
Virginia Department of Mines, Minerals & Energy
Division of Mines

Non-Injury Accident Investigation Report
Underground Coal Mine

Methane Ignition / Explosion Accident

June 17, 2015

Mill Branch Coal Corp.
Dorchester Mine
Mine Index No. 14698AB

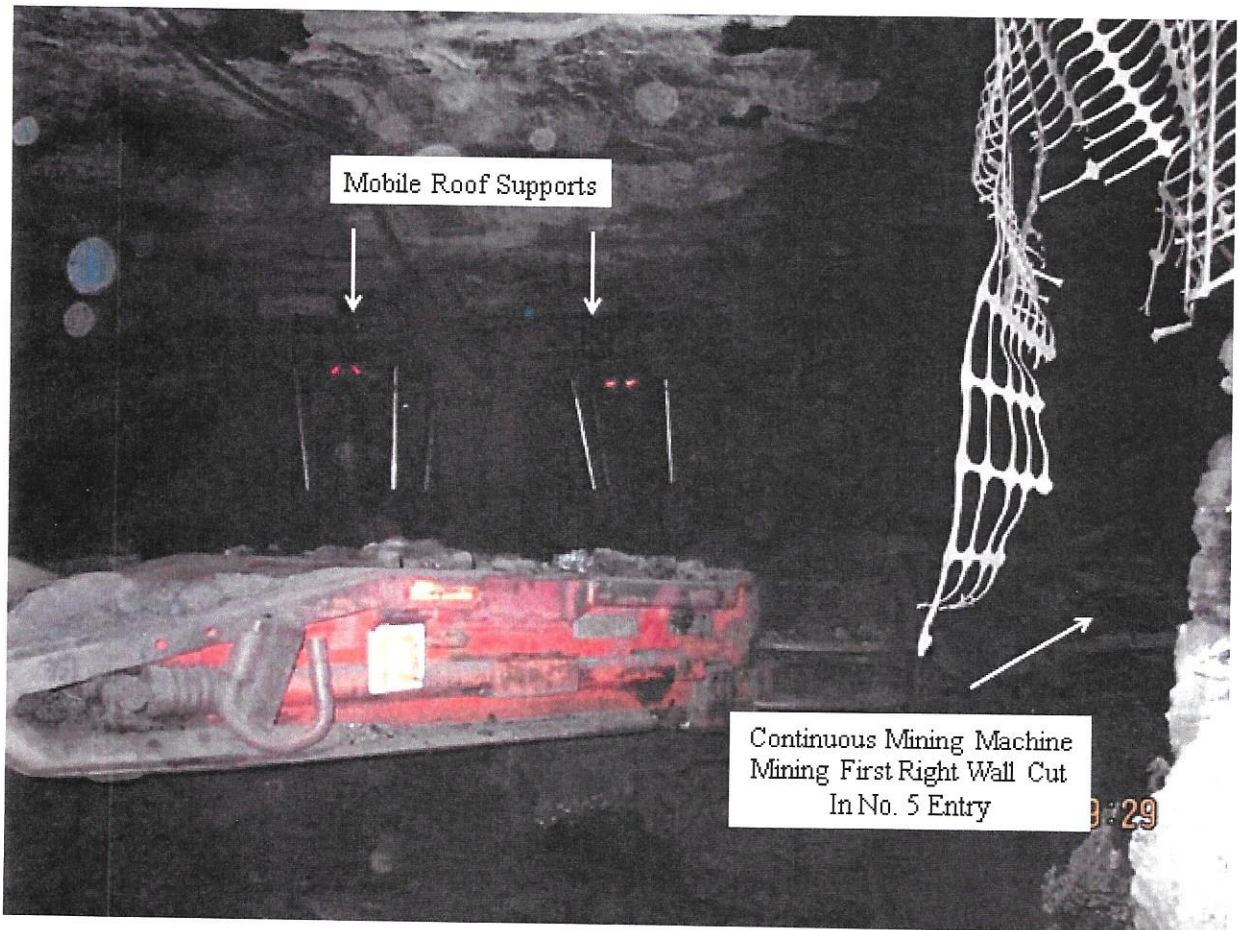
Wise County, Virginia

TABLE OF CONTENTS

Overview	2	Conclusion	14
General Information.....	3	Enforcement Action	15
Description of Accident	4	Recommendations	16
Physical Factors	13	Appendix	17

Overview

On Wednesday, June 17, 2015, at approximately 9:58 p.m., an ignition and subsequent explosion occurred on the 002 retreat mining section during the mining operations on the 4A North panel of the Mill Branch Coal Corporation's Dorchester Mine. According to testimony, the explosion appeared as a sudden flash in the inby gob area. The continuous mining machine operator and the mobile roof support operator were knocked to the ground by the explosion forces, and the heat generated from the explosion singed their hair. The explosion occurred as a result of a disruption of face ventilation allowing methane gas to accumulate to an explosive range within the gob area.



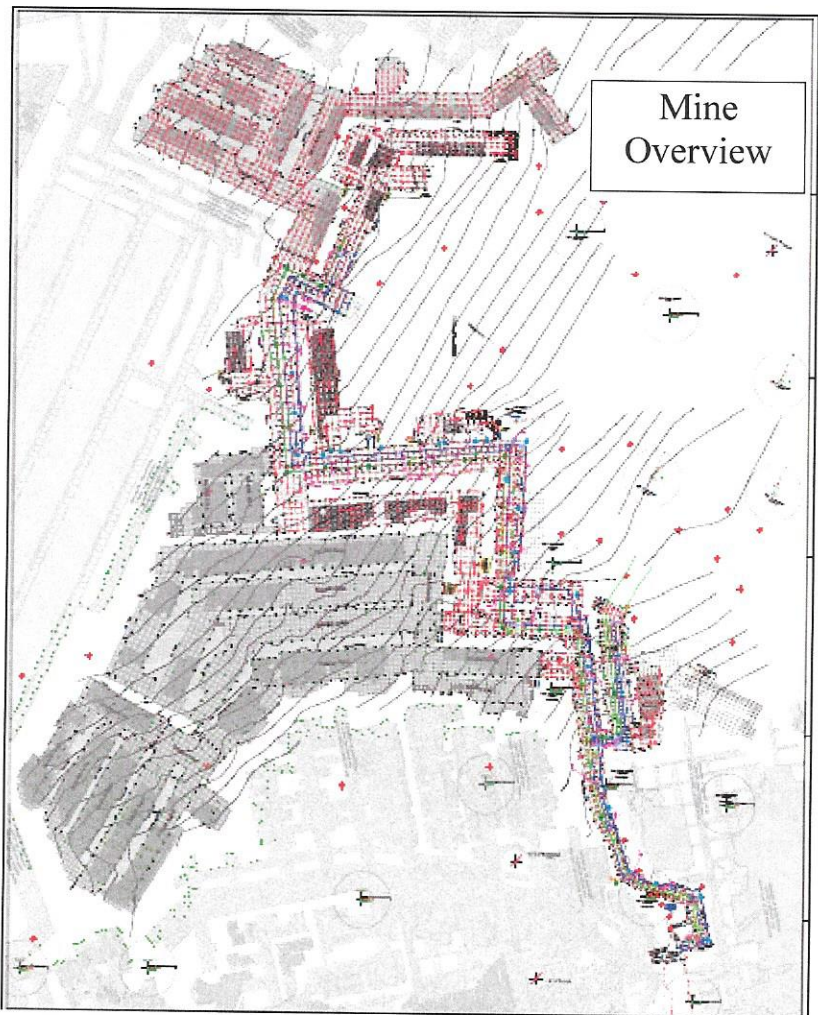
The following investigation was conducted pursuant to §45.1-161.78.E of the Coal Mine Safety Laws of Virginia:

General Information:

On June 18, 2015, at approximately 1:45 a.m., the Department of Mines, Minerals & Energy (DMME), Division of Mines (DM), was notified that a large pillar fall had occurred that destroyed several permanent stoppings on the 002 section on the second shift on June 17, 2015, at approximately 10:30 p.m. An investigation team consisting of Mine Safety and Health Administration (MSHA), District 5, and DM representatives promptly responded to the accident on June 18, 2015. The investigation started under the initial assessment that a pillar fall had destroyed a number of permanent stoppings resulting in a disruption of ventilation on the 4A North 002 section. Later, it was determined that a methane ignition and explosion had occurred at the mine. Photographs, measurements, survey mapping, and personnel interviews were conducted during the investigation.

The Dorchester Mine is a large deep mine, which initially started operation in 2002. The mine has four surface portals located near Stonega in Wise County, Virginia, off state route 78. The mine utilized room and pillar mining with retreat mining operations. The mine operated with two coal production shifts followed by a maintenance shift on the midnight shift and employed 52 mine personnel. The mine utilized continuous mining machine methods to produce approximately 1,700 tons of raw coal daily from the Imboden coal seam. Coal is transported to the surface by conveyor belt systems then by truck to a nearby preparation plant facility for processing and shipment.

The height of the coal seam varied from 60 to 72 inches. The coal seam is layered with rock partings resulting in overall mining heights reaching 150 inches (12.5 feet). The five entries on the 002 section were developed by mining the top seam of coal and rock for a distance of one



crosscut then mining the remaining bottom seam of coal and rock. The overall height while mining the top split was approximately 8 feet high. Once the bottom seam was mined, the overall mining height exceeded 12 feet.

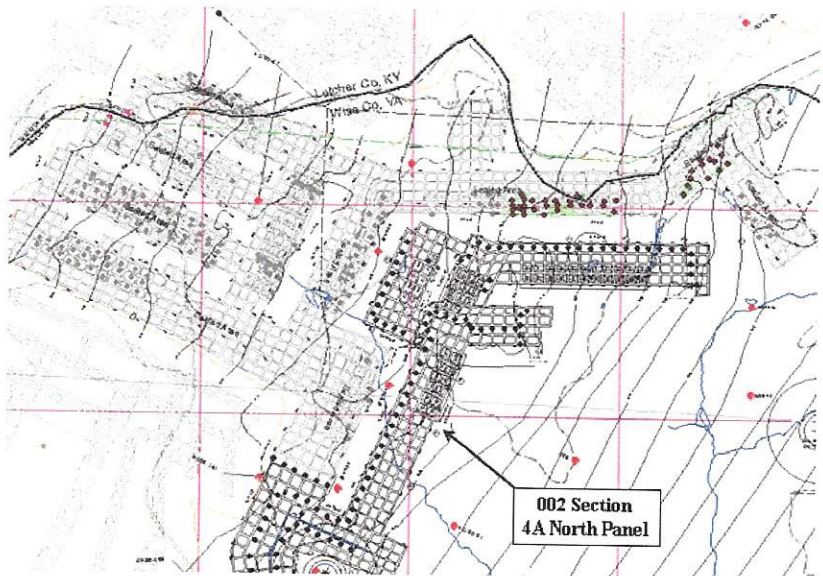
Mining operations consisted of panel development and retreat mining operations. The 001 section was advancing the 1 Northeast panel with split ventilation when the panel development was discontinued on May 15, 2015. The 002 section was conducting retreat mining operations on the 4A North panel using an approved retreat mining plan and was ventilated using a single split ventilation system introduced from right to left. The mine ventilation is provided by one 84-inch Jeffrey forced air fan.

Two rows of pillars and a solid wall cut were retreat mined using 33 foot deep cuts on the 002 section. Four Fletcher mobile roof support units were utilized as supplemental roof support during pillar extraction. The 002 section was developed 23,620 feet from the surface at the time of the accident. A regular inspection was initiated at the mine by DM on May 7, 2015, and the inspection was incomplete when the accident occurred.

The mine entered a non-production status following the June 17, 2015 accident. On August 5, 2015, the mine was purchased and re-licensed under Revelation Energy, LLC. Currently, the mine remains in non-production status conducting only the work necessary to maintain the mine (See License Information in Appendix A).

Description of the Accident:

On Wednesday, June 17, 2015, Clarence Chandler, second shift 002 section foreman, entered the Dorchester Mine at approximately 2:00 p.m. At approximately 2:20 p.m., Mr. Chandler's production crew; consisting of James Mosko, continuous mining machine operator, Jonathan Clark, MRS operator, Russell Mullins and Mark Hughes, shuttle car operators, and Jon Moore, section repairman; entered the mine to relieve the day shift production crew. After the crew arrived on the 002 section, Chandler walked across the section conducting an on-shift examination checking for methane and conducting dust parameters at the continuous mining machine and section loading point. The second shift crew relieved the day shift crew and began coal production at approximately 2:50 p.m. The day shift had completed mining in the No. 4 entry and moved the MRS units and continuous mining machine to the No. 3 entry working place.



Mosko and the second shift production crew resumed mining operations in the No. 3 entry. At approximately 7:00 p.m., James Whitt, second shift mine foreman, arrived on the 002 section to observe the mining cycle in progress; and once completed, observed the continuous mining machine / MRS units being moved back across the section toward the No. 5 entry working place. Whitt traveled ahead of the move to the No. 5 entry working place where he made a gas test and tossed a number of steel belt rails into the gob area inby to clear the roadway. He observed the installation of the MRS units in the No. 5 entry before departing the No. 5 entry at approximately 8:25 p.m. prior to resuming mining operations in the No. 5 entry. Whitt left the 002 section at approximately 8:40 p.m. and returned to the surface.

Mosko started mining the first left pillar cut in the No. 5 entry at approximately 8:35 p.m. and completed the cut when it holed through into the inby crosscut connecting the Nos. 4 and 5 entries. Clark positioned the MRS units for the continuous mining machine to mine the first right cut from the solid wall. Mosko loaded Mullins' shuttle car mining 27 feet into the right wall cut and de-energized the continuous mining machine. Mullins traveled toward the section loading point and stopped inby the section feeder to wait on Hughes, who was having trouble dumping his shuttle car at the side dump on the feeder.

During this time, Chandler walked across the section observing Moore at the roof bolting machine located in the No. 2 entry. Chandler checked on the shuttle car operations at the section feeder before traveling to check on Mosko and Clark at the continuous mining machine in the No. 5 entry working place. Chandler left the No. 5 entry after checking on the mining operation. Shortly after Chandler left, Clark and Mosko heard some small pieces of rock fall from behind the MRS units; and a few seconds later, observed a flash in the gob area at the location of the left pillar cut that was mined toward No. 4 entry. Mosko and Clark immediately experienced the forces from an explosion feeling heat and excessive pressure as they were knocked to the ground. Visibility was limited from thick dust in the air. Clark's hard hat and cap light were knocked off, and Mosko's corded cap light became disconnected from his hard hat. Chandler was traveling approximately 40 to 50 feet outby when he felt pressure forces that he described as "nothing like anything he ever felt before". All three men described seeing sparks or flickering ambers floating in the air, and the dust was thick in the air.

Mosko and Clark also observed their Solaris multigas handheld detectors were alarming reaching 160 parts per million (ppm) Carbon Monoxide (CO), and the detectors remained in alarm as they immediately retreated down the No. 5 entry primary escapeway. They continued to retreat until their detectors stopped alarming when they arrived in the intake air course of the No. 5 entry. Chandler did not see Mosko or Clark retreating due to the limited visibility following the explosion. Chandler yelled for Mosko and Clark; then observed a hard hat and cap light lying on the mine floor in the No. 5 entry working place. Chandler later found Mosko and Clark in the primary escapeway near the emergency telephone.

When the explosion occurred, Moore was located in the No. 2 entry at the roof bolting machine; and was positioned with his back toward the inby gob area. He experienced a huge concussion force and walked through a cloud of dust, which limited visibility, as he traveled to the No. 5 entry. Moore was unaware of Clark's and Mosko's retreat when he observed Clark's cap light

near the rib, and Chandler's personal strobe light in the No. 5 entry working place near the location of the continuous mining machine. Moore continued to search for Mosko and Clark believing that they were still in the working place. He yelled for the missing miners; then heard a response coming from the direction of the emergency telephone.

At the time of the explosion, Mullins was sitting in his shuttle car and facing the location of the section feeder when he felt his ears pop; and observed the curtains on the section "suck back" as he ducked down in the shuttle car because of the pressure forces and ensuing dust. Hughes had just finished unloading his shuttle car into the feeder when he also felt the pressure forces of the explosion and saw dust in the air.

The section crew gathered in the primary escapeway near the No. 7 crosscut where they were instructed by Chandler to travel to the mantrip located in the No. 2 entry. Chandler called Whitt on the surface using the travelway telephone and reported the incident as a major roof fall and stated that they were evacuating the section. Chandler instructed Moore and Mullins to de-energize the equipment at the section power center then walked outby in the No. 4 entry to assess the condition of the permanent stoppings since no air movement could be detected. Chandler walked outby several crosscuts and observed that the return air course stoppings were destroyed. The section crew gathered at the Mac 10 diesel mantrip personnel carrier and began traveling the No. 2 entry alternate escapeway toward the surface.

As Chandler and crew traveled toward the surface, they stopped at the No. 2 belt drive and de-energized the drive power center. Coy Barnette and Jimmy Stipes, owl shift repairmen, had started early and were traveling to the 002 section to work on a Lo-Trac utility vehicle. As they arrived at the airlock doors used to access the 002 section, Barnette and Stipes stated that both of the airlock doors were standing open. They traveled through the airlock where they met Chandler and his crew at the inby set of airlock doors and pulled into a crosscut. Chandler informed Barnette and Stipes that they were evacuating the mine, and there was no ventilation on the section. Barnette and Stipes turned their vehicle around and followed Chandler and his crew toward the surface. Near the No. 6 belt drive, the crew met Whitt, who was traveling alone to the 002 section, and discussed the events that occurred on the 002 section.

Chandler told Whitt that they had a pillar fall, and he thought he saw sparks. Mosko told Whitt that there may have been an ignition because his hair was burnt. Whitt questioned the crew about whether an ignition had occurred to which the crew replied "they were not really sure". Whitt decided to travel to the 002 section to see for himself. Barnette and Stipes accompanied Whitt.

Whitt, Barnette, and Stipes continued traveling toward the 002 section as Chandler and the 002 section crew traveled to the surface arriving at 10:45 p.m. Arriving at a location just outby the 002 section, Whitt observed a number of permanent stoppings destroyed and detected CO levels in excess of 100 ppm. Whitt, Barnette, and Stipes retreated from the 002 section and traveled outby to the airlock where Whitt instructed Landon Litton, owl shift section foreman, and the owl shift crew to start hanging curtains to replace the damaged stoppings and restore the section ventilation starting from the airlock doors inby toward the 002 section. Whitt, Barnette, and Stipes traveled to the surface and arrived at 12:29 a.m. on June 18, 2015. Upon arrival, Whitt

called Scott Orr, mine superintendent, at approximately 12:30 a.m. on June 18, 2015, and told him that there had been a pillar fall, which blew out some stoppings on the 002 section.

The owl shift crew including Roger Baker, acting owl shift mine foreman, and Roger Fleenor, owl shift fire boss, entered the mine and traveled to the 002 section; and started erecting curtains to replace the damaged stoppings starting at the mouth of the 4A North panel. Baker and Fleenor advanced inby the work crew and encountered elevated levels of up to 170 ppm CO on the 002 section. The owl shift crew installed check curtains toward the 002 section for a distance of approximately 13 crosscuts.

Investigation of the Accident:

Upon arrival at the mine, investigators discovered that the CO monitoring system on the surface indicated the underground CO monitors installed from the No. 7 belt drive inby to the No. 11 belt tailpiece were detecting CO levels ranging from four to eight ppm. Orr arrived at the mine between 2:30 a.m. and 3:00 a.m. and accompanied Christopher Cain, MSHA roof specialist, traveling the alternate escapeway to the 002 section. Arriving at the airlock doors approaching the 002 section, Cain entered the return air course at the location of the 4 North seals where his Solaris multigas detector went into alarm indicating 35 ppm CO. Cain discussed the situation and elevated CO levels with Orr, and Orr then instructed Litton to take his crew to the surface. Proceeding on to the 002 section, CO levels exceeding 50 ppm were detected in the Nos. 2 and 3 entries near survey station 4222. Orr and Cain traveled inby the pillar line into the bleeder system to evaluate the condition of the 4A North bleeder. Near crosscut No. 12, the Solaris instrument alarmed near survey station 4232 and indicated CO levels in excess of 100 ppm. All of the stoppings constructed between the Nos. 1 and 2 entries on the 002 section were destroyed by the explosion, and there was no perceptible air movement detected.

The investigation course is listed:

- On June 18, 2015, Alpha Natural Resources' mine rescue team accompanied by DMME representatives collected air samples in the 4A North bleeder. The air samples were analyzed at MSHA's National Air and Dust Laboratory in Mt. Hope, West Virginia, and the analysis revealed fire gases indicative of a combustion event.
- On Friday, June 19, 2015, additional temporary ventilation controls were installed to ventilate the 002 section and the 4A North bleeder system. The mine remained idle for three days (through the weekend) while monitoring and sampling of gases at the mine portals were conducted by company personnel.
- On Sunday, June 21, 2015, Allen Dupree, VP of Safety, reported that miners had reported that they had observed a flash that extended into the gob when the incident originally occurred on the 002 section on June 17, 2015.
- On Monday, June 22, 2015, interviews were conducted with mine personnel at the DMME Office in Big Stone Gap, Virginia.
- On Wednesday, June 24, 2015, the underground accident investigation was resumed by Alpha Natural Resources, DMME, and MSHA representatives. The investigators encountered elevated methane levels and poor air quality forcing retreat from the mine.

Rescue teams continued the work to improve ventilation and address air quality deficiencies until the air qualities were restored to acceptable levels.

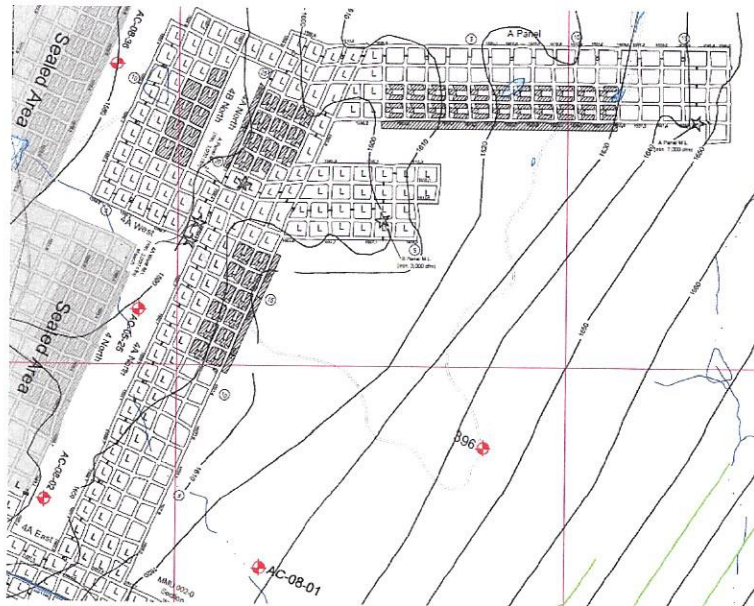
- On Tuesday, June 30, 2015, the investigation teams collected equipment data, checked permissible conditions, and mapped the accident scene.
- On Wednesday, July 1, 2015, DMME, MSHA's Technical Support Ventilation Group, MSHA, and Dorchester representatives conducted a ventilation air quantity investigation on the 4A North panel and associated bleeder system.
- On Wednesday, July 15, 2015, MSHA's Technical Roof Control Division visited the mine to analyze geological features of the mine including roof, floor, and rib conditions and collected samples of liquid hydrocarbons for analysis.
- On Wednesday, September 2, 2015, and Thursday, September 3, 2015, a number of mine personnel previously interviewed were compelled to appear and testify under oath in additional interviews in accordance with §45.1-161.23.E of the Coal Mine Safety Laws of Virginia.

Discussion

Mining Conditions:

The 4A North panel was developed with a two entry air course directed inby, a two entry air course directed outby for the belt entry, and a single return entry directed outby. The air courses were separated by permanent stoppings constructed with dry stacked Omega blocks sealed with foam sealant.

As shown in this map, the limited number of pillars extracted during retreat mining operations resulted in the extent of gob area being relatively small. The section of retreat mining on the 4A North panel started at crosscut No. 17, and mining had progressed outby to crosscut 11. Six lines of pillars and solid wall cuts had been mined on the 002 section prior to the accident. Providing and controlling adequate ventilation during retreat mining operations is difficult where excessive mining heights exists together with roof caving, which could occur as much as 20 feet above the 12+ feet high coal. Managing effective air flow through the gob is even more of a challenge when forced air ventilation is used.



The Dorchester Mine is a multiple seam mining environment with abandoned mine works present in the overlying Taggart and Lower Parsons seams located approximately 380 feet and 1,190 feet, respectively, above the Dorchester Mine. The depth of cover above the 4A North panel ranges from 1,200 to 1,800 feet.

The evaluation findings by the Pittsburgh Safety and Health Technology Center's Mine Emergency Operations Division concluded that there was enough evidence gathered to classify the event at the Dorchester Mine on June 17, 2015, as an ignition resulting in explosive forces. The epicenter of the explosion occurred in the pillar area being extracted on the 4A North panel. The amount of fuel involved in the explosion had to have been localized as evidenced by a calculated, maximum explosion overpressure of 4.1 psi that occurred outby the miners' location, and lesser, dissipating pressures farther outby. Other than heat thresholds high enough to melt plastic meshing, wire ties, and nylon rope around the area of the continuous mining machine, there was no evidence of flame progressing further outby or inby.

Examination and Analysis of Mine Samples:

On July 15, 2015, eight samples were collected from seepage of oil substances that was prevalent in the mine roof, and coal ribs in the area of the ignition / explosion that occurred at the Dorchester Mine on June 17, 2015. The samples were analyzed by the Pittsburgh Safety and Health Technology Center's Physical and Toxic Agents Division. The purpose of the analysis was to determine the potential for the oil substances to contribute to the flame propagation observed that resulted from the ignition / explosion event. The examinations found that five of the eight samples analyzed contained hydrocarbons that have the potential of being flammable.

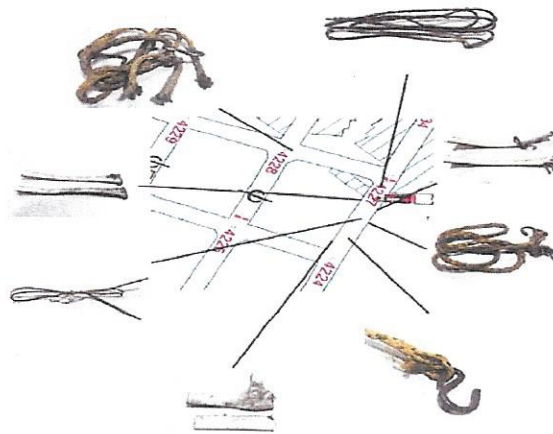
The possibility that liquid hydrocarbons ignited, which then ignited methane accumulations, should not be ruled out. Research has shown that methane air mixtures can be more readily ignited in the presence of hydrocarbons than methane air mixtures alone. The hydrocarbon vapors can ignite at significantly lower temperatures than methane. The National Institute of Occupational Safety and Health's (NIOSH) Pittsburgh Research Laboratory conducted experiments on the effect of added hydrocarbon liquids to the frictional heating potential of steel-on-rock contact. In experiments that involved striking sandstone with rotating cutter bits, it was found that in tests in an air-methane atmosphere ignitions were not achieved. However, ignitions occurred when a hydrocarbon liquid stimulant was incorporated in the experiment. Thus, it was determined that the presence of liquid hydrocarbon in the mining environment has the potential to increase the ignition hazard associated with the frictional heating from impact of steel on sandstone.

Flames / Heat Evaluation:

A dust survey was conducted underground around the pillared area on the active 4A North section of the mine. A total of 63 dust samples were collected over various days including two samples taken off of the continuous mining machine. The 63 samples were sent to MSHA's National Air and Dust Laboratory in Mt. Hope, West Virginia. Each sample was subjected to an Alcohol Coke Test.

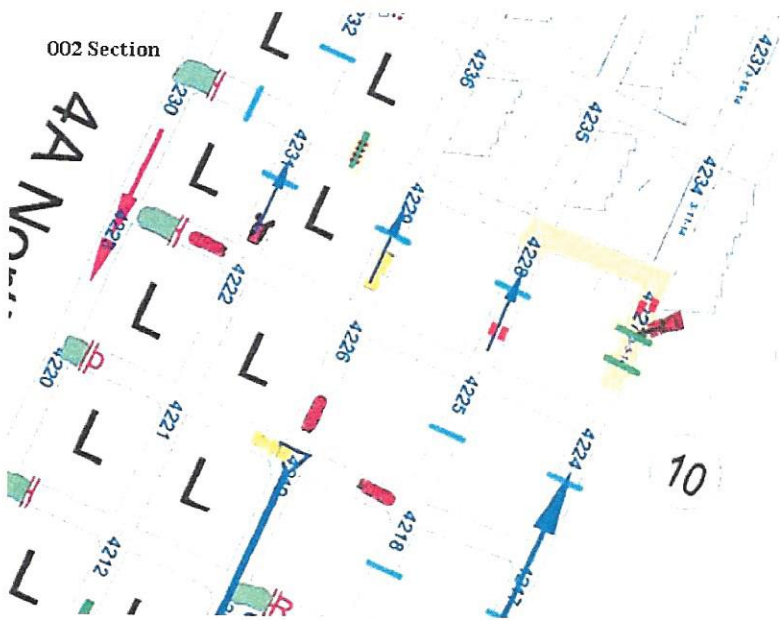
The Alcohol Coke Test identified the quantity of coke in each sample as none, trace, large, or extra-large. Large and extra large quantities of coke are indicative of flame travel. Of the 63 dust samples, “small” or “trace” amounts of coke were found. The two samples collected off of the continuous mining machine; both contained coke (one was “trace”; one was “small”). The other two samples containing “small” or “trace” were located in various areas of the mine; but did not form a definitive trend to draw a reliable, scientific conclusion attributing the limited coking to propagating heat wave. The lack of coking amount and the lack of coking trend indicate that flaming did not occur anywhere outside the pillared area.

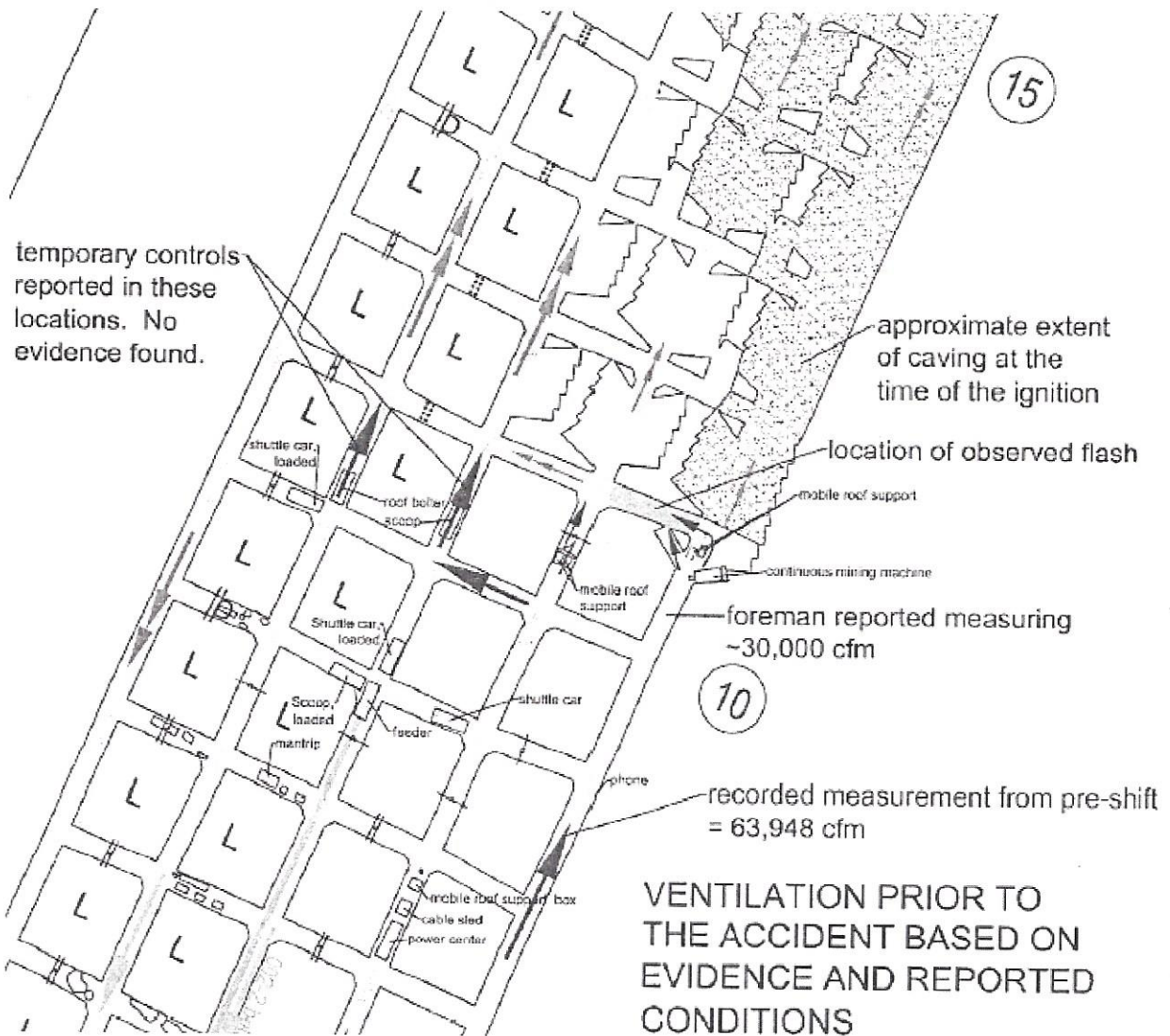
Various items that had been exposed to heat were observed in the Nos. 4 and 5 entries outby the location of the MRS units and continuous mining machine on the 002 section.



Items collected with their location depicted on the 002 section underlay map

The highlighted area showed evidence of heat exposure extending from the location of the continuous mining machine depicted in the inby connecting crosscut between Nos. 4 and 5 entries and outby the location of the continuous mining machine in the No. 5 entry.





VENTILATION PRIOR TO THE ACCIDENT BASED ON EVIDENCE AND REPORTED CONDITIONS

Ventilation:

The above illustration depicts 002 section face ventilation controls according to evidence, testimony, the location of the observed flash, and the approximate extend of caving in the No. 5 entry at the time of the ignition and subsequent explosion on June 17, 2015. A check curtain was found in the No. 4 entry blown against the MRS units. No evidence was found to indicate check curtains were installed in the Nos. 2 and 3 entries as indicated in Chandler’s testimony. If the check curtains were not installed in the Nos. 2 and 3 entries, a short circuit of airflow would have existed, which would have greatly reduced the air available for dilution of methane in the No. 5 entry working place. The mine records indicated 63,948 cfm was measured at the intake end of the pillar line during Chandler’s preshift examination of the 002 section for the oncoming shift conducted earlier in the shift prior to the explosion. The measurement was taken between crosscut Nos. 8 and 9. The measurement should have been taken between crosscut Nos. 9 and 10 in the intake entry furthest from the return air course immediately outby the first open crosscut

outby the line of pillars being mined (§45.1-161.208.C.3 of the Coal Mine Safety Laws of Virginia).

A ventilation survey was conducted on July 1, 2015, after the section ventilation was reestablished. The reestablished ventilation consisted of temporary and permanent stoppings constructed between the Nos. 1 and 2 entries. The curtains across the pillar line were not installed. With the ventilation partially reestablished, approximately 52,000 cfm ventilation was measured for the 002 section. A quantity of approximately 32,000 cfm flowed through the No. 2 entry around the pillared area with the remaining 20,000 cfm flowing into the pillared area.

The amount of air short circuited was approximated from the air measurements taken post explosion. After the explosion, a total of 48,500 cfm was measured between crosscuts 10 and 11. Of the 48,500 cfm, 31,500 cfm was measured in the Nos. 2 and 3 entries. 10,700 cfm was measured in the No. 4 entry, and 6,300 cfm was measured in the No. 5 entry where the continuous mining machine was located. Although it is believed that the check curtain in the No. 4 entry was installed at the time of the explosion, the majority of the air on the section would have been short circuited through the Nos. 2 and 3 entries.

It is plausible that the gob area inby the MRS units in the No. 5 entry working place and particularly along the solid rib where mining had taken place was not well ventilated allowing explosive mixtures to accumulate. An ignition at the continuous mining machine could have propagated into the gob area inby the MRS units. It is possible, however, unlikely, that an accumulation of explosive mixtures in the pillared gob area was ignited by a roof fall given the minor amount of roof that fell immediately before the ignition occurred according to mine personnel.

4 North Airlock Doors:

The airlock doors used to access the 002 section were constructed near survey station 3059. The mine's tracking system indicated that the last person traveling through the airlock doors prior to the explosion on June 17, 2015, was Jamie Harris, fire boss, at approximately 9:20 p.m. Harris testified that he closed the airlock doors after traveling through the airlock. Barnette and Stripes testified that the outby set of airlock doors were standing open when they approached them after the explosion occurred. They met the 002 section crew prior to traveling through the inby set of airlock doors. The 002 section crew stated that as they were evacuating the mine, one of the doors was open on the inby set of doors when they arrived at the airlock. When both sets of doors of the airlock are open, intake air is short circuited to the outby belt air course, which would significantly reduce the amount of intake air available to ventilate the working places on the 002 section.

Mine Examination Records:

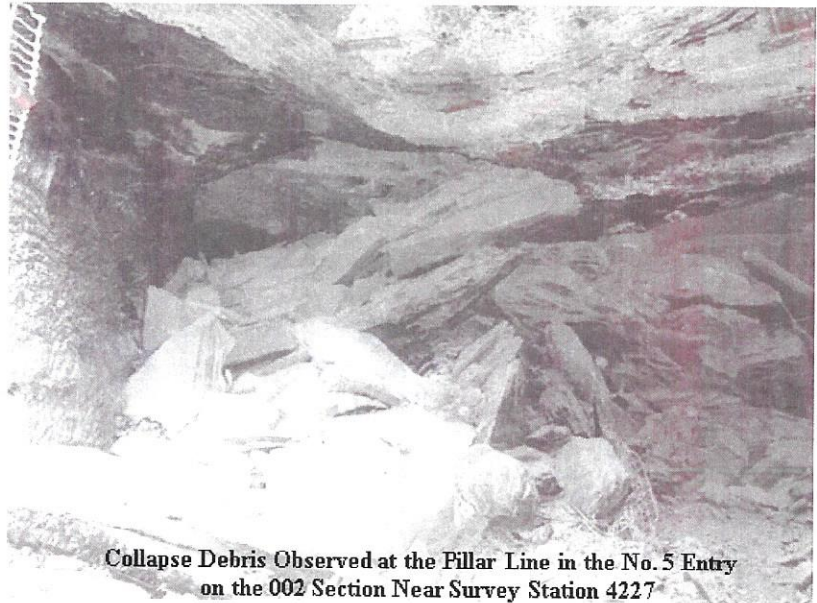
The preshift / onshift mine examination records were reviewed. The records indicated that Chandler conducted a preshift examination on the 002 section on June 17, 2015, from 7:00 p.m. to 9:15 p.m.; and at 9:40 p.m., the report was called out to Danny Baker, outside man. Chandler's preshift examination record showed a 63,948 cfm of air measured at the intake end of

the pillar line on the 002 section. The record indicated 0.4% methane detected in the No. 1 entry; and zero (0.0) % methane detected in the Nos. 2, 3, 4, and 5 working places on the 002 section. Chandler stated that more than 30,000 cfm of air was measured at the continuous mining machine prior to mining the first left pillar cut in the No. 5 entry working place on the 002 section at approximately 8:35 p.m.

Physical Factors / Other Factors:

The accident investigation revealed the following:

1. The methane ignition / explosion accident occurred on the 002 section at approximately 9:58 p.m. on June 17, 2015. The accident occurred in the No. 5 entry working place 4 entry left crosscut on the No. 3 section approximately 96 feet in by survey station No. 4224.
2. The 4A North 002 section was well rock dusted with firm coal rib conditions and adequately supported roof / rib conditions.
3. Sandstone roof was the dominant roof type on the 002 section across the pillar line and into the gob area. Core hole logs provided by the company that were taken nearby the 4A panel indicated overlying sandstone ranging from 20 to 30 feet above the Imboden coal seam. This was consistent with the visual observations made of the roof collapse debris observed in the No. 5 entry working place. The roof rock in the collapse consisted of slabs of rock ranging in thickness from a few inches to two or more feet. The slabs of rock appeared to be gray sandstone laminated with streaks of shale or coal, which was consistent with the core logs.
4. The continuous mining machine was a Joy 14CM15 mining machine, Serial No. JM6919. The two MRS units that were set up in the No. 5 entry working place were identified as No. 3 Fletcher MRS, Serial No. 2008967, and No. 4 Fletcher MRS, Serial No. 2008968.
5. The continuous mining machine was positioned with the cutter head against the mine roof in the first right wall cut that had been mined to a depth of 27 feet.
6. The permissible conditions of the continuous mining machine and MRS units were inspected. No potential ignition sources related to the permissible conditions that could have contributed to the explosion were found.



**Collapse Debris Observed at the Pillar Line in the No. 5 Entry
on the 002 Section Near Survey Station 4227**

7. The methane monitor provided for the continuous mining machine was tested with a 2.5% mixture of methane and air, and the methane monitor functioned properly. Fourteen cutter bits were worn on the cutter head, and six water sprays were inoperative when tested.
8. A pillar fall in the gob area was observed inby the location of the two MRS units in the No. 5 entry working place. There was no pillar fall observed in the crosscut connecting the Nos. 4 and 5 entries located inby the location of the continuous mining machine. No significant pillar fall had occurred in the gob area of the No. 4 entry for three crosscuts inby and in the No. 3 entry for four crosscuts inby.
9. Two (2) shuttle cars were positioned at the section feeder with the center shuttle car still loaded with coal.
10. Dinner buckets and the remote control unit for the continuous mining machine were located at the mine telephone located in the No. 2 entry.
11. Most of the permanent stoppings on the 002 section were either damaged or destroyed starting outby in the 4A North Mains at survey station 3060 and extending through the 4A East area and extending inby on the 4A North section to survey station 4287. Fifty five (55) permanent stoppings were damaged or destroyed by the explosion (See Appendix D).
12. The preshift and onshift mine examination records were reviewed, and the air measurements recorded by Chandler for the June 17, 2015, preshift examination of the 002 section were consistent with previous air measurements recorded for the 002 section. There were no entries in the preshift examination records relating to the accident.
13. The mine utilizes American Mine Research, Inc. (AMR) Mine Net electronic communications / tracking and mine atmospheric monitoring systems. The tracking system consists of an underground network of fixed communication units that communicate with an individual active tag worn by miners that transmit miner identification, ambient temperatures, messaging codes, and battery levels to Smart Readers in the Mine Net System. The tracking system provides continuous tracking within 50 feet mine wide showing location tracking and direction of travel. Every 30 seconds the communicators transmit location data that travels through the network to a user interface at the surface
14. The data log of the AMR CO monitoring systems for June 17, 2015, and June 18, 2015, was reviewed. A peak value of 5.51 ppm with an alarm was indicated at 10:04 40 p.m. at the 002 section CO monitor on June 17, 2015. When the investigation was initiated at the mine, the CO monitoring system on the surface indicated the underground CO monitors installed from the No. 7 belt drive inby to the No. 11 belt tailpiece were detecting CO levels ranging from four to eight ppm. The data log from June 17, 2015, through June 18, 2015, showed the CO monitoring system was entering warning and alarm status recurrently.
15. The MSHA laboratory analysis of the air quality that exits the Dorchester Mine shows a methane liberation rate of 448,511 cubic feet of methane liberated per 24-hour period.

Conclusion:

On June 17, 2015, at approximately 9:58 p.m., a methane ignition and subsequent explosion occurred on the 4A North 002 section. The ventilation on the 002 section active pillar line was

disrupted allowing an accumulation of methane to occur. The failure to ensure that the air current on the 002 section active pillar line was of a sufficient volume and velocity to readily dilute and carry away any flammable or harmful gases and dust resulted in a methane ignition / explosion accident. Physical evidence indicated that heating was most prevalent near the continuous mining machine. Normally, this type of heating occurs at the origin of the ignition.

Enforcement Action:

The following enforcement actions were taken as a result of the investigation:

- Order of Closure No. HLH0011257 was issued under §45.1-161.91A (ii), of the Coal Mine Safety Laws of Virginia to preserve the scene of the accident on the No. 2 section pending investigation. When a methane ignition and methane explosion was determined, the order was modified to restrict personnel from entering the mine. Once ventilation was reestablished on the 002 section and the mine was determined safe for entry by mine rescue personnel, the order was modified to allow mine examinations, restore the CO Monitoring / Tracking System, and to implement a number of action plans approved to ensure the safe operation of the mine during recovery operations.
- Order of Closure No. HLH0011277 was issued under §45.1-161.91.A(i) referencing 45.1-161.77.B. of the Coal Mine Safety Laws of Virginia due to the mine operator instructing miners to construct ventilation controls underground on the 4A East and 4A North panels after evidence showed that a methane ignition / explosion had occurred on June 17, 2015, on the 002 section.
- Order of Closure No. HLH0011277 was issued under §45.1-161.91.A(i) referencing 45.1-161.219.B. of the Coal Mine Safety Laws of Virginia for failure to ensure that the air current on the 002 section active pillar line was of a sufficient volume and velocity to readily dilute and carry away any flammable or harmful gases and dust resulting in a methane ignition / explosion, which occurred on June 17, 2015.
- Notice of Violation No. HLH0011275 was issued under §45.1-161.77.A. of the Coal Mine Safety Laws of Virginia for failing to notify the Department by the quickest available means of a methane ignition / explosion that occurred on the 002 section on June 17, 2015.
- Individual Notice of Violation No. HLH0011275 was issued under §45.1-161.77.A. of the Coal Mine Safety Laws of Virginia to James R. Whitt, evening shift mine foreman, for failing to notify the Department by the quickest available means of an methane ignition / explosion that occurred on the 002 section on June 17, 2015. The correction of the violation required personal training.
- Individual Notice of Violation No. HLH0011279 was issued under §45.1-161.77.B. of the Coal Mine Safety Laws of Virginia to James R. Whitt, evening shift mine foreman, for instructing miners to construct ventilation controls underground on the 4A East and 4A North panels after evidence showed that a methane ignition / explosion had occurred on June 17, 2015, on the 002 section. The correction of the violation required personal training. Whitt's First Class Mine Foreman (FCMF) certification was placed in temporary suspension on July 9, 2015. On August 11, 2015, Whitt appeared before the Board of Coal Mining Examiners (BCME) to address conditions regarding the Mill

Branch Coal Corporation's Dorchester Mine. The Board voted to reinstate his FCMF certification and place his FCMF certification under six-month probationary period.

- Individual Notice of Violation HLH0011281 was issued under §45.1-161.219.B. of the Coal Mine Safety Laws of Virginia to Clarence Chandler, evening shift section foreman, for failing to ensure that the air current at the 002 section pillar line was of a sufficient volume and velocity to readily dilute and carry away any flammable or harmful gases and dust in that a methane ignition / explosion occurred on June 17, 2015, on the 002 section. The correction of the violation required personal training. Chandler was required to appear before the BCME to address conditions regarding the Mill Branch Coal Corporation's Dorchester Mine. The Board voted to place Chandler's FCMF certification under a six-month probationary period.
- Individual Notice of Violation HLH0011282 was issued under §45.1-161.249.B. of the Coal Mine Safety Laws of Virginia to Roger Fleenor, owl shift fire boss, for failing to see that the requirements of this Act that pertain to his duties and to the health and safety of the miners are fully complied with at all times in that he allowed miners to remain on the 4A North panel after he was aware that there was Carbon Monoxide (CO) in excess of 50 parts per million following a methane ignition / explosion that occurred on the 002 section on June 17, 2015. The correction of the violation required personal training. Fleenor was required to appear before the BCME to address conditions regarding the Mill Branch Coal Corporation's Dorchester Mine. The Board voted to take no action against Fleenor's FCMF certification – no probationary period.
- Individual Notice of Violation HLH0011283 was issued under §45.1-161.249.B. of the Coal Mine Safety Laws of Virginia to Roger Baker, owl shift maintenance foreman, for failing to see that the requirements of this Act that pertain to his duties and to the health and safety of the miners are fully complied with at all times in that he allowed miners to remain on the 4A North panel after he was aware that there was Carbon Monoxide (CO) in excess of 50 parts per million following a methane ignition / explosion that occurred on the 002 section on June 17, 2015. The correction of the violation required personal training. Baker was required to appear before the BCME to address conditions regarding the Mill Branch Coal Corporation's Dorchester Mine. The Board voted to place Baker's FCMF certification under a six-month probationary period.

Recommendations:

1. The air current at working faces shall under all conditions have a sufficient volume and velocity to readily dilute and carry away smoke from blasting and any flammable or harmful gases and dust.
2. If an explosion or mine fire occurs in a mine, the operator shall notify the Department by the quickest available means. All facilities of the mine shall be made available for rescue and recovery operations and firefighting. No work other than rescue and recovery work and firefighting may be attempted or started until and unless it is authorized by the Department.
3. Extra precautions to prevent fires and explosions must be taken when liquid hydrocarbons are present in addition to methane in underground mine environments.
4. Worn or damaged cutter bits on the continuous mining machine must be replaced on a regular basis.

APPENDIX

MINE LICENSE INFORMATION.....	A18
PERSONS INTERVIEWED DURING THE INVESTIGATION.....	B19
REFERENCES.....	C22
PHOTOS.....	23
SIGNATURE SHEET.....	24

APPENDIX A

ORIGINAL MINE LICENSE INFORMATION

Official Corporation:	Mill Branch Coal Corp.
Official Business Name of Operator:	Dorchester Mine
Mine Index.	14698AB
Person with Overall Responsibility:	David Scott Orr, Superintendent
Person in Charge of Health and Safety:	David Scott Orr, Superintendent

ACQUISITION MINE LICENSE INFORMATION

Official Corporation:	Revelation Energy, LLC
Official Business Name of Operator:	D-10 Dorchester
Mine Index	14698AC
Person with Overall Responsibility:	Anthony Worley
Person in Charge of Health and Safety:	Anthony Worley

APPENDIX B

The following mine personnel provided information and/or were present during the accident investigation:

Mill Branch Coal Corp. Dorchester Mine

David Scott Orr	Superintendent
Allen Dupree	V.P. Safety
R. Tom Asbury	Safety Manager
Bobby Fields	Safety Representative
Teddy Starnes	Day Shift Mine Foreman
Anthony Worley	Owl Shift Mine Foreman
Joseph E. Rudder, Jr.	Director of Regulatory Compliance
Reddy Hadising	Ventilation Group
Mike Sowder	Ventilation Group

Personnel Interviewed During the Accident Investigation

David Scott Orr	Superintendent	Day Shift
Teddy Starnes	Mine Foreman	Day Shift
Sammy Mosley	Weekly Mine Examiner	Day Shift
James Whitt	Mine Foreman	Evening Shift
Clarence Chandler	Section Foreman	Evening Shift
James Mosko	Continuous Mining Machine Operator	Evening Shift
Jonathan Clark	MRS Operator	Evening Shift
Mark Hughes	Shuttle Car Operator	Evening Shift
James Mullins	Shuttle Car Operator	Evening Shift
Jon Moore	Section Repairman	Evening Shift
James Harris	Fire Boss	Evening Shift
Russell Mullins	Outside Man Operator	Owl Shift
Roger Baker	Maintenance Foreman	Owl Shift
Roger Fleenor	Fire Boss	Owl Shift
Coy Barnette	Outby Mechanic	Owl Shift
Jimmy Stripes	Outby Mechanic	Owl Shift
Anthony Worley	Mine Foreman	Owl Shift
Matt Gillam	Section Foreman	Owl Shift

Virginia Department of Mines, Minerals & Energy

M. Randy Moore	Chief, Division of Mines
Chris Whitt	Emergency Response Coordinator
Mike Willis	Mine Safety Engineer
Matt Smith	Ventilation Specialist
Anthony Sturgill	Mine Technical Engineer
Sammy Fleming	Coal Mine Inspector Supervisor
Hershiel Hayden	Coal Mine Inspector
Buddy Begley	Electrical Specialist
Kenneth Johnson	Coal Mine Inspector
Danny Mullins	Coal Mine Inspector
Charles C. Shortt	Coal Mine Inspector
Glendon Sturgill	Coal Mine Inspector
Rick Taylor	Coal Mine Inspector

Mine Safety and Health Administration

Clayton E. Sparks	District Manager
Benjamin S. Harding	Assistant District Manager (Technical)
James A. Kiser	Assistant District Manager (Enforcement)
John Urosek	Chief, Mine Emergency Operations Division
Virgil Brown	Manager, Mine Emergency Operations Division
Dave Leverknight	Mine Emergency Operations Division
Lloyd Robinette	Supervisory, Mining Engineer (Ventilation)
Gary Hall	Supervisory, Mine Safety and Health Specialist (Roof Control)
Scott Beverly	Supervisory, Mine Safety and Health Inspector
Jeff Webb	Supervisory, Mine Safety and Health Inspector
Jason Lane	Supervisory, Electrical Engineer
Robert Clay	Supervisory, Special Investigator
Terry Sheffield	Staff Assistant (Accident Investigation Coordinator)
Steve Sawyer	Civil Engineer, Mine Emergency Operations Division
Chris Snyder	Civil Engineer, Mine Emergency Operations Division
Gregory Rumbaugh	Civil Engineer, Roof Control Division
Paul Tryna	Geologist, Roof Control Division
Charles Wiedrich	Chemist, Physical and Toxic Agents Center
Jason Reichart	Mining Engineer, Ventilation Division
Tom Morley	Mining Engineer, Ventilation Division
Vance Rumbaugh	Mining Engineer, Ventilation Division
G. Eric Howe	General Engineer, Ventilation Division
Chad Huntley	P.E. Electrical Engineer
David Barkland	P.E. Electrical Engineer

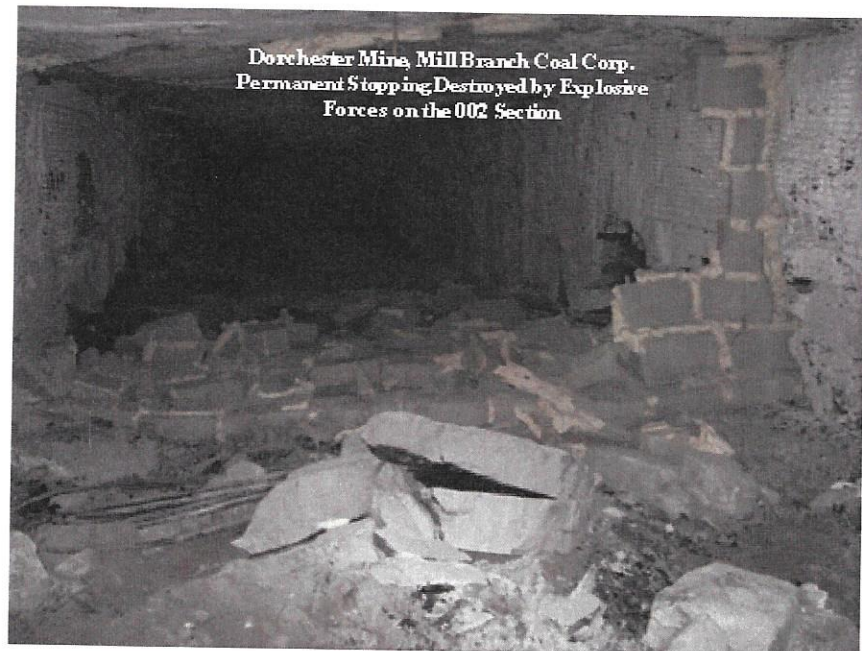
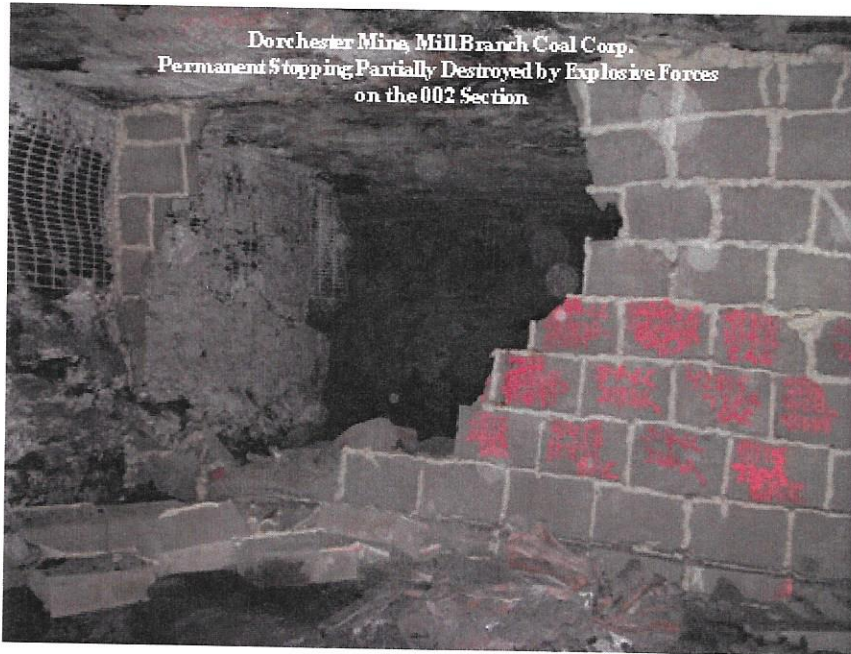
Gerry L. Lowe	Mining Engineer (Ventilation)
Jason Hess	Mine Safety and Health Specialist (Ventilation)
Larry Stanley	Mine Safety and Health Specialist (Ventilation)
Christopher L. Cain	Mine Safety and Health Specialist (Roof Control)
Dennis Carter	Mine Safety and Health Specialist (Roof Control)
Ernie Sexton	Mine Safety and Health Specialist (Roof Control)
Russell Dresh	Electrical Engineer
Roger Day	Mine Safety and Health Specialist (Diesel)
Benjamin Branham	Mine Safety and Health Inspector
Sammy Elswick	Mine Safety and Health Inspector
Scott Adams	Mine Safety and Health Inspector
Mike Hughes	Special Investigator

APPENDIX C

References:

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- Gregory M. Rumbaugh, Civil Engineer, Paul L. Tyrna, Geologist, August 14, 2015, U.S. Department of Labor, Roof Control Division: Evaluation of the Potential for a Roof Fall to Cause an Ignition at the Dorchester Mine, Mill Branch Coal Corp.
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- Richard T. Stoltz, Chief, Ventilation Division, September 29, 2015, Pittsburg Safety and Health Technology Center: Post Explosion Mapping and Ventilation Survey of the 4A North Section at the Dorchester Mine, Mill Branch Coal Corp.
- Stephen G. Sawyer, Jr., Civil Engineer, Christopher Snyder, Civil Engineer, September 29, 2015, U.S. Department of Labor, Mine Emergency Operations Division: Post Event Investigation of the 4A North Section at the Dorchester Mine, Mill Branch Coal Corp.

Appendix D



SIGNATURE SHEET

This report is hereby submitted by Terry A. Ratliff and approved by Marshall Randy Moore:

Terry A. Ratliff

Terry A. Ratliff, Division of Mines

Date: 03/23/16

M. Randy Moore

M. Randy Moore, Chief

Date: 03/30/2016