

**NSW  
Resources  
Regulator**

# **Quarterly safety report**

January to March 2018



## About this report

This quarterly health and safety performance report has been prepared by the NSW Resources Regulator for mining operators in NSW. It contains industry and sector specific information. Wherever possible, trends and patterns have been identified. Statistical analysis of trend lines in the report was determined by a simple regression model using Tableau V10.5.

The report also contains information on matters of concern to the regulator including controls and actions that may be implemented to prevent or reduce the likelihood of future safety incidents.

Operators should use the sector specific information, emerging issues and good practice examples presented in this report to assist them in improving their safety management systems and undertaking risk assessments at their sites.

### Document control

Published by NSW Department of Planning and Environment, NSW Resources Regulator

Title: Quarterly Report

First published: 12 Jun 2018 with data current at 14 April 2018 except where otherwise noted.

Authorised by: Chief Compliance Officer

CM9 reference: DOC18/352598

Amendment schedule		
Date	Version	Amendment
1 June 2018	DRAFT	
7 June 2018	FINAL	

© State of New South Wales through the NSW Department of Planning and Environment 2018.

This publication is copyright. You may download, display, print and reproduce this material in an unaltered form only (retaining this notice) for your personal use or for non-commercial use within your organisation. To copy, adapt, publish, distribute or commercialise any of this publication you will need to seek permission from the NSW Department of Planning and Environment.

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (June 2018). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the NSW Department of Planning and Environment or the user's independent advisor.

## Contents

Executive summary.....	3
1. National and international significant events.....	5
2. Industry safety profile .....	6
3. Compliance activities.....	10
4. Industry spotlight on safety issues.....	19
5. Coal sector.....	22
5.1 Coal safety profile.....	22
5.2 Coal sector - compliance activities.....	27
5.3 Emerging issues in the coal sector .....	33
5.4 A good practice example in the coal sector.....	33
6. Large mines and quarries .....	34
6.1 Large mines and quarries safety profile .....	34
6.2 Large mines and quarries - compliance activities .....	38
6.3 Emerging issues in the large mines and quarry sector.....	43
6.4 A good practice example in a large metalliferous mine .....	43
7. Small mines and quarries.....	44
7.1 Small mines and quarries safety profile .....	44
7.2 Small mines and quarries - compliance activities.....	48
7.3 Emerging issue for the planned inspection program.....	53
7.4 A good practice example - dredge mines.....	54
8. Opal mines.....	55
8.1 Opal mines safety profile .....	55
8.2 Opal mines - compliance activities.....	56
8.3 Good practice example at an opal mine .....	58
9. Petroleum and geothermal .....	59
9.1 Petroleum and geothermal safety profile .....	59
9.2 Petroleum and geothermal - compliance activities.....	59
10. Exploration .....	60
10.1 Exploration safety profile .....	60
10.2 Exploration - compliance activities.....	60

## Executive summary

This report was prepared by the NSW Resources Regulator to assist mine and petroleum site operators in meeting their obligations under relevant work, health and safety legislation including the *Work Health and Safety (Mines and Petroleum Sites) Act 2013*. It is also a way in which the regulator monitors its progress in implementing its Incident Prevention Strategy.

As a high-hazard regulator, the Resources Regulator focusses on compliance with legislative requirements associated with the principal mining hazards and other high-risk hazards including mechanical, electrical and explosives.

As well as providing an overview of incidents across the mining industry, the report looks at the safety performance and regulatory activities of six sectors defined by the regulator: coal, large (non-coal) mines and quarries, small mines and quarries (including gemstones), opal mines, petroleum and geothermal sites and exploration sites.

The report provides information on significant mining events in Australia and globally, summarises safety incident notifications, compliance activities and outcomes for quarter one 2018 and across a 12 month period from April 2017 to March 2018. To this end, trends are established and underlying causes identified where-ever possible.

In summary:

- Since January 2018, two fatalities occurred in Australian mines (NSW and Western Australia).
- There has been no change in the overall number of safety incident notifications by mines over the past 12 months. On average, five incidents are reported per notifying mine for the 12 month period. By comparison seven incidents and three incidents per notifying mine were reported by the coal and large mines and quarries sector respectively. In part, this reflects the higher number of reportable incidents due to the inherent hazards associated with the underground coal sector.
- There has been a significant upward trend in the number of dangerous incidents reported by the large metalliferous mines and quarries sector during the 12 month reporting period.
- On average, just over one in ten mines reported safety incidents in the past 12 months. The highest rate of incident notification reporting was observed in the coal sector where more than 8 in 10 mines notified incidents during the 12 month reporting period. Very low rates of incident notifications were observed for small mines, opal, petroleum and geothermal and exploration sectors. The regulator plans on measuring the success of its compliance priority project for addressing under-reporting against this established benchmark.
- In quarter one 2018, the regulator commenced work on two prosecutions and one major investigation.
- Overall, from April 2017 to March 2018, there has been no substantial change in the number and types of safety notices issued by the regulator. On average, the regulator issues one prohibition notice for every four improvement notices. Compared to the previous quarter, an increase in the number of improvement and prohibition notices issued by the regulator was observed for quarter one 2018.

- From April 2017 to March 2018, the regulator averaged 369 safety assessments every quarter. A total of 1,436 assessments were performed over the 12 month reporting period, with almost half of these conducted in the coal sector.
- In quarter one 2018, the regulator issued approximately one notice in the coal sector for every seven assessments conducted. In comparison, for opal mines, the regulator issued approximately one notice every assessment conducted. No notices were issued in the petroleum and geothermal sector after 19 assessments. One notice was issued in the exploration sector after 10 assessments.
- For the 12 month reporting period, approximately 70% of the regulator's compliance effort in high hazard mines was proactive, focusing on preventing catastrophic and multiple fatality and serious incidents rather than only responding to incidents that had already occurred. However, in quarter one 2018, preventative compliance activity had decreased to just over half of all assessments. This was attributed to the compliance focus during that period on closing out aged matters.
- Three Targeted Assessment Programs (TAPs) rounds were completed in quarter one of 2018. Consolidated reports for airborne contaminants in underground metalliferous mines, diesel exhaust emissions and coal dust explosion suppression in underground coal mines were published on our website.

# 1. National and international significant events

## January to April 2018

The NSW Resources Regulator is committed to sharing safety information about significant mining events and fatalities with a view to increasing industry awareness about mine safety and regulatory matters. This list is not exhaustive but represents information gathered as part of the regulator's ongoing publication monitoring process. Fatalities and significant events from January to April 2018 have been included.

The criteria for selecting articles is their relevance to equipment and processes commonly used across the NSW mining industry.

## Australia

### Fatalities

#### ***New South Wales***

NSW reported one fatality in January 2018. On 17 January 2018 a worker was driving an articulated dump truck as part of rehabilitation activities at the mine when the truck was seen to veer off the haul road coming to a stop after travelling approximately 250 metres. The regulator is investigating whether the death was workplace-related.

Further details are available in the [investigation information release](#).

#### ***Other states***

Western Australia reported a fatality on 26 April 2018, at Griffin Coal's Ewington mine site near Collie. No further details were available at the time of publication.

### Dangerous incidents

#### ***New South Wales Resources Regulator safety alerts and bulletins***

2 Jan 2018	SB18-01	<a href="#">Use of wireless controlled hazard reduction device on welding machines</a>
17 Jan 2018	SB18-02	<a href="#">Mines preparing for fires</a>
17 Jan 2018	SA18-01	<a href="#">Potentially dangerous component on opal mines material handling hoists</a>
29 Jan 2018	SA18-02	<a href="#">Loader loses brakes and crashes at bottom of wall</a>
1 Feb 2018	SA18-03	<a href="#">Two workers suffer serious fluid injection injuries in separate incidents</a>
21 Mar 2018	SB18-03	<a href="#">Diesel exhaust filters in underground coal mines</a>
23 Mar 2018	SA18-04	<a href="#">Workers withdrawn after methane frictional ignition</a>

#### ***Other states***

[Western Australia Mines Department](#) reported a dinghy capsize in dredge pond after entanglement. The worker fell into 3.5-metre-deep water and the personal flotation device failed to inflate.

Western Australia Mines Department [Safety Bulletin No. 48](#) 'Stench gas activation stations in underground mines'. An audit found activation stations within 50 metres of mine openings. Combustible and in some instances flammable material and were stored together with potential ignition sources.

## International

### Fatalities

#### ***New Zealand***

Fatalities: The Pike River Recovery Agency commenced the first stages of a manned re-entry of the mine in early 2018. Its aim is to conduct a manned recovery of the mine drift in order to:

- gather evidence to better understand what happened in 2010 with an eye to preventing future mining tragedies
- give the Pike River families and victims' overdue closure and peace of mind, and
- recover remains where possible.

Available at the [New Zealand government website](#)<sup>1</sup>.

#### ***United States of America***

Fatality: On 28 March 2018, a coal miner was fatally injured on becoming entangled with belt splicing tools as the conveyor moved. He was splicing an underground conveyor when it inadvertently kicked on. Available at: [EHS website](#)<sup>2</sup>.

Fatality: On 6 February 2018, an electrician was fatally injured while working alone performing routine maintenance on a continuous mining machine. A portion of rib measuring 42 inches long, 28 inches high and 14 inches thick fell and struck the victim. He was found between a coal rib and the continuous mining machine. See also [NSW Resources Regulator Safety Alert SA10-03](#).

#### ***Bangladesh***

Fatality: On 12 April 2018, two miners were fatally injured in two separate incidents at Maddhyapara Granite Mining Company Ltd mine in Parbatipur upazila of Dinajpur. In one incident, the worker fell from a moving transport trolley and was critically injured. No details were provided on the other fatality. Available at: [Daily Star website](#)<sup>3</sup>.

## 2. Industry safety profile

This industry profile is composed of a sector breakdown of the number of active<sup>4</sup> mines and quarterly reporting data for the past 12 months. From April 2017, the number of mines that reported hours worked<sup>5</sup> and safety incident notifications to the Resources Regulator has also been included.

---

<sup>1</sup> Accessed on 9 May 2018.

<sup>2</sup> Accessed on: 15 April 2018.

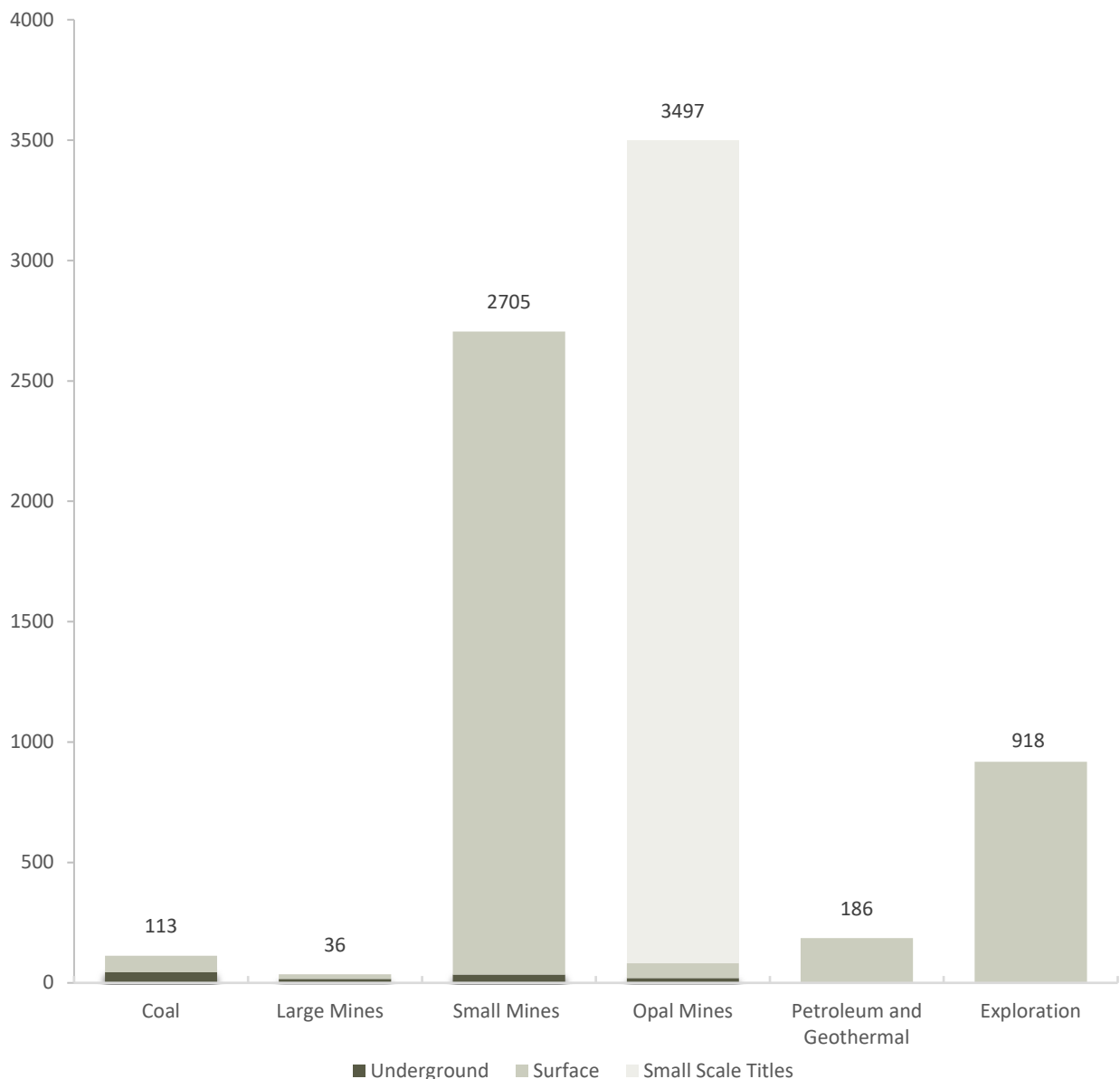
<sup>3</sup> Accessed on 9 May 2018



## Snapshot of mines by sector in NSW

As at 5 April 2018, there were 6,537 active<sup>4</sup> mines in NSW. The chart below shows the number of active mines in each of the six mining sectors. Collectively, coal and large metalliferous mines and quarries represent less than 2% of the total number of mines. The small mines sector comprises metalliferous, quarries and other gemstones.

**Figure 1. Number of active mines by sector**



<sup>4</sup> Active mines are defined as open, intermittent, mines under care and maintenance, open tourist mines, planned, to be determined and small-scale titles that are current or pending.



## Safety incident notifications

Under the *Work Health and Safety (Mine and Petroleum Sites) Act 2013*, mine operators are required to notify the regulator about the occurrence of certain types of safety incidents.

As presented in Table 1, incident rates (numbers of incidents reported per notifying mine) have remained stable over the past 12 months. On average, 4.6 incidents per notifying mine were reported during this period. It also appears that, on average, only 12% of the mines that report hours<sup>5</sup> notified incidents during this period. Further analysis found that most of the non-notifying mines were small operations. The regulator is currently addressing incident under-reporting as a priority compliance project.

**Table 1. Safety incident notifications and mine reporting rates in NSW**

	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Average
<b>Number of notified incidents</b>	403	494	460	454	453
<b>Mines that notified incidents</b>	93	99	95	108	99
<b>Incidents per notifying mine</b>	4.3	5.0	4.8	4.2	4.6
<b>Mines that reported hours<sup>5</sup></b>	936	859	735	287*	843 <sup>^</sup>
<b>Proportion of all mines reporting incidents</b>	10%	12%	13%	NC	12%

\*Suspected reporting lag -six monthly reports; <sup>^</sup>Excludes quarter one 2018 from calculation; NC=Not Calculated

## Safety incident notification trends

There has been no significant increase in the overall number of safety incidents notified to the Resources Regulator over the past 12 months (April 2017 to March 2018). However, as shown by Figure 2, there has been a statistically significant upward trend in 'Dangerous Incident' notifications.

Further analysis of 'Dangerous Incidents' as seen in Figure 3, found that the upward trend was driven by a significant increase of notifications by the large mines and quarries sector. The apparent increasing trend in coal sector notifications was not statistically significant.

<sup>5</sup> Mines that reported hours - every six months certain mines are required to submit hours worked per quarter to the regulator. Data extracted 14 April 2018

Figure 2. All incident notifications by type

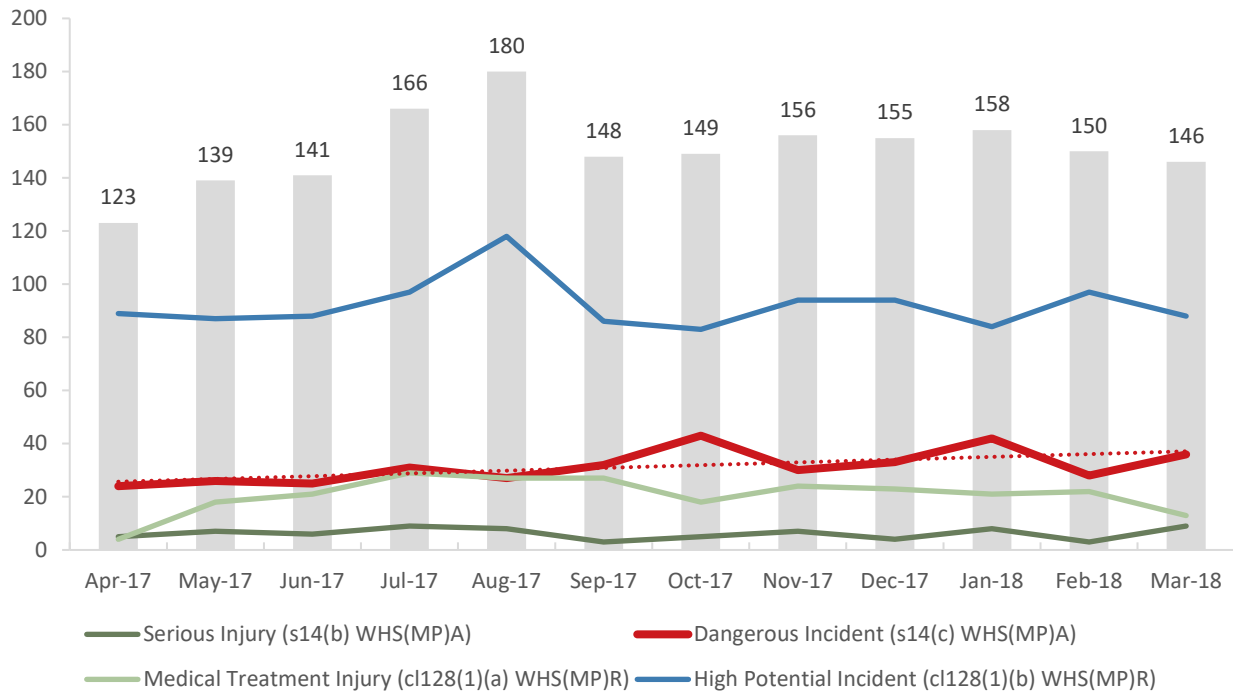
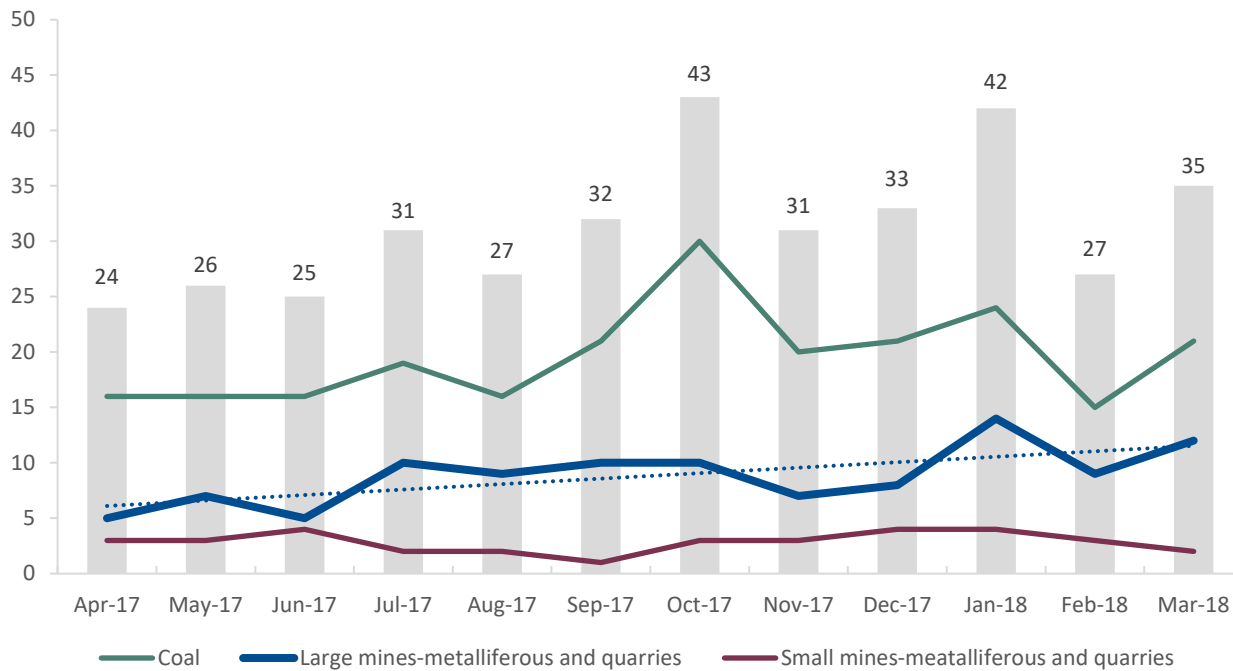


Figure 3. Dangerous incident notifications by sector



### 3. Compliance activities

The regulator uses a range of tools to promote and secure compliance in mines in relation to the relevant work, health and safety legislation. These range from prosecutions and notices to inspections, investigations and safety assessments.

#### Prosecutions and investigations

In quarter one 2018, two prosecutions and one investigation commenced. Detailed information relating to prosecutions, investigations and causal investigations is published on our [website](#).

**Table 2. Prosecution proceedings commenced January 2018 to March 2018**

Date of decision	Defendant	Outcome	Date of incident	Location of incident	Summary of incident
<b>Proceedings commenced 30 Jan 2018</b>	Sibelco Australia Limited	Prosecution under WHS Act 2011	1 Feb 2016	Salt Ash Sand Plant, Salt Ash	Serious injuries fall from haul truck on low loader
<b>Proceedings commenced 19 Jan 2018</b>	Lake Coal Pty Ltd LDO Operations Pty Ltd	Prosecution under WHS Act 2011	22 Jan 2016	Manning Colliery, Manning Park	Serious injuries struck by damaged W-strap while travelling underground

**Table 3. Investigations commenced January 2018 to March 2018**

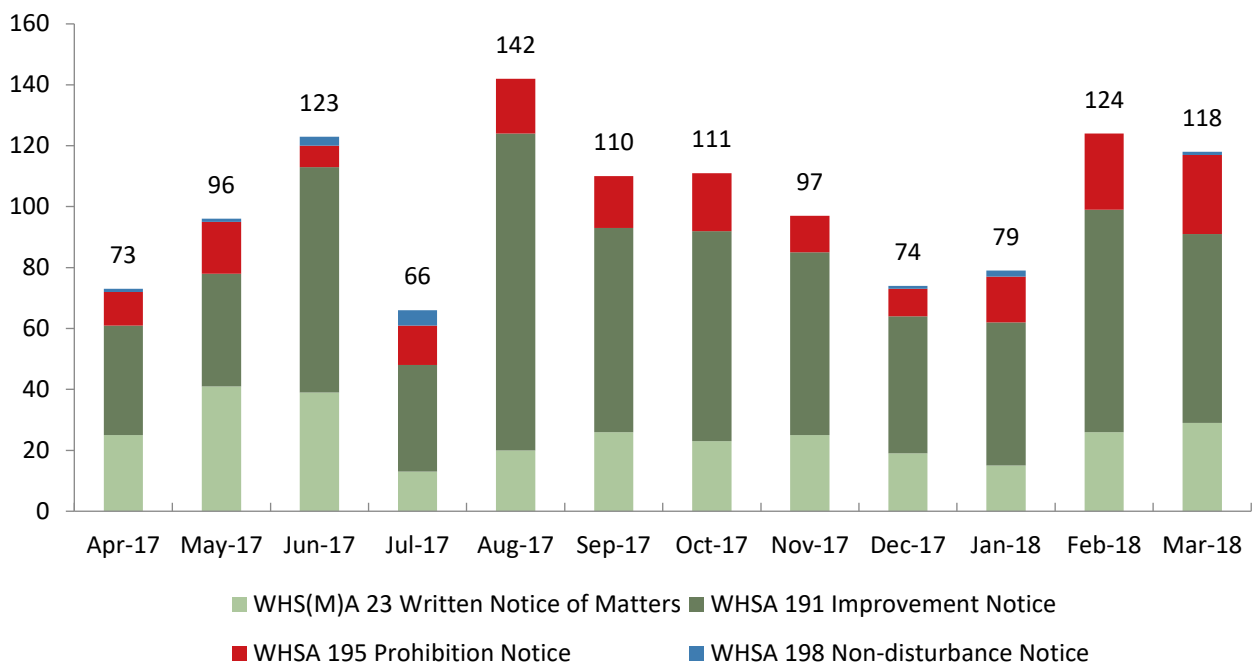
Date of release	Date of incident	Location of incident	Summary of incident
2 Feb 2018	17 Jan 2018	Glendell Open Cut Mine, Ravensworth, NSW	A worker was driving an articulated dump which veered off the haul road and crossed the contour drain coming to a stop after travelling a further 250 metres. The driver was found unresponsive in the cabin.

## Safety notices issued

Safety notices issued by the regulator include prohibition and improvement notices, notices of concern (written notice of matters) and non-disturbance notices.

The graph below shows the number and types of notices issued by the regulator during the 12 month reporting period. No obvious trends are evident as the overall volume of notices varies month to month. The variability seen across months is, in part, a reflection of inspection activity. It is worth noting that the regulator consistently employs prohibition notices in response to any serious safety issue identified. On average, the regulator issues one prohibition notice for every four improvement notices. Compared to the previous quarter, an increase in the number of improvement and prohibition notices issued by the regulator was observed for quarter one 2018.

**Figure 4. Mine safety notices issued from April 2017 to March 2018**



## Safety notices and assessments conducted

Table 4 lists the number of safety notices issued by the regulator and the assessments conducted by sector for quarter one 2018. With the exception of the petroleum and geothermal and exploration sectors (where no notices were issued in the quarter), the greatest number of assessments were conducted in the coal sector before the regulator issued a notice. For every seven coal sector safety assessments, approximately one notice was issued. In comparison, for every assessment conducted in the small mines and opal sector, the regulator issued at least one notice.

**Table 4. Safety notices and assessments by sector for quarter one 2018**

	Safety Assessments	Notices Issued	No. of assessments conducted per notice
All mines	1118	324	3.45
Coal	785	110	7.1
Large mines and quarries	171	98	1.7
Small mines and quarries	98	98	1
Opal mines	11	13	1.18
Petroleum and geothermal	19	0	N/A
Exploration	10	0	N/A
Non-mine	24	5	4.8

## Safety assessments and investigations

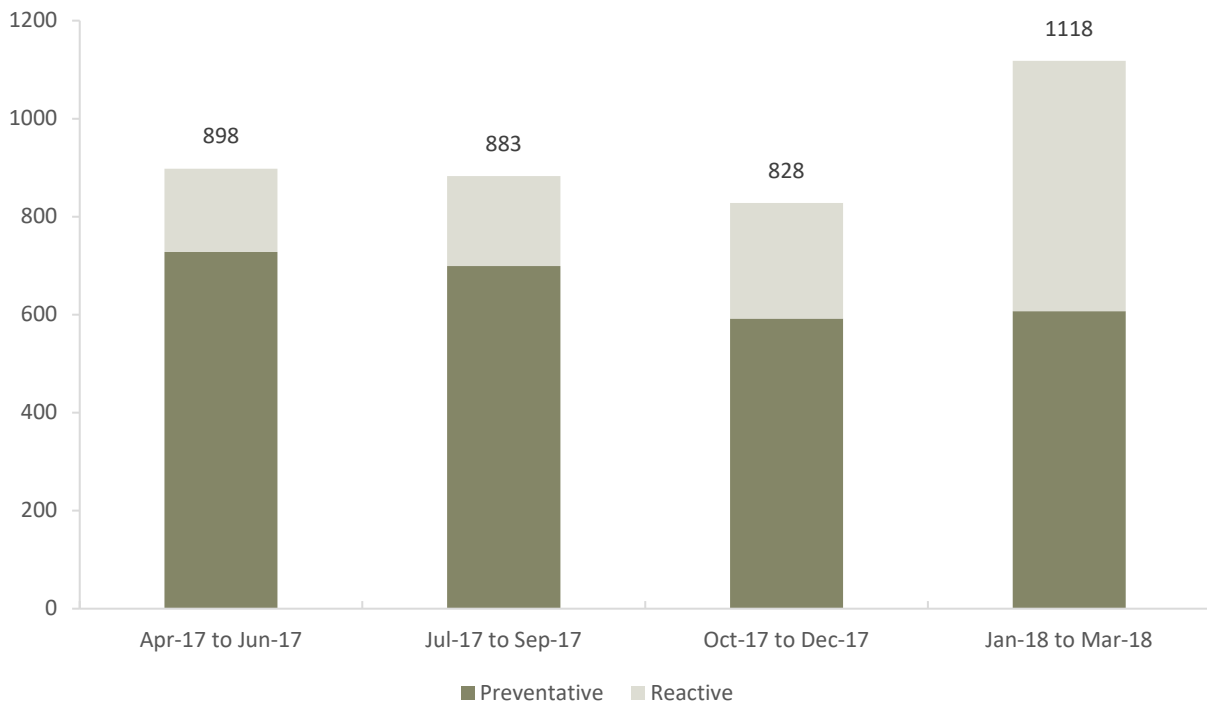
### Preventative and reactive assessments

The regulator's [Incident Prevention Strategy](#) shifts the focus of its compliance activity from incident investigation (reactive) to preventing incidents through planned, risk-based interventions (preventative).

Targeted Assessment Program (TAPs) and Planned Inspections (PIs) are considered preventative. They are conducted to identify potential compliance weaknesses which could lead to an accident or illness. Both follow a pre-prepared plan focusing on principal mining hazards. TAPs focus closely on one mining hazard per assessment. PIs also focus on a specific hazard including principal control plans. Explosion suppression assessments in underground coal mines represent another preventative program of work.

Figure 5 shows that for each quarter since April 2017, the regulator's effort was focussed on preventative programs. On average, approximately 660 preventative assessments (activities not related to incidents and complaints) were conducted every quarter, representing just over 70% of all assessments. Figure 5 reveals that in quarter one 2018, the regulator conducted more than double its usual number of reactive assessments (incidents related to incidents and complaints) as compared to previous quarters. This increase represents the compliance focus during that period on closing out aged matters.

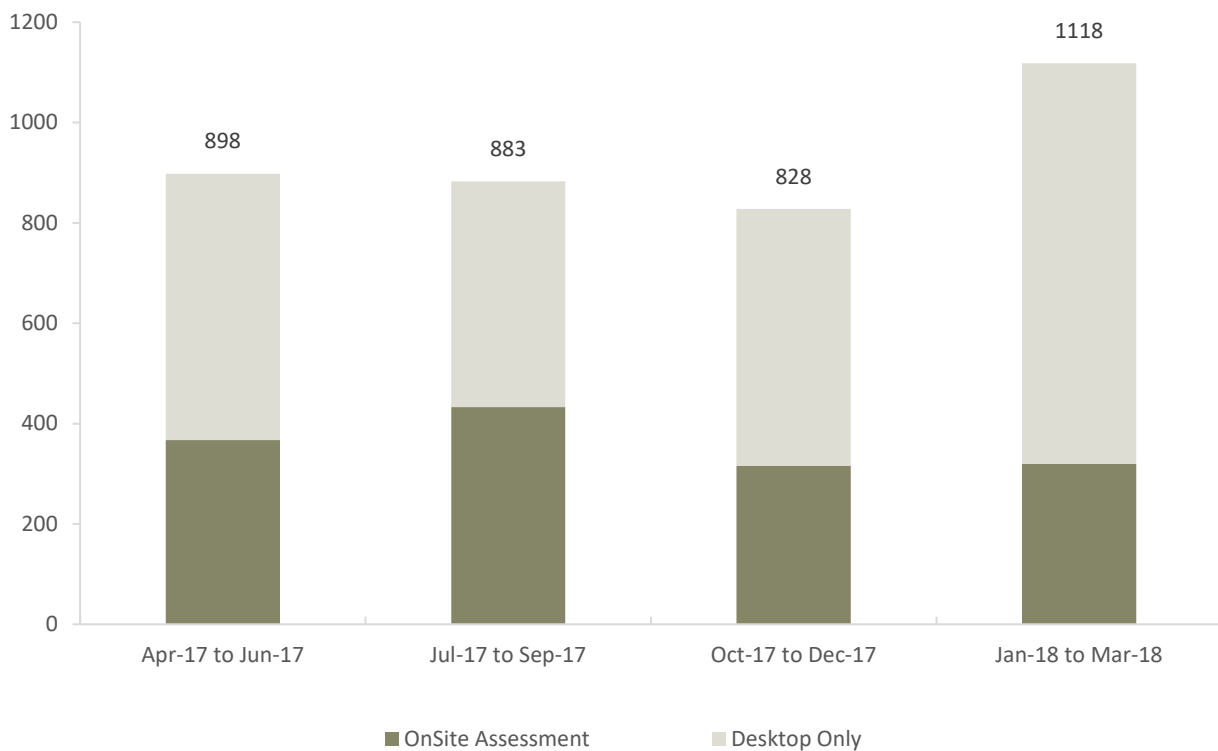
**Figure 5. Preventative and reactive safety assessments for all mines in NSW**



**Site-based and desktop compliance activity**

Visiting work places and undertaking desktop reviews of documents are both important regulatory tools. Desktop work includes reviews of control measures following an incident, review of standing dust committee reports, assessment of high risk activity notifications, applications for exemptions from work health and safety laws, subsidence management plans and preparation for site work. Figure 6 below displays the site based and desktop assessments for each quarter since April 2017.

**Figure 6. Onsite and desk top safety assessments for all mines in NSW**

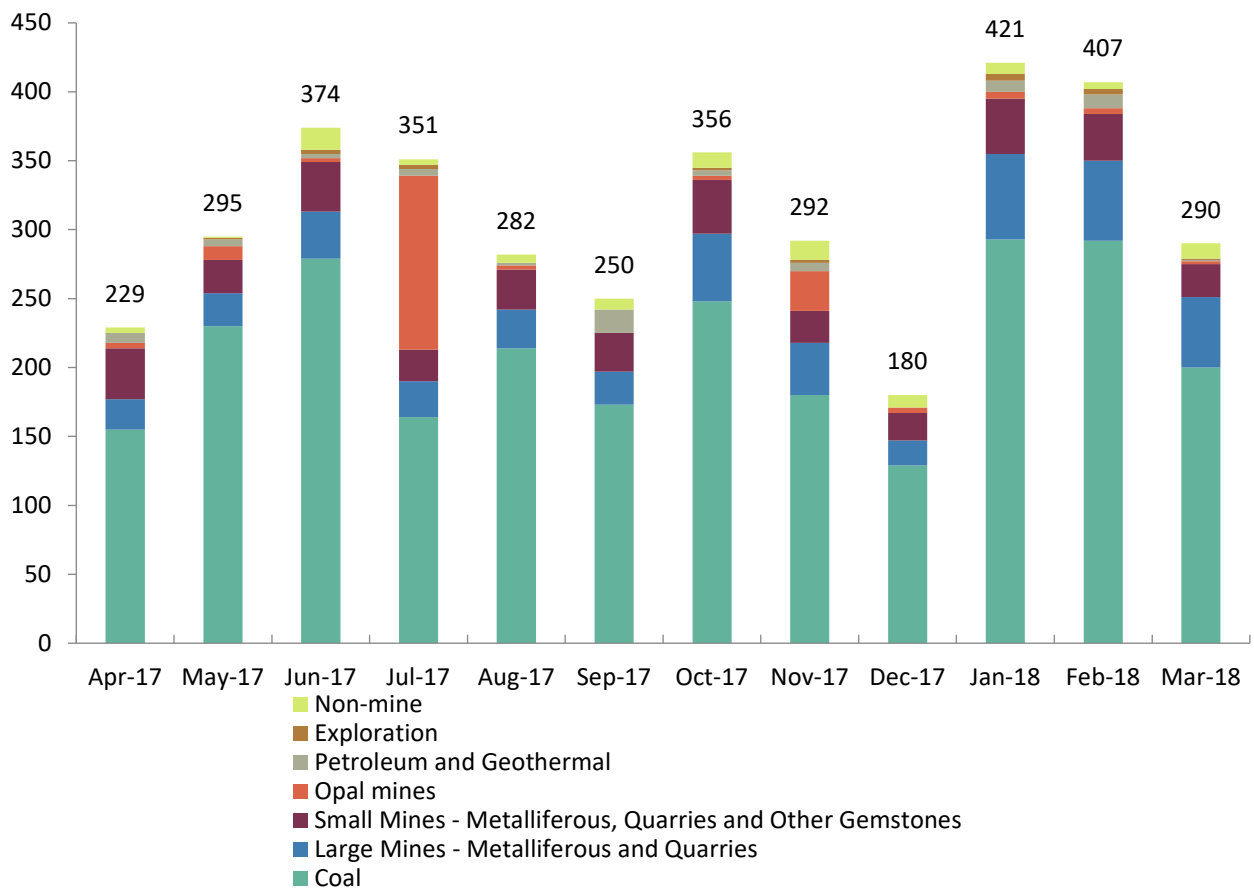




### Safety assessments by sector

Figure 7 shows that every month in the reporting period, the regulator conducted a greater number of coal sector assessments as compared to all other sectors. Coal sector assessments comprise almost 70% of all assessments during the 12 month period. See the sector profile sections of this report for more details.

**Figure 7. Safety assessments by mining sector from April 2017 to March 2018**



## Targeted assessment program

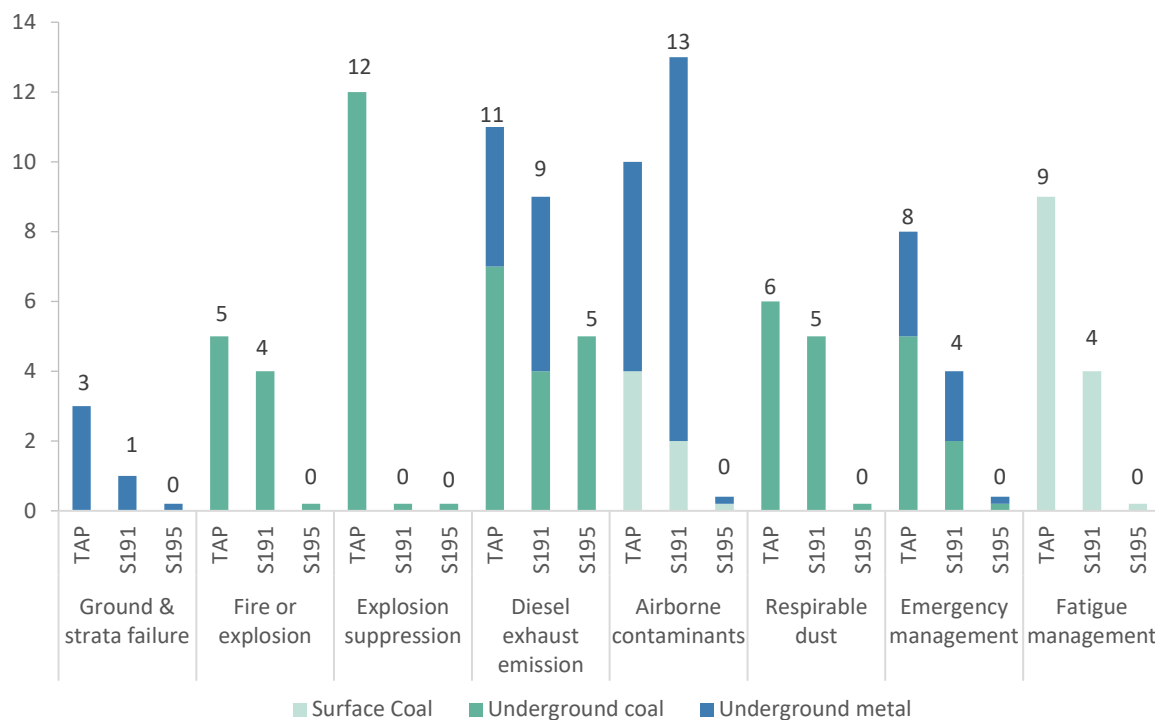
The regulator’s TAPs provide a planned, risk-based and proactive approach for assessing how effective an operation is when it comes to controlling critical risk. Each TAP is performed by a team of inspectors from various disciplines. The inspectors work with the operation’s management team to undertake a thorough assessment of the control measures associated with the relevant hazard and their implementation.

Figure 8 shows the number of TAPs conducted and notices<sup>6</sup> issued by principal mining hazard and sector for the 12 month reporting period.

The corresponding TAP reports were published on website:

- [Coal dust explosion suppression in underground coal mines \(January 2018\)](#)
- [Diesel exhaust emissions in underground coal mines \(March 2018\)](#)
- [Airborne contaminants in underground metalliferous mines \(January 2018\).](#)

**Figure 8. TAPs and notices by sector - April 2017 to March 2018**



<sup>6</sup> Notices issued under s.191 and s.195 Work Health and Safety Act 2011

As seen in Table 5, the regulator conducted 14 TAPs across high risk rated coal and metalliferous mines in quarter one 2018.

**Table 5: Targeted assessment programs – assessment completed**

Sector	Hazard	Month	Notices
Surface coal	Fatigue management	Jan 2018	No s191 or s195 notices issued
		Feb 2018	No s191 or s195 notices issued
		Mar 2018	No s191 or s195 notices issued
	Air quality – airborne contaminants	Feb 2018	1 x s191 – plan does not require worker ready access to RPE & does not detail pressurised cabin specifications or maintenance of pressurised cabins
		Feb 2018	No s191 or s195 notices issued
Underground coal	Air quality - diesel exhaust emission	Jan 2018	No notices issued
		Feb 2018	1 x s195 – faulty DPM seal
		Mar 2018	2 x s191 – Mechanical engineering control plan not fully implemented & road surfaces not maintained to standard 1 x s195 – faulty DPM seal
	Emergency management	Mar 2018	No notices issued
	Fire & explosion	Feb 2018	No notices issued
		Mar 2018	No notices issued
	Explosion suppression	Feb 2018	No notices issued
Underground metal	Air quality – airborne contaminants	Feb 2018	2 x s191- hazardous chemicals at the processing plant, lead concentrate contamination
	Emergency management	Feb 2018	No s191 or s195 notices issued

## Targeted intervention program

The purpose of the targeted intervention program (TIP) is to maximise voluntary compliance to prevent multiple-fatality and single fatality events and serious injury. TIPs are conducted in response to identified safety incidents or issues.

From April 2017 to March 2018, four TIPs were conducted. Details are listed in the table below.

**Table 6. Targeted Intervention Program April 2017 – March 2018**

Principal Mining Hazard	Quarter	Mine
Gas outburst	Q2 17	<a href="#">Appin, Metropolitan, Narrabri, Tahmoor</a>
Gas outburst	Q3 17	Mandalong <sup>7</sup>
Subsidence	Q1 18	Metropolitan <sup>7</sup>
Winders / shafts and elevated work	Q1 18	Perilya (See the Compliance Case study below.)



### TAPs and TIPs, an integrated approach - Compliance case study at an underground metalliferous mine

This case study shows how the regulator's preventative targeted assessment program is integrated with its reactive targeted intervention program for managing principal mining hazards in high-risk mines.

In late 2017, a TAP was conducted at an underground metalliferous operation on the principal mining hazard 'air quality or dust or other airborne contaminants'. Significant failings were identified and seven improvement notices were issued. Whilst on-site, other safety issues were identified relating to elevated work on aged infrastructure, including a mill and shaft winding system. In response, the regulator informed the mine that a TIP was scheduled for early 2018. Its focus was to assess how the mine has addressed the identified organisational level, systemic failures. The purpose of the TIP was to maximise voluntary compliance while preventing fatalities and serious injury.

Ahead of the scheduled TIP, the mine engaged an independent consultant engineer to assess the mill and shaft winding system and to address the issues identified. As a result, a schedule of work for rectifying the identified non-compliances was developed and rehabilitation work commenced.

In March 2018, three specialist engineering inspectors performed the TIP. The regulator's team found that the mill and man riding shaft had not been maintained to standards identified in the Mechanical Engineering Control Plan. Broader systemic failures were also identified where engineering standards outlined in the Mechanical Engineering Control Plan had not been linked with the mill and winder maintenance program.

Due to the serious nature of many of the hazards identified the regulator is closely monitoring the rehabilitation work.

<sup>7</sup> Reports not yet published on our website

## 4. Industry spotlight on safety issues



### Fatigue management, a TAP focus at surface coal mines

In March 2017, a series of TAPs commenced in relation to health and safety risks associated with worker fatigue at surface coal mines. To date 12 mines have been assessed. These assessments included desktop reviews and site inspections involving interaction with managers, supervisors and workers to assess the implementation of controls to manage worker fatigue at surface coal mines.

#### Issue

During TAPs interviews with workers at all sites, it was identified that napping in cabins of heavy equipment during crib breaks on night shift is common practice. Although this accepted and embedded practice amounts to a risk control, no mines had developed documented procedures to capture this risk control within the mine safety management system.

Arising from TAPs, several mines were issued notices of concern under section 23 of the *Work Health and Safety (Mines and Petroleum Sites) Act 2013*. Issues included undocumented fatigue management plans and procedures not aligned with the embedded practice of operators napping in cabins of heavy equipment during crib breaks.

As a result, some mines have acknowledged and included the practice in the mine's documented safety management system. The documented procedures identify circumstances when napping in cabins of heavy equipment is permitted, and requirements including risk controls that must be met to allow the practice to occur.

#### Advice to industry

The operator of a mine must establish a safety management system for the mine that sets out the arrangements for managing risks in accordance with clause 9 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Mine operators need to ensure that fatigue management practices, including risk controls, are documented and integrated within the mine safety management system.



## Diesel particulates in underground mines

### Introduction

In October 2017, a series of TAPs commenced in relation to worker exposure to diesel exhaust emissions in underground coal mines. To date, seven mines have been assessed. These assessments included desktop reviews and site inspections involving interaction with managers, supervisors and workers to assess the implementation of controls to manage worker exposure to diesel exhaust emissions.

### Issue

The TAP process identified that some mines did not ensure adequate sealing of diesel particulate filters within the housing on explosion protected diesel engine systems (ExDES) operated underground. Ineffective sealing of removable exhaust filters results in increased quantities of diesel particulate matter (DPM) in the mine's atmosphere, exposing workers to higher levels of DPM.

In one mine, several transport vehicles were found to have had the correct removable exhaust filters installed. However, the housings were not fitted with the necessary seals to provide the clamping and sealing required to ensure all engine exhaust gas was passing through the removable exhaust filter.

At another mine, due to the similarity of filters used in transport vehicles and Load Haul Dump (LHD) vehicles from the same original equipment manufacturer (OEM), filters for the transport vehicle were inadvertently interchanged in an LHD. In another instance at the same mine, a third type of plant had the correct filters installed but the seals that were supposed to be fitted to the housing, were missing or removed.

At a third mine, it was found that incorrect diesel particulate filters had been deliberately modified by removing seal rings to fit a vehicle for which the filters were not designed, potentially compromising the integrity of the OEM control measure to reduce diesel particulate matter being liberated into the mine atmosphere. Under section 195, *Work Health and Safety Act 2011*, the mine was required to withdraw the affected vehicles from service until the correct diesel particulate filters were installed and all seals were in place (as per the machine registration). Other directions of the prohibition notice included a requirement to determine the reasons for modifying and installing incorrect diesel particulate filters, and to develop and implement risk control measures to prevent the incident occurring in the future.

### Advice to industry

Under clause 54 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014, operators of an underground mine must ensure that in any accessible place at the mine the concentration of any airborne contaminant is as low as is reasonably practicable. In achieving this requirement, mine operators should ensure the adequate sealing of diesel particulate filters within filter housing, and should ensure that correct filters are fitted to diesel equipment as identified in the machine registration.



## Sector profiles

This report presents sector-based mine safety data for six sectors defined by the regulator – coal, large (non-coal) mines and quarries, small mines and quarries (including gemstones), opal mines, petroleum and geothermal sites and exploration sites.

**NSW  
Resources  
Regulator**

**SECTOR  
REPORTING**

### **Coal mines**

Opencut, underground and coal preparation plants

### **Large mines**

METALLIFEROUS AND QUARRIES

Quarries that produce >900,000 tonnes pa and large opencut or underground metalliferous mines

### **Small mines**

METALLIFEROUS, QUARRIES AND OTHER GEMSTONES

Quarries and other mine types (eg sand, clay, lime) that produce <900,000 tonnes pa, opencut or underground metalliferous mines and gemstone mines

### **Petroleum and Geothermal**

Onshore petroleum and geothermal productions and exploration sites

### **Opal Mines**

Opal mines at Lightning Ridge and White Cliffs

### **Exploration**

Exploration sites (excluding petroleum)

### **Non-mine**

Includes many manufacturers (including OEMs), suppliers, designers, importers, licence holders and registration holders



## 5. Coal sector

### 5.1 Coal safety profile

As at 5 April 2018, there were 113 active<sup>4</sup> coal mines, consisting of 69 surface operations and 44 underground mines (see Figure 1 p 7).

#### Safety incident notifications

As presented in Table 7, incident rates (number of incidents reported per notifying mine) have remained stable over the past 12 months. For the coal sector, on average, seven incidents per notifying mine were reported during this period.

A high rate of notification was observed for the coal sector. On average, 83% of mines<sup>5</sup> reported a safety incident during the reporting period (12 months from April 2017 to March 2018).

**Table 7. Safety incident notifications and reporting rates in NSW coal mines**

	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Average
<b>Number of notified incidents</b>	316	389	381	355	360
<b>Mines that notified incidents</b>	48	55	55	56	54
<b>Incidents per notifying mine</b>	7	7	7	6	7
<b>Mines that reported hours<sup>5</sup></b>	68	63	60	22*	64 <sup>^</sup>
<b>Proportion of coal mines reporting</b>	70%	87%	91%	NC	83% <sup>^</sup>

\*Suspected reporting lag; <sup>^</sup> Q1 2018 excluded from calculation; NC= Not Calculated

## Safety incident notification trends

Figure 9 shows incident notification results of analysis by coal sector operation type: underground, open-cut and processing. A significant upward trend in notifications from open cut operations was observed.

**Figure 9. All coal notifications by operation type**

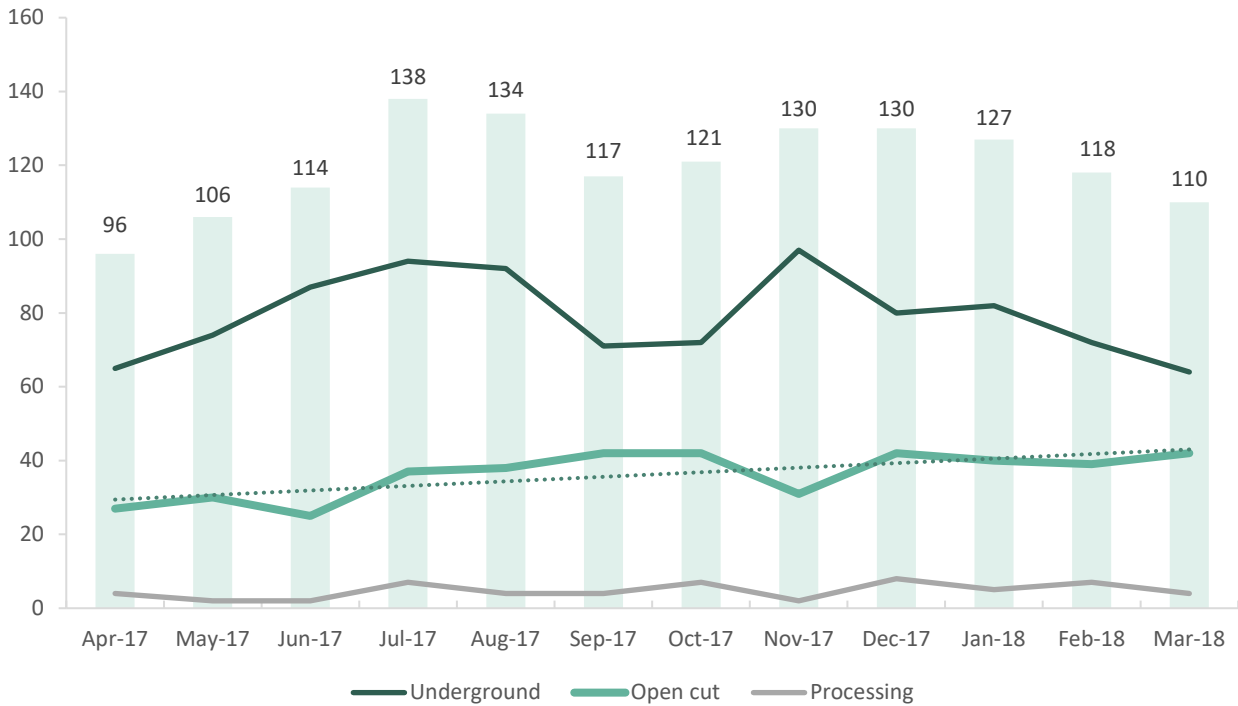
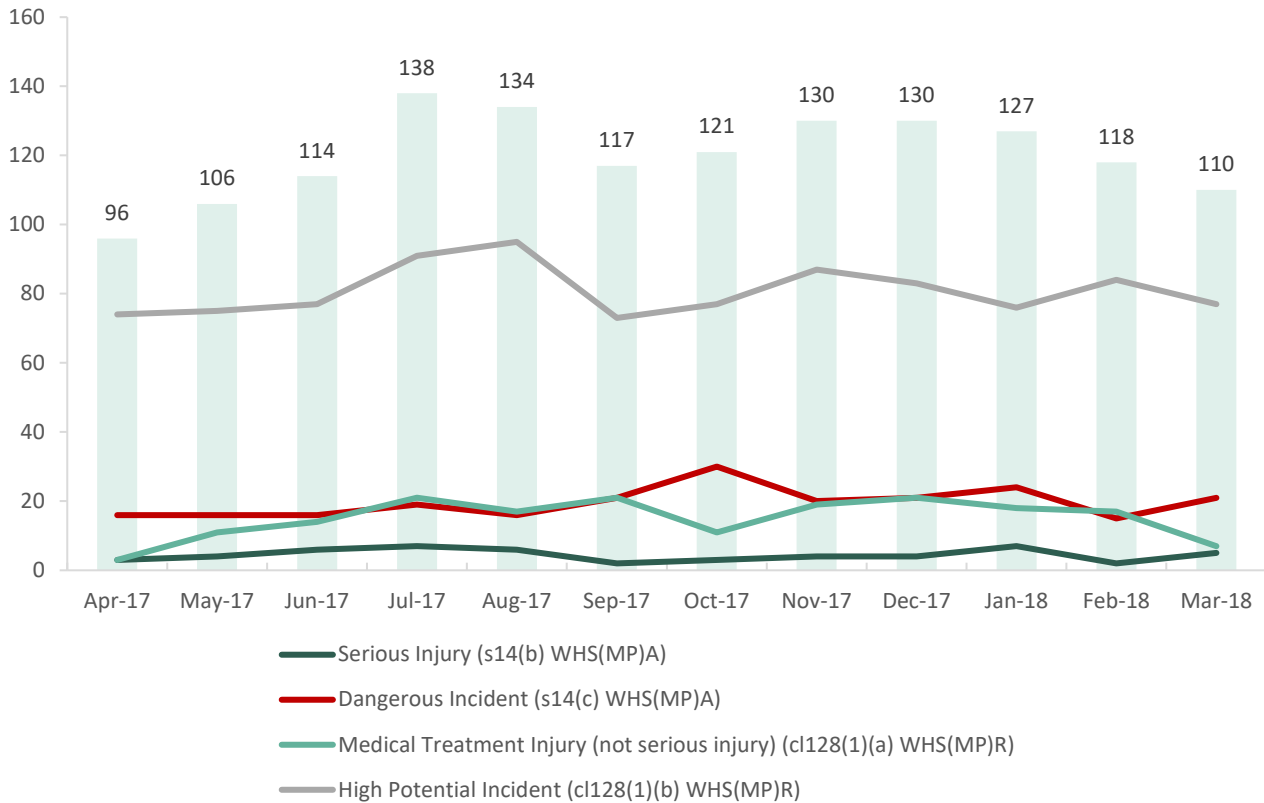


Figure 10 shows safety incident notifications by the clause under which they were first notified. In the coal sector, there has been no overall increase in the number of safety incidents notified to the regulator over the past 12 months (April 2017 to March 2018). No significant increase for any of the notification types was observed within this period.

**Figure 10. Coal notifications by notification type**



## Coal sector safety incidents by mining hazard

Table 8 examines critical, severe and elevated safety incident notifications from quarter one 2018 where the regulator determined further assessment was required. These incidents were then subjected to further investigation and possible action. As seen in the table below, the incidents were assigned to a principal mining hazard and categorised by event type. This provides insight into areas and activities most commonly requiring additional scrutiny and/or improvement.

**Table 8. Coal sector - summary of incidents selected for further assessment in quarter one 2018**

Principal Mining Hazard or Control Plan	Unwanted event	Event summaries
<b>Ground or strata</b>	Coal burst <b>Underground – 2</b>	Geotechnical conditions and system of work. Failure of proactive management of risk.
<b>Roads &amp; vehicle operating areas</b>	Single vehicle rollovers/rollaway Vehicle to structure Vehicle to vehicle  <b>Surface - 6</b> <b>Underground - 4</b>	Interaction between engineered condition of vehicle operating areas and not driving to conditions contributed to loss of control and vehicle to structure interactions. Overwatering may lead to decrease skid resistance and contribute to destabilisation of slopes. Other control failures include failure to park fundamentally stable and loss of braking due to damage or component wear (brakes).
<b>Gas outburst</b>	Release of gas in a concentration that could lead to fire/explosion  <b>Underground - 1</b>	Geotechnical conditions (mining near fault). High residual in-situ gas levels –gas drainage and ventilation not adequate to dilute/remove in-situ gas.
<b>Fire and explosion</b>	Frictional ignition of gas or dust in drill holes when drilling shot pattern in surface mines <b>Surface - 2</b> <b>Underground - 1</b>	Combination of fine dust, gas and frictional ignition within drill holes resulting in fire propagating to plant in surface drilling incidents. Ventilation quantity not adequate to dilute methane gas in underground mining. Failure to control frictional ignition was common to all incidents.

**Table 8 (cont'd). Coal sector - summary of incidents selected for further assessment in quarter one 2018**

Principal Mining Hazard or Control Plan	Unwanted event	Event summaries
<b>Fire and explosion and ventilation control plan</b>	Frictional ignition underground <b>Underground – 1</b>	Ventilation failed to dilute/remove accumulated layer of methane gas together with failure to manage frictional ignition - maintenance of picks and water sprays.
<b>Ventilation control plan</b>	Gas exceedance <b>Underground – 2</b>	Failure of ventilation to dilute methane gas to safe level.
<b>Mechanical control plan</b>	Energised plant or equipment – loss of control <b>Surface – 3 Underground - 4</b>	Workers being hit by substance or equipment under pressure. Cleaning vehicles/sump areas, underground services and vehicle maintenance activities Failure of isolation, dissipation of energy and test for dead. Failures due to human factors including worker competence, non-compliance or unintentional error (slips and lapses).
	Fires on mobile plant <b>Surface – 2</b>	Fires frequently occur after maintenance and typically due to tighten fasteners and hose and routing of fuel lines. Fires occurred to due component failure allowing fluid to contact hot surfaces.
	Loss of control of lifted equipment <b>Underground - 2</b>	Failure of screwed connections or strata shearing forces allowing material to drop due to gravity. Floor brushing undermines base support of steel cross beam in belt roadway.

## 5.2 Coal sector - compliance activities

### Prosecutions and investigations

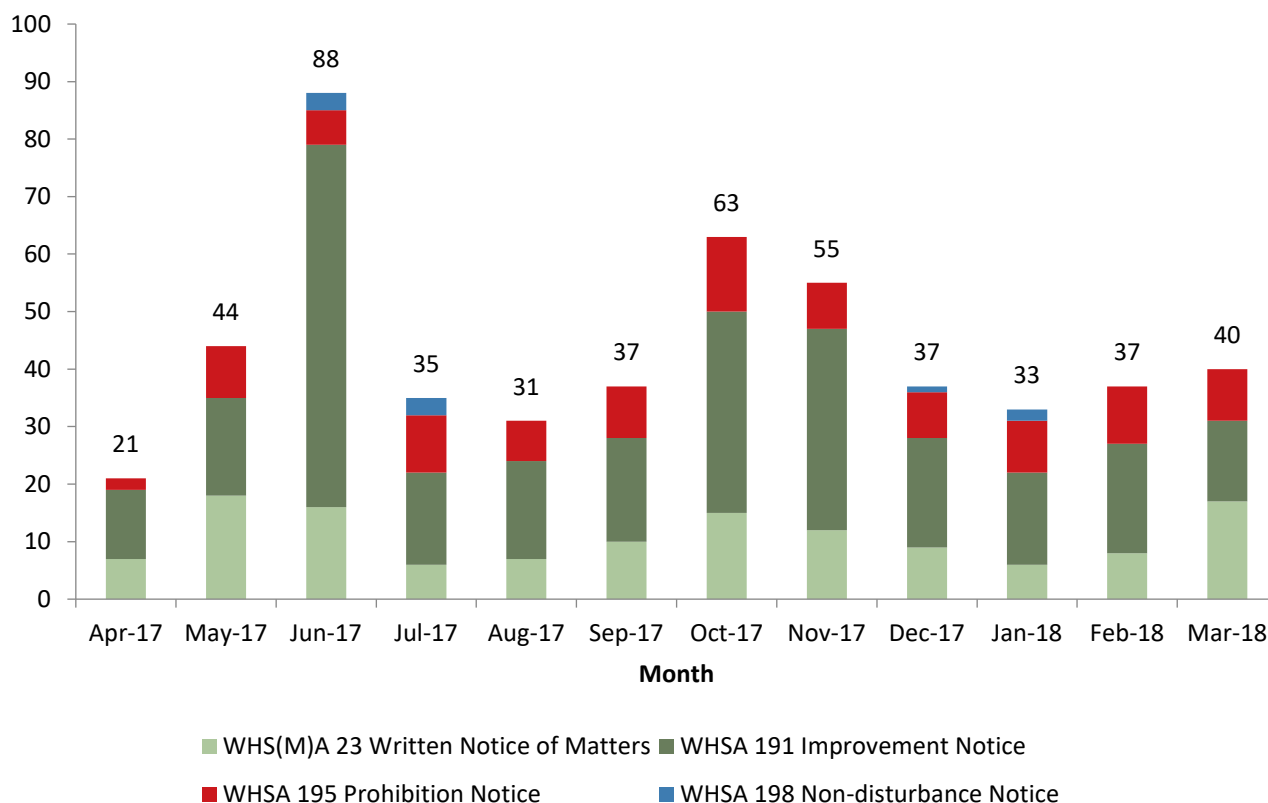
On 30 January 2018, the regulator commenced prosecution proceedings for potential breach under the *Work Health and Safety Act 2011* against LakeCoal Pty Ltd.

On 17 January 2018, the regulator initiated its investigation into the fatality at Glendell open cut mine. Information is published [on our website](#).

### Safety notices issued

Figure 11 shows the number and types of notices issued by the regulator during the 12 month reporting period. No obvious trends are evident. Inspection activity contributes to the differences observed in the number of notices issued every month.

**Figure 11. Coal sector safety notices issued from April 2017 to March 2018**



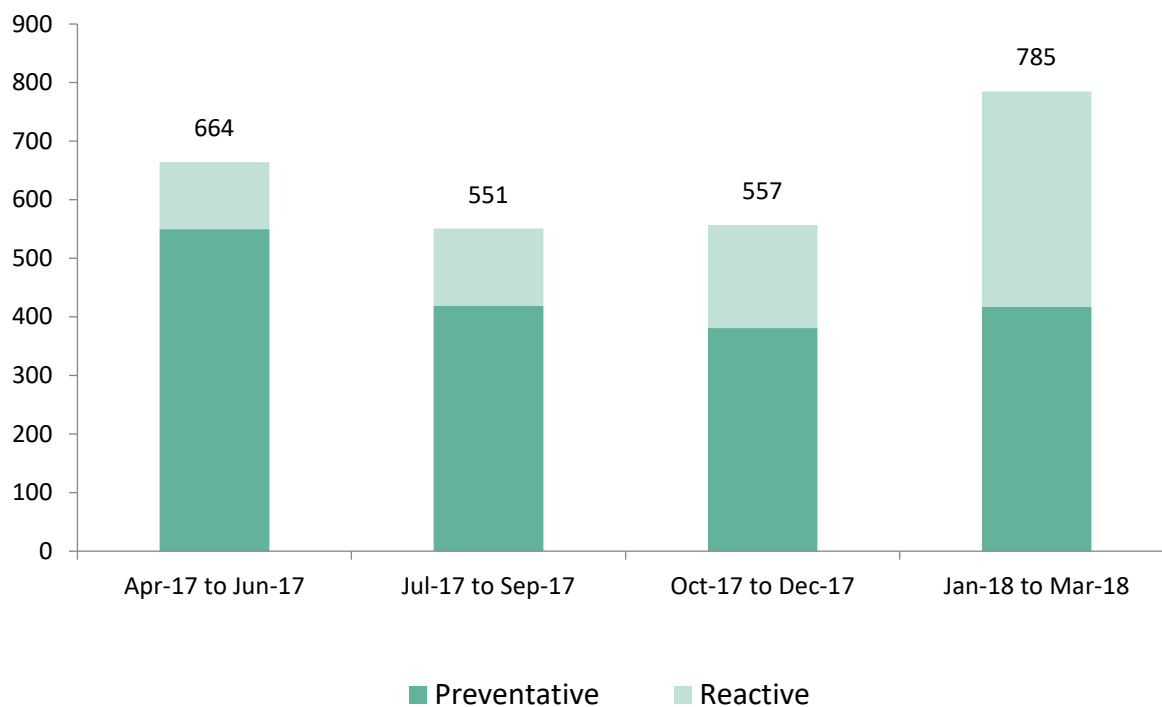
## Safety assessments and investigations

### Preventative and reactive assessments

Figure 12 shows that for each of the quarters since April 2017, the regulator’s effort was focussed on preventative programs. On average, 442 preventative assessments (activities not related to incidents and complaints) were conducted each quarter, representing just under 70% of all assessments.

The higher proportion of reactive assessments conducted in quarter one 2018 reflects the compliance focus during the period on closing out aged matters.

**Figure 12. Coal sector - preventative and reactive assessments**





### Site based and desk-top compliance activities

In the coal sector, the regulator conducts various purpose driven site-based assessments. The general categories are described below:

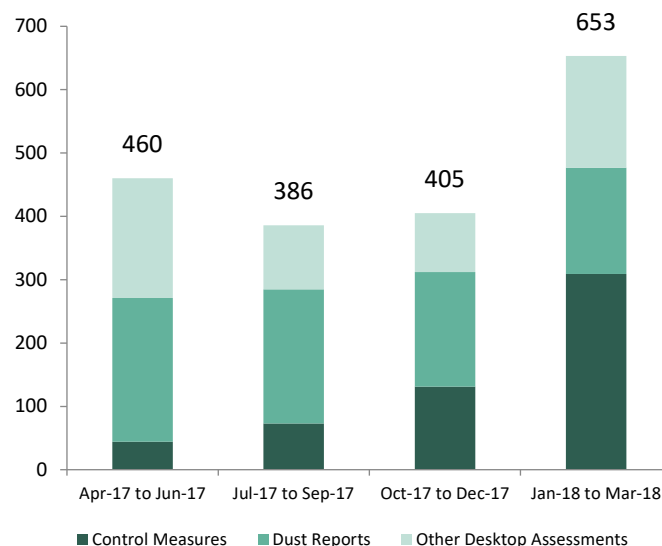
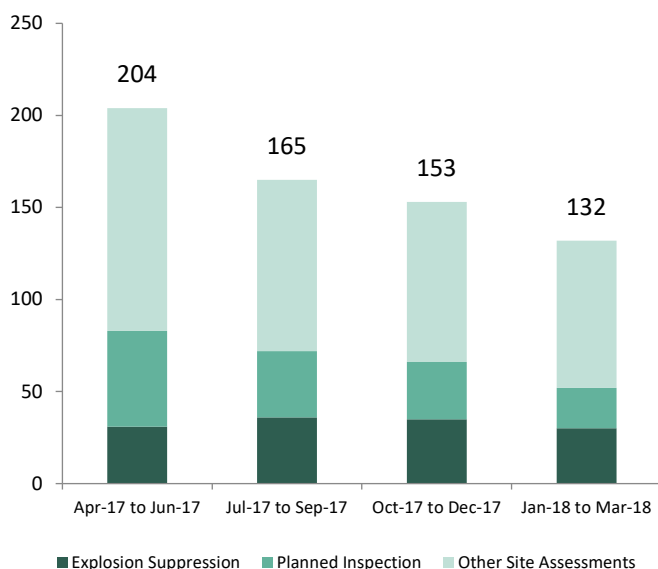
- Planned inspections – follow a pre-prepared plan focused on selected principal mining hazards.
- Explosion suppression assessments – conducted by explosion suppression officers and assess compliance with clause 65 of the Work Health and Safety (Mines and Petroleum Site) Regulation 2014.
- Other assessments – site assessments including assessments associated with TAPs and TIPs and assessments related to investigations.

In quarter one 2018, approximately 60% of all site-based coal sector assessments were ‘other assessments’. The remainder were an even number of planned inspections and explosion suppression assessments.

Desk-top assessments include a review of mine reports on their review of control measures following an incident, dust reports and other desk-top assessments. Other desk top assessments include the regulator’s review incident notifications, review of high risk activity notifications and authorisations. The increased number of control measure reviews in quarter one 2018 represents the compliance focus during this quarter on closing out aged incident reports.

**Figure 13. Coal sector site-based assessments**

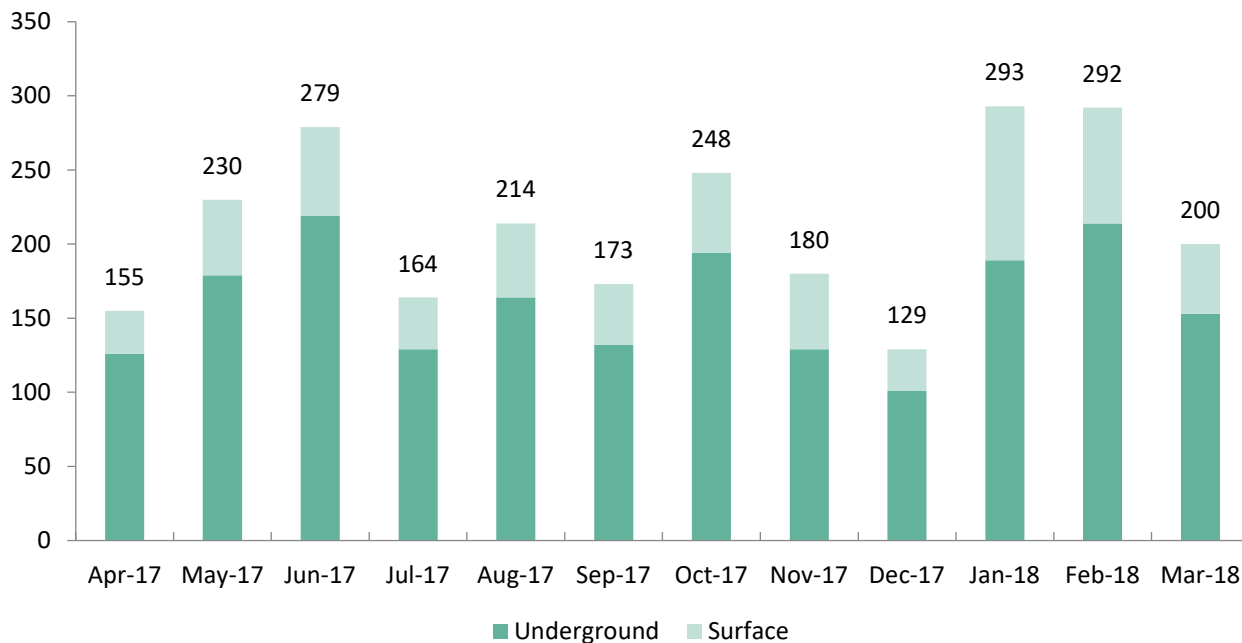
**Figure 14. Coal sector desk-top assessments**



**Safety assessments by coal operation type – underground and surface**

Figure 15 shows that in the reporting period, the regulator conducted a greater number of assessments in underground compared to surface operations. Underground assessments comprise 75% of all coal assessments during the 12 month period.

**Figure 15. Coal sector safety assessments by operation type - April 2017 to March 2018**



## Targeted assessment program notices issued

Figure 16 shows the TAPs conducted over the reporting period from April 2017 to March 2018 and notices issued. During quarter one 2018, 12 TAPs were conducted in the coal sector, 11 of which were in surface mines. Over the 12 month reporting period, just over 70% of TAPs were in underground mines.

All five of the prohibition notices issued by the regulator were in response to diesel exhaust emission TAPs. More TAPs were conducted for explosion suppression than any for any of the other principal mining hazards and no notices were issued.

**Figure 16. Coal sector TAPs and notices by operation type – April 2017 to March 2018**

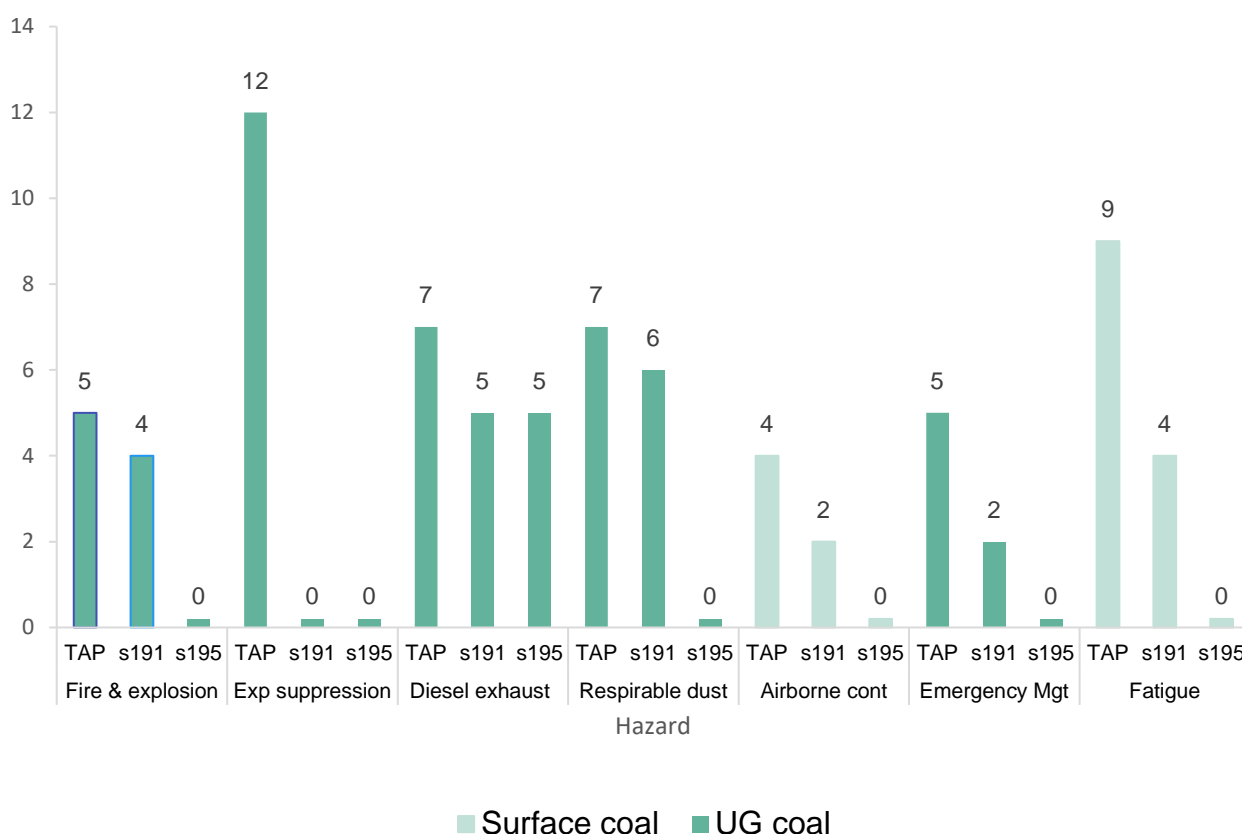


Table 9 below lists the notices issued for each TAP in quarter one 2018 by principal mining hazard.

**Table 9. Coal sector – analysis of targeted assessment notices for January – March 2018**

Targeted assessment program	# TAP	Operation type	Notice	
			s.191	s.195
Fire or explosion	2	Underground	0	0
Explosion suppression	1	Underground	0	0
Air quality - diesel exhaust emission	3	Underground	2	2
Air quality – airborne contaminants	2	Surface	1	0
Emergency management	1	Underground	0	0
Fatigue	3	Surface	0	0
<b>Total</b>	<b>12</b>		<b>3</b>	<b>2</b>

## 5.3 Emerging issues in the coal sector



### Non-compliant risk management systems - an emerging issue in coal operations

At recent planned inspections of coal operations, the regulator consistently identified non-compliant risk management systems. Issues included Principal Hazard Management Plans that were not underpinned by a risk assessment (as required by clause 23(2) of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014), risk assessments that were not available for review at the time of inspection and Principal Hazard Management Plans that had not been reviewed for an extended period of time.

All mine operations are reminded that up-to-date and appropriate risk management systems are fundamental tools for managing safety and preventing incidents at mining operations. Inspecting and verifying these systems in practice continues to be a key focus of any proactive or reactive inspection conducted by the regulator.

## 5.4 A good practice example in the coal sector



### Open-cut coal mine introduces a fatigue prevention program

An open-cut coal mine introduced a fatigue check sheet which is currently being used by supervisors across its mining, maintenance and coal handling processing plant areas to proactively assess worker fatigue. The use of the mine's new fatigue check sheet is a control measure arising out of the regulator's recent review of its Fatigue Management Plan.

In January 2018, mining supervisors attended a tailor-made fatigue recognition training session with Ethos Health. Communication and training for the workforce on the revised Fatigue Management Plan is scheduled for April 2018.

## 6. Large mines and quarries

### 6.1 Large mines and quarries safety profile

As at 5 April 2018, there were 36 active<sup>4</sup> large mines and quarries, consisting of 20 surface operations and 16 underground mines (see Figure 1 p 7).

#### Safety incident notifications

Large mines that notified incidents, on average, represent 61% of all mines defined as active<sup>4</sup> and 74% of active mines report hours<sup>5</sup>.

As seen in Table 10 below, incident rates (number of incidents reported per notifying mine) have remained stable over the past 12 months. On average, three incidents per notifying mine were reported during this period.

**Table 10. Safety incident notifications and reporting rates in large mines and quarries**

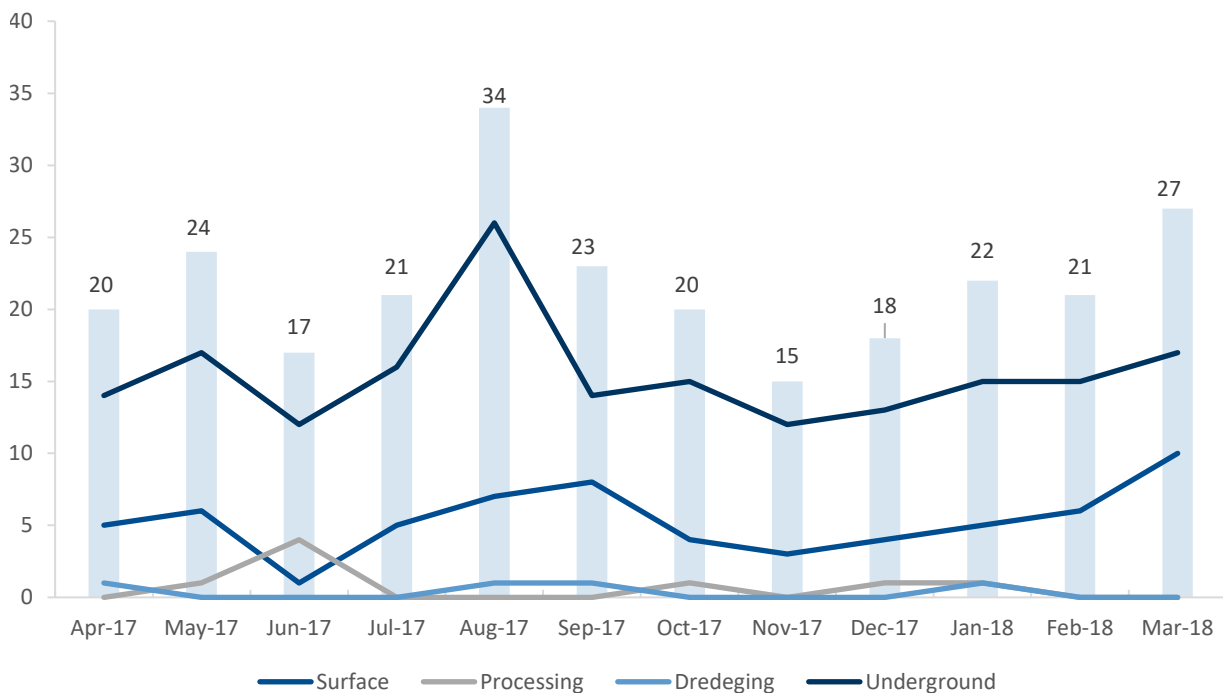
	Q2 2107	Q3 2017	Q4 2017	Q1 2018	Average
<b>Number of notified incidents</b>	61	78	53	70	65.5
<b>Mines that notified incidents</b>	22	20	20	24	21.5
<b>Incidents per notifying mine</b>	2.8	3.9	2.6	2.9	3
<b>Mines that reported hours<sup>5</sup></b>	29	29	29	9*	29^
<b>Proportion of large mines reporting</b>	76%	69%	69%	NC	74%^

\*Suspected reporting lag; ^Q12018 excluded from calculation; NC=Not Calculated

## Safety incident notification trends

Figure 17 shows that there were no significant trends in the number of incidents notified to the regulator by the large mines and quarry sector even though a sharp increase was observed in August 2017 for underground mines in this sector. Underground large mines and quarries constitute 40% of the mines in this sector yet are responsible for 71% of all safety incident notifications reported by the sector. This is not unexpected given the inherent hazards associated with underground mines.

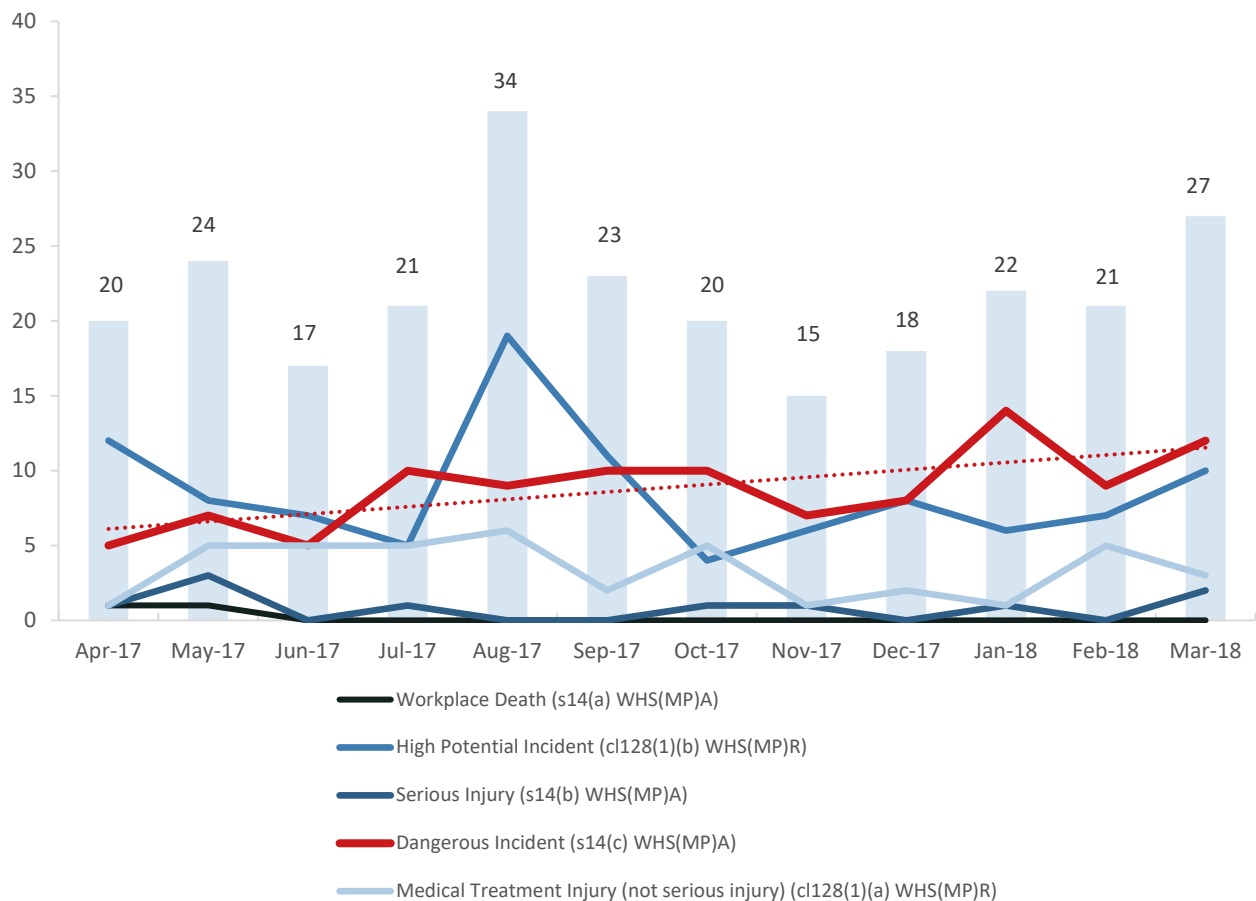
**Figure 17. Large mines and quarries notifications by operation type Apr 2017 – Mar 2018**





For the large mines and quarries sector, Figure 18 graphs incident notifications and notifications by the clause under which they were notified. For the 12 month reporting period, trend analysis revealed that the only significant trend was the upward trend for 'Dangerous incident' notifications.

**Figure 18. Large mines and quarries - notifications by incident type April 2017 – March 2018**



## Large mines and quarries safety incidents by mining hazard

Table 11 examines critical, severe and elevated safety incident notifications from quarter one 2018 where the regulator determined further assessment was required. These incidents were then subjected to further investigation and possible action. In underground operations, fires on mobile plant was the most common unwanted incident of this type requiring further assessment.

As seen in the table below, the incidents were assigned to a principal mining hazard and categorised by event type. This provides insight into areas and practices most commonly requiring additional scrutiny and/or improvement.

**Table 11. Large mines and quarries - summary of incidents selected for further assessment in quarter one 2018**

Principal Mining Hazard /Control Plan	Unwanted event	Event summaries
<b>Roads &amp; vehicle operating areas</b>  <b>Surface – 1</b> <b>Underground –2</b>	Single vehicle rollovers/rollaway  Vehicle to vehicle interaction	Control failures include: <ul style="list-style-type: none"> <li>failure to park fundamentally stable</li> <li>loss of breaking due to damage or component wear (brakes)</li> <li>not driving to conditions.</li> </ul>
<b>Fire and explosion</b>  <b>Underground – 1</b>	Ignition of gas or dust in drill holes when drilling shot pattern in surface mines	Combination of fine dust, gas and frictional ignition within drill holes results in fire balls propagating to plant.
<b>Mechanical Engineering control plan</b>  <b>Surface – 5</b> <b>Underground – 7</b>	Energised plant or equipment – loss of control (4)	Workers hit by substance (water/slurry) under pressure when cleaning vehicles and sump areas.  Isolation and dissipation of energy, an important control may fail due to human factors including worker competence, non-compliance or unintentional error (slips and lapses).  Poor design and incorrect assembly of high pressure fluid system components. Failure or inadequate inspection and maintenance programs also contributes to failure.
	Fire on mobile plant (5)	Fires frequently occur after maintenance and are typically due to failure to tighten fasteners, hoses and routing of fuel lines.  Fires occurred due to component failure allowing fluid to contact hot surfaces.
	Loss of control of lifted equipment (3)	Failure of systems of work – inappropriate plan or deviation from plan including: <ul style="list-style-type: none"> <li>wrong technology (incorrectly rated lifting equipment)</li> <li>not securing materials.</li> </ul>
<b>Engineered infrastructure</b>  <b>Underground – 2</b>	Loss of integrity	Tailings dam failure (no information in the public domain).

Principal Mining Hazard /Control Plan	Unwanted event	Event summaries
		Surface mill – structural members falling from a height possibly due to corrosion.

## 6.2 Large mines and quarries - compliance activities

### Prosecutions and investigations

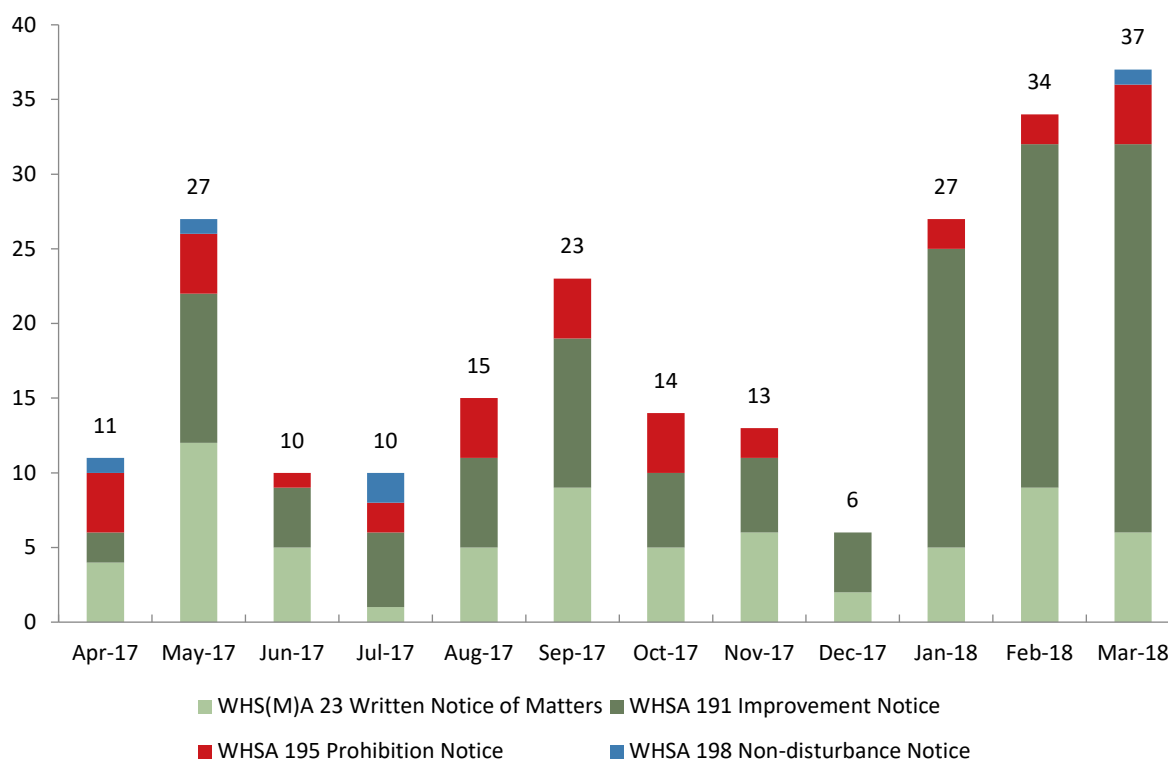
This quarter prosecution proceedings commenced against Sibelco Australia Ltd for a serious injury resulting from a fall from a haul truck which was located on a low loader at the time of the incident.

No new investigations for potential breaches of legislation associated with incidents in the large mines and quarries sector commenced this quarter.

### Safety notices issued

Figure 19 shows the number and types of notices issued by the regulator during the 12 month reporting period. Inspection activity contributes to the monthly variability in the number of notices issued.

**Figure 19. Large mines, quarries mine safety notices issued -April 2017 to March 2018**

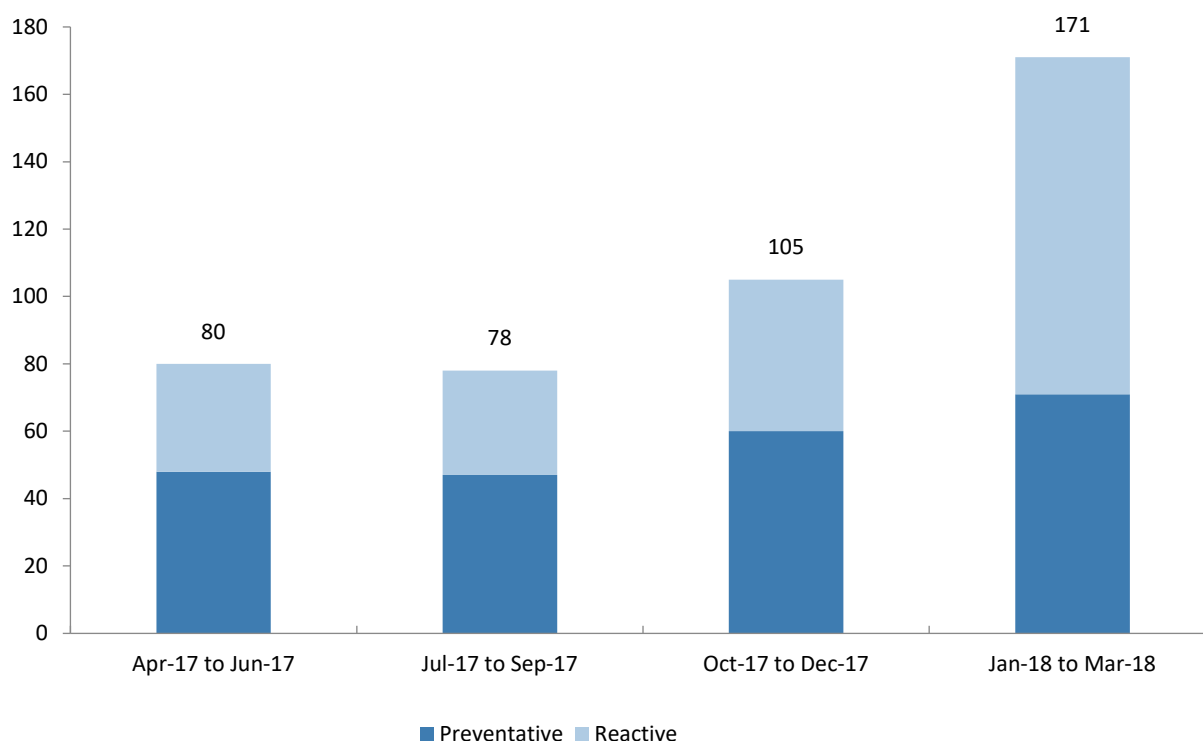


## Safety assessments and investigations

### Preventative and reactive assessments

Figure 20 shows that for three of the four quarters in the reporting period, well over half of the regulator's compliance effort was focussed on preventative programs rather than reactive ones. The increased number of reactive assessments conducted in quarter one 2018 reflects the compliance focus at the time on closing out aged matters.

**Figure 20. Large mines and quarries – preventative and reactive assessments**



### Site-based and desktop compliance activities

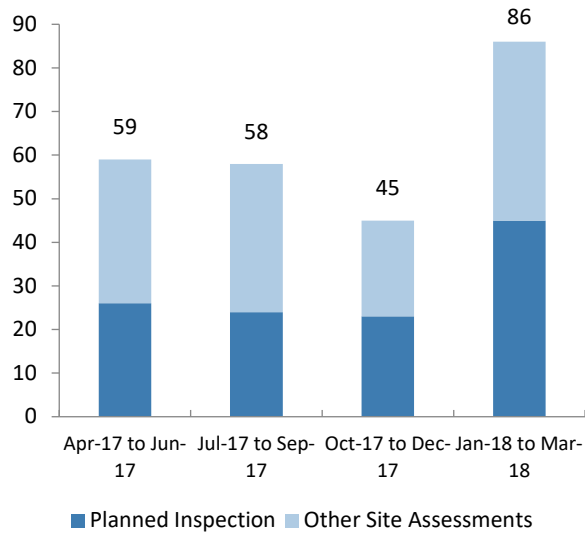
In the large mines sector, the regulator conducts various purpose driven site-based assessments. The general categories are described below:

- Planned inspections - follow a pre-prepared plan focusing on selected principal mining hazards
- Other assessments – TAPs, TIPs and assessments related to investigations.

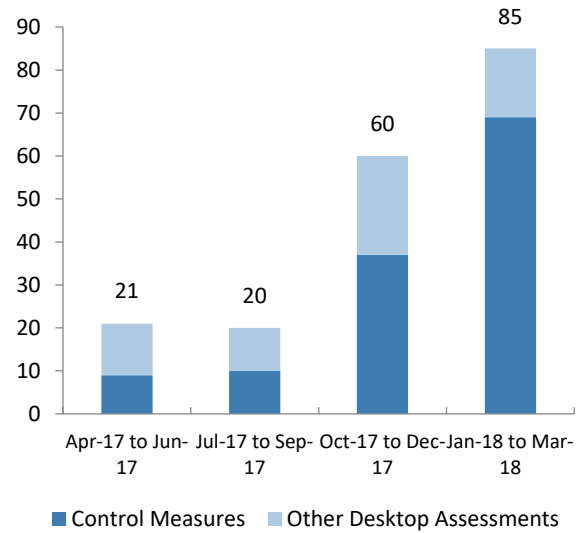
Desk-top assessments include a review of mine reports on their review of control measures following an incident and other desk-top assessments. Other desk-top assessments include the regulator's review of incident notifications, review of high risk activity notifications and authorisations. The increased number of control measure reviews in quarter one 2018 represents the compliance focus during this quarter on closing out aged incident reports.

Figure 21 presents a breakdown of site-based assessments by the type of assessment. In quarter one 2018, planned inspections represented approximately 50% of site assessments. Figure 22 shows there was an increase in the number of control measure reviews in quarter one 2018. This represents the compliance focus during this quarter in closing out aged matters.

**Figure 21. Large mines - site-based**



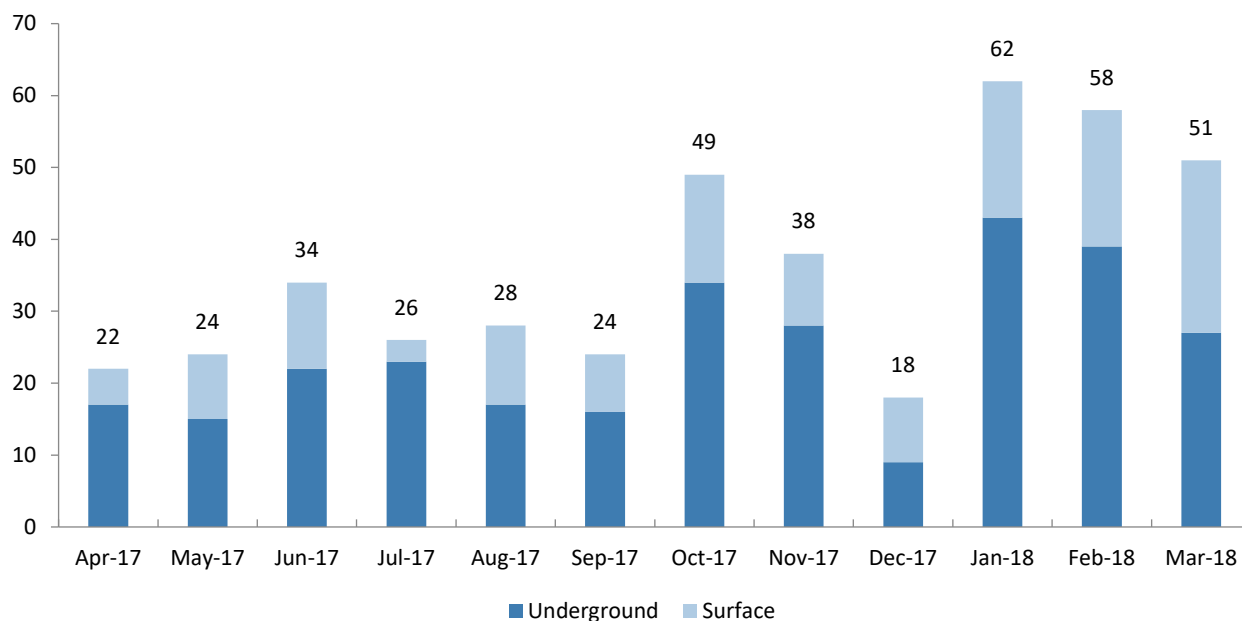
**Figure 22. Large mines – desk-top**



**Safety assessments by operation type**

Figure 23 shows the number of safety assessments conducted in underground and surface operations in the large mines sector for the last 12 months commencing April 2017. There were substantially more assessments conducted in quarter one 2018 compared to previous quarters within the 12 month period.

**Figure 23. Large mines safety assessments by operation - April 2017 to March 2018**



## Targeted assessment program notices issued

As seen in Figure 24, all TAPs conducted in large mines and quarries sector over the 12 month reporting period took place in underground mines. No prohibition notices were issued in any of the four principal mining hazards assessed.

**Figure 24. Large mines and quarries TAPs and notices - April 2017 to March 2018**

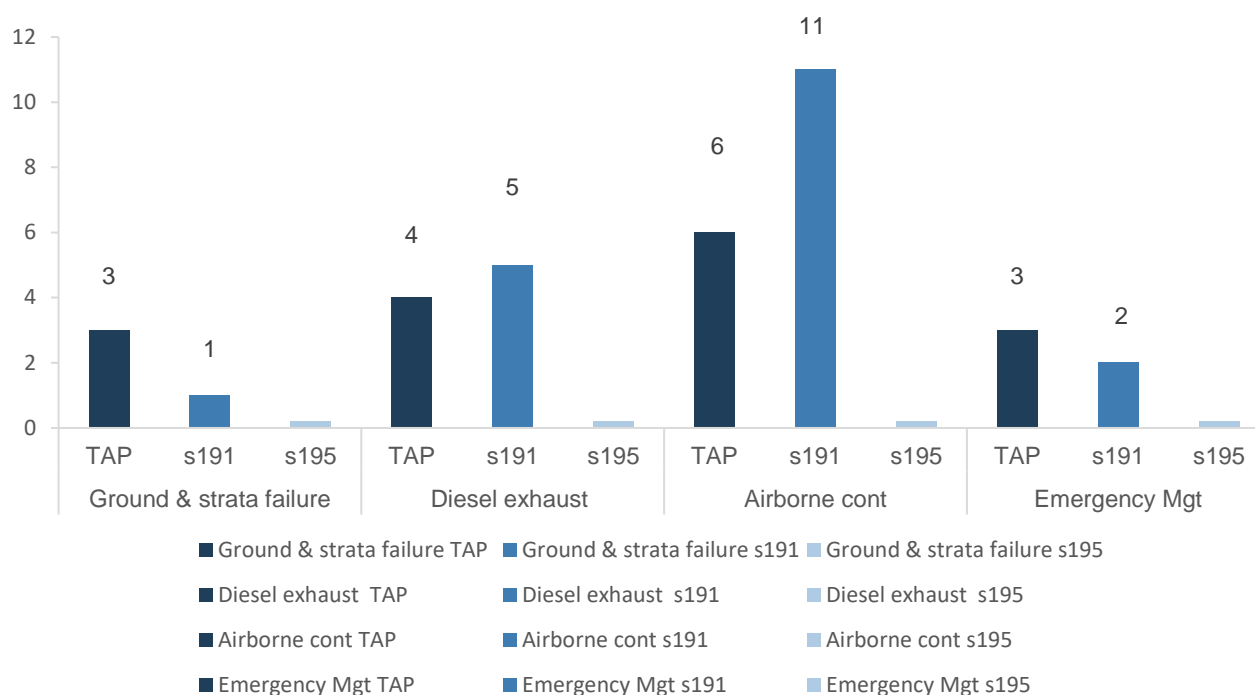


Table 12 lists the number of notices issued for each TAP in quarter one 2018 by principal mining hazard.

**Table 12. Large mines analysis of targeted assessment notices for January – March 2018**

Targeted assessment program	# TAPs	Operation type	Notices issued	
			S191	S195
Air quality - airborne contaminants	1	Underground	2	0
Emergency management	1	Underground	0	0
Total	2		2	0

## 6.3 Emerging issues in the large mines and quarry sector



### Maintaining sufficient numbers of qualified key statutory position holders in underground metalliferous mines requires forward planning

Large metalliferous mines are at risk of non-compliance with low numbers of qualified mining engineering managers.

Since June 2017, certain underground mines are now required to have a qualified mining engineering manager under Schedule 10 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014. Mines must also ensure qualified relief mining engineering managers are available for periods where the substantive position holder is absent greater than seven days. In the past two years, there were only four successful candidates sitting the mining engineering manager below ground (metals) certificate of competence examination.

Mines are strongly encouraged to plan ahead in order to ensure they are able to meet statutory function requirements.

## 6.4 A good practice example in a large metalliferous mine



### Technological system manages explosives access in a large metalliferous mine

At a large metalliferous mine, Inspectors from the Resources Regulator observed how a technological system was being used to better manage staff access to explosives.

By linking personal identification tags to explosives magazine key access, the shotfirer is unable to leave the site until the magazine keys are returned to the safe. The stores personnel do not have the combination to the safe, but they do control access to the magazine keys.

The system works by requiring the shotfirer to present their personal identification to the stores person when collecting magazine keys. The stores person then electronically de-activates the tag for leaving the mine site. The shotfirer cannot personally exit the site via the full-height turnstile until the keys have been returned to the safe and their tag has been reactivated.

This control system does not prevent the theft of explosives or detonators but it does ensure that the shotfirer cannot leave site without returning the magazine keys. This results in improved risk management and compliance with statutory requirements for management of magazines.



## 7. Small mines and quarries

### 7.1 Small mines and quarries safety profile

As at 5 April 2018 there were 2,705 active<sup>4</sup> small mines and quarries in NSW. Almost 98% of small mines are surface operations. Every quarter, on average, only 640 small mines report hours of operation to the regulator<sup>4</sup>.

#### Safety incident notifications

As seen in Table 13, there were a total of 97 incidents notified to the regulator between April 2017 to March 2018 for the small mines and quarries sector. This represents about 5% of the total number of incidents for the period.

As seen below, incident rates (number of incidents per reporting mine<sup>5</sup>) have remained stable over the reporting period, April 2017 to March 2018. There has been no change to the proportion of small mines reporting incidents every quarter (approximately 3%).

The regulator is currently addressing incident under-reporting as a priority compliance project. This report therefore sought to establish reporting benchmarks against which to measure future impacts of the project.

**Table 13. Safety incident notifications and reporting rates in small mines and quarries**

	Q2 2107	Q3 2017	Q4 2017	Q1 2018	Total (Av)
<b>Number of incidents</b>	23	27	21	26	97 (24.3)
<b>Mines that notified incidents</b>	20	24	17	25	86 (21.5)
<b>Incidents per notifying mine</b>	1.2	1.1	1.2	1	1.1
<b>Mines that reported hours<sup>5</sup></b>	727	646	546	192*	(639)^
<b>Proportion of small mines</b>	3%	4%	3%	NC	(3.3%)^
<b>All sectors notified incidents</b>	403	494	460	454	1811 (453)

\*Suspected reporting lag; ^Q1-2018 excluded from calculation; NC=Not Calculated

## Safety incident notification trends

Figure 25 shows that on average, the regulator receives eight incident notifications per month from the small mines sector and most notifications were received from open-cut mines. See Figure 25 below. There are too few reported incidents to perform any meaningful trend analysis. Overall, low levels of incidents were reported compared to the coal and large mines sector.

**Figure 25. Small mines all notifications by operation type – April 2017 to March 2018**

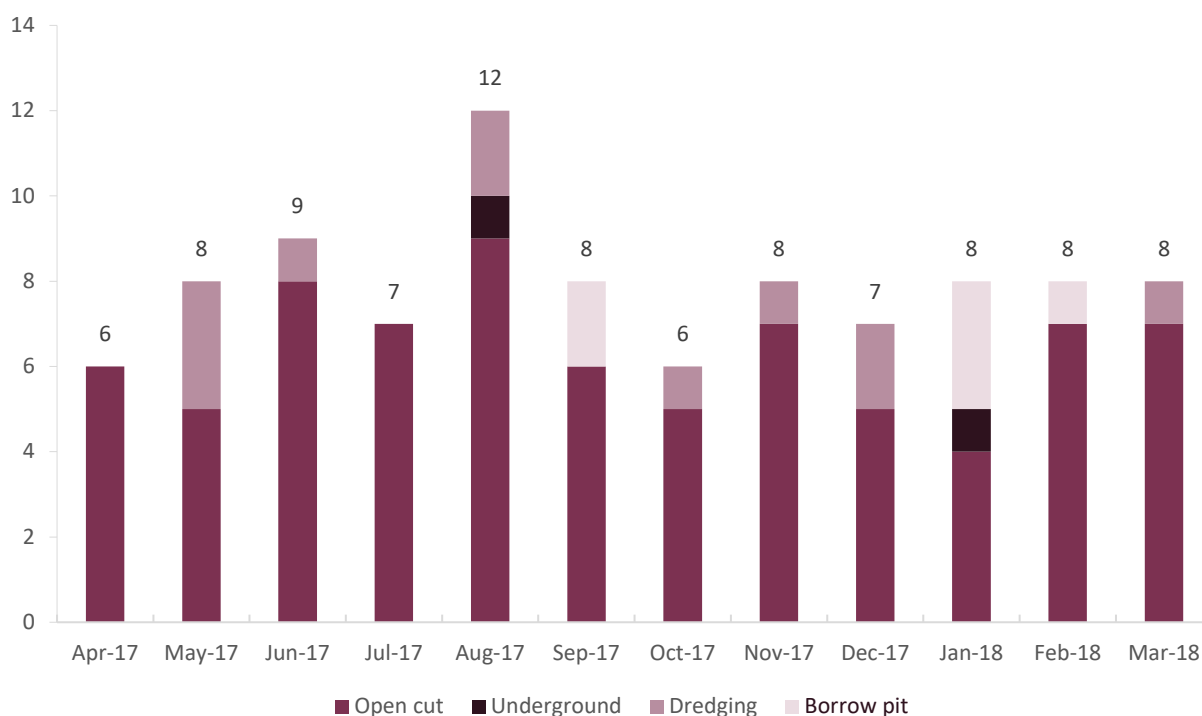
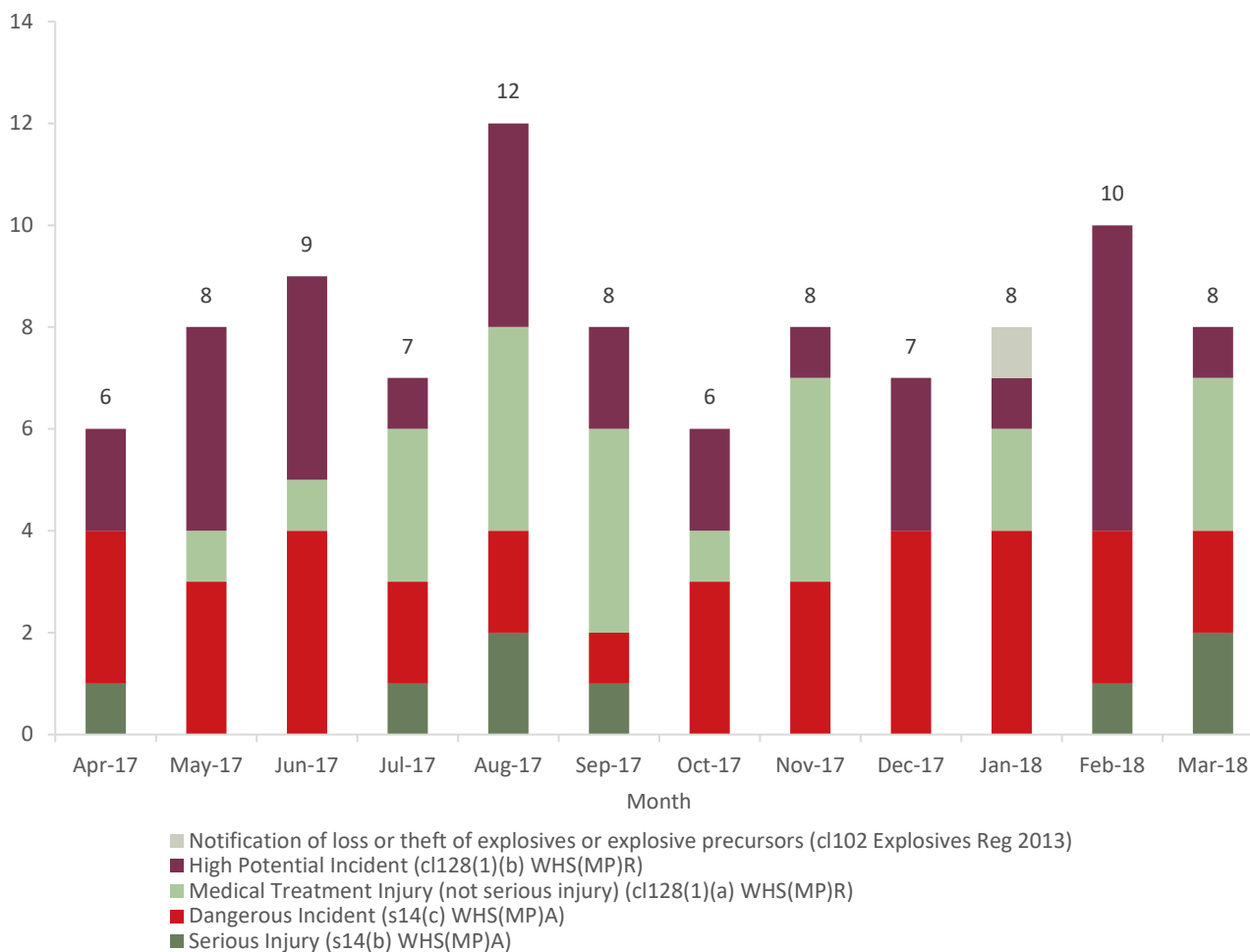


Figure 26 shows safety incident notifications by the clauses under which they were first notified.

**Figure 26. Small mines incident by notification by type - April 2017 to March 2018**



## Small mines and quarries sector incidents by mining hazard

Table 14 examines critical, severe and elevated safety incident notifications from quarter one 2018 where the regulator determined further assessment was required. These incidents were then subjected to additional investigation and possible action. In small surface mines and quarries, single vehicle roll-overs were the most common unwanted event that were identified for further assessment. This quarter, the regulator issued safety alerts and bulletins on vehicle rollovers.

**Table 14. Small mines and quarries - summary of incidents selected for further assessment**

Principal Mining Hazard /Control Plan	Unwanted event	Event summaries
<b>Roads &amp; vehicle operating areas</b> Surface – 2	Single vehicle rollovers	Loss of braking due to damage or component wear (brakes). Failure to park fundamentally stable. Loading/unloading areas not within specified limits for truck.
<b>Electrical Engineering Control Plan</b> Surface – 1	Person exposed to energised plant	Poor identification of hazards in a Safe Work Method Statement. Incorrect isolation labelling. Failure to follow isolation and test procedures. Contractor management was also identified as an issue.
<b>Explosives management Plan</b> Underground – 1	Unaccounted explosives	Underground charge sheets not filled in correctly.

## 7.2 Small mines and quarries - compliance activities

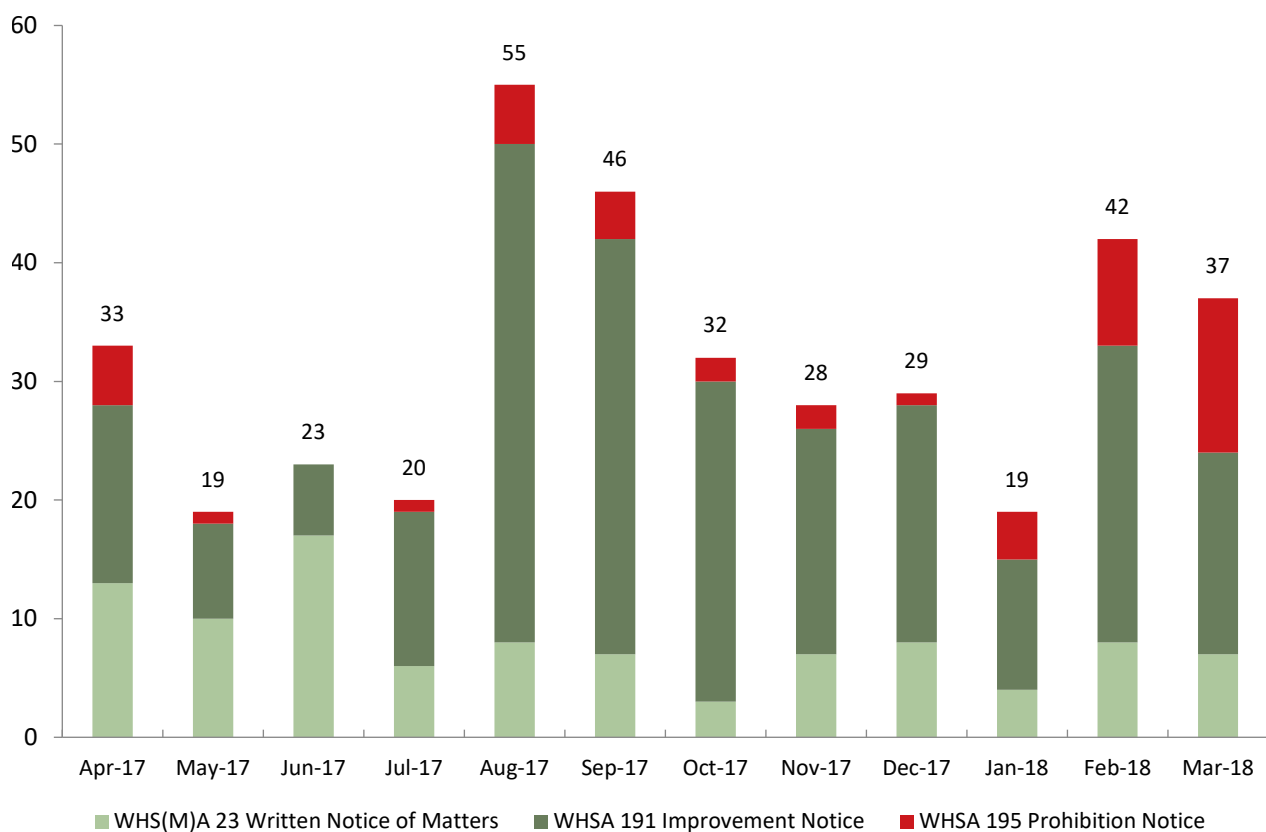
### Prosecutions and investigations

No prosecution proceedings or incident investigations commenced in quarter one 2018.

### Safety notices issued

Figure 27 depicts the number and types of notices issued by the regulator from April 2017 to March 2018.

**Figure 27. Small mines and quarries - safety notices issued**

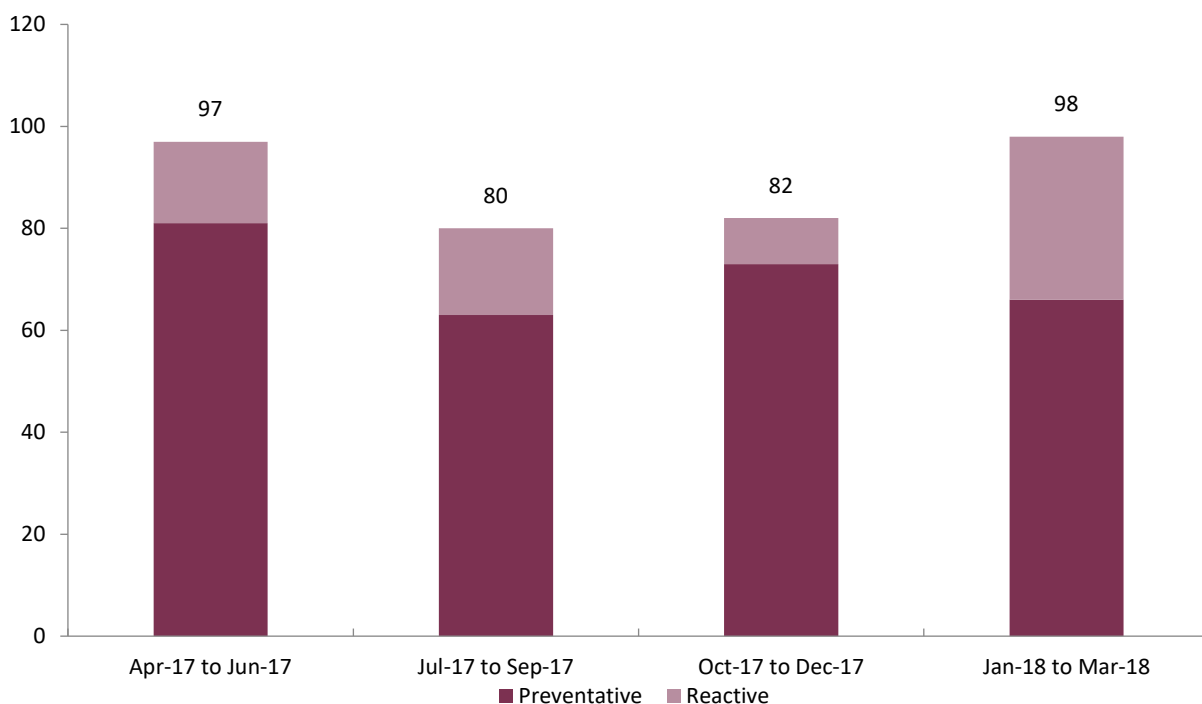


## Safety assessments

### Preventative and reactive assessments

Figure 28 shows that for each quarter in the 12 month reporting period (April 2017 – March 2018) the regulator's compliance effort in the small mines sector was focussed on preventative programs rather than reactive ones. On average, 80% of assessments conducted in the reporting period were preventative in nature rather than reactive. The increased number of reactive assessments conducted in quarter one 2018 reflects the compliance focus during this time of closing out aged matters.

**Figure 28. Small mines preventative and reactive assessments – April 2017 to March 2018**



### Site-based and desktop compliance activities

In the small mines sector, the regulator conducts various purpose driven site-based assessments. The general categories are described below:

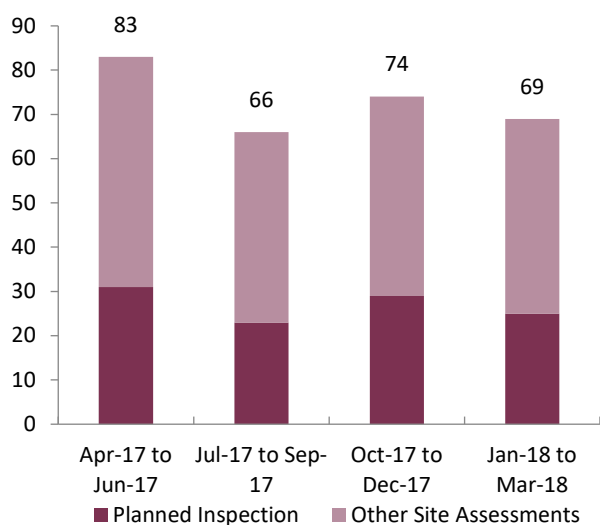
- Planned inspections - follow a pre-prepared plan focusing on selected principal mining hazards
- Other site assessments – TAPs, TIPs and assessments related to investigations.

For small mines, other desk-top assessments include a review of mine reports on their review of control measures following an incident and other desk-top assessments include the regulator's review of incident notifications and authorisations. The increased number of control measure

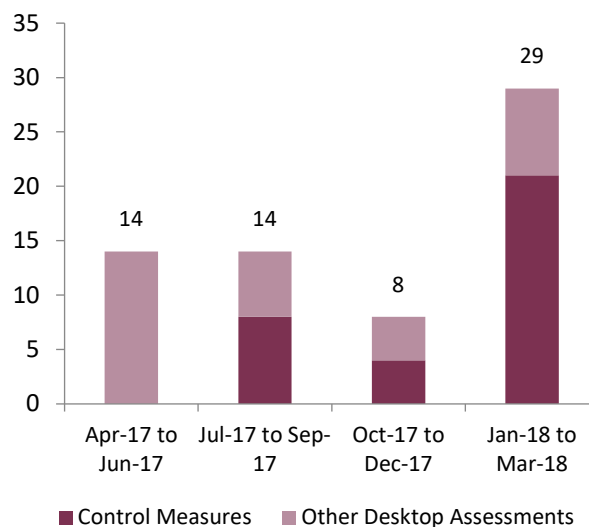
reviews in quarter one 2018 represents the compliance focus during this quarter on closing out aged incident reports.

As shown in Figure 29, approximately one-third of all site-based inspections were planned inspections in quarter one 2018. As seen in Figure 30, the increased number of control measure reviews in quarter one 2018 reflects the compliance focus during this quarter on closing out aged matters.

**Figure 29. Small mines - site-based activities**



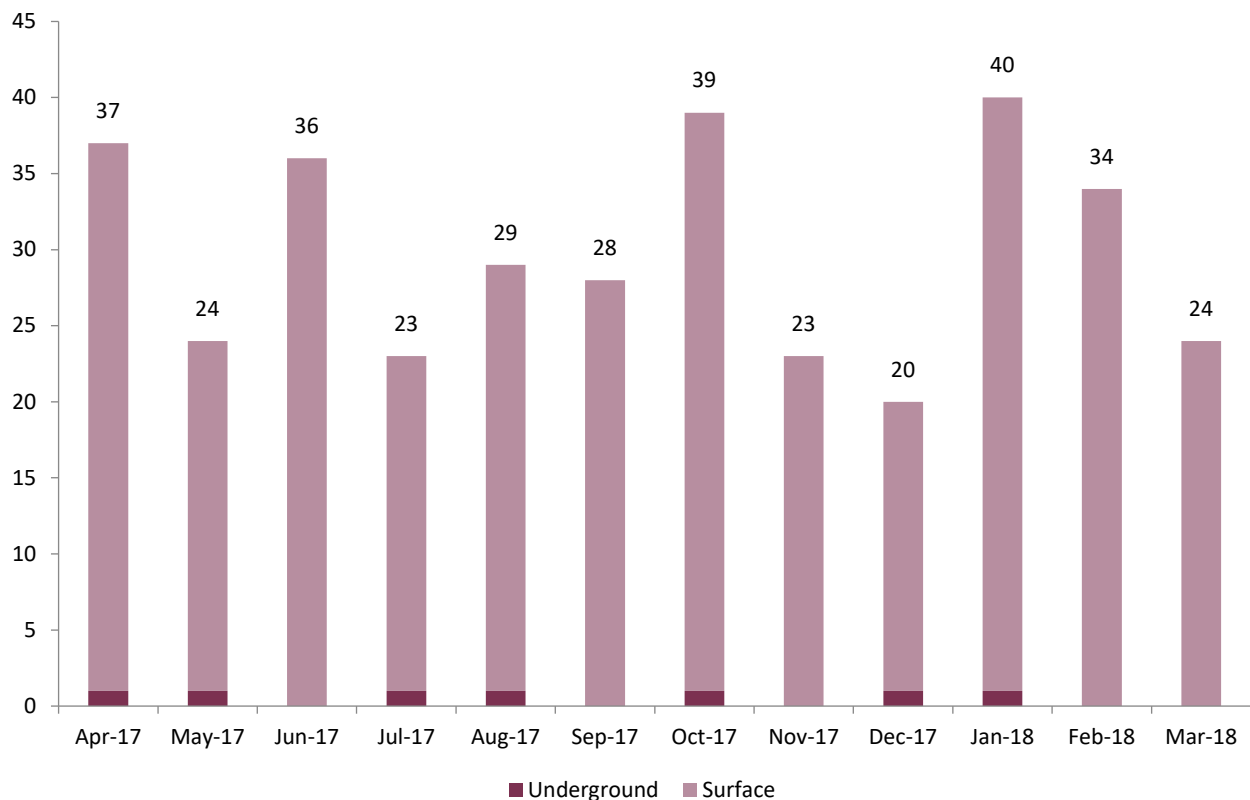
**Figure 30. Small mines - desk-top activities**



### Safety assessments by operation type

Figure 31 graphs the number of safety assessments conducted by the regulator at underground and surface small mines and quarries over the last 12 months from April 2017 to March 2018. It can be seen very few underground assessments were conducted within the 12-month period.

**Figure 31. Small mines and quarries safety assessments by operation type**

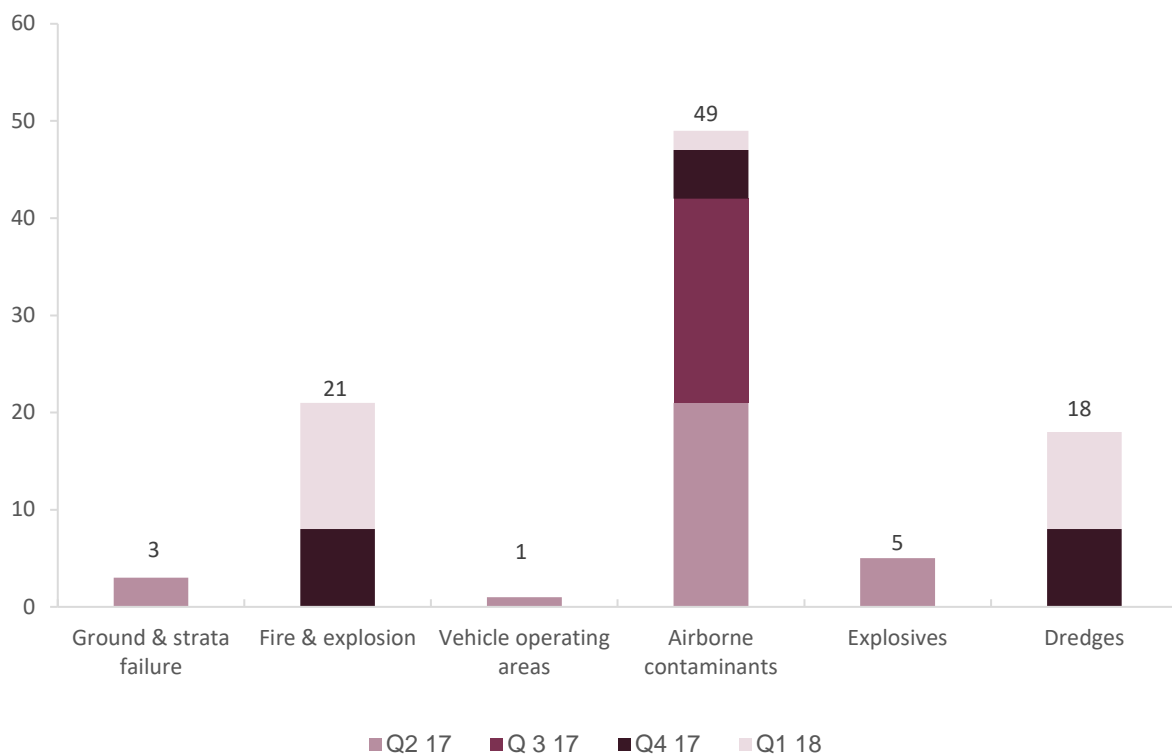




## Planned inspections

Since April 2017, the regulator has conducted more planned inspections on airborne contaminants than on any other principal mining hazard. As seen in Figure 32, more than double the number of inspections for airborne contaminants were conducted in small mines as compared to the fire and explosion hazard.

**Figure 32. Small mines and quarries - planned inspections April 2017 – March 2018**



## 7.3 Emerging issue for the planned inspection program



### Safe systems of work for articulated trucks – a focus for the planned inspection program

In response to serious incidents associated with articulated trucks, the Resources Regulator will soon commence its three-month compliance campaign across the coal, metalliferous and quarrying sectors.

The compliance campaign includes a risk-based program of planned inspections targeting mines utilising articulated trucks. A recently published Safety Bulletin ([SB18-07 Safe systems of work for mobile plant](#)) and related investigation and incident reports are available on our website:

- Report into the serious injury of a mine worker on 1 February 2016 at the [Sibelco Salt Ash Sand Plant](#)
- [IIR16-03](#) Worker seriously injured in fall from truck
- [IIR18-02](#) Serious injury at open cut coal mine – Werris Creek.

## 7.4 A good practice example - dredge mines



### Inspection strategy in dredge mines in NSW

In June 2017, a dredge sank. Around that time, other safety incidents associated with dredge operations had also been reported to the NSW Resources Regulator. In response, the regulator implemented a strategy for verifying the condition of all dredges operating in NSW under its planned inspection program.

As a first step, a standardised inspection document was developed. Incorporating expert advice from a representative of the NSW Roads and Maritime Services (Ship's Surveyor), the inspection document was aligned with the current NSW legislation and the expectations of the Australian Maritime Safety Authority.

To date, 18 out of 22 dredges have been inspected. The dredges inspected varied in size (6 metres to 42 metres long), area of operation (ponds or navigable waterways) and complexity (manned/unmanned, GPS control, spud or cable location).

A wide variety of good practice initiatives were identified during the planned inspections including:

- Extensive documentation that was logical, easy to understand and developed after a rigorous risk based approach that included effective consultation with workers.
- A high standard of environmental and safety controls used to deal with Dangerous Goods and combustible liquids transported and consumed on the dredge.
- A structured preventative maintenance program that utilised external expertise including structural, electrical and marine Engineers engaged to ensure seaworthiness.
- Engagement of Naval Architect to provide Stability Assessments.
- AMSA Issued certificates of operation which included Individual Identifiers on Dredge and support vessels.
- Well-engineered mooring facilities that allowed ease of embarking and disembarking.
- 'Man' down response systems including back to base notification devices and auto inflation personal flotation devices (PFD).

The strategy demonstrates how the Resources Regulator has delivered an up-to-date and consistent compliance approach for dredge mines in NSW. The final four inspections are scheduled for completion in mid-2018.

## 8. Opal mines

### 8.1 Opal mines safety profile

As at 5 April 2018, there were 3497 active<sup>4</sup> opal mines in NSW. All were surface mines (see Figure 1 p.7). As seen in Table 15, almost 98% of the opal mine sector is composed of small scale titles.

**Table 15. Opal mines by operation type**

Surface operations	Underground operations	Small scale titles	Total
61	20	3416	3497

### Safety incident notifications

As seen in Table 16, there were no incidents notified to the regulator between April 2017 to March 2018 for the opal mine sector.

The regulator is currently addressing incident under-reporting as a priority compliance project. This report therefore sought to establish reporting benchmarks against which to measure future impacts of the project.

**Table 16. Opal mines sites and number of incidents**

	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Total (Av)
Number of notified incidents	0	0	0	1	1
All sectors - total number of notified incidents	403	494	460	454	1811 (453)

## 8.2 Opal mines - compliance activities

### Safety assessments and notices issued

Table 17 lists opal sector notices and assessments on a quarterly basis from April 2017 to March 2018. Over the 12 month reporting period, 75 notices were issued (comprising approximately 6% of the total notices issued by the regulator) and 191 assessments were conducted (representing approximately 13% of all assessments conducted by the regulator). Over 95% of assessments conducted over this period were site based assessments.

**Table 17. Opal mines safety notices issued and assessments – April 2017 to March 2018**

	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Total
<b>Safety notices issued</b>	15	44	3	13	75
<b>Safety assessments conducted</b>	17	129	36	11	193

In July 2017, the Resources Regulator conducted a proactive program of inspections on opal claims in Lightning Ridge. A total of 124 claims were inspected, comprising 61 expired or cancelled claims and 63 active claims. The program addressed safety, land rehabilitation and compliance with mineral claim conditions.

As seen in Figure 33 below, this compliance operation resulted in a substantial increase in the number of improvement notices issued in the July 17 – September 2017 period. In total, forty-four improvement notices were issued under section 191 of the *Work Health and Safety Act 2011* requiring remedial actions to be taken to address potential safety risks. Four penalty notices were issued for failing to comply with improvement notices issued under the legislation, resulting in \$2,880 in fines.

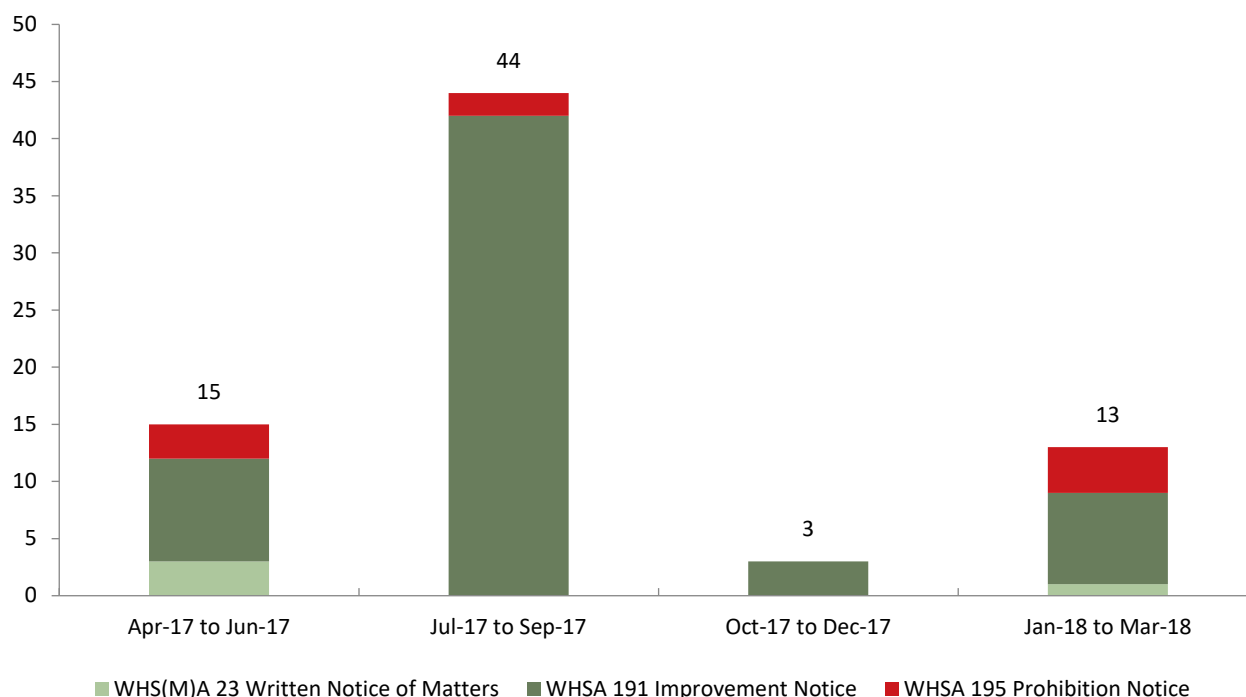
Notices were also issued under the *Mining Act 1992* for non-compliance with rehabilitation requirements and breaches of mining conditions.

Of concern, only 14 of the 61 expired or cancelled claims were found to be compliant with rehabilitation requirements.

Specifically, notices required claim holders to:

- ensure that their shafts and auger holes are appropriately secured in accordance with the guidelines
- excess rubbish and mullock be removed from claims
- plant and equipment has appropriate guarding and
- electrical equipment is safe to use and regularly tested.

Figure 33. Opal mines mine safety notices issued - April 2017 to March 2018



In the opal mining sector, the regulator conducts preventative assessments called Planned Inspections. Their purpose is to identify potential compliance weaknesses which could lead to an accident or illness. The assessments follow a pre-prepared plan and are focused on a principal mining hazard. Table 18 below presents opal sector data showing the number of assessments conducted in the four principal mining hazards listed. Every quarter, the regulator conducts at least three ground or strata failure planned inspections.

Table 18. Opal mines planned safety inspections by hazard

Site safety assessments	Planned inspections April 17- March 18			
	Q2 17	Q3 17	Q4 17	Q1 18
Ground or strata failure	6	4	3	3
Inrush and inundation	1	2		
Work at heights			3	1
Ventilation			1	
<b>Total</b>	<b>7</b>	<b>6</b>	<b>7</b>	<b>4</b>

## 8.3 Good practice example at an opal mine



### Roof bolts at a tourist mine

During a planned inspection at a tourist mine in Lightning Ridge, it was identified that roof support was inadequate and posed a risk to tourists visiting the mine. Cracks were evident in a number of primary supports and across some roof areas.

Consequently, a prohibition notice under the *Work Health and Safety Act (2011)* was issued, prohibiting operation of the mine until it was made safe.

The typical method used at Lightning Ridge is to install secondary roof support in the form of wooden props. These props are cut from local timber, are about 150 mm in diameter and about 2 metres long (depending on the roof height).

The mine owners recognised that if props were used, future tourist movement in the mine would be impeded by the location of the new secondary support (usually in the centre of walkways and rooms).

The mine owners sought an alternative to timber props and found it in the form of roof bolts. Roof bolts are used extensively in both underground coal and extractives mining. Roof bolts are installed using a roof bolting machine. As this was unusual for Lightning Ridge a unit was shipped in from the Hunter Valley for the purpose.

After installation of the roof bolts, the mine was made safe and reopened for operation.

## 9. Petroleum and geothermal

### 9.1 Petroleum and geothermal safety profile

As at 5 April 2018, there were 186 active<sup>4</sup> petroleum and geothermal mines in NSW. All were surface mines (see Figure 1 p.7).

#### Safety incident notifications

As seen in Table 19, there were no incidents notified to the regulator between April 2017 to March 2018 for mines in the petroleum and geothermal sector. The regulator is currently addressing incident under-reporting as a priority compliance project. This report therefore sought to establish reporting benchmarks against which to measure future impacts of the project.

**Table 19. Petroleum and geothermal sites notified incidents**

	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Total (Av)
Number of notified incidents	0	0	0	0	0
All sectors - notified incidents	403	494	460	454	1811 (453)

### 9.2 Petroleum and geothermal - compliance activities

#### Safety notices issued and assessments

No notices were issued by the regulator in the petroleum and geothermal sector from April 2017 to March 2018. However, as per Table 20 a total of 68 safety assessments were conducted in the sector during that time. In general, these activities were focused on responding to notified high risk activities associated with decommissioning and abandoning of wells.

**Table 20. Petroleum geothermal sector - assessments and notices April 2017 to March 2018**

	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Total
Safety notices issued	0	0	0	0	0
Safety assessments conducted	15	24	10	19	68



## 10. Exploration

### 10.1 Exploration safety profile

As at 5 April 2018, there were 918 active<sup>4</sup> exploration mines in NSW. All were surface exploration mines (see Figure 1 p7).

#### Safety incident notifications

As seen in Table 21, nine incidents were notified to the regulator between April 2017 to March 2018, representing just under 0.5% of the total number of incidents from all sectors reported during that time. These comprised one dangerous and two high potential incidents; and two serious and two medical treatment injuries. One of the serious injury incidents was investigated by the regulator.

The regulator is currently addressing incident under-reporting as a priority compliance project. This report therefore sought to establish reporting benchmarks against which to measure future impacts of the project.

**Table 21. Exploration - number of sites and notifications – April 2017 to March 2018**

	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Total (Av)
Number of notified incidents	3	0	4	2	9
All sectors notified incidents	403	494	460	454	1811 (453)

### 10.2 Exploration - compliance activities

#### Safety notices issued and assessments

Only one notice was issued by the regulator in the exploration sector in the 12 month reporting period. The improvement notice was issued in quarter four of 2017 related to an unwanted event involving energised equipment – loss of control.

A total of 21 safety assessments were conducted in the exploration sector from April 2017 to March 2018. As seen in Table 22 below, almost half of these assessments took place in quarter one 2018. These assessments were focussing on assessing risk management practices in accordance with the principal mining hazards and control plans.

**Table 22. Exploration - number of assessments and notices – April 2017 to March 2018**

	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Total
Safety notices issued	0	0	1	0	1
Safety assessments conducted	4	3	4	10	21

## Appendix 1. Data Summary

### Mines by sector, operation type, number of incidents, assessments and notices

	Q2 2107	Q3 2017	Q4 2017	Q1 2018	Ave (Total)
Active mines*				7455	
Coal mines				113	
Large mines & quarries				36	
Small mines & quarries				2705	
Opal mines				3497	
Petroleum & geothermal				186	
Exploration				918	
Mines that reported hours **	936	859	735	287	
Mines that notified incidents	93	99	95	108	98.8
Number of incident notifications	403	494	460	454	452.8
Coal mines	316	389	381	355	1441 (360)
Large mines & quarries	61	78	53	70	262 (66)
Small mines & quarries	23	27	21	26	97 (24)
Opal mines	0	0	0	1	1
Petroleum & geothermal	0	0	0	0	0
Exploration	3	0	4	2	9 (2.25)
Non-mine	0	0	1	0	0
Notifications per mine that notified	4.3	5.0	4.8	4.2	4.6
All safety assessments conducted	898	883	828	1,118	3,727 (532)
Coal mines	664	551	557	785	2557 (639)
Large mines & quarries	80	78	105	171	434 (109)
Small mines & quarries	97	80	82	98	357 (89)
Opal mines	17	129	36	11	193 (48)
Petroleum & geothermal	15	24	10	19	68 (17)
Exploration	4	3	4	10	21 (5)
Non-mine	21	18	34	24	97 (24)
Notices issued	292	318	282	324	1216 (303)
Coal mines	153	103	155	110	521 (130.3)
Large mines & quarries	48	48	33	98	227 (56.7)
Small mines & quarries	75	121	89	98	383 (5.7)
Opal mines	15	44	3	13	75 (8.8)
Petroleum & geothermal	0	0	0	0	0
Exploration	0	0	1	0	1
Non-mine	1	2	1	5	9 (2.25)

\* Based on query run on 5<sup>th</sup> April 2018. Data not available for previous quarters. \*\* Based on query run on 14<sup>th</sup> April 2018. \*\*\* This average is based on mines who had reported hours for Q 2 2017, Q3 2017 and Q4 2017.

## Appendix 2

### TAPs assessment summary data April 2017 – March 2018

Targeted Assessment Program	Sector	Q2 17			Q3 17			Q4 17			Q1 18			Totals		
		TAP	S191	S195	TAP	S191	S195	TAP	S191	S195	TAP	S191	S195	TAP	Notices	
Ground or strata failure	UG coal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	UG metal	2	0	0	1	1	-	-	-	-	-	-	-	3	1	
Diesel exhaust emissions	UG coal	-	-	-	-	-	-	4	3	1	3	2	2	7	8	
	UG metal	3	4	0	1	1	0	-	-	-	-	-	-	4	5	
Emergency management	UG coal	2	1	0	-	-	-	2	1	0	1	0	0	5	2	
	UG metal	1	1	0	-	-	-	1	1	0	1	0	0	3	2	
Explosion suppression	UG coal	4	0	0	4	0	0	3	0	0	1	0	0	12	0	
Fatigue	Surface coal	3	4	0	1	0	0	2	0	0	3	0	0	9	4	
Fire and explosion	UG coal	-	-	-	-	-	-	3	4	2*	2	0	0	5	6*	
Respirable dust	UG coal	4	1	0	3	5	0	-	-	-	-	-	-	7	6	
Airborne Contaminants	Surface coal	-	-	-	-	-	-	2	1	0	2	1	0	4	2	
	UG metal	-	-	-	2	1	0	3	7	0	1	3	0	6	11	
	Subtotal													UG coal	36	22
	Subtotal													Surface coal	13	6
	Subtotal													UG metal	16	19
<b>Total</b>		19	11	0	12	8	0	20	17	3	14	6	2	65	47	

\*Two prohibition notices issued during the fire and explosion TAP were prohibiting operation of diesel equipment where there is inadequate ventilation and have been represented against Diesel Exhaust TAP in the graphs and tables in the body of the document