

# Survivable Leaky Feeder Communication System

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# Objective

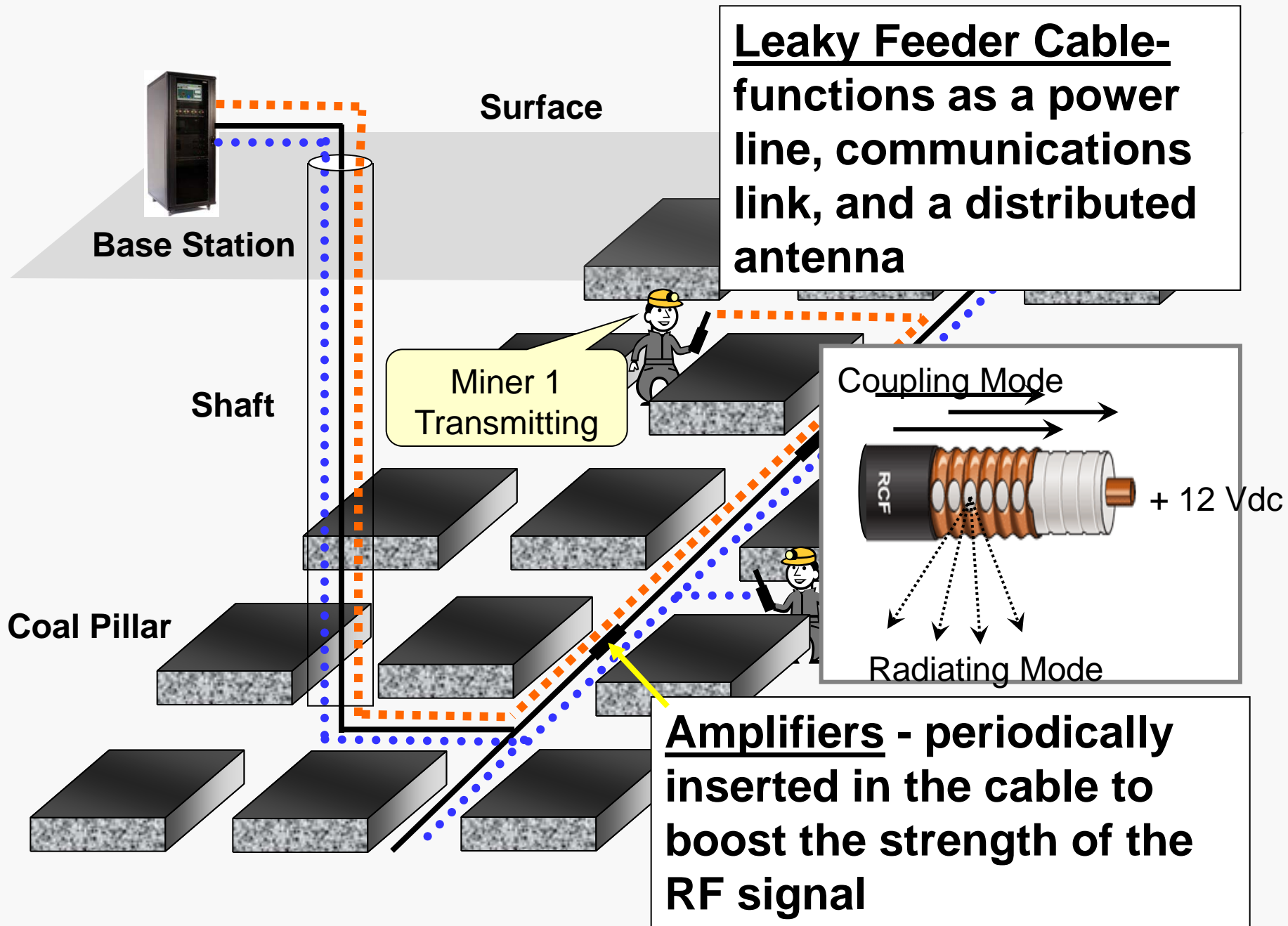
- **Start with a robust and demonstrated technology – Leaky Feeder**
  - used in mines since the 1980s
  - several vendors selling systems to mining industry
- **Investigate approaches to make Leaky Feeder more survivable**
- **Develop hardware and demonstrate technology in-mine**



# Pillar proposed using the Becker UHF leaky feeder system as the base system

– Consol Energy Loveridge Mine

LOVERIDGE MINE  
MIRACLE RUN PORTAL

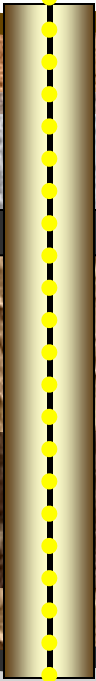




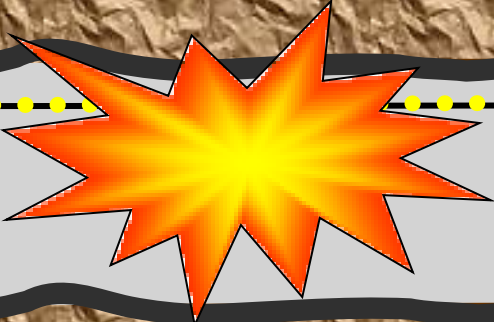
**Base Station**



**Elevator Shaft**



**Leaky Feeder**



# Approaches for Survivability

- **Hardening**

- Measures to improve the ability of communication system parts or components to survive mine incidents.

- **Redundancy**

- Changes to the communication system design or implementation that allow it to continue functioning after a mine incident has caused part of the system to fail.

# Hardening

- Cable Installation Methods
  - j-hooks, latch-back hooks, cable ties with PVC spacers, and rope hangers
- Stress Relief
- Leaky Feeder Cable Covered/Buried
  - Covered with gunite
  - Buried in floor
- Component Fire Protection
- Cable in Conduit, Integrated Messenger with Cable
- Explosion tests

# Redundancy :

- Dual-base station loop linkage
- Independent cables run in parallel entries
  - Coverage extension using antennas and low-cost cable



# Approach 1 - Redundant loop

Secondary Base Station

Primary Base Station

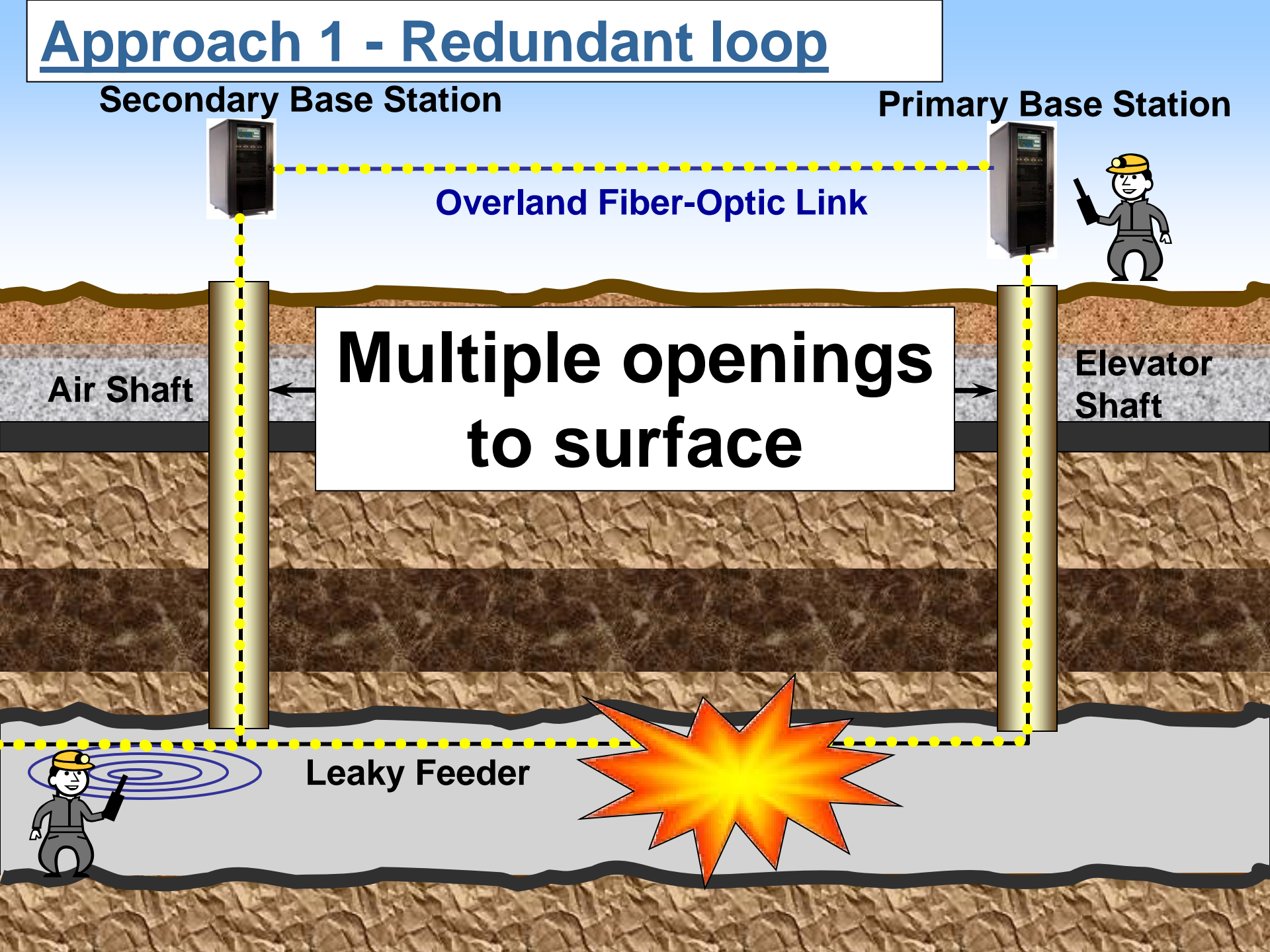
Overland Fiber-Optic Link

**Multiple openings  
to surface**

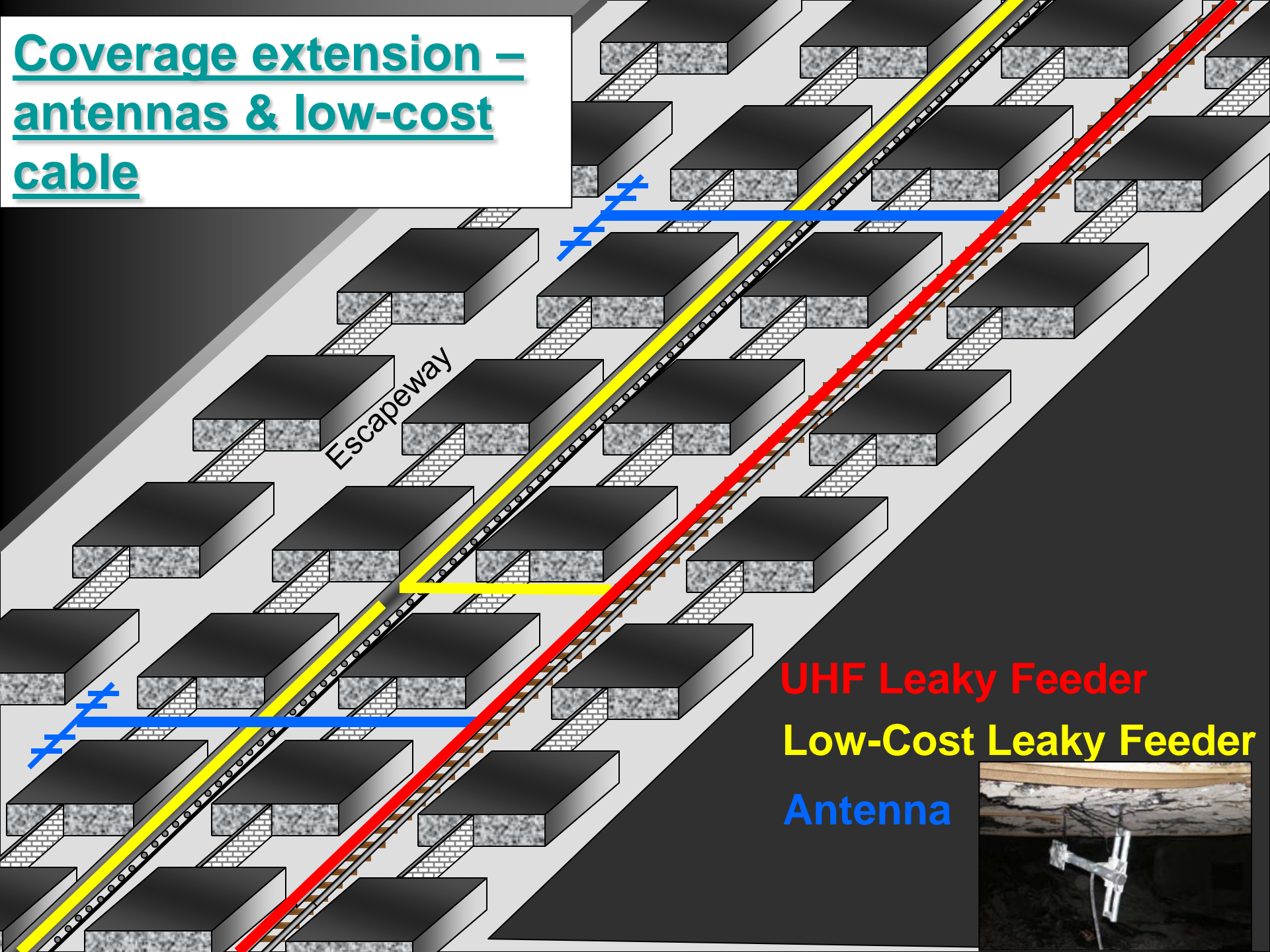
Air Shaft

Elevator Shaft

Leaky Feeder



# Coverage extension – antennas & low-cost cable



UHF Leaky Feeder

Low-Cost Leaky Feeder

Antenna



# Approach 2 — Independent Leaky Feeder Cables in Parallel Entries

Base Station



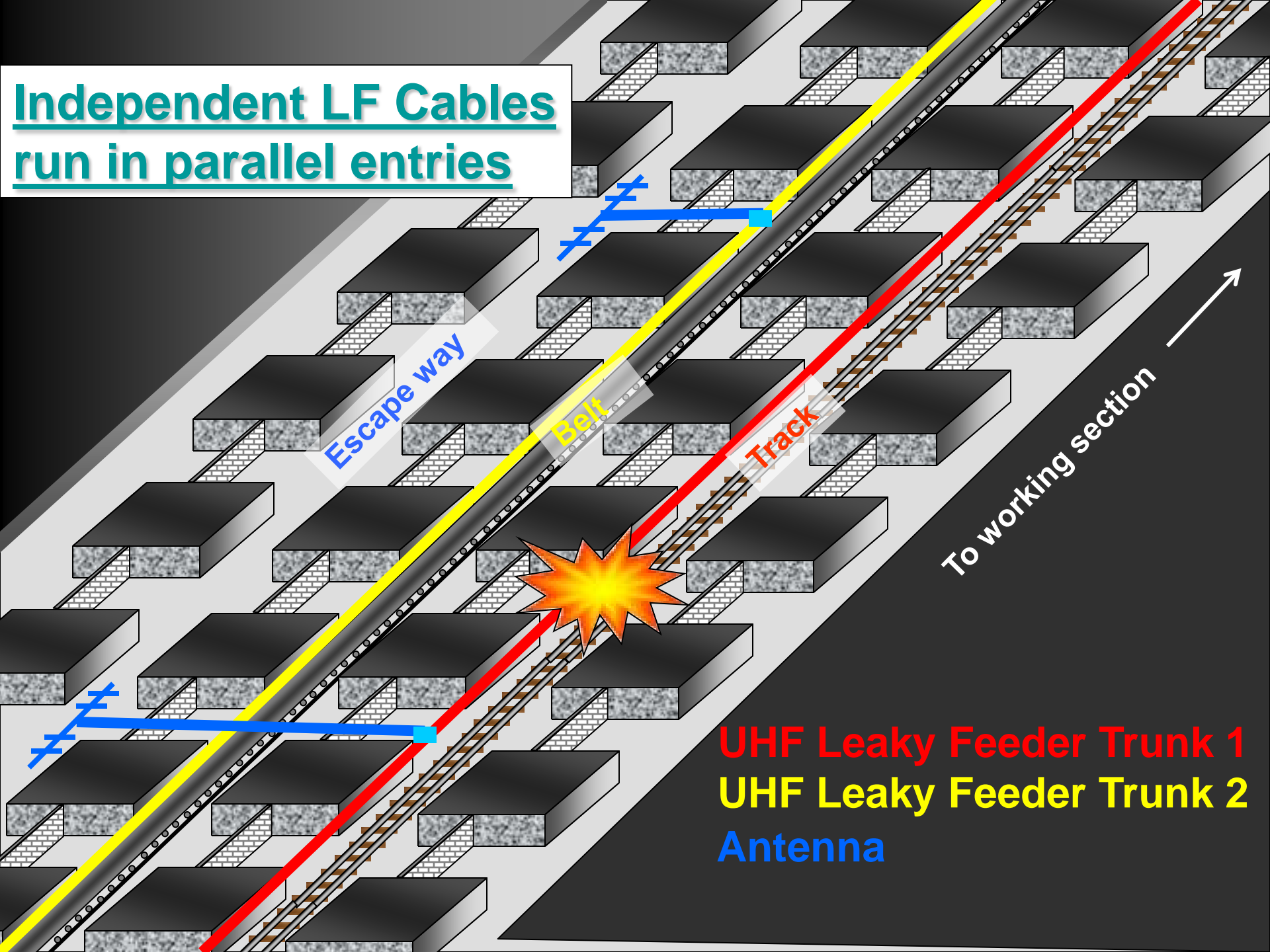
Elevator  
Shaft

From most inby opening  
to the surface to working  
section

Leaky Feeder Trunks 1 & 2



Independent LF Cables  
run in parallel entries



Escape way

Belt

Track

To working section

UHF Leaky Feeder Trunk 1  
UHF Leaky Feeder Trunk 2  
Antenna





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# Questions?

