Copper chromated arsenate (CCA) timber waste—storage and management

Updated March 2016[1]

EPA 572/16: This guideline offers advice to industry on the on-site management of CCA-treated timber waste.

Introduction

Several industries within South Australia—in particular viticulture but also building and aquaculture—use timber treated with copper chromated arsenate (CCA; commonly known as 'permapine'). Growing quantities of waste timber are being generated.

An economically and environmentally sound disposal technology for this waste timber is currently not available in South Australia, but appropriate options for the possible treatment, re-use and/or disposal are being considered by the relevant industries and the EPA.

This guideline identifies some indicators that authorised officers of the EPA will consider when inspecting a site and assessing the management and storage of waste CCA timber until better disposal alternatives are identified.

The SA Wine Industry Association (SAWIA) and Zero Waste SA (ZWSA) have been consulted in the development of this guideline.

Definitions

CCA	Copper chromated arsenate
Toxic	A toxic substance can be defined as one with an inherent ability to cause systemic damage to living organisms. Toxic substances occur in the air, soil and water and in other living things, and they can enter the body in various ways. Many substances are only toxic when, over defined times of exposure, specified amounts are exceeded.
APVMA	The Australian Pesticides and Veterinary Medicine Authority
ZWSA	Zero Waste South Australia
SAWIA	South Australian Wine Industry Association

1 Updated according to *Environment Protection (Water Quality) Policy 2015*

Background

Risks associated with the use and disposal of CCA timber have been reviewed internationally and within Australia (see www.epa.nsw.gov.au/pesticides/index.htm and www.ccaresearch.org). The SA EPA is also engaged in such a review. The Australian Pesticides and Veterinary Medicine Authority (APVMA 2003) published a review into timber treatments in 2005.

An economically and environmentally sound disposal technology for large quantities of CCA waste timber is not available in South Australia at this time.

Landfill disposal, as a long-term practice, is inconsistent with the Zero Waste SA strategic direction for waste management. Research in simulated landfill experiments indicates that the leachate from CCA timber may, under certain conditions, require treatment and may have the potential to contaminate ground-water (Jambeck et al. no date). Landfill sites that are not suitably engineered for leachate management carry a risk of breaching the Environment Protection (Water Quality) Policy 2015 (Water Quality EPP).

Clause 10.1 of the Water Quality EPP imposes an 'obligation not to discharge a class 1 pollutant (which includs timber preservatives) into any waters or onto land in a place from which it is reasonably likely to enter any waters (including by processes such as seepage or infiltration or carriage by wind, rain, sea spray or stormwater or by the rising of the water table).

Schedule 1, Part B of the Environment Protection Act 1993 (the Act) includes the components of CCA—arsenic, chromium and copper—and their compounds and solutions, as Listed Wastes.

Heavy metal leachate

Stockpiling CCA treated timber, and thus concentrating quantities, may increase the potential for leachate to contaminate soils and ground-water. When wet, CCA treated timber can produce a leachate that contains the heavy metals arsenic (As), chromium (Cr) and copper (Cu) (APVMA 2003).

These heavy metals can vary in their chemical speciation and chemical state of reactivity (oxidation state).

The Cr in CCA timber can exist in two oxidation states: the more mobile and toxic hexavalent chromate, Cr (VI); and the less mobile and less toxic trivalent chromium, Cr (III). Cr (VI) is readily released during the fixation period when freshly treated timber is curing. Although Cr (VI) can leach trace amounts under certain conditions, even when a 99% fixation level is achieved, Cr (III) is the principal form of chromium leachate (APVMA 2005).

Copper is released in the cationic form as divalent Cu (II). Copper is toxic to aquatic environments (APVMA 2005).

Arsenic is released in two oxidation states: the more toxic and mobile arsenite, As(III); and the less toxic and mobile arsenate, As(V). As(V) is the principal leachate but readily converts to As(III) in mild reducing conditions (e.g. in moist and anaerobic soil). Arsenic is a recognised carcinogen (level 1), teratogen and potential mutagen (NOHSC 1995; APVMA 2005). The leachate consists predominantly of inorganic arsenic speciation; however, these can convert to organic forms, particularly in aged timber, or in certain soils (Solo-Gabriele et al. 2003).

Relative concentrations of the three metals may vary between formulations of CCA used to treat timber, but generally chromium is present in the highest concentration, followed by arsenic and then copper (Sinclair Knight Merz 1999).

Leachate generation depends on many variables, such as manufacture quality control standards, the time interval since treatment, temperature, timber density, humidity, and rainfall (APVMA 2005; Lebow et al. 2004). Rates of leachate mobility depend on the chemical speciation of the leachate on reaction with the soil environment, as well as a range of variables such as soil pH, soil composition and texture, rainfall, and hydrology. Phosphorus competes with arsenic chemistry, with phosphorus being generally more reactive. The presence of phosphorus can release arsenic in ion exchange and hence increase arsenic mobility in soils. Data is not yet available to quantify the rates and magnitudes of leachate generation under varying conditions, (Lebow et al 2004) and hence risk assessments need to be site specific.

Chipping and mulching increases the surface area of the timber and can produce more concentrated leachate under certain conditions (Jacobi et al. no date).

Dry, oxygenated, organic-rich soils generate lower mobility than reductive, saturated, sandy soils. Clays readily capture many As(III) and As(V) ions and hence reduce mobility. Organic materials in soils also facilitate the binding of arsenic and hence the reduction of mobility (Belluck et al. 2003). Iron oxides/hydroxides have also been recognised as binding agents (APVMA, 2005). Trivalent chromium will not be generally oxidised to Cr(VI) with one exception—manganese oxides in soil can oxidise Cr(III) to Cr(VI) (Solo-Gabriele et al, 2003). Organic acids can facilitate leaching (Lebow et al 2004).

These factors may affect risk assessments for some small stockpiles in low rainfall conditions and low water-table environments.

Toxic gas and ash

Combustion releases toxic gases and toxic residual ash. Some gas (arsenic trioxide) can be released at temperatures as low as 200°C (Helsen and Van den Bulck no date; CRESA 2002). The residual ash would contain concentrations of arsenic and hexavalent chromium, as Cr(III) readily converts to Cr(VI) during combustion (Solo-Gabriele et al. 2003). These heavy metals present risks to ground- and surface-water quality, human and animal health, and soil quality. Accumulation of these heavy metals may make the land unsuitable for agriculture. The ash also may be attractive to live stock due to the salty taste (Environmental Health Unit 2003).

Waste management

The viticulture industry is one of the largest users of CCA timber in SA and consequently generates significant quantities of waste CCA timber requiring management and disposal (Sinclair Knight Merz 1999). Waste CCA timber posts generated by this industry are being stockpiled at various sites and in increasing volumes; the quantity can be expected to continue increasing in the short to mid term, with exponential growth in the longer term. The growing volume of waste CCA timber requiring disposal generates serious implications for landfill. Projected volumes of waste CCA timber present values in the order of 150,000 m3 per year (Sinclair Knight Merz 1999).

The aquaculture industry also uses quantities of CCA-treated timber and should give consideration to appropriate waste disposal. The EPA’s Aquaculture Branch is currently developing further industry-specific information.

Interim management

Given the recent global reviews of CCA-treated timber for toxicity risk assessment and leachate generation, the EPA promotes precautionary management of waste CCA timber.

Landfill options do not provide long-term solutions that support a zero waste management strategy. Due to leachate generation, only suitably engineered and licensed landfills should accept waste CCA-treated timber.

Combustion is an unacceptable polluting practice.

The EPA will not endorse burning permits (pursuant to the Environmental Protection (Burning) Policy 1994, or the Country Fires Act 1989), when there is a potential that preservative treated timber may be burnt.

Waste management process, such as vineyard clearing, require material sorting. The preservative treated timber, the organics, the plastics, and any other materials need to be separated and disposed of appropriately.

The storage of waste CCA timber (as a temporary means of management) is to be managed on a site-specific basis. The EPA recommends that sites develop their own waste management plans, which should consider and address the following sound management practices:

- Ensure that waste CCA timber is sorted and stored separately from other material.
- Pack the waste CCA timber onto pallets, into dedicated waste bins, or in readily accessible stockpiles.

- Keep the waste CCA timber as dry as possible.
- Store larger quantities of waste CCA timber in appropriately constructed roofed and bunded structures (see EPA Guideline Bunding and spill management, www.epa.sa.gov.au/pdfs/guide_bunding.pdf
- Keep smaller quantities in plastic heat-shrink wrap on packed pallets, bins with lids, or covered with canvas tarpaulins.
- Elevate stockpiles above the ground surface. Storing small quantities on high ground may be an acceptable interim measure in some environments.
- Make provision for the future handling and transportation of the waste CCA timber.
- Improve ground water protection with the use of a sealed base (e.g. clay liner), bunding, and leachate collection. (Leachate may require concentration and collection by an EPA-licensed waste transporter.)
- Do not locate large stockpiles of the material on unlined surfaces, exposed to the weather, in pooling water, in areas subject to storm water run-off, or on saturated soils.
- Maintain a firebreak zone around the storage area and keep fire fighting resources readily accessible.
- Address potential fire hazards and the risks associated with contaminated ash and the release of arsenic trioxide.
- Develop a fire fighting strategy and ensure clear fire fighting access.
- Do not locate stockpiles in grasslands or surrounded by combustible materials.
- Recognise the following hierarchy in the waste management plan: Avoidance—Reduction—Reuse—Recycling—Recovery—Treatment—Disposal.

References

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Disclaimer

Further information

Legislation

Online legislation is freely available. Copies of legislation are available for purchase from:

Service SA Government Legislation Outlet
Adelaide Service SA Centre
108 North Terrace
Adelaide SA 5000

Telephone:	13 23 24
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General information

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