Management of asbestos in recovered fines and recovered materials for beneficial reuse in NSW

Discussion Paper

June 2024

Contents

Acronyms

ACD	Asbestos-contaminated dust or debris
ACM	Asbestos-containing material
AF	Asbestos fines
ASEA	Asbestos Safety and Eradication Agency
C&D	Construction and demolition
CLM Act	Contaminated Land Management Act 1997
EER	Excess exposure risk
EPA	Environment Protection Agency
EU	European Union
f/mL	Fibres/mL
FA	Fibrous asbestos
HACCP	Hazard Analysis, Critical Control Points
HSL	Health Screening Level
LFAI	Loose fill asbestos insulation
NACC	NSW Asbestos Coordination Committee
NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999
NHMRC	National Health and Medical Research Council
NOA	Naturally occurring asbestos
NSW	New South Wales
OCSE	Office of the Chief Scientist & Engineer
QA/QC	Quality assurance/quality control
TOR	Terms of Reference
w/w	Weight/weight
WA	Western Australia
WA DOH	Western Australian Department of Health
WA DWER	Western Australian Department of Water and Environmental Regulation
WHO	World Health Organization
WHS	Work health and safety

1. Introduction

1.1 Overview

In December 2022, the Office of the NSW Chief Scientist & Engineer (OCSE) was requested by the then Minister for the Environment to provide independent advice in relation to the safe and effective management of asbestos in recovered fines and other recovered material for their beneficial reuse. The Terms of Reference (TOR) for this OCSE review (the Review) (see attachment) includes:

- reviewing national and international approaches to managing asbestos in recovered fines and materials, including where tolerable threshold level for asbestos have been established and the basis behind these approaches
- considering the use of tolerable threshold levels for asbestos in waste intended for beneficial use including the robustness and evidence supporting the levels and under what circumstances they can be implemented
- potential approaches to sampling and analysis of asbestos in recovered material
- the applicability of existing tolerable threshold levels in asbestos-contaminated soils
- other potential approaches to managing asbestos in recovered material
- the scientific and risk assessment principles that should be considered when setting thresholds.

There are several impetuses for this Review. In 2021, the NSW Environmental Protection Authority (NSW EPA) commissioned an independent review of the resource recovery framework (NSW EPA, 2023c). The objective was to review the current NSW waste and resource recovery framework and consider how it protects human health, allows for a beneficial resource recovery framework facilitating circular economy outcomes and provides transparency, clarity and enforceability. The management of asbestos in waste and recovered materials was considered as part of the review with the final report recommending (Wilkinson, n.d.):

> ***Recommendation 20****: A scientific expert external to the EPA should review and provide advice on the NSW approach to management of asbestos contaminants in waste and recovered material. The review should include, but not necessarily be limited to protection human health and the environment and considerations of opportunities and constraints of beneficial reuse.*

The NSW Asbestos Coordination Committee (NACC), which has an independent chair and consists of several NSW agencies and organisations, has been established to improve the management, monitoring and response to asbestos issues (NSW Government, n.d.). To inform future improvements to asbestos management in waste intended for beneficial reuse, the NACC considers there is a need for an improved evidence base on the risk tolerance, health and environmental impacts, technologies and cost-effective methods.

Further, in late 2021 NSW EPA proposed changes to the Recovered Fines and Soils Orders and Exemption (NSW EPA, 2022b). These changes aimed to improve compliance and included requirements for record keeping, notification, quality assurance/control, and sampling and testing (NSW EPA, 2022c). During consultation, stakeholders raised concerns about the ability to comply with the requirements and potential cost and suggested that the proposed changes would have a perverse impact on recycling and recovery. Due to these concerns NSW EPA undertook to examine other ways to improve compliance.

1.2 Purpose of the Review

The purpose of the Review is to evaluate any scientific evidence that would support alternative approaches to managing asbestos in recovered material and fines, particularly the potential adoption of thresholds as opposed to the current zero-tolerance approach. The Review is not an examination of the current policy or alternative policy approaches, nor an investigation of previous compliance issues.

However, information from this Review could be considered in any future review of policies and regulations.

1.3 Review Process

The methodology for this Review follows established OCSE principles and procedures for independent reviews to deliver formal advice on issues and challenges as requested by the Premier and Ministers. OCSE has and will continue to undertake activities providing quantitative and qualitative data to inform the Review. OCSE has established an Expert Panel to provide advice and direction for the Review. The Expert Panel comprises field experts with a range of expertise relevant to the TOR for the Review and includes Linda Apthorpe (University of Wollongong), Dr Liyaning Maggie Tang (University of Newcastle), Pierina Otness (Western Australia, Health) and Prof. Timothy McCarthy (University of Wollongong). The Expert Panel supports the Review team by providing advice and analysis, evaluation of submissions, steering the Review, and assisting in identifying information that may be required.

Further, two independent literature reviews have been commissioned:

- Review of National and International Standards and Guidelines for Asbestos in Waste
- Review of Sampling and Analysis of Asbestos in Recovered Material

Preliminary research, stakeholder discussions, site visits and initial findings from the independent literature reviews were used to develop this discussion paper (this paper).

Guided by the Expert Panel, the Final Report will be informed by and draw on information from stakeholder submissions and consultations (including site visits), literature reviews and research, and expert advice outside of the Expert Panel, all of which are important aspects of the Review.

1.4 Purpose of discussion paper

The purpose of this paper is to present the preliminary research and provide guidance for stakeholders wishing to make submissions in response to the TOR. This paper:

- sets out some background information on asbestos and its management in waste and soil of relevance to the TOR
- provides a snapshot of national and international standards and guidelines for asbestos threshold levels in an environmental context
- presents the initial findings from a review of existing asbestos sampling and analytical methodologies
- defines the scope of initial research to date against each of the TOR and aims to engage and seek input from stakeholders and other experts in the field on this initial work
- seeks to facilitate discussion around key questions posed within this paper, which will then help inform the Review Final Report.

When providing input or feedback, it is recommended that stakeholders and other interested parties read this paper in its entirety before considering the questions asked.

2. Asbestos overview

2.1 Types and sources of asbestos

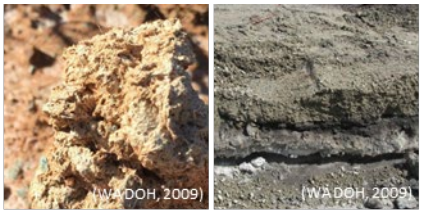
In this paper, asbestos refers to a group of naturally occurring mineral fibres with asbestiform habit[1] found in commercial products. This is to be differentiated from the term naturally occurring asbestos (NOA), which refers to asbestos naturally present in soils or rocks. Less than 1% of the land in NSW is estimated to contain NOA within 10 metres of the ground surface (SafeWork NSW, n.d.).

Asbestos mineral fibres can be classified into two main groups: serpentine (chrysotile, also known as white asbestos) and amphibole. Chrysotile is the most used form of asbestos in commercial asbestos products. Amphibole asbestos includes amosite (brown asbestos), crocidolite (blue asbestos), and a number of less known types such as tremolite, actinolite and anthophyllite. Although both groups are classified as carcinogenic (IARC, 1977), amphibole forms are more potent than chrysotile (Bernstein, et al., 2010).

Asbestos products, also known as asbestos-containing materials (ACM), can be present in the form of bonded (non-friable) asbestos and friable asbestos. Bonded asbestos refers to asbestos fibres that are embedded in solid matrix such as cement or resin that is greater than 7mm x 7mm and in good condition (NEPC, 2013b). Bonded asbestos does not readily release free asbestos fibres until it loses its matrix integrity when disturbed, damaged or severely weathered. It can be detected with visual inspection. Examples of common non-friable asbestos products include asbestos cement, asbestos cement sheeting (known as 'fibro') and vinyl asbestos flooring tiles.

Fibrous asbestos (FA) includes loose insulation or any other material that has become degraded to a friable condition (NEPC, 2013b). Examples of common friable asbestos products include pipe insulations, asbestos rope, and loose-fill asbestos insulation (LFAI) in ceiling spaces. When dry, FA can be easily reduced to a powder if crumbled or crushed by hand. Like bonded ACM, it can often be detected visually. Two other terms that are often used are asbestos-contaminated dust or debris (ACD) and asbestos fines (AF) (Safe Work Australia, 2013b; WA DOH, 2009). AF are used in assessments of asbestos in soil to describe any asbestos that is less than 7mm x 7mm, including free fibres of asbestos, small fibre bundles and ACM fragments resulting from degraded, broken, damaged bonded ACM or FA (NEPC, 2013b). Often, minor amounts of AF and ACD are found with non-friable asbestos. FA, ACD and AF have a friable nature and thus have higher potential to generate or be associated with free asbestos fibres. Figure 1 shows these materials.

[1] Asbestiform habit refers to the tendency of fibres to split longitudinally when subjected to mechanical action, forming finer fibres that maintain a high length-to-width aspect ratio.



Friable (fibrous) asbestos (FA)
whole or partly friable
can be crumbled by hand pressure
may be visibly distinguished in soil and mixed waste

Non-friable (bonded) ACM
most common

Asbestos fines (AF) – based on size
(less than 7 x 7 mm)
loose fibre bundles, small pieces of friable and non-friable material

Asbestos-contaminated dust or debris (ACD)
dust or debris that has settled, and is, or assumed to be, contaminated with asbestos

Figure 1: Examples of asbestos materials: friable (fibrous asbestos) (FA), non-friable (bonded) ACM and asbestos fines (AF) (photos from (WA DOH, 2009)), and asbestos-contaminated dust or debris (ACD) (photo showing asbestos-resin board dust in an electrical switchbox from (ASEA, 2022)).

2.2 Asbestos exposure

Asbestos can pose a health risk primarily through the inhalation of respirable fibres. Generally, these fibres are extremely small, measuring less than 3 micrometres in diameter, greater than 5 micrometres in length and with length-to-width aspect ratios of at least 3:1 ([NOHSC: 3003 (2005)]). When inhaled, they can settle in the lower regions of the lungs. Over time, these fibres can lead to lung tissue scarring, known as asbestosis, an inflammatory condition resulting in permanent lung damage. Other molecular and cellular interactions may also cause various cancers, including lung cancer and mesothelioma, an incurable cancer affecting the lining of organs such as the lungs.

Asbestos is a non-threshold carcinogen. The World Health Organization (WHO) notes that there is no known safe level of asbestos exposure (WHO, 2000). This means that there is no identified dose or exposure level below which cancer will not occur. The risk of developing an asbestos-related disease depends on the inhaled dose, represented by the amount of airborne respirable asbestos and duration of exposure. Although every population group is exposed to asbestos at some level, the disease risk is low to very low for most of the population.

The public is generally exposed to low level of asbestos fibres in the air. The typical ambient or background asbestos exposure is 0.0005 fibre/mL (f/mL) outdoor and 0.0002 f/mL indoor (Safe Work Australia, 2013a). Assuming the daily inhalation volume for an average adult is 22 m^3 and time spent indoors is 20 hours/day, a person may breathe up to 5,500 fibres per day (Safe Work Australia, 2013a).

The population group at greatest risk of exposure is those working with asbestos at their workplace (i.e. occupational exposure). Significant exposure can also occur in non-occupational settings, including DIY renovators, people who live near a demolition site, close contacts of occupationally exposed individuals and people exposed to environmental contamination.

The concentration of respirable fibres in occupational and non-occupational settings depends on the materials involved and the type of activities conducted. For instance, using power tools and breaking asbestos-containing materials in poorly ventilated areas without proper PPE can result in unacceptable exposure for workers and renovators (ASEA, 2016).

Although there is no safe level of asbestos exposure, workplace and environmental protection laws rely heavily on guideline values to manage risks to human health and the environment.

The current maximum workplace exposure standard for respirable asbestos in Australia is 0.1 f/mL over an eight-hour period (Safe Work Australia, 2024). Exposure to asbestos at this level has been estimated to cause an additional 125 cases of cancer during a lifetime per 100,000 people (ECHA RAC, 2021). In the European Union (EU), the comparable limit of 0.1f/mL was derived from an exposure-risk relationship based on studies carried out across EU countries for the years 2011-2016. This relationship expresses the excess risk for combined lung cancer and mesothelioma mortality as a function of the fibre concentration in the air. It is calculated for all types of asbestos by combining all studies, regardless of the asbestos fibre type to which the working population is exposed (ECHA, 2021).

Airborne asbestos exposure monitoring in workplaces is undertaken according to the Guidance note on the membrane filter method for estimating airborne asbestos fibres ([NOHSC: 3003 (2005)]). The sample is collected by drawing a measured quantity of air through a membrane filter. The respirable fibres on the filter are counted using a phase contrast microscope. The limit of detection of this method is 0.01 f/mL.

Asbestos fibres can be released into the water supply when reinforced pipes deteriorate. This can create an ingestion risk through activities like drinking, bathing and cleaning. WHO currently does not consider the ingestion of asbestos in drinking water as a significant risk to human health (WHO, 2021). In Australia, the asbestos content in drinking water is not monitored because there is insufficient evidence that it causes cancer when ingested (NHMRC, NRMMC, 2011).

In soil, asbestos contamination is only considered hazardous when respirable fibres are released into the air upon disturbance. The amount of respirable fibre released into the environment depends on the type and quantity of ACM, soil type, moisture content, soil movement and the presence of a soil cap such as building or vegetation (Swartjes & Tromp, 2008). Trials have shown a soil level of 0.01% for friable asbestos is likely to keep airborne levels below 0.001 f/ml and more likely to 0.0001 f/ml (Swartjes & Tromp, 2008). Note that this study relates to contamination from commercial asbestos, as NOA can be different. Bonded asbestos in general releases respirable fibre lower than the reporting limit of NOSHC:3003 (2005) method, even when the soil is disturbed during remediation activities (Pickford, Apthorpe, Alamango, Conaty, & Rhyder, 2004).

2.3 Thresholds and screening levels

Various thresholds are in use across jurisdictions to manage exposure and risk related to handling and managing asbestos-containing materials. Their purpose, methodology and basis for use vary widely.

In health science, a threshold is defined as the lowest dose of a chemical at which a specified measurable effect is observed and below which it is not observed (Environmental Health Standing Committee (enHealth), 2012). In occupational and environmental toxicology terms, threshold is defined as the maximum exposure to a chemical that causes a defined form of toxicity at which toxicity does not occur (Aldridge, 1995).

The use of the term ‘threshold’ in other contexts varies and may reflect a screening level or limit above which certain actions are triggered. In the context of managing asbestos in soil and waste, generally a screening level is a set value upon which further investigation and a risk-based assessment may be allowed. A threshold value may not be consistent with a workable set value upon which an action is required (e.g. disposal to landfill). Applying a threshold as a screening value would be a conservative approach.

When managing asbestos in soil in Australia, the threshold concept is specifically referred to as a Health Screening Level (HSL) – the concentration of a contaminate above which further appropriate investigation and evaluation will be required (NEPC, 2013a).

Table 1 outlines some of the known Australian examples of thresholds/limits used for asbestos management and the basis from which they were derived and are applied. Further information on these thresholds/limits is presented later in this paper.

Table 1: Examples of thresholds/screening levels for asbestos

Application	Jurisdiction	Asbestos 'threshold'	Derived from/basis for
Asbestos in waste for reuse	WA	0.001% weight/weight (w/w) fibres	Based on WA Soil Guidelines (WA DOH, 2009). Threshold not a standalone – combined with various risk-based processes. Focus is more as an indicator of success of quality assurance/quality control (QA/QC) processes to keep asbestos out. Threshold is for characterising recycled construction and demolition (C&D) waste. If beyond this threshold, it is categorised as controlled waste.
Soil	Australia	0.001% w/w (AF and FA) bonded asbestos: 0.01% w/w (residential, low density) 0.04% w/w (residential, with limited soil access) 0.02% w/w (open spaces) 0.05% w/w (commercial/industrial)	Detailed in the National Environment Protection (Assessment of Site Contamination) Measure. Refers to WA Soil Guidelines and Dutch study (Swartjes & Tromp, 2008) adjusted for Australian conditions and NEPM exposure scenarios. Screening level is Health Screening Level (HSL) – the concentration above which further appropriate investigation and evaluation is required.
Soil	WA	0.001% w/w (AF and FA) 0.01% w/w (bonded asbestos)	
Occupational/ workplace exposure standard	Australia	0.1 f/mL over 8 hours	Asbestos is a non-threshold carcinogen (i.e. no health-based occupational exposure limit (OEL) can be identified). Therefore, an exposure/risk relationship is derived which expresses the excess exposure risk (EER) for lung cancer and mesothelioma mortality as a function of the airborne asbestos fibre concentration. The EER is calculated based on all types of asbestos by combining all studies regardless of the asbestos type and the working population that was exposed.

Application	Jurisdiction	Asbestos 'threshold'	Derived from/basis for
Clearance monitoring – friable asbestos removal work	NSW WHS 2017 (Reg 477 (4) /Australia	0.01 f/mL	Clearance level for friable removal enclosures
Import of asbestos materials	Australia	Detection limit based on AS4964 (i.e. limit of reporting for reference method of an Australian or Internationally accredited laboratory)	Asbestos (abf.gov.au) Customs (Prohibited Imports) Regulations 1956 and custons (Prohibited Exports) Regulations 1958

Question 1: *What factors should be considered when deriving a threshold or screening level for asbestos in recovered fines and material for beneficial reuse?*

3. Asbestos and waste

As noted in the TOR for this Review, asbestos waste in NSW cannot be reused or recycled in any form or any concentration. Further, asbestos waste cannot be processed, screened or segregated. As such, all asbestos waste or waste containing asbestos must be disposed of at a landfill licensed to receive the waste.

This section will provide:

- an overview of how asbestos waste and waste containing asbestos is managed in NSW
- preliminary information about volumes and types of waste with asbestos
- an overview of managing waste at recycling facilities
- types of products produced at recycling facilities.

3.1 Management of asbestos

Australia commenced phasing out the use of asbestos in the 1980s and by 2003 its use, sale and import was banned (NSW Government, n.d.). Prior to the ban, the physical and chemical properties of asbestos, (i.e. resistance to heat, wear, alkalis and acids and its flexibility) made it attractive for use across a number of industries, including construction and vehicles. Asbestos is still likely to be found in homes and buildings built prior to 1990, presenting a significant issue when demolishing, renovating and repairing. In 2021, it was estimated that 6.4 million tonnes of legacy asbestos remain in the built environment, with 4.9 million tonnes estimated to remain in 2030 (ASEA, 2024a).

All three levels of government have a role in asbestos management and ensuring the ban on the use, sale and importation of asbestos. An overview of the roles and responsibility of NSW Government agencies in managing asbestos is presented in *Asbestos Blueprint: A Guide to the Roles and Responsibilities of Government Agencies in NSW* (SafeWork NSW, 2017).

Under the *Protection of the Environment Operations Act 1997*, no asbestos waste can be reused or recycled. Asbestos waste means any waste that contains asbestos, with asbestos defined as "*the fibrous form of those minerals that being to the serpentine or amphibole groups of rock-forming minerals, including actinolite, amosite (brown asbestos), anthophyllite, chrysotile (white asbestos), crocidolite (blue asbestos) and tremolite*" (NSW Government, 2024), i.e. all forms of asbestos. This requirement is reflected in the notes of the resource recovery orders and exemptions (NSW EPA, 2022a). As such all asbestos waste, or waste containing any level of asbestos, must be sent to a landfill that accepts asbestos waste.

3.2 Volumes of asbestos waste

Asbestos is often found in construction and demolition (C&D) waste from old building demolitions or legacy asbestos contamination in soil. In NSW, the C&D waste stream accounted for the largest proportion of both wastes generated and recycled. In 2019-20, the amount of C&D waste generated was 12.5 million tonnes, of which almost 80% was recovered and thus diverted from landfill. However, even at this rate, the non-putrescible landfills at Greater Sydney which accept inert C&D wastes are expected to reach their capacity by 2028 (NSW DPIE, 2021).

There are two waste streams for asbestos waste. These include ACM that has been removed, wrapped and disposed in accordance with work health and safety (WHS) requirements (SafeWork NSW, 2022) and any waste including soil that is contaminated with asbestos at any concentrations. In 2022-23, for instance, the amount of asbestos waste disposed in NSW was 0.8 million tonnes: 0.2 million tonnes wrapped ACM and 0.6 million tonnes asbestos-contaminated soils (ASEA, 2024b). This accounts for 69% of total reported asbestos waste in Australia (1.2 million tonnes) (ASEA, 2024b). The reported number is likely an underestimate because it does not include data from illegal dumping or asbestos detected at resource recovery facilities.

Furthermore, the volume of asbestos-contaminated soil is much larger than that of wrapped ACM, reducing the potential availability of landfill space for ageing ACM still present in the built environment. Therefore, there is an urgent need for proper asbestos removal and disposal to minimise asbestos

contamination, reduce the amount of asbestos waste going to landfill and allow for greater recovery of materials for beneficial reuse.

As part of the Review, more in-depth data to inform the Review, particularly in relation to C&D waste and recycling and volumes of asbestos waste, will be explored.

3.3 Asbestos waste management at recycling facilities

This section provides an overview of C&D waste at recycling facilities, with a focus on asbestos. It is based on initial site visits to recycling facilities and will be further explored through responses to this discussion paper, further stakeholder consultation and further site visits.

A number of measures exist to minimise the presence of asbestos in C&D waste prior to being received at recycling facilities, including identifying ACM and safely removing it from other C&D waste. After removal, C&D waste is re-inspected to ensure ACM has been removed. Further guidance on managing risks associated with demolition work is provided in SafeWork NSW's publication *Code of Practice – Demolition Work* (SafeWork NSW, 2019).

The incoming C&D waste stream to recycling facilities typically consists of either source-separated waste or mixed waste. Commercial demolition waste is largely source separated, while mixed waste often originates from skip bin waste from residential C&D and commercial construction fitouts. The accepted materials include asphalt, bricks, concrete, ceramics, soil and timber and should not include hazardous materials such as asbestos.

To ensure the quality of materials recovered from C&D waste, recycling facilities implement a two-point inspection for asbestos waste and other contaminants arriving at the facility, as outlined in the publication *Standards for managing construction waste in NSW* (NSW EPA, 2019). The two-point inspection is carried out visually. At the first point, the top of each load is inspected from an elevated inspection point either manually or using a video camera. If the load passes this initial inspection, it must undergo another inspection, where it is tipped and spread at the second point and further inspected visually.

Should asbestos or other contaminants be detected at either inspection point, the entire load is rejected. The driver is then instructed to leave the facility and the details of the load and vehicle are logged in the facility's rejected load register. The rejected load register is kept for internal company records only and can be supplied for EPA review when requested.

Although visual inspections are the norm, they may not be sufficient to ensure complete asbestos removal from the processed waste stream. This is partly because the visual inspections rely on manual labour and appropriately trained personnel. Asbestos may be embedded within concrete or only visible from certain sides, and identifying ACM in mixed waste stream is particularly challenging. Consequently, there is a chance that asbestos may be found in the stockpile during or after processing.

To manage unexpected finds of asbestos, recycling facilities establish their own procedures for safe asbestos removal. However, there are uncertainties about what constitutes a stockpile, particularly when only a small fragment of bonded ACM is found. It is important to note that in NSW the practice of hand picking to remove visible asbestos fragments is not allowed as a remedial approach for asbestos-contaminated stockpile (NSW EPA, 2023a).

The inspected and sorted waste is then classified into an individually listed waste type, such as asphalt, bricks or concrete, soil and mixed C&D waste including residues from the processing of skip bin waste. The materials can be recovered if they meet the resource recovery order requirements, ensuring they are safe for beneficial reuse. These requirements vary depending on the materials, but may include implementing risk management protocols, sampling and testing to validate the process and ensure compliance with regulated chemicals and material properties, notifying material specifications to customer, maintaining records and reporting to the regulator.

The customer then uses the materials as set out in the resource recovery exemption, which may specify where and at what condition the recovered material can be applied to land. Land application means applying to land by depositing on the land, mixing into the land or filling the land for roadmaking,

building, landscaping or construction purposes (NSW EPA, 2021). Examples of the end use or reuse of materials include road bases, aggregates, bedding sand, crushed concrete, cement, sandstone and soils.

While the focus of this Review is primarily on C&D waste, OCSE is aware asbestos may be present in other materials. As noted previously, this is reflected in the notes of the resource recovery orders and exemptions and is highlighted by the recent detection of asbestos in mulch in NSW and other states.

***Question 2**: Can you provide any data on annual volumes of C&D waste being recycled or alternatively sent to landfill? Data on rejected loads due to asbestos presence and any other data related to all TOR items is welcomed.*

***Question 3**: Can you provide any other information on the potential presence of asbestos in recycled C&D material?*

i. Information on the methods of separating and removing asbestos from waste that can inform alternative approaches?
ii. What reuse scenarios are there for recycled waste, including end-products and their use?

***Question 4**: While this section focuses on C&D waste, are there other waste types which are suitable for beneficial reuse which have the potential to be contaminated with asbestos?*

4. Management of asbestos in soils

This section focuses on managing asbestos in soils as it relates to the TOR for this Review, providing an overview of thresholds and processes used. Land that is contaminated because of poor historical on-site management of asbestos materials is generally regulated under the *Contaminated Land Management Act 1997* (CLM Act). Whereas land that is contaminated because of an off-site asbestos waste source is generally regulated under the POEO Act and associated waste regulation (NSW EPA, 2023b).

Detailed guidance on managing asbestos is soils is outlined in the publication *Managing Asbestos in or on Soil* (SafeWork NSW, 2014). This guidance mainly applies to legacies from poor historical onsite management of asbestos materials, and not to illegal disposal or landfilling activities related to waste generated offsite.

Soil containing asbestos cannot be remediated and taken offsite for reuse. If taken offsite, soil containing asbestos is treated as waste. In some circumstances under the contaminated land regulatory framework, asbestos-contaminated soils can be managed and reused onsite.

When managing asbestos in or on soils a risk-based approach is taken ensuring controls are proportionate, practical and applied according to regulatory requirement commensurate with the actual risk (SafeWork NSW, 2014). When managing asbestos in or on soil the following factors should be considered:

- form of asbestos-containing material and the potential to generate airborne fibres
- extent and scale of asbestos contamination
- location of the asbestos, whether is it on the surface or buried
- current and future use of the land and whether these uses will affect the risk associated with the asbestos-containing material.

Figure 2 provides an overview of the process chart when managing asbestos in or on soils.

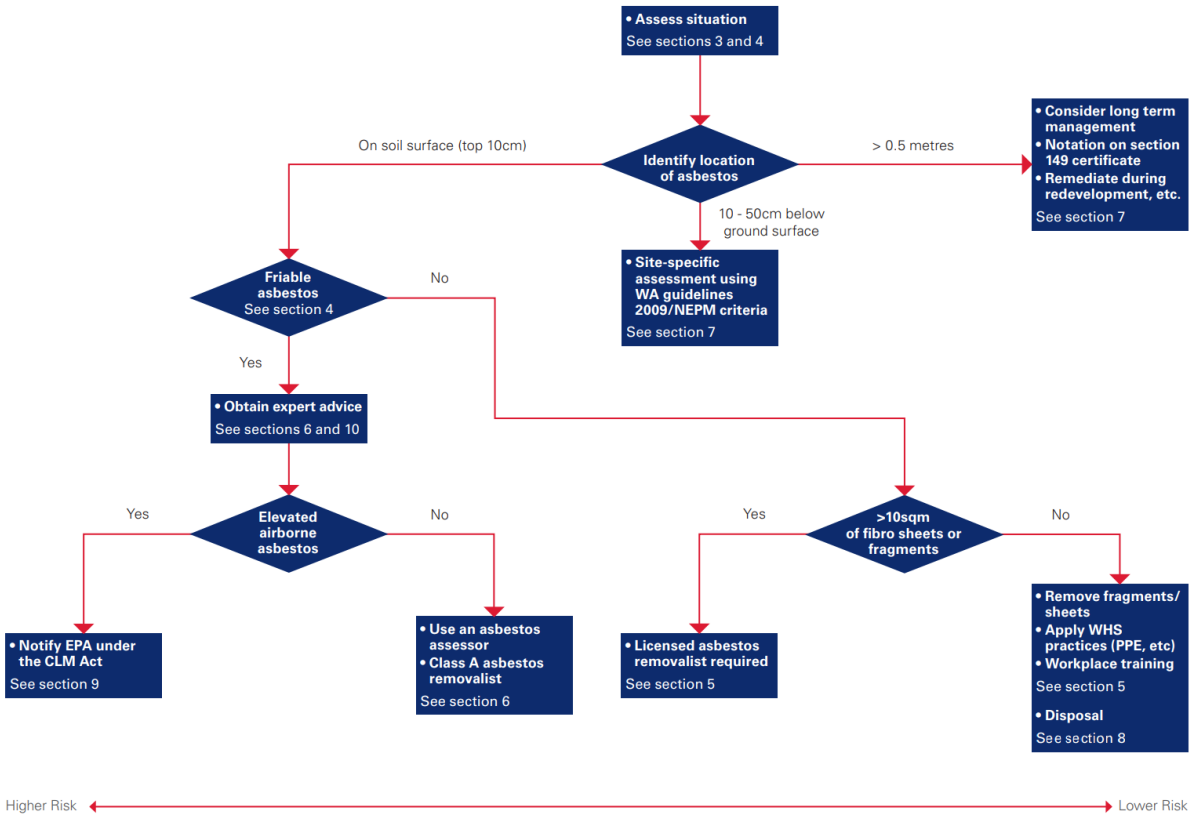


Figure 2 A process chart from the guide: Managing Asbestos in or on Soil (SafeWork NSW, 2014). Note that the section references in the chart refer to the sections in the guide, and some information may not be the most recent information. (e.g. section 149 planning certificates are now called section 10.7 certificates under Environmental Planning and Assessment Act 1979).

Where non-friable asbestos (fibro) is present on the surface of soil around homes, it can be hand-picked, tiled or screened, ensuring work health and safety practices are followed. Collected material must be securely wrapped and taken to a landfill that can lawfully receive asbestos waste.

Where non-friable asbestos fragments are present at a workplace, all workers handling asbestos must be appropriately trained. For non-friable asbestos fragments present in an area greater than 10 m^2, a licensed asbestos removalist must be used to remove the asbestos. Soil sampling for the detection of asbestos fibres is not required where the non-friable asbestos is in good condition. For more complex sites, an independent expert should advise on the assessment and remediation of the asbestos-contaminated soils and application of the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (NEPM) (NEPC, 2013a).

Where friable asbestos is identified, the site should be isolated and action taken to prevent disturbing the area and generating airborne asbestos fibres. An independent expert should be engaged to provide specialist management advice.

Where either non-friable or friable asbestos is present at a depth greater than 0.5 metres, the asbestos material should not be disturbed. If site remediation, redevelopment or site management is proposed, assessment and remediation should be undertaken in accordance with the contaminated land management framework, including the application of guidelines such as *Consultants reporting on contaminated land: Contaminated land guidelines* (NSW EPA, 2020) and NEPM (NEPC, 2013a).

Where asbestos is present in soil between 10 cm and 0.5 metres, a site-specific assessment should be undertaken to determine the management strategy. For more complex sites where the asbestos is spread throughout the soil, an assessment should be undertaken to determine the extent of the contamination and where remediation might be required.

Health Screening Levels (HSLs) have been identified to assist with managing asbestos in soils (Table 2). A HSL is a concentration of a contaminant above which further appropriate investigation and evaluation will be required (NEPC, 2013a). These HSLs are applied to specific scenarios based on likely exposure and are taken from the Western Australian Department of Health (WA DOH) *Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia* (WA Soil Guidelines) (WA DOH, 2009). WA DOH adopted the values based on a Dutch study (Swartjes & Tromp, 2008) and adjusted them based on Australian soil conditions. The findings of the study will be presented in more detail in the next section.

Table 2: Asbestos in soil screening levels (Australian Government, 2013)

Form	Residential A[1]	Residential B[2]	Recreational C[3]	Commercial/Industrial D[4]
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF[5]	0.001%			
All forms of asbestos	No visible asbestos for surface soil (top 10 cm)			

1. Residential A with garden/accessible soil also includes children's day care centres, preschools and primary schools.
2. Residential B with minimal opportunities for soil access includes dwelling with fully and permanently paved yard space such as high-rise building and apartments.
3. Recreational C includes public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and unpaved footpaths.
4. Commercial/industrial D includes premises such as shops, offices, factories and industrial sites.
5. The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies when FA and AF are able to be quantified by gravimetric procedures (i.e. found in field or in sample preparation steps of AS4964). This screening level is not applicable to free fibres (i.e. asbestos fibres identified in the 'trace analysis' step in AS4964).

***Question 5**: Is it appropriate for the health screening levels for asbestos in soils to apply to asbestos in waste? Note that the threshold level in this instance refers to a level where further action is required.*

i. Why or why not?

***Question 6:** Health screening levels are not the only tool used for managing asbestos in soils. If threshold levels in soils were to be applied to asbestos in **waste for beneficial reuse**,*

i. what other tools can support managing asbestos in waste for beneficial reuse?
ii. what would be the limitations, costs or feasibility of safely removing asbestos in waste?
iii. are there certain scenarios where recycled C&D material should not be reused?
iv. are there certain scenarios where reuse of recycled C&D material could result in land legacy issues?

5. Standards and guidelines for asbestos in waste

To address TOR 1, OCSE commissioned crcCARE to undertake a review on the national and international standards and guidelines where asbestos thresholds in waste and recovered materials have been applied. The literature review also seeks to understand the basis for existing thresholds and identify processes in place to ensure compliance with the threshold, as well as end use or reuse of recovered materials where thresholds have been set.

This review is still being completed by crcCARE, with preliminary findings discussed below. The final report will be considered and published as part of the Review.

5.1 Australian guidelines

Standards and guidelines for the management of asbestos in waste and recovered materials differ between states and territories. In general, most jurisdictions either do not have explicit threshold criteria for recycled waste containing asbestos, or adopt a limit for asbestos content of 0.001% w/w.

5.1.1 Western Australia

Western Australia has established the limit for asbestos content of 0.001% w/w in recycled C&D waste through the guideline *Managing asbestos at construction and demolition waste recycling facilities* (WA Guideline) (WA DWER, 2021). The WA Environmental (Controlled Waste) Regulations requires the material that contains 0.001% or more of asbestos fibres w/w, alongside microscopic identification requirements, to be defined as material containing asbestos (i.e. ACM) (WA Government, 2020).

Consistent with the national asbestos ban, all asbestos waste from removal work in WA is sent to a licensed landfill. Asbestos in buildings and structures must be removed and separated from other C&D waste. However, asbestos embedded in or attached to concrete columns that cannot be readily identified through the asbestos clearance inspection will remain within the C&D waste. The WA guideline provides C&D waste recyclers with information to assist them to implement procedures to:

- minimise the risk of asbestos being received and processed at the premises
- minimise the potential risk of asbestos in emissions within and from their recycling premises
- minimise the potential risk of asbestos contamination in recycled construction and demolition (C&D) materials and products. (WA DWER, 2021)

The WA Guideline applies the following controls to meet the above objectives:

- pre-acceptance procedures to prevent asbestos-containing wastes being accepted at recycling centres
- acceptance procedures that require all persons bringing waste to sign a declaration that their load is free from asbestos and carry out visual inspections based on the waste risk classification
- waste processing controls that include ongoing inspections for waste at all recycling stages
- asbestos management plan that outlines procedures related to the control of asbestos that inadvertently enters the recycling process including asbestos-related incidents or emergencies, monitoring and plan review
- product sampling and testing to validate the above procedures have prevented asbestos presence in the final product to be sold/supplied.

All loads must be visually inspected when they arrive at the recycling site. Where the inspection identifies the wastes are not permitted by the licence and/or asbestos is visually identified in the load, it shall be rejected for acceptance. The guideline allows accepted loads contaminated with suspect asbestos to be managed by the recycler. If there is suspect friable asbestos or asbestos fines (e.g. visible <7mm debris) the load is treated as 'high risk', wetted to prevent fibre release, and redirected to a licensed landfill facility.

For non-friable asbestos contamination, any suspect ACM can be tested first or assumed to contain asbestos and separated for appropriate disposal while the remaining waste materials can be stockpiled

at the facility for further processing. If testing confirms the materials tested do not contain asbestos, they can be added back to the stockpile.

The WA Guideline uses the threshold as a tool to verify that the recovered materials have been produced to the required specifications. It is part of a risk-based approach that allows for interpretation of sample results using multiple lines of evidence rather than using single sample detects of asbestos to characterise the whole stockpile (Otness, 2021). Thus, in the case of single exceedance at a level less than 0.01% w/w (10 times the regulatory value), the stockpile (nominally 4000 tonnes) may not be deemed contaminated if repeat samples of immediately adjacent areas do not demonstrate specification exceedances.

The asbestos threshold level in the guideline is adopted from the soil screening criteria in the *WA Soil Guidelines* (WA DOH, 2009). The screening criteria was established based on the Swartjes and Tromp study in the Netherlands (Swartjes & Tromp, 2008). They developed a three-tier approach for the assessment of human health risks of asbestos in soils that is triggered by the concentration of asbestos in soils exceeding the generic soil quality standard (i.e. Intervention Value). Their research generated an extensive database of field and simulation trials of friable and non-friable asbestos concentration in soil and their respective airborne concentrations (Figure 3).

Weighing the different risk levels of asbestos fibre concentrations on human health for lifelong exposure, Swartjes and Tromp applied an investigation level of 100 mg/kg or 0.01% w/w for both friable and non-friable asbestos in soil. This concentration is expected to keep outdoor airborne fibre levels below 0.001 f/mL and probably around 0.0001 f/mL (see Figure 3). This threshold value considers amphibole asbestos as 10 times more potent than chrysotile asbestos. It also applies to standard Dutch situations only, which means there are no systematic activities such as digging, dumping or sifting to disturb the soil, and the topsoil layer is relatively wet for most of the year.

WA DOH adopted this value in the guidelines but made some adjustments based on Australian conditions. The threshold of 0.01% w/w is applied to non-friable asbestos in soil. For friable asbestos, a lower criterion is applied as it generates airborne asbestos more easily. The threshold value of friable asbestos is 0.001% w/w in soil (i.e. 10 times lower) to account for the dry Australian soil and dust-generating potential, as well as the fact that all mineralogical forms of asbestos are treated as equivalent by other Australian standards. In addition, the Swartjes and Tromp study made a distinction between the exposure to asbestos concentration in soils (tier 1) and the respirable fraction in soil (tier 2). WA Soil Guidelines assume that all asbestos measured in soil will turn into respirable fibres.

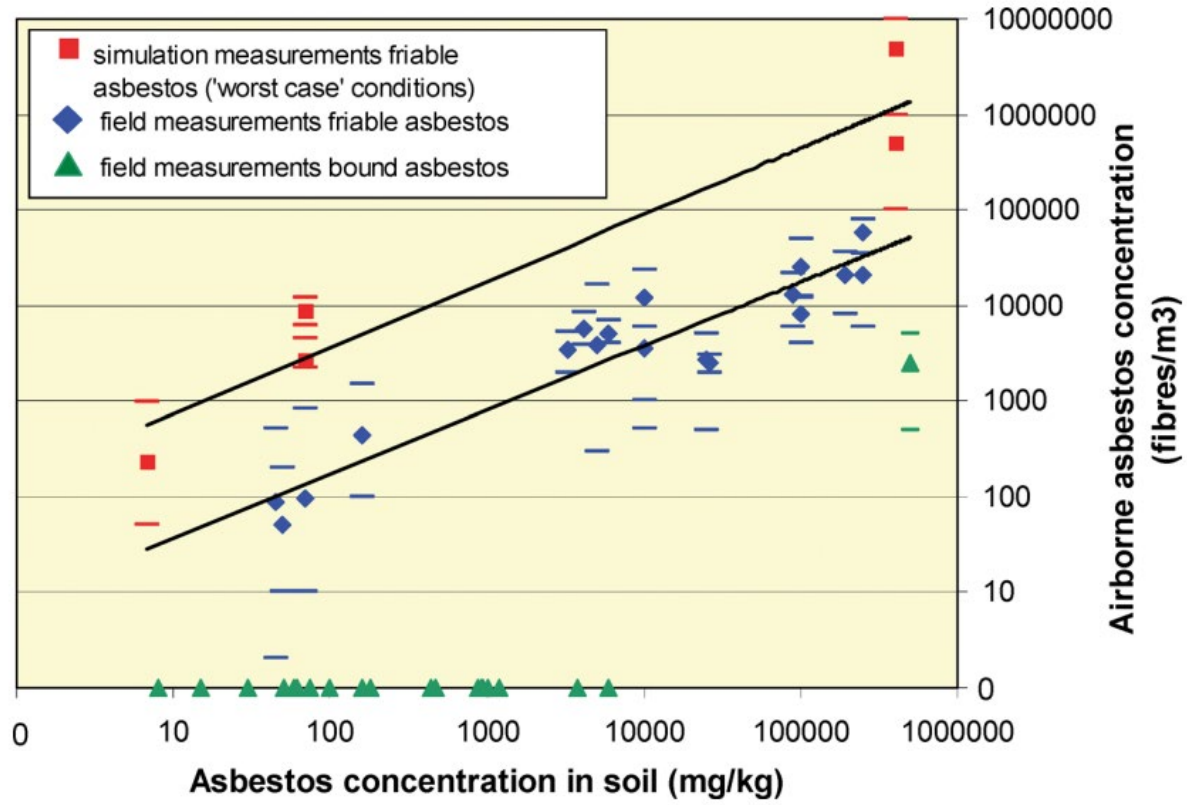


Figure 3. Average airborne asbestos concentration as a function of asbestos concentration in soil based on simulation and field measurements (Swartjes & Tromp, 2008).

Another important piece of research that forms the basis of a practical limit for asbestos content of soil below which no further decontamination would be necessary was the *Institute of Occupational Medicine study* (Addison, Davies, Roberson, & Willey, 1988). The study demonstrated that, with a known asbestos fibre (loose fibre) concentration of 0.001% in dry soil (w/w homogeneous sample), the fibre concentration in air is unlikely to exceed 0.1 f/mL (occupational exposure standard) even if respirable dust up to 5 mg/m^3 is generated.[2] The study recommended an action to be taken (e.g. wetting the soil) for asbestos contamination in soils higher than 0.001% to minimise exposure to respirable fibre.

5.2 International guidelines

Various international jurisdictions have established threshold limits for asbestos in waste, below which the waste is generally not considered to contain asbestos and may be reused. Some jurisdictions also distinguish between waste containing friable and non-friable asbestos.

In the United States, the US Environmental Protection Agency sets standards and guidelines for the safe handling and disposal of ACMs, however threshold concentrations for asbestos in recycled waste are generally addressed by individual states. Many states have adopted a threshold level of 1.0% w/w, above which the waste is generally considered hazardous waste. In California, waste is classified as hazardous asbestos-containing waste if it is both in a friable, powdered or finely divided state, and contains greater than 1.0% w/w of asbestos. New York also defines the threshold level for ACM is 1.0% w/w friable asbestos. Wastes containing greater than 1.0% w/w asbestos, but that are not easily reduced to powder, are not considered friable asbestos-containing waste and may be considered another waste type. Similarly, Texas, Florida and Oregon all consider waste containing greater than 1.0% w/w as regulated ACM and must be handled and disposed of accordingly.

[2] To put into context, an industrial environment with respirable dust of 5 mg/m^3 is very dusty. By comparison, PM2.5 daily average standard is 25 µg/m^3 (0.025 mg/ m^3) and is a portion of respirable dust (PM4).

In the European Union, EU waste legislation classifies asbestos-containing waste as hazardous waste and applies stringent provisions to its transport and management, including reporting and traceability requirements. Landfilling remains the main approach to safety dispose of asbestos-containing waste. A threshold limit of 0.1% w/w applies for asbestos-containing waste to be considered hazardous; this threshold is based on the classification of asbestos as hazard class 'Carc. 1A' (carcinogenic).

Several European countries such as Italy, the United Kingdom and Germany have adopted a threshold level of 0.1% w/w for waste to be classified as asbestos waste. In some jurisdictions, waste with a concentration below this level can be recycled or re-used.

***Question 7**: Are there other standards or guidelines that would be applicable for managing asbestos in waste for beneficial reuse that can be provided?*

***Question 8:** Should the approach in the WA guideline (Managing asbestos at construction and demolition waste recycling facilities), be implemented in NSW and if so, why or why not?*

i. Are there other factors that should be considered if the WA Guideline is to be implemented?

ii. Is there an alternative approach that could be considered?

6. Sampling and analysis

To address TOR 3, OCSE commissioned enRiskS to undertake a review of sampling and analysis for asbestos in recovered material. enRiskS, working with Hibbs and Envirolab Services, were asked to provide an overview of sampling approaches for several recovered materials and available sampling guidance and analytical methods, including limitations and how these may impact on the development of potential thresholds in recovered materials.

The literature review is currently in development and will be considered in full for the Review Final Report. Preliminary results are highlighting issues with sampling and analysis of asbestos which are briefly discussed in this section.

Designing sampling programs for resource recovery materials is difficult given the heterogeneous nature of these materials. Most jurisdictions require processors of resource recovery materials to design a relevant sampling program based on their site processes and materials, which must be approved by a regulator.

Guidance from regulators often requires the use of composite samples where several individual samples are taken throughout a stockpile and mixed together on-site. The single mixed sample (i.e. composite) is then sent to the laboratory. This works well when the goal is to find the average nature of the material being sampled. It does not work well for asbestos if the goal is to determine the presence/absence of asbestos.

Any sampling program should consider its objectives. Sampling should consider the size of the material that is being recycled and the potential for visual observation of materials and ID analysis using Polarised Light Microscopy to be important, including potential targeted sampling of any suspect material.

As asbestos is naturally occurring in the ground, there is potential that low/negligible levels could be present in soil or other resource recovery materials due to natural sources.

The analytical method for detecting asbestos has limitations. It is not as sensitive or repeatable as other types of analysis (e.g. those used for metals). It also relies on the observational skills of the analyst rather than a calibrated detector in a machine.

Confusion in the waste and contaminated land industry around how to undertake sampling and analysis for asbestos is high. Australian Standard (AS) 4964 is a qualitative method. It determines the presence or absence of asbestos only and not a concentration. A concentration is needed if showing compliance with a threshold or guidelines. AS4964 does not specify a volume or mass of a sample to collect, but this is needed to allow determination of a concentration of asbestos in soil or other resource recovery materials. The ASC NEPM provides guidance on volume/mass but the guidance is somewhat unclear and, because it is not part of the AS4964 method, laboratories cannot report on concentration under their NATA accreditation.

Most organisations seem to focus on source control for asbestos rather than using sampling and analysis for asbestos at the end of processing. This is done to ensure large amounts of asbestos-containing materials are not present in the resource recovery material, while also acknowledging that low/negligible levels could be present.

***Question 9**: Apart from AS4964 and ASC NEPM, are there other sampling and analysis methods for detecting and quantifying asbestos in waste materials or recycled products that are being received and processed at recycling facilities?*

- *i. Are you aware of any other methods/processes for sampling and analysis of asbestos that the Review should consider? If so, please provide details and basis for their relevance to this Review.*
- *ii. How reliable and accurate are these methods in ensuring that recycled waste is not contaminated?*

7. Risk-based approaches for managing asbestos in waste

As noted above, the WHO states that there is no known safe level of asbestos exposure. Nonetheless, an exposure/risk relationship can be useful to determine acceptable risks on the potential health effects of asbestos exposure. For asbestos in or on soils, the HSL has been established to determine whether further appropriate investigation and evaluation is needed. It is important to note that the health risk is associated with the amount of respirable fibre that can be released into air, rather than the absolute amount of asbestos fibre present in soil. When determining the HSL, conservative end-use conditions based on worst-case soil-to-air scenarios have been considered.

The heterogeneous nature of waste and background exposure to asbestos needs to be considered when undertaking sampling and analysis to determine the presence of asbestos, especially when there are no visual ACM detected. A sampling design based solely on statistical considerations has the potential to require a significant number of samples to provide a high level of confidence that the waste meets the required threshold. Further, sampling designs attempt to balance statistical design with policy determinations and cost/time practicalities.

Thresholds or screening levels along with actions plans that aim to reduce the risk associated with contaminants are commonly used across different scenarios. The WA Guideline includes a threshold for managing asbestos at recycling facilities, as well as other actions and controls to undertake when asbestos is found in the material. Resource Recovery Orders and Exemptions can also include limits for contaminants, as well as process requirements. This is also the case for managing asbestos in soil, where screening levels are used in conjunction with a risk-based approach to managing the asbestos in the soil.

A risk-based approach into managing the presence of asbestos in C&D materials for recycling might involve businesses throughout the supply chain identifying the presence of asbestos, assessing the potential risk and developing controls/actions to mitigate the risk. This allows a through-chain approach to manage asbestos in waste for beneficial reuse.

A similar system exists within the food industry, known as the Hazard Analysis, Critical Control Points (HACCP) system. HACCP is a system where hazards are identified, and analysis and controls are implemented to eliminate or minimise the risk from the hazard. The system can be supported by verification testing to demonstrate controls are achieving the desired outcome.

Question 10: *Would a through-chain approach to managing asbestos in waste, where each business looks to minimise or eliminate the risk from asbestos in waste for beneficial reuse, work?*

i. What elements would be part of the system/approach?

ii. What would be the advantages/disadvantages of such a system?

Question 11: *Are there other risk-based approaches to managing asbestos in waste for beneficial reuse?*

8. Next steps

As noted previously, this discussion paper seeks information from stakeholders relevant to key aspects of the TOR for the Review. This information, along with commissioned studies, will inform the next round of stakeholder consultations, site visits and information gathering to guide preparation of the Final Report.

The Review team is seeking feedback, particularly on the specific questions posed within this discussion paper, by 31 July 2024. Submissions and attachments can be emailed to asbestosreview@chiefscientist.nsw.gov.au. All submissions will be considered by the Review team and the Expert Panel and will be published on the OCSE website with the final report. If you wish for your submission not to be published, please mark it 'Confidential' and note this in the submission.

The final report is due before the end of 2024.

9. List of questions for submissions

Thresholds and screening levels

Question 1: What factors should be considered when deriving a threshold or screening level for asbestos in recovered fines and material for beneficial reuse?

Asbestos waste management at recycling facilities

Question 2: Can you provide any data on annual volumes of C&D waste being recycled or alternatively sent to landfill? Data on rejected loads due to asbestos presence and any other data related to all TOR items is welcomed.

Question 3: Can you provide any other information on the potential presence of asbestos in recycled C&D material?

i. Information on the methods of separating and removing asbestos from waste that can inform alternative approaches?
ii. What reuse scenarios are there for recycled waste, including end-products and their use?

Question 4: While this section focuses on C&D waste, are there other waste types which are suitable for beneficial reuse which have the potential to be contaminated with asbestos?

Management of asbestos in soil

Question 5: Is it appropriate for the health screening levels for asbestos in soils to apply to asbestos in waste? Note that the threshold level in this instance refers to a level where further action is required.

i. Why or why not?

Question 6: Health screening levels are not the only tool used for managing asbestos in soils. If threshold levels in soils are applied to asbestos in **waste for beneficial reuse**,

i. what other tools can support managing asbestos in waste for beneficial reuse?
ii. what would be the limitations, costs or feasibility of safely removing asbestos in waste?
iii. are there certain scenarios where recycled C&D material should not be reused?
iv. are there certain scenarios where reuse of recycled C&D material could result in land legacy issues?

Standards and guidelines for asbestos in waste

Question 7: Are there other standards or guidelines that would be applicable for managing asbestos in waste for beneficial reuse that can be provided?

Question 8: Should the approach in the WA guideline (*Managing asbestos at construction and demolition waste recycling facilities*), be implemented in NSW and if so, why or why not?

i. Are there other factors that should be considered if the WA Guideline is to be implemented?
ii. Is there an alternative approach that could be considered?

Sampling and analysis

Question 9: Apart from AS4964 and ASC NEPM, are there other sampling and analysis methods for detecting and quantifying asbestos in waste materials or recycled products that are being received and processed at recycling facilities?

i. Are you aware of any other methods/processes for sampling and analysis of asbestos that the Review should consider? If so, please provide details and basis for their relevance to this Review.
ii. How reliable and accurate are these methods in ensuring that recycled waste is not contaminated?

Risk-based approaches for managing asbestos in waste

Question 10: Would a through-chain approach to managing asbestos in waste, where each business looks to minimise or eliminate the risk from asbestos in waste for beneficial reuse, work?

i. What elements would be part of the system/approach?
ii. What would be the advantages/disadvantages of such a system?

Question 11: Are there other risk-based approaches to managing asbestos in waste for beneficial reuse?

General

Questions 12: Is there any further information you would like to provide the Review to assist us with in responding to the Terms of Reference?

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Terms of Reference

Advice on the management of asbestos in recovered fines and recovered materials for beneficial reuse in NSW

The previous Minister for Environment and Heritage, the Hon. James Griffin MP requested the Office of the Chief Scientist and Engineer (OCSE) to provide advice on the management of asbestos in recovered fines.

Background

Asbestos regulation in NSW

Since 2003, the use or sale of asbestos has been banned in Australia.

Consistent with the national ban on asbestos, section 144AAB of the *Protection of the Environment Operations Act 1997* (POEO Act) makes it an offence to cause or permit asbestos waste in any form to be re-used or recycled. The prohibition applies to all wastes containing any form of asbestos at any concentration. Also, it means asbestos waste cannot be processed, screened or segregated. Therefore, asbestos cement material, for instance, cannot be removed from the waste and all asbestos containing waste must be disposed of to a landfill licensed to receive the waste.

It should be noted that asbestos containing materials managed at the site of their occurrence may not be defined as waste, and different rules can apply to their management and re-use. For example, asbestos-contaminated soil that needs to be processed (generally by excavating the soil and removing the asbestos from it) prior to reuse is considered waste, even if it remains on the same site. If the soil does not need to be processed prior to on-site reuse (generally because contamination levels are extremely low), then it may not be waste, if certain pre-conditions are met.

There will generally be a practical level of exposure below which it is impossible to detect increased risk of asbestos related diseases. This is reflected in the *National Environment Protection (Assessment of Site Contamination) Measure 1999*, which regards levels of asbestos cement material below 0.01% w/w as safe. A more stringent level of 0.001% w/w is applied to fibrous asbestos and asbestos fines due to their greater risk of air borne fibres.

Unlike the national approach for managing asbestos contaminated land, inconsistent approaches exist across jurisdictions in managing asbestos contaminated waste. For instance, in Western Australia where significant efforts are taken to keep asbestos contaminated materials out of construction & demolition waste recycling facilities, it is acceptable to screen and remove asbestos cement material at recycling facilities if it cannot be avoided. Also, the WA guidance on managing asbestos in construction and demolition waste recycling facilities states that to ensure the health of those using or coming into contact with recycled C&D products is protected, the asbestos content (in any form) in any recycled products must not exceed 0.001 % w/w. More information is available on the EPA website.

There is considerable industry confusion around the overlap between the requirements of the contaminated land and waste regulatory frameworks in relation to on-site reuse of asbestos-contaminated soils. The EPA is currently working with industry and other authorities to develop policy and guidance to help clarify this issue, but further advice from the OCSE would be beneficial.

Recovered fines

Recovered fines are the residues remaining after all recyclable construction and demolition waste material has been removed from skip bins. They are reused as a sand/soil substitute in landscaping materials such as turf underlays or construction fill.

Compliance testing by the EPA in 2019 found that around half of all recovered fines produced is high quality clean soils which is of benefit to reuse. However, the other half contained contaminants including asbestos, which may have human health or environmental risks. Other key contaminants were synthetic mineral fibres and plastics and micro-plastics.

Earlier in the year, the EPA commenced consultation with industry and other stakeholders on a proposal to change the rules that apply to the production of recovered fines. This included sampling requirements and the intention to revoke the generic or 'batch' resource recovery orders and exemptions that apply to recovered fines. Skip bin fines would only be able to be reused on a site-by-site basis where high-quality produce could be demonstrated.

The industry raised significant concerns with the proposed changes, as they considered the standards set would be challenging to comply with and could impose significant cost to industry that would be passed onto skip bin customers. They further suggested the proposed changes would see recycling and recovery rates drop significantly and increased illegal dumping.

Industry has separately raised concerns over many years suggesting there is a need for a threshold quantity of asbestos in waste before it is treated as asbestos waste, with the need for a more proportionate approach to risk when dealing with small amounts of bonded asbestos. Concerns have also been raised relating to the remediation of contaminated sites, with site auditors seeking greater clarity on what can be done on and off site with soils containing asbestos

Improving the management and beneficial reuse of waste in NSW

The EPA is currently reviewing its approach to the management of asbestos in the context of reuse/recycling and resource recovery to support both a circular waste economy, resource recovery and reuse and explore options for greater consistency between jurisdictions.

The NACC consider there needs to be an improved evidence base on the risk tolerance, health and environmental impacts, technologies and cost-effective methods to inform any future improvements to the safe and effective management of asbestos in recovered fines and in relation to recovered materials / waste intended to be beneficially reused.

Scope of advice

The OCSE will convene a technical panel with relevant experts to address the following:

1. Undertake a review of national and international jurisdictions standards and guidelines to determine if asbestos threshold levels (in waste) in an environmental context have been set; where threshold levels exist and what they are; report on the basis (environmental, human health) for determining thresholds and how compliance with those thresholds is achieved.

2. Can a tolerable threshold level be set for asbestos in waste intended for beneficial reuse irrespective of its end use? In answering this question, consideration should be given to:

    a. What would be a scientifically robust basis for determining the threshold level?

    b. Are there controls that could be applied to mitigate environmental and human health risks (including education, regulation, monitoring, reporting etc) to a level where the recovered material could be used in a limited set of circumstances?

    c. In what circumstances would it be possible to land apply recovered materials with minimal or controllable/manageable risk (i.e. under infrastructure if capped and sealed), and what would appropriate methods look like? What are the risks of creating legacy issues and how could this be managed?

    d. Where should the application of recovered materials be restricted?

    e. If no acceptable threshold could be set, what is the scientific basis for maintaining a zero tolerance?

3. What is the most appropriate sampling and analytical approach for asbestos in recovered material? In answering this question, consideration should be given to:

    a. How many samples to collect and test for a given volume to be fair, cost-effective and representative

b. What test methods would represent best practice, for example, AS4964-2004, NEPM gravimetric and AF/FA sampling or other test methods

c. The technology available in the context of the recommended acceptable thresholds and its accessibility.

4. Should a tolerable threshold level for historically asbestos-contaminated soils be different to a tolerable threshold level for asbestos in waste? Is it safe and practical to process asbestos-contaminated soils to reach a threshold level and reuse them on-site.

5. Are setting threshold levels the best way to manage asbestos in recovered materials? Or are there better risk-based approaches to achieve these outcomes?

6. Are there scientific and risk assessment principles that the EPA should consider when setting threshold levels for asbestos?

Final advice

The OCSE will produce a report to the Minister and the NACC setting out their advice and recommendations on the questions above within 12 months of receiving this terms of reference. The Minister may request that the final report be publicly released. The report and inputs into this review by the OCSE should be treated confidentially in the meantime.