SAFETY & SUSTAINABLE DEVELOPMENT

LEARNING FROM INCIDENTS

INVESTIGATION REPORT

GRASSTREE MINE

Metallurgical Coal

Incident Number: IN.206200
Classification: HPI
Incident Title: LW909 TG CH4 >2.5%
Incident Date: 28/07/2019
Report Date: 20/08/2019

Learning from Incidents Investigation Report

1 EXECUTIVE SUMMARY

At approximately 09:00hrs on 28th July 2019 the CH4 concentration in the LW909 tailgate roadway, located outbye the longwall face, began increasing at a steady rate coincident with the falling barometric pressure. At approximately 11:00hrs the CH4 concentration had reached 1.90% and LW coal production ceased and the TG CH4 concentration continued to rise, reaching a maximum and started levelling off at 2.25% between 12:40 to 12:50hrs. At approximately 13:10hrs there was a sudden rise in the TG CH4 concentration, reaching 2.5% at 13:15hrs.

At the time of the incident the shearer was parked at around 70 chock and shut down for high TG gas. All personnel were withdrawn back to the panel crib room.

The LW tailgate CH4 concentration continued to rise and levelled off, reaching a maximum concentration of 2.98% at 14:48hrs.

Inspection of surface goaf drainage arrangements found the compressor used to operate the goaf drainage venturi installed on the 908MG 11ct Hammer Hole has failed due to a blown radiator hose.

The compressor was not able to be repaired and was replaced by a compressor from a less critical goaf drainage venturi.

The 908MG 11ct Hammer Hole venturi was returned to operation at approximately 15:00hrs on 28th July 2019 which coincided with a rapid reduction in LW tailgate CH4 concentration below 2.5%.

2 INVESTIGATION TEAM MEMBERS

Damian Cavanagh	David Holt	Danny Brouwer
Dennis Black	Shaun Stingle	

3 KEY WITNESSES

List of Key Witnesses	
Name	Designation
Shaun Stingle	LW ERZ controller
Ben Millar	MSO
Shane Bailey	Seamgas technical officer

4 METHODOLOGY AND TOOLS USED

An investigation has been conducted in accordance with the Anglo American investigation methodology known as the Learning from Incidents model, supported by various investigative and analytical tools.

The analysis tools used for this investigation are:

Analysis Tool	Attached as Appendix if applicable - Yes/No
Time Series Events Chart	Yes – mandatory tool
Control Analysis	Yes / No
Behaviour Analysis	Yes / No
Change Analysis	Yes / No
Why Analysis	Yes / No

5 EXECUTIVE SUMMARY OF INCIDENT

Summary of Incident						
Incident Number		206200		Department		Longwall
Area / location		Longwall tailgate		Contracting Company (if applicable)		
Summary of findings from Incident Investigation						
Incident Category e.g. Safety, Health, Env, Legal, Reputation, Community.	Agent EG – Fall of Ground	Actual ISR Rating	Potential ISR Rating	Date of Incident	Time of Incident	Number of hours worked
Legal and Regulatory	High gas	Minor	Minor	27/04/2019	13:15	2.75
Task being performed at time of incident	Gas delay – no production due to TG CH4 >1.9%				Planned or Unplanned task?	
					Unplanned	Planned
Summary of Incident	No production was taking place in LW909 (CH4 >1.9%) due to elevated tailgate CH4 concentration; rising through day shift on the falling barometer. At 13:10 there was a sudden increase in tailgate CH4 concentration, exceeding 2.5% at 13:15hrs. Investigate of surface goaf drainage arrangements found there was no goaf gas drainage from the MG908 11ct hammer hole due to a blown hydraulic oil hose on the diesel compressor.					
Immediate actions taken	• ERZ controller removed CMWs from the face • Investigate surface goaf drainage arrangements to increase total goaf gas extraction • Seamgas technical officer attempted to locate a replacement hydraulic hose. No spare hose available. Relocated a compressor from a separate venturi stack to replace the U/S compressor on the 11ct hammer hole.					

6 DESCRIPTION OF INCIDENT

At approximately 09:00hrs on 28th July 2019 the CH4 concentration in the LW909 tailgate roadway, located outbye the longwall face, began increasing at a steady rate coincident with the falling barometric pressure. The goaf drainage plant and blower were operating at maximum capacity and additional venturi gas extractors were operating. A number of venturi unit were found to be sharing one compressor unit between two venturis.

At approximately 11:00hrs the CH4 concentration had reached 1.90% and LW coal production ceased and the TG CH4 concentration continued to rise, reaching a maximum and started levelling off at 2.25% between 12:40 to 12:50hrs. At approximately 13:10hrs there was a sudden rise in the TG CH4 concentration, reaching 2.5% at 13:15hrs.

At the time of the incident the shearer was cutting back to the MG, all personnel where on the maingate side of the shearer. All personnel were withdrawn back to the panel crib room.

The LW tailgate CH4 concentration continued to rise and levelled off, reaching a maximum concentration of 2.98% at 14:48hrs.

Inspection of surface goaf drainage arrangements found the compressor used to operate the goaf drainage venturi installed on the 908MG 11ct Hammer Hole has failed due to a blown radiator hose.

The compressor was not able to be repaired and was replaced by a compressor from a less critical goaf drainage venturi.

The 908MG 11ct Hammer Hole venturi was returned to operation at approximately 15:00hrs on 28th July 2019 which coincided with a rapid reduction in LW tailgate CH4 concentration below 2.5%.

7 CRITICAL CONTROL FAILURE

(List any identified critical control failures that contributed to this event)

What / which critical controls failed? (List CT number)	NIL
Why did the critical control fail?'	N/A
How did the critical control fail?'	N/A
What additional or revised critical controls and/or monitoring activities need to be established/change to mitigate risk of recurrences, or to improve risk control?'	N/A

8 FINDINGS / CONCLUSIONS

It is believed that the gas exceedance occurred as a result of a loss of tailgate goaf gas extraction through the failure of the MG908 11ct hammer hole venturi gas extractor caused by a failed radiator hose on the diesel compressor that supplied compressed air to operate that venturi.

9 PREVENTATIVE ACTIONS / RECOMMENDATIONS

The following key actions were identified to prevent recurrence and have been assigned as detailed below in Enablon.

Task Description	Hierarchy of Control	Task Assignee	Due Date	Task ID
Source additional fixed plant capacity to minimize use of compressors (compressor failure affects a complete individual hole, whereas plant failure would affect a part of the total capacity, no complete failure of individual hole).	Engineering	D. Holt	30/9/19	TS.01092459
Investigate and implement real time citect monitoring of goaf drainage borehole flow and composition, if it is practical to do so with the current life of mine	Admin	D. Holt	30/9/19	TS.01092460
Holes identified as critical to the goaf drainage infrastructure to be set up to plant, not compressors (where gas composition and capacity permits).	Engineering	D. Holt	23/9/19	TS.01092461

10 TEST FOR EFFECTIVENESS

Post Implementation Action Plan

Test of effectiveness is to be done to ensure that the above actions to prevent recurrence have worked as intended. (Nominally scheduled 3,6 or 12 months after completion of preventative action plan)

Enablon Task No.	Action Description	Responsible Person	Due Date	Completed Date
TS.01092462	Confirm operation and effectiveness of real time citect monitoring of goaf drainage borehole flow and monitoring	D. Black	30/03/2020	

11 INVESTIGATION REPORT SIGN –OFF

The Incident Investigation Team submits this report as a true reflection of the information gathered. To maximize the preventive potential of the investigation report, the findings, conclusions and learning's of the report should be distributed as appropriate.

Department Manager		
Name	Signature	Date
Tim McNally	Confidential	23-08-2019
SHE Manager		
Name	Signature	Date
Tim Roddan	Confidential	23-08-2019
General Manager		
Name	Signature	Date
Damien Wynn	Confidential	27/8/19
Head of Operations		
Name	Signature	Date
Additional EXCO member signoff – if applicable		
Name	Signature	Date

12 EVIDENCE & ANALYSIS TOOL APPENDICE

Time Series Event Chart:

Time Series Event Chart

1 - TM.00021595 28/07/19 10:30:00
Attend pre shift meeting

2 - TM.00021596 28/07/19 10:40:00
Travel

3 - TM.00021597 28/07/19 11:10:00
Minesafe / Prestarts

4 - TM.00021598 28/07/19 11:25:00
CH4 >1.9% cease mining

5 - TM.00022672 28/07/19 13:10:00
Compressor failed on MG908 11ct hammer hole venturi goaf gas extractor

6 - TM.00021599 28/07/19 13:15:00
TG roadway sensor reaching 2.5% Ch4

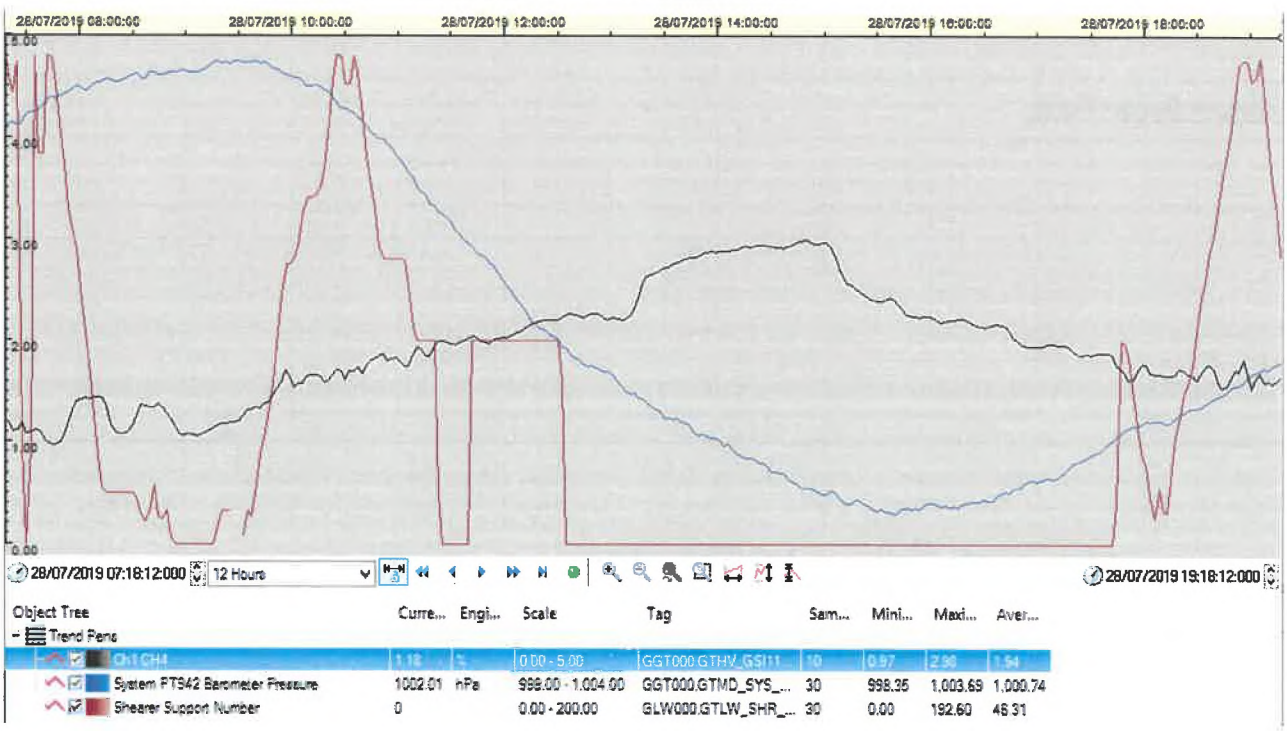
7 - TM.00021600 28/07/19 13:30:00
Withdrew personnel to cribroom and accounted for. Notified MSO / CRO

8 - TM.00022673 28/07/19 15:00:00
New compressor installed on MG908 11ct hammer hole and resumed goaf gas extraction

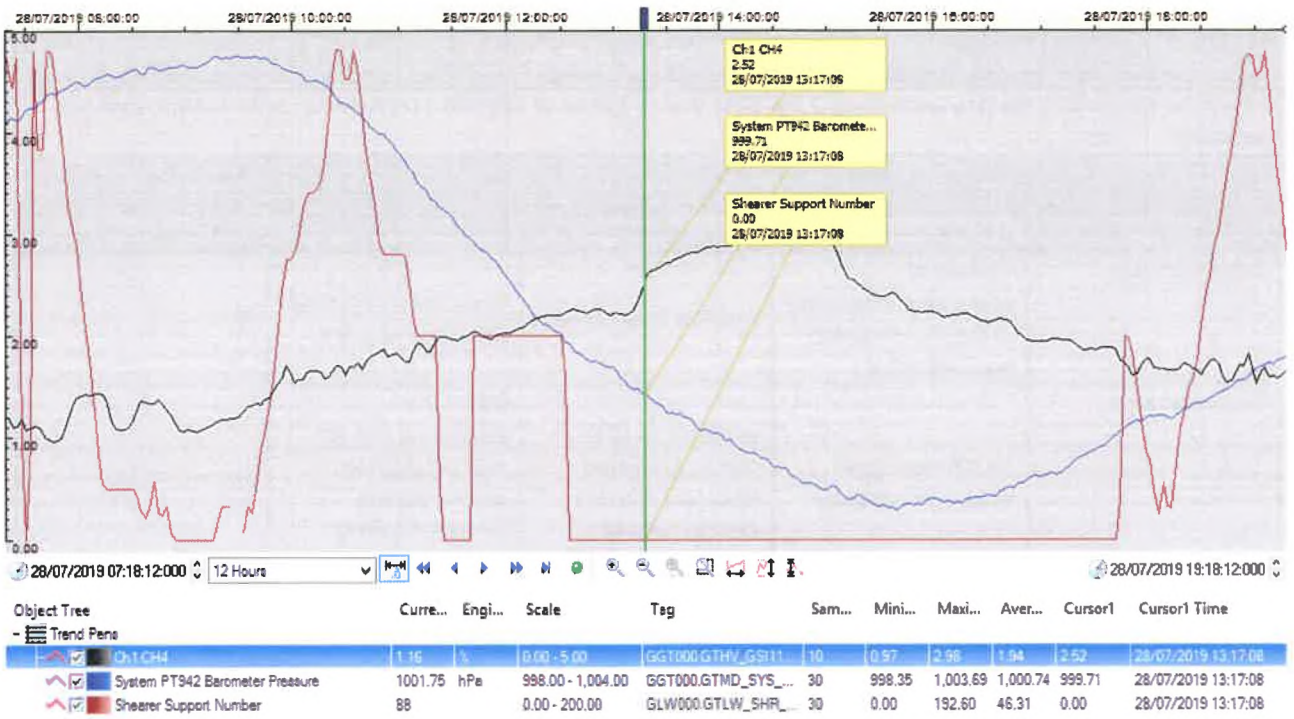
Control Analysis:

Control Analysis				
Unwanted Event: Tailgate gas exceeding 2.5% CH4 due to failure of MG908 11ct hammer hole venturi goaf gas extractor				
Absent or failed controls and support systems	How did they perform?	Why did they fail or were absent?	Outcome of failed or absent controls and support systems?	Site Critical Control. Yes or No?
Goaf drainage	Failure of compressor resulted in failure of venturi gas extractor	radiator hose failed	increase in TG CH4 level above 2.5%	No
Goaf drainage	insufficient goaf drainage capacity	increase in SGE above predicted level and system design capacity	high CH4 background level and production delays during period of falling barometric pressure	No

Citect Trend – TG CH4, Barometric Pressure and Shearer Position:



Citect Trend – TG CH4, Barometric Pressure and Shearer Position – time when TG CH4 exceeded 2.5%:



Object Tree	Curre...	Engi...	Scale	Tag	Sam...	Mini...	Maxi...	Aver...	Cursor1	Cursor1 Time
Trend Pens										
Ch1 CH4	1.16	%	0.00 - 5.00	GGT000.GTHV_GSI11...	10	0.97	2.98	1.94	2.52	28/07/2019 13:17:08
System PT942 Barometer Pressure	1001.75	hPa	998.00 - 1,004.00	GGT000.GTMD_SYS_...	30	998.35	1,003.69	1,000.74	999.71	28/07/2019 13:17:08
Shearer Support Number	88		0.00 - 200.00	GLW000.GTLW_SHR_...	30	0.00	192.60	46.31	0.00	28/07/2019 13:17:08

Incident Report Form:

Classification: Personal data

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To be completed by reporting person with assistance from Supervisor (Surface incidents) or ERZ Controller (UG incidents)

ALL Sections of this form are mandatory unless marked.

Incident Number: 206200

Title of Hazard / Incident:	>25% TG Roadway			
Date occurred:	28-07-19	Time:	1315	Hrs
Date Reported:	28-07-19	Time:	1325	Hrs

Classification: Safety ☐ Material Losses / Damage / Business Interruption ☐ Legal / Regulatory ☑
Environment ☐ Social / Community ☐ Impact on Reputation ☐ Workplace Exposure ☐ Health Illness ☐

Department: Longwall ☑ Development ☐ Outbye ☐ Compliance ☐ Tech Services ☐ Seamgas ☐
SHE ☐ Human Resources ☐ Commercial / Supply Chain ☐ Maintenance / Engineering ☐ Business Improvement ☐
Other: _____

Reportable to external bodies? Yes ☑ No ☐	Mines Dept		
Specific Location:	Refer to pulse		
Reported by:	S. Stingle	ID # 17923	Contracting Name / Staff: GT
Key Person Involved:		ID #	Contracting Name / Staff:
Key Person Involved:		ID #	Contracting Name / Staff:
Key Person Involved:		ID #	Contracting Name / Staff:
Injured Person:		ID #	Contracting Name / Staff:
Others Involved:		ID #	Contracting Name / Staff:
Initial Investigation Team e.g. ERZC / Crew Supervisor / CMW:	S Stingle, B. Millar		

Equipment Involved:			ERZC/ Supervisor: Include ID #	S. Stingle 17923	
Crew:	B		Process Area & Department	Longwall	
Shift Length:	12	Hours into Shift:	3	Consecutive days worked:	3
Activity:	Coal Production		Drug and Alcohol	☐ Yes	☐ No
Incident Description:	>2.5% in TG Roadway				
Immediate Direct Cause:	Other Causes		Mechanism:	Environmental / Contamination	
Immediate Corrective Actions Taken:	Withdrawn men as panel back to Crib room				

Refer to AAMC Risk Matrix to determine the appropriate Consequence Type (matrix on back page)

Consequence Type: Safety Injury ☐ Material Losses / Equipment Damage / Business Interruption ☐
Legal / Regulatory ☑ Environment ☐ Hazard (POTENTIAL Consequence required only) ☐

	Insignificant ☐	Minor ☐	Moderate ☐	High ☐	Major ☐
Actual Consequence: Not Applicable for Hazards	(first aid case, damage <0.01% annual revenue etc)	(medical treatment, damage 0.01-0.1% annual revenue)	(lost time injury, damage 0.1-1.0% annual revenue)	(permanent disability/ fatality, Angle MPI)	(numerous permanent disabilities/ fatalities, Angle MPI)
Potential Consequence:	Insignificant ☐ (first aid case, damage <0.01% annual revenue etc)	Minor ☐ (medical treatment, damage 0.01-0.1% annual revenue)	Moderate ☐ (lost time injury, damage 0.1-1.0% annual revenue)	High ☐ (permanent disability/ fatality, Angle MPI)	Major ☐ (numerous permanent disabilities/ fatalities, Angle MPI)

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Has the hazard, defect or incident been effectively controlled on shift?			**YES** ☑	**NO** ☐
If not, why not?				
Safety				
Parts Injured / Location:		**Medical Treatment:**	**YES** ☐	**NO** ☐
		Hospitalised:	**YES** ☐	**NO** ☐
Environmental				
Media Impacted:	Refer to guide	**Environmental Impact:**	Refer to guide	
Hazard				
Hazard Agent:	Hazardous Substance (Gas)	**Hazard Type:**	**Act** ☐	**Condition** ☐

Timeline:		
01/01/18 06:00		*Example: Attended Start of Shift*
28-7-19 0530/0600	Before the Incident	Attend Pre Shift meeting
" " 0540/1140		Travel
1140 - 1125		Mansafe / Permits
1125		CH4 >1.99%. Cease mining
1315 28-7-19		TG Roadway Sensor Reached 2.5% CH4
		Incident Occurred
1330 28-7-19	After the Incident	Withdrawn Personnel → Crib room and accounted for
		method MSO/ CEO

Additional Actions to prevent reoccurrence: (ERZ Controller/ Supervisor to complete)

Initial Incident Report Checklist:

Contact relevant site personnel: Completed ☑	Have statements been collected?: Completed ☐ *e.g. Key person involved, witnesses (submit with this form)*
Collect any relevant SHE MS Documents: Completed ☐	Take photos of incident scene as required: Completed ☐

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	Task Description	By Whom	Action Due (date)	Enablon ID #
PEOPLE Tasks	**Is counselling of the CMW required** *(std text to be used in task)*? **Yes** ☐ **No** ☑ CMW to be counselled in line with the Anglo Coal Consequence Model and Applicable Misconduct Policy. *Evidence to be sent to site HR for file.*			
	AND IMPLEMENT.			
WORKPLACE Tasks	REVIEW ACCESS RIGHTS TO REMOTELY MONITOR GOAF WELL PERFORMANCE FOR VO, UMM CAO AND MSO (READ ONLY)	T/M NOW.	9/8/19	
	AND IMPLEMENT.			
	REVIEW COMPRESSOR AND GOAF DRAINAGE CRITICAL SPARE LIST AND STOCK LEVEL.	T/M NOW.	9/8/19	
	SETUP MCM HAMMER HOLE TO EXTRACT	T/M NOW.	9/8/19	
	AND IMPLEMENT.			
ORGANISATIONAL Tasks	REVIEW TOTAL GOAF EXTRACTION CAPACITY AND INCREASE TOTAL AVAILABILITY	T/M NOW	9/8/19	
	IMPLEMENT ON ALARMING SYSTEM TO THE CONTROL ROOM WITH HOLE PERFORMANCE	T/M NOW.	9/9/19	

Conclusion:	IT WAS IDENTIFIED DURING TRIGGERED RESPONSE THAT THE MCM HAMMER HOLE BEING USED FOR GOAF DRAINAGE OF LW909 - COMPRESSOR BLOWN BAROMETER HOSE WHICH ISOLATED ADS EXTRACTION ON A FALLING BAROMETER WHICH FLOATED TG909 OR ADS LEVELS.

Incident Sign Off:				
Person Reporting	**Name:** S Stringle	**Supervisor (For surface incident)** **ERZ Controller (For UG Incidents)**	**Name:** T. FLETCHER	
Signature: [redacted]		**Signature:** [redacted]		
Date: 28-07-19		**Date:** 29/7/19.		
Verification Sign Off:				
Undermanager/ MSO	**Name:** B. MCCOY	**Signature:** [redacted]	**Date:** 29/7/19	
Superintendent/ Manager	**Name** D Calloway	**Signature:**	**Date:** 30/7/2019	
Entered into Enablon By:	Name:	Date:	Staff ID #	
If reported to the DNRME, is a form 5A required? Yes ☐ No ☐ If Yes, Raise relevant task for the completion of Form 5A		Is a 'Learning From Incident' Investigation Required? Yes ☐ No ☐ *If Yes, Raise relevant task for the completion of LFI report*		
LFI Task Enablon ID:		**Completion Date of Task**		

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Map / diagram (if required):

Anglo American Plc Risk Matrix		Hazard Effect / Consequence [illegible]				
Loss Type [illegible]		1 Insignificant	2 Minor	3 Moderate	4 High	5 Major
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Likelihood	Estimates [illegible]	Risk Rating				
5 (Almost Certain)	[illegible]	11 (M)	16 (S)	20 (S)	[illegible]	[illegible]
4 (Likely)	[illegible]	7 (M)	12 (M)	17 (S)	[illegible]	[illegible]
3 (Possible)	[illegible]	4 (L)	8 (M)	13 (S)	18 (S)	[illegible]
2 (Unlikely)	[illegible]	2 (L)	5 (L)	6 (M)	14 (S)	19 (S)
1 (Rare)	[illegible]	1 (L)	3 (L)	6 (M)	10 (M)	15 (S)

Risk Rating	Risk Level	Guidelines for Risk Matrix
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

13 RECORD OF AMENDMENTS

Issue 6	:	Full review to align the investigation report to the Learning from Incidents process being rolled out at Met Coal in 2018.	08 June 2018, Chris Gately, Lynda Butler
Issue 5	:	• Sign off table updated to include "Additional EXCO" member signoff. • Section 7 – New – Critical Control Failure (for HPI's only) • References to Met Coal removed.	15 September 2015, Allan Gordon
Issue 4	:	Reviewed Sign off table updated to include sign off from Head of Operations	22 April 2014, Allan Gordon
Issue 3	:	Reviewed for currency – reformatted	8 January 2014, Bruce Gavin
Issue 2	:	Reviewed to align with Enablon Incident Database	6 March 2013, Graeme Redding
Issue 1	:	New Template	15 December 2011, Bruce Gavin