

Incident: Rockfall - Demo - 2602

Description: On July 28, 2024, a rockfall occurred in North Pit Section A, causing minor injuries to an excavator operator and significant equipment damage after a nearby blast.

Visibility: Company

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Title: Damaged mobile plant with personnel present

Description: Tracked excavator on sandy ground with multiple people positioned around the machine. Equipment shows visible damage and discoloration. Appears to be post-incident assessment or recovery operations consistent with emergency response described in evidence.

Brief

Last updated: Feb 5, 2026, 06:02 AM by eraydinekin@gmail.com

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On July 28, 2024, at approximately 3:15 PM, a rockfall occurred from the highwall in North Pit, Section A at Central Queensland Coal Mine, striking an excavator and causing minor injuries to operator John Miller along with significant equipment damage. The incident occurred shortly after a scheduled blast in the adjacent Section B, with the rockfall attributed to a combination of recent heavy rainfall (150mm over the past week) weakening the rock mass and blast-induced vibrations triggering the failure along pre-existing discontinuities in the sandstone layers.

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Name	Questions
James Anderson	<ul style="list-style-type: none"> • Tell me about your morning inspection at 7:00 AM on July 28th - walk me through what you were specifically looking for and what conditions you observed in both Section A and Section B [CI-CONTEXT] • Describe the communication you had with Robert Wilson at 2:45 PM about the blast coordination - what specific information was exchanged about safety procedures and area clearance [COMMS] • Help me understand your decision-making process at 3:05 PM when you received confirmation from Robert Wilson - what factors influenced your assessment that it was safe to resume operations [WAI-WAD] • Walk me through the 72 hours leading up to this shift - tell me about your sleep patterns, any overtime work, shift changes, and how you were feeling physically and mentally on July 28th [P-72H] • Explain what you were doing and thinking during the 10-minute window between 3:05 PM when you gave the all-clear and 3:15 PM when the rockfall occurred [CI-TIMELINE]
Robert Wilson	<ul style="list-style-type: none"> • Describe the specific conditions and environment you observed during your post-blast inspection - what were you looking for and what did you see, hear, or notice about the highwall [CI-CONTEXT] [CUES] • Tell me about your communication with John Miller and the operations team at 3:05 PM - walk me through exactly what information you conveyed and how you determined it was safe [COMMS] • Help me understand how you conducted post-blast inspections - what was your normal process versus what you did on July 28th, and what adaptations or shortcuts might have been made due to time or other pressures [WAI-WAD] • Explain your experience and state of mind in the days leading up to July 28th - tell me about your work schedule, rest periods, and any factors that might have influenced your attention to detail during the inspection [P-72H] • Walk me through your thought process when you observed 'minor cracks and slight water seepage' but deemed them not immediately threatening - what criteria were you using to make that assessment [CI-FREERECALL]
John Miller	<ul style="list-style-type: none"> • Describe the scene around you at 3:02 PM when you completed your Take 5 assessment - tell me about the lighting, weather conditions, sounds, and what you could see of the highwall [CI-CONTEXT] [CUES] • Walk me through your observations of 'loose material' on the highwall - help me understand what you saw, where exactly it was located, and what made you decide it wasn't significant enough to report urgently [CI-FREERECALL] • Tell me about the period from 3:10 PM when you resumed operations until 3:15 PM when the rockfall occurred - describe your activities, what you were focused on, and any changes you noticed [CI-TIMELINE] • Explain how you were feeling and what your situation was in the 72 hours before this incident - tell me about your sleep, work schedule, any personal stressors, and how these might have affected your alertness or decision-making [P-72H] • Help me understand how you normally assess and respond to loose material on highwalls - what training or experience guided your judgment, and what factors influence when you would stop work versus continue [WAI-WAD]
Lisa Thompson	<ul style="list-style-type: none"> • Tell me about your routine inspection in the South Pit at the time of the incident - what was occupying your attention and how did this influence your availability to monitor North Pit operations [CI-CONTEXT] • Walk me through the two-minute journey from when you received John's call to when you arrived at Section A - describe what you observed as you approached and your initial assessment of the scene [CI-TIMELINE] • Help me understand your normal supervisory practices for post-blast operations - what monitoring or check-ins would you typically do, and how did July 28th differ from your usual approach [WAI-WAD] • Describe your work situation and personal state in the days leading up to July 28th - tell me about your schedule, workload, any pressures or challenges that might have influenced your supervisory decisions [P-72H]
Mark Johnson	<ul style="list-style-type: none"> • Tell me about the production pressures and operational context on July 28th - what targets, schedules, or priorities were influencing decisions about resuming work after the blast [CI-CONTEXT] • Help me understand the communication flow and decision-making structure for post-blast operations - walk me through who typically makes what decisions and how information flows between blast crew, supervisors, and operators [COMMS] • Explain how production demands and safety considerations are typically balanced in your operations - what trade-offs or adaptations do supervisors and operators make to meet both objectives [WAI-WAD] • Describe your awareness and involvement in the specific post-blast inspection and clearance process on July 28th - what information were you receiving and what oversight were you providing [CI-FREERECALL]

Name	Questions
Circumstantial Witnesses	<ul style="list-style-type: none">• Tell me about any observations or communications you had regarding the weather conditions and their impact on operations in the days leading up to July 28th - what discussions or concerns were raised about the 150mm of rainfall [CI-CONTEXT]• Describe any previous experiences or incidents involving post-blast highwall stability that might have influenced expectations or procedures on July 28th [WAI-WAD]• Walk me through any maintenance, equipment, or operational issues that were occurring around July 28th that might have created additional workload or distraction for the key personnel involved [P-72H]• Help me understand the typical communication patterns and information sharing between shifts, departments, and crews - what information about blast impacts or highwall conditions would normally be passed along [COMMS]• Explain any recent changes to procedures, personnel, or equipment that might have influenced how post-blast inspections or excavation operations were conducted [RAG]

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Category	Details	Other	RelevantData
People	<ul style="list-style-type: none"> • John Miller - Excavator Operator • Robert Wilson - Blast Crew Leader/Shotfirer • James Anderson - Open Cut Examiner • Lisa Thompson - Area Supervisor • Dr. Anthony Richards - RPEQ Geotechnical Engineer • Mark Johnson - Production Manager 	<ul style="list-style-type: none"> • John Miller - 5 years experience at mine • Lisa Thompson - 3 years as area supervisor • Mark Johnson - 4 years as production manager • Robert Wilson - C crew shotfirer 	<ul style="list-style-type: none"> • John Miller's hazard identification competency • Robert Wilson's post-blast inspection training • James Anderson's geotechnical assessment skills • Communication effectiveness between blast crew and excavation crew • Personnel training records on highwall stability recognition
Environment	<ul style="list-style-type: none"> • 150mm rainfall in week prior to incident • 40-meter highwall in Section A • Sedimentary rock layers - sandstone and shale with coal seams • Water seepage along failure planes • 30-meter proximity between blast location and highwall 	<ul style="list-style-type: none"> • North Pit Section A and Section B locations • Ground vibrations from blast propagation • Pre-existing discontinuities in rock mass • Moisture infiltration reducing rock strength 	<ul style="list-style-type: none"> • Historical rainfall impact on slope stability • Geotechnical monitoring data trends • Water management system effectiveness • Blast vibration monitoring records • Previous highwall failure incidents in similar conditions
Equipment	<ul style="list-style-type: none"> • Excavator operated by John Miller • ANFO explosives with Nonel initiation system • Hand-held radios for communication • Slope stability monitoring equipment availability 	<ul style="list-style-type: none"> • Excavator sustained significant damage • All blast charges detonated successfully • No equipment malfunctions reported • Emergency response equipment deployment 	<ul style="list-style-type: none"> • Excavator maintenance records • Blast monitoring equipment calibration • Communication system reliability • Availability and deployment of continuous monitoring systems • Ground-penetrating radar and slope stability radar usage
Procedures	<ul style="list-style-type: none"> • Post-blast inspection protocols • Take 5 risk assessment process • Working Near Crests and Slopes Procedures • Emergency response protocols • Geotechnical assessment procedures 	<ul style="list-style-type: none"> • Visual inspection methods used • Risk communication between crews • Blast design and execution standards • Incident reporting protocols • Area isolation procedures 	<ul style="list-style-type: none"> • Adequacy of post-blast inspection depth • Take 5 hazard identification effectiveness • Geotechnical assessment frequency after weather events • Communication protocol clarity • Emergency response time effectiveness • Procedure compliance monitoring
Organization	<ul style="list-style-type: none"> • Redstone Coal Mine operations • Shift coordination between blast and excavation crews • Management oversight structures • Safety culture and reporting • Training and competency systems 	<ul style="list-style-type: none"> • Production targets vs safety priorities • Resource allocation for monitoring systems • Investigation and improvement processes • Contractor vs employee responsibilities 	<ul style="list-style-type: none"> • Management of change processes for weather conditions • Safety performance indicators and trends • Training program effectiveness • Resource allocation for geotechnical monitoring • Organizational learning from previous incidents • Integration between technical specialists and operations

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	21/07/24 -	26/07/24 -	28/07/24 06:00	28/07/24 14:45	28/07/24 15:00	28/07/24 15:02	28/07/24 15:05	28/07/24 15:10	28/07/24 15:14	28/07/24 15:15
Work as Intended	-	Enhanced inspections after significant rainfall per geotechnical recommendations	Morning inspection of highwalls per OCE duties	Pre-blast assessment considering recent weather conditions	Post-blast inspection to detect signs of instability per QCM-SAF-PROC-002	Pre-work risk assessment identifying potential hazards per QCM-SAF-PROC-002	Safe clearance communication after post-blast inspection	Regular visual inspections of highwalls per QCM-SAF-PROC-002	Report hazards immediately to supervisor per QCM-SAF-PROC-002	Emergency evacuation and incident response per QCM-SAF-PROC-002
Work as Done	Significant rainfall (150mm) over past week increased moisture in rock mass	Routine geotechnical assessment conducted - no visible instability signs noted	James Anderson conducted morning inspection - no immediate hazards identified	Blast conducted in Section B using standard parameters	Robert Wilson conducted visual post-blast inspection - no immediate large cracks or loose material observed	John Miller completed Take 5 assessment - identified vehicle interaction only, missed rockfall hazard	Robert Wilson communicated all clear to John Miller for Section A operations	John Miller resumed excavation operations in Section A	John Miller observed loose material on highwall but did not report as urgent concern	Rockfall occurred from 40m highwall - John Miller injured, excavator damaged
WAD meets WAI	Unknown	No	Yes	Unknown	No	No	Yes	Yes	No	Yes
GapQuestion	-	Why was enhanced inspection protocol not implemented after 150mm rainfall?	-	Were recent weather conditions adequately considered in blast assessment?	Why did visual inspection fail to detect water seepage and minor cracks?	Why was rockfall hazard not identified despite recent blast and rainfall?	-	-	Why was observed loose material not reported as urgent concern?	-
Contributed	Yes	Yes	No	Unknown	Yes	Yes	No	No	Yes	No
Why1	Heavy rainfall increased water infiltration along discontinuities [Geotechnical Report] (95%)	Assessment lacked detailed examination after significant rainfall [Follow-up Interview - Dr Richards] (92%)	-	-	Quick visual scan rather than detailed examination conducted [Follow-up Interview - Dr Richards] (94%)	Take 5 assessment did not consider blast-weakened highwall conditions [Take 5 Form] (89%)	-	-	Assumed post-blast inspection covered all risks adequately [Follow-up Interview - John Miller] (87%)	-

	21/07/24 -	26/07/24 -	28/07/24 06:00	28/07/24 14:45	28/07/24 15:00	28/07/24 15:02	28/07/24 15:05	28/07/24 15:10	28/07/24 15:14	28/07/24 15:15
Why2	Water acted as lubricant on pre-existing weakness planes [Geotechnical Report] (93%)	CTRL: Enhanced monitoring protocols after rainfall {Preventive} not implemented [Geotechnical Report recommendations] (90%)	-	-	CTRL: Detailed post-blast inspection protocols {Detective} insufficient for detecting subtle instability signs [Follow-up Interview - Dr Richards] (91%)	Risk assessment template did not prompt consideration of recent blast effects [Take 5 Form] (85%)	-	-	Detailed post-blast findings not communicated to excavation crew [Follow-up Interview - Robert Wilson] (84%)	-
Why3	Blast vibrations disrupted already weakened rock mass structure [Geotechnical Report] (91%)	Standard assessment protocols inadequate for post-rainfall conditions [Geotechnical Report] (88%)	-	-	Inspection personnel not trained to identify water infiltration effects [Follow-up Interview - Dr Richards] (89%)	CTRL: Hazard identification training {Preventive} did not cover post-blast geological risks (83%)	-	-	Communication protocols did not require detailed hazard briefings [Follow-up Interview - Robert Wilson] (82%)	-
Why4	Proximity of blast (30m) amplified vibration effects on saturated rock [Geotechnical Report] (89%)	CTRL: Continuous monitoring systems {Detective} not implemented despite recommendations [Geotechnical Report] (85%)	-	-	CTRL: Post-blast inspection training {Preventive} inadequate for complex geological conditions (87%)	-	-	-	CTRL: Risk communication protocols {Preventive} between crews insufficient (80%)	-
Why5	CTRL: Blast impact assessments {Preventive} did not account for rainfall-weakened conditions [Geotechnical Report] (87%)	Water management systems inadequate for significant rainfall events [Geotechnical Report] (82%)	-	-	-	-	-	-	-	-
EvidenceRefs	Geotechnical Report	Geotechnical Report; Follow-up Interview - Dr Richards	OCE Statement - James Anderson	Drill and Blast Report	Follow-up Interview - Dr Richards; Follow-up Interview - Robert Wilson	Take 5 Form - John Miller; Follow-up Interview - John Miller	Follow-up Interview - Robert Wilson; OCE Statement	John Miller Statement	Follow-up Interview - John Miller; John Miller Statement	John Miller Statement; Lisa Thompson Statement; OCE Statement
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Category	Evaluation
Absent / Failed Defences	<ul style="list-style-type: none"> • SM6: Post-blast inspection protocols failed to detect critical highwall instability indicators. According to Dr. Anthony Richards' geotechnical report, 'subtle indicators such as minor cracks and slight water seepage might have been overlooked due to the quick visual scan rather than a detailed examination.' Robert Wilson, Blast Crew Leader, confirmed they conducted only visual assessments without detailed geotechnical evaluation after the blast in Section B (85%) • SM1: Risk management arrangements were inadequate for assessing combined effects of recent heavy rainfall and blast-induced vibrations. The geotechnical analysis by Dr. Anthony Richards identified that 'the influence of recent heavy rainfall on highwall stability was not adequately considered' in pre-blast assessments, despite 150mm of rainfall in the preceding week (90%) • QA1: Monitoring and inspection systems failed to provide real-time detection of highwall stability changes. Dr. Anthony Richards recommended 'implementing continuous monitoring systems, such as ground-penetrating radar and slope stability radar' indicating these critical defenses were absent during the incident (88%) • SM4: Arrangements for high-risk work near highwalls were insufficient following significant weather events. The existing 'Working Near Crests and Slopes Procedure' required suspension of operations 'during and after heavy rainfall' but failed to specify adequate assessment protocols for resuming work after 150mm of recent rainfall (87%)
Individual / Team Actions	<ul style="list-style-type: none"> • IN1: John Miller, Excavator Operator, demonstrated inadequate situation assessment when he 'observed some loose material on the highwall but did not consider it significant enough to report urgently,' according to his statement and the follow-up interview responses. His Take 5 assessment failed to identify rockfall hazards despite visible loose material (92%) • CF1: Robert Wilson, Blast Crew Leader, provided incomplete information content to the excavation crew. According to follow-up interviews, Wilson 'did not explicitly discuss the potential risks associated with minor signs of instability, such as small cracks or water seepage, that we observed but did not deem immediately threatening' (89%) • IN2: The blast crew's perception and understanding of highwall stability indicators was insufficient. Robert Wilson's statement indicates they 'had not anticipated that the blast would have such a significant impact on the adjacent highwall' despite conducting post-blast inspections (86%) • WP1: Team risk management practices were inadequate as evidenced by John Miller not being 'given detailed information about the specific findings of the post-blast inspection' according to follow-up interview responses, limiting his ability to make informed risk decisions (84%)
Task / Environmental Conditions	<ul style="list-style-type: none"> • EC1: Adverse weather conditions significantly contributed to the incident. Dr. Anthony Richards' geotechnical analysis identified that 'the site had experienced significant rainfall (approximately 150mm) over the past week, leading to increased moisture content in the rock mass' which reduced overall rock strength (95%) • TD6: Non-standard activity conditions existed due to the proximity of recent blasting operations. The geotechnical report confirms 'the blast conducted in Section B was approximately 30 meters from the highwall in Section A' and 'vibrations from the blast likely exacerbated the existing weakness in the highwall, triggering the rockfall' (93%) • EC3: Ground vibrations from the blast in Section B created unstable environmental conditions. Dr. Anthony Richards determined that 'blast-induced vibrations likely disrupted the already weakened highwall' creating a critical environmental hazard not adequately controlled (91%) • TD4: Task design was inadequate for post-blast excavation activities near potentially compromised highwalls. The combination of water-weakened rock mass and recent blast vibrations created task conditions requiring enhanced safety protocols that were not implemented (88%)

Category	Evaluation
Organisational Factors	<ul style="list-style-type: none"> • TC4: Training suitability was inadequate for recognizing combined geotechnical hazards. John Miller's Take 5 assessment and his failure to recognize the significance of loose material indicates insufficient training on identifying post-blast highwall instability indicators, particularly after significant rainfall events (89%) • SM8: Safety trend analysis and review practices failed to identify the increased risk profile created by combining recent heavy rainfall with blast operations near highwalls. Dr. Anthony Richards noted that existing controls 'were insufficient to prevent the incident' suggesting systemic review failures (87%) • PL1: Planning and coordination of resources was inadequate for managing the combined risks of post-blast operations and weather-affected ground conditions. The incident occurred despite multiple personnel (James Anderson, OCE; Robert Wilson, Blast Crew Leader; John Miller, Excavator Operator) being involved without adequate risk coordination (85%) • SM5: Change management processes failed to account for changed risk conditions due to significant rainfall. The 150mm of rainfall over the previous week represented a substantial change in ground conditions that required modified risk management approaches, but existing procedures were followed without adaptation (83%)

Contributing Factors



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ContributingFactor	RelativityRating	Explanation
Inadequate post-blast inspection protocols failed to identify subtle signs of highwall instability including minor cracks and water seepage	95%	Dr. Anthony Richards confirmed that 'subtle indicators such as minor cracks and slight water seepage might have been overlooked due to the quick visual scan rather than a detailed examination.' Robert Wilson acknowledged they observed but 'did not explicitly discuss the potential risks associated with minor signs of instability.' This directly contributed to the incident.
Recent heavy rainfall (150mm over past week) weakened rock mass strength and created lubricated failure planes along pre-existing discontinuities	90%	Dr. Anthony Richards' geotechnical report explicitly states 'significant rainfall prior to the incident increased the moisture content within the rock mass, reducing its overall strength' and 'water infiltration along pre-existing discontinuities created a lubricated plane of weakness.' This is identified as a primary root cause.
Blast-induced vibrations from Section B blast (30 meters away) triggered the rockfall in the already weakened highwall	90%	Geotechnical analysis confirms 'the vibrations from the blast in Section B likely exacerbated the existing weakness in the highwall, triggering the rockfall.' The timing correlation between 3:00 PM blast and 3:15 PM rockfall supports this direct causal relationship.
Insufficient communication of specific post-blast inspection findings and potential risks to excavation crew	85%	John Miller stated he 'was not given detailed information about the specific findings of the post-blast inspection, such as the minor cracks and slight water seepage noted.' Robert Wilson confirmed they 'did not explicitly discuss the potential risks associated with minor signs of instability' with the excavation crew.
John Miller's Take 5 risk assessment failed to identify rockfall hazards despite visible loose material on highwall	80%	John Miller's Take 5 shows 'No' for rockfall from highwall hazards, yet he observed 'some loose material on the highwall' before starting work. His statement confirms he 'did not consider it significant enough to report urgently,' indicating inadequate hazard identification.
Inadequate drainage systems failed to manage surface water infiltration into highwall after heavy rainfall	75%	Dr. Anthony Richards noted 'existing drainage systems were not adequate to mitigate the impact of significant rainfall on highwall stability.' Evidence of water seepage along failure plane indicates water management systems were insufficient for the conditions.
Lack of continuous monitoring systems to detect real-time changes in highwall stability after significant weather events	70%	Dr. Anthony Richards recommended 'implement continuous monitoring systems, such as ground-penetrating radar and slope stability radar, to detect real-time changes in highwall stability.' The absence of such systems meant subtle changes went undetected until failure occurred.
Blast design did not adequately consider proximity to highwall and recent weather conditions affecting rock mass strength	65%	While Claire Robertson's blast reconciliation report states design followed standard practices, Dr. Anthony Richards recommended 'more detailed blast impact assessments, considering the proximity of highwalls and recent weather conditions.' The 30-meter proximity and weakened conditions suggest design considerations were insufficient.
James Anderson (Open Cut Examiner) did not personally participate in post-blast inspection, relying on briefing from blast crew leader	60%	James Anderson stated 'I did not personally participate in the post-blast inspection conducted before resuming work in North Pit. However, I was briefed by the blast crew leader.' This created a communication gap where critical inspection details may not have been effectively communicated to the statutory official responsible for workplace safety.

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1. Inadequate Post-Blast Inspection and Risk Communication

The post-blast inspection conducted by Robert Wilson, Blast Crew Leader, failed to adequately assess and communicate the significance of observed warning signs including minor cracks and water seepage. According to Dr. Anthony Richards' geotechnical report, subtle indicators were overlooked due to quick visual scanning rather than detailed examination, and Robert Wilson acknowledged in follow-up interviews that potential risks associated with minor signs of instability were not explicitly discussed with the excavation crew.

Contributing Factor	Relativity Rating	Explanation
Insufficient inspection protocols for post-blast assessments	85%	Dr. Anthony Richards noted that post-blast inspections lacked thoroughness required to detect subtle changes in highwall stability, and recommended more rigorous inspection protocols incorporating both visual and instrumented inspections
Inadequate risk communication between blast crew and excavation operators	75%	Robert Wilson confirmed the area was safe but did not communicate observed minor cracks and water seepage to John Miller, who stated he was not given detailed information about specific inspection findings
Lack of consideration for recent weather conditions in inspection criteria	70%	The inspection did not adequately account for the impact of 150mm rainfall over the previous week, which Dr. Anthony Richards identified as a critical factor that reduced rock mass strength through water infiltration

2. Environmental Conditions Combined with Blast-Induced Destabilization

The combination of significant rainfall (150mm over the previous week) causing water infiltration and weakening of the rock mass, followed by blast-induced vibrations from Section B operations, created the conditions for highwall failure. Dr. Anthony Richards' geotechnical analysis identified this as the primary mechanism, with water infiltration along pre-existing discontinuities creating lubricated planes of weakness that were then triggered by blast vibrations.

Contributing Factor	Relativity Rating	Explanation
Water infiltration weakening rock mass integrity	90%	Dr. Anthony Richards identified that 150mm of rainfall increased moisture content within the rock mass, reducing overall strength and creating lubricated planes of weakness along pre-existing discontinuities
Blast-induced ground vibrations triggering instability	80%	The blast in Section B, located approximately 30 meters from the highwall in Section A, generated vibrations that propagated through the already weakened rock mass and disrupted the highwall according to the geotechnical analysis
Inadequate water management systems for extreme weather events	65%	Dr. Anthony Richards noted that existing drainage systems were not adequate to mitigate the impact of significant rainfall on highwall stability, recommending upgraded drainage systems to reduce water infiltration

Actions Most Likely to Eliminate Recurrence

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Hierarchy of Control	Contributing Factor	Action	Description
Engineering Controls	Insufficient post-blast inspection protocols failed to detect subtle signs of highwall instability	Install automated slope stability radar monitoring system with real-time alerts	Deploy continuous monitoring technology that automatically detects millimeter-level ground movement and triggers immediate alerts when stability thresholds are exceeded, eliminating reliance on visual-only inspections. [Proximity Rank: 1] - acts directly on the failed detection mechanism that missed the imminent failure signs
Engineering Controls	Water infiltration from recent heavy rainfall (150mm) weakened rock mass along pre-existing discontinuities	Upgrade highwall drainage systems with automated pump stations and interceptor drains	Install engineered drainage infrastructure to actively remove water from critical highwall areas, preventing saturation of rock discontinuities. Include backup pumping capacity and flow monitoring. [Proximity Rank: 1] - directly controls the water infiltration that created the failure plane
Administrative Controls	Post-blast inspection by Robert Wilson (Blast Crew Leader) was limited to visual assessment and failed to identify water seepage and minor cracks	Implement mandatory geotechnical sign-off for post-blast inspections after significant weather events	Require RPEQ geotechnical engineer inspection and written clearance before resuming operations when rainfall exceeds 100mm in preceding 7 days, supplementing blast crew visual checks. [Proximity Rank: 2] - acts on the failed critical control that cleared the area as safe
Administrative Controls	John Miller (Excavator Operator) was not informed of specific inspection findings including minor cracks and water seepage observed during post-blast assessment	Establish detailed hazard communication protocol for post-blast clearances	Require written hazard briefings to equipment operators detailing all observations from post-blast inspections, including minor concerns and increased vigilance requirements. [Proximity Rank: 2] - addresses the information gap that prevented operator awareness of elevated risk

Other Improvement Actions

Hierarchy of Control	Contributing Factor	Action	Description
Engineering Controls	Blast-induced vibrations from Section B (30 meters away) triggered the rockfall in the already weakened highwall	Implement controlled blasting techniques with vibration monitoring for adjacent highwalls	Use electronic delay detonators and reduced charge weights when blasting within 50m of potentially unstable highwalls, with real-time vibration monitoring. [Proximity Rank: 2] - controls the trigger mechanism that initiated the failure
Administrative Controls	Take 5 risk assessment by John Miller failed to identify rockfall hazard despite recent blast and weather conditions	Enhance Take 5 assessment with weather-specific and post-blast hazard prompts	Add mandatory consideration items for highwall stability after rainfall >50mm or nearby blasting within 48 hours, with supervisor verification required. [Proximity Rank: 3] - improves upstream hazard identification process
Administrative Controls	Geotechnical assessment two days prior did not adequately consider impact of 150mm rainfall on rock mass strength	Establish rainfall trigger levels for enhanced geotechnical reassessment	Require formal geotechnical review within 24 hours when cumulative rainfall exceeds 100mm in 7-day period, with updated stability assessments and control measures. [Proximity Rank: 3] - addresses upstream planning deficiency in weather impact assessment

Hierarchy of Control	Contributing Factor	Action	Description
Administrative Controls	Working Near Crests and Slopes Procedure did not specifically address post-blast and post-rainfall combined risk scenarios	Update procedure to include specific controls for combined weather and blast scenarios	Revise QCM-SAF-PROC-002 to include mandatory stand-down periods and enhanced controls when rainfall and blasting activities occur in proximity within defined timeframes. [Proximity Rank: 4] - addresses organizational document gaps that enabled the scenario

Appendix

Image 1



Title: Damaged mobile plant operator cabin interior

Description: Interior view of excavator cab showing operator seat and controls with front windscreen area displaying irregular jagged opening. Visible dirt accumulation and damage to cabin structure. Consistent with rockfall impact damage described in incident evidence.

Image 2



Title: Mobile plant operating at base of highwall

Description: Yellow tracked excavator positioned at base of layered rock face with loose debris scattered around work area. Highwall shows exposed sedimentary strata with near-vertical face. Consistent with North Pit excavation operations described in evidence.



Title: Rock surface with visible cracks and fractures

Description: Close-up view of gray rock surface showing multiple cracks including a prominent diagonal fracture and network of smaller hairline cracks. Angular fragments and rough granular texture visible throughout. Link to incident evidence is unclear.