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**International Power
Hazelwood**

**Report for Major Mining Hazards
Assessment**

Interim Submission

December 2009

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Executive Summary

Hazelwood Mine (International Power) commissioned GHD to facilitate Safety Assessments on their Major Mining Hazards. The Victorian Occupational Health and Safety (OHS) Regulations 2007 define a Major Mining Hazard (MMH) as a mining hazard that has the potential to cause an incident that would cause, or pose a significant risk of causing, more than one death (Reg. 1.1.5).

This is an interim report covering the Safety Assessments conducted at Hazelwood using a team-based assessment approach over the course of four workshops in December 2009. The Safety Assessments identified risks associated with selected MMHs within and adjacent to Hazelwood's mining area. Bow-tie diagrams were developed for each MMH group. Existing control measures including Critical System and Risk controls, and potential additional controls were identified.

In total 321 existing controls were listed. The workshop team raised 11 potential controls for possible future implementation. 22 Critical System controls and 33 Risk (engineering) controls were identified collectively for the MMHs at Hazelwood Mine.

Ongoing further works include risk assessments to be carried out for each of the scenarios for the MMHs illustrating that risk has been reduced to as low as reasonably practicable. Additionally, the next phase of the safety assessment process requires the development of Performance Standards for all Critical System and Risk Controls.

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1. Introduction

1.1 Overview

Hazelwood Mine (International Power) commissioned GHD to facilitate Safety Assessments on their Major Mining Hazards. The Victorian Occupational Health and Safety (OHS) Regulations 2007 define a Major Mining Hazard (MMH) as a mining hazard that has the potential to cause an incident that would cause, or pose a significant risk of causing, more than one death (Reg. 1.1.5).

This is an interim report covering the Safety Assessments conducted at Hazelwood using a team-based assessment approach over the course of four workshops in December 2009.

1.2 Scope of Work

The scope of work for the MMH Safety Assessments captured the following requirements.

- » Review Hazelwood's Mining Hazards Register and assess currently recognised MMHs against the definition for MMHs in the Victorian OHS Regulations 2007 (regulation 1.1.5). On the basis of hazards that match the definition, select representative hazard groupings for Safety Assessment.
- » For each MMH, conduct a team-based workshop exercise to identify representative, reasonable and thoroughly defined risk scenarios that have the potential to lead to a multiple fatality.
- » For each risk scenario, identify current controls and select 'Critical System' & 'Risk' controls.
- » Develop performance standards for all identified 'Critical System' & 'Risk' Controls.

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2. Assessment Methodology

2.1 Principles

The methodology adopted contemporary principles for team-based risk assessments, including the method steps and ideals reflected by the following standards.

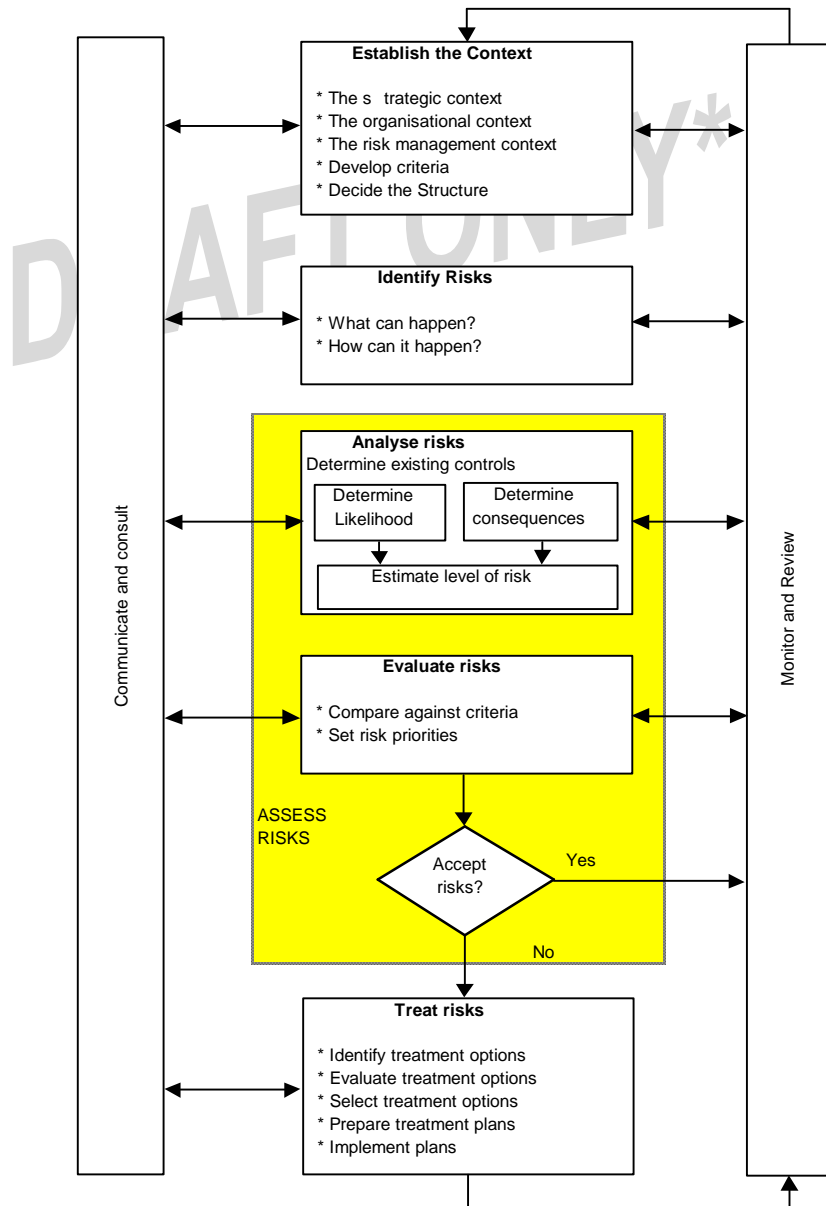
- » AS/NZS ISO 31000:2009 (Risk Management) published by Standards Australia.
- » MDG 1010 (Risk Management Handbook for The Mining Industry) published by NSW Department of Primary Industries.

Each of these standards provided guidelines for conducting the safety assessments.

A model process for a risk assessment is shown in the following diagrams, reflecting the AS/NZS ISO 31000 process steps.

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Figure 1 - AS ISO 31000 Process diagram



This generic process diagram was used by the workshop team to develop a work-breakdown structure, which is shown overleaf. This work-breakdown structure was used to guide each MMH workshop and is shown in Table 1.

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Table 1 Work-breakdown structure

Step	Work activity	See Section	See Appendix
1	Scope & objectives	1.1, 1.2, 3	
2	MMH Safety Assessment process	2	
3	Model scenario dynamics in a bow-tie diagram	2.3, 2.4, 2.5	A
4	Critical Control Selection	2.5	B
5	Performance Standard Development	4	C

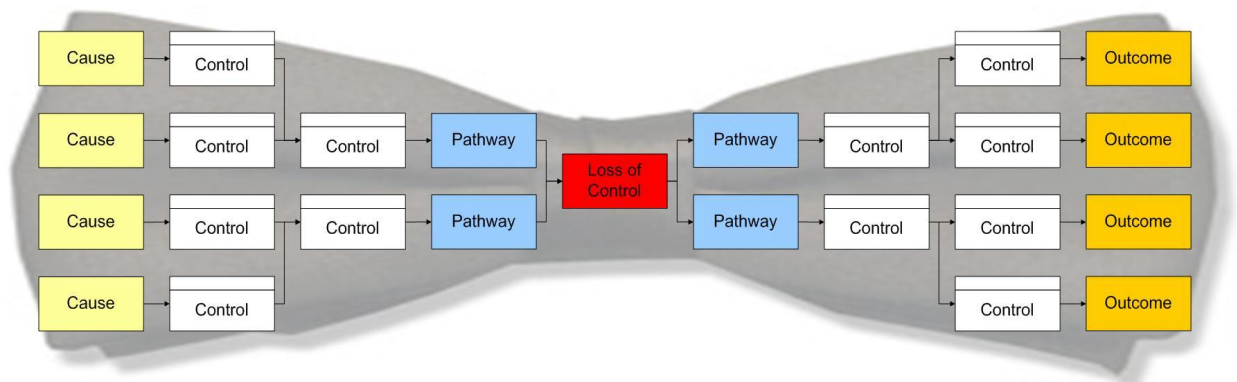
2.2 Review of 2004 Study & Selection of MMHs

Prior to the commencement of the structured workshop process a review of the 2004 Major Mining Hazard study was conducted. This was done to recognise hazards that are still applicable to Hazelwood Mine and identify any new MMHs that are now relevant to the operation. Thirteen potential MMHs were identified. This list was reduced to 10 with flooding, flammable gas release in workshop and Earthworks failure being the 3 MMHs not viewed as credible multiple fatality events relevant to Hazelwood mine. A more detailed description of the MMHs can be found in Section 3.

2.3 Bow-tie Diagrams

This 'bow-tie' diagram represents causes and outcomes associated with any failure type, and the current study developed a bow-tie diagram for each MMH group. The bow-tie format displays causes, loss of control events, consequences, and control types on one diagram to allow appreciation of the 'scenario dynamics' of a risk event, as shown in Figure 2.

Figure 2 - Bow-tie (scenario dynamics) format



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2.3.1 Bow-tie Validation

Prior to the formal workshop process a validation and update of the 2004 bow-ties was conducted. This involved the preparation of bow-ties by a GHD consultant in a smaller workshop setting where a member of Mine Management, Mine Asset Manager and a Safety Representative were present. All known, reasonably foreseeable causes associated with each MMH group were itemised and listed for the team's reference. This was done in order to effectively 'gear' the team workshops to be held for each of the 10 MMHs.

2.4 Workshop Process

GHD facilitated 4 MMH workshops in December 2009. Schedules for the assessments are shown in Table 2. The objective of these workshops was to engage discussion amongst relevant personnel regarding each of the MMHs. This involved a further review and update of the bow-ties and determination of Critical System and Risk Controls (Section 2.5). Key features of the workshop process were :

- » A comprehensive team of experienced participants was required. The team make-up and experience are listed in Table 3.
- » Independent facilitation. A GHD facilitator led the team through a structured process.

In addition to a 'core group' that attended each of the MMH workshops appropriate MMH 'specialist groups' were assembled for workshop exercises relevant to their area of expertise. The basis for this decision was so that the relevant team members for that specific MMH group (and its associated work activities, equipment maintenance and management systems and control monitoring and inspection tasks) could be brought together. This provided access to recorded data, incidents, information and knowledge relating to the subject at hand. The team summarised all known information concerning each MMH group, past incidents and events, and known future plans and anticipated threats and vulnerabilities. These included summaries of the following issues.

- » Lost-time injury events, reportables, accident reports and investigations.
- » Regulator Safety Alerts and Notices relating to MMH issues.
- » Planned changes to assets, layout, work design and workflow configuration.
- » The MMH team members were taken through a MMH Safety Assessment training and awareness session prior to each workshop.
- » WorkSafe personnel at times observed Hazelwood and GHD personnel, in order to provide differing perspectives and input into the process.

Table 2 Hazelwood MMH List

MMH group	Workshop date
1. Confined Spaces	2 nd December, 2009

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2. Mobile Plant Interactions	2 nd December, 2009
3. Dredger / Stacker Collapse	3 rd December, 2009
4. Jacking of Plant	8 th December, 2009
5. Vehicle Interactions	3 rd December, 2009
6. Exposure to HV Electricity	3 rd December, 2009
7. Mine Fire	8 th December, 2009
8. Batter Failure (Engulfment or fall from heights)	8 th December, 2009
9. Falling Materials and Loads (Gravity)	9 th December 2009
10. Structural Failure of Fixed Structures	9 th December 2009

Table 3 Attendance List

Name	Position/Role	Department/ Company	Industry years	MMH Attended
Rob Kaiser	Maint/Engineering	IPRH	2.5	1,2,3,4,5,6,7,9
Peter Brimblecombe	Asset Manager,Maint	IPRH	30	1,2,3,4,5,6,7,8,9,10
Kevin Hayes	Inspector	Worksafe	20	1
Greg Sleziak	Inspector	Worksafe	15	1
Gaetano Giardina	HSR Operations	IPRH	20	1,3,4,5,6,7,9
Mark Callow	Maint HSR	IPRH	32	1,2,3,4,5,6,7,9
Stuart Reeves	Planning	Belle Banne	29	1,5
Zak Zizopolous	Safety Officer	IPRH	2.5	1,2,3,5,6,7,9
Garry Mauger	Mine Management	IPRH	35	1,2,3,4,5,6,7,8,9,10
Terry McDonald	Mine Surveyor	IPRH	27	1,2,3,4,5,7,9
Duncan Orr	Civil Engineer	IPRH	8	1,2,3,4,5,6,7,8,9,10
Bill Estrada	Mine Productions Manager	IPRH	25	5
Peter Sheridan	Supervisor	IPRH	33	3,5
Jayantha Fernando	Mine Hydrogeologist	IPRH	30	3,4,5,7,8

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Name	Position/Role	Department/ Company	Industry years	MMH Attended
Sam Frankland	Mine Tech Electrician (HSR)	IPRH	7	6
Frank Meranti	Mine H&S officer	IPRH	6	7
Romeo Preziosa	Mine Ops FSO	IPRH	25	4,7
Tony Vuillermin	Mine Maint Planner	Belle Banne	25	3,4,7
Russell Mills	Facilitator	GHD	28	1,2,3,4,5,6,7,8,9,10
Vish Khera	Co-Facilitator	GHD	1	1,2,3,4,5,6,7,8,9,10

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2.5 Critical Control Selection & Adequacy

Critical Controls for MMHs fell into 2 categories –

- Risk Controls
- Critical System Controls

An explanation of each category is provided in Table 4.

Table 4 Critical Control Type

Risk Control	Critical System Control
<p>Engineering controls execute automatically and do not require human intervention.</p> <p>Engineering-based controls may include both hardware and automated IT-based controls.</p> <p>Engineering controls are designed to achieve a specific repeatable level of control to a set level of availability.</p> <p>Reliability of engineering controls is achieved through the management system surrounding the ongoing review and improvement of the controls performance</p>	<p>System-based controls are executed by individuals within the bounds of a management system.</p> <p>Execution is based on a prescribed approach either as a common practice or as a defined procedure and in some instances, input from people is governed by system-set rules and protocols.</p> <p>Control reliability is achieved through the system surrounding the control, including management review and follow-up.</p>

Due to high reliance on critical controls to manage MMH risks a robust approach to assessing this adequacy must be applied. The assessment of critical control adequacy addresses four characteristics of the control:

- » Dependability
- » Practicality
- » Monitoring
- » Workforce Involvement

2.6 Performance Standard Template development

Risk assessment alone does not manage risk. To improve and sustain safety at a site requires implementation and maintenance of critical controls identified during the safety assessments.

Performance standards are designed to set out a systematic and detailed definition of critical controls, which can then be audited to ensure their effectiveness in managing the MMH for which they were

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identified.

The key parameters recorded in the performance standard were aligned with the Adequacy Assessment prompts.

For the performance standard to be beneficial each of these factors must be verifiable, to enable performance of the critical control to be tracked over time. The performance standards are designed to be a living document and should be updated / altered as necessary to reflect the requirements of the controls and any changes that may occur over time.

2.7 Database

The information gathered during the analysis was collected using a Microsoft Access risk register database designed specifically for semi-quantitative risk analysis by GHD. The risk register, which enables all the risk information to be centrally and conveniently located, can also be used to generate reports and charts of various outputs from the process. It will be delivered to site at the completion of the process for use as a reference tool and to assist in tracking and monitoring potential controls.

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3. Interim Findings for Major Mining Hazards

3.1 Description of Major Mining Hazards

A review of the Hazelwood Hazard and Risk Register was conducted on 13 November 2009. Attendees are shown in Table 5.

Table 5 MMH Hazelwood review attendance list

Name	Position/Role	Department/Company	Industry years
Peter Brimblecombe	Asset Manager, Maint	IPRH	30
Zak Zizopolous	Safety Officer	IPRH	2.5
Garry Mauger	Mine Management	IPRH	35
Duncan Orr	Civil Engineer	IPRH	8
Jayantha Fernando	Mine Hydrogeologist	IPRH	30
Richard Polmear			

The attendees reviewed the list of MMHs identified in the Hazards and Risk Register and confirmed the list of MMHs shown in Table 6. below. These MMHs are to be carried forward into the study.

Table 6 Descriptions of MMHs

MMH No	Title	Description
1.	Confined Spaces	<p>A pathway to the MMH arises through exposure to engulfment by coal in the Raw Coal Bunker or by drowning when maintenance work is being undertaken in water tanks or water mains.</p> <p>Another pathway arises when personnel enter a confined space and are exposed to an unsafe atmosphere, through a lack of oxygen, presence of contaminants or there is an explosive atmosphere from coal dust.</p> <p>Temperature excesses were considered, but rejected because multiple fatality outcomes were not considered credible.</p>

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MMH No	Title	Description
2.	Mobile Plant Interactions	<p>Mobile plant consists of:</p> <ul style="list-style-type: none"> » Dozers; » Graders; » Dredgers / Stackers; » Slew Conveyors; » Heavy dump trucks; » Excavators; » Drill Rigs; » Cranes; » EWPs; and » Forklifts <p>A pathway to the MMH arises from collisions between mobile plant on the mine roads and surfaces caused by poor visibility, road surfaces or operator condition.</p> <p>A second pathway is from the toppling of a crane or EWP arises from mechanical or electrical failures, collisions with other plant, working on unstable or uneven ground or working in extreme weather conditions</p> <p>A pathway involving the collision of the Dredger cabin with the batters was considered but rejected</p>
3.	Dredger / Stacker Collapse	<p>Collapse of a Dredger / Stacker. Pathways to the MMH include operating outside the design limits of the machines and/or mining methods, a mechanical/structural failure during operation, a batter collapse onto/below the Dredger / Stacker or a dump slip.</p> <p>Collisions with heavy plant or coalfaces were considered but rejected because multiple fatalities on the Dredger / Stacker are not considered credible. Collapses due to digging in soft formations was also rejected as a credible multiple fatality pathway.</p>
4.	Jacking of Plant	<p>Personnel involved in jacking of plant, maintenance activities. Pathways to the MMH are a failure of the jacking equipment, ground failure, or procedure/process failure during jacking of plant, jacking during extreme weather conditions or an error in the jacking methods used.</p>

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MMH No	Title	Description
5.	Vehicle Interactions	<p>Light vehicles consist of:</p> <ul style="list-style-type: none"> » Cars and 4WDs; » Forklifts; » Tractors; » Bobcats; » Fire trucks; » Maintenance trucks; and » Vehicles with trailers <p>Collisions or interactions involving light vehicles with heavy plant, other light vehicles or pedestrians in the mine area, mine roads and surfaces.</p> <p>Pathways to the MMH include road conditions, vehicle condition, and driver error.</p>
6.	Exposure to Electricity	<p>HV electricity exposure involving:</p> <ul style="list-style-type: none"> » Overhead power lines; » Trailing cables; » HV equipment; » SP Ausnet 22 kV and 6.6 kV equipment; and » Substations (4) <p>Pathways to the MMH via HV include interaction with overhead powerlines, a failure in the trailing cable and interactions with HV equipment.</p> <p>A pathway to the MMH via LV is working on or in the vicinity of live LV equipment.</p>
7.	Mine Fire	<p>A mine fire with the potential to cause multiple fatalities may arise from maintenance (hot) work, individuals (e.g. smoking), external fires impacting on the mine, spontaneous combustion of reactive coal, and from a range of ignition sources where there are combustibles (coal, coal dust) or flammables (liquids and gases).</p>
8.	Batter Failure (Engulfment or fall from heights)	<p>Batter failures leading to engulfment by materials, or falls from height, occurring in the vicinity of batters. Pathways to the MMH include operator errors, geotechnical failures or environmental factors affecting the batter stability.</p>

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MMH No	Title	Description
9.	Falling Materials and Loads (Gravity)	Personnel are exposed when working in the vicinity of plant to falling materials including coal spills or falling objects. Pathways to the MMH include coal spills from overhead conveyors, and transfer points. Another pathway involving falling materials is the ingress of water or coal slurry into the Raw Coal Bunker, engulfing personnel. A pathway involving gravity is loads being dropped from cranes during planned activities.
10.	Structural Failure of Fixed Structures	<p>Fixed structures include:</p> <ul style="list-style-type: none"> » Rising conveyors; » Tension carriages; » Transfer points; » Bridges & tunnels; » Reinforced earth structures » The Hazelwood Slot Bunker; and » Towers (fire, communications, transmission) <p>The pathways to the MMH involving structural failure include failure of structures, mechanical failures, mobile plant interaction with the structures and external factors.</p>

Several potential MMHs were considered, but were rejected based on discussions held by Hazelwood personnel in a MMH scoping meeting. These rejected hazards, with reasons for rejection are shown in Table 7 below.

Table 7 Other MMHs considered

Hazard	Title	Description	Reason for Rejection
9	Inrush of Water in Mine (Flooding)	Flooding in mine from extreme weather events or groundwater release	<ul style="list-style-type: none"> • 1 in 10,000 year flood protection from river • Inflows from main drain failure too small to create inrush • Inflows from catchments or drain failures unlikely to have sufficient volumes to cause fatality.

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Hazard	Title	Description	Reason for Rejection
11	Earthworks Failure (Engulfment)	Collapse of trenches, drains, bores or fire holes during work activities	<ul style="list-style-type: none">• Only a single fatality circumstance can be conceived as even remotely a possibility.
13	Flammable Gases	Release of flammable gases in the workshop with ignition	<ul style="list-style-type: none">• Gas volumes (acetylene) are low amounting to one bottle at a time.• Potential for a fatality most unlikely, let alone a multiple fatality.

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3.2 Bow-ties

The MMH workshops reviewed each bow-tie in detail. There was considerable discussion on many of the credible 'risk scenarios' and active discussion on the controls. Prior to this discussion the nature of the MMH was discussed to ensure that all the team had a clear understanding of the MMH. The reviewed bow-tie diagrams are shown in Appendix A.

3.3 Critical Controls

A total of 55 Critical controls were selected for all of the MMHs on the Bow Tie diagrams and were either:

- » Engineering based Risk Controls (33 Controls)
- » System Based (22 Controls)

These controls should receive the highest level of scrutiny and ongoing management attention to ensure that their effectiveness is maintained. The selections were based around discussions held by the team and personnel opinions on which controls were instrumental in preventing the respective multiple fatality event. Preference was given to 'Risk Controls' due to their engineering nature and lack of reliance on human factors and systems.

The identified Critical controls are listed in Table 8.

Table 8 Critical System & Risk Controls

MMH	Risk/Critical System Controls (R/CS)
Confined Spaces	0005 Emergency Response Plan (2895) (CS) 0318 Physical Isolation of tanks eg. Handrails/guarding, Lockable valves (R) 0090 Procedure - Mine Registered & Confined Space including Confined Space Register/Permit System (3090) (CS) 0213 Mine Permit System (CS) 0145 Design - Raw Coal Bunker (eg. personnel guarding) (R)
Mobile Plant Interactions	0005 Emergency Response Plan (2895) (CS) 0326 Major haul roads conforming with standards (R) 0229 Mobile Equipment - Fit for purpose (Cab layout & design, Failsafe controls) (R) 0236 Load Monitoring/limiting devices (R) 0113 ROPs on Mining plant where fitted (R) 0148 Exclusion zone around plant (R)

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MMH	Risk/Critical System Controls (R/CS)
Dredger/Stacker Collapse	0028 Weekly Geotechnical Inspections (CS) 0030 Depressurisation of aquifers & Groundwater Modelling (CS) 0032 Surface drainage (R) 0044 Dump design (height) (R) 0257 Safety limits on Machinery (R) 0412 Design - Dredger/Stacker eg. Safety hooks (R) 0469 Monitoring: On-line bore output (CS)
Jacking of Plant	0005 Emergency Response Plan (2895) (CS) 0238 External testing of jacking equipment (CS) 0137 Engineer Approved Procedures – Jacking (CS) 0138 Jack design & failsafe devices (eg. Pilot operated check valves) (R) 0148 Exclusion zone around plant (R)
Vehicle Interactions	0340 Design - Fit for purpose vehicle (light vehicle/forklifts/scissor lifts/bobcats/firetrucks/trailers) (R) 0129 Preventative Maintenance Program (CS) 0164 Design – Roadways (R)
Exposure to Electricity	0011 HV Routine Maintenance program (CS) 0012 Design - HV Switching Equipment (R) 0016 Design & Layout – Cables (R) 0021 Restricted access to authorised personnel (locks & signs) (CS) 0187 Limits of approach to be maintained around HV Plant (R) 0270 Electrical Protection Systems (R) 0376 HV Electrical protection systems (Sensitive earth leakage protection/IT earthing system) (R) 0386 Procedure - Isolation/Earthing (CS) 0388 Isolation & Earths (R) 0391 Procedure - HV Switching (CS)

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MMH	Risk/Critical System Controls (R/CS)
Mine Fire	0005 Emergency Response Plan (2895) (CS) 0062 Maintenance - Daily cleaning or on request (hose down / shovel clean) (CS) 0064 Procedure - Permit System (Hot work) (CS) 0293 Equipment Protection Devices (R) 0151 Shiftly Fault inspections (CS) 0468 Mine Fire Services Policy & Code of Practice (CS) 0470 Fire Instructions (CS)
Batter Failure (Engulfment or fall from heights)	0005 Emergency Response Plan (2895) (CS) 0028 Weekly Geotechnical Inspections (CS) 0030 Depressurisation of aquifers & Groundwater Modelling (CS) 0032 Surface drainage (R) 0154 Horizontal bores (relief bores) 0448 Design – Batter (R)
Falling Materials and loads (gravity)	0299 Safety devices (Dredgers) & (H/E Unit) 0184 Design - Conveyor systems (chute size, gradient, loading) (R) 0213 Mine Permit System (CS) 0168 Design/Selection - Rigging Equipment (R) 0169 Design - Crane including safety devices (R) 0170 Procedure - Independent assessment & Inspection of rigging equipment (CS) 0458 Design - Lifting Points on equipment (R) 0463 Belt Clamps, chains & certified beams (R) 0464 Procedure - Belt clamping & creating a belt envelope (CS)

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MMH	Risk/Critical System Controls (R/CS)
Structural failure of fixed structures	0005 Emergency Response Plan (2895) (CS) 0028 Weekly Geotechnical Inspections (CS) 0345 Design - Structures including material selection & corrosion protection (R) 0352 Procedure - Maintenance for fixed structures including inspection routine (CS) 0355 Design - Structures including limits and protection devices (R) 0369 Over tension protection devices (R) 0251 Civil Asset Management Plan including routine inspections (CS) 0150 Design - Conveyor (braking systems/shutdown/belt failure detection devices) (R)

3.4 Performance Standards

As part of the development of the Performance Standard for a critical control an assessment of its adequacy is required. A number of the critical controls identified in the 2004 study were assessed for their adequacy using the prompts:

- » Dependability
- » Practicality
- » Monitoring
- » Workforce Involvement

Checklists provided the relevant criteria for each of these prompts. This approach will now be required for new critical controls identified in this study and verification that adequacy assessments of critical controls reviewed in the 2004 study are still valid. The performance standards also identify improvement actions and owners. Preliminary sample performance standards were developed for Hazelwood mine and are included in Appendix C.

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4. Further Work

4.1 Risk Assessment of Scenarios

Risk assessments are to be carried out for each of the scenarios for the MMHs illustrating that risk has been reduced to as low as reasonably practicable. Discussions with Hazelwood Mine management are continuing to determine the most appropriate method to complete the risk assessment.

4.2 Performance Standards

To improve and sustain safety at a site requires implementation and maintenance of critical controls identified during the safety assessments. It is anticipated that Hazelwood mine will endeavour to develop performance standards around each of the Critical System and Risk Controls identified during the safety assessment workshops. As part of the development of the performance standard an assessment of the current adequacy of the critical control will be required.

GHD will facilitate further workshops to assist Hazelwood Mine personnel draw up these performance standards. Sample performance standards have been issued to site (Appendix C) to assist with familiarisation.

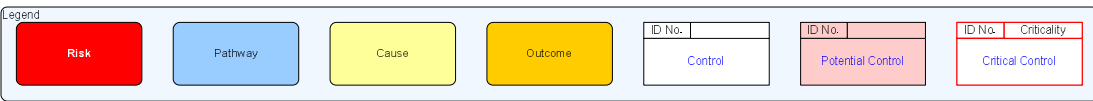
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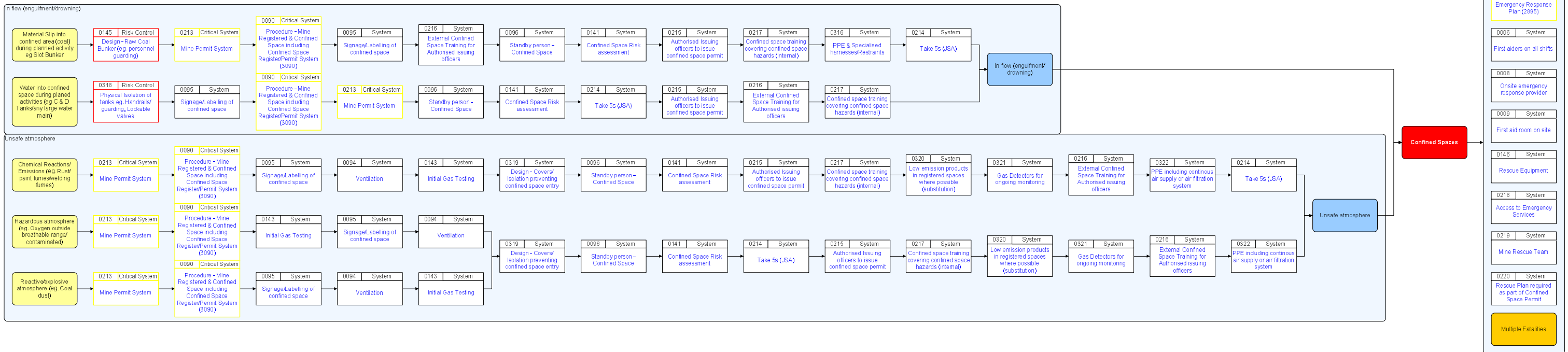
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Bow ties

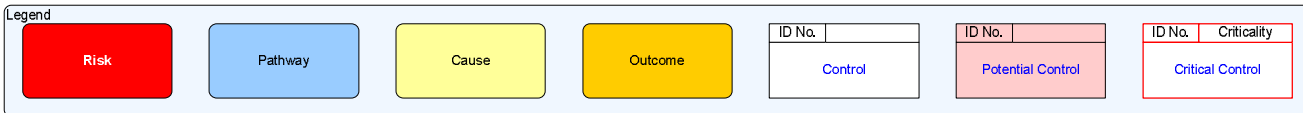
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Operation	Hazelwood Mine
Hazard Type	
Risk No	1
Risk	Confined Spaces
SQRA Date	2 Dec 2009

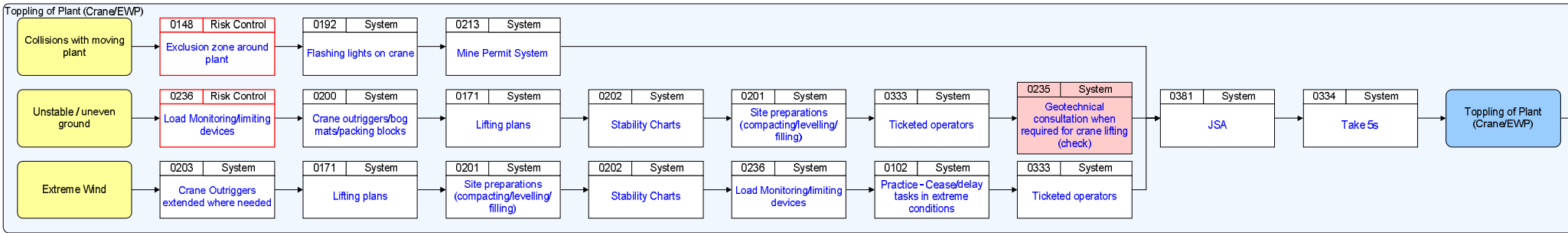
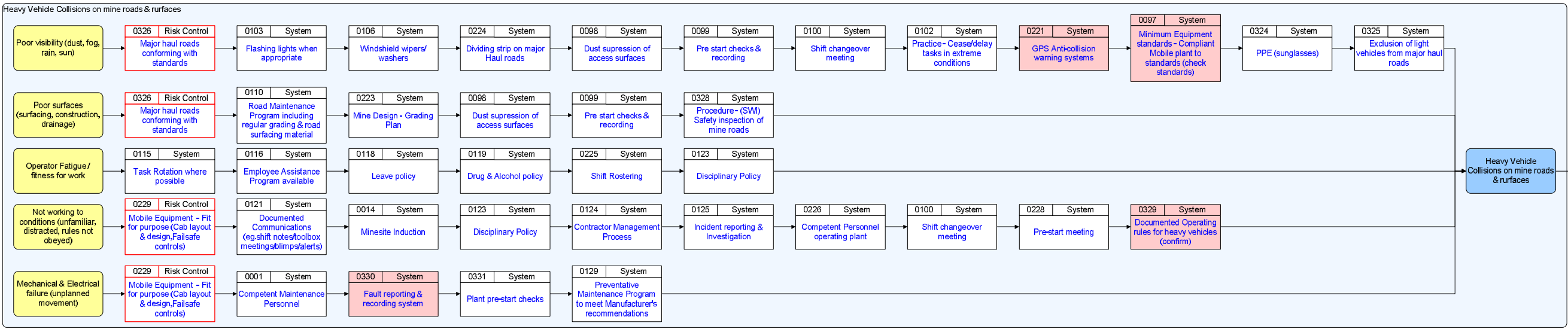
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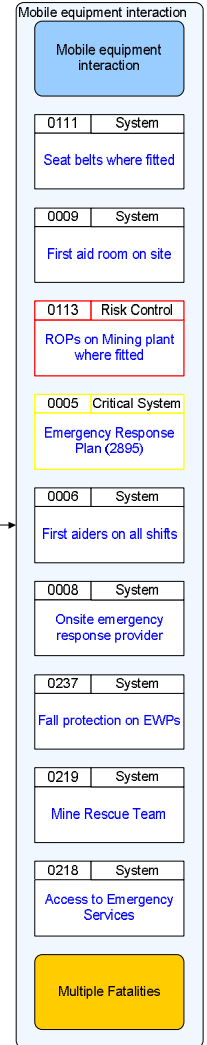


Operation	Hazelwood Mine
Hazard Type	
Risk No	2
Risk	Mobile Plant Interactions
SQRA Date	2 Dec 2009

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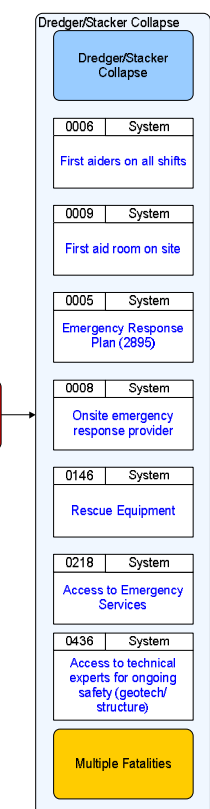
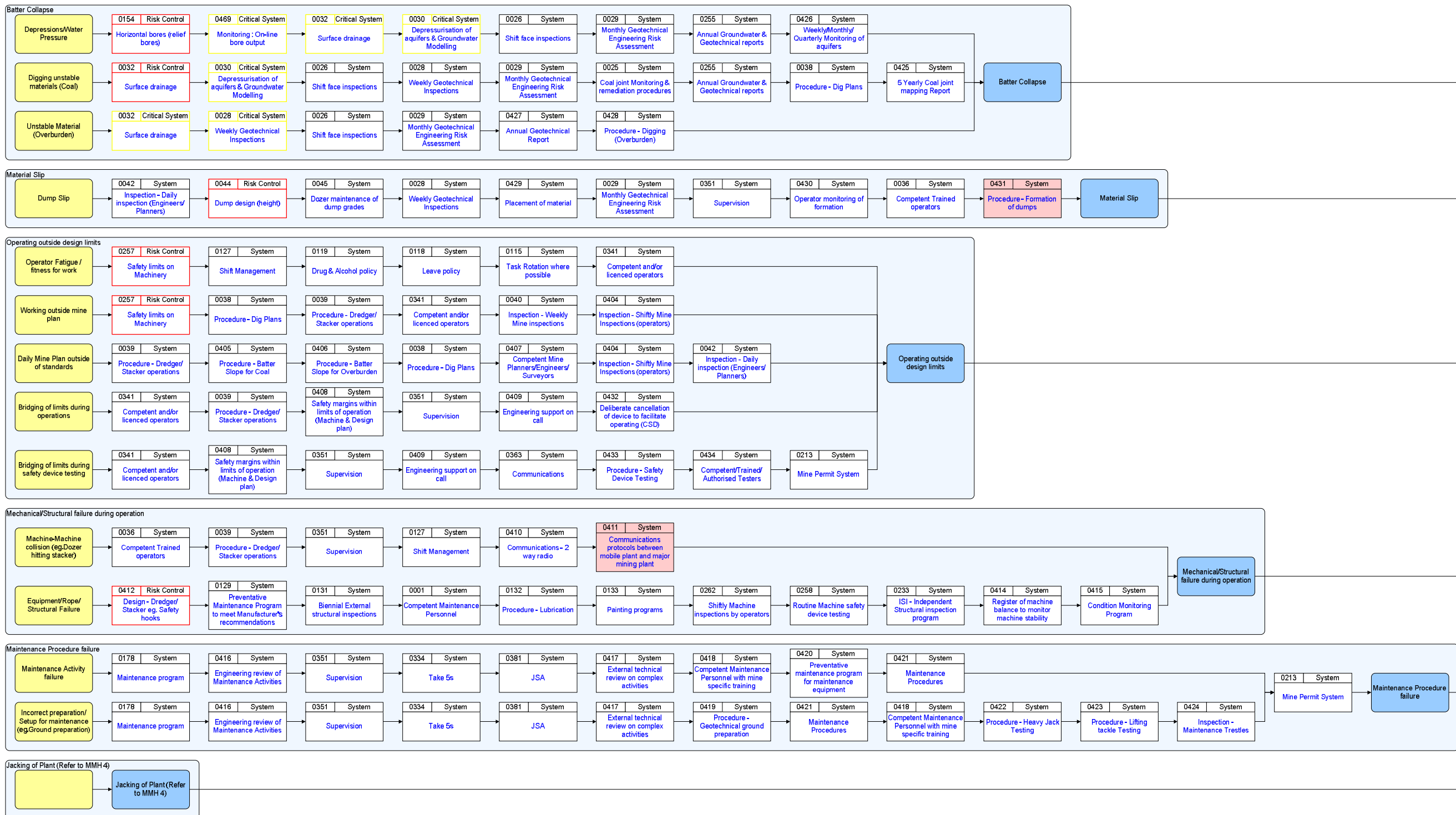
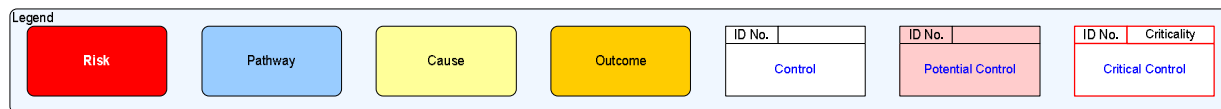
Mobile Plant Interactions

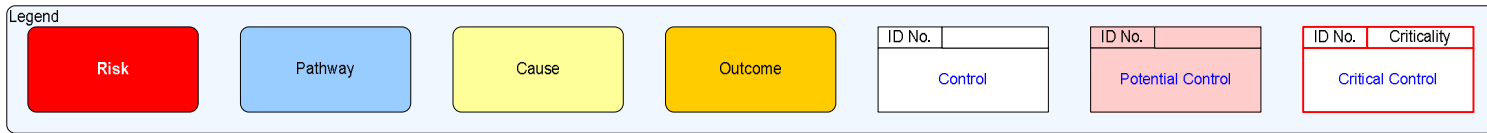




Operation	Hazelwood Mine
Hazard Type	
Risk No	3
Risk	Dredger/Stacker Collapse
SQRA Date	2 Dec 2009

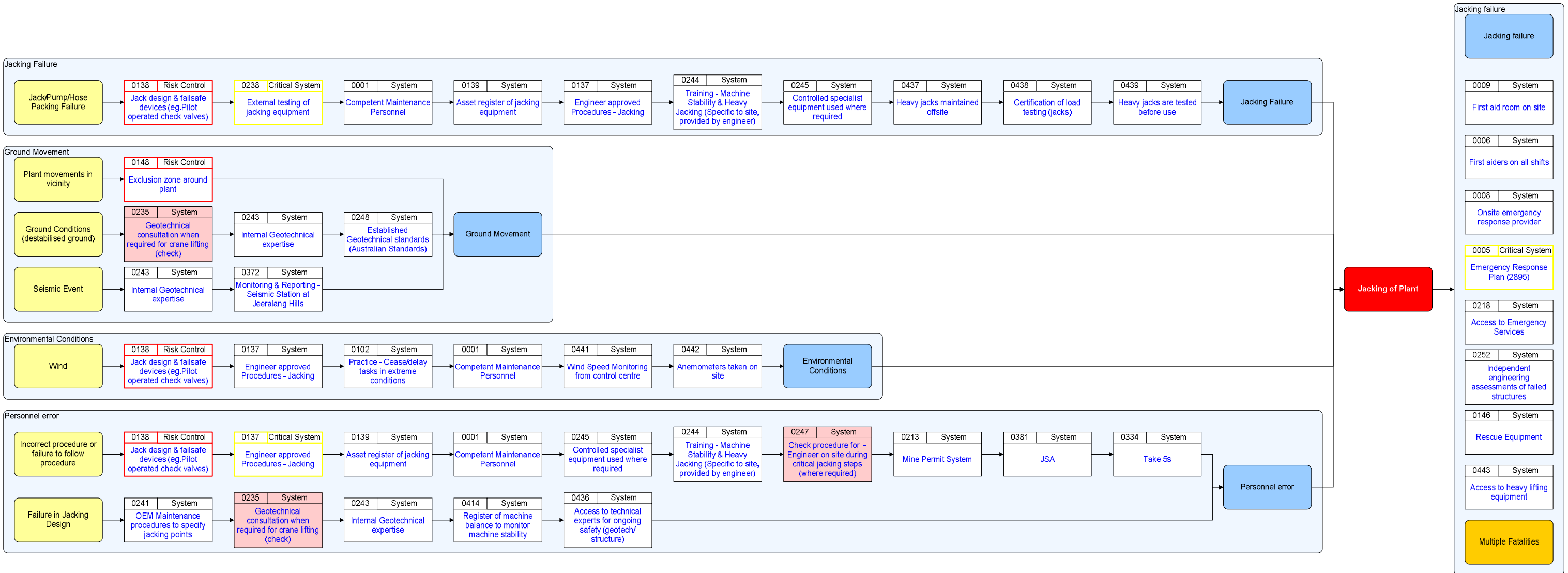
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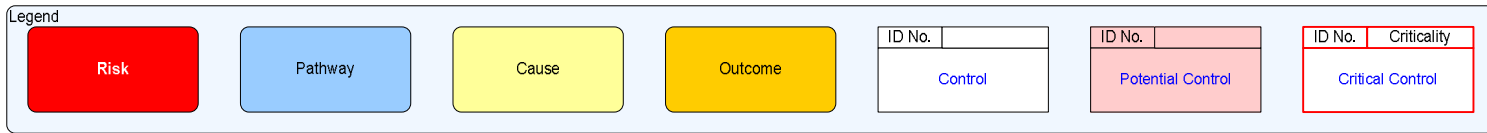




Operation	Hazelwood Mine
Hazard Type	
Risk No	4
Risk	Jacking of Plant
SQRA Date	2 Dec 2009

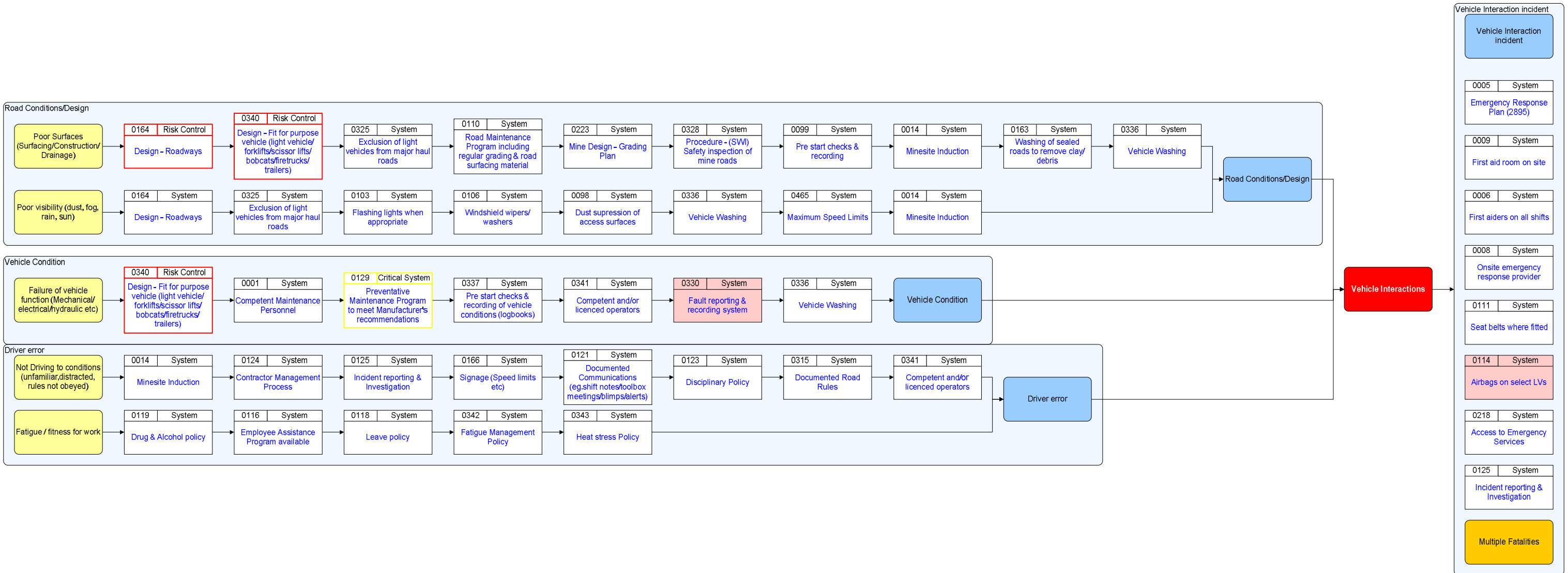
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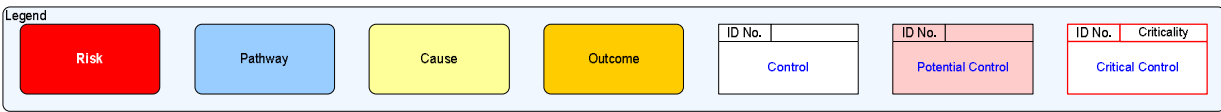




Operation	Hazelwood Mine
Hazard Type	
Risk No	5
Risk	Vehicle Interactions
SQRA Date	2 Dec 2009

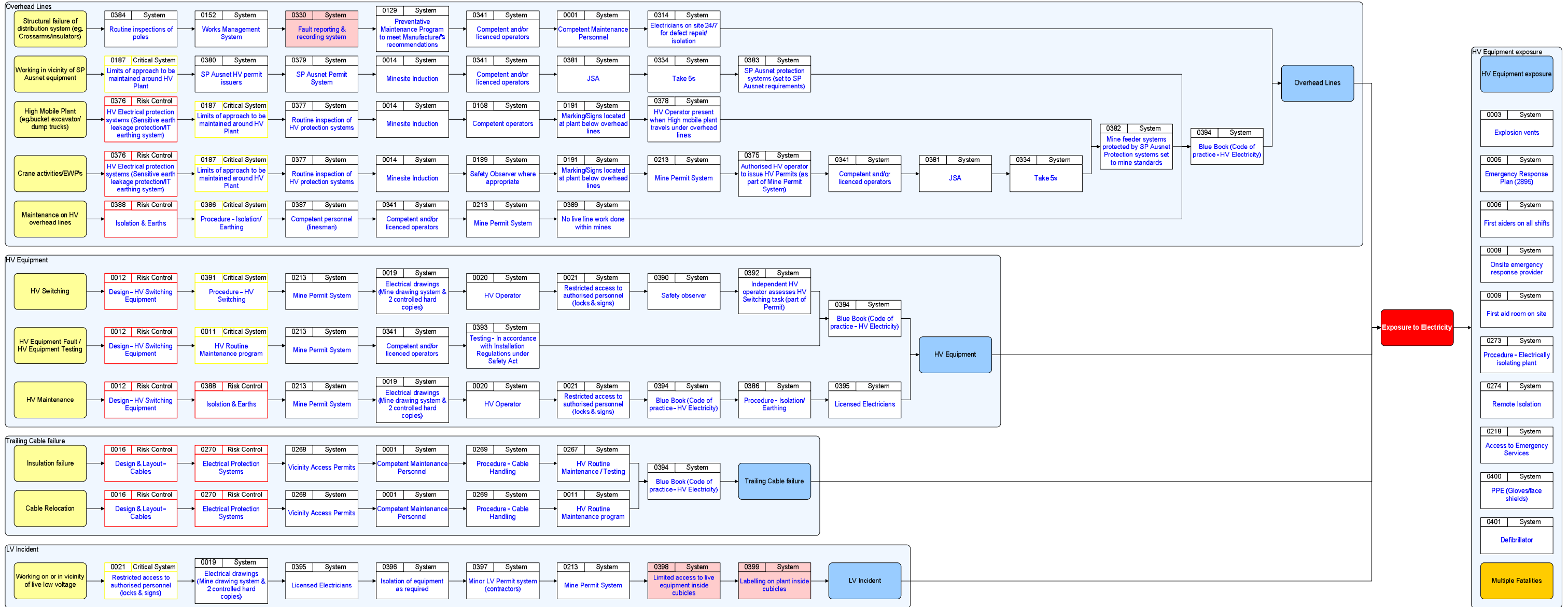
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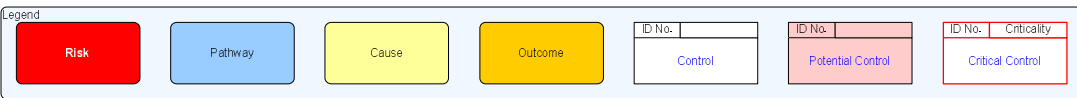




Operation	Hazelwood Mine
Hazard Type	
Risk No	6
Risk	Exposure to Electricity
SQRA Date	2 Dec 2009

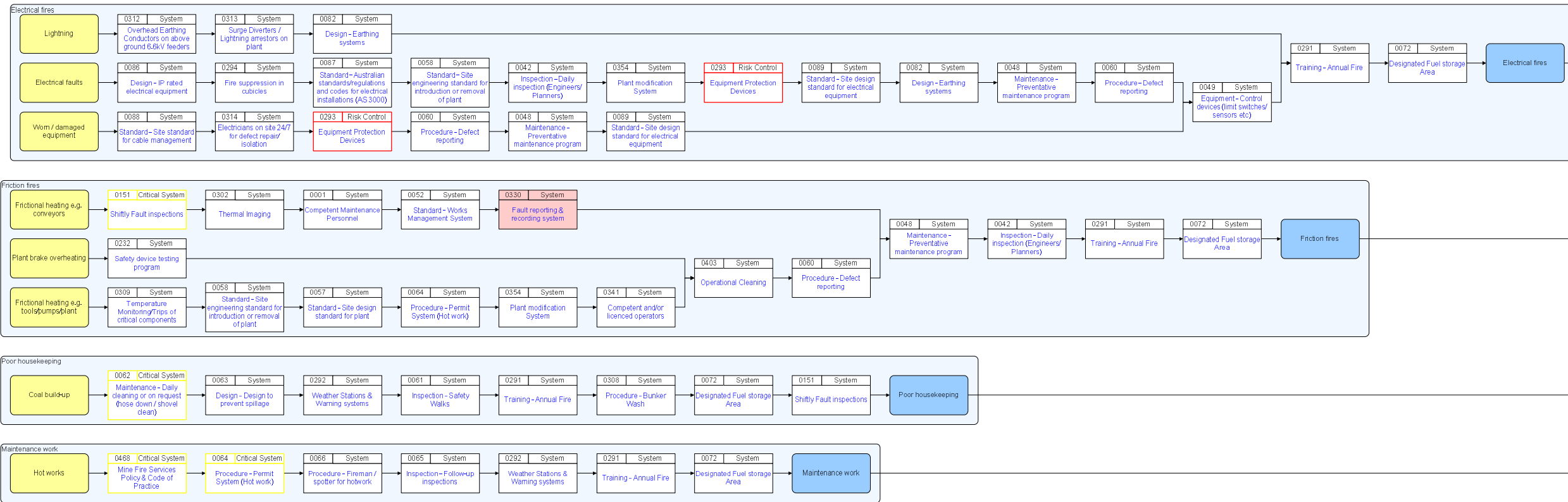
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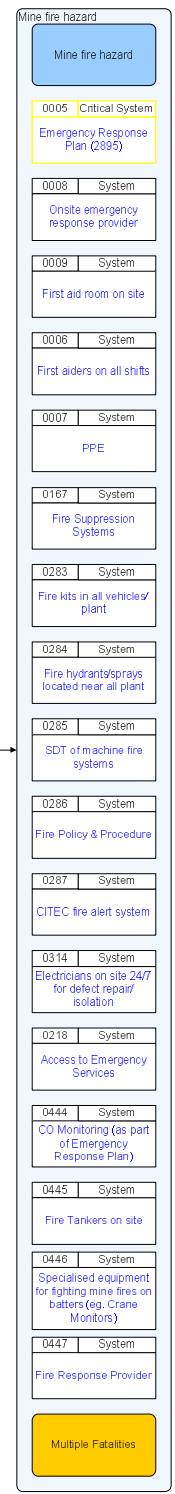
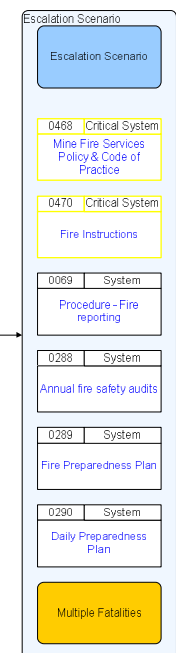
Operation	Hazelwood Mine
Hazard Type	
Risk No	7 (Page 1 of 2)
Risk	Mine Fire
SORA Date	2 Dec 2009

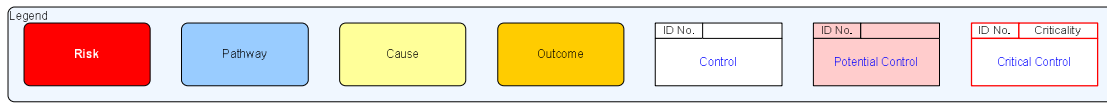
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Mine Fire

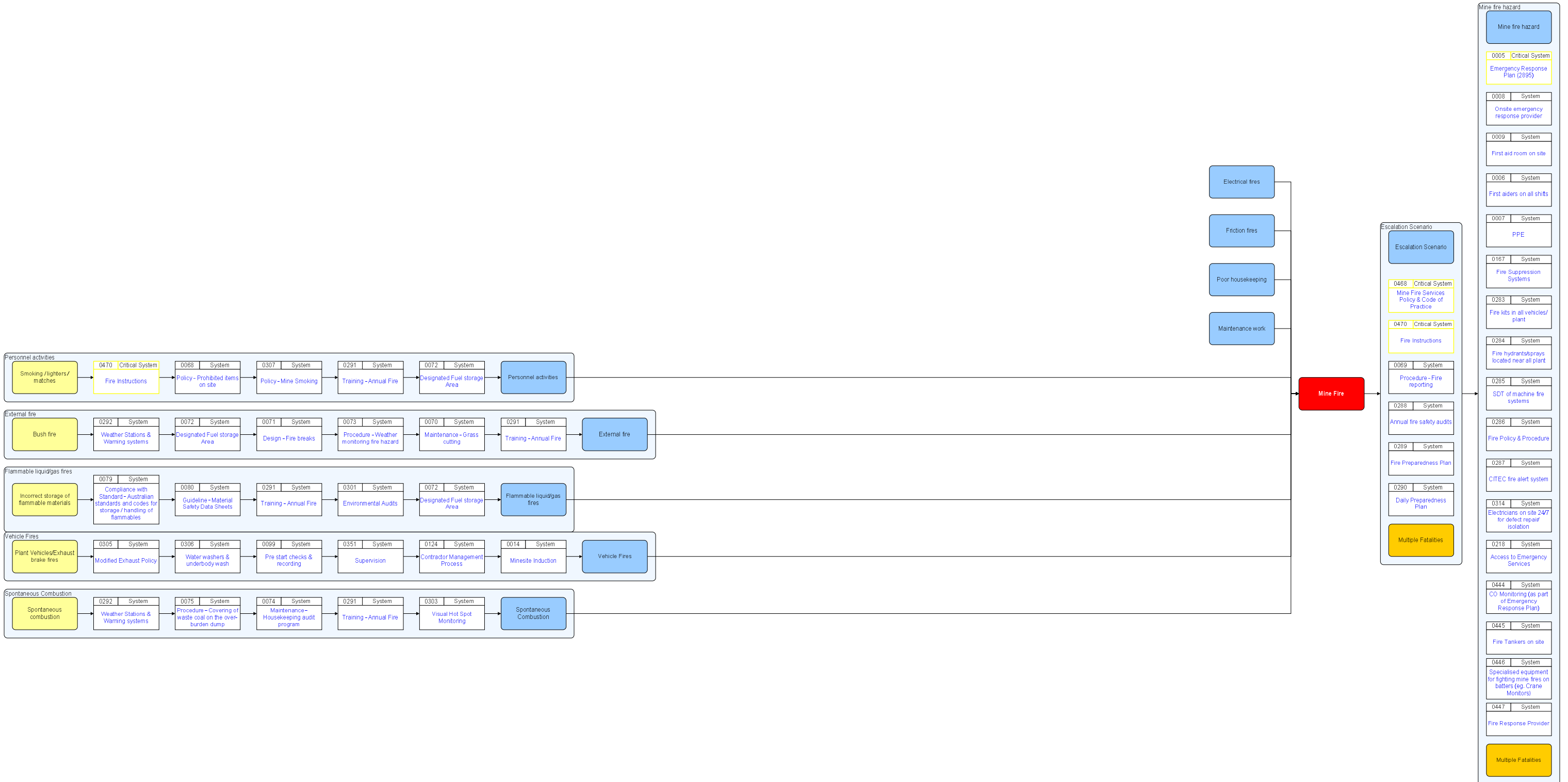
- Personnel activities
- External fire
- Flammable liquid/gas fires
- Vehicle Fires
- Spontaneous Combustion

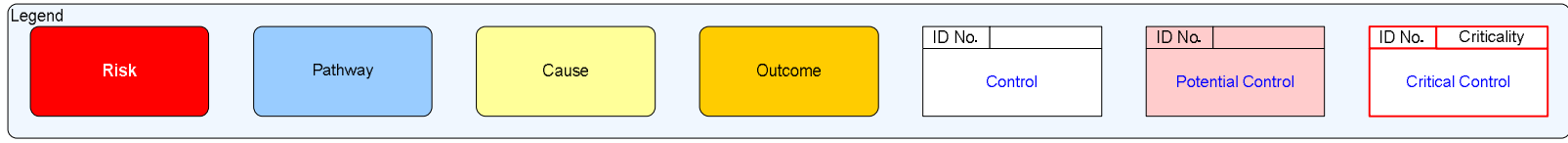




Operation	Hazelwood Mine
Hazard Type	
Risk No	7 (Page 2 of 2)
Risk	Mine Fire
SGRA Date	2 Dec 2009

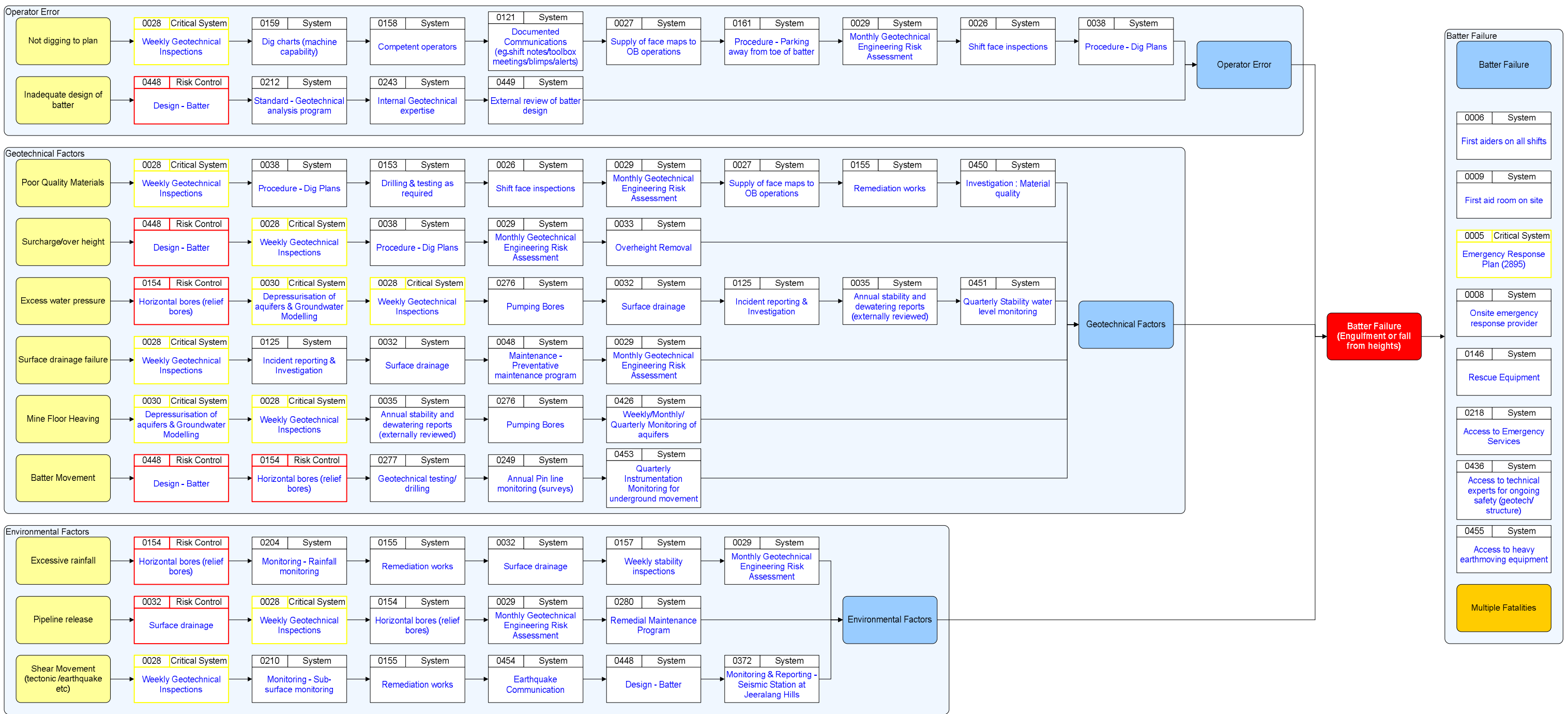
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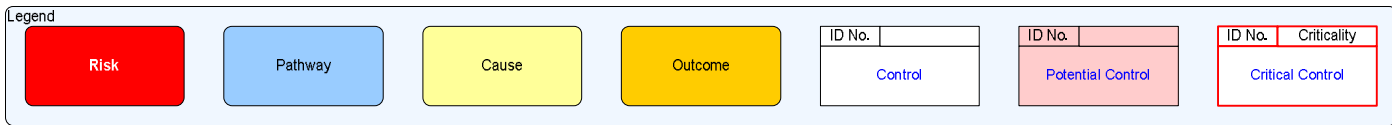




Operation	Hazelwood Mine
Hazard Type	
Risk No	8
Risk	Batter Failure (Engulfment or fall from heights)
SQRA Date	2 Dec 2009

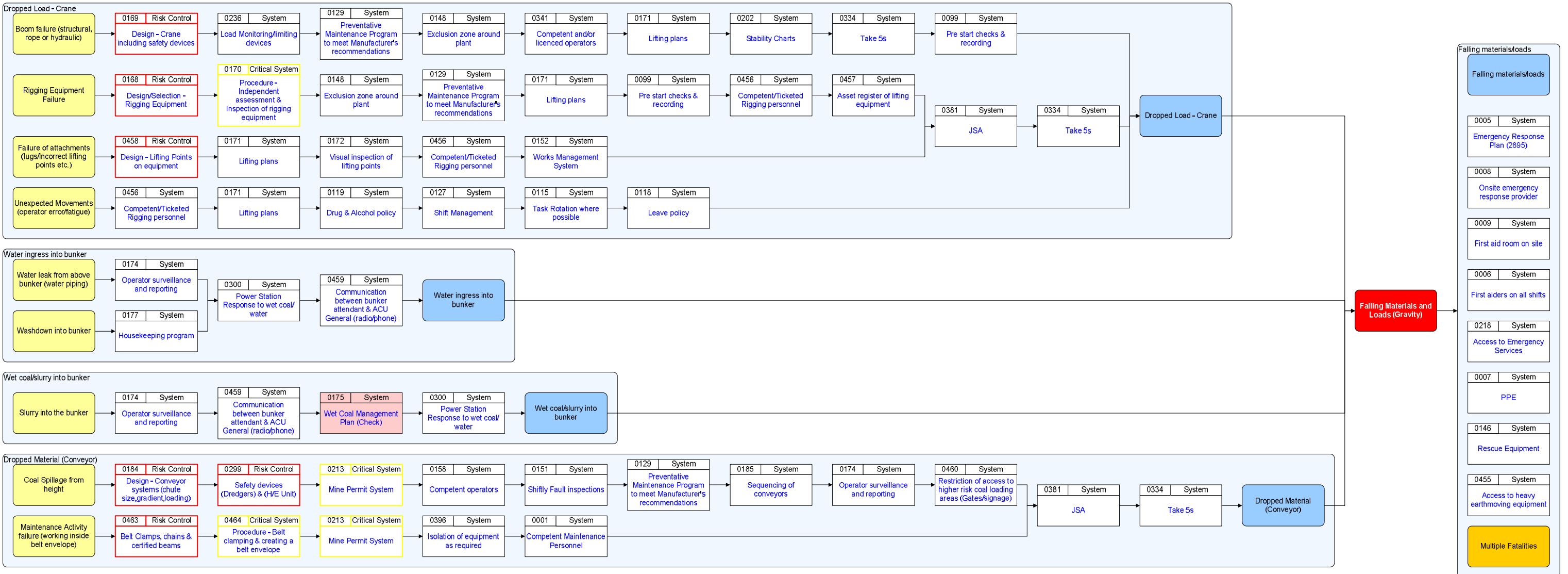
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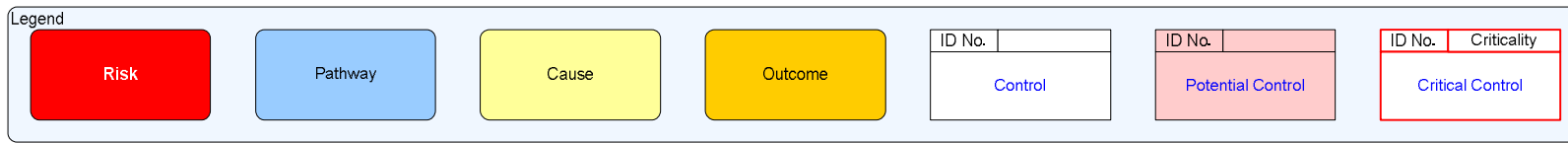




Operation	Hazelwood Mine
Hazard Type	
Risk No	9
Risk	Falling Materials and Loads (Gravity)
SQRA Date	2 Dec 2009

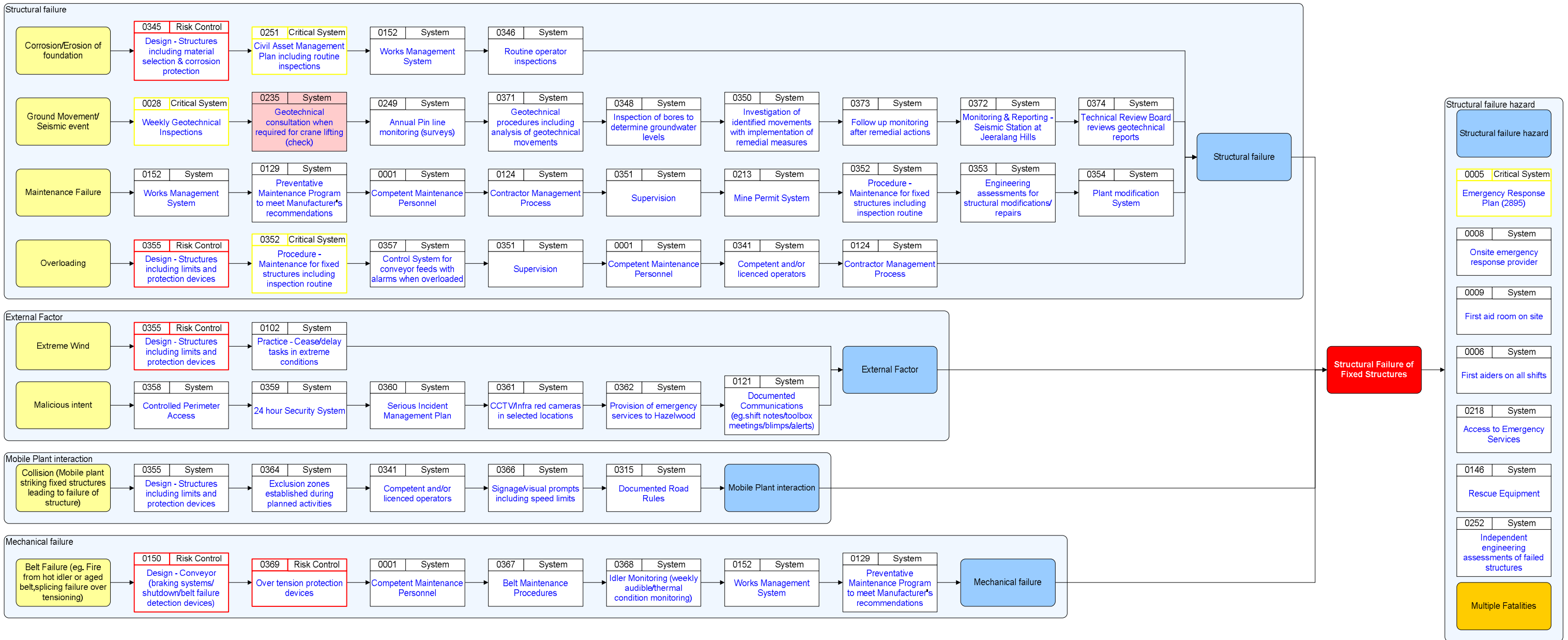
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Operation	Hazelwood Mine
Hazard Type	
Risk No	10
Risk	Structural Failure of Fixed Structures
SQRA Date	2 Dec 2009

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Appendix B Controls List

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ID	Control Name	Criticality
0001	Competent Maintenance Personnel	System
0003	Explosion vents	System
0005	Emergency Response Plan (2895)	Critical System
0006	First aiders on all shifts	System
0007	PPE	System
0008	Onsite emergency response provider	System
0009	First aid room on site	System
0011	HV Routine Maintenance program	Critical System
0012	Design - HV Switching Equipment	Risk Control
0014	Minesite Induction	System
0016	Design & Layout - Cables	Risk Control
0019	Electrical drawings (Mine drawing system & 2 controlled hard copies)	System
0020	HV Operator	System
0021	Restricted access to authorised personnel (locks & signs)	Critical System
0024	Digging Procedures	System
0025	Coal joint Monitoring & remediation procedures	System
0026	Shift face inspections	System
0027	Supply of face maps to OB operations	System
0028	Weekly Geotechnical Inspections	Critical System
0029	Monthly Geotechnical Engineering Risk Assessment	System
0030	Depressurisation of aquifers & Groundwater Modelling	Critical System
0032	Surface drainage	Risk Control
0033	Overheight Removal	System
0035	Annual stability and dewatering reports (externally reviewed)	System
0036	Competent Trained operators	System
0038	Procedure - Dig Plans	System
0039	Procedure - Dredger/Stacker operations	System
0040	Inspection - Weekly Mine inspections	System
0042	Inspection - Daily inspection (Engineers/Planners)	System
0044	Dump design (height)	Risk Control
0045	Dozer maintenance of dump grades	System
0048	Maintenance - Preventative maintenance program	System
0049	Equipment - Control devices (limit switches/sensors etc)	System
0052	Standard - Works Management System	System
0057	Standard - Site design standard for plant	System

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ID	Control Name	Criticality
0058	Standard - Site engineering standard for introduction or removal of plant	System
0060	Procedure - Defect reporting	System
0061	Inspection - Safety Walks	System
0062	Maintenance - Daily cleaning or on request (hose down / shovel clean)	Critical System
0063	Design - Design to prevent spillage	System
0064	Procedure - Permit System (Hot work)	Critical System
0065	Inspection - Follow-up inspections	System
0066	Procedure - Fireman / spotter for hotwork	System
0068	Policy - Prohibited items on site	System
0069	Procedure - Fire reporting	System
0070	Maintenance - Grass cutting	System
0071	Design - Fire breaks	System
0072	Designated Fuel storage Area	System
0073	Procedure - Weather monitoring fire hazard	System
0074	Maintenance - Housekeeping audit program	System
0075	Procedure - Covering of waste coal on the over-burden dump	System
0079	Compliance with Standard - Australian standards and codes for storage / handling of flammables	System
0080	Guideline - Material Safety Data Sheets	System
0082	Design - Earthing systems	System
0086	Design - IP rated electrical equipment	System
0087	Standard - Australian standards/regulations and codes for electrical installations (AS 3000)	System
0088	Standard - Site standard for cable management	System
0089	Standard - Site design standard for electrical equipment	System
0090	Procedure - Mine Registered & Confined Space including Confined Space Register/Permit System (3090)	Critical System
0094	Ventilation	System
0095	Signage/Labelling of confined space	System
0096	Standby person - Confined Space	System
0097	Minimum Equipment standards - Compliant Mobile plant to standards (check standards)	System
0098	Dust suppression of access surfaces	System
0099	Pre start checks & recording	System
0100	Shift changeover meeting	System
0102	Practice - Cease/delay tasks in extreme conditions	System
0103	Flashing lights when appropriate	System
0106	Windshield wipers/washers	System
0110	Road Maintenance Program including regular grading & road surfacing material	System
0111	Seat belts where fitted	System

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ID	Control Name	Criticality
0113	ROPs on Mining plant where fitted	Risk Control
0114	Airbags on select LVs	System
0115	Task Rotation where possible	System
0116	Employee Assistance Program available	System
0118	Leave policy	System
0119	Drug & Alcohol policy	System
0121	Documented Communications (eg.shift notes/toolbox meetings/blimps/alerts)	System
0123	Disciplinary Policy	System
0124	Contractor Management Process	System
0125	Incident reporting & Investigation	System
0127	Shift Management	System
0129	Preventative Maintenance Program to meet manufacturer's specifications	Critical System
0131	Biennial External structural inspections	System
0132	Procedure - Lubrication	System
0133	Painting programs	System
0137	Engineer approved Procedures - Jacking	Critical System
0138	Jack design & failsafe devices (eg.Pilot operated check valves)	Risk Control
0139	Asset register of jacking equipment	System
0141	Confined Space Risk assessment	System
0143	Initial Gas Testing	System
0145	Design - Raw Coal Bunker (eg. personnel guarding)	Risk Control
0146	Rescue Equipment	System
0148	Exclusion zone around plant	Risk Control
0150	Design - Conveyor (braking systems/shutdown/belt failure detection devices)	Risk Control
0151	Shiftly Fault inspections	Critical System
0152	Works Management System	System
0153	Drilling & testing as required	System
0154	Horizontal bores (relief bores)	Risk Control
0155	Remediation works	System
0157	Weekly stability inspections	System
0158	Competent operators	System
0159	Dig charts (machine capability)	System
0161	Procedure - Parking away from toe of batter	System
0163	Washing of sealed roads to remove clay/debris	System
0164	Design - Roadways	Risk Control
0165	Design - Light Vehicles (fit for purpose)	Risk Control
0166	Signage (Speed limits etc)	System

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ID	Control Name	Criticality
0167	Fire Suppression Systems	System
0168	Design/Selection - Rigging Equipment	Risk Control
0169	Design - Crane including safety devices	Risk Control
0170	Procedure - Independent assessment & Inspection of rigging equipment	Critical System
0171	Lifting plans	System
0172	Visual inspection of lifting points	System
0174	Operator surveillance and reporting	System
0175	Wet Coal Management Plan (Check)	System
0177	Housekeeping program	System
0178	Maintenance program	System
0184	Design - Conveyor systems (chute size, gradient, loading)	Risk Control
0185	Sequencing of conveyors	System
0187	Limits of approach to be maintained around HV Plant	Critical System
0189	Safety Observer where appropriate	System
0191	Marking/Signs located at plant below overhead lines	System
0192	Flashing lights on crane	System
0200	Crane outriggers/bog mats/packing blocks	System
0201	Site preparations (compacting/levelling/filling)	System
0202	Stability Charts	System
0203	Crane Outriggers extended where needed	System
0204	Monitoring - Rainfall monitoring	System
0210	Monitoring - Sub-surface monitoring	System
0212	Standard - Geotechnical analysis program	System
0213	Mine Permit System	Critical System
0214	Take 5s (JSA)	System
0215	Authorised Issuing officers to issue confined space permit	System
0216	External Confined Space Training for Authorised issuing officers	System
0217	Confined space training covering confined space hazards (internal)	System
0218	Access to Emergency Services	System
0219	Mine Rescue Team	System
0220	Rescue Plan required as part of Confined Space Permit	System
0221	GPS Anti-collision warning systems	System
0223	Mine Design - Grading Plan	System
0224	Dividing strip on major Haul roads	System
0225	Shift Rostering	System
0226	Competent Personnel operating plant	System
0228	Pre-start meeting	System

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ID	Control Name	Criticality
0229	Mobile Equipment - Fit for purpose (Cab layout & design, Failsafe controls)	Risk Control
0232	Safety device testing program	System
0233	ISI - Independent Structural inspection program	System
0235	Geotechnical consultation when required for crane lifting (check)	System
0236	Load Monitoring/limiting devices	Risk Control
0237	Fall protection on EWPs	System
0238	External testing of jacking equipment	Critical System
0241	OEM Maintenance procedures to specify jacking points	System
0243	Internal Geotechnical expertise	System
0244	Training - Machine Stability & Heavy Jacking (Specific to site, provided by engineer)	System
0245	Controlled specialist equipment used where required	System
0247	Check procedure for - Engineer on site during critical jacking steps (where required)	System
0248	Established Geotechnical standards (Australian Standards)	System
0249	Annual Pin line monitoring (surveys)	System
0251	Civil Asset Management Plan including routine inspections	Critical System
0252	Independent engineering assessments of failed structures	System
0255	Annual Groundwater & Geotechnical reports	System
0257	Safety limits on Machinery	Risk Control
0258	Routine Machine safety device testing	System
0262	Shiftly Machine inspections by operators	System
0267	HV Routine Maintenance / Testing	System
0268	Vicinity Access Permits	System
0269	Procedure - Cable Handling	System
0270	Electrical Protection Systems	Risk Control
0273	Procedure - Electrically isolating plant	System
0274	Remote Isolation	System
0276	Pumping Bores	System
0277	Geotechnical testing/drilling	System
0280	Remedial Maintenance Program	System
0283	Fire kits in all vehicles/plant	System
0284	Fire hydrants/sprays located near all plant	System
0285	SDT of machine fire systems	System
0286	Fire Policy & Procedure	System
0287	CITEC fire alert system	System
0288	Annual fire safety audits	System
0289	Fire Preparedness Plan	System
0290	Daily Preparedness Plan	System

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ID	Control Name	Criticality
0291	Training - Annual Fire	System
0292	Weather Stations & Warning systems	System
0293	Equipment Protection Devices	Risk Control
0294	Fire suppression in cubicles	System
0299	Safety devices (Dredgers) & (H/E Unit)	Risk Control
0300	Power Station Response to wet coal/water	System
0301	Environmental Audits	System
0302	Thermal Imaging	System
0303	Visual Hot Spot Monitoring	System
0305	Modified Exhaust Policy	System
0306	Water washers & underbody wash	System
0307	Policy - Mine Smoking	System
0308	Procedure - Bunker Wash	System
0309	Temperature Monitoring/Trips of critical components	System
0312	Overhead Earthing Conductors on above ground 6.6kV feeders	System
0313	Surge Diverters / Lightning arrestors on plant	System
0314	Electricians on site 24/7 for defect repair/isolation	System
0315	Documented Road Rules	System
0316	PPE & Specialised harnesses/Restraints	System
0318	Physical Isolation of tanks eg. Handrails/guarding, Lockable valves	Risk Control
0319	Design - Covers/Isolation preventing confined space entry	System
0320	Low emission products in registered spaces where possible (substitution)	System
0321	Gas Detectors for ongoing monitoring	System
0322	PPE including continuous air supply or air filtration system	System
0324	PPE (sunglasses)	System
0325	Exclusion of light vehicles from major haul roads	System
0326	Major haul roads conforming with standards	Risk Control
0328	Procedure - (SWI) Safety inspection of mine roads	System
0329	Documented Operating rules for heavy vehicles (confirm)	System
0330	Fault reporting & recording system	System
0331	Plant pre-start checks	System
0333	Ticketed operators	System
0334	Take 5s	System
0336	Vehicle Washing	System
0337	Pre start checks & recording of vehicle conditions (logbooks)	System
0340	Design - Fit for purpose vehicle (light vehicle/forklifts/scissor lifts/bobcats/firetrucks/trailers)	Risk Control
0341	Competent and/or licenced operators	System

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ID	Control Name	Criticality
0342	Fatigue Management Policy	System
0343	Heat stress Policy	System
0345	Design - Structures including material selection & corrosion protection	Risk Control
0346	Routine operator inspections	System
0348	Inspection of bores to determine groundwater levels	System
0350	Investigation of identified movements with implementation of remedial measures	System
0351	Supervision	System
0352	Procedure - Maintenance for fixed structures including inspection routine	Critical System
0353	Engineering assessments for structural modifications/repairs	System
0354	Plant modification System	System
0355	Design - Structures including limits and protection devices	Risk Control
0357	Control System for conveyor feeds with alarms when overloaded	System
0358	Controlled Perimeter Access	System
0359	24 hour Security System	System
0360	Serious Incident Management Plan	System
0361	CCTV/Infra red cameras in selected locations	System
0362	Provision of emergency services to Hazelwood	System
0363	Communications	System
0364	Exclusion zones established during planned activities	System
0366	Signage/visual prompts including speed limits	System
0367	Belt Maintenance Procedures	System
0368	Idler Monitoring (weekly audible/thermal condition monitoring)	System
0369	Over tension protection devices	Risk Control
0371	Geotechnical procedures including analysis of geotechnical movements	System
0372	Monitoring & Reporting - Seismic Station at Jeeralang Hills	System
0373	Follow up monitoring after remedial actions	System
0374	Technical Review Board reviews geotechnical reports	System
0375	Authorised HV operator to issue HV Permits (as part of Mine Permit System)	System
0376	HV Electrical protection systems (Sensitive earth leakage protection/IT earthing system)	Risk Control
0377	Routine inspection of HV protection systems	System
0378	HV Operator present when High mobile plant travels under overhead lines	System
0379	SP Ausnet Permit System	System
0380	SP Ausnet HV permit issuers	System
0381	JSA	System
0382	Mine feeder systems protected by SP Ausnet Protection systems set to mine standards	System
0383	SP Ausnet protection systems (set to SP Ausnet requirements)	System
0384	Routine inspections of poles	System

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ID	Control Name	Criticality
0386	Procedure - Isolation/Earthing	Critical System
0387	Competent personnel (linesman)	System
0388	Isolation & Earths	Risk Control
0389	No live line work done within mines	System
0390	Safety observer	System
0391	Procedure - HV Switching	Critical System
0392	Independent HV operator assesses HV Switching task (part of Permit)	System
0393	Testing - In accordance with Installation Regulations under Safety Act	System
0394	Blue Book (Code of practice - HV Electricity)	System
0395	Licensed Electricians	System
0396	Isolation of equipment as required	System
0397	Minor LV Permit system (contractors)	System
0398	Limited access to live equipment inside cubicles	System
0399	Labelling on plant inside cubicles	System
0400	PPE (Gloves/face shields)	System
0401	Defibrillator	System
0403	Operational Cleaning	System
0404	Inspection - Shiftly Mine Inspections (operators)	System
0405	Procedure - Batter Slope for Coal	System
0406	Procedure - Batter Slope for Overburden	System
0407	Competent Mine Planners/Engineers/Surveyors	System
0408	Safety margins within limits of operation (Machine & Design plan)	System
0409	Engineering support on call	System
0410	Communications - 2 way radio	System
0411	Communications protocols between mobile plant and major mining plant	System
0412	Design - Dredger/Stacker eg. Safety hooks	Risk Control
0414	Register of machine balance to monitor machine stability	System
0415	Condition Monitoring Program	System
0416	Engineering review of Maintenance Activities	System
0417	External technical review on complex activities	System
0418	Competent Maintenance Personnel with mine specific training	System
0419	Procedure - Geotechnical ground preparation	System
0420	Preventative maintenance program for maintenance equipment	System
0421	Maintenance Procedures	System
0422	Procedure - Heavy Jack Testing	System
0423	Procedure - Lifting tackle Testing	System
0424	Inspection - Maintenance Trestles	System

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ID	Control Name	Criticality
0425	5 Yearly Coal joint mapping Report	System
0426	Weekly/Monthly/Quarterly Monitoring of aquifers	System
0427	Annual Geotechnical Report	System
0428	Procedure - Digging (Overburden)	System
0429	Placement of material	System
0430	Operator monitoring of formation	System
0431	Procedure - Formation of dumps	System
0432	Deliberate cancellation of device to facilitate operating (CSD)	System
0433	Procedure - Safety Device Testing	System
0434	Competent/Trained/Authorised Testers	System
0436	Access to technical experts for ongoing safety (geotech/structure)	System
0437	Heavy jacks maintained offsite	System
0438	Certification of load testing (jacks)	System
0439	Heavy jacks are tested before use	System
0441	Wind Speed Monitoring from control centre	System
0442	Anemometers taken on site	System
0443	Access to heavy lifting equipment	System
0444	CO Monitoring (as part of Emergency Response Plan)	System
0445	Fire Tankers on site	System
0446	Specialised equipment for fighting mine fires on batters (eg. Crane Monitors)	System
0447	Fire Response Provider	System
0448	Design - Batter	Risk Control
0449	External review of batter design	System
0450	Investigation: Material quality	System
0451	Quarterly Stability water level monitoring	System
0453	Quarterly Instrumentation Monitoring for underground movement	System
0454	Earthquake Communication	System
0455	Access to heavy earthmoving equipment	System
0456	Competent/Ticketed Rigging personnel	System
0457	Asset register of lifting equipment	System
0458	Design - Lifting Points on equipment	Risk Control
0459	Communication between bunker attendant & ACU General (radio/phone)	System
0460	Restriction of access to higher risk coal loading areas (Gates/signage)	System
0463	Belt Clamps, chains & certified beams	Risk Control
0464	Procedure - Belt clamping & creating a belt envelope	Critical System
0465	Maximum Speed Limits	System
0468	Mine Fire Services Policy & Code of Practice	Critical System

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ID	Control Name	Criticality
0469	Monitoring: On-line bore output	Critical System
0470	Fire Instructions	Critical System

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Appendix C Sample Performance Standards

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Risk Control # 00	Critical Control description: Design - Conveyor systems (chute size, gradient, loading)	
MMH Group	Falling Materials and Loads (Gravity)	SMS Ref No. -
Dependability assessment: <ul style="list-style-type: none"> Reduces spill from conveyors This has been designed into new plant Equipment is designed by external engineers to applicable standard and design criteria / specification Designed to be compatible with material being handled 	Practicality assessment: <ul style="list-style-type: none"> New conveyor design relates to westfield area. Older plant is to be retired in 2 years, continuing active maintenance and monitoring will be conducted in the interim Not possible to retrofit many new design features to old equipment / conveyors (soft loading chutes have been retrofitted, but some others could not be) 	
Monitoring assessment: <ul style="list-style-type: none"> None 	Workforce involvement assessment: <ul style="list-style-type: none"> Equipment is measured against design criteria / specification (and suitability / effectiveness evaluated) 	
Related actions & owners:	Notes:	
Performance Standards: <ul style="list-style-type: none"> Conveyor systems design meet Australian Standards (minimum requirement) Coal is contained by conveyor systems Load limits on conveyors are defined Conveyor systems have overload detection and warning Conveyor systems fail safe on blockage or flow restriction 	Effectiveness Measures: <ul style="list-style-type: none"> 100% compliance of design Inspection, reporting and investigation routine for coal spills Coal load limits not exceeded Overload detection and warning devices tested periodically and found to be fully functional Fail safe controls tested periodically and found to be fully functional 	

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Critical System Control # 00	Critical Control description: Confined Space Procedure	
MMH Group	Confined Spaces	SMS Ref No. -
Dependability assessment: <ul style="list-style-type: none"> • Confined space procedures are also applied to registered spaces at the discretion of personnel entering space • People in mine are not well trained in confined space entry procedures, as it is an abnormal job (i.e. limited confined spaces in the mine) • Chemists from the power station are used for testing of air quality in confined spaces 	Practicality assessment: <ul style="list-style-type: none"> • Mine maintenance personnel are required to enter confined spaces as they have to do the work, but it is considered practical to use chemists to test the atmosphere and recommend measures to make it acceptable to work in • Use of standard procedures is deemed practical • Industry standard confined space entry procedures are used 	
Monitoring assessment: <ul style="list-style-type: none"> • Chemists are used for air quality monitoring • A Spotter is required for all confined space entries 	Workforce involvement assessment: <ul style="list-style-type: none"> • Confined space entry procedure is common across entire business • Limited training in confined spaces for mine maintenance personnel 	
Related actions & owners:	Notes:	

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<p>Performance Standards:</p> <ul style="list-style-type: none">• Confined Spaces are identified and registered• Confined Space Risk Assessments are documented for all confined spaces• A confined Space Entry Permit is issued for each confined space entry• An Authorised person issues Confined Space Entry Permits• Gas testing is undertaken on confined spaces prior to entry	<p>Effectiveness Measures:</p> <ul style="list-style-type: none">• Register of Confined spaces• Register of Confined Space Risk assessments• 100% compliance with confined space entry permits• 100% of confined space entry permits are issued by authorised persons• Records of gas testing results are retained
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