QUEENSLAND MINES AND QUARRIES SAFETY PERFORMANCE AND HEALTH REPORT

2017–2018

Queensland Government

This publication has been compiled by the Department of Natural Resources, Mines and Energy.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES

LIST OF TABLES

MESSAGE FROM THE CHIEF INSPECTOR OF MINES

I am pleased to introduce the annual Queensland Mines and Quarries Safety Performance and Health Report, covering incidents, trends and emerging safety and health issues in our mines and quarries for the 2017-18 financial year.

The mines inspectorate administers state mining safety and health legislation, working with industry, unions and other stakeholders. This cooperative approach, so important in improving safety and health in mining, also extends to producing this report containing information reported by industry. Further information on high potential incidents, lost time injuries, monthly employment and lost time data is available on our website.

I am saddened to report one Queensland mining fatality in 2017–18, on an open-cut coal mine. On 5 August 2017, Mr Daniel Springer a coal mine worker was fatally injured when a wear plate which he was gas-cutting from an excavator bucket unexpectedly sprung up, striking him in the head.

While extending my deepest sympathy to Mr Springer's family, friends, and co-workers, I'm also aware that among the 2164 high potential incidents that industry reported last financial year, many were near misses which could have resulted in serious injury or death.

My key takeaways from this report are:

- The positive effect of targeted compliance and enforcement activities: when the regulator makes specific safety and health areas its focus, industry's response is positive and we observe a reduction in incident frequency involving the specific hazard or area being targeted.
- The coal sector has made major improvements in respirable dust monitoring and control. Changes to the regulatory framework as well as ongoing periodic review and publishing of data online appear to have helped sustain good performance.
- Respirable crystalline silica is a growing concern across all mining and quarrying due to its toxicity and potential to cause lung disease where exposures are high. I am pleased with the support for and adoption of QGL02 Guideline for Management of Respirable Crystalline Silica in Queensland Mineral Mines and Quarries and expect to see implementation of the requirements driven by industry leaders and site management.
- Gas management in underground coal mines continues to be a concern and therefore a focus area for the regulator and industry. At the time of writing, a high-profile HPI at the North Goonyella underground coal mine is unfolding and will undoubtedly provide learnings for industry.

The mines inspectorate conducted a drug and alcohol survey in 2017–18. Analysis of the data will be published on our website.

Industry is encouraged to use the information in this report, and the detailed data available for download to improve safety and health management systems and processes. The data is costly in terms of the human suffering it records and financial cost to collect; do not waste it.

LUCA ROCCHI
CHIEF INSPECTOR OF MINES
(COAL AND MINERAL MINES AND QUARRIES)

EXECUTIVE SUMMARY

The Queensland mines inspectorate is a data-driven, risk-based regulator. Consistent with our risk-based legislative framework and the obligations it imposes on the mining industry, our objective is to focus regulatory activity on areas of greatest risk, with a view to minimising serious harm.

Risk-based regulation – and industry's ability to discharge its obligations to protect workers from harm – depends upon accurate, timely reporting of safety and health data, to allow identification and adequate assessment and management of risk.

This report provides detail on a fatal accident that occurred at an open cut coal mine in August 2017, resulting in the death of Daniel Springer and provides learnings for industry. The impact of a fatality in the mining industry is all the more tragic for being a lag indicator of safety performance – and so places an obligation on all industry participants to learn from its nature and cause.

In particular, this report highlights the opportunity presented in lead indicators such as HPIs. Going forward the mines inspectorate will focus its assessment of industry safety and health performance on the analysis of HPIs, including the presence and effectiveness of critical controls.

Regulatory activity targeted to specific hazards or areas appears to be working, evidenced by a reduction in certain HPI types following adherence to advice and directives issued by inspectors during inspection activities. Enforcement is not the preferred way to achieve safety and health performance; sites must take responsibility for hazard identification and risk management.

The mines inspectorate has moved away from lost time injury (LTI) as a measure of safety and health performance due to its aggregation of a wide range of injury severity. The metric may be distorted by a high proportion of low consequence injuries and illnesses and may provide industry with only a general indicator of relatively minor events.

Analysis of serious accidents and injuries/diseases resulting in permanent incapacity show a flat or increasing trend and should be the target of attention for mine management.

Gas management in underground coal mines remains a focus for the mines inspectorate. Following investigation into a number of reported HPIs relating to exceedances of regulated methane levels, the mines inspectorate has conducted gas management audits in all but one of the state's ten operating underground coal mines – seven completed within 2017–18.

The mandatory corrective actions and advice arising from these audits can be themed as: gas monitoring equipment not in accordance with required plans and standards; a failure to display gas monitoring results and trends; and deficient risk assessment and trigger action response plans.

The mines inspectorate is currently reviewing mine gas monitoring data, specifically methane concentrations in the return roadways of second workings extraction panels, to identify the effectiveness of controls and level of risk to workers. The Queensland mining industry should not need to be reminded of the human tragedy that can occur if gas management is ineffective.

Coal sector performance in controlling the respirable dust hazard continues to be strong. Regulatory reforms and sustained focus of industry, unions, and the regulator continue to drive down results. Attention has expanded to respirable crystalline silica exposure, particularly in open cut mines, given the toxicity of silica.

For the mineral mine and quarry sector, the introduction of a new guideline (QGL02) including mandatory reporting of exposure data has been well received by industry. The mines inspectorate expects full implementation by sites and replication of the good results achieved by the coal sector.

TABLE 1¤

COMPARISON OF KEY PERFORMANCE INDICATORS 2016–17 AND 2017–18 BY SECTOR

	Lost time injuries (LTI)		Disabling injuries (DI)		Serious accidents (SA)		High potential incidents (HPI)		LTI days lost†		DI days*		LTI frequency rate		HPI frequency rate		Million hours worked		Permanent incapacities		Fatalities	
Year	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18
Coal surface	141	164	199	243	32	50	1 240	1 404	7 002	5 191	5 434	6 520	2.7	2.8	24	24	52.2	59.0	19	23	1	1
Coal underground	93	63	117	71	28	27	304	372	5 016	2 055	4 206	2 610	7.8	5.2	25	31	12.0	12.1	11	4	0	0
All coal	**234**	**227**	**316**	**314**	**60**	**77**	**1 544**	**1 776**	**12 018**	**7 246**	**9 640**	**9 130**	**3.6**	**3.2**	**24**	**25**	**64.1**	**71.1**	**30**	**27**	**1**	**1**
Mineral surface	32	31	33	55	2	8	163	180	1 171	829	1 278	1 819	2.3	1.6	12	9	14.1	19.9	0	1	1	0
Mineral underground	20	17	60	78	7	4	112	128	2 033	890	3 470	2 930	1.9	1.5	10	11	10.7	11.4	1	1	0	0
All minerals	**52**	**48**	**93**	**133**	**9**	**12**	**275**	**308**	**3 204**	**1 719**	**4 748**	**4 749**	**2.1**	**1.5**	**11**	**10**	**24.8**	**31.3**	**1**	**2**	**1**	**0**
Quarries	**23**	**17**	**11**	**8**	**6**	**5**	**69**	**80**	**591**	**220**	**125**	**149**	**10.2**	**7.4**	**31**	**35**	**2.3**	**2.3**	**0**	**1**	**0**	**0**
All sectors	**309**	**292**	**420**	**455**	**75**	**94**	**1 888**	**2 164**	**15 813**	**9 185**	**14 513**	**14 028**	**3.4**	**2.8**	**21**	**21**	**91.2**	**104.7**	**31**	**30**	**2**	**1**

† Days lost to LTIs includes lost time days and days on alternative duties ** Number of disabling injury days includes days on alternative duties*

¤ The information in this report is sourced primarily from data returns submitted by mine and quarry operators. Data is collected in accordance with sections 198 and 279 of the *Coal Mining Safety and Health Act 1999* and the *Mining and Quarrying Safety and Health Act 1999*. The data collection is approved by the Chief Inspector of Mines under section 281 and 261 of the legislation. Due to publication deadlines, information received by the Department of Natural Resources, Mines and Energy on or before 31 August 2018 for the 2017-18 financial year is included in the report. Due to the cut-off date, there may be minor changes in data reported for previous years as each new annual report includes the finalised data for the previous financial year.

TABLE 2

COMPARISON OF KEY REGULATION INDICATORS 2016–17 AND 2017–18 BY SECTOR

	Number of inspections		Number of audits		Number of investigations		Number of substandard conditions or practices (SCP)		Number of directives		Number of accountability meetings (SSE level)		Number of accountability meetings (SSE/operator level)		Number of complaints	
Year	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18	16–17	17–18
Coal surface	288	295	8	18	37	32	198	184	83	116	4	4	4	0	38	40
Coal underground	123	95	2	24	4	13	80	57	47	31	1	18	1	4	5	14
All coal	**411**	**390**	**10**	**42**	**41**	**45**	**278**	**241**	**130**	**147**	**5**	**22**	**5**	**4**	**43**	**54**
Mineral surface	383	373	20	4	21	24	298	211	101	125	5	0	2	1	24	21
Mineral underground	116	140	1	10	19	12	77	123	28	49	1	0	0	0	10	10
All minerals	**499**	**513**	**21**	**14**	**40**	**36**	**375**	**334**	**129**	**174**	**6**	**0**	**2**	**1**	**34**	**31**
Quarries	**549**	**473**	**21**	**9**	**13**	**5**	**435**	**289**	**198**	**129**	**1**	**0**	**0**	**2**	**23**	**18**
Minerals and quarries	**1 048**	**986**	**42**	**23**	**53**	**41**	**810**	**623**	**327**	**303**	**7**	**0**	**2**	**3**	**57**	**49**
All sectors	**1 459**	**1 376**	**52**	**65**	**94**	**86**	**1 088**	**864**	**457**	**450**	**12**	**22**	**7**	**7**	**100**	**107***

**Total includes 4 complaints with no mine identified*

CHAPTER 1
INDUSTRY OVERVIEW OF SAFETY OUTCOMES

FATAL ACCIDENT IN 2017–18[1]

1

DANIEL SPRINGER
5 August 2017

There was one fatal accident in the Queensland mining industry in 2017–18, which occurred in a surface coal mine.

Mr Daniel Springer, was fatally injured on 5 August 2017 when an external wear plate that he was in the process of removing from an excavator bucket unexpectedly sprung up and struck him in the head. Mr Springer had been using an air carbon arc gouger to cut pieces of the wear plate into smaller sections, as part of maintenance activities.

An investigation by the mines inspectorate identified a number of factors that contributed to the incident. These included deficiencies in risk assessment prior to modifications being made to equipment, insufficient knowledge of what could cause build-up of stored tension and not recognising the level of risk associated with the hazard of elastic spring-back.

The investigation revealed that prior to the incident the mine undertook maintenance on a number of buckets which involved modifications to the original design without consulting the original manufacturer or obtaining expert advice. The external wear plate was originally made up of multiple small, thin plates. The equipment was modified to replace the multiple small plates with two, large continuous plates.

Analysis undertaken by an independent expert showed that the indentations in the wear plate were the major reason for the build-up of stored tension, which caused it to violently spring out. The expert concluded that having two large, continuous wear plates would cause the spring-back to occur with much greater force compared to multiple, small thin plates. The spring-back distance was also magnified by the length of the wear plate[2].

The mine failed to identify the risks associated with changing the wear plate design prior to the modifications being made. As such Mr Springer was not aware that he was exposed to a fatal hazard.

https://www.dnrme.qld.gov.au/business/mining/safety-and-health/alerts-and-bulletins/mines-safety/coal-mine-worker-fatally-injured-performing-maintenance-on-a-large-excavator-bucket

https://www.dnrme.qld.gov.au/business/mining/safety-and-health/alerts-and-bulletins/mines-safety/elastic-springback-in-plates-on-equipment

In response to the incident:

- On 7 August 2017, a directive was issued to all surface coal mines requiring the mine's Site Senior Executive (SSE) to review elements of the Safety and Health Management System (SHMS) relating to the removal and replacement of wear/liner plates on earth moving equipment to ensure that risk is at an acceptable level.
- Mines Safety Alert No. 347 was issued on 22 September 2017 requesting SSEs to recognise and quantify the magnitude of stored energy that may be present when completing similar tasks and the need to communicate this information to affected workers.
- Mines Safety Bulletin no.172 was issued on 27 June 2018[3] highlighting the hazard that may exist in plates that have been indented and provide information to help reduce the risk to persons working on or near plates with spring-back potential. Recommendations in the safety bulletin included that:
  - Persons working on plates should be made aware of the elastic spring-back.
  - Work should be planned with the assumption that spring-back will occur. Risk indicators include indentations, deformed material, cracking and wear.
  - Designs featuring small wear plates are preferred.
  - When an installed plate is being removed, measures should be put in place to release it in a controlled and systematic manner.

1 The number of fatalities that have occured in Queensland mines since 1900 is provided in Appendix 1.

2 L.J. McInnes, R.G. Dobeson, "Investigation of fatal incident during removal of wear plate from excavator bucket", UQ Materials Performance, 13 April 2018.

3 Mines safety bulletins are issued once the inspectorate has sufficient information on the causes of the incident gathered through an investigation.

GAS MANAGEMENT

In January 2017 the mines inspectorate formed the view that gas management in underground coal mines was an emerging issue which required additional regulatory focus.

The Chief Inspector of Mines issued two letters to industry clarifying legislative requirements and stated at the 2017 annual industry leaders briefing that industry should review their gas management strategies to ensure effective control measures are in place for the management of all gases, in particular methane.

An increase in the number of reported high potential incidents relating to exceedances of regulated methane levels followed this communication, which has improved identification of the issue and industry's plans to address.

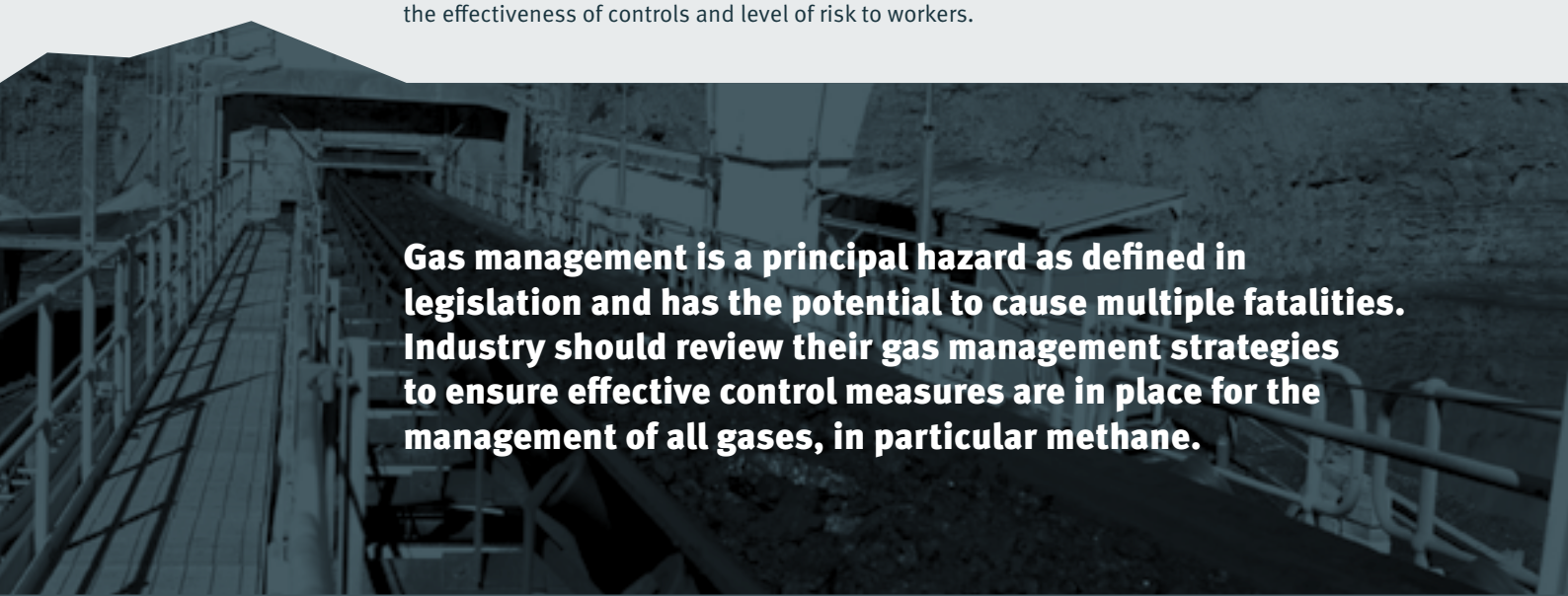
Investigations into exceedances were undertaken and in some cases have resulted in compliance and enforcement action, including issuing directives and recommendations for appropriate gas management, as well as audits focussed on methane management.

The mines inspectorate has conducted gas management audits in all but one of the state's ten operating underground coal mines, of which seven were completed within 2017–18. Arising from this audit were 30 mandatory corrective actions and 30 recommendations.

While there is variation in the corrective actions for mine sites, there are common themes:

- gas monitoring equipment installation, testing and maintenance not in accordance with required plans and standards
- failure to display mandatory information including gas monitoring results and trends
- deficient risk assessment and trigger action response plans, including absent and erroneous information.

The mines inspectorate is also undertaking a review of mine gas monitoring data, specifically methane concentrations in the return roadways of second workings extraction panels, to identify the effectiveness of controls and level of risk to workers.



Gas management is a principal hazard as defined in legislation and has the potential to cause multiple fatalities. Industry should review their gas management strategies to ensure effective control measures are in place for the management of all gases, in particular methane.

IMPACT OF COMPLIANCE ACTIVITY

The mines inspectorate continuously reviews and refines its compliance program based upon analysis of industry data and emerging risk.

Among other areas, compliance activities have in recent years focussed on issues identified through analysis of industry safety and health performance data. In mineral mines and quarries these focus areas have been termed the fatal five. In coal they are termed the critical few.

FATAL FIVE

- Collisions
- Entanglement
- Falls
- Respirable dust
- Uncontrolled pressure release

CRITICAL FEW

- Gas management
- Lifting and slinging
- Supervision

The figures below show the positive impact of compliance activity on several HPIs in the mining industry. They also highlight the importance of accurate and timely reporting of incidents in improving safety and health outcomes for workers.

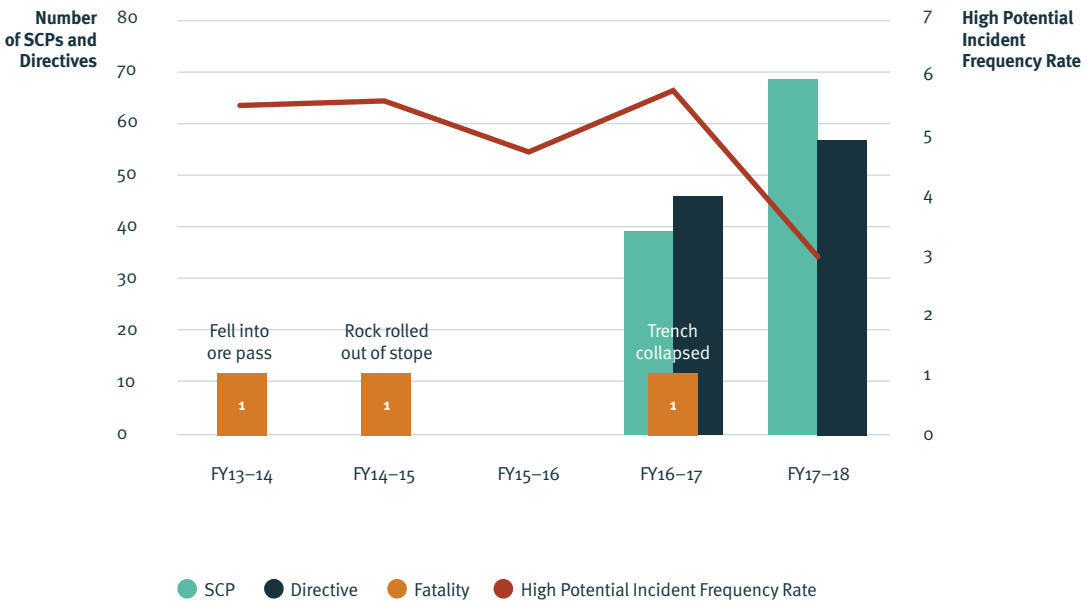
To ensure sustained control of these hazards, industry must ensure critical controls are identified, implemented and monitored for effectiveness. The mines inspectorate will monitor industry's performance in relation to critical controls.

Incidents involving people falling from structures or into vertical openings, being struck by falling objects or rocks and entering voids while operating mobile equipment have featured in 12 mining fatalities since 2000.

In response to this, the mines inspectorate implemented specific inspection campaigns and developed guidance material for industry, focussing on the control of this hazard. Consequently, the mines inspectorate observed an increase in the reporting of HPIs involving this harm followed by a steep reduction due in part to the issue of directives and engagement with affected mine sites on the issue.

FIGURE 1

HPI FREQUENCY RATE FOR FALLS AGAINST DIRECTIVES AND SCPs

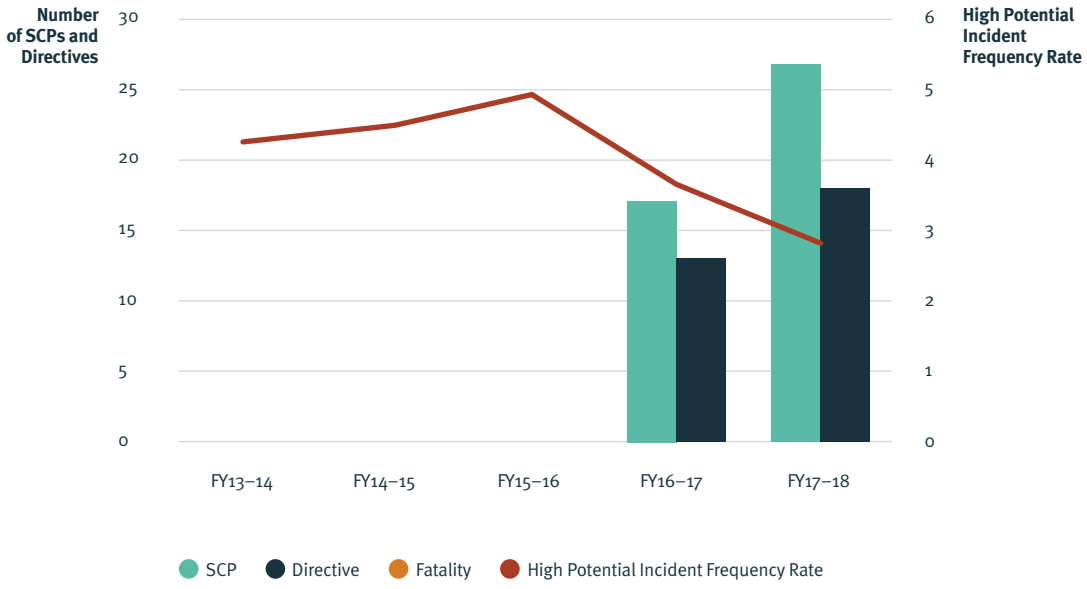


Compliance activity for figures 1-4 is only associated with hazards from 2016-17 onwards.

A similar approach has been taken for collisions, where the Queensland mining and quarrying industry has experienced five fatalities since 2000. Again, we observed an initial uptick in industry reporting of the hazard followed by a reduction in incident frequency rate.

FIGURE 2

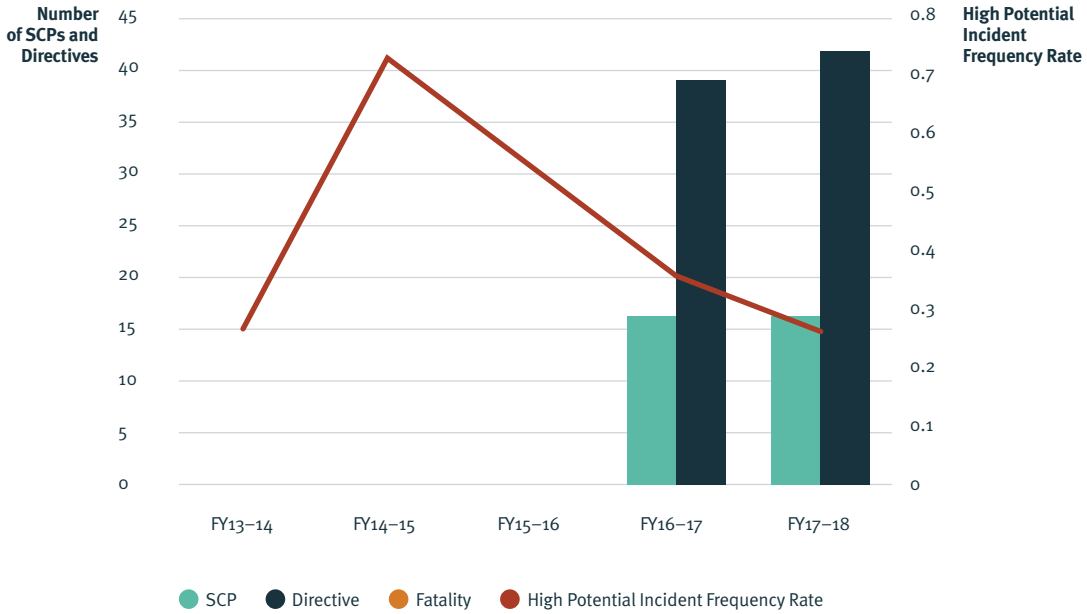
HPI FREQUENCY RATE FOR COLLISIONS AGAINST DIRECTIVES AND SCPs



The mines inspectorate tailors its compliance approach to the particular hazard. In the case of entanglement, which was the cause of two fatalities and numerous HPIs since 2000, the compliance approach involved routine targeted inspections with a zero tolerance approach to unguarded or otherwise unprotected equipment.

FIGURE 3

HPI FREQUENCY RATE FOR ENTANGLEMENT AGAINST DIRECTIVES AND SCPs

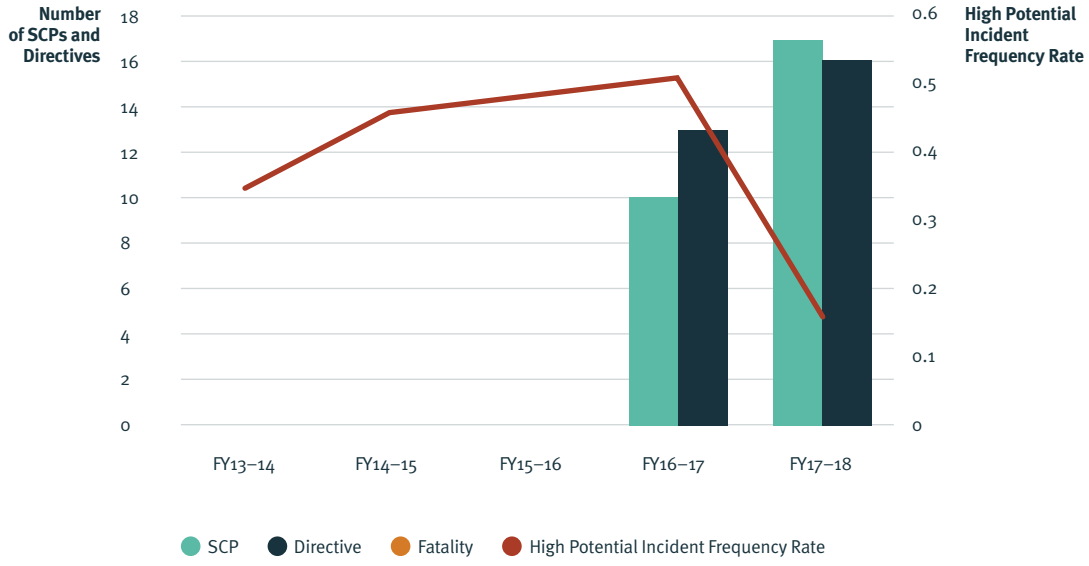


Pressure release has been the cause of two fatalities and numerous serious injuries since 2000 and increasingly featured in HPIs. Compliance is being addressed in two ways; firstly the development of tyre and rims guidance material, in consultation with industry, and secondly a review of isolation and lockout procedures to ensure the hazard of pressurised plant and equipment is effectively controlled.

The mines inspectorate encourages the reporting of all high potential incidents, and stresses the importance of accurate identification of hazards present, as well as absent and failed controls.

FIGURE 4

HPI FREQUENCY RATE FOR UNCONTROLLED PRESSURE RELEASE AGAINST DIRECTIVES AND SCPs



RESPIRABLE DUST HAZARD

The control and monitoring of respirable dust exposures is a critical part of the process for minimising the risk of mine and quarry workers developing mine dust lung disease (MDLD). The likelihood of developing an MDLD is dependent on the amount, frequency and duration of the dust exposure. It is important that mines and quarries implement control strategies to reduce dust levels and undertake monitoring to ensure that the controls that have been put in place are effective.

COAL MINES

Since 1 January 2017, all Queensland coal mines have been required to provide all their personal dust data to the Chief Inspector of Mines.

The data is stored in the Department of Natural Resources, Mines and Energy exposures database. The mines inspectorate now holds all available respirable dust data for all coal mines from 2000 to 2018.

The data show a major improvement in measured respirable dust levels, driven by:

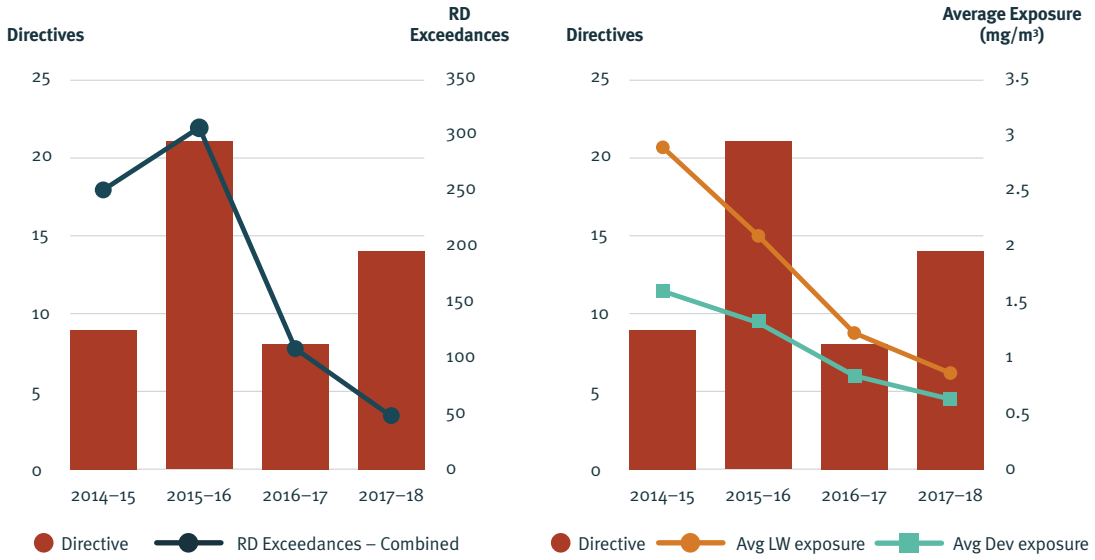
- increased industry focus on respirable dust following the re-identification of Coal Workers' Pneumoconiosis (CWP) in 2015
- the introduction of recognised standards for dust control and monitoring
- regulatory changes requiring the reporting of respirable dust data, including single sample exceedances
- a coordinated and focused enforcement regime by the mines inspectorate including audits against the new recognised standard for dust monitoring and inspections focused on dust control
- significant industry effort to trial and implement more effective engineering controls
- industry workshops on respirable dust management
- mandatory training for persons carrying out dust sampling at mines and quarries
- mandatory qualifications for persons reviewing and approving dust monitoring programs.

Respirable dust

Traditionally longwall and development operators have represented the highest risk work groups in our coalmines. Respirable dust levels for these workers demonstrate a major downward trend since the 2014-15 financial year.

FIGURE 5

RESPIRABLE DUST EXCEEDANCES AND AVERAGE EXPOSURES AGAINST DIRECTIVES AND SCPs



The single exceedance rate for respirable dust in underground coal mines reduced tenfold from the first half of 2016 to the same period in 2017, and there has been a further reduction in the first half of 2018.

A single exceedance refers to a personal monitoring sample collected during a single shift that exceeds the regulatory limit. This provides a clear signal to the mine and the regulator that attention is required to review the circumstances that led to the exceedance. This must involve undertaking an investigation to verify existing controls as well as considering additional controls with an objective to preventing further exceedance during similar tasks. The mine must then undertake further monitoring (resample) to ensure that the source of dust exposure has been controlled.

FIGURE 6

SINGLE EXCEEDANCE RATE – RESPIRABLE DUST – UNDERGROUND COAL MINES 2016 TO 2018

1H 2016	1H 2017	1H 2018
10%	1%	0.6%

Research shows that the type of work undertaken may increase a worker's risk of developing a MDLD if effective controls are not put in place. All coal mines must establish a risk based monitoring program by following the methodology as outlined in recognised standard 14 – monitoring respirable dust in coal mines. Recognised standard 14 requires mines to allocate their coal mine workers into similar exposure groups (SEGs) and determine the risk (exposure) profile for each SEG. There is more personal monitoring required for those SEGs with a higher risk profile. The SEGs with the highest level of risk in our underground coal mines include longwall and development workgroups.

Mines with these work groups are required to monitor at least every quarter under the Coal Mining Safety and Health Regulation 2017.

The graphs provided below highlight the fact that average exposures across all high risk SEGs for respirable dust are below the occupational exposure standard and in compliance with the regulation. Each vertical bar and numbered circle represents a different, de-identified mine site. In addition to the exposure standard of 3 mg/m^3, the figures below show the shift-adjusted standard of 2.8 mg/m^3.

Furthermore as of 1 November 2018 the exposure standard for respirable coal dust was reduced to 2.5 mg/m^3. All SEGs in all coal mines remain below this revised limit.

FIGURE 7

RESPIRABLE DUST, LONGWALL WORKERS SEG, UNDERGROUND SITES

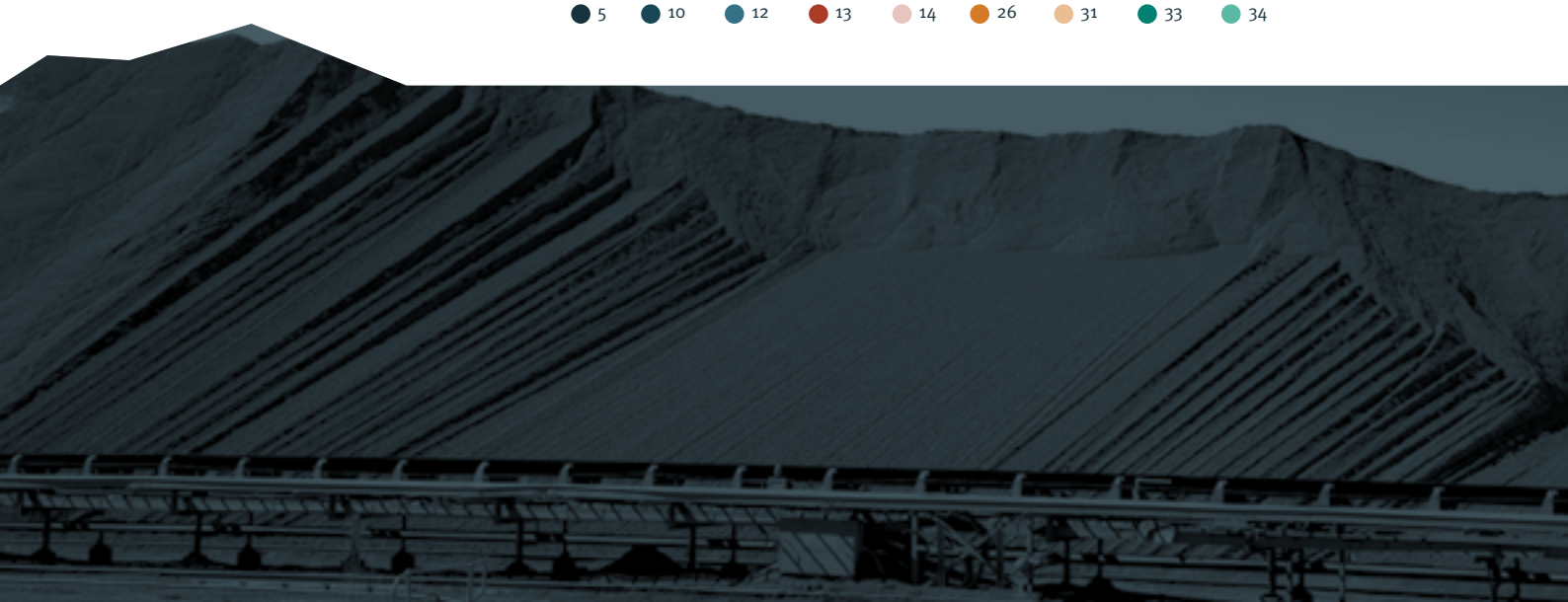


FIGURE 8

RESPIRABLE DUST, DEVELOPMENT WORKERS SEG, UNDERGROUND SITES

FIGURE 9

RESPIRABLE DUST, BLAST DRILLERS SEG, OPEN CUT SITE

FIGURE 10

RESPIRABLE DUST, BLAST CREW SEG, OPEN CUT SITE

Respirable crystalline silica (quartz)

Coal mines are also required to monitor and report worker exposure to respirable crystalline silica (RCS) dust. Like respirable dust, exposure to RCS can lead to the development of MDLD including silicosis. In addition, RCS has been classified by the International Agency for Research on Cancer (IARC) as a Class 1 human carcinogen of the lung.

RCS has the potential to be generated during drilling, blasting, crushing, cutting and mining. Exposure to RCS represents a risk to surface and underground coal mine workers. RCS remains a major focus for open cut sites due to the volume of silica-rich overburden handled during mining activities. RCS accounted for approximately 70 per cent of all single sample exceedances reported by open cut coal mines, since January 2017.

The following figures show monitoring results for the high risk SEGs for underground and open cut sites. In addition to the exposure standard of 0.1 mg/m^3, the figures also shows a typical shift-adjusted exposure standard of 0.09 mg/m^3 for miners who work extended shift lengths or alternate rosters that equate to an average of more than 40 hours per week.

FIGURE 11

RESPIRABLE CRYSTALLINE SILICA, LONGWALL WORKERS SEG, UNDERGROUND SITES

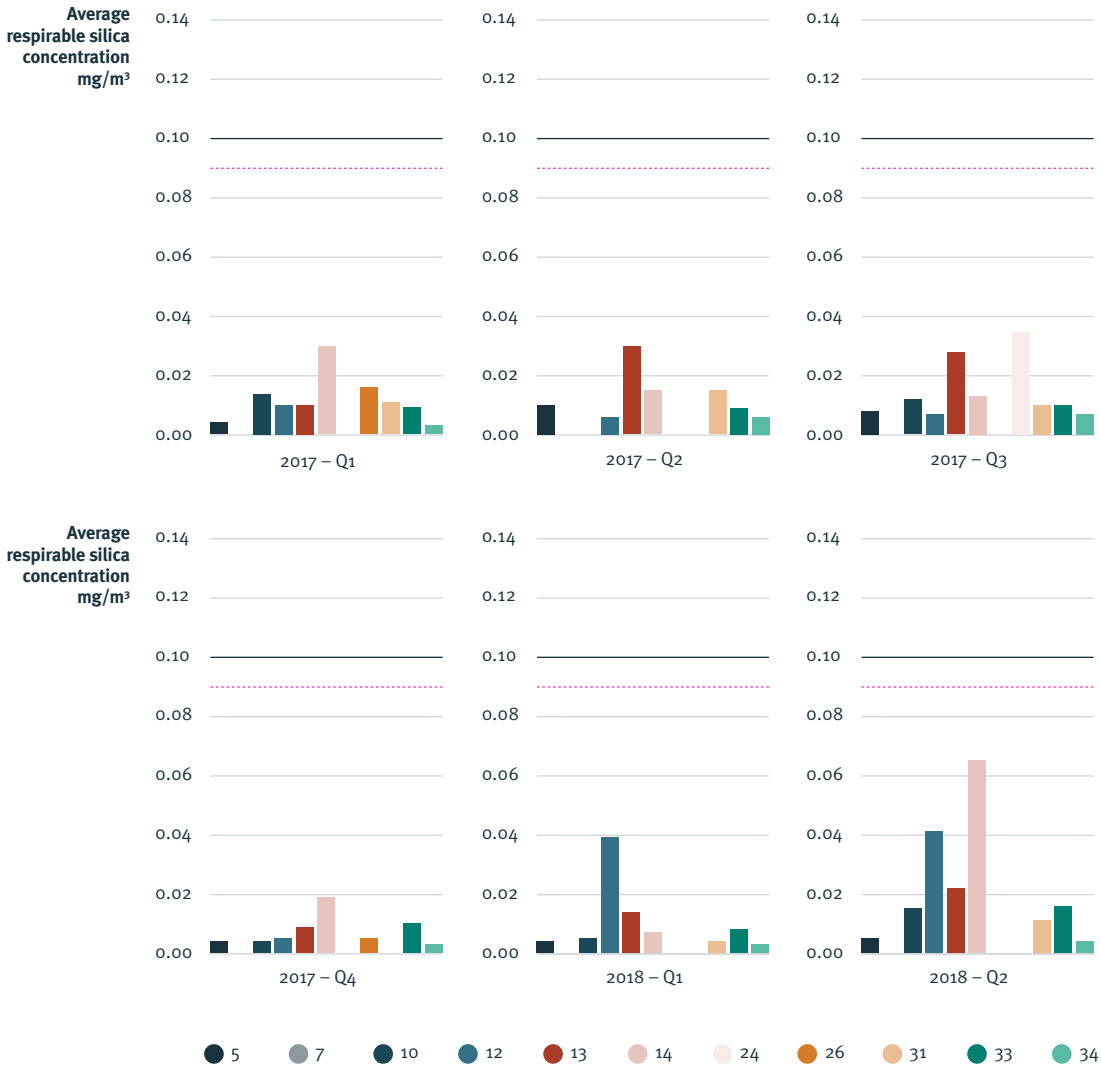


FIGURE 12

RESPIRABLE CRYSTALLINE SILICA, DEVELOPMENT WORKERS SEG, UNDERGROUND SITES

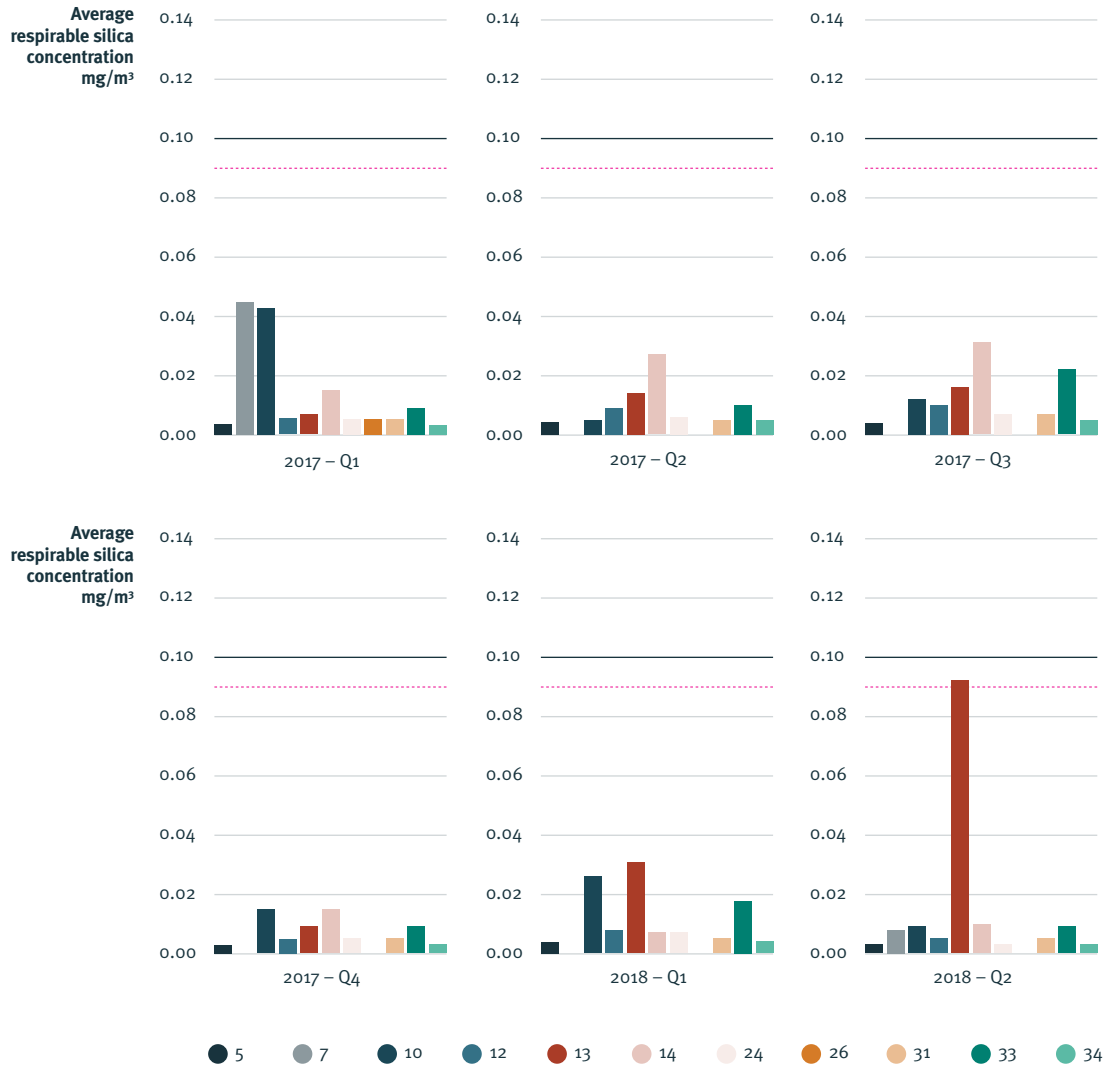


FIGURE 13

RESPIRABLE SILICA CONCENTRATION, BLAST DRILLERS SEG, OPEN CUT SITE

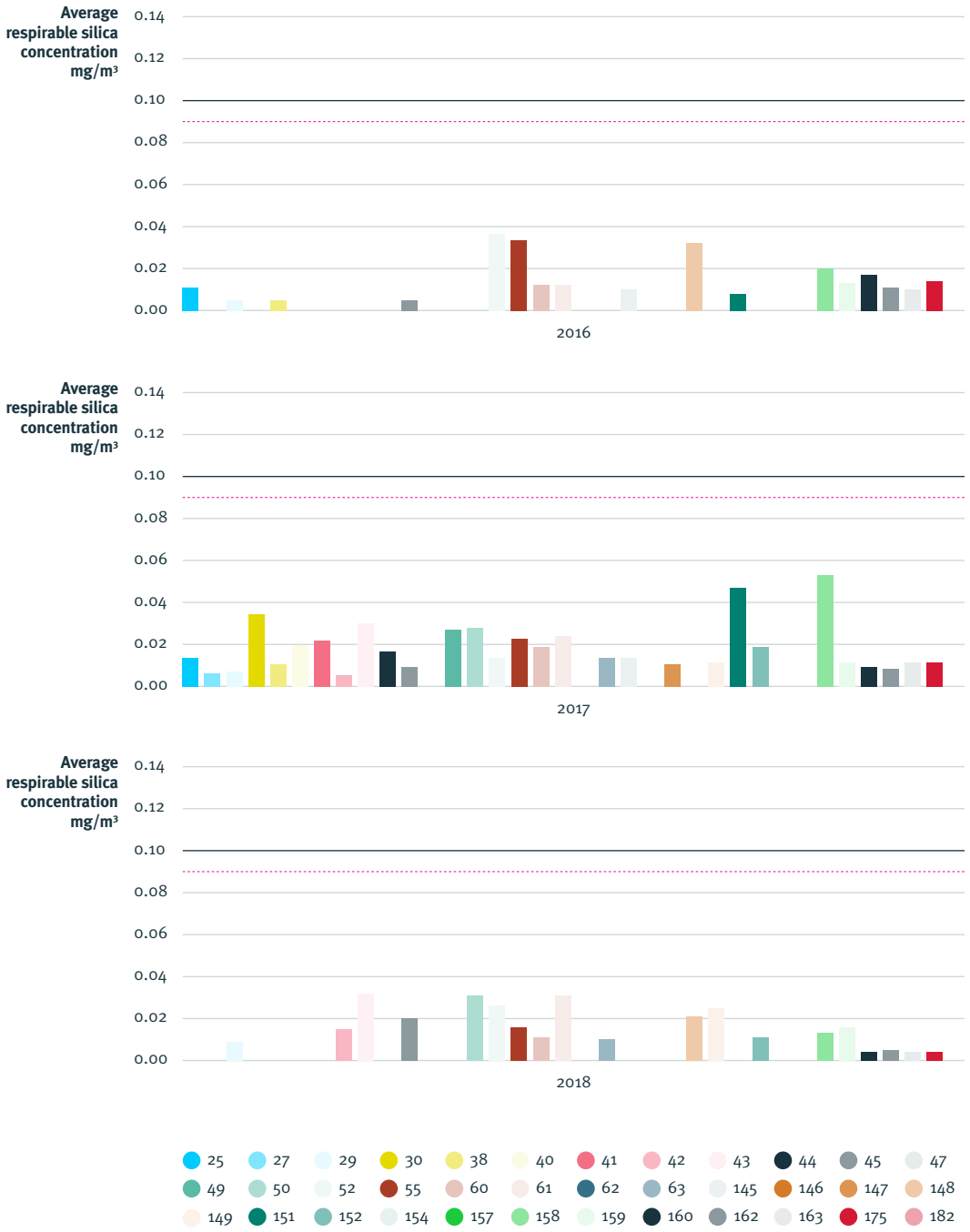
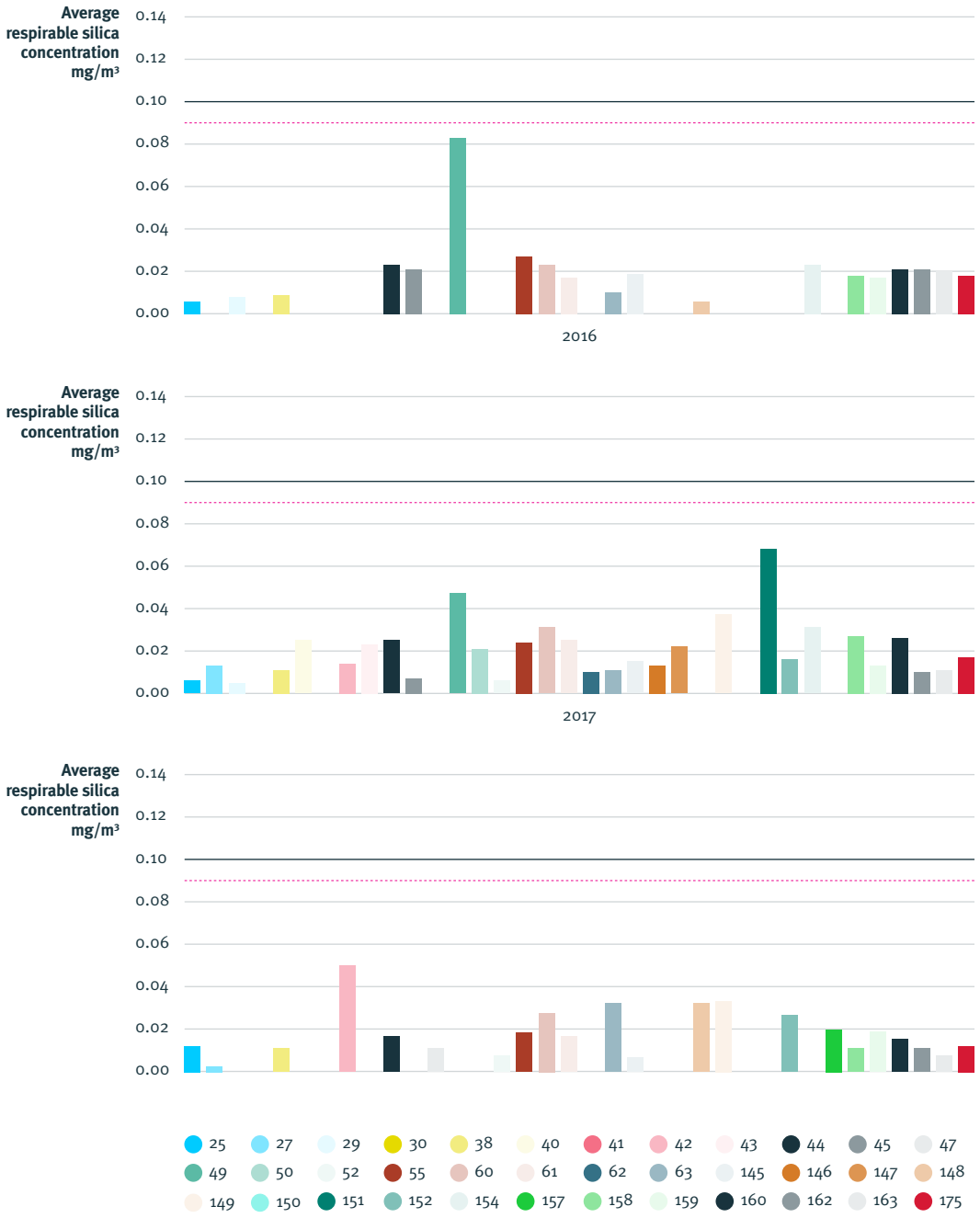


FIGURE 14

RESPIRABLE SILICA CONCENTRATION, BLAST CREW SEG, OPEN CUT SITE



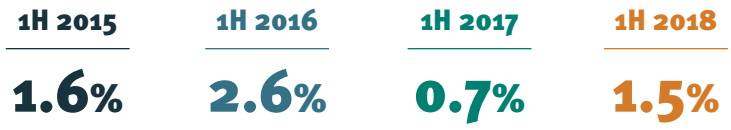
There was a considerable reduction in the single exceedance rate for respirable crystalline silica for open cut and underground coal mines in 2017 but results for the first half of 2018 show an increasing trend.

While average exposures remain compliant this upward trend is concerning. The Coal inspectorate has communicated these concerns to the Coal Mining Safety and Health Advisory Committee (CMSHAC) and at other industry forums.

The occupational exposures standard for RCS is currently under review by Safe Work Australia. Mines need to consider the impacts of any likely reduction of the exposure standard and continue to control exposures to as low as reasonably achievable.

FIGURE 15

SINGLE EXCEEDANCE RATE – RESPIRABLE CRYSTALLINE SILICA – OPEN CUT AND UNDERGROUND COAL SITES – 2016, 2017 AND 2018



MINERAL MINES AND QUARRIES

Respirable crystalline silica (quartz)

In August 2017, the mines inspectorate published QGL02 Guideline for Management of Respirable Crystalline Silica in Queensland Mineral Mines and Quarries. The guideline states ways that mines may achieve an acceptable level of risk in managing RCS.

Of the 1161 operating mineral mines, the mines inspectorate conducted 199 inspections to review the progress with implementation of QGL02. The inspectorate observed that of the 199 sites inspected, 119 sites or 60 per cent have engaged an occupational hygienist to assist the site senior executive to develop exposure monitoring programs. Of these 119 sites, approximately 72 per cent have commenced respirable dust and respirable silica monitoring.

More than 64 compliance actions were issued to operators as part of these inspections. The type of compliance actions included:

- assessing respirable crystalline silica risk to workers
- engaging an occupational hygienist to develop an exposure monitoring program
- conducting respirable crystalline silica dust monitoring
- investigating the cause of respirable crystalline silica exceedances
- conducting health surveillance for workers.

In 2017–18, 55 single exceedances of the exposure limit for RCS, across 19 sites, were reported to the mines inspectorate under QGL02. Of these exceedances, 20 percent of workers were reported as not wearing any respiratory protection during the sampling period.

During 2017-18 the Queensland Mines Inspectorate also published a list of occupational hygiene consultancies suitable to assist mines and quarries with QGL02.

In May 2018, Version 2 of QGL02 was released with the following changes that took effect on 1 July 2018:

- SSE is required to notify the Queensland Mines Inspectorate of all respirable dust and respirable crystalline silica dust monitoring results
- The recognised competencies for an Occupational Hygiene Technician to conduct sampling have been simplified.

This data will populate an exposure database maintained by the mines inspectorate to enable monitoring of industry performance and identification of areas requiring attention.

In 2018-19, the Queensland Mines Inspectorate will undertake compliance inspections and monitoring which will assess the principal aspects of QGL02:

- the evaluation by the SSE of the respirable crystalline silica risk during operations and activities at the mine
- whether the SSE has assessed the adequacy of current control measures
- the extent to which workers are informed and trained on the respirable crystalline silica risk and the necessary control measures to maintain the risk at an acceptable level
- the requirement for an exposure monitoring program and the analysis and reporting of monitoring results as required by QGL02
- whether the mine has consulted with a suitably qualified occupational hygienist
- the need for health surveillance of workers at elevated risk of RCS exposure
- the review and auditing of the mine's SHMS and the retention of records relating to the management of respirable crystalline silica at the mine.

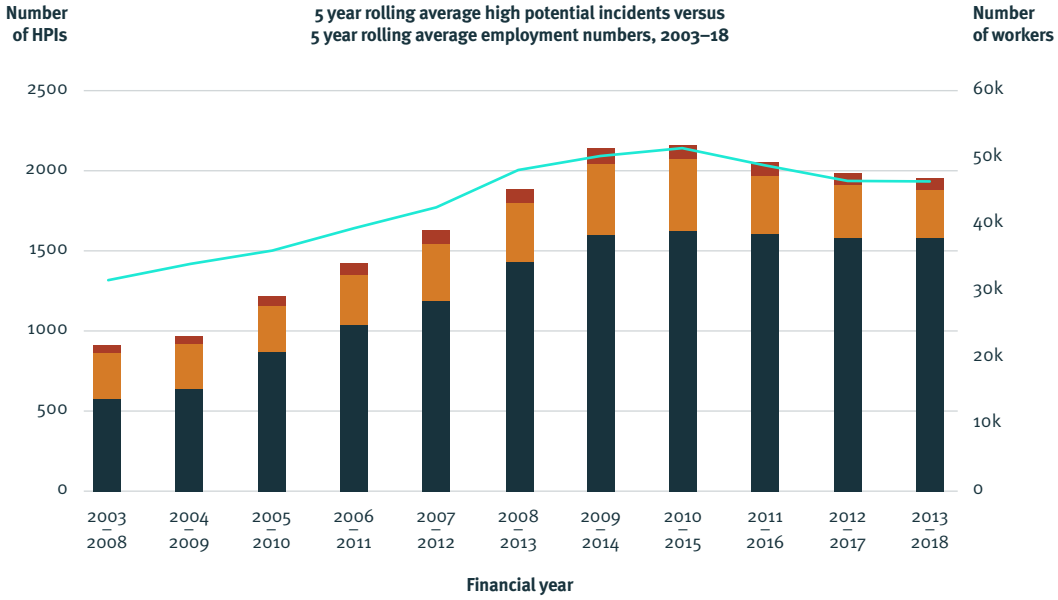
The aim of the program is to clarify the respirable crystalline silica risk profile of workers at small mineral mines and quarries.

HIGH POTENTIAL INCIDENTS

The mines inspectorate considers HPIs an important 'lead' indicator for measuring the effectiveness of safety and health systems. Analysing their root cause plays an important role in improving performance. Figure 16 shows the number of HPIs relative to the mining workforce.

FIGURE 16

FIVE-YEAR ROLLING AVERAGE OF HIGH POTENTIAL INCIDENTS AND FIVE-YEAR ROLLING AVERAGE EMPLOYMENT NUMBERS (ALL SECTORS), 2004–09 TO 2013–18.



	2003–2008	2004–2009	2005–2010	2006–2011	2007–2012	2008–2013	2009–2014	2010–2015	2011–2016	2012–2017	2013–2018
Total HPIs	**879**	**967**	**1169**	**1392**	**1637**	**1897**	**2126**	**2162**	**2133**	**2032**	**1996**
Coal	579	661	846	1042	1226	1447	1648	1683	1670	1623	1613
Minerals	262	266	276	297	347	382	406	410	397	348	320
Quarry	39	40	47	53	64	68	73	69	66	61	63
No. of workers	**30 515**	**33 337**	**35 929**	**38 890**	**43 811**	**47 741**	**50 302**	**51 420**	**50 109**	**47 570**	**47 290**

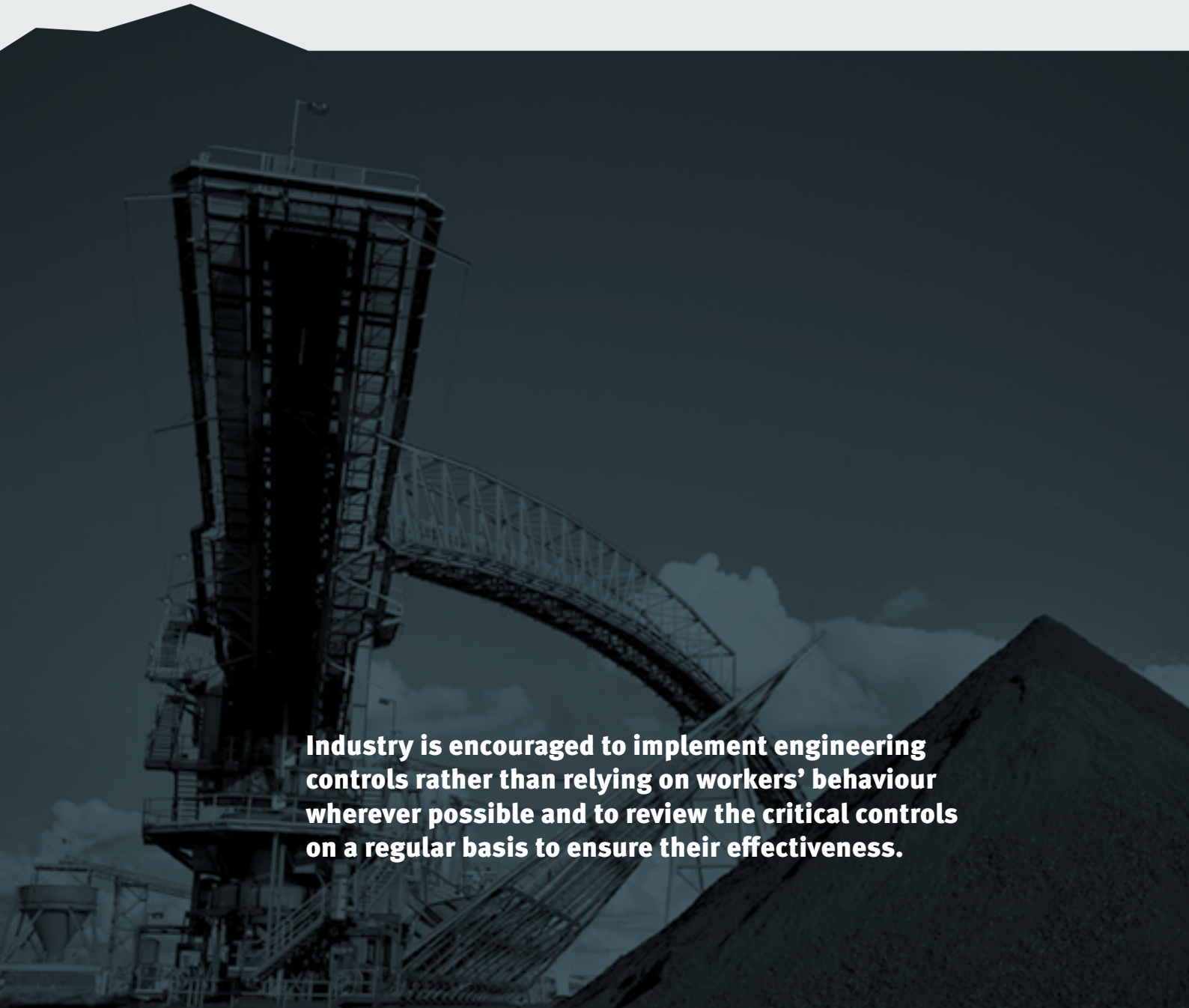
High potential incident data for coal mines indicate there has been a significant increase in the number of incidents related to gas management. Fires, explosives (misfires), electric shocks and vehicle incidents continue to be areas of focus.

In mineral mines and quarries we have seen an increase in the number of high potential incidents related to fires, explosives (misfires) and electric shocks. Falls and vehicle incidents continue to be areas of concern although we have seen a substantial decrease in the number of falls.

The cause of high potential incidents can be varied, including organisational factors, the operating environment, individual and team causes, and absent or failed defences. Based on the information collected from industry a substantial number of high potential incidents have been linked to a lack of awareness about the hazard(s) and absent or failed controls.

Some of the corrective actions recommended by mine sites to improve hazard awareness include addressing hazards at toolbox talks and providing refresher of controls; ensuring all workers involved in the task understand the hazards and critical controls, as well as human factors which may compromise them; re-enforcing the need to stop and re-asses when changes to the job scope are introduced; communicating incident learnings; developing and delivering safety presentations; and providing refresher courses for specific tasks.

Some of the preventative measures identified by industry when reporting incidents include reviewing risk assessment to identify all hazards associated with the task; improving engineering and administrative controls; and reviewing pre-start checklists and safe work instructions.



Industry is encouraged to implement engineering controls rather than relying on workers' behaviour wherever possible and to review the critical controls on a regular basis to ensure their effectiveness.

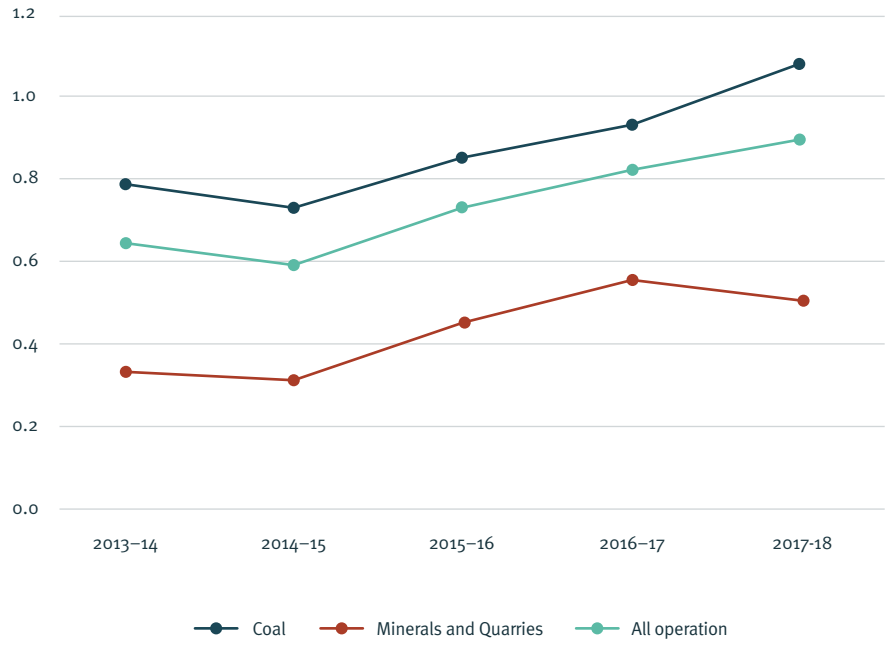
SERIOUS ACCIDENTS

Serious accidents are defined as those requiring admission to hospital as an inpatient, and include fatalities. The frequency rate of serious accidents provides an insight into the effectiveness of critical controls. Figure 17 shows an increasing trend for serious accidents in the industry as a whole.

In 2017-18, we have seen a rise in serious accidents involving lifting and slinging, entanglement, drilling rigs and dump trucks. Falls and being trapped/crushed continue to be areas of concern. On a positive note the number of serious accidents related to longwall equipment decreased significantly.

FIGURE 17

SERIOUS ACCIDENT FREQUENCY RATE, 2013 TO 2018 (ALL SECTORS)



LOST TIME INJURY AND PERMANENT INCAPACITY

Lost time injury is an incident resulting in a fatality, permanent disability or time lost from work of one shift or more. LTI figures tend to include a high proportion of low consequence injuries, as a result they may poorly represent safety and health performance.

Analysis of serious accidents and injuries/diseases resulting in permanent incapacity should be the target of attention for mine management. Site senior executive and mine operator interest in the nature and cause of these incidents is likely to help drive improvement. Figures below indicate a flat or increasing trend for permanent incapacities.

In 2017–18 there were 30 permanent incapacities of which almost half were due to noise induced hearing loss and eight to lung disease. Mines should review their noise abatement and hearing conservation programs including the frequency of audiometry.

FIGURE 18

FIVE-YEAR ROLLING AVERAGE OF LOST TIME INCIDENTS AND PERMANENT INCAPACITY FREQUENCY RATES (COAL SECTOR), 2009 TO 2018

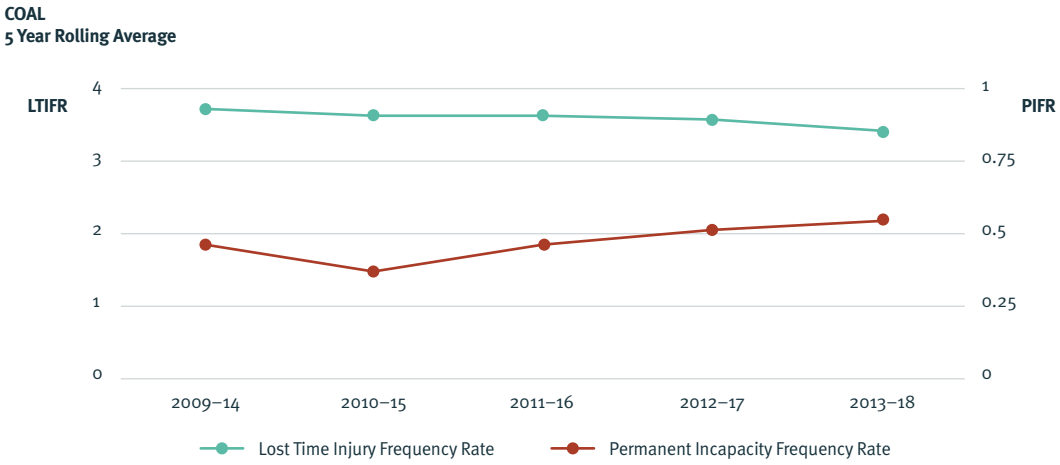
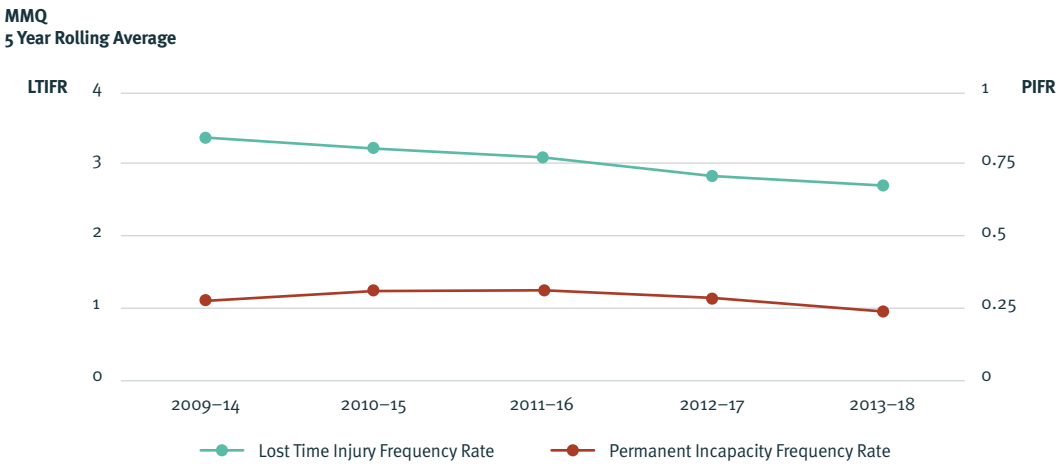


FIGURE 19

FIVE-YEAR ROLLING AVERAGE OF LOST TIME INCIDENTS AND PERMANENT INCAPACITY FREQUENCY RATES (MINERAL MINES AND QUARRIES SECTOR), 2009 TO 2018



Fatalities included when calculating Permanent Incapacity Frequency Rate.

CHAPTER 2
OVERVIEW OF OCCUPATIONAL HEALTH OUTCOMES

MINE DUST LUNG DISEASE

COAL MINES

The department has completed all 18 recommendations from an independent review of the respiratory component of the Coal Mine Workers' Health Scheme (the scheme) performed by Monash University in collaboration with the University of Illinois at Chicago in July 2016.

The department directed significant effort and resources to ensuring that the respiratory health of mine and quarry workers is protected and in 2018–19 there will be continued investment to embed and sustain the reforms to the scheme.

The following reforms have been delivered in response to the Monash University review recommendations:

- a range of regulatory amendments such as:
    - compulsory chest X-rays and lung function tests
    - medicals for retiring coal mine workers
    - mandatory reporting of coal mine dust lung diseases
- a register of approved doctors, spirometry and X-ray imaging providers
- a clinical pathway guideline to ensure consistency in the referral and diagnosis of coal mine dust lung disease
- a training program for doctors undertaking health assessments for Queensland coal mine workers
- spirometry standards developed by the Thoracic Society of Australia and New Zealand
- electronic portal to submit and request coal mine worker health assessments
- information for workers including the Miners' Health Matters website and pocket-book guides with orders taken for over 16 000 copies
- chest X-ray imaging standards in consultation with members of the Royal Australian and New Zealand College of Radiologists
- B-reader training conducted in Brisbane by experts from the US Government's National Institute for Occupational Safety and Health, including Dr Robert Cohen
- engagement of Lungscreen Australia to provide local B-reading services.

As recommended by Monash University, another independent review will be commissioned in 2019 to ensure that the scheme continues to perform according to best practice.

As at 30 June 2018, there were 68 confirmed cases of MDLD amongst current and former Queensland coal mine workers. This consolidated reporting captures all confirmed cases of MDLD among coal mine workers from 1984. Of this total, 14 cases involved coal mine workers with experience in mineral mines and/or quarries. Twenty-six confirmed cases were reported in 2017–18, of which eight coal mine workers also had experience in mineral mines and/or quarries.

As a result of improvements made to the screening process and increased awareness of MDLD, it is reasonably expected that the number of reported disease cases will increase.

Other improvements to the dataset of cases of disease include legislated requirements for mines to report known cases of prescribed diseases and the provision of data about accepted workers' compensation claim from the Office of Industrial Relations.

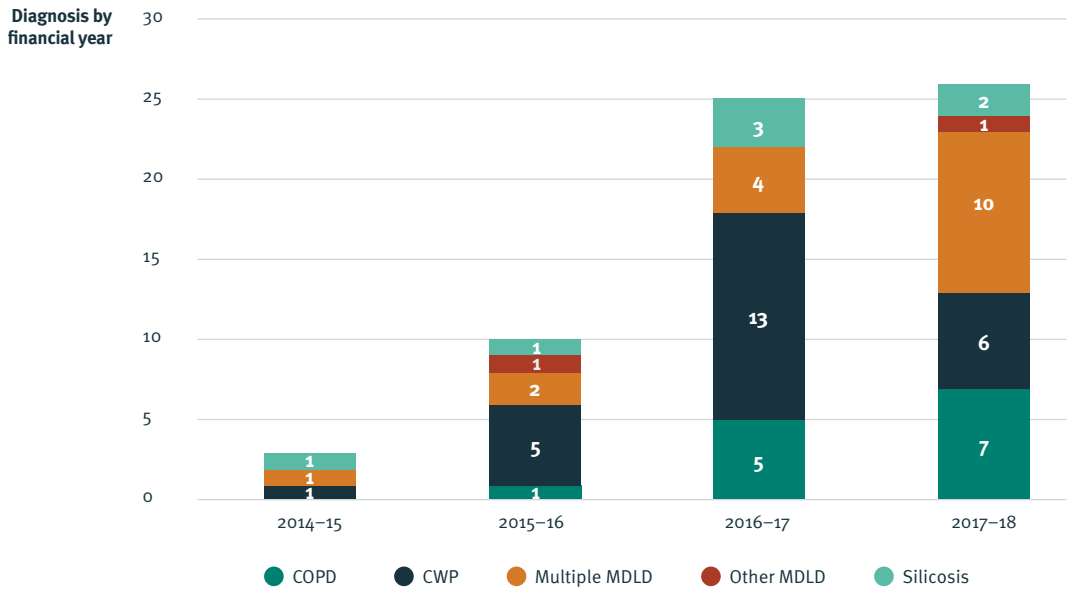
Figure 20 shows the number of cases reported each financial year for coal mine workers since 2015 when CWP was re-identified.

The data show an increase in the identification of dust-related chronic obstructive pulmonary disease (COPD). This may relate to greater awareness in the medical community of the link between respirable dust and the condition. Alternatively, it may be a consequence of regulatory amendment in 2017 requiring this condition as a prescribed disease which must be notified to the department.

The data also show an increase in coal mine workers diagnosed with multiple MDLD. There is no identifiable pattern of disease within this cohort, with a variety of combinations of disease diagnosed.

FIGURE 20

DIAGNOSIS BY FINANCIAL YEAR – COAL AND MINERAL/COAL WORK HISTORY



While any diagnosis is cause for concern, in comparison to some coal mining jurisdictions, such as the United States where health screening is not mandatory and participation is low relative to Queensland, the number of confirmed cases of MDLD in Queensland is relatively low. A recent report from the United States indicates between 1996 and 2016, over 2000 coal miners were diagnosed with the most severe stage of disease – progressive massive fibrosis (PMF).

Of the 68 confirmed cases for coal miner workers in Queensland:

- 78 per cent aged › 50 years
- 60 per cent underground workers
- 25 per cent surface workers
- 25 per cent with interstate or international mining work history.

Most of Queensland's confirmed cases have been identified during the early stages of disease and removing or reducing the worker's exposure to dust can prevent symptoms from progressing. Early stage mine dust lung disease has a good prognosis. Ceasing tobacco smoking can also prevent deterioration of the worker's lung function.

Generally, it does not result in any symptoms and lung capacity remains within a normal range. However, health surveillance is key to identifying the disease in its earliest stages so that exposure can be reduced to prevent the disease from progressing[4].

The department is supporting research by the Wesley Hospital to improve the understanding of occupational lung disease in mine workers, including trends in disease severity, occupational and lifestyle history and radiological presentations.The research includes a review of recently identified positive cases of MDLD and is expected to deliver its findings in 2019.

All chest X-rays are now examined against the International Labour Organisation, International Classification of Radiographs of Pneumoconioses (ILO Classification). The ILO Classification is the accepted international standard to describe and code potential abnormalities in chest X-rays that may indicate mine dust lung disease. Through this screening process, the worker's X-ray is compared against a set of standard X-ray images. The concentration of small opacities in the affected zone of the lung is classified by increasing size on a 12-point scale which consists of four major categories (0,1, 2 and 3) with three subcategories in each.

A classification of category 0 indicates a negative screening result. A result of 1 to 3 may indicate early stages of disease. Large abnormalities are classified as A, B or C and may indicate advanced stages of the disease, commonly referred to as PMF.

It is important to note that this is a screening process, and any positive screening result does not necessarily lead to a disease being diagnosed. Results must be further investigated using the clinical pathway guidelines which provide the recommended process for follow-up investigation and referral to appropriate medical specialists and tests.

Since July 2016, the department has sent over 29,000 chest X-rays to the United States, for assessment by National Institute for Occupational Safety and Health (NIOSH) approved B-readers. Over 18,000 chest X-rays have been returned to the department, which equates to more than half the Queensland coal mining workforce.

Table 3 shows the ILO Classification categories of chest X-rays reported by NIOSH approved readers in the United States as at 30 June 2018.

4 Dr Robert Edwards, "Miners' Health Matters", Department of Natural Resources Mines and Energy, https://www.dnrme.qld.gov.au/miners-health-matters/detection [video], 2018

TABLE 3

CHEST X-RAY SCREENING RESULTS FROM THE UNITED STATES

ILO Category	
Negative (0)	17,945
1/0	130
1/1	84
1/2	18
2/1	6
A,B,C	6

Of the screening results from the United States, nine workers (three of whom had combination of coal and mineral mining work history) were subsequently diagnosed with MDLD. None were diagnosed with PMF. Correlation between Australian radiologists and United States B-readers has been very high at 97 per cent.

United States X-ray reading has been an interim measure until Australian radiologists have gained the internationally-recognised B-reading qualification and sufficient experience in performing B reads. There are now 13 Australian B-readers and the transition to an Australian X-ray reading service has commenced.

As part of its surveillance activities, the department's Health Surveillance Unit collects and maintains the health assessment records of all coal mine workers in Queensland. These records are generated and submitted by Nominated Medical Advisers (NMAs), whose role is to assess fitness for duty and identify and detect disease on behalf of operators and coal mine workers.

The unit receives an average of 250–400 health assessment records each week. Over a 10 year period, a backlog developed of health assessments awaiting processing. With the assistance of additional temporary resources, the Health Surveillance Unit cleared the backlog over an 18 month period. In that time, a total of 174,288 records were processed.

The Health Surveillance Unit now holds more than 400,000 health records for coal mine workers, including records of health assessments conducted under the scheme as well as health assessments conducted under the previous Queensland Coal Board Medical, dating back to 1983.

MINERAL MINES AND QUARRIES

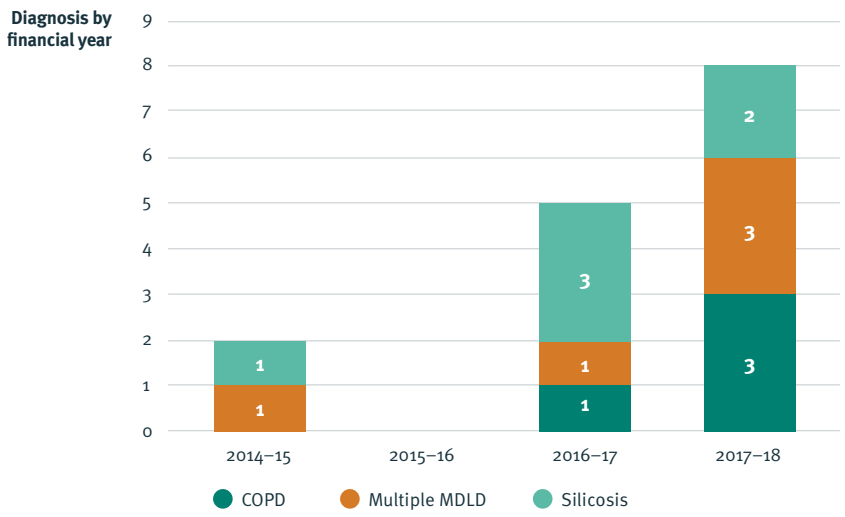
As at 30 June 2018, five cases of confirmed mine dust lung disease amongst current and former Queensland mineral mine workers have been notified to the department (since 1984). There have been no confirmed cases of disease in quarries notified to the department. Of note is that there are 14 confirmed cases notified to the department, in which the worker had mixed work experience across mineral mines and coal.

No cases of workers with only a mineral and quarry work history were reported in 2017–18 however, eight cases of workers with a mixed work history across both mineral mines and coal were reported during this period.

Figure 21 represents the incidence of confirmed cases of disease in workers with a mineral or mineral and coal work history since the re-identification of CWP in 2015, 12 of the 15 cases of disease represent mineral/coal combination work experience. Mineral mine work history only accounted for two cases identified in 2014–15 (silicosis and multiple MDLD) and one case in 2016–17 (silicosis).

FIGURE 21

DIAGNOSIS BY FINANCIAL YEAR – MINERAL AND MINERAL/COAL WORK HISTORY



DIESEL PARTICULATE MATTER

Diesel particulate matter (DPM) is another airborne contaminant of concern for underground mine workers due to the extensive use of diesel powered machinery in this environment. Without effective controls in place, workers may be exposed to hazardous atmospheres.

The mines inspectorate has been collecting and reviewing data in underground coal mines since the early 2000's. Over this period there have been significant improvements in mean exposure across both of the highest risk SEGs; longwall move and development:

- For longwall move SEG, 60 per cent of mines recorded mean exposures above the shift adjusted exposure guideline in 2016; this reduced to 10 per cent in 2017.
- For development SEG, 20 per cent of mines recorded mean exposure above the shift adjusted exposure guideline. No mines recorded mean exposures above the limit for development SEG in 2017.

Data for diesel particulate matter is collected at the beginning of each year for the previous calendar year. Hence data for the first half of 2018 is not available for inclusion in this report.

Despite the significant improvements observed in 2017, longwall move activities continue to represent the highest risk SEG in underground coal mines. While this SEG does not operate continuously, some of the coal mine workers within the SEG are contractors who potentially move from mine to mine performing multiple longwall retraction/installations, and may be subject to elevated exposure risk.

FIGURE 22

MEAN EXPOSURES, DPM, LONGWALL MOVE SEG, 2014 – 2017

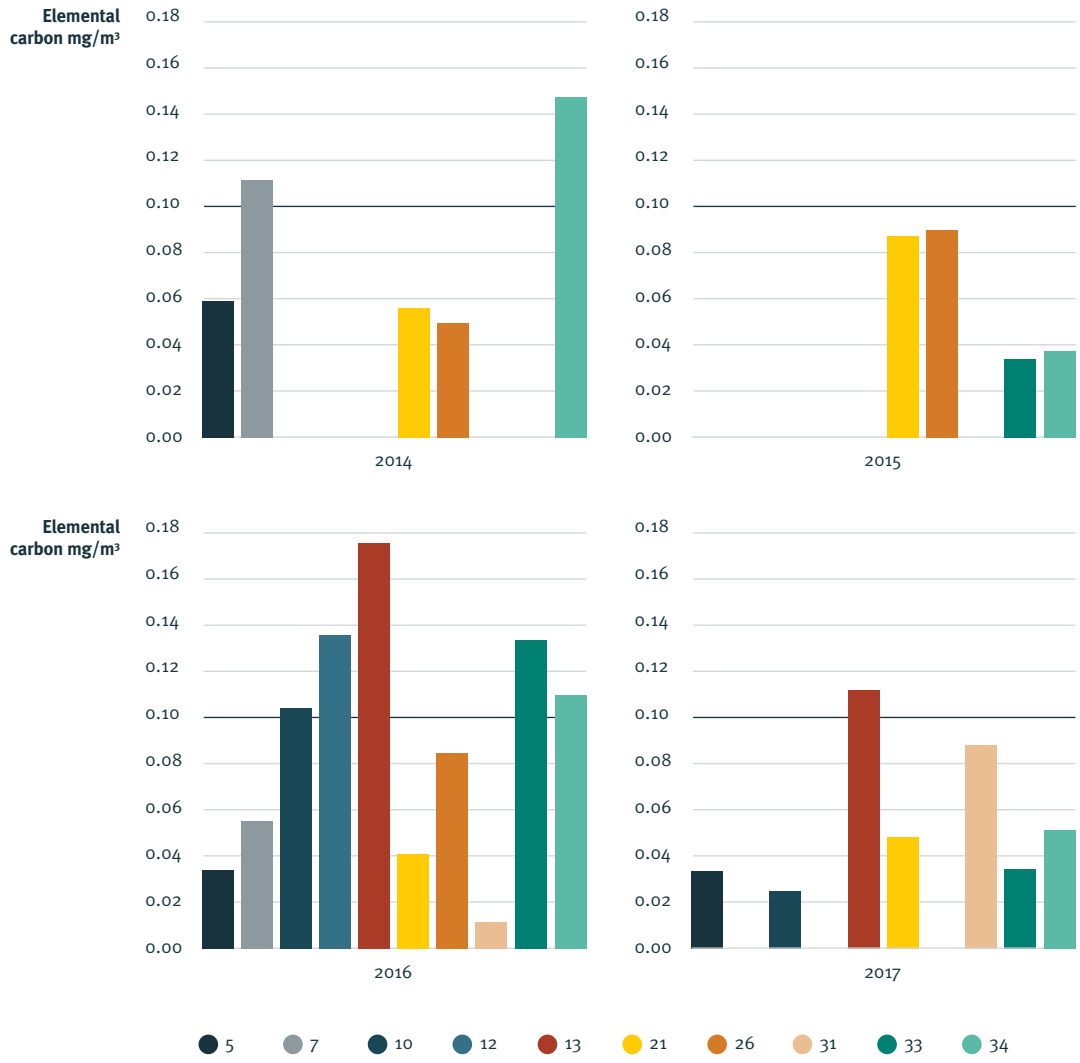


FIGURE 23

MEAN EXPOSURES, DPM, DEVELOPMENT PRODUCTION SEG, 2014 – 2017

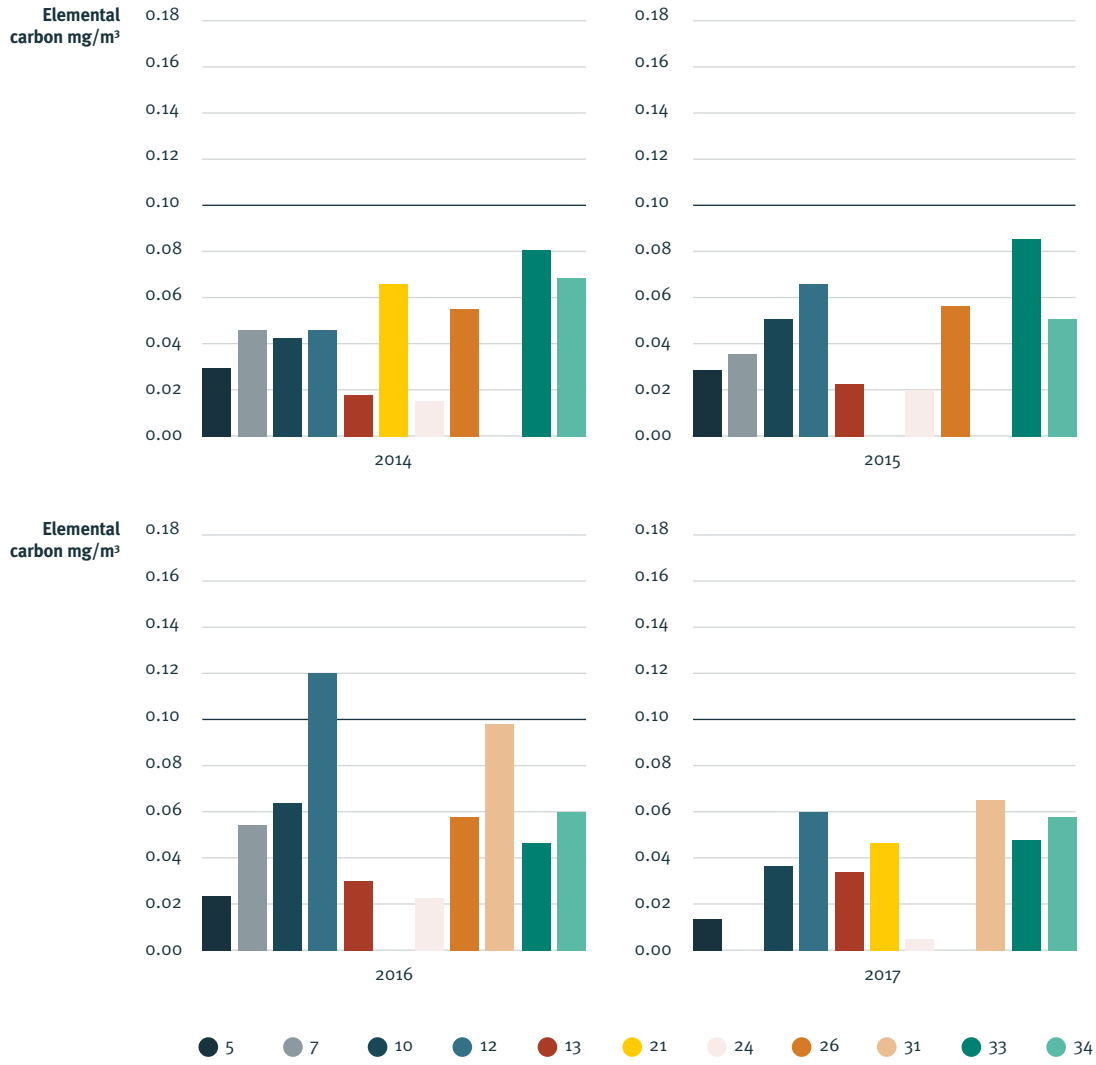


FIGURE 24

MEAN EXPOSURES, DPM, UNDERGROUND MAINTENANCE SEG, 2014 – 2017

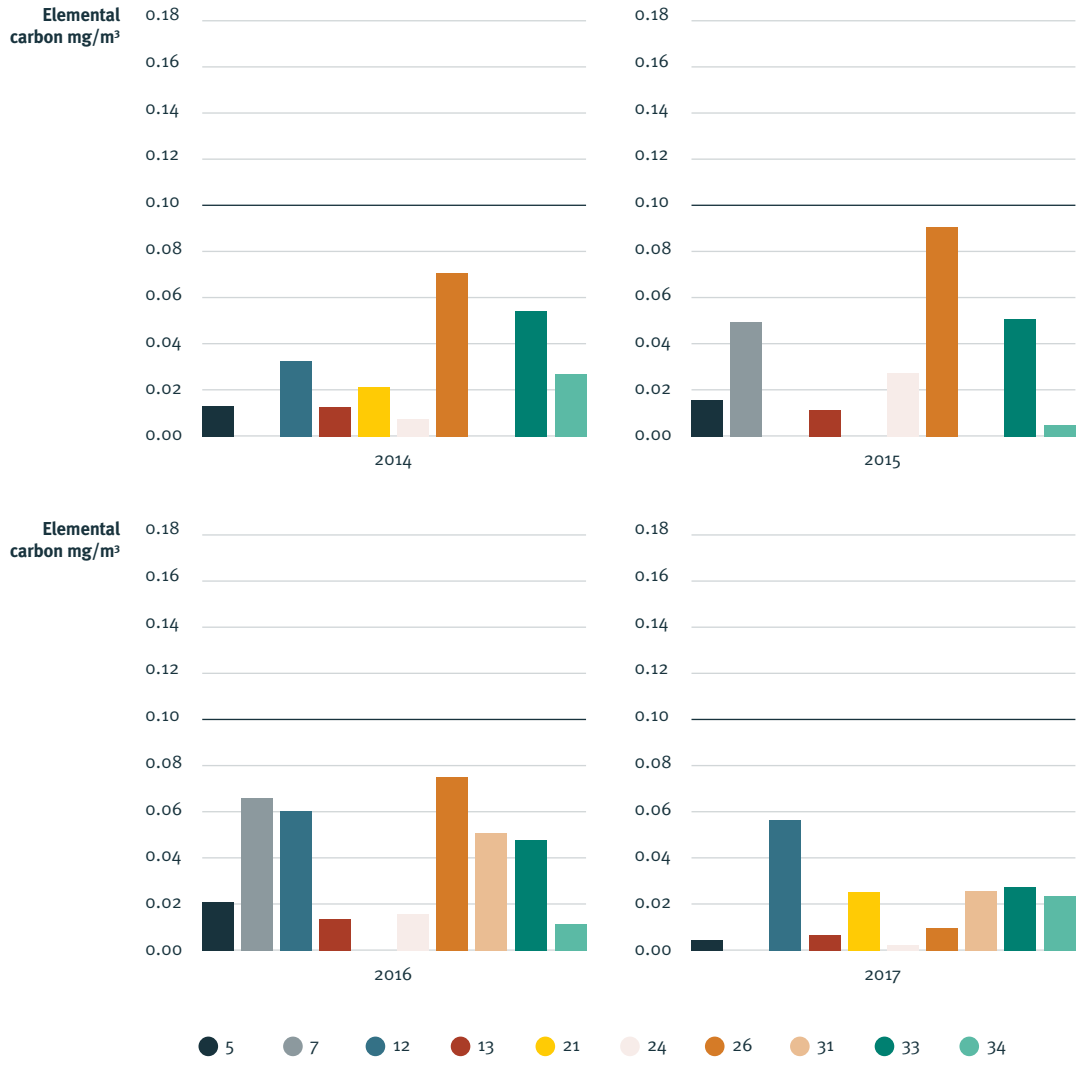


FIGURE 25

MEAN EXPOSURES, DPM, LONGWALL PRODUCTION SEG, 2014 – 2017

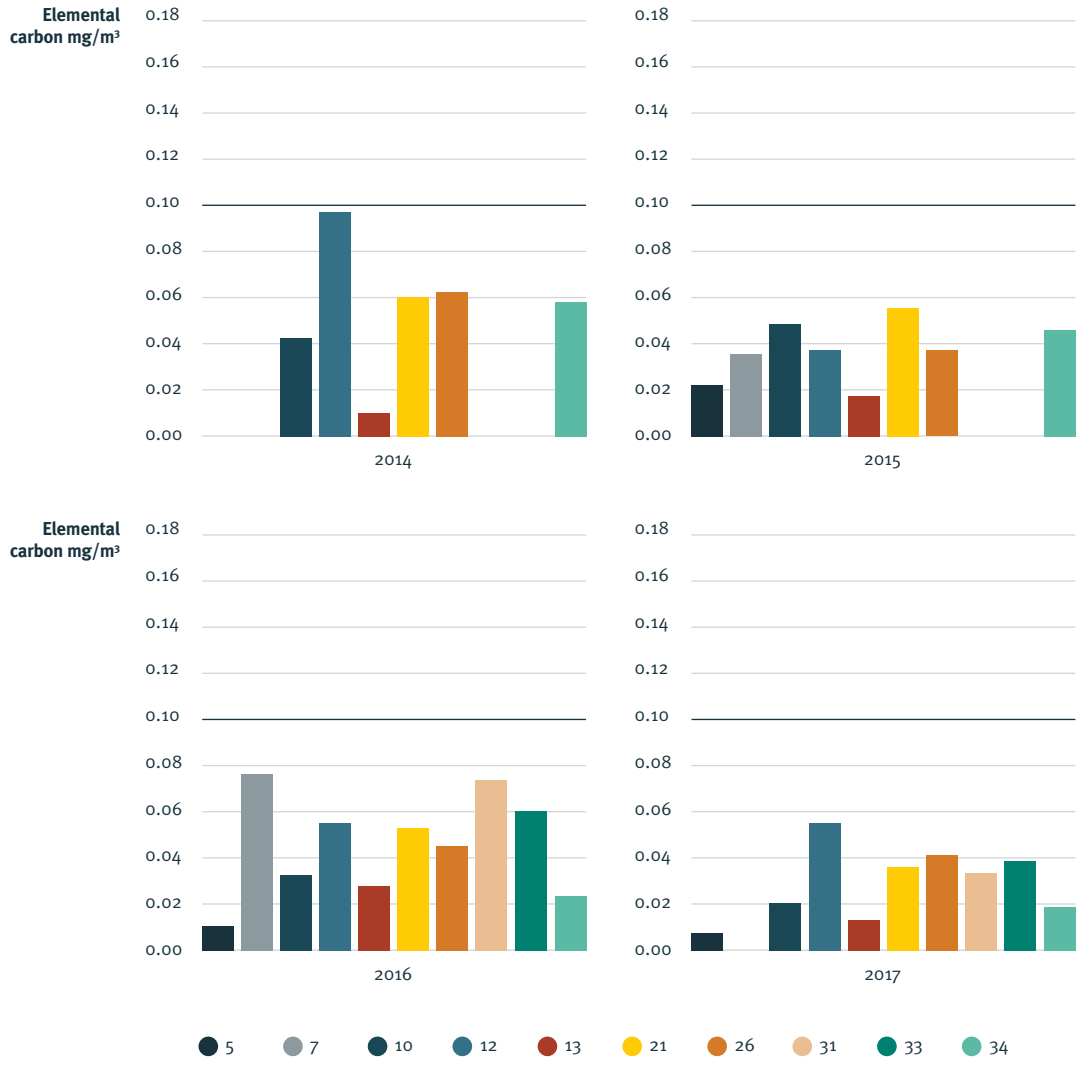
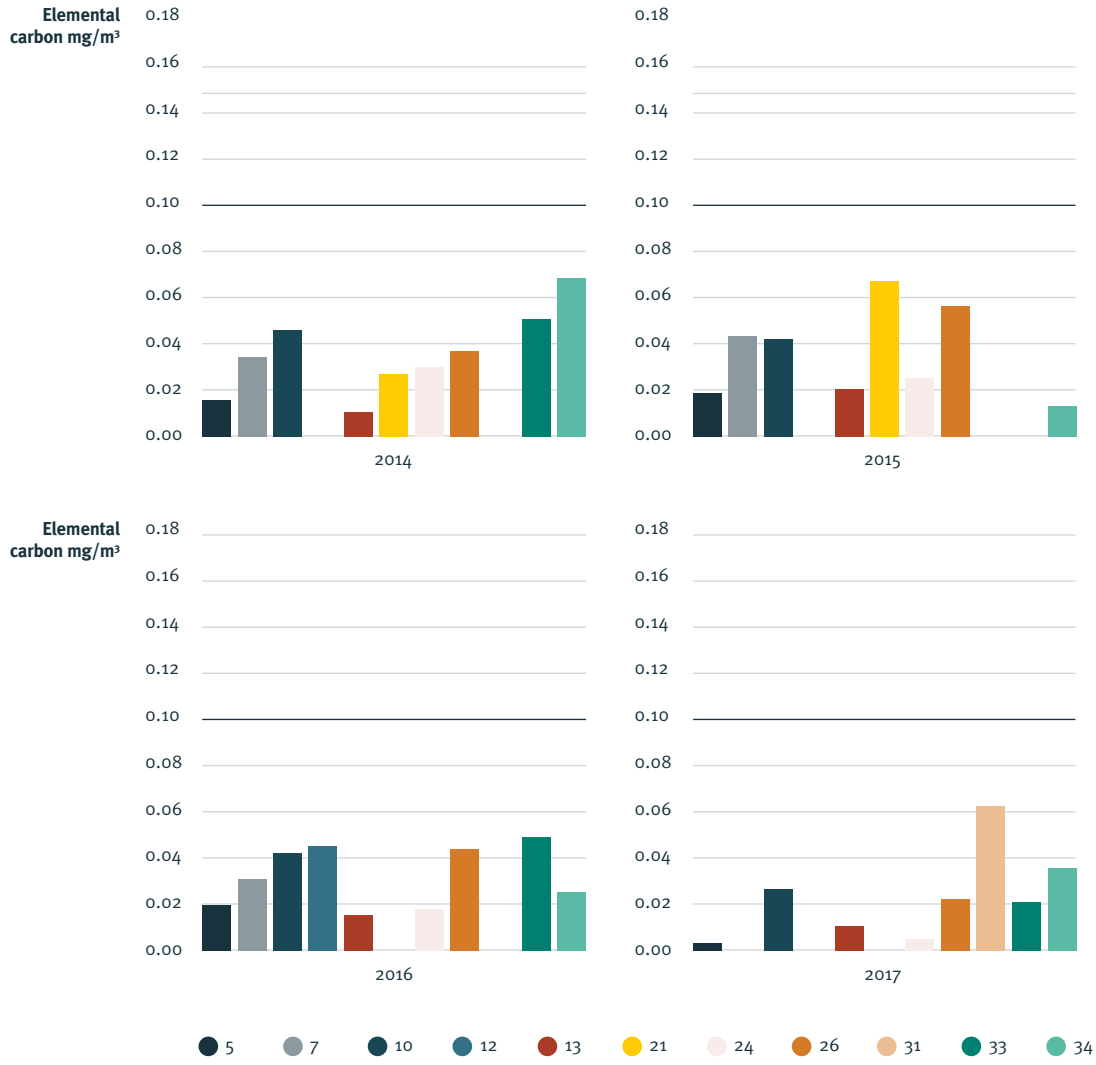


FIGURE 26

MEAN EXPOSURES, DPM, OUTBYE CONSTRUCTION AND INFRASTRUCTURE, 2014–2017



In 2017, there were also noticeable improvements in the single exceedance rates for DPM for longwall move and development SEGs. Over the period of 2015-16 the single exceedance rate for DPM for these groups demonstrated an increasing trend, before reducing by more than half in the year 2017. Exposure data for 2018 will be requested from sites in early 2019 and analysed for exposure trending and assessment of the effectiveness of controls.

FIGURE 27

SINGLE EXCEEDANCE RATE – DIESEL PARTICULATE MATTER – LONGWALL MOVE SEG

2015	2016	2017
21%	41%	18%

FIGURE 28

SINGLE EXCEEDANCE RATE – DIESEL PARTICULATE MATTER – DEVELOPMENT PRODUCTION SEG

2015	2016	2017
7%	15%	3%

During 2018, the mines inspectorate audited the diesel exhaust management systems of all underground coal mines. These audits focused on the mines' emissions based maintenance programs.

INORGANIC LEAD – AIRBORNE AND BLOOD LEAD

Workers in lead (Pb) mining and mineral processing can be exposed to lead as an airborne particulate or settled material. Lead is toxic and when inhaled or ingested can cause a broad range of health problems to workers and their children if the levels become elevated. In April 2018, Safe Work Australia completed an epidemiological review and established new levels at which workers must be removed from lead risk operations to ensure health is not compromised.

The mandatory removal levels which take effect in 2020 will be:

- 10 micrograms per decilitre (10 µg/dL) for females of reproductive capacity
- 30 µg/dL for males and all other females.

Mining and mineral processing operations in Queensland were assessed to the revised lead levels and the results showed that most sites were largely compliant with only a small number of workers (approximately 20 out 5000) that would be subject to removal.

Operations have been developing additional control measures in line with the hierarchy of hazard control.

In addition to the reduction of the removal levels, Safe Work Australia also increased the frequency of blood lead monitoring.

CHAPTER 3
OVERVIEW OF COMPLIANCE ACTIVITY

OVERVIEW OF COMPLIANCE ACTIVITY

The objective of the mines inspectorate's compliance approach is to protect the safety and health of resource industry workers and the Queensland community at large, by ensuring that:

- the risk of injury or illness resulting from regulated activities is at an acceptable level
- obligation-holders receive the support, guidance, and information necessary to discharge their safety and health obligations
- industry, workers and the broader community have confidence in Queensland's resources safety and health framework.

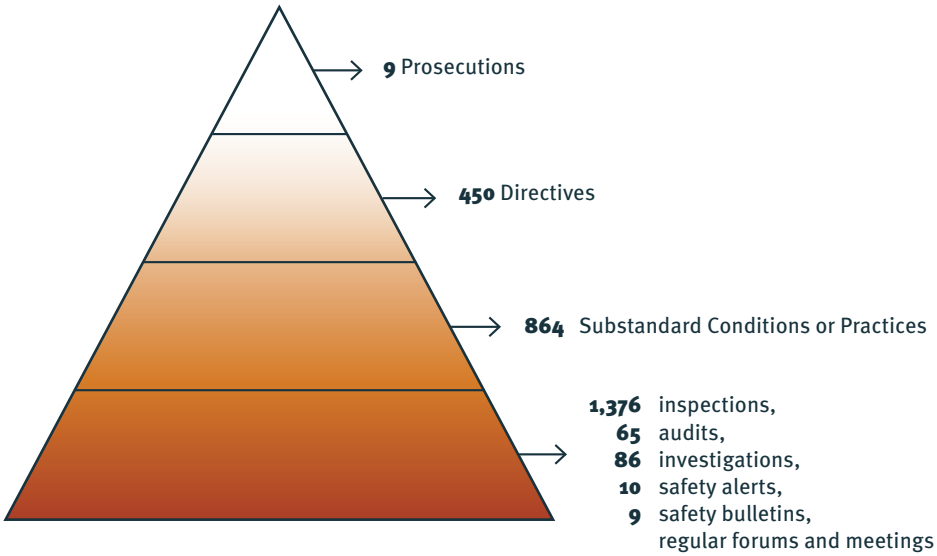
Being an outcomes-focussed, risk-based regulator, the mines inspectorate applies its resources to the areas of greatest risk and to the activities that will achieve the best safety and health outcomes.

The various compliance and enforcement tools employed by the mines inspectorate have characteristics that are **educational** (engagement activities, safety alerts and bulletins, substandard condition and practice advice, inspection and audit activities); **corrective** (directives, inspections, audits, substandard condition or practice advice); **deterrent** (prosecutions, directives, investigations, random inspections and audits); and in some cases, **punitive** (prosecutions).

In determining which of these actions are the most appropriate in any given case, the mines inspectorate will have regard to all relevant circumstances. The mines inspectorate seeks to support industry participants to uphold their obligations, recognising that most of the time, most people try to do the right thing. As such, in the majority of cases an educational or corrective approach is taken. However, in a small minority of cases obligation holders demonstrate behaviours that require a deterrent or punitive response. This is reflected in the compliance and enforcement activities undertaken in 2017–18.

FIGURE 29

COMPLIANCE ACTIVITIES IN 2017-18



EDUCATION AND AWARENESS

The mines inspectorate works collaboratively with industry and unions toward improving safety and health performance. This tripartite relationship plays a vital role in creating an environment where issues can be raised and responded to, as they emerge, for the protection of worker safety and health.

During the 2017–18 year, the mines inspectorate conducted meetings and forums with sectors of the mining industry to highlight emerging issues, get feedback and invite comments on incidents and issues. The meeting and forums were held with underground mine managers, open cut examiners, explosion risk zone controllers, open cut and underground electrical engineering managers, ventilation officers and mechanical engineering managers.

The mines inspectorate also provides industry with general advice and issues safety alerts and bulletins. In 2017–18, ten safety alerts and nine safety bulletins were issued to industry. A list of the safety alerts and bulletins is summarised in Appendices 2 and 3.

INSPECTIONS, AUDITS AND INVESTIGATIONS

Inspectors and inspection officers have the power to enter and inspect or audit mines under legislation. Inspection and audit scheduling is based on a risk model which considers the hazards present at the site, as well as the demonstrated ability of the site to manage the hazards. Compliance activities are continually reviewed and amended to reflect emerging risks and priorities while ensuring that sites are being inspected at appropriate intervals.

Inspections may be undertaken with or without prior notice, depending on the purpose of the visit and the issue at hand. The number of inspections decreased from 1459 in 2016–17 to 1376 in 2017–18 although there was an increase in the number of staff days spent on inspections, from 1598 to 1619 in 2017–18.

TABLE 4

INSPECTIONS UNDERTAKEN, BY SECTOR, 2015–16 TO 2017–18

Inspections	Coal surface	Coal underground	Mineral surface	Mineral underground	Quarries	Total
2015–16	274	155	477	134	557	1597
2016–17	288	123	383	116	549	1459
2017–18	295	95	373	140	473	1376

Audits are undertaken across a range of issues, including serious accidents or high potential incidents, or as part of a scheduled audit following a site inspection.

Audit activity increased from 52 to 65 audits in 2017–18. This translates to an increase in audit staff days, from 266 to 386 days. Most of the audits were for coal surface (18) and coal underground (24).

Respirable dust and silica remains an ongoing focus, with structured inspections/audits based against Recognised Standard 14: monitoring respirable dust in coal mines and the QGL02 Guideline for Management of Respirable Crystalline Silica in Queensland Mineral Mines and Quarries.

Gas management in underground coal mines continues to be a concern, with incidents of methane greater than 2.5 per cent still occurring during 2017–18. The mines inspectorate conducted gas management audits at seven of the ten operating underground coal mines in 2017-18.

TABLE 5

AUDITS UNDERTAKEN, BY SECTOR, 2015–16 TO 2017–18

Audits	Coal surface	Coal underground	Mineral surface	Mineral underground	Quarries	Total
2015–16	1	3	9	7	12	32
2016–17	8	2	20	1	21	52
2017–18	18	24	4	10	9	65

Investigations of serious accidents allow inspectors to determine the underlying cause and make recommendations to the industry to minimise the likelihood of the incident occurring again.

The number of investigations undertaken by the mines inspectorate decreased in 2017–18, down from 94 to 86. Most of the investigations were in coal surface mines (32) and mineral surface mines (24).

Investigations of incidents in coal mines revealed, the quality of frontline supervision continues to be prevalent in all categories of incidents. Inspectors found that in general, supervisors do not understand their role, their influence or their responsibility, and industry needs to improve the quality of supervision.

TABLE 6

INVESTIGATIONS UNDERTAKEN, BY SECTOR, 2015–16 TO 2017–18

Inspections	Coal surface	Coal underground	Mineral surface	Mineral underground	Quarries	Total
2015–16	54	11	18	11	7	101
2016–17	37	4	21	19	13	94
2017–18	32	13	24	12	5	86

The mines inspectorate identified 864 substandard conditions or practices (SCP) in 2017–18 down from 1088 in 2016–17. Most of these occurred in quarries (289), surface mineral mines (211) and surface coal mines (184).

TABLE 7

NUMBER OF SUBSTANDARD CONDITIONS OR PRACTICES, BY SECTOR, 2015–16 TO 2017–18

Substandard conditions or practices (SCP)	Coal surface	Coal underground	Mineral surface	Mineral underground	Quarries	Total
2015–16	147	96	288	68	402	1001
2016–17	198	80	298	77	435	1088
2017–18	184	57	211	123	289	864

CORRECTIVE ACTION

Inspectors of mines and inspection officers have the power to issue various directives under the *Coal Mining Safety and Health Act 1999* and the *Mining and Quarrying Safety and Health Act 1999*.

Directives are among the most effective mechanisms for ensuring serious safety and health issues are addressed effectively and as a priority. Directives usually require a mine to take prompt action and rectify issues or deficiencies by a stated date.

A total of 450 directives were issued in 2017–18 which is only a small decrease from the previous year.

TABLE 8

DIRECTIVES UNDERTAKEN, BY SECTOR, 2015-16 TO 2017-18

Directives	Coal surface	Coal underground	Mineral surface	Mineral underground	Quarries	Total
2015–16	72	77	88	13	84	334
2016–17	83	47	101	28	198	457
2017–18	116	31	125	49	129	450

Directives issued included:

- Suspending longwall cutting operations after ventilation changes resulted in methane readings above 5 per cent measured in a cut-through. The mine was required to demonstrate how it would comply with legislative ventilation requirements for underground coal mines.
- The mine was requested to review a Trigger Action Response Plan (TARP) which allowed for the longwall shearer to be operated when methane levels exceeded 2.5%. The TARP was reviewed, preventing this from occurring.
- Suspending the use of a temporary refuelling bay installed where there was the possibility of methane greater than 0.5%. In response the mine reviewed the risk assessment and management plan, and temporary fuelling facilities were withdrawn from such areas.
- Suspending all mining and production activity until an acceptable level of risk was achieved and was as low as reasonably possible in regard to various issues, including working at height. The mine implemented controls requiring maintenance and repair work to be undertaken only when a mobile platform with hand rails was used.

- The mine was requested to review and update the Traffic Management Plan to identify the hazards and apply effective risk controls associated with traffic interaction. The mine responded with an updated plan addressing issues including mobile plant and vehicle requirements, emergency situations, speed limits, overtaking, stopping and parking, traffic control, loading and unloading trucks, watering roads, heavy vehicle training authorisation, berms, electrical hazards, fatigue, and alcohol and other drugs.
- Prior to any further tyre and rim maintenance tasks being conducted on site, the mines inspectorate required the site senior executive to ensure procedures or risk assessments used by anyone maintaining tyres and rims were incorporated into the site's safety and health management system. Procedures needed to address issues including mandatory deflation of tyres such as deflating both tyres when working on dual wheel assemblies, and ensuring rim components seat correctly and persons are protected from a sudden release of pressure during inflation after re-assembly. The mine responded by reviewing the safe work procedure for removal of wheels and rim assemblies and for type pressure maintenance, incorporating these, and other controls.
- Suspending operation of the plant until the site senior executive conducted an inspection of all conveyors and machines to rectify all missing and inadequate guarding of accessible nip points and rotating parts, and established a systematic process that ensures that all guards are in place and undamaged prior to the operation of the plant. In response, the mine provided evidence of installed, repaired and replaced guarding, and a plant pre-start checklist that included protective guarding, rotating parts and nip points.
- A fatality on 5 August 2017 in an open-cut coal mine workshop highlighted the potential risk of spring-back in equipment that has been indented during operation or otherwise. The mine was requested to suspend all work relating to the removal and/or replacement of wear liner plates on earthmoving equipment buckets. The mine was also requested to review the safety and health management system for this type of work to ensure the level of risk is at an acceptable level. A directive was also sent to all operating surface coal mines in Queensland requiring the mine's site senior executive to have elements of the safety and health management system that relate to the removal and replacement of wear/liner plates on earthmoving equipment (buckets, truck trays, dozer blades etc.) reviewed so as to ensure that the risk was at an acceptable level.

Where compliance with a directive is not achieved by a certain date, the mines inspectorate can undertake further action in the form of accountability meetings or other compliance activity including suspension of operation or prosecutions. They may conduct an accountability meeting with the mine site senior executive, or both the site senior executive and a senior representative of the operator and others accountable for safety and health performance. Accountability meetings require the site senior executive, operator and others to explain why a deficiency occurred, and the actions taken to ensure it does not occur again.

The mines inspectorate undertook a total of 29 accountability meetings in 2017–18 (see Tables 9 and 10). The number of accountability meetings at the site senior executive level increased from 12 to 22 in 2017–18.

TABLE 9

NUMBER OF ACCOUNTABILITY MEETINGS (SSE LEVEL), 2015–16 TO 2017–18

Accountability action (SSE)	Coal surface	Coal underground	Mineral surface	Mineral underground	Quarries	Total
2015–16	3	11	5	1	3	23
2016–17	4	1	5	1	1	12
2017–18	4	18	0	0	0	22

TABLE 10

NUMBER OF ACCOUNTABILITY ACTIONS (SSE/OPERATOR LEVEL), 2015–16 TO 2017–18

Accountability action (SSE/ Operator)	Coal surface	Coal underground	Mineral surface	Mineral underground	Quarries	Total
2015–16	1	7	0	0	0	8
2016–17	4	1	2	0	0	7
2017–18	0	4	1	0	2	7

PROSECUTIONS

Prosecutions may be undertaken in response to instances of non-compliance where it is in the public interest to prosecute and there is sufficient evidence as to be capable of securing a conviction. For example, prosecution may be considered appropriate where the alleged offender shows significant resistance to or disengagement with its safety and health obligations.

In 2017–18, there were eight on-going prosecutions before the courts involving 17 defendants. Three of these prosecutions were finalised during this period. One additional prosecution was commenced against four defendants.

Examples of prosecutions before the courts during 2017–18, including one case relating to a fatality, are outlined below.

- On 6 February 2015, an incident occurred at a coal mine in central Queensland in which a coal mine worker was fatally injured and another suffered grievous bodily harm after they were hit with tyre components when a tyre exploded. The injured person and the deceased had been in the process of changing one of the tyres on a water truck at the time of the incident.

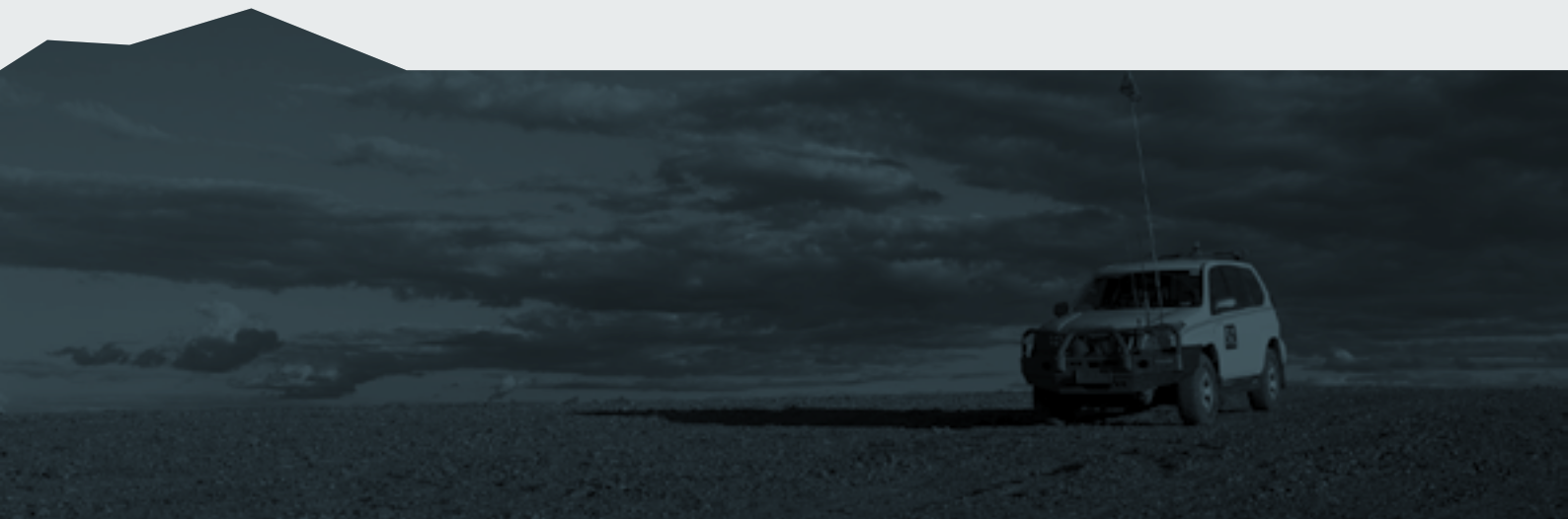
  One defendant, a contracting company at the mine, entered a plea of guilty to the charges and was sentenced at the Rockhampton Industrial Magistrates Court on 25 August 2017. The company was fined $150 000 and ordered to pay costs to the department of $149 000. A conviction was not recorded.

  The prosecution that had been commenced against the individual who had been supervising the activity at the time of the incident was discontinued.

- On 22 June 2014, shot-firer training was being conducted by an individual at a coal mine in central Queensland. The training that was provided involved a number of breaches, including failures to report a misfire and failing to store explosives in a secured area. However, the incident did not result in any injuries or damage to property.

  One defendant, the shot-firer, entered pleas of guilty to a number of the charges and the remaining charges were listed for trial. The defendant was convicted of one of the offences that proceeded to trial and acquitted in relation to the other offences. The defendant was fined $7200 and ordered to pay costs amounting to $9374.

  The charges were discontinued against the other defendant, the Underground Mine Manager.



COMPLAINTS ABOUT MINE SAFETY AND HEALTH

Queensland mining safety and health legislation allows mine workers, their representatives or others to make confidential complaints about safety and health matters to the mines inspectorate. In 2017–18, a total of 107 complaints were made, an increase of seven from the previous year. The mines inspectorate takes the investigation of complaints seriously. Only nine complaints remain open as at 30 June 2018.

TABLE 11

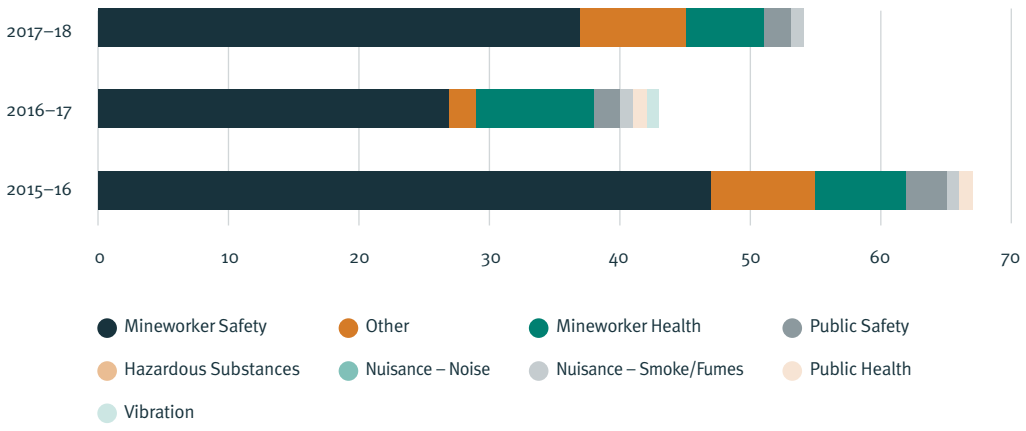
NUMBER OF COMPLAINTS, ALL SECTORS, 2015–16 TO 2017–18

Complaints	Coal surface	Coal underground	Mineral surface	Mineral underground	Quarries	Other – no mine involved	Total
2015–16	61	6	18	7	29	0	121
2016–17	38	5	24	10	23	0	100
2017–18	40	14	21	10	18	4	107

There has been a large increase in the number of complaints in relation to mineworker safety in coal mines up from 27 in 2016–17 to 37 in 2017–18. Most of the complaints were made by mine workers (76 per cent) and the remaining 22 per cent were made by the public.

FIGURE 30

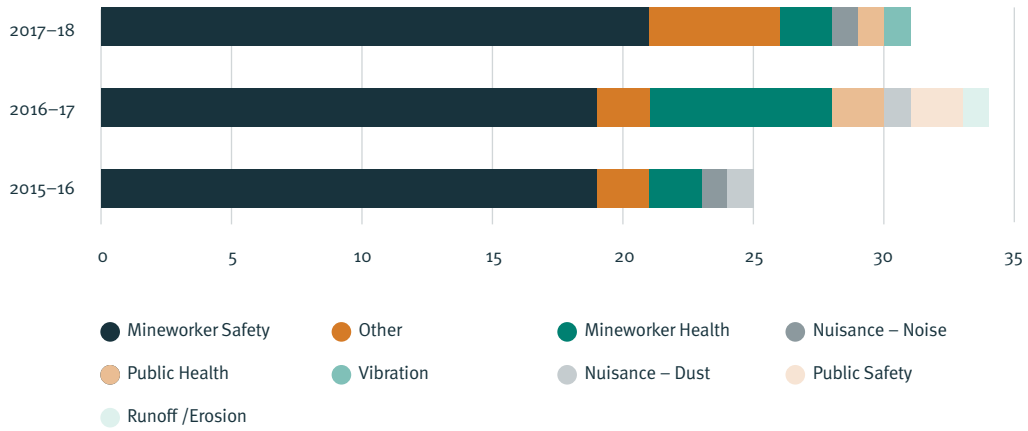
NUMBER OF COMPLAINTS BY TYPE, COAL, 2015–16 TO 2017–18



Thirty-one complaints were made about mineral mines in 2017–18. Mineworker safety continues to be a concern with the number of corresponding complaints increasing from 56 per cent in 2016–17 to 68 per cent in 2017–18. Complaints were made by mine workers (58 per cent) and the public (39 per cent).

FIGURE 31

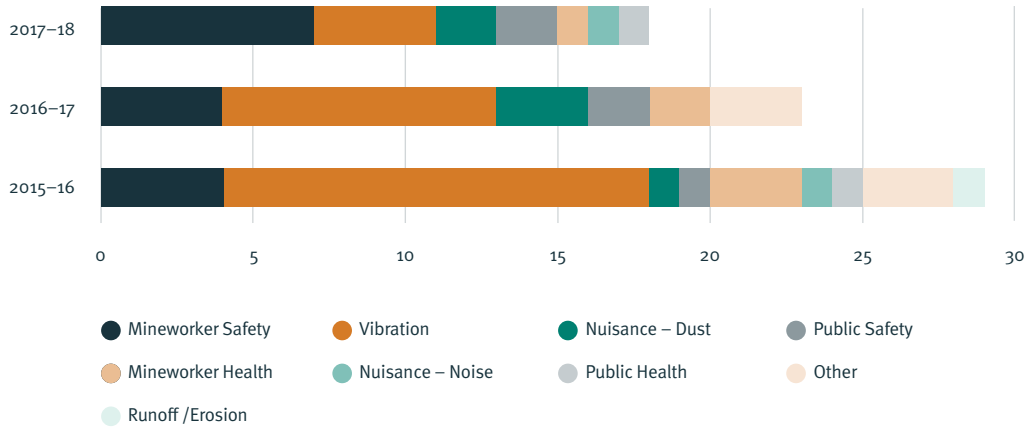
NUMBER OF COMPLAINTS BY TYPE, MINERALS, 2015–16 TO 2017–18



In 2017–18, 18 complaints were made about quarries. A total of 72 per cent of the complaints were made by the public and 28 per cent by mine workers. The most common complaints were on mineworker safety (33 per cent) and vibration (28 per cent). We have seen a large decrease in complaints due to vibration (down from 14 in 2015–16 to 5 in 2017–18). This may be a result of the quarries communicating with the public and improving their practices.

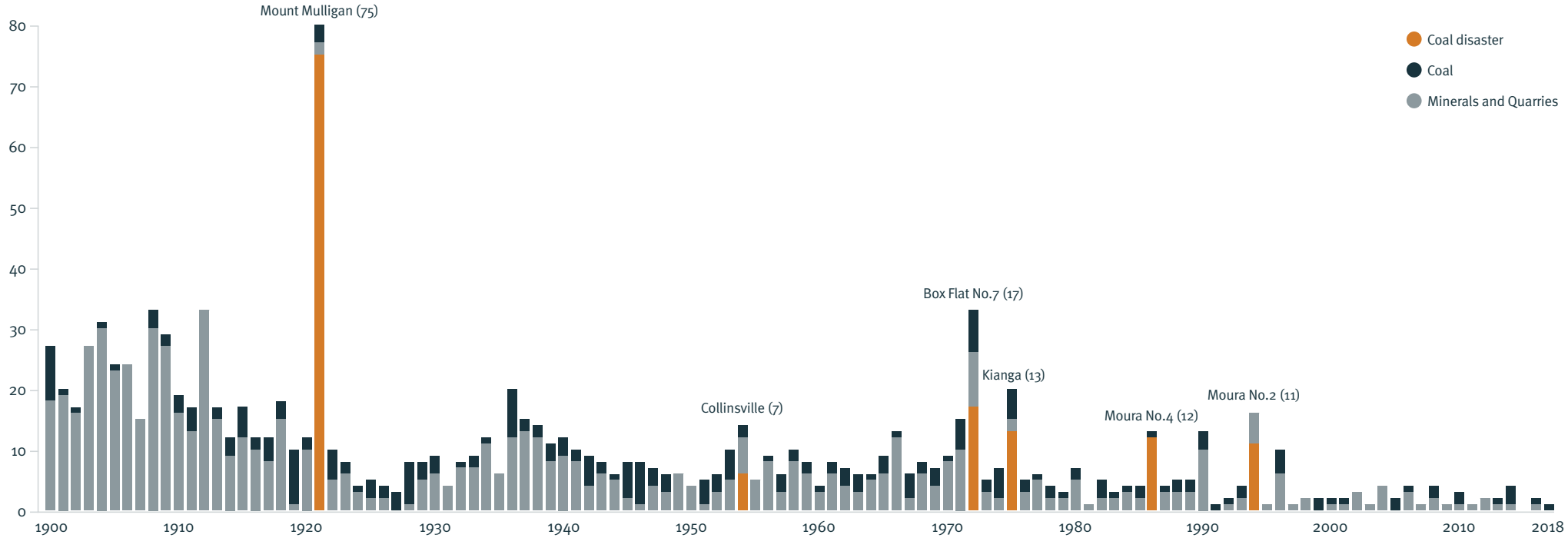
FIGURE 32

NUMBER OF COMPLAINTS BY TYPE, QUARRIES, 2015–16 TO 2017–18



APPENDICES

FATALITIES IN QUEENSLAND MINES (ALL SECTORS) 1900 TO 2018



SAFETY ALERTS ISSUED IN 2017–18

SAFETY ALERT NO.	TITLE	DESCRIPTION
Mines safety alert 344	Worker injured due to ineffective isolation	A maintenance worker was repairing a pump discharge control valve when the final two bolts failed and the shuttle bottom was ejected, striking and injuring the worker's right hand.
Mines safety alert 345	Truck driven from Go-line with turbo timer activated	Off-highway truck in shutdown mode with the turbo timer activated was driven onto the haul road. When the turbo timer timed out the park brakes applied and the truck skidded for over 50 metres.
Mines safety alert 346	Slurry pump explosion	A slurry pump exploded after becoming deadheaded during operation.
Mines safety alert 347	Coal mine worker fatally injured performing maintenance on a large excavator bucket	A coal mine worker carrying out repairs on a large excavator bucket was fatally injured when struck by a piece of the wear plate.
Mines safety alert 348	Methane hazards at open-cut excavations	On an open-cut coal mine, intermittent pockets of methane gas issuing from the ground beneath the excavator track pads when ignited by sparks from hot work being performed above.
Mines safety alert 349	Inrush from raisebore hole	An inrush occurred from a raisebore hole resulting in a flow of material into a roadway.
Mines safety alert 350	Control of ERZ Controller (Deputy) keys	Unauthorised coal mine workers (CMWs) have, on occasions, been found with gas monitor bypass keys they were not authorised to hold.
Mines safety alert 351	Welding machine incidents	At a coal mine site two coal mine workers suffered electric shocks from an engine driven welding machine.
Mines safety alert 352	Potential variability in methane monitoring capabilities	A supplier recently conducted laboratory testing on methane monitor sensors under various environmental conditions and calibration procedures which could be found in underground coal mines.
Mines safety alert 353	Front wheels of integrated tool carrier lifted off ground during boom energy lowering	A worker was operating an after-market manual emergency lowering system on an integrated tool carrier (IT) when the front wheels lifted off the ground and the whole machine tilted over towards the worker.

SAFETY BULLETINS ISSUED IN 2017–18

SAFETY BULLETIN NO.	TITLE	DESCRIPTION
Mines safety bulletin 164	Circumferential failure of lockrings	A Caterpillar 992C front end loader left the tyre bay after a new O-ring had been fitted to the position 1 tyre-and-rim assembly. After travelling approximately 100 metres, this same assembly failed catastrophically.
Mines safety bulletin 165	Accessing personal dust exposures during maintenance, production support and non-routine work activities	Potential for exposure to excessive airborne dust concentrations during maintenance, production support and inspection tasks at underground coal mines can be underestimated due to limited duration and frequency of certain tasks and the false perception hey are not related to production activities.
Mines safety bulletin 166	Preventing supply of asbestos goods or materials containing asbestos to Queensland mines and quarries	This document describes imported products that may contain asbestos, legislative controls, testing and reporting procedures.
Mines safety bulletin 167	Coal mine worker struck by coal from a longwall face	A longwall bolt-up was conducted with three Rapid Face Bolters when a serious accident occurred at the #64 shield zone, on the face line, where the coal face spalled injuring 3 coal mine workers.
Mines safety bulletin 168	Seismic emergency response and preparedness	Seismic events can be either natural (through earthquakes) or mining induced and both can affect open cut and underground mining operations.
Mines safety bulletin 169	Storm season 2017	The SSE must ensure adequate resources, facilities and procedures are available before, during and after a storm.
Mines safety bulletin 170	Articulated truck rollovers (update)	On average, an articulated dump truck/water truck rollover every 2 months.
Mines safety bulletin 171	Xanthates in mining (update)	Xanthates are a group of chemicals typically used in sulphite flotation in mining applications. Common xanthate products are sodium ethyl xanthate (SEX), sodium isopropyl xanthate (SIPX), sodium isobutyl xanthate (SIBX) and potassium amyl xanthate.
Mines safety bulletin 172	Elastic springback in plates on equipment	The results of a fatality investigation have highlighted potential hazards that may exist in plates that have been indented during operations or otherwise.

ABBREVIATIONS

CMDLD
Coal mine dust lung disease

CMSHAC
Coal Mining Safety and Health Advisory Committee

CMWHS
Coal mine workers' health scheme

COPD
Chronic obstructive pulmonary disease

CWP
Coal workers' pneumoconiosis

DI
Disabling injury

DNRME
Department of Natural Resources and Mines

DPM
Diesel particular matter

HPI
High potential incident

HSU
Health Surveillance Unit

IARC
International Agency for Research on Cancer

ILO
International Labour Organisation

ILO Classification
International Classification of Radiographs of Pneumoconiosis

ISHR
Industry Safety and Health Representative

LTI
Lost time injury/disease

LTIFR
Lost time injury frequency rate

MDLD
Mine dust lung disease

NIOSH
National Institute for Occupational Safety and Health

NMA
Nominated medical adviser

PMF
Progressive massive fibrosis

RCS
Respirable crystalline silica

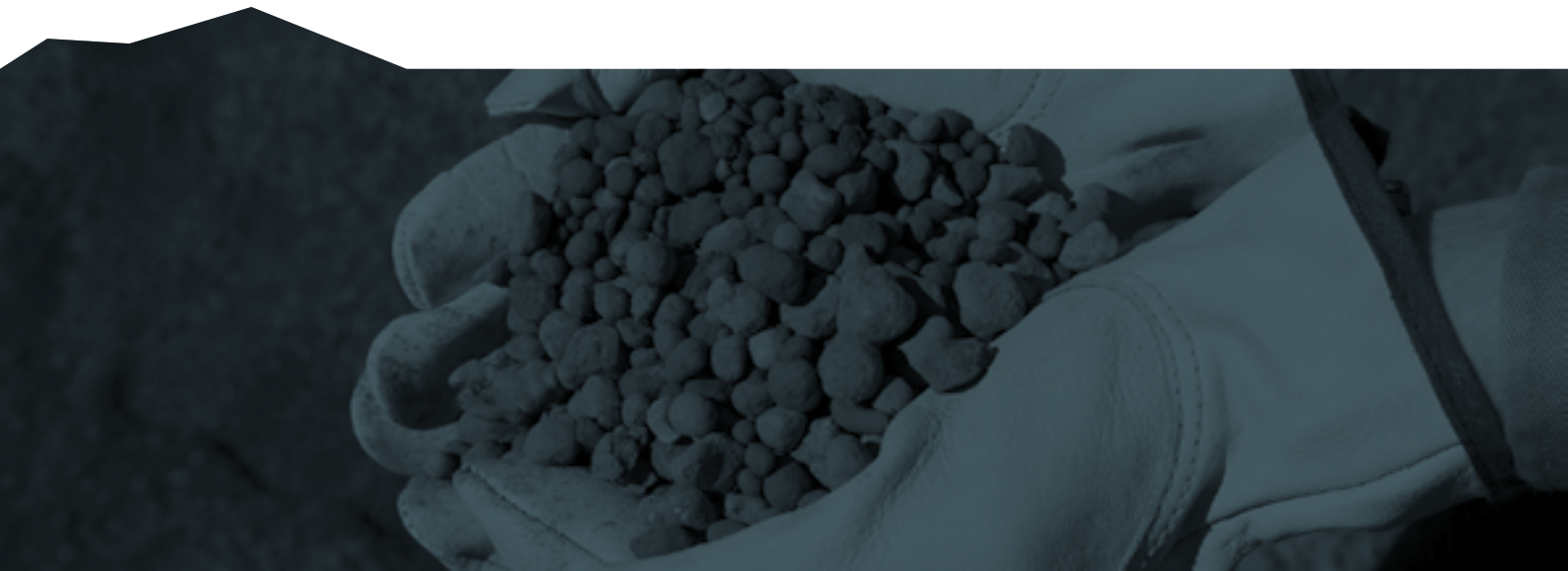
SCP
Substandard condition or practice

SEGs
Similar exposure groups

SHMS
Safety and Health Management System

SSE
Site Senior Executive

TARP
Trigger action response plan



DEFINITIONS[3]

COAL MINE
Mine subject to the *Coal Mining Safety and Health Act 1999* and associated regulations.

COAL WORKERS' PNEUMOCONIOSIS
Coal workers' pneumoconiosis is a disease of the lung parenchyma caused by deposition of dust particles, and the reaction of lung tissue to the dust. Emphysema, chronic bronchitis, lung function impairment, and diffuse dust-related fibrosis are other manifestations of the disease.

DAYS ON ALTERNATIVE DUTIES
The number of days a worker is unable to perform his/her regular job and has been assigned other temporary or modified duties. Alternative duties include a changed work environment, roster or shift pattern.

DAYS LOST
All rostered shifts that a worker is unable to work because of injury, not including the day of the injury. This also includes days lost because of recurrences of injuries from previous periods and days on alternative duties after returning to work. A fatal injury is treated as 220 days lost (as per Australian Standard AS1885.1–1990, Clause 6.17).

DISABLING INJURY
A work-related injury or disease resulting in a worker being unable to fully perform his/her regular job. Either light or alternative duties are performed.

DURATION RATE
The average time (days) lost and the time (days) on alternative duties for each LTI or DI. In this report, time lost includes all time lost for an incident to date.

HIGH POTENTIAL INCIDENT
An event, or series of events, that causes or has the potential to cause a significant adverse effect on the safety or health of a person.

LOST TIME INJURY / DISEASE
An incident resulting in a fatality, permanent disability or time lost from work of one shift or more. The shift on which the incident occurred is not counted as a shift lost.

LOST TIME INJURY FREQUENCY RATE
The number of lost time injuries/diseases per million hours worked.

LOST TIME AND DISABLING INJURY FREQUENCY RATE
The number of lost time injuries/diseases and disabling injuries per million hours worked.

MECHANISM OF INJURY
The action, exposure or event that is the direct cause of the most serious injury.

MINE DUST LUNG DISEASE
Mine dust lung disease is caused by mine dust exposure, and comprises a group of occupational lung diseases that result from the cumulative inhalation of respirable mine dust over several years.

MINERAL MINE
Mine subject to the *Mining and Quarrying Safety and Health Act 1999* and associated regulation.

PERMANENT INCAPACITY
A permanent incapacity is any work-related injury or disease that leads to one or more of the following outcomes:
- the complete loss, or permanent loss of use, of any member or part of the body
- any permanent impairment of any member or part of the body, regardless of any pre-existing disability of that member or part
- any permanent impairment of physical/mental functioning, regardless of any pre-existing impaired physical or mental functioning
- a permanent transfer to a different job
- termination of employment

QUARRY
Excavation of hard rock for use in construction (operations covered by the *Mining and Quarrying Safety and Health Act 1999* and associated regulation).

SAFETY AND HEALTH MANAGEMENT SYSTEM
A system that incorporates risk management elements and practices that ensure safety and health of persons who may be affected by mining or quarrying operations.

SERIOUS ACCIDENT
An accident at a mine that causes:
a) the death of a person; or
b) a person to be admitted to a hospital as an in-patient for treatment for the injury.

SEVERITY RATE
The time (days) lost and time (days) on alternative duties per million hours worked.

SIMILAR EXPOSURE GROUP
Groups of workers who have the same general exposure to risk e.g. they perform similar tasks or use the same types of materials or processes.

SITE SENIOR EXECUTIVE
The most senior officer employed or otherwise engaged by the mine or quarry operator who is located at or near the mine or quarry and has responsibility for the mine or quarry.

3 The definitions in the report for bodily location, breakdown agency, lost time injury/disease, mechanism of injury, nature of injury, incidence rate and frequency rate generally conform to the workplace injury and disease recording Australian Standard (AS 1885.1–1990). The Standard's 'average lost time rate' (number of days lost per lost time injury) is called duration rate. The Standard's 'no lost time injuries/diseases' (those occurrences that were not lost time injuries and for which first aid or medical treatment was administered) are called medical treatment injuries or disabling injuries (the injured person cannot return to their normal job and is put on alternative duties). When calculating duration rate (number of days per lost time injury) and severity rate (days lost per million hours worked) for a lost time injury, the days lost include the days away from work and the days on alternative duties. The Australian Standard is not clear on whether days lost should include days on alternative duties. It is common practice in other Australian jurisdictions to only include days away from work in duration and severity calculations. However, as the number of days required to be spent on alternative duties is a reflection of the severity of the injury, it is considered that including these days presents a more accurate picture of the industry with respect to the severity of an injury or illness.

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