APPENDIX AJ

OPERATION OF THE MINECOM UHF LEAKY FEEDER SYSTEM, PYOTT-BOONE TRACKING, AND PYOTT-BOONE CARBON MONOXIDE MONITORING SYSTEM

U.S. DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
TECHNICAL SUPPORT

INVESTIGATIVE REPORT

Operation of the Minecom UHF Leaky Feeder System, Pyott-Boone Tracking, and Pyott-Boone Carbon Monoxide Monitoring System at Performance Coal Company

Upper Big Branch Mine-South (MSHA ID 46-08436)
Montcoal (Raleigh County), WV

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1 ABSTRACT

The Approval and Certification Center (A&CC), as requested by Upper Big Branch Mine Accident Investigation Team Leader, Norman Page, conducted an investigation related to the post-accident communications and tracking system and the carbon monoxide monitoring system installed in the Upper Big Branch Mine (UBB) prior to the explosion on April 5, 2010. The investigation included:

A. The operation of the leaky feeder, tracking, and carbon monoxide (CO) monitoring systems in place at the UBB mine prior to the explosion, including an issue with a fuse in the leaky feeder amplifier circuit; and
B. An estimation of the time interval between the explosion and the time the CO monitoring system indicated a problem. Additionally, data was collected to apply a correction of the clock on the computer in use at UBB to GPS time.

The communications and tracking systems consisted of a MineCom Model MCA 2000 UHF leaky feeder system and Pyott-Boone Model Tracker Boss tracking system. Tracking data was displayed by the MineBoss software package. These systems were not fully installed according to UBB's approved Emergency Response Plan (ERP) at the time of the explosion. Of the 48 readers displayed on the tracking map within MineBoss, the histories of only 21 of them indicate they were operational on April 5, 2010. Some tags were not assigned to an individual in the database, so unless the mine maintained a list outside the electronic tracking system, the miners associated with these tags were not tracked.

After the explosion, only the readers nearest the North and South portals remained operational. The system layout did not take advantage of installing an additional Head End Unit at the existing Ellis Portal. This would have provided more redundancy in the systems and might have allowed additional portions of the communication and tracking system to remain operational after the explosion. Data available indicates that the portions of the post-accident communications and tracking systems that were in use at UBB prior to the explosion were not maintained in a serviceable manner.

The event log indicates that several components of the CO monitoring system were in a fluctuating status prior to the explosion on April 5, 2010, and that the entire CO monitoring system was disabled as a result of the explosion. It cannot be determined from the event log whether the entire system was rendered inoperable immediately after the explosion, or whether portions of the system lost functionality over time, because all components did not report or communicate their status in the event log at the same time.

Pyott-Boone Electronics (Pyott-Boone) has addressed the leaky feeder system amplifiers with opened fuses in the field. Pyott-Boone subsequently modified the Model 1950 barrier to the Model 1950A barrier so that the modified barrier reduces

the susceptibility of the fuse in the amplifier. Minecom has submitted a design change to their approval to address the susceptible fuse in the amplifier.

Calculations based upon data within the configuration of MineBoss indicate that the event that interrupted communications between CO monitor 88 and the monitoring and control system (MCS) computer occurred approximately 1 minute 48 seconds prior to 15:08:01. Given the location of CO monitor 88, that event is assumed to be the explosion that occurred on April 5, 2010.

The time estimate between the event that initiated the COMMUNICATIONS DEAD status of CO Monitor 88 and its record into the event log can be applied to the PC clock to obtain a corrected time with respect to the GPS clock. Applying the 1 minute 48 second interval to the corrected CO Monitor 88 COMMUNICATIONS DEAD status time, using data taken in April 2010, indicates the event that initiated the status reached CO Monitor 88 at 15:00:31 on April 5, 2010. Applying the 1 minute 48 second time to the corrected CO Monitor 88 COMMUNICATIONS DEAD status time, using data taken between August and September 2011, shows that the event that initiated the status reached CO Monitor 88 at 15:00:28 on April 5, 2010.

The data collected in April 2010 (prior to the PC's removal from the mine) is believed to be more reliable than the data collected after the PC was returned to the mine. However, the maintenance of the tracking system (refer to §2.8), unknown scanning priority at the time of the explosion (refer to §3.4.3), the approximations of the CO monitoring system specifications (refer to §3.4.5), and the unknown status of the actual PC (refer to §3.5.3) combine to introduce uncertainty in both the time estimate between the explosion and the status change of CO Monitor 88 in the event log, and the time difference calculated between the PC clock and reference time. Additionally, time drift analyses based on other equipment recovered from the mine (the DVR and multi-gas detectors) indicate the explosion occurred at approximately 3:02 pm on April 5, 2010. Based on the maintenance, configuration, and conditions of the MineBoss PC and in comparison with other time calculations, both corrected times of 15:00:31 and 15:00:28 are not being considered accurate estimates.

Information presented in this report is based upon data obtained from an electronic copy of the event log database of the system in use at UBB from September 2009 to April 2010. This report also includes information received from the UBB accident investigation team.

2 THE OPERATION OF THE LEAKY FEEDER, TRACKING, AND CO MONITORING SYSTEMS IN PLACE AT THE UBB MINE PRIOR TO THE EXPLOSION.

2.1. **Communications System**. The post-accident communications system approved in UBB's ERP is an ultra high frequency (UHF) leaky feeder system manufactured by Minecom. The Model MCA 2000 UHF Leaky Feeder System holds MSHA

approval 23-A090001-0 and operates at a frequency of approximately 450 MHz. The Minecom leaky feeder system is comprised of the following components:

Head End Unit (4 input)
HEB1 barriers
UMLAD-BAT UHF in-line amplifiers
VBU1 and VBU2 splitters
VPC power couplers
VTB cable termination
VJB in-line connector/splice
Radiating (leaky feeder) cable
Pyott-Boone Model 1925 24 V_{dc} power supplies
Pyott-Boone Model 1950 power barriers
Pyott-Boone Model 1955 amplifier
Battery backup (12 V lead-acid gel cell)

The leaky feeder communication system is a distributed antenna system that provides two-way voice communications throughout the mine and to the surface. Radio frequency is transmitted to and radiates from the coaxial (leaky feeder) cable distributed in the mine from the Head End Unit installed at the surface. UMLAD-BAT UHF in-line amplifiers placed at regular intervals along the coaxial cable periodically boost the signal. When within range of the leaky feeder system, miners use separately approved, portable UHF radios to communicate throughout the mine and with the surface. In their ERP, UBB calls out Motorola HT750 radios, MSHA approval number 23-A080007-0, for use with the Minecom leaky feeder system.

The leaky feeder system is intrinsically safe when operated on standby power. Equipment that may be operated in permissible areas is segregated by HEB1 barriers and VPC power couplers. The Pyott-Boone Model 1955 amplifier battery backup is rated to provide 96 hours of standby power.

2.2. **Tracking System**. The post-accident tracking system approved in UBB's ERP is a radio frequency identification (RFID) system manufactured by Pyott-Boone. The Model Tracker Boss Tagging System holds MSHA approval 23-A090011-0. The Pyott-Boone tracking system is comprised of the following components:

Model 1981 UHF Tag Readers with antennas
Model 1925 120VAC/24VDC Power Supplies
Minecom HEB1 barriers
Model 1980 RFID Tracking Tags (MSHA Approval No. 23-A080004-0)

Readers are placed throughout the mine at known locations, so tags within range of a particular reader are associated with that location. Antennas may be extended to permissible areas when segregated by HEB1 barriers. Readers collect location data from tracking tags in the 900 MHz frequency band. The readers transmit the location data over the leaky feeder system, but there is no electrical connection between the two systems. The tracking data uses the leaky feeder system as a backbone to get the data to the surface, which then interfaces with the computer and associated hardware and software.

The tracking system is intrinsically safe when operated on standby power. The lead-acid gel cell battery housed in the reader is rated to supply 96 hours of standby power. The total duration depends upon how much activity the reader is exposed to while operating under battery power, but the condition and state of charge of the battery when line power is removed also affects the operation.

2.3. **MineBoss.** Pyott-Boone provides the MineBoss software package (MineBoss) at the monitoring and control system (MCS) computer at the surface to interface with various systems in use at a mine. MineBoss provides event driven data logging (an event log) that monitors the systems integrated into the mine. At the time of the explosion, the systems at UBB monitored by MineBoss included the CO monitoring, belt monitoring, and tracking systems, which are all manufactured by Pyott-Boone.

The MineBoss event log records events with the CO monitoring system such as the status of communications, warnings, calibrations, the status of uninterrupted power supplies, alarms, etc. Belt starts and stops are monitored in the Belt Boss system. With respect to the tracking system, MineBoss records events such as a reader coming online or offline, and advisories and panics associated with tags in the event log. However, the event log does not record a tag's reception at a reader. Each reader maintains an individual history in the MineBoss report database which may be accessed via report functions.

In addition to the event log for each of the systems, MineBoss provides maps for the systems it monitors. The respective system components are displayed along representations of the conveyor belts installed throughout the mine. The readers' histories and other data can be accessed from the tracking map screen by clicking on the reader icons. Similar to the tracking map, the CO monitor icons can be clicked for information as well. There are also buttons on the mapping displays for navigating to other screens within MineBoss.

Information presented in this report is based upon data obtained from an electronic copy of the MineBoss software and event log database of the system in use at UBB from September 2009 to April 2010.

2.4. **Communications and Tracking Systems**. The leaky feeder communication system is a distributed antenna with amplifiers placed periodically to boost the RF signal. The system is provided with standby power in the event that line power is disrupted. The tracking system is comprised of readers placed throughout the mine; each reader has a standby power source as well. Although there is no electrical connection between the communications and tracking systems, the readers use the leaky feeder as the backbone to send location data to the MCS. So even though there is no connection between the two systems, the performance of the tracking system is entirely dependent upon the operation of the leaky feeder communications system. Pyott-Boone representatives state the readers could continue to function (store location data) if the leaky feeder system ceased

functioning. However, the tracking data collected during this time would be lost if the leaky feeder system were not restored to service before the standby power of the readers was depleted.

2.5. **Installation of the Communication and Tracking Systems**. The Minecom leaky feeder and Pyott-Boone tracking systems were not completely installed according to UBB's approved ERP on April 5, 2010.

2.5.1. The accident investigation team reported that leaky feeder cable was attached to each of the four inputs of the Head End Unit. The inputs were labeled: North Track, North Intake, South Track, and South Intake. With some exceptions, the post-accident communications and tracking systems were not yet installed on the working sections to provide the coverage as described in Appendices A and B of the mine's approved ERP.

2.5.2. The accident investigation team reported that the leaky feeder was installed 12 crosscuts outby Headgate 22 in the primary and secondary escapeways. The leaky feeder went up to the stageloader on the longwall (just outby the face) in the secondary escapeway and up to the mule train in the primary escapeway. Additionally, the leaky feeder extended to the mouth of the Tailgate 22 area.

2.5.3. No readers were installed on working sections. The accident investigation team reported that the tracking system stopped at the mouth of Headgate 1 north of the current longwall face.

2.5.4. Aside from the two different areas of the mine (North and South), it is not known which branch of the leaky feeder system (track or intake) with which the readers were associated.

2.6. **Operation of the Communication and Tracking Systems Prior to the Explosion**. Between January 1, 2010, and April 10, 2010, the MineBoss database shows that 251 tags were tracked underground. Many of the tracking tags detected within the system did not have names associated with them in the database. The tracking system was configured such that readers at the North, South, and Ellis portals could read tags that were on the surface. The result is the all 251 tags may not have gone underground at UBB between January 1, 2010, and April 10, 2010. Refer to the Appendix for a listing of these tags.

2.6.1. One hundred eighteen (118) tags were detected by the tracking system on April 5, 2010. As stated previously, this may include tags that were near portals but did not go underground on April 5, 2010. Refer to the Appendix for a listing of these tags.

2.6.2. The event log lists 58 readers at the time of the explosion. The 18 readers on the bottom left corner of the tracking map described as spares are <u>not</u> included in this count. There are 50 readers displayed on the tracking map. **The following**

information is reported assuming that the readers displayed on the tracking map were located accordingly underground. The 58 readers are comprised of:

- Two of the readers on the tracking map (111 & 112) were designated as test readers and as such are not part of the tracking system installation.
- Forty-eight (48) of the 50 readers displayed on the tracking map comprise the electronic tracking system throughout the mine.
- The remaining eight (8) readers are listed in the event log but are <u>not</u> displayed on the tracking map.
    - Four of these readers (34, 59, 67, and 96) have histories in the report database, although the latest date any of these four readers reported a tag is March 23, 2010. There is no indication of where these readers may have been located underground. It is not known if any of them were intended as part of the tracking system installation.
    - The other four readers (35, 48, 57, and 80) listed in the event log but not displayed on the tracking map are not listed in the report database. A reader that is not listed in the report database would not have a tracking history. It is likely that these readers were not linked to the report database, although it is now known if they were ever linked or when the link to the database may have been disconnected. While these four readers may have been reading tags and even reporting location data to the surface, no tracking data was available in the report database from these readers. As such, they are considered inoperable.

2.6.3. The tracking map display in MineBoss shows 48 readers positioned along the conveyor belts. Map 1 in Appendix A shows the layout of the tracking system in use at UBB at the time of the explosion. Table 1 sorts the readers by the last date a tag was read, as indicated by the individual reader histories.

Table 1 Reader Operability as Indicated by Reader History

	Readers Not Operating on April 5, 2010			Readers Operating on April 5, 2010		
	reader ID	location description in MineBoss	last date a tag was read	reader ID	location description in MineBoss	last date a tag was read
1	**3.44**	4 Brk on East Mains Track	02/27/10	**3.18**	5 North Belt Starter	04/05/10
2	**3.98**	East Mains Punchout	02/27/10	**3.20**	52 Brk Track	04/05/10
3	**3.79**		03/17/10	**3.30**		04/05/10
4	**3.26**	22Brk on Track	03/18/10	**3.32**	64 Brk Intake	04/05/10
5	**3.17**	25 Brk In 4 Sect Intake	03/22/10	**3.5**	76 Brk on Track	04/05/10
6	**3.50**	24 Brk In 3 Sect Intake	03/22/10	**3.56**		04/05/10
7	**3.45**	2 BRK on 4 Section Track	03/24/10	**3.58**	31 Brk on North Track	04/05/10
8	**3.74**	2 Section Intake Split	03/24/10	**3.62**	58 Brk on track	04/05/10
9	**3.94**	Ellis Punchout Intake	03/24/10	**3.70**	62 Brk on track	04/05/10
10	**3.15**		03/25/10	**3.72**	3 brks inby ellis switch	04/05/10
11	**3.53**	4 Brk South Track	03/25/10	**3.75**	6 North Starter Box	04/05/10
12	**3.97**	13Brk East Mains Track	03/25/10	**3.76**	2 Brk on 4 section track	04/05/10
13	**3.22**	Ellis Switch	03/29/10	**3.82**	83 Brk on Track	04/05/10
14	**3.37**	3Section 1 Head Starter	03/31/10	**3.92**	Ellis Punchout Track	04/05/10
15	**3.65**	3 Brk on 3 Section Track	03/31/10	**3.99**	2Brks Outby Switch Ellis	04/05/10
16	**3.10**	100 Brk Intake	04/01/10	**3.43**	3 Brk Intake	04/06/10
17	**3.16**	60 Brk Intake	04/01/10	**3.9**	North Fan	04/06/10
18	**3.54**	2Brks Inby Intake Split	04/01/10	**3.1**	North Track Portal	04/10/10
19	**3.66**	49 Brk Intake	04/01/10	**3.11**	11Brk on North Track	04/10/10
20	**3.23**	Ellis Intake Split	04/03/10	**3.47**	3 Brk on North Track	04/10/10
21	**3.55**	83 Brk Intake	04/03/10	**3.87**	South Track Portal	04/10/10
22	**3.90**	Ellis Intake Split UBB Side	04/03/10			
23	**3.19**	1 Brk Inby 2 Section 1 Head	no history			
24	**3.25**	20 Brk In Intake	no history			
25	**3.71**	100 Brk Track	no history			
26	**3.8**	South Fan	no history			
27	**3.83**	4 Brk South Intake	no history			

- Twenty-one (21) of the readers were operational on April 5, 2010 as indicated by tags reported in their tracking histories. This indicates that the leaky feeder system was operational in these areas of the mine and outby to the head end because the tracking system uses the leaky feeder system as a backbone to transmit location data to the surface.
- Searches of the report database within MineBoss indicate that 27 of the 48 readers on the tracking map did not read a tag on April 5, 2010. This could indicate that no tags were within range of any of these readers on April 5, 2010. However, this is viewed as unlikely for many of these readers because as shown in the table, the tracking histories indicate that it was at least two days and in many cases several weeks since the last time a tag was read. If system(s) or components were inoperable, this could result from either problems with the individual readers or with the leaky feeder system (either the track or intake branches in each of the North and South areas of the mine). Reader 30 is shown as the most inby reader on the tracking map and was operational on April 5, 2010. This indicates that at least one branch of the leaky feeder system was operational as far inby as the longwall section in the North area of the mine.

- Five (5) of the 27 readers determined inoperable on April 5, 2010 (8, 19, 25, 71, 83) but displayed on the tracking map had no tracking history available in MineBoss. Similar to readers 35, 48, 57, and 80 above, these five readers do not appear linked to the report database and are therefore considered inoperable.

2.6.4. In the South area of the mine, only reader 87 described as South Track Portal reports a tracking history up to and after April 5, 2010. The latest date any of the other 12 readers shown on the tracking map in the South area of the mine is March 25, 2010 by readers 15, 53, and 97. Given that reader 87 was located near a portal, it would not be as susceptible to issues that might interfere with its operation as readers installed in more inby areas of the mine. Other than reader 87, the 12 readers displayed on the tracking map in the South area of the mine last report histories between 02/27/10 to 03/25/10. While it can be assumed that the leaky feeder system was operational until 02/27/10 in the South area of the mine, there is no indication in the MineBoss database whether the readers stopped reporting location data due to problems with the readers themselves, or if the leaky feeder system for this entire area of the mine inby reader 87 ceased functioning on or after 03/25/10.

2.6.5. Reader 1 (North Track Portal) detected a panic button pressed on Tag 176 twice at 06:55 on April 5, 2010. Tag 176 did not have a name assigned to it in the tag database. Tag 176 was tracked at Reader 1 twice at 06:55:27. Tag 176 was cleared in the event log at 07:46:40.

2.6.6. In the days immediately prior to the explosion, Reader 82 described as 83 Brk on track came ALIVE and went DEAD repeatedly in the event log. Readers report as ALIVE when first picked up by a starting master station, or when beginning communications with the master station after the leaky feeder was repaired. Conversely, readers report DEAD when communications with the master station is disrupted. The status of reader 82 changed sometimes over the span of a couple of hours on a particular day (April 4, 2010), and sometimes throughout the duration of a day (April 1, 2010). The event log shows this continued in the early morning hours until 14:54:42 on April 5, 2010. Reader 82 did report location data for tags during this time.

2.7. **Operation of the Communication and Tracking Systems After the Explosion**. The explosion at UBB occurred shortly after 3:00 pm on April 5, 2010.

2.7.1. According to the MineBoss clock, between 15:11:14 and 15:11:44 on April 5, 2010, 14 readers reported as DEAD in the event log. Three more readers reported as DEAD between 16:35:25 and 16:35:56. A total of 17 readers reported as DEAD in the event log shortly after the explosion.

2.7.2. The following six readers continued to report location data after the explosion on April 5, 2010: 1; 11; 43; 47; 87; and 9. The tracking map indicates that these readers are all located at or near a mine portal. (Note: The first location data

reported by reader 9 on April 5, 2010 was at 15:49:45. Prior to the explosion on April 5, 2010, reader 9 last reported location data on April 1, 2010.) MAP 2 in Appendix A shows the status of the readers after the explosion on April 5, 2010 by the event log.

2.7.3. Between 19:02:49 and 19:05:52, 57 of the 58 readers in the event log came ONLINE. Readers are reported as ONLINE as a result of user configuration changes at the master station at the surface. Eight of the readers reporting as coming ONLINE at this time are not shown on the MineBoss tracking map. These are the same eight readers described previously as listed in the event log but not displayed on the tracking map. Two readers that came ONLINE are the test readers 111 and 112. The remaining 47 readers that came ONLINE are displayed on the tracking system map.

2.7.4. Reader 99 described as 2Brks Outby Ellis Switch did not report ONLINE in the event log with the other 57 readers beginning at 19:02:49 on April 5, 2010. Reader 99 was in the report database and reported location data in the days before and up to 14:51:30 on April 5, 2010 as indicated by its reader history. The only status reported in the event log for Reader 99 on April 5, 2010 was DEAD with the other 16 readers shortly after the explosion at 15:11:36.

2.7.5. There is no activity in the event log tracking system between 16:35:56 and 19:02:49. The accident investigation team indicated that around this time on April 5, 2010 representatives of Pyott-Boone on site at UBB offered their assistance in monitoring the MineBoss system.

2.7.6. Between 19:02:50 and 19:04:40 on April 5, 2010, six readers (1, 9, 11, 43, 47, and 87) came ALIVE in the event log. As stated earlier, readers report as ALIVE when first picked up by a starting master station, or when beginning communications with the master station after the leaky feeder was repaired. The six readers that came ALIVE are located at or near a portal and are the same six readers that continued to operate after the explosion.

2.7.7. At 21:50:45 and 21:50:51 on April 5, 2010, Reader 87 (South Track Portal) reported in the event log that Tag 701 pressed PANIC. Tag 701 is assigned to Jim Bowyer in the MineBoss database. After the two PANIC reports, the only other listing in the event log for Reader 87 is that it reported DEAD at 19:09:42 on 04/10/10. Tag 701 was last tracked at 23:43:35 on April 5, 2010 at Reader 87. Since Reader 87 is located near a portal, it is unknown if Tag 701 was actually underground at the time the PANIC alarms were initiated.

2.8. **CONCLUSION**. When compared with each other prior to the explosion, the event log and the tracking map within MineBoss indicate inconsistencies in the electronic tracking system at UBB. Some readers included on the tracking map were not operational on April 5, 2010, and some readers in the report database were not on the tracking map and vice versa. Some tags were not assigned to an individual in

the database, so unless the mine maintained a list outside the electronic tracking system, the miners associated with these unassigned tags were not tracked. Of the 48 readers displayed on the tracking map within MineBoss, the histories of only 21 of them indicate they were operational on April 5, 2010. This resulted in gaps in the coverage of the electronic tracking system, the largest being the entire South area of the mine inby Reader 87. After the explosion, only the readers nearest the North and South portals remained operational. The system layout did not take advantage of installing an additional Head End Unit at the existing Ellis Portal. This would have provided more redundancy in the systems and might have allowed additional portions of the communication and tracking system to remain operational after the explosion. Data available from MineBoss indicates that the portions of the post-accident communications and tracking systems that were in use at UBB prior to the explosion were not maintained in a serviceable manner.

2.9. DESCRIPTION OF FUSE ISSUE WITH LEAKY FEEDER LINE AMPLIFIERS

2.9.1. As previously described, the leaky feeder communication system is a distributed antenna with amplifiers placed periodically to boost the RF signal. The leaky feeder system has standby power supplied by batteries which are charged during normal operation. When line power is interrupted, the leaky feeder system continues to operate using the standby power source, which is the Pyott-Boone Model 1955 12 volt lead-acid Line Amplifier Battery Backup (1955 battery). Although the standby power source for the tracking system is a battery housed within each reader enclosure, the operation of the tracking system during loss of line power is also dependent upon the standby power source for the leaky feeder system because the tracking data is transmitted to the surface over the leaky feeder system.

2.9.2. Each amplifier in the leaky feeder system has its own 1955 battery backup unit. Amplifiers receive power over the leaky feeder cable from power couplers which are in line with a power supply. The 1955 battery is charged from DC voltage that travels over the leaky feeder cable, through the amplifier circuit, and through the four conductor cable to the 1955 battery charge circuit as shown in Figure 1.

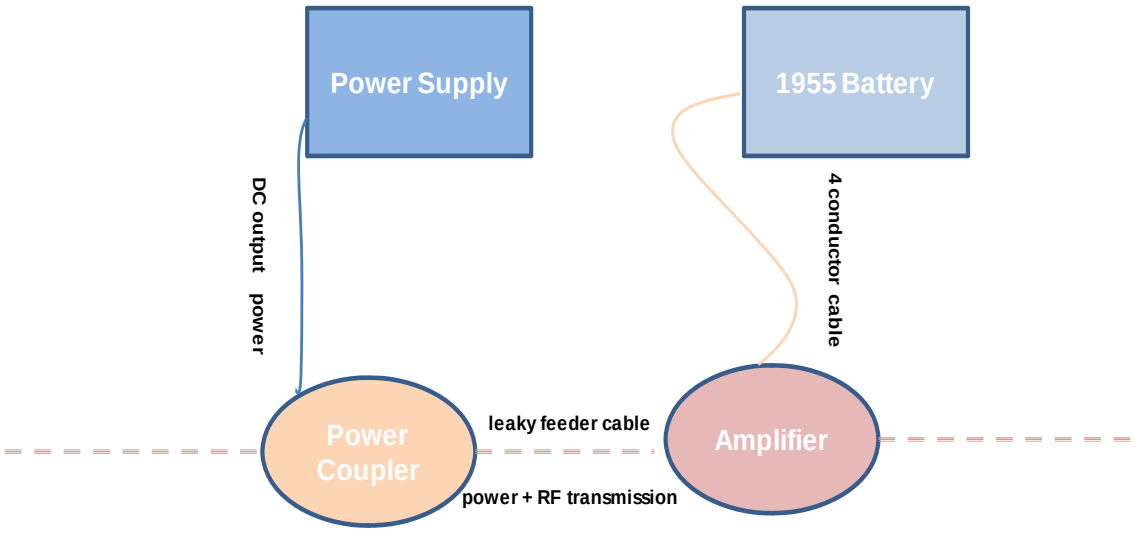

Figure 1 Sketch of Part of the Power Path for the Leaky Feeder System

2.9.3. The amplifier circuit includes a non-replaceable (soldered to the printed circuit board) fuse. Reports from field installations indicate that this fuse is susceptible to opening, reportedly due to voltage spikes from the line power source. Even when a 1955 battery is fully charged, an open fuse renders the amplifier inoperable, so communications inby the inoperable amplifier are severed. Although the operation of the tracking readers would be unaffected by the open fuse in the amplifier because they could continue to function on their own standby power source, they would not be able to transmit tracking data to the surface because the open fuse in the amplifier disrupts the operation of the leaky feeder system.

2.9.4. As stated previously, the open fuse in the amplifier renders it inoperable. As a result, communications via the leaky feeder system inby any amplifier with an open fuse is disrupted. This also results in an interruption of the electronic tracking system, because the tracking system uses the leaky feeder as a backbone to transmit tracking data to the surface. It was noted in a previous section of this report that there were areas of the mine where the tracking system was shown as installed but MineBoss did not have tracking data for weeks prior to the accident. As reported by members of the accident investigation team, efforts to reinstall the communications and tracking system after the accident indicate that open fuses in amplifiers interfered with the performance of the electronic tracking system.

2.9.5. The problem of the fuse being susceptible to voltage fluctuations was recognized soon after the approval for the leaky feeder system was issued. The A&CC subsequently received questions from mine operators who wanted to be able to replace the fuse themselves. However, the design of the amplifier required that the fuse be replaced by the manufacturer only. An alternative solution to the problem might be to replace the amplifier, but some operators

report this to be burdensome for several reasons: the occurrence of the fuses opening is frequent; and, replacing the amplifier requires keeping a significant amount of inventory on hand.

2.9.6. **CONCLUSION**. Pyott-Boone, as Minecom's distributor, has addressed the amplifiers with opened fuses in the field. Pyott-Boone modified the Model 1950 barrier to the Model 1950A barrier. The design of the modified barrier reduces the susceptibility of the fuse in the amplifier. Minecom has submitted a design change to their approval to address this issue.

3 OPERATION OF THE CO MONITORING SYSTEM.

3.1. **Operation of the CO Monitoring System Prior to the Explosion**.

3.1.1. The MineBoss Station 1 Scanner in the CO monitoring system lists 126 components as online in the system. This includes 18 components for the belt boss system.

3.1.2. In the 24 hours prior to the explosion on April 5, 2010, there were several dozen entries to the event log for six components within the CO monitoring system at UBB. **The following information is reported assuming that the components of the CO monitoring system displayed on the CO monitoring map in MineBoss were located accordingly underground.**

3.1.3. Component 21 described as Eastmains UPS GAINED COMMUNICATIONS and reported DEAD COMMUNICATIONS. GAINED COMMUNICATIONS indicates that the component is communicating with the master station. DEAD COMMUNICATIONS indicates that communication between the master station at the surface and the component is disrupted.

3.1.4. CO Monitor 26 described as Ellis #4 Tail reported several warnings, alarms, relaunches, etc. for CO. The warnings indicate a CO concentration that ranged up to 28 ppm.

3.1.5. CO Monitor 45 described as 500 From Face GAINED COMMUNICATIONS and reported DEAD COMMUNICATIONS over three dozen times.

3.1.6. CO Monitor 63 described as BLUE OUT had several status changes, some of which were: alarm relaunched (0 ppm); alarm latch set (0 ppm); warning latch set (0 ppm); alarm latch resets (0 ppm); warning latch reset (0 ppm); and maximum CO value obtained during alarm condition was (0 ppm).

3.1.7. Component 71 described as SMART REMOTE ELLIS 5 HEAD reported CO Monoxide Warning (4, 5, and 6 ppm); CO Monoxide Warning CLEARED (3 and 4 ppm); and Warning Latch Set and Reset over 2 dozen times.

3.1.8. Component 100 described as Analog Scanner had several status changes related to remote switch, winch, gob switch, fire, AC power, and sequence.

3.1.9. The last record in the CO monitoring system event log prior to 3:00 pm on April 5, 2010 is for CO Monitor 71 “Carbon Monoxide Warning CLEARED (4 ppm),” which was reported at 14:46:21.

3.1.10. The map in Mineboss for the CO monitoring system consists of 70 components (CO monitors, UPSes, a test CO monitor, etc.) configured along representations of the conveyor belts.

3.2. **Operation of the CO Monitoring System After the Explosion**.

3.2.1. CO monitor 88 reported COMMUNICATIONS DEAD at 15:08:01 on April 5, 2010. Fifty-one (51) other components of the CO monitoring system reported COMMUNICATIONS DEAD between 15:08:01 and 15:25:59. Forty-nine (49) of the 52 components were displayed on the CO map in MineBoss. MAP 3 in Appendix A shows the status of the CO monitoring system after the explosion on April 5, 2010 as indicated by the event log.

3.2.2. CO Monitor 118 described as 5 North at Flow Thru reported an alarm of 105 ppm at 15:11:58. In addition to CO Monitor 118, seven other CO monitors alarmed with high concentrations of CO between 15:12:29 and 15:12:49 (77; 82; 83; 84; 85; 86; and 120). These eight CO monitors alarmed and relaunched alarms more than two dozen times from 15:11:58 to 17:56:42.

3.2.3. There is no activity in the event log for the CO monitoring system between 17:56:42 and 19:02:52. As stated previously, the accident investigation team indicated that at this time on April 5, 2010, representatives of Pyott-Boone on site at UBB offered their assistance and began monitoring the MineBoss system.

3.2.4. The event log indicates that 69 CO monitors reported COMMUNICATIONS DEAD status between 19:03:25 and 22:01:05 on April 5, 2010. During this time, the Component 21 Eastmains UPS indicated an ALARM status.

3.2.5. Several CO monitors, including two monitors that are displayed on the CO map in the North area of the mine (41 and 96), did not report COMMUNICATIONS DEAD with the other 52 components of the system before 15:25:59. However, the event log indicates that the components in the entire CO monitor system reported COMMUNICATIONS DEAD by 22:01:05 on April 5, 2010.

3.3. **CONCLUSION.** The event log indicates that several components of the CO monitoring system were in a fluctuating status prior to the explosion on April 5, 2010. After the explosion, the continuously relaunching CO monitors and the absence of information from the CO system that appeared to remain operational indicate problems with the operation of the system. After the assistance from

representatives of Pyott-Boone, the event log indicates that the CO monitoring system was disabled in the entire North area of the mine and then throughout the entire mine as a result of the explosion. It cannot be determined from the event log whether the entire system was rendered inoperable immediately after the explosion, or whether portions of the system lost functionality over time, because all components did not report or communicate their status in the event log at the same time.

3.4. **Estimation of the time interval leading to the "COMMUNICATIONS DEAD" status of CO Monitor 88 at 15:08:01 in the event log**.

3.4.1. The event log generated by the MineBoss software indicates that CO Monitor 88 reported COMMUNICATIONS DEAD at 15:08:01 on April 5, 2010. Given the layout of the CO monitors in place at UBB and the extent of the area affected by the explosion, an assumption can be made that this was the first CO monitor to successfully communicate an event to the event log as a consequence of the explosion. Based on that assumption and with the assistance of representatives from Pyott-Boone, an estimate of the time between the events that initiated the COMMUNICATIONS DEAD status of CO Monitor 88 and its record into the event log can be calculated. The following is an estimation of the time required by MineBoss to report the status of CO Monitor 88 as COMMUNICATIONS DEAD at 15:08:01 on April 5, 2010after the event that caused the COMMUNICATIONS DEAD status.

3.4.2. MineBoss indicates that 126 units were online for the MineBoss Station 1 Scanner in the Pyott-Boone CO Monitoring System. (The Station 1 Scanner is the scanner within MineBoss used for the CO monitoring system.) The system scans components based on an election scheme that takes multiple variables into account to develop a priority scanning profile, in addition to parameters that are configured within MineBoss at the MCS. Some of these variables are alarms, successful prior communications, unsuccessful prior communications, the number of screens open in MineBoss at a time, etc. As a result, the scanning profile constantly changes.

3.4.3. MineBoss does not offer information on the scanning priority present in the system prior to the explosion. However, the time between an event that interrupts a component's communications and the time that COMMUNICATIONS DEAD is recorded in the event log can be estimated based on the configuration of the system and data obtained from the event log.

3.4.4. The event log indicates that 52 components within the CO monitoring system recorded a COMMUNICATIONS DEAD status in the event log beginning at 15:08:01 on April 5, 2010. Using this data and an approximation of the specifications of the system as configured at UBB, the calculations in Table 2 estimate that approximately 1 minute and 48 seconds elapsed between the event that stopped communications with CO Monitor 88 and the resulting COMMUNICATIONS DEAD status that was recorded in the event log.

Table 2 Calculation of Elapsed Time

Description	*Time, s*
time required for a successful communication	0.141
total time for 74 successful communications	**10.406**
time required for an unsuccessful communication	0.069
time required for a port timeout w/no response	0.210
total time required for an unsuccessful communication	0.279
total time for 52 unsuccessful communications	**14.495**
total time for all devices to communicate	**24.901**
total time for communication w/ all devices prior to priority downgrade	249.013
Weighted Average Time (52 units are dead; 74 units operational)	0.198
number of cycles required to reach communications fail	36.000
average time required to reach communications fail	7.115
AVERAGE TIME TO COMMUNICATION DEAD STATUS:	**107.515**

3.4.5. Table 3 shows some of the specifications of the CO monitoring system that were used in the above calculations. However, these specifications are approximated, because it is unknown what configuration existed in MineBoss at the time of the explosion.

Table 3 CO Monitoring System Specifications

System Specifications		
Baud	320	
bits required for successful communication	45	
bits required for an unsuccessful communication	22	
size of scanner queue (# of scan cycles)	4	
# of time intervals between the retry count (10 scans)	9	
channel dead countdown	100	seconds
uncertainty figure	0.4	seconds
time for channel dead countdown	10	seconds
time required for a port timeout w/no response	0.210	seconds

3.4.6. These calculations were based upon data from the CO monitoring system. Data from the tracking system would yield a less reliable time estimate than the CO monitoring system because of the use subchannels within the tracking system.

3.4.7. **CONCLUSION.** Calculations based upon an approximation of the configuration of MineBoss indicate that the event that interrupted communications between CO Monitor 88 and the MCS occurred approximately 1 minute 48 seconds prior to 15:08:01, which is the time according to the MineBoss

system on April 5, 2010. Given the location of CO Monitor 88, that event is assumed to be the explosion that occurred on April 5, 2010.

3.5. Time drift measurements on the UUB personal computer (PC).

3.5.1. Following the explosion on April 5, 2010, the time difference between the PC clock in use at UBB for the Pyott-Boone Tracking, CO Monitoring, and BeltBoss Systems was compared to GPS time.

3.5.2. Three data points were taken in April 2010. However, the data point recorded on April 5, 2010 at 19:45 did not include seconds; this data point was not included in the drift calculation. This left two data points from April 15 (time difference of 00:05:48) and April 29 (time difference of 00:05:56). The time drift calculates to 0.576 seconds/day over approximately 14 days. The drift was calculated by Microsoft Excel's 'Linear Trendline' function. The resulting slope (drift) and y-intercept were used to determine the corrected COMMUNICATIONS DEAD status time. If this correction is applied to the time recorded in the event log when CO Monitor 88 reported a COMMUNICATIONS DEAD status, this adjusts the time stamp from 15:08:01 to 15:02:19.

3.5.3. The accident team indicated that the Federal Bureau of Investigation confiscated the subject PC and subsequently returned it to the mine after the collection of the initial set of time drift data. It is also reported that the MineBoss software was upgraded after the PC was returned to the mine. It is unknown what other changes may have occurred to the PC.

3.5.4. Additional time drift data points were taken at seven day intervals (with the exception that the last interval was six days) between August 26 and September 15, 2011. The time differences noted were 00:59:04 on August 26; 00:59:06 on September 2; 00:59:08 on September 9; and 00:59:10 on September 15. The time drift calculates to 0.30 seconds/day over approximately 20 days using these data points. The drift was calculated by Microsoft Excel's 'Linear Trendline' function. The resulting slope (drift) and y-intercept were different from the data taken in April 2010. Since the exact environmental, hardware, or software conditions could not be verified, the data was used with conditions set by the initial data points taken in April 2010. The resulting slope (drift) was used with the y-intercept from the April 2010 data to determine the corrected COMMUNICATIONS DEAD status time. If this correction is applied to the time recorded in the event log when CO Monitor 88 reported a COMMUNICATIONS DEAD status, this adjusts the time stamp from 15:08:01 to 15:02:16.

3.5.5. There is a difference of three seconds between the times calculated using the respective time drift rates calculated with the two sets of data. Since the environmental, hardware, and software conditions could not be accounted for by MSHA after the evidence was returned to the mine, the difference in the data taken between August and September 2011and the data taken in April 2010

cannot be accurately determined. These circumstances indicate that the time drift calculated prior to the removal of the PC from UBB is more reliable than the time drift calculated after the PC was returned to the mine.

3.5.6. **CONCLUSION**. An assumption is asserted that CO Monitor 88 was successfully able to record to the event log at 15:08:01 a change in its status as a result of the explosion that occurred on April 5, 2010. With the assistance of Pyott-Boone, the estimate of the time (including the approximations of the MCS configurations) between the event that initiated the COMMUNICATIONS DEAD status of CO Monitor 88 and its record into the event log was calculated to be approximately 1 minute 48 seconds.

Two sets of data were collected to evaluate the time difference between the PC clock in use at UBB and a reference time, which is established by GPS time. The data collected in April 2010 results in a GPS time of 15:02:19; the data collected beginning August 2011, when used in conjunction with data taken in April 2010, results in a GPS time of 15:02:16.

The time estimate between the event that initiated the COMMUNICATIONS DEAD status of CO Monitor 88 and its record into the event log can be applied to the PC clock to obtain a corrected time with respect to the GPS clock. Applying the 1 minute 48 second interval to the corrected CO Monitor 88 COMMUNICATIONS DEAD status time, using data taken in April 2010, indicates the event that initiated the status reached CO Monitor 88 at 15:00:31 on April 5, 2010. Applying the 1 minute 48 second time to the corrected CO Monitor 88 COMMUNICATIONS DEAD status time, using data taken between August and September 2011, shows that the event that initiated the status reached CO Monitor 88 at 15:00:28 on April 5, 2010.

The data collected in April 2010 (prior to the PC's removal from the mine) is believed to be more reliable than the data collected after the PC was returned to the mine. However, the maintenance of the tracking system (refer to §2.8), unknown scanning priority at the time of the explosion (refer to §3.4.3), the approximations of the CO monitoring system specifications (refer to §3.4.5), and the unknown status of the actual PC (refer to §3.5.3) combine to introduce uncertainty in both the time estimate between the explosion and the status change of CO Monitor 88 in the event log, and the time difference calculated between the PC clock and reference time. Additionally, time drift analyses based on other equipment recovered from the mine (the DVR and multi-gas detectors) indicate the explosion occurred at approximately 3:02 pm on April 5, 2010. Based on the maintenance, configuration, and conditions of the MineBoss PC and in comparison with other time calculations, both corrected times of 15:00:31 and 15:00:28 are not being considered accurate estimates.

APPENDIX A Tracking and CO Monitoring System Documents

- List of 251 tracking tags tracked between January 1 and April 10, 2010, 8 pages; Section 2.6
- List of 118 tracking tags tracked on April 5, 2010, 4 pages; Section 2.6.1
- Map1 Tracking system map in MineBoss at the time of the explosion; Section 2.6.3
- Map 2 Status of the readers after the explosion as indicated by the event log; Section 2.7.2
- Map 3 Status of CO monitors after the explosion as indicated by the event log; Section 3.2.1

List of 251 Tags in Database

	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
1	0	2/26/2010 3:38	15420.3.47..0				3 Brk on North Track
2	4	3/24/2010 18:58	15420.3.1..0	personnel	Clamme	Michael	North Track Portal
3	13	3/9/2010 14:26	15420.3.87..0				South Track Portal
4	102	3/30/2010 10:12	15420.3.87..0				South Track Portal
5	103	4/5/2010 16:22	15420.3.87..0	personnel	Earls	Clifton	South Track Portal
6	105	4/5/2010 20:05	15420.3.1..0	personnel	Baker	Bobby	North Track Portal
7	107	4/5/2010 7:29	15420.3.92..0	personnel	Mills	Nate	Ellis Punchout Track
8	108	4/5/2010 16:08	15420.3.87..0	personnel	Reed	Jeremy	South Track Portal
9	110	4/5/2010 8:18	15420.3.92..0				Ellis Punchout Track
10	112	4/1/2010 14:05	15420.3.92..0	personnel	Adkins	Bobby	Ellis Punchout Track
11	113	2/25/2010 12:17	15420.3.1..0				North Track Portal
12	115	3/12/2010 16:56	15420.3.92..0	personnel	Blevins	Tommy	Ellis Punchout Track
13	116	3/26/2010 20:54	15420.3.87..0	personnel	Cullop	Gregg	South Track Portal
14	117	3/26/2010 21:58	15420.3.87..0	personnel	Davis	James	South Track Portal
15	118	4/5/2010 16:25	15420.3.87..0	personnel	Bishop	Bobby	South Track Portal
16	121	4/5/2010 14:35	15420.3.92..0	personnel	Halstead	Scott	Ellis Punchout Track
17	122	4/5/2010 14:30	15420.3.92..0	personnel	Hagar	Everett	Ellis Punchout Track
18	123	3/8/2010 8:56	15420.3.1..0	personnel	Browning	Kevin	North Track Portal
19	128	4/5/2010 15:05	15420.3.92..0	personnel	Plumley	Ralph	Ellis Punchout Track
20	130	4/5/2010 15:06	15420.3.92..0	personnel	Jackson	Eric	Ellis Punchout Track
21	132	4/3/2010 6:51	15420.3.92..0	personnel	Irvin	Cody	Ellis Punchout Track
22	134	4/3/2010 6:50	15420.3.92..0	personnel	Mcfalls	Dave	Ellis Punchout Track
23	135	4/2/2010 7:23	15420.3.92..0	personnel	Martin	Scott	Ellis Punchout Track
24	137	4/3/2010 7:30	15420.3.92..0	personnel	Plumley	Jon	Ellis Punchout Track
25	138	3/26/2010 14:30	15420.3.18..0	personnel	Williams	Michael	5 North Belt Starter
26	141	4/3/2010 7:29	15420.3.92..0	personnel	Gillenwater	John	Ellis Punchout Track
27	145	4/5/2010 15:07	15420.3.75..0	personnel	Woods	James	6 North Starter Box
28	150	3/26/2010 14:41	15420.3.18..0	personnel	Honaker	Wes	5 North Belt Starter
29	160	3/11/2010 8:36	15420.3.99..0				2Brks Outby Switch Ellis
30	176	4/5/2010 6:55	15420.3.1..0				North Track Portal
31	224	3/23/2010 23:46	15420.3.1..0				North Track Portal
32	226	4/5/2010 9:29	15420.3.1..0	personnel	Daniel	Roger	North Track Portal
33	230	4/5/2010 13:50	15420.3.92..0	personnel	Weeks	Jerry	Ellis Punchout Track

List of 251 Tags in Database

	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
34	231	4/5/2010 12:27	15420.3.1..0	personnel	Semenske	Charles	North Track Portal
35	271	2/24/2010 10:09	15420.3.34..0				Eunice Intake
36	283	4/5/2010 21:08	15420.3.87..0				South Track Portal
37	285	4/1/2010 7:29	15420.3.92..0	personnel	Sims	Dennis	Ellis Punchout Track
38	286	4/2/2010 12:58	15420.3.92..0	personnel	Lilly	Harold	Ellis Punchout Track
39	287	4/5/2010 6:04	15420.3.1..0	personnel	Brackett	Bruce	North Track Portal
40	289	3/31/2010 16:32	15420.3.1..0	personnel	Hansford	Jerry	North Track Portal
41	300	4/5/2010 6:33	15420.3.56..0	personnel	Morgan	Adam	
42	301	3/26/2010 15:50	15420.3.18..0	personnel	Jarrell	Kory	5 North Belt Starter
43	303	4/5/2010 5:32	15420.3.92..0	personnel	Bickford	John	Ellis Punchout Track
44	304	4/5/2010 16:32	15420.3.87..0	personnel	Lambert	Kevin	South Track Portal
45	305	4/5/2010 6:33	15420.3.56..0	personnel	Napper	Josh	
46	306	4/5/2010 15:44	15420.3.87..0	personnel	Rife	Jeremy	South Track Portal
47	307	3/31/2010 14:55	15420.3.92..0	personnel	Lilly	Eric	Ellis Punchout Track
48	308	3/26/2010 16:05	15420.3.87..0	personnel	Salazar	N	South Track Portal
49	309	3/27/2010 16:35	15420.3.5..0	personnel	Ross	Dustin	76 Brk on Track
50	310	4/5/2010 15:43	15420.3.87..0	personnel	Foster	Eddie	South Track Portal
51	313	4/5/2010 15:50	15420.3.87..0	personnel	Williams	Danny	South Track Portal
52	314	3/26/2010 15:45	15420.3.87..0	personnel	Campbell	Randall	South Track Portal
53	315	3/26/2010 8:17	15420.3.87..0	personnel	McKinney	Donald	South Track Portal
54	316	4/5/2010 15:40	15420.3.87..0	personnel	Brown	Ricky	South Track Portal
55	317	3/30/2010 1:13	15420.3.1..0	personnel	Campbell	Ricky	North Track Portal
56	319	4/5/2010 15:12	15420.3.87..0	personnel	Gray	Charles	South Track Portal
57	320	3/27/2010 8:24	15420.3.87..0	personnel	Cook	John	South Track Portal
58	321	4/2/2010 1:15	15420.3.1..0	personnel	William	May	North Track Portal
59	322	3/8/2010 8:36	15420.3.1..0	personnel	Legansky	Luke	North Track Portal
60	323	4/5/2010 15:44	15420.3.87..0	personnel	Holdren	Travis	South Track Portal
61	324	4/5/2010 15:44	15420.3.87..0	personnel	Curry	Wes	South Track Portal
62	325	4/2/2010 1:18	15420.3.87..0	personnel	Harold	Gary	South Track Portal
63	327	4/5/2010 15:58	15420.3.87..0	personnel	Lucas	James	South Track Portal
64	329	4/5/2010 7:51	15420.3.87..0	personnel	Sciculuna	Cliff	South Track Portal
65	330	4/5/2010 15:45	15420.3.87..0	personnel	Cadle	Chris	South Track Portal
66	331	4/5/2010 7:55	15420.3.87..0	personnel	McAlpine	Kevin	South Track Portal

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	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
67	332	3/23/2010 3:53	15420.3.1..0	personnel	Ball	Adam	North Track Portal
68	334	3/22/2010 15:17	15420.3.92..0	personnel	Price	James	Ellis Punchout Track
69	352	3/25/2010 9:29	15420.3.53..0				4 Brk South Track
70	353	3/25/2010 8:58	15420.3.1..0				North Track Portal
71	354	3/25/2010 9:30	15420.3.1..0				North Track Portal
72	368	3/25/2010 9:30	15420.3.1..0				North Track Portal
73	369	3/25/2010 8:58	15420.3.1..0				North Track Portal
74	388	3/25/2010 9:24	15420.3.1..0				North Track Portal
75	455	2/21/2010 18:24	15420.3.1..0				North Track Portal
76	501	4/5/2010 6:41	15420.3.56..0	personnel	Payne	Boone	
77	502	4/5/2010 6:34	15420.3.5..0	personnel	Marcum	Joe	76 Brk on Track
78	503	3/26/2010 5:45	15420.3.18..0	personnel	Tolliver	Jeremy	5 North Belt Starter
79	504	4/5/2010 15:46	15420.3.87..0	personnel	Lynch	Melvin	South Track Portal
80	510	4/3/2010 7:30	15420.3.92..0	personnel	Andrew	Bennett	Ellis Punchout Track
81	511	4/5/2010 12:55	15420.3.92..0				Ellis Punchout Track
82	512	3/1/2010 7:59	15420.3.87..0	personnel	Welch	Brad	South Track Portal
83	513	4/5/2010 5:38	15420.3.92..0	personnel	Neely	John	Ellis Punchout Track
84	515	4/2/2010 1:03	15420.3.92..0	personnel	Hulgan	Morris	Ellis Punchout Track
85	518	4/2/2010 1:03	15420.3.92..0	personnel	Derek	Williams	Ellis Punchout Track
86	519	4/5/2010 8:18	15420.3.92..0	personnel	Dicken	Mike	Ellis Punchout Track
87	526	4/5/2010 6:41	15420.3.56..0	personnel	Chapman	Kenny	
88	527	4/2/2010 0:50	15420.3.87..0	personnel	McCallister	Danny	South Track Portal
89	528	4/3/2010 23:55	15420.3.99..0	personnel	Kortaa	Hall	2Brks Outby Switch Ellis
90	529	4/3/2010 13:38	15420.3.92..0	personnel	Moore	Terry	Ellis Punchout Track
91	530	4/5/2010 8:18	15420.3.92..0	personnel	Nutter	Kevin	Ellis Punchout Track
92	535	4/4/2010 0:07	15420.3.92..0	personnel	Davis	Daniel	Ellis Punchout Track
93	536	3/4/2010 6:24	15420.3.99..0	personnel	Cozart	Arless	2Brks Outby Switch Ellis
94	537	4/5/2010 6:53	15420.3.92..0	personnel	Tilley	Joe	Ellis Punchout Track
95	539	4/3/2010 23:54	15420.3.99..0	personnel	Bowling	Brandon	2Brks Outby Switch Ellis
96	540	4/5/2010 6:33	15420.3.56..0	personnel	Persinger	Dewey	
97	543	4/3/2010 7:30	15420.3.92..0	personnel	Smith	James	Ellis Punchout Track
98	545	4/5/2010 17:00	15420.3.87..0	personnel	Smith	Mike	South Track Portal
99	547	4/5/2010 6:33	15420.3.56..0	personnel	Quarles	Gary	

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	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
100	548	3/29/2010 8:06	15420.3.87..0	personnel	Spence	Justin	South Track Portal
101	549	4/3/2010 7:29	15420.3.92..0	personnel	Plumbley	Josh	Ellis Punchout Track
102	550	4/4/2010 0:06	15420.3.92..0	personnel	Hutchens	Rick	Ellis Punchout Track
103	552	4/3/2010 7:30	15420.3.92..0	personnel	Pettry	Derek	Ellis Punchout Track
104	554	4/2/2010 8:00	15420.3.1..0	personnel	Meadows	Greg	North Track Portal
105	556	4/3/2010 23:47	15420.3.92..0	personnel	Woodrum	Kenny	Ellis Punchout Track
106	557	4/1/2010 5:48	15420.3.92..0	personnel	Visitor 1		Ellis Punchout Track
107	559	4/5/2010 21:47	15420.3.87..0	personnel	Stewart	Lacy	South Track Portal
108	560	4/5/2010 7:42	15420.3.87..0	personnel	Stanley	Jeff	South Track Portal
109	561	4/1/2010 7:29	15420.3.92..0	personnel	Doss	Jacob	Ellis Punchout Track
110	562	4/4/2010 0:06	15420.3.92..0	personnel	Pauley	Bobby	Ellis Punchout Track
111	563	4/1/2010 5:45	15420.3.92..0	personnel	Visitor 2		Ellis Punchout Track
112	564	4/5/2010 6:32	15420.3.56..0	personnel	Lane	Rick	
113	565	3/13/2010 13:33	15420.3.1..0	personnel	Cantley	Roger	North Track Portal
114	567	4/5/2010 7:42	15420.3.87..0	personnel	Jerry	Martin	South Track Portal
115	568	3/26/2010 6:46	15420.3.18..0	personnel	Aldermin	Alvis	5 North Belt Starter
116	569	4/5/2010 15:07	15420.3.92..0	personnel	Shears	Dave	Ellis Punchout Track
117	570	4/5/2010 6:33	15420.3.56..0	personnel	Bell	Chris	
118	571	4/2/2010 1:03	15420.3.92..0	personnel	Racer	Brent	Ellis Punchout Track
119	572	4/2/2010 1:03	15420.3.92..0	personnel	Stanley	Stewart	Ellis Punchout Track
120	573	4/5/2010 16:57	15420.3.87..0	personnel	Coalson	Kenneth	South Track Portal
121	574	4/4/2010 0:06	15420.3.92..0	personnel	Griffith	James	Ellis Punchout Track
122	576	4/5/2010 15:06	15420.3.92..0	personnel	Cox	Lacy	Ellis Punchout Track
123	577	4/2/2010 0:55	15420.3.99..0	personnel	Crouse	Greg	2Brks Outby Switch Ellis
124	578	3/31/2010 7:58	15420.3.47..0	personnel	Dickens	Shannon	3 Brk on North Track
125	579	3/30/2010 14:36	15420.3.92..0	personnel	Hendrickson	Wes	Ellis Punchout Track
126	580	2/28/2010 18:27	15420.3.99..0	personnel	Goss	Bobby	2Brks Outby Switch Ellis
127	581	2/22/2010 6:26	15420.3.5..0				76 Brk on Track
128	582	3/31/2010 1:21	15420.3.72..0	personnel	Farthing	Adam	3 brks inby ellis switch
129	583	4/5/2010 7:36	15420.3.87..0	personnel	Acord	Blake	South Track Portal
130	584	4/5/2010 6:33	15420.3.56..0	personnel	Price	Joel	
131	587	4/3/2010 7:22	15420.3.87..0	personnel	Slentz	Tracy	South Track Portal
132	588	4/3/2010 15:43	15420.3.92..0	personnel	Bailey	Delbert	Ellis Punchout Track

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	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
133	589	4/5/2010 13:39	15420.3.92..0	personnel	Craddock	Bill	Ellis Punchout Track
134	590	3/29/2010 16:53	15420.3.92..0	personnel	Davis	Cody	Ellis Punchout Track
135	591	4/5/2010 6:52	15420.3.92..0	personnel	Walker	Shawn	Ellis Punchout Track
136	592	4/5/2010 6:53	15420.3.92..0	personnel	Fleming	Tom	Ellis Punchout Track
137	593	4/3/2010 7:31	15420.3.92..0	personnel	Lucas	Andrew	Ellis Punchout Track
138	594	4/3/2010 23:47	15420.3.92..0	personnel	Estep	Tommy	Ellis Punchout Track
139	595	4/5/2010 6:33	15420.3.56..0	personnel	Davis	Timmy	
140	596	4/5/2010 7:25	15420.3.92..0	personnel	Adame	Jerry	Ellis Punchout Track
141	597	4/5/2010 7:05	15420.3.99..0	personnel	Ferrell	Joe	2Brks Outby Switch Ellis
142	599	4/3/2010 16:32	15420.3.92..0	personnel	Webb	Mike	Ellis Punchout Track
143	600	4/5/2010 14:08	15420.3.92..0	personnel	Cox	John	Ellis Punchout Track
144	601	4/5/2010 14:25	15420.3.87..0	personnel	Williams	Tim	South Track Portal
145	603	4/5/2010 15:07	15420.3.92..0	personnel	Farely	David	Ellis Punchout Track
146	604	3/23/2010 0:41	15420.3.87..0	personnel	Young	Thomas	South Track Portal
147	608	4/3/2010 7:30	15420.3.92..0	personnel	Anderson	Kyle	Ellis Punchout Track
148	611	4/5/2010 7:55	15420.3.87..0	personnel	Hatcher	Justin	South Track Portal
149	613	4/3/2010 16:33	15420.3.92..0	personnel	Gwinn	Randy	Ellis Punchout Track
150	614	4/5/2010 15:04	15420.3.92..0	personnel	Medley	Kevin	Ellis Punchout Track
151	618	4/4/2010 0:07	15420.3.92..0	personnel	Gray	Richard	Ellis Punchout Track
152	619	4/3/2010 6:50	15420.3.92..0	personnel	Wriston	Dwayne	Ellis Punchout Track
153	620	4/2/2010 7:23	15420.3.92..0	personnel	Waddell	Brandon	Ellis Punchout Track
154	621	4/5/2010 6:41	15420.3.56..0	personnel	Brock	Greg	
155	623	4/2/2010 0:55	15420.3.99..0	personnel	Richmond	Larry	2Brks Outby Switch Ellis
156	625	2/22/2010 16:50	15420.3.34..0	personnel	Hill	Joe	Eunice Intake
157	646	4/2/2010 7:59	15420.3.87..0	personnel	Cozart	Kelton	South Track Portal
158	648	4/5/2010 15:07	15420.3.92..0	personnel	Brown	Chad	Ellis Punchout Track
159	649	4/5/2010 13:01	15420.3.92..0	personnel	Bailey	Tad	Ellis Punchout Track
160	650	4/5/2010 15:05	15420.3.92..0	personnel	Davis	Owen	Ellis Punchout Track
161	651	4/2/2010 1:03	15420.3.92..0	personnel	Dancy	Jason	Ellis Punchout Track
162	654	4/5/2010 6:14	15420.3.1..0	personnel	Richardson	Dustin	North Track Portal
163	656	4/5/2010 9:46	15420.3.1..0	personnel	Farley	Brian	North Track Portal
164	657	4/5/2010 6:53	15420.3.92..0	personnel	Wilson	Scott	Ellis Punchout Track
165	659	4/3/2010 7:30	15420.3.92..0	personnel	Covey	Dave	Ellis Punchout Track

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	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
166	661	4/5/2010 5:33	15420.3.92..0				Ellis Punchout Track
167	663	4/5/2010 6:33	15420.3.56..0	personnel	McCrosky	Nick	
168	664	3/31/2010 13:02	15420.3.92..0	personnel	Nicolau	Rick	Ellis Punchout Track
169	666	4/5/2010 15:07	15420.3.92..0	personnel	Burghduff	Jeremy	Ellis Punchout Track
170	670	4/5/2010 6:53	15420.3.92..0	personnel	Mourad	Justin	Ellis Punchout Track
171	675	4/1/2010 15:16	15420.3.92..0	personnel	Athey	Charles	Ellis Punchout Track
172	691	3/18/2010 9:07	15420.3.87..0				South Track Portal
173	698	3/18/2010 9:07	15420.3.1..0				North Track Portal
174	699	3/18/2010 9:12	15420.3.1..0				North Track Portal
175	700	3/18/2010 9:12	15420.3.1..0				North Track Portal
176	701	4/5/2010 23:43	15420.3.87..0	personnel	Bowyer	Jim	South Track Portal
177	702	4/3/2010 16:33	15420.3.92..0	personnel	Williams	Jim	Ellis Punchout Track
178	703	4/5/2010 5:26	15420.3.87..0	personnel	Peterson	Terry	South Track Portal
179	704	4/5/2010 15:11	15420.3.87..0	personnel	Massey	Joe	South Track Portal
180	705	4/5/2010 17:39	15420.3.87..0				South Track Portal
181	706	4/3/2010 7:22	15420.3.99..0	personnel	Osborne	Rodney	2Brks Outby Switch Ellis
182	707	4/5/2010 15:06	15420.3.75..0	personnel	Harrah	Steve	6 North Starter Box
183	708	4/5/2010 7:56	15420.3.87..0	personnel	Mclaine	Brian	South Track Portal
184	709	4/5/2010 14:43	15420.3.1..0	personnel	Gilbert	Mark	North Track Portal
185	710	4/5/2010 15:07	15420.3.92..0	personnel	Stanley	Jason	Ellis Punchout Track
186	711	4/5/2010 6:21	15420.3.1..0	personnel	Stover	Cliff	North Track Portal
187	712	3/25/2010 14:33	15420.3.1..0	personnel	Woods	Jeremy	North Track Portal
188	713	4/3/2010 16:02	15420.3.92..0	personnel	Ellison	Shawn	Ellis Punchout Track
189	718	4/1/2010 9:01	15420.3.1..0				North Track Portal
190	721	4/5/2010 23:57	15420.3.1..0				North Track Portal
191	723	4/5/2010 13:14	15420.3.92..0				Ellis Punchout Track
192	726	4/4/2010 0:06	15420.3.92..0	personnel	Lambert	Tracy	Ellis Punchout Track
193	728	4/2/2010 0:54	15420.3.99..0	personnel	Powers	Ryan	2Brks Outby Switch Ellis
194	729	4/5/2010 13:16	15420.3.92..0				Ellis Punchout Track
195	730	4/4/2010 0:07	15420.3.92..0	personnel	Massey	Josh	Ellis Punchout Track
196	742	3/25/2010 9:29	15420.3.1..0				North Track Portal
197	747	4/5/2010 6:36	15420.3.75..0	personnel	Griffith	Bob	6 North Starter Box
198	761	4/1/2010 10:55	15420.3.87..0	personnel	Musick	Charles	South Track Portal

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	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
199	762	4/5/2010 15:58	15420.3.1..0	personnel	Lambert	Denver	North Track Portal
200	763	3/30/2010 14:58	15420.3.1..0	personnel	Daniels	Donovan	North Track Portal
201	765	4/5/2010 7:53	15420.3.87..0	personnel	Greer	Kenny	South Track Portal
202	766	4/3/2010 16:31	15420.3.92..0	personnel	Pettry	Pacer	Ellis Punchout Track
203	768	4/5/2010 14:18	15420.3.92..0	personnel	Toney	Roger	Ellis Punchout Track
204	769	4/5/2010 6:41	15420.3.56..0	personnel	Mooney	Eddie	
205	772	4/5/2010 9:29	15420.3.1..0	personnel	Daniel	Timmy	North Track Portal
206	773	3/11/2010 7:48	15420.3.87..0	personnel	Nichols	Rick	South Track Portal
207	774	4/5/2010 6:41	15420.3.56..0	personnel	Workman	Ricky	
208	776	4/3/2010 6:28	15420.3.56..0	personnel	Scarbro	Roger	
209	777	4/5/2010 6:36	15420.3.75..0	personnel	Maynor	Romald	6 North Starter Box
210	778	4/5/2010 15:06	15420.3.92..0	personnel	Stout	Josh	Ellis Punchout Track
211	779	4/5/2010 7:05	15420.3.99..0	personnel	Smith	Chuck	2Brks Outby Switch Ellis
212	780	4/5/2010 15:07	15420.3.56..0	personnel	Elswick	Mike	
213	781	4/1/2010 5:51	15420.3.92..0	personnel	Visitor 4		Ellis Punchout Track
214	782	4/2/2010 0:50	15420.3.87..0	personnel	Daniel	Steven	South Track Portal
215	783	3/26/2010 4:55	15420.3.5..0	personnel	Visitor 3		76 Brk on Track
216	785	4/3/2010 16:32	15420.3.92..0	personnel	Nelson	Travis	Ellis Punchout Track
217	786	4/5/2010 17:01	15420.3.87..0	personnel	Hodge	Josh	South Track Portal
218	788	4/5/2010 8:04	15420.3.87..0	personnel	Cooper	Harold	South Track Portal
219	789	4/5/2010 16:05	15420.3.87..0	personnel	Williams	Josh	South Track Portal
220	790	4/3/2010 16:32	15420.3.92..0	personnel	Ford	Luke	Ellis Punchout Track
221	791	4/1/2010 15:17	15420.3.87..0	personnel	Lewis	Omar	South Track Portal
222	792	3/26/2010 8:18	15420.3.87..0	personnel	Martin	Eric	South Track Portal
223	793	4/5/2010 15:07	15420.3.5..0	personnel	Atkins	Jason	76 Brk on Track
224	794	4/1/2010 15:15	15420.3.47..0	personnel	Jacquez	Mike	3 Brk on North Track
225	795	4/5/2010 18:00	15420.3.87..0	personnel	Irvin	Jeremy	South Track Portal
226	796	3/26/2010 22:24	15420.3.87..0	personnel	Sorrells	Eric	South Track Portal
227	797	4/5/2010 9:38	15420.3.87..0	personnel	Griffith	Jason	South Track Portal
228	798	4/5/2010 8:01	15420.3.87..0	personnel	Snow	Kieth	South Track Portal
229	799	4/2/2010 1:03	15420.3.92..0	personnel	Patrick	Hilbert	Ellis Punchout Track
230	801	4/1/2010 7:40	15420.3.92..0	personnel	Stanley	Darrell	Ellis Punchout Track
231	802	4/5/2010 9:43	15420.3.87..0	personnel	Clemmons	John	South Track Portal

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	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
232	804	3/26/2010 14:26	15420.3.5..0	personnel	Pompie	David	76 Brk on Track
233	805	4/5/2010 15:07	15420.3.75..0	personnel	Scott	Deward	6 North Starter Box
234	806	4/5/2010 6:33	15420.3.56..0	personnel	Mullins	Rex	
235	807	4/5/2010 15:07	15420.3.75..0	personnel	Acord	Carl	6 North Starter Box
236	809	4/1/2010 15:16	15420.3.87..0	personnel	Basham	Henry	South Track Portal
237	811	4/1/2010 15:16	15420.3.87..0				South Track Portal
238	812	4/5/2010 7:48	15420.3.87..0	personnel	Todd	Nick	South Track Portal
239	813	3/10/2010 23:29	15420.3.87..0				South Track Portal
240	814	4/5/2010 16:56	15420.3.1..0	personnel	Williams	Mitch	North Track Portal
241	815	4/5/2010 15:07	15420.3.5..0	personnel	Willingham	Benny	76 Brk on Track
242	816	4/4/2010 22:17	15420.3.87..0	personnel	Maynor	Buddy	South Track Portal
243	817	4/5/2010 11:02	15420.3.99..0	personnel	Sullivan	Bill	2Brks Outby Switch Ellis
244	818	4/5/2010 15:07	15420.3.75..0	personnel	Clark	Robert	6 North Starter Box
245	819	4/5/2010 13:40	15420.3.87..0	personnel	Justice	Will	South Track Portal
246	820	3/29/2010 6:34	15420.3.87..0	personnel	JENKINS	ADAM	South Track Portal
247	832	3/19/2010 6:35	15420.3.5..0				76 Brk on Track
248	861	2/11/2010 10:25	15420.3.1..0				North Track Portal
249	976	4/5/2010 6:41	15420.3.56..0	personnel	Jones	Dean	
250	991	3/26/2010 14:25	15420.3.5..0	personnel	Pettry	James	76 Brk on Track
251	999	4/5/2010 7:59	15420.3.87..0	personnel	Morris	John	South Track Portal

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	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
1	703	4/5/2010 5:26	15420.3.87..0	personnel	Peterson	Terry	South Track Portal
2	303	4/5/2010 5:32	15420.3.92..0	personnel	Bickford	John	Ellis Punchout Track
3	661	4/5/2010 5:33	15420.3.92..0				Ellis Punchout Track
4	513	4/5/2010 5:38	15420.3.92..0	personnel	Neely	John	Ellis Punchout Track
5	287	4/5/2010 6:04	15420.3.1..0	personnel	Brackett	Bruce	North Track Portal
6	654	4/5/2010 6:14	15420.3.1..0	personnel	Richardson	Dustin	North Track Portal
7	711	4/5/2010 6:21	15420.3.1..0	personnel	Stover	Cliff	North Track Portal
8	564	4/5/2010 6:32	15420.3.56..0	personnel	Lane	Rick	
9	595	4/5/2010 6:33	15420.3.56..0	personnel	Davis	Timmy	
10	663	4/5/2010 6:33	15420.3.56..0	personnel	McCrosky	Nick	
11	570	4/5/2010 6:33	15420.3.56..0	personnel	Bell	Chris	
12	806	4/5/2010 6:33	15420.3.56..0	personnel	Mullins	Rex	
13	305	4/5/2010 6:33	15420.3.56..0	personnel	Napper	Josh	
14	540	4/5/2010 6:33	15420.3.56..0	personnel	Persinger	Dewey	
15	584	4/5/2010 6:33	15420.3.56..0	personnel	Price	Joel	
16	300	4/5/2010 6:33	15420.3.56..0	personnel	Morgan	Adam	
17	547	4/5/2010 6:33	15420.3.56..0	personnel	Quarles	Gary	
18	502	4/5/2010 6:34	15420.3.5..0	personnel	Marcum	Joe	76 Brk on Track
19	747	4/5/2010 6:36	15420.3.75..0	personnel	Griffith	Bob	6 North Starter Box
20	777	4/5/2010 6:36	15420.3.75..0	personnel	Maynor	Romald	6 North Starter Box
21	769	4/5/2010 6:41	15420.3.56..0	personnel	Mooney	Eddie	
22	976	4/5/2010 6:41	15420.3.56..0	personnel	Jones	Dean	
23	526	4/5/2010 6:41	15420.3.56..0	personnel	Chapman	Kenny	
24	501	4/5/2010 6:41	15420.3.56..0	personnel	Payne	Boone	
25	774	4/5/2010 6:41	15420.3.56..0	personnel	Workman	Ricky	
26	621	4/5/2010 6:41	15420.3.56..0	personnel	Brock	Greg	
27	591	4/5/2010 6:52	15420.3.92..0	personnel	Walker	Shawn	Ellis Punchout Track
28	670	4/5/2010 6:53	15420.3.92..0	personnel	Mourad	Justin	Ellis Punchout Track
29	537	4/5/2010 6:53	15420.3.92..0	personnel	Tilley	Joe	Ellis Punchout Track
30	592	4/5/2010 6:53	15420.3.92..0	personnel	Fleming	Tom	Ellis Punchout Track
31	657	4/5/2010 6:53	15420.3.92..0	personnel	Wilson	Scott	Ellis Punchout Track
32	176	4/5/2010 6:55	15420.3.1..0				North Track Portal
33	779	4/5/2010 7:05	15420.3.99..0	personnel	Smith	Chuck	2Brks Outby Switch Ellis

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	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
34	597	4/5/2010 7:05	15420.3.99..0	personnel	Ferrell	Joe	2Brks Outby Switch Ellis
35	596	4/5/2010 7:25	15420.3.92..0	personnel	Adame	Jerry	Ellis Punchout Track
36	107	4/5/2010 7:29	15420.3.92..0	personnel	Mills	Nate	Ellis Punchout Track
37	583	4/5/2010 7:36	15420.3.87..0	personnel	Acord	Blake	South Track Portal
38	567	4/5/2010 7:42	15420.3.87..0	personnel	Jerry	Martin	South Track Portal
39	560	4/5/2010 7:42	15420.3.87..0	personnel	Stanley	Jeff	South Track Portal
40	812	4/5/2010 7:48	15420.3.87..0	personnel	Todd	Nick	South Track Portal
41	329	4/5/2010 7:51	15420.3.87..0	personnel	Sciculuna	Cliff	South Track Portal
42	765	4/5/2010 7:53	15420.3.87..0	personnel	Greer	Kenny	South Track Portal
43	331	4/5/2010 7:55	15420.3.87..0	personnel	McAlpine	Kevin	South Track Portal
44	611	4/5/2010 7:55	15420.3.87..0	personnel	Hatcher	Justin	South Track Portal
45	708	4/5/2010 7:56	15420.3.87..0	personnel	Mclaine	Brian	South Track Portal
46	999	4/5/2010 7:59	15420.3.87..0	personnel	Morris	John	South Track Portal
47	798	4/5/2010 8:01	15420.3.87..0	personnel	Snow	Kieth	South Track Portal
48	788	4/5/2010 8:04	15420.3.87..0	personnel	Cooper	Harold	South Track Portal
49	519	4/5/2010 8:18	15420.3.92..0	personnel	Dicken	Mike	Ellis Punchout Track
50	110	4/5/2010 8:18	15420.3.92..0				Ellis Punchout Track
51	530	4/5/2010 8:18	15420.3.92..0	personnel	Nutter	Kevin	Ellis Punchout Track
52	772	4/5/2010 9:29	15420.3.1..0	personnel	Daniel	Timmy	North Track Portal
53	226	4/5/2010 9:29	15420.3.1..0	personnel	Daniel	Roger	North Track Portal
54	797	4/5/2010 9:38	15420.3.87..0	personnel	Griffith	Jason	South Track Portal
55	802	4/5/2010 9:43	15420.3.87..0	personnel	Clemmons	John	South Track Portal
56	656	4/5/2010 9:46	15420.3.1..0	personnel	Farley	Brian	North Track Portal
57	817	4/5/2010 11:02	15420.3.99..0	personnel	Sullivan	Bill	2Brks Outby Switch Ellis
58	231	4/5/2010 12:27	15420.3.1..0	personnel	Semenske	Charles	North Track Portal
59	511	4/5/2010 12:55	15420.3.92..0				Ellis Punchout Track
60	649	4/5/2010 13:01	15420.3.92..0	personnel	Bailey	Tad	Ellis Punchout Track
61	723	4/5/2010 13:14	15420.3.92..0				Ellis Punchout Track
62	729	4/5/2010 13:16	15420.3.92..0				Ellis Punchout Track
63	589	4/5/2010 13:39	15420.3.92..0	personnel	Craddock	Bill	Ellis Punchout Track
64	819	4/5/2010 13:40	15420.3.87..0	personnel	Justice	Will	South Track Portal
65	230	4/5/2010 13:50	15420.3.92..0	personnel	Weeks	Jerry	Ellis Punchout Track
66	600	4/5/2010 14:08	15420.3.92..0	personnel	Cox	John	Ellis Punchout Track

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	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
67	768	4/5/2010 14:18	15420.3.92..0	personnel	Toney	Roger	Ellis Punchout Track
68	601	4/5/2010 14:25	15420.3.87..0	personnel	Williams	Tim	South Track Portal
69	122	4/5/2010 14:30	15420.3.92..0	personnel	Hagar	Everett	Ellis Punchout Track
70	121	4/5/2010 14:35	15420.3.92..0	personnel	Halstead	Scott	Ellis Punchout Track
71	709	4/5/2010 14:43	15420.3.1..0	personnel	Gilbert	Mark	North Track Portal
72	614	4/5/2010 15:04	15420.3.92..0	personnel	Medley	Kevin	Ellis Punchout Track
73	650	4/5/2010 15:05	15420.3.92..0	personnel	Davis	Owen	Ellis Punchout Track
74	128	4/5/2010 15:05	15420.3.92..0	personnel	Plumley	Ralph	Ellis Punchout Track
75	707	4/5/2010 15:06	15420.3.75..0	personnel	Harrah	Steve	6 North Starter Box
76	778	4/5/2010 15:06	15420.3.92..0	personnel	Stout	Josh	Ellis Punchout Track
77	130	4/5/2010 15:06	15420.3.92..0	personnel	Jackson	Eric	Ellis Punchout Track
78	576	4/5/2010 15:06	15420.3.92..0	personnel	Cox	Lacy	Ellis Punchout Track
79	805	4/5/2010 15:07	15420.3.75..0	personnel	Scott	Deward	6 North Starter Box
80	603	4/5/2010 15:07	15420.3.92..0	personnel	Farely	David	Ellis Punchout Track
81	145	4/5/2010 15:07	15420.3.75..0	personnel	Woods	James	6 North Starter Box
82	780	4/5/2010 15:07	15420.3.56..0	personnel	Elswick	Mike	
83	648	4/5/2010 15:07	15420.3.92..0	personnel	Brown	Chad	Ellis Punchout Track
84	666	4/5/2010 15:07	15420.3.92..0	personnel	Burghduff	Jeremy	Ellis Punchout Track
85	807	4/5/2010 15:07	15420.3.75..0	personnel	Acord	Carl	6 North Starter Box
86	793	4/5/2010 15:07	15420.3.5..0	personnel	Atkins	Jason	76 Brk on Track
87	569	4/5/2010 15:07	15420.3.92..0	personnel	Shears	Dave	Ellis Punchout Track
88	710	4/5/2010 15:07	15420.3.92..0	personnel	Stanley	Jason	Ellis Punchout Track
89	818	4/5/2010 15:07	15420.3.75..0	personnel	Clark	Robert	6 North Starter Box
90	815	4/5/2010 15:07	15420.3.5..0	personnel	Willingham	Benny	76 Brk on Track
91	704	4/5/2010 15:11	15420.3.87..0	personnel	Massey	Joe	South Track Portal
92	319	4/5/2010 15:12	15420.3.87..0	personnel	Gray	Charles	South Track Portal
93	316	4/5/2010 15:40	15420.3.87..0	personnel	Brown	Ricky	South Track Portal
94	310	4/5/2010 15:43	15420.3.87..0	personnel	Foster	Eddie	South Track Portal
95	306	4/5/2010 15:44	15420.3.87..0	personnel	Rife	Jeremy	South Track Portal
96	323	4/5/2010 15:44	15420.3.87..0	personnel	Holdren	Travis	South Track Portal
97	324	4/5/2010 15:44	15420.3.87..0	personnel	Curry	Wes	South Track Portal
98	330	4/5/2010 15:45	15420.3.87..0	personnel	Cadle	Chris	South Track Portal
99	504	4/5/2010 15:46	15420.3.87..0	personnel	Lynch	Melvin	South Track Portal

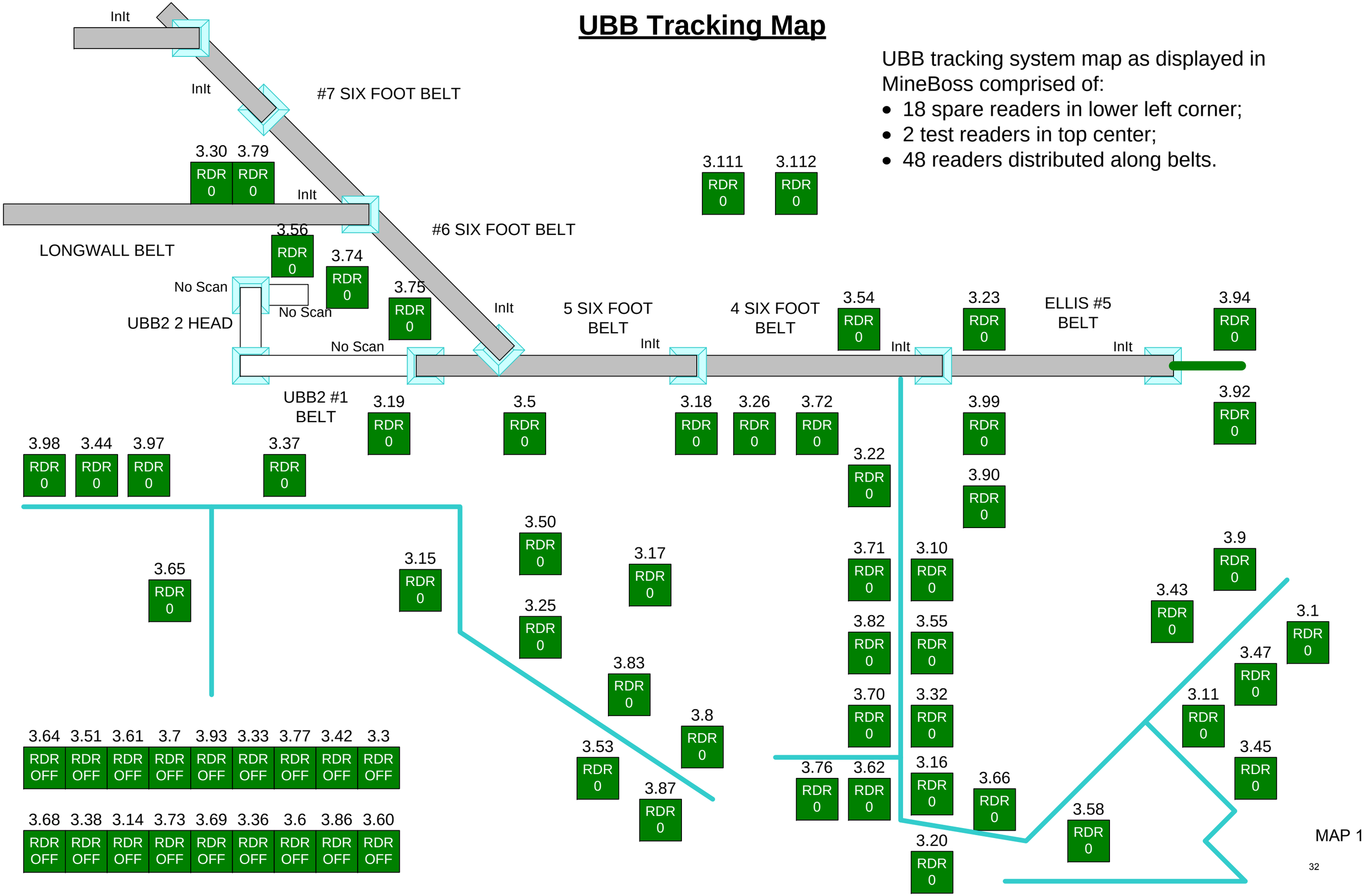
List of 118 Tags in Database

	tag_id	time	reader_address	resource_type	last_name	first_name	reader_label
100	313	4/5/2010 15:50	15420.3.87..0	personnel	Williams	Danny	South Track Portal
101	327	4/5/2010 15:58	15420.3.87..0	personnel	Lucas	James	South Track Portal
102	762	4/5/2010 15:58	15420.3.1..0	personnel	Lambert	Denver	North Track Portal
103	789	4/5/2010 16:05	15420.3.87..0	personnel	Williams	Josh	South Track Portal
104	108	4/5/2010 16:08	15420.3.87..0	personnel	Reed	Jeremy	South Track Portal
105	103	4/5/2010 16:22	15420.3.87..0	personnel	Earls	Clifton	South Track Portal
106	118	4/5/2010 16:25	15420.3.87..0	personnel	Bishop	Bobby	South Track Portal
107	304	4/5/2010 16:32	15420.3.87..0	personnel	Lambert	Kevin	South Track Portal
108	814	4/5/2010 16:56	15420.3.1..0	personnel	Williams	Mitch	North Track Portal
109	573	4/5/2010 16:57	15420.3.87..0	personnel	Coalson	Kenneth	South Track Portal
110	545	4/5/2010 17:00	15420.3.87..0	personnel	Smith	Mike	South Track Portal
111	786	4/5/2010 17:01	15420.3.87..0	personnel	Hodge	Josh	South Track Portal
112	705	4/5/2010 17:39	15420.3.87..0				South Track Portal
113	795	4/5/2010 18:00	15420.3.87..0	personnel	Irvin	Jeremy	South Track Portal
114	105	4/5/2010 20:05	15420.3.1..0	personnel	Baker	Bobby	North Track Portal
115	283	4/5/2010 21:08	15420.3.87..0				South Track Portal
116	559	4/5/2010 21:47	15420.3.87..0	personnel	Stewart	Lacy	South Track Portal
117	701	4/5/2010 23:43	15420.3.87..0	personnel	Bowyer	Jim	South Track Portal
118	721	4/5/2010 23:57	15420.3.1..0				North Track Portal

UBB Tracking Map

UBB tracking system map as displayed in MineBoss comprised of:

- 18 spare readers in lower left corner;
- 2 test readers in top center;
- 48 readers distributed along belts.



UBB Tracking Map

Status of the readers according to the event log and their tracking histories on 04/05/10.

- 27 readers displayed on the tracking map did not detect a tag on 04/05/10.
- 14 readers detected a tag prior to the explosion and reported as DEAD after the explosion.
- 3 readers did not detect a tag prior to the explosion and reported as DEAD after the explosion.
- 6 readers remained operational after the explosion.
- 1 reader was operational prior but did not report as DEAD after explosion.

InIt
InIt
#7 SIX FOOT BELT
3.30
3.79
InIt
#6 SIX FOOT BELT
LONGWALL BELT
3.56
3.74
3.75
No Scan
No Scan
UBB2 2 HEAD
No Scan
InIt
5 SIX FOOT BELT
InIt
4 SIX FOOT BELT
3.111
3.112
3.54
3.23
ELLIS #5 BELT
3.94
InIt
InIt
UBB2 #1 BELT
3.19
3.5
3.18
3.26
3.72
3.99
3.92
3.98
3.44
3.97
3.37
3.22
3.90
3.50
3.65
3.15
3.17
3.71
3.10
3.9
3.25
3.82
3.55
3.43
3.1
3.83
3.47
3.70
3.32
3.11
3.8
3.53
3.45
3.76
3.62
3.16
3.66
3.87
3.58
3.20
MAP 2

3.64	3.51	3.61	3.7	3.93	3.33	3.77	3.42	3.3
RDR OFF	RDR OFF	RDR OFF	RDR OFF	RDR OFF	RDR OFF	RDR OFF	RDR OFF	RDR OFF

3.68	3.38	3.14	3.73	3.69	3.36	3.6	3.86	3.60
RDR OFF	RDR OFF	RDR OFF	RDR OFF	RDR OFF	RDR OFF	RDR OFF	RDR OFF	RDR OFF

18 spare tag readers not in service

Performance Coal
UBB CO Monitors

CO Monitors that reported Communications Dead between 15:08:01 and 15:25:59 on 04/05/10.

HG22
HG22 1 Belt
Crossover Belt
Tailgate
Longwall Belt
TRIPPER
MD
North Mains #7, 6' Belt
North Mains #6, 6' Belt
North Mains #5, 6' Belt
North Mains #4
North Mains #1, 6' Belt
UBB2, #1 Belt
UBB 3, #1 Belt
#1 South, 6" Belt
#2 North Belt
#3 Section #2 Head
Barrier Sec #1, Head
BARRIER SECTION
Training Unit in Office
Ellis #5
Ellis
East Main

MAP 3

APPENDIX B – MSHA PERSONNEL INVOLVED IN THE INVESTIGATION

Mine Safety and Health Administration

Juliette Hill
Kevin Hedrick
Matthew Heightland
Stephen Dubina

APPENDIX AK

MINE EMERGENCY EVACUATION AND FIREFIGHTING PLAN