

Fire or explosion hazards (PHMP and risk assessment)

Small Mines Roadshow

February to April 2024

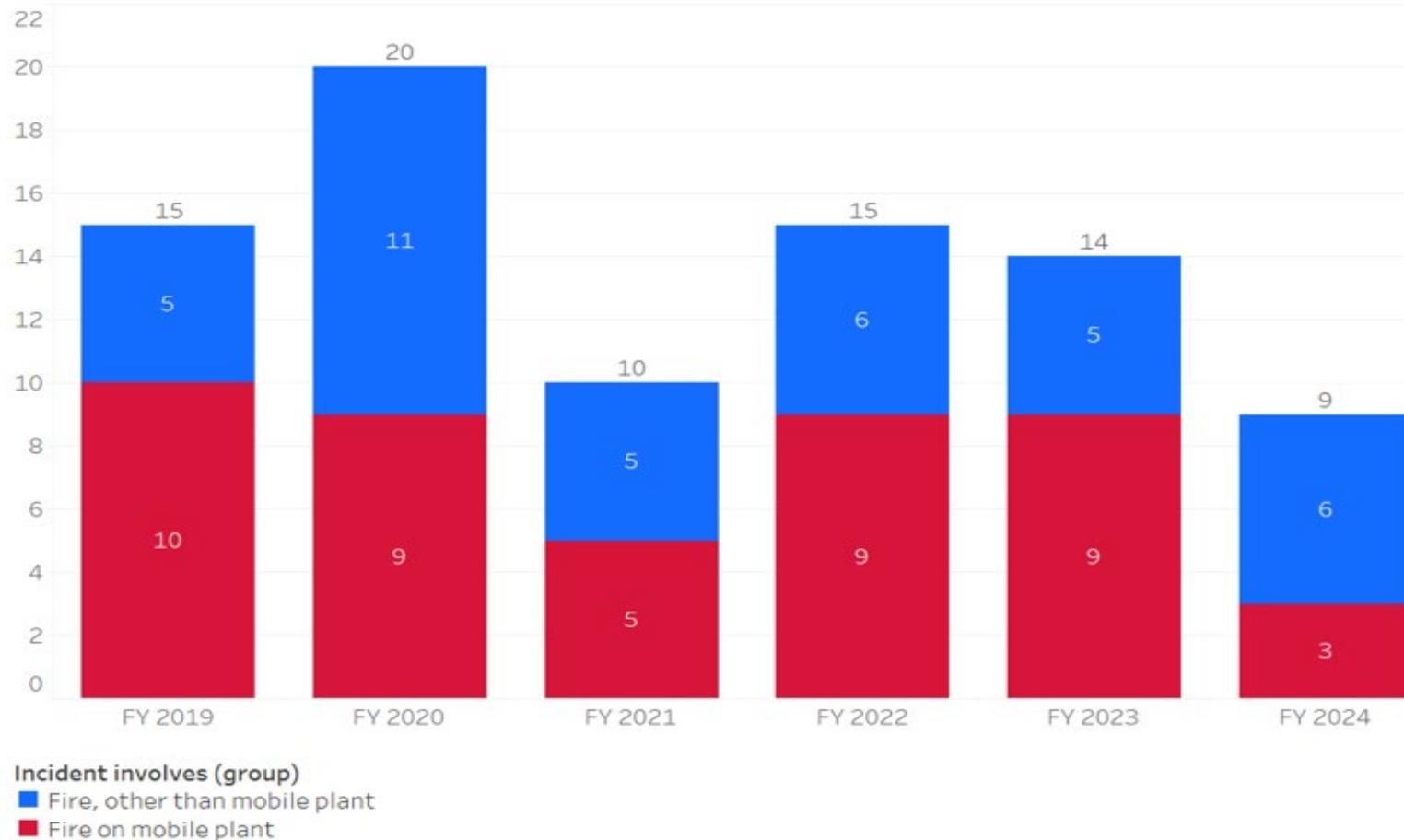


Presentation covers

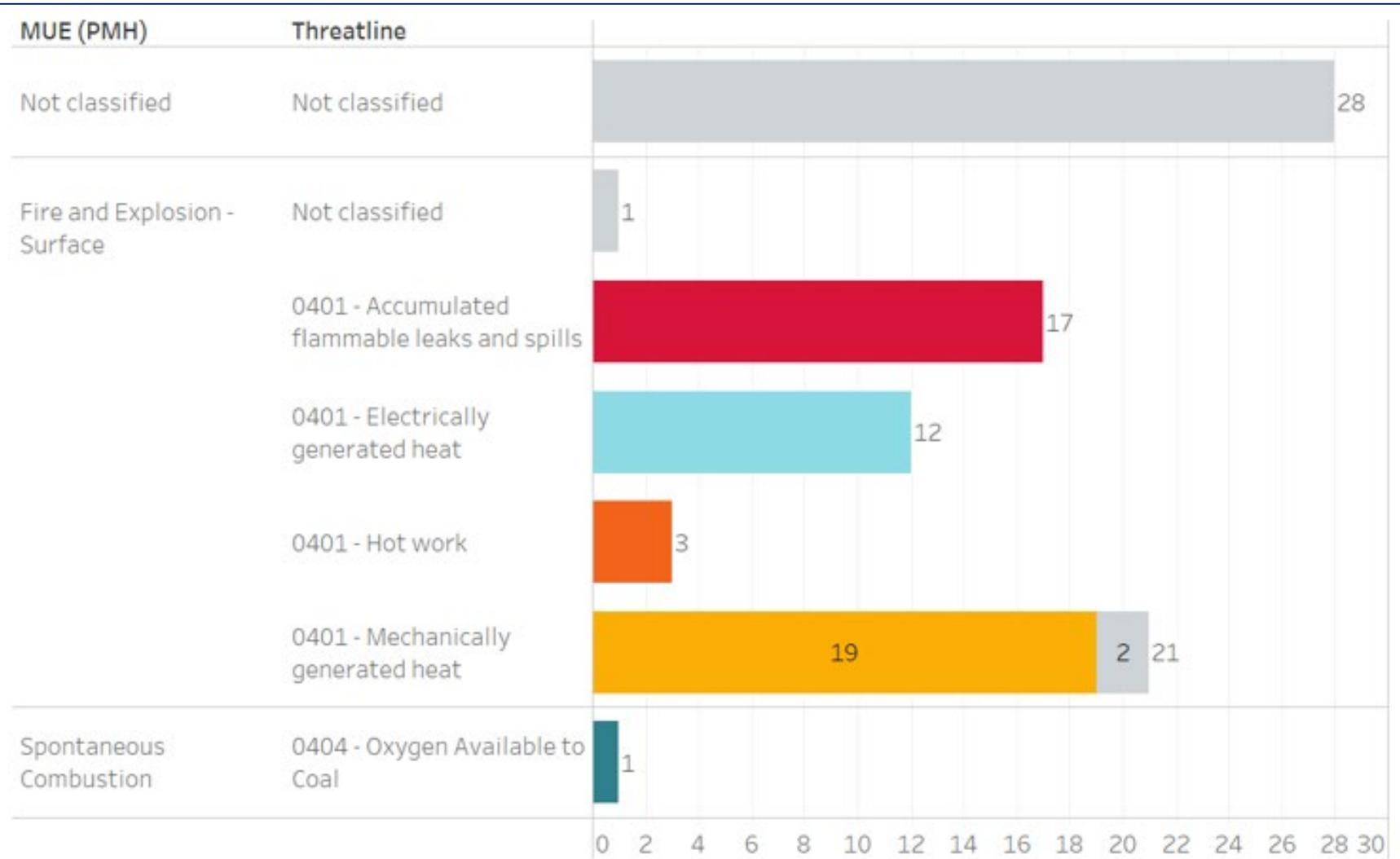
- WHS legislation and schedule 1 considerations
- Field observations and shortcomings
- Consequence of poor fire or explosion risk assessments
- Fire or explosion exercise & feedback
- Hierarchy of controls
- Good Practice
- Take home messages



Fires reported at extractive sites 2019 -2024 = (83)



Fires reported by control failure 2019 -2024 = (83)



Critical control

- Not classified
- 0401 - PC1.1 - Electrical Protection
- 0401 - PC2.1 - Minimise friction and control hot surfaces
- 0401 - PC3.2 - Flammable fluid containment
- 0401 - PC5.1 - Manage hot work fuel sources
- 0404 - PC1.2 - Identify and Respond to Heating

What does the legislation say?

Work Health and Safety (Mines and Petroleum Sites Regulation) 2022

- WHS(MPS)R – section 4 “**Meaning of Principal Hazard**”... anything that has a reasonable potential to result in multiple deaths in a single incident or a series of reoccurring incidents in relation to...(ix) **Fire or Explosion**
- Section 27 (1) mine operator **must identify** all principal hazards
- Section 27 (2) mine operator **must conduct a risk assessment** for each principal hazard identified
- Section 28 (1) mine operator **must prepare a PHMP** for each principal hazard in accordance with schedule 1
- Section 28 (2) the PHMP must provide for the **management of all aspects of risk control** in relation to the principal hazard



WHS(MPS)R 2022 - Schedule 1 considerations

The following matters must be considered in developing the control measures to manage the risks of fire or explosion –

- The **potential sources** of flammable, combustible and explosive substances
- The potential **sources of ignition**, fire or explosion, including plant, electricity, static electricity, spontaneous combustion (coal), lightning, light metal alloys, hot work and other work practices
- The **potential for propagation** of fire or explosion to other parts of the mine
- The potential sources of flammable material with a flash point of **less than 61 degrees**
- Arrangements for the management and **control of the transport and storage** of combustible liquids
- Arrangements for the prevention of fires, including the types and location of systems for the early **detection and suppression of fires**
- The **equipment for fighting fire** at the mine
- Must include details of procedures to be used for **carrying out hot work**

Inspection observations and shortcomings

- Fire or explosion risk assessments not completed **‘at all’**
- Quality of fire or explosion risk assessments **‘very poor’** (generic, cut and paste, **not location or task specific**)
- No involvement of **competent persons** (no fire potential knowledge or fire management experience)
- Missing obvious **locations and tasks** (refuelling, workshop, hot work, mobile plant, tyres, electricity, explosives)



Consequences of poor fire or explosion risk assessments

- Failure to identify areas and tasks where fire could be a hazard
- Failure to assess fire hazard and propagation potential
- Failure to implement controls to eliminate or mitigate fire hazards
- Failure to implement adequate fire identification and suppression controls
- Failure to install adequate firefighting equipment
- Failure to train workers in firefighting techniques
- Loss of plant, equipment, infrastructure, production and \$\$ and maybe business !



WORKERS PUT AT RISK

Fire or explosion risk assessment– (what does yours cover ?)

- Electrical fires (elec motors, batteries, solar, switch room, overhead lines)
- Mechanical fires (HME, drill rigs, tyres)
- Cutting and welding
- Flammable and combustible liquids & gases (transport, storage, refuelling use)
- Explosives (transport, storage, use)
- Laboratories
- Bushfires
- Workshops
- Maintenance practices –hydraulic hoses



FORM 19 E

Principal Hazard Management Plan		FIRE or EXPLOSION			Review Date :	
Hierarchy of Controls (HoC): 1. Eliminate, 2. Substitute, 3. Isolate, 4. Engineering, 5. Administrative, 6. PPE						
Other Hazards associated with the Principal Hazard:						
<ul style="list-style-type: none"> • • • 						
Considerations	Potential Hazard	L	C	Risk	Controls used to manage hazard	HoC
Sources of flammable, combustible and explosive substances and materials	<ul style="list-style-type: none"> • What sources for fire or explosions are on site <ul style="list-style-type: none"> ○ Diesel ○ Petrol ○ General lubricants (flash point<61°C) ○ Solvents ○ Oxy/acetylene ○ Other gases ○ Welding Equipment ○ Explosives ○ Electrical installations ○ Natural vegetation ○ Naturally occurring substances (ores) ○ Storage areas (tyres, timber, chemicals, batteries) ○ Mobile plant ○ Fixed plant 				(Yes /No) (do sources exist and do procedures and standards exist to manage)	
Ignition sources that may be present on site	<ul style="list-style-type: none"> • Potential sources (man-made) <ul style="list-style-type: none"> ○ Electricity ○ Hot work (cutting & welding) ○ Heat generated from mobile plant, fixed plant ○ Blasting 				(Yes/No) (describe procedures used to control potential source)	

- SMSMK
- Smaller sites
- Broad brush RA

Fire or explosion – group exercise (10-15 min)

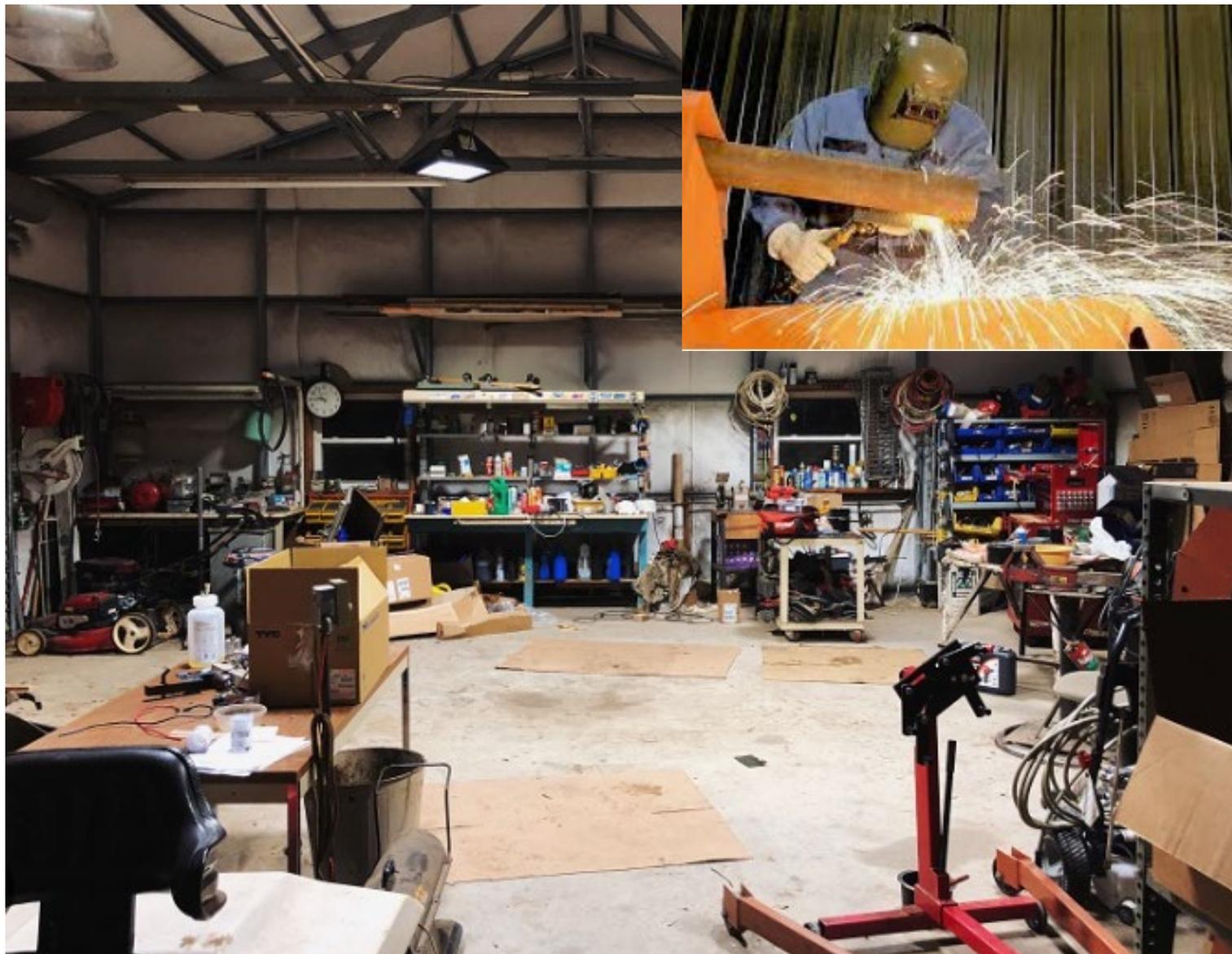
- Blank fire or explosion risk assessment sheet
- Split quarry site into areas for this exercise
- Each group (table) has a different area
- Complete assessment identifying and recording;
 - Ignition sources,
 - Fuel sources
 - Propagation potential – list controls (barriers, spacing, isolation)
 - Prevention, detection, suppression
 - Firefighting controls
 - Storage and transport



GROUP 1

Workshop – (2 areas & tasks)

- Hot Work Area
- Battery charging area



GROUP 2

Fuel distribution – (2 areas & tasks)

- HME refuelling facility and task of refuelling HME
- In pit refuelling (mobile fuel trailer)



GROUP 3

Electrical installations – (2 areas & tasks)

- Electrical switch boards/rooms in fixed crushing plant
- Contact with overhead powerlines





GROUP 4

Natural hazards – bushfire and lightning (2 areas and tasks)



- In pit welding maintenance during high-risk bushfire environment
- Loading a shot during a storm event



GROUP 5

Heavy mobile equipment – (2 areas and tasks)

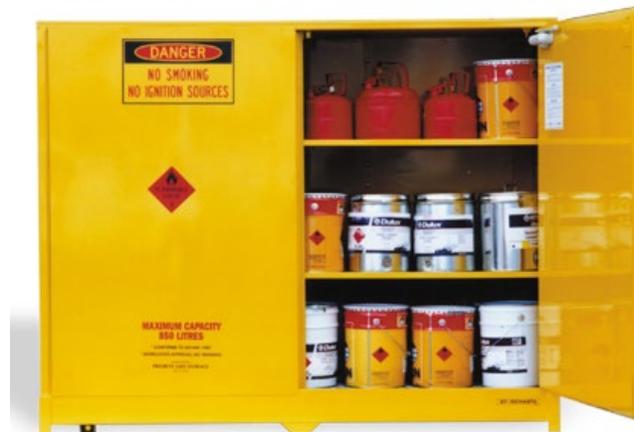
- Maintenance involving ‘hot work’ and a 250 hour service including replacement of batteries
- Intro of contractor's drill rig to site



GROUP 6

Storage and transport (2 areas and tasks)

- Diesel storage tanks (large volume – overhead or trans tank)
- Flammable storage (small containers – handheld drums)



FIRE or EXPLOSION – Risk Assessment Exercise

Hierarchy of Controls (HOC): 1. Eliminate, 2. Substitute, 3. Isolate, 4. Engineering, 5. Administrative, 6. PPE

Other (PPE) are (PPE) associated with this Hazard (Fire or Explosion):

RISK ASSESSMENT RATING - Example
Risk = Likelihood (Probability) x Consequence

Likelihood of (activity occurring)		Consequences	
A	Common or repeating occurrence	1	Fatality
B	Known to have occurred – "has happened"	2	Permanent disability
C	Could occur or "heard of it happening"	3	Medical/hospital or lost
D	Not likely to occur	4	First aid or no lost time
E	Almost impossible	5	No injury

RISK ASSESSMENT MATRIX

Likelihood/Consequences	A	B	C	D	E
1	1	2	4	7	11
2	3	5	6	12	16
3	6	9	13	17	20
4	10	14	18	21	23
5	15	19	22	24	25

RISK RATING

High Risk	1 – 6
Medium Risk	7 – 15
Low Risk	16 – 25

WHS(MPSR) 2022 Schedule 1 - Considerations

List the Activity/task you are assessing	Sources of flammable, combustible and explosive substances and materials (list sources)	Ignition sources that may be present on site	Arrangements for the prevention, detection and suppression of fires including fire fighting equip	HOC	The equipment for fighting fire at the mine	Likelihood of propagation to other parts of the mine
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L	C	Risk
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Workshop

What fuel sources are located at this job location or task? (list 3)

What potential ignition sources are located at this job location or task (manmade and/or natural) for each fuel source? (list up to 3 for each fuel source)

What arrangements (controls) are in place for the prevention, detection and suppression of fires? (list all you can identify)

Selected Hierarchy of Control (1,2,3,4,5,6)

What fire fighting equipment will be in place to fight the fire? (Type and location, functionality)

What propagation controls are in place at this job location or task to prevent the spread of the fire to other parts of the mine? (list all you can identify)

1 Hot Work area

1

2

3

2. Battery charging area

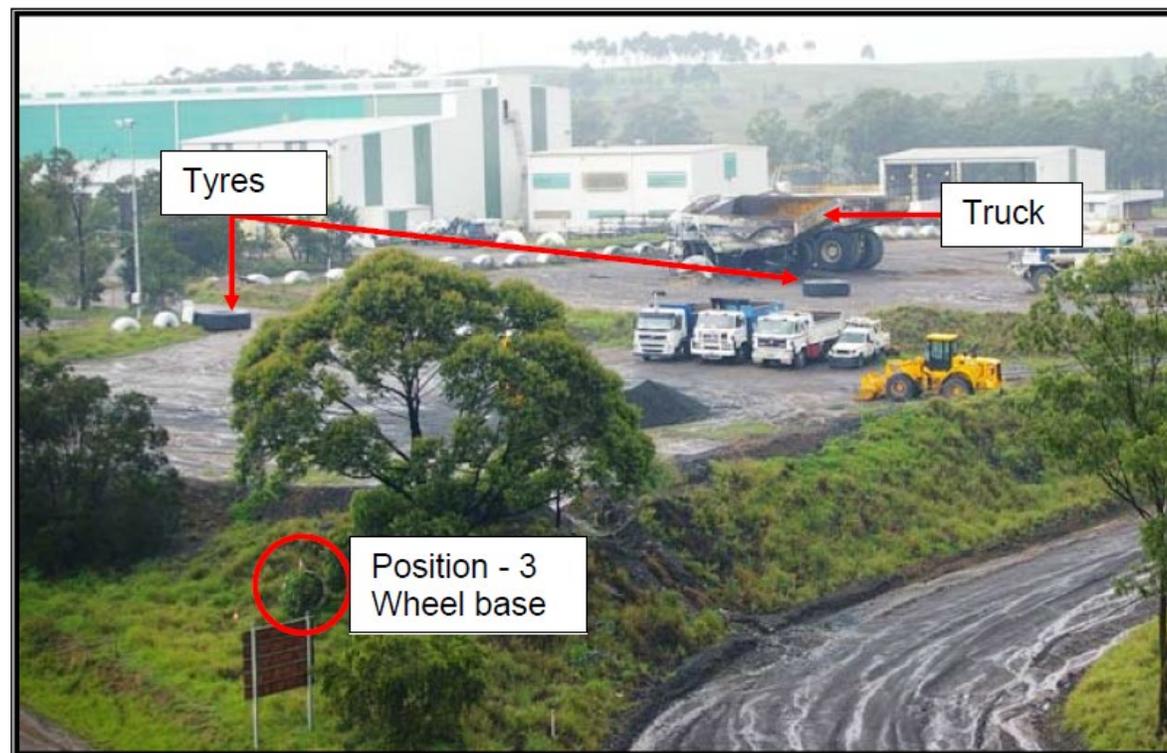
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Around the tables for some feedback



How did we go with - hierarchy of controls?

• Proactive

- Eliminate - (no longer use)
- Substitute - (less volatile product or equipment), petroleum oils vs synthetic, diesel vs petrol engine
- Isolate - (separation) – explosives and fuel storage facilities
- Engineer (barriers) - gas storage and refuelling (bollards)
- Admin - (signage, procedures, safety data sheets, and training)
chemical/flammable storage training, SWMS
- PPE (gloves, face masks)

Reactive

- Safety data sheets
- Detection systems
- Shut off isolators
- Fire suppression (fit for purpose)
- Firefighting training
- Form relationships with emergency services
- Tested emergency plan



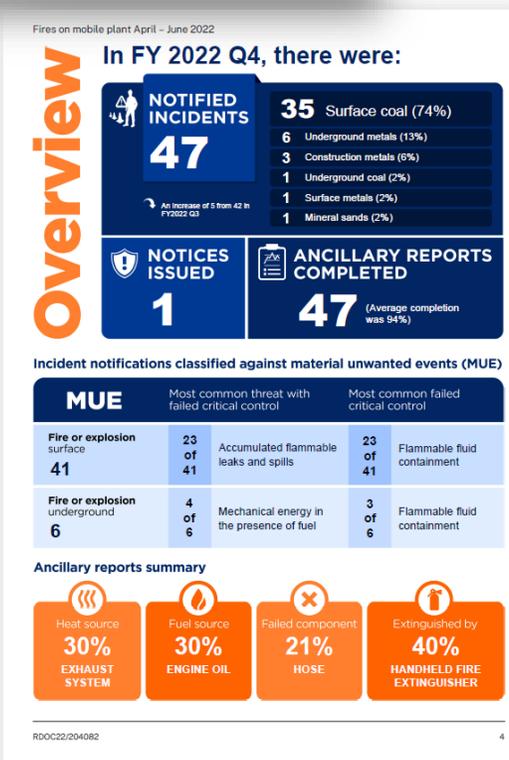
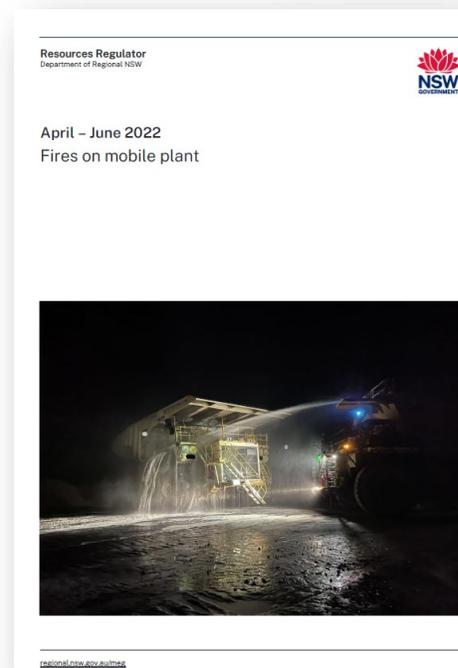
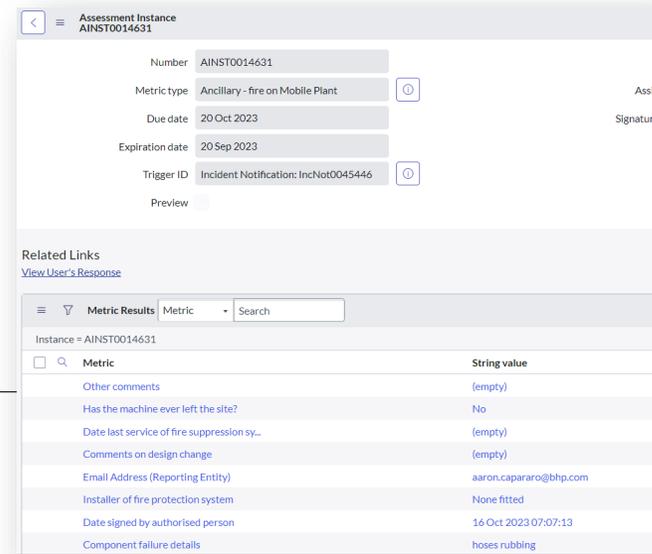
Checking that controls are maintained

- **Pre starts** (HME, crushing plant)
- **Workplace inspections** (whole of site)
- **Routine servicing** (250 -1000 hr)
- **Thermal imaging** (electrical and bearings)
- **Statutory testing** (extinguishers and other fire equipment, blankets, hoses, plans etc)
- **External audit** – fire professionals



Investigating fire incidents

- Report to CAU - s190 & s125 WHS(MPS)R
- Additional “ancillary fire on mobile plant”
- Involve subject matter experts (SME)
- Consider forensic fire assessment



Finding information

Safety management kit for small-scale mines, quarries and extractive industry operations

The **Safety management kit for small-scale mines, quarries and extractive industry operations** has been redesigned to help prepare a safety management system and to help you comply with mine safety legislation. This kit has been specifically developed for small-sized mines, quarries and extractive industry operations.

It recognises that finding and organising the resources for preparing a safety management system can be difficult for a small mine. There is a need to streamline the preparation of safety management system's as well as meet documentation requirements. The kit, however, can be modified to fit any small or medium size mine and may help prepare the basis for a comprehensive safety management system.

[Safety management kit for small-scale mines, quarries and extractive industry operations: Introduction \(DOCX, 5.39 MB\)](#)

[Safety management kit for small-scale mines, quarries and extractive industry operations: Part 1 \(PDF, 1.38 MB\)](#)

[Instruction pages \(Programs 1-21\)](#)

[Fillable templates \(Programs 1-21\)](#)

[Safety management system assessment \(DOCX, 4.76 MB\)](#)

[Safety management system development chart \(PDF, 27.95 KB\)](#)



11.9.7 VEHICLE FIRES

Typical causes of fires on or in vehicles include component failure and poor or inadequate maintenance. When completing a risk assessment for prevention of fires consider:

The design – for example:

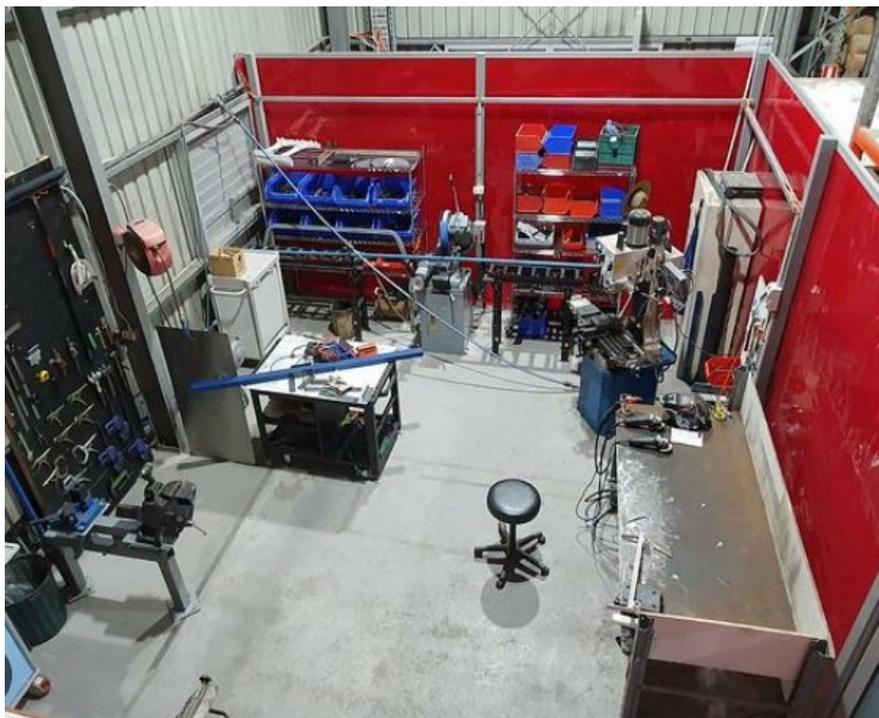
- > Hydraulic components are like for like and considered suitable for use. Always consult the original equipment manufacturer(s) (OEM) before making changes.
- > Any maintenance, installations or design modifications that are undertaken off-site are verified before use and are equivalent to the OEMs standards and design.
- > Implementing quality checks or audits by OEM authorised service providers periodically as a cross check for site maintenance.
- > Using low flammability hydraulic fluids.

- Guide - Health and Safety at Quarries
- Small Mines Safety Management Kit

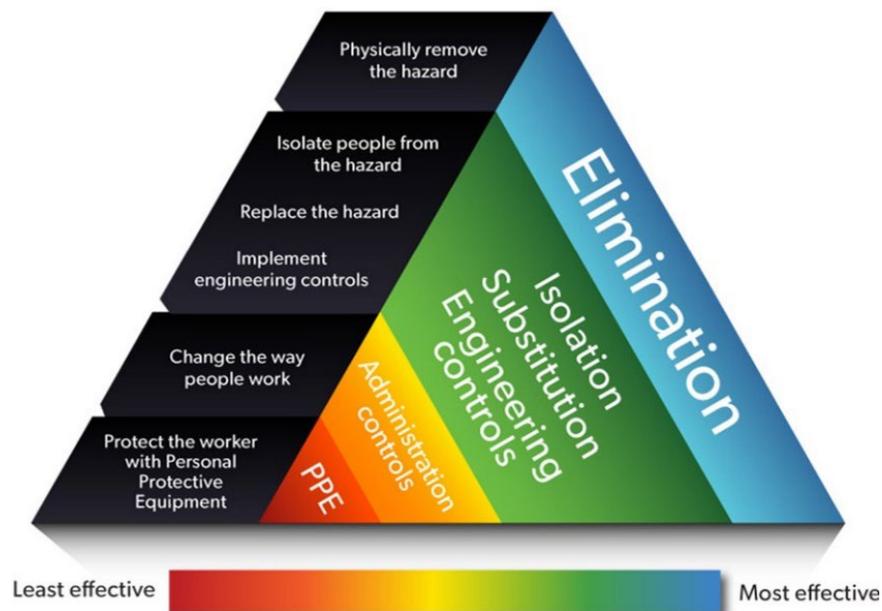
Fire or explosion – good practice



Fire or explosion – good practice



Take home messages



- Review risk assessments and update where deficiencies are identified
- Review and update PHMP (where required)
- Include subject matter experts (RFS, fire service contractor, fire brigade etc)
- Review and ensure that inspection programs are confirming controls are maintained
- Ensure procedures (SWMS) are available and being followed
- Ensure workers are trained



Any questions ?