NSW GOVERNMENT

NSW Resources Regulator

INVESTIGATION REPORT

SERIOUS INJURY

Springvale Colliery – 5 February 2019

NSW Resources Regulator

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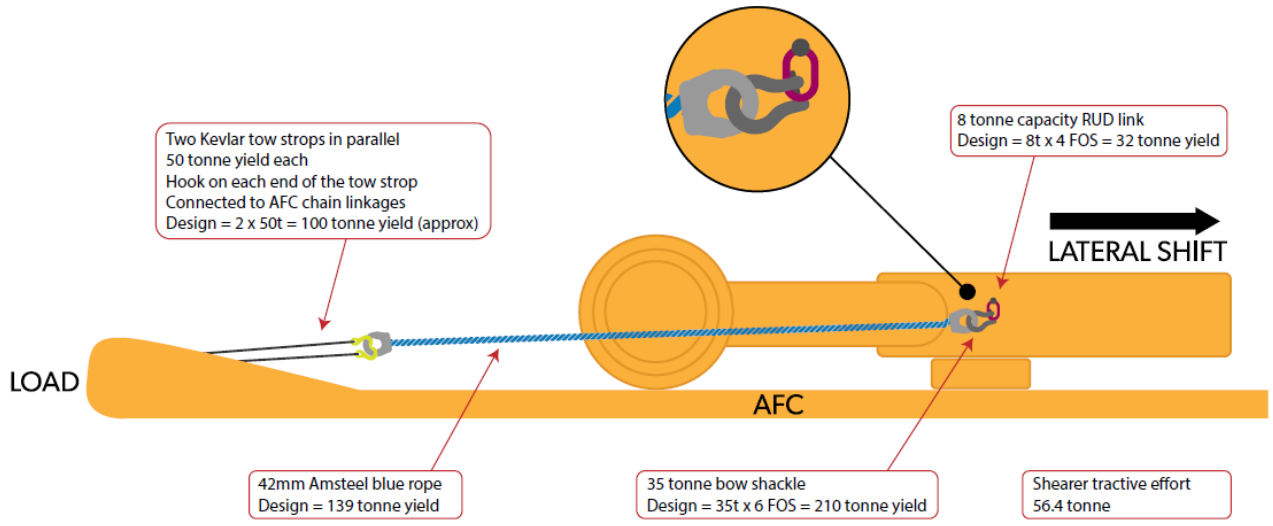
Executive summary

A 56-year-old worker suffered serious lower leg injuries when he was hit by a bow shackle, after a RUD link failed during a towing operation at Springvale Colliery near Lithgow, NSW, on 5 February 2019.

Before the incident, the worker and co-workers were unjamming an armoured face conveyor (AFC) chain at the longwall. The AFC chain had a flight bar jammed in the bottom race. The jammed flight bar was released and the AFC chain required inspection to assess damage. To help the inspection, workers decided to run the AFC in reverse and move the chain onto the top race. The tailgate slow runner drive on the AFC was not operational at the time. The maingate slow runner drive was not capable of moving the AFC chain. Workers decided to use the shearer (the longwall cutting machine) to support the maingate slow runner drive to move the AFC chain in reverse by towing the AFC chain with the shearer towards the tailgate end.

Workers began to assemble a towing system to move the AFC chain using the shearer. The towing system consisted of a 35-tonne bow shackle, a 42-millimetre nylon rope and two 'Recover Fast' Kevlar 50-tonne tow strops fitted with 16-tonne coupling links and 16-tonne sling hooks at either end. The towing system was attached to the AFC chain, with the sling hooks of the tow strops hooked into the links of the AFC chain. The towing system was attached to the shearer using the 35-tonne bow shackle connected to an 8-tonne RUD link, which was fitted to the shearer.

Figure 1 Towing system used at the time of the incident



The workers began to move the AFC chain by simultaneously powering the maingate slow runner and the shearer. Shortly after starting, a loud bang was heard. The 8-tonne RUD link on the shearer failed,

resulting in the nylon rope with the 35-tonne bow shackle attached recoiling towards the maingate. The shackle hit the worker operating the shearer in the lower leg. The impact fractured his tibia and fibula.

Other workers went to help the injured worker. He was given first aid before being transported to the surface. The injured worker was taken to hospital for treatment.

The incident scene was preserved and the mine operator notified the NSW Resources Regulator.

Causal factors

The direct cause of the incident was:

- the failure of the 8-tonne RUD link on the shearer, which was used as a connection point of the towing system, resulting in the uncontrolled release of energy.

The following factors contributed to the incident:

- The RUD link attachment point was not fit-for-purpose.
- The working load limits of the towing system assembly were not known or assessed.
- Safe standing zones were not properly identified.
- No safe work procedure existed for the task and no job safety analysis (JSA) or risk assessment was undertaken.
- The workers were not trained in underground lifting, slinging and towing operations.
- The workers were not provided with adequate instruction, information or supervision while undertaking the task.

Recommendations

Mine operators have a duty to identify hazards and manage risks to health and safety associated with the uncontrolled release of energy and to ensure that workers are adequately informed, instructed, trained and supervised in accordance with the *Work Health and Safety Act 2011*. It is recommended that mine operators:

- Review their lifting and towing equipment management plans to ensure all activities using lifting and towing equipment are appropriately addressed, including non-routine activities.
- Ensure the provision of adequate information, training, instruction and supervision to protect workers from risk when carrying out lifting and towing tasks.

- Seek the appropriate engineering advice in the design and selection of equipment when conducting complex lifting and towing tasks.
- When planning a task involving lifting or towing, the rating and yield load of all components, including the connection points, must be considered in the design of the lifting or towing system. Additionally, the structure supporting the connecting point should also be considered.
- People designing towing (pulling or snigging) activities must know and understand the maximum forces capable of being applied to the system, such as tractive effort or weight force.
- Safe standing zones must be established to account for component failures within the system.

Contents

1. Purpose of the report

This report describes the mining workplace incident investigation conducted by the NSW Resources Regulator into the cause and circumstances of a serious injury at Springvale Colliery at Lidsdale on 5 February 2019.

2. Investigation overview

2.1. The Regulator

We investigate major workplace incidents in the NSW mining, petroleum and extractives industries. Our role is to carry out a detailed analysis of incidents and report its findings to enhance industry safety and to give effect to our Compliance and enforcement approach.

2.2. Legislative authority to investigate

Investigators are appointed as government officials under the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and are deemed to be inspectors for the purposes of the *Work Health and Safety Act 2011*. The Regulator has also delegated some additional functions to investigators, including exercising the power to obtain information and documents for the purposes of monitoring compliance with the WHS Act.

2.3. Regulator response

The incident was reported to the Regulator on 5 February 2019. We deployed an inspector to the site to undertake an initial assessment of the incident and to ensure the scene was preserved.

We issued an Investigation Information Release IIR19-03 on 15 May, 2019. The information release was published to provide information concerning the incident and recommendations to the mining industry.

We published a lateral load shifting incidents video on 12 March 2020.

3. The incident

3.1. Parties involved

3.1.1. Mine operator and holder

At the time of the incident, Springvale Colliery was operated by Springvale Coal Pty Limited, for and on behalf of, the Springvale joint venture company owned in equal share between Centennial Springvale Pty Limited and Springvale SK Kores Pty Limited. Springvale occupies mining authorisations ML1303, ML1323, ML1326, ML1424, ML1537, ML1588, ML1670, ML1727, MLA445, MLA497, CL377, MPL314, AUTH460 and EL6974.

Springvale Coal is the appointed mine operator of the mine. Springvale Coal is the legal entity employer of all employees for the operation. Centennial Springvale Pty Limited and Springvale SK Kores Pty Limited are the authorisation holders of ML1727. The incident occurred within the boundaries of ML1727.

3.1.2. Injured worker

The injured worker was 56 years of age at the time of the incident. He was employed as an operator. He had 24 years' experience as an underground coal miner with about 12 years working on longwalls. On the day of the incident, the worker was assigned duties as the shearer operator at the longwall.

3.2. The mine

Springvale is an underground coal mine at Lidsdale, about 15 kilometres to the northwest of Lithgow in the western coalfields of NSW. Underground coal mining commenced in 1995. The mine produces high quality thermal coal, which is supplied to domestic and international markets.

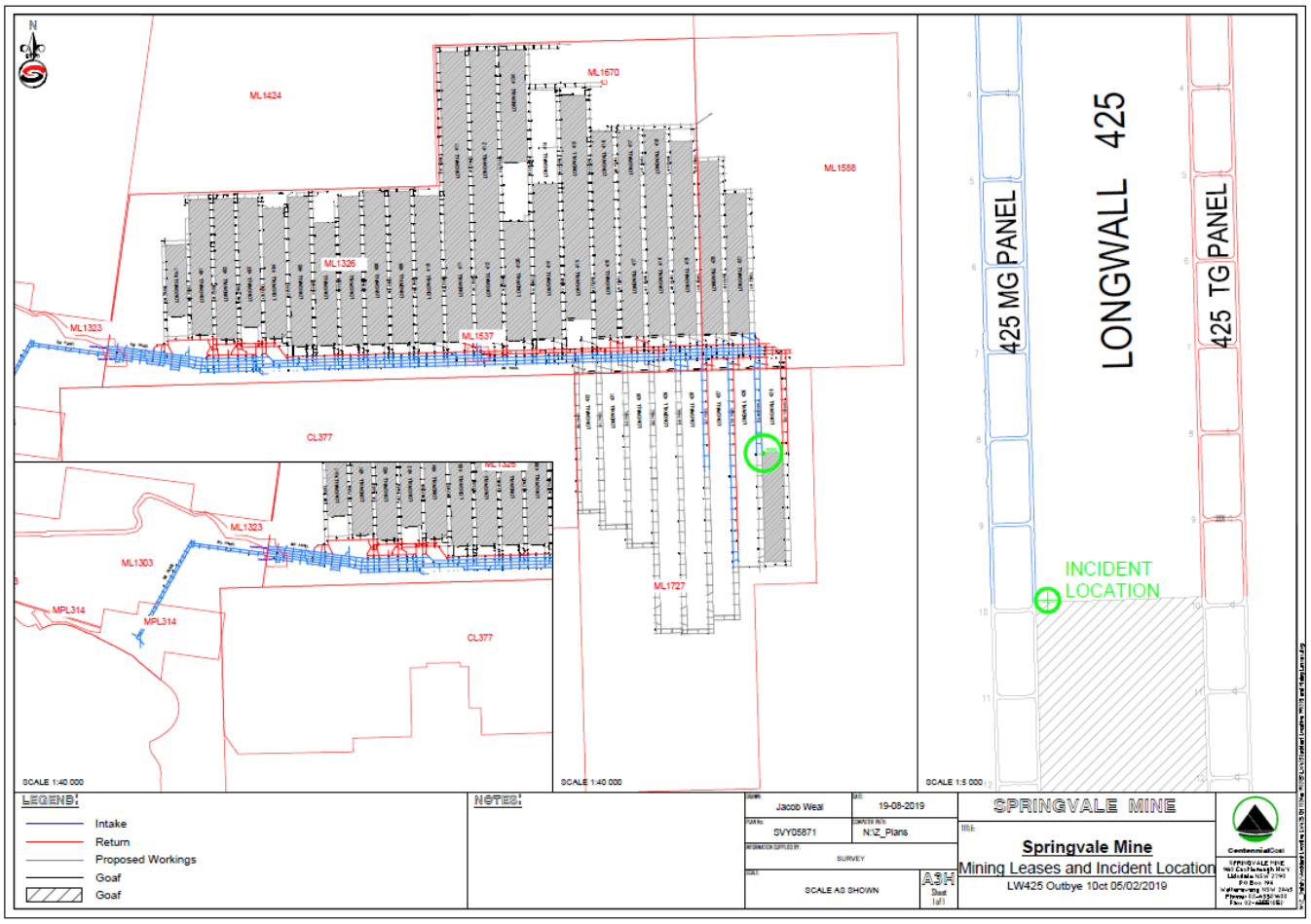
3.3. Mining method

Springvale uses the longwall retreat method of mining to extract coal from the Lithgow Seam.

3.4. Incident location

The incident occurred within mining lease ML1727. The figure below identifies the mining lease boundaries of Springvale and the approximate incident location.

Figure 2 Springvale mining leases and incident location



3.1. The incident

3.1.1. Pre-incident

The armoured face conveyor (AFC) chain jammed at longwall 425 at 11.38am on 4 February 2019. The AFC was a one-sided trough scraper conveyor, the second side of the trough being formed by the coal face. Cut coal fell into this trough, which had an endless chain with scraper flight bars attached running along the base plate and returning below the base plate in an enclosed lower section or 'race'. The coal was dragged along the base plate by the flight bars.

Work began to remove the jammed flight bar and release the AFC chain.

About 6pm that same day, the slow runner at the tailgate drive became inoperable. Work continued to remove the jammed flight bar and release the AFC chain.

During the next shift on 5 February 2019, a JSA was completed by the deputy and work group at 4.15am. The JSA was created for the work activity/task to 'pull AFC with shearer'. No procedure or work instruction was found that described or detailed the use of the shearer to tow the AFC chain.

The JSA was created because the AFC chain was unable to be moved with only the maingate slow runner drive operational. The shearer was to tow the AFC chain and to assist the maingate slow runner drive, because the tailgate slow runner drive was not operational.

A JSA was required for this task because it was an unusual task. The JSA describes numerous steps and potential hazards. One hazard described was the potential of the tow rope breaking while under load. Three controls were identified to manage this hazard. The control measures were:

- no go zones
- no person was to stand between the shearer and the pulling point
- the shearer operator was to be standing on the tailgate side of the shearer.

These control measures were put in place to make the job as safe as possible.

The towing system was assembled by attaching a tow rope to the shearer. The rope was attached by tying the rope around the ranging arm of the shearer. The operator of the shearer stood away from the shearer, towards the tailgate. The operator moved the shearer, resulting in the tow rope failing. The tow rope broke towards the middle of the rope, resulting in part of the rope recoiling back towards the shearer to where the operator was standing. The operator was not hit. The failure of the towing system was not reported or documented.

The night shift completed their shift.

At about 6am on 5 February 2019, day shift commenced. The work group for LW425 was assigned work to repair the jammed AFC chain at the pre-shift meeting. The night deputy spoke to the oncoming dayshift deputy and informed him that the work group had tried to move the AFC chain with a tow rope attached to the shearer, however the rope failed.

The night shift deputy advised the day shift deputy that if they intended to move the AFC chain using a rope and the shearer, then a heavier rope would be needed. The day shift deputy informed the night shift deputy that the work group had already started collecting towing equipment for the task. During an interview with inspectors, the day shift deputy said he had been informed by the longwall mining co-ordinator to collect towing equipment. The conversation between the night shift deputy and the day shift deputy took place over the phone.

At about 7am, the work group arrived underground and made their way to the crib room. The work group had a shift meeting where the tasks for the shift were discussed. The meeting was led by the

longwall deputy. The discussion also included the need for any JSAs to be completed for any tasks 'out of the ordinary'. The work group reviewed a JSA that was previously completed for the task of flight bar replacement and repairs.

The work group then began their various tasks. Several workers were assigned to work on freeing the jammed AFC chain. This task included removing the inspection plates on the AFC. The removal of the inspection plates allowed workers to visually inspect the bottom race of the AFC chain. The workers found a jammed flight bar in the bottom race.

A towing system was assembled to lift the AFC chain and pull the flight bar simultaneously. The vertical lift was required to take the weight of the AFC chain off the flight bar, and the angled pull was required to remove the flight bar through the inspection panel. Workers tried this process, however a chain in the towing system attached between the flight bar and flipper on the roof support failed, breaking suddenly. The same towing system was reassembled using a new chain to replace the broken chain.

The workers tried a second time to lift the AFC chain and pull the flight bar simultaneously, which resulted in the flight bar coming free from the AFC chain.

This task is unusual. No procedure or work instruction exists that describes or details this task. As such, a JSA was required to be completed, but this did not occur. The failure of the towing system was not reported or documented. The flight bar was removed from the bottom race, freeing the AFC chain.

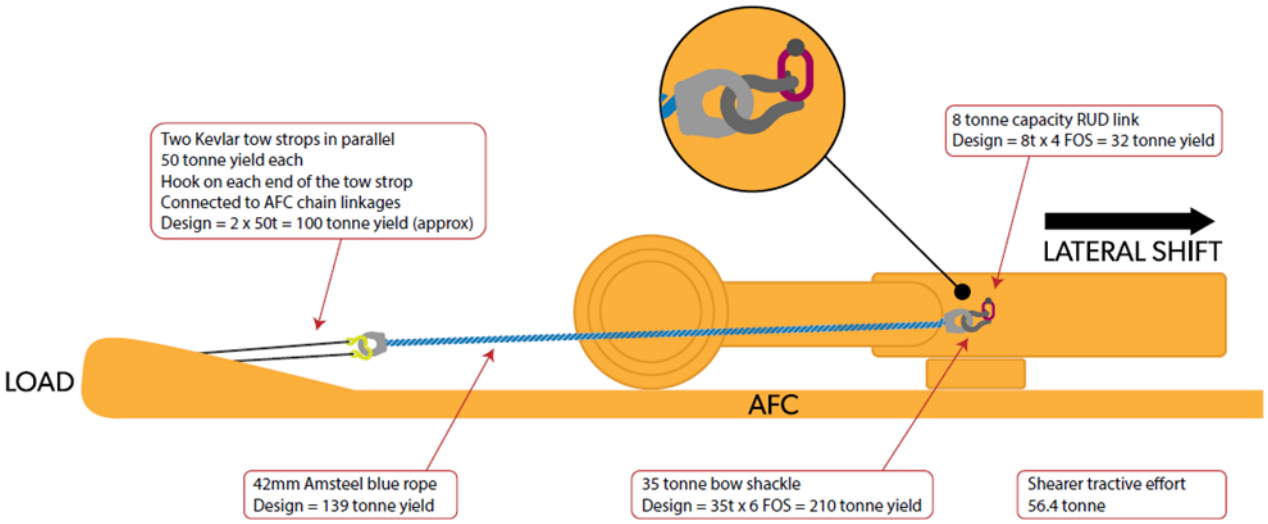
Workers then began to move the AFC chain in order to assess damage. The damage on the AFC chain was near the number 6 roof support. It was decided to move the AFC chain in the reverse direction, to bring the damaged section through the maingate end and onto the top race. It should be noted that the original equipment manufacturer's (OEM) Joy Longwall System Plant Synopsis stated that the slow running procedure was not intended for use to run the AFC chain in reverse. Furthermore, the OEM did not recommend running the conveyor in reverse and that if the AFC was to be run in reverse, the OEM stated that mine procedures and control system manufacturer's information should be checked to determine the approved method and procedure.

As the slow drive runner at the tailgate was inoperable, the AFC chain was to be moved by attaching the AFC chain to the shearer, using a towing system. The shearer was to be trammed towards the tailgate end, which would assist the maingate slow drive runner. The maingate slow drive runner did not have sufficient power to move the AFC chain alone. This task was an unusual task and no procedure existed for the task. As such, a JSA was required to be completed for the unusual task however no JSA was completed.

3.1.2. The incident

Workers began to assemble a towing system to move the AFC chain using the shearer. The towing system consisted of a 35-tonne bow shackle, 42-millimetre nylon rope and two 'Recover Fast' Kevlar 50-tonne tow strops fitted with 16-tonne coupling links and 16-tonne sling hooks at either end. The towing system was attached to the AFC chain, with the sling hooks of the tow strops hooked into the links of the AFC chain. The towing system was attached to the shearer using the 35-tonne bow shackle connected to an 8-tonne RUD link, which was already fitted to the shearer.

Figure 3 Towing system used at the time of the incident



At 2pm, the towing system was completed and connected to the shearer and AFC chain. To conduct the towing operation, one worker was to operate the slow drive runner at the maingate and another worker was to operate the shearer. At the time, the shearer was near the number 21 roof support. The slow runner operator was standing near number 4 roof support and the shearer operator was standing near numbers 5 and 6 roof supports. Another worker was standing near numbers 1 and 2 roof supports, watching the AFC chain.

The workers began to move the AFC chain by simultaneously powering the maingate slow drive runner and the shearer, which was trammed towards the tailgate. Shortly after starting the task, a loud bang was heard. The 8-tonne RUD link on the shearer failed, resulting in the nylon rope with the 35-tonne bow shackle that was attached recoiling towards the maingate. The 35-tonne bow shackle hit the worker operating the shearer in the lower leg.

3.1.2.1. The longwall AFC

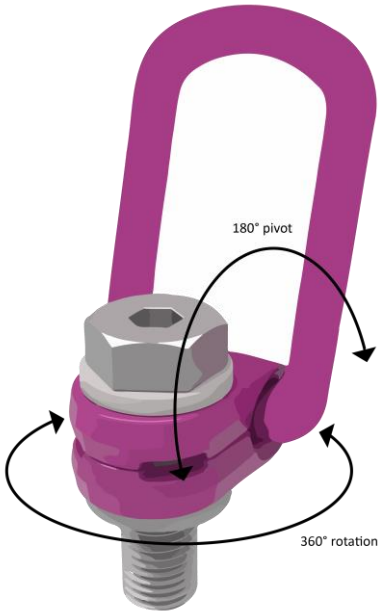
The incident occurred at longwall 425. Mining at longwall 425 commenced on 3 August 2018. The length of the panel is about 2394 metres and 385 metres in width, inclusive of tailgate and maingate pillars. The height of the panel is about 3 metres. The longwall system consists of 144 roof supports and 136 armoured face conveyor pans. The total length of armoured face conveyor chain is 504 metres and consists of two strands of chain. The total weight of the armoured face conveyor chain is 37.699 tonne.

3.1.2.2. The shearer and RUD link

The shearer at longwall 425 was manufactured by Joy. The model of the shearer was 7LS 2A. Its date of manufacture was 29 December 2003. The shearer's estimated weight was 53 tonne. The tractive force of the shearer was rated at 56.4 tonne.

The RUD link fitted to the shearer was an 8-tonne swivel load ring. The link had a working load limit of 8-tonne and was normally used for loading in all directions. The link was fitted to the shearer by the OEM at the time of an overhaul of the shearer in July 2018. The purpose of the installation of the link was for lifting the ranging arm of the shearer during transport, installation and removal of the shearer.

Figure 4 Representation of a RUD link that was fitted to the shearer



The mine operator arranged for the RUD link to be examined after the incident. Examination of the link found that link failed in a single tensile loading event. The link exhibited twisting and bending deformation indicating off-axis loading. The off-axis loading led to increased, resolved loading and overload failure. There was no evidence of fatigue or other pre-existing cracks.

Figure 5 Representation of the RUD link that was fitted to the shearer showing the location of fracture (indicted by blue arrows)

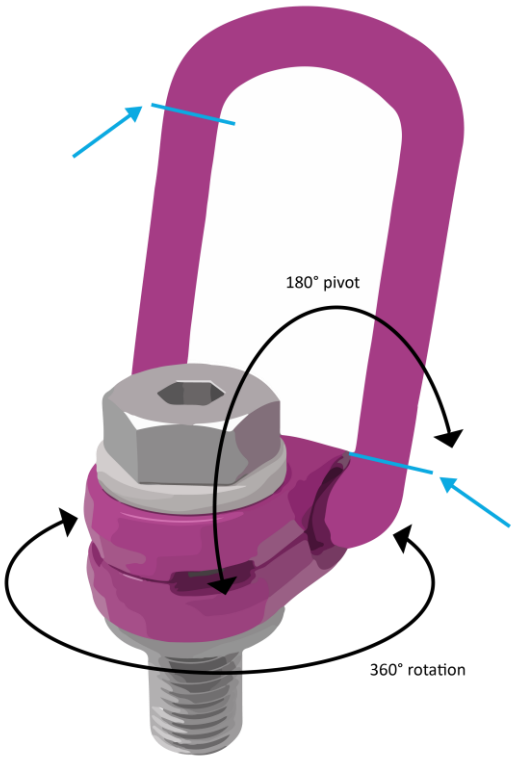


Figure 6 The failed 8 tonne RUD Link

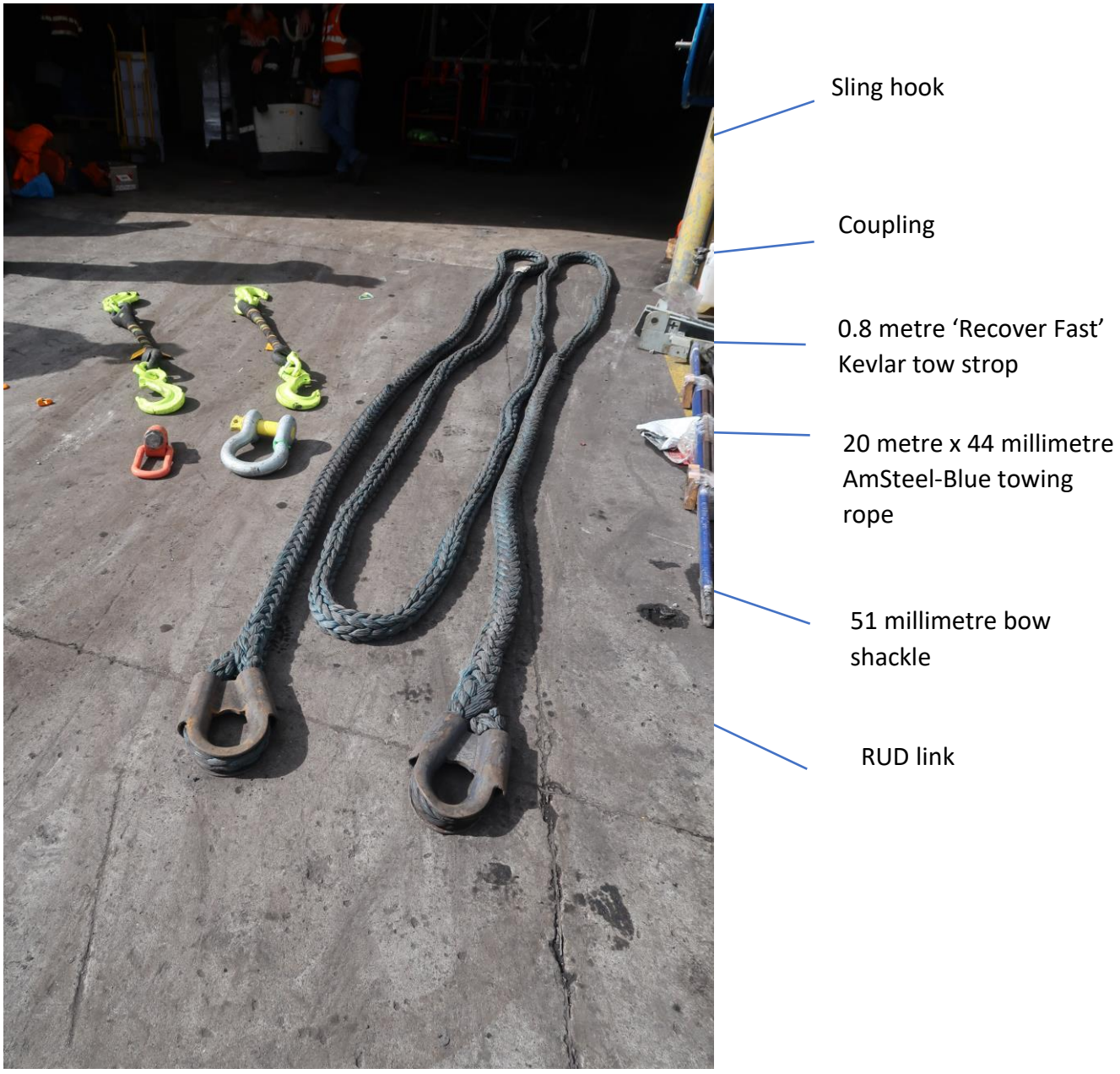
3.1.2.3. The towing system

The towing system set up at the time of the incident consisted of the following components:

- RUD link fitted to the shearer with 8-tonne working load limit, connected to a
  - 51-millimetre bow shackle with 35-tonne working load limit, connected to a
  - 20 metre x 44-millimetre AmSteel-Blue towing rope with 62.5-tonne working load limit, connected to
  - 2 x sling hooks each with 16-tonne working load limited, connected to
  - 2 x coupling links each with 16-tonne working load limit, connected to
  - 2 x 0.8 metre 'Recover Fast' Kevlar tow strops each with 50-tonne working load limit, connected to
  - 2 x coupling links each with 16-tonne working load limit, connected to
  - 2 x sling hooks each with 16-tonne working load limited, connected to
  - 2 x links of the armoured face conveyor chain.

The towing system was attached to the shearer by placing the 35-tonne bow shackle through the RUD link attached to the shearer. The towing system was attached to the AFC chain by placing the sling hooks through the links in the two strands of chain.

Figure 7 A reproduction of the towing system components as was used in the incident



3.1.2.1. The workers

The workers involved in the towing operation were two machine operators and a mechanical fitter/maintenance supervisor. The mechanical fitter was the worker who assembled and connected the towing system. The workers were supervised by a deputy, but he was not present when the towing system was assembled and connected, nor present at the time of the incident. A longwall engineering co-ordinator was also present during the shift at the longwall but was not present when the towing

system was assembled or connected, nor present at the time of the incident. A longwall mechanical supervisor was also present during the shift but was not present when the towing system was assembled or connected nor at the time of the incident.

Table 1 Chronology

SHIFT	TIME	EVENTS
Day shift – 4 February 2019 (Monday)	11.38am	AFC chain becomes jammed.
	4pm	Day shift finishes.
Afternoon shift – 4 February 2019	2pm	Afternoon shift commences.
	6pm	Tailgate slow runner becomes inoperable.
	midnight	Afternoon shift finishes.
Night shift – 5 February 2019 (Monday – Tuesday)	10pm	Night shift commences.
	4.15am	JSA created to use shearer to tow AFC chain.
		Towing activity failure.
		Night shift deputy completes handover with day shift deputy on the telephone. Discussed failure of tow rope and advised 'heavier' rope required.
Day shift – 5 February 2019 (Tuesday)	6am	Day shift commences.
		Work group arrive underground at crib room.
	7am	Pre-shift meeting.
		SLAMs completed at crib room.

	Review previous JSA completed for flight bar replacement.
	Towing activity failure.
	Towing activity successful. Flight bar released.
12.30pm	Set up towing system on shearer.
2pm	Incident occurs.

4. The investigation

4.1. Activity

The investigation examined the incident, including the factors leading up to the incident, the cause of the incident, the actions of the workers and the mine operator.

To undertake these enquiries the investigation team conducted several interviews with workers, issued several section 155 of WHS Act notices to produce information and evidence. The team also conducted a reconstruction of the towing activity.

5. Investigation findings

The investigation found that the mine operator failed to identify the risks associated with the uncontrolled release of energy when undertaking towing activities.

The investigation found that the mine operator failed to implement a safe system of work on the use of the shearer for towing purposes. The mine operator did not prohibit the use of the shearer for towing, did not assess the pulling capacity of the shearer and did not prevent the use of, or assess the fit-for-purpose of, the shearer attachments.

The investigation found that the mine operator failed to undertake an adequate risk assessment in relation to unjamming the AFC chain.

The mine operator failed to ensure that workers were adequately informed, instructed and trained in towing activities, including the use of links, shackles, ropes, slings and working load limits.

The investigation found the mine operator failed to provide adequate supervision and identify clear lines of responsibility of workers.

5.1. Identified risks

In September 2017, the mine completed a risk assessment in relation to lifting, slinging and towing operations at Springvale Colliery. The risk assessment identified numerous potential incidents being caused by 'untrained or inexperienced personnel' or 'weight of component not accurately known' or 'use of non-fit-for-purpose equipment' or 'incorrect selection of towing point' or 'incorrect selection of towing equipment'. The hazards identified include 'personnel injury'. The training of underground workers in RIIUND207A Conduct of Underground Lifting Operations was listed as the number one recommended control, with a due date of 31 December 2018.

Before the task was undertaken, three workers involved completed personal risk assessments known as SLAMs. The SLAM (Stop..Look..Assess..Manage) technique is used to remind workers to stop work if they think their health and safety is at risk. The SLAMs have 11 questions to identify any common hazards that may be associated with the task. The SLAMs completed by the workers failed to identify hazards such as the uncontrolled release of energy or training required to complete the task.

The SLAMs also failed to identify the requirement of a JSA to be completed before undertaking the task.

5.2. Risk to workers

The workers were at risk due to the potential for an uncontrolled release of energy that may result in being hit by objects and materials.

The workers assigned to complete the task did so without adequate information, training, instruction or supervision. This included the assembly of a towing system, assessment of working load limits when lifting or towing and the identification of no-go zones and safe standing zones.

5.3. SMS – relevant controls

The mine had an implemented safety management system (SMS) pursuant to clause 13 of the Work Health and Safety (Mines and Petroleum Sites) Regulations 2014. The mine's SMS was last reviewed in 2017. The SMS is the integration of documented plans, policies and procedures. The purpose of the SMS is to protect workers and other people against harm to their health, safety and welfare through the elimination or minimisation of risks.

Within the SMS are plans that detail the mine's training and competency management system, information and communication system and supervision arrangements.

5.4. Procedures to control risk

5.4.1. Risk management

The mine has provided responses via section 155 notices that state the safe operation of the AFC chain is governed by the Springvale Risk Management Standard with the Springvale SMS Framework. The standard requires a pre-job assessment be conducted and that all employees at Springvale be trained in hazard identification and control, commensurate with the tasks to be performed and their work environment.

The workers performing the task had received training hazard awareness and risk management training.

5.4.2. Lifting, slinging and towing

A lifting equipment management plan sits within the mine's SMS. The management plan is known as the Lifting, Slinging and Towing Standard. The standard specifies the engineering and management controls for the use of lifting, slinging, towing and tie down equipment used underground and on the surface at Springvale Colliery. The requirement of the standard applies to all employees, contractors, sub-contractors and visitors and is applicable to all areas within the mine, both underground and on the surface. It encompasses all lifting activities and lifting equipment, regardless of the owner and the application of the equipment. Lifting equipment includes wire and synthetic slings, anchor points, pull lifts, shackles and RUD lifting lugs.

The management plan outlines the training requirements for people supervising and undertaking lifting tasks, as specified in the Centennial Coal Lifting Matrix. All workers who are likely to operate or maintain lifting equipment systems need to be trained and assessed on the hazards of lifting.

The management plan further states 'General Work Force – 1-10 Tonne lifting and equipment awareness training (competency based) to be given to all employees'.

At the time of the incident, the workers performing the task had received no training in relation to undertaking underground lifting, slinging and towing activities.

5.4.3. AFC chain repairs

No specific safe work procedures (SWP) existed at Springvale Colliery to control risks while working to unjam the AFC chain on a longwall. SWPs do exist for tasks on the AFC chain, including installation and removal of AFC flight bars and breaking and removing the AFC chain from tailgate.

5.4.4. Use of shearer for towing

A SWP does exist for towing a roof support with the shearer. This SWP relates only to roof support 145. This task is undertaken when the roof support leans too far to the tailgate roadway. The shearer is used to pull the roof support back towards the maingate. The SWP details the towing equipment to be used for the task. The SWP states that a JSA is to be carried out before starting the task.

5.5. Training and instruction

Before the incident, the mine operator had delivered underground lifting operations training to 50 workers. The training was delivered by an external registered training organisation. The most recent training was completed on 10 December 2013. The most recent appointment of competency upon completion of the training was 10 February 2014.

At the time of the incident, the workers performing the task had received no training in relation to undertaking underground lifting, slinging and towing activities. The workers received no instruction on how to assemble the towing system and undertake the task.

The mine's training needs analysis was supplied through a section 155 notice. The training needs analysis does not list underground lifting, slinging or towing as a skill, competency or training course as a requirement for any worker or staff.

In response to the incident, the mine operator delivered training in the Springvale Lifting, Slinging and Towing Standard to 233 workers across seven days between 12 February and 22 March 2019.

The mine operator provided evidence through a section 155 notice response of a risk assessment relating to lifting, slinging and towing operations at Springvale Colliery. The risk assessment identifies the training of underground workers in conducting underground lifting operations as the number one control measure.

5.6. Supervision

At the time of the incident, the shift deputy was the supervisor for the work group undertaking the task. Also present was the longwall engineering co-ordinator and the longwall mechanical supervisor. There was confusion among the work group as to who was in control of the task. The workers could not identify clear lines of responsibility in relation to the task.

5.7. Safe system of work

At the time of the incident, the mine operator had not implemented a safe system of work in relation to unjamming the AFC chain. The mine operator provided evidence through a section 155 notice response that it had experienced 13 incidents over 18 weeks involving a jam of the AFC chain. As stated earlier, the mine operator had not implemented any SWPs in relation to unjamming the AFC chain.

The mine operator did not prohibit the use of the shearer in towing the AFC chain nor did it assess the pulling capacity of the shearer. The mine operator did not prohibit the use of the RUD link attached to the shearer for towing purposes. The mine operator did not assess of the pulling capacity of the shearer.

5.8. Actions taken after the incident

The mine operator conducted a review of control measures pursuant to clause 38 of the *Work Health and Safety Regulation 2017* and clause 10 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Following the incident, the mine operator delivered additional training to its workers. Training delivered included lifting, slinging and towing training. Several workers obtained dogging and rigging qualifications. The total worker hours for the training was 3285 hours.

In response to the incident, the mine operator conducted a review of the effectiveness of the Springvale SLAM process for workers to 'identify and manage risks of tasks undertaken'. The mine operator, in consultation with workers, determined that a change to the SLAM process was not required.

Other actions undertaken by the mine operator following the incident include:

- implementing a 'Complex Lift Permit', which requires a certified dogman to review and sign off on a lift before undertaking a lifting task
- conducting a review to identify non-standard or complex pulling, towing or snigging activities
- developing procedures for non-standard or complex pulling, towing or snigging activities.

6. Recommendations

Mine operators have a duty to identify hazards and manage risks to health and safety associated with the uncontrolled release of energy and to ensure that workers are adequately informed, instructed, trained and supervised in accordance with the *Work Health and Safety Act 2011*. It is recommended that mine operators:

- Review their lifting and towing equipment management plans to ensure all activities using lifting and towing equipment are appropriately addressed, including non-routine activities.

- Ensure the provision of adequate information, training, instruction and supervision to protect workers from risk for carrying out lifting and towing tasks.
- Seek the appropriate engineering advice in the design and selection of equipment when conducting complex lifting and towing tasks.
- When planning a task involving lifting or towing, the rating and yield load of all components, including the connection points, must be considered in the design of the lifting or towing system. Additionally, the structure supporting the connecting point should also be considered.
- People designing towing (pulling or snigging) activities must know and understand the maximum forces capable of being applied to the system, such as tractive effort or weight force.
- Safe standing zones must be established to account for component failures within the system.