of the waste and conditions within the stockpile / landfill will influence the species of arsenic and chromium within the leachate, the potential mobility of the arsenic, and the rate of leachate production. Alkaline leachate will promote higher concentrations of Cr(VI), while burning of CCA timber with alkaline material also promotes higher concentrations of Cr(VI) in ash (Song et al. 2006).

In CCA-treated timber, arsenic is present in the inorganic form As(v). However, both this form and the reduced inorganic As(III) form, that is more toxic, have been detected leaching from new and weathered CCA-treated timber (Khan et al. 2006).

There has been a range of studies reported in the literature that have assessed leachability of metals from treated timber based on laboratory TCLP type tests (i.e. toxicity characteristic leaching procedure). Wong (2003) considered that preservative treated timber that has weathered is considered to have a lower leachate generation potential. However, CCA timber that had been exposed to years of weathering still exceeded the US toxicity characteristic level for arsenic (5mg/L) and this would require even weathered treated timber to be treated as a hazardous waste if it were not for the regulatory exemption that applies for treated timber (Townsend et al 2005).

3.7 Environmental Risk Assessment

An environmental risk assessment is a useful first step in managing risks posed by treated timber stored or disposed of on site. An assessment takes into consideration the specific location, company's operating procedures and unique characteristics of the storage/disposal method. The design and implementation of a risk management system should consider the needs of the organisation, the objectives, products and services and the specific practices and processes conducted (Standards Australia 2004).

Suggested measures for risk management to achieve the objectives should be implemented in a manner that complements the attributes of the site's natural setting and its ability to control hazards. Engineering systems should be designed as a second line of defence to the natural attributes of the site to prevent adverse environmental impacts. Suggested measures may not be necessarily appropriate for every treated timber storage site. Where treated timber storage facilities are located in a particularly sensitive environment, alternative measures to those initially suggested may be required to meet legislative obligations and environmental best practice.

The objectives of a risk assessment for the temporary storage of treated timber waste (stockpiling) are as follows:

- to identify potential environmental, health and safety hazards associated with handling and storage of treated timber, and suggest measures to manage the associated risks;
- to assist each site to prepare a management plan for handling and storage of treated timber at the vineyard or winery;
- to assess the relative suitability of potential storage site locations based on consideration of capacity, transport access, operational issues and potential risks to the environment and local amenity;
- to identify areas of the vineyard that are not suitable for the storage of treated timber because of unacceptable risks to the environment or other factors;
- to promote appropriate reuse of treated timber and reduce the production of waste timber;

- to implement a fire prevention and management plan for treated timber waste;
- to manage the risk of leaching of contaminants from treated timber waste and the potential adverse impact on soil, surface water and groundwater;
- to control vermin and pests;
- to prevent the presence of treated timber waste giving rise to an environmental nuisance; and
- to implement a system for monitoring, reporting and reviewing of the management measures for handling and storing treated timber.

A risk analysis of the storage of treated timber waste was conducted and the risk assessment tables are presented in Appendix 1.

3.7.1 Common Stockpile Risks

Fire

Burning of treated timber waste may result from an act of arson, accidental ignition or result from a bushfire. There is a risk that embers from a bushfire or sparks from equipment may ignite treated timber waste stored at a vineyard or winery. In turn, there is a risk that a fire within a stockpile of treated timber waste may spread and damage facilities at the property or even spread off site to cause property and stock losses and threaten life.

The potential consequences of a fire incident include resources required for fire fighting and cleanup, harm to people, property and infrastructure, remedial measures and potential disruption to other site operations. A fire incident may lead to temporary or permanent closure of the treated timber waste storage area.

Fighting a fire within treated timber waste presents a risk to the fire fighters from exposure to the fire and the toxic volatile compounds that are produced when treated timber is burnt. The smoke presents a hazard to individuals exposed to it. Susceptible individuals such as asthmatics would be at higher risk when exposed to the toxic smoke from a treated timber fire. Metals present in CCA timber become concentrated in the ash when this timber is burnt, presenting an environmental hazard. Fire fighting water may become contaminated with heavy metals and other timber preservatives presenting an additional environmental hazard.

Consideration of hazards related to fire fighting include the size and geometry of stockpiles, access to stockpiles and the infrastructure and equipment for fire fighting. Large stockpiles with poor access pose a greater hazard compared to small stockpiles with good access.

Leaching

The leaching of heavy metals and organic compounds from treated timber can contaminate soil, surface water and groundwater. Risk of leaching depends on the nature of the treated timber present and the physical characteristics of the site including soil type, exposure to rainfall, stormwater management, geology, surface water and groundwater.

Preferred sites for the location of the storage area are those that reduce the risk of impact on the environmental values of soil, surface water and groundwater. For groundwater protection, preferred conditions include a natural unsaturated attenuation zone for contaminants that may leach from the treated timber. For example, sites with clay soils that have low permeability and natural attenuation properties are preferred to those with sandy soils.

Studies have indicated that under certain conditions, the risk of leaching of contaminants may increase if the treated timber is size reduced, by chipping or grinding, for example. This causes the surface area to volume ratio to increase and may expose less weathered parts of the treated timber to leaching.

Vermin, pests and animal hazards
The storage of treated timber on site may provide a refuge for animals including rabbits, rats, mice, foxes, snakes, spiders and others. An increase of any of these species is generally considered undesirable for reasons including rabbits damaging vines, in particular new plantings, while rats and mice may damage fruit and are undesirable within a food production facility, potentially causing contamination of a food product. Serious financial penalties and operational restrictions exist for breaches of the South Australian Food Act 2001, while there are potential consequences to a winery's and the industry's reputation.

While snakes are protected and perform a beneficial function in reducing numbers of rats and mice, venomous species such as the Brown Snake pose an OHSW risk to workers and are likely to be attracted to the potential shelter and prey associated with a timber stockpile.

Phylloxera
The potential of treated timber waste from vineyards to carry a soil borne pest such as Phylloxera is a serious issue for all industry members to consider. Phylloxera is an aphid that attacks the roots of vines and reduces vine vitality and may even kill the vine. South Australia is currently free of Phylloxera, however, there are Phylloxera Infested Zones (PIZ) within Victoria and parts of New South Wales. One means by which Phylloxera may be spread is through soil, including soil attached to posts. The National Phylloxera Management Protocol (National Vine Health Steering Committee 2003) and South Australian Vineyard Protection Protocol (Phylloxera and Grape Industry Board of South Australia 2008) that provide direction to growers to aid in the protection against weeds, diseases and phylloxera.

Atmospheric emissions (odour, vapour, dust)
Creosote timber that has not been adequately seasoned will release volatile emissions which may be an issue with the stockpiling of new creosote-treated posts. This will present an OHSW risk to workers and sensitive receivers and to a greater extent is likely to give rise to an environmental nuisance. Emissions from CCA-treated timber are unlikely to give rise to an odour that would cause an environmental nuisance. The odour hazard posed by seasoned creosote-treated timber is lower, subject to climatic conditions, the volume of timber stored and the weathering of creosote-treated timber.

Treatment of treated timber by cutting, grinding or chipping may generate dust, which has the potential to be a hazard to human health and the environment.

Physical hazards
The nature of the timber stored presents a number of physical hazards, in that this material may be damaged or splintered leaving jagged or sharp material that is capable of causing injury.

The improper storage of treated timber can produce an unstable stockpile that may move and injure workers or cause damage to property and infrastructure. Storage pile stability should also consider potential impacts from the subgrade ground conditions, loading and unloading, disturbance, fire, etc. The EPA recommends that

"maximum stockpile heights for material management or resource recovery activities be in the range of 3-5 metres" (EPA 2009).

Slips, trips and falls are hazards presented by this material.

Timber posts removed from the vineyard may be associated with extraneous materials, including trellis wire, nails, clips and plastic flagging tape that may present hazards to those handling the posts or limit reuse or resource recovery options.

Siting, layout and amenity
The location of the treated timber storage area will require access by vehicles in order to transport posts to and from the storage area and equipment to move, load and bundle timber posts. Siting of the storage facility will need to consider the capacity and safety of access roads for the anticipated vehicle traffic and the proximity of a water supply for fire fighting.

Inadequate road access may restrict the size of the vehicle or times when the vehicle is able to access the stockpile, resulting in economic and functional inefficiencies. Equipment or vehicle damage and collisions may result from inadequate turning circles, working areas or traffic management being present. Failure to consider the local amenity when siting a storage area may result in complaints from the public affected by vehicle traffic on the access road, visual aspects, odour and dust.

An inadequate separation distance between the treated timber storage facility and sensitive land uses can result in complaints being received in relation to odour, dust or loss of visual amenity. The provision of an adequate separation distance between the treated timber storage facility and sensitive land uses acts as a primary control of potential adverse impacts (EPA 2007).

3.7.2 Common Risks in Transporting Treated Timber Waste

Many of the environmental hazards associated with storage of treated timber are also common to the storage at vineyards and the transportation of treated timber waste.

Fire
There is a hazard associated with treated timber waste catching on fire in transit. This may be the result of a mechanical fault associated with the transport vehicle, vehicle accident, arson, accidental ignition from a nearby source or chemical interaction in particular where the vehicle is transporting a range of materials (mixed load) or a flammable residue remains from a previous load.

There is a risk of fire associated with the transport of treated timber with additional flammable materials or potential ignition sources.

Leaching
Leaching is not a significant issue associated with the transport of dry treated timber in a covered vehicle.

An issue may arise if timber is stored within an uncovered vehicle and exposed to a series of prolonged rainfall events or is allowed to sit in water for an extended period of time.

Vermin, pests and animal hazards

It is important that the transport of timber does not aid the dispersal of pest plants or pest animals. Treated timber should be stored in a manner and managed so that vermin are controlled and the timber is kept free of pests and vermin. Soil should be removed from posts and where necessary posts must be cleaned or disinfected. Phylloxera can be spread in soil attached to posts and winery or vineyard equipment. Quarantine areas exist for the weed branched broomrape which can also be spread by soil attached to equipment, vehicles and posts.

Atmospheric Emissions (odour & vapour)

Odour management is a more significant issue with new timber, in particular, creosote-treated timber than it is with the transport of aged treated timber. Odour is only likely to be an issue where some new material is included within the treated timber and the load is retained near a sensitive receiver. For example, a truck loaded with treated timber including some new creosote-treated timber is parked outside of a residence during a period of hot weather.

The transport of dirty treated timber in an uncovered vehicle may result in the emission of dust (particulate matter), although this can be minimised by removing soil from posts prior to storage and ensuring that vehicle loads are enclosed.

Physical hazards

Hazards associated with the transport of treated timber are typical of those associated with the transport of many materials. All relevant aspects of road safety and transport legislation must be complied with. The treated timber must form a stable bundle so that the load does not shift during transport or spill from the vehicle. There are potential benefits if bundling of treated timber is standardised. The bindings must be of sufficient strength to secure the load and must not present a hazard to the operator should they snap. The treated timber must be loaded so that the vehicle is balanced and the load does not shift during transport. The vehicle must be loaded in accordance with the weight limit of the vehicle. Treated timber should be separated into the various timber treatment types prior to transport and be identified.

4 Further reading and resources

Internet

A useful source of information relating to research on the potential environmental impacts of CCA-treated timber is located at www.ccaresearch.org. This website is based at the Bill Hinkley Center for Solid and Hazardous Waste Management Hosted by the University of Florida, College of Engineering.

Guidelines and reports

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6 Glossary

CCA	Timber treated with Copper Chrome Arsenate, which acts to protect the timber from insect and fungal attack. The timber has a distinctive pale green colour that fades over time.
Creosote	Creosote is a mixture of organic compounds produced from the distillation of coal and blast furnace tar and is used as a timber preservative.
Drainage Line	A natural or artificially created channel in which stormwater or irrigation water flows.
EPA	Environment Protection Authority (South Australia)
General environmental duty	A person must not undertake an activity that pollutes, or might pollute, the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm. (Section 25 (1) Environment Protection Act 1993)
OHSW	Occupational Health, Safety and Welfare
Phylloxera	Is an aphid that attacks the roots of grapevines, reducing vine vitality and eventually killing the vine. South Australia is currently Phylloxera free. The insect may be transported in soil attached to posts and equipment.
SAWIA	South Australian Wine Industry Association
Stormwater	Defined in the EPA's Environment Protection (Water Quality) Policy 2003 as rain or melted precipitation that runs off land or structures on land.
Treated Timber Waste	For the purposes of these guidelines, this includes timber posts that have been treated with copper chrome arsenate (CCA) or creosote.
Watercourse	Defined in the EPA's Environment Protection (Water Quality) Policy 2003 as any of the following (whether or not temporarily dry): (a) a river, creek or other natural watercourse (whether modified or not); (b) a dam or reservoir that collects water flowing in a watercourse; (c) a lake, wetland or other body of water through which water flows: (d) the Coorong; (e) an artificial channel; (f) a public stormwater disposal system; (g) part of a watercourse.

Appendix 1 — Risk assessment tables

A risk level matrix was used to determine the level of risk associated with each hazard by multiplying the 'consequence' value with the 'likelihood value'. The resultant risk score was then assigned a qualitative level of risk as presented below.

Risk level matrix		Consequences				
		5 Major	4 Major to moderate	3 Moderate	2 Moderate to Minor	1 Minor
Likelihood	5 Very likely	25	20	15	10	5
	4 Likely	20	16	12	8	4
	3 Possible	15	12	9	6	3
	2 Unlikely	10	8	6	4	2

Code	Risk Treatment Key
	Very high level of risk (Scores 20-25) Management action planning essential. Unacceptable risk - if risk cannot be lowered, activity is to be avoided.
	High level of risk (Scores 11-19) Management Action planning & implementation required. Management responsibility specified. Consider alternatives. Monitoring.
	Moderate level of risk (Scores 5-10) Management responsibility needs to be specified. Monitoring and response procedures required.
	Low level of risk (Scores 1-4). Manage by routine procedures, signage, monitoring.

The risk assessment tables for vineyard storage of treated timber waste as developed by Golder Associates (2008) are given on the following pages. The table includes a risk rank for a 'typical' situation both before and after the application of risk management measures such as those described in this guideline.

Category	Specific Hazard	Comment	Likelihood Rank	Consequence Rank	Risk Rank	Likelihood Rank after management	Consequence Rank after management	"Residual" Risk Rank after management
VINEYARD STORAGE OF TREATED TIMBER WASTE								
Fire	Deliberate burning of treated timber waste by management or staff	Improper disposal method	3	3	9	1	3	3
	Act of arson	Un-authorized access to stockpile	3	5	15	2	4	8
	Stockpile ignited due to ember attack	Bushfire or burning off activity	2	5	10	1	3	3
	Stockpile ignition caused by machinery	Accidental ignition	3	5	15	2	3	6
	Fire contained within stockpile	No off site damage	3	3	9	2	3	6
	Fire spreads off site	Off site & off property damage	2	5	10	1	5	5
	Fire disrupts site activity	Temporary or permanent closure of treated timber waste storage area	3	4	12	2	3	6
	Resources required for fire fighting	Will be a required element	5	2	10	5	2	10
	Economic cost of a stockpile fire	Assuming limited damage on site	3	3	9	2	3	6

Category	Specific Hazard	Comment	Likelihood Rank	Consequence Rank	Risk Rank	Likelihood Rank after management	Consequence Rank after management	"Residual" Risk Rank after management
	Legal action resulting from fire related activity or practices.	Regulatory authority	3	3	9	2	2	4
	Toxic smoke generated by fire	Local population potentially at risk & fire fighters	3	4	12	3	4	12
	General fire risk		3	5	15	2	3	6
Leachate	Seepage into and pollution of groundwater and subsequent discharge of groundwater to surface water.	Consider hydrogeology and groundwater conditions	3	3	9	1	3	3
	Seepage into and pollution of groundwater, surface water and or soil.	Determined by site specific characteristics	3	4	12	2	3	6
	Cover system does not perform to expectation		2	3	6	2	2	4
Vermin Pests & animals	Vermin	Stockpile harbours, mice, rats or rabbits.	5	1	5	3	1	3
	Snakes present in the stockpile – potential to bite workers when disturbed.	Due to inherent risk associated with Brown/Tiger/Red Bellied black snakes – residual risk remains.	5	5	25	3	5	15

Category	Specific Hazard	Comment	Likelihood Rank	Consequence Rank	Risk Rank	Likelihood Rank after management	Consequence Rank after management	"Residual" Risk Rank after management
Odour, vapour& dust.	Vapour emission to atmosphere	Associated with storage of unseasoned or new creosote posts.	3	1	3	2	1	2
	Odour emission impacts upon receivers off-site	Associated with creosote posts & siting.	3	1	3	2	1	2
	Size reduction of timber generates dust	OHS&W issue for workers	3	4	12	1	2	2
Physical	Unstable stockpile causes damage/injury	OHS&W issue & may cause environmental or property damage	4	5	20	2	3	6
	Jagged edges & splintered posts	OHS&W issue for workers & handling issue	5	3	15	3	3	9
	Extraneous material present on posts	Wire & other foreign material can pose OHS&W issue	5	3	15	3	2	6
	Stormwater flow leading to on-site land disturbance, erosion or pooling.		4	3	12	2	2	4

Category	Specific Hazard	Comment	Likelihood Rank	Consequence Rank	Risk Rank	Likelihood Rank after management	Consequence Rank after management	"Residual" Risk Rank after management
Waste Management	Un-authorised site access.	Site fenced	3	2	6	2	2	4
	Failure of appropriate waste management system	Possible economic, environmental costs & increased generation of treated timber waste.	3	3	6	2	2	4
	Regulatory changes	Risk controlled by external agency	4	3	12	3	2	6
Siting, Layout & Amenity	Remnant vegetation destroyed or damaged		3	3	9	1	2	2
	Visual amenity issues in the area		2	2	4	1	2	2
	Community perception		3	2	6	2	2	4
	Adequate, all weather vehicle access	Includes provision for loading, unloading timber for transport & storage.	4	3	12	2	2	4
	Provision of adequate separation distance from sensitive receivers		4	2	8	2	1	2