# Managing the Hazards Associated with Open Stopes

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**Can we please take a moments silence.**

**Where were you at 6pm on the 28th of July, 2016?**

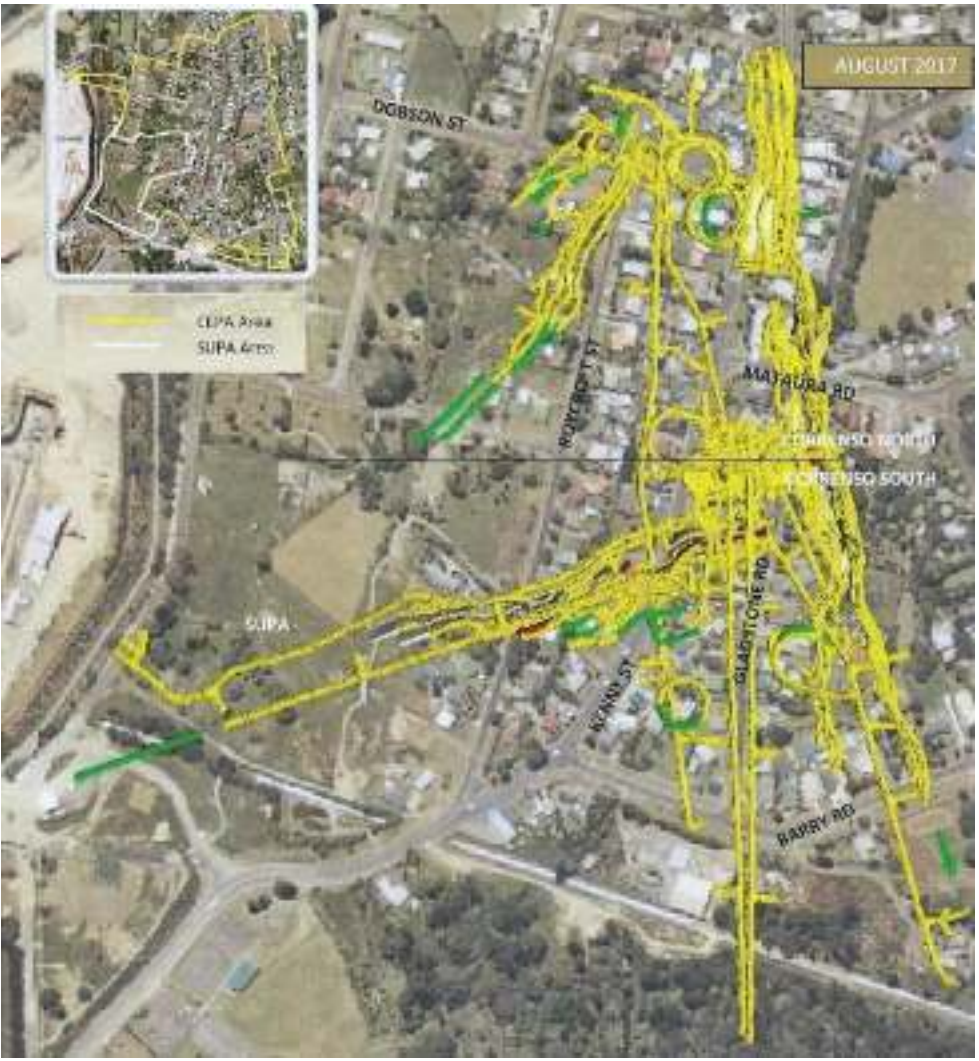
**I remember exactly where I was and I can even tell you what I was wearing when I received a call from the mine that a loader was upside down in a stope.**

# Summary of the Incident

28th of July 2016

- **7:15am loader operator assigned task to commence backfilling operations at the 840-1-South**
- **Underground loader 122 was out of service so operator assisted charge-up crew until lunchtime.**
- **15:05pm loader operator proceeded underground in loader 123 to commence the backfilling task.**
- **15:40pm loader operator contacted remote operator on level below for confirmation that the appropriate barricades etc where in place as per procedure.**
- **Approximately 18:00pm remote operator discovered loader 123 upside down on the 825-1-South level and initiated emergency response.**

# Location of the Incident

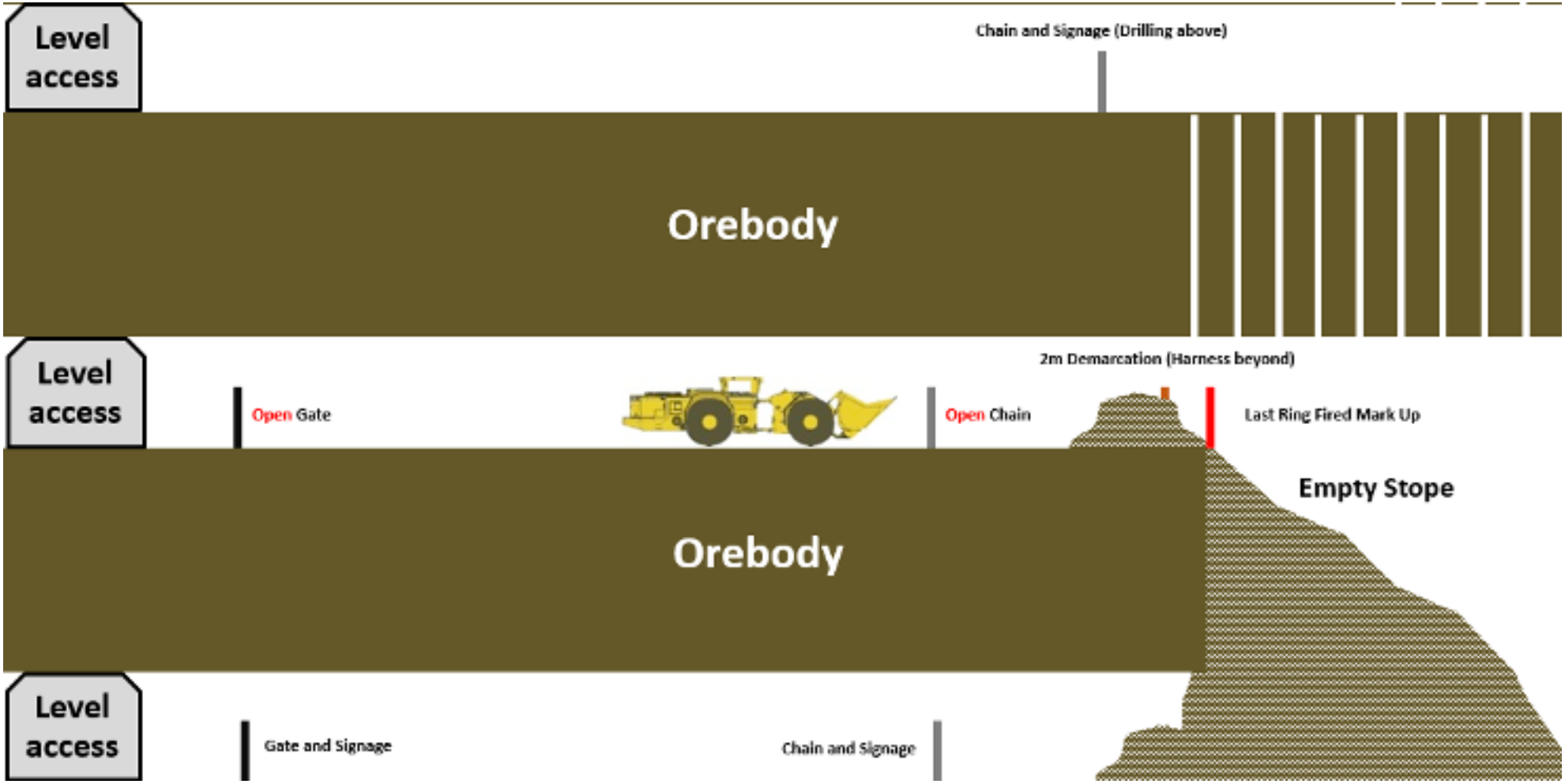



# Location of the Incident


# What was the System for Backfilling Operations at the time of the Incident

- Operator must
  - have a minimum of 12 months bogging experience to undertake this task
  - familiarise themselves with the location of all drive intersections, undercuts and pillars within the stope.
  - check that chain barricades and signage are in place.
  - wash and scale the area.
  - check for any faults or cracks in the floor
  - repaint the 2m marker line if not visible

# The Backfilling Process



# Constructing a Bund Wall – Standard Industry Practice

- Operator must
  - Get a bucket of waste and take it to the access where filling will take place.
  - Slowly approach the stope edge in first gear until the lip of the bucket is 2m from the brow of the stope. Use the paint “marker” line to gauge the distance from the brow.
  - Apply the service brake and select reverse. Make sure the machine is in reverse.
  - Raise the boom and dump the load to begin the bund wall.
  - Release the service brake and reverse back.
  - Continue building the bund wall until it is at least 1.5m high and reaches right across the drive from wall to wall.

**Prior to placing any material in the stope the “Placing Backfill” checklist MUST be completed.**

**Check machine is in reverse by rechecking the gear lever, listening for the reverse alarm and slowly increasing the revs until you feel a slight backwards movement.**

# We were not alone – below is a History of similar events in Australia

6 October 1996 – loader enters stope during push-off

4 June 1997 – loader enters stope

26 January 1991 – loader enters stope void

30 August 2007 – loader enters open stope

19 May 2009 – loader pushing bund enters open stope

24 June 2009 – loader enters open stope

11 April 2010 – loader enters open stope

# Safety Alerts and Detailed Investigations

Government of Western Australia
Department of Mines and Petroleum
Resources Safety

## Fatality Summary

**Date:** 11 April 2010

**Fatality Summary for industry awareness**

It has been reported that a 45 year old underground loader operator employed on an Eastern Goldfields underground nickel mine was fatally injured when he drove into an open stope void on the morning of 11 April 2010. Department of Mines and Petroleum Inspectors of Mines are at the scene of the incident.

This Fatality Summary was approved for release by the Chief Mining Engineer on 11 April 2010

Government of Western Australia
Department of Mines and Petroleum
Resources Safety

## Significant Incident Report No. 199

**Subject:** Manned loader drives into open stope - fatal accident

**Date:** 17 June 2014

**Summary of incident**

In April 2010, an operator was driving a loader in an ore drive in an underground mine when the loader fell over the edge of an open stope. The loader fell about 25 m and landed on the lower level of the stope. The operator suffered fatal injuries as a result of this accident.

It is likely that the operator was in the process of building a rock bund at the edge of the stope at the time of the accident, as he had removed warning signage and wall bollards before operating the loader in the drive. There was no other physical barrier in place to prevent access to the void.

This accident was the subject of a coronial inquest held in February 2014, with findings and recommendations documented in the Coroner's record of investigation.

**Direct causes**

- There was no physical barrier in place near the edge of the stope void.
- The loader operator did not detect the location of the stope void.

**Contributory causes**

- Warning controls had been removed without implementing alternative temporary methods of delineating the stope void.
- Warning controls were able to be removed by the operator without the presence and approval of nominated persons authorised to remove the controls.
- The field-level risk assessment performed by the operator did not assign the correct level of risk for work in this location.
- The supervisor was delayed from inspecting the workplace due to the need to attend a production meeting.
- Operator visibility from loaders operating in ore drives was severely limited due to the position of the cabin and obstructions to fields of view.
- Changes to operating procedures and practices may not have been clearly understood by all relevant workers working at the mine.
- There may have been a misunderstanding about job requirements by workers involved.

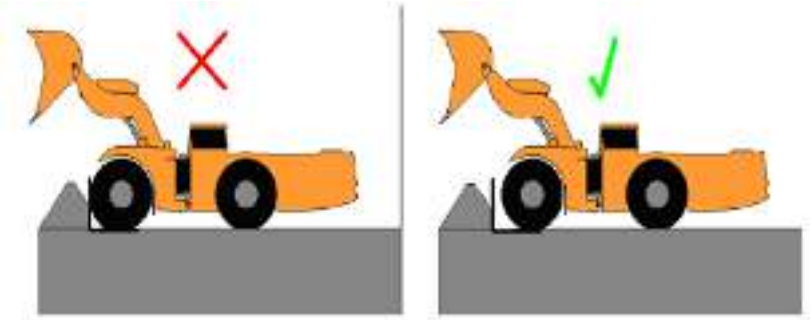
This process takes too long and as an industry we need to do better

# Recommendations from Previous Event

- Where equipment and operators, and especially manned loaders, are required to work near open holes, complete **formal team-based risk assessments** to determine appropriate controls for the hazards associated with the tasks.
- **Do not rely solely on lower level risk assessments** (e.g. field level risk assessments, Task Hazard Analysis) performed by workers to identify and control hazards associated with high risk tasks near open holes.
- Critically examine the circumstances under which there is a need for a manned loader to be operated near an open hole, and assess whether a manned loader is fit-for-purpose for the planned task. Alternative equipment or techniques should be considered, including application of **remote controlled technology** to keep the operator away from the open hole.
- The appointed responsible persons should manage the hazard of open holes in mines by designing, constructing and locating **physical hard barriers** to prevent equipment from having access to the edge of such open holes. The barriers should be used in conjunction with lower level access control systems such as demarcation and lockable barriers controlled by supervisors or managers. Wherever possible, install hard barriers before creating an open hole.
- Clearly **communicate changes to operating procedures and practices** to the workforce, including supervisors, with reinforcement and monitoring from management to ensure adherence to the new standards and procedures.
- Ensure **work instructions given to operators are clear**, unambiguous and understood so that there is no misinterpretation of job requirements.

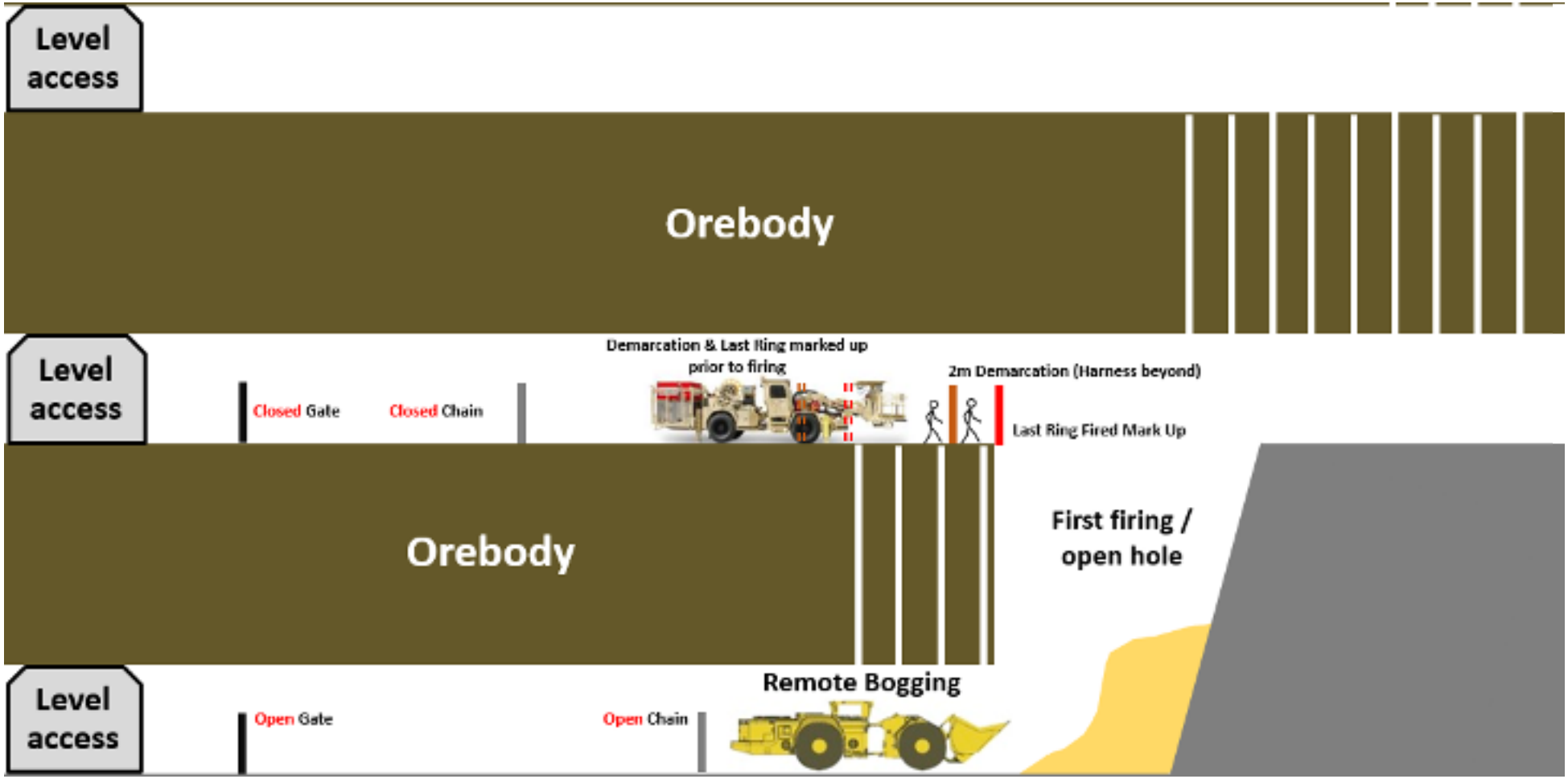
# The Problems with Physical Barriers/Stop Logs

- Steel Stop Logs are generally not designed to stop a loader.



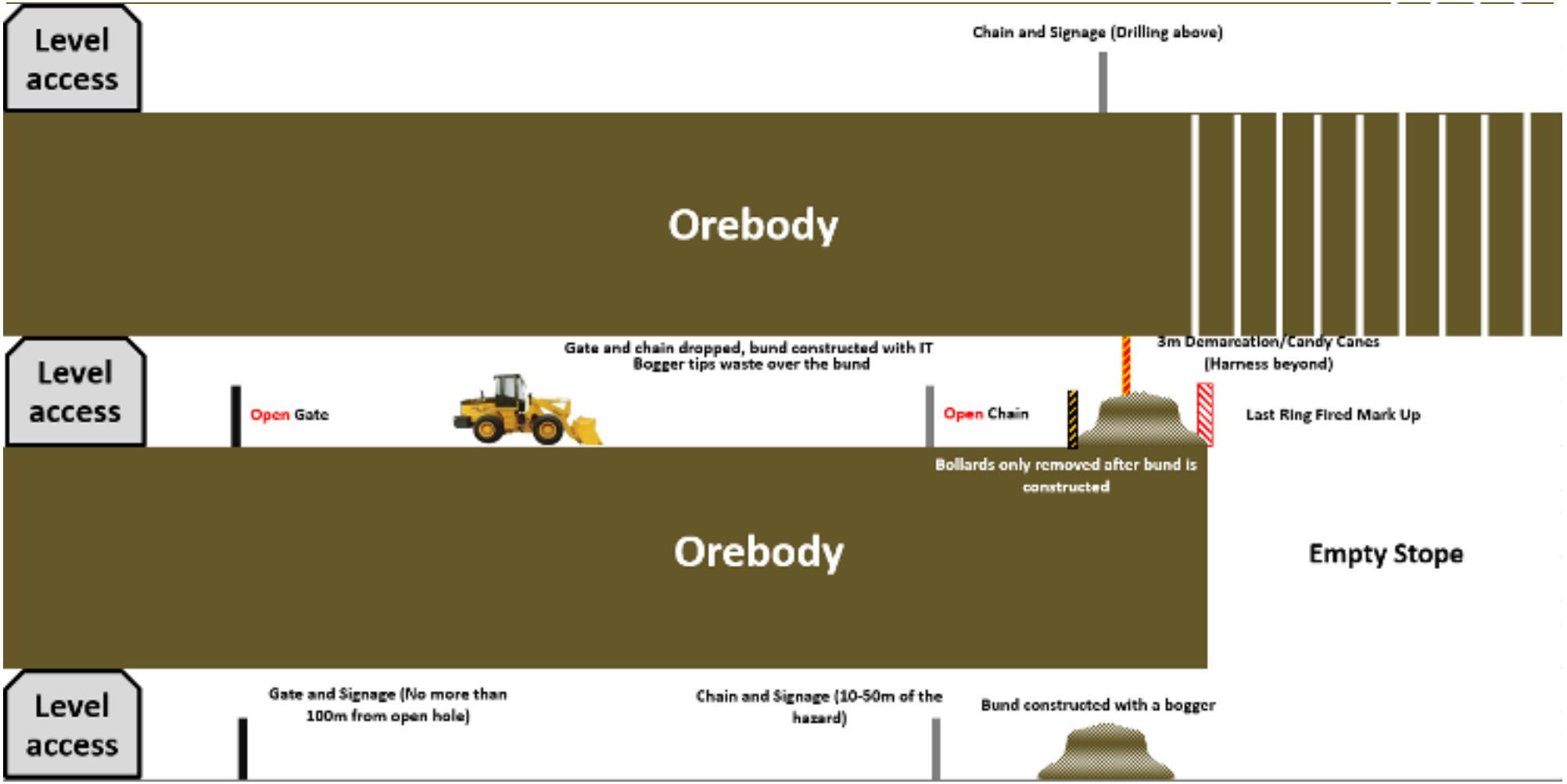
- Installing the Steel Stop Log has the same primary risk as the building of a waste bund. That is a loader drives towards an unprotected void with a bucket full of steel as opposed to a bucket full of rock!
- The increased complexity of installing the Steel Stop Log when compared to the rock bund construction was likely to lead to ad hoc modifications or on the fly hacks in the field.
- Steel Stop Logs and their associated chains require a significant amount of ongoing maintenance and checks. These multiple activities increase the risk associated with working around open stopes.
- Steel Stop Logs could give an operator a false sense of security as it will not stop their loader from entering a stope.

# Why Steel Stop Logs Can't be used at Waihi



# The Steel Bollards

# Working around Open Stopes with Steel Bollards



# Finally what did I say about we must do better?

Government of Western Australia
Department of Mines, Industry Regulation and Safety

## Significant Incident Report No. 265

**Subject:** Manned loader falling into an open stope

**Date:** 03 August 2018

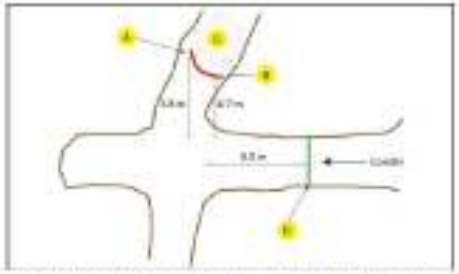
### Summary of incident

*Note: The Department of Mines, Industry Regulation and Safety's investigation is ongoing. The information contained in this significant incident report is based on materials received, knowledge and understanding at the time of writing.*

In February 2018 a loader operator was instructed to build a rock bund, using a loader, at the upper ledge of an open stope in an underground mine.

The operator trammed to the level, bogged dirt from a stockpile and then drove towards the open stope. On approaching the stope, there was a sign hanging on a chain that restricted unauthorised access to the stope and surrounding area. The operator removed the sign and conducted a visual inspection of the work area before returning to the loader and driving in close proximity to the edge of the stope to place the bund.

As the operator was tipping the load, the right hand side of the loader slumped and the operator exited the loader via the cab door. The loader kept moving forward under its own power and fell over the crest into the stope, coming to rest on the rill of ore below. The operator was uninjured.




Level plan showing the direction the loader was travelling, as well as the bore pick-up (A), the edge of the open stope (B), the void (C) and the location of the restricted access sign (D) in the drive.

### Direct causes

- Lack of adequate controls to manage the risks for mining activities near a void.

### Contributory causes

- No visual markers on the wall for the operator to position the bund safely.
- Reduced operator visibility:
  - the edge to an open stope was located on a bend
  - the loader was still articulated at the point of tipping (poor operator visibility)
  - there was limited lighting.
- The operator misjudged the location of the edge leading into the void.

### Actions required

Mine operators, managers and front line supervisors are reminded of the importance of developing safe systems of work and implementing appropriate controls for all work near open stopes or any voids underground. The following actions are recommended:

- perform a formal team-based risk assessment to identify hazards and control measures before any work is commenced in the vicinity of an open stope or any other void. This should be in addition to lower level risk assessments (e.g. field level risk assessments, Task Hazard Analysis)
- install physical hard barriers in conjunction with lower level access controls (e.g. signage, demarcation). Hard barriers prevent workers and equipment accessing the edges of voids and should be:
  - designed and constructed at appropriate locations before open stopes or voids
  - where practicable, installed before creating a void
- use markers or spotters for or during the construction of bunds when safe to do so.

### Further information

- Department of Mines, Industry Regulation and Safety, Safety publications www.dmirs.wa.gov.au/ResourcesSafety
  - *Vertical opening safety practice in underground mines – guideline*
  - *Working at height in underground mines – guideline*
  - Significant Incident Report No. 110 *Vehicle over stope edge*
  - Significant Incident Report No. 148 *Loader falling into an open stope*
  - Significant Incident Report No. 199 *Manned loader drives into open stope – fatal accident*
  - Significant Incident Report No. 234 *Light vehicle driven partly over edge of open stope*
- Coroner's Court of Western Australia, www.coronerscourt.wa.gov.au
  - Inquest into the death of Wayne Ross

# Questions?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