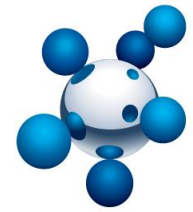


# SASOL MINING ENTRY EXAMINATION

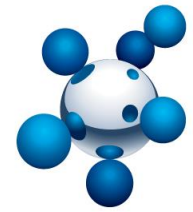
14 May 2021



**SASOL**

**OUR Sasol Mining**



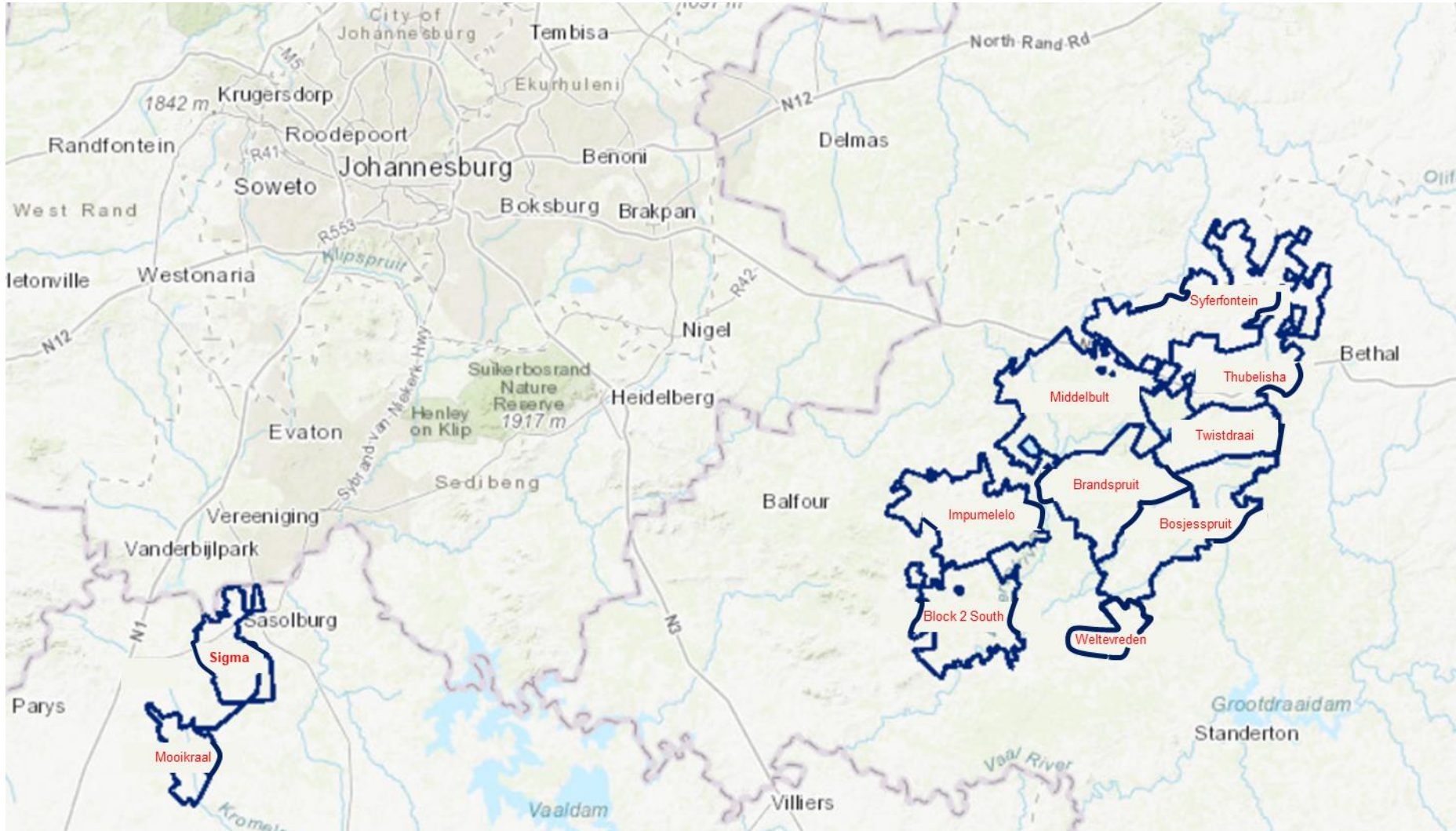


**SASOL**

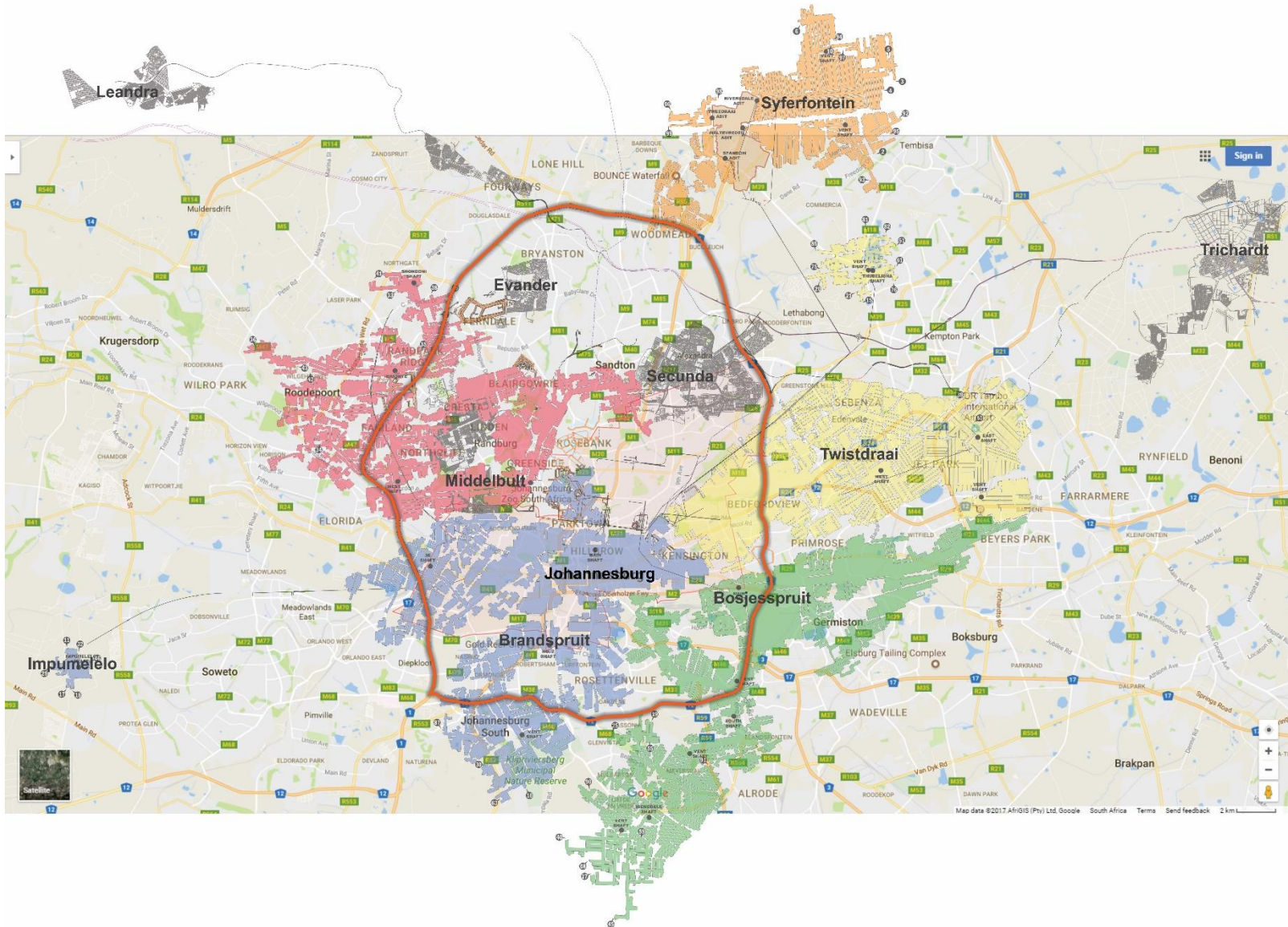
## **Locality**

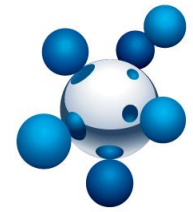
Secunda and Sasolburg Operations

# Locality and Operation size



# 2018 Mined out scale vs the city of JHB





**SASOL**

# **Underground Coal Mining Equipment**

# Continuous Miner (CM)



# Shuttle cars



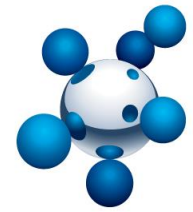
# Twin boom bolter with TRS





# Load Haul Dumper (LHD)



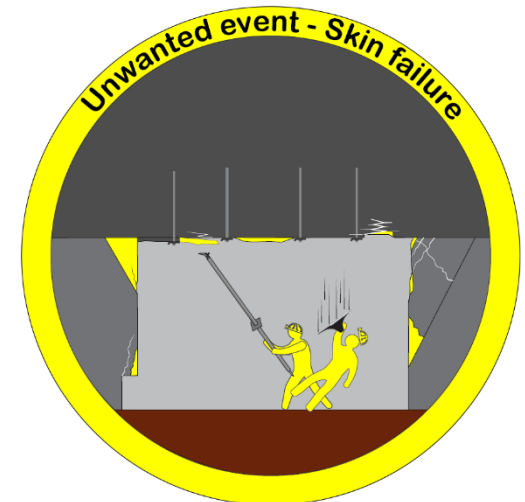
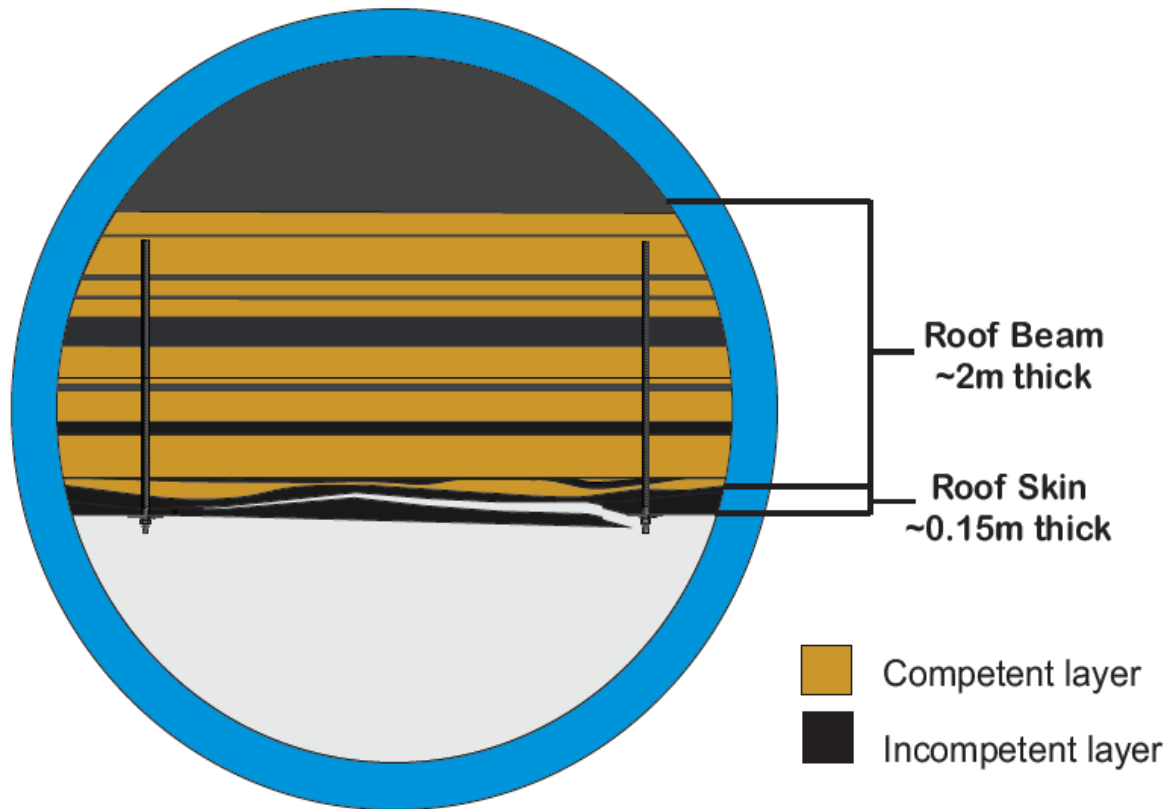


**SASOL**

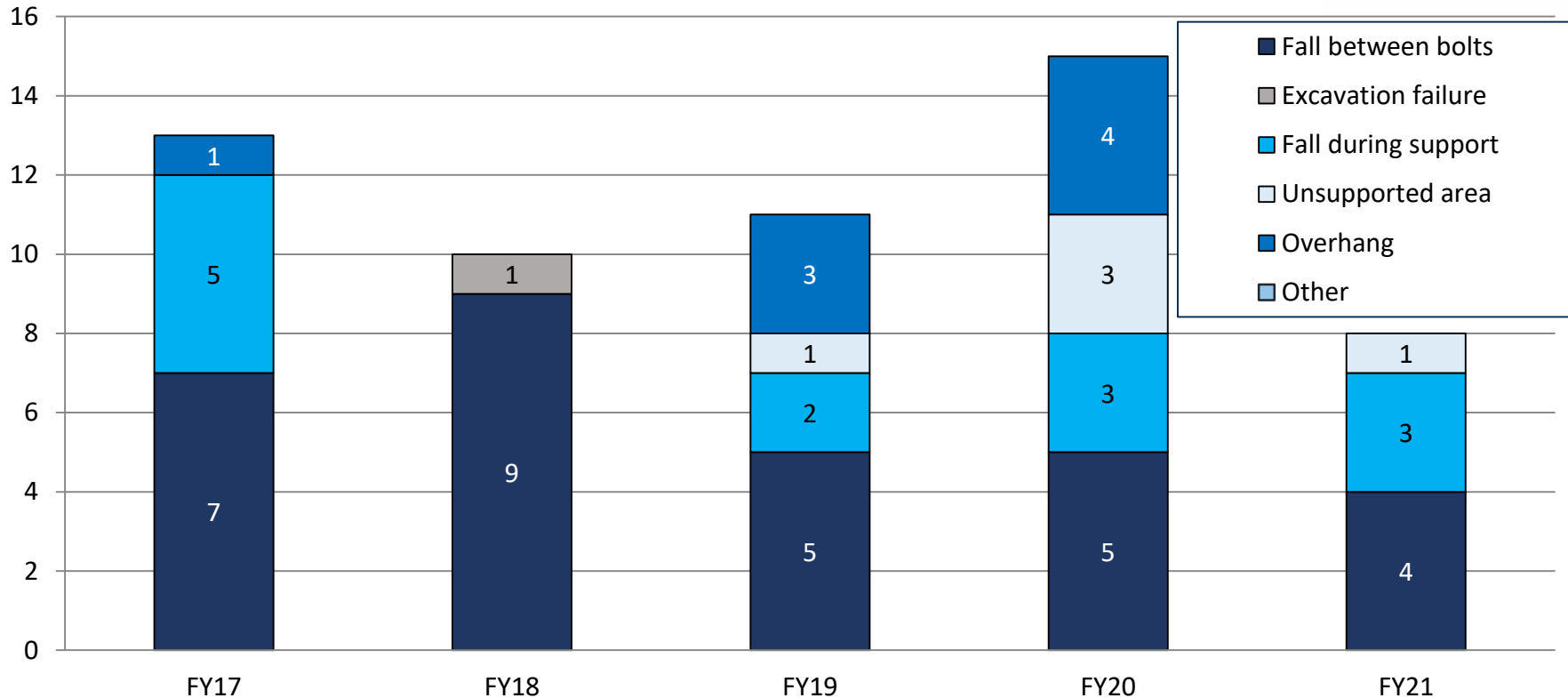
# **Incident analyses**

FY17 – FY21

## Roof Beam and Roof Skin Definition



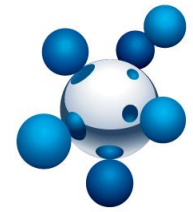
# FOG failure mechanisms FY17 to FY21



➤ 51 FOG incidents since FY17

➤ Of which 89% was skin related failures not identified during Inspection and Safe making

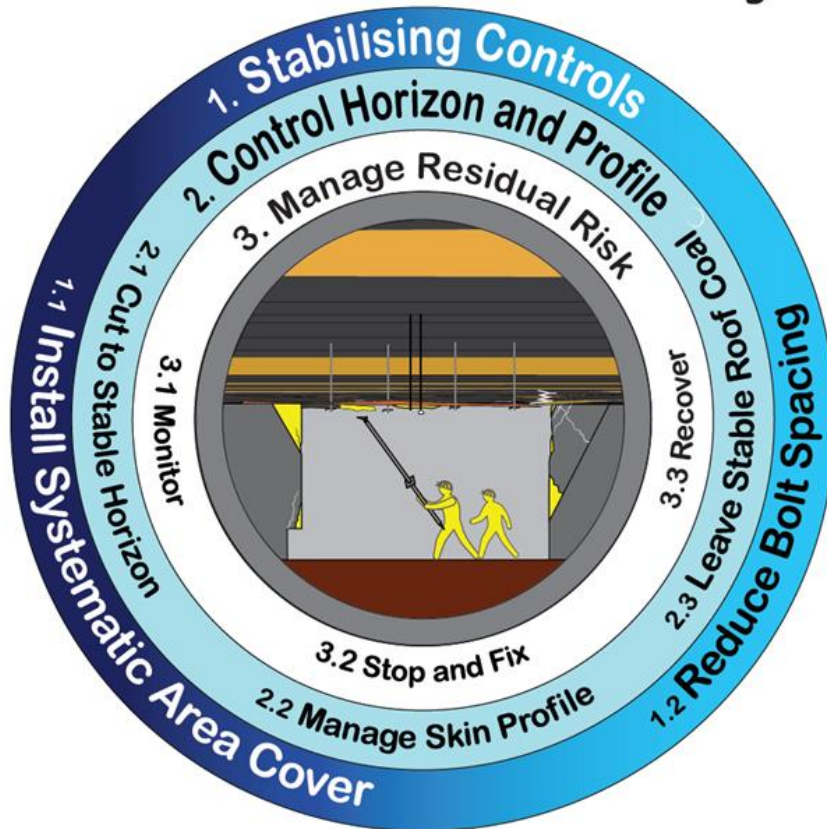
- 52% Falls between bolts
- 23% Falls during support
- 14% Unsupported overhang and Blasting faces



**SASOL**

## **FOG Management System - Skin**

## Skin Control Hierarchy



- Entry examination is dependent on Human-based controls and is not as reliable as engineering controls to manage residual risk

# FOG SLAM control effectiveness verification

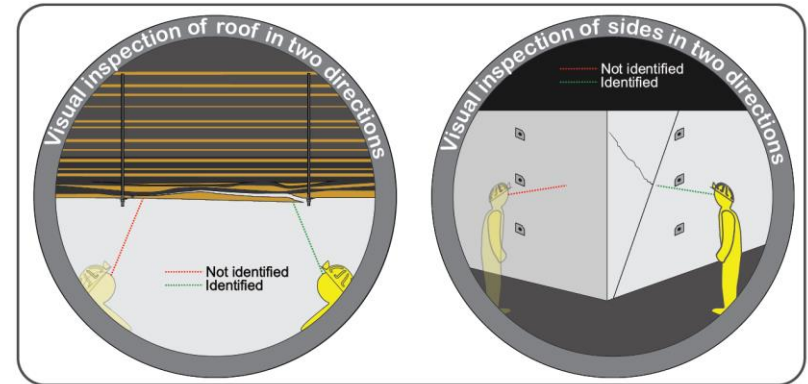
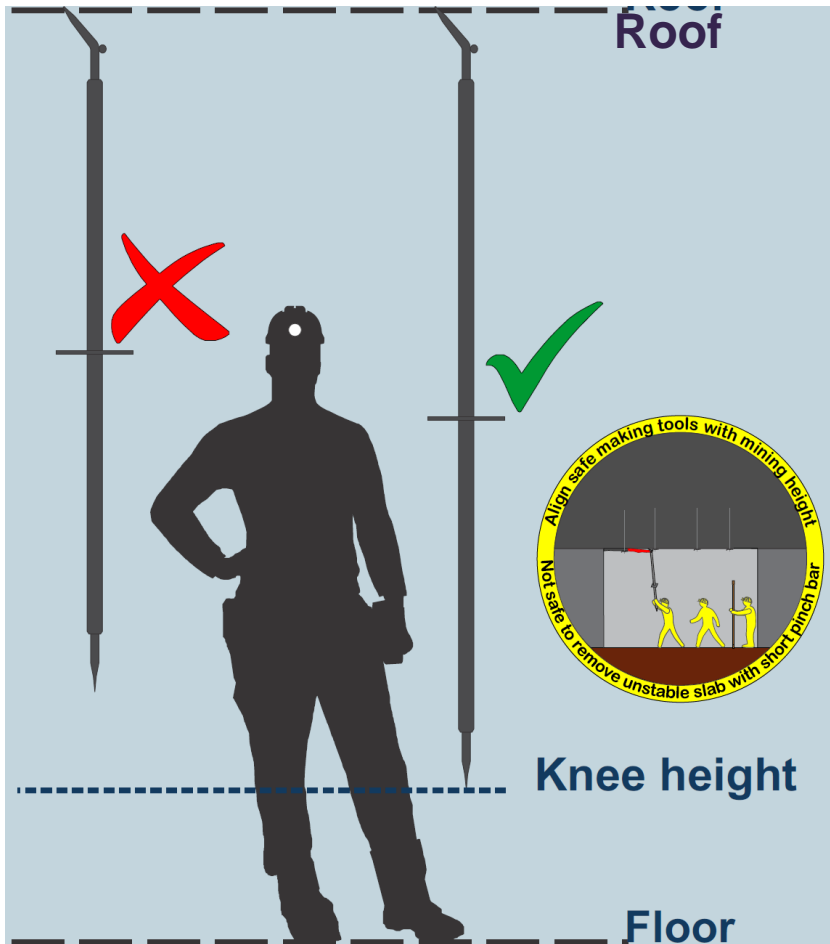


Fall of Ground SLAM				
<b>Stop and Look for Triggers</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> No red triggers</li> <li><input type="checkbox"/> Yellow triggers present</li> <li><input type="checkbox"/> Risk areas can be identified and made safe</li> <li><input type="checkbox"/> Gradual deterioration</li> <li><input type="checkbox"/> Extent of failures and conditions manageable</li> <li><input type="checkbox"/> Stable once made safe i.e. removed and/or supported</li> <li><input type="checkbox"/> No failure since previous inspection and safe making</li> <li><input type="checkbox"/> No MHSa Section 23 concerns raised</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Red triggers present</li> <li><input type="checkbox"/> Excessive yellow triggers and insufficient resources to manage risk</li> <li><input type="checkbox"/> Unsafe and/or difficult to inspect and make risk areas safe:                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Mining height, confined spaces - cannot make safe</li> <li><input type="checkbox"/> Damage prior to support, falls in unsupported area</li> <li><input type="checkbox"/> Progressive/Sudden failure</li> <li><input type="checkbox"/> Unexpected failures, support failing</li> <li><input type="checkbox"/> High failure rate – new failures since previous safe making</li> </ul> </li> <li><input type="checkbox"/> Repeated failure in identifying triggers</li> <li><input type="checkbox"/> Difficult or impossible to identify triggers</li> <li><input type="checkbox"/> Multiple cycles of safe making or continuous stop and fix</li> </ul>		
<b>Assess Controls</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Stop and Fix appropriate</li> <li><input type="checkbox"/> Required controls identified and can be implemented</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Stop and Fix not appropriate</li> <li><input type="checkbox"/> Uncertainty regarding required controls</li> <li><input type="checkbox"/> Required controls cannot be implemented</li> </ul>		
<b>Assessment Outcome</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Control Plan Effective</b></li> <li><input type="checkbox"/> Uncontrolled excavation failure unlikely</li> <li><input type="checkbox"/> Uncontrolled skin failure unlikely</li> <li><input type="checkbox"/> Yellow triggers manageable</li> </ul> <p><b>We can fix this</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Control Plan Deficient or uncertain</b></li> <li><input type="checkbox"/> Uncontrolled excavation failure likely</li> <li><input type="checkbox"/> Uncontrolled skin failure likely</li> <li><input type="checkbox"/> Triggers cannot be managed</li> <li><input type="checkbox"/> Available controls do not reduce risk or potentially increase risk</li> </ul> <p><b>We need assistance</b></p> <ul style="list-style-type: none"> <li>• Immediately stop, withdraw personnel and equipment from risk area; and</li> <li>• Fence risk area.</li> </ul>		
<b>Manage</b>	<p><b>Continue with Control Plan:</b></p> <ul style="list-style-type: none"> <li>• Implement stop and fix actions or fence risk area until made safe</li> <li>• Residual risk significantly reduced and acceptable</li> <li>• Miner or Competent A person declare area safe when all risk areas are made safe. Fence areas that cannot be made and declared safe</li> <li>• Verify controls are effective and give permission to proceed</li> <li>• Continuously monitor and make safe</li> </ul>	<p style="text-align: center;"><b>Follow the Management Plan Alignment process to manage change</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Revise Skin Control Plan</b></li> <li>• Issue instructions</li> <li>• Ensure necessary resources are made available and enable implementation</li> <li>• Report to Mine Manager</li> </ul> </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Initiate Excavation Control Plan review</b></li> <li>• Report to Mine Manager and Rock Engineer</li> <li>• Ensure necessary resources are made available</li> <li>• Align Management Plan with risk</li> <li>• Implement revised Management Plan</li> </ul> </td> </tr> </table>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Revise Skin Control Plan</b></li> <li>• Issue instructions</li> <li>• Ensure necessary resources are made available and enable implementation</li> <li>• Report to Mine Manager</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Initiate Excavation Control Plan review</b></li> <li>• Report to Mine Manager and Rock Engineer</li> <li>• Ensure necessary resources are made available</li> <li>• Align Management Plan with risk</li> <li>• Implement revised Management Plan</li> </ul>
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➤ Assessment used by operational personnel to assess their capability to manage residual risk

# General Rules of Inspection and safe making

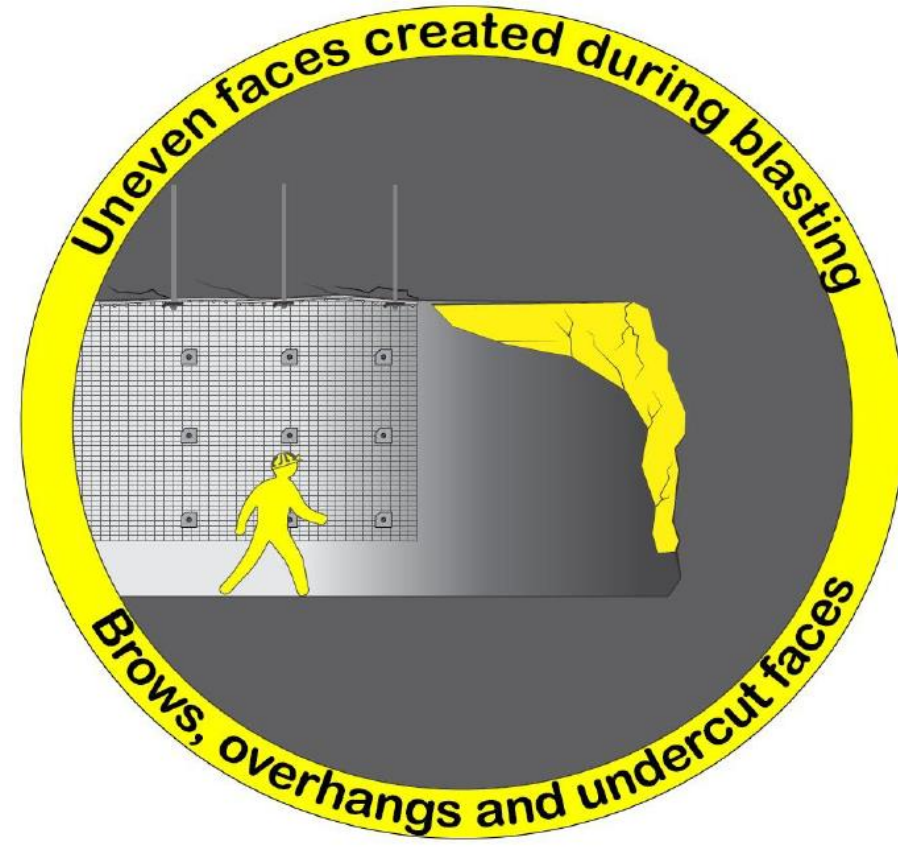
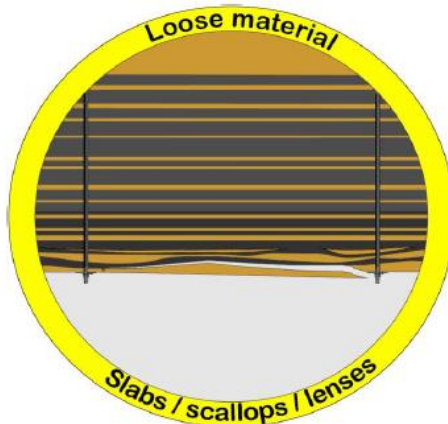
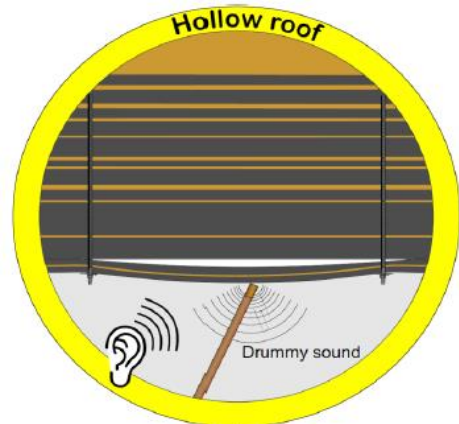
- Inspect roof and sidewalls in multiple directions

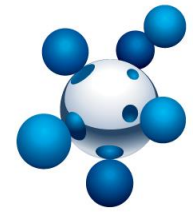


- Manual safe making tools (pinch bars and sounding sticks), to touch the roof and knee of person conducting safe making.
- Position person away from falling skin.



# Trigger Response Action Plan (TRAP) - Skin





**SASOL**

**Innovation**

## Bolter improvements

- Introduction of Temporary roof support (TRS) on RHAM bolters in (2002)
  - To prevent overrun of the unsupported area into area being supported
- Twin boom bolters with canopy protection on bolting platforms and tramming position (2004)
  - Protect operators against skin failures during tramming and bolting
  - Most incidents during bolting still occurred on the bolter walkway
- Introduction of bolter walkway canopies (2019)
- Narrow bolter able to support confined spaces in back areas (2018)

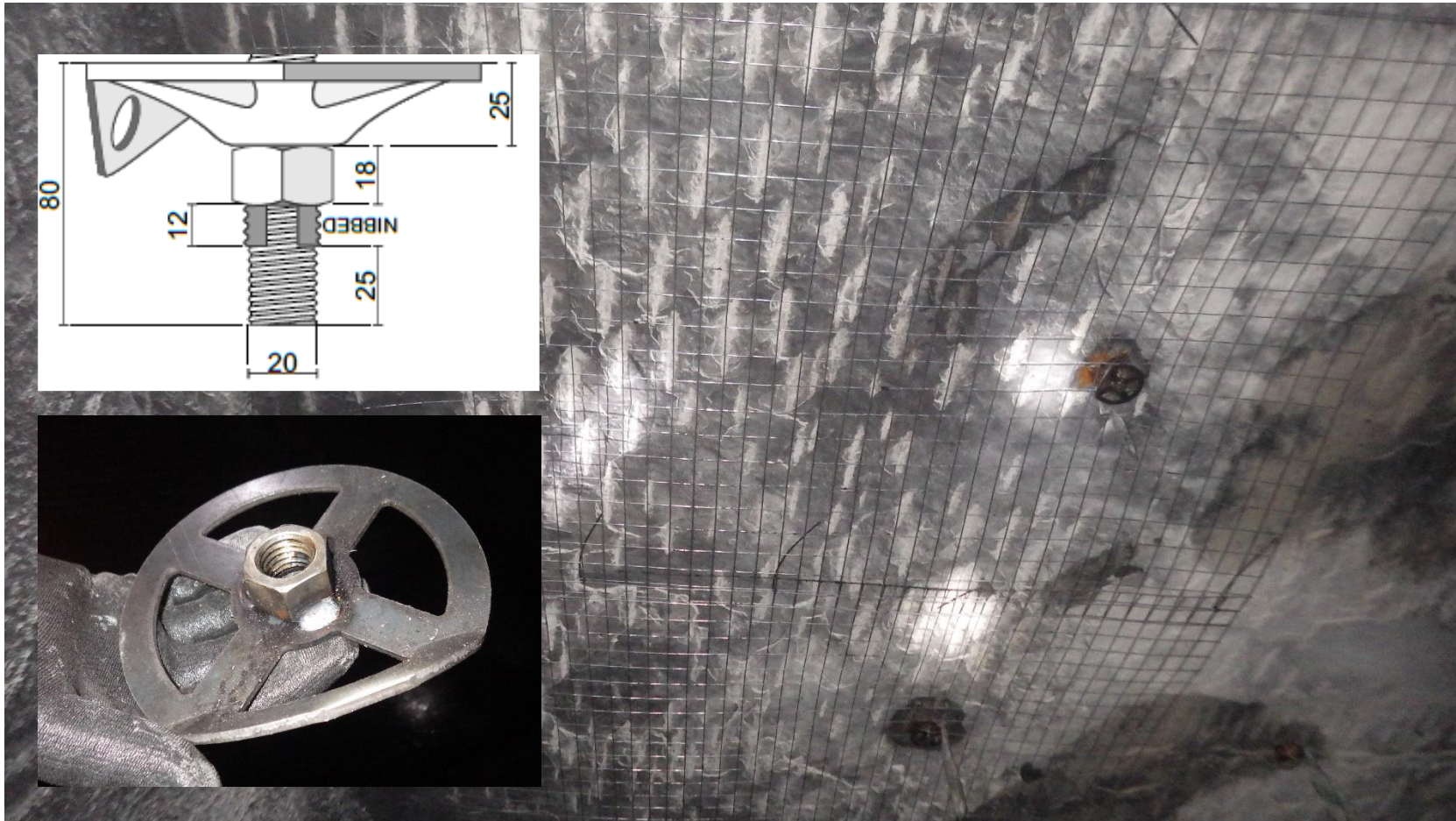


# Mesh installation – Concurrent with Primary support



- Mesh handler implemented on bolters TRS's to improve concurrent installation
- Enable full systematic area cover where required

# Mesh installation - Follow-on



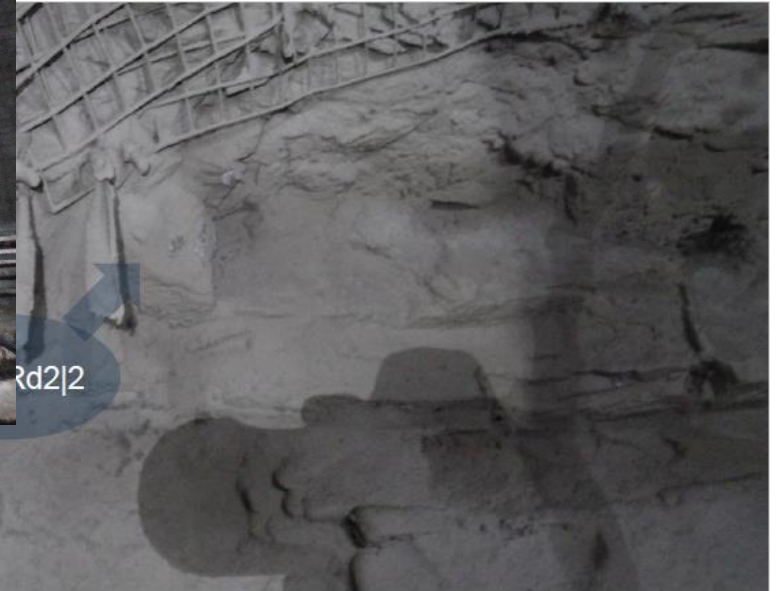
- Additional thread available below nib to allow for double-nut installation
- Double nut assembly used to install mesh in risk areas where bolting is not available

# Blasting face protection - Charging cage



- Charging cage used to conduct face activities past last line of support
- Personnel protection against unsupported blasting faces

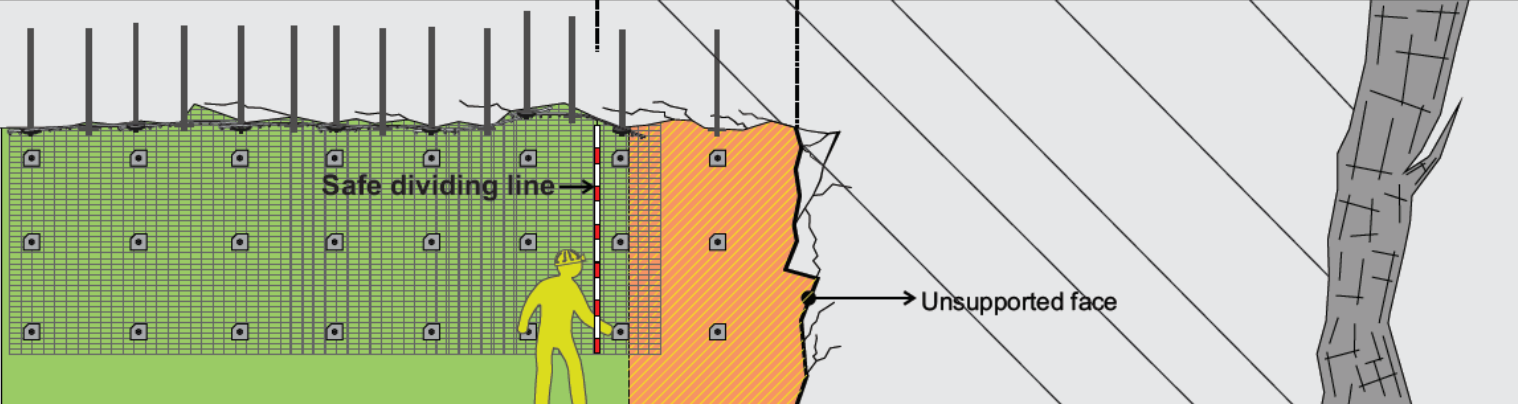
# Alternative blasting face protection - Thin Skin Liner (TSL)



- TSL used in blasting faces to confine material
- Personnel protection against unsupported blasting face

# Blasting face protection – Safe dividing line

**Pre-blasting**

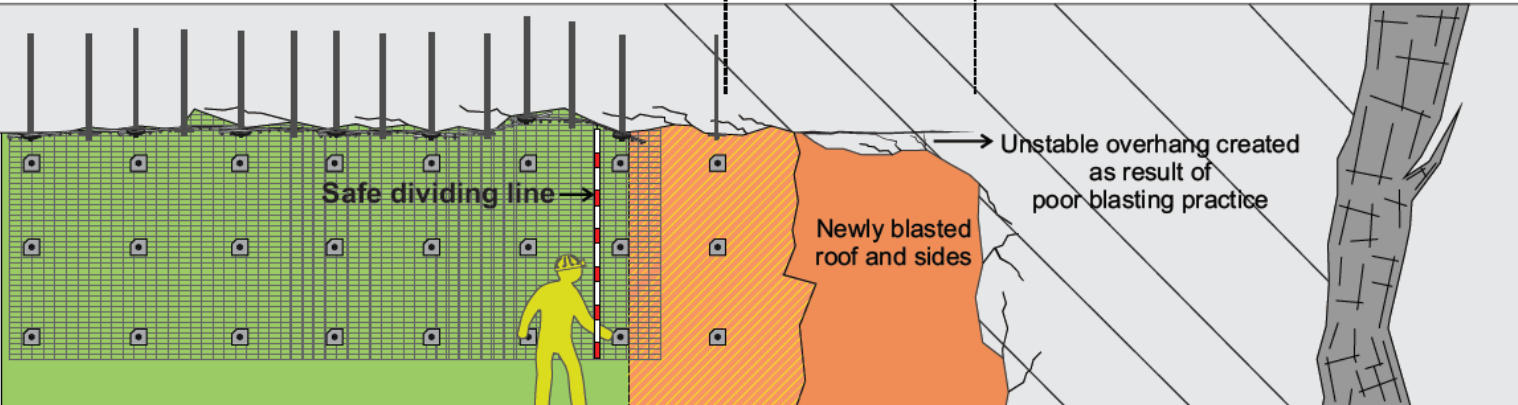


2.5 m

Safe dividing line

Unsupported face

**Post-blasting**



Unsupported

Safe dividing line

Newly blasted roof and sides

Unstable overhang created as result of poor blasting practice

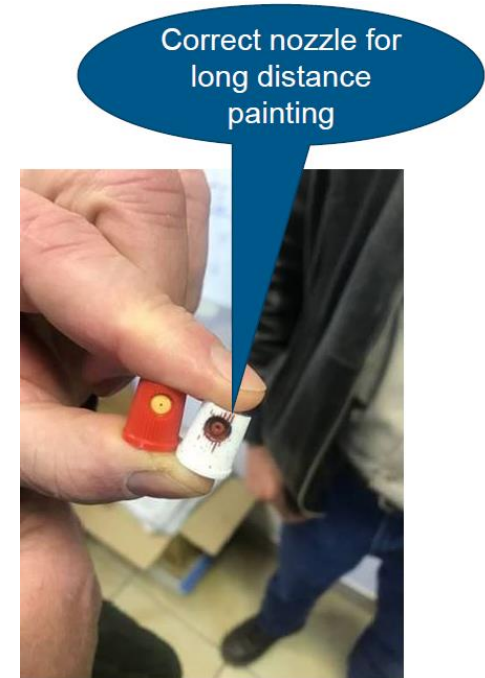
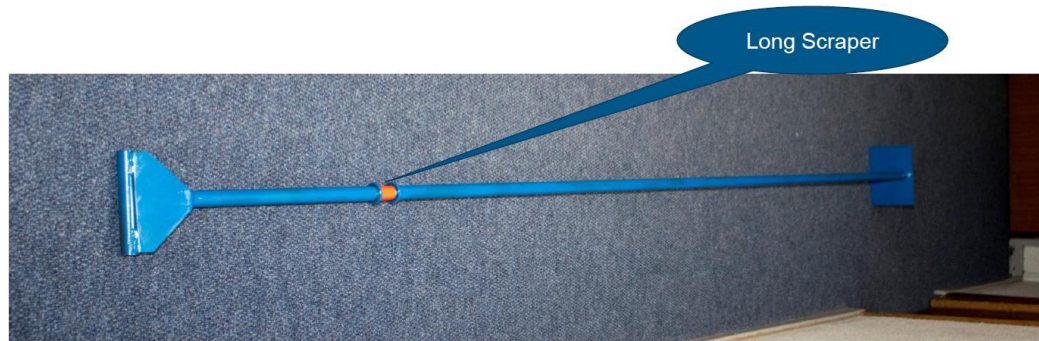
**Support must be to standard prior to each blast.**

**No person on foot shall be allowed closer than 2.5 m from the working face or past the 2nd last line of support, which ever is furthest, without an approved barrier. Includes charge up cage / Bolter canopy**



# Blasting face protection – Enable remote activities

- Flexible and extendable charging sticks
- Spray paint extender and long distance spray nozzle
- Long scraper to allow cleaning of bottom holes



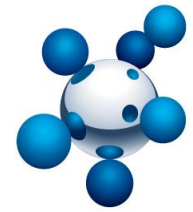
# Thin Skin Liner (TSL) – For rehabilitation of back area



- Weathered and deteriorated roof skin in the belt road prior rehabilitation.
- Limited access for rehabilitation and re-support due to belt and props

- TSL applied as temporary barrier to create safe working area for re-supporting with handheld drills





**SASOL**

**Training**

## safety alert

### FALL OF GROUND - OVERHANGS

Always focus on pillar corners especially where triggers are present such as: Joints, Steps, Overhangs and Scaling Corners

Corner support is for massive wedges and should not give false security that failure between bolts CANNOT occur!

**Remain FOCUSED on inspection and safe making of corners!**

#### STOP and FIX options for overhangs:

**1. Remove**

Bar down

Bump down

Cut down

**2. Support**

Install spot bolt

Install mesh

**3. Demarcate**

Hang reflective sticks to create awareness!!

**REMEMBER!**

- Walk in the middle of the road away from corners as far as possible
- Never sit or lean against the sidewall
- Do focussed inspections before taking up a work position near corners

## LIFE SAVING RULES

I choose to comply with our Life Saving Rules

### FALL OF GROUND ROOF AND SIDES

**Commitment to myself and my team members:**

- I will protect myself and my team (MHSA Section 22 and 23)
- I will remain in an area that is declared safe
- I will apply Fall of Ground SLAM where triggers are present

**Because I C.A.R.E.**

### Critical Controls - Why and What?

Unwanted Event	Cause	Critical Control
 Skin failure	Poor cutting discipline Poor safe making	Cut roof clean SLAM and Bar down
 Beam failure	Cutting too wide and deep Late support Water in the roof	Adhere to Doc 3 FOG TRAP
 Sidewall failure	Unsupported Slips/Corners Poor cutting discipline Corner bolts	FOG SLAM

### Consequence of Critical Control Failure

**Critical Controls are non negotiable and must be complied with 100%!!**

## LIFE SAVING RULES

I choose to comply with our Life Saving Rules

### FALL OF GROUND ROOF AND SIDES

**Commitment to myself and my team members:**

- I will protect myself and my team (MHSA Section 22 and 23)
- I will remain in an area that is declared safe
- I will apply Fall of Ground SLAM where triggers are present

**Because I C.A.R.E.**

### Apply FOG SLAM

Fall of Ground Stop Look Assess Manage

#### Stop and Look

**Yellow Triggers**

We can fix this

**Red Triggers**

We need assistance

#### Assess and Manage

**We Stop and Fix**

Stop	Assess	Manage
1. Stop work immediately if you observe any of the following: <ul style="list-style-type: none"> <li>• Poor cutting discipline</li> <li>• Poor safe making</li> <li>• Late support</li> <li>• Water in the roof</li> <li>• Unsupported Slips/Corners</li> <li>• Poor cutting discipline</li> <li>• Corner bolts</li> </ul>	1. Assess the situation and determine the level of risk. <ul style="list-style-type: none"> <li>• If the risk is high, stop work immediately and report the situation to your supervisor.</li> <li>• If the risk is low, you may continue to work, but you must remain alert and ready to stop work if the situation changes.</li> </ul>	1. Manage the situation by taking the necessary actions to eliminate the hazard or reduce the risk to a safe level. <ul style="list-style-type: none"> <li>• If you are unable to manage the situation, report it to your supervisor.</li> </ul>

**We Stop, Fence and Report**

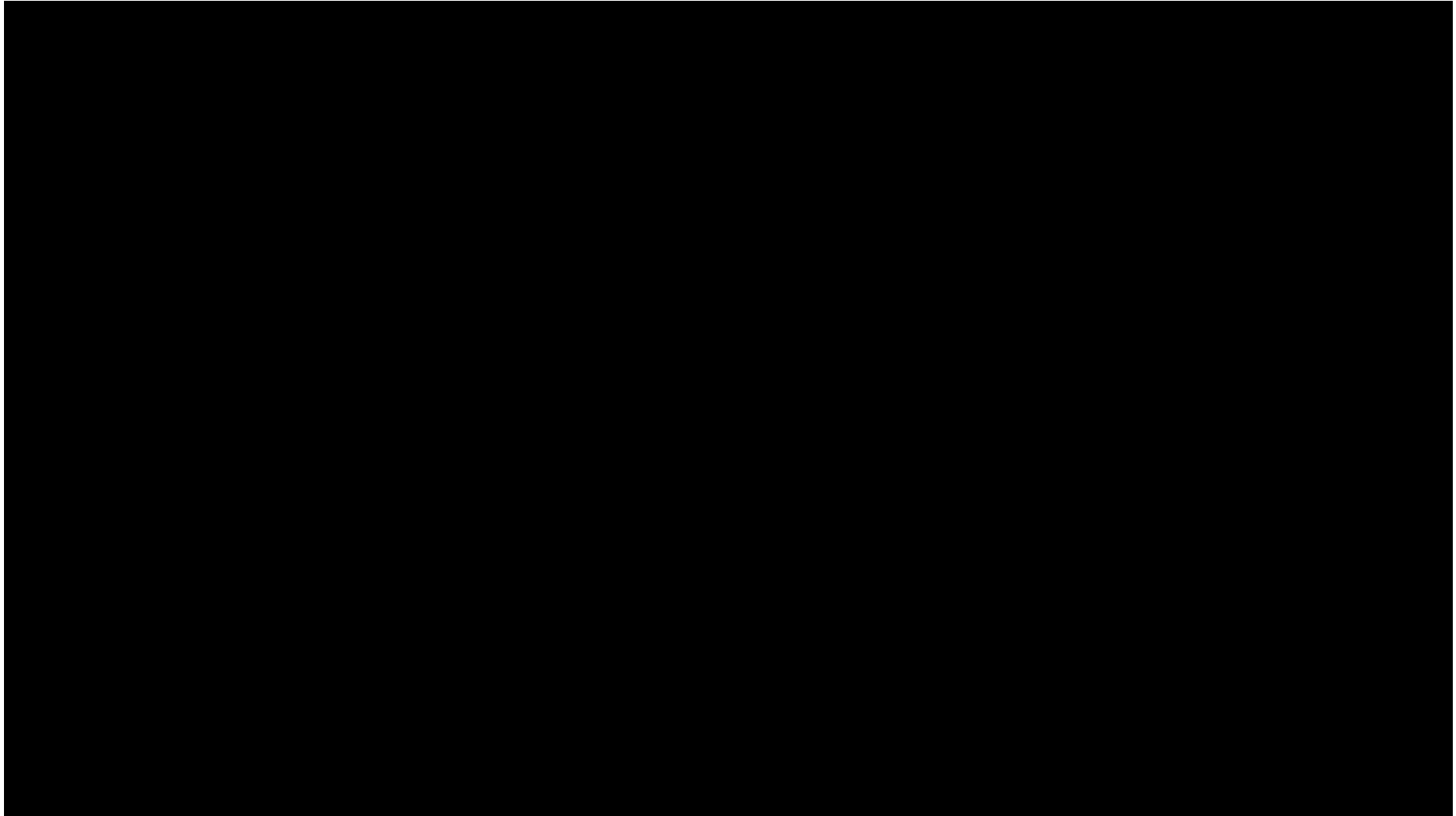
Stop	Assess	Manage
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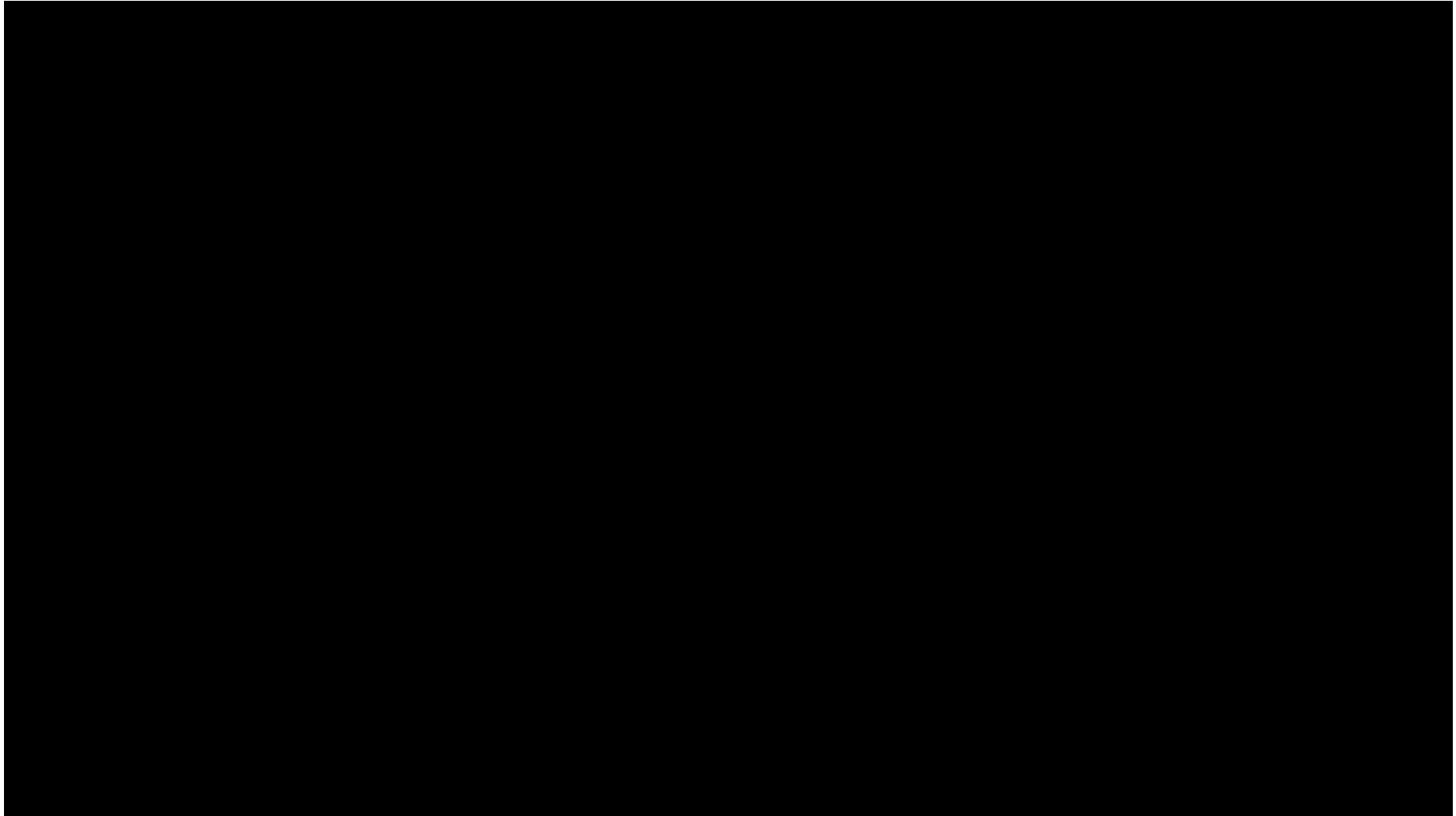
**Know when to Report!!**

# Mock Mine and Training facility



➤ Mine simulation built to train risk identification and facility explaining FOG management system





# Questions?