

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

OFFICE OF THE ASSISTANT DIRECTOR—
COAL MINE HEALTH AND SAFETY

OFFICIAL REPORT OF MAJOR MINE EXPLOSION DISASTER

ITMANN NO. 3 MINE (ID. 46-01576
ITMANN COAL COMPANY
ITMANN, WYOMING COUNTY, WEST VIRGINIA

December 16, 1972

By

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INTRODUCTION

This report is based on an investigation made pursuant to Section 103 of the Federal Coal Mine Health and Safety Act of 1969 (83 Stat. 742).

A mine explosion occurred about 3:45 p.m., Saturday, December 16, 1972, along the combined haulage track and belt entry in the Cabin Creek 4 panel section. At the time of the explosion, all section crews were on duty and shift changeout operations were occurring; the day-shift crews were either enroute to the surface, on the surface, or performing miscellaneous work tasks throughout the mine. A total of 121 men worked in the mine on the 8 a.m. to 4 p.m. shift. The Cabin Creek 4 panel crew was in a portal bus enroute to the surface when the explosion occurred; five of the 8-man crew were killed and the other three men were burned severely and required hospitalization. None of the other shift employees were affected by the occurrence.

The explosion originated about 1,000 feet outby the section working faces and was confined to the Cabin Creek 4 panel section. An explosive methane-air mixture accumulated in No. 1 entry used for conveyor belt and track haulage and was ignited by the portal bus transporting the section crew to the surface.

The names of the victims, their Social Security numbers, ages, occupations, experience, and number of their dependents are listed in Appendix A of this report.

GENERAL INFORMATION

The Itmann No. 3 mine is located at Itmann, West Virginia. The Itmann Coal Company, operated under a management agreement with the Pocahontas Fuel Company, is jointly owned by the National Steel Corporation (33-1/3 percent), Consolidation Coal Company (32-2/3 percent), Bethlehem Steel Corporation (25 percent) and the Dominion Foundries and Steel Ltd. of Canada (9 percent). The Pocahontas Fuel Company is a division of the Consolidation Coal Company, a wholly owned subsidiary of the Continental Oil Company. The names, titles, and addresses of the operating officials of the Pocahontas Fuel Company are:

President	Joseph M. Richards	Pocahontas, Virginia
Vice President	William D. Starling	Itmann, West Virginia
Manager of Mines	C. W. McDonald	Itmann, West Virginia
Superintendent and Principal Officer		
Health and Safety	J. H. Johnson	Itmann, West Virginia
Chief Safety Inspector	Jerry Shaffer	Pocahontas, Virginia
Mine Foreman	Hampton Clark	Itmann, West Virginia

At the time of the accident, a total of 292 men was employed, 290 worked underground, 3 shifts a day, 5 and 6 days a week, and produced an average of 3,500 tons of coal a day. Production during the year of 1972 was 670,011 tons of coal. The mine is opened by 3 drifts and 2 concrete-lined double compartment shafts, 503 and 365 feet in depth, into the Pocahontas No. 3 coalbed, which ranges from 40 to 48 inches in thickness locally. The floor is shale ranging from soft to firm. The immediate roof is about 14 feet of firm shale overlain with sandstone ranging from 40 to 70 feet in thickness. The Itmann No. 4 mine is extracting coal from the Pocahontas No. 4 coalbed, which overlies active working areas of the Itmann No. 3 mine.

The analysis of a coal sample taken from the Pocahontas No. 3 coalbed at Itmann, as reported in Technical Paper No. 626, "Analysis of West Virginia Coals", published by the United States Bureau of Mines is as follows:

	<u>Percent</u>
Moisture	2.0
Volatile matter	18.8
Fixed carbon	73.8
Ash	5.4

Numerous tests by the Bureau of Mines have shown that coal dust having a volatile ratio of 0.12 and higher is explosive. The volatile ratio of the coal in this area indicates that the dust from this coal is explosive.

Federal safety inspections of the mine have been scheduled on a 5-day week basis since September 5, 1972, and a health inspection had been started of the entire mine prior to the explosion.

The mine experienced a coal-dust explosion on January 4, 1972, in which three men were injured. On June 19, 1972, methane was ignited at a working face when the cutting head of a continuous miner contacted sandstone roof. None of the face employees were injured by the ignition. During the year 1972 to the day of the explosion, the Bureau issued 4 Orders of Withdrawal and 89 Notices of Violation at the mine, and none of these entered into or contributed to the explosion.

MINING METHODS, CONDITIONS, AND EQUIPMENT

Mining Methods: The method of mining employed in the Cabin Creek mains (explosion area) consisted of longwall-type mining and the advancing of three entry sections to prepare longwall faces.

The longwall system of mining employed at the mine consisted of:

Panels in sets of three entries were advanced at 20-foot widths to depths in excess of 5,000 feet to provide longwall faces of 470 feet in width. These panels were advanced at centers of 55 feet between Nos. 1 and 2 entries and 100 feet between Nos. 2 and 3 entries, and staggered crosscuts were driven on 100-foot centers. These projections were utilized as roof-control measures for the longwall system, and continuous miners employing shuttle-car and belt-conveyor haulage systems, were used for advancing the longwall panels. The three panel entries were used as follows: No. 1 entry contained a supply and mantrip track-haulage system and a 36-inch belt conveyor for coal-haulage purposes; No. 2 entry was the intake air escapeway; and No. 3 entry was maintained as a return air escape-way. A shearer longwall machine was used for coal production from the longwall face.

Connector entries, in sets of two, were provided about 1,000 feet inby the mouth of the panels and at the inby ends of the panels. The connector entries were used for the setting up and moving of the longwall equipment, and the entries were used also for various ventilation purposes.

A roof-support plan for the mine has been approved with roof bolting as the primary method of roof support, except on the longwall unit in the Cabin Creek 3 panel section where hydraulic chocks are used.

Ventilation and Mine Gases: Ventilation was induced by four surface-installed axial-flow fans, exhausting continuously. The following air measurements and methane determinations were made at the fans following the explosion:

<u>Location</u>	<u>Volume of Air CFM</u>	<u>Methane Percent</u>	<u>Cubic Feet of Methane in 24 Hours</u>
Main Portal			
Fan	259,000	0.31	1,156,000
Cabin Creek			
Fan	78,000	0.10	112,000
No. 3 Mine			
Sugar Run Shaft			
(Two Fans in Parallel)	200,000	0.19	<u>547,000</u>
			1,815,000

Two drifts and the Sugar Run shaft were used for intake air openings. Overcasts and permanent stoppings were constructed of incombustible material. Metal stoppings had been used in some instances for the isolation of belt haulage and intake escapeway entries; however, the company had decided to discontinue using this type of stoppings and was in the process of replacing them with concrete-block stoppings. Temporary stoppings and line brattice of flame-resistant material were used to control the airflow in the face areas. Auxiliary ventilating equipment was not used underground.

Preshift examinations were made by certified examiners before the first operating shift following an idle period. The mine was operated on a basis of three coal-producing shifts a day and fire bosses examined the mine prior to the 8 a.m. shift, and preshift examinations for succeeding shifts were made by certified officials during their regular tour of duty. Results of the preshift examinations were telephoned to the surface by section foremen and examiners prior to leaving the respective sections and the reports were received by the appropriate oncoming foreman. On-shift examinations for methane and other hazards were made by certified on-shift examiners and these results were recorded.

Each continuous-mining unit and the longwall unit was ventilated with a separate split of air, and the longwall advance entries consisted of two intake airways and a single return. The approved ventilation plan required a minimum of 9,000 cubic feet of air a minute passing through the last open entry crosscuts and a minimum of 3,000 cubic feet of air a minute being delivered to within 10 feet of the working faces where mining operations were in progress. Line brattice was used to provide face ventilation and plastic and/or fire-resistant brattice cloth materials were used for check, fly, and baffle ventilation controls. The longwall unit was ventilated with a continuous current of air passing from the Cabin Creek 3 panel

entries across the longwall face to the Cabin Creek 2 panel. Special bleeder entries were developed and maintained to continuously move air-methane mixtures from the gobs and away from the working faces to the mine return air courses.

The initial and three supplemental ventilation plans were submitted and approved by the Bureau of Mines. Panel entries off Cabin Creek mains for longwall operations were developed in sets of three without unusual difficulties, except in the inby portion of the Cabin Creek 4 panel. These entries were projected in sets of three for roof-control purposes and for faster development of panels for the longwall operations.

Development of Cabin Creek 4 panel was begun during the summer of 1971; therefore, the provisions of Title 30 of the Code of Federal Regulations (C. F. R.) necessitated that the entries used as intake and return air courses be separated from belt-haulage entries and that the intake escapeway be separated from the belt and track-haulage entries. Pursuant to Section 75.326, "In any coal mine opened after March 30, 1970, the entries used as intake and return air courses shall be separated from belt haulage entries, and each operator of such mine shall limit the velocity of the air coursed through belt haulage entries to the amount necessary to provide an adequate supply of oxygen in such entries, and to insure that the air therein shall contain less than 1.0 volume per centum of methane, and such air shall not be used to ventilate active working places. Whenever an authorized representative of the Secretary finds, in the case of any coal mine opened on or prior to March 30, 1970, which has been developed with more than two entries, are such as to permit adequately the coursing of intake or return air through such entries, (a) the belt haulage entries shall not be used to ventilate, unless such entries are necessary to ventilate, active working places, and (b) when the belt haulage entries are not necessary to ventilate the active working places, the operator of such mine shall limit the velocity of the air coursed through the belt haulage entries to the amount necessary to provide an adequate supply of oxygen in such entries, and to insure that the air therein shall contain less than 1.0 volume per centum of methane."

Pursuant to Section 75.1707, "In the case of all coal mines opened on or after March 30, 1970, and in the case of all new working sections opened on or after such date in mines opened prior to such date, the escapeway required by this section to be ventilated with intake air shall be separated from the belt and trolley haulage entries of the mine for the entire length of such entries to the beginning of each working section, except that the Secretary or his authorized representative may permit such separation to be extended for a greater or lesser distance so long as such extension does not pose a hazard to the miners."

To comply with these requirements, the conveyor belt and track-haulage systems were installed in No. 1 entry; No. 2 entry was used for the isolated intake air escapeway; and No. 3 entry was used as the return airway. Until shortly before the explosion, Cabin Creek 4 panel was ventilated by the use of Nos. 2 and 3 entries as intake and return airways, respectively, and No. 1 entry (belt and track) was ventilated by returning a small split of intake air from the section loading point along the entry to an outby set of entries connecting Cabin Creek 3 and 4 panels (See Figures 3 and 4). Because of the difficulties in keeping the inby areas of No. 1 entry reasonably free of methane and in maintaining adequate ventilation in the entry, the Bureau of Mines, pursuant to Section 75.326 (Title 30, C. F. R.), about a month prior to the explosion, permitted mine management to course intake air along No. 1 entry and into the working places.

The ventilating system for the Cabin Creek 4 panel section on the day of the explosion was to use the Nos. 1 and 2 entries (haulage and intake escapeway) as intakes and the No. 3 entry as a return. These entries were separated with permanent stoppings constructed of concrete blocks, except that metal stoppings were used to separate the intake escapeway from the haulage entry from the entrance of the section to the connector entries between 3 and 4 panels, a distance of about 900 feet. A check curtain closing about 3/4 of the entry was installed in the No. 2 entry outby the section loading point to divert part of the intake air through the No. 1 entry. Three man doors were left open in stoppings inby the No. 2 belt drive to provide additional paths for the air current to flow from the escapeway entry to the haulage entry. Plastic line curtain and canvas-type fly pads were used to direct the air current into the working places. The exhaust system of ventilation was utilized in the working places. More than 3,000 cubic feet of air a minute was coursed to the working faces in Cabin Creek 4 panel, and sworn statements of the section crews taken by the Bureau of Mines during the investigation following the explosion affirmed the working faces were well ventilated. The section face employees also stated that the methane monitor on the continuous miner occasionally deenergized the machine but that the methane responsible for deenergizing the machine was diluted rapidly, generally in 2 or 3 minutes.

The installation of the belt conveyor and track-haulage system in the same entry (No. 1 entry) in addition to maintaining the No. 2 entry as an isolated intake air escapeway required the installation of stoppings between Nos. 1 and 2 entries and between Nos. 2 and 3 entries, as the Cabin Creek 4 panel entries were developed. This method of developing these panel entries permitted only one entry (No. 2 entry) to be used for the coursing of intake air to the working faces and required that shelter holes be provided along the track haulageway at 100-foot intervals in the solid rib in No. 1 entry. Although this set of panel entries was being developed with the fewest number of entries possible, no particular ventilation or other

problems were encountered in the developing of the first 3,000 lineal feet of the entries. However, in October 1972, company officials and employees and State and Federal inspectors became aware that methane liberations from the solid rib and shelter holes along No. 1 entry of Cabin Creek 4 panel and from freshly mined coal discharged from the shuttle cars into the belt feeder had increased substantially and required additional precautions and ventilation changes. These same officials and inspectors began detecting 0.5 to 1.0 percent methane in the shelter holes in No. 1 entry and 0.5 to 0.8 and 0.9 percent methane in the area adjacent to the conveyor belt feeder, and about 6 weeks prior to the explosion, about 1.5 percent methane was found by a State inspector in the atmosphere adjacent to the belt feeder in No. 1 entry. The company officials immediately acted in diluting the methane at this location by increasing the volume of intake air coursed over the feeder. About 2 weeks later, more than 1 percent methane was found at the same location, and company officials immediately arranged to have the area cleared of methane by increasing the volume of intake air coursed over the feeder.

On November 16 and 17, 1972, a Bureau of Mines ventilation engineer checked ventilation of the No. 1 entry, Cabin Creek 4 panel. The Bureau engineer observed that No. 1 entry was being ventilated with a split of intake air and this intake air was used to help ventilate the working faces. The Bureau engineer also found air leaking through the metal stoppings installed in the crosscuts between Nos. 1 and 2 entries from the entrance of the Cabin Creek 4 panel section to a location four crosscuts inby the connector entries. The Bureau engineer concluded that the elimination of the metal stoppings between Nos. 1 and 2 entries and the replacing of these stoppings with concrete-block stoppings would be necessary to increase the ventilation pressure differential from the connector entries to the belt feeder. He suggested several additional minor ventilation changes, and company officials agreed to replace the metal stoppings inby the connector entries with block stoppings, make the minor ventilation changes on the following weekend, and then determine the effectiveness of returning a split of intake air in No. 1 entry from the belt tailpiece through the connector entries to the Cabin Creek 3 panel return. The metal stoppings were replaced with concrete-block stoppings, and company officials on November 19, 1972, after making the necessary ventilation changes, attempted to course adequate volumes of intake air from No. 2 entry near the belt tailpiece outby in No. 1 entry to the connector entries between Nos. 3 and 4 panels. An adequate volume of air would not flow in No. 1 entry, and company officials thereafter requested that the mine ventilation plan be revised to permit coursing of intake air along the conveyor belt entry (No. 1 entry) and into the working faces.

To permit better ventilation and dilute methane liberated in No. 1 entry, Cabin Creek 4 panel, the requested change in the mine ventilation plan was approved by the Bureau of Mines.

Dust: The mine surfaces varied from dry to wet, and the Cabin Creek 4 panel surfaces were dry to wet. Water was used to allay dust at the belt feeder and discharge point of the No. 2 conveyor belt and at the working faces in Cabin Creek 4 panel. Coal dust produced during other mining operations was not considered excessive.

The 4 panel section was provided with a trickle rock-dusting machine for use in the return airway. Rock dust was applied by hand during the coal-producing shifts followed with generalized rock dusting of the face areas with a rock-dusting machine.

On December 14, 1972, a Federal inspector made a health inspection of the Cabin Creek 4 panel section and observed that coal dust and loose coal had not accumulated in dangerous quantities in the active working areas and all areas examined were rock dusted adequately. During the underground investigation of the explosion, it was evident that coal dust had entered into the explosion only to a minor degree. On December 18, 1972, a total of 61 regular mine dust samples was collected in the three entries of Cabin Creek 4 panel. Forty of the 61 samples contained more than the minimum incombustibles required by the Federal Coal Mine Health and Safety Act of 1969. Nineteen of the samples contained more than 50 percent incombustibles, and the incombustible contents of the other 2 samples were 45 and 49 percent. Nevertheless, the investigators believe that adequate rock dusting of the mine surfaces in Cabin Creek 4 panel section prevented propagation of the explosion by mine dusts and helped confine the explosion to the relatively small area disturbed (See Figure 2). Skim samples of the mine dust on the floor were collected as close to the regular samples as possible, and the incombustible contents of the skim samples were generally less than the incombustible content of regular adjacent samples collected in the disturbed area (See Figure 2).

Transportation: Shuttle cars, longwall conveyors, and belt conveyors were used to transport coal from the face areas to mine carloading stations. Trolley locomotives were used to haul the coal in mine cars to the surface.

Men were transported underground in closed- and/or open-type personnel carriers under the supervision of certified officials. The personnel carrier involved in the occurrence was examined carefully by electrical inspectors during the investigation and the electrical and mechanical components were found to be in satisfactory condition, except that the emergency brake was inoperable. Track-haulage traffic was controlled by a dispatcher and communications were provided with the use of stationary and/or trolley telephones installed on mobile track vehicles.

Electricity: Purchased electric power at 13,200 volts alternating current was reduced to selected ranges from 4,160 to 110 volts alternating current and rectified to 300 volts direct current for use on the surface and underground.

The 300-volt direct-current power used in the trolley wire and feeder circuits was provided by 150- to 500-kw. rectifiers. These circuits were not provided with overcurrent protection and on August 8, 1972, a Notice of Violation of Section 75.1001 (Title 30, C. F. R.) was issued at the mine requiring that suitable overcurrent protection be provided in the direct-current trolley circuits. Satisfactory progress was being made to effect the required protection throughout the mine with the installation of sectionalizing breakers and rectifiers at strategic locations to establish dead blocks. Cutout switches were installed at suitable intervals.

Electric face equipment was of the permissible type. The trailing cables were of the flame-resistant type and were provided with short-circuit protection. Suitable tests for methane were made by qualified persons before electrical equipment was taken into any working place, and regular methane tests were made while the electrical equipment was being operated in the working places.

Illumination and Smoking: Permissible electric cap lamps were used for portable illumination underground. Smoking was prohibited underground, and searches for smokers' articles were conducted.

Mine Rescue: A trained mine rescue team was maintained by the company and served the company's four mines located in the immediate area. The rescue station for the team's oxygen breathing and accessories is located at the Itmann No. 1 mine, about a mile from the Itmann No. 3 mine. Several different operating companies in the surrounding area maintained trained and fully equipped teams, and these teams were available.

Self-rescuers (W-65) were provided for all underground employees and each employee had been trained in the use and maintenance of the self-rescuer.

STORY OF EXPLOSION AND RECOVERY OPERATIONS

Participating Organizations: Employees and officials of the Itmann Coal Company and representatives of the Consolidation Coal Company, United Mine Workers of America, West Virginia Department of Mines, and the Bureau of Mines participated in the recovery operations and investigation of the explosion. Four mine rescue teams from the following companies were either utilized underground or on a standby basis: Itmann Coal Company, Allied Chemical Corporation, United States Steel Corporation, and Olga Coal Company.

Activities of Bureau of Mines Personnel: The Bureau of Mines was notified of the explosion at 4:55 p.m., Saturday, December 16, 1972, when Lawrence Snyder, company safety inspector, telephoned Sylvester Gaspersich, Princeton Subdistrict Manager. Gaspersich immediately notified the District 4 officials at Mount Hope, West Virginia, and Cloyd Blankenship, Mining Engineer, and Jules Gautier,

Federal Coal-Mine Inspector, were dispatched to the mine to confirm the reported explosion and secure available details. The occurrence was confirmed to the District 4 headquarters promptly and all available information was thereafter relayed to Bureau of Mines officials in Washington, D.C. An Imminent Danger Order, Form 104(a), was issued on December 16, 1972, requiring that all persons be withdrawn and prohibited from entering the mine, except those persons engaged in recovery operations. Before the Order was issued, management had withdrawn all men not connected with the recovery operations from the mine.

Blankenship and Gautier assisted in examining the mine fans, testing the return air from the mine, establishing a check-in and check-out system, and concurring with the initial recovery operations being performed in the Cabin Creek 4 panel section. Joseph Singleton and Morris Bragg, Coal-Mine Inspection Supervisors, and Gaspersich arrived at the mine about 7 p.m., and W. R. Park, District Manager, and John E. Weekly, Subdistrict Manager, arrived shortly thereafter. Bureau officials, upon arrival at the mine, were advised in detail of the occurrence, the recovery work, and other details of work in progress. Ranking representatives of the company, the United Mine Workers of America, West Virginia Department of Mines, and the Bureau of Mines conferred throughout the evening on recovery procedures and policies, were in constant telephone communications with the recovery crew, and maintained a log on all underground activities. Shortly after arrival at the mine, Inspection Supervisor Singleton and Inspector Gautier traveled underground and joined the recovery crews, thereafter assisting with and directing the recovery of the explosion victims and the establishment of temporary ventilation of the entire section. The Bureau's investigation of the occurrence was started at 1 p.m. on December 17, 1972.

Mining Conditions Immediately Prior to the Explosion: The weather was cold and partly cloudy with light snowfall on December 16, 1972. Records of barometric pressure recorded at the United States Weather Bureau at the Raleigh County Airport, Beckley, West Virginia, from 12 noon, December 15, to 6 p.m., December 16, 1972, are as follows:

12 noon	December 15, 1972	27.13
6 p.m.	December 15, 1972	27.18
1 a.m.	December 16, 1972	27.28
6 a.m.	December 16, 1972	27.34
12 noon	December 16, 1972	27.39
6 p.m.	December 16, 1972	27.49

It is the opinion of the Bureau investigators that the slight variation in atmospheric pressure had no bearing on the explosion.

Evidence of Activities and Story of Explosion: Management decided to produce coal on Saturday, December 16, 1972, and the day-shift crew (8 a.m. to 4 p.m.) consisting of 121 men, entered the mine about 8 a.m., and they were transported to their respective sections without incident.

Normal production operations continued in Cabin Creek 4 panel section throughout the shift, except that Dallas Mullens, section electrician, and Raymond Osborne, Jr., mine electrician, performed repair work on a shuttle car in the section until about 2:45 p.m. Thereafter, Osborne left the section in a track-mounted personnel carrier. About 3:30 p.m., Larry Akers, section foreman, called his preshift examination report to the surface and the report was given verbally to John Sizemore, the oncoming section foreman, and about 3:35 p.m., Mullens likewise telephoned the surface with a repair parts list for the oncoming section electrician.

The portal bus used for transportation of the Cabin Creek 4 panel section crew was parked at the end of the haulage track, and the crew left the face working area about 3:40 p.m. The crew positioned themselves in the portal bus as follows: Larry B. Akers, section foreman, and Jerry R. Billings, shuttle-car operator and survivor, were in the open operator's compartment; Dallas Mullens, electrician and survivor, Larry E. Bailey, continuous-miner operator and survivor, Lacy N. Akers, general laborer, and Bill Hatfield, shuttle-car operator, were in the closed compartment on the inby end of the vehicle; and Teddy D. McMillion, roof-bolt operator, and David R. Meador, Jr., general laborer, were in the closed compartment on the outby end of the vehicle. Billings stated that he usually operated the portal bus, but that Larry Akers on this occasion operated the vehicle.

According to his sworn statements given during the Bureau's investigation, after the portal bus had traveled about 1,000 feet outby the section face working areas, Billings heard the trolley pole become disengaged from the trolley wire and that he noticed the usual arc that occurs when the electrical contact between the trolley-pole harp and the trolley wire is broken. Billings turned to get out of the vehicle when the explosion occurred; he believes that he was partly knocked out of the vehicle and dazed by the explosion forces. However, he believes that he regained consciousness quickly and began to crawl toward the face area of the section. Billings' face and hands were burned, and he temporarily lost his vision because of the explosion heat and flames and the dense smoke and dust. Billings stated that after he had traveled about 200 feet inby the stopped portal bus, he realized that he was traveling in the wrong direction. He then stopped his travel and attempted to open his self-rescuer. He stated that after breaking the seal he could not pull the opening lever and that after several unsuccessful attempts, he attempted with his opened penknife to free the securing band from the case without success and broke the blade of the knife. Thereafter he struck the self-rescuer case against the track rail, but was unable to open the case. Billings placed the self-rescuer in his coveralls and traveled back towards the portal bus. Near the vehicle, Billings encountered McMillion, who was asking for help. Billings was unable to help McMillion because of his own injuries and he continued to crawl along the track outby the vehicle until he became unconscious.

The self-rescuer that Billings attempted to open was sent to the testing laboratories of the Bureau of Mines in Pittsburgh, Pennsylvania. Laboratory technicians examined the self-rescuer and determined that it opened easily and was in good working order. From the information obtained from Billing's testimony, the Bureau investigators concluded that the extensive burns to his (Billings) hands prevented him from opening the self-rescuer.

Mullens (survivor) in sworn statements mentioned that he got into the inby compartment of the portal bus and was the first man in the compartment. After the portal bus traveled a short distance, Mullens heard a whishing sound and felt a heat wave engulf him. Mullens' first thoughts were that the trolley wire had contacted the top of the portal bus and was burning through the metal top of the compartment. He yelled for the other men to get out of the vehicle and began to climb over the other men and out the compartment opening. Thereafter, Mullens remembers being conscious only a few seconds near the vehicle.

According to sworn statements, Bailey was in the inby compartment of the portal bus with Mullens when the explosion occurred; he was quickly aware of the heat wave and jumped from the vehicle. Because of the smoke and dust and his burned face, Bailey likewise was unable to see. He managed to open and use his self-rescuer and traveled inby the portal bus checking for a route to the No. 2 entry (intake escapeway). Bailey thereafter reversed his direction, passed the portal bus, and likewise encountered McMillion but was unable to help him. Bailey crossed the belt conveyor and traveled into the No. 2 entry and crawled outby until he became unconscious.

The Cabin Creek 5 panel section crew was loading into their portal bus, located about 500 feet from the entrance to the Cabin Creek 4 panel section, when the explosion occurred. Ray H. Bailey, section electrician, in his sworn statement disclosed that he observed momentarily a slight reversal of the air current and a slight air wave, similar to an air force caused by a roof fall. The section crew was not alarmed by this occurrence and they traveled to the surface without investigating. All other section production crews were unaware of the explosion and they traveled to the surface without incident. The second shift section crews wait on the surface until the day shift crews arrive; thereafter, the second shift crews use the portal bus for their transportation. When the Cabin Creek 4 panel man-trip failed to arrive on the surface as scheduled and trolley phone communications could not be established with the portal bus, management became concerned that the crew (portal bus) might have wrecked along the haulage track or was blocked behind a roof fall along the Cabin Creek 4 panel track system.

According to sworn statements made at the Bureau's investigation, John H. Johnson, superintendent, Hampton Clark, mine foreman, David Trump, assistant mine foreman, and James D. Phillips, evening

shift foreman, traveled underground on a track-mounted personnel carrier to investigate the area, while other mantrip units were enroute to their respective areas of the mine. Upon reaching the entrance to the Cabin Creek 4 panel section, Johnson went through a door into the return airway and observed heavy smoke. He (Johnson) then instructed a foreman to arrange to have all men removed from the mine and to deenergize the electric power circuits to the affected area. Johnson also instructed management personnel to begin examining the Cabin Creek 4 panel section. The examiners found a blown-out stopping between Nos. 2 and 3 entries about 2,800 feet inby the entrance to the section (See Figure 1). Johnson then arranged to have the trolley wire, the track rails, and the telephone lines cut outby the dislodged stopping.

Continued examination of the Cabin Creek 4 panel section revealed that methane had been ignited by the portal bus about 1,000 feet outby the working faces. Five of the section employees died as a result of the explosion, and three other crew employees survived, although burned seriously. Fourteen stoppings between Nos. 1 and 2 entries and 16 stoppings between Nos. 2 and 3 entries were partially or totally destroyed. Some timbers were blown out, several small roof falls occurred, and a few conveyor belt supports and rollers were dislodged.

Recovery Operations: The main fans were neither damaged nor affected by the explosion, and the main ventilating currents, except in Cabin Creek 4 panel section, were not affected.

After local mine management confirmed that an explosion had occurred and during the period between 4:30 p.m. and 5 p.m., December 16, 1972, telephone calls advising of the explosion were made to higher management, State and Federal inspection agencies, and the company's safety department, including the mine rescue team.

Johnson, along with the other management officials at the explosion scene, decided that exploration of the affected Cabin Creek 4 panel section should be made as quickly as possible and that temporary ventilating of the entries should be started immediately. Plastic checks and other ventilation materials were acquired from the surface, and a plastic check stopping was installed across the No. 2 entry outby the last undamaged permanent stopping between Nos. 2 and 3 entries to divert the entire available intake air into No. 1 entry. Plastic checks were then progressively installed in the crosscuts between the Nos. 1 and 2 entries, resulting in the use of the No. 1 entry as an intake airway and the Nos. 2 and 3 entries as return airways. This procedure permitted relatively rapid advancement into the section at 100-foot intervals, as the No. 1 entry was cleared of methane, carbon monoxide, and smoke.

The Itmann mine rescue team arrived on the section about 7:45 p.m., and the rescue team immediately began to explore the No. 1 entry at 200-foot intervals before temporary ventilation was reestablished in the explored areas.

About 8 p.m., Larry E. Bailey, section crew member, was located alive but unconscious and in serious condition in the No. 2 entry. Bailey was transported by stretcher and track-mounted equipment to the surface, where he arrived about 8:42 p.m. Bailey was examined by a physician and thereafter transported by ambulance to the Wyoming General Hospital, Incorporated, at Mullens, West Virginia. By 8:30 p.m., the remainder of the section crew was found near the mantrip car, and these men included two who were seriously injured and five who were dead. The two injured men, Jerry Billings and Dallas Mullens, were transported to the surface, arriving about 9:24 p.m. Billings and Mullens were examined promptly by a physician and then transported to the hospital. The five fatally injured victims were transported to the surface later, arriving about 11:30 p.m.

The mine atmosphere inby the portal bus contained carbon monoxide and explosive mixtures of methane; however, the percentage of carbon monoxide in the atmosphere remained stable.

The mine rescue team of the Allied Chemical Corporation, utilizing self-contained oxygen breathing apparatus, explored the remaining inby 1,000 lineal feet of the Cabin Creek 4 panel section, and they completed the exploratory work about 3 a.m., December 17, 1972. Plastic brattice materials were used to reestablish temporary ventilation in the entire section and clear the areas of carbon monoxide and methane. The temporary ventilation was established about 5 a.m.; thereafter, all persons were removed from the mine.

Bureau of Mines representatives decided to begin the underground investigation of the disaster on December 17, 1972. Representatives of the United Mine Workers of America, the West Virginia Department of Mines, and the company were invited to participate in the investigation.

Company employees began rehabilitating the Cabin Creek 4 panel section on December 19, 1972, by replacing the damaged permanent stoppings in the section; thereafter, the explosion area was rerock dusted and roof supports were reinstalled at necessary locations. Four days after the explosion on December 20, 1972, while damaged and destroyed stoppings were being replaced between Nos. 2 and 3 entries of Cabin Creek 4 panel, a sudden buildup of methane occurred in No. 1 entry adjacent to the portal bus. Methane in the atmosphere at the location reached 8 per centum. All work in the area was stopped for several hours while the methane was being cleared. When permanent ventilation in the Cabin Creek 4 panel entries was reestablished, the Bureau of Mines began conducting a series of ventilation tests directed to ascertaining areas of methane buildups in the No. 1 entry. The location of the atmosphere sampling stations in No. 1 entry and the analytical results of the air samples collected at the sampling stations are shown in Figure 3.

Test No. 1. Under the direction of company officials, the ventilation method and controls used in Cabin Creek 4 panel prior to the explosion were reestablished and Bureau representatives sampled the mine atmosphere in No. 1 entry at the predetermined test locations from 12 noon to 3 p.m. on December 23, 1972. The largest increase in methane in the mine atmosphere in No. 1 entry during the test was from 0.51 to 0.80 and occurred at test station No. 8. However, intermittent fluctuations of the methane content occurred in the moving air at this test station as indicated hereafter by the analysis of samples collected at about 45-minute intervals: (a) 0.64, (b) 0.77, (c) 0.51, (d) 0.69, (e) 0.80. Similar fluctuation occurred at the other test stations and station No. 7 showed essentially similar analyses of air samples as station No. 8. Fluctuations of the methane content at the other stations were within a range of about 0.10 percent. About 6,300 cubic feet of air a minute was being coursed along No. 1 entry during this test.

Test No. 2. Ventilation methods and controls for this test were the same as for Test No. 1, except that the regulation in the connector entries between Cabin Creek 3 and 4 panels was reduced. Bureau representatives sampled the atmosphere in No. 1 entry from 12 noon until 4 p.m., December 26, 1972, at the same sampling stations used in Test No. 1. The largest increase in methane in the atmosphere during the test was from 0.48 to 0.79 percent and occurred at test station No. 7. However, intermittent liberation of methane continued, and samples collected about 40 minutes apart contained the following percentages of methane: (a) 0.61, (b) 0.76, (c) 0.48, (d) 0.79, (e) 0.68, and (f) 0.79. Similar fluctuations on the amount of methane in the air were detected at stations Nos. 5 through 8A, ranging from 0.2 to 0.3 percent. About 4,000 cubic feet of air a minute was traveling in No. 1 entry during this test.

Test No. 3. Tight check curtains were installed across No. 1 entry outby the belt tailpiece and immediately inby the connector entries between 3 and 4 panels. The atmosphere in No. 1 entry was sampled from 10 a.m. until 3 p.m., December 30, 1972, at the same sampling stations used in Tests Nos. 1 and 2. The largest increase in methane in the atmosphere during the test was from 0.77 to 1.17 percent and occurred at test station No. 8A. Methane liberation in the test area fluctuated as in Test Nos. 1 and 2, as indicated by the methane content in the samples collected about 1 hour apart: (a) 0.77, (b) 1.07, (c) 0.94, (d) 1.17, (e) 0.96, and (f) 1.06. Similar methane fluctuations were recorded at test station Nos. 5A, 6, 7, and 8 during the test. Airflow in No. 1 entry during this test was too minimal to measure.

Test No. 4. Ventilating methods and controls for this test were the same as for Test No. 3, except that stoppings and check curtains in the area were repaired and retightened. The atmosphere in No. 1 entry was sampled for 22 consecutive hours on January 3 and 4, 1973. Methane accumulations exceeding 5 percent were detected in the atmosphere 80 feet outby test station No. 5.

During this test, Bureau engineers used chemical smoke to study the airflow patterns immediately outby the location where the portal bus stopped in No. 1 entry on the day of the explosion. The area tested was restricted to 40 feet in length, because the smoke would dissipate beyond this distance of travel. The air flowed towards the working faces at a velocity of 20 feet a minute from the vertical center of the entry to the floor. However, smoke expelled near the roof migrated in the opposite direction towards the mouth of the section and accumulated near test station No. 5.

These tests conducted in Cabin Creek 4 panel showed that methane accumulations increased as the quantity of air flowing in No. 1 entry decreased. When the velocity of the air moving inby along No. 1 entry was decreased to 20 feet a minute near the mine floor, a smoke cloud migrated slowly along the roof towards the entrance of the section and accumulated in the higher areas of the entry outby the portal bus. Similar methane migration occurred during Test No. 4, and more than 5 percent methane was detected in the atmosphere in these higher areas of the entry. The tests also showed that methane liberations were intermittent and the methane contents in the atmosphere fluctuated considerably.

Test No. 5. On January 11, 1973, the Bureau of Mines installed four continuous methane recorders at sampling locations in No. 1 entry of Cabin Creek 4 panel where high concentrations of methane had been detected in the previous tests. The sensor heads of the recorders were placed approximately 8 inches from the mine roof and over the center of the track. The recorders were installed to ascertain, if possible, the location and fluctuation of the methane content in the atmosphere in No. 1 entry during idle and production shifts. Air samples were collected at the sensor head one and two times a day to correlate actual laboratory analytical results with the readings of the recording instruments.

The atmosphere in No. 1 entry was monitored for a period of eight days before coal production was resumed following modification of the Withdrawal Order on January 17, 1973, permitting coal production to resume in the Cabin Creek 4 panel and the Farley 2 panel sections, pursuant to our inspections of the areas. During this period, the air quantities in the No. 1 entry varied from 10,500 to 17,640 cubic feet a minute. Review of the recorder tapes and the analyses of the air samples collected indicated the methane content of the atmosphere at the test stations in No. 1 entry varied from 0.13 to 0.46 per centum with a fluctuation ranging from 0.04 to 0.33 per centum during the time the section was idle. The 0.46 per centum methane was detected when the man door in the stopping across No. 2 entry was open, thereby reducing the air quantity at test station No. 1. With the exclusion of this sample, the methane content at test station No. 1 varied from 0.13 to 0.27 per centum with a fluctuation ranging from 0.04 to 0.12 per centum.

On January 21, 1973, the sensor head at station No. 1 was placed directly over the belt-conveyor tailpiece to determine the increase in methane as coal was being loaded onto the belt conveyor and to see if this increase was being emitted into the atmosphere as coal was being transported on the belt conveyor. The recorder tapes indicated an increase in methane in the atmosphere that varied from 0.01 to 0.4 per centum, and an increase in the methane content of the atmosphere to a maximum of 0.70 per centum while coal was being loaded onto the belt conveyor. In correlating the recorder tapes with idle and production shifts, there were no appreciable changes except at the section loading point. The methane contents in the mine atmosphere during the test period varied as follows: Station No. 1, 0.17 to 0.7; Station No. 2, 0.13 to 0.21; Station No. 3, 0.14 to 0.26; Station No. 4, 0.13 to 0.21 per centum (See Figure 4).

Test No. 6. On January 26, 1973, the Bureau of Mines installed pressure cells within the longwall pillar block at locations where movement of the roof strata had occurred in the belt and track entry (No. 1 entry) of Cabin Creek 4 panel to determine whether pressure buildup occurred within the longwall pillar block that might force a surge of methane into the air current of No. 1 entry. A 3-week testing period revealed that changes in pressure within the longwall pillar block did not register on the pressure-recording charts.

The aforementioned surveys and tests indicate that normal methane liberations from the solid rib and shelter holes along No. 1 entry of Cabin Creek 4 panel will not accumulate to explosive mixture with only minimal quantities of air passing through the No. 1 entry. All records and statements of company employees and inspectors indicate that an airflow ranging from perceptible movement to 15,000 cubic feet a minute was coursed along No. 1 entry; therefore, methane from normal liberations should not have accumulated in an explosive mixture in No. 1 entry of Cabin Creek 4 panel in the area of the stopped portal bus on the day of the explosion.

In addition, two personnel carriers traveled from the inby working areas of Cabin Creek 4 panel about 12 noon and about 2:45 p.m. on the day of the explosion without incident. Therefore, the investigators must assume that regardless of possible fluctuating volumes of air coursed along No. 1 entry Cabin Creek 4 panel for a short time prior to the explosion, the accumulation of methane that was ignited in the No. 1 entry was released suddenly and shortly before the explosion and in all likelihood by excessive pressure developed in the strata adjacent to Cabin Creek 4 panel.

INVESTIGATION OF CAUSE OF EXPLOSION

Investigating Committee: A detailed examination of the area affected by the explosion was conducted by the Bureau of Mines on December 17, 1972. Those persons present during the initial investigation were:

Company Officials

D. G. Werner	Vice President-Operations, Consolidation Coal Company
Joseph M. Richards	President, Itmann Coal Company
C. William Parisi	Safety Director, Consolidation Coal Company
William D. Starling	Vice President, Itmann Coal Company
C. W. McDonald	Manager of Mines, Itmann Coal Company
J. H. Johnson	Superintendent, Itmann Coal Company
Hampton Clark	Mine Foreman, Itmann Coal Company
David Trump	Assistant Foreman, Itmann Coal Company
James Phillips	Shift Foreman, Itmann Coal Company

United Mine Workers of America

Charles Browning	Safety Coordinator, District 29
Carl Parks	Acting Chairman, Mine Health and Safety Committee
William Burleson	Vice President, Local Union No. 9690
Robert Bailey	Member, Mine Health and Safety Committee

West Virginia Department of Mines

John Ashcraft	Director
Paul Riley	Deputy Director
Jay Philpott	Inspector-at-Large
Jess Hatfield	Assistant Inspector-at-Large
Oather Rushbrook	District Inspector
Steve C. Colasi	Electrical Inspector

United States Bureau of Mines

John W. Crawford	Assistant Director, Coal Mine Health and Safety
Joseph O. Cook	Deputy Assistant Director, Coal Mine Health and Safety
W. R. Park	District Manager, Coal Mine Health and Safety
S. E. Gaspersich	Subdistrict Manager
John E. Weekly	Subdistrict Manager
Morris E. Bragg	Coal-Mine Inspection Supervisor
Fred E. Ferguson	Coal-Mine Inspection Supervisor
Jerry L. Spicer	Supervisory Electrical Engineer
Cloyd Blankenship	Mining Engineer
Jimmie Humphrey	Mining Engineer
Franklin M. Walls	Federal Coal-Mine Inspector (Electrical)
James E. Kaylor	Federal Coal-Mine Inspector

Following the initial investigation of the explosion area, the Bureau of Mines continued the investigation to include: A survey of the entire mine ventilation system; the reestablishment of the ventilating controls on Cabin Creek 4 panel section as they had been prior to the explosion; monitoring the methane and methane buildups in the air current in No. 1 entry of Cabin Creek 4 panel section; installation of continuous recording methane monitors and pressure cells in No. 1 entry; collection of regular and skim samples of the mine dust at regular intervals in Cabin Creek 4 panel section; and inspection of all open accessible areas of the mine.

The Bureau of Mines, with the assistance of E. Jeff Moriarity, Trial Attorney from the Solicitor's Office, United States Department of the Interior, as part of the investigation of the mine explosion disaster, took sworn statements from 10 company officials and 23 rank-and-file miners at Twin Falls Lodge, located near Pineville, West Virginia, on December 19-21, 1972. Statements were also obtained from two of the survivors on January 25, and from the third survivor on February 1, 1973. At the Bureau's invitation, representatives of the West Virginia Department of Mines participated in this phase of the investigation. Also present while the statements were given to the Bureau were representatives from the United Mine Workers of America and the Consolidation Coal Company.

Information obtained through these statements and the underground investigation is summarized in this report. Full transcripts of all 36 sworn statements are available for examination at the Bureau's offices in Washington, D. C. and Mount Hope, West Virginia.

Methane as a Factor in the Explosion:

1. Methane has been detected in the mine on numerous occasions.
2. Methane was occasionally detected in the working places of Cabin Creek 4 panel section, and sufficient methane to cause the methane monitor to deenergize the continuous miner was frequently liberated.
3. Methane was liberated from the solid ribs of Nos. 1 and 3 entries of Cabin Creek 4 panel continuously, but such liberations decreased proportionately to the length of time the solid ribs were exposed to the ventilating current.
4. Methane was released in shelter holes cut in the solid rib along No. 1 entry of Cabin Creek 4 panel, and such methane liberation was greater in the newly made shelter holes closest to the advancing working faces. The inby five or six shelter holes closest to the face of No. 1 entry were ventilated by means of baffle curtains.
5. The three-entry development of Cabin Creek 4 panel with high production equipment on a 24-hour day basis resulted in rapid, continuing rib exposure and minimum time for methane bleed-off.

6. Methane in percentages of less than one percent was detected frequently in No. 1 entry Cabin Creek 4 panel in the vicinity of the conveyor-belt tailpiece and feeder.

7. The physical characteristics of the coalbed and adjacent strata in the Cabin Creek 4 panel section were conducive to heavy and sudden methane releases, in that areas of the section were under "heavy" mountain cover; the active mining areas of the panel were located under mined-out areas of an active mine with limited strata between the two coalbeds; adverse roof conditions were encountered in areas of 4 panel section; the panel was located adjacent to an active re-treating longwall face and within an area of expected mountain pressure releases; and the panel was being advanced at a descending grade with a profile conducive to methane migration.

8. A series of tests made to measure methane liberation and methane increases in the atmosphere of No. 1 entry, Cabin Creek 4 panel showed clearly that methane liberation was intermittent and fluctuated. These tests also indicated that methane liberations increased with decreased volumes of air being circulated in No. 1 entry.

Flame: Following the explosion, the areas of Cabin Creek 4 panel near the portal bus contained substantial evidence of the explosion forces, but relatively small amounts of flame evidence. The mine surfaces, especially the ribs, floor, timbers, conveyor belt, and tracks near the portal bus were covered with a fine thin coating of mine dust, slightly brown in color. Easily distinguishable soot deposits were not observed, and heavy coke deposits were not found. One of the explosion victim's headgear that showed evidence of heat and flame was sent to the testing laboratories of the Bureau of Mines in Pittsburgh, Pennsylvania, to determine temperatures that were developed in the areas by the explosion. The results of the tests indicated that the headgear had been subjected to heat of more than 190 degrees, but less than 400 degrees Fahrenheit.

Regular and skim samples of the mine dust in the Cabin Creek 4 panel section were collected after the explosion, and many of these samples contained coke, ranging in size from traces to large particles (See Figure No. 2).

The presence of coke in the mine dust samples is one of the criteria by which the extent of flame was fixed, although it is possible that such coke farthest from the portal bus may have been blown there. The coke particles indicated that flame extended about 650 feet inby and outby the portal bus on No. 1 entry and to lesser distances in the adjacent No. 2 entry of Cabin Creek 4 panel section (See Figure No. 2).

Forces: Evidence in the Cabin Creek 4 panel section indicated that the forces of the explosion radiated from the portal bus on 1 entry

about 1,000 feet outby the working faces, traversed the three entries of 4 panel for about 1,000 feet inby and outby the portal bus and were dissipated within the 4 panel section. Violence occurred within the section as evidenced by blown-out stoppings, dislodging of roof supports (line timbers), and minor damage to the conveyor belt near the portal bus. Employees boarding their mantrip in the Cabin Creek 5 panel section near the entrance to the 4 panel section and about 4,000 feet from the explosion origin felt only a slight reversal of the air current. The explosion forces did not register on the pressure-recording gages provided at the three main fan installations.

Point of Origin: Bureau of Mines investigators believe the explosion originated near the location of the portal bus about 1,000 feet outby the working faces in the No. 1 entry of Cabin Creek 4 panel section.

Factors Preventing Spread of Explosion: All evidence indicates that the explosion was relatively weak; nothing in the explosion area showed that high pressures and/or excessive speeds developed during the explosion. The factors that probably confined this to being a relatively weak explosion and inhibited propagation are:

1. The explosive methane ignited was relatively small in volume.
2. The ignition of the methane was in relatively open entries rather than in a confining working place; consequently, the forces were able to expand readily without a quick buildup of pressure.
3. The mine floor in Nos. 1 and 2 entries of Cabin Creek 4 panel ranged from dry to wet, and the mine floor in No. 3 entry ranged from damp to wet.
4. The mine floor in Cabin Creek 4 panel section was relatively free of accumulations of loose coal and coal dust, and the areas under and adjacent to the belt conveyor were maintained free of coal spillage and coal dust.
5. Only small amounts of coal at two different locations were on the conveyor belt when the explosion occurred.
6. The Cabin Creek 4 panel section had been well rock dusted prior to the explosion, and the incombustible content of the mixed mine dusts inhibited propagation of the explosion by explosive coal dust.

Summary of Evidence: Conditions observed in the mine during recovery operations and the investigation following the disaster, together with information obtained during ventilation tests conducted by Bureau of Mines engineers, mine records, information available from previous Federal coal-mine inspection reports, and information received from company officials and workmen as a result of sworn statements obtained by an attorney of the Solicitor's Office of the United

States Department of the Interior constitute the available evidence as to the cause and origin of the explosion. To summarize:

1. The report of the preshift examination of the active working areas of the Cabin Creek 4 panel section made shortly before the explosion was relayed over the telephone to the surface and indicated that no unusual conditions were observed during the examination.
2. This was primarily a methane explosion, and coal dust entered into propagation only to a minor degree.
3. All forces emanated from the immediate area adjacent to the stopped portal bus on No. 1 entry Cabin Creek 4 panel section.
4. Five victims died in the area immediately adjacent to the portal bus; two survivors were located near the portal bus; and the remaining crew member and survivor traveled about 325 feet from the portal bus and into the No. 2 entry. The survivor located in No. 2 entry was apparently the only man who used his self-rescuer, although six additional crew members had self-rescuers in their possession and two of these self-rescuers had been opened. The section mechanic left his self-rescuer in his tool bag on the section at the end of the shift.
5. The Cabin Creek 4 panel section conveyor belt had small amounts of coal thereon at two different locations at the time of the explosion.
6. Cabin Creek 4 panel was driven 4,800 feet following a 3-entry projection with the belt conveyor and track haulageway in a common entry (No. 1 entry) adjacent to solid coal. The section crew was enroute to the surface in a portal bus when the explosion occurred.
7. The injured members of the Cabin Creek 4 panel section crew stated that on the day the explosion occurred, the working places were well ventilated, that methane had not been detected at the working faces, and that the methane monitor had not deenergized the continuous miner.
8. Records of examinations of No. 1 entry Cabin Creek 4 panel prior to the explosion show no dangerous conditions or accumulations of methane, and officials and inspectors who examined this entry stated that they had not detected more than 0.3 to 0.6 percent methane at locations in the entry, except in proximity of the belt feeder and in the shelter holes.
9. Officials, employees, and inspectors who traveled and/or examined the No. 1 entry Cabin Creek 4 panel section stated that air flow in the entry varied from a perceptible movement to 15,000 cubic feet a minute.

10. The split of air ventilating the Cabin Creek 4 panel section was practically an unregulated split; 60 square feet of the 80 square feet of No. 3 entry was open at the section regulator.

11. About a month prior to the explosion, the operator's request to change the mine ventilation plan by ventilating the section working faces with air coursed over the belt conveyor in Cabin Creek 4 panel was approved by the Bureau of Mines, to provide adequate ventilation of the entry and to dilute methane liberated from the shelter holes and at the belt feeder.

12. Two exit trips from the Cabin Creek 4 panel section made with a personnel carrier operated by Raymond Osborne, Jr., shortly after 12 noon and about 55 minutes prior to the explosion were without incident.

13. Reconstruction of the Cabin Creek 4 panel ventilation system after the explosion showed air volumes of 6,300 cubic feet a minute in No. 1 entry, 16,400 cubic feet a minute in the last open entry crosscut, and 20,400 cubic feet a minute at the regulator in No. 3 entry.

14. The Cabin Creek 4 panel entries were advanced under "heavy" mountain cover and beneath mined-out areas of the Itmann No. 4 mine.

15. Methane was liberated freely from the solid rib and shelter holes in No. 1 entry Cabin Creek 4 panel, and as much as one percent methane was found frequently in the shelter holes along the inby end of the haulage track. The inby six shelter holes were ventilated with baffle curtains installed from the center of No. 1 entry into the shelter holes.

16. Several areas of the inby portion of No. 1 entry Cabin Creek 4 panel contained evidence of excessive pressures that had fractured the roof and floor, and methane was liberated freely from some of the fractures.

17. On February 6, 1973, excess pressures caused a fracture in the floor of about 25 lineal feet beginning near the last open crosscut in No. 1 entry, Cabin Creek 4 panel section, and methane in excess of 5 percent flowed from the fracture for a period and necessitated stopping section face production for about an hour.

18. Continuous methane recorders indicated 0.2 percent methane in the air current of No. 1 entry of Cabin Creek 4 panel for more than a month, when suddenly about 10:18 a.m., February 8, 1973, increased methane was detected by a Federal inspector 40 feet outby Engineer Station 6783, a location about 225 feet inby the origin of explosion. An air sample collected in the moving air current at this location by the inspector contained 0.47 percent of methane. About 13,600 cubic feet of air a minute was coursed along No. 1 entry at this time. No particular reasons could be found to account for the sudden increase in methane at this location.

APPENDIX A

Victims of mine explosion, Itmann No. 3 mine, Itmann Coal Company:

<u>Name and Social Security Number</u>	<u>Age</u>	<u>Dependents</u>	<u>Occupation</u>	<u>Mining Experience</u>
Larry B. Akers 234-76-8679	24	Wife and 2 children	Section Foreman	6-1/2 years
Bill K. Hatfield 235-38-1039	44	Wife	Shuttle-Car Operator	28 years
Lacy N. Akers 236-66-9289	28	Wife and 3 children	General Laborer	3-1/2 months
Teddy D. McMillion 233-58-3400	35	Wife and 1 child	Roof-Bolt Operator	4 years and 11 months
David R. Meador, Jr. 235-70-5911	26	Wife and 1 child	General Laborer	5 months
Injured employees:				
Larry E. Bailey 234-76-3346	24	Wife	Continuous- Miner Operator	3 years
Jerry Billings 234-84-2578	20	Wife	Shuttle-Car Operator	2 years and 10 months
Dallas Mullens 233-62-6355	31	Wife and 4 children	Electrician	3 years and 2 months

19. Methane in percentages of 0.6, 0.7, 0.8, and 0.9 was detected frequently in the atmosphere near the belt feeder and tailpiece for several months prior to the explosion, and about 1.5 percent methane was detected at this location twice during this period. The discharging of coal from the shuttle cars into the belt feeder increased the methane content in the atmosphere adjacent to the belt feeder.

20. A series of tests were made to measure methane liberations in No. 1 entry of Cabin Creek 4 panel after the explosion. These tests showed that methane liberations in No. 1 entry were intermittent and fluctuated.

Cause of Explosion: This explosion resulted from the ignition of a methane-air mixture in the No. 1 entry about 1,000 feet outby the working faces of Cabin Creek 4 panel section. The methane was ignited by an electric arc from a portal bus being used to transport the section crew to the surface. The electric arc occurred when the trolley-pole harp lost electrical contact with the trolley wire. The source of the methane could not be determined positively, and probable reasons for its accumulation at the specific time and location are conjectural. The investigators are of the opinion that in addition to the usual methane liberation in No. 1 entry, excessive pressure from the adjacent strata released additional methane into the No. 1 entry shortly before the explosion occurred.

VIOLETIONS

The investigation of the explosion indicated that violations of the Federal Coal Mine Health and Safety Act of 1969 apparently were not present in Cabin Creek 4 panel section immediately prior to the explosion.

Investigation of all other working sections and open areas of the mine revealed conditions that required the issuance of 12 Notices of Violation, Form 104(b), including: Section 75.400--four violations of coal-dust accumulations and inadequate rock dusting, Section 75.1704--two violations of escapeways, and Section 75.200--a roof-support violation, 75.326--a ventilation violation, and 75.512, 75.807, 75.810, and 75.1003--four electrical violations. These violations were corrected promptly and before the sections resumed operations.

Federal inspectors in 1972, prior to the explosion, issued at the mine 4 Withdrawal Orders and 89 Notices of Violation. An Order was issued during the investigation of a dust explosion; an Order because of methane accumulations in face regions; and two Orders because of loose coal and coal dust, float coal dust, and inadequate rock dusting. The 89 Notices of Violation included: 49 electrical violations, 6 rock-dust violations, 7 failure to clean equipment violations, 7 roof-control violations, 6 ventilation violations, 6 miscellaneous violations, 2 respirable dust violations, 1 surface violation, and 5 haulage Safeguard Notices. Management took action promptly to correct the violations.

A 104(a) Withdrawal Order was issued by the first Federal inspector who arrived at the mine following the explosion on December 16, 1972.

Imminent Danger - Section 104(a)

An ignition had occurred in the 4 panel Cabin Creek section and management has withdrawn all persons from the mine. This Order was written for investigation purposes.

Action taken

Order No. 1, Form 104(a), was issued December 16, 1972, requiring that all persons, except persons referred to in Section 104(d) of the Act, be withdrawn from and prohibited from entering the mine.

The Order was modified on December 28, 1972, to permit reopening of areas of the mine for production purposes pursuant to inspections of the areas and such areas included: West mains, 3 and 4 panel sections, South mains, 2 and 3 panel section, and the Bee Tree mains for haulage purposes.

The Order was modified on January 2, 1973, to permit coal production in Cabin Creek 3 panel section, pursuant to an inspection of the area. The Order was modified on January 12, 1973, to permit production in Cabin Creek 5 panel section, pursuant to an inspection of the area. The Order was modified on January 17, 1973, to permit coal production to resume in Cabin Creek 4 panel and Farley 2 panel, pursuant to our inspection of the sections. The Order was again modified on February 8, 1973, to prohibit mining in the Cabin Creek 4 panel section because of excessive methane detected in the No. 1 entry.

The Order was modified on February 9, 1973, to permit resumption of coal production in the Cabin Creek 4 panel section pursuant to an inspection of the area.

REQUIREMENTS

The investigation of the explosion shows clearly that pursuant to Section 75.316 of Title 30, C. F. R., the operator of the Itmann No. 3 mine shall include the following requirements in the ventilation plan for the mine:

1. Entries developed for longwall mining or other mining shall be driven in sets of at least four entries.
2. Track haulage shall not be installed in outside entries adjacent to blocks of solid coal. The ventilation system for a set of entries being advanced in a solid block of coal should require that the outside entries adjacent to solid coal be used as return airways.
3. All entries of extended advancing entries shall be examined regularly for methane and other dangerous conditions, and suitable records of the examinations shall be kept.

4. The volume and velocity of the current of air used to ventilate panel entry sections shall be sufficient to dilute and render harmless any unusual, intermittent, sudden, or abnormal releases of methane in any entry or such section.
5. Management shall specify the minimum quantity of air necessary to ventilate adequately extended sets of entries, and development of such entries shall not begin until the necessary minimum quantity of air is available.
6. Additional working sections shall not begin producing coal until the ventilation system and controls for the additional sections have been approved by the District Office of the Bureau of Mines.
7. When increased methane is detected in entry development or in advancing working faces, the quantity of air coursed along such entries or to such working faces shall be increased sufficiently to dilute and render harmless the methane liberations.

Respectfully submitted,

/s/ W. R. Park

W. R. Park
District Manager

/s/ Sylvester E. Gaspersich

Sylvester E. Gaspersich
Subdistrict Manager

/s/ Fred E. Ferguson

Fred E. Ferguson
Federal Coal-Mine Inspection
Supervisor

Approved by:

/s/ John W. Crawford

Assistant Director--Coal Mine Health and Safety

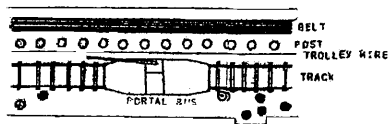
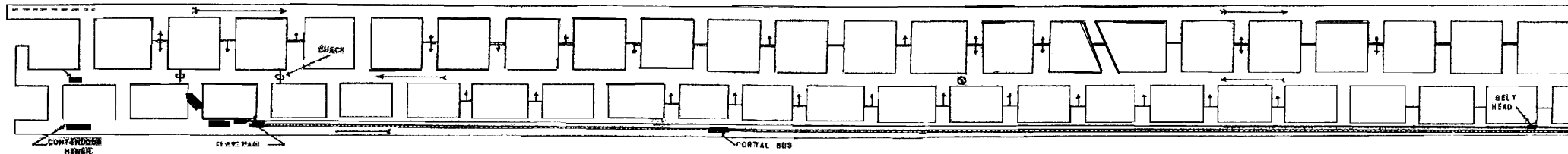
/s/ Donald P. Schlick

Deputy Director--Health and Safety

/s/ Elburt F. Osborn

Director

CABIN CREEK 4-PANEL



LEGEND

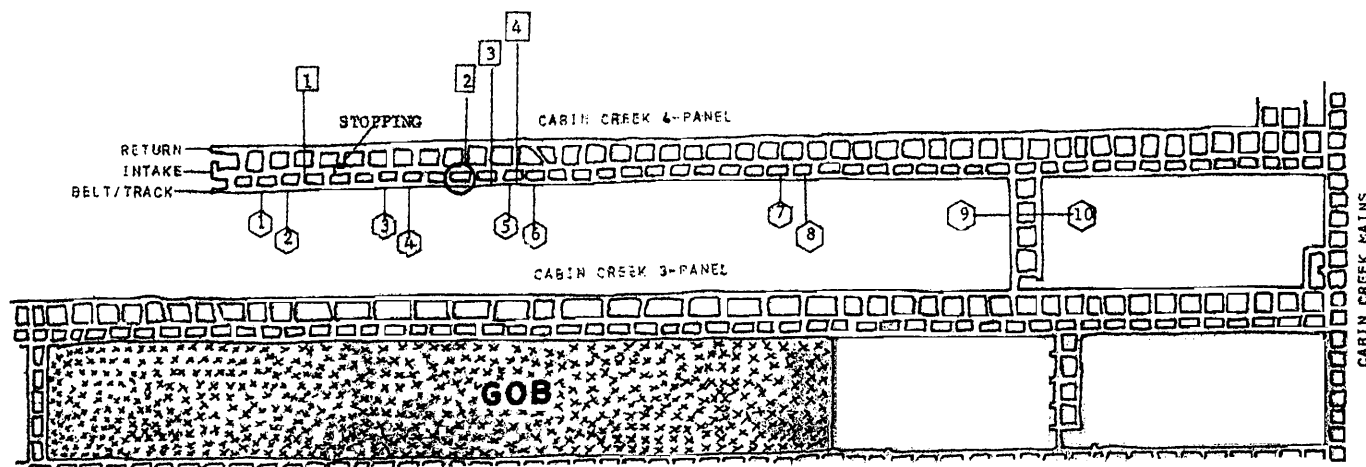
- ← INTAKE
- ← RETURN
- ← FORCES
- == PERMANENT STOPPING
- o- CHECK CURTAIN
- BODY
- ⊙ INJURED MAN

ITMANN COAL COMPANY
NO. 3 MINE
ITMANN, WEST VIRGINIA

Scale 1" = 100'

MAP FOLLOWING EXPLOSION OF DECEMBER 16, 1972

FIGURE NO. 1



LEGEND:

□ - MONITORING STATIONS

⬡ - PRESSURE CELLS

○ - PORTAL BUS

L - LAB. ANALYSES

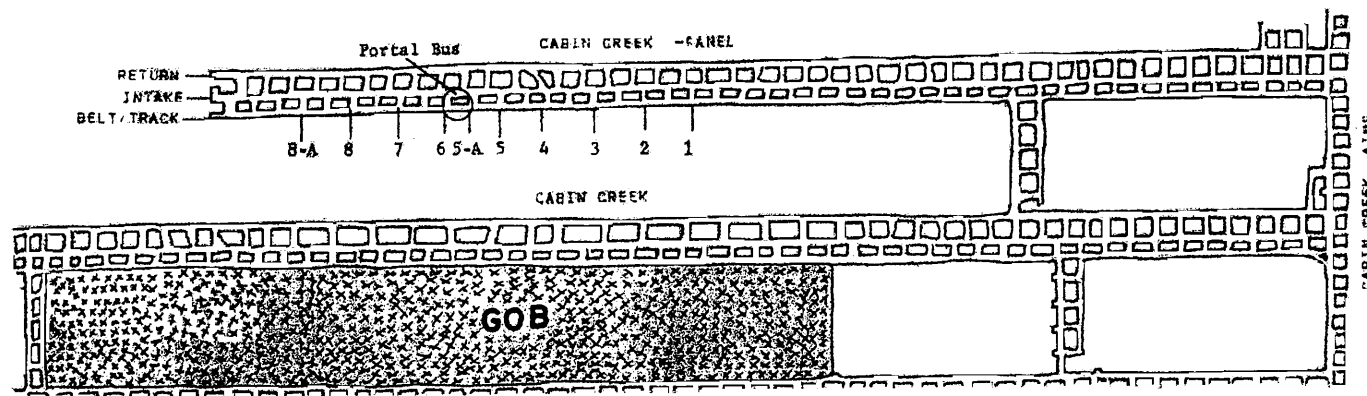
R - METHANE RECORDERS

MONITORING PERIOD JANUARY 11-30, 1973

STATIONS		METHANE (%)		AIR QUANTITY (CFM)
No. 1	Low	0.17 _L	0.17 _R	15,600
	High	0.70	0.70	17,760
No. 2	Low	0.13 _L	0.13 _R	13,500
	High	0.21	0.30	17,640
No. 3	Low	0.14 _L	0.14 _R	10,500
	High	0.26	0.30	15,600
No. 4	Low	0.13 _L	0.13 _R	11,520
	High	0.21	0.25	16,960

**LOCATIONS OF METHANE MONITORS
AND
PRESSURE CELLS
ITMANN COAL COMPANY
NO. 3 MINE
ITMANN, WEST VIRGINIA**
Scale 1"=500'

FIGURE NO. 4



		METHANE (%)									
TEST		1	2	3	4	5	5A	6	7	8	8
1.	Low	0.21	0.22	0.25	0.35	0.41	0.39	0.34	0.54	0.51	0.52
	High	0.23	0.30	0.33	0.49	0.49	0.54	0.51	0.76	0.80	0.64
2.	Low	0.30	0.32	0.35	0.52	0.41	0.46	0.41	0.48	0.71	0.69
	High	0.50	0.42	0.44	0.58	0.49	0.53	0.69	0.79	0.81	0.79
3.	Low	0.29	0.28	0.52	0.57	0.68	0.82	0.81	0.97	0.70	0.77
	High	0.40	0.45	0.61	0.62	0.96	1.14	1.08	1.16	1.15	1.17
4.	Low				1.04	3.94	1.54				0.59
	High				4.52	4.34	2.48				1.95
		5.64									
		(80 Feet Outby									
		Station No. 5)									

LOCATIONS OF METHANE TESTS

ITMANN COAL COMPANY
NO. 3 MINE
ITMANN, WEST VIRGINIA

Scale 1" = 500'

FIGURE NO. 3

98.0
X68.7
X56.0

80.0
74.0

56.7T

68.0T

66.5L

55.9RL

56.1L

61.7L

65.9L

67.1L

63.6L

67.0T

67.3S

73 T

85

84

75

I C

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W

50.8

78.4

69.1S

55.6L

68.7L

55.7L

61.3L

74.1S

62.5L

W

72.3S

67 T

W

82 T

86

85

87

89

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96
X65.5
X45.0

87
X74

W
X70.5

85.0
X67.0

93 T
X54.5T

68.5S
X71.0T

62.7L
X61.2S

76.5T
X73.0T

65.1L
X56.6S

78.0L
X75.4L

64.3L
X68.7S

65.3S
X61.6T

64.5T
X56.0T

W

73
X W

55.9
X W

55.5
X49.0

83.0
X88.0

94
X66.5

W

77
X53

67
X75

W

60.3
X W

W

56.4
X W

I C

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No. 3

No. 2

No. 1

SKIM SAMPLES

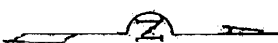
LEGEND:

- I - INCOMBUSTIBLE (X)
- W - WET
- C - COKE
- T - TRACE
- S - SMALL
- L - LARGE
- RL - EXTRA LARGE
- X - CROSSCUT
- - EXTENT OF FLAME

CABIN CREEK 4-PANEL DUST SURVEY MAP

Scale 1"=300'

FIGURE NO.2



BAND SAMPLES