

Fatal Mine Fire

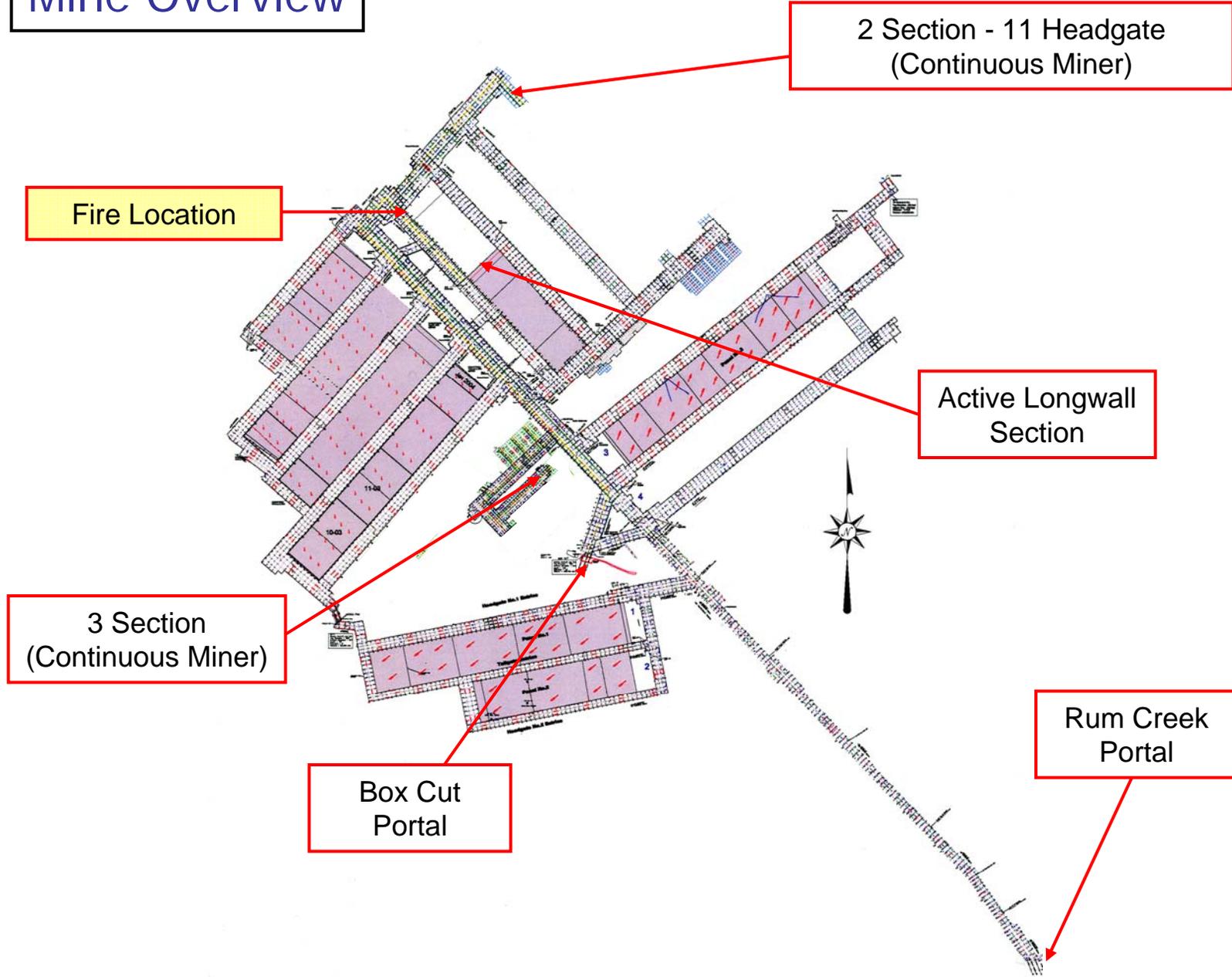
Aracoma Alma Mine #1
January 19, 2006

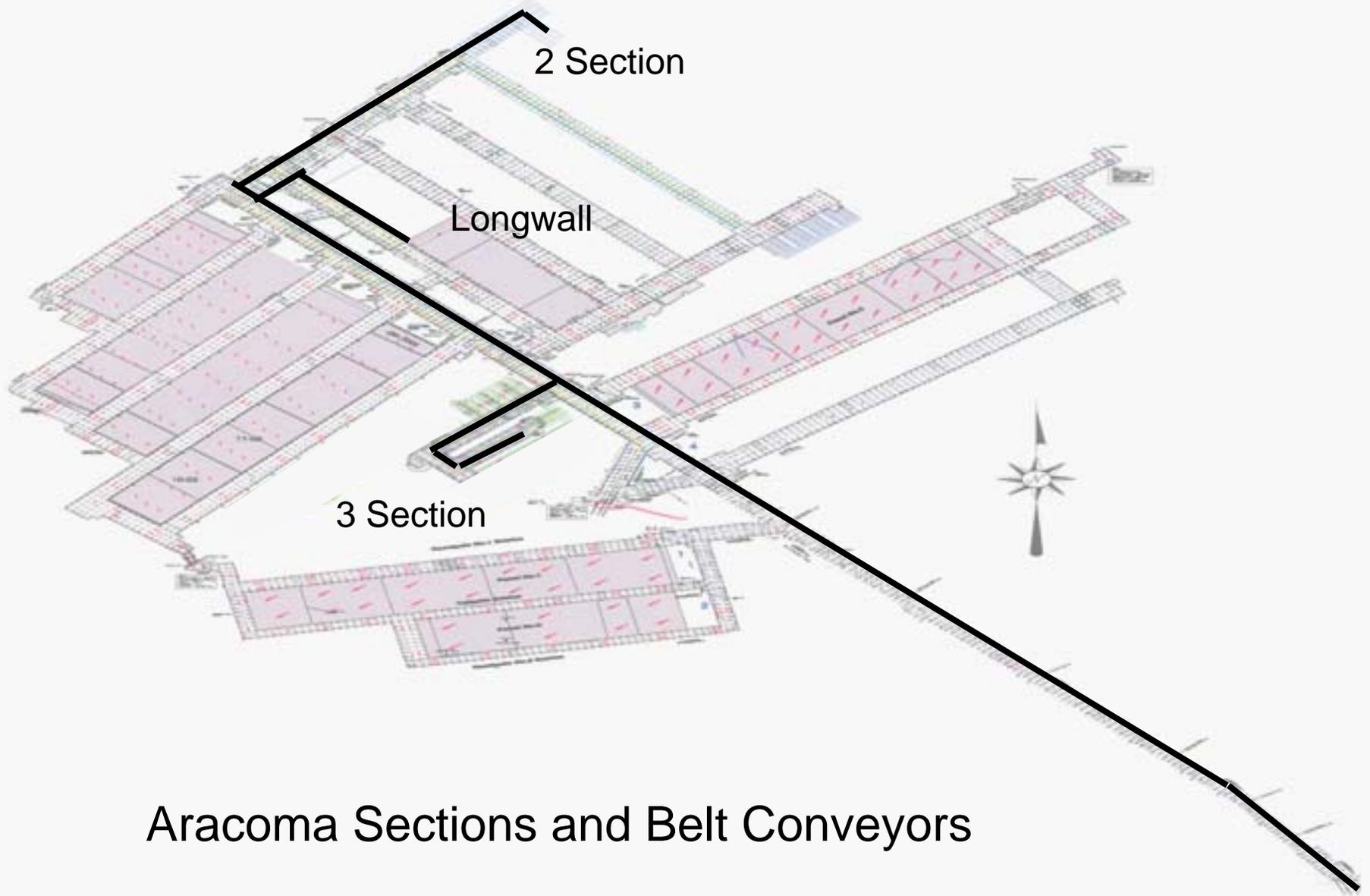


Overview

- Summary of Accident Investigation
- Use of Belt Air and Compliance with Belt Air Regulations on January 19, 2006

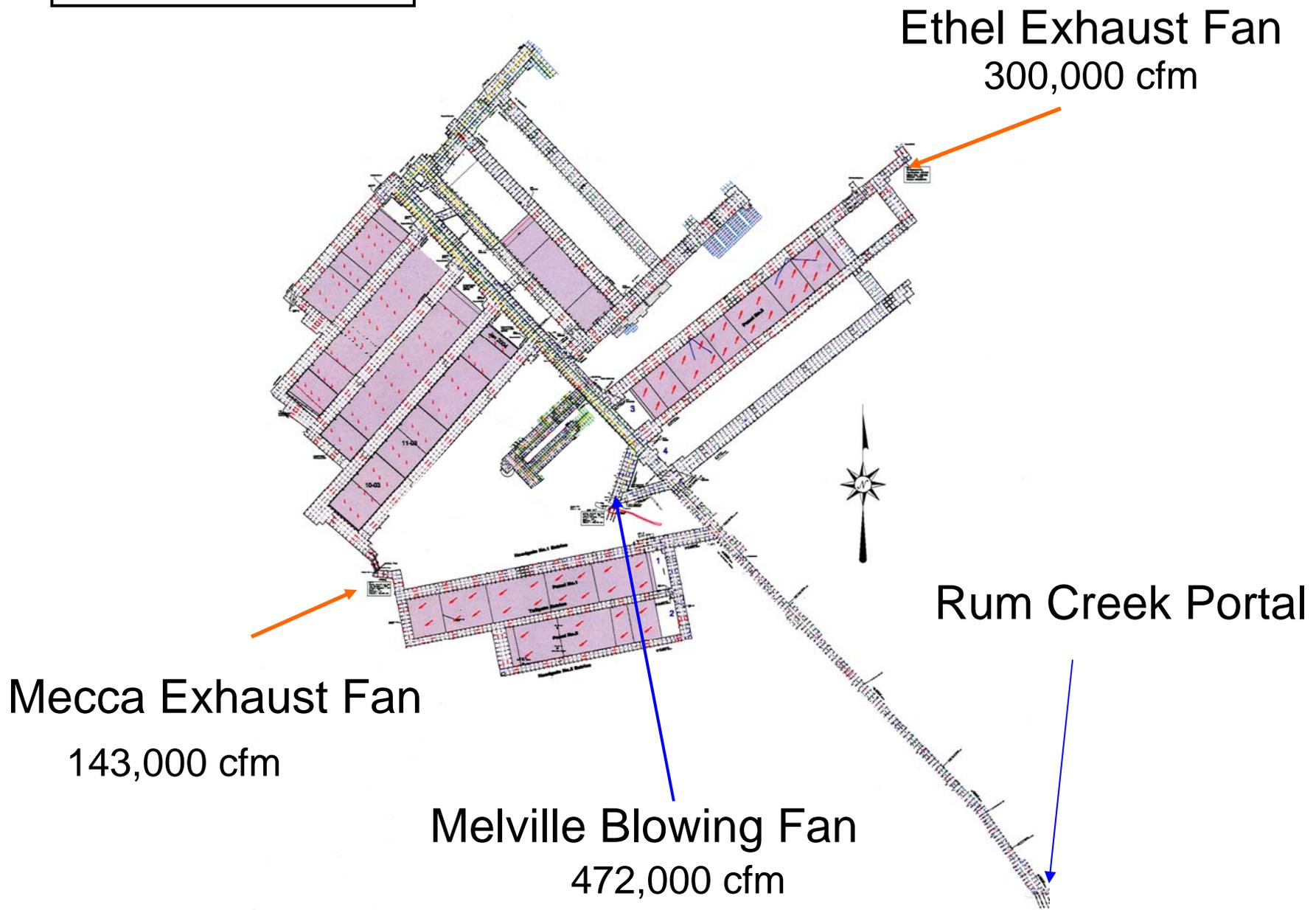
Mine Overview



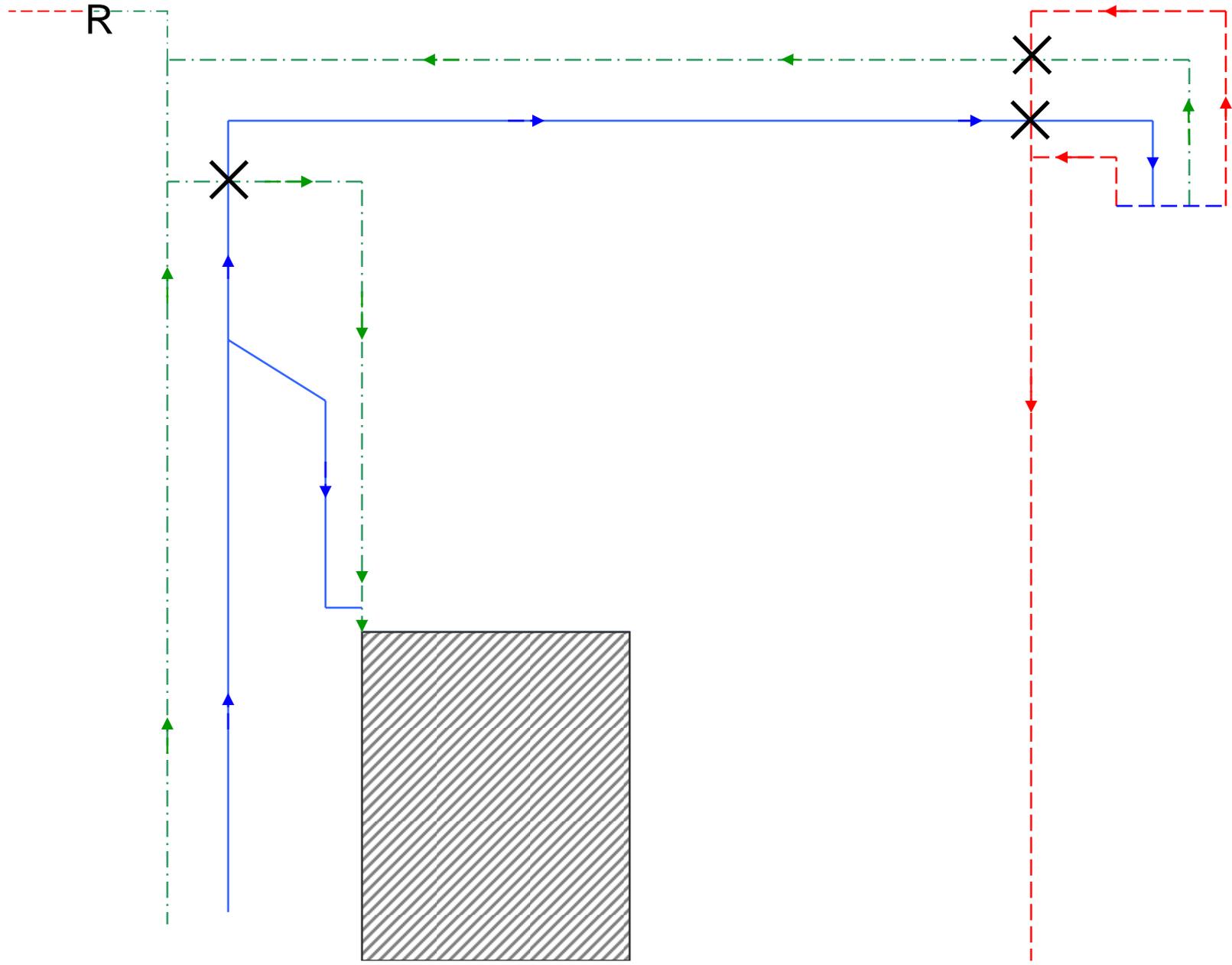


Aracoma Sections and Belt Conveyors

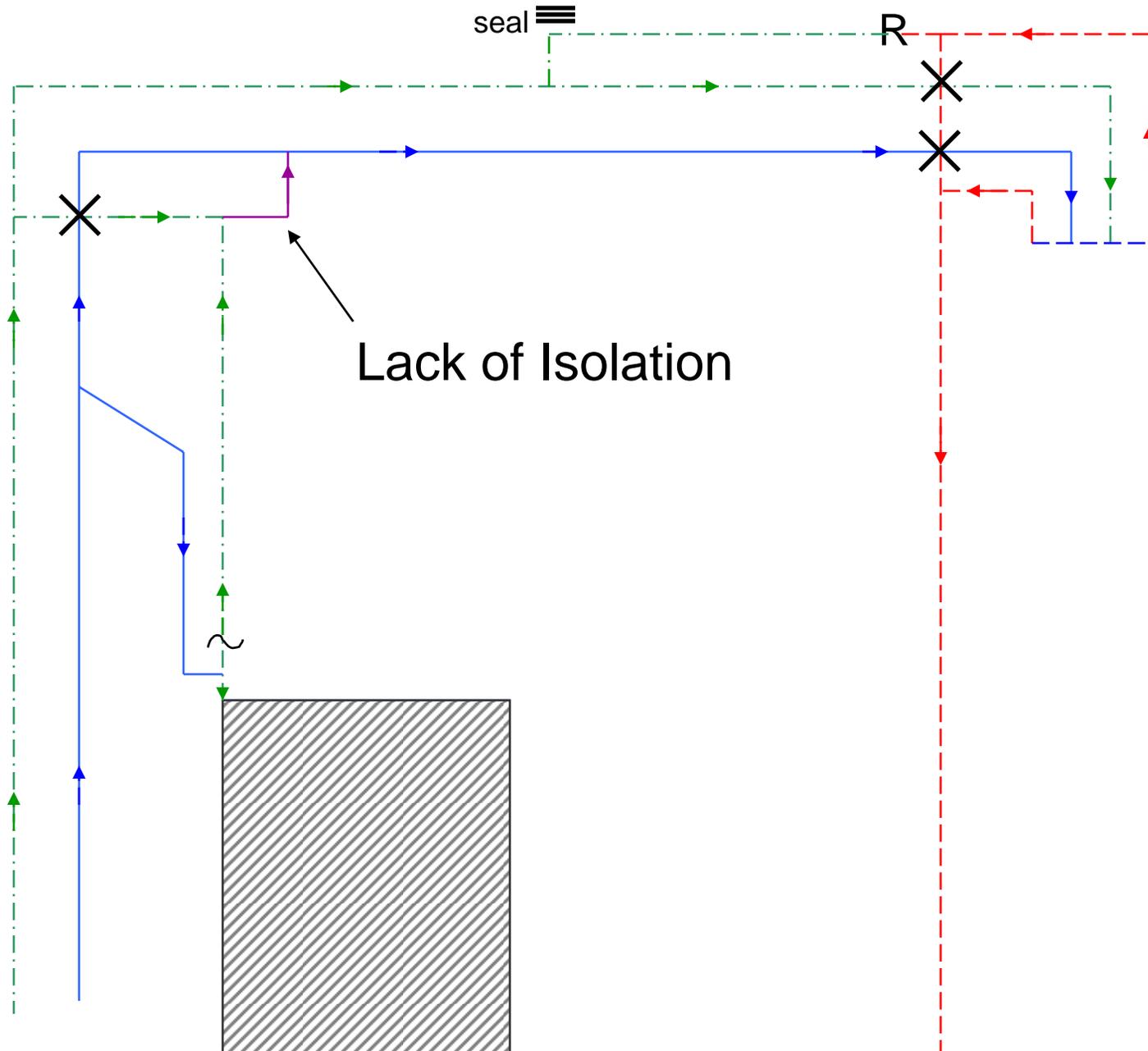
Mine Ventilation



Per Approved Ventilation Plan



Ventilation on January 19, 2006



Common Air Courses



Critical Ventilation Controls Removed Prior to Fire



Stopping Removed to Install Dual Switch House
(72" Belt Structure Later Installed Prior to Fire)



72" Belt Structure
Installed



Stopping Removed Prior to Fire

Critical Ventilation Control Not Installed Prior to Fire



No Evidence of Stopping at Tail Pulley of No. 7 Belt

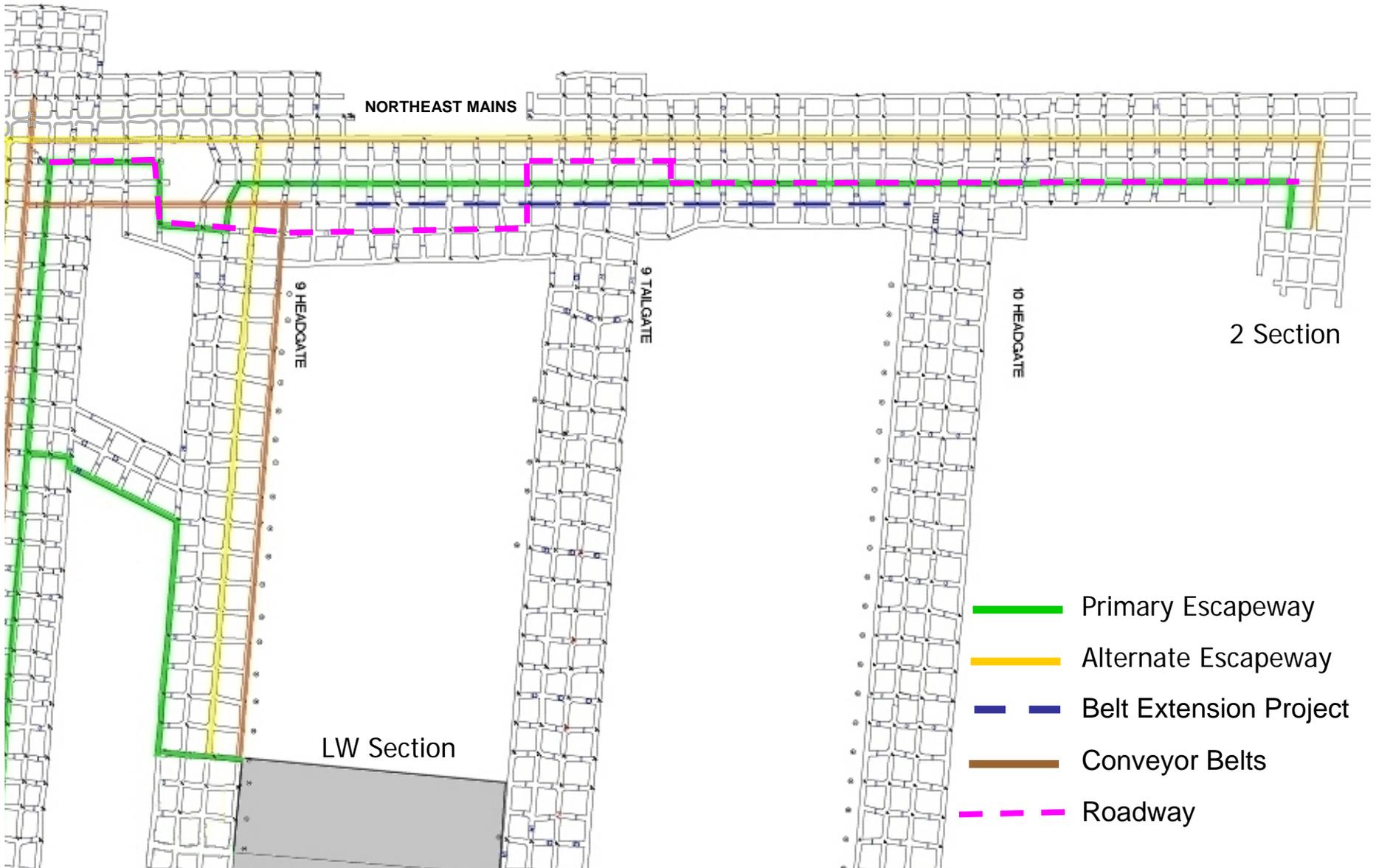


No. 7 Belt Tail Pulley

72" Belt Structure Being Installed

9 HEADGATE

9 TAILGATE



NORTHEAST MAINS

2 Section

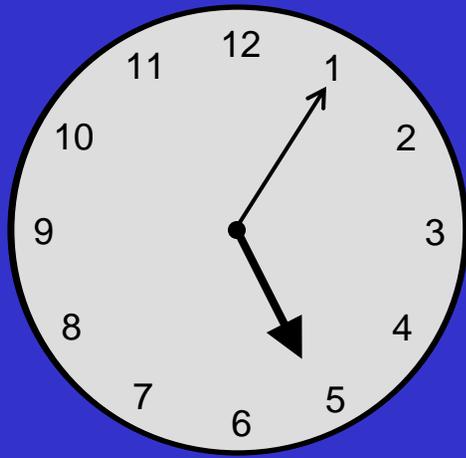
LW Section

9 HEADGATE

9 TAILGATE

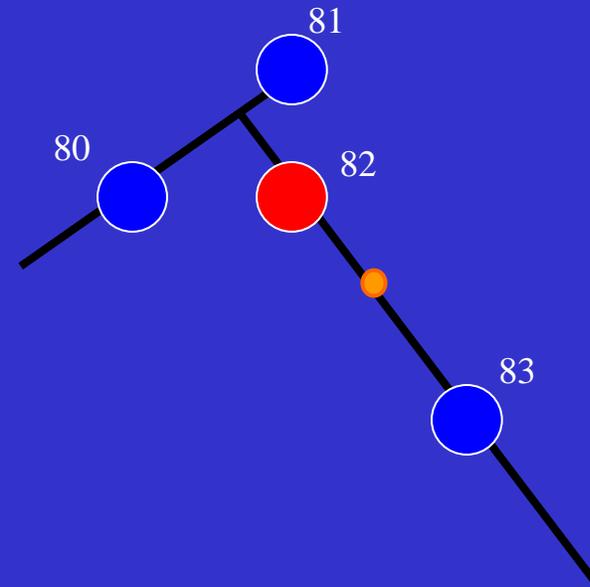
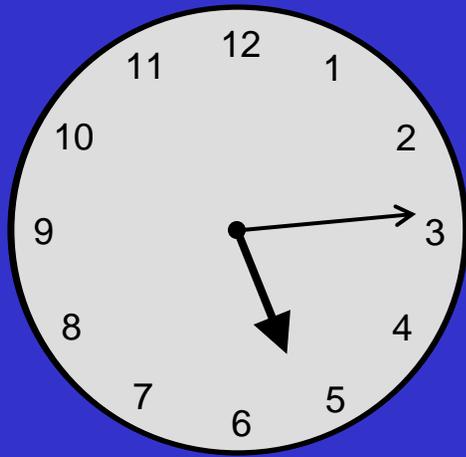
10 HEADGATE

- Primary Escapeway
- Alternate Escapeway
- Belt Extension Project
- Conveyor Belts
- Roadway



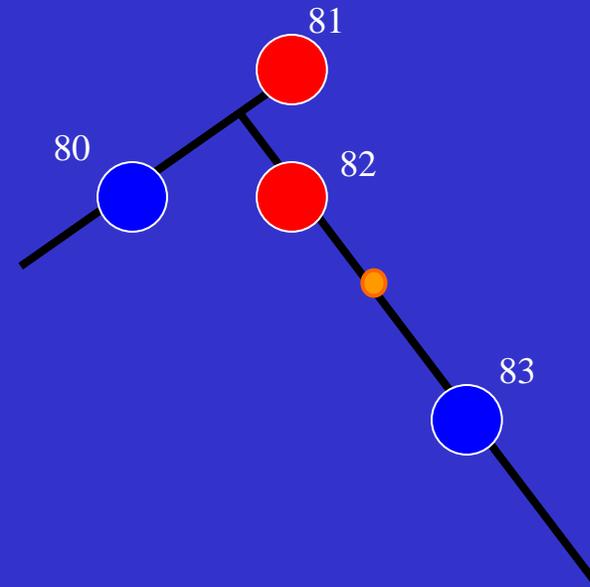
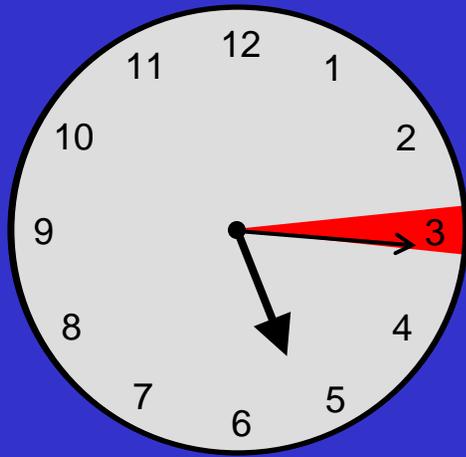
Before 5:00 pm, Bryan Cabell (Belt Examiner) finds belt alignment problem; His attempts to realign unsuccessful, Cabell calls for assistance.

Belt is shut down 5:05 p.m. to avoid damage to belt material.



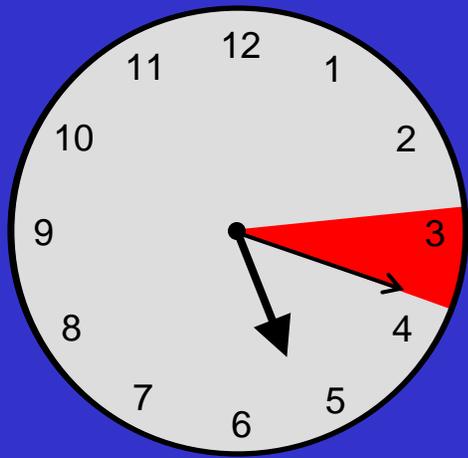
Cabell reports smoke to longwall headgate; Cabell sees smoke increasing in intensity and calls again for help. First AMS Alert and Alarm signals occur 5:14 p.m. for Sensor 82.

First AMS alert and alarm signals 5:14 p.m.



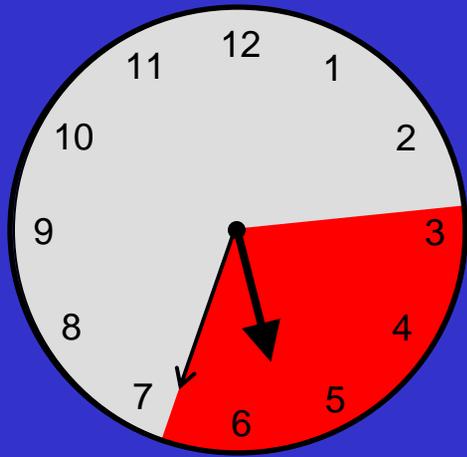
Cabell calling for Fred Horton (Afternoon Shift Mine Foreman). Brown (Dispatcher/AMS Operator) first answers pager phone at 5:14 p.m. and Horton joins call. Alert and alarm signals for Sensor 81 occur at 5:16 p.m.

First AMS alert and alarm signals 5:14 p.m.



Cabell is on phone with Horton when Callaway (Foreman) and Rose arrive at drive at 5:18 p.m. Flames are visible in fire area. Three men begin fighting fire, but only fire extinguishers could be used in the attempt.

First AMS alert and alarm signals 5:14 p.m.

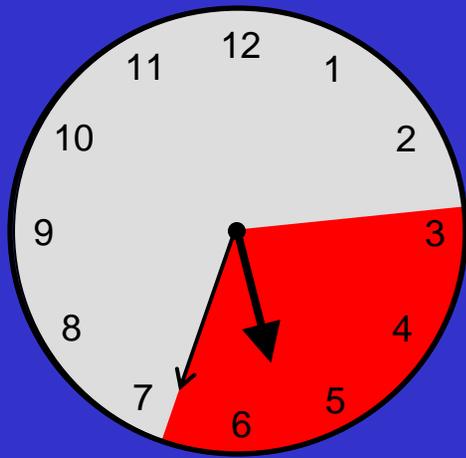


Firefighting Activities

No water was available in water line for fighting fire

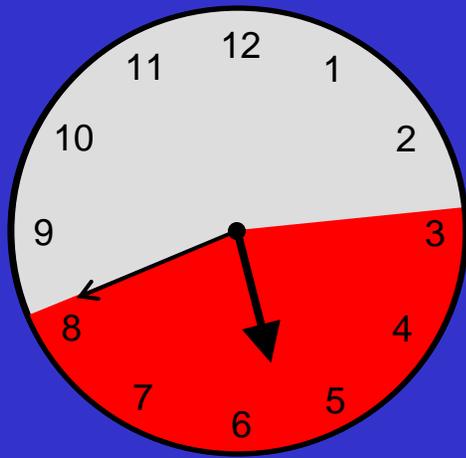
Water outlets and fire hoses could not be connected due to mismatched threads

No automatic fire suppression system was installed in drive area as required



Cabell has asked Dispatcher Brown to evacuate 2 Section. Brown begins to call, then sets off warning strobe light to gain attention.

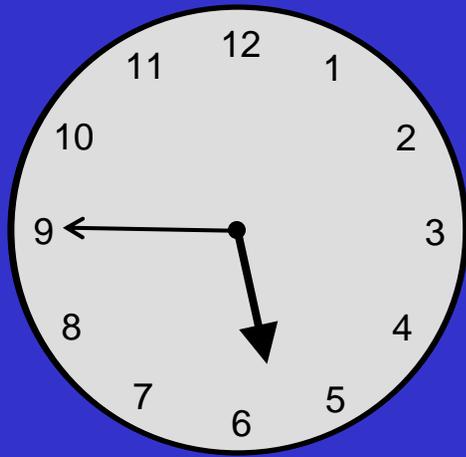
First AMS alert and alarm signals 5:14 p.m.



Brown shuts off belts at 5:39 p.m. Order to evacuate issued by Horton minutes later at 5:42 p.m. after Plumley (Foreman on 2 Section) calls Brown to find out why belts are stopped.

First notification to evacuate 5:42 p.m.

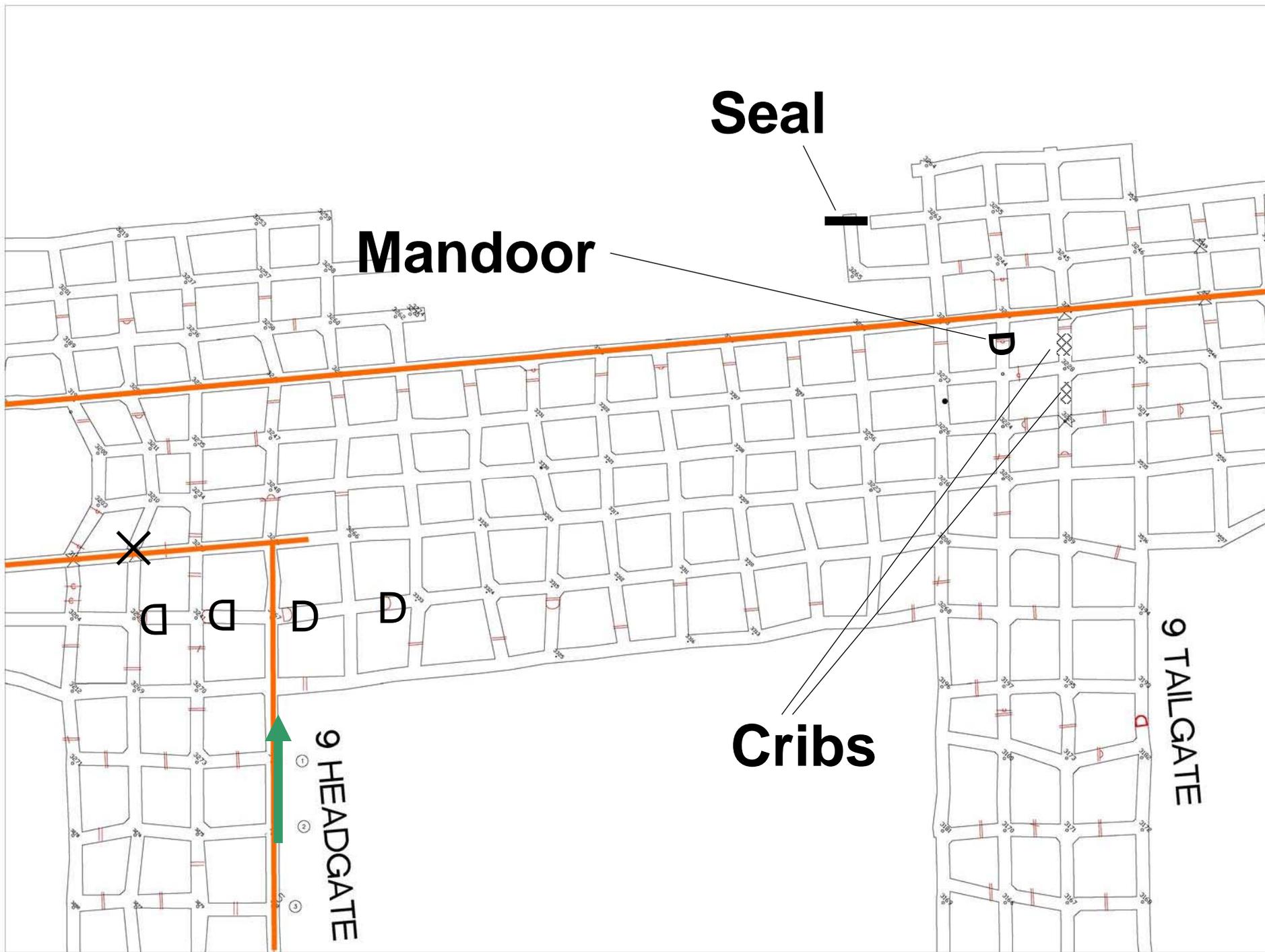
First AMS alert and alarm signals 5:14 p.m.

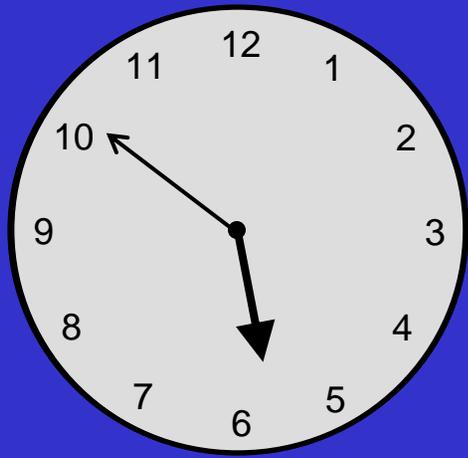


Plumley assembles crew and boards mantrip.

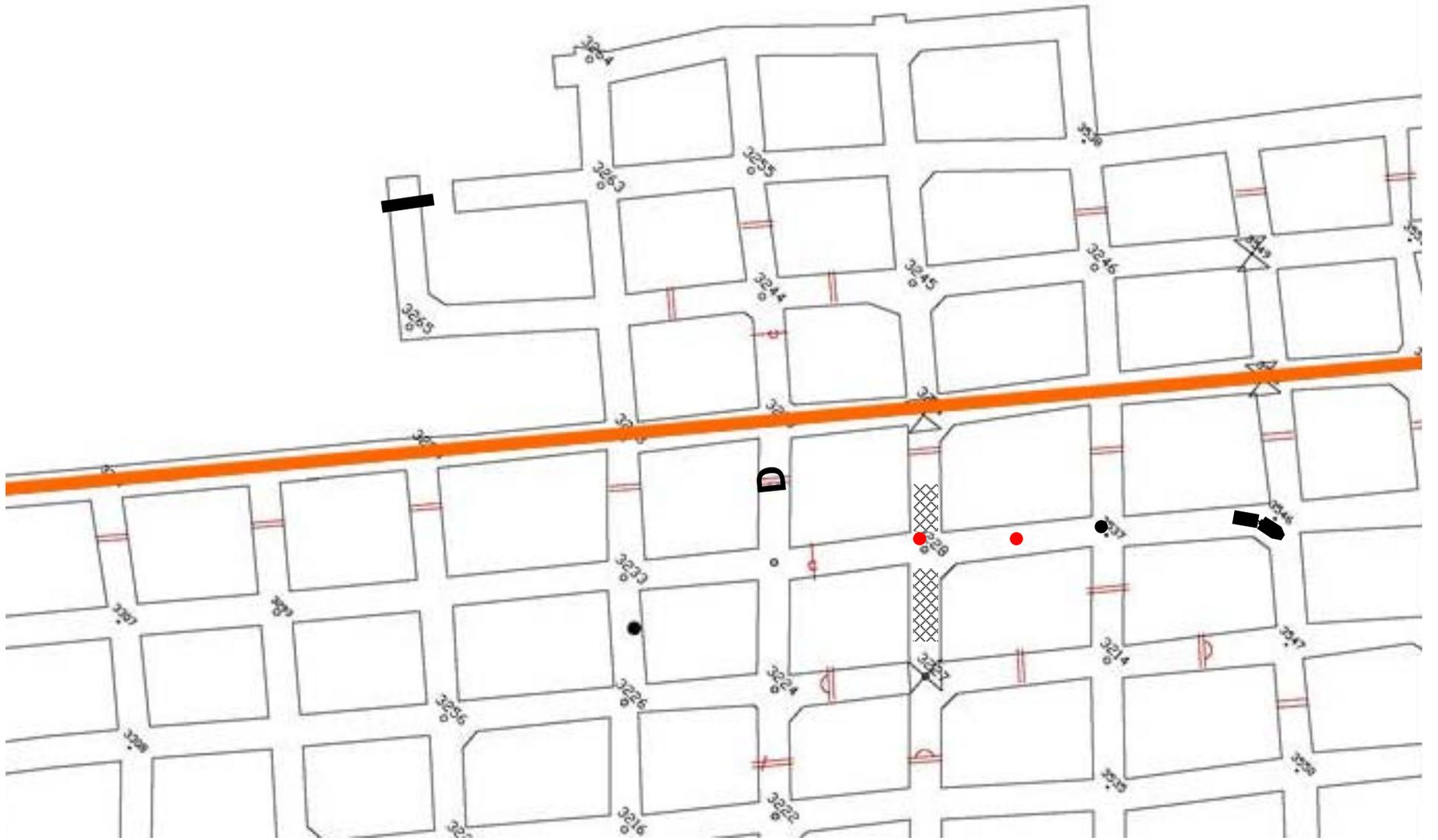
**Miners instructed to move to alternate
escapeway if they hit smoke, identifying
mandoor to seal just outby cribs.**

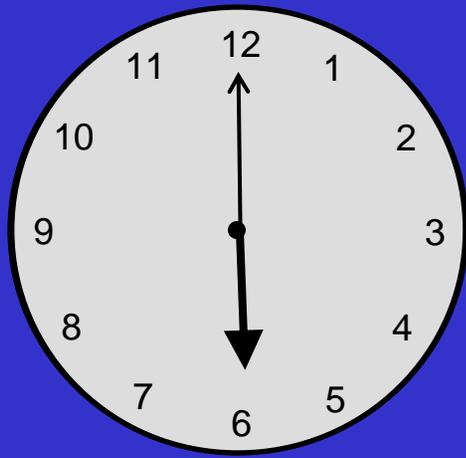
**Crew members are not aware of severity
of the fire.**



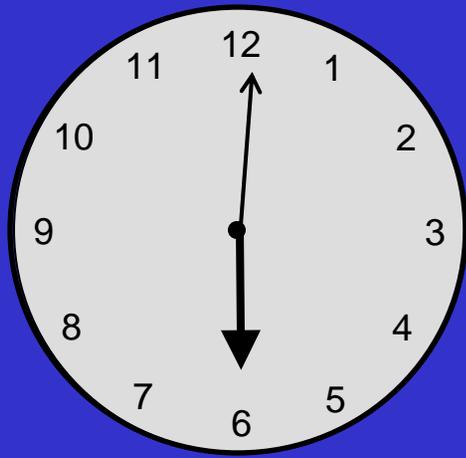


Mantrip hits thick smoke in primary escapeway and crew must abandon vehicle. Miners begin donning SCSRs. Miners must now walk through smoke to escape.



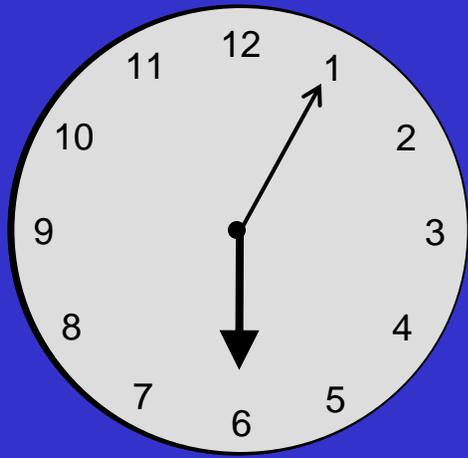


Ten miners find door between primary escapeway and belt (alternate escapeway) and begin moving to fresh air.

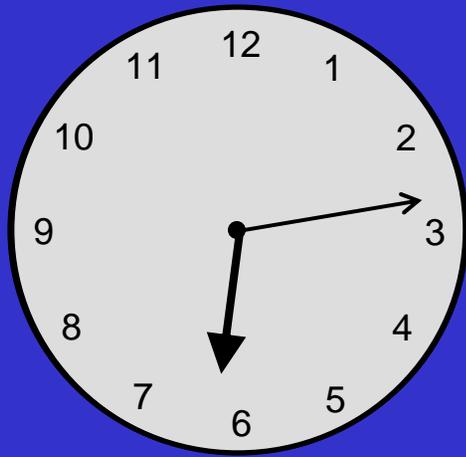


Crew members Don Bragg and Elvis Hatfield are discovered missing from the 2 Section crew.

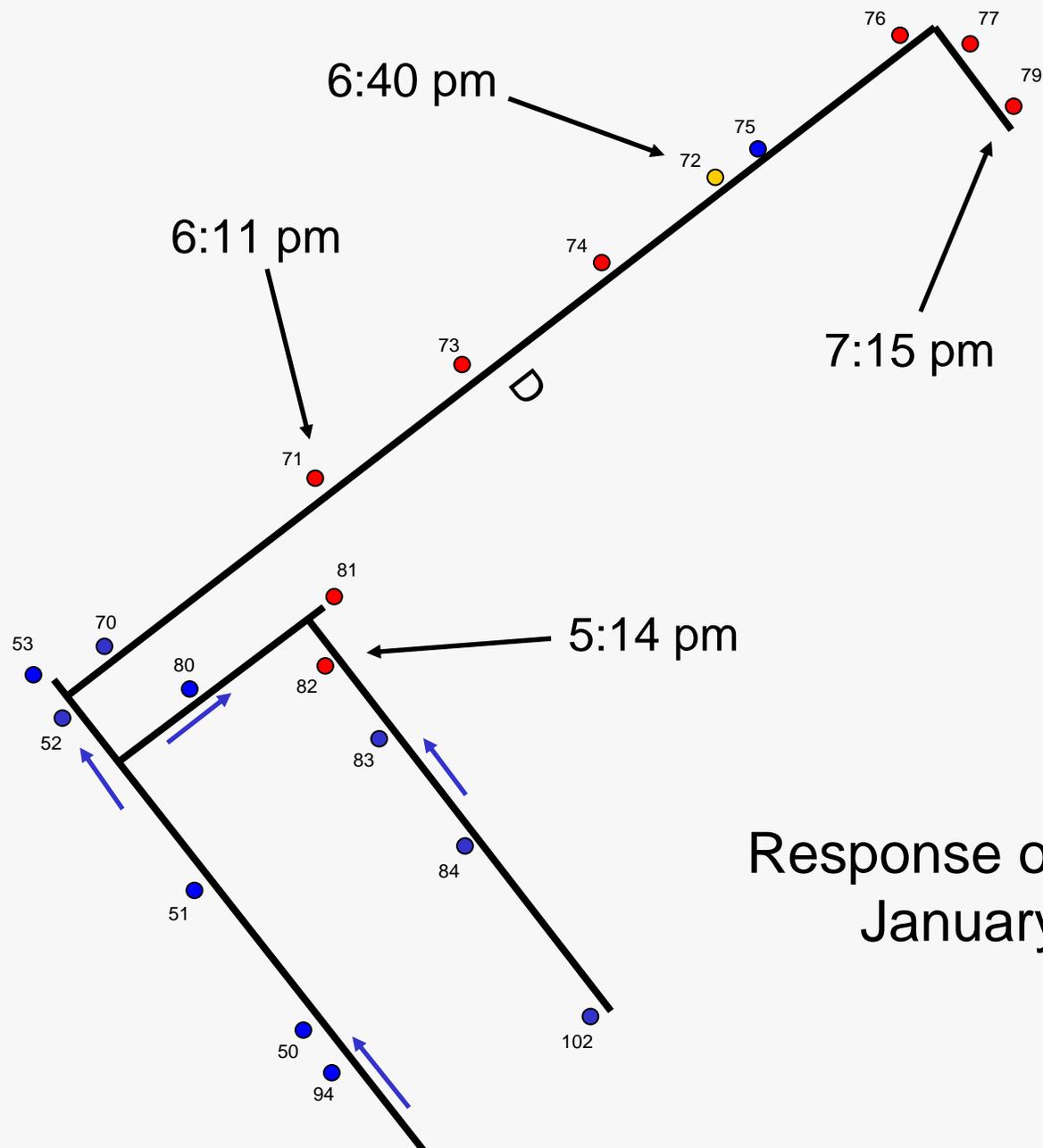
Three miners return to smoke-filled intake to search for miners. They return to the belt to resume evacuation.



Longwall section loses power. Crew members decide to leave section and begin to move to intake.



Ten members of the 2 Section crew arrive outby the fire area at approximately 6:13 p.m., one hour after first CO alarm signal.

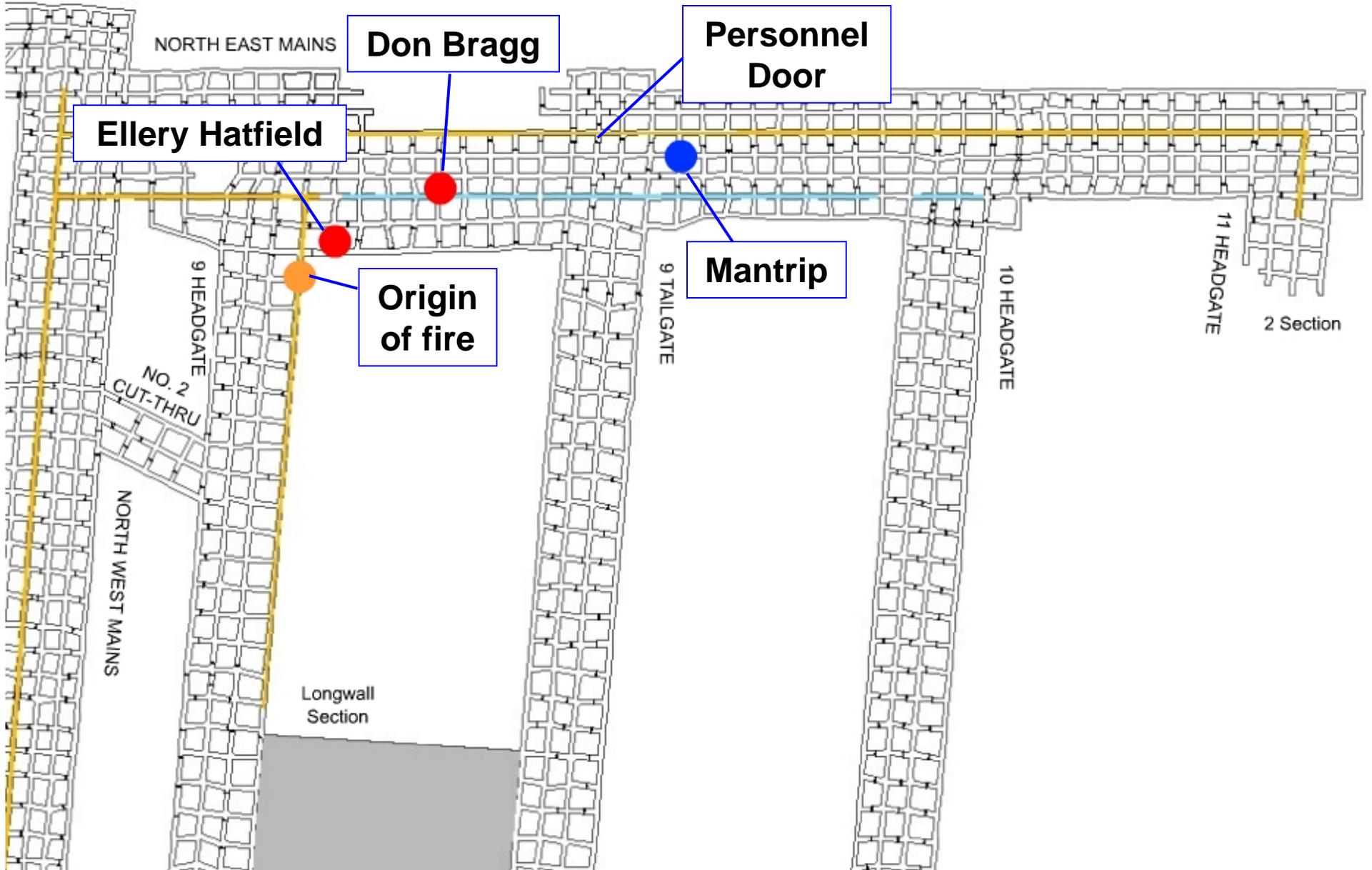


Response of AMS Sensors
January 19, 2006

Mine Rescue Teams respond to conduct search and rescue activities, fire fighting.

Heat from fire does not permit exploration in North East Mains in by fire.

After cooling fire area sufficiently, two missing miners are found nearly two days after fire begins.



ACCIDENT INVESTIGATION VIOLATIONS

25 Contributory Violations

99 Noncontributory Violations
Issued by investigation team

32 of 124 violations related to belt air

309 Other Violations
Issued by other MSHA Inspectors

25 Contributory Violations

- 3 Escapeway Violations
- 7 Examinations Violations
- 5 Fire Protection Violations
- 4 Belt Air Regulations Violations
- 1 Evacuation Violation
- 1 Equipment Maintenance Violation
- 1 Accumulation of Combustibles Violation
- 1 Mine Map Violation
- 2 Training Violations

4 Belt Air Violations

- Failed to withdraw miners from affected sections when CO alarm signal was received.
- Failed to notify appropriate personnel that an alarm signal was received.
- Failed to install alarm unit at location where it could be seen or heard by miners on 2 Section.
- Failed to conduct adequate visual examinations of AMS.

Escapeway Violation

- Failed to provide separation between Primary Escapeway and 7 Belt – also required under belt air rule.

2 Training Violations

- Inadequate training for personnel installing and maintaining AMS.
- Inadequate training for AMS Operators assigned to respond to alert, alarm and malfunction signals.
Both related to belt air regulations.

ACCIDENT INVESTIGATION CONCLUSIONS

CONCLUSIONS

- ❖ The fire occurred as a result of frictional heating when the longwall belt became misaligned in the 9 Headgate longwall belt takeup storage unit;
- ❖ This frictional heating ignited accumulated combustible materials and the belt;
- ❖ The lack of a fire suppression system allowed the fire to spread;
- ❖ The lack of water compromised firefighting activities;
- ❖ The lack of separation between the No. 7 Belt entry and the primary escapeway for 2 Section allowed smoke and CO to inundate the primary escapeway;

CONCLUSIONS (cont.)

- ❖ Examinations of the mine were inadequate and failed to identify obvious hazardous conditions;
- ❖ Examinations of safety systems failed to identify deficiencies which contributed to the severity and extent of the mine fire;
- ❖ The response to AMS alarm signals was not appropriate;
- ❖ Miners were not evacuated when the fire presented an imminent danger;
- ❖ Escapeways were not properly marked and escapeway drills were not properly conducted;

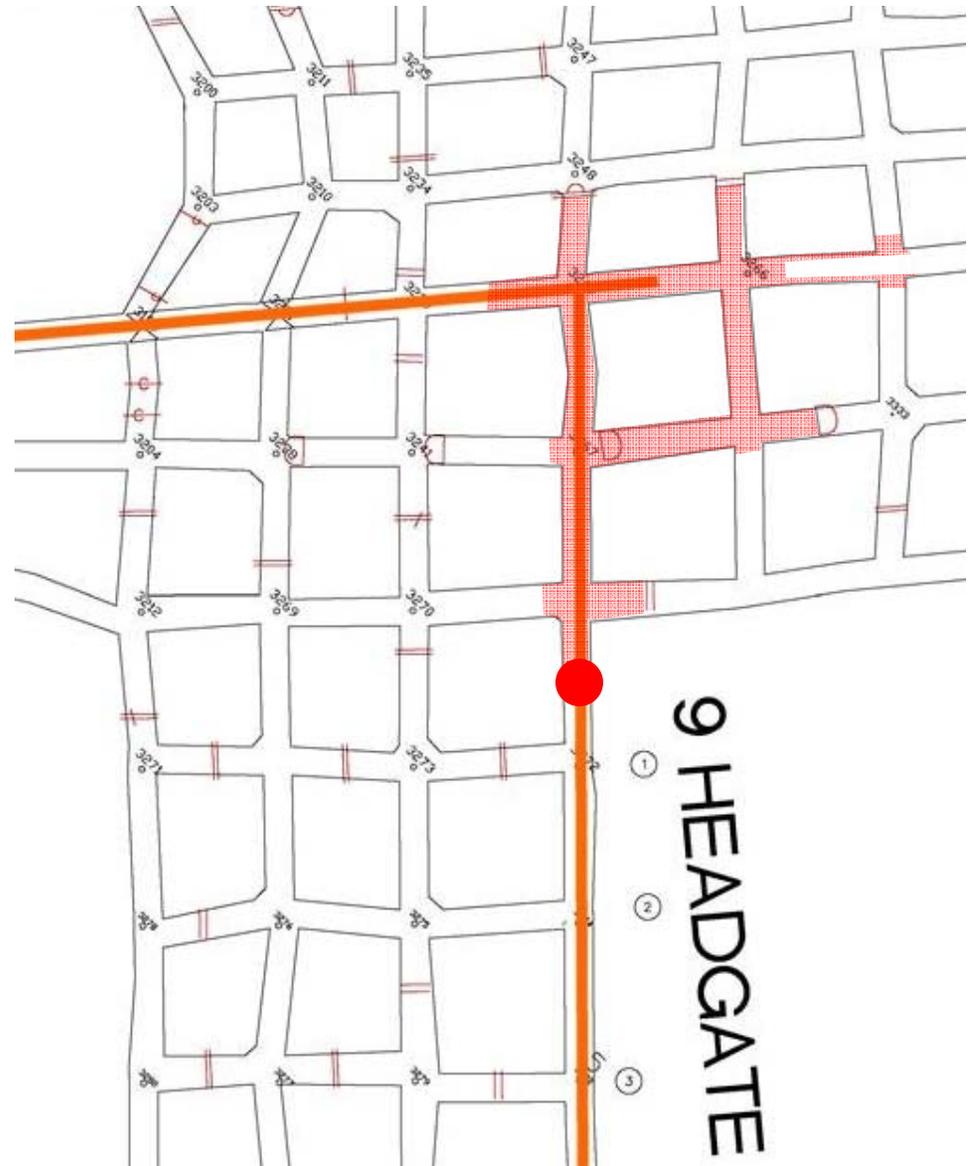
CONCLUSIONS (cont.)

- ❖ The 2 Section was using belt air to ventilate the working section without an approved change to the ventilation plan and without implementing required additional safety measures;
- ❖ Adequate training was not provided for personnel responsible for installing and maintaining the AMS;
- ❖ Adequate training was not provided for personnel responsible for responding to AMS signals;
- ❖ Compliance with the belt air rule would have prevented the two fatalities.

Belt Flame Resistance



**Approximately
4200 ft²
of belt consumed**





Belt from Aracoma met 2(g) flame resistance test requirements.

Additional testing conducted post-investigation on improved flame resistance testing – sampled failed to meet the requirements.



Use of Belt Entry Air

**and
Belt Air Rule Compliance**

**at
Aracoma Alma Mine #1**

Belt Air Overview

- Belt Air Petition for Modification
- Petition Requirements vs. Final Rule
- Compliance with Final Rule Provisions on January 19, 2006
- What if Belt Air was not used at Aracoma?

Petition for Modification

30 CFR § 75.350

- Mine began production October 1, 1999
- Petition initially submitted to MSHA December 14, 1999
- Petition filed on January 21, 2000
 - Expedited processing requested by Company
- Petition Granted by MSHA May 3, 2000

Petition (PDO) Requirements vs. Final Rule

- AMS Installation required in both PDO and Final Rule.
- Design and maintenance requirements similar except :
 - Sensors from mouth of section up to 4,000 feet outby automatically activate section alarms in PDO. Final rule requires any sensor (affected areas).
 - PDO Maximum quantity 202,000 cfm in belt air course
 - Ambient determination method specified in PDO.
 - Dilution study required in PDO for multiple entries.

Petition (PDO) Requirements vs. Final Rule

- Velocity requirements similar; however final rule allows reduced sensor spacing if velocities less than 50 fpm.
- PDO warning and alarm levels from tables; final rule 5/10 ppm, with reduced levels in ventilation plan.
- Examination and Calibration requirements similar.
- PDO prohibits miners entering mine after alarm; not included in final rule.
- PDO required miners 'on same split of air' to be withdrawn upon alarm. Final rule requires all affected areas to be withdrawn.

Petition (PDO) Requirements vs. Final Rule

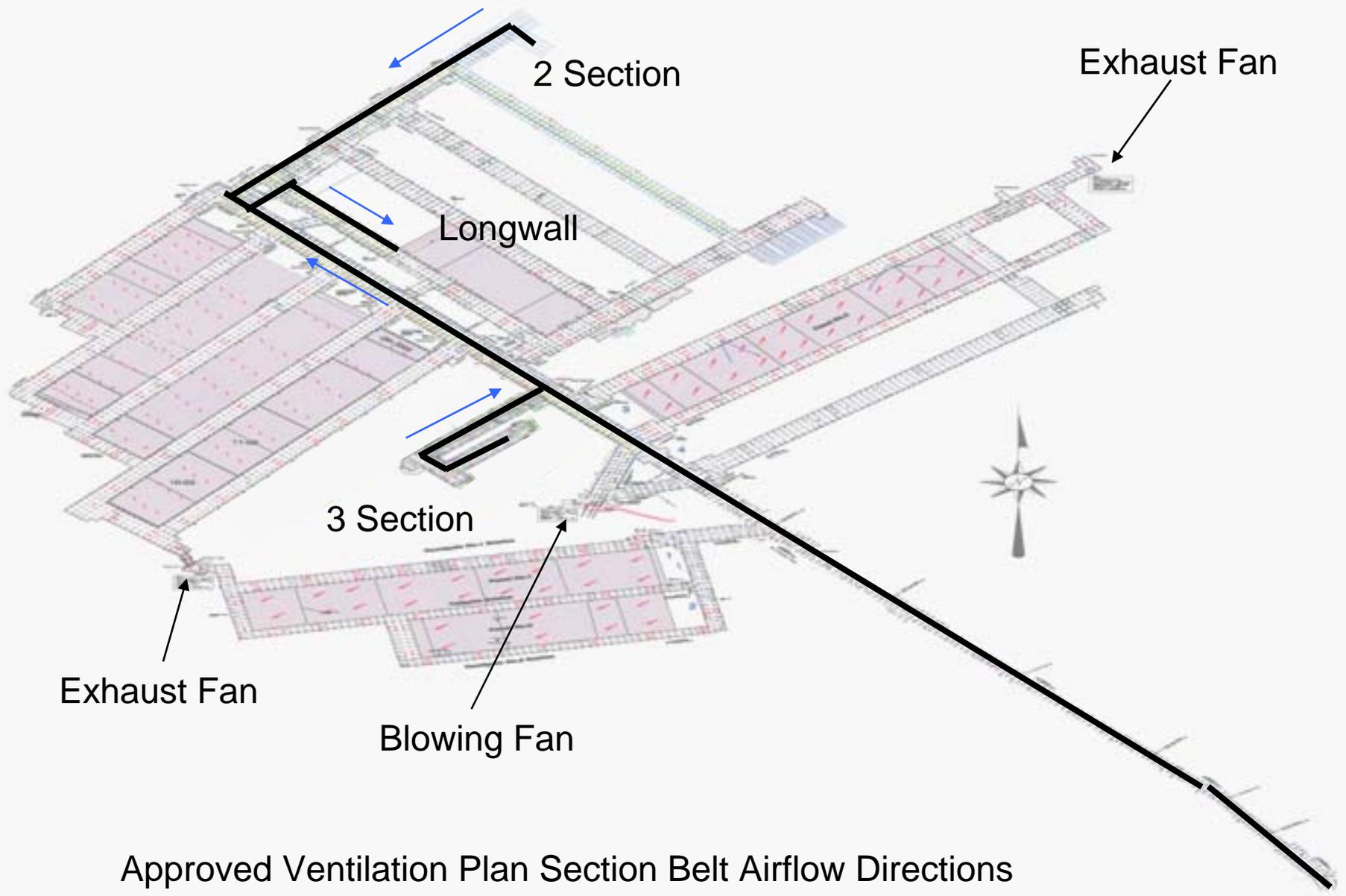
- System malfunctions not limited in duration by final rule; PDO allows for short period only, defined by time required to repair system; not addressed in final rule or existing regulations.
- PDO required new flame-resistant belting when commercially available; not addressed in final rule or existing regulations.
- PDO required equipment operated in primary escapeway to have automatic fire suppression systems installed; covered by other existing regulations.

Petition (PDO) Requirements vs. Final Rule

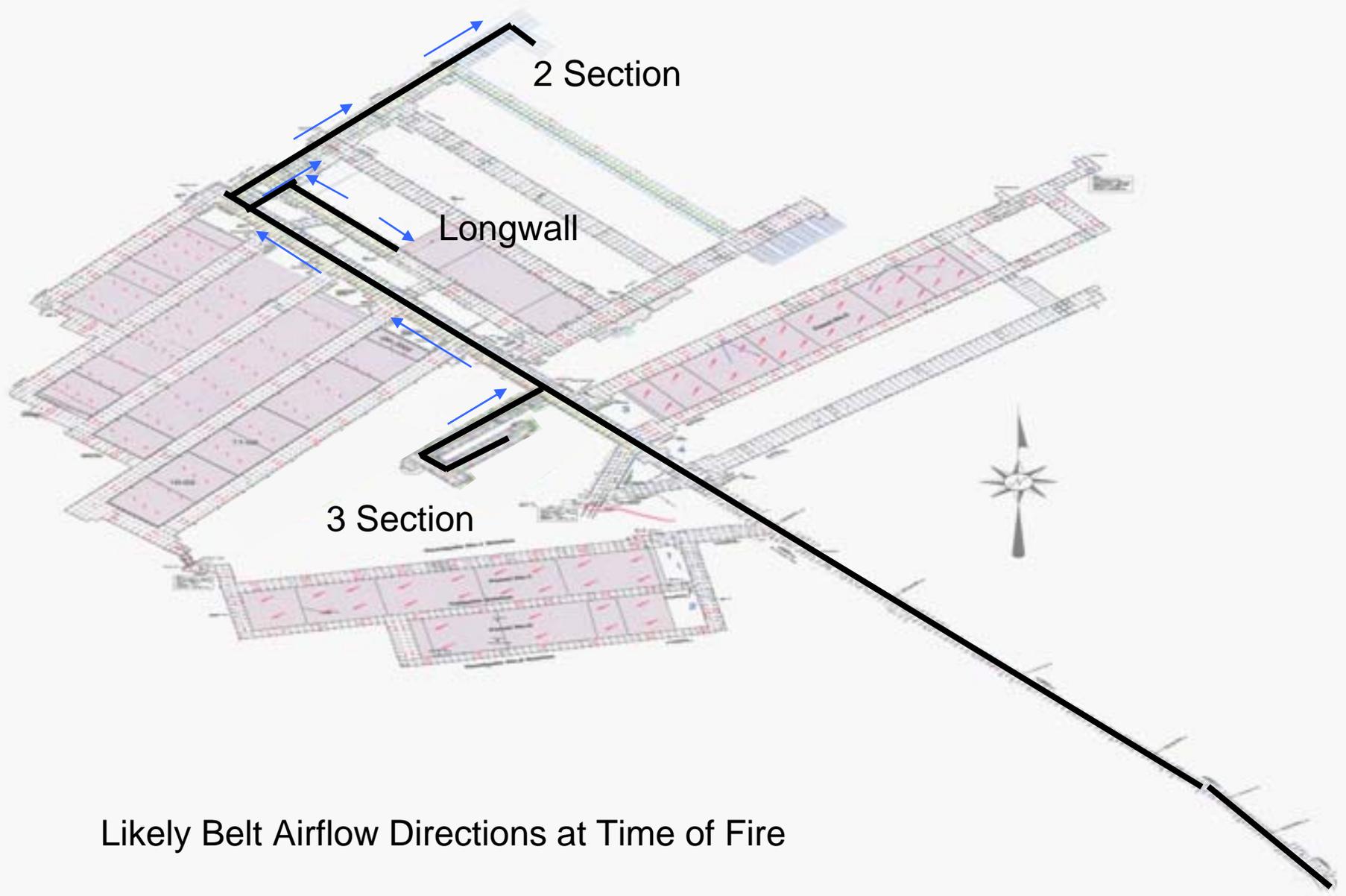
- PDO specifically requires maintaining integrity of primary escapeway. 50 percent provision in PDO; does not specify pressure differential requirement from primary escapeway to belt at all times (to extent practical); PDO specifies stopping repair and maintenance.
- PDO and final rule contain similar training requirements for Miners and AMS Operators.

Belt Air Courses

January 19, 2006



Approved Ventilation Plan Section Belt Airflow Directions



Likely Belt Airflow Directions at Time of Fire

Belt Air Ventilation

Basic Requirements in

30 CFR §75.350

30 CFR § 75.350 Belt air course ventilation

§ 75.350 (a)

The belt air course must not be used as a return air course; cannot be used to provide air to working sections except under (b); must be separated from other intake air courses; air velocities must be compatible with fire detection and suppression systems.

30 CFR § 75.350 Belt air course ventilation

§ 75.350 (b)

Air from a belt air course may be used to ventilate a working section... provided the following additional requirements are met:

- AMS Installed, Operated, Examined and Maintained per 75.351
- Training for Miners; AMS Operator
- Respirable Dust Sampling
- Monitor Primary Escapeway for CO or Smoke
- Development with at least Three Entries
- Maximum 50 percent of Total Intake for Section from Belt Air Course

Accident Investigation Report :

Belt Air Compliance Deficiencies

- Mine operator failed to maintain physical separation of No. 7 belt air course from the primary escapeway of 2 Section.

This provision applies to all mines regardless of utilization of belt air

Critical Ventilation Controls Removed Prior to Fire



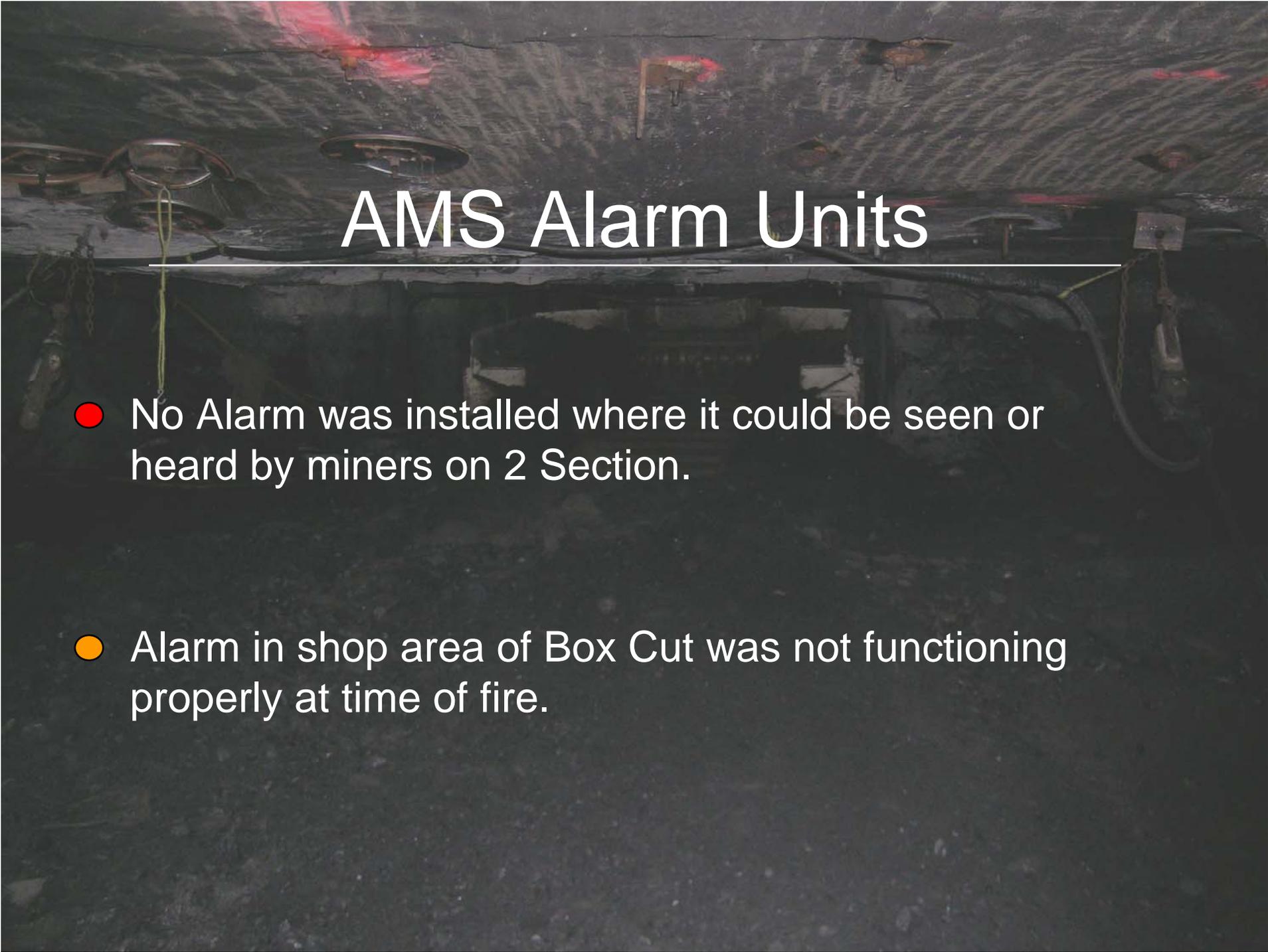
Stopping Removed to Install Dual Switch House
(72" Belt Structure Later Installed Prior to Fire)



72" Belt Structure
Installed



Stopping Removed Prior to Fire



AMS Alarm Units

- No Alarm was installed where it could be seen or heard by miners on 2 Section.
- Alarm in shop area of Box Cut was not functioning properly at time of fire.

Alarm Unit - Longwall

- The alarm for the longwall headgate was not maintained in proper operating condition.
- The alarm and sensor on the Longwall headgate were not properly installed.
- AMS was not properly programmed to provide automatic activation of alarms as required.



CO Sensor Installations

- Sensor spacing exceeded 1000 feet in some cases.
- Sensors were not all installed appropriately within belt entry.
- Sensor at longwall headgate was not permissible.
- A sensor was not installed within 100 feet downwind of transfer point from 7 Belt to 6 Belt.
- No CO or smoke sensors were installed in Primary Escapeways as required.

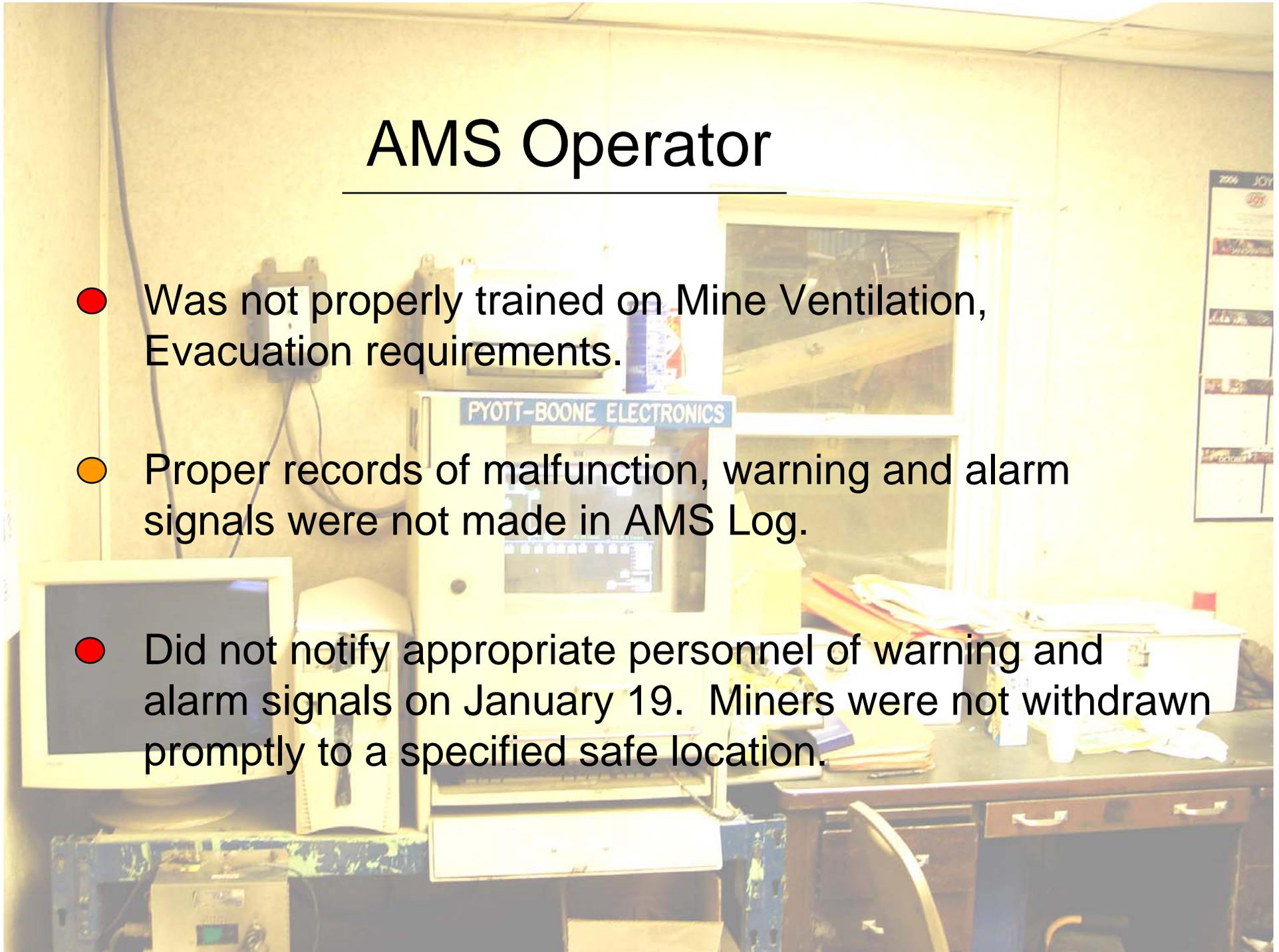


CO Sensor Calibrations

- Sensor calibration frequency often exceeded 31 days.
- Records indicated proper calibration procedures were not always followed.
- Calibration and Examination records were not maintained as required.

AMS Operator

- Was not properly trained on Mine Ventilation, Evacuation requirements.
- Proper records of malfunction, warning and alarm signals were not made in AMS Log.
- Did not notify appropriate personnel of warning and alarm signals on January 19. Miners were not withdrawn promptly to a specified safe location.



Other Requirements

- Pager phone and AMS cable were not installed in separate entries. Both systems utilized a common cable bundle.
- No Designated Area (DA) was established for 2 Section in the approved mine ventilation plan.
- AMS was not properly examined each shift; deficiencies were not identified and corrected.
- No record of 7-day AMS functional tests was provided.

- The mine map posted at the designated surface location was not up-to-date.
- When a sensor on 2 Section beltline malfunctioned earlier on January 19, it was not repaired, and the belt continued to operate without required monitoring.
- Not all miners were properly trained on the operation of the AMS.
- The person responsible for installing and maintaining the AMS was not adequately trained on belt air rule installation requirements.

Conclusions

- Belt Air was used on both 2 Section and the Longwall Section.
- Even with deficiencies in the system, the AMS detected the fire as designed.
- Approved Ventilation Plan was not amended to permit the use of Belt Air on 2 Section.

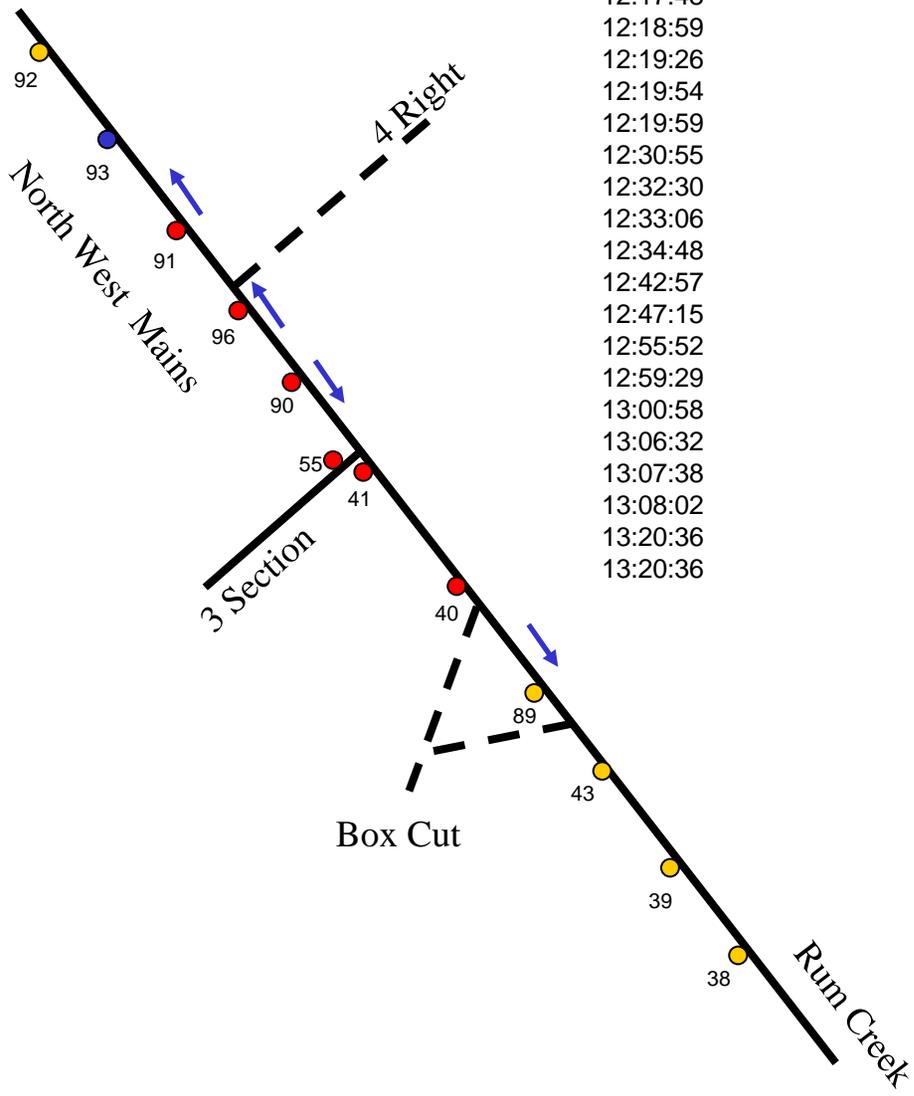
Conclusions, continued

- The Accident Investigation identified 32 failures to comply with provisions related to using Belt Air.
- Several failures affected the miners working on 2 Section on January 19, 2006 (contributory violations):
 - Lack of Physical Separation between air courses
 - Lack of Alarm Unit for 2 Section
 - Failure to Withdraw Miners on Alarm Signal
 - Failure to Notify Appropriate Personnel of Alarm
 - Inadequate Training of AMS Operator
 - Inadequate Training of AMS Installer
 - Inadequate Examinations of AMS

Other Fires and AMS Responses

October 8, 2005

- Alert and Alarm signals for eleven CO sensors
Period of over one hour
- No investigation indicated or record made in AMS Log
Source of CO unknown
- No withdrawal of miners initiated



October 8, 2005

Time	Sensor	Signal
12:17:34	90	Warning
12:17:48	90	Alarm
12:18:59	41	Warning
12:19:26	41	Alarm
12:19:54	55	Warning
12:19:59	55	Alarm
12:30:55	96	Warning
12:32:30	96	Alarm
12:33:06	91	Warning
12:34:48	91	Alarm
12:42:57	40	Warning
12:47:15	40	Alarm
12:55:52	43	Warning
12:59:29	39	Warning
13:00:58	89	Warning
13:06:32	92	Warning
13:07:38	89	Cleared
13:08:02	89	Warning
13:20:36	38	Warning
13:20:36	Warnings and Alarms begin to Clear	

Other Fires and AMS Responses

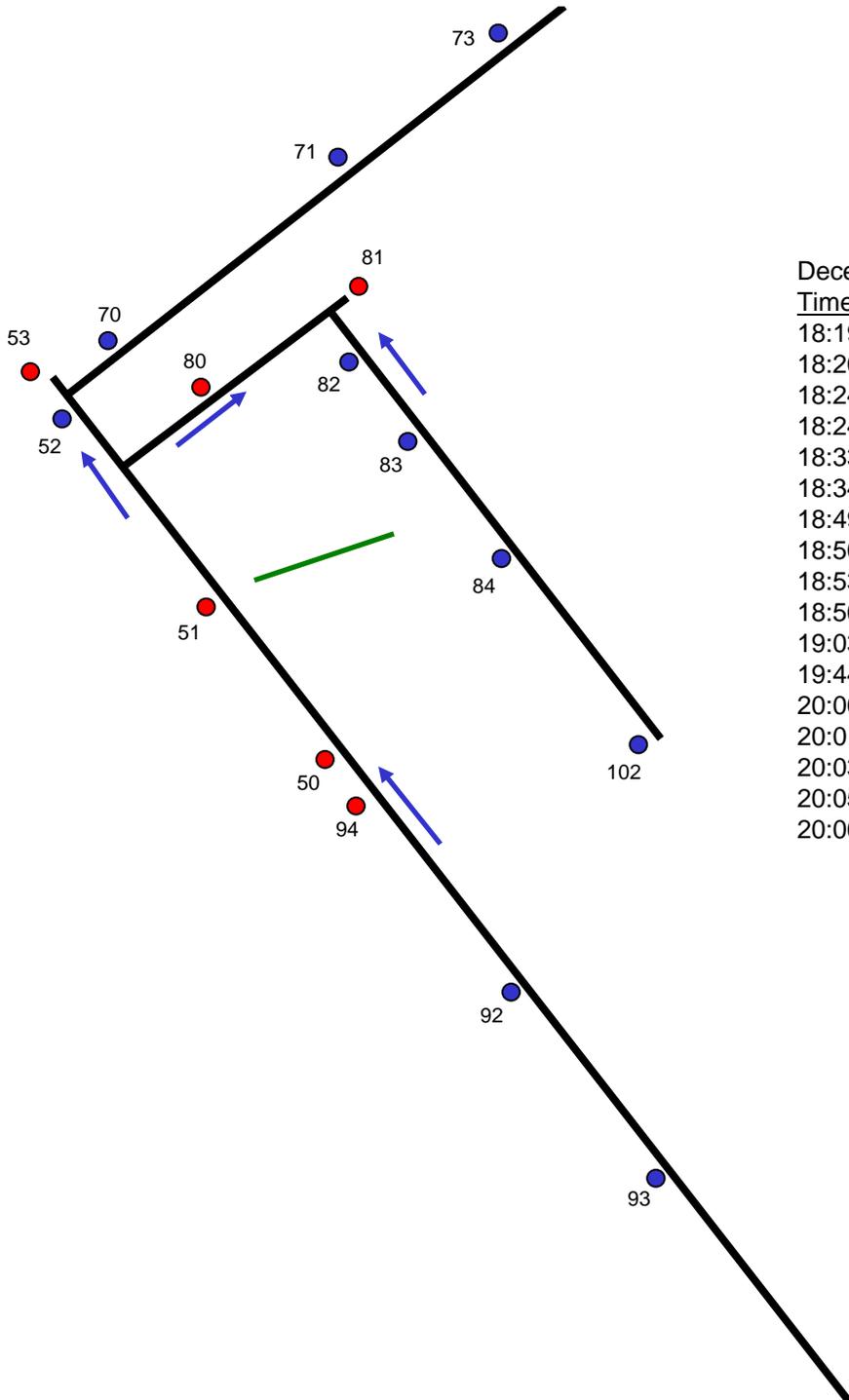
December 23, 2005

- Alert and Alarm signals for two CO sensors
Nonreportable fire (< 30 minutes)
Belt Storage Unit on Longwall Headgate
- Fire recorded in AMS Log
- No withdrawal of miners on 2 Section initiated
- Miner dispatched to investigate alarm
extinguished fire using water hose

Other Fires and AMS Responses

December 29, 2005

- Alert and Alarm signals for six CO sensors
Period of over $1\frac{1}{2}$ hours
Reportable fire – was not reported to MSHA
- Fire recorded in AMS Log
- No withdrawal of miners initiated
- Miners dispatched to investigate alarm extinguished fire



December 29, 2005

Time	Sensor	Signal
18:19:52	94	Warning
18:20:24	94	Alarm
18:24:07	50	Warning
18:24:34	50	Alarm
18:33:33	51	Warning
18:34:49	51	Alarm
18:49:13	53	Warning
18:50:09	53	Alarm
18:53:07	80	Warning
18:56:05	80	Alarm
19:03:31	81	Warning
19:44:18	51*	Warning Cleared
20:00:56	94	Warning Cleared
20:01:30	50	Warning Cleared
20:03:30	80	Warning Cleared
20:05:43	81	Warning Cleared
20:06:56	53	Warning Cleared

SUMMARY

Compliance with the belt air rule provisions would likely have prevented the fatalities at the Aracoma Alma Mine #1

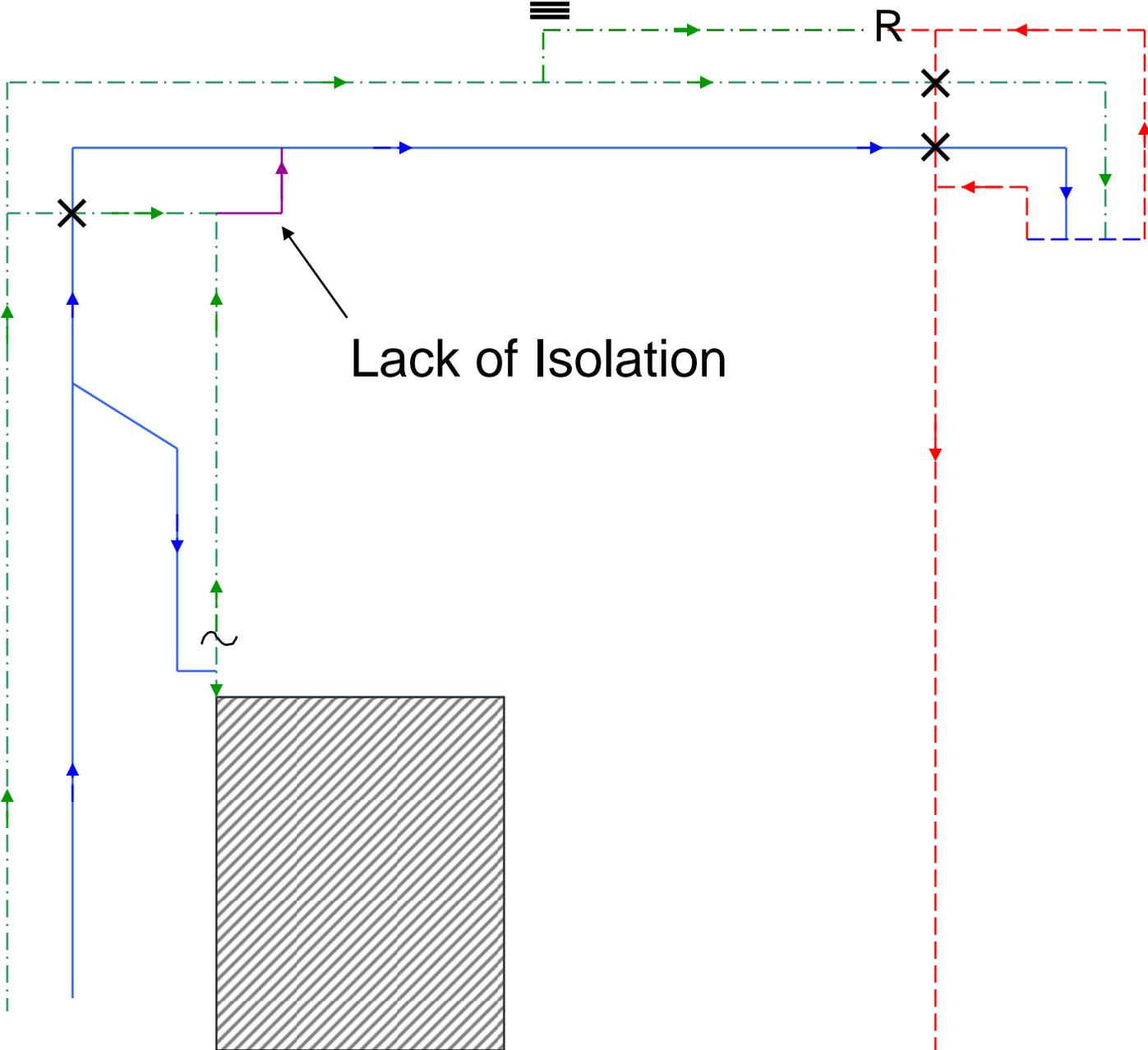
Lack of separation between air courses allowed smoke and CO to inundate the primary escapeway for 2 Section.

Lack of automatic notification of alarms and immediate withdrawal delayed 2 Section miners' departure by 28 minutes.

What If

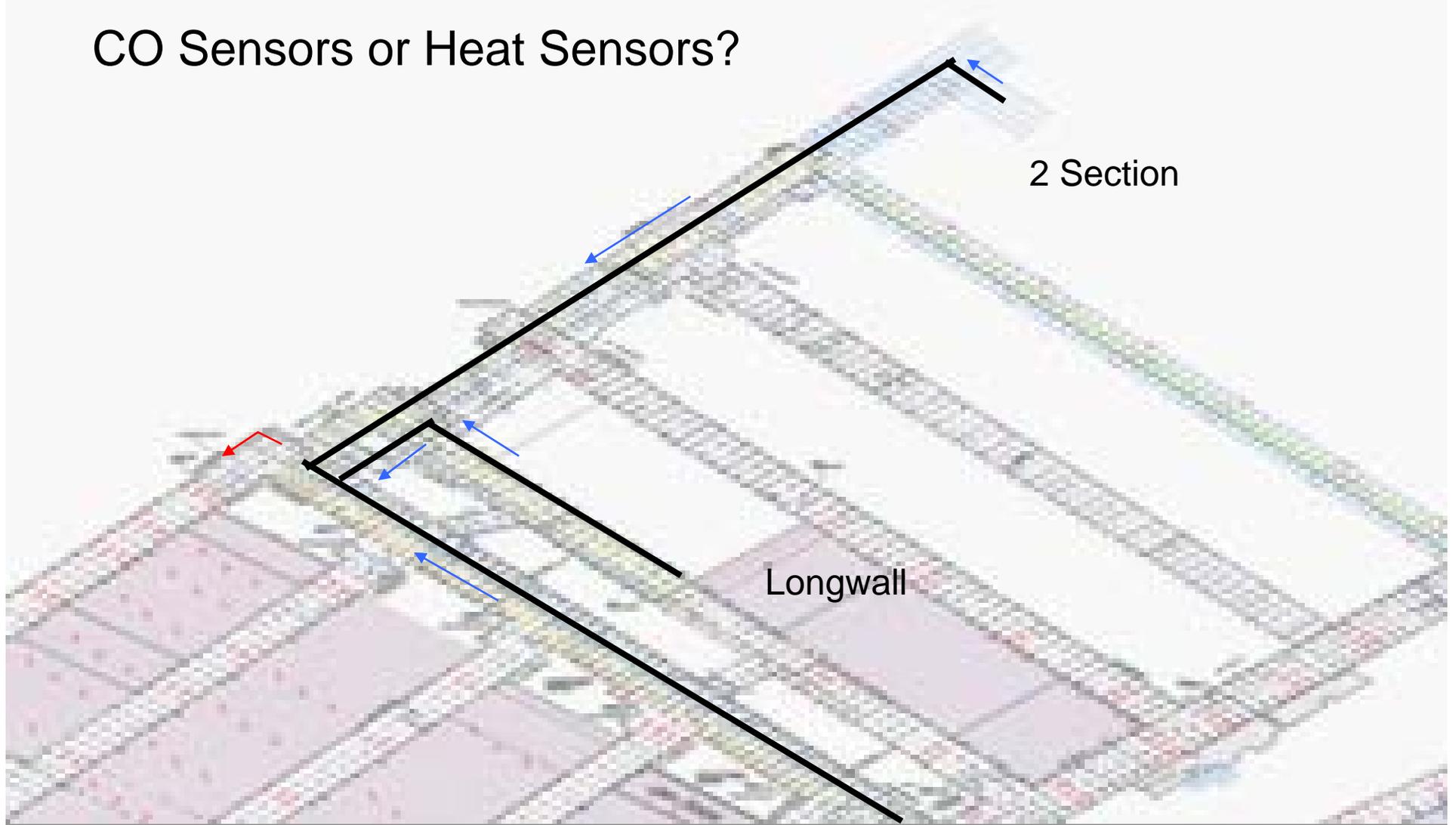
- Belt Air was Not Used
- Belts were ventilated in outby direction and air was directed to a return? Inby direction and vented to the return?

Ventilation on January 19, 2006



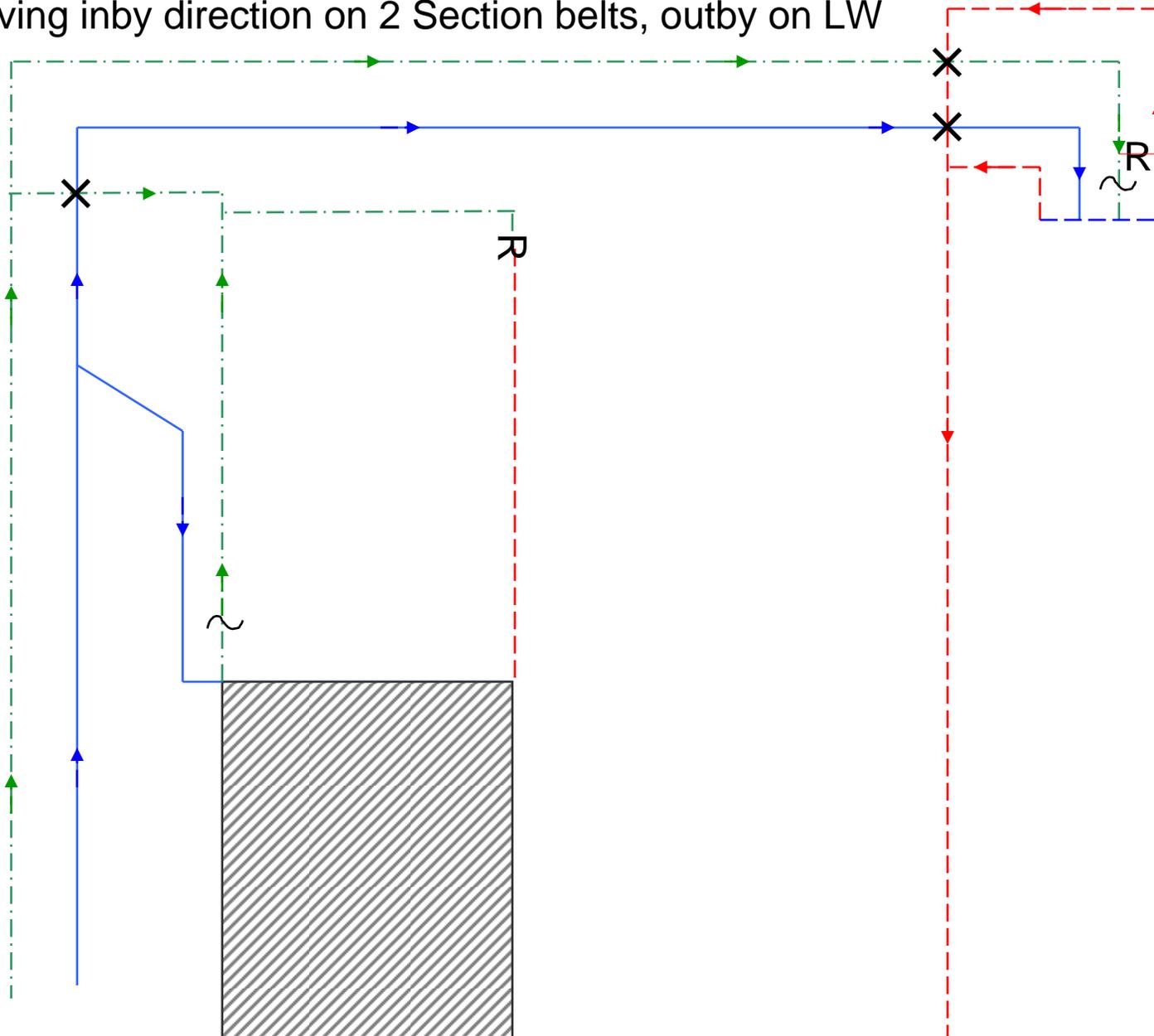
If not using belt air, what Changes?

CO Sensors or Heat Sensors?



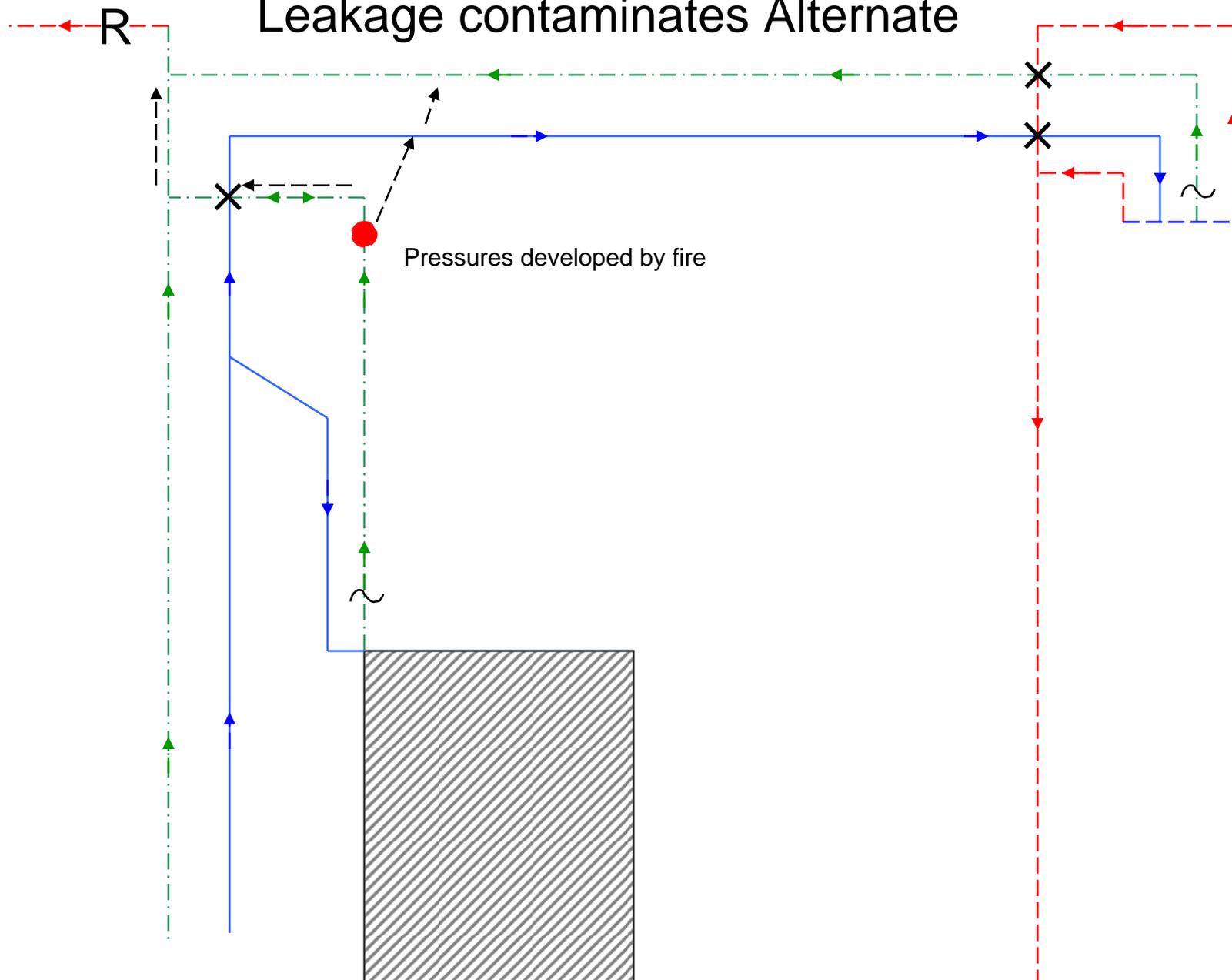
Compliance without using belt air

Air moving inby direction on 2 Section belts, outby on LW



Lack of Isolation may still contaminate Primary Escapeway

Leakage contaminates Alternate



If Belt Air was Not Used ?

- Lack of physical separation still allows for inundation of primary escapeway
- Fire detection system is likely to be point-type heat sensors rather than CO-based AMS