



Underground Communication and Tracking Systems



20 Years
of
Mining Innovation

www.minesite.com.au

Australia: Sydney-Kalgoorlie-Mt Isa-Mackay

Canada: Sudbury

USA: St Louis



Our mission

Enhancing Safety and Production

Via

- **Specific communication technologies and devices designed for the mining industry**
- **Safety enhancements through use of communication technologies**
- **Process control through the use of these technologies**
- **Systems designed to a more stringent standard for the mining industry I.E. Cell Phones.**

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MST is the global leader in underground communications

- **PED** – a text message system to every miner underground
- **TRACKER** – a system to track location of people and equipment in zones
- **ICCL** – integration of PED and Tracker into a light weight cap lamp battery
- **ImPact** – wireless technologies.
- **VDV Leaky Feeder Radio** - two way voice radio system



Over 250 clients in 5 Continents

Canada:

3 ImPact Systems
 12 PED/BlastPED Systems
 3 VDV System

Sweden:

1 PED System

Mongolia:

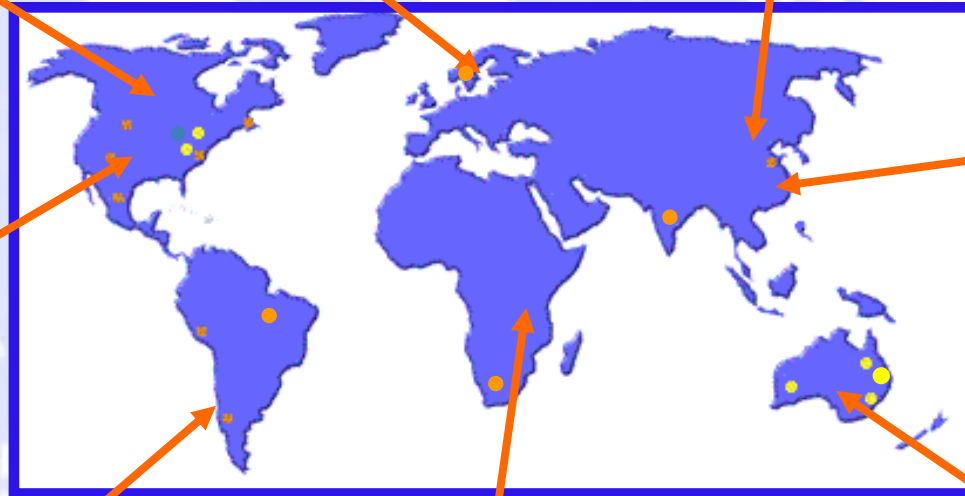
1 ImPact System

United States:

2 ImPact Systems
 20 PED Systems
 2 BlastPED Systems
 10 VDV Systems

China:

15 PED Systems
 4 TRACKER Systems



Australia:

3 ImPact Systems
 72 PED Systems
 55 VDV Systems
 40 BlastPED Systems
 4 TRACKER Systems

Chile:

2 VDV Systems
 1 BlastPED System

Tanzania:

3 BlastPED System

● MST Office

● MST Distributor



Some of our Valued Customers Include:



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Personal Emergency Device®

- **Following Moura 1986 explosion, 12 fatalities.**
- **Underground infrastructure destroyed.**

- **Development started in 1987**
- **Review of previous research**
- **Fire evacuation notice. Sunshine Mine, Kellogg, Idaho
May 2, 1972 - 91 Killed**

- **Contact U/G-- with surface antenna, text had more usefulness**

- **Commercially available 1990**
- **MSHA approved June-1991**

- *COMMUNICATIONS during a mine emergency are a critical part of fire fighting and evacuation activities. A successful evacuation or fire fighting operation is dependent on the quality of the information that is communicated.*
The sooner miners are notified of a problem, the greater the chance of escape and/or fire fighting activities can begin.

TIME IS NEVER YOUR FRIEND

U.S. Department of Labor Mine Safety and Health Administration



*P*ersonal *E*mergency *D*ivce[®]

ULF Mine Wide Text messaging system

➤ **Safety:**

- **Mine Wide Warning.** (Is not limited to line of sight)
- **Everyday communication tool.**
- **Custom text messages detail hazard, evacuation route, update situation, etc.**
- **Remote, surface blast initiation.**

➤ **Productivity:**

- **Contact personnel wherever they are in the mine.**
- **Efficiency through remote control of fans, pumps etc.**
- **Effective remote blast initiation.**



PED Receiver - from "Add ON" to Integration

1989 Prototype Receiver



1990 BeltPED 1 – 3.2 kg



1992 BeltPED 2 – 3.1 kg



**2 – Way
2007-2008**

2005 ICCL – 0.8 kg



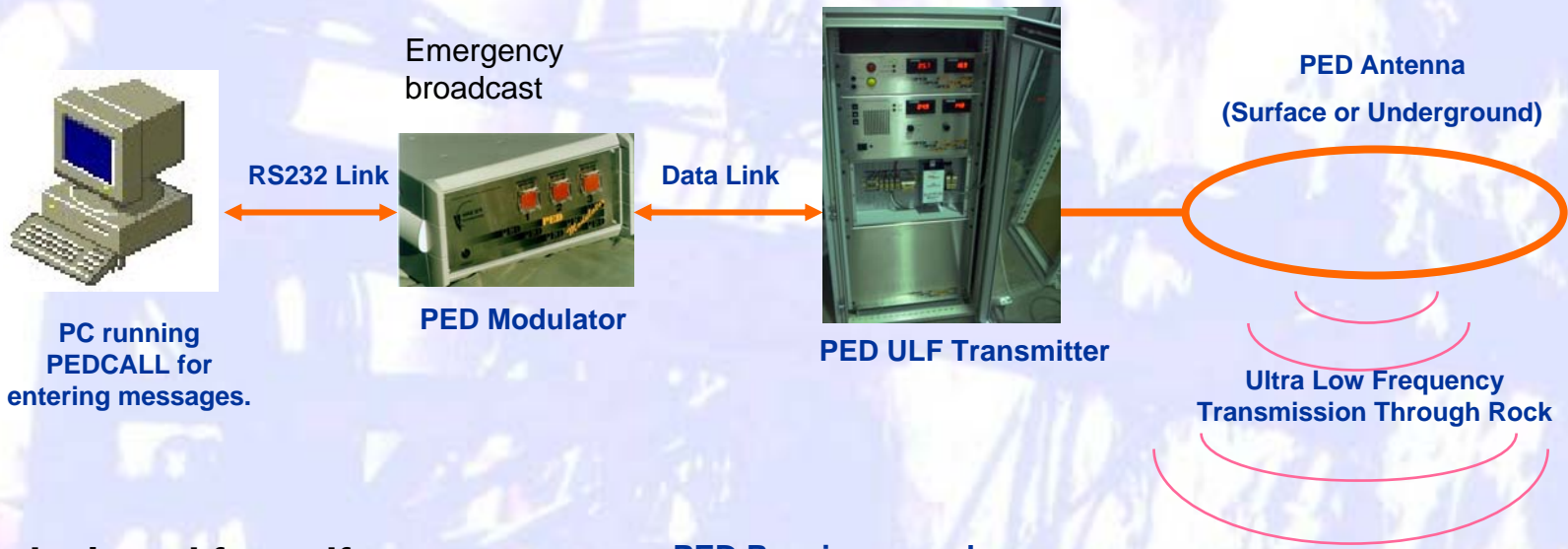
1995 BeltPED 3 – 2.4 kg



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PED[®] Operation Schematic

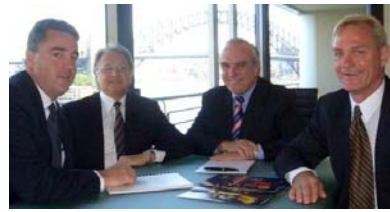


System designed for self-diagnostics, ground fault, open antenna, lighting etc.

PED Receivers can be:

- **ICCL** Personal Receiver (shown)
- **AutoPED** Vehicle Receiver
- **ControlPED** for Equipment Switching
- **BlastPED** for Remote Blast Initiation





BeltPED[®] Top

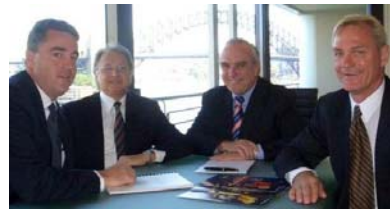
Push button to
Light up Display or
Recall Stored
Messages

Push Button Lights
Display so time can be
read, after 5 seconds
the last message
received is displayed.

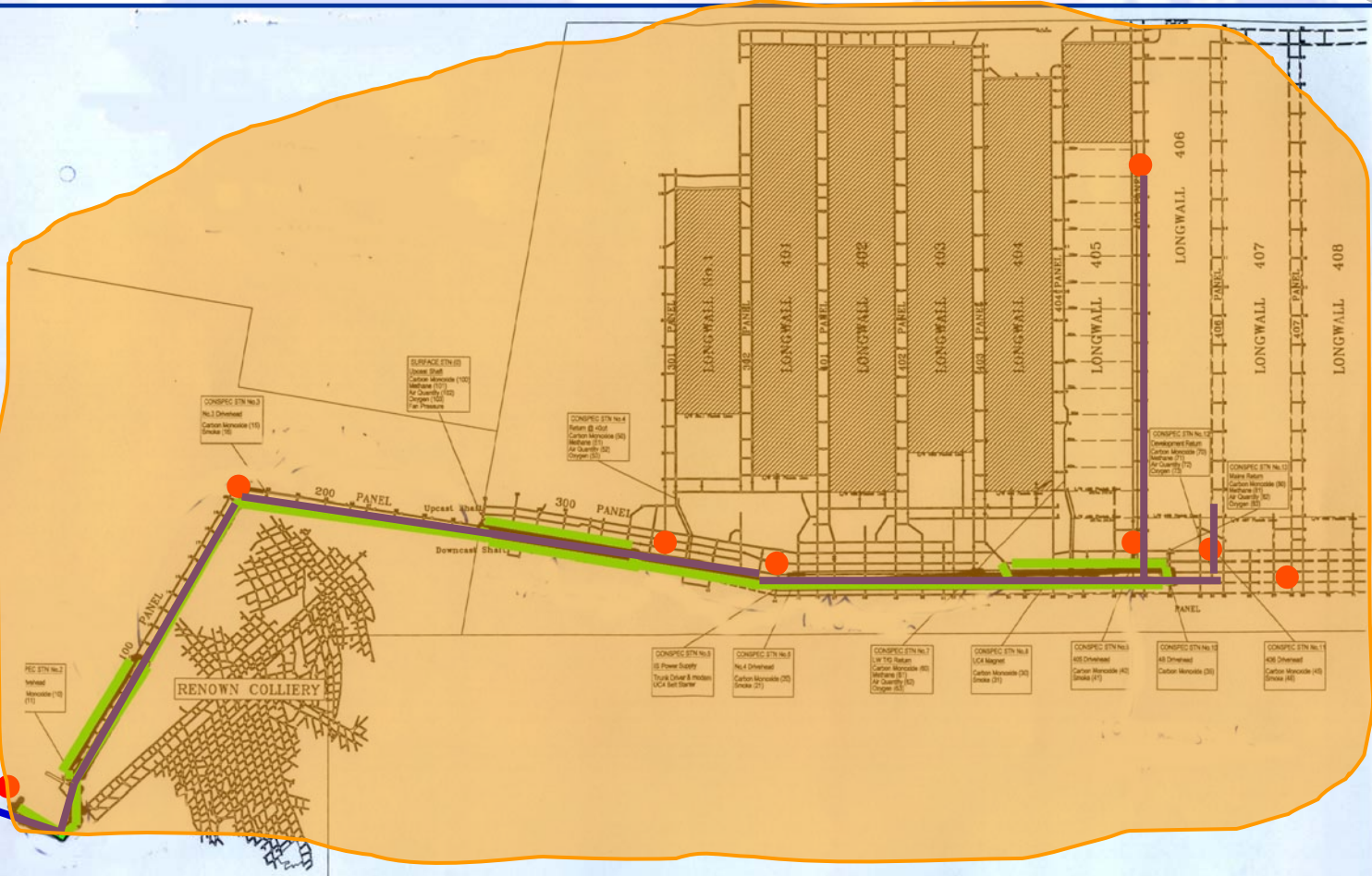


Liquid Crystal
Display Screen

Can display up to 32
character message



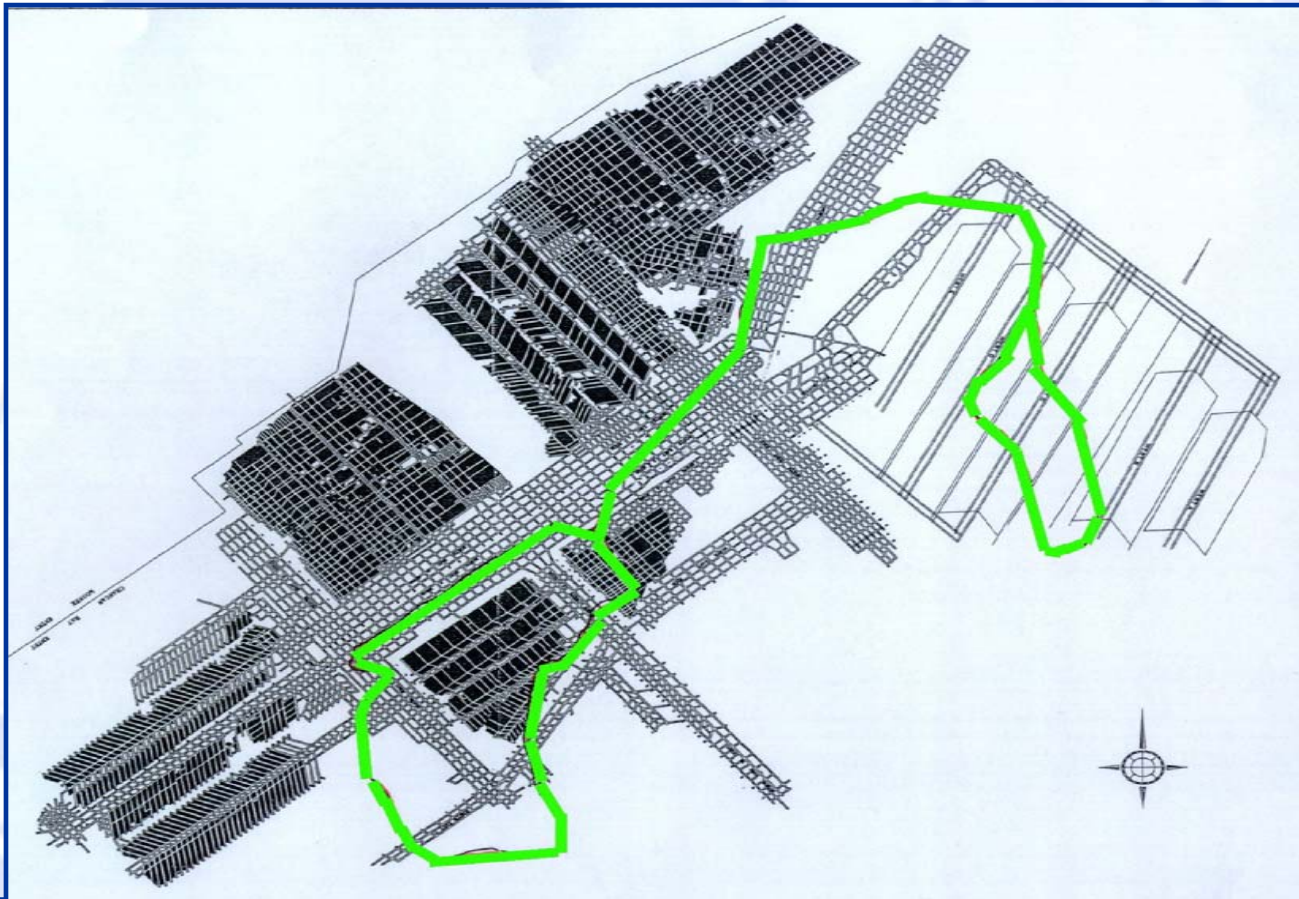
Communication Coverage



- Phones – 5%**
- Leaky Feeder – 20%**
- PED – One-Way +98%**



PED[®] Antenna - Wallarah Colliery



Surface antenna protected from blast and fire.

12,000 ft & 8,000 ft Surface Antennas

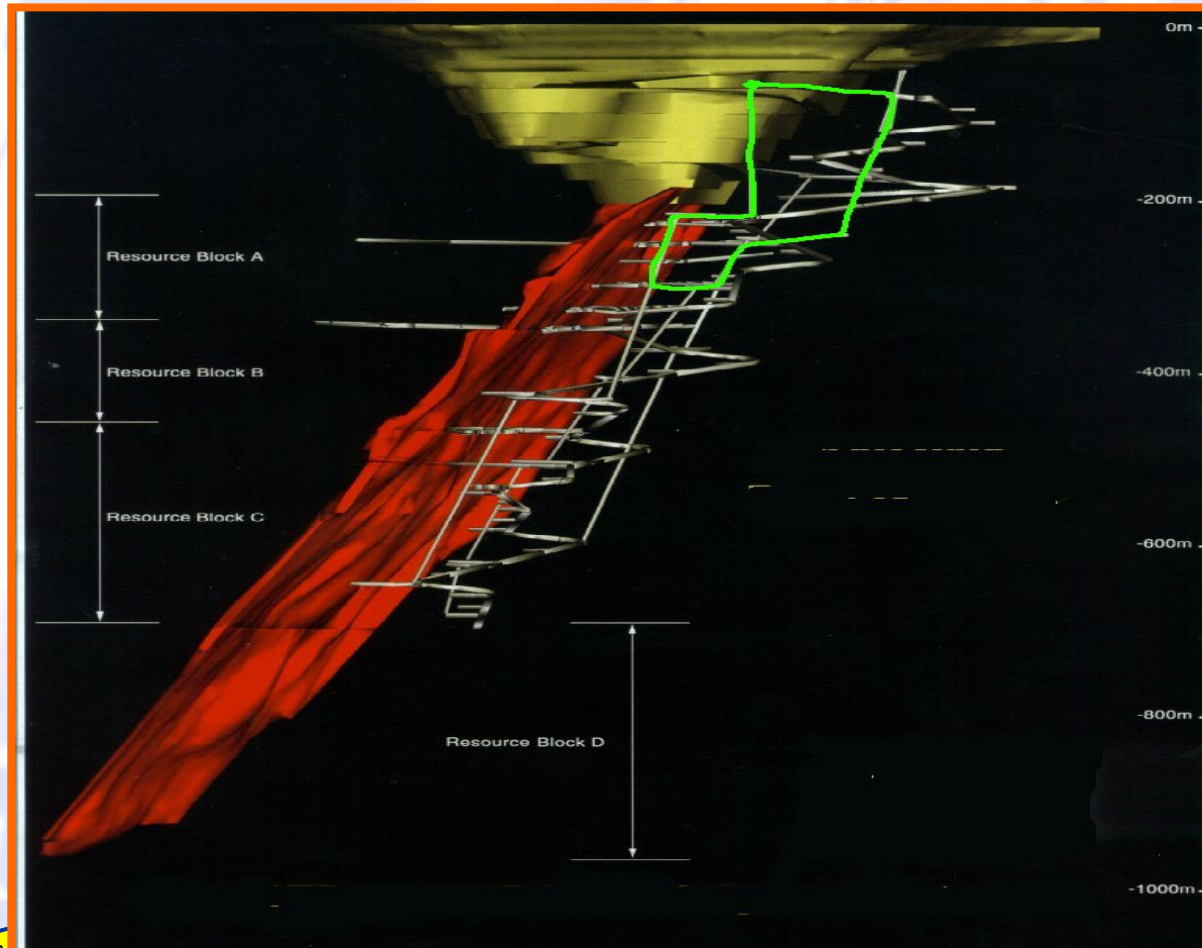
Powered by one Transmitter

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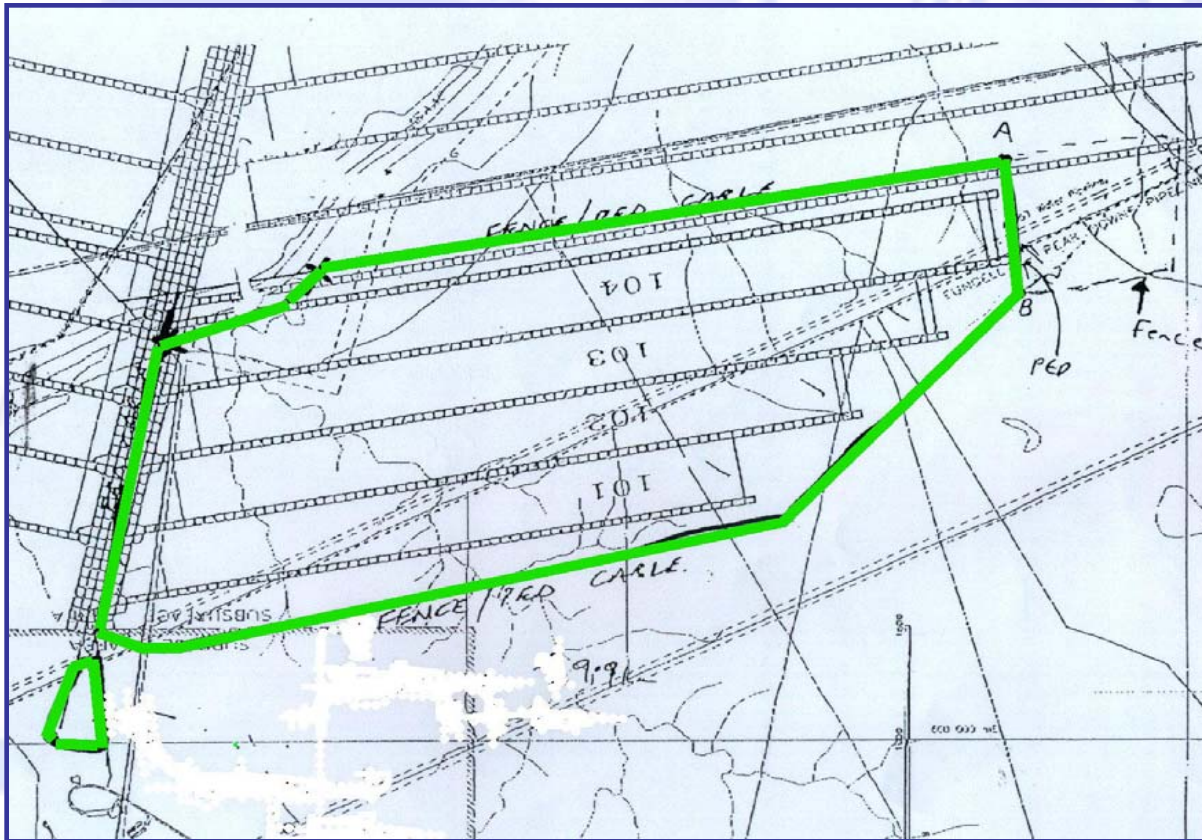
PED[®] Antenna -Kanowna Belle



5,000 ft
Underground
Antenna

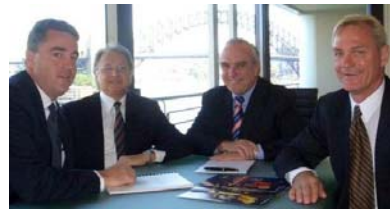


PED[®] Antenna - Moranbah North Coal Mine

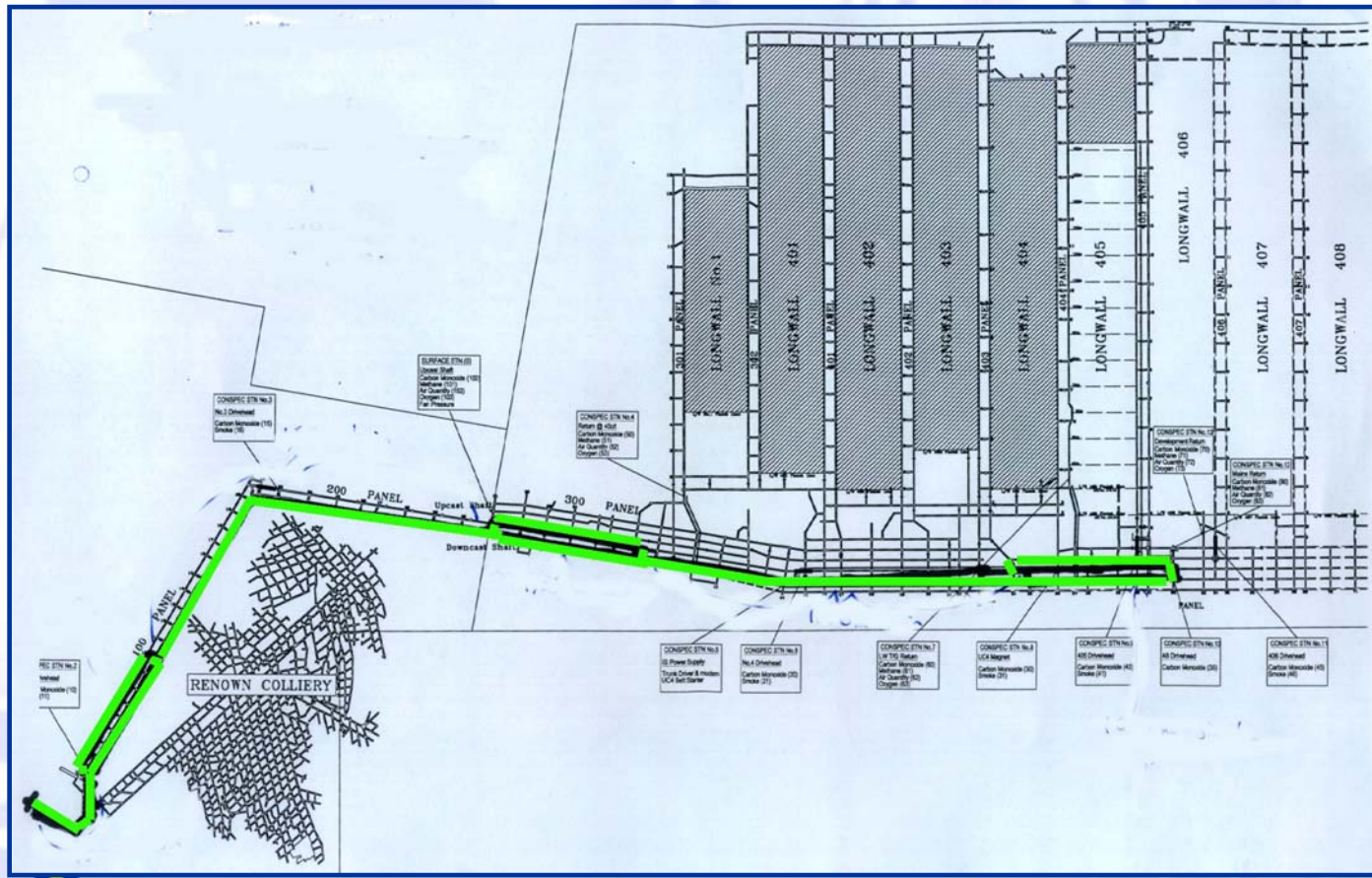


**Broader
coverage by
increasing
antenna size!!**

**33,000 ft
Surface
Antenna.**



PED[®] Antenna - Springvale Coal Mine



Surface antenna could be used in an emergency.

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20,000 ft Underground Antenna.



PED Installations and Usage

Australia

Mine		Antenna	Pagers	Messages/Shift
Cook	1991	Surface – 30,000 ft	45	10-20
North Goonyella	1993	Surface – 29,000 ft	140	20-30
Newstan	2000	U/G – 35,000 ft	250	40-50
Myuna	2001	U/G – 28,000 ft (Covers 3 seams)	200	35-45
Oaky North	1998	Surface– x 2	245	30-50
Clarence	2000	U/G – 32,000 ft	120	25-35
Moranbah North	1997	Surface – 33,000 ft	320	40-50
Crinum	1997	Surface – 27,000 ft & 35,000 ft	280	40-60
West Cliff	2001	Surface – 29,000 ft & 44,000 ft	260	50-60

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PED Installations and Usage

United States / Australia

Mine		Antenna	Pagers	Messages/Shift
Andalex	1997	U/G – 40,000 ft	100	30-40
Genwal	1998	U/G – 38,000 ft	50	20-30
Dendrobium	2004	U/G – 34,000 ft	180	40-50
Springvale	2001	U/G – 20,000 ft	250	35-45
Beltana	2003	Surface – 22,000 ft	80	25-30
Glennies Creek	2001	U/G – 25,000 ft	50	20-30
Broadmeadow	2005	Surface – 33,000 ft	140	30-40
West Wallsend	2000	Surface & U/G – 27,000 ft & 20,000 ft	170	40-50
Enterprise	1998	U/G - 15,000 ft	690	60-80

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PED Installations and Usage

United States

Mine		Antenna	Pagers	Messages/Shift
Co-op	1999	U/G	40	20-40
Dugout	2000	U/G	75	20-30
BHP	1999	Surface X 2	150	40-50
Air Quality	2001	U/G	50	30-40
Laurel Mountain	2000	U/G	21	25-30
North American Rock Salt	1999	U/G	50	20-30
Robison Run	2000	U/G	X	20-30
18 total U.S. ----	1 ST 1996	70 -100% Coverage		<u>Antenna Dependent</u>
	<u>World wide</u>	<u>140 systems</u>	<u>+ 10,000</u>	

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TRACKER Tagging System Benefits

- You always know who is **IN**, or **OUT** of the mine.
- You know the location of **Personnel** and **Equipment** within clearly defined zones underground.
- Enables you to control mine logistics.
- Integrates with a mine's existing systems.

Significant benefits can therefore gained in:

- **Safety Management**
- **People**
- **Equipment-Asset Management**
- **Supplies**



TRACKER Tagging System - Basic Operation

- Readers/Beacons are set up at Strategic Locations throughout the mine.
- 150 ft reading radius.
- An active Tag, worn by personnel or mounted on vehicles, radiates a unique “ID” to the Reader Beacons.



Self Contained Tag

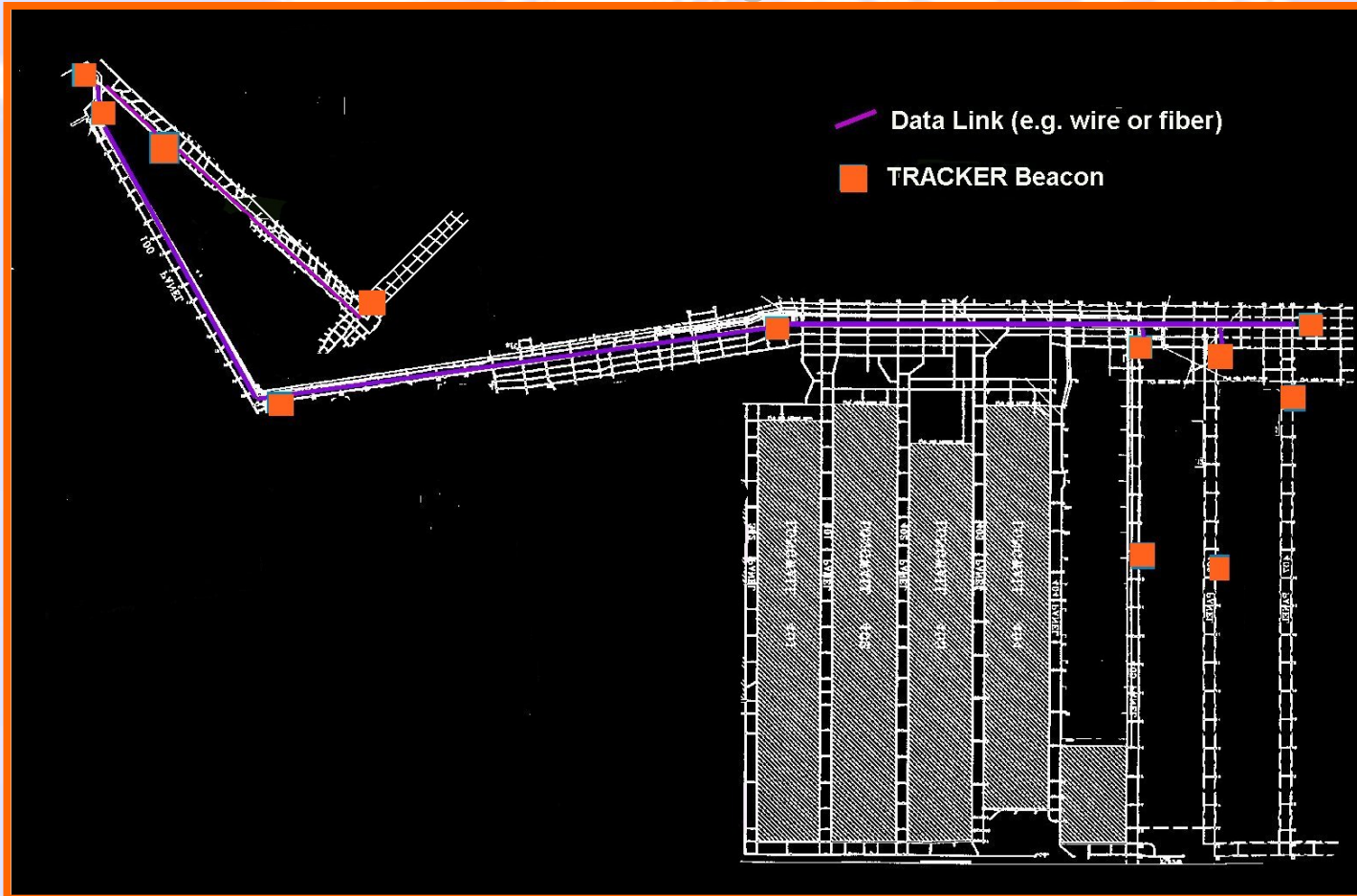


Tag in ICCL

MSHA - approved 2003



TRACKER Beacon Layout - Coal Mine





TRACKER Display Software

Mine Site Technologies - Tracker Viewer

File View Tools Help

Map List History Search Details Events Print...

Map View (Filter On)

Filter: All Tags | All Groups | Underground | Show All

Portal Safe 10 | Brace Safe 1 | Sub Brace Safe 3

4 Level Safe 22 | 4 Level Hot 4

5 Level Safe 0 | 5 Level Hot 2

6 Level Safe 9 | 6 Level Hot 12

7 Level Safe 6 | 7 Level Hot 9

8 Level Safe 2 | 8 Level Hot 2 | 8 Level Decline 2

Details

4 Level Safe

Last Update: 2:43:24 AM 30/06/2003

Poll Retries: 0
Poll Fails: 0
Status: Beacon 8: No Errors

2 Test Tag1	2:43:21 AM
3 R Stokes	11:18:50 AM
4 V Carr	11:17:38 AM
6 M Bloxham	11:19:03 AM
10 F Scoble	2:43:19 AM
21 M Cowan	6:18:55 AM
57 C Neeson	2:28:28 AM
63 J Prestedge	2:43:24 AM
70 D Fisher	2:43:23 AM
75 C Elvin	11:19:05 AM
76 M Torrent	2:43:22 AM
78	2:43:24 AM
95 I Njirich	2:20:47 PM
123 P Graham	27/06/2003
170 P Burns	28/06/2003
211 Dean Murphy	4:54:47 AM
225 Rob Mellersche	27/06/2003
230 Scott Miller	27/06/2003
312 Mike Werner	28/06/2003
329 Bryan Kilpatrick	26/06/2003
331 Sam Vine	12:17:35 PM
337 Tim Williams	26/06/2003

Administrator | Filter On | 84 Tags

start | Jasc Paint Shop Pro - ... | MST Tracker Viewer

EN | 2:43 AM | Monday | 30/06/2003

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TRACKER Display Software

Mine Site Technologies - Tracker Viewer

File View Tools Help

Map List History Search Details Events Print...


List View

Search: zac Filter Show All

Tag		Tag Holder			Location			
ID	Batt.	Type	First Name	Last Name	Job Title	Latest	Date	Time
239			Danny	Sillitto		Sub Brace Out	29/06/2003	2:55:24 PM
240			Therisa	Swift		4 Level Hot	30/06/2003	2:17:23 PM
241			Mark	Mason		Sub Brace Out	27/06/2003	2:33:55 PM
243			Craig	Tremaine		8 Level Safe	30/06/2003	1:59:44 PM
248			Neville	Gardner		Portal Out	30/06/2003	2:15:38 PM
250			Joe	Fitzpatrick		Portal Out	30/06/2003	4:00:04 AM
254			Dave	Barrett		7 Level Hot	30/06/2003	1:28:04 PM
257			Derek	Scott		6 Level Safe	30/06/2003	2:18:50 PM
259			Steve	Bunce		Portal Out	30/06/2003	6:35:45 AM
263			Bryn	Sargeant		Sub Brace Out	27/06/2003	9:22:33 AM
264			Mark	Lambert		6 Level Safe	7/07/2003	2:39:50 AM
268			Mat	Stirling	Field Tech	Sub Brace Out	27/06/2003	6:18:15 PM
271			D	Baily		7 Level Hot	30/06/2003	1:28:07 PM
272			Zac	Darch		Portal Safe	30/06/2003	12:58:10 PM
275			T	VanVliet		Sub Brace Safe	30/06/2003	2:02:46 PM
282			Jeff	Daniels		Portal Out	29/06/2003	6:38:59 PM
285			W	Williams		Portal Out	30/06/2003	6:28:39 AM
288			Kin	McGagh		Portal Safe	30/06/2003	8:39:34 AM
290			Phil	Riddle		Portal Out	30/06/2003	5:00:26 AM
294			W	Crapella		Portal Out	30/06/2003	11:32:12 AM
295			Gavin	Schuback		4 Level Hot	30/06/2003	9:50:19 AM
298			Dale	Chaplin		Portal Out	30/06/2003	6:28:39 AM
300			Ivan	Carstensen		Portal Out	30/06/2003	7:56:56 AM
303			Brent	Scoble		Portal Safe	30/06/2003	2:16:24 PM
307			Brett	Domrow		Portal Safe	30/06/2003	6:50:03 AM
311			Chris	Stone		Portal Out	28/06/2003	1:00:46 PM
312			Mike	Werner		4 Level Safe	28/06/2003	1:01:07 PM
316			Paul	Sewell		Portal Out	30/06/2003	11:13:41 AM

Administrator 156 Tags

Details

 **Zac Darch**
272
MST

Short Name: Z.Darch

Last Read: **Portal Safe**
Last Time: 12:58:10 PM
30/06/2003

Previously: **4 Level Safe**

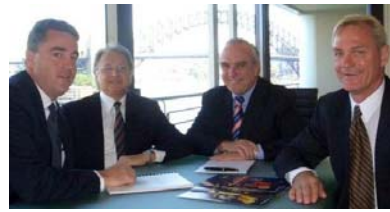
Contact:

TRACKER

start Jasc Paint Shop Pro - ... MST Tracker Viewer

EN 2:26 AM Monday 30/06/2003

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Zone Display Units



Large Format LED Units allow Tag numbers into zones to be displayed to control access, such as:

- Personnel numbers can be displayed relative to a pre-set limit (e.g. because of availability of SCSR's or CABA re-fill points).
- Diesel equipment limitations can be automatically displayed to control access dependent on ventilation requirements

<p>STAFF 40 MAX</p>	<p>Longwall</p>	<p>MST Tracker</p>	<p>DIESEL 10 MAX</p>
			



Tagging System - Personnel Safety

Improves safety management of personnel, by knowing their location underground at all times. Benefits include:

- Streamlines access control into ventilation districts in line with available self rescue apparatus inbye – removes tag board delays.
- During an emergency the withdrawal of personnel can be monitored.
- During an evacuation the location of items (e.g. PJB) that may assist their evacuation can be known and advised.
- These safety enhancements are paid for by the vehicle/asset cost benefits
- Potential to extend Tag technology into Proximity Detection



Thank you !!

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