



Guidance Note on Public Health Risk Management of Asbestiform Minerals Associated with Mining

Purpose

To provide guidance to regulators, consultants and mining companies on identifying public health risks from asbestiform minerals in the mining industry and how they should be assessed and managed. It is based on and complements key regulatory processes undertaken by other Western Australia (WA) Government Agencies.

Scope

This document relates to potential health risk to members of the public or community and not to the mine-related workforce in their work capacity.

Mining is considered to include any commercial mining-related activities and quarrying e.g. exploratory drilling, mine establishment, blasting and excavation, stockpiling, transport, processing, export of product, mine closure activities and post-closure arrangements.

Asbestiform minerals can be defined as material having the mineralogical fibrous habit and features of asbestos with similar potential health effects to asbestos.

Although not specifically addressed in this document some non-asbestiform minerals, such as erionite and wollastonite, may have fibre characteristics that make them as potentially hazardous as asbestiform minerals. If these minerals have the asbestiform minerals fibre characteristic as outlined in the Hazards of Asbestiform Minerals section then they should be managed as asbestiform minerals unless there is adequate evidence to indicate otherwise.

Background

The geological material that produces asbestiform minerals is common throughout WA including in ore bodies being or with potential to be exploited.

These asbestiform minerals can add another source of risk to the many other possible physical, chemical, radiological and biological risks that may be associated with mining activities. Most of these risks can be well managed for worker safety purposes but this does not necessarily translate into public health protection. DOH has published the following document to help the public health management of the different types of associated risks *Mine sites, exploration camps and construction villages. Scoping Tool: Public Health Considerations – May 2011*.

Asbestiform minerals constitute a special type of health risk because of their potential widespread presence, their disease causing potential, the ease of dispersal of their fibres if disturbed and their resistance to break-down into less harmful forms. Public health risk arises if the fibres contaminate materials or areas where the public may be exposed to them.

In 2012 there was some public and regulatory concern that a commonly used quarry product (cracker dust) was contaminated with the asbestiform mineral actinolite. A thorough health risk assessment subsequently demonstrated that the actinolite was only present in low concentrations and primarily as low hazard cleavage fragments (i.e. non-asbestiform) and so public risk was also low.

As there may not be sufficient awareness of possible public risks from asbestiform minerals mined incidentally, the Department of Health (DOH) has developed this document to highlight the issue and to provide some guidance on how it considers such risks should be managed through the existing regulatory system.

Roles and Responsibilities

The primary regulator in regard to mining safety is the Department of Mines and Petroleum (DMP), although WorkSafe, the Department of Environment and Conservation (DEC), and DOH may have risk management roles in certain circumstances. Also where asbestiform minerals are a significant factor in mining proposals subject to assessment by the Environmental Protection Authority (EPA), the EPA will, with technical advice from other agencies, consider the risk posed by these materials.

The main mining regulatory guidance on asbestiform minerals is the DMP *Guideline – Management of fibrous minerals in Western Australian mining operations – 2010* (DMP Guideline). This is primarily concerned with worker health.

DOH has a role in protecting general public health in accordance with the *Health Act 1911* and, in regard to asbestos, through the associated *Health (Asbestos) Regulations 1992* (Regulations). Although the Regulations were intended primarily as a means to control the sale, supply and use of asbestos-related products, they are sufficiently broad to allow DOH or a delegated authority to require management measures related to “material containing asbestos” in any context.

DOH also has some statutory responsibilities under the *Contaminated Sites Act 2003* (CS Act) which is administered by the DEC. In this regard DOH is the primary advisor to DEC on asbestos health risks from contaminated sites and with DEC has gazetted the *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia – May 2009* (DOH Guidelines). The DOH Guidelines are in part based on the national enHealth *Management of asbestos in the non-occupational environment - 2005* (enHealth Guidance).

Under the CS Act there is a requirement for any site suspected or known to be contaminated, including by asbestos, to be reported to the DEC for classification and possible assessment and cleanup action. This reporting obligation does not apply to naturally occurring asbestiform material that has not been disturbed, but, through the extraction and processing of ore deposits, many mining operations have the potential to trigger the CS Act if asbestiform minerals happen to be present.

Occurrence of Asbestiform Minerals

As shown in Figure 1, asbestiform minerals potentially occur widely in WA, often in conjunction with a number of mined minerals, particularly iron ore and nickel sulphides (DME, 1992).

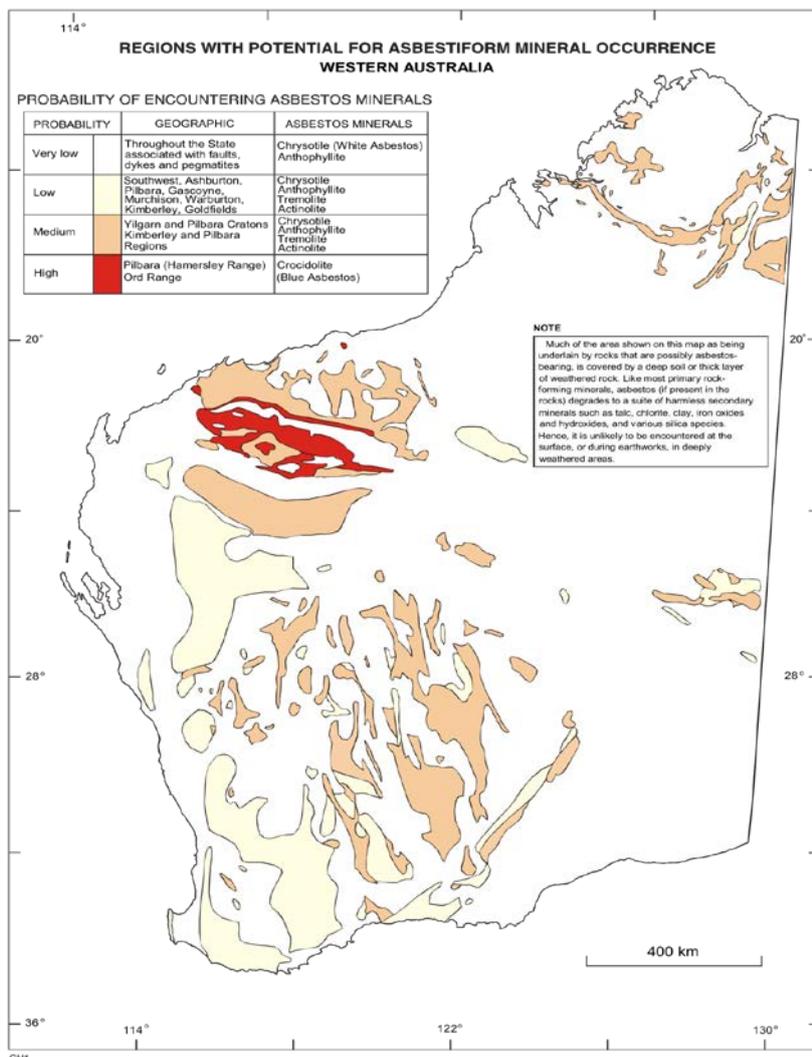
The areas of highest likely presence are in the Pilbara (Hamersley) and Ord Ranges, where the asbestiform material may appear as crocidolite (blue) asbestos. The abandoned Wittenoom crocidolite mine is in the Hamersley Range.

Regions where there is a medium potential for asbestiform minerals are the Yilgarn, Pilbara and Kimberley, usually presenting as chrysotile, anthophyllite, tremolite or actinolite asbestos.

Much of the rock in these areas has places where, in the right geological conditions (faulting, folding or slippage with attendant heat and pressure), the chemical composition could produce the various asbestiform minerals. The resulting asbestiform minerals occur most often as lenses or bands. This type of genesis and product means that the occurrence of the asbestos can be localised or widespread as well as sporadic.

Although asbestiform minerals are resistant to degradation, many surface occurrences will have been subject to weathering over geological timeframes and thus have lost their dangerous fibre characteristics. It is the deeper asbestiform minerals, with some exceptions such as at Wittenoom, which will normally pose the greater health risk if disturbed by human activity, potentially mainly as the result of mining.

Figure 1 – Potential Incidence of Asbestiform Minerals in WA



Hazards of Asbestiform Minerals

Inhalation of asbestiform mineral fibres has the potential to produce a number of adverse health effects including asbestosis, lung cancer and mesothelioma, a cancer with no known cure.

It is the small fibres that can penetrate deep into the lungs that present the greatest hazard. DOH supports the definition of asbestiform fibre as all particles of length > 5 µm, diameter < 3 µm and a length to width ratio of greater than 3:1 as promulgated by both Safe Work Australia

and the enHealth Guidance. DMP employs slightly differing figures of 5µm, 1 µm and 5:1, respectively.

Cleavage fragments from parent materials of asbestiform minerals may not conform to these dimensions and so not pose a significant concern. However, some non-asbestiform minerals with these fibre characteristics may be hazardous.

In addition to fibre characteristics the other key contributors to hazard are the duration and level of exposure, as well as the type of asbestiform mineral. Crocidolite or blue asbestos is considered the most dangerous.

Asbestos-related diseases most commonly result from higher levels of exposure associated with previous mining or processing specifically of asbestiform minerals, Lower exposures can sometimes have an effect, especially of mesothelioma, which has been associated with some do-it-yourself (DIY) home renovation activities and in particular tradesmen working on buildings containing asbestiform minerals.

Public Risk Assessment and Management

Worker risk assessment and management issues associated with asbestiform minerals are addressed in the DMP Guidelines and in its Appendix 3 - Fibrous minerals management plan (FMMP). In addition to key standard risk information and processes, the FMMP includes provision for “Environmental considerations and site cleanup”. This heading also should include public health issues. Alternatively these issues may be addressed and/or referenced under a range of relevant issue specific headings in the FMMP such as “Legislative requirements”. Wherever they appear, the public health and environmental elements should be clearly delineated from other areas of risk.

If worker safety elements in the DMP Guidelines are properly implemented in the FMMP, this will also mitigate to a large extent against public health risk. However, public health risk management includes some different standards and issues which are not specifically identified in the DMP Guidelines.

These differences emerge because the public can include a greater range of at risk groups, some potentially more vulnerable, such as children, who may be exposed without volition in unexpected ways and without the normal management measures afforded to workers. Therefore any possible public exposure is subject to some additional and more rigorous processes than for workers.

The main public health-related differences are outlined below under the following headings:

- Scope and Context;
- Legislative requirements;
- Exposure standards;
- Air Modelling and Monitoring
- Contamination Assessment;
- Exposure situations;
- At risk populations;
- Public risk rating process; and
- Management measures.

These issues are what DOH would expect a mining-related company to respond to by way of the FMMP submitted to DMP and through it or the Environmental Protection Authority (EPA) to DOH as necessary. The DMP Guidelines should of course be the primary basis of the FMMP.

Some additional general guidance is available on health risk assessment in the DOH *Health Risk Assessment (Scoping) Guidelines – 2010*. This document is particularly useful when considering new projects and draws upon the EPA Report: *Review of the Environmental Impact Assessment Process in Western Australia – March 2009*.

Scope and Context

The FMMP should explicitly state that in addition to worker safety issues that it also encompasses protection of the public. As indicated under the Scope in this document, the mining-related activities should be broadly inclusive and if applicable should cover those related to the genesis of the mine, its operations, product and closure.

Any consultants employed to undertake this work should be able to demonstrate public health expertise in this area of work.

The FMMP should normally contain sufficient contextual information about the character of any asbestiform minerals present and details of relevant mine-related activities so that the reader does not have to refer to other more detailed planning documents, though these can be referenced.

Legislative Requirements

The FMMP should indicate familiarity with and specifically reference the relevant public health-related legislation, namely:

- *Health Act 1911 and Health (Asbestos) Regulations 1992*;
- *Contaminated Sites Act 2003 and the Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia – May 2009*; and
- *enHealth Management of asbestos in the non-occupational environment – 2005*.

Exposure Standards

Safe Work Australia, DMP and WorkSafe apply air exposure standards of 0.1f/ml for asbestos on a time weighted basis for workers.

The enHealth Guidance and DOH Guidelines use a limit of 0.01f/ml in conjunction with limited duration activities, 6 months in the case of DOH. Lower limits apply to the public because exposure can be 24/7, is non-voluntary when it occurs, and can involve potentially more susceptible groups such as children, the aged or the infirm.

enHealth *Guidance, National Environmental Protection (Assessment of Site Contamination) Measure (Amended 2013)* and DOH Guidelines also apply a threshold of 0.001% weight for weight asbestos for soil to be deemed to be contaminated with asbestos fibre. For the DOH Guidelines this would apply to dust, soil, excavated rock, processed material and waste material, although not the parent rock if left undisturbed.

While DOH works to published generic standards, it will consider the acceptability of other limits based on site or task specific circumstances and an accompanying justification.

Air Modelling and Monitoring

If asbestiform minerals may be associated with any site subject to mining activities it is recommended that background air sampling for asbestiform minerals occur beforehand. This can inform protective measures early in any activity and provide a baseline for changes in levels of air contamination.

In the case of prospective large developments, modelling of the likely dispersal patterns and air concentrations of any disturbed asbestiform minerals is also recommended. This is particularly important in cases where blasting may encounter asbestiform mineral deposits. To the extent practical the results of air monitoring programs from comparable other operations should be exploited for planning and management purposes.

A program of air monitoring may need to be developed and implemented to demonstrate that the public is protected during the operational phase of any large scale mining enterprise. This may only be necessary if modelling data or other information indicates possible public exposure but regardless the issue should be discussed and any course of action justified.

enHealth Guidance and DOH Guidelines recommend use of the National Occupational Health and Safety Commission *Guidance Note on the Membrane Filter Method for Estimating the Airborne Asbestos Fibre – 2005*, but DOH would support use of the DMP modified version of the latter as a practical alternative.

Contamination Assessment

In some situations it may be necessary to check the level of contamination by asbestiform minerals of areas or of material, such as in processed product or waste material (unless assumed to be contaminated). The DOH Guidelines provide a procedure as to how this should be done including by taking minimums of 14 random samples per 1000 m³ of a stockpile or one sample per 70 m³ of throughput material. In the case of possible area contamination the sampling rate should be a minimum of twice the rate as outlined in Appendix A of the DOH Guidelines.

The method of analysis should normally be in a NATA (or its mutual recognition agreement partner) laboratory approved for and using the Australian Standard *Method for the Qualitative Identification of asbestos in bulk samples* (AS4964-2004). This method has a reported detection limit of up to 0.01% which although above action-related threshold of 0.001% is acceptable to DOH if any asbestos identified is reported in terms of presence or absence regardless of its form.

Through agreement with the DOH it may be possible to use other analytical methods, especially those that have detection limits up to or better than 0.001% asbestos weight for weight. Such methods exist and, although making use of AS4964-2004, are not at this time accredited for the purpose by NATA.

Exposure Situations

The potential for public exposure should be considered at every phase of the mining activity and not just close to the disturbing activity during the operational phase. Relevant activities should include exploratory drilling, mine establishment, blasting and excavation, stockpiling, transport, processing and export of product, and mine closure and post-closure arrangements.

The closer people are to these activities and the higher the potential level of airborne fibre the greater the level of possible exposure.

Blasting is a particular concern in potentially generating high exposure scenarios. It and other activities may result in long term contamination of the whole operational area as well as waste stockpiles, and the contamination may spread into adjacent areas from wind and water action.

Crushing and processing activities may also result in generation of very fine and dangerous fibre if not properly managed.

Depending on site-specific circumstances, exposure could conceivably continue for a great number of years but normally intermittent and limited exposure if any would be more likely.

Consideration should be given to potential build up of fibre concentrations in residue/waste products and any risks associated with potential future land uses on completion of mining activities.

At Risk Populations

Community groups who may be exposed depending on the activity and circumstances include:

- Workers and contractors and their families who live on or near the site. For workers and contractors this is exposure covering the hours outside work shifts, when non-occupational exposure standards should apply. This is a standard DOH position because such people may be exposed on a non-voluntary basis to the same type and source of occupational contaminant, albeit at a likely lower level;
- People in nearby rural properties or communities;
- Visitors to the site, or travellers or tourists in the vicinity;
- Indigenous groups who may live in, visit or travel through the adjacent areas;
- Members of the public who may be exposed during transport, stockpiling and export of the product;
- People who may have access to the site or adjacent areas including disposal areas after cessation of operations; and
- Future land owners or users of the site.

When risks groups are being considered it is important to take account of numbers and types of people, and any particular susceptibility to risks arising from asbestiform minerals.

Public Risk Rating

Taking account of information and considerations arising from the preceding sections it is important that some sort of risk rating be developed and ascribed to any at risk public group. This may be in qualitative terms such as very low, low, medium, high and extreme. They should be primarily based on the DOH *Health Risk Assessment (Scoping) Guidelines – 2010*.

In this way a project proponent can demonstrate that a proven and systematic risk process has been conducted and that the conclusions are reliable and useful as a basis for a management program.

Management Measures

The general management principles that DOH endorses in approximate descending priority from most preferred to less preferred are as follows:

- Avoidance;
- Containment;
- Separation;
- Cleanup; and
- Monitoring and review.

In many cases a combination of these may be employed, and monitoring and review should always be undertaken, albeit not normally as the primary means of management

The principles should be implemented in the form of specific and cross-referenced management measures many of which are outlined in the DMP Guidelines. Some of these measures may need to be directed at protecting particular public groups, and if so then this should be made explicit.

Management measures should also include information, training and communication arrangements with potentially affected groups including informing them about potential risks and their management and also a system to respond to and record any queries or concerns.

Where a number of management options are possible and only certain ones are selected this should be appropriately justified.

DOH would expect that the management measures would be translated into standard operating procedures that relevant employees can use to ensure effective implementation. The structure of manager and employee responsibilities should also be made clear in regard to public health protection.

Where air monitoring is necessary there should be an action plan to address any potential or actual exceedences of public health exposure limits.

It is appreciated that the effectiveness of measures adopted may not become apparent until the FMMP is implemented during operations. If there is any doubt as to effectiveness, then a precautionary approach is recommended, with more rigorous and conservative management measures adopted initially and subsequently reviewed as a result of operational experience.

In Conclusion

Given the widespread nature of potential asbestiform minerals in WA and the distribution of mining operations, it is likely that asbestiform minerals and their attendant risks will be encountered during such activities. The remoteness of many mining sites and the worker safety measures that are put in place will likely ensure that, in most circumstances, the public is not exposed to unacceptable risks. Regardless, in keeping with regulatory requirements and as a result of the range of circumstances and uncertainties involved, it is important that public risks are considered for all relevant situations and appropriately assessed. Any such risks should be addressed through proper management plans and actions.

Contact Details

Any queries about the technical content of this Guidance Note may be directed to the Manager, Environment Health Hazards Unit, Department of Health on 08 9285 5506 or reception.GVH@health.wa.gov.au.

Reference Material

Australian Standard *Method for the Qualitative Identification of asbestos in bulk samples* (AS4964-2004).

Department of Environment and Conservation, *Contaminated Sites Act 2003*.
<http://www.slp.wa.gov.au/Index.html>

Department of Health and Aging (Commonwealth), *enHealth Management of asbestos in the non-occupational environment – 2005*.
<http://www.health.gov.au/internet/main/publishing.nsf/content/ohp-enhealth-asbestos-cnt.htm>

Department of Health (WA), *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia – May 2009*, Western Australia Department of Health.

<http://www.public.health.wa.gov.au/cproot/3763/2/Guidelines%20for%20Asbestos-Contaminated%20Sites%20-%20May%202009.pdf>

Department of Health (WA), *Health Act 1911*. <http://www.slp.wa.gov.au/Index.html>

Department of Health (WA), *Health (Asbestos) Regulations 1992*.
<http://www.slp.wa.gov.au/Index.html>

Department of Health (WA), *Mine sites, exploration camps and construction villages. Scoping Tool: Public Health Considerations – May 2011*.
<http://www.public.health.wa.gov.au/cproot/3937/2/Mine%20sites%20and%20exploration%20camps%20JUNE%202011.pdf>

Department of Health (WA), *Health Risk Assessment (Scoping) Guidelines – 2010*.
http://www.public.health.wa.gov.au/cproot/3087/2/HRA_Scoping.pdf

Department of Minerals and Energy (WA), *Regions with Potential for Asbestiform Mineral Occurrence – Western Australia – 1992*.

Department of Mines and Petroleum (WA), *Guideline – Management of fibrous minerals in Western Australian mining operations – 2010*.

http://www.dmp.wa.gov.au/documents/Guidelines/MSH_G_ManagementOfFibrousMinerals.pdf

Environmental Protection Authority (WA), Report: *Review of the Environmental Impact Assessment Process in Western Australia – March 2009*.
<http://www.epa.wa.gov.au/AbouttheEPA/eiareview/Pages/default.aspx>

National Environmental Protection (Assessment of Site Contamination) Measure
<http://www.scew.gov.au/nepms/assessment-of-site-contamination.html>

National Occupational Health and Safety Commission *Guidance Note on the Membrane Filter Method for Estimating the Airborne Asbestos Fibre – 2005*.
<http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/gn2005membranefiltermethod2ndedition>

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