

**Report by: Mr Mike Caffery, Inspector of Mines, Central Region.**  
**Dated: 25 March 1999**

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**OAKY CREEK NO 1 UNDERGROUND**

**AT**

**ON 20<sup>TH</sup> JANUARY 1999**

**INJURY TO MR BRANT NORTH**

**OF THE**

**ACCIDENT INVESTIGATION REPORT**

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**EXECUTIVE SUMMARY**

This report records how two well intentioned changes to a longwall mining installation, separated in time by over two years, had a combined effect to cause horrific injuries to a young mineworker. The lessons learnt are not complex, however they serve to reiterate the fact that people must not work in close proximity to unguarded moving machinery.

On Wednesday 20<sup>th</sup> January at approximately 0500 hours, an accident occurred in longwall 14 panel of Oaky No 1 Underground, resulting in the injuries to Mr Brant North. The longwall face had retreated to near the end of the panel and coal production had temporarily stopped. At the time of the accident, work was being carried out to position materials along the face, in readiness for supporting the roof prior to the salvage of equipment. One pod of roof bolts had been unloaded at the tailgate drive onto the armoured face conveyor and transported to near the maingate where men were removing the bolts. A supply basket containing winches had been placed next to the tailgate drive for unloading.

Mr North and another person Mr Adam Clarke were deployed to unload the winches from the basket. Mr North was on top of the tailgate drive cover clearing additional space for more winches, whilst the maingate crew started the armoured face conveyor and moved the bolts 10 metres to position them for removal.

In attempting to descend from the tailgate drive Mr North either slipped or he misjudged his footing and one or both legs became entangled in the moving armoured face conveyor.

The moving armoured face conveyor dragged Mr North an estimated distance of 7 metres. His right leg was trapped under a flight bar and his left leg was severely damaged below the knee. Fortunately the crew at the maingate stopped the conveyor, for their own purposes, approximately 4 seconds before Mr North would have been dragged under the longwall shearer.

The mine emergency services quickly responded. The Tieri doctor and later a surgeon from the Royal Flying Doctor Service attended the injured person underground. The severe extent of the injuries to the legs necessitated amputation of both legs at the accident site. The injured person was freed from the machinery at 0910 hours and transported to the Rockhampton base hospital at 1030 hours. The co-ordination of the emergency response and recovery of the injured person was well conducted under extremely difficult circumstances.

The investigation into the nature and cause of the accident has identified the following primary causes:

- a) Inadequate guarding of the tailgate sprocket.
- b) Failure to isolate while persons were working in close proximity of the armoured face conveyor.
- c) Inadequate awareness of hazards associated with the work environment.

The report outlines further findings that identify system deficiencies at the mine.

The investigation into this accident found no evidence of deliberate negligence on the part of any person or persons associated with the accident.

This report has been prepared without input from Mr North, who for his own reasons, has declined to participate in the investigation.

A review of industry practice in all other Queensland longwall mines has been carried out. Two mines have indicated a potential for a similar hazard and have added additional guard protection over the tailgate sprocket.

**Recommendations**, which address the findings, have been prepared. The recommendations are considered to be applicable to all underground coalmines. These are:

1. A structured risk assessment should be performed into all activities conducted at the mine site associated with the potential hazards arising out of persons falling into unguarded moving machinery.
2. Risk management techniques must be applied before changes, that could affect safety, are made to equipment design and work procedures.
3. Inspection systems must determine personnel understanding and compliance with isolation procedures and ensure adequate guarding is in place.
4. A program to improve employee hazard awareness skills in the work place should be implemented.
5. A structured program of training for the supervisory personnel should be provided to improve skills in communication, safety management and work planning.
6. Employee induction and authorisation systems are to address minimum competencies in hazard awareness for the specific work areas.

Further detail on the recommendations is included in the report.

## 1. DETAILS OF INJURED PERSON

**Person Injured:** Brant North  
**Address:** 64 Malvern Avenue, Tieri, Queensland 4709  
**Age:** 22 years  
**Partner:** Rebecca Van Zanden  
**Children:** one son (aged 7 months)  
**Employer:** Oaky Creek Coal Pty Ltd  
**Occupation:** Trainee Miner  
**Height:** 167cms or 5ft 6ins  
**Industry Experience:**

- a) Mr North was employed as a junior miner under a youth employment scheme, commencing in the open cut in June 1997 and transferring to underground in March 1998.
- b) He has worked in the development panel and transferred to the longwall panel two weeks prior to the accident.

## 2. ACCIDENT NOTIFICATION

The accident was reported to Mr Mike Caffery, Inspector of Mines, at 0620 hours on Wednesday 20<sup>th</sup> January 1997 by Mr Murray Wood, Registered Mine Manager, Oaky No 1 Underground. Mr Wood advised that a man was trapped by the legs in the armoured face conveyor at the tailgate. He requested permission to use oxy-cutting equipment to free the injured person. Mr Caffery faxed permission to Mr Wood, phoned Mr Brian Lyne, Deputy Chief Inspector of Mines, Coal and then travelled to Oaky Creek leaving at 0720 hours.

The notification by the Registered Mine Manager satisfies the requirement of Section 71(1) of the Coal Mining Act 1925.

## 3. EMERGENCY RESPONSE

- a) **Emergency Response** (refer Appendix 2)
- The crew supervisor notified the control room operator at approximately 0510 hours of the accident and requested entonox to tailgate.
  - Crew members attended to Mr North.
  - Mine underground ambulance was taken into the longwall tailgate.
  - Mine site Protective Services Officer, PSO was notified.
  - At 0530 Queensland ambulance arrived at the mine.
  - At 0540 Mr Wood, Registered Mine Manager arrived at the mine.
  - At 0552 air evacuation was arranged.
  - At 0620 Mr Wood notified the Inspector.
  - At 0740 permission to use oxy cutting equipment was faxed to the mine.
- Note: Mr Frank North, father of Brant North, was underground at the time of the accident. He was instructed to come out of mine and go to the control room. The company made trauma counselling available to all persons.

**b) Attendance by medical personnel**

- i) PSO's arrived at the accident site prior to 0600 and continued with emergency first aid response.

- ii) Mr North was conscious throughout the ordeal.

- iii) At 0600 Tieri doctor went underground.

- iv) At 0658 Royal Flying Doctor Service, RFDS, contacted control to notify they would arrive at the mine strip by 0740.

- v) At 0743 RFDS was at top of ramp.

- vi) At 0800 RFDS surgeon left for underground.

- vii) At 0910 longwall notified control that the injured person was free of armoured face conveyor.

Note: A direct line of communication was established from underground to the RFDS plane to allow the Tieri doctor to talk to the RFDS surgeon.

**c) Transport to hospital**

- i) At 0946 underground ambulance was out of pit at top of ramp.

- ii) At 1030 RFDS plane left mine strip for Rockhampton base hospital.

**4. BACKGROUND TO MINE****4.1. Mine operations**

No1 Underground is one of three mines Oaky Creek operated by Oaky Creek Coal Pty Ltd, a joint venture, under management control of Mount Isa Mines Limited. The other mines at Oaky Creek site are Oaky North, a new longwall underground mine and Oaky Creek open cut mine. Oaky Creek No 1 has permanent workforce of 160 employees. An additional 55 employees are employed by a contractor in developing a new section of the mine from Maywin highwall entries. In the year 1997/98 Oaky No1 produced 3 million tonnes of coal.

**4.1.1. Location**

No1 Underground mine utilises modern longwall methods to extract coal from the German Creek seam in the Bowen Basin. The mine is served by the town of Tieri located 13 kms from the mine. Tieri is situated 85 km from Emerald, 333 km from Rockhampton and 335 km from Mackay.

**4.1.2. Mine plan**

The main headings were developed in a south-easterly direction in 1989 from portals established under pit G6 highwall. Previously 12 longwall panels have been extracted in a herringbone layout from these headings. In recent years the main headings have been extended in a north-easterly direction to access a block of coal beyond the Stuart fault zone. Separate development has been performed from the Maywin pit to link up with the NE main headings. Longwall 14 panel was the first longwall extracted from this block. This panel is 1950 metres long and 200 metres wide. Extraction of longwall 14 commenced in June 1998. Refer to Fig 1 showing the mine layout. At the time of the accident the longwall face was 50 metres from completion.

#### 4.1.3. Management and Supervisory structure

The Management structure at the time of the accident was:

General Manager, Oaky Creek Coal Pty Ltd	Mr Peter Lynch
Registered Mine Manager, No 1 Underground	Mr Murray Wood
Production Superintendent, No 1 Underground	Mr Ces Ivers
Longwall Superintendent	Mr Greg Burgess
Longwall Co-ordinator	Mr Don Foster
Longwall Electrical Engineer	Mr Tony Goodwin
Longwall Mechanical Engineer	Mr Mick Norris
Shift Undermanager on night shift	Mr Les Bunt
Longwall crew Supervisor on night shift	Mr Peter McPhail
Safety Advisor	Mr Philip Jackson

#### 4.1.4. Shifts worked

The mine operates with three crews who work day, afternoon and night shifts on a weekly rotation system. Panels worked in the mine include longwall extraction and development panels in SE mains, NE mains and Maingate 16 as well as two panels in Maywin entries.

#### 4.1.5. Operations Planning

A mine standard titled, Operations Planning UG1 – S – 33 is followed at Oaky No 1 to review and plan mine activities. This standard comprises a weekly plan and a 24 hour plan and includes content and responsibilities. These plans are distributed to the immediate supervisors.

#### 4.2. Safety Management Systems

Two systems are in place at the mine to manage safety and health. These are MIMSafe and Safety Management Plans.

##### 4.2.1. MIMSafe

In 1996 MIM introduced a NOSA based system called **MIMSafe** as a corporate strategy to improve safety at their operations. MIMSafe has been customised to create MIMSafe OCC as the applicable system for Oaky Creek mines. This was an initiative to systematically adopt safety and health in the functions of planning, organising, leading and controlling. Reference to the company brochure introducing MIMSafe OCC states (Appendix 16): *"The system will provide focus for key priorities such as hazard identification, risk assessment, the development of standards and procedures, training, housekeeping, design of machinery and equipment....."* Further reference states:

*"We must get into the habit of identifying and eliminating hazards to accomplish our tasks without danger to ourselves or others."*

MIMSafe is actioned through several standards. A system of regular workplace inspections is established under MIMSafe. The mine is divided into designated areas and inspections are carried out by trained and appointed area assessors who inspect and report monthly to the area custodians.



#### 4.2.2. Safety Management Plans (SMP'S)

In response to Moura Inquiry recommendations, Oaky No 1 Underground has introduced Safety Management Plans consisting of three components:

- a) **The Overview Plan.** This plan establishes the structure of the system, identifies the principal hazards at the mine and establishes management standards for document control, training, record keeping, corrective action and internal audit.
- b) **Principal Hazard Management Plans** as required under CMA GR 61. Plans have been prepared and implemented for control of "irrespirable, explosive and toxic atmospheres", emergency evacuation, strata control and spontaneous combustion. These plans identify responsibilities, controls, triggers and response action.
- c) **Operational Standards.** These standards are being progressively developed and describe the methods to follow and the standard of the completed task. There were 49 operational standards developed at the time of the accident. In addition work procedures have been developed for individual work areas, including 44 procedures for the longwall operations. (Three of these procedures address work carried out on night shift 20<sup>th</sup> January.)

Note:

- i) The Overview Management Plan version 1.1 issued 23/05/98 requires major hazards and their associated risks to be identified and assessed in accordance with MGP0013- Group Policy - Risk Management. It is the responsibility of the OH&S co-ordinator to ensure that MGP0013- Group Policy - Risk Management or equivalent processes are implemented, maintained and reviewed.
- ii) The Overview Management Plan identifies 18 hazards with immediate fatal potential in a hazard applicability matrix. This matrix includes the hazard of "Persons falling from height or into equipment". This hazard is identified to apply to the mining activity.
- iii) The Overview Management Plan specifies Principal Hazard Management Plans address the major hazards at the mine. Major hazards are defined as those, which have the potential to cause loss of two or more lives.
- iv) The hazard of "Persons falling from height or into equipment" is not classified as major hazard requiring a Principal Hazard Management Plan. The hazard is managed by the application of standards and procedures for specific work sites.
- v) Isolation procedures have been sighted for the longwall. These address the hazard of the moving armoured face conveyor.
- vi) A total of 44 work procedures have been developed for the longwall.

Where possible the mine has attempted to integrate the two systems and has produced a reference handbook explaining SMP's and MIMSafe.

#### 4.3. Mine Safety Performance

The Queensland Mines and Quarries statistical report for 1997/1998 shows Oaky No 1 to have a LTIFR of 46 and a severity rate of 641 compared with underground industry averages of 39.4 and 544 respectively. Over the past three years the trend shows improvement. Records of accidents on Longwall 14 prior to the accident to Mr North show a total of 20 reported accidents including 2 disabling injury and 1 lost time injury. Refer Appendix 23.

## 5. ACCIDENT INVESTIGATION

### 5.1. Aim

The aim of this investigation has been to determine the nature and cause of the accident and make recommendations to reduce the potential for a recurrence of a similar accident in the coal industry.

### 5.2. Investigation process

The investigation process consists of **four parts**. These are summarised as follows:

#### Part 1

The gathering of evidence from:

- ☐ Inspection of accident site including observations, photographs and survey plan (refer section 5.3).
- ☐ Interview statements (section 5.5).
- ☐ Post incident examination of pre-start alarm operation, noise surveys and operation of communication and emergency stop systems (section 5.6).
- ☐ Registered Mine Manager's report (section 5.7).
- ☐ Audit reports (section 5.8).
- ☐ Planned shift activities (section 5.9).
- ☐ Other evidence including training records, inspection reports, shift work plans, mine standards, engineering drawings and mine procedures is referenced and included in the appendix.

### Part 2 (section 5.10)

The sequence of events leading up to the accident was developed from the interview statements and Registered Mine Manager's report.

### Part 3 (section 6)

The Accident scene characteristics and evidence were collated to develop an accident fault tree to assess the causal factors that contributed to the accident. These factors were assessed according to the accident triangle identifying:

- a) Energy source which caused the accident,
- b) Equipment and environment that was involved in the accident and
- c) Human factors that contributed to the accident.

Refer to the accident fault tree in Fig 4.

### Part 4 (Section 7.0)

An analytical method was followed to examine the causal factors and identify failures in the systems at the mine. This method was used to present the accident findings in terms of:

- a) **Breached defences** – these included specific defences that failed or should have been present to prevent the accident. Some of these may have been breached by unsafe acts. These defences are the last line and may include awareness, detection and warning, protection, control and interim recovery, and emergency response to the accident.
- b) **Unsafe acts** – included slips, lapses, mistakes and violations that were committed in the presence of the hazard and defeated the existing defence barriers.

- c) **Preconditions** – included conditions that are conducive to committing unsafe acts or making safety related errors. Conditions, which could produce unsafe acts, include physical environment, the accepted practice for doing things and lack of pride in work.
- d) **Latent failures** – included deficiencies in the systems that manage planning, leading, organising and controlling functions to provide a safe work environment. These failures may be in the functions of management responsibility, design, maintenance, materials, work method control, work culture, housekeeping, communication and training.

## **PART 1**

### **5.3. Inspection of accident site**

An initial investigation of the site was made at approximately 1130 hours on Wednesday 20/01/99. This investigation was undertaken by Mr Caffery, Mr Murray Wood, Registered Mine Manager and Mr Bill Allison - District Union Inspector, assisted by Mr Ces Ivers - Production Superintendent, Mr Phillip Jackson - Safety Co-ordinator and Mr Tom Lambie - Miners Officer. Mr Adam Clarke – REB Engineering employee, the only witness and Mr Greg Burgess - Longwall Superintendent, who was present at the scene prior to the recovery of Mr North from the mine, assisted with re-creating the accident scene. Mr Steve Brown - REB Engineering Supervisor was granted permission to attend.

Permission was granted to re-commence longwall operations at the site following the completion of the survey and the implementation of immediate corrective action. Refer Appendix 1 Mine Record Book Entry 20<sup>th</sup> January 1999. Refer to Figs 1, 2 and 3 showing accident site.

### **5.3.1. Activities being undertaken**

The longwall 14 had 50 metres of retreat to undertake followed by equipment salvage and relocation to longwall 15. On Wednesday night shift 20<sup>th</sup> January 1999 the crew had cut two shears and was preparing for the bolt up cycle. The preparation required the placement of roof support materials in designated storage positions along the face equipment. One pod of roof bolts had been unloaded at the tailgate onto the armoured face conveyor and transported to near the maingate where they were being unloaded. A supply basket containing winches had been placed next to the tailgate drive for unloading. A crew of two men was in the process of unloading this basket at the tailgate.

### **5.3.2. Changes to accident scene post accident**

- a) The armoured face conveyor had been washed down following the recovery of the injured person and the amputated legs.
- b) The Eimco LHD loader with basket attached had been removed from the tailgate drive to provide access to the accident scene by the mine ambulance.
- c) A number of timber props had been stood to provide immediate roof and face control to Mr North and those involved in the recovery.
- d) The right boot of the injured person had been removed from the goaf side race. The boot remained on the armoured face conveyor adjacent to where it was caught. The boot was 1 flight bar closer to the maingate than the position of Mr North.

### ***Photograph NPI and survey plan VF11-354.***

**5.3.3. Observations at the accident scene**

The following observations were made as being potentially relevant to the investigation.

**5.3.3.1. An inspection of the armoured face conveyor identified**

- a) The position of the injured person's head and right leg was marked by chalk on the armoured face conveyor. *Photograph NP2 and survey plan VF11-354.*
- b) The shearer was parked with the tailgate drum opposite #127 chock. The shearer trapping shoe was approximately 4 metres from the injured person. *Photograph NP3.*
- c) There was noticeable wear on the end of the armoured face conveyor flight bars. *Photograph NP4.*
- d) There was approximately 80 mm free space under the flight bar near the tailgate sprocket when the armoured face conveyor was running. *Survey plan VF11-355.*

**5.3.3.2. An inspection of the tailgate sprocket unit identified:**

- a) There was an exposed area between the sprocket cover plate and re-router guides showing the topside of the sprocket, armoured face conveyor chain and flight bar over the ramp pan. *Photograph NP5.*
- b) This exposed area measured 350mm x 1000mm. *Photograph NP6.*
- c) The sprocket cover plate covered only part of the drive sprocket. *Survey plan VF11-353.*
- d) The re-router had been widened by approximately 150 mm. *Photograph NP4.*
- e) There was some coal on the sprocket cover plate. *Photograph NP7.*
- f) The coal on the sprocket cover plate was moist however at the time of inspection did not appear to be abnormally slippery.
- g) There was no emergency stop in the tailgate roadway.
- h) A stone dust tray was attached to the topside of the tailgate drive. *Photograph NP7.*

**5.3.4. An inspection on top of the tailgate drive motor cover identified:**

- a) Drill steels were placed on the tailgate end, then a gap and 5 Boat winches, with several 5 litre containers of oil on the maingate end. There were several stone dust bags, two roof bolts, some loose coal and other small items on the drive cover. *Photographs NP7, NP8 and NP9.*
- b) There was a partially obstructed access path over the tailgate drive, which exited over the tailgate sprocket cover. *Photograph NP7, NP10 and NP11.*
- c) Hoses and cables hanging down from the tailgate chock canopy hindered access from the chock side. *Photograph NP11.*

**5.3.5. An inspection of the tailgate roadway identified:**

- a) Several bundles of roof bolt washers were next to the tailgate drive on the floor of the roadway. *Photograph NP9.*
- b) There was a build up of loose coal on the floor on top side of the tailgate drive sprocket unit. *Photograph NP9 and survey plan VF11-352.*
- c) The roof in the tailgate roadway appeared stable on topside of the tailgate drive. *Plan VF11-354.*
- d) The goat edge was directly opposite the back of the tailgate chock canopy. *Survey*
- e) The area was well ventilated and the air was cool and comfortable.

**5.3.6. An inspection of the tailgate chock identified:**

- a) A steel plate was secured to the topside of the tailgate chock canopy. *Photograph NP8.*

- b) An arrangement of heavy chains was suspended from this plate to within 300mm of the floor. *Survey plan VF11-352.*
- c) The face end of the plate did not have suspended chain. *Photograph NP8.*
- d) Access from the face into the tailgate roadway through or past the chain was not possible. *Photograph NP10.*
- e) The tailgate chocks were advanced over the tailgate drive. *Photograph NP12.*
- f) In this position there was limited space between the chocks and the tailgate drive.
- g) Access into the tailgate roadway was possible with some difficulty over the tailgate drive. The clearance between the canopy and tailgate drive cover was 900mm. This was achieved from the chock side by climbing up onto the motor cover plate and exiting onto the sprocket cover. Exit onto the stone dust tray was not possible due to restricted clearance 300mm and obstruction by the drill steels. *Photograph NP7.*

#### 5.3.7. Recall of events by Mr Adam Clarke

Mr Clarke recalled to the best of his ability the immediate circumstances leading up to the accident. This was done on site during this initial inspection.

- a) Mr North had been on the tailgate drive motor cover moving oil bottles.
- b) Mr Clarke was standing on the top side of the tailgate drive and facing the basket.
- c) Mr Clarke turned towards the sprocket and saw Mr North fall/step onto the chain.
- d) Mr Clarke reached out to grab Mr North.
- e) Mr Clarke scrambled across the tailgate drive and called the alarm on the DAC.
- f) The armoured face conveyor stopped.
- g) People came to assist.

#### 5.3.8. Photographs of the accident scene

During the course of the investigation 54 photographs were taken of the scene. Twelve selected photographs are shown in Appendix 3.

#### 5.3.9. Survey plan of the scene

The mine surveyor, Mr Chris Hayes, undertook a survey of the accident scene and produced plan views and side and end elevation views. Six plans were produced and are included in Appendix 4. These are:

- a) VF11 – 351 Longwall 14 and accident site
- b) VF11 – 352 End view of tailgate details
- c) VF11 – 353 Plan view of tailgate details
- d) VF11 – 354 Plan view showing position of injured person
- e) VF11 – 355 Side view of tailgate and re-router guide details
- f) VF11 – 356 Design plan of mine workings

#### 5.4. Immediate Corrective Action

Following the initial inspection of the accident site a direction was issued in the mine record book. These are:

- a) As an interim measure "Persons crossing the TG drive must lock out the AFC".
- b) Other activities associated with the preparation and securing of the face for chock recovery must have the hazards reviewed to ensure positive isolation of the face.
- c) Training of all crews is to be refreshed on isolation procedures.
- d) The Manager is to investigate engineering controls to minimise the hazard at the tailgate drive.

## 5.5. Interviews

Mr M Caffery, Inspector of Mines, conducted the interviews, assisted by Mr M Wood, Registered Mine Manager and Mr W Allison, CFMEU District Union Inspector.

Mr Steve Brown, REB Engineering Project Manager, requested to be present for the interview with Mr Adam Clarke, REB employee. This was agreed to due to the traumatic experience Mr Clarke had witnessed.

### 5.5.1. Process Explanation

It was explained to each of the interviewees that the purpose of the interview was to obtain a signed statement of events pertaining to the accident, which could assist in the investigation to determine nature and cause and derive recommendations to prevent a recurrence. Each interviewee was asked if they were satisfied with the presence of the three members of the interview panel. Also the interviewees were advised that legally they could not be compelled to provide a statement.

### 5.5.2. Interviewees

A total of seven persons were interviewed on Thursday 21<sup>st</sup> January 1999. The signed statements are contained in Appendix 6.

All interviewees appeared honest and frank during the interviews. The trauma of the accident had clearly affected those witnesses who were present at the accident site when efforts were being made to recover Mr North.

The following table identifies each interviewee, occupation at time of accident and nature of relation to the accident.

Name	Occupation	Nature Of Evidence
Thomas McDonald	Contract Crew Supervisor (Maingate 15 Deputy)	Visited longwall shortly before accident
Leslie John Bunt	Shift Supervisor	Attended to the accident at approximately 0525 hours and assisted until Mr North was recovered.
Peter James McPhail	Crew Supervisor (Longwall Deputy)	Deployed the task to Mr North and Mr Clarke. He was approximately 50 metres away in the tailgate when accident occurred.
Adam Clarke	Contract Miner (REB)	Only immediate witness to accident was standing on the floor on the top side of tailgate sprocket
Lesley Stelling	Miner	He had worked with Mr North in the tailgate prior to the accident.
Tony Melville	Miner	He had placed the basket at the tailgate drive and was about 50 metres away in the tailgate at time of accident. Attended to Mr North.
Michael George Darmody	Miner	He was about 60 metres away in the tailgate at time of accident.

### 5.5.3. Interview of Mr North

At the time of submitting this report an interview of Brant North has not been possible. The solicitor acting on behalf of Mr North has requested that an interview be delayed until Mr North's condition has improved (telephone discussion of 15<sup>th</sup> February).

### 5.6. Post accident tests

#### 5.6.1. Post incident video recording

On Friday 22<sup>nd</sup> January a video recording of some aspects of the longwall 14 operation was carried out by Oaky Creek Coal. This video did not attempt to recreate the events leading up to the accident. At the time that the video was taken the longwall equipment had not moved and the accident scene was largely unchanged. The scenes recorded included the operation of the pre-start alarm, working environment at the tailgate drive and movement of the armoured face conveyor near the tailgate drive. This video is the property of Oaky Creek Coal Pty Ltd. The outline of the video recording is shown in Appendix 8. The video is expected to assist with training needs.

#### 5.6.2. Post incident noise survey

In conjunction with video recording a noise survey was carried out to measure background levels and the noise levels of the pre-start alarm for the armoured face conveyor, motor start up and the armoured face conveyor running without coal. These noise tests were performed in the tailgate roadway at designated distances outbye of the tailgate drive. The results are shown in Appendix 8. The results indicated that the alarm levels were over four times the background sound levels in the immediate vicinity of the tailgate drive and were indistinguishable beyond 22 metres from tailgate drive. Refer Manager's report in Appendix 5.

#### 5.6.3. Post incident armoured face conveyor operational tests

On Wednesday 20<sup>th</sup> January Mr Tony Goodwin, Longwall Electrical Engineer tested the armoured face conveyor cadlocks and lockouts for functionality. The results are reported in Appendix 7. Appendix 8. This report states the pre-start was loud and clear at maingate, mid face and tailgate. The pre-start sounded for 6 secs before the tailgate motor started.

On Friday 22<sup>nd</sup> January further tests to measure the sequence and timing of the armoured face conveyor pre-start alarm at the maingate and tailgate were recorded on video. The movement of the armoured face conveyor over 10 metres was also recorded. The results are reported in Appendix 8. Appendix 9.

These results show a voice message warning of BSL starting 1-2 secs, followed by pre-start alarm for 6 secs, followed by start up of motor for 8 secs and then start of the armoured face conveyor after 16 secs. The chain then moved 10 metres in 12.5 secs.

### 5.7. Mine Managers Report

The Manager's Report was submitted on 5<sup>th</sup> February 1999. The Manager had requested and was granted an extension of time to complete the investigation. The report is contained in Appendix 5. The evidence presented and the incident event tree investigation was reviewed.

## 5.8. Audits

A number of internal and external audits have been carried out to measure the effectiveness of the MIMSafe system. The most recent was an external **NOSA grading audit** conducted from 19<sup>th</sup> to 23<sup>rd</sup> October 1998. The site safety effort rating was recorded as 68.7%, with No 1 Underground recording a rating of 65.3%. The audit report provides observations under NOSA elements referenced to mine area, however summary findings specific to Oaky No 1 were not sighted. The observations did not identify any non-conformances with guarding or isolation procedures at the mine. The longwall observations recorded several references to storage and labelling along the chocks and pantech of the longwall, however there was no specific mention of hazards near the tailgate.

A **SafeGuard** audit was conducted by the Department of Mines and Energy from 23<sup>rd</sup> to 27<sup>th</sup> November into the safety and health systems and activities at No 1 Underground. The audit findings included:

### Weaknesses

- a) "Below the middle management level, poor knowledge of area custodians and area assessors and MIMSafe."
- b) "There is not a clear understanding of when to use risk assessment techniques"
- c) "no formal method for checking of contractors competence"
- d) "no system in place to monitor movement of personnel underground"
- e) "persons being interviewed had no knowledge of the outcomes of area assessors inspections"

### Strengths

- a) Management had demonstrated the need to evaluate risks when introducing new equipment in recent time eg chock controls.

### Improvement opportunities

- b) The integration of SMP's with MIMSafe
- c) The implementation of further elements of MIMSafe including Element 3 (emergency response), Element 4.42 (control of design, engineering, new plant and contractors).
- d) Broaden the knowledge base of hazard management and risk assessment techniques
- e) MIM Group Standard MGS 0014 to be implemented to verify training effectiveness
- f) Training opportunities exist in areas of hazard identification

## 5.9. Planned activities (refer Appendix 10)

The weekly plan for Monday 18/01/99 to Sunday 25/01/99 provided a schedule of activities to prepare the face for the bolt up cycle, which takes place prior to the longwall move. The activities included stopping the face at approximately the 50 m mark after Wednesday D/S and stocking up the face.

The 24 hour plan for Tuesday A/S 19/1/99 to Wednesday D/S 20/01/99 revised the weekly plan schedule and stated "Face is to stop at the 50m mark to stock up face." This was scheduled to occur on night shift.

In addition to these planning documents, a **longwall work list** was produced by the Longwall Co-ordinator, Don Foster, and forwarded to the night shift longwall supervisor, Peter McPhail, for night shift of 20/01/99. This list specifically stated the jobs to be done and identified the relevant longwall procedures to be applied.

Mr McPhail attended a handover meeting at 2230 hours (½ hour prior to shift start). At this meeting he received a handover sheet from the controller. This sheet stated "Peter to pick up procedures from control room" and message from Don Foster advising "to pull up at 50 m".



**PART 2****5.10. Sequence of events leading up to the accident**

- i. At approximately 2300 hours on Tuesday 19/01/99 the longwall 'green' crew consisting of the Supervisor, 5 miners, 2 fitters and 2 electricians left the surface to travel to longwall 14. Refer Appendix 11.
- ii. Longwall crew consisted of:
  - Peter McPhail – deputy with 10 years industry experience
  - Les Parker – miner with 23 years industry experience and longwall trainer
  - Les Stelling – miner with 20 years industry experience and longwall trainer
  - Mick Darmody – miner with 9 years industry experience
  - Tony Goodwin – miner with 19 years industry experience
  - Brant North – trainee miner with 18 months industry experience
  - Perry Simpson – Electrician
  - Chris Selmer – Apprentice Electrician
  - Shane Jackson – Fitter
  - Ashley Howarth – Apprentice Fitter
- iii. Note: Tony Goodwin went underground at 2300 hours with the North East crew to pick up a MPV and then to transport a pod of bolting supplies from the surface to the longwall tailgate.
- iv. Graham Cornwill, REB supervisor, deployed the following REB personnel at the start of shift with the following instructions:
  - Peter Church – to take Eimco LHD and load bucket with roof bolts and plates and take to longwall 14 and to assist in the longwall for shift until 0500 hours, when he would be picked up and brought out of mine to undertake other duties.
  - Adam Clarke, M Boyd and Jim Andrews – went to Maywin entries with Richard Campbell to undertake gopher and hand borer training. One of these men was to go to the longwall when cutting stopped to assist the crew. (Adam Clarke later volunteered for this task.)
- v. On arrival at longwall 14 crib room, Peter McPhail advised the crew they would be cutting until the 50 m mark, and then there would be other work which he would explain then. Peter then conferred with the afternoon shift deputy and read the previous 24 hour reports.
- vi. The night shift crew proceeded to the face and changed over with afternoon shift.
- vii. The crew with Les Parker on the shearer and Les Stelling on chocks, cut into the tailgate and back to the maingate. There were some signs of roof guttering in the maingate reported from afternoon shift. On inspection of the roof conditions the crew with Peter McPhail decided to take one more shear to the tailgate and then park up. This was completed at **0106 hours** on 20/01/99 (as verified by shearer motor current records).
- viii. Crew members were then deployed tasks by Peter McPhail from the longwall work list as follows:
  - ix. Les Parker hosed down the shearer at the tailgate
  - x. Les Stelling, Brant North and Mick Darmody cleared hoses off the face at the maingate.
  - xi. Les Stelling, Brant North and Mick Darmody were further instructed by Peter McPhail that there next job would be to bring bolts into the tailgate and load onto the shearer for subsequent unloading along the face. At approximately **0130 hours** Adam Clarke (REB employee) reported to the longwall to assist. Mr McPhail gave Clarke the task of using a Eimco LHD to relocate supply baskets from A15 and A16 cut-

- throughs in the NE heading to 3 cut-through in longwall 14 tailgate, a task he carried out after some initial trouble starting the LHD.
- xii. At approximately 0215 hours Tony Goodwin arrived in the panel with the multi purpose vehicle (MPV) and pod of bolting supplies. He parked the machine next to the tailgate drive. At approximately 0230 hours Les Stelling and Brant North, went for crib.
- xiii. Peter Church (REB employee) had arrived in the panel with an Eimco LHD and the remainder of the bolting supplies.
- xiv. Later, at the tailgate Peter McPhail discussed the method of transporting the bolts down the face with Les Stelling and others. The longwall work list required the bolts to be loaded onto the shear and to use the shear as a means to carry the bolts to the required positions along the face. The bolts would then be unloaded and tied onto the back of the spill plates in preparation for the bolt up cycle. Since the face was pushed over another shear would have been required. It was decided to load the bolts onto the AFC instead. This method had been used by the crew members on previous occasions.
- xv. This task was then undertaken by the following:
- Les Stelling – who stayed at #129 and controlled the isolation of armoured face conveyor,
  - Peter Church - who passed the bolts from the MPV to Adam Clarke,
  - Adam Clarke - who passed the bolts to Brant North and
  - Brant North – who placed the bolts on AFC at tailgate. He stood beside the AFC on the face side.
- xvi. Mr Les Stelling's statement on Page 1 lines 30 to 35 and Page 2 lines 1 to 6 identified the technique used and stated that when the armoured face conveyor was loaded with a string of bolts from the shear to the tailgate drive he checked that everyone was clear. On each occasion Mr North climbed over the armoured face conveyor to the chock side to Mr Stelling. Mr Stelling then started the armoured face conveyor and ran it for approximately 10 metres. This sequence was repeated 9 times as recorded by drive motor current monitor.
- xvii. On each start of the armoured face conveyor the pre-start operated as recalled by Mr Stelling.
- xviii. Mr McPhail told Mr North and Mr Clarke to wait in the tailgate and move MPV out and bring in Eimco LHD with basket.
- xix. At approximately 4.45am Jim Andrews arrived to replace Mr Church.
- xx. The leading bolts on the armoured face conveyor had reached # 60 chock as advised to Mr Stelling by Mr Parker. Mr Stelling was at the tailgate and started the armoured face conveyor to run the bolts further down the face to 9 or 10 chock.
- xxi. Before leaving the tailgate, Mr Stelling asked Mr North what he was going to do. Mr North replied that he had to take the MPV out and bring in the Eimco LHD ( with basket of winches) refer Mr Stelling's statement page 2 lines 22 to 25.
- xxii. I said "O.K. Do you know what we are going to do now?" He said "No."
- xxiii. I said "Are you aware we will be using the chain? We will be using the face chain, Mr North and what ever you do, keep clear of the Tail Gate drive."
- xxiv. Peter McPhail instructed Brant North and Adam Clarke to unload washers from the MPV pod and put near the tailgate drive. This was done. They also threw 2 dollies and 2 bundles of drill steels onto the tailgate drive cover.
- xxv. Brant North then drove the MPV outbye and parked in 3 cut-through.
- xxvi. Tony Goodwin brought in the Eimco LHD with supply basket of winches and parked it next to tailgate drive. Refer survey plan. The basket was guided into position next to tailgate drive sprocket with the assistance of Peter McPhail.

xxvii. Peter McPhail then instructed Adam Clarke and Brant North to unload the boat winches from the basket. Refer to Mr McPhail's statement on page 3 lines 9 to 12 as follows:

xxviii. Said there were four drums of oil on drive. I said there was room on Tail Gate drive for 2 winches. I said I wanted the other winches thrown on the ground next to roof bolt washers. I said to Brant NORTH and Adam Clarke to make sure you stay clear of Tail Gate drive. I said you're okay with that?

xxix. Peter McPhail then proceeded outbye along the tailgate towards 3 ct. The statement from Adam Clarke page 2 lines 32 to 41 relates the following account of what happened immediately before the accident:

xxxi. I placed the winches towards the back of the Tail Gate cover. I had only put up a couple of winches when Brant arrived and said he will make some room on the Tail Gate drive cover. Brant hopped up onto drive cover and moved oil bottles. I saw him do this. He was on his hands and knees on top of the Tail Gate drive. I think (this is not clear), I turned around to get another winch. I turned back around - not sure if I had a winch in hand.

xxxii. Brant seemed to jump off, was in mid flight, and his foot hit the cover, he slipped into chain. I'm not sure if he was thrown forwards or backwards but I remember his head hat came off.

xxxiii. The chain was running when he slipped in.

xxxiv. At the maingate end of the face work had continued with unloading the bolts from the AFC. Mr Stelling's statement on page 2 lines 45 to 46 and page 3 lines 1 to 5 states:

xxxv. We unloaded probably 10 bundles of bolts and tied to AFC spill plate. At that stage, there was a gap between bolts on AFC and where the bolts were tied up.

xxxvi. We decided to run AFC. We took the lockout off, ran chain 10-12 metres, until bolts were in position. At that stage, put the lockout back on. I heard someone shouting over the DAC. Words to the effect: "Don't run the chain again, someone trapped up here".

xxxvii. The chain ran at least 10 metres, not more than 12 metres.

xxxviii. Mr Clarke scrambled across the tailgate drive and called from the DAC at #129 chock to the maingate crew.

xxxix. Peter McPhail had reached 3 cut-through when he stated in his statement on page 3 lines 19 to 23:

xl. I heard the prestart and AFC start up and continued with my tasks. After 2-3 seconds from AFC start up I heard one of the two guys yelling out. I heard the chain start up from 3 ct, approximately 60 metres. I went back to Tail Gate drive. The chain was stopped. I saw where Brant NORTH was. I climbed over the Tail Gate drive, called to bolting guys, advised Brant NORTH was caught under chain and to proceed to me.

xli. Mr North was facing down on top of a flight bar almost obscuring it and with his forehead resting on the face side running rail of armoured face conveyor. His left leg was on top of the flight bar and under his stomach and his right leg was twisted under and around the goaf end of the flight bar. His right boot was off, the sole of his right foot was facing up and pointing to the tailgate. The left leg was almost severed below the knee and the left foot, with boot still on, was caught by the goaf end of the flight bar. Appendix 24.

**PART 3****6. Collation of evidence**

The evidence has been collated and reviewed as follows:

**6.1. Accident scene characteristics**

- a) The equipment present at the accident site were:
- i) Deutsche Bergbau - Technik maingate and tailgate with controlled soft start drive unit,
  - ii) Deutsche Bergbau - Technik armoured face conveyor consisting of a dual 42mm chain with flight bars connected at 1000 mm spacing within 900mm width pans,
  - iii) Deutsche Bergbau - Technik panline and race in which the armoured face conveyor travels,
  - iv) Long Airdox Electra 1000 double ended ranging drum shearer parked with the tailgate drum opposite #127 chock,
  - v) 133 four leg 800tonne Mecco shields and
  - vi) Load haul dump machine (LHD) and supply basket parked with the basket next to the tailgate drive.
  - vii) Basket contained 47 winches when positioned at tailgate drive
- b) The environment was characterised by
- i) a 2.8 metre high coal seam,
  - ii) gently dipping floor at 1:30,
  - iii) a flaky unsupported roof 1.5m wide between the chock canopy and the face line,
  - iv) a build of loose coal approximately 700mm high spilled out from face on the top side of the tailgate drive,
  - v) night time with cool atmosphere
  - vi) the ventilation report for January records dry bulb temp 27.6 deg C and wet bulb 26.8 deg C. Air readings were 3.25 m/s and 43.8 m<sup>3</sup>/s.
  - vii) a low level of background noise recorded as 5.1.7 dB,
  - viii) restricted height of 900mm above the tailgate drive.
- b) The personnel working in the immediate area were
- i) Brant North, miner 10 months underground experience with only 2 weeks in longwall
  - ii) Adam Clarke, contract miner with REB Engineering since July 1997. No prior longwall experience.
  - iii) Mr North's personnel file records no previous report of any accidents while employed at Oaky No1.

**6.2. Review of causal factors****6.2.1. Movement of armoured face conveyor**

- a) The maingate crew started and stopped the armoured face conveyor when the bolts were moved to the required position, a distance of 10 to 12 metres.
- b) The average speed of the armoured face conveyor when moving from 0 to 12 m was found to be 1.25 m/s.
- c) Hence the chain would have been moving for 12.5 to 15 secs from start to stop.
- d) Mr North was dragged by the flight bar a distance of approximately 7 metres before the chain was stopped. Hence, Mr North was in contact with the chain for a minimum of 8 secs.
- e) The chain was moving for a period of 3.5 to 6 secs before the chain dragged Mr North.
- f) In this interval it is believed that Mr North attempted to step down, slipped into the chain, struggled to recover footing and then was dragged by the chain.

- g) Tests of the armoured face conveyor at the tailgate showed that: voice over sounds for 1 – 2 secs, followed by the pre-start alarm for 6 secs, followed by the motor start for 8 secs and then chain starts to move after 16 secs.
- h) The total time from pre-start alarm to stop of the armoured face conveyor was a max of 31 secs.
- i) The armoured face conveyor had not started when Mr North climbed onto the tailgate drive.
- j) The armoured face conveyor is believed to have just started prior to Mr North stepping down.

#### 6.2.2. Activities at tailgate drive

- a) Mr Clarke recalled that prior to unloading the winches the oil bottles were near the drill steels. ( This would have positioned the oil bottles in the access way) Mr Clarke stated he started unloading the winches and placed them towards the back of the tailgate drive, which would have been clear apart from stone dust bags.
- b) Mr Clarke had unloaded a couple of winches when Mr North arrived and is reported as saying he would make some more room.
- c) Mr North climbed onto the top of the tailgate drive cover and moved oil bottles from immediately in front of the sprocket and next to the drill steels. He was on his hands and knees and moved these oil bottles to the bottom side of the boat winches. Clearance above the cover was 900mm.
- d) Mr North had moved all the oil bottles to a point beyond the winches.
- e) There were five winches on the tailgate drive at the time of the accident.
- f) Mr Clarke in further evidence of 15<sup>th</sup> March stated that he did not place any winches on the drive while Mr North was on the drive.
- g) While on the tailgate drive cover Mr North was clear of the armoured face conveyor.

#### 6.2.3. Immediate actions prior to the accident

- a) Mr Clarke was facing the basket and turned towards Mr North who he saw in "mid flight" and his foot hitting the cover. Mr Clarke could not recall if he had another winch in his hand.
- b) He said the chain was running when Mr North was thrown off balance.
- c) The evidence indicates that Mr North, in attempting to come down off the tailgate drive either slipped on the sprocket cover or he misjudged his footing and became entangled in the moving armoured face conveyor.
- d) It is possible that in descending Mr North attempted to avoid making contact with Mr Clarke and stumbled.

#### 6.2.4. Actions immediately following the accident

- a) **There was no emergency stop immediately accessible to Mr Clarke.**
- b) Mr Clarke went to the cadlock (DAC & Isolation point), believed to be #129 chock, and called the maingate. He was heard by the maingate, by which time the armoured face conveyor had been stopped after moving 10 to 12 m.
- c) Mr McPhail was first on the scene and sought assistance for Mr North. He then went to the maingate and called control for emergency assistance.
- d) Mr Parker on hearing the call over the DAC by Mr Clarke went to the tailgate and attended to Mr North until emergency response arrived.

**6.2.5. Work environment**

- a) A build up of coal on floor and sprocket cover adversely affected the immediate work area. Mr Clarke's movement was restricted by the closeness of the basket to the tailgate sprocket.
- b) The work area could have been improved by clearing of the pile of loose coal and supporting the face at the tailgate where men had to work.

**6.2.6. Evidence from injuries and location of Mr North**

- a) Evidence including the nature of the injuries, location of the right boot and the final trapped position of Mr North indicates Mr North's right foot first became trapped between the flight bar and the goat side re-router. The right boot had been removed during the accident and was found one flight bar in advance of the final position of Mr North.
- b) Mr North's right leg was caught under the flight bar on the goat side.
- c) The video re-construction showed that on start up the tailgate drive did not throw slack chain over the sprocket. However the flight bars do strike hard against the re-router guides leaving up to 80mm space under the bars, sufficient for a limb to be trapped.
- d) The armoured face conveyor stopped with Mr North approximately 4 metres from shearer tapping shoes.
- e) Further movement of the chain could have had devastating results.

**6.2.7. Work instructions**

- a) Mr North and Mr Clarke were deployed to unload the boat winches from the supply basket. Mr McPhail gave an instruction that he wanted a couple of the winches to be thrown on the tailgate drive and the remainder to be placed on the floor.
- b) Mr Clarke vaguely recalled Mr McPhail telling him to put "what (winches) they could on tailgate drive and the rest on the floor".
- c) Mr Goodwin who was within 3-4 metres away when this instruction was given recalls hearing Mr McPhail say put some on the drive and rest on floor.
- d) Mr McPhail could not recall Mr North responding in a manner that showed he did or did not understand the instruction. He went onto to say that a supervisor is not expected to be able to verify that every detail of an instruction is comprehended.
- e) It is possible that Mr North did not hear the work instruction clearly.

**6.2.8. Safety Instructions**

- a) Mr Stelling, an experienced miner, claims he told Mr North to keep clear of the tailgate drive, as he would be running the chain.
- b) Mr McPhail, crew supervisor, claims he said to Mr Clarke and Mr North to stay clear of the tailgate drive after explaining the task to them.
- c) The intent of these warnings is not clear. The specific hazard was not identified and mentioned in the warning.
- d) Mr North and Mr Clarke had been instructed to carry out work in close vicinity to the tailgate drive.
- e) There appears to have been an incompatible goal between work instructions and safety instructions.
- f) This leaves a possible lack of understanding of the instruction in the mind of Mr North.
- g) Mr North had been instructed to work near the tailgate drive.
- h) It is believed that Mr North, in arriving after Mr Clarke had unloaded some winches onto the drive, with the best of intentions saw the opportunity to place more winches on the tailgate drive and set out to do this.

- i) The armoured face conveyor was not running.
- j) Mr North followed the accepted path onto the drive to move the oil bottles.
- k) While on the tailgate drive cover Mr North was not in danger.
- l) However the action of stepping down after the armoured face conveyor had moved or was about to move was an unsafe act.
- m) Factors, which are believed to have influenced Mr North's unsafe action, are unfamiliarity with the work site hazards and trying to do a better job.

#### 6.2.9. Hazard identification

- a) During coal production persons normally remain on chock side of the spill plates when the chain is running. Exceptions include a deputy inspecting the tailgate with the face producing.
- b) The activities being carried out on the night shift of 20<sup>th</sup> January were a normal task prior to bolt up however only performed over a relatively small proportion of a longwall life cycle.
- c) There was an **increased hazard** present because men were working on the tailgate side of a moving chain.
- d) Both Mr Clarke and Mr North had received no formal training in this part of the longwall operation.
- e) The work team of Mr North and Clarke collectively and individually had inadequate knowledge of the hazards.
- f) There was no hard barrier between Mr Clarke and Mr North and the armoured face conveyor. The soft barriers of skill, knowledge and verbal instruction were the only control.
- g) An examination of MIMSafe area assessor observations, longwall deputies statutory reports and longwall deputy production reports for longwall 14 revealed no record of the hazard from inadequate guarding at the tailgate sprocket being identified.

#### 6.2.10. Work Experience, deployment, training

- a) During the shift 3 contract miners Clarke, Church and Andrews were provided to McPhail at different times (0130, 0215 and 0445 hours) to deploy. McPhail had no or little information on their abilities.
- b) Mr Clarke had started with REB in July 1997. Prior to this he had no previous underground experience. While with REB, Clarke has gained experience on conveyor construction, roof support and operation of diesels. He had authorisation to operate PJB, Wagner ST31/2 and Eimco LHD 130 LHD. Mr Clarke has had no prior experience with longwalls other than familiarisation visits.
- c) Mr Clarke had not received a longwall area induction at Oaky Creek No1. He stated he did not know how to stop the armoured face conveyor.
- d) Mr Clarke was placed in a work situation with inadequate knowledge and skill. This indicates a failure in the system that manages the supply of extra labour to the longwall.
- f) Mr North had only two weeks exposure to the longwall equipment. This consisted of being trained on the boot end duties in the maingate. His trainer was Les Parker.
- g) Mr North had little exposure to the longwall beyond the maingate.
- h) Mr North was deployed to the tailgate work site with limited knowledge and skill of the hazards and procedures in this part of the longwall.
- i) Mr McPhail deployed two inexperienced people to the task. However, experienced personnel were available: Stelling and Parker on the maingate and Goodwin and

Darmody on the tailgate pipe job. The crew supervisor had the opportunity to

- j) The training records of Mr McPhail, Mr Parker, Mr Stelling, Mr Clark, Mr North, Mr Darmody and Mr Andrews were examined on 22<sup>nd</sup> January.
- k) The training records were found to be incomplete. The personnel training records did not show evidence of all training on Oaky Creek site procedures issued June 1998 and Longwall procedures issued 22<sup>nd</sup> July 1998.

#### 6.2.11. Pre-start alarm

- a) There were two teams remote from each other working adjacent to the armoured face conveyor. The maingate team communicated their intentions to run the armoured face conveyor by the pre-start alarm.
- b) Mr Clarke could not recall hearing the armoured face conveyor pre-start alarm sound. Mr McPhail was walking outbye from the tailgate drive and recalled he heard the pre-start.

- c) Mr Stelling was adamant the pre-start sounded at the maingate.
- d) Mr North was present at the tailgate earlier in the shift when the bolts were loaded onto the armoured face conveyor. The armoured face conveyor was started and stopped 9 times with the pre-start sequence reported as having worked on each occasion. The pre-start consisted of a voice message followed by a pre-start warble. The voice message said, "BSL is starting" rather than "armoured face conveyor is starting". Operational difficulties with the face control system, known as CLOIS and supplied by Ausdac, required interim changes to the voice message facility. Longwall personnel were previously advised of the change. Refer Mine Manager' report App 5.
- e) Mr Tony Goodwin, Longwall Electrical Engineer, conducted tests on the functionality of the pre-start alarm on Wednesday afternoon, 20th January. Refer appendix 8. This report states the pre-start was loud and clear at maingate, mid face and tailgate. The pre-start sounded for 6 secs before the tailgate motor started. This was confirmed during further tests on Friday 22<sup>nd</sup> January. Refer Appendix 9.

- f) Initially, the maingate crew attempted to start the armoured face conveyor. This attempt was unsuccessful as the pre-start sounded and the motor failed to start. It is not clear where Mr North was during this unsuccessful start up sequence.
- g) The control was reset and a second attempt made. The pre-start alarm sounded followed by motor start up and normal armoured face conveyor start up.
- h) There is no evidence of any noise that would have prevented Mr North from hearing the pre-start immediately prior to the accident.
- i) Company records show a hearing test was carried out on Mr North in May 1997 prior to his employment. This test showed no deficiency in either ear that would have prevented Mr North from hearing the pre start alarm. Appendix 25.

#### 6.2.12. Isolation procedures

- a) There was no isolation point for the armoured face conveyor in the tailgate roadway. The nearest isolation point was at No 133 chock, a distance of 7 m away from Clarke and over the tailgate drive.
- b) However, it is not normal industry practice to have a isolation point on the tailgate drive accessible from the tailgate roadway.

- c) Mr Clarke stated he did not know how to isolate the armoured face conveyor.
- d) Safety tags and isolation procedures for Oaky Creek Coal Pty Ltd were produced in June 1998. Training was stated as being provided during the course of the regular Friday communication sessions held on 13<sup>th</sup>, 20<sup>th</sup> and 27<sup>th</sup> November 1998. Appendix 20.



- e) **Records verifying presentation of safety tags and isolation procedures could not be found for all of the Green crew on personnel training files.**
- f) **Longwall face equipment isolation procedure, UG1-LW Procedure-120 was prepared to address specific modes of isolation required for different tasks on the longwall. The procedures were issued on the 22<sup>nd</sup> July 1998 specifying. The modes of isolation include face lockout isolation being carried out by switching off a face cadlock. Appendix 19. g) These procedures were presented to green crew on 12 November 1998.**
- h) **Records verifying presentation of longwall face equipment isolation procedures were not sighted on the personnel training files.**
- i) **UG1-LW Procedure-120 provides examples of tasks requiring face lockout isolation. Access into the tailgate is not included. These procedures were scheduled for review on 22<sup>nd</sup> January 1999, two days after the accident.**
- j) **The procedures were reviewed following the accident and re-issued on 25<sup>th</sup> January 1999 and now include:**
- i) **Crossing over the tailgate drive as a task requiring face lockout isolation and**
- ii) **Addition of a hazard control matrix to focus attention to the specific hazards.**
- k) **Mr North's training records show the results of an assessment on tagging, isolation, permits and defect reports dated 5<sup>th</sup> March 1998. This was part of the generic underground induction. He recorded a 100% pass for the multiple choice test. Refer Appendix 17.**
- l) **Mr Clarke also received training in tagging, isolation, permits and defect reports as part of generic underground induction.**

### 6.2.13. Modifications to sprocket cover

- a) **The guard over the tailgate sprocket had been cut back leaving a gap of 350mm between the cover and the re-router. This is reported to have resulted from a incompatibility between the original cover design and the tailgate ranging arm of a previous AM500 shearer in May 1996 prior to longwall 8. A compatibility report by Long Airtox Australia Pty Ltd does not mention the modification to the sprocket cover.**
- b) **Minutes of a meeting of 31 July 1996 involving Oaky Creek and DEUTSCHE BERGBAU - TECHNIK personnel records that DEUTSCHE BERGBAU - TECHNIK was to document in drawings and parts book what changes were made to let the shearer tow arm enter the tailgate. These documents have not been sighted.**
- c) **There is no record of a risk assessment being conducted into the modification carried out during the compatibility trial with the AM500 shearer.**
- d) **The Electra 1000 shearer was introduced on Longwall 9 in March 1997. No record has been found of the compatibility of the Electra 1000 shearer with the modified sprocket cover being examined.**
- e) **The guard was not returned to original design when the Electra 1000 was installed.**
- f) **An examination on the 29<sup>th</sup> January 1999 revealed there was no fouling of the Electra 1000 and the tailgate sprocket cover. Refer to D Alcock's report 29<sup>th</sup> February 1999. Appendix 18.**
- g) **The longwall 14 panline and tailgate drive was installed as new on longwall 8. The only subsequent changes have been a widening of the chain re-router to spread the wear on the flight bars. Section 6.2.17.**

### 6.2.14. Tailgate chock modifications (Appendix 24)

- a) **During and prior to LW11 difficulties were encountered with tailgate roadway roof support. Timber cogs were installed to support intersections. Normally the longwall panels were designed to operate with 1.5 chocks into tailgate.**

- b) Following assessment of the conditions it was decided to design the block width to operate with only 300mm of chock overlap into tailgate.
- c) Systematic secondary support was installed in L W14 tailgate.
- d) For L W 12 no goat shield was used and access into the tailgate was controlled by warning signs placed in the tailgate roadway and at the end of the chock line. App 24.
- e) During the changeover from L W12 to L W14 goat shield consisting of steel top plate and suspended heavy chains was installed. This design was based on experience at other mines. App 24
- f) There is no record of a risk assessment of this modification being carried out.
- g) During the production of longwall 14 several chains were removed to improve access into the tailgate. App 24.
- h) Experience from mining through a fault at 10 cut-through showed the benefit from the chains to control flushing. With the tailgate chock close to the rib line it was not trying to advance through fallen roof.
- i) However, further difficulties were experienced with access, refer MIMSafe area assessor report. Section 6.2.16

#### 6.2.15. Tailgate access

- a) There is no record of a risk assessment of tailgate access being conducted.
- b) On interviewing personnel it is apparent that three methods were used to access the tailgate. These were:
- i) Access over the tailgate drive without isolation,
- ii) Access through the chains when tailgate drive was extended with some difficulty and
- iii) Isolation and crossing armoured face conveyor.
- c) There was a pathway across the tailgate drive exiting over the sprocket cover which was used as a access from the chocks to the tailgate roadway and vice versa. In fact, at the time of the accident this was the only practicable access across to the chocks from the tailgate roadway.
- d) Access over the tailgate drive into the tailgate roadway exposed personnel to the hazard of the moving armoured face conveyor. Personnel accessing this way without isolation carried out an unsafe act.
- e) An examination of deputies statutory inspection reports from the start of longwall 14 showed: (Refer Appendix 24) 2, 7

- i) On 2<sup>nd</sup> September 1998 a comment was made in longwall deputies production report - *chains at TG are a hazard.*
- ii) On 14<sup>th</sup> September 1998 the deputy's statutory inspection report records in general comment section - *Chains at TG still cause problems when accessing TG.*
- iii) On 14<sup>th</sup> September 1998 a comment was made in longwall deputies production report - *require to cut one or two chains from TG chock for access.*
- f) Access into the tailgate was possible by crossing over the armoured face conveyor in accordance with the longwall equipment isolation procedure. This route was not available when the shearer was at the tailgate end of the face.
- g) A safe and serviceable access was not always available into the tailgate.

#### 6.2.16. Inspection reports

- a) A MIMSafe area assessor's observation of 7th December 1998 identified concern regarding access into the tailgate during production time. The observation was that deputies could only access the tailgate over the tailgate drive sprocket. A further comment suggested that - a few chains in middle of old access may need to be removed for access. Refer Appendix 21.

- b) The inspection action sheet dated 21<sup>st</sup> December 1998 relating to this observation stated: *Deputies having difficulty accessing roadway past the goaf shield.* Appendix 22.
- c) The action recommended was: *The goaf shield will be lengthened to provide better protection, making access more difficult.*
- d) Further comment was: *Action on this item does not fit in with the design and purpose of the goaf shield.*
- e) It is clear that there was a incompatible goal between attempting to access directly into the tailgate roadway past the tailgate chock and the maintenance of an adequate goaf shield.
- f) However, immediate corrective action to address the hazard by interim procedures was not evident.
- g) The area assessor inspections of longwall have been carried out monthly in accordance with MIMSate procedures. An examination of six previous inspection reports has identified:
- i) Several observations in Element 1.22 - Good stacking and storage practices two of which related to the un tidy nature of storage on the tailgate drive.
- ii) Nil observation in Element 2.11 - Machine Guarding anywhere in longwall system.
- iii) Only two observations in Element 2.12 - Lock out system and usage. One was in relation to the shearer isolation and the other connected to DAC communication.
- 6.2.17. **Wear on armoured face conveyor (Appendix 24)**
- a) Oaky Creek approached MTA (now Deutsche Bergbau - Technik) prior to the completion of LW12 to assess the wear on the chain and flight bars. Deutsche Bergbau - Technik advised the chain was in specification and was expected to last through longwall 14.
- b) After 400m of retreat the flights showed extreme wear. Deutsche Bergbau - Technik proposed widening of the tailgate re-routers to spread the area of wear on the flights.
- c) The widening of the re-routers was completed on 5<sup>th</sup> October 1998.
- d) **The potential hazard at the tailgate sprocket was not recognised, although work was carried out on the re-routers immediately adjacent to the sprocket.**
- 6.2.18. **Review of industry tailgate access**
- a) The access paths used by the other eleven longwall mines in Queensland have been reviewed and a report is included in Appendix 26. **Two mines have added additional guard protection to the sprocket.** A number of mines (mainly higher seam operations) provide an access way over the tailgate drive. These mines employ goaf shields similar to Oaky No1, which restrict access past the tailgate chock.

**PART 4****7. FINDINGS**

Arising from an analysis of the evidence and causal factors the following findings are presented:

**7.1. Breached defences**

The causal analysis has identified that the primary causes of the accident were:

- a) Inadequate guarding of the tailgate sprocket between the sprocket cover and the chain re-router guides.
- b) Failure to isolate the armoured face conveyor before working on the face side of the tailgate drive.
- c) Inadequate hazard awareness of longwall mining environment.

**7.2. Unsafe Acts**

- a) The injured person attempted to step down from the tailgate drive cover after the chain had moved or was about to move and failed to secure an adequate footing.

**7.3. Preconditions**

The following conditions were found to be conducive to committing unsafe acts:

- a) Changes made to the sprocket cover plate during shearer compatibility trials carried out in 1996 prior to longwall 8 exposed a gap of approximately 350 mm between the cover plate and re-router guides.
- b) Prior to longwall 14, access to and from the tailgate roadway was achieved directly through the zone between the tailgate chock and the tailgate drive unit. During the installation of longwall 14 in May 1998 chains were installed on the tailgate chock to guard against the hazard of stone flushing into this zone. These chains significantly restricted, and in effect prevented direct access into the tailgate. Under this arrangement, it became normal practice for persons to access the tailgate by climbing over the tailgate drive. The path followed exposed persons to the gap between the cover plate and the re-router guides. At the time of the accident the access path used from the tailgate roadway onto the chock side was over the tailgate drive.
- c) Persons deployed to the task had:
  - i) Inadequate knowledge of work site procedures and hazards.
  - ii) Inadequate understanding of work instructions

- d) Planning and supervision practices were deficient due to:
  - i) Inadequate deployment practice with two inexperienced persons left to work unsupervised in an area of increased hazard.
  - ii) Limited knowledge by the crew supervisor of the work experience of the contractor sent to assist with the task at the tailgate drive.
  - iii) A incompatible goal existed between the work instructions and the warnings to keep clear of the tailgate drive.
- b) Lack of emergency stop facility available to persons working on the face side of the tailgate drive.

**7.4. Latent failures**

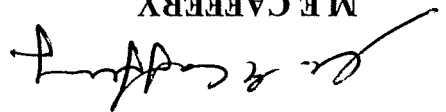
In addition the investigation determined the following deficiencies in the mine management system.

- a) Inadequate application of risk assessment techniques to the changes to equipment design as evidenced by:

## 8. RECOMMENDATIONS

- The following recommendations are made in accordance with the findings.
- a) It is recommended that a structured risk assessment should be conducted into all activities associated with the potential hazards arising out of persons falling into unguarded moving machinery. The scope of the assessment is to cover the total underground and surface activities of the underground operation and include:
- i) Identification of all potential hazards
  - ii) Assessment of the risks
  - iii) Examination of existing controls including adequate guarding and isolation
  - iv) An action plan to implement controls
  - v) Verification that actions have been completed
  - vi) Schedule for regular review of the hazards and adequacy of controls.
- b) Risk management techniques must be applied before changes, that could affect safety, are made to equipment design and work procedures.
- c) A system must be in place to measure workplace compliance with safety controls and should include:
- i) A means to check personnel understanding and compliance with isolation procedures.
  - ii) An inspection of the workplace to ensure adequate guarding is always in place to protect personnel from hazards for the full range of activities carried out.
- d) A program to improve hazard awareness at the work site should be implemented that includes:
- i) A structured training program for employees covering the identification of hazards in the workplace, adequacy of controls, contingency for unplanned actions and emergency response. This training should be followed up by scheduled refresher.
- e) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- f) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- g) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- h) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- i) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
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- k) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
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- n) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- o) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- p) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- q) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- r) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- s) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- t) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- u) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- v) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- w) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- x) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- y) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.
- z) Inadequate training records as evidenced by incomplete records of training in isolation procedures on personnel training files.

- ii) Planning for new tasks and changed work environments is to include the identification of potential hazards.
- iii) Regular review of hazards and controls by supervisors with crews before work commences.
- iv) Proactive reinforcement of hazard awareness by supervisors and management.
- e) A structured program of training for the supervisory personnel should be provided to improve skills in:
  - i) Communication,
  - ii) Safety management and
  - iii) Work planning.
- f) Employee induction and authorisation systems to include:
  - i) A checklist of hazards and minimum standards of competencies in hazard identification and control for the specific work areas in the mine.
  - ii) Authorisation for new, transferred and contract personnel is to include competency with these minimum standards and authorisation to work in specific work areas.
  - iii) Personnel records are to provide all relevant training, authorisation and work experience history.



**M E CAFFERY**  
**Inspector of Mines**  
**Central Region**

25 March 1999  
 File ref I:\coal\insp\accserio\oakyno.1\north-rpt2.doc

## Erratum

### ACCIDENT INVESTIGATION REPORT OF THE INJURY TO MR BRANT NORTH

20<sup>th</sup> January 1999

Report dated 25<sup>th</sup> March 1999

1. Page 15 Section 5.6.3 Post incident armoured face conveyor operational tests  
On Wednesday 20<sup>th</sup> January Mr Tony Goodwin, Longwall Electrical Engineer tested the  
armoured face conveyor cadlocks and lockouts for functionality. The results are reported in  
Appendix 7.

This report states the pre-start was loud and clear at maingate, mid face and tailgate. The pre-  
start sounded for 6 secs before the tailgate motor started.  
On Friday 22<sup>nd</sup> January further tests to measure the sequence and timing of the armoured face  
conveyor pre-start alarm at the maingate and tailgate were recorded on video. The movement  
of the armoured face conveyor over 10 metres was also recorded. The results are reported in  
Appendix 8.

These results show a voice message warning of BSL starting 1-2 secs, followed by pre-start  
alarm for 6 secs, followed by start up of motor for 8 secs and then start of the armoured face  
conveyor after 16 secs. The chain then moved 10 metres in 12.5 secs.  
These results show a voice message warning of BSL starting 1-2 secs, followed by pre-start  
alarm for 6 secs, followed by start up of motor for 8 secs and then start of the armoured face  
conveyor after 16 secs. The chain then moved 10 metres in 12.5 secs.

#### Corrections:-

Appendix 7 should read Appendix 8 and Appendix 8 should read Appendix 9.  
The last sentence should read:- "The chain then moved 12.5 metres in 10 secs.

#### 2. Page 20 Section 6.2.1 Movement of armoured face conveyor (c), (d) and (e)

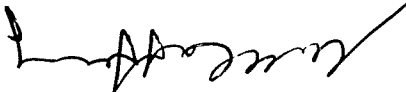
(c) Hence the chain would have been moving for 12.5 to 15 secs from start to stop.  
(d) Mr North was dragged by the flight bar a distance of approximately 7 metres before  
the chain was stopped. Hence, Mr North was in contact with the chain for a minimum  
of 9 secs.  
(e) The chain was moving for a period of 3.5 to 6 secs before the chain dragged Mr  
North.

#### Corrections:

(c) Hence the chain would have been moving for 8 to 10 secs from start to stop.  
(d) Mr North was dragged by the flight bar a distance of approximately 7 metres before  
the chain was stopped. Hence, Mr North was in contact with the chain for a minimum  
of 6 secs.  
(e) The chain was moving for a period of 2 to 4 secs before the chain dragged Mr North.

Note: The information on pages 15 and 20 is derived from the evidence presented in  
Appendix 9 titled: "Report on armoured face conveyor stopping distances and noise tests".  
This evidence is a correct record of observations.

3. Page 3 list of Attachments  
Appendix 27 titled "Deputies statutory reports referring to tailgate access" is added to the list of Attachments. This material is referenced in Section 6.2.15(e) as Appendix 24.
4. Page 26 Section 6.2.15 (e)  
An examination of deputies statutory inspection reports from the start of longwall 14 showed:  
(Refer Appendix 24.)  
Correction:  
Appendix 24 should read **Appendix 27**.
- The corrections made do not affect the findings or recommendations.

  
ME Caffery  
Inspector of Mines  
Central Region  
21 April 1999