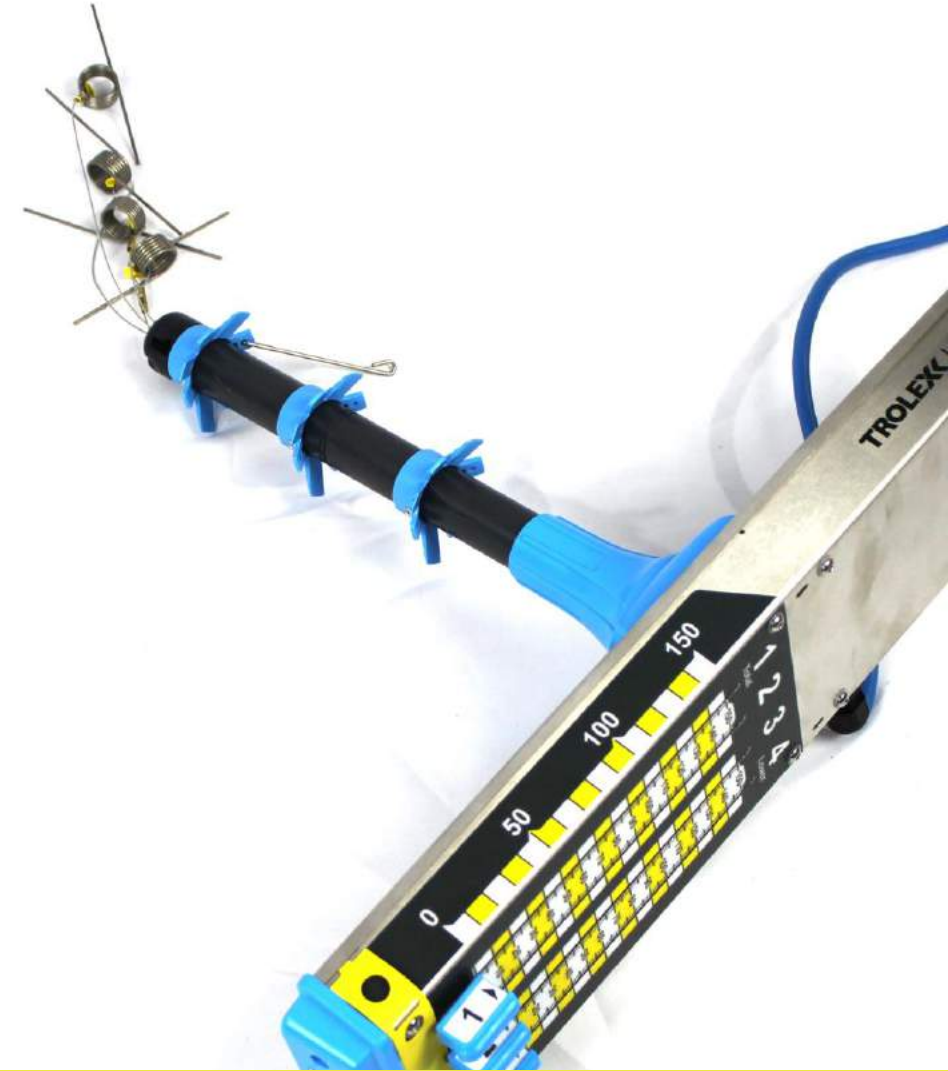


RockMonitor XR / XM

Product Overview

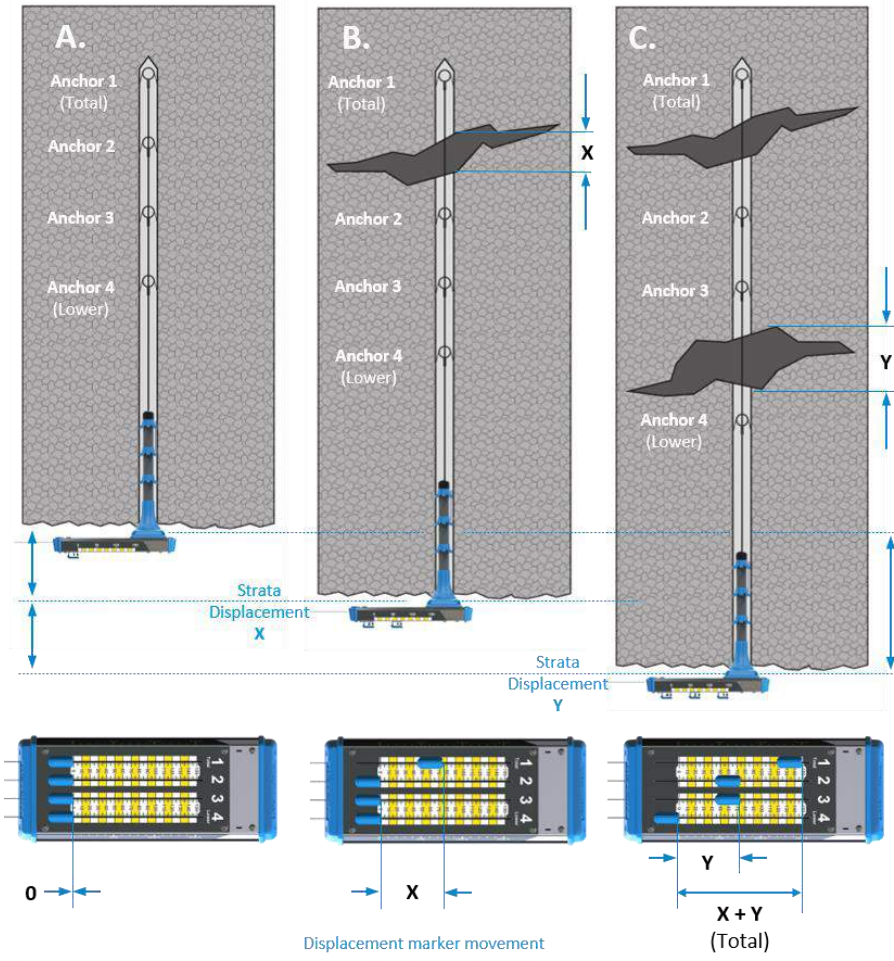


- Rockfalls remain a major cause of injury and fatalities in underground mining with around **40% of all fatalities** attributed to falling rock
- **Reliable monitoring** is a key element of any ground control strategy
- Trolex|Nome offers a range of telltale monitoring solutions from simple, reliable, low-cost mechanical telltales, high visibility auto-warning telltales through to fully networked, mine-wide remote monitoring solutions
- This presentation will introduce the telltale measurement concept with a focus on **continuous, mine-wide remote monitoring** using the RockMonitor XR system
- Continuous monitoring has been proven to provide the **highest levels of safety and efficiency** for mining operations

Mechanical Telltales

Strata Monitoring

TROLEXX | NOME



Leading Safety Technology

Limitations of Manual Inspection

RMXM Strata Monitoring

TROLEXX | NOME

Whilst mechanical telltales provide a simple low-cost means for visually monitoring strata displacement, manual inspection has a number of limitations:

- Time consuming
- Limited accuracy
- Error prone
- Manual data entry into software
- Delayed data analysis
- Difficult to accurately identify trends
- Not possible in restricted and inaccessible areas



Chinese coal mine roof collapse in Shaanxi kills 21

13 January 2019



Threat of closure best tool to urge roof safety in N.S. coal mine: Minister

'Fines of \$2,000, \$20,000 and \$200,000 a lot of time are a drop in the bucket for some companies'

BY MICHAEL TUTTON (THE CANADIAN PRESS)

WWW.COS-MAG.COM

China coal mine rescue: 18 miners remain trapped after two killed in tunnel collapse

Rescuers free two workers following the rock burst 'explosion' in Shandong province

Peter Stubleby | Sunday 21 October 2018 19:21 | 21 shares |



Like Click to follow The Independent



Utah Miner Killed After Roof Collapses at Nevada Gold Mine

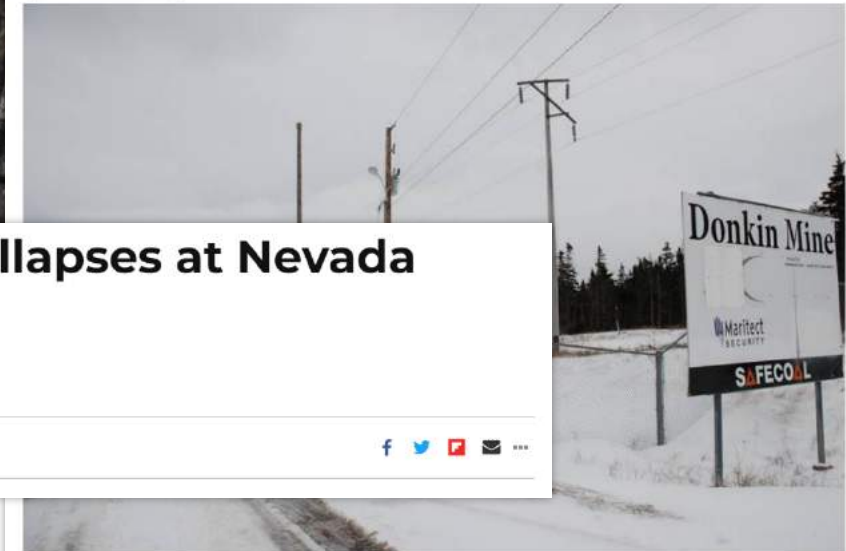
A Utah miner died after a roof collapsed at a Nevada gold mine.

Oct. 27, 2018, at 3:58 p.m.



Cape Breton coal mine cited for breaking reporting rules in 'massive' cave in

Canadian Press
Published: Feb 05 at 10:23 a.m.
Updated: Feb 05 at 1:34 p.m.



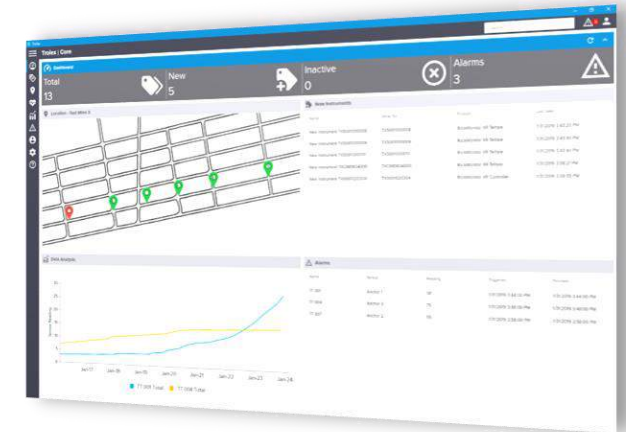
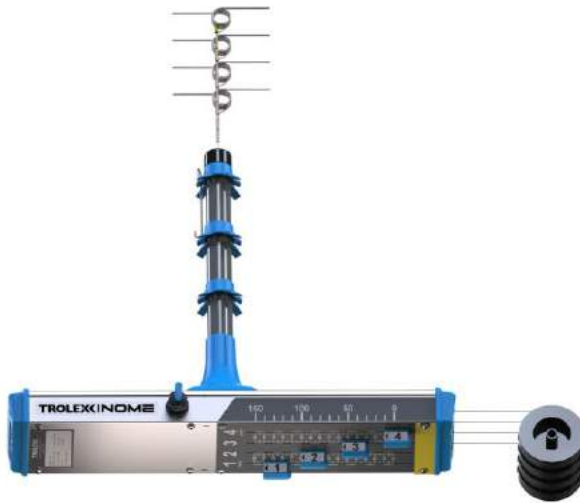
The gates leading to the Donkin mine are shown in this file photo. - Cape Breton Post

At least 21 miners
China, officials say

- Real time monitoring of critical areas provides early indication of strata movement to prevent a fall of ground event
- Remote reading telltales are the safest way to monitor and manage ground conditions

Type	Cost
Clean up and bolt up	\$200,000
Spiles and backfill	\$1,000,000
Cost of production loss	\$1,000,000 per day
Loss of equipment	\$5,000,000
Injury / loss of life	Priceless

» NEW ROCKMONITOR XR SYSTEM



RockMonitor XR Telltale

Robust, accurate monitoring of strata displacement with up to four measurement points

RockMonitor XR Controller

Collects and stores data from the telltale network and communicates information back to a surface PC or server

RockMonitor XR Reader

Battery powered installation and maintenance tool for quick and reliable system setup. Includes data logging capability

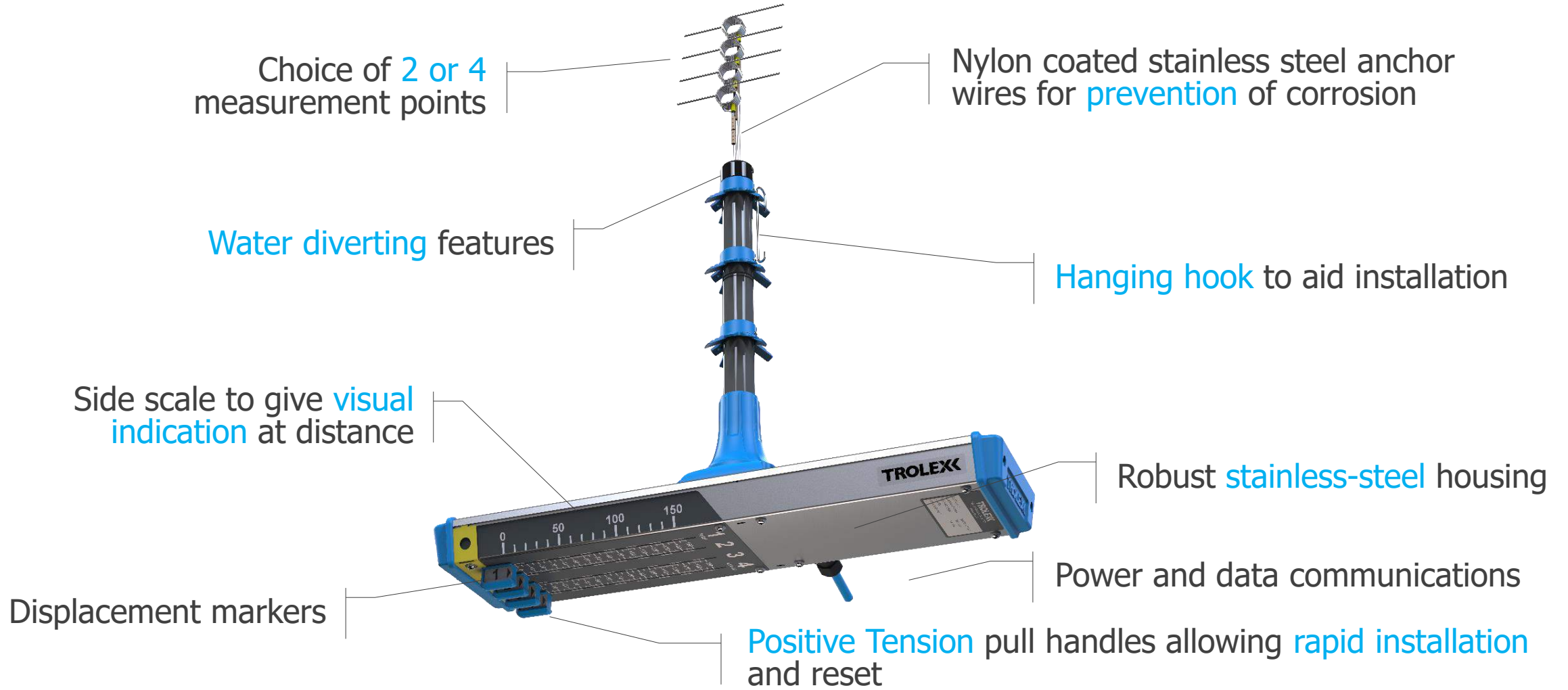
Core Software

Easy to use application software with powerful features for alert configuration, data display and system monitoring

RMXR Remote Telltale

RMXR Features

TROLEXX | NOME



<https://www.youtube.com/watch?v=VebsxyNwRZc>

- Plot telltale positioning on a **GIS map** for improved safety and monitoring
- Get **real-time information** on system status and strata movement
- Fully **configurable alarms** and **automated alerts**
- Easily integrate with central SCADA systems

Trox | Core

YELLOW TARP TOTAL MOVEMENT

Alarm: YELLOW TARP TOTAL MOVEMENT
Device Name: MG605 A HDG 30 5CT TT138

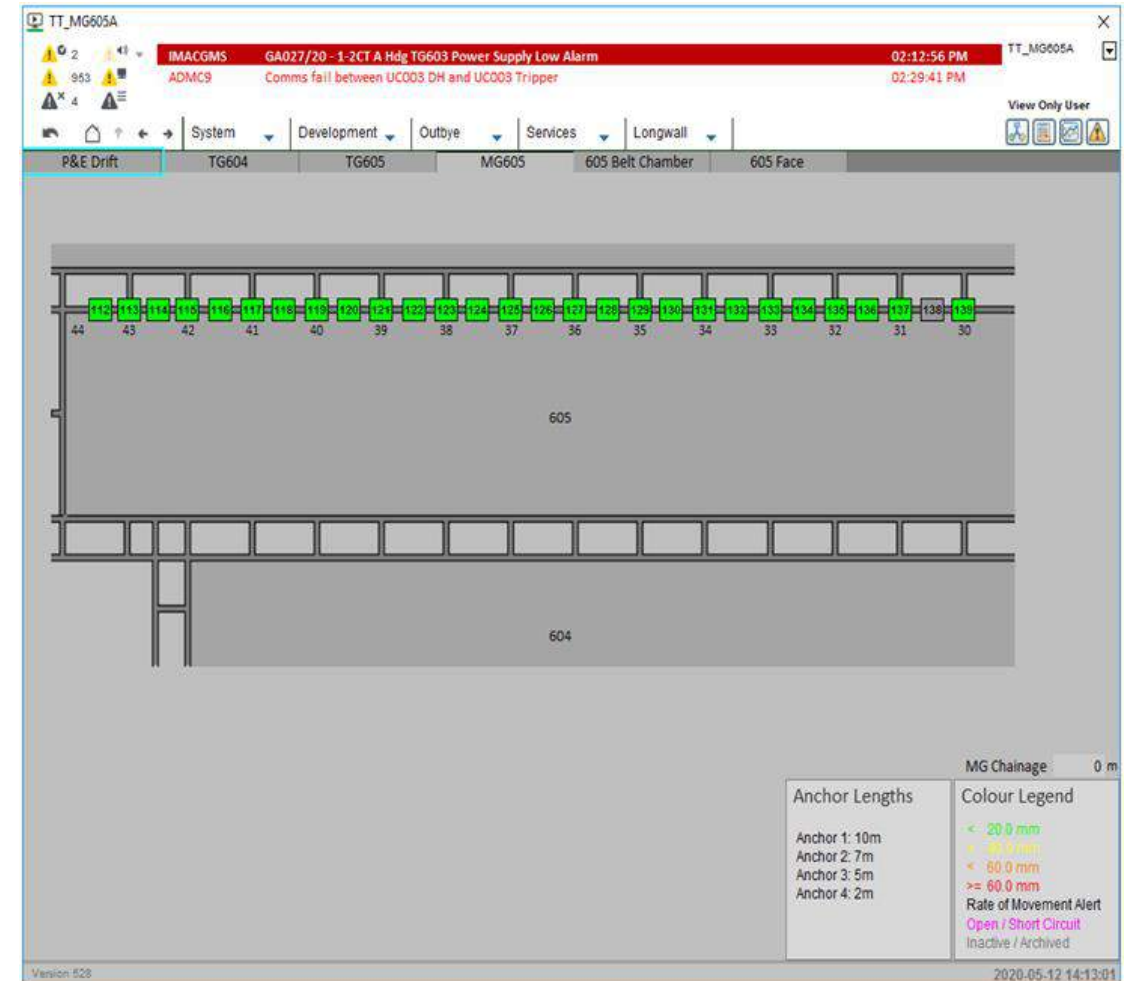
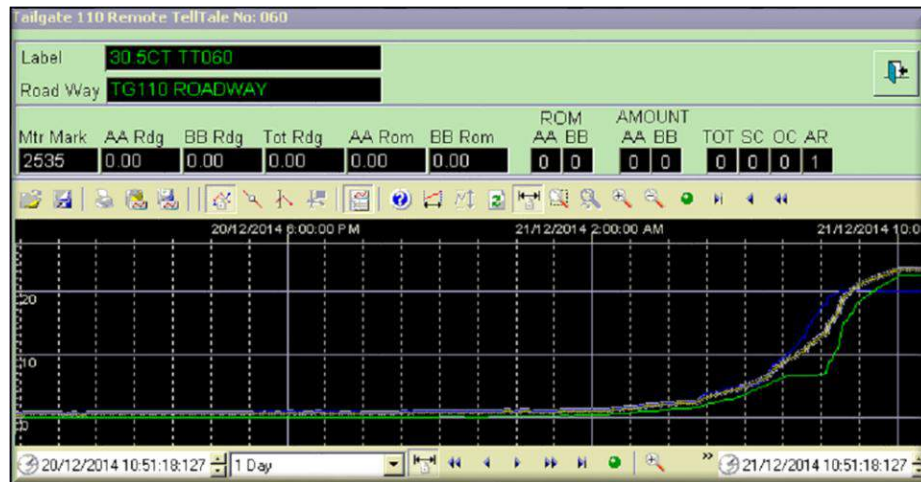
Location: MG605
Anchor 1: 15.1mm

Device Readings
Anchor 2: 15.5mm
Anchor 3: 17.5mm
Anchor 4: 0.3mm
Temperature: 25.2Deg C
Current: 5.1mA
Supply Voltage: 13.8V
A1ROM: 9mm/1hr
A2ROM: 9mm/1hr
A3ROM: 0mm/1hr
A4ROM: 0mm/1hr

Nome Services Pty Ltd, 23 Taree Street, Bundeigh Heads, QLD, Australia, 4220
Email: admin@nomeservices.com.au
Tel: +61 (0) 756 481 315



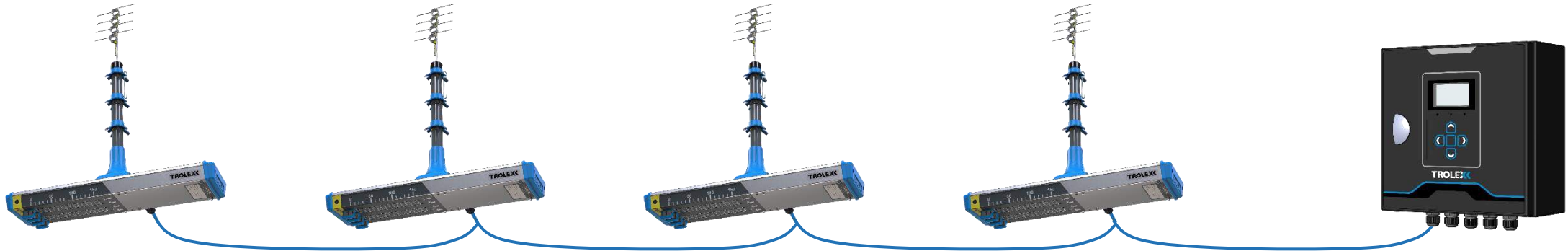
- Available on any console or tablet running SCADA
- Live alerts and historical trending
- Is easily integrated with existing database software
- Ability to tailor reading frequencies and trigger levels to each site/mine area



Benefits of Remote Monitoring

RMXR Strata Monitoring

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Enhance Safety

Automated alerts and advanced warnings allow mining operations to take early action, often many hours before the data from manual inspection

Improve Efficiency

Increase operational up time by reducing the need to shut down for manual inspections. Minimize the need for manual data collection

Optimise Bolting

Analyse detailed data to gain insights regarding the effectiveness of roof support strategies. Use accurate information to avoid under or over-bolting

Reduce Standing Support

Use continuous accurate real-time monitoring to safely reduce the amount of standing support required. Significantly reduces incidents/injury through a reduction in manual handling and installation

Drifts/Tunnel Monitoring
Gate-roads
Faceline Monitoring
Life of Mine Roadways
Longwall Operations
Development Operations
Bord and Pillar Operations
Civil Projects

There are currently 1000's of RockMonitor instruments installed in multiple operations across Australia, USA & Canada.

Along with trials approved in Russia, India for 2021

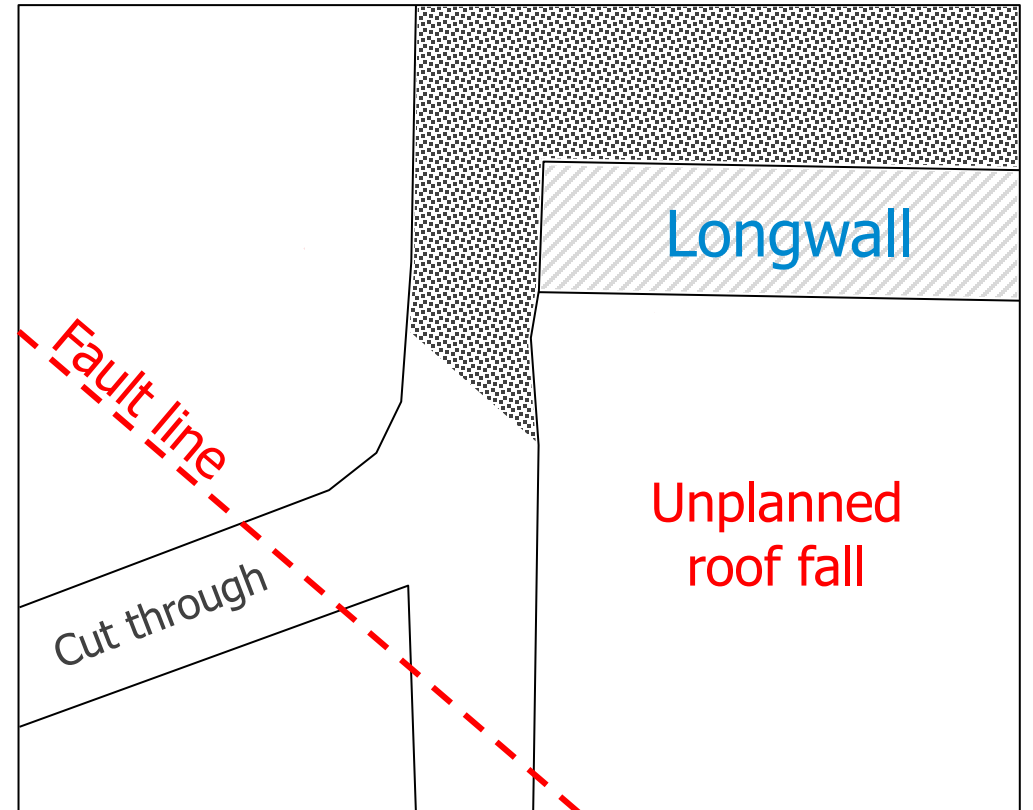
Case Studies

RockMonitor XR / XM

Predicting Roof Collapse

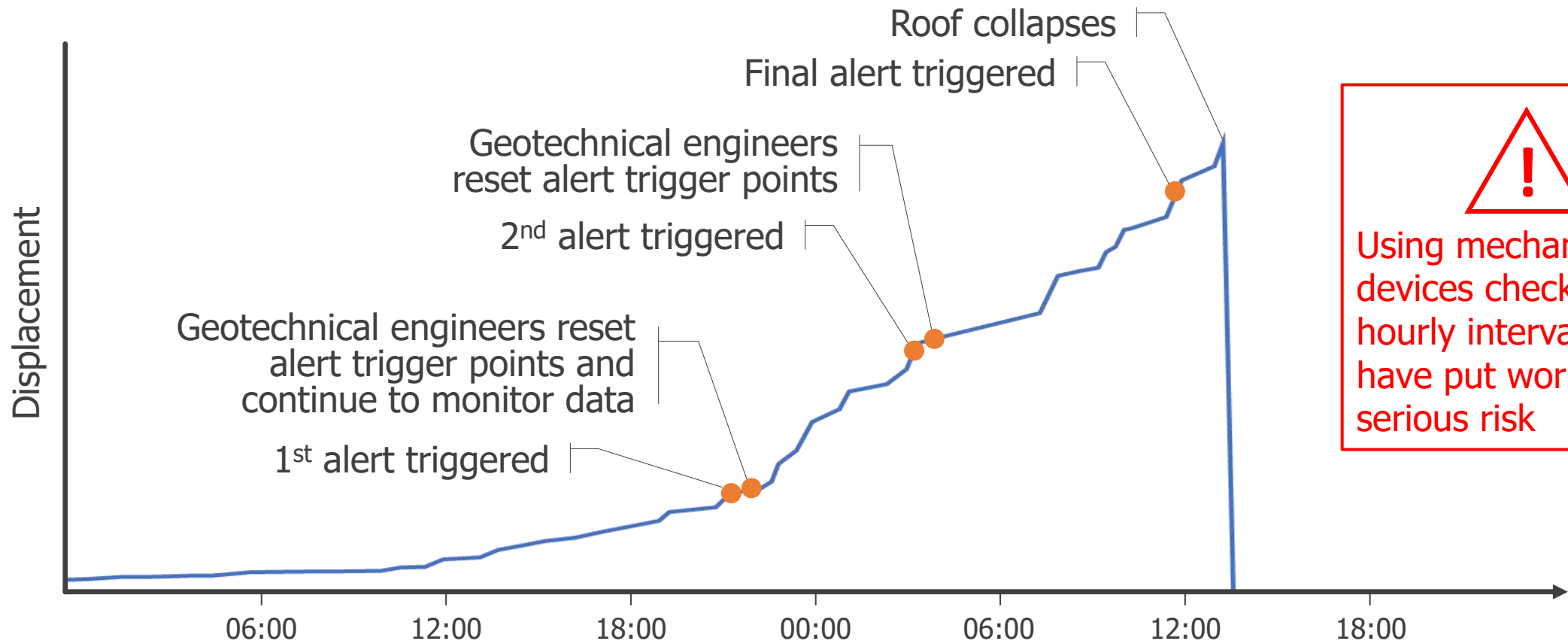
Strata Monitoring


- The existing RRTT telltale system has been proven to give advance warning prior to roof collapse
- **In all instances workers were safely evacuated**
- Automated alarms gave early warning of abnormal movement alerting key staff via e-mail
- Continuous, accurate, remote monitoring allowed intelligent decisions to be made
- Impact of the unplanned falls were minimised



Predicting Roof Collapse

Strata Monitoring

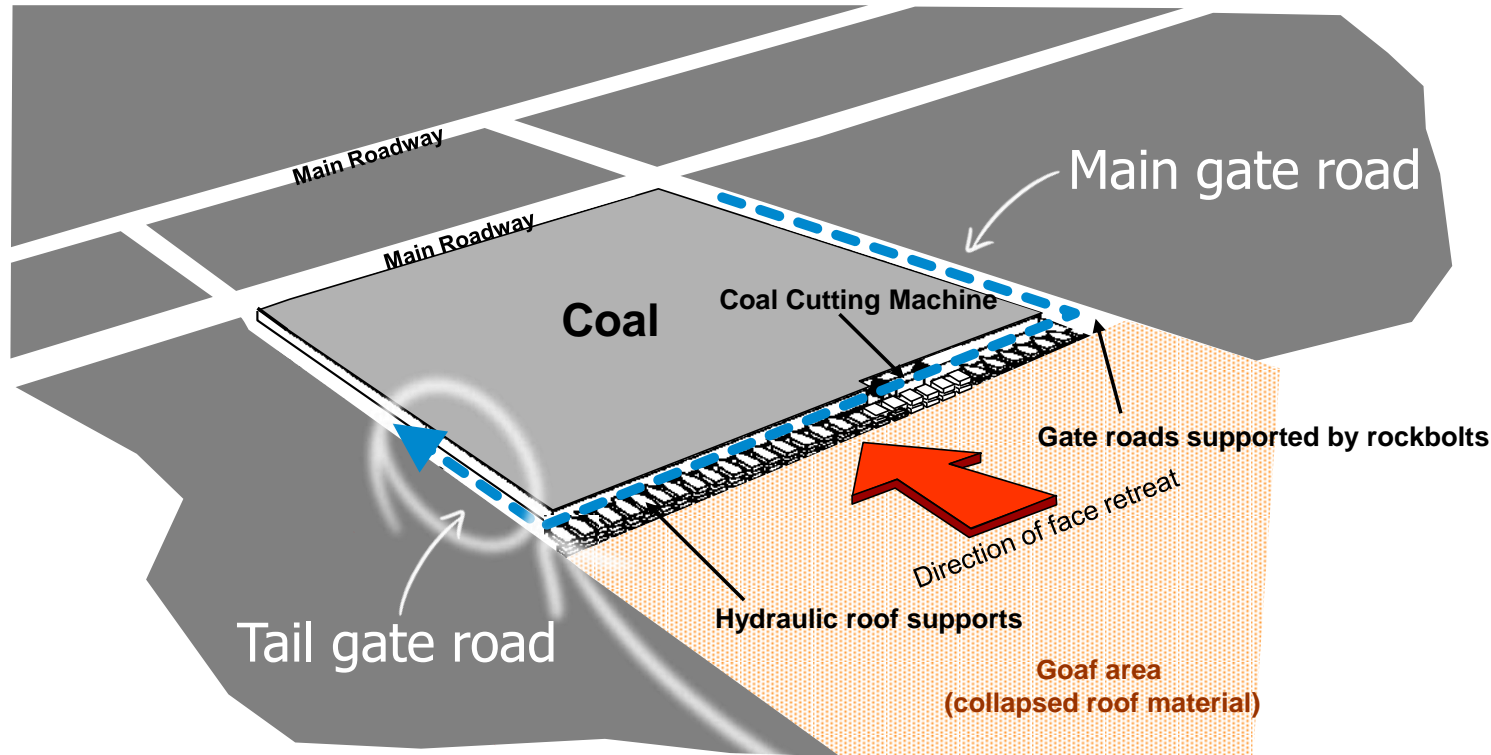



Using mechanical devices checked at 8 hourly intervals could have put workers at serious risk

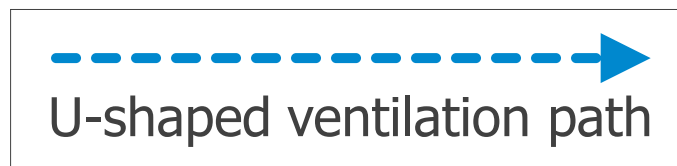
Longwall / Tailgate Reducing Standing Support

Strata Monitoring

TROLEXX | NOME



- Longwall tailgate application
- Part of continual drive for 'zero harm'
- 100m 'outbye' area in tailgate inaccessible ~90% of time
- Aim to dramatically reduce the need for standing support
- Time is money



Leading cause of injury and incident was having to erect support (cribs) to prevent strata control problems

Longwall / Tailgate Reducing Standing Support

Strata Monitoring

TROLEXX | NOME



*Link 'n' Lock wooden cribs

49%

reduction in standing supports through greater spacing (data collection and analysis)

25%

Increase in up-time each maintenance shift

4%

Increase in production rates per day

65%

Reduction in injury/incident reports

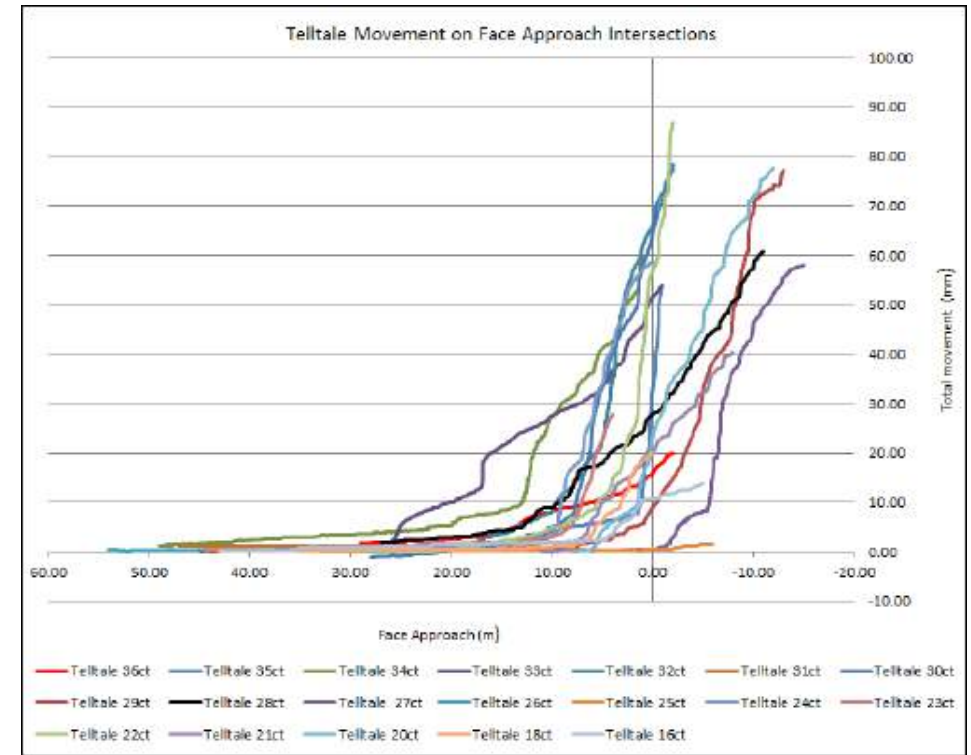
Optimising TARP Triggers

Strata Monitoring

Real time data provides geotechnical engineers valuable insight into:

- Roof stability in front of longwall face
- Effects of changed stress orientation
- Effects of coal mine roof rating
- Movement by horizon
- Acceleration rates

Using this information in combination with total movement in relation to the longwall face position, can be used to establish baseline roof movement behaviour and help develop appropriate TARP triggers.



RRTT device (ct)	Total Movement (mm)	Movement by Horizon (mm)			
		0 - 1.5m	1.5 - 3.5m	3.5 - 5.5m	5.5 - 8.0m
20ct	97	49	20	22	0
19.5	150	44	52	43	10
19	-	-	-	-	-
18.5	150	48	76	26	0
18	-	-	-	-	-
17.5	150	101	33	16	0
17	14	9	4	0	0

- Remote monitoring provides significant benefits vs. manual checking, including a dramatic increase in safety
- Trolex|Nome strata monitoring systems have been **proven** in some of the world's largest mines
- Collection and processing of detailed and accurate data allows standing support and bolting strategies to be optimised safely
- Efficiency improvements gained through increased up-time and reduced manual checking can provide significant savings

Continue the Automation Journey!

- SMART junction box being designed and certified to allow for automated disconnection and in conjunction with remote operating centres
- Bond University collaboration to incorporate machine learning
- Predictive TARPS for proactive not reactive planning
- Proximity detection included for elimination of personal out of areas when trigger points reached

Thank You

Questions?