NSW GOVERNMENT

NSW Resources Regulator

PLANNED INSPECTION PROGRAM

CONSOLIDATED REPORT: FIRE OR EXPLOSION – SURFACE COAL - MECHANICAL

December 2019-January 2021

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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 is a focus on assessing an operation's control of critical risks through evaluating the effectiveness of control measures in the mine's safety management system.

To this end, we 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.

This final report summarises assessment findings from 25 mines and coal handling and preparation plants (CHPP) in relation to assessments for the principal hazard of fire or explosion, surface coal mines, mechanical, conducted during the period from December 2019 to January 2021.

The threats and critical controls assessed for the material unwanted event of fire or explosion, surface coal mines, mechanical, are shown in Table 1. Note that not all critical controls were applicable at all mines.

Table 1. Threats and critical controls for the material unwanted event – fire or explosion - surface coal mines - mechanical

THREAT	CRITICAL CONTROL
Mechanically generated heat	PC 2.1 – Minimize friction and control hot surfaces
Accumulated flammable material, leaks or spills	PC 3.2 – Flammable fluid containment
Hot work	PC 5.1 – Manage hot work fuel sources

Legislative requirements and published guidance relating to the principal hazard of fire or explosion are listed in Appendix A. Figures 1 and 2 present safety compliance findings for each de-identified mine and critical control assessed for the material unwanted event of fire or explosion. Explanatory notes on the assessment system are also listed in Appendix B.

Key Findings

Regulatory compliance action was required at a number of sites due to various contraventions of the relevant acts and regulations. Fortunately, no sites required immediate intervention relevant to this planned inspection program. However, fifteen statutory notices were issued under section 191 of the *Work Health and Safety Act 2011*, and 29 statutory notices under section 23 of the *Work Health and Safety (Mines and Petroleum Sites) Act 2013*.

Significant issues were identified across a number of sites in relation to a range of areas including:

- Documentation including risk assessments, principal hazard management plans and engineering control plans not identifying hazards or controls, were not current and didn't include appropriate workforce representation.
- Inadequate controls in hot work areas including lack of maintenance and signage, poor housekeeping, lack of pre-use inspections and poor gas cylinder management.
- Some coal handling plants and reclaim tunnels where firefighting equipment was not accessible or poorly maintained.
- Poor installation and maintenance standards for heat shielding on turbos, manifolds and exhausts.

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:

- Review relevant risk assessments to confirm all hazards are identified, appropriate controls are documented, a cross section of the workforce were involved and control implementation is monitored and verified.
- The Mechanical Engineering Control Plan and supporting documents should detail all controls and site requirements for managing fire and explosion risks. Appropriate review periods should be implemented and workers trained in the requirements detailed in these documents.

- Mine operators should also ensure that appropriate resources are made available to adequately manage the fire or explosion risks, to validate and verify control effectiveness and identify any deficiencies which may exist.
- It is recommended that mine operators review their site's relevant risk assessment, principal hazard management plans, and associated documents, to manage the mechanical risks associated with fire or explosion that are unique to their site.
- Mines should review maintenance practices to ensure hazards related to fire and explosion are not created through poor quality maintenance, lack of housekeeping or unidentified defects.

Introduction

The NSW Resources Regulator's planned assessment 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 fire or explosion – 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 fire or explosion.
  - 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 the inspection of plant and worker interviews only.

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

Threats and controls assessed

Threats:

- Mechanically generated heat.

Critical control: PC 2.1 – Minimise friction and control hot surfaces.

Control objective: Mechanical ignition sources are controlled.

Performance requirement:

- Mechanical equipment is designed to eliminate or minimise ignition sources.
- Mechanical equipment is installed and maintained to eliminate or minimise ignition sources.

The following issues were identified throughout the planned inspection program:

- Fire or explosion risk assessments did not clearly identify hazards, controls were not implemented or the risk assessment required reviewing. In some cases, management plans were nominated as controls. Some risk assessments did not include an adequate cross-section of the workforce.
- Heat shielding around turbos, manifolds, and exhausts were either absent, poorly installed, contaminated by combustible fluids, or had poor inspection and maintenance standards.
- Reclaim tunnels where firefighting equipment was installed without considering the ventilation flow and the direction personnel would access the tunnel to fight a fire. In one instance, modifications to the second egress ladder prevented access with a stretcher.
- Firefighting equipment and suppression activation buttons on dozers were not accessible when the engine bay doors were opened.
- Conveyor belt wander switches where not installed where conveyors passed through fixed infrastructure such as boot ends, load stations, loop take ups and drives.

- Combustible materials (e.g. spillage, fines, float dust, oil, grease, rubbish) had accumulated to the point of contacting moving or rotating components. This was evident in several cases under conveyor belts where rollers or the moving belt were contacting coal fines.
- Water cart operators and firefighting team training requirements inconsistent, unclear, intermittent, or absent.
- Accumulated flammable material, leaks or spills.

Critical control: PC 3.2 – Flammable fluid containment.

Control objective: Flammable fluid containment prevents contact with an ignition source.

Performance requirement: Flammable fluids are contained while being stored, transferred and used.

The following issues were identified throughout the planned inspection program:

- Document, inspect and maintain the equipment and procedures for transferring flammable fluids to mechanical plant for storage or use. Specific issues noted include refuelling areas not bunded, ute back diesel dispensing tanks were not being inspected and maintained and static lines not being used.
- Housekeeping standards, including vegetation control, are inadequately documented and managed.
- Firefighting equipment was not accessible in areas where combustible materials were contained or stored. This included conveyor gantries, upper levels of washery buildings and tail end of reclaim tunnels.
- Firefighting equipment signage was not clearly visible or was faded by sunlight.
- Oxygen and fuel gas cylinder storage practices were inadequate. Poor security, segregation and storage practices were observed.
- Accumulation of combustible material around workshops, such as the use of bunds under bulk stores, spillage of oils and greases, or build-up of fines, rubbish and vegetation.

- Storage racks were not installed level and allowed spillage.
- Fuel and ignition sources in close proximity, such as batteries stored in the bulk oil storage area, cardboard boxes stored next to compressors, or a compressor mounted above a workshop waste oil bund.
- Site waste oil containers were not marked, of poor standard, open to the elements, or surrounded by vegetation.

Hot work

Critical control: PC 5.1 – Manage hot work fuel sources

Control objective: Hot work activities do not ignite flammable or combustible material.

Performance requirement:

- hot work activities posing a fire or explosion risk are identified
- flammable and combustible material is protected from being ignited by hot work.

The following issues were identified throughout the planned inspection program relating to hot work:

- Hot work management plan (HWMP) provided no detail on fire watch arrangements, or standards for the designated hot work area .
- Hot work permit systems were incomplete, not correctly filled in, not understood, or not followed, such as not including a check on fire ban status, or the fire watcher not signing on to the permit.
- Hot work equipment:
  - was defective, not inspected, or inspection tags were out-of-date
  - pre-use inspections were not documented, or contractor pre-use was not approved by the mine
  - electric welder handpiece and earth clamp left on the same metal welding table with the potential to be energised

  - pressure regulator gauges on bottles had different units of measurement
  - auxiliary ventilation/extraction device poorly used. Inspectors observed unfiltered gasses recirculating back into the work area.
- Designated hot work areas:
  - At some mines, did not exist or were not delineated
  - were untidy and/or had accumulated combustible materials
  - combustible materials such as spray cans stored in the area
  - had no communications means installed
  - had no eyewash facilities in the area
  - had no firefighting equipment.
- Firefighting depots and spill kits both in red bins with poor signage to identify each.
- Hot work was being performed in close proximity to combustible material and the hazard was not identified. This included waste bins and oil drum storage.

Findings by mine

Figures 1 and 2 present aggregate assessment findings by critical control, providing a summary view of the status of each mine's hazard management processes. Importantly, the system recognises the value of fully implemented and documented controls by awarding an additional point if both elements were assessed as present. More details explaining the assessment system are found at Appendix B.

Figure 1: Assessment findings for the planned inspection program – fire or explosion – surface coal mines - mechanical – overall results < 90%

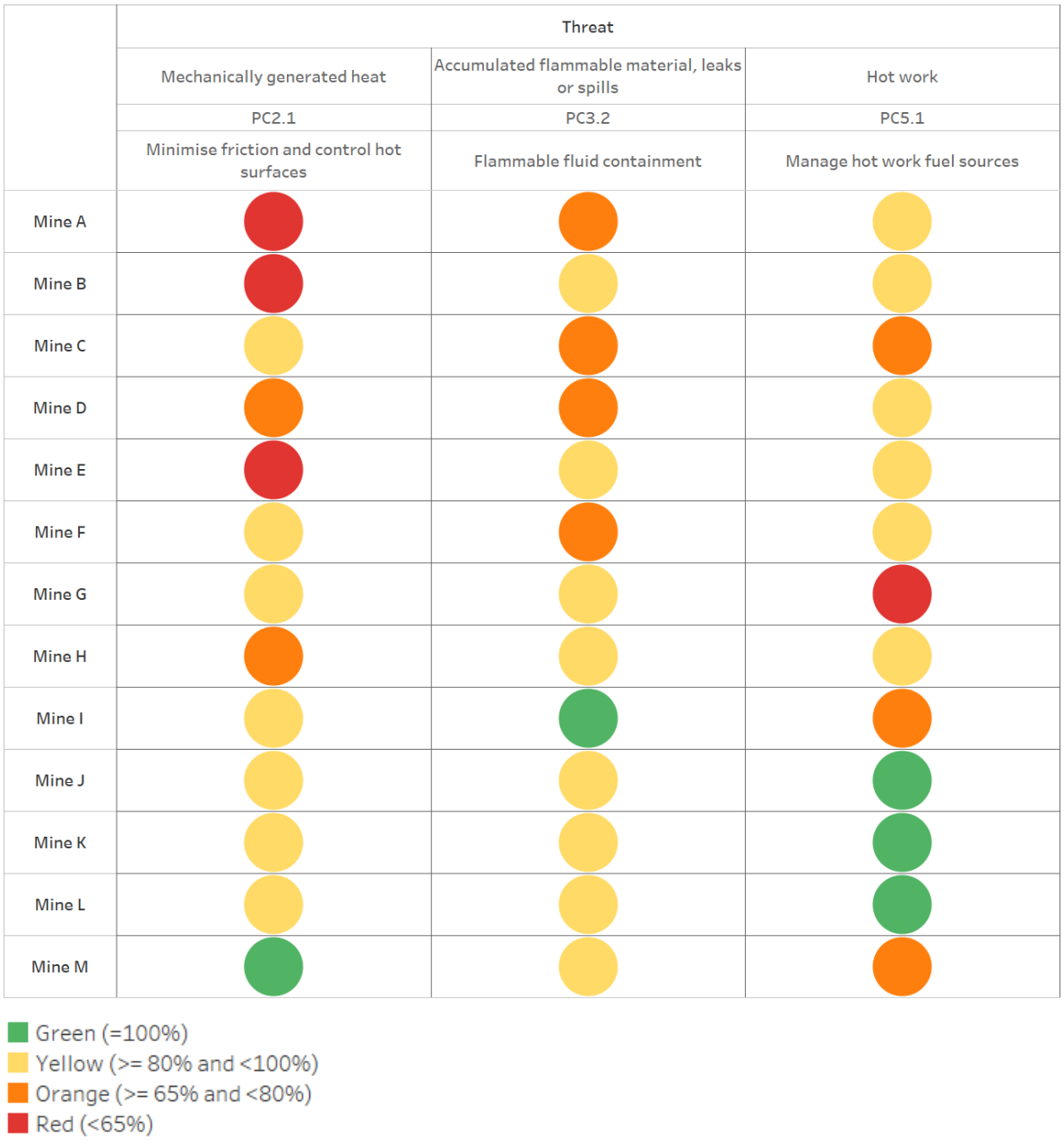

Figure 2: Assessment findings for the planned inspection program – fire or explosion – surface coal mines - mechanical – overall results ≥ 90%

	Threat		
	Mechanically generated heat	Accumulated flammable material, leaks or spills	Hot work
	PC2.1	PC3.2	PC5.1
	Minimise friction and control hot surfaces	Flammable fluid containment	Manage hot work fuel sources
Mine N			
Mine O			
Mine P			
Mine Q			
Mine R			
Mine S			
Mine T			
Mine U			
Mine V			
Mine W			
Mine X			
Mine Y			

Green (=100%)
Yellow (>= 80% and <100%)
Orange (>= 65% and <80%)
Red (<65%)

Notices issued

Of the 25 sites assessed under the inspection program, 23 separate mines received notices relating to the principal hazard of fire or explosion, while some mines received notices in relation to other matters. For the purposes of this report, contraventions related to other matters have been removed from the analysis. The notices issued for fire or explosion were examined in detail and Table 2 below lists the notices issued by type and details.

Table 2: Notices issued for the planned inspection program – fire or explosion – surface coal mines - mechanical

NOTICE TYPE	TOTAL ISSUED	NUMBER OF MINES
s.195 prohibition notice	-	-
s.191 improvement notice	15	11
s.23 notice of concerns	29	23
Total	**44**	**23**

Of the combined 44 notices issued, there were some common themes which were apparent throughout the program plan. Table 3 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 3: Notices issued - prevalence of categories of concern

IDENTIFIED CONCERN CATEGORY	TOTAL OCCURRENCES IN NOTICES
Emergency equipment (e.g. firefighting, first aid, chemical spills) is not readily available, maintained, fit-for-purpose or located appropriately	25
Fuel sources (e.g. vegetation, rubbish, oils, chemicals) not identified or managed	17
Poor standard of storage or separation of flammable chemicals and materials	16
Plant guarding not readily available, maintained appropriately or inadequate	11
Poor standard of signage for emergency equipment or hot work areas	10
Workers not trained adequately on permits to work, hot work equipment, firefighting, emergencies (TARPS)	9
Poor standard of verifying compliance to nominated controls on site	7
Documentation relating to controls for fire or explosion (e.g. risk assessment, PHMP, TARPs) not relevant, current, or readily available	7
Competent person not accurately identifying conditions on conveyor belts that were likely to cause fire	6
Lack of controls to restrict unauthorised persons from being exposed to energised equipment, hazardous chemicals, designated permit to work areas	6
Permits to work inappropriate, incomplete, incorrect or not available	6
Supervisors not familiar with inspection regimes for firefighting equipment	4
Ignition sources (e.g. exposed wiring, static electricity, hot surfaces, sparking, friction) not identified or managed	4

Further information

For more information on safety assessment programs, the findings outlined in this report, or other mine safety information, please contact the NSW Resources 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	https://www.resourcesregulator.nsw.gov.au/
Address	NSW Resources Regulator 516 High Street Maitland NSW 2320

Appendix A. Legislative requirements and published guidance relating to the principal hazard fire or explosion

The following is a list of certain legislative requirements for the management of fire or explosion 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.

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

- Clause 5 – Meaning of principal hazard
- Clause 23 - Identification of principal hazards and conduct of risk assessments
- Clause 24 - Preparation of principal hazard management plans
- Schedule 1 Part 2 Clause 6 - Fire or explosion.

Other published guidance:

- NSW Code of Practice – Mechanical engineering control plan
- TRG Hot Work (cutting and welding) at mines and petroleum sites
- SafeWork NSW Code of Practice welding processes
- MDG 15 Mobile and Transportable plant for use on mines and petroleum sites
- AS1674.1 Safety in welding and allied processes Part 1: Fire precautions
- AS1674.1 Safety in welding and allied processes Part 2: Electrical
- AS5062:2016 Fire protection for mobile and transportable equipment.

Appendix B. Assessment system explained

We use 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 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 calculation

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 were 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

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.

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

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 and 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