



**NSW  
Resources  
Regulator**

**TARGETED ASSESSMENT PROGRAM**

# **DUST AND OTHER AIRBORNE CONTAMINANTS IN OPEN CUT COAL MINES**

August 2019

### Document control

Published by NSW Resources Regulator

Title: TAP Final consolidated report – Dust and other airborne contaminants in open cut coal mines

First published: August 2019

Authorised by: Chief Inspector of Mines

CM9 reference: DOC19/470300

### AMENDMENT SCHEDULE

| Date        | Version | Amendment       |
|-------------|---------|-----------------|
| August 2019 | 1       | First published |
|             |         |                 |

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## Executive summary

This report summarises the findings of the targeted assessment program undertaken in relation to the hazard of dust and other airborne contaminants in open cut coal mines. This program began in November 2017, with a total of 16 mines assessed.

The findings of the assessments are grouped into those that could be applied generally to all aspects of risk management and those that were specific to the hazard of airborne dust.

Mines did not always include a cross section of the workforce or include workers that were most likely to be exposed to the hazard. Most notable was the exclusion of shotfirers and maintenance workers from the risk assessment process. Furthermore, there was no documented evidence that the risk assessment processes had considered and applied the hierarchy of control measures.

The principal hazard management plans did not include all the control measures identified in the risk assessment processes and did not set out the reasons for adopting or rejecting each control measure required by legislation.

Induction training packages gave limited information and instruction on the risks to workers' health from airborne dust, and were typically focussed on dust management in relation to adverse environmental impacts. Additional training was not conducted in every occasion to provide and maintain workers' specific knowledge on the hazards associated with airborne dust.

Some mines assessed were implementing a critical control identification and management process, however there was not always a documented plan for the implementation and integration into the existing safety management systems and the criteria for the critical control selection was not well defined.

In most cases, the mines' standards for personal protective equipment (PPE) and task-specific procedures did not nominate the mandatory respiratory protection equipment (RPE) required for tasks and areas of the mine where workers are at increased risk, due to exposure to dust or other airborne contaminants. Workers did not always carry or wear appropriate RPE when working in areas of the mine where respirable dust was present.

Pre-start inspection checklists did not always include specific inspections for cabin cleanliness, cabin sealing arrangements or cabin pressure systems, and in some cases, were not aligned with the requirements of the safety management system. Trigger action response plans (TARPs) for dust did not include actions required for workers on the ground. Shotfirers and maintenance workers were often overlooked when weather conditions required operations to be modified or cease.

## Background

The targeted assessment program (TAP) provides a planned, risk-based and proactive approach to assessing how effective an operation is when it comes to controlling critical risk. The TAPs apply the following principles:

- a focus on managing prescribed 'principal hazards' from the WHS (M&PS) Regulation.
- evaluation of the effectiveness of control measures implemented through an organisation's safety management system.
- consideration of the operation's risk profile and the targeting of operations deemed to be highest risk.

The objective of the risk profiling is to identify the inherent hazards and the hazard burdens that exist at individual operations in each mining sector in NSW. The information is used to develop the operational assessment and inspection plans that inform the program.

## Scope

The scope of the targeted assessments includes two elements:

1. a desktop assessment of:
  - compliance against legislation with respect to the management of risks to health and safety associated with airborne contaminants at the mine
  - controls the mine utilises to prevent and mitigate the risks to health and safety associated with airborne contaminants
  - means the mine utilises to monitor the effectiveness of those controls.
2. a workplace assessment of the implementation of those controls.

## The process

The process for undertaking a TAP generally involves the following stages:

- preliminary team meetings, preparation and review of documents
- execution of an on-site assessment involving:
  - a site desktop assessment of relevant plans and processes measuring legislative compliance of the relevant plans
  - the inspection of relevant site operations.
- discussion and feedback to the mine management team on the findings and actions that need to be taken by the mine operators in response.

# Airborne contaminants in open cut coal mines

Airborne contaminants are generated during mining activities such as extraction, drilling, crushing, hauling and stockpiling. Workers in coal mines may be exposed to both coal dust and crystalline silica dust.

In open cut coal mining, coal and crystalline silica dust occur at both inhalable and respirable fractions. Normally, dust of the larger inhalable fraction is considered an irritant because it is deposited in the upper respiratory tract. At the smaller respirable fraction, dust contaminants represent a health risk to workers, subject to exposure levels.

The smaller-sized particles can penetrate the lower regions of the lungs where gas exchange takes place. Coal and silica dust at the respirable fraction can cause pneumoconiosis (in the case of coal) or silicosis (in the case of crystalline silica). Both are debilitating and often fatal lung diseases.<sup>1</sup>

In NSW mines, no person is to be exposed to airborne dust that exceeds in total<sup>2</sup>:

- 3 mg/m<sup>3</sup> (or 2.5 mg/m<sup>3</sup> in the case of a coal mine) for respirable dust
- 10 mg/m<sup>3</sup> for inhalable dust.

Exposure standards for individual substances must be satisfied within these overall limits. For example, the exposure standard for crystalline silica is 0.1 mg/m<sup>3</sup>.

Note the exposure levels detailed above are presently subject to review by Safe Work Australia, and it is anticipated these levels will be reduced.

For further information, including obligations under work health and safety legislation, refer to the fact sheet on [Airborne contaminants at open cut mines](#)

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<sup>1</sup> [CDC - Mining Topic - Respirable Dust - NIOSH](#)

<sup>2</sup> Measured in accordance with Australian Standard, AS 2985-2009

## Assessment findings

The findings of this assessment are grouped into two categories:

- **General findings** that can be used to inform all aspects of an operation's safety management and provide valuable information and insight across all sectors and operation types.
- **Specific findings** should be used to inform and improve safety management systems to address this principal hazard.

## General findings

### Risk assessments

**Issue:** Risk assessments for dust did not always include a cross section of the workforce and did not include workers or similar exposure groups (SEGs) at increased risk due to the nature of the work they perform e.g. shotfirers and other workers on the ground.

**Response:** The operator of a mine or petroleum site must consult with workers at the mine or petroleum site in relation to conducting risk assessments for principal hazard management plans. (Clause 121 WHS (M&PS) Regulation)

**Issue:** There was no documented evidence that the risk assessment processes had considered the hierarchy of control measures.

**Response:** Mine operators must manage risks to health and safety associated with mining operations at the mine site in accordance with Part 3.1 of the WHS Regulations<sup>3</sup>, including consideration of the hierarchy of controls<sup>4</sup> to eliminate the hazard.

### Training of workers

**Issue:** The induction processes lacked sufficient information, training and instruction for workers on the risks to their health from dust and other airborne contaminants.

**Response:** Operators of mine or petroleum sites must ensure that each worker at the mine or petroleum site is provided with suitable and adequate information, training and instruction related to

<sup>3</sup> Clause 9, WHS (M&PS) Regulation

<sup>4</sup> Clause 36 WHS Regulation

the hazards associated with the work being carried out and the implementation of control measures relating to the work being carried out by the worker. [Clause 104(2) WHS (M&PS) Regulation]

**Issue:** Additional training was not always conducted on a regular basis to provide and maintain workers' specific knowledge on the hazards associated with airborne dust.

**Response:** Dust awareness training should be provided regularly to the workforce to reinforce the risks to workers' health from dust and other airborne contaminants and the risk controls that are in place at the mine.

## Critical controls

**Issue:** Some of the mines assessed were implementing a critical control identification and management process. But there was not always documented plans for the implementation and integration into the existing safety management systems and the criteria for the critical control selection was not well defined.

**Response:** The International Council on Mining & Metals (ICMM) provides guidance on the implementation of critical control management (CCM) systems. This guidance advises that, 'a successful CCM process will have monitoring and reporting components embedded into business-as-usual operations, this includes integrating scheduled verification activities and reporting into current maintenance and inspection systems'.<sup>5</sup>

Additionally, there should be a fundamental understanding of the critical control approach at all levels of the organisation and a process of review.

In relation to selection of critical controls, mine operators should ensure that criteria are clearly defined to ensure a credible and sustainable focus on those controls having greatest impact in managing risks associated with rare but catastrophic unwanted events. The ICMM provides a definition for critical control that may provide guidance in the selection of site critical controls.<sup>6</sup>

## Principal hazard management plan

**Issue:** The principal hazard management plan for air quality or dust or other airborne contaminants did not include all control measures identified in the risk assessment process and did not set out the reasons for adopting or rejecting each control measure considered.

<sup>5</sup> Critical Control Management Implementation Guide, International Council on Mining & Metals, 2015, p50

<sup>6</sup> Critical Control Management Implementation Guide, International Council on Mining & Metals, 2015, p53



**Response:** A principal hazard management plan must describe all control measures to be implemented to manage risks to health and safety associated with the principal hazard and set out the reasons for adopting or rejecting each control measure considered.<sup>7</sup>

## Specific findings

### Personal protective equipment

**Issue:** In many cases, mine's standards for personal protective equipment (PPE) and task specific procedures did not nominate the mandatory respiratory protection equipment (RPE) required for tasks and areas of the mine where workers were at increased risk because of exposure to dust or other airborne contaminants. e.g. maintenance electricians working on high voltage cabinets in trucks, maintenance workers replacing equipment filters and handling used filters.

**Response:** Mine operators must ensure the documented PPE procedures clearly identify the circumstances when wearing RPE is mandatory. The nominated RPE must be appropriate for the nature of the work and any hazard associated with the work. (Clause 44(3)(a)(i) WHS Regulation)

For example, the use of powered air purifying respirators (PAPR) for higher risk tasks.

**Issue:** Workers did not always carry or wear appropriate RPE when working in areas of the mine where respirable dust was likely to be present.

**Response:** Mine operators must ensure that workers are provided with appropriate PPE and are provided with information, training and instruction in the proper use of the equipment.<sup>8</sup> The worker must, as far as the worker is reasonably able, use or wear the PPE in accordance with the information, training or instruction provided.

<sup>7</sup> Clause 24, WHS (M&PS) Regulation

<sup>8</sup> Clause 44, WHS Regulation

## Pre-start inspections of mobile equipment

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**Issue:** The pre-start inspection report checklist did not always include specific inspections of the cabin cleanliness, the cabin sealing arrangements and the operation of the filtered pressurised systems.

**Response:** Inspection requirements should include confirmation of housekeeping standards and absence of threats related to dust and other contaminants. When developing a control measure to manage the risks to health and safety associated with dust and other airborne contaminants (e.g. cabin cleanliness and cabin sealing arrangements) inspection and testing of mobile plant must be considered.<sup>9</sup>

**Issue:** Documented pre-start inspection checklists did not always reflect the prevalent practices at the mine. In one assessment, the pre-start inspection checklist nominated faulty air conditioning as a defect that did not require the equipment to be stood down, whereas the standard practice was to stand the equipment down if the air conditioning or cabin pressurisation was defective.

**Response:** Mine operators should ensure that the documented pre-start inspection checklists and required actions are clear and are aligned with the safety management systems.

## Communication of personal monitoring results to workers

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**Issue:** At some sites, workers were only notified of their personal monitoring results when there was an exceedance.

**Response:** Mine operators should take every opportunity to engage workers in health and safety matters. Communicating their personal monitoring results, regardless of whether they have reached an exceedance threshold, helps workers to manage their risk behaviour. Sampling results for the similar exposure groups (SEGs) should be made available to workers as well as the work health and safety committee.

## Trigger action response plans

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**Issue:** Trigger action response plans (TARPs) for dust did not include actions required for workers on the ground. Shotfirers and maintenance workers were often overlooked when weather conditions required operations to be modified or cease.

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<sup>9</sup> Schedule 2 clause(2)(3)(e) WHS (M&PS) Regulation

**Response:** Mine operators should ensure that workers on the ground are included in the dust TARPs and that actions are clear for this group of workers. Workers on the ground must be informed when they must remove themselves from dust hazards.

## Areas of good practice

- ✓ Implementation of programs to educate workers on the health hazards associated with dust, and correct fitment of RPE.
- ✓ Relocating haul truck routes in response to dust generation from wind direction and speed.
- ✓ Allocating a dedicated small water cart to the shotfirers' crew to ensure the bench was sufficiently watered down.
- ✓ Shotfirers had dust masks available in their light vehicles for easy access.
- ✓ Trialling real time dust monitoring on the shot bench.
- ✓ Progressively rehabilitating mined-out areas of the pit, to reduce the dust potentially liberated into the atmosphere.
- ✓ Using powered air purifying respirators (PAPR) to clean high voltage cabinets.
- ✓ Trialling dust/fume extractors to clean high voltage cabinets.
- ✓ A stemming truck had enclosed conveyors and discharge chute fitted with water sprays.
- ✓ Detailed cabin cleaning of heavy mobile equipment at specified intervals.
- ✓ Monitoring pressurised operator cabins in real time to alert operators of the possible opportunity for dust ingress.
- ✓ Run of mine to primary crusher operations was contained within an enclosed building, using sprays to contain and suppress dust.

## Compliance

Targeted assessments provide an account of the issues observed at particular sites at a point in time. Some of the findings resulted in notices being issued, including notices of concern, under section 23 of the WHS (M&PS) Act, and improvement notices, under section 191 of the WHS Act.

| Notice                    | In relation to:   |
|---------------------------|---|
| Improvement notices, s191 | <ul style="list-style-type: none"> <li>■ training for all workers on air quality, dust and other airborne contaminants principal hazard management plan</li> <li>■ workers requiring ready access to respiratory protection equipment</li> <li>■ documenting communication arrangements between shifts</li> <li>■ reviewing tasks to determine mandatory PPE for tasks where workers may potentially be exposed to airborne contaminants</li> <li>■ air quality, dust and other airborne contaminants principal hazard management plan to address clause 24(3) of the WHS (M&amp;PS) Regulation</li> </ul>                  |
| Notices of concern, s23   | <ul style="list-style-type: none"> <li>■ pre-start inspection records (no monitoring of inspections completed)</li> <li>■ information (dust results, notices) not on the workshop notice board</li> <li>■ dusty haul roads</li> <li>■ non-compliance with closed window policy</li> <li>■ documented pre-operational inspection report system not being correctly implemented</li> <li>■ mandatory wearing of respiratory protection for particular tasks and areas of the mine had not been identified and documented</li> <li>■ the availability of a suitable water cart able to access the shotfirers' bench</li> </ul> |

## Where to now

This report provides all operators with an opportunity to review their own safety management systems armed with the insight and knowledge gained by the Regulator in relation to the management of airborne contaminants.

The outcomes of these targeted assessments will provide information that will be used to inform the Regulator's ongoing education and compliance efforts.

This targeted assessment program has identified many common issues around the approach taken by sites to manage the hazard of dust and other airborne contaminants. It also highlighted broader issues that were common across mine sites associated with the process of developing, implementing and reviewing risk assessments, management plans and procedures.

Operations should challenge their control measures and ensure risks are being managed so far as reasonably practicable. Mine operators should also ensure they have robust systems in place to verify the effectiveness of their risk control measures.

### Issued by

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NSW Resources Regulator  
NSW Department of Planning, Industry and Environment

## Further information

For more information on targeted assessment programs, the findings outlined in this report, or other mine safety information, please contact the NSW Resources Regulator. The contact details are below.

| Type               | Contact details  |
|--------------------|--|
| Email              | cau@planning.nsw.gov.au  |
| Incident reporting | To report an incident or injury call <b>1300 814 609</b>                         |
| Website            | <a href="http://resourcesregulator.nsw.gov.au">resourcesregulator.nsw.gov.au</a> |
| Address            | NSW Resources Regulator<br>516 High Street<br>Maitland NSW 2320                  |

## Appendix A: Legislative requirements relating to the management of dust and other airborne contaminants

The appendix provides a list of legislative requirements for the management of dust and other airborne contaminants referred to in this report as provided by the *Work Health and Safety Act 2011*, *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* and *Work Health and Safety Regulation 2017*.

| Legislation, section/clause      | Legislative requirements  |
|----------------------------------|---|
| WHS Act, section 19              | <a href="#">Primary duty of care</a>  |
| WHS (MPS) Regulation, clause 24  | <a href="#">Preparation of principal hazard management plan</a>               |
| WHS (MPS) Regulation, clause 104 | <a href="#">Duty to provide information, training and instruction</a>         |
| WHS (MPS) Regulation, clause 121 | <a href="#">Duty to consult with workers</a>                                  |
| WHS (MPS) Regulation, Schedule 2 | <a href="#">Principal control plans - matters to be addressed</a>             |
| WHS Regulation, clause 9         | <a href="#">Management of risks to health and safety</a>                      |
| WHS Regulation, clause 36        | <a href="#">Hierarchy of control measures</a>                                 |
| WHS Regulation, clause 39        | <a href="#">Provision of information, training and instruction</a>            |
| WHS Regulation clause 44         | <a href="#">Provision to workers and use of personal protective equipment</a> |