Resources Regulator
Department of Regional NSW

Fires on mobile plant

2022–23

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Contents

Overview

In FY 2022–23, there were:

190 Notified incidents

A decrease of 17 from 207 in FY2021–22

13 Notices issued

138	Surface coal (73%)
29	Underground metals (15%)
8	Surface metals (4%)
7	Construction materials (4%)
3	Underground coal (2%)
3	Mineral sands (2%)

Incident notifications classified against material unwanted events (MUE)

MUE		Most common threat with failed critical control		Most common failed critical control
Fire or explosion surface 164	92 of 164	Accumulated flammable leaks and spills	92 of 164	Flammable fluid containment
Fire or explosion underground 26	18 of 26	Mechanical energy in the presence of fuel	9 of 26	Flammable fluid containment

Ancillary reports summary

Heat source
37%
Exhaust system

Fuel source
27%
Hydraulic oil

Failed component
18%
Hose

Extinguished by
45%
Handheld fire extinguisher

Executive summary

This report has been prepared by the NSW Resources Regulator (the Regulator) for the NSW mining industry, original equipment manufacturers and suppliers. It contains annual data of notified incidents involving fires on mobile plant (FOMP) for the period 1 July 2022 to 30 June 2023.

The Regulator's position is that all fires on mobile plant are avoidable and preventable and we have adopted a zero-tolerance approach where mine operators have not taken appropriate steps to manage this risk.

Fires on mobile plant are inherently dangerous. They affect the safety of workers and have potentially catastrophic consequences. Despite a focus on the issues in recent years, the number of incidents remains high. The Regulator is committed to working with industry to ensure health and safety obligations are being met to reduce the number of fires on mobile plant and to prevent potentially catastrophic events.

Since 2018, the Regulator has published quarterly reports on fire on mobile plant incidents. From FY2023, these reports will be published annually. Information on mobile plant fires will continue to be provided at industry engagement forums such as scheduled quarterly engineers and managers forums, plus published in the weekly incident summary.

Annual data for 1 July 2022 to 30 June 2023 identified the following:

- There was an 8% decrease in fire on mobile plant incidents compared to the previous year. Despite the decrease, the number of FOMP incidents (190) was still the third highest recorded over the last 9 years. The increase in notified FOMP incidents between FY2020 to FY2021 can be partly explained in by amendments to the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 in February 2020 to include a duty to notify all incidents where there was 'an uncontrolled fire on mobile plant that is in operations (whether operated directly, remotely or autonomously)' (clause 124(5)(u)).
- Notified fire on mobile plant incidents occurring at surface coal mines account for 73% of all FOMPs in FY2023, which is lower than the previous year (76%). Since 2019 the percentage of FOMP incidents occurring underground at underground mines has decreased from 22% to 13%, however underground FOMPs continue to be the second most common FOMP incidents in FY2023.
- Notices issued in response to a FOMP incident increased by 160% from 5 in FY2022 to 13 in FY2023. For the first time since 2019, notices were issued in 4 separate categories (s191 improvement notices, s23 notices of concern, s195 prohibition notices and s198 non-disturbance notices).
- The most common combination of heat and fuel source in FOMPs in FY2023 was exhaust system and hydraulic oil which accounted for 17% of all FOMP incidents.

Significant incidents

November 2022 – IncNot0043390

A worker in a quarry was driving an articulated dump truck when the operator noticed smoke coming from the engine bay. The worker stopped and opened the engine bay and it burst into flames. He activated the onboard fire suppression, but this failed to extinguish the fire. The local fire brigade sent several units to respond to the fire. The engine bay and cabin were destroyed. There were no injuries. Due to the extent of the damage, a cause has not been identified.

Picture 1. Engine bay and cabin damage

January 2023 – IncNot0043845

A large tractor was working on rehab carting topsoil. Fluid sprayed from the engine bay over the windscreen and shortly after, flames appeared around the engine. The operator received minor burns to their wrist and was taken to hospital for assessment. Several nearby workers immediately rendered assistance and attempted to extinguish the fire. The workers were unable to directly raise the emergency and relied on another worker to relay the emergency message. The mine's emergency response team responded with a fire tender, and water carts were used to extinguish the fire. The tractor was destroyed.

Picture 2. Tractor during fire event

January 2023 – IncNot0043987

The operator of a water cart noticed a strange smell and returned to the workshop. An inspection did not identify any issues. The truck left the workshop heading to a dump when the operator noticed a loss of power and saw smoke in the rear mirrors. The truck was immediately parked up. Flames then started coming from the engine bay around the front of the truck. The fire was extinguished by other water carts. The operator complained of breathing issues and was taken to hospital. After being assessed, the worker was released and returned to the mine to complete their shift.

Picture 3. Smoke and soot damage to water cart

April 2023 – IncNot0044568

A Caterpillar 789 haul truck had an engine fire while operating on a ramp in the main pit. The operator observed smoke and flames from the engine bay and between the tub/tray. An emergency was initiated. The operator stopped the truck. The operator was unable to remove the retaining pin for the fire suppression system to allow them to manually activate the fire suppression system. The operator exited the truck safely and the fire suppression system activated automatically once the operator was off the truck. Watercarts and ERT attended the incident and extinguished the fire.

Picture 4. Haul truck following engine fire

Notified incidents

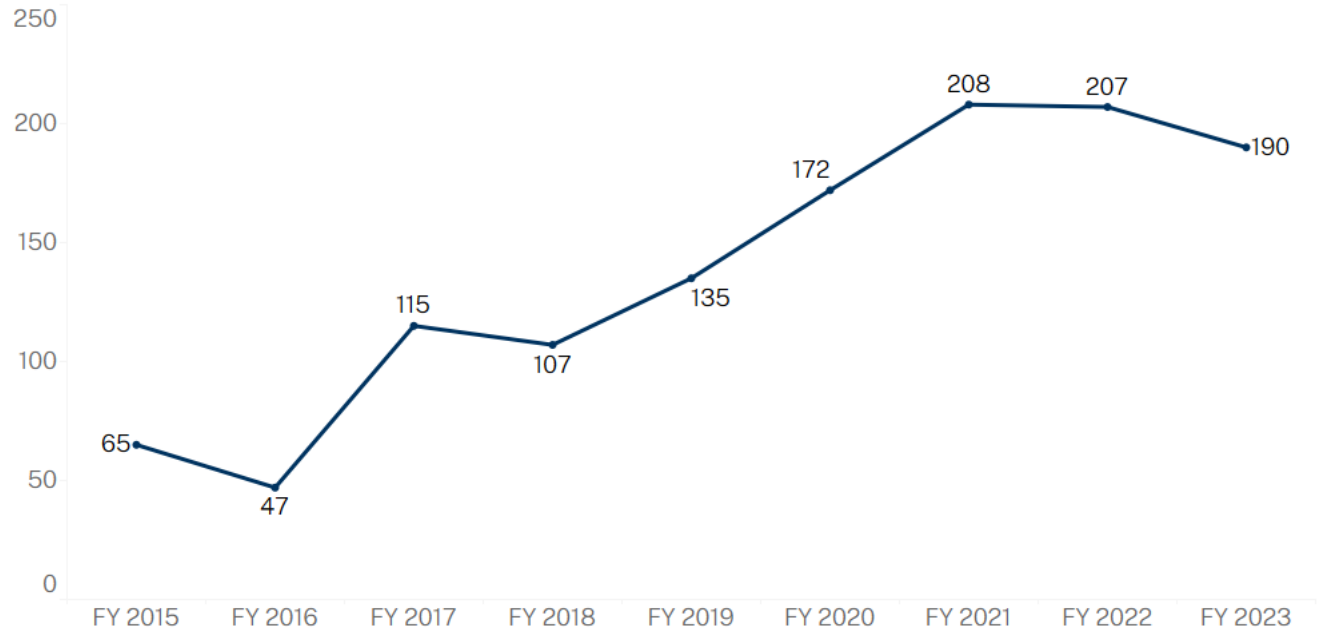
Notified incidents between FY2015 and FY2023

Figure 1 relates to incidents involving fires on mobile plant notified to the Regulator each financial year since FY2015, based on the date the incident occurred.

Figure 1 shows an 8% decrease in notified incidents in FY2023, following a 94% increase between FY2018 and FY2021.

The overall increase in notified FOMP incidents can be explained in part by amendments to the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 in February 2020 to include a duty to notify all incidents where there was 'an uncontrolled fire on mobile plant that is in operation (whether operated directly, remotely or autonomously)' (clause 124(5)(u)).

Figure 1. Notified incidents between FY2015 and FY2023



Notified incidents by legislative requirement to report

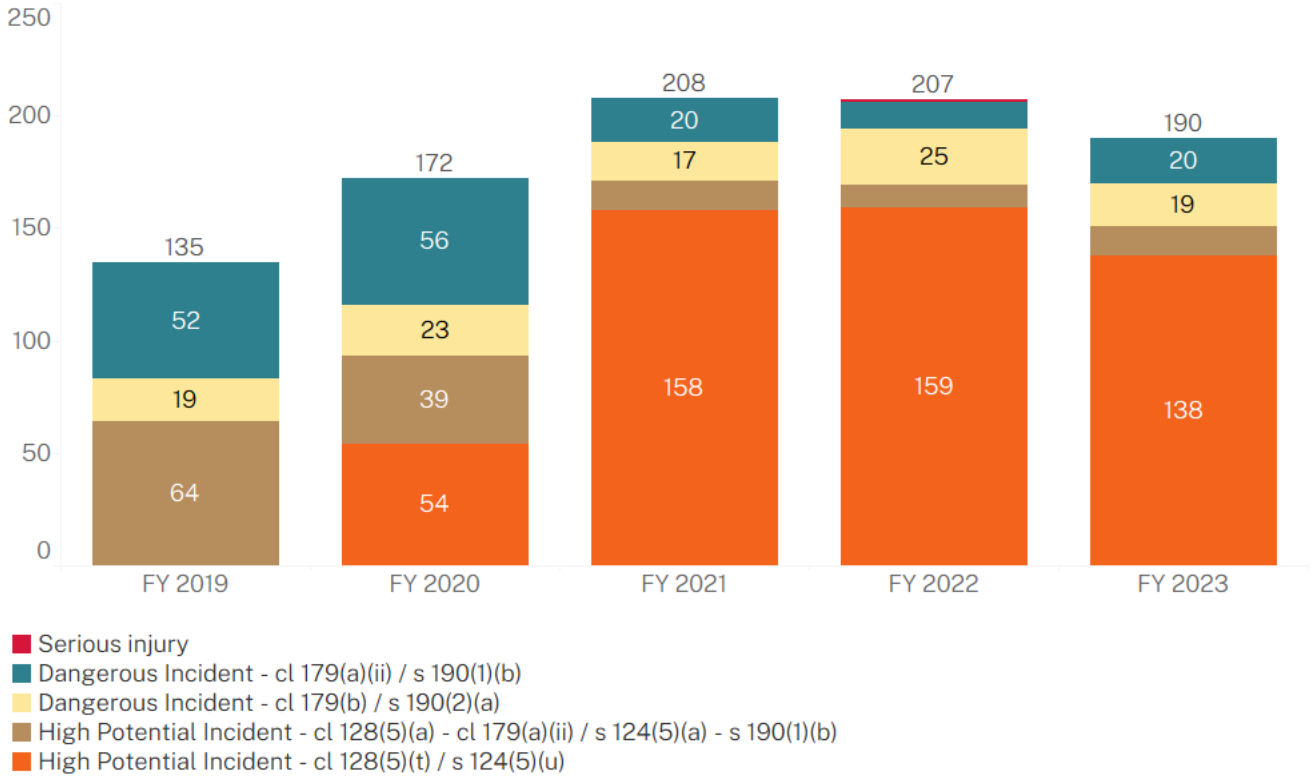
Figure 2 highlights the number of notified incidents recorded, by the legislative requirement to report.

Most fires on mobile plant notified to the Regulator in FY2023 (79%) were recorded as high potential incidents. The remainder were recorded as dangerous incidents. This aligns with the previous 4 years except for FY2022 where one serious injury was recorded.

Incidents recorded as a dangerous incident occur where there was 'a fire in the underground parts of a mine, including where the fire is in the form of an oxidation that releases heat and light' (s190(2)(a)).

Incidents recorded as a high potential incident occur where the incident would have been a dangerous incident if a person were reasonably in or could have been in the vicinity at the time (s124(5)(a)). In the case of fire on mobile plant, where there is an uncontrolled fire on mobile plant that is in operation, whether operated directly, remotely or autonomously (s124(5)(u)).

Figure 2. Notified incidents by legislative requirement to report between FY2019 and FY2023



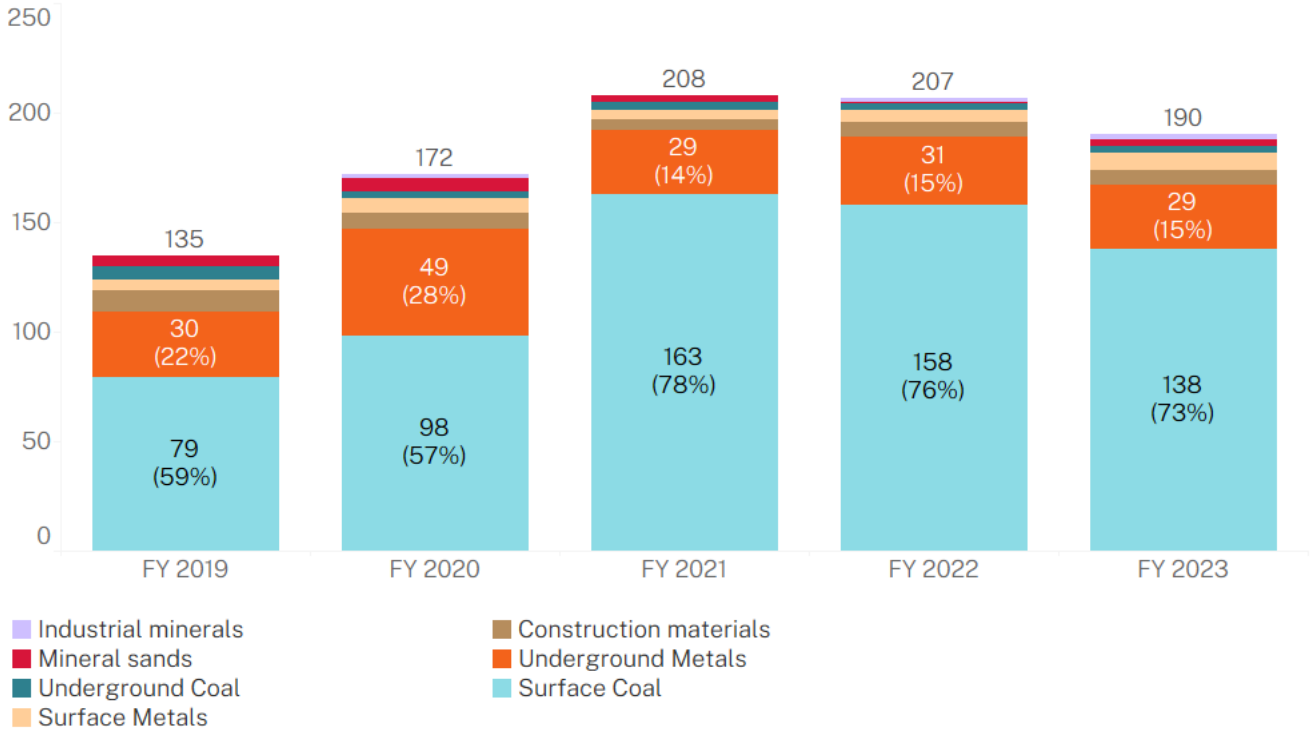
Notified incidents by mine and operation type

Figure 3 shows the number of notified incidents by mine type, operation type and incident location.

The breakdown has remained consistent over the last 3 years with most notified incidents occurring at mines categorised as surface coal mines followed by underground metals mines. In FY2023 these 2 categories accounted for 88% of notified incidents.

Small increases were observed in notified incidents occurring at mines categorised as surface metals and mineral sands mines.

Figure 3. Notified incidents by mine and operation type between FY2019 and FY2023

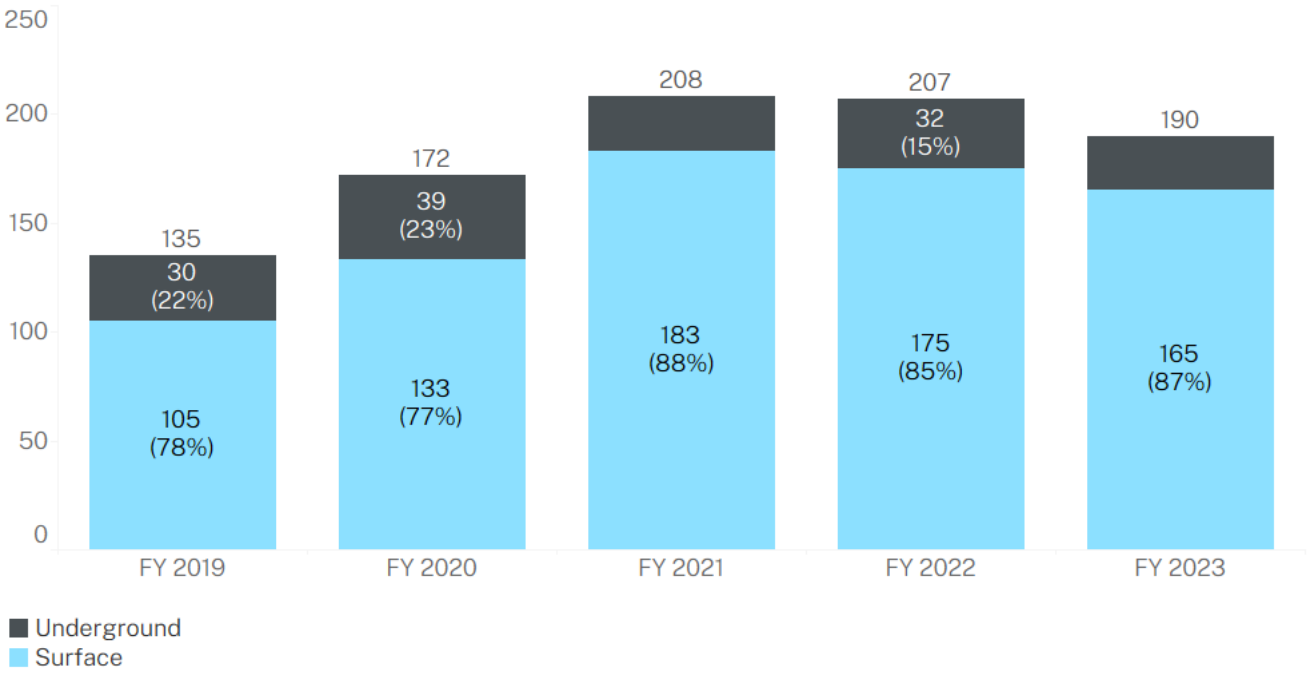


Notified incidents by incident location

Figure 4 shows that the actual location of FOMP incidents, irrespective of the mine operation type, typically occurs on the surface rather than underground.

There were 25 FOMP incidents reported as occurring underground in FY2023, a decrease from 32 underground FOMP incidents in FY2022.

Figure 4. Notified incidents by incident location between FY2019 and FY2023



Notified incidents by mine type, operation type and incident location

Fires on mobile plant at surface coal mines have accounted for most notified FOMP incidents every year for the past 5 years (73% in FY2023). FOMPs occurring at an underground location in underground metals mines continue to be the second highest category with 13% of incidents in FY2023.

Since 2019 the percentage of FOMP incidents occurring underground at mines classified as underground metals mines and underground coal mines has decreased from 22% to 13%.

Of the 912 notified FOMP incidents since FY2019, only 1% occurred underground at an underground coal mine.

Table 1. Notified incidents by mine type, operation type and incident location 2022–23

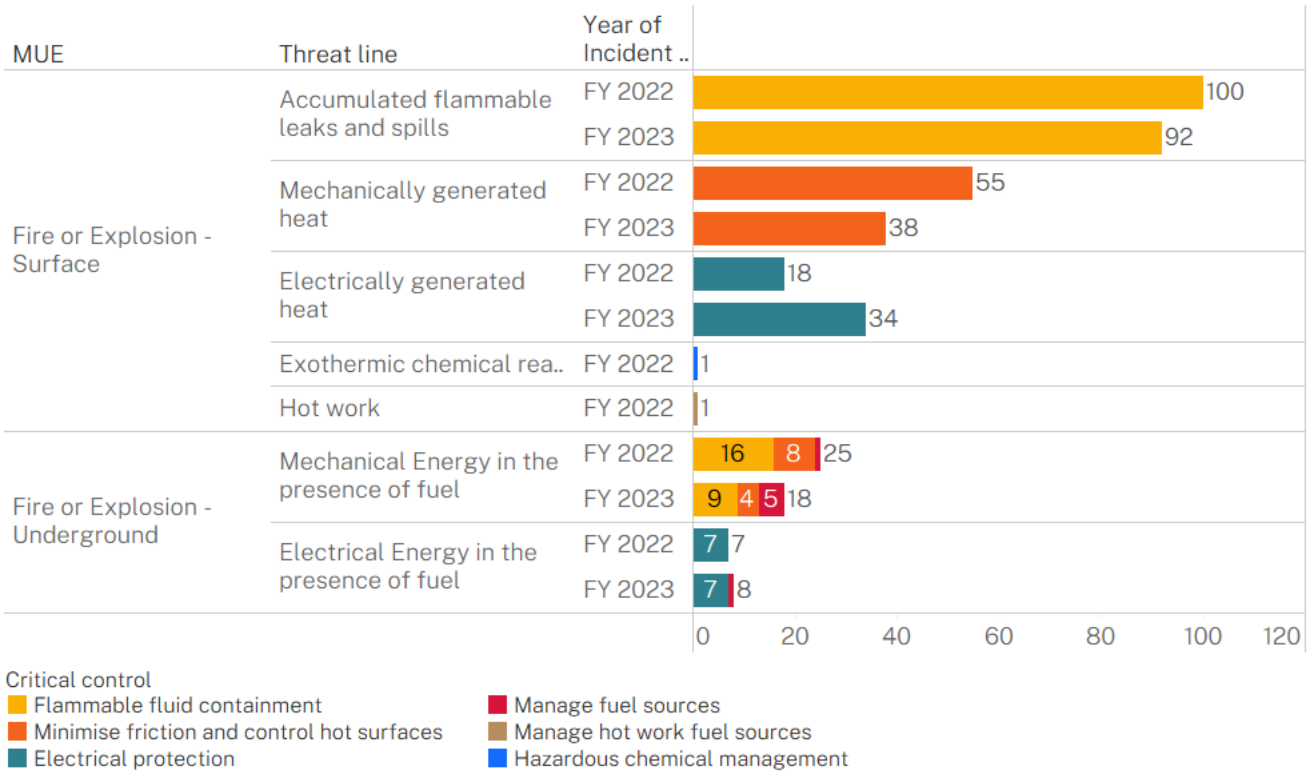
Mine type / Operation type / Incident location	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Grand total
Surface coal	79	98	163	158	138	636
Underground metals — Underground location	27	37	24	30	24	142
Construction materials	10	7	5	7	7	36
Surface metals	5	7	4	5	8	29
Underground metals — Surface location	3	12	5	1	5	26
Mineral sands	5	6	3	1	3	18
Underground coal — Surface location	3	1	3	1	2	10
Underground coal — Underground location	3	2	1	2	1	9
Industrial minerals	0	2	0	2	2	6
Grand total	**135**	**172**	**208**	**207**	**190**	**912**

Notified incidents classified by hazard, MUE, threat and critical control

Hazard management bowties are a widely used risk management tool that incorporates preventative and mitigating controls onto threat lines that relate to a material unwanted event (MUE). The Regulator uses MUE bowtie frameworks when proactively assessing how mine sites manage their principal hazards. Since October 2019, these MUE bowtie frameworks have also been used to classify notified incidents. Classifications highlight increased areas of risk at hazard, MUE, threat and critical control levels.

Most threats showed a decrease in notified FOMP incidents from FY2022. The main exception was surface electrically generated heat which increased by 89% from 18 in FY2022 to 34 in FY2023.

Figure 5. Notified incidents classified by MUE, threat and critical control FY2022 and FY2023

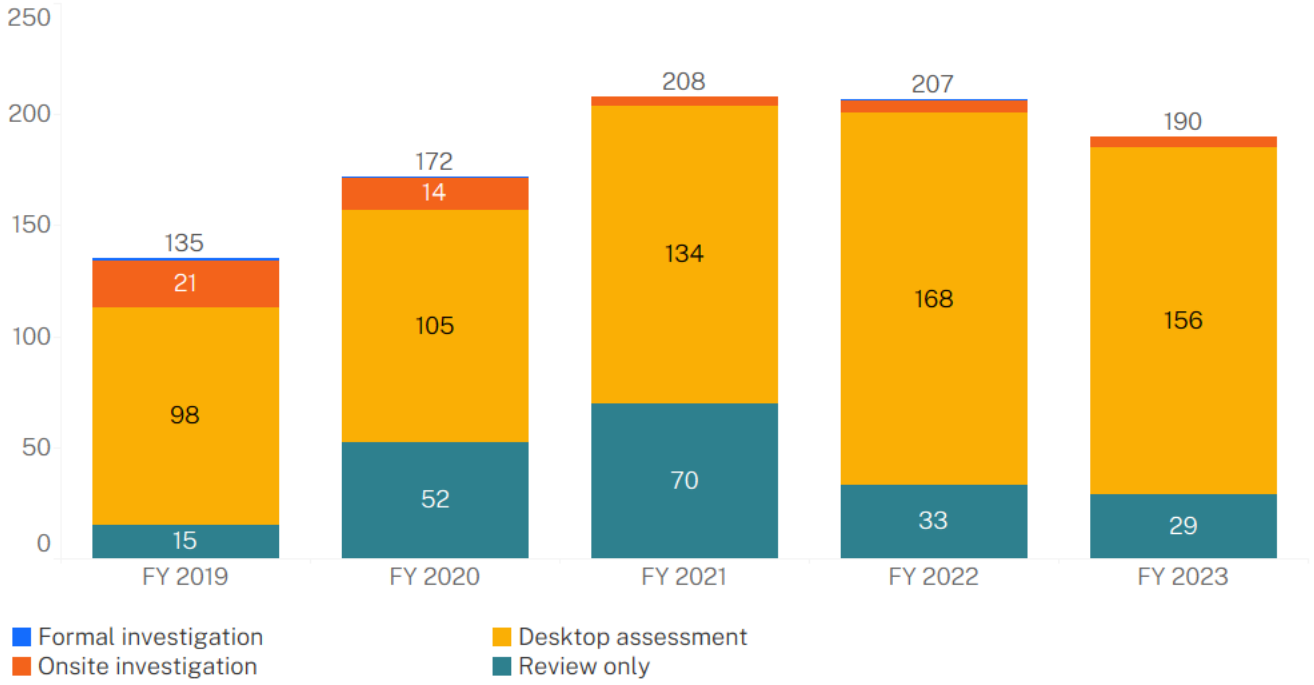


Our response to notified incidents involving FOMP

The Regulator holds the position that all fires that occur on mobile plant are preventable (see position paper). Each incident reported is assessed and outcomes reviewed. This process involves an inspector attending the mine (onsite investigation) or reviewing investigation findings and actions (desktop assessment).

Figure 6 shows that in FY2023, desktop assessments were the Regulator's response to 82% of notified fire on mobile plant incidents, with 5 onsite investigations commencing during the year.

Figure 6. Notified incidents by response level between FY2019 and FY2023

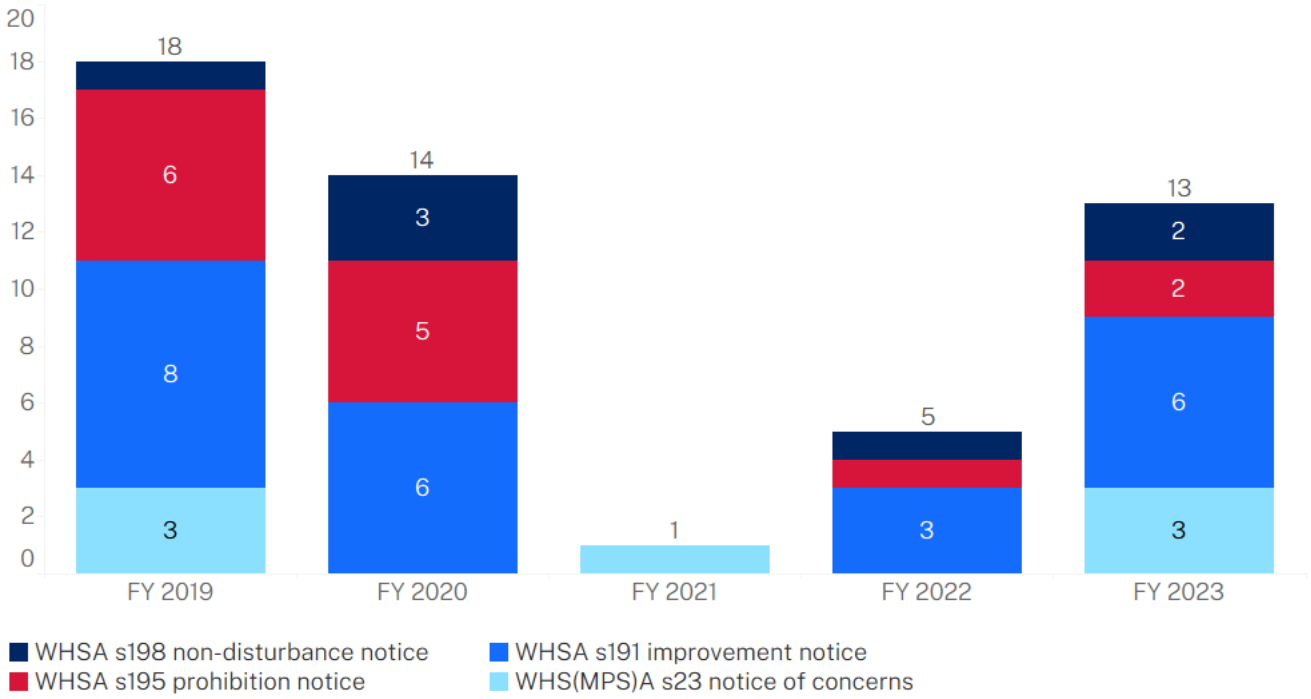


Notices issued

As part of the Regulator's position paper on preventing fires on mobile plant — where a mine operator has not taken appropriate steps to manage the risk of fires on mobile plant, escalated enforcement action will be taken.

Figure 7 shows that 13 notices were issued in relation to notified FOMP incidents in FY2023, with s191 improvement notices (6), s23 notices of concern (3), s195 prohibition notices (2) and s198 non-disturbance notices (2) issued under the *Work Health and Safety (Mines and Petroleum Sites) Act 2013*. This is an increase of 160% compared to the 5 notices issued in FY2022.

Figure 7. Notices issued in relation to FOMP incidents between FY2019 and FY2023



Fires on mobile plant ancillary reports

When an incident involving fires on mobile plant is notified to the Regulator, additional information, known as an ancillary report, must be submitted via the Regulator Portal no later than 30 days after the incident was required to be notified. There were 190 ancillary reports completed for 2022–23.

Ancillary reports – combination heat/fuel sources

Data recorded in ancillary reports in notified FOMP incidents in FY2023 indicate that the most common heat source/fuel source combination was exhaust system and hydraulic oil, accounting for 32 of the 190 incidents (17%).

The second most common were turbo system and engine oil, and electrical component and electrical insulation materials (each accounting for 18 of 190 incidents – 9%).

Other notable heat source/fuel source combinations were exhaust system and diesel (14) and exhaust system and engine oil (11).

Figure 8. Ancillary reports — fuel sources combined with heat sources — FY2023

	Fuel sources																	
Heat sources	Gases	Hydrocarbon contaminated exhaust system lagging	Hydrocarbon contaminated sound suppression or insulation material	Paint	Sound suppression or insulation material	Tyre	Coolant	Rubber	Gear oil	Plastic	Rags, cartons or other debris	Grease	Diesel	Other	Electrical insulation materials	Engine oil	Hydraulic oil	Grand Total
Exhaust system	1						3	1			3		14	5	1	11	32	71
Turbo		1	1		1						1		3	4		18	9	38
Electrical component														6	18	3	2	29
Friction						1		1	2	2		6		2	1		2	17
Electrical fault				1						1			1	2	6	1	1	13
Engine													3	1	1	2	2	9
Battery											1			2	3			6
Other										1							3	4
Bearing failure								1	2									3
Grand Total	1	1	1	1	1	1	3	3	4	4	5	6	21	22	30	35	51	190

Incidents
1 32

Table 2. Ancillary reports — top 10 fuel source combined with heat source — FY2019 to FY2023

Heat source and fuel source	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Grand total
Exhaust system + hydraulic oil	17	19	20	26	32	114
Electrical component + electrical wiring	11	16	24	21	18	90
Turbo + engine oil	5	15	30	21	18	89
Turbo + hydraulic oil	8	19	16	18	9	70
Exhaust system + engine oil	4	10	15	16	11	56
Exhaust system + diesel or petrol	5	5	9	11	14	44
Exhaust system + other	4	6	8	16	5	39
Turbo + other	2	8	10	6	4	30
Engine + hydraulic oil	7	6	6	5	2	26
Electrical component + other	3	4	5	5	6	23
Engine + diesel	4	5	2	9	3	23

Ancillary reports — extinguished by

Figure 9 shows that a handheld fire extinguisher was the most common method of extinguishment for fires on mobile plant (45%) in FY2023. The second most common method of extinguishment was a manually deployed fire protection system (23%). In 11% of incidents (21 of 190), the FOMP self-extinguished.

Figure 9. Ancillary reports — extinguished by – FY2023

	Fire protection system							
Extinguished by	Engineered - Foam	Engineered - Water mist	N/A	No permanent fire suppression system installed	Pre-engineered - Dual agent	Pre-engineered - Foam water spray	Pre-engineered - Powder	Grand Total
Hand-held fire extinguisher	22	3	4	14	10	17	15	85
Fire protection system (manually deployed)	13	2			1	9	18	43
Self-extinguished	5			1	8	6	1	21
Water tanker	4	2		2	2	1	2	13
Fire protection system (automatically deployed)	6	1			1	2	1	11
Combination fire protection system and hand-held fire extinguisher	2				1	4	2	9
Combination fire protection system and water-tanker	1					1	1	3
Other				3				3
Miscellaneous water hose							1	1
Smothered						1		1
Grand Total	53	8	4	20	23	41	41	190

Incidents
1 22

Table 3. Ancillary reports — extinguished by — FY2019 and FY2023

Heat source and fuel source	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Grand total
Hand-held fire extinguisher	30	66	83	84	85	**348**
Fire protection system (manually deployed)	33	47	55	56	43	**234**
Fire protection system (automatically deployed)	10	18	19	26	11	**84**
Self-extinguished	7	14	19	19	21	**80**
Water tanker	9	6	13	16	13	**57**
Other		7	14	3	3	**27**
Combination fire protection system and hand-held fire extinguisher					9	**9**
N/A			3	2		**5**
Combination fire protection system and water-tanker					3	**3**
Not classified			1			**1**
Miscellaneous water hose					1	**1**
Smothered					1	**1**
Grand Total	**89**	**158**	**207**	**206**	**190**	**850**

Ancillary reports — failed component

The hose was the most common single failed component in FY2023, being involved in 18% of FOMP incidents. Notable increases from FY2022 were observed in failed components of ‘any other electrical component’ (9 to 15), ‘fuel system component’ (5 to 10) and ‘hydraulic system component’ (0 to 5).

Figure 10. Ancillary reports — failed components — FY2023

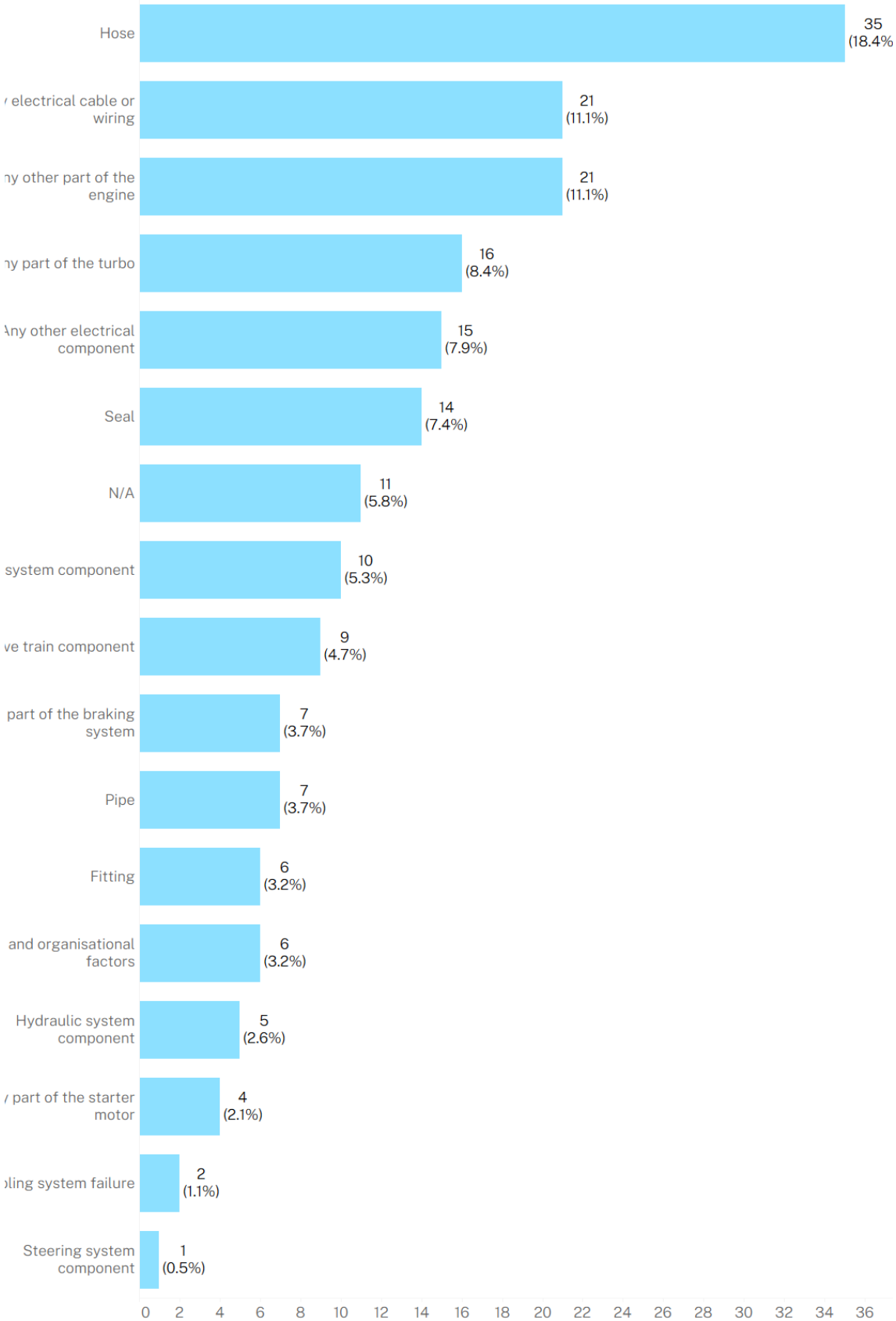


Table 4. Ancillary reports — failed component — FY2019 to FY2023

Heat source and fuel source	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Grand total
Hose	27	31	45	49	35	**187**
Any electrical cable or wiring	11	18	26	23	21	**99**
Any part of the turbo	6	13	27	23	16	**85**
Any other part of the engine	2	15	20	19	21	**77**
Seal	10	18	14	15	14	**71**
Fitting	8	14	11	16	6	**55**
Any other electrical component	5	7	10	9	15	**46**
Drive train component	4	8	12	10	9	**43**
N/A	5	6	3	8	11	**33**
Any part of the braking system	1	5	8	7	7	**28**
Pipe	1	5	8	7	7	**28**
Fuel system component	2	2	5	5	10	**24**
Human and organisational factors	3	4	6	3	6	**22**
Any part of the starter motor	2	5	5	5	4	**21**
Cooling system failure	1	3	3	5	2	**14**
Hydraulic system component	1	4	2		5	**12**
Any part of the air conditioning system			1	2		**3**
Not classified			1			**1**
Steering system component					1	**1**
Grand Total	**89**	**158**	**207**	**206**	**190**	**850**

Ancillary reports — combination failed component and cause of component failure

The most common combinations of failed component and cause of component failure in FY2023 were ‘hose’ and ‘wear and tear’ (13 incidents) and ‘hose’ and ‘fatigue’ (11 incidents). These combinations accounted for 13% of all FOMP incidents in FY2023.

Categories may be recorded as ‘other’ for several reasons including human error or uncategorised component failure. The Regulator recently conducted a review of incidents in which failed components and cause of component failure were listed as ‘other’ to reduce the instances of this grouping in future reports.

Figure 11. Ancillary reports — failed component and cause of component failure — FY2023

	Cause of component failure														
Failed component	Corrosion	Failure of electrical component	Fatigue	Frictional heating	Human and organisational factors	Incorrect component fitted	Loose fitting	N/A	Other	Physical damage	Poor lubrication	manufactured and assembled component	Thermal degradation	Wear and tear	Grand Total
Hose	1		11		1		2		3	4				13	35
Any electrical cable or wiring	3	3	1				1		3	5		1		4	21
Any other part of the engine			4		1		1		6	1		1	2	5	21
Any part of the turbo			4				1	1	7		1		1	1	16
Any other electrical component	1	4	1				2		3					4	15
Seal			2			1	3		3	1		1	1	2	14
N/A		1		1				7	1			1			11
Fuel system component			2		1		1	1	4			1			10
Drive train component			1	2						1				5	9
Any part of the braking system		1	1						2	1				2	7
Pipe			1				1		3	1		1			7
Fitting			1		1		2		1					1	6
Human and organisational factors				1	2				3						6
Hydraulic system component									3	1				1	5
Any part of the starter motor		1	1				1							1	4
Cooling system failure		1												1	2
Steering system component		1													1
Grand Total	5	12	30	4	6	1	15	9	42	15	1	6	4	40	190

Incidents
1 13

Table 5. Ancillary reports — top 10 failed component and cause of component failure FY2019–FY2023

Failed component and cause	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Grand total
Hose + wear and tear	9	11	18	13	13	**64**
Hose + physical damage	9	7	9	10	4	**39**
Any electrical cable or wiring + other	5	9	10	8	3	**35**
Hose + other	7	7	5	13	3	**35**
Any part of the turbo + fatigue	1	6	12	9	4	**32**
Any other part of the engine + other	2	6	10	8	6	**32**
Hose + fatigue	2	3	7	6	11	**29**
Any other electrical component + other	3	7	10	4	3	**27**
Any part of the turbo + other	3	1	8	6	7	**25**
Fitting + loose fitting	3	5	5	8	2	**23**

Incident details

The information in the table provides a summary of the fire on mobile plant incidents reported in FY2023.

Table 6. Fires on mobile plant incidents reported in FY2023

Equipment type	Equipment model	Failed component	Heat source	Fuel source	Extinguished by
Coal / open cut					
Dozer	854K	Fitting	Exhaust system	Diesel	Combination fire protection system and hand-held fire extinguisher
			Turbo	Diesel	Fire protection system (manually deployed)
		Hose	Exhaust system	Diesel	Fire protection system (automatically deployed)
	D10T	Any electrical cable or wiring	Electrical fault	Diesel	Combination fire protection system and hand-held fire extinguisher
		Any other electrical component	Electrical fault	Electrical insulation materials	Hand-held fire extinguisher
		Any other part of the engine	Exhaust system	Electrical insulation materials	Hand-held fire extinguisher
			Exhaust system	Engine oil	Hand-held fire extinguisher
			Turbo	Engine oil	Hand-held fire extinguisher
		Fitting	Engine	Diesel	Hand-held fire extinguisher
		Hose	Turbo	Hydraulic oil	Fire protection system (manually deployed)
		Seal	Exhaust system	Hydraulic oil	Fire protection system (automatically deployed)
	D10T2	Seal	Exhaust system	Hydraulic oil	Combination fire protection system and hand-held fire extinguisher
			Exhaust system	Hydraulic oil	Hand-held fire extinguisher

Equipment type	Equipment model	Failed component	Heat source	Fuel source	Extinguished by
Dozer	D11	Hydraulic system component	Engine	Diesel	Water tanker
	D11R	Drive train component	Bearing failure	Gear oil	Self-extinguished
		Hose	Other	Hydraulic oil	Hand-held fire extinguisher
	D11T	Any electrical cabling or wiring	Electrical component	Electrical insulation materials	Hand-held fire extinguisher
			Engine	Electrical insulation materials	Hand-held fire extinguisher
		Any other part of the engine	Exhaust system	Engine oil	Fire protection system (manually deployed)
			Exhaust system	Hydraulic oil	Hand-held fire extinguisher
		Drive train component	Friction	Other	Hand-held fire extinguisher
			Bearing failure	Gear oil	Hand-held fire extinguisher
		Fuel system component	Exhaust system	Diesel	Hand-held fire extinguisher
		Hose	Exhaust system	Hydraulic oil	Fire protection system (manually deployed)
			Exhaust system	Hydraulic oil	Hand-held fire extinguisher
		Hydraulic system component	Exhaust system	Hydraulic oil	Fire protection system (manually deployed)
		Seal	Turbo	Hydraulic oil	Fire protection system (manually deployed)
			Other	Hydraulic oil	Self-extinguished
	D11T GEB	Fuel system component	Exhaust system	Diesel	Combination fire protection system and water tanker
Drill rig and/or bolter	D75k	Any other part of the engine	Turbo	Other	Hand-held fire extinguisher
		Human and organisational factors	Turbo	Hydrocarbon contaminated exhaust system lagging	Hand-held fire extinguisher
		N/A	Electrical component	Electrical insulation materials	Hand-held fire extinguisher

Equipment type	Equipment model	Failed component	Heat source	Fuel source	Extinguished by
Drill rig and/or bolter	DR460	Human and organisational factors	Other	Plastic	Hand-held fire extinguisher
	MD6290	N/A	Friction	Plastic	Hand-held fire extinguisher
	MD6310	Seal	Exhaust system	Hydraulic oil	Fire protection system (manually deployed)
	MD6420	Seal	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
	Pit Viper 235	Hydraulic system component	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
	Ree-Drill SKF	Any electrical cabling or wiring	Electrical component	Electrical insulation materials	Hand-held fire extinguisher
	SK50	N/A	Engine	Other	Water tanker
	SKF98	Any part of the starter motor	Electrical component	Electrical insulation materials	Hand-held fire extinguisher
	SKS75	Hose	Exhaust system	Coolant	Fire protection system (manually deployed)
	SKS-W	Pipe	Turbo	Diesel	Fire protection system (manually deployed)
	TRX68SKF	Hose	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
Dump truck or haul truck	9.30E-01	N/A	Electrical component	Other	Hand-held fire extinguisher
	730E	Any part of the turbo	Turbo	Engine oil	Fire protection system (manually deployed)
	730B Ejector	Hose	Turbo	Hydraulic oil	Fire protection system (manually deployed)
	775G	Pipe	Exhaust system	Diesel	Fire protection system (automatically deployed)
	789C	Any other part of the engine	Electrical fault	Engine oil	Fire protection system (manually deployed)

Equipment type	Equipment model	Failed component	Heat source	Fuel source	Extinguished by
Dump truck or haul truck	789C	Any part of the turbo	Exhaust system	Engine oil	Fire protection system (manually deployed)
			Turbo	Engine oil	Fire protection system (manually deployed)
		Human and organisational factors	Turbo	Rags, cartons or other debris	Hand-held fire extinguisher
	789C XQ	Any part of the turbo	Exhaust system	Engine oil	Fire protection system (manually deployed)
			Turbo	Engine oil	Hand-held fire extinguisher
	789D	Hose	Turbo	Engine oil	Fire protection system (manually deployed)
	789D XQ	Any other part of the engine	Engine	Engine oil	Fire protection system (manually deployed)
	793C	Any part of the turbo	Turbo	Engine oil	Hand-held fire extinguisher
		Hose	Exhaust system	Other	Hand-held fire extinguisher
	793C XQ	Seal	Exhaust system	Hydraulic oil	Fire protection system (manually deployed)
	793D	Any electrical cabling or wiring	Electrical component	Engine oil	Hand-held fire extinguisher
		Fuel system component	Exhaust system	Diesel	Fire protection system (automatically deployed)
	793D	N/A	Exhaust system	Rags, cartons or other debris	Hand-held fire extinguisher
		Seal	Exhaust system	Hydraulic oil	Fire protection system (manually deployed)
	793D XQ	Any other part of the engine	Exhaust system	Other	Fire protection system (manually deployed)
	797F	Seal	Turbo	Engine oil	Fire protection system (manually deployed)

Equipment type	Equipment model	Failed component	Heat source	Fuel source	Extinguished by
Dump truck or haul truck	830E-1AC	Any other electrical component	Electrical component	Electrical insulation materials	Water tanker
			Electrical fault	Electrical insulation materials	Water tanker
		Any part of the braking system	Electrical component	Other	Self-extinguished
	830E-AC	Any part of the braking system	Electrical fault	Other	Self-extinguished
	830E-AC1	Any part of the braking system	Friction	Hydraulic oil	Hand-held fire extinguisher
	930E	Any electrical cable or wiring	Electrical component	Other	Hand-held fire extinguisher
		Any other electrical component	Electrical fault	Paint	Self-extinguished
	EH3500	Human and organisational factors	Turbo	Engine oil	Self-extinguished
	EH5000	Any part of the turbo	Engine	Engine oil	Water tanker
	EH5000-AC3	Any part of the turbo	Turbo	Engine oil	Self-extinguished
		Hose	Turbo	Other	Water tanker
		Human and organisational factors	Friction	Grease	Hand-held fire extinguisher
	EH5000-AC3M1	Hose	Turbo	Other	Hand-held fire extinguisher
	NHL 360A	Seal	Friction	Hydraulic oil	Self-extinguished
	T282C	Any electrical cable or wiring	Electrical fault	Electrical insulation materials	Hand-held fire extinguisher
Elevated work platform	800AJ	Any other electrical component	Battery	Other	Other
Excavator or shovel	996	Hose	Exhaust System	Engine oil	Hand-held fire extinguisher
	3600	Cooling system failure	Exhaust System	Coolant	Fire protection system (automatically deployed)
	6060	Any electrical cable or wiring	Electrical component	Electrical insulation materials	Hand-held fire extinguisher
		Hose	Exhaust system	Hydraulic oil	Combination fire protection system and hand-held fire extinguisher

Equipment type	Equipment model	Failed component	Heat source	Fuel source	Extinguished by
Excavator or shovel	6090	Hose	Exhaust System	Coolant	Hand-held fire extinguisher
		Pipe	Exhaust System	Hydraulic oil	Hand-held fire extinguisher
	9350	Any part of the turbo	Exhaust System	Engine oil	Self-extinguished
	9400	Drive train component	Friction	Gear oil	Self-extinguished
	EX1900-6	Any part of the turbo	Turbo	Engine oil	Fire protection system (manually deployed)
	EX3600-6	Pipe	Turbo	Engine oil	Fire protection system (manually deployed)
	EX8000	Any other electrical component	Electrical component	Hydraulic oil	Hand-held fire extinguisher
		Any part of the turbo	Turbo	Engine oil	Hand-held fire extinguisher
		Seal	Exhaust system	Other	Hand-held fire extinguisher
	EXC3600-3	Any other part of the engine	Exhaust system	Other	Self-extinguished
	PC 5500	Any part of the starter motor	Electrical fault	Electrical insulation materials	Hand-held fire extinguisher
	R996A	Any part of the starter motor	Electrical component	Engine oil	Self-extinguished
	R9400	Any other part of the engine	Turbo	Sound suppression or insulation material	Hand-held fire extinguisher
	R9800	Any electrical cable or wiring	Electrical fault	Electrical insulation materials	Miscellaneous water hose
	RH170	Hose	Turbo	Hydraulic oil	Combination fire protection system and hand-held fire extinguisher
		N/A	Turbo	Other	Fire protection system (automatically deployed)
	ZX470	Drive train component	Other	Hydraulic oil	Hand-held fire extinguisher

Equipment type	Equipment model	Failed component	Heat source	Fuel source	Extinguished by
Grader	16M	Fuel system component	Exhaust system	Diesel	Fire protection system (manually deployed)
			Exhaust system	Diesel	Hand-held fire extinguisher
			Turbo	Diesel	Water tanker
			Engine	Diesel	Combination fire protection system and hand-held fire extinguisher
		N/A	Battery	Electrical insulation materials	Smothered
		Steering system component	Electrical component	Electrical insulation materials	Hand-held fire extinguisher
	24H	Any electrical cable or wiring	Electrical component	Electrical insulation materials	Hand-held fire extinguisher
	24M	Any other part of the engine	Exhaust system	Engine oil	Fire protection system (manually deployed)
			Rubber	Engine oil	Combination fire protection system and water tanker
		Any part of the turbo	Turbo	Engine oil	Fire protection system (automatically deployed)
		Fitting	Exhaust system	Hydraulic oil	Fire protection system (automatically deployed)
		Seal	Exhaust system	Engine oil	Fire protection system (manually deployed)
Heavy/special purpose vehicle	Caterpillar 785C Water Cart	Drive train component	Friction	Grease	Water tanker
	D10T	Fitting	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
	Off-highway water truck	Any part of the turbo	Exhaust system	Engine oil	Fire protection system (manually deployed)
	R620	Any electrical cable or wiring	Battery	Electrical insulation materials	Hand-held fire extinguisher
	SK50	Any electrical cable or wiring	Electrical component	Electrical insulation materials	Hand-held fire extinguisher
	Volvo: FMX/ Elphinstone: Bulkmaster 7	Any electrical cable or wiring	Electrical component	Electrical insulation materials	Hand-held fire extinguisher

Equipment type	Equipment model	Failed component	Heat source	Fuel source	Extinguished by
Light or medium vehicle	Hilux GUN	Any part of the braking system	Friction	Grease	Hand-held fire extinguisher
	Hilux	Drive train component	Friction	Grease	Hand-held fire extinguisher
	Hilux GUN	Any other part of the engine	Friction	Grease	Other
Loader	988G	Any electrical cable or wiring	Electrical fault	Other	Fire protection system (automatically deployed)
	L1850	Any part of the braking system	Friction	Electrical insulation materials	Hand-held fire extinguisher
		Hose	Exhaust system	Engine oil	Hand-held fire extinguisher
	WA900	Hydraulic system component	Electrical fault	Hydraulic oil	Self-extinguished
Service truck/Lube truck	775F	Fuel system component	Exhaust system	Diesel	Fire protection system (manually deployed)
Water truck	777F	Any other electrical component	Electrical component	Electrical insulation materials	Self-extinguished
		Hose	Exhaust system	Hydraulic oil	Fire protection system (manually deployed)
	777G	Hose	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
	785-5	Hose	Exhaust system	Hydraulic oil	Combination fire protection system and water tanker
	785D	Any other electrical component	Electrical component	Electrical insulation materials	Fire protection system (manually deployed)
		Any part of the turbo	Exhaust system	Engine oil	Self-extinguished
Underground coal / Surface location					
Dozer	D8T	Hose	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
	D10T	Hose	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
Underground coal / Underground location					
Heavy/special purpose vehicle	8T GP	Drive train component	Friction	Tyre	Hand-held fire extinguisher

Equipment type	Equipment model	Failed component	Heat source	Fuel source	Extinguished by
Surface metals					
Dozer	D10T	Hose	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
Drill rig and/or bolter	D65	Hose	Engine	Hydraulic oil	Fire protection system (manually deployed)
Dump truck or haul truck		Any other electrical component	Electrical component	Hydraulic oil	Water tanker
	730	Any part of the starter motor	Electrical component	Electrical insulation materials	Hand-held fire extinguisher
Forklift or telehandler	MX625	Any other electrical component	Electrical fault	Plastic	Hand-held fire extinguisher
Grader	16M	Hose	Exhaust system	Diesel	Fire protection system (manually deployed)
Heavy/special purpose vehicle	AT-20	Hose	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
Water truck	HM300-2	Fuel system component	Exhaust system	Diesel	Self-extinguished
Underground metals / Surface location					
Drill rig and/or bolter	Simba E7C	Any electrical cable or wiring	Electrical component	Other	Hand-held fire extinguisher
Excavator or shovel	500LC-7	Any other part of the engine	Turbo	Hydrocarbon contaminated sound suppression or insulation material	Hand-held fire extinguisher
	ZX33DLC	Any other electrical component	Battery	Electrical insulation materials	Self-extinguished
Grader	14H	Any other electrical component	Electrical component	Other	Other
Heavy/special purpose vehicle	727H	Pipe	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
Underground metals / Underground location					
Agitator	WR820	Any other part of the engine	Exhaust system	Hydraulic oil	Fire protection system (manually deployed)
				Other	Fire protection system (manually deployed)
		Any part of the braking system	Friction	Gear oil	Self-extinguished

Equipment type	Equipment model	Failed component	Heat source	Fuel source	Extinguished by
Dump truck or haul truck	EIROC 5020	Any other part of the engine	Turbo	Engine oil	Hand-held fire extinguisher
	MT54	N/A	Exhaust system	Gases	Combination fire protection system and hand-held fire extinguisher
	TH663I	Any part of the turbo	Turbo	Engine oil	Hand-held fire extinguisher
Heavy/special purpose vehicle	L90F	Any electrical cable or wiring	Electrical component	Engine oil	Fire protection system (automatically deployed)
	L120F Volvo Integrated Tool Carrier	Any part of the turbo	Turbo	Engine oil	Hand-held fire extinguisher
	MF050VC	Hose	Turbo	Hydraulic oil	Fire protection system (automatically deployed)
	SF050D	Any other electrical component	Electrical fault	Electrical insulation materials	Hand-held fire extinguisher
	Spraymec MF050VC	N/A	Exhaust system	Rags, cartons or other debris	Fire protection system (manually deployed)
Light or medium vehicle	HZJ79	Any electrical cable or wiring	Electrical component	Other	Hand-held fire extinguisher
	HZJ79R	N/A	Battery	Other	Hand-held fire extinguisher
	Land Cruiser (Double Cab)	Pipe	Exhaust system	Diesel	Combination fire protection system and hand-held fire extinguisher
Loader	IT28G	Any electrical cable or wiring	Electrical component	Electrical insulation materials	Self-extinguished
	LF90	Human and organisational factors	Friction	Other	Hand-held fire extinguisher
	LH514D	Hose	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
	LH621	Hose	Turbo	Hydraulic oil	Fire protection system (manually deployed)
	R2900G	Any electrical cable or wiring	Electrical component	Electrical insulation materials	Self-extinguished
		Fuel system component	Exhaust system	Diesel	Combination fire protection system and hand-held fire extinguisher

Equipment type	Equipment model	Failed component	Heat source	Fuel source	Extinguished by
Loader	R3000H	Any other electrical component	Electrical component	Electrical insulation materials	Self-extinguished
		Hose	Exhaust system	Hydraulic oil	Fire protection system (manually deployed)
Water truck	ISUZU FVZ 1400	Cooling system failure	Friction	Plastic	Hand-held fire extinguisher
	WR810	Any other part of the engine	Exhaust system	Rags, cartons or other debris	Fire protection system (manually deployed)
Mineral sands					
Dozer	D10T	Hose	Turbo	Hydraulic oil	Fire protection system (manually deployed)
Dump truck or haul truck	785	Seal	Turbo	Engine oil	Fire protection system (manually deployed)
Heavy/special purpose vehicle	Case IH600 Tractors	Hydraulic system component	Engine	Hydraulic oil	Water tanker
Construction materials					
Excavator or shovel	PC450LC-S	Any electrical cable or wiring	Battery	Rags, cartons or other debris	Hand-held fire extinguisher
Heavy/special purpose vehicle	740B Ejector	Any other part of the engine	Turbo	Hydraulic oil	Water tanker
	J1175	Drive train component	Bearing failure	Rubber	Hand-held fire extinguisher
Loader	HL770-9	Hose	Exhaust system	Hydraulic oil	Hand-held fire extinguisher
	WA500-8	Fitting	Exhaust system	Diesel	Self-extinguished
	WA700	Any part of the braking system	Friction	Grease	Hand-held fire extinguisher
Mobile crusher/ mobile screen	C12	N/A	Friction	Rubber	Hand-held fire extinguisher
Industrial minerals					
Excavator or shovel	6015B	Any other part of the engine	Turbo	Engine oil	Hand-held fire extinguisher
Loader	993K	Pipe	Turbo	Hydraulic oil	Fire protection system (manually deployed)

For further information refer to our dedicated Fires on mobile plant web page.

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