NSW GOVERNMENT

NSW Resources Regulator

CONSOLIDATED REPORT (STAGE 1 OF 2)

AIR QUALITY OR DUST OR OTHER AIRBORNE CONTAMINANTS – OPEN CUT COAL

Planned Inspection Program

July-November 2020

NSW Resources Regulator

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Contents

Executive Summary

A crucial part of the NSW Resources Regulator's Incident Prevention Strategy involves targeted assessment and planned inspection programs for mines and petroleum sites. This focuses on assessing an operation's control of critical risks through evaluating the effectiveness of control measures in the mine's safety management system.

The Regulator has developed a bowtie hazard management framework and standardised assessment checklist for each program plan. Under each program plan, the effectiveness of the safety management system at each mine site is assessed against a standard set of control supports and critical controls.

Due to the various controls that were derived from the bowtie analysis for the principal hazard of air quality or dust or other airborne contaminants within the open cut coal industry, the overall program plan was split into two stages. This report summarises the assessment findings from stage one of the program, which covered 27 mines during the period from July 2020 to November 2020.

For stage one of the program, the threats and critical controls assessed for the material unwanted event (exposure to hazardous atmosphere) are shown in Table 1. Stage two of the program will cover the remaining controls derived from the bowtie.

Table 1. Threats and critical controls for the material unwanted event (exposure to hazardous atmosphere – open cut coal) – Stage 1.

	THREAT/CONSEQUENCE	CRITICAL CONTROL
Threat	1. Low oxygen environment 2. Dust raised into suspension 3. Hazardous chemicals in the atmosphere 4. Carcinogens in the atmosphere	PC 1.3 – **Ventilate workplace**
Consequence	1. One or more fatalities	MC 1.2 – **Hygiene monitoring** MC 1.3 – **Health monitoring**

Legislative requirements and published guidance relating to the principal hazard of air quality or dust or airborne contaminants is listed in Appendix A. Figure 1 presents safety compliance findings for each de-identified mine and critical control assessed for the material unwanted event of exposure to hazardous atmosphere. Explanatory notes on the assessment system are also listed in Appendix B.

Key findings

Throughout the inspection program, there were several examples where a site could demonstrate positive reinforcement with their nominated controls for air quality or dust or other airborne contaminants. Some of these key findings were:

- Health monitoring was well carried out, with COVID-19 related delays rectified promptly.
- Many mines had instituted comprehensive similar exposure group (SEGs) monitoring for airborne contaminants, including welding fume and diesel particulate matter.
- Several mines had introduced trigger action response plans for visible airborne dust.
- Several mines had engaged external providers to deliver training on airborne contaminants and their health effects. Workers at those sites had detailed knowledge of the hazards in their workplace, the health effects of those contaminants and the major controls for the hazard.
- Most mines had defects of the dust controls for diesel equipment listed as a high-level defect requiring rectification prior to operation.

Whilst the above points were encouraging, there were some concerning elements, as described below:

- Several mines did not maintain the currency of risk assessments, management plans and the associated procedures. There is a legal requirement to review these documents on a three yearly basis to ensure that they still adequately control the hazards at the mine.
- Several mines had issues with cabin cleanliness on mobile equipment and poor uptake of vacuum or wet methods of cleaning to prevent dust becoming airborne.
- There was little consideration of the potential for fugitive welding fume and the need for exclusion zones to protect other workers from this hazard.

Recommendations

The planned inspection program highlighted varying levels of control implementation and effectiveness across all the sites assessed. This highlighted several practices which could be improved to assist in protecting the health and safety of workers when exposed to this hazard. Based on the assessments completed, the recommendations are as follows:

- mine operators should consider the risk of fugitive fume from hot works and identify appropriate exclusion zones

- mine operators should identify maximum running times for diesel equipment in workshops and where that time is going to be exceeded, then identifying additional controls to ventilate the area
- all relevant controls for airborne contaminants should be included in the pre-start inspections for diesel equipment
- controls for airborne dust on mobile equipment should be classed as a high-level defect
- mine operators should implement a “windows up” policy for general operations at the mine. Note, conditions may exist where an activity may require exemptions from this due to other risks and controls
- mine operators should identify similar exposure groups (SEGs) for workers who may be exposed to airborne contaminants
- mine operators should carry out base line monitoring for those SEGs
- mine operators should develop, in conjunction with an occupational hygienist, an appropriate monitoring program for those SEGs
- results from hygiene monitoring should be communicated to the work groups and, where individual monitoring is carried out, a copy given to the individual

Introduction

The NSW Resources Regulator's planned inspection programs provide a planned, risk-based and proactive approach to assessing how effective an operation is when it comes to controlling critical risk. These programs apply the following principles:

- a focus on managing prescribed 'principal hazards' from the Work Health and Safety (Mines & Petroleum Sites) Regulation 2014
- evaluation of the effectiveness of control measures implemented through an organisation's safety management system
- consideration of the operation's risk profile.

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

Scope

Planned inspection programs include two assessment types:

- targeted assessments, incorporating:
  - desktop assessment of:
    - compliance against legislation with respect to the management of health and safety risks associated with air quality or dust or other airborne contaminants – open cut coal – see Appendix A for details
    - the definition of the controls the mine utilises to prevent and mitigate the risks to health and safety associated with air quality or dust or other airborne contaminants.
  - a workplace assessment of the implementation of those controls through the inspection of plant and worker interviews.
- planned assessments, which involve a workplace assessment of the implementation of controls through worker interviews and the inspection of plant.

The process

The process for undertaking an assessment under a planned inspection program generally involves the following stages:

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

Assessment findings

Controls assessed

Threats:

- low oxygen environment
- dust raised into suspension
- hazardous chemicals in the atmosphere
- carcinogens in the atmosphere.

Critical control: PC1.3 Ventilate workplace.

Objective: Dilute airborne contaminant levels to as low as reasonably practicable or direct them away from the breathing zone of people in the workplace.

Performance requirement:

1. Ventilation is identified as a means of reducing the risk of people being exposed to poor air quality, dust or other airborne contaminants.
2. The nominated ventilation systems effectively maintain air quality or reduce dust and airborne contaminants exposure to as low as reasonably practicable.

The areas assessed for ventilation controls included maintenance workshops (potential contaminants were identified as diesel emissions, dust and welding fumes), laboratories (dust), reclaim tunnels (dust and gases from the product) and vehicle cabins (dust).

Within workshop areas, welding bays generally had exhaust or filtration systems in place to deal with welding fumes. Some workshops had mobile extractors for use in other areas of the workshop for when hot work was being carried out. There was little guidance provided in hot work permits for defining exclusion zones based on the risk of personnel being exposed to the airborne contaminants generated by the hot work. Similarly, there was little guidance for boilermakers on when to use higher level PPE such as powered air purifying respirators. Some workshops, as a minimum, had a bay that was always open to fresh air to provide some airflow through the workshop. Live testing of diesel equipment in the workshop was described as generally of a short duration with a corresponding low risk.

Reclaim tunnels were generally seen as being effectively ventilated, with fixed environmental monitoring in place for the gases that may accumulate in the tunnels. Some consideration should be given for purge times when ventilation systems fail, as well such systems for personnel to monitor the environment.

Cabin ventilation standards were generally seen as being well implemented across sites. Issues were identified with pre-start inspections with several mines not inspecting all the controls for dust through this process. Several mines had the dust controls listed as a lower level defect – meaning they could continue to operate with defects in air conditioning, cabin pressurisation and door seals. A small number of mines did not have a “windows up” policy, which is required to ensure the effectiveness of other dust controls in place.

Consequence: One or more fatalities.

Critical control: MC1.2 Hygiene monitoring.

Objective: Worker exposure to airborne contaminants is monitored to confirm control effectiveness and to gather data to drive improvement activity.

Performance requirement:

1. Hygiene monitoring is identified as a means of monitoring worker exposure to poor air quality or dust or other airborne contaminants.

2. Workers participate in a hygiene monitoring program.

All of the mines assessed had Coal Services monitoring (Order 42) in place. Many mines had gone beyond this requirement with a site-specific risk-based monitoring program with designated SEGs. In all cases where SEGs were identified, the hygiene monitoring went beyond just dust and included contaminants such as welding fume and diesel particulates. Groups monitored for these specific contaminants included laboratory workers, personnel flushing electrical cabinets with compressed air, boilermakers, workshop fitters and cleaners.

Although the majority of mines could demonstrate effective communication of hygiene monitoring results, there were some mines where the results were poorly communicated to the workforce. This included not posting results on noticeboards or information walls, as well as workers not receiving their individual monitoring results.

Consequence: One or more fatalities.

Critical control: MC1.3 Health monitoring.

Objective: Early indication of health impacts caused by exposure to poor air quality or dust or airborne contaminants are identified.

Performance requirement:

1. Health monitoring is identified as a means of detecting early changes to workers' health as a result of exposure to poor air quality or dust or other airborne contaminants.
2. Workers participate in a health monitoring program.

All of the mines assessed conformed with Coal Services Order 43 health monitoring requirements. Some mines, at the time of assessment, were slightly behind in health monitoring due to restrictions imposed because of COVID-19. However, evidence could be produced to show that these had been re-scheduled in the near future to rectify the issue. Only one work group, a contract crushing company, was reported as going beyond the Order 43 requirements with yearly medicals scheduled which also included spirometry.

Assessment findings by mine

Figure 1 and Figure 2 present aggregate assessment findings by critical control, providing a summary view of the status of each mine's hazard management processes.. More details explaining the assessment system are found at Appendix B.

Figure 1. Assessment findings for the planned inspection program air quality or dust or other airborne contaminants – open cut coal – Overall results < 100%

Mine	Threat	Consequence	
	1. Low oxygen environment 2. Dust raised into suspension 3. Hazardous chemicals in the atmosphere 4. Carcinogens in the atmosphere	One or more fatalities	
	PC1.3	MC1.2	MC1.3
	Ventilate workplace	Hygiene monitoring	Health monitoring
Mine A			
Mine B			
Mine C			
Mine D			
Mine E			
Mine F			
Mine G			
Mine H			
Mine I			
Mine J			

Green (=100%)
Yellow (>= 80% and <100%)
Orange (>= 65% and <80%)
Red (<65%)
Not applicable

Figure 2. Assessment findings for the planned inspection program air quality or dust or other airborne contaminants – open cut coal – Overall results = 100%

Mine	Threat	Consequence	
	1. Low oxygen environment 2. Dust raised into suspension 3. Hazardous chemicals in the atmosphere 4. Carcinogens in the atmosphere	One or more fatalities	
	PC1.3	MC1.2	MC1.3
	Ventilate workplace	Hygiene monitoring	Health monitoring
Mine K	●	●	●
Mine L	●	●	●
Mine M	●	●	●
Mine N	●	●	●
Mine O	●	●	●
Mine P	●	●	●
Mine Q	●	●	●
Mine R	●	●	●
Mine S	●	●	●
Mine T	●	●	●
Mine U	●	●	●
Mine V	●	●	●
Mine W	●	●	●
Mine X	●	●	●
Mine Y	●	●	●
Mine Z	●	●	●
Mine AA	●	●	●

- Green (=100%)
- Yellow (>= 80% and <100%)
- Orange (>= 65% and <80%)
- Red (<65%)
- Not applicable

Notices issued

Of the 27 sites assessed under the inspection program, 14 separate mines received notices relating to the principal hazard of air quality or dust or other airborne contaminants, whilst some mines received notices in relation to other matters. For the purposes of this report, contraventions relating to other matters have been removed from the analysis. The notices issued for air quality or dust or other airborne contaminants were examined in detail and Table 1 below lists the notices issued by type and details.

Table 1. Notices issued for the planned inspection program for air quality or dust or other airborne contaminants

NOTICE TYPE	TOTAL ISSUED	NUMBER OF MINES
s.195 prohibition notice	0	0
s.191 improvement notice	7	7
s.23 notice of concerns	12	12
Total	19	14

Of the combined 19 notices issued, there were some common themes which were apparent throughout the program plan. Table 2 summarises the type of contraventions and outlines the total occurrences encountered. These themes can be related back to the critical controls outlined earlier and identify some trends which are of concern.

Table 2. Notices issued - prevalence of categories of concern

IDENTIFIED CONCERN CATEGORY	TOTAL OCCURRENCES IN NOTICES
Documentation relating to controls for airborne dust (Risk Assessment, PHMP, TARPs) not relevant, current, or readily available	9
Vehicle pre-use inspection checklists did not accurately specify controls of the hazard	7
Poor standard of vehicle cabin housekeeping or dust mitigation	6
Workers not familiar with sources of hazard or what controls to use	5
Workers not familiar with exposure standards or risk to health	4
Information for workers not clearly communicated or detailed in relation to hazard monitoring	3
Equipment used to remove airborne containments is not readily available, maintained appropriately or inadequate	2
Opportunities for maximising access to PPE not adequately addressed or implemented	1
Workers not trained adequately on the principals of dust monitoring devices or access to such devices	1
Hazard monitoring devices either not positioned appropriately or installed as per site standards	1
Workers or work groups not identified for monitoring in relation to the hazard	1
SEG group results not adequately communicated to workforce	1
Workers not familiar with nominated controls on site	1
Supervisors not familiar with exposure standards or risk to health	1

Further information

For more information on safety assessment programs, the findings outlined in this report, or other mine safety information, please contact the Regulator:

CONTACT TYPE	CONTACT DETAILS
Email	cau@planning.nsw.gov.au
Incident reporting	To report an incident or injury call 1300 814 609 or log in to the Regulator Portal
Website	www.resourcesregulator.nsw.gov.au
Address	NSW Resources Regulator 516 High Street Maitland NSW 2320

Appendix A.

Legislative requirements and published guidance

The following is a list of certain legislative requirements for the management of air quality or dust or other airborne contaminants risks referred to in this report as provided by the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 and Work Health and Safety Regulation 2017. In addition, several guidance documents are also noted which have been published and are available for industry distribution.

Work Health and Safety Regulation 2017:

- Clause 36 - Hierarchy of control measures
- Clause 49 - Ensuring exposure standards for substances and mixtures not exceeded
- Clause 50 - Monitoring airborne contaminants levels
- Clause 51 - Managing risks to health and safety (Safe oxygen level).

Work Health and Safety (Mines and Petroleum Sites) Regulation 2014:

- Clause 9 - Management of risks to health and safety
- Clause 26 (3) - Health control plan
- Clause 39 - Ensuring exposure standards for dust not exceeded
- Clause 86 - Sampling and analysis of airborne dust (Coal mines)
- Clause 103-108 - Information, training and instruction.

Schedule 1, Clause 5 - Air quality or dust or other airborne contaminants.

Schedule 2, Clause 1 - Health control plan.

Safe Work Australia - Hazardous chemicals requiring health monitoring.

Learning from disasters event:

- Re-emergence of dust diseases including coal miner's pneumoconiosis and silicosis in the mining industry.

Appendix B.

Assessment system explained

The Regulator uses a bowtie framework to proactively assess how mine sites manage their principal hazards. Bowties are a widely used risk management tool that integrates preventative and mitigating controls onto threat lines that relate to a material unwanted event.

As part of program planning, controls were categorised by the Regulator in accordance with the ICMM handbook. Only controls deemed critical[1] are assessed under a planned inspection program. For a control to be assessed as effective, each of its control supports must be in place and operational.

Assessment findings

During the program, each control support assessed at each mine was rated and the findings recorded. Points were awarded depending on whether there was evidence that the control support had been documented and/or implemented. Importantly, the system recognises the value of fully implemented and documented controls by allocating four points if both these elements are present.

For finding outcomes, points were awarded for each control support identified within a critical control. An overall assessment result for the critical control was then calculated as a proportion of the maximum possible points for that critical control. For example, if a critical control comprises ten control supports and five were assessed as fully implemented (‘documented and implemented’) and five were found to be ‘not documented and not implemented’ then the overall assessment result for that critical control would be 50%.

Table 3. Finding outcome and points

FINDING OUTCOME	POINTS
Documented and implemented	4
Implemented but not documented	2
Documented but not implemented	1
Not documented and not implemented	0

[1] Critical Control Management Implementation Guide, International Council on Mining and Metals (ICMM), 2015.

Critical control calculations also took into account instances where control supports were not applicable to the mine being assessed or when control supports were not able to be assessed during a site visit.

The overall assessment result for each critical control has been assigned a colour based on the assessment bands presented in the table below. The colour band results are then used to identify industry focus areas requiring improvement.

Table 4. Assessment results colour code

CRITERIA	COLOUR
An assessment result of 100% of possible points	Green
An assessment result of ≥ 80% but < 100% of possible points	Yellow
An assessment result of ≥ 65% but < 80% of possible points	Orange
An assessment result of < 65% of possible points	Red