Resources Regulator
Department of Regional NSW

Targeted intervention program

Underground coal – ground or strata failure

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Executive summary

A crucial part of the NSW Resources Regulator's *Incident prevention strategy* involves compliance priority programs for mines and petroleum sites. This involves proactively assessing a principal hazard which is an emerging risk across the industry, that is driven primarily from incident data, inclusive of evolving industry trends. Although these principal hazards may also be contained within the Resources Regulator's planned inspection programs, this targeted intervention program was developed to validate the effectiveness of the industries ground or strata failure critical controls.

This report summarises the assessment findings from the targeted intervention program on ground or strata failure in the underground coal industry. It covered 18 mines between February 2022 and June 2022. Several key elements were assessed as part of this program that included, but were not limited to:

Design process:

- How strata support is designed and maintained
- How factors of safety (FoS) are incorporated into the design

Review process:

- Past strata failure events
- Strata mapping
- Strata monitoring
- Damaged strata defect management

Verification process:

- Knowledge of workers relating to the controls outlined in ground or strata failure management plan and associated systems of work
- Dimensions of roadways during extraction
- Defect management lifecycle

Legislative requirements and published guidance relating to ground or strata failure are listed in Appendix A. Figure 1 presents safety compliance findings for each de identified mine and the element assessed as part of the program. Explanatory notes on the assessment system are also listed in Appendix B.

Introduction

In February 2016, the NSW Resources Regulator published its Incident prevention strategy.

A key component of the strategy is the introduction and implementation of a risk-based intervention framework. The framework identifies and confirms risk profiles, verifies risk control measures and allocates resources based on risk priority.

The implementation of the strategy included the development of two operational approaches to regulatory activity. These are:

- targeted assessment programs (TAP): a planned, proactive program that assesses the overall effectiveness of an operator's attempt to control critical risk and
- targeted interventions: a response to a specific incident, series of incidents or other intelligence, which assesses how effectively relevant risks are being controlled (see below for further detail).

Background

Targeted interventions provide a systematic response to a critical risk. They can be applied across all sectors of the mining industry. The need to undertake an intervention will be identified through:

- a series of events
- a single significant event, such as a catastrophic failure or fatality
- a change in the operation's risk profile or
- data that suggests an emerging issue.

Targeted interventions are typically undertaken by a team of inspectors. The interventions provide an assessment of the:

- operational and management plans and supporting documentation
- implementation of plans and procedures
- effectiveness of control measures or
- operator's compliance with relevant legislative provisions.

Scope

The scope of the assessments included two elements:

- a desktop assessment of:
  - compliance against legislation with respect to the management of risks to health and safety associated with ground or strata failure on site
  - controls the mine utilises to prevent and mitigate the risks to health and safety associated with ground or strata failure and
  - the systems the mine utilises to monitor the effectiveness of those controls.
- A workplace assessment of the implementation of those controls.

Key findings

- Sites generally have design methodologies for ground or strata support that included analytical methods, numerical modelling, empirical models, and physical modelling utilizing a combination of internal and external expertise.
- Strata support designs are commonly peer reviewed, and regularly reviewed.
- While most sites could demonstrate regular strata mapping processes, it was not uncommon to observe those workers tasked with the responsibility of maintaining this system to be relatively inexperienced to the underground coal mining industry.
- Some sites throughout this assessment program were found to have strata monitoring devices set to less than zero (0) millimetres on the associated scale, which was often recorded as '0mm' in the database, and not recorded in the strata defect system.
- Most sites were found to have up to date records of strata defects, with a smaller number of sites found to have no overdue secondary support requirements.
- Workers at most sites could demonstrate appropriate knowledge relating to the installation of strata monitoring devices and the importance of anchoring at the correct locations, within the primary and secondary support tiers.
- Most sites have a well-established strata management team who meet regularly
- Some sites have successfully implemented a monitoring strategy for strata monitoring devices to be electronically recorded and accessible from a remote location.

Recommendations

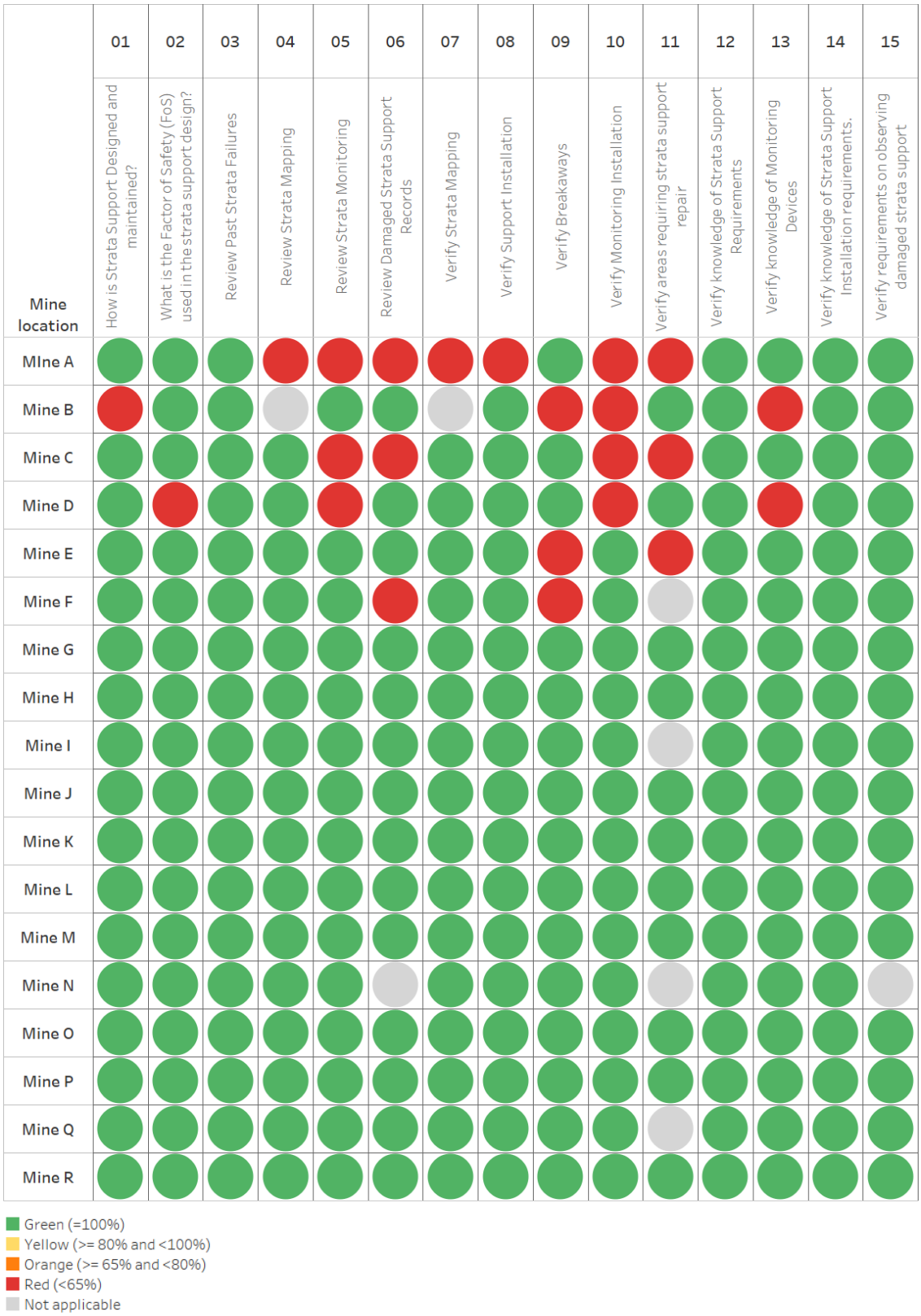
To address the defects identified within this targeted intervention program, mine operators should:

- Train and assess all workers that are required to install, maintain, read and report on strata monitoring devices in the relative systems of work. Refresher training should occur at regular intervals, i.e. commencement of a new development panel, longwall retreat panel, new area of the mine
- Develop and document a training and assessment package for the installation, maintenance, reading and reporting relating to the various strata monitoring devices (SMDs) in use
- Develop a TARP strategy for the strata defect registry, with relevant line managers responsible for the allocation of resources to have prescribed actions when a trigger has been reached and discuss the progress of any associated triggers at the relevant strata management team meeting.
- Incorporate, where practicable – a digital recording system of strata related defects and progress reports. This should greatly assist future workers tasked with the responsibility of the strata defect register.
- Document minutes at the conclusion of any strata management team meetings. Agreed actions from these meetings should also be recorded into the site action database for tracking and status reporting.

Findings by mine

Figure 1 presents aggregate assessment findings, providing a summary view of the status of each mine's hazard management processes. More details explaining the assessment system are found at Appendix A.

Figure 1: Assessment findings for targeted intervention program – underground coal – ground or strata failure – overall results



Notices issued

Of the 18 sites assessed under the inspection program, 8 separate mines received notices relating to ground or strata failure, 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 ground or strata failure were examined in detail and Table 2 below lists the notices issued by type and details.

Table 2: Notices issued for the targeted intervention program – underground coal – ground or strata failure

NOTICE TYPE	TOTAL ISSUED	NUMBER OF MINES
s.195 prohibition notice	-	-
s.191 improvement notice	9	5
s.23 notice of concerns	8	7
Total	17	8

Of the combined 17 notices issued, there were some common themes which were apparent throughout the program. Table 3 summarises the type of contraventions and identifies some trends which are of concern.

Table 3: Notices issued - prevalence of categories of concern

IDENTIFIED CONCERN CATEGORIES
Strata monitoring devices installed incorrectly, i.e. initial reading below 0mm.
Strata defects overdue for repair based on the sites ground or strata related systems of work
Strata monitoring devices inconsistently reported on, i.e. records not entered into the database
Not all strata management team meetings have minutes recorded, or actions captured and entered into the sites action database for tracking through to completion

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@regional.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. Assessment system explained

The NSW Resources 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 NSW Resources Regulator's Mine Safety Inspectorate 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 results 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 4: 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.

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 5: 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

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