

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

REPORT OF INVESTIGATION

Underground Coal Mine

Fatal Explosion Methane Gas
July 31, 2019

Paradise #9 Mine
KenAmerican Resources, LLC
Bremen, Muhlenberg County, Kentucky
ID No. 15-17741

Accident Investigators

Adam Carlisle
Electrical Specialist/Lead Investigator

Matt Stone
Roof Control Specialist

Ray Cartwright
Surface Specialist

Originating Office
Mine Safety and Health Administration
District 10
100 YMCA Drive
Madisonville, KY 42431
Robert A. Simms, District Manager

TABLE OF CONTENTS

OVERVIEW.....	1
GENERAL INFORMATION	2
DESCRIPTION OF THE ACCIDENT	3
INVESTIGATION OF THE ACCIDENT	5
RESCUE AND RECOVERY EFFORTS	5
DISCUSSION	7
ACCIDENT SCENE	7
POSSIBLE IGNITION SOURCES	7
EXPLOSION FORCE	7
VENTILATION PLAN	7
MINE SEALING SEQUENCE	7
TESTING AND EVALUATION	8
TRAINING.....	9
ROOT CAUSE ANALYSIS	10
CONCLUSION.....	12
ENFORCEMENT ACTIONS.....	13
APPENDIX A - PERSONS PARTICIPATING IN THE INVESTIGATION.....	15
APPENDIX B - ALTAIR MULTI-GAS DETECTORS LOCATIONS.....	16



OVERVIEW

On Wednesday, July 31, 2019, at 4:31 p.m., Richard Knapp, a 62-year-old contract welder/iron worker, died when multiple methane gas explosions occurred in the intake air shaft. When the explosions occurred, Knapp was working on metal sheeting above the shaft, in preparation for a concrete pour, to seal the shaft. This placed Knapp in the direct line of the explosion forces.

The accident occurred because the mine operator did not: (A) instruct the contractor, hired to seal the shaft, in the provisions of the ventilation plan and ensure the plan was followed, (B) properly measure methane concentrations, and (C) prevent smoking, oxygen-acetylene torches from being used, and grinding from being performed after measuring excessive methane concentrations. Furthermore, the contractor: (1) did not properly measure methane concentrations, (2) used oxygen-acetylene torches in the presence of excessive methane concentrations, (3) smoked in the presence of excessive methane concentrations, and (4) did not stop using oxygen-acetylene torches, grinding, and smoking when a gas detector alarmed because of excessive methane concentrations.

Also, the mine operator and contractor should have properly eliminated or safely mitigated the risks involved with the method used to seal the shaft. The installation of metal sheeting over the open shaft involved trimming the metal sheeting, with tools

that create ignition sources, over an atmosphere that had the potential to contain explosive gas.

GENERAL INFORMATION

The Paradise #9 Mine is located near Bremen, Muhlenberg County, Kentucky on Kentucky Highway 2551. When the mine was active, miners entered the mine via the intake shaft and the drift openings. The mine was ventilated through one intake air shaft, three drift openings, and one return air shaft. An exhausting main mine fan was connected to the main return air shaft opening. The mine liberated approximately 445,667 cubic feet of methane in a 24 hour period. In accordance with Section 103(i) of the Mine Act, the mine was inspected every 10 days because of excessive methane liberation.

On February 23, 2019, the Paradise #9 mine ceased production and began the reclamation of the mine. All further work activities focused on recovering equipment and sealing the mine. Murray Energy Corporation (Murray Energy) employed eight people to perform the reclamation work. This included sorting, inventorying, and loading mining equipment for shipment to other locations.

On June 17, 2019, Murray Energy submitted a "Drift Opening and Shaft Sealing Plan" addendum to the approved ventilation plan. The addendum required both shafts to be pre-shifted and continuously monitored for methane during the sealing (cap) construction. It also required work to stop, and corrective actions to be taken, if methane reached 1% or more. MSHA approved the addendum on June 24, 2019.

Mine management contracted KCK Welding to construct the seals at the drift openings and Fricke Management and Contracting Inc. (FMC) to construct the seals at the two shaft locations. Murray Energy did not share the sealing plan with the contractors. Through the contractors, Murray Energy sealed the drift openings first, followed by the return shaft. The construction of the drift seals began July 12, 2019 and was completed on July 19, 2019. Work to seal the return shaft began July 24, 2019, and was completed July 25, 2019, by FMC. On July 31, 2019, FMC began the process of sealing the intake air shaft. FMC had four workers at the mine working during the day shift to seal the intake shaft.

The Mine Safety and Health Administration (MSHA) was in the process of completing a regular E01 safety and health inspection of the mine at the time of the accident. The previous regular E01 safety and health inspection of the mine was completed on June 26, 2019. The Non-Fatal Days Lost (NFDL) rate for this mine in 2018 was 8.80. The national NFDL rate for mines of this type in 2018 was 2.99. The principal officer for the mine at the time of the accident was Jeff Rideout, Superintendent.

DESCRIPTION OF THE ACCIDENT

On Wednesday, July 31, 2019, at approximately 6:00 a.m., Terry Schmitt, Murray Energy Project Supervisory Employee, arrived at the Paradise No. 9 mine shaft sealing project. Schmitt stated he performed a functional test (bump test) of a multi-gas detector (MGD) and measured the methane concentration coming out of a 4-inch ventilation pipe installed in the return shaft seal. The methane reading on the MGD rapidly rose to 3 percent and Schmitt removed the MGD so the high methane concentration wouldn't damage the sensor in the MGD. Schmitt stated air was moving out of the return shaft (out gassing) when he measured the methane. Schmitt then went to the closed west gate at the intake shaft to measure methane. Schmitt extended his arm over the west gate which was 4.5 feet from the edge of the shaft. The MGD indicated 0.5 percent methane. Schmitt stated he did not notify any members of management of Murray Energy of the high methane concentration he measured at the return shaft. FMC employees had not yet arrived at the mine when Schmitt measured the methane, but when they did, Schmitt stated that he did not inform FMC of the methane concentrations. Schmitt also did not record the results of his methane measurements in a record book. During the investigation, no pre-shift record book could be located and Schmitt stated that he did not perform a pre-shift examination. The pre-shift examination was required by the MSHA-approved sealing plan.

At approximately 6:40 a.m., Knapp arrived at the Paradise No. 9 mine shaft sealing work site. By 7:00 a.m., Alex Cocke, FMC Supervisor; Michael Tyson and Josh Sarensen, FMC Iron Workers/Laborers, also arrived at the work site. Schmitt issued two MGDs to the FMC employees. Sarensen stated he received the two MGDs from a Murray Energy employee but could not remember who it was. Sarensen kept one of the MGDs for himself and gave the other to an FMC employee but did not recall who he gave it to. Sarensen stated he measured the methane concentration over the intake shaft before FMC contractors started working on the shaft. After it was determined no concentration of methane was present, Sarensen placed the MGD on the hoist control box, located on the west side of the intake shaft approximately 6-8 feet away from the edge of the shaft, because the belt clip was missing. Sarensen stated this MGD alarmed approximately two times during the shift due to carbon monoxide (CO) generated from use of the oxygen/acetylene torch. After each MGD alarm Sarensen stated that he used the MGD to see if methane was present, but none was detected. Investigators found a third MGD near the shaft on the hoist control box but were not able to determine who placed it in that location or when it was placed there.

At 9:03 a.m., the FMC crew began installing four 8" X 16' steel beams in the shaft. At 10:40 a.m., the workers began installing metal Q-Decking over the shaft to support the wet concrete cap until the concrete cured. No methane measurement was performed after the shaft was covered with Q-Decking.

According to Technical Support analysis of the three MGDs, only the MGD with the missing belt clip was turned on in the few hours immediately preceding the explosion. As for the other two MGDs, one was turned off at 7:29 a.m. after alarming several times at methane concentrations between 0.5% and 1%. The other was turned off at 10:54 a.m., also after alarming several times for methane concentrations between 0.5% and 1%.

The analysis showed that from 2:51 p.m. until 3:28 p.m., the MGD with the missing belt clip sounded an alarm indicating a methane concentration over 1%. At 3:28 p.m., this MGD was turned off. At 3:38 p.m., the MGD was turned back on and again sounded an alarm indicating a methane concentration over 1%. At approximately 3:50 p.m., Michael Marvel, Murray Energy Recovery/Training Employee, arrived at the Paradise #9 mine. At 3:52 p.m., the MGD alarm was reset, which can occur only by pressing a button on the front panel of the MGD once the methane concentration was below 1%. At approximately 4:00 p.m., Schmitt, Cocke, Marvel and Knapp walked to the shaft. Schmitt discussed with Cocke the need to trim the Q-Decking so the concrete could adhere to the concrete pad. Cocke made the decision to pour the concrete the next morning. Knapp, Tyson, and Sarensen trimmed the Q-Decking using an oxygen-acetylene torch and battery-powered grinders in preparation for the concrete pour.

The first explosion occurred at 4:31 p.m. while Tyson and Knapp were working on the North end of the shaft. Tyson heard a loud sound under the Q-Decking and felt the metal get hot. Both he and Knapp ran toward the edge of the shaft; Tyson in a southerly direction and Knapp in a westerly direction.

Cocke was in the operator's compartment of a crane, which was south of the shaft. Cocke said he heard a loud noise, felt the crane shake, and saw what looked like dust coming from the shaft. Cocke saw Tyson running from the shaft and Knapp fall into the shaft.

The second methane explosion occurred approximately 5 to 6 seconds after the first explosion. At least one additional explosion occurred after the second methane explosion.

Mike Harris, Murray Energy Emergency Technician, Schmitt, and Marvel, were in the mine office talking when they heard a loud noise and felt the office shake. Harris, Marvel, and Schmitt began walking to the shaft approximately 180 feet away. Harris and Schmitt heard someone say, "He's in the shaft," but they didn't know who said it or who that person was talking about. When they arrived at the shaft, Harris, Marvel, and Schmitt began to check on the men and secure the scene of the accident.

At approximately 4:35 p.m., Schmitt called Anthony Yates, Murray Energy Vice-President and General Manager, and William Snider, Murray Energy Corporate Safety

Manager, and notified them of the accident. Harris realized that one of the FMC workers was missing and he went to the shaft and yelled. There was no response. Harris told the FMC workers to stay away from the shaft to prevent them from falling into the shaft or from being injured by another explosion.

INVESTIGATION OF THE ACCIDENT

On Wednesday, July 31, 2019, at 4:47 p.m., Snider called the Department of Labor (DOL) National Contact Center to report the accident. The contact center called Hubert Wright, Health Supervisor. Wright notified District Management who in turn dispatched Abe Deleon, Field Office Supervisor, and Jon Newbury, Mine Safety and Health Inspector to the mine site. Adam Carlisle, Electrical Specialist/Lead Accident Investigator; Ray Cartwright, Surface Specialist; and Matt Stone, Roof Control Specialist, were also directed to investigate the accident.

Deleon arrived at the mine at 5:20 p.m. and Newbury arrived at 6:02 p.m. A 103(k) order was issued. Deleon and Newbury gathered preliminary information, examined the accident scene, and took photographs. At 7:15 p.m. Stone and Cartwright arrived at the mine and collected records and conducted interviews with inspectors from the Kentucky Division of Mine Safety (KDMS) (see Appendix A). At 8:40 p.m. Carlisle arrived at the mine and continued the investigation with Stone and Cartwright. John Dagner, MSHA Training Specialist, conducted a review of the training plan and records.

RESCUE AND RECOVERY EFFORTS

At approximately 10:15 p.m., Carlisle and John Stringer, Murray Energy Surface Foreman, looked down the shaft with their cap lights but they did not see Knapp.

The explosions caused large metal beams and Q-decking to be blown away from the shaft. The area on the surface near the shaft was searched but Knapp was not located. Several air samples in the shaft were taken, beginning at 11:17 p.m. on July 31, 2019, at depths of 125 feet, 250 feet, and 350 feet. The results of these initial samples, shown below, indicated to rescuers that an explosive mixture of methane and air existed in the shaft.

Date	Time	intake shaft			
		depth (feet)	%O2	%CH4	CO ppm
7/31/2019	11:17 PM	350	14.90	7.07	25
7/31/2019	11:17 PM	250	15.60	5.07	27
7/31/2019	11:17 PM	125	16.90	2.59	28

On August 1, 2019, an auxiliary fan and duct were installed. The auxiliary fan was not very effective in lowering the explosive mixtures of methane in the shaft due to the duct being kinked at the collar of the shaft.

On August 2, 2019, a larger auxiliary fan was installed on the same duct as the first auxiliary fan. By approximately 10:35 p.m., Murray Energy installed 24 inch nylon tubing on the first auxiliary fan, 36 inch tubing on the larger fan, and started ventilating the shaft with both fans. At approximately 10:52 p.m., methane levels began dropping significantly in the shaft.

On August 3, 2019, a video camera was used to visually examine the shaft from the shaft collar to the mine floor. The camera was also submerged in the water at the bottom of the shaft. The water was relatively clear and rescuers saw steel sheeting and other debris from the explosions. However, no evidence of Knapp was found with the video camera.

At approximately 3:30 p.m., Murray Energy and FMC made the decision to stop searching for Mr. Knapp in the shaft. Murray Energy and FMC expressed concern with possible rescue team endangerment issues, related to personnel entering the shaft to conduct a physical search of the bottom areas, due to potential roof control issues and the risk of another explosion.

From August 3 to 6, 2019, MSHA, company personnel, and volunteers performed extended searches, in all directions, in the fields and parking lot surrounding the shaft. The mine operator also used a drone to search the surrounding areas near the shaft and the roofs of all surface structures. No evidence of Mr. Knapp was ever found. Larry Vincent, Muhlenberg County Coroner, determined the date and time of death was July 31, 2019, at 4:31 p.m.

On August 5 and 8, 2019, Carlisle; Stone; Tim Gardner, Roof Control Supervisor, and Tim Fugate, KDMS Chief Accident Investigator, conducted interviews of witnesses at the KDMS office building in Madisonville, Kentucky. Representatives of Murray Energy and FMC were present during these formal interviews.

On Tuesday, August 13, 2019, Carlisle, met with Richard Hicks, Murray Energy Security Manager, at the MSHA office in Madisonville, Kentucky. Hicks delivered video footage taken from the security camera located on the mine hoist house. This video shows most of the activity around the intake shaft from the beginning of the shift on July 31 through approximately one hour after the explosions, including Knapp falling into the shaft.

DISCUSSION

Accident Scene

The methane explosions occurred in the intake shaft located at the Bremen portal of the Paradise No. 9 mine. The shaft extends from the surface to 360 feet deep into the mine with a landing at 350 feet at the Kentucky No. 9 coal seam. The shaft is 18 feet in diameter.

Possible Ignition Sources

Based on gas levels measured after the explosion, investigators concluded the fuel for the explosion was likely methane. While the accident investigation team could not determine the exact source of the ignition(s), obvious possible ignition sources were identified. One source is smoldering metal or sparks generated from the oxygen-acetylene torches and the grinding involved in the trimming of the Q-Decking that may have fallen into the shaft.

Another possible ignition source was the heat from cigarettes being smoked by workers over the shaft. There were several cigarette butts and a cigarette lighter found near the shaft. During interviews, investigators learned that Knapp and Tyson were smoking while working on the shaft.

Explosion Force

The magnitude of the force generated by the explosions could not be determined. A welded steel beam weighing approximately 384 pounds was torn loose and propelled approximately 40 feet in the air. The force of the explosions also propelled large pieces of Q-Decking approximately 100 feet from the shaft.

Ventilation Plan

On the day of the accident, the shaft sealing addendum to the ventilation plan was not followed. Specifically, adequate pre-shift examinations were not performed because the methane measurement at the intake shaft was made at least 3 feet away from the shaft and not over the shaft (see Appendix B). Additionally, methane was not continuously monitored properly because the MGDs were not positioned over the shaft but were 6 to 8 feet away from the shaft.

Mine Sealing Sequence

Murray Energy sealed the drift openings first and the return shaft second, which left the intake shaft to be sealed last. Because the return shaft had contained the exhausting mine fan, this meant that the fan was not operating from the time work began on the return shaft (July 24) through the time of the July 31 explosion. Investigators determined that with no ventilation in the mine, methane was able to accumulate. Due to falling barometric pressure, the mine began to out-gas, forcing the methane/air mixture to the surface. This was evident by the methane concentrations Schmitt stated

he measured at both the return shaft and the location at least three feet away from the edge of the intake shaft the morning of the accident.

Testing and Evaluation

The MSA Altair 4X MGDs used at the mine were hand-held devices configured to detect concentrations of oxygen, methane, and carbon monoxide. Three Altair 4X MGDs were found at the accident scene. Two of the MGDs were laying on top of the hoist control box and one was found hanging on the chain link fence approximately two feet away from the control box (see Appendix B). On August 22, 2019, MSHA Technical Support personnel conducted testing on the three MGDs recovered from the accident scene.

Technical Support personnel labeled the MGDs as exhibits 1, 2, and 3 and observed the response of the MGDs to known concentrations of methane, oxygen, and carbon monoxide. Each of the MGDs has data logging capabilities, which provides date and time stamps for each reading at preset 3-minute intervals.

The data indicates that MGD exhibits 1 and 2 were bump tested the morning of the accident. Data retrieved from exhibit 1 reveals the MGD was de-energized at 10:54 a.m. after alarming several times for methane concentrations above 0.5% and below 1% and was re-energized after the explosions at 4:36 p.m.

Data retrieved from exhibit 2 reveals the MGD alarmed at a methane concentration of 4.8% approximately 12 minutes after the bump test, and then several times above 0.5% and below 1%, before it was de-energized at 7:29 a.m. It was re-energized after the explosions at 4:33 p.m. Because of the high methane gas reading stored in the data for the morning of July 31, 2019, investigators believe Schmitt used this MGD when he measured methane gas concentrations the morning of the accident. This is consistent with Schmitt's statement that he measured a high concentration of methane at the return shaft first, before taking a measurement at the intake shaft.

Investigators noted the following high alarms, and related data, from exhibit 3 (the MGD without a belt clip):

1. From 2:51 pm until 3:28 pm a high alarm for methane over 1% was given and the MGD was de-energized at 3:28 pm.
2. The MGD was reenergized at 3:38 pm and a high alarm for methane over 1% was given.
3. At 3:52 pm the MGD alarm was reset which can only occur by pressing a button on the front panel of the MGD after the methane reading had fallen below 1%.
4. At 4:29 pm the MGD gave high CO (120 to 130 ppm) and low oxygen alarms. This is the approximate time of the explosions.

5. At 4:34 pm the alarms were reset by pressing a button on the front panel of the MGD. The oxygen reading had returned to 20.8%, and the CO reading had fallen below the warning level.

Investigators determined that the exhibit 3 MGD was energized at the beginning of the shift and remained on throughout the shift. Sarensen stated that he put a MGD on the hoist control box because it had no belt clip, and that this MGD alarmed two times during the shift because of CO from the use of oxygen/acetylene torches.

Training

Schmitt, Cocke, Tyson, and Knapp were certified by a state and/or qualified by MSHA in methane detection. The FMC workers were given hazard training by Murray Energy employee Michael Marvel on July 24, 2019. The hazard training consisted of hazards associated with truck movement on the mine property, loaders, and moving the equipment around the supply yard.

The FMC workers were not trained on the dangers of smoking around open mine shafts, and where fire or explosion hazards exist. Investigators learned that the FMC workers were not instructed in the requirements of the approved ventilation plan and they were not given a copy of the approved ventilation plan.

ROOT CAUSE ANALYSIS

The accident investigation team conducted an analysis to identify the underlying causes of the accident that were correctable through reasonable management controls. The team identified root causes that, if eliminated, would have either prevented the accident or mitigated its consequences.

Listed below are the root causes identified during the analysis and the corrective actions implemented to prevent a recurrence of this type of accident:

1. Root Cause: The mine operator did not ensure that the ventilation plan was followed – specifically, methane was not monitored and responded to as required. The mine operator did not train workers on the dangers of oxygen-acetylene torches, grinding, and smoking where fire or explosion hazards exist around open mine shafts. Also, the mine operator did not instruct the contractor, who was hired to seal the shaft, on the provisions of the ventilation plan, nor did it adequately oversee the work practices of the contractor.

Corrective Action: FMC was removed from the mine site and replaced with Miller Contracting Services, Inc. (Miller) (MSHA I.D. S956). Miller employees received training on the dangers of smoking, welding, and cutting where fire or explosion hazards exist around open mine shafts. The mine operator submitted another shaft sealing plan, and MSHA approved it on August 16, 2019. Mine management issued Miller a copy of the new sealing plan, trained all workers on the provisions in the plan, the hazards of methane, and how to properly test for methane. The new shaft sealing plan contained detailed seal and construction sequence details and detailed steps to maintain adequate ventilation to dilute and remove explosive gases. In addition, it contained the following safety provisions:

- 1) In event ventilation is damaged or removed for any reason, all work will cease until ventilation is restored
- 2) Any person working within 10 feet of the shaft will wear fall protection at all times
- 3) If at any time lightning is detected within 30 miles of the site, work will stop. Work will commence 30 minutes after last lightning is detected within 30 miles of site
- 4) All miners working near a shaft or in a slope will be equipped with an approved MGD calibrated per manufacturers recommendations
- 5) The shaft will be continuously monitored at depths of 350 feet, 250 feet, and 125 feet with tygon tubing and a multi-gas monitor (MX6 IBRID) for CH₄, O₂, and CO, and recorded at 30 minute intervals

- 6) In the event of CH₄ is measured at or above 1% at the surface of the shaft, or CH₄ at or above 2% is measured inside the shaft, operations will immediately stop. Ventilation will be adjusted and CH₄ levels will be below 1% on the surface, or 2% inside the shaft prior to resuming work
- 7) No cutting, welding, soldering, or grinding will be done where CH₄ is at or above 1%
- 8) Metal frame/form fabrication will be conducted no closer than 300 feet of the shaft and set in place by a crane
- 9) All work will be performed under the direction of a foreman certified in the State of Kentucky
- 10) All workers must be miners certified in the State of Kentucky
- 11) The mine operator must notify MSHA at least five days prior to implementing the seal plan
- 12) All persons working on the sealing project will be trained on the plan by a certified trainer
- 13) Adequate lighting is required for work at night

The mine operator ensured the new plan was being followed while work was being performed, which included making proper methane measurements and continuous methane monitoring.

2. Root Cause: The contractor: (1) did not properly measure methane concentrations, (2) used oxygen-acetylene torches in the presence of excessive methane concentrations, (3) smoked in the presence of excessive methane concentrations, and (4) did not stop using oxygen-acetylene torches, grinding, and smoking when a gas detector alarmed because of excessive methane concentrations.

Corrective Action: Methane was continuously monitored in the shaft during the construction of the intake shaft seal by Miller. Sampling tubing that was lowered into the shaft was used to sample the atmosphere in the shaft. No welding or cutting was performed during the intake shaft sealing operation and there was no smoking near the shaft.

CONCLUSION

On Wednesday, July 31, 2019, at 4:31 p.m., Richard Knapp, a 62-year-old contract welder/iron worker, died when multiple methane gas explosions occurred in the intake air shaft. When the explosions occurred, Knapp was working on metal sheeting above the shaft, in preparation for a concrete pour, to seal the shaft. This placed Knapp in the direct line of the explosion forces.

The accident occurred because the mine operator did not: (A) instruct the contractor, hired to seal the shaft, in the provisions of the ventilation plan and ensure the plan was followed, (B) properly measure methane concentrations, and (C) prevent smoking, oxygen-acetylene torches from being used, and grinding from being performed after measuring excessive methane concentrations. Furthermore, the contractor: (1) did not properly measure methane concentrations, (2) used oxygen-acetylene torches in the presence of excessive methane concentrations, (3) smoked in the presence of excessive methane concentrations, and (4) did not stop using oxygen-acetylene torches, grinding, and smoking when a gas detector alarmed because of excessive methane concentrations.

Also, the mine operator and contractor should have properly eliminated or safely mitigated the risks involved with the method used to seal the shaft. The installation of metal sheeting over the open shaft involved trimming the metal sheeting, with tools that create ignition sources, over an atmosphere that had the potential to contain explosive gas.

Approved By:

Robert A. Simms
District Manager

Date

ENFORCEMENT ACTIONS

1. 103(k) Order, 9149031, was issued to protect the miners and preserve the accident scene. The order prohibits all activities around the shaft and openings until MSHA determines the area is safe to resume normal operations.
2. 104(d)(1) Citation, 9142906, 30 CFR §75.370(e), issued to KenAmerican Resources, Inc.

On July 31, 2019, a fatal accident occurred at the intake shaft of the Paradise #9 mine. A contract worker died when multiple methane explosions occurred causing the worker to fall into the shaft. The mine operator did not provide a copy of, or instruction in, the "Drift Opening and Shaft Sealing Plan" addendum to the Ventilation Plan to Fricke Management and Contracting, Inc. (FMC) and its employees, before implementing the approved plan, and allowing FMC to perform work to seal the shaft. This violation is an unwarrantable failure of a mandatory standard.

3. 104(d)(1) Order, 9142907, 30 CFR §75.370(a)(1), issued to KenAmerican Resources, Inc.

On July 31, 2019, a fatal accident occurred at the intake shaft of the Paradise #9 mine. A contract worker died when multiple methane explosions occurred causing the worker to fall into the shaft. The mine operator did not follow the "Drift Opening and Shaft Sealing Plan" addendum to the Ventilation Plan. During the construction of the intake shaft seal, the mine operator did not conduct adequate pre-shift examinations or properly continuously monitor for methane as required in the addendum. This violation is an unwarrantable failure of a mandatory standard.

4. 104(d)(1) Order, 9142908, 30 CFR §75.360(g), issued to KenAmerican Resources, Inc.
On July 31, 2019, a fatal accident occurred at the intake shaft of the Paradise #9 mine. A contract worker died when multiple methane explosions occurred causing the worker to fall into the shaft. No record book was provided at the Paradise #9 mine for the mine examiner to record the explosive concentration of methane measured the morning before the explosions. The pre-shift examination is required in the "Drift Opening and Shaft Sealing Plan" addendum to the Ventilation Plan. This violation is an unwarrantable failure of a mandatory standard.

5. 104(d)(1) Order, 9142910, 30 CFR §77.1112(b), issued to KenAmerican Resources, Inc.

On July 31, 2019, a fatal accident occurred at the intake shaft of the Paradise #9 mine. A contract worker died when multiple methane explosions occurred causing the worker to fall into the shaft. No examination for methane was conducted immediately before, and periodically during, welding, cutting or grinding at the intake shaft during seal construction. This violation is an unwarrantable failure to comply with a mandatory standard.

6. 104(d)(1) Citation, 9142911, 30 CFR §77.1112(b), issued to Fricke Management and Contracting, Inc.

On July 31, 2019, a fatal accident occurred at the intake shaft of the Paradise #9 mine. A contract worker died when multiple methane explosions occurred causing the worker to fall into the shaft. No examination for methane was conducted immediately before, and periodically during, welding, cutting or grinding at the intake shaft during seal construction. This violation is an unwarrantable failure to comply with a mandatory standard.

7. 104(d)(1) Order, 9142912, 30 CFR §77.1711, issued to KenAmerican Resources, Inc.

On July 31, 2019, a fatal accident occurred at the intake shaft of the Paradise #9 mine. A contract worker died when multiple methane explosions occurred causing the worker to fall into the shaft. Smoking occurred in an area where explosive gas existed. Numerous cigarette butts and a cigarette lighter were found near the shaft and the contract foreman stated that two of his workers routinely smoked while working on and around the shaft. The mine operator did not train the contract workers in the hazards of smoking over or near the shaft [30 CFR § 48.31(a)] in the presence of methane, and did not adequately oversee their work. This violation is an unwarrantable failure to comply with a mandatory standard.

8. 104(d)(1) Order, 9142913, 30 CFR §77.1711, issued to Fricke Management and Contracting, Inc.

On July 31, 2019, a fatal accident occurred at the intake shaft of the Paradise #9 mine. A contract worker died when multiple methane explosions occurred causing the worker to fall into the shaft. Smoking occurred in an area where explosive gas existed. The area was not properly checked for methane and smoking occurred in the area even though a methane detector had alarmed. Numerous cigarette butts and a cigarette lighter were found near the shaft. The foreman for Fricke Management and Contracting, Inc. stated that two of his workers routinely smoked while working on and around the shaft and he allowed them to smoke in that area. This violation is an unwarrantable failure to comply with a mandatory standard.

APPENDIX A
Persons Participating in the Investigation
(Persons interviewed are indicated by a * next to their name)

Mine Company Officials

*Anthony Yates..... Murray Energy Vice-President/General Mine Manager
William Snider..... Murray Energy Corporate Safety Manager
Ron VanHorn Murray Energy Corporate Safety Manager
*Michael Sherman Murray Energy Plant Supervisor
*Jeff Rideout Superintendent
*Brandon Wix Electrician
*Willie Collins Chief Electrician
*Terry Schmitt..... Murray Energy Project Supervisory Employee
*Mike Harris..... Murray Energy Emergency Technician
*Michael Marvel Murray Energy Recovery/Training Employee

Fricke Management and Contracting, Inc. (FMC)

*Josh Sarensen..... FMC Iron Worker/Laborer
*Michael Tyson..... FMC Iron Worker/Laborer
*Alex Cocke..... FMC Supervisor
*Dewayne Dagner FMC General Manager of Field Services

Kentucky Division of Mine Safety

Tim Fugate KDMS Chief Accident Investigator
Kenny Mitchell District Supervisor
Lee Vincent..... Mine Safety Specialist
Eric Nichols Mine Safety Specialist
William Millay Mine Safety Specialist/Roof Control

Mine Safety and Health Administration

Adam Carlisle Electrical Specialist/Lead Accident Investigator
Matt Stone Roof control Specialist
Ray Cartwright Surface Specialist
Jon Newbury Mine Safety and Health Inspector
Charles Jones Family Liaison
John Dagner MSHA Training Specialist
Ronald Gast Electrical Technician, Technical Support
Terry Garrison Electrical Engineer, Technical Support
Kevin Hedrick Electrical Safety Division Team Leader, Technical Support

APPENDIX B
Altair Multi-Gas Detectors Locations



Altair Multi-Gas Detectors Location before the Accident

