



## Mines Safety Bulletin No. 171

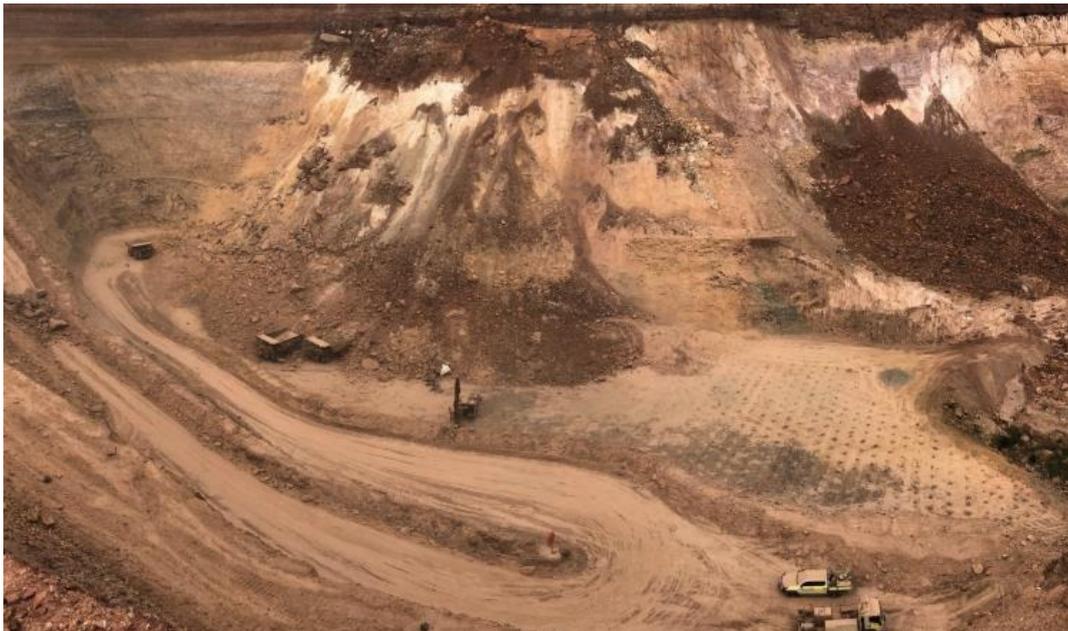
**Subject:** Pit wall failure management

**Date:** 28 February 2020

### Background

During the last 18 months, there were five significant open pit wall failures in Western Australian mines. These incidents caused damage to excavators, vehicles and ancillary equipment, with near misses involving operating personnel at the time of failures. Over the same timeframe, two fatalities due to wall failures occurred in Queensland and the Northern Territory. A number of near misses have also been reported in New South Wales.

In some cases, the hazard was known to mine personnel (monitoring data indicating active movement), and access to these areas remained unrestricted.



Multi-bench pit wall failure. Note the vehicles in the vicinity of the wall failure.

### Summary of hazard

Failures of both single-bench and multi-bench pit walls can occur in a variety of conditions, from weathered ground to fresh rock. In the majority of incidents, the pit walls remained exposed for a period of time before failure occurred. However, wall failures have occurred during active operations.

A fall of ground has the potential to extend a considerable distance from the toe of the pit wall resulting in persons and equipment being struck by falling objects or engulfed.



Left: Single bench failure. Right: Interim pit wall failure.

## Contributory factors

- Inadequate geotechnical information and analysis to determine the hazards of pit wall failures in changing geotechnical domains.
- Aggressive mine designs with high/steep face heights in weak or poor geology.
- Not mining to design and lack of survey controls.
- No controls in place limiting interim pit wall heights.
- Limited surface and groundwater management.
- Inaccurate recognition of pit wall hazards, including unfavourably orientated structures.
- Lack of effective monitoring processes by competent personnel.
- Positioning of equipment close to the pit wall.
- Ineffective determination of the size, location and shape of exclusion zones.
- Poor communication to the workforce on ground control hazards and management controls.
- Lack of training of the workforce on ground control hazards and management controls.
- Not enacting controls based on trigger action response plan (TARP) management.

## Actions required

- Ensure appropriate design process is undertaken by competent personnel, using adequate geotechnical/geological/surface and groundwater information.
- Implement controls for geotechnical hazards of interim and final pit walls.
- Manage final pit walls using appropriate blasting and pre-splitting techniques.
- Provide continuous catch berms or other methods to catch and contain fall of ground.
- Conduct ongoing assessment and reassessment of ground conditions as mining progresses, making changes to design, as required, in accordance with robust change management procedures.
- Conduct ongoing inspections of pit walls and catch berms.
- Use real time effective monitoring systems, utilise the data and act on the findings.
- Provide and enforce a pit wall stand-off procedure, including conditions where loaded berms exist above the working pit floor.
- Ensure appropriate equipment is used and position equipment for the protection of the operator.

- Use effective engineering exclusion zone design methodology to determine the potential failure run-out distance, including the design of hard barriers to isolate a pending failure from the rest of the pit workings.
- Ensure the workforce are aware of all hazards (e.g. communication and training that includes geotechnical hazards, use of hazard management maps, signage and demarcation).
- Use of Ground Control Management Plan (GCMP) and trigger action response plans (TARPS) for managing rockfall, single bench and multiple bench failure hazards.

## Further information

The Department's *Code of practice – Ground control for Western Australian mining operations* and *Guideline – Ground control management in Western Australian mining operations* have recently been released to assist in the effective management of ground control.

[www.dmp.wa.gov.au/Documents/Safety/MSH\\_CoP\\_GroundControl.pdf](http://www.dmp.wa.gov.au/Documents/Safety/MSH_CoP_GroundControl.pdf)

[www.dmp.wa.gov.au/Documents/Safety/MSH\\_GL\\_GroundControl.pdf](http://www.dmp.wa.gov.au/Documents/Safety/MSH_GL_GroundControl.pdf)

- Mines Safety Bulletin 69 Slope stability in open cut operations

[www.dmp.wa.gov.au/Documents/Safety/MSH\\_SB\\_069.pdf](http://www.dmp.wa.gov.au/Documents/Safety/MSH_SB_069.pdf)

- NSW Resources Regulator

Failure of highwalls, low walls and dumps safety bulletin

[www.resourcesregulator.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0005/1198256/SB20-01-Failure-of-highwalls.pdf](http://www.resourcesregulator.nsw.gov.au/__data/assets/pdf_file/0005/1198256/SB20-01-Failure-of-highwalls.pdf)

- Queensland Department of Natural Resources, Mines and Energy

Fatal incident when excavator engulfed after pit wall failure

[www.dnrme.qld.gov.au/business/mining/safety-and-health/alerts-and-bulletins/mines-safety/fatal-incident-when-excavator-engulfed-after-pit-wall-failure](http://www.dnrme.qld.gov.au/business/mining/safety-and-health/alerts-and-bulletins/mines-safety/fatal-incident-when-excavator-engulfed-after-pit-wall-failure)

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