Highwall Failure & Misfire

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Incident

Background

- Change in Wall design from soft wall to presplit
  - Geotechnical assessment

EVENT 1 Highwall failure

- Removal of persons just in time.
- Lost blast holes on highwall

EVENT 2 Large scale overburden misfire

- Combined floor and cast blast Ikon electronic det shot

EVENT 3 Heating of Misfired Areas

- Misfire Treatment

Geotechnical assessment -17/6/14

Mine changed from Soft wall to Highwall 70 degrees presplit and had a Geotechnical assessment which identified

- Factor of safety (FOS) 1.5 and 1.6
- View that faulting would occur even though high FOS
- Suggestion of controls
  - *monitoring including considerations of radar ,spotters, regular inspections*
  - *keeping out of the line of fire (i.e. no go zones around faulting)*
  - *good blasting practices*

Second Geotechnical assessment -12/11/14

After Blast and commencement of dragline operation

Geotechnical Inspection identified:-

- Saw tooth profiles
- Substantial fracturing past the mid split line
- Potential for wedge failure.

Suggestions

- Removing loose areas
- Possible modifications to future blasts.

Highwall Failure- 19/12/14

8.20hrs- Highwall showed signs of movement.

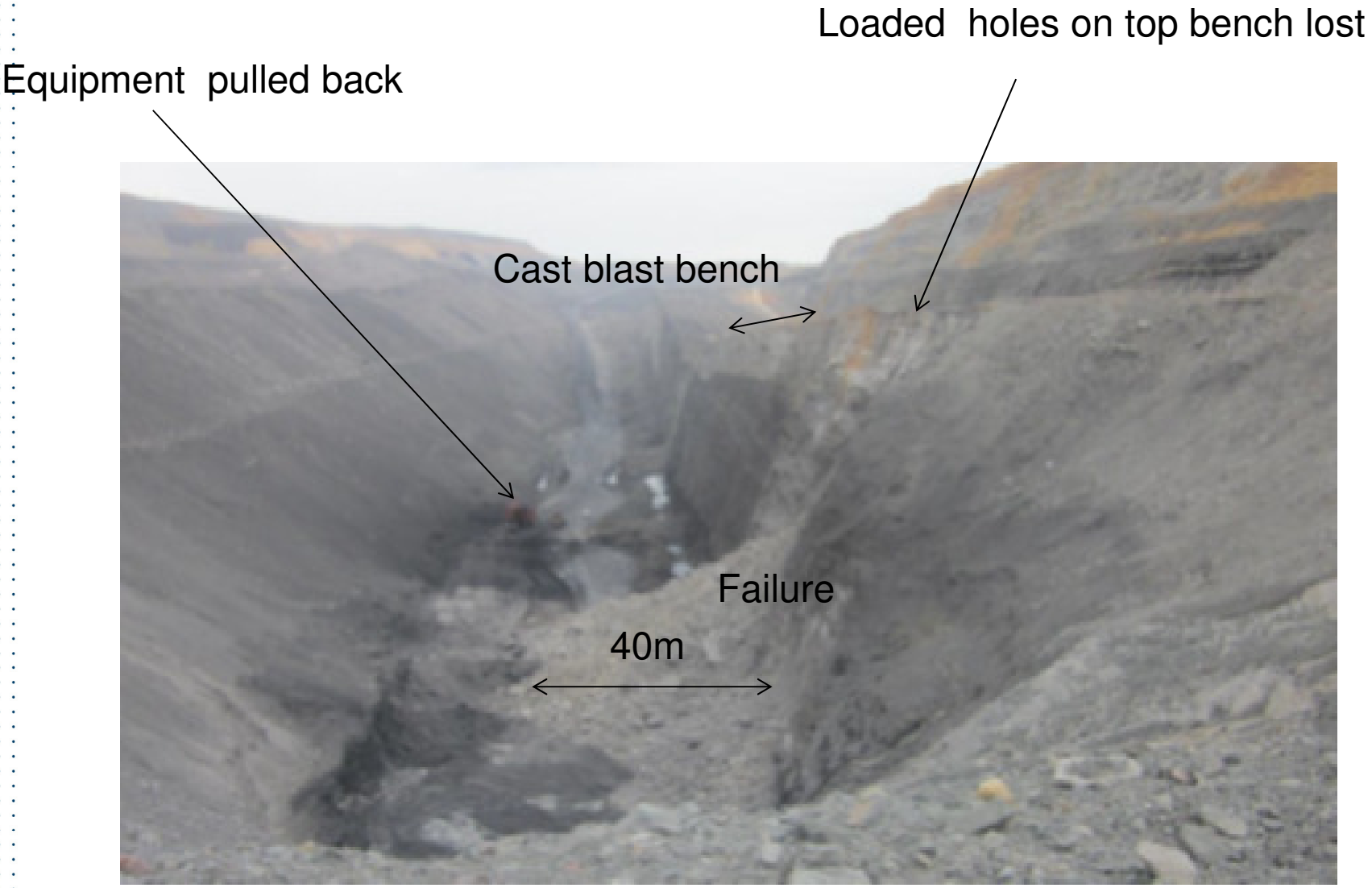
- No radar in place
- A 15mt standoff bund had been put in place.

8.21hrs –All mining personnel and equipment were cleared

8.45hrs- Highwall collapse

- Material breached bunding, and extended approx 40mts across the pit floor.
- Loaded shot for a scheduled cast blast and loaded holes were part of the collapsed material

Highwall Failure- 19/12/14



Learnings

The awareness of the operators and coordination of the evacuation prevented adverse consequence to the mine workers working in the area

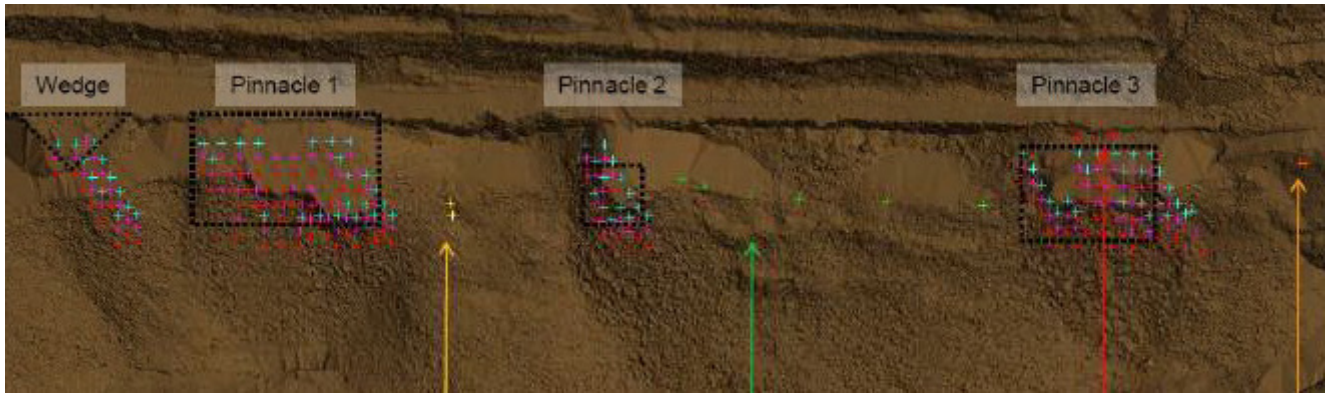
- The site does have an excellent geotechnical awareness package and training and assessment is conducted

The Inspectorate encourages mines to conduct good quality geotechnical awareness training

Floor shot and cast blast – Fired 22/12/14

Fired with Ikon 2

Misfire had 4 zones (wedge , pinnacle 1 , 2 & 3)



Factors Identified in misfire

- Failure to recognise risk of fly rock from floor shot impacting on cast blast during first det - last det -fire command
- Change (to fire with two separate blasters) was not managed through a Risk Assessment to use two separate blasters
- No Procedure for this particular task (Multi blast), supported by a Risk Assessment

Task and environment

- Logistically difficult to run harness wire from floor shots to cast shot

Individual and Team Action

- Time constraint to re-log to enable using one control box and undertake formal risk management

Heating in Misfire Areas- occurred a few days later… (flaring was observed in blast video)

Incident Management Team implemented

- Consistent & regular communication was undertaken
- Good briefing and updates to Inspectorate

This briefing is to share with you the events over the last few days and where the recovery plan is up to.

- There are three heated areas along the highwall edge at Pinnacles 1, 2 and 3. We are treating them as follows:
  - Pinnacle 1 – water cannon from exclusion zone edge will pump continuously onto the affected area
  - Pinnacles 2 and 3 – pump-line that was installed today will pump continuously onto the affected area
- Pinnacle 1 has a heat reading of 68° Celsius
- Pinnacle 2 has a heat reading of 42° Celsius

Today's Activities

The work done today to enable the pipework to be pulled into position are as follows:

- Rope was secured at the Eastern end to a cable reeler
- The rope was attached to the helicopter by one of our ERT personnel
- The helicopter placed rope along highwall and dropped the end outside the exclusion zone on the western end
- The pump crew blanked off the end of the pipe and cut a series of holes to create a 'soaker hose' effect at the end (Pinnacle 3) and at the 250 metre mark (Pinnacle 2)
- The poly pipe was pulled by two light vehicles and the rope is spooled by the cable reeler
- It will be connected to the pump and will run continuously

Risk assessment controls …

Use of Staged & Revised Risk assessment controls included

- Exclusion Zone put in place
- Remote Monitoring (drones - temperature sensing)
- Poly pipes brought in to cool heated areas
- Explosive supplier advice used

Misfire management

Dragline was walked away and there was some consideration of using dozers/ excavators & /or reshooting where possible

Dragline brought in after area cooled and dug out misfires.

Misfire management

Key question in handling misfires – Selecting equipment, using best information & developing a process that :-

- **Minimises risk of initiation &**

- **If initiation occurs uses the hierarchy of controls to minimise risk to people in area.**