



11 DREDGER CENTRE CHUTE FIRE INCIDENT

FINAL INCIDENT INVESTIGATION REPORT

**Incident Date 21/1/2012
AT 06:10 HOURS**

FINAL

Investigation Team:

- John Robinson (Health & Safety Manager – Investigation Leader)
- Peter Brimblecombe (Mine Senior Electrical Engineer, Compliance)
- Marc Callow (Maintenance Tradesperson – Health & Safety Representative)
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CONTENTS OF REPORT

Introduction

A draft report was issued on 23/2/2012, prior to gaining access to the machine.

The final version of this report has been significantly delayed for 2 reasons:

- 1.** The inability of the Investigation Team to access the machine because of a Prohibition Notice issued by the regulator WorkSafe Victoria
- 2.** The time required to dismantle and analyse the impact idlers suspected of being the cause of the fire, after the Prohibition Notice was modified due to extensive analysis by an Independent Structural Expert to verify the safety of the dredger.

The Investigation Team would like to thank witnesses and other personnel who provided extensive interviews, photographs and video evidence.

This evidence, together with previous fire reports and information on the mechanisms of fire in Brown Coal Open Cut mines has been used in the compilation of this report

This report covers all items of the Terms of Reference (Appendix 6.1) except for Item 6 – Provide a preliminary assessment on impacts on Insurance Coverage. Item 6 was addressed separately.

Executive Summary

The investigation team concluded the fire was caused by an impact idler in the discharge boom chute that had overheated due to a bearing failure not identified by normal inspections. When the conveyor stopped the localised heat ignited the coal and rubber under the carry belt inside the chute. The fire was detected in its early stages by the operational crew.

The fire spread extremely rapidly upwards through the centre transfer area of the Dredger fuelled by flammable materials comprising conveyor belt, impact idler discs, spill rubbers, plastic chute linings, impact curtain, pulley lagging, and electrical cable insulation. The contribution of coal to the fire was negligible as the belts had been run off and coal below the discharge boom belt was unburnt after the fire was extinguished. The rate of increase of the fire was significantly influenced by the machine configuration leading to an updraft (chimney effect) and the amount of fuel available.

The two crew members on 11 Dredger used all resources at their disposal in an attempt to extinguish the fire (5 fire extinguishers were used and the local hose reel), at numerous times they managed to quell the fire at the centre transfer chute however it flared up each time. By the time an external water supply to the machine was secured it was too late.

The difficulty in connecting an external water supply to the machine in a timely manner was a significant contributing factor in the incident but was mainly due to the digging configuration at the time (the three plant items on three different levels).

Resources both internal and external arrived post the collapse of the discharge boom structure and performed admirably in the overall extinguishment of the fire although the effectiveness of both the CFA and mine fire trucks was poor due to the height and distance of the fire from the coal surface. The specialised equipment used by the mine services group was the most effective.

The speed with which the fire developed (19 minutes from first sight of a small fire to boom collapse), the intensity within the limited area and the lack of significant water in a timely manner led to the incurred damage.

1.0 Incident Description

1.1 Incident

Location :	Dredger 11
Time :	06:10
Date :	21 st January 2012

Details of Injured

Name :	Nil
Company :	
Injuries sustained :	
Medical treatment:	

Details of damage / impact

Damage to equipment :	Dredger 11 extensive structural and fire damage
Environmental impact :	Nil

Risk Rating

Actual consequence level:	High Potential Near Miss
Potential consequence Level :	Multiple Fatalities / Collapse of machine

Events leading up to the Incident

Known defects associated with the centre transfer chute of D11 scheduled for rectification on the day shift of 21st were worn spill rubbers. In addition the only reported defective idler on the discharge conveyor (WO 11-173870 tag 41478) was a centre troughing idler at location 40 with a collapsed bearing, located outside the loading chute (Note: this idler was found to have been removed prior to the fire).

On the night shift of 21/1/12 Dredger 11 (D11) was operating via Mobile Slew Conveyor 96 (S96) digging deep bottom side of M820 conveyor. D11 was approximately 18 metres below M820 conveyor and approximately 78 metres away from M820 conveyor (see appendix 6.5)

D11's output was limited by the control system on the dredger due to restrictions arising from the M170's rising conveyor structural upgrade works.

D11 was requested to cease operation by the control centre attendant at 05:19hrs. The crew then awaited further instructions, the control centre called D11 at 06:10 advising the machine needed to be parked due to maintenance works scheduled for day shift. The crew identified they needed to travel back 20m in order to connect to an existing fire service hose that was connected to a hydrant on the fire service pipe that runs along side the M820 conveyor. The crew then commenced to travel back with the Dredger, mobile slew and hopper all travelling together. The operator of S96 identified what he presumed was a fire at the centre transfer point of D11 following slewing of the D11's discharge boom which gave him a view of the centre chute. The time recorded for this event was 06:12hrs.

Incident Description

The operator of S96 confirmed that a small fire was present at D11's centre chute, he then informed D11's crew of the fire via the local communication system between the dredger, mobile slew conveyor and hopper. The two Dredger 11 operators went to assess the fire, as required by the Fire Instructions. A small fire was found at the mid point of the centre transfer chute burning on the bottom of the carry side of the discharge conveyor belt. The fire was observed to be 1 metre wide on the left hand side of the discharge conveyor chute. The fire was very hot with little flame evident. The operators believed they could extinguish the small fire. At this point they did not contact the Control Centre to report the fire. The two operators on D11 proceeded to fight the fire with resources at hand which included fire extinguishers and hose reels located on the machine. At times the fire was almost extinguished however it continued to reignite; the operators only accessed the left hand side of the transfer chute. The other two operators one on S96 and one on the hopper commenced to connect a water supply to D11 from the nearest water supply source (M820 West header hydrant connection). This required the running out and connection of 5 lengths of 30m long, 90mm diameter percolating hoses. (Involved collecting the hoses from storage on the various machines, running them out over the coal faces and dropping hose over two batters – refer Appendix 6.5 for digging configuration and photo #18 for overview)

D11 Senior Operator dropped the machine's wash down hose off the end of the discharge boom (photo #84) to allow connection to a water supply once received. This would have provided a significant water supply directly at the centre chute area via a rubber hose (photo #83). This water source is used to enable off line cleaning of the centre area of the machine.

The hose dropped down the batter by the S96 operator was connected by an RTL operator directly onto the D11 rotary spray connection located at the

crew room/lubrication room underframe steps (photo #68). The S96 operator then informed the hopper operator located on M820 header to turn the hydrant on. The rotary sprays commenced operation low water pressure was apparent but the sprays were working as seen in the video clips. These sprays were not effective in fighting the fire in the transfer chute; they are designed to protect the machine from an encroaching fire.

(Note: The sprays did wet down the area round the machine, which would have helped prevent the spread of the fire if it had come off the dredger. This was confirmed by the CFA who requested the sprays be turned off when they arrived to allow them to safely approach the dredger.)

At 6:25 power to the machine was removed by the shift electrician under instruction from the control centre.

The Senior Operator located on the machine was unable to communicate with the RTL operator on the ground and descended the machine to relocate the installed hose from the rotary spray connection onto the hose he had lowered from the discharge boom.

At about this stage a loud "swoosh" was heard and it was observed flames were shooting up the middle of the machine, the intensity of the fire increased rapidly as evidenced by video taken by the hopper operator.

The fire rapidly escalated up the centre section of D11 reaching the upper tower section damaging steel structure, cabling, ancillary conveyor components and the discharge boom fixed stay ropes.

At approximately 6:27 the right hand side fixed stay rope providing support to the discharge boom mast was observed to fail at its centre tower connection by the S96 operator who heard a snap and witnessed the discharge boom tilt to the right hand side.

The Senior Operator heard someone yell out "get out of there it is going to fall", he stepped sideways and moments later the discharge boom fell approximately 10 metres to the ground beside him. He then reconnected the hose back up to the rotary spray connection and had the water turned on by the hopper operator. The water pressure was still low.

From the first sighting of the fire to the collapse of the discharge boom, a period of only 19 minutes elapsed.

The RTL tanker arrived on site at 6:30, two RTL operators then directed it into a location suitable to fight the fire.

The day shift operations manager initiated the emergency response plan and assumed the role of emergency commander.

Additional resources arrived at D11 including internal fire tankers, RTL (contractor) tanker, internal personnel and the Country Fire Authority (CFA). The CFA assumed the role of Incident Controller when they arrived at the fire.

The fire was declared contained by the CFA at 10:00hrs on 21st January 2012. The fire was left in the control of internal resources to fully extinguish all remaining smouldering and spot fires.

The fire was eventually confirmed extinguished on D11 by approximately 1600 hrs on the 21st January 2012.

The investigation team believe the D11 crew are to be commended for their actions and effort given the short time frame and intensity of the fire.

Events Post Incident

An independent structural expert was engaged to assess the damage sustained and the implications to the stability of D11.

WorkSafe attended the site at 1310 hrs and commenced their investigations which subsequently lead to imposing verbal restrictions on accessing the machine. These restrictions covered all personnel only allowing access for fire fighting and structural assessment by the independent structural expert. Under these access restrictions it was noted with photographic evidence the reported defective idler (No 40) had been removed prior to the fire, this was substantiated by a witness statement. These WorkSafe verbal restrictions were later formalised by the issue of a prohibition notice. Appendix 6.6 details the requirements of this notice.

During the day shift on the 21st January, the area around D11 was barricaded. S96 high voltage supply cable was disconnected from D11. S96 was connected to an auxiliary power supply and travelled away from the scene.

The Mine operational shift undertook post incident inspections on D11 to monitor for further fires.

A management meeting was held on Monday 23rd January whereby a project management and an investigation team were appointed.

A formal investigation into the incident commenced Tuesday 24th January 2012 following the terms of reference issued by the Mining Director. (Appendix 6.1)

Events Post Incident

When the Independent Structural Expert had completed an assessment of the dredger stability, the report was reviewed by the regulator and the Prohibition Notice was reissued allowing limited access to the dredger.

The investigation team with an independent fire assessor made an initial inspection of the dredger and determined the probable cause to be an impact idler.

The impact idlers were subsequently removed and sent for metallurgical analysis to determine a specific cause.

The investigation team, upon inspection with HRLT representatives, found that the RHS (in direction of conveyor belt travel) fixed stay rope at the centre tower socket connection had sustained a tensile failure as observed by "Necking" of the rope at the point of failure (photo 87 and 88). The RHS rope socket had also sustained cracking at its connection to the tower (photo 59). The LHS rope at the point of failure did not have the same tensile failure (photo 89). The conclusion from this is that the LHS rope failed due to the fire followed by the RHS rope due to overloading.

1.2 Photographs

Appendix 6.7 shows photographic evidence recorded by personnel at the incident. There are also some photos taken by the Investigation Team after the Prohibition Notice was modified to allow limited access for investigation and testing purposes.

The D11 machine general arrangement is also shown.

1.3 Time Line

Friday 20/1/2012

1900 Night shift crew commence work. Shift Manager – Peter Smith, D11 crew - Senior Driver Alex Prochazka, Driver - Colin Smith, S96 Driver - Frank Giardina, Hopper operator - Simon Quail.
D11 digging – Double bottom side via S96 mobile slew conveyor towards the head end of M820. In the vicinity of the 700 metre mark.

Saturday 21/1/2012

0519 D11 "Called Off" by control centre – Not required to dig due to high bunker levels
0519 To 0610 D11 and S96 idle awaiting instructions to continue digging. The Senior Driver and the driver remained in the cabin awaiting instruction.
0610 D11 and S96 instructed to park the dredger up for maintenance. Commenced travelling back from the face to "Hose up" (connect D11 to fire fighting water at M820 West side header) and shut down.
0612 S96 operator moves the discharge boom away from D11. First sighting of small fire estimated at 0.5m wide by S96 operator at the centre of the 11 Dredger discharge loading boot. Fire reported to D11 driver and Senior Driver.
0613 D11 and S96 stop. D11 Driver and Senior Driver attend to the fire to investigate. Begin fire fighting with extinguishers and machine hose reels. Fire had increased in size to 1m.
0613 S96 and Hopper operators commence connecting fire hoses from the West header topside of the M820 conveyer.
0615 Fire seen by RTL employee and Mine Control centre advised.
0615 Control room unsuccessfully attempt to contact Dredger crew.
0616 Control room dispatch Road Runner to investigate fire.
0620 Day Shift Manager dispatched to scene with fire tanker.
0620 CFA called
0625 Fire fighting water hoses connected to rotary sprays. Not effective for fighting the fire.
0625 Dredger 11 6.6kV supply isolated by shift electrician at power pole switch.
0626 Water then disconnected from rotary sprays in an attempt to reconnect supply to discharge boom wash down supply point in order to attack fire at the centre transfer chute.
0627 Right hand guy rope fails on the discharge boom.
0628 Emergency incident notified to site emergency services provider (Diamond Protection)
0630 Mining Director Richard Polmear advised of incident by Control centre.
0630 RTL fire tanker arrived on scene.
0631 Discharge boom supports fail – boom falls to ground. S96 operator observed 11 Dredger rocked forward once.
0634 Water re connected to 11 Dredger rotary sprays.
0635 Gary Honeychurch (Mine Maintenance Superintendent) advised.
0635 RTL and Hazelwood fire tankers arrive on scene. Unable to effectively direct water to the height of the centre transfer area.
0635 CFA enter rear slide gate for site access.
0641 OHS Manager John Robinson advised.
0645 CFA arrive at 11 Dredger

0650 to 1000 Fire fighting operation involving CFA and Hazelwood equipment in progress.
0700 D11 and S96 night shift crew sent home.
0716 Diamond Protection tanker arrived at D11
0850 Diamond Protection tanker left D11
1000 CFA declared fire contained. CFA leave site.
1230 Klaus Haberler (MMHE), independent structural engineer on site.
1310 WorkSafe on site.
1600 Fire extinguished
16:00 Inspection and "making safe" activities under the oversight of WorkSafe
17:00 Prohibition Notice issued by WorkSafe restricting all access onto D11 except to put out new fires and electrical disconnections.
1900 to 2230 Interviews conducted with D11 and S96 crew when they returned for their second night shift commencement.

20/2/2012 Prohibition Notice was reissued to allow limited access for testing and investigation of the fire
5/3/2012 Prohibition Notice lifted
9/3/2012 Idlers removed from the dredger for testing and analysis
29/5/2012 Final report on Impact Idler Analysis received from Independent Laboratory

2. Key Findings

The key findings outline why the incident occurred and the contributing factors deduced from the investigation have been categorised using the Incident Cause Analysis Method (ICAM). The ICAM analysis chart is shown in Appendix 6.2.

2.1 Probable Cause

The HRL Technology Pty Ltd report "Metallurgical Assessment of Discharge Conveyor Impact Idlers" provided the following

"Conclusion

Based on the findings it was concluded that the fire could have started at one of the bearings on Idler String 49B, probably the LHS bearing. It is believed that this was caused by rubbing the outer race against shell generated hot spots in which temperatures were above 800°C."

This confirms the initial conclusion of the Investigation Team, and the independent Fire Investigator appointed by the Insurance Company, that the fire originated in the centre transfer chute due to the failure of an impact idler.

When the belt stopped the heat from the idler was concentrated in a single spot which heated the belt rubber and surrounding coal to ignition point.

Note: This type of failure accounts for a small percentage of failures each year and is very difficult to detect with visual and aural inspection techniques used by mine operators.

2.2 Contributing Factors

Based on the evidence to hand, the Investigation Team believe the following were the main contributing factors to the incident:

2.2.1 Absent or Failed Defences

- Failure to detect or predict the impact idler failure
- Failure to detect the fire early
- Lack of water volume & accessibility
- Lack of water pressure (5 lengths of hose run out)
- Insufficient hydrants in the vicinity available on M820 header
- Fire policy focuses protection of the machine from external fire

- Water supply once available was connected to D11 rotary sprays (not birdsmouth conveyor sprays)
- There are no birdsmouth sprays in the discharge boom chute area
- The birdsmouth sprays in the bucket wheel boom discharge chute area were not correctly set up

2.2.2 Individual or Team Actions

- Crew failed to call control centre to report incident
- Control centre unable to contact any member of the D11 crew
- Crew attempted to extinguish fire at centre transfer point with a combination of extinguishers and hose reel (water supply from overhead tank)
- RTL connected water supply to D11 rotary spray line as per their perceived normal practice and experience. Connection of the water supply to the birdsmouth conveyor sprays would have better complied with the Fire Service Policy for this specific type of fire.
- D11 crew attempted to connect water supply to the discharge tail end wash down connection for water supply via a hose into the centre chute area.
- D11 crew were not aware of the rate of development of the fire when attempting to extinguish it at the centre transfer chute

2.2.3 Task or Environmental Condition

- D11 centre chute area acted as a chimney (once the discharge boom belt had burnt through). The machine configuration, with the discharge boom being elevated, may have made the chimney more effective in concentrating the fire and drawing air into the combustion area.
- A significant amount of flammable material, other than coal, is located in and above the chute area which fuelled the fire
- Weather conditions were calm and pleasant, no wind apparent which assisted in preventing the spread of fire to other areas of the mine.
- Visibility was good as the fire occurred just prior to sunrise at 06:23hrs.
- The fire origin was located approximately 12 metres above the coal surface. The closest access to the fire from the ground outside the machine was 25 metres from the fire source on the machine (refer photograph 13). This severely limited the effectiveness of some fire equipment.

2.2.4 Organisational factors

- Y Branch used to connect both S96 & D11 to a single hydrant on M820 West side header when unmanned is not compliant with the mine fire policy
- A copy of the Mine Availability roster was not included within the Mine operations shift notes on the day of the incident
- Diamond Protection (Site Emergency Services Provider) called the incorrect Emergency Services Liaison Officer.
- No formal routine exists for the regular inspection and testing of fire equipment located at the Mine control centre (fire trucks, booster pumps and hose trailers) although informal checks are done.
- One Fire service monitor taken to the fire was not in a serviceable condition (seized swivel)
- One Fire service booster pump taken to the fire was not in a serviceable condition (flat battery)
- One Fire service hose trailer had a flat tyre.
- The hose trailer did not contain 90mm Diameter hoses that were required to fight this particular fire.

3 Conclusions and Observations

The investigation concluded the following findings were or could have been contributory factors or were observations worth noting relating to the incident:

The Senior Operator of 11 Dredger walked past the centre conveyor transfer point at least five times during the course of the night shift. During these times he did not notice any indications of fire at the centre chute location or any indications of a failed idler. The last walk past the centre chute area was at 05:20hrs.

The last reported idler fault on the discharge boom from an operational inspection was 17/12/2011. These inspections are part of an operators shiftly operational duty.

The fire spread extremely rapidly upwards through the centre transfer area of the Dredger fuelled by flammable materials comprising conveyor belt, impact idler discs, spill rubbers, plastic chute linings, impact curtain, pulley lagging, and electrical cable insulation. The grease lines in the vicinity were found to be intact so did not contribute to the fire intensity. The contribution of coal to the fire was negligible as the belts had been run off and coal below the discharge boom belt was unburnt after the fire was extinguished. The rate of increase of the fire was significantly influenced by the machine configuration leading to an updraft (chimney effect) and the amount of fuel available.

The two crew members on 11 Dredger used all resources at their disposal in an attempt to extinguish the fire (5 fire extinguishers were used and the local hose reel), at numerous times they managed to quell the fire at the centre transfer chute however it reignited, by the time a water supply to the machine was secured it was too late. An observation made is if the water supply had been connected to the machines birdsmouth spray line initially this may have had an impact on reducing the fire intensity within the chute areas of the machine where the majority of the volatile materials were burning (at this stage the RHS discharge guy rope had possibly already broken).

Initial reporting of the fire to the control centre was not undertaken by the operating crew contrary to standard operating practice. Within the overall timeline this is not seen as a contributing factor as RTL had reported the fire promptly.

The unavailability of a suitable water supply to the machine in a timely manner was a significant contributing factor in the incident.

Resources both internal and external responding post the collapse of the discharge boom structure performed admirably in the overall extinguishment of the fire although the effectiveness of both the CFA and mine fire trucks was poor due to the height and distance of the fire from the coal surface. The specialised equipment used by the mine services group was the most effective.

The speed with which the fire developed, the intensity within the limited area and the lack of significant water in a timely manner led to the incurred damage.

3.1 REVIEW OF RECOMMENDATION FROM 2006 FIRE REPORT

Recommendations

Subsequent to the incident investigation many of the underlying causes related to the lack of review, implementation and adherence to organisational documentation including procedures, roles and responsibilities. Recommendations for preventative and corrective actions were developed to address deficiencies in system defences and organisational processes by reviewing each contributing factor and underlying cause, depicted in the ICAM charts.

Recommendation 1

In July of each year, a plan should be developed for the upcoming fire season based on weather predictions and mine conditions. Note that with the current conditions, a fire season may need to be designated from October to March.

The 'Pre Summer & Fire Season Works' program is based on a fire season that starts in January and requires a number of activities to be undertaken in December. Developing a plan would ensure that this program is rescheduled according to the most recent fire conditions.

Hazelwood Response/Action

The fire season is declared as defined the paradigm document 36547, Fire Instruction – Mine, Section 5

Recommendation 2

An annual audit of the fire system should be undertaken prior to the start of the fire season in accordance with the fire season plan (Refer to Recommendation 1). The audit should review all aspects of the fire service facilities, systems and procedures. This should include hardware, documentation (eg. emergency response plan), fire pumps and electrical supply, spray coverage of coal levels and fire fighting training, etc.

The 'Mine Fire Service Policy and Code of Practice' states that an annual audit of all fire service facilities, systems and procedures is to be undertaken using checklist information.

As reported from the incident investigation, the fire service equipment, services and

procedures were not as effective as they should have been including the following:

- Some hydrants were damaged resulting in wider spacing between fire fighting areas, which required the use of extra hoses.
- Water spraying was insufficient to wet coal faces since water pipes were located too far from coal faces particularly as wind pushed spray water in other direction.
- Fire fighting was interrupted due to loss of power supply to the external fire pump stations at PH50 and PH53 that led to severe reduction of water supply.
- Insufficient supply of PPE led to IPRH mine personnel being removed from fighting fires.
- Damaged equipment including stands on the fire monitor trailers required fire fighting personnel to manhandle.

An annual audit of the fire service facilities, systems and procedures would ensure that the above listed fire systems including crucial systems such as the pump system power supply would have been reviewed and controlled or mitigated accordingly prior to an incident.

Hazelwood Response/Action

Once the fire season is determined the annual fire equipment annual audit and inspection and checklist (Paradigm document 36548) are completed as defined in the paradigm document 36547, Fire Instruction – Mine, Section 5.

Although the audit was commenced on 2nd July 2011, to date the audit has not been closed off. The audit documentation needs to be reviewed to for completeness. There appears to be insufficient information to determine if the actions identified have been completed. There is room for reporting additional comments and this appears to be completed randomly.

When listing equipment to audit, it is unclear the quantities of each area.

Recommendation 3

Predefined conditions should be identified to assist in determining whether a Fire Alert should be declared. The criteria should not be based solely on CFA Total Fire Bans as the CFA criteria includes factors relating to conditions that are not applicable to an open-cut coal mine. These conditions should include ranges in outside temperature, outside humidity, and wind direction and speed that can define 'severe weather conditions'.

Currently the declaration of Fire Alert varies according to differing opinions of mine personnel, their interpretation of 'severe weather conditions', and the CFA Total Fire Bans. Pre defined conditions could include consideration of outside temperature, outside humidity and wind conditions in addition to mine personnel experience. The CFA criteria are

inconsistent with the mine conditions as they include factors that are not applicable to an open-cut coal mine.

Hazelwood Response/Action

The declaration of fire alert is declared as defined in the paradigm document 36547, Fire Instruction – Mine, Section 6

Recommendation 4

Fire Alert processes are understood but are not always fully complied with. As the Fire Alert is a critical control to prevent fires, the procedures including roles and responsibilities should be reviewed, updated, reiterated and enforced for mine personnel.

Subsequent to the Fire Alert declared on the 12th of October '06 there were a few contributing factors that could have been managed if the Fire Alert procedures were reviewed, updated, reiterated and enforced for mine personnel. These factors included:

- Maintenance work was still being completed after the Fire Alert was declared. Non-urgent vehicle access to coal levels during Fire Alert.
- Authorisation to access the coal level by a vehicle was given by the Control Centre independent of Fire Services.
- Mobile water tanker units were not full of water and were not immediately available on coal levels as they were being used elsewhere (eg. on roads) for wetting down.

Hazelwood Response/Action

The action required of personnel when a fire alert has been declared and listed actions are defined in the paradigm document 36547, Fire Instruction – Mine, Section 6.2

Recommendation 5

Roles and responsibilities of Fire Services and personnel to support Fire Services during a Fire Alert and in an incident should be reviewed. The review should cover the responsibilities and tasks required by the Fire Services Group including the Fire Services Officer, Supervisor and Operators for the normal daily tasks, during a Fire Alert and during an incident. The review should also cover which mine personnel or contractors would provide a valuable and effective resource to support Fire Services during a Fire Alert and an incident dependent on their roles and responsibilities. For instance, utilising the maintenance crew for additional fire spotting after a Fire Alert has been declared.

The incident investigation determined that after the Fire Alert was declared, there were insufficient Fire Service resources to undertake all the required tasks including the fire spotting, event logging, the sourcing and setting up of fire equipment. The number of personnel initially available on the 12th of October '06 was also insufficient to assist in suppressing all the spot fires reported.

The following factors would require review within the Fire Services as they were contributing factors to this incident that could have been managed to eliminate or minimise the impact of the incident:

- Insufficient Fire Service resources during a Fire Alert to undertake fire patrol (spotting), as they are busy preparing fire system.
- Maintenance crews were not used for fire patrolling (spotting) and fire fighting as they were sent off site or deployed elsewhere during the Fire Alert.
- Fire Service Operators are busy preparing fire systems and are not available to undertake fire spotting during initial reports of spot fires.
- Too few mine personnel available to control initial spot fires.
- A comprehensive log of events was not maintained after Fire Alert was declared.
- Personnel were unclear of when or where spot fires were reported, and were too slow to arrive at location of fire.
- Decreased ability to fight fires due to a slow process of replacing damaged or used fire fighting equipment for fire fighters at the fire front (eg. replacement of damaged hoses).
- Unclear role between Control Centre and Fire Service Office.

Hazelwood Response/Action

The action required of personnel to support the fire services are defined in the paradigm document 36547, Fire Instruction – Mine, Section 6.2 & 6.3

The titles of personnel responsible need to be updated to reflect the current organisational structure.

Recommendation 6

Interface and communications between Operations, Fire Services and Maintenance needs to be reviewed in terms of fire systems, particularly in relation to the power supply for the fire pumps.

During the incident, Operations and the IPRH EC were unaware that the external fire pump stations PH50 and PH53 were operating on a single power supply. As a result once the single power supply was no longer available, fire fighting was interrupted due to a severe reduction of water supply.

Hazelwood Response/Action

The action required in relation to the power supply for the fire pumps is defined in the paradigm document 2589, H&S- Mine Fire Service Policy and Code of Practice, Section 4.5

Recommendation 7

Roles, responsibilities and procedures outlined within the IPRH Emergency Response Plan should be reviewed and rewritten utilising a checklist approach so that each person undertaking an emergency role can confirm that they are undertaking their key activities.

Roles, responsibilities and procedures were not systematically referred to during an emergency as mine personnel took up and immediate roles very quickly and efficiently, based on competence and experience. The current Emergency Response Plan defines many roles and creates confusion between each role, as it is not user friendly.

Contributing factors to this included:

- Too many personnel went to fight the fire, and not enough co-ordination of fire fighting. The Production Supervisor was controlling too many fire fighting activities at all coal levels.
- Assignment of emergency roles and responsibilities for the strategic ongoing emergency response was a slow process due to lack of knowledge and duplication of roles and responsibilities.

- Emergency response took too long to change from the initial reactive response into a strategic ongoing response.
- Fire fighting was interrupted due to loss of power supply to the external fire pump stations at PH50 and PH53 that led to severe reduction of water supply.

Resourcing of personnel during an ongoing incident response should also be reviewed and take into account both power station and mine requirements.

Hazelwood Response/Action

The roles and responsibilities are outlined within the Emergency Response Plan Hazelwood Mine, Paradigm Doc. I/D 2895, section 6, although there does not appear to be a check list for the individual roles and responsibilities. All roles and responsibilities have been reviewed with copies issued to the relevant personnel. Personnel are instructed and mock exercises are conducted to familiarize them in their roles and responsibilities.

The titles of personnel responsible need to be updated to reflect the current organisational structure.

Recommendation 8

In a significant fire, each coal level should be treated as a fire zone and a Zone leader allocated after consultation with the CFA.

Hazelwood Response/Action

As defined in the Emergency Response Plan Hazelwood Mine, Paradigm Doc. I/D 2895, section 6.8

Recommendation 9

Once it has been determined that there is a significant fire, all supervisors should return to the ICP for a briefing and to undertake a role of co-ordinating the fire teams. A co-ordinated approach to fighting fires is more effective than just large numbers of fire fighters.

Hazelwood Response/Action

No reference for this requirement has been found.

Recommendation 10

The ICP should continue to be established as a special facility separate from normal operations or mine activities. The ICP should have available all essential equipment required for an emergency response, that is easily and quickly accessible; and able to be transported to any onsite facility. This equipment may be available as a mobile 'kit'.

There was inadequate preparation and establishment of the ICP including lack of communications, access to equipment and documentation required in the incident. Establishing this special facility with easily and quickly accessible essential equipment would assist in managing these problems for future incidents.

Hazelwood Response/Action

Hazelwood has established a dedicated incident control centre in the mine training centre.

Recommendation 11

IPRH should consider notifying the CFA immediately once a spot fire has been reported and verified on site. The CFA remains on alert for a nominated amount of time (eg. 15 minutes). Within this time frame they must receive further notification from the site that the fire has been extinguished otherwise they will send out an initial response crew in anticipation that the fire has escalated and requires their assistance. This practice is undertaken at other mines in Latrobe Valley.

The initial spot fires on the 12th of October '06 escalated to out of control fires within a small time interval primarily with the assistance of adverse weather conditions and lack of

resources to control the amount of spot fires.

The Emergency Response Plan (Issued 5/09/05) notes:

'A coal fire or series of spot fires that do not spread beyond their initial point of ignition, do not constitute an emergency notifiable to CFA. Mine Fire Alerts are not notifiable.'

In this incident, CFA notification could have assisted with initiating an earlier initial response to the escalating fires.

Hazelwood Response/Action

The action required to notify the CFA is defined in the paradigm document 36547, Fire Instruction – Mine, Section 7.1. This procedure has been developed with endorsement from the CFA

7.1 Protocol in Reporting of Fires to the C.F.A.

All calls to the C.F.A. are to be via Telstra's **000** phone number.

All fires shall be reported to the **C.F.A.** on days of declared Total Fire Bans for the Victorian Eastern Total Fire Ban District or at anytime that the Hazelwood Mine has declared a Fire Alert.

At all other times, the **C.F.A.** response is to be requested immediately when:

- The fire becomes beyond the capability of the mine fire crews in attendance; or
- The initial response has exceeded 30 minutes.

Recommendation 12

The IPRH Significant Issue Corporate Response Plan and the IP Corporate Serious Incident Procedure should be reviewed and updated to ensure there are no discrepancies; and the IPRH Emergency Response Plan should be consistent with the IPRH Significant Issue Corporate Response Plan.

There was confusion between **IPRH** Significant Issue Corporate Response Plan and the **IP** Corporate Serious Incident Procedure since there were discrepancies between the two documents. Once these documents are reviewed they should also be consistent with the IPRH Emergency Response Plan to avoid further confusion.

Hazelwood Response/Action

These documents have been revised into the SIMRP document (Ref Paradigm document 6841)

Recommendation 13

Work procedures and practices within the 'Mine Fire Service Policy and Code of Practice' and the 'Fire Instructions' should be systematically reviewed and updated.

The 'Mine Fire Service Policy and Code of Practice' (Rev: Sept 1995) is an existing document at the IPRH site. The purpose of this document as stated *'is to achieve the Fire Protection Policy requirements by providing acceptable operating procedures for fire protection services for Mining Operations'*.

The main aspects of this document that require specific review and updating are listed below:

- Resources for Protection including 'The 'Pre Summer & Fire Season Works' program and 'High Fire Risk Days (Declaration of Fire Alert)';
- Plant and Equipment; and
- Fire Service Audits and Documentation.

The 'Fire Instructions- Hazelwood Power Mine' (Issued: 30 Oct '96) is another existing document at the **IPRH** mine site. As stated, the instructions apply to all personnel working in the Hazelwood Power Mine and they should be aware of their responsibilities in relation to the prevention, reporting and fighting of fires in or near the mine. Currently, the 'Mine Fire Service Policy and Code of Practice' states that the 'Fire Instructions' are maintained for each open cut and reissued to Supervisory staff and key operating personnel by the beginning of October each year.

The key aspects within this document that require specific review and updating are listed below:

- Organisational responsibilities in relation to Fire Prevention;
- Fire Prevention;
- Declaration of a Fire Alert; and
- Procedures on plant during fire.

Hazelwood Response/Action

The Fire Instructions procedure Paradigm I.D 2758 has been revised on the 26th November 2008, 7th August 2009, 22nd March 2010, 27th July 2010 and 27th July 2011.

The 'Mine Fire Service Policy and Code of Practice' has been revised on the 20th November 2008, 4th August 2009, 22nd March 2010, 1st April 2011 27th July 2011 and 28th November

2011. and the following documents are all reviewed annually at the start of the declared fire season

1. Hazelwood Mine Fire Service Policy and Code of Practice 2589
2. Hazelwood Mine Emergency Response Plan 2895
3. Hazelwood Mine Fire Instructions 2758
4. Hazelwood Mine Fire Training Manual
5. Hazelwood Mine Guidelines for Season & Period Specific Fire Preparedness and Mitigation Planning 36546
6. Hazelwood Mine Guidelines for Season Specific Fire Preparedness and Mitigation Planning 36547
7. Hazelwood Mine Check List for Fire Fighting Equipment Annual Audit and Inspection 36548
8. Hazelwood Mine Check List for Season Specific Fire Preparedness and Mitigation Planning 36549

Recommendation 14

Whilst it should be recognised that the priority is to ensure that sufficient water is used to control the spread of fires, particularly to ensure no burning coal is transferred to the power station, mine operations should be trained to understand the effects of excessive water being transferred to the power station.

The IPRH mine continued to provide coal to the power station throughout the incident. As a result, coal exposed to large quantities of water at the mine, particularly on the conveyors, was transported to the power station. This caused significant issues to operations at the power station.

It should be recognised that the priority is to ensure that sufficient water is used to control the spread of fires, particularly to ensure no burning coal is transferred to the power station. However, operations should understand the effects of excessive water being transferred to the power station.

Hazelwood Response/Action

This is noted however people will always be conservative when ensuring coal will not burn by application of water. In addition sprays will be operating along all conveyors and at each transfer point, to prevent the spread of fire, which will send large amounts of water to the power station.

Recommendation 15

The use of thermal imaging cameras and other technology in the detection of faulty idlers should be investigated for their application and used where appropriate.

The likely ignition of the spot fires at the M620 conveyor was due to a collapsed bearing smouldering in the coal at the M620 conveyer and detection currently relies upon visual inspection from mine personnel.

Hazelwood Response/Action

The equipment has been purchased and weekly routines are scheduled for thermal imaging of conveyors. On days of high fire risk additional thermal imaging of face conveyors is conducted.

This equipment is not routinely being utilised on machines.

Recommendation 16

The use of thermal imaging cameras was effective during the fire fighting and should be considered as well as other technology for wider use in spotting fires within the mine.

Hazelwood Response/Action

Specialised Infrared cameras have been purchased for use in fire fighting. These are used for checking for hot spots after fires have been wet down.

Recommendation 17

A procedure for dealing with Carbon Monoxide (CO) during fire fighting, including the use of CO monitors, should be developed since personnel safety is a major responsibility and concern in fighting coal fires.

Mine personnel reported headaches from exposure to carbon monoxide whilst fire fighting. The use of CO monitors would ensure that personnel exposure to CO would be kept within the 'safe' exposure levels.

Hazelwood Response/Action

The Fire Instructions procedure Paradigm I.D 2758 includes precaution and exposure limit for CO in section 9.8.

Recommendation 18

Whilst the efforts of all mine, contractor and CFA personnel are highly commended in their assistance with the fire fighting, it should be emphasised and reinforced to all personnel that no job is so important that they should take excessive risks.

Hazelwood Response/Action

IPR-GDF Suez H&S Policy on site requires that people do not put themselves at risk.

The Mine Fire Service Policy and Code of Practice Paradigm I.D 2589 section E instructs all personnel to "ensure personnel safety" prior to taking any action to extinguish or control a fire.

Recommendation 19

Allocating IPRH operations staff to CFA strike teams during a fire should be included within IPRH procedures (eg. Emergency Response Plan and/or Fire Instructions) and reinforced so that it becomes normal practice.

Some CFA non Morwell personnel were inexperienced in fighting coal fires. The allocation of IPRH personnel to CFA strike teams became an efficient and effective method of assisting the inexperienced CFA personnel in fighting coal fires. This method should be reviewed and included within IPRH procedures (eg. Emergency Response Plan and/or Fire Instructions) so that it becomes normal practice in response to all fires.

Hazelwood Response/Action

Emergency Response Plan Hazelwood Mine, Paradigm Doc. I/D 2895, section 6.8 specifies that the Zone Leaders may be allocated to the CFA Strike Teams,

Recommendation 20

To ensure that the ongoing efficient operations of the mine are not compromised over the long term as a result of the fire incident, a detailed risk analysis should be carried out to assess the life cycle impact of the fire on maintenance costs and longevity of the mine infrastructure assets.

Hazelwood Response/Action

The cost of additional annual fire preparations are incorporated in the annual operational budget.

4 Recommendations

The following recommended corrective actions are put forward for consideration. The recommendations address the **Absent or Failed Defences** and **Organisational Factors** identified as key findings of the investigation.

Because the chute configuration is very similar on all dredgers in the mine, consideration should be given to applying these recommendations to all dredgers.

- 4.1.1 No birdsmouth sprays are directed at the belt in the discharge boom chute area. Review the system and determine the practicality of installing birdsmouth sprays in this area.
- 4.1.2 The flow rate from the 3000 litres on board water tank was too slow to be effective in fighting the fire. Determine if a fire hydrant can be connected to this tank to allow higher flow rates to be directed to a fire hose at the discharge boom chute area. An alternative could be to have a dump system down the centre chute to flood the area from this tank. When the fire fighting effort moved off the dredger, the water supply in the dredger tank had not been exhausted.
- 4.1.3 Look at the possibility of installing a fire damper above the discharge boom chute to stop the spread of fire up the machine centre chute. This could be manually or automatically operated.
- 4.1.4 Maintenance practices require review for all machine centre chutes due to the high consequences of potential fires. This review needs to cover the potential methods for the detection of hot idlers and or fires together with improved maintenance strategies. i.e. early fire detectors
- 4.1.5 Due to the rapid acceleration and intensity of the fire a technical assessment of the flammable materials within the centre chute areas in use on all machines is recommended.
- 4.1.6 Review recommendations arising from the Loy Yang Powers centre chute fire on Dredger 15 where it is believed a fire detection system may have been investigated. Review any practices being developed at TruEnergy Yallourn
- 4.1.7 A coordinated focussed approach is recommended for the effective management of the fire service responsibilities within the Mine.
- 4.1.8 The International Power GDF Suez Hazelwood Mine – Mine Fire Service Policy & Code of Practice (doc Ref 2589) requires review to cover significant fire events within the Mine including;

- 4.1.8.1 Requires review to cover significant fire events occurring on machines. Specifically for procedures covering different machine digging configurations and water supply access requirements
 - 4.1.8.2 Actions required for the effective management of fire equipment and its maintenance.
 - 4.1.8.3 Consideration of installing monitors on booster pump trailers.
 - 4.1.8.4 Consideration of installing signage on large fire fighting equipment (fire truck and equipment trailers) identifying inventory that is to be carried and inspection and audit mechanisms that ensure compliance.
 - 4.1.8.5 Content of the annual training program for mine personnel, specifically relating to fires on machines and/or conveyors relating to all fire types i.e. coal, electrical, rubber and fire on elevated structures.
- 4.1.9 The International Power GDF Suez Hazelwood Mine – Fire Instructions (doc Ref 2758) requires review to cover significant fire events occurring on machines.
- 4.1.10 Training manuals for machine operators and the fire instructions require review and alignment to ensure clarity is provided on the fire prevention procedures applicable for machine protection.
- 4.1.11 The provision of an adequate water supply to meet fire service protection obligations for different machine configurations where long hose runs are required should be part of the daily digging plan process. In the configuration on the day of the fire there was insufficient water supply to protect both D11 and S96 in the event of a fire on the coal surface.
- 4.1.11.1 Consideration should be given to the use of multiple hydrant banks on headers in lieu of the existing 50 – 55m spacing standard.
 - 4.1.11.2 Consideration for additional spur line installation to have a water supply close to a dredger operating on bottom side and especially double bottom side.
 - 4.1.11.3 Consideration must be given to the time required to connect the machine configuration to the available water supply.
 - 4.1.11.4 Testing of the water pressure applicable at 5 hose lengths of 90mm hose to mimic the incident set up is recommended. Under these conditions the effectiveness of both the rotary and birdsmouth spray lines need to be assessed (suggest Dredger 9 or 10 used). Based on the findings a limit on the distance from a hydrant to a machine connection could be established.
- 4.1.12 Strategies for fighting fires at height on machines is required, consideration should be given to remote ground attack to prevent personnel risk due to potential machine failure.
- 4.1.13 Portable radios should be carried by operational machine crews whenever the dredger operators' cabin is not manned.

- 4.1.14 Conveyor fire service header tail end feeds must only be removed for the immediate travel requirements of machines and should be reinstated as a matter of priority as they form an integral part of the Mines fire prevention defence.
- 4.1.15 Due to the failures sustained by the discharge boom fixed stay ropes a technical assessment of their failure together with their history is recommended. A review of the current policy for the replacement of machine fixed stay ropes should be based on the results of the assessment.
- 4.1.16 Given the intensity of the fire in the centre chute, a review should be conducted of the benefit of coating important structural elements above the chutes with fire protection materials.

5 Significant Observations

The investigation has raised a number of key observations which are covered in the body of the report. The significant observations for IPR GDF Suez Hazelwood Mine are:

- 5.1.1 The fire in the machines centre chute rapidly intensified to a significant fire. Access to an adequate water supply could not be made in a timely manner to cool the fire.
- 5.1.2 The initial communication that occurred was ineffective – the crew at D11 were isolated by distance and accessibility across three operating levels, the fire was not reported by the crew to the Mine control centre.
- 5.1.3 Water supply once received was connected onto the machines rotary sprays and not the birdsmouth spray system. Connection to the birdsmouth spray system would have been more appropriate but may only have had a small effect in reducing the damage, due to the intensity of the fire and the lack of nozzles on the ring main in the discharge boom chute area.
- 5.1.4 The two crew members on D11 appeared to be unaware of the extent and potential of the fire burning above them while fighting the fire at the bottom of the discharge conveyor transfer chute.
- 5.1.5 The potential for a fatality at the incident was significant.
- 5.1.6 The extent of damage to the machine in the short timeframe was significant and far faster than any previous experience at the site or other sites with similar dredgers. An independent initial report undertaken by Mining Materials Handling Engineering details the extent of the structural damage.
- 5.1.7 Mandatory testing of the machines fire fighting equipment comprising fire extinguishers, hose reels with gravity fed fire tank, rotary sprays and birdsmouth spray systems had been successfully completed on 20/1/12 as part of the Mine Safety Device Testing program. A test witnessed by an independent officer comprising a full wet test was conducted on 30/11/11 with all defects arising out of the test rectified by 13/12/11.
- 5.1.8 All outstanding maintenance defects on the machine were reviewed; specific items relating to the centre transfer chute of the machine were assessed for possible cause of the fire. No recorded defects were found to be the cause of the fire. A spill rubber defect already noted would have allowed spill to occur – it was noted by the operators only a small amount of spillage was identified under the impact idlers when the fire was first noticed, the machine had also been cleaned the previous day. All transfer points spill to an extent, cleaning is undertaken as part of the standard operating procedures.

5.1.9 The calm weather conditions prevented the fire from spreading away from the dredger into the rest of the mine. If the weather conditions had been different it would have been appropriate to declare a Fire Alert within the mine. It was noted that the coal area around the dredger had been suitably wet down, by the operation of the Dredger 11 rotary sprays, to prevent the coal burning by the time the CFA arrived.

6 Appendices

	Title	Page No.
6.1	Terms of Reference	36
6.2	ICAM Analysis	37
6.3	Corrective Action Plan	39
6.4	Information Sources	43
6.5	Machine Digging Configuration	44
6.6	Worksafe Prohibition Notice	46
6.7	Drawing of D11	49
6.8	Photographs	50
6.9	Impact Idler Analysis	67

6.1 TERMS OF REFERENCE

Dredger 11 Fire – 21 January 2012

Investigation Terms of Reference

Background

A fire was reported at 0615 on the centre transfer chute of D11 on Saturday 21st January 2012. It subsequently resulted in the discharge boom collapsing to the ground.

Whilst there were no injuries reported the financial and potential impact to mine operations from the incident was serious enough to warrant an investigation.

Specific Terms of Reference

1. Develop a time sequence of the events leading to, during and after the incident.
2. Document external factors (e.g. weather) and any impact at the time of the incident.
3. Determine the cause or likely cause.
4. Determine any and all learning that can be applied to future operations and maintenance practices and activities so as to minimise a recurrence.
5. Under take a review of the 2006 fire recommendations for completeness of implementation and provide commentary on applicability to the current incident.
6. Provide a preliminary assessment on impacts on insurance coverage.

Timeline to report

A draft report is required to be submitted for Management review by COB 31 January 2012.

The report is to be finalised to a timeline agreed by Management.

Regards,

Richard Polmear

6.2 ICAM ANALYSIS

The features of the above ICAM chart for the purposes of this Interim Report are:

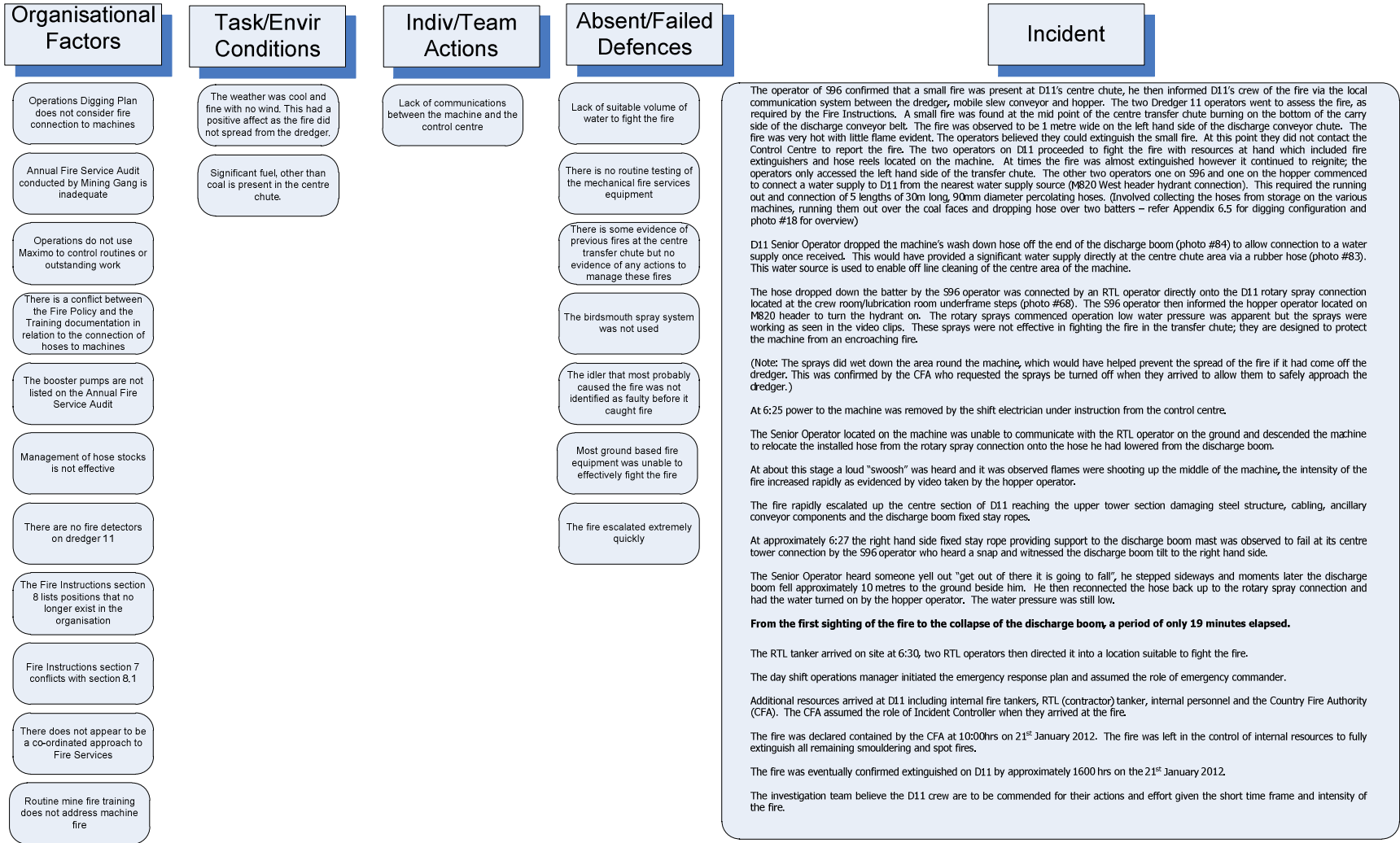
- It provides a graphical representation of all the key circumstances and factors relating to the incident;
- It outlines the relationship of the various elements considered throughout this report.

In addition ICAM is designed to:

- Provide a framework to organise the data collected;
- Assist in assuring the investigation follows a logical path;
- Aid in the resolution of conflicting information and the identification of missing data;
- Provide a diagrammatical display of the investigative process for management briefing.

Accordingly, this ICAM table should not be considered in isolation and needs to be considered in the context of all the comments in this report and, no doubt, the additional matters that will be addressed in the final report.

ICAM CHART



6.3 Corrective Action Plan

It is recommended that the following action plan is implemented and all actions entered into Paradigm:

Item Ref	Recommendation	Responsible Department	Responsible Person	Completion Date	Sign off
4.1.1(a)	Review the Birdsmouth spray system on the discharge boom and determine the practicality of installing sprays in the discharge boom chute area.	Asset Management	Wayne Buckley	31 Aug 2012	
4.1.1(b)	Implement the findings of the discharge boom birdsmouth spray system review (4.1.1.(a)).	Asset Management	Wayne Buckley	31 Aug 2013	
4.1.2(a)	Review uses of the water from the 3000 Litre tank and determine if a deluge system for the centre chute is feasible and practicable or if better use could be made of this water.	Asset Management	Wayne Buckley	31 Aug 2012	
4.1.2(b)	Implement the findings from the 3000l water tank review.	Asset Management	Wayne Buckley	31 Dec 2013	
4.1.3(a)	Investigate the possibility of designing and installing a fire damper in the centre chute to stop the spread of fire up the machine without impacting machine operation.	Asset Management	Wayne Buckley	30 Nov 2012	
4.1.3(b)	Implement findings of the fire damper investigation.	Asset Management	Wayne Buckley	31 Dec 2013	

4.1.4(a)	Review maintenance practices for machine centre chutes in light of the high consequence of a fire.	Mine Maintenance	G Wilkinson	30 June 2012	
4.1.4(b)	Review potential methods for the early detection of faulty components (hot idlers) or fires in the centre chute area.	Asset Management	W Buckley	30 Nov 2012	
4.1.4(c)	Implement maintenance practice changes based on the findings of the reviews 4.1.4(a) and 4.1.4(b)	Mine Maintenance	G Wilkinson	31 Dec 2013	
4.1.5	Technical assessment of flammable materials on machines typically centre chute. Establish recommendations and implement as appropriate.	Asset Management	W Buckley	30 Nov 2012	
4.1.6	Review recommendations and actions taken by similar local operators i.e. Loy Yang Power & Tru Energy Yallourn.	Mine Maintenance	G Wilkinson	30 Jun 2012	
4.1.7	Ensure there exists a coordinated approach for the overall management of fire service responsibilities within the Mine	Director Mining	R Polmear	30/6/12	

4.1.8	Review of the Mine Fire Service Policy & Code of Practice and implementation of recommendations.	Production Manager	Garry Wilkinson	31/7/12	
4.1.9	Review of the Mine Fire Instructions and implementation of recommendations	Production Manager	Garry Wilkinson	31/7/12	
4.1.10(a)	Alignment of operator training manuals with revised fire service policy and instruction documentation.	Director Mining	R Polmear	31/8/12	
4.1.10(b)	Undertake training to reflect revisions to documentation.	Director Mining	R Polmear	31/8/12	
4.1.11(a)	Establish an adequate provision of water supply for machine configurations as per the recommendations.	Production Manager	Garry Wilkinson	31/7/12	
4.1.11(b)	Ensure machine set ups comply with the revised requirement.	Production Manager	Garry Wilkinson	31/12/12	
4.1.12	Establish and implement strategies for fighting fires at height on machines	Production Manager	Garry Wilkinson	31/10/12	
4.1.13	Improve operational crews communication when drivers cabin is vacated.	Production Manager	Garry Wilkinson	29/6/12	
4.1.14	Improve the management of conveyor tail end feeds	Production Manager	Garry Wilkinson	30/6/12	
4.1.15(a)	Undertake a technical assessment of fixed stay ropes and policy.	Asset Management	W Buckley	31/12/12	

4.1.15(b)	Implement findings of fixed stay ropes review.	Asset Management	W Buckley	31/12/13	
4.1.16	Review of the benefit of coating important structural elements above the chutes with fire protection materials. Implement findings as appropriate.	Asset Management	W Buckley	30/11/12	
Director of Mine Close out of Incident – All corrective actions have been completed, where corrective actions have not been fully implemented, the following measures have been put in place to ensure ongoing monitoring until implementation is complete.					
Name:		Signature:		Date:	

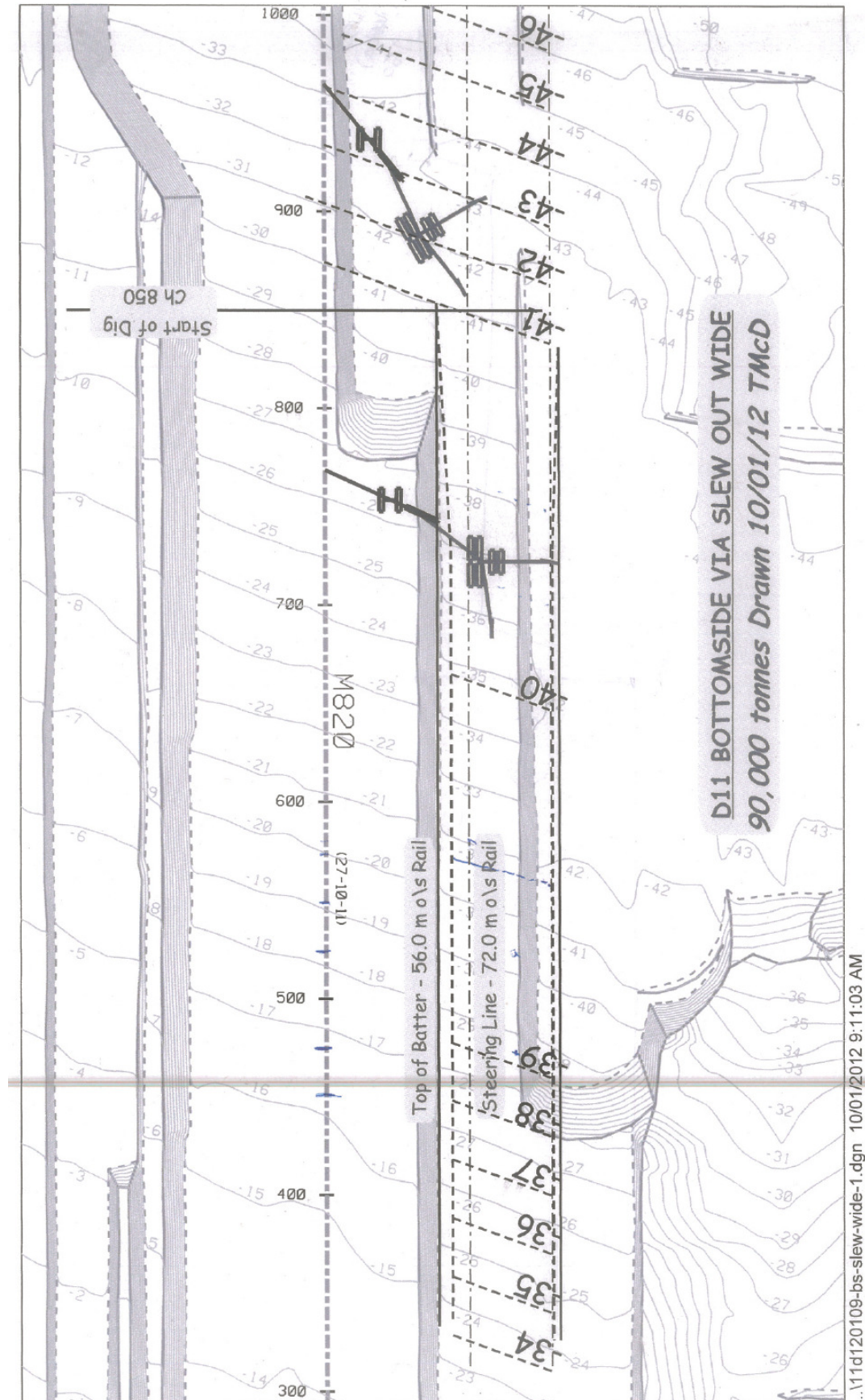
6.4 INFORMATION SOURCE

1. Dredger drivers reports
2. Control centre logs
3. Shift manager reporting logs
4. Operational morning hand over minutes
5. Mine operations shift instructions
6. Mine operations compliance to shift instructions
7. Major mechanical access permit book for 11 Dredger
8. Fire reports
9. Diamond Protection shift and incident log
10. Maximo (detailing maintenance defects and plant maintenance routines)
11. 11 Dredger machine safety device testing records
12. Fire service annual checklist audit
13. Operational machine training manuals
 - 13a Operators training records
14. 11 Dredger machine independent structural inspection report
15. Cleaning and permits list for 11 Dredger
16. Citect information
17. Weather reports
18. Hazelwood Mine fire service policy & Code of Practice
19. Fire instructions
20. Hazelwood Mine emergency response plan
21. October 2006 Mine fire investigation report
22. 11 Dredger digging configurations
23. Mine operational plan
24. Mine maintenance schedule
25. Site visit in accordance with WorkSafe prohibition notice using binoculars and camera.
- 25a. Video recording of incident in part – Notes on fire video's
- 25b. Hazelwood Mine D11 Fire January 2012 – Metallurgical assessment HLC/2012/200 Rev 1

The following personnel were interviewed as part of the investigation;

26. Alex Prochazka (Senior Operator)
27. Colin Smith (Operator)
28. Frank Giardina (Operator)
29. Simon Quail (Operator)
30. Peter Smith (Shift Manager – Night Shift)
31. Peter Sheridan (Shift Manager – Day Shift)
32. Gary Honeychurch (Mechanical maintenance superintendent)
33. Peter Anton (Operator)
34. Rob Dugan (Acting Mine production manager)
35. Romeo Presiozo (Mine planning superintendent)
36. Noel Coxall (Mining group planner)
37. Dean Suares (Mining group team leader)
38. John O'Bryan (Mechanical team leader)
39. Trevor Shaw (Mining group operator)
40. Jimmy Kidd (RTL contractor)
41. Greg Cam (RTL contractor)

6.5 MACHINE DIGGING CONFIGURATIONS



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6.6 WORKSAFE PROHIBITION NOTICE

Occupational Health and Safety Act 2004 PROHIBITION NOTICE



WorkSafe Victoria is a division of
the Victorian WorkCover Authority

This notice is issued under section 112 of the Occupational Health and Safety Act 2004 to the person (which can mean a body corporate) who has or may be reasonably presumed to have control over the prohibited activity. This notice prohibits an activity which involves or will involve an immediate risk to the health and safety of any person. The activity remains prohibited until an inspector certifies in writing that the matters which give or will give rise to the risk are remedied. Section 115(2) places obligations on the person to whom a prohibition notice is issued. If that person is an employee, he or she must give a copy of the notice to the employer. Otherwise, and for an employer given a copy of a notice issued to an employee, the person must:

- * bring the notice to the attention of all persons whose work is affected by the notice,
- * give a copy to each health and safety representative who represents employees whose work is affected by the notice; and
- * display a copy of the notice in a prominent place at or near the workplace or part of the workplace where the affected work is being performed.

Issued by: *Marnie Pamela Ross*, an Inspector appointed under the Occupational Health and Safety Act 2004.

Signature: 

Date of Issue: 21/01/2012

Notice issued to: AUSTRALIAN POWER PARTNERS B V & OTHERS

Tenement No: MIN5004

BRODBRIBB ROAD
HAZELWOOD 3840

ABN: 40924759557

Notice given to: Luc Dietvorst

Service method: Left for a person

WORKPLACE ACTIVITY PROHIBITED: The workplace activity prohibited is access onto the D11 Dredger.

The reasons for the Inspector's belief that the activity involves an IMMEDIATE risk to health and safety: I believe the activity described above involves an immediate risk to the health and safety of persons because the health and safety of employees could be affected if access onto the D11 Dredger continues, as there is a risk of serious or fatal injuries occurring to any person that enters the area in which a fire occurred. The structural integrity of the areas involved in the fire is unknown and may not be able to sustain a persons weight.

Directions as to the measures to be taken to remedy the IMMEDIATE risk: AUSTRALIAN POWER PARTNERS B V & OTHERS must ensure that access onto the D11 Dredger by any person, other than for rendering the D11 Dredger safe - such as attending to electrical work, conducting firefighting and inspection of the structural integrity of the D11 Dredger - is prohibited, until an initial report indicating the structural integrity of the fire affected areas of the D11 Dredger has been obtained.

The report is to be provided by an independent Structural Engineer and must include information on the condition of all of the structures affected by the fire and actions that will need to be taken to dismantle the D11 Dredger.

A copy of the initial report and associated action plan is to be provided to WorkSafe Victoria for review, in order to achieve remedy of the immediate risk.

Provision of this Act and / or the Regulation(s) that is being contravened: I reasonably believe the activity involves a contravention of Section 21(1) and 21(2)(a) of the Occupational Health and Safety Act 2004

Reason(s) for the belief that the activity involves a contravention or likely contravention: There is a failure to provide a safe system of work associated with access onto the D11 Dredger as the structural integrity of the areas involved in the fire is unknown and may not be able to sustain a persons weight. A person exposed to the affected areas may sustain serious or fatal injuries if the areas accessed collapse whilst the person is located on them.

This notice remains in force until an inspector certifies in writing that the matters which give or will give rise to the IMMEDIATE risk have been remedied.

If you believe you have remedied the IMMEDIATE risk identified above, contact WorkSafe to arrange for an inspector to attend your workplace and review the matter.

Remedying the IMMEDIATE risk may also remedy the contravention, or likely contravention, identified above. However, remedying the IMMEDIATE risk may not also remedy the identified contravention, or likely contravention.

If, when certifying that the IMMEDIATE risk has been remedied, the inspector believes that the measures taken will not also remedy the contravention or likely contravention identified above, an improvement notice(s) may be issued to the relevant dutyholder(s).

The following provides additional guidance for remedying the contravention or likely contravention: The employer must ensure that no work is conducted on the D11 Dredger is performed until an initial report indicating the structural integrity of the fire affected areas of the D11 Dredger has been obtained.

The report is to be provided by an independent Structural Engineer and must include information on the condition of all of the structures affected by the fire and actions that will need to be taken to dismantle the D11 Dredger.

A copy of the initial report and associated action plan is to be provided to WorkSafe Victoria for review, in order to achieve remedy of the contravention.

See Review and Offence provisions below

Internal Review

As the person to whom this prohibition notice has been issued, you or another eligible person can apply to WorkSafe Victoria (WorkSafe) for internal review of this reviewable decision. Your application must be in the approved form and must be received by WorkSafe's Internal Review Unit within 14 days after the day on which the decision first came to your notice or came to the eligible person's notice. WorkSafe may however allow a longer period of time within which the application has to be lodged in appropriate cases. The applicant may also request a stay of the operation of the reviewable decision pending the outcome of the internal review. The request for a stay must accompany the application for internal review. WorkSafe must make a decision to grant a stay with or without conditions or not to grant a stay and communicate that decision within 24 hours of receipt of the request for a stay. If no decision is made, WorkSafe is considered to have granted a stay. If no request for a stay is made the operation of this prohibition notice remains in force. The application for internal review must be made to the Internal Review Unit, WorkSafe Victoria, Ground Floor, 222 Exhibition Street, Melbourne 3000. An inspector must not give written certification that the activity or matters to which the notice relates have been remedied whilst there is an internal review pending.

You can contact the Internal Review Unit on telephone (03) 8663 5450, fax (03) 8663 5451 or by email at internalreviewunit@worksafe.vic.gov.au

If you have lodged an application for internal review and you do not receive a decision within the required time frame (which is taken to be a decision to affirm the reviewable decision) or you receive a decision that you are not happy with you can apply to Victorian Civil and Administrative Tribunal for external review within 14 days of the date the decision or non-decision came to the attention of the applicant. Applicants seeking external review must be an eligible person.

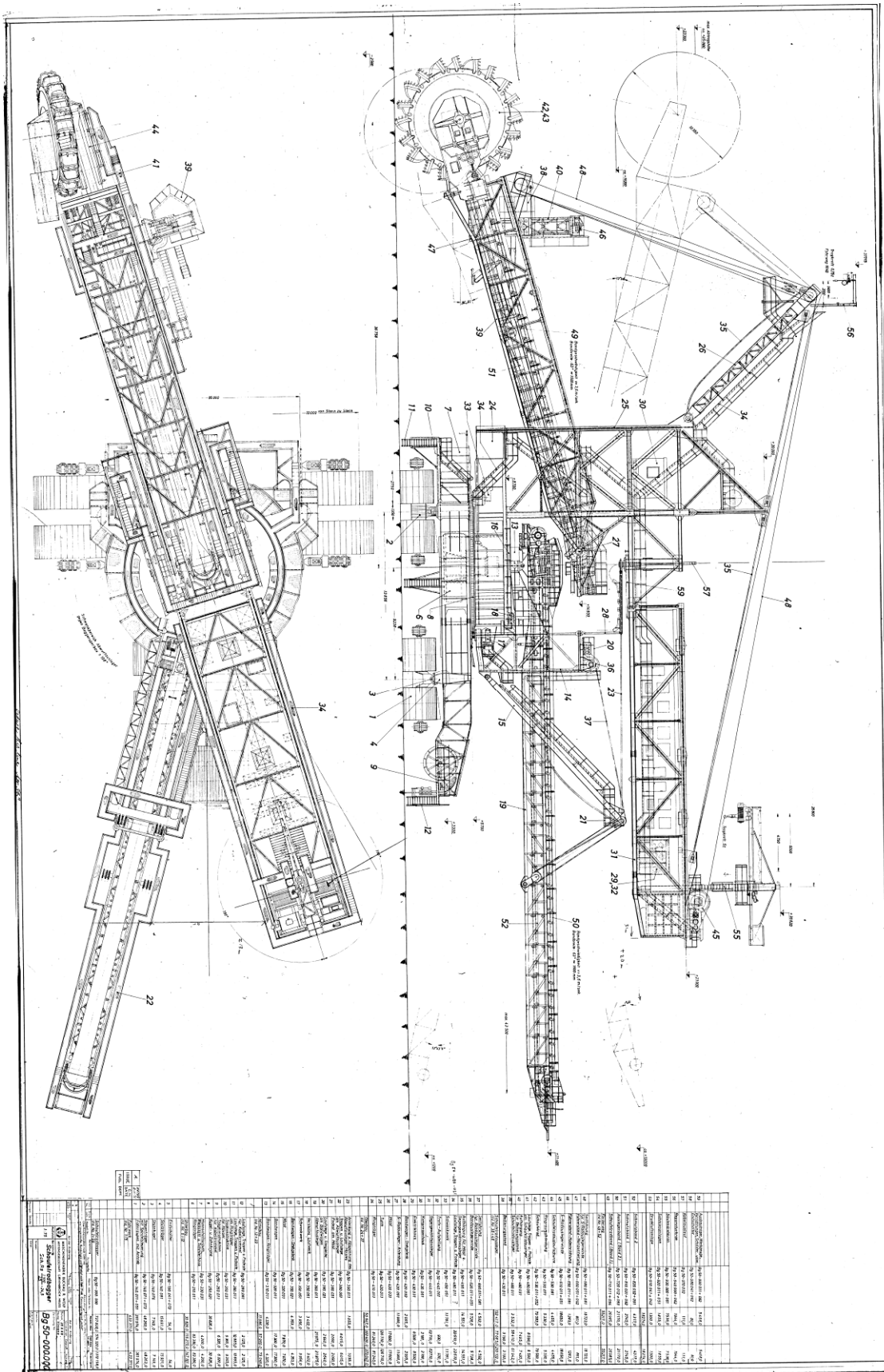
Offence

A person to whom a prohibition notice is issued and who does not comply with the prohibition notice shall be guilty of an indictable offence against the Act. In the case of a natural person, the indictable offence carries a penalty of not more than \$61,070. In the case of a body corporate, the indictable offence carries a penalty of not more than \$305,350.

The issue, variation or cancellation of this notice does not affect any proceedings for an offence against this Act or the regulations in connection with any matter in respect of which the notice was issued.

COMPLIANCE WITH THIS NOTICE DOES NOT indicate that the person to whom it is issued complies with all health and safety requirements, NOR does it affect the continuing obligation to ensure workplace health and safety.

6.7 Drawing of 11 Dredger



6.8 PHOTOGRAPHS

The following is a tabulation of the photographs taken by various persons, some of which are referenced in the report.

Full size copies of the photographs are available in the permanent file on site or on request from the Investigating Team or D11 Recovery Project Manager.

Photos of D11 Centre Chute Fire- source 1



Photo #1



Photo #2



Photo #3



Photo #4



Photo #5



Photo #6



Photo #7



Photo #8

Photos of D11 Centre Chute Fire- per source 2



Photo #9



Photo #10



Photo #11



Photo #12



Photo #13



Photo #14



Photo #15



Photo #16



Photo #17



Photo #18



Photo #19



Photo #20



Photo #21



Photo #22



Photo #23



Photo #24



Photo #25



Photo #26



Photo #27



Photo #28



Photo #29



Photo #30



Photo #31



Photo #32



Photo #33



Photo #34



Photo #35



Photo #36



Photo #37



Photo #38



Photo #39



Photo #40



Photo #41



Photo #42



Photo #43



Photo #44



Photo #45



Photo #46



Photo #47



Photo #48



Photo #49



Photo #50



Photo #51



Photo #52



Photo #53



Photo #54



Photo #55



Photo #56



Photo #57



Photo #58



Photo #59 – crack at weld



Photo #60



Photo #61



Photo #62



Photo #63



Photo #64



Photo #65



Photo #66



Photo #67



Photo#68 Showing rotary hose connection and the birds mouth connection on the other side

Additional photos taken by the Fire Investigation Team after Worksafe allowed access back onto the Dredger



Photo 69



Photo 70



Photo 71



Photo 72



Photo 73



Photo 74



Photo 75



Photo 76



Photo 77



Photo 78



Photo 79



Photo 80



Photo 81



Photo 82



Photo 83



Photo 84



Photo 85



Photo 86



Photo 87

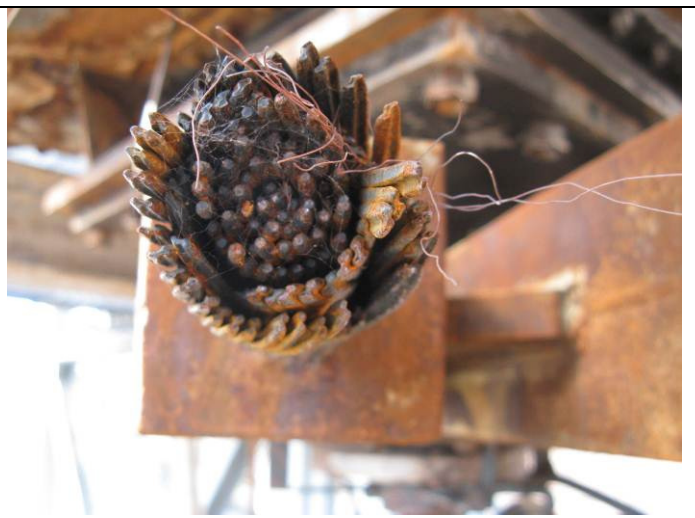


Photo 88



Photo 89

6.9 Impact Idler Analysis

The following is the executive summary from the "Hazelwood Mine D11 Fire January 2012 – Metallurgical assessment HLC/2012/200 Rev 1". The full report is available from the business files.

Executive Summary

In January 2012 Dredger 11 sustained extensive damage as the result of a fire. As a consequence of the fire the machine sustained significant structural damage to its superstructure and discharge boom. The majority of the structural damage occurred within 19 minutes of the fire being sighted.

The initial site investigation suggested that the fire could have started as a result of seizing and overheating of discharge conveyor impact idler bearings. A large number of the discharge conveyor impact idlers were removed from the area where it was likely that the fire started and were sent to HRL Technology for examination to attempt to determine the fire initiation point.

Based on the findings it was concluded that the fire could quite conceivably have started at one of the bearings on Idler String 49B, probably the LHS bearing. It is believed that rubbing of the outer race against the shell caused hot spots in which generated temperatures were above 800°C. This temperature is sufficient to ignite loose coal in contact with the bearing area.¹

The other findings were as follows:

The Idler String 49B shaft was found to be bent, and that it had been bent for a long period prior to the fire event. The wear pattern of the bearing housings indicates that wear of the shaft had occurred gradually over an extended period of time. This conclusion is also supported by extensive corrosion of the shaft leading to the formation of thick and adherent oxide scale in the shaft and bearings;

In most of the idlers examined, it was established that the idlers had experienced temperatures above 200°C, at least inside the shell;

The majority of bearings were still free to manually rotate;

No appreciable metallurgical changes were recorded in the majority of samples taken from bearings, shafts and shells.

7.0 Report Sign-off

To maximise the preventative potential of the investigation report, the findings and conclusions of the report should be distributed to the various people involved in the incident and as widely as practicable.

Feedback to the Involved Person(s) and comments		
Name: Alex Prochazka	Signature:	Date:
Name: Colin Smith	Signature:	Date:
Name: Frank Giardina	Signature:	Date:
Feedback to the Involved Person(s) Supervisor(s) and comments		
Name: Peter Smith	Signature:	Date:
Department Manager's acceptance of findings and comments		
Name: Garry Wilkinson	Signature:	Date:
Safety Manager's acceptance of findings and comments		
Name: John Robinson	Signature:	Date:
Director of Mine's acceptance of findings and comments		
Name: Richard Polmear	Signature:	Date: