

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
OFFICE OF THE ADMINISTRATOR
COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION
UNDERGROUND COAL MINE EXPLOSION

No. 2 Mine (I. D. 44-02274)
P and P Coal Company, Incorporated
St. Charles, Lee County, Virginia

July 7, 1977

By

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Authority

This report is based on an investigation made pursuant to the Federal Coal Mine Health and Safety Act of 1969 (83 Stat. 742). This report refers to the enforcement agency as the Mine Safety and Health Administration (MSHA), Department of Labor, which reflects the changes brought about by the Federal Mine Safety and Health Amendments Act of 1977.

Abstract

An explosion occurred at approximately 10:00 a.m., July 7, 1977, in the 1 Left Section off "C" Mains of the No. 2 mine, P and P Coal Company, Incorporated, St. Charles, Lee County, Virginia. Three workmen and a foreman who were in the area at the time of the explosion were killed. Sixteen other persons in other areas of the mine when the explosion occurred escaped to the surface uninjured.

MSHA investigators conclude that the explosion originated at or near the rubber-tired mine car located approximately 125 feet outby the face of the No. 2 entry. An explosive mixture of methane had accumulated because of insufficient ventilation and was ignited by a cigarette lighter that was found at the accident scene. Forces from the explosion extended through the 1 Left Section and into the 2 Left and 3 Left entries off "C" Mains and dissipated near the No. 3 belt drive approximately 3,500 feet from point of ignition. The explosion forces dislodged posts and destroyed stoppings 900 feet outby the faces of 1 Left.

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PART I

GENERAL INFORMATION

The No. 2 Mine, P and P Coal Company, Incorporated, is located on State Route 634 at St. Charles, Lee County, Virginia. At the time of this investigation, corporate and supervisory officials were as follows:

President & Superintendent	Charlie James Poe	Route 1, Box 294 Dryden, Va. 24243
Vice President	Clyde Poe	Box 516 Jonesville, Va. 24262
Secretary & Treasurer	Barbara Poe	Route 1, Box 294 Dryden, Va. 24243
Mine Foreman	Edward C. Bryson	St. Charles, Va. 24282
Section Foreman (001 Section)	Carl Harber	St. Charles, Va. 24282
Section Foreman (002 Section)	Charles Coleman	Pennington Gap, Va. 24277

The mine was opened in August 1971 by Smitty Baker Coal Company, Incorporated, which abandoned it in November 1971. Thereafter, P and P Coal Company, Incorporated, acquired ownership and reopened the mine in March 1972. At the No. 2 Mine, a total of 42 men was employed, 39 underground, two shifts a day, five days a week, in producing an average of 600 tons of coal daily from two working sections. However, at the time of the explosion, some employees were taking their annual vacation and the mine was being operated one shift per day.

Prior to the explosion, entries utilized as main entries had not been given a designation whereby written reference could readily be made. As a result, writers of this report have arbitrarily assigned designations to the main entries as described below.

For the purpose of discussion in this report, the six entry set of main entries, starting at the drift openings and extending for about 2,500 feet in a southwesterly direction, has been designated as "A" Mains. Panels 4 Right (three entries) and 6 Right (two entries) were driven to the right at about 90 degrees to the "A" Mains and interconnected when the 6 Right panel was developed. For purposes of this report, these 4 Right and 6 Right panels are designated as "B" Mains (five entries). In a similar manner, 4th Left from 4 Right entries and 5th Left from 6 Right entries were developed northwesterly from the "B" Mains and the six entry set is designated as "C" Mains. (See Appendix J.)

Using the aforementioned designations, the two working sections were operating in 1 Left off "B" Mains (001 section) and in 3 Left off "C" Mains (002 section). The mine, opened by four drifts into the No. 3 Mason coalbed, generally dips to the northwest and the coalbed

ranges from 32 to 50 inches in thickness locally. The explosion area in 1 Left off "C" Mains had been developed slightly upgrate in a southwesterly direction, and the increase in elevation was visually detectable near the faces in 1 Left entries. Company engineering data indicates that from the intersection of 1 Left entries with "C" Mains to a location about 280 feet outby the faces in 1 Left, elevation increased 63.7 feet. Cover over the coalbed is about 500 feet in the explosion area.

Analysis of a coal sample taken from the No. 3 coalbed near St. Charles, as reported in Technical Paper 656, "Analysis of Virginia Coals," published by the United States Bureau of Mines, is as follows:

	<u>Percent</u>
Moisture	3.3
Volatile Matter	38.1
Fixed Carbon	50.0
Ash	8.6

Numerous tests have shown that coal dust having a volatile ratio of 0.12 and higher is explosive. Volatile ratio in this area indicates that dust from this coal is explosive and 9 of 73 dust samples collected in 1 Left off "C" Mains during the investigation showed traces of coke.

The last Safety and Health inspection of the mine was conducted on June 7, 8, 15, 21, and 24, 1977. During this inspection, Notice of violation of sections 75.200, 75.202, 75.400, 75.523-1, and 75.1103, 30 CFR 75, were cited and terminated. The violation of section 75.400, 30 CFR 75, specified that "loose wet coal and float coal dust ranging in depths of 0 to 8 inches were permitted to accumulate along and beneath the 002 section belt conveyor for a distance of approximately 1,200 feet from the 002 section belt conveyor drive and inby to the section tailpiece." Dust samples were not collected because the mine surfaces were too damp.

MINING METHODS, CONDITIONS, AND EQUIPMENT

Mining Methods

A multiple-entry method of mining was followed and Wilcox Mark 20 continuous mining machines were used exclusively. The 1 Left entries off "C" Mains were developed three abreast, about 28 feet wide, on 50- and 55-foot centers with crosscuts about 28 feet wide on 87.5-foot centers for a distance of about 2,100 feet. The adjacent 2 Left entries were developed in a similar manner for a distance of about 1,000 feet. The 3 Left entries, currently active as the No. 002 section, were developed in a similar manner for a distance of about 1,200 feet. The 1 Left, 2 Left and 3 Left entries were interconnected at irregular intervals. Pillars were not recovered in the mine. See Appendix I.

A conventional roof control plan with spot bolting, approved March 15, 1974, was in use at the mine. The approved roof control plan stipulates that the 28-foot wide entries and crosscuts be supported by installing 2 rows of posts on each side of a 14-foot roadway in the working place where the Wilcox continuous mining machine is active. Upon removal of the continuous mining machine from the place, a 16-foot roadway is permitted. Where roof testing indicates that such measures are necessary, roof bolts (spot bolting) are required. Roof structure in the mine was generally firm blue shale in active working areas. However, in utilizing the Wilcox continuous mining machines to remove about 73 percent of the coal during development the roof eventually deteriorates, resulting in bottom heaving and bad roof, which are generally located in abandoned or inactive areas. During the inspection completed after the explosion, 16 violations of the approved roof control plan were cited.

Ventilation

Ventilation was induced by two 6-foot diameter belt driven, axial-flow fans, built by Click's Welding and Manufacturing Company, Incorporated. The Model A-72-6 fans, operated in the No. 5 blade position at about 1,005 r.p.m., were variable pitch in design with seven blade positions. Motive power for each fan was provided by a 460-volt, three-phase, 50 h.p. electric motor rated at 1,725 r.p.m. Based on ampacity determinations made during this investigation, the fans were operating at maximum load while using the aforementioned 50 h.p. motors in that the amperage was at the maximum permitted by the National Electric Code. The fans, located on the surface and operated exhausting, were equipped with automatic closing doors operable if one fan should stop. During the Federal inspection of the mine completed on March 31, 1977, the Nos. 1 and 2 fans were exhausting 44,800 and 42,790 cubic feet of air per minute, respectively, and 50,000 cubic feet of methane was being liberated each 24 hours as determined by air analysis.

Each active working section was ventilated by a separate split of air. Intake air was coursed through the main entries, consisting of the "A", "B", and "C" Mains, to the intake side of each working section. In traversing through the Mains, intake air was split just inby the overcast, located at the intersection of "B" and "C" Mains, with the left split being directed to the 1 Left off "B" Mains (001) section; thence to the main return on the south side of the mine back to the No. 1 fan. The second intake air split was directed through intake entries from the overcast to the 3 Left off "C" Mains (002) section. In 3 Left, No. 1 entry was utilized for intake, No. 2 entry contained the belt installation and return air from the face area of 3 Left was intended to course across 2 Left entries to the face area of 1 Left entries (explosion area) and return via No. 3 entry of 1 Left to the main return; thence through returns on the north side of the mine to the No. 2 fan.

In directing the ventilating current through the mine, only one overcast was in use. Except as noted below, return air entries and the belt entry were separated from intake air by cinder block stoppings which were normally constructed by dry stacking the blocks and plastering one side. Flame resistant line brattice material was used to construct line brattices, and to serve as manddoors in the permanent cinder block stoppings. Use of brattice cloth material to construct manddoors was cited during this investigation as a violation of the Approved Ventilation System and Methane and Dust Control Plan. Additionally, line brattice material had been utilized to serve as stoppings from the seventh and tenth open crosscuts outby the faces, respectively, on the 1 Left off "B" Mains (001) section and on the 3 Left off "C" Mains (002) section.

According to company maps obtained during the investigation, belt lines were ventilated by a separate split of air with the belt air being split, directing a portion of air to the 1 Left off "B" Mains section; thence into the return. Additionally air was being coursed through the one active overcast to the 3 Left off "C" Mains (002) section; thence into the returns. However, during the investigation, forces from the explosion had apparently affected ventilation of the belt entry on the 3 Left off "C" Mains section in that investigators found the belt entry on return air as shown on Appendix I. Change of direction of the belt entry ventilating current could have occurred as a result of the explosion forces destroying the brattice cloth manddoors. Sufficient forces to cause removal of the manddoors were generated in the area as evidenced by information supplied by Lester Wade in the interview on July 15, 1977. Mr. Wade, who was near the No. 3 main belt drive at the intersection of "B" and "C" Mains at the time of the explosion, stated that the explosion forces destroyed the check curtain at his location.

The Ventilation System and Methane and Dust Control Plan in effect at the mine was approved by the District Manager on January 4, 1977. The mine map, certified by Charles E. Metcalf, Certificate No. 54-17-3(a) 899, Commonwealth of Virginia, with a last posting date of September 10, 1976, was certified on September 13, 1976. As submitted for the January approval, the map did not show mine development extending into the 1 Left off "C" Mains (explosion area).

In discussion of mine ventilation it is pertinent to consider the history of methane liberation at the No. 2 Mine. By considering results provided in the mine atmosphere bottle sample record and from notes maintained by mine inspection personnel, methane liberation data has been compiled. Methane was first detected in the mine ventilation current in February 1973 as evidenced by a bottle sample which showed 0.03 percent methane in the immediate return of the active section. In October 1973, bottle sample J5576 indicated 0.02 percent methane in the immediate return of 1 Left off 2 Right. Although 2 Right off "A" Mains area of the mine is about 4,800 feet from the explosion

area, a summary of methane findings and subsequent sealing and un-sealing of the area is provided. Following the above described finding of methane, the 2 Right entries were deactivated and mining proceeded to virgin areas inby. In December 1973, a bottle sample of the mine atmosphere from the abandoned 2 Right entries showed 1.53 percent methane. In February 1974, 2 Right entries were sealed and pipes were installed to permit monitoring of the mine atmosphere behind the seals. Air sample analysis and the inspector's methane detection instrument indicated 1.24 and 2.5 percent methane, respectively, in samples drawn from behind the seals on February 27, 1974. In discussion between company and MSHA officials, it was decided to ventilate the 2 Right area. After completing this action, subsequent bottle samples taken in 2 Right bleeder entries indicated methane ranging from 0 to 0.38 percent. On February 14, 1976, a three entry panel was completed from "B" Mains to interconnect near the faces of 2 Right entries. In August 1976, company officials requested and received approval to install No. 2 mine fan. Installation was completed and 2 Right entries were utilized for return air; thereby continuing ventilation of the previously sealed area.

Recent history of methane liberation on the active working sections indicate that on June 15, 1977, Federal Inspector George R. Vass collected bottle samples from the return side of each working section containing 0.02 and 0.06 percent methane which showed 2,800 and 7,900 cubic feet of methane liberated within a 24-hour period for the 3 Left off "C" Mains (002) and the 1 Left off "B" Mains (001) section, respectively. A bottle sample taken on June 22, 1977, at the inby end of the line curtain on 3 Left off "C" Mains showed 0.3 percent of methane. During an interview Mr. Charlie James Poe, Superintendent, stated that after he observed Vass make a methane test which indicated 0.2 percent methane, he stopped coal production to instruct the workmen about installation of line curtain, including a safety talk on dealing with methane.

On August 10, 1977, methane was detected escaping from a crack in the mine floor approximately eight crosscuts outby the face of No. 2 entry on 1 Left off "C" Mains by members of the investigating committee. When held 12 inches from the mine floor above the crack, no methane was detected; however, by inserting the intake port of the detector into the crack, 5 percent methane was detected.

At the request of company and UMWA personnel, MSHA's District 5 Ventilation Group conducted a ventilation survey at the mine on March 1 - 4, 1977. At the time, 1 Left off "C" Mains was active as 002 section and 2 Left off "C" Mains was active as 001 section. Air measurements, taken when the mine was not producing coal, indicated 10,000 and 13,000 cubic feet of air per minute was being coursed through the last open crosscut of the 1 Left and 2 Left sections. MSHA survey personnel determined that 80,000 cubic feet of intake air per minute was being coursed into the mine, the No. 1 fan was

exhausting 41,000 cubic feet of air a minute and the No. 2 fan was exhausting 39,000 cubic feet of air a minute with operating pressures of 2.0 and 2.5 respectively.

During the last Federal inspection completed on June 24, 1977, Inspector George R. Vass determined that 9,882 and 9,100 cubic feet of air per minute was being coursed through the last open crosscut of the 1 Left off "B" Mains (001 section) and 3 Left off "C" Mains (002 section), respectively. Except on the 001 section and extending outby for a distance of approximately 520 feet, two travelable escapeways were provided from the working sections to the surface.

No oil or gas wells were located on mine property. According to available information, exploratory core drilling had been done in that one core drill hole penetrated the No. 3 coalbed in solid coal in the No. 2 Mine area between 2 Right entries and "B" Mains. It was concluded that core drilling had no bearing on the explosion occurrence.

Preshift examinations were recorded as being made before the first operating shift entered the mine each day by Edward C. Bryson, mine foreman and certified examiner. Results of preshift examinations reportedly were either telephoned to a certified official on the surface or the preshift examiner completed his report at the mine office prior to the 7:00 a.m. shift entering the mine. Preshift examinations for the succeeding shift and onshift examinations were made by certified officials, including Bryson, mine foreman; and Carl Harber, Charles Coleman, and Randall Wells (victim), section foremen. In an interview conducted after the explosion, Bryson stated that he arrived at the mine a little before 6:00 a.m., on July 7, 1977, and proceeded to make the preshift examination, returned to the surface sometime before 7:00 a.m. and participated in planning the day's work activity with Charlie James Poe and the two section foremen.

Review of the preshift examination records indicated that the two working sections, 1 Left off "B" Mains and 3 Left off "C" Mains, were examined on July 7. Examination of the mine record books showed that results of preshift examination in 1 Left off "C" Mains had not been recorded. Edward C. Bryson, mine foreman and preshift examiner, stated that he did not examine the area as part of his preshift examination. Interviews with mine employees indicated that it was not unusual for miners to enter inactive areas to recover equipment. Yet, mine preshift examination books contained no record to indicate that preshift examinations were conducted in such areas prior to miners entering therein to work. One of the victims was certified; however, the investigation disclosed that, at the time of the explosion, none of the victims had the necessary instruments to make tests for methane or oxygen deficiency.

Further interviews of Charles Coleman and Carl Harber, foremen, revealed that weekly examinations for hazardous conditions in idle and abandoned workings had not been made for the period of June 14 through June 28, 1977; however, Bryson stated that he examined the 1 Left off "C" Mains on July 5, 1977, and did not detect methane or observe any hazardous conditions. Bryson did not enter his findings in mine record books nor were investigators able to find where he had placed date and initials at the time of his examination.

Coal Dust

During the last Federal inspection of the mine, completed June 24, 1977, an accumulation of loose wet coal and float coal dust beneath the conveyor belt beginning at the belt drive and extending inby to the tailpiece, a distance of some 1,200 feet, was observed on the 3 Left section.

Water, obtained from a well, was piped underground through a 2-inch line and used to allay coal dust during mining. At belt transfer points, a hose with spray nozzle was provided to permit the man stationed at that location to apply water as needed. The Wilcox Mark 20 continuous mining machines were equipped with "wet augers," utilizing nine sprays on each auger. Water pressure at the spray nozzles on continuous mining machines is required to be 200 pounds per square inch with flow at 8 gallons per minute as specified in June 3, 1975, supplement to the Approved Ventilation System and Methane and Dust Control Plan.

During development, workmen used shovels to clean up loose coal as a part of the mining cycle. During this investigation, eight violations of section 75.400, 30 CFR 75, were issued listing accumulations of loose coal, coal dust, and/or float coal dust. Rock dust was applied by hand in the working places. A trickle rock dusting machine, used to apply rock dust to return airways, was provided for each working section. Two violations of section 75.403, 30 CFR 75, were issued during the investigation for inadequate applications of rock dust.

Electricity

Three-phase electric power at 12,470 volts was purchased from Old Dominion Power Company, and transmitted to a surface substation near the mine portal. The surface substation was a Line Power Manufacturing Corporation unit equipped to reduce voltage to 7,200 volts by a 1,000 kVA three-phase transformer rated at 12,470-7200 Y/4160 volts for underground distribution. The dry-type transformers were connected in a delta-wye configuration and the secondary neutral was grounded through a 25-ampere ground fault current-limiting resistor. A grounding circuit, originating at the ground terminal of the grounding resistor, was used to ground metallic frames of

all high-voltage equipment served by this circuit. This grounding conductor was not properly "earthed" prior to the investigation.

A General Electric oil blast oil circuit breaker, Type FK-143-7.2-50, 600 amperes, 7,200 volts, inside the unitized substation was equipped with a ground check monitor circuit and a relaying system designed to provide overload, short-circuit, grounded-phase and undervoltage protection for the high-voltage underground circuit. This equipment was not properly maintained and tested and the tests were not properly recorded.

The three-phase high-voltage circuit extended underground via an Anaconda No. 2 AWG, three conductor, MP-GC, 8 KV, shielded mine power cable. Disconnecting switches and lightning arrestors were installed in this circuit within 100 feet of the point where the circuit entered the underground portion of the mine.

The six portable power centers in the mine ranged in size from 112.5 kVA to 400 kVA. These power centers reduced the 7,200-volt alternating current to 480-volts alternating current for operation of three belt conveyor drive units, two pumping stations, and the permissible electric face equipment of the two coal-producing sections.

The portable power centers, which supplied power to the belt conveyor drive units and drainage pumps, were equipped with molded-case circuit breakers that provided short-circuit, grounded-phase, and undervoltage protection for the 480-volt circuit originating at the power centers. In most cases, overload protection was provided in the controllers for the loads served by the power centers; however, some circuit breakers provided this feature.

The section power centers supplied three-phase 480-volt power to the section distribution boxes which in turn supplied three-phase 480-volt power to the electric equipment on the sections. The section power centers were equipped with molded-case circuit breakers which had devices that provided short-circuit grounded-phase, and undervoltage protection for the circuits originating at the power centers. The permissible-type electric face equipment was not maintained in permissible condition in all cases. Some of the electric equipment in use in the last open crosscut area of one working section was not of permissible type.

Surface circuits were supplied by a three-phase step-down transformer in the Line Power Manufacturing Corporation unitized substation. A 350 kVA three-phase transformer was connected delta-wye (solidly grounded) and rated 12,470-480 Y/277 volts. All surface circuits were protected by molded-case circuit breakers and appropriate line starters.

The last Safety and Health Electrical Inspection at the mine was conducted from April 25, 1977 through May 13, 1977. During this inspection, 11 notices of violation and one Notice to Provide Safeguards were issued. At the close of this inspection, all notices of violation had been terminated and the Notice to Provide Safeguard was pending.

Transportation

Coal was mined by Wilcox Mark 20 continuous mining machines and was transported from the faces by a system of lo-low belt conveyors; thence onto a series of haulage belts to the surface railroad car loading facility.

Men and supplies were transported underground in rubber-tired trailers pulled by battery-powered tractors and also a battery-power scoop was used for supply haulage. No haulage equipment was present in the 1 Left off "C" Mains at the time of the explosion.

Communications

Telephones, manufactured by FEMCO and Pyott-Boone, were provided for mine communications at all belt transfer points underground, at each active working section, and at five locations on the surface. The telephone communication system did not extend into the 1 Left off "C" Mains explosion area.

Fire Protection

Well water was pumped into a 500-gallon tank on the surface and water supply to underground areas was distributed by a 2-inch water line. Substandard conditions were found and are enumerated below. Except the conveyor drive unit for the 1 Left off "B" Mains (001) section, deluge type water spray systems had been installed on all belt conveyor drive units. The deluge type fire suppression system for the No. 2 main belt drive was not in operative condition. The 2-inch water line, which paralleled the underground belt conveyor installation, was not equipped with fire hose outlets at 300-foot intervals.

During the complete inspection of the mine following the explosion, the automatic fire sensing system was found to be inadequate in that: in the 3 Left off "C" Mains (002) section, the system was not installed along the entire length of the conveyor belt; a fire sensor system was not provided on the 1 Left off "B" Mains (001) section belt conveyor; and the fire sensor system for the No. 1 conveyor belt, extending from the portal approximately 2,700 feet inby, was inoperative in that the fire sensor cable was broken at two locations.

Other deficiencies in the fire protection system consisted of an inoperative fire extinguisher at the No. 1 belt tailpiece and improper handling of compressed oxygen and acetylene tanks found in the face area of No. 3 entry, 3 Left off "C" Mains (002) section.

Explosives

Explosives, used to excavate roof material to provide clearance for belt head drives and to establish overcasts, were stored exclusively on the surface. Explosives were transported underground in a specially prepared container constructed of nonconductive material. According to available information explosives were last used in the mine during the first week of May 1977 on the new 1 Left off "B" Mains (001) section.

Training Program - Medical Assistance Program

The training program, approved by the District Manager on October 5, 1973, provided for training in First Aid Methods, Principles of Mine Rescue, Mine Gases and Detection Devices, Safe Use and Care of Flame Safety Lamp, Use of Self-Rescuer, Coal Mine Health and Safety Act of 1969, Coal Mine Ventilation, Roof and Rib Control, and Electrical Training. P and P Coal Company, Incorporated utilized MSHA instructors to provide training. The training in all of the above listed courses, except Electrical Training, was completed for 42 persons on June 11, 1976.

Arrangements for emergency medical treatment and emergency ambulance service for employees were provided.

Illumination and Smoking

Permissible-type electric cap lamps, manufactured by Koehler Manufacturing Company, Approval No. 6D-30, were used for portable illumination underground. Except when an employee elected to provide his own, cap lamps were provided by the company. During this investigation, the company-owned permissible-type cap lamps were examined at the mine office by MSHA inspection personnel. Twenty-two lamps were found in non-permissible condition. The defects involved 20 lamps with inoperative headpiece locking devices, one lamp with a cut cord and the headpiece lock missing, and one lamp on which the rubber conduit was improperly installed in the headpiece. Three lamps used by the victims, including the personally owned lamp of Harold Johnson and one on which the headpiece was torn apart, were sent to the MSHA Approval and Certification Center for evaluation. The company-provided cap lamp used by Daniel Tester was reportedly destroyed after being removed from the victim at the coroner's office. As a result, MSHA personnel were not able to obtain it for examination and testing. It was concluded by the Approval and Certification Center that none of the submitted lamps

were capable of igniting a methane/air or methane/coal dust/air mixture. A copy of the test report is in Appendix E.

The operator's program to prevent smoking materials from being taken into underground areas of the mine was approved by the District Manager on March 31, 1972. The searching program was not effectively carried out in that smoking was practiced underground, a cigarette lighter was found underground during the investigation and cigarettes and a cigarette lighter were found in the clothing of two of the victims of the explosion. See Appendix B for personal effects of victims. Mine record books indicated that searches for smoker's articles were being made. However, during interviews conducted after the explosion, several workmen stated that they had seen discarded cigarette butts, empty cigarette packs, and/or match stems, in underground areas of the mine and several workmen stated that they had never been searched for smoking articles as required by the approved searching program.

Mine Rescue

The company does not maintain a mine rescue team; however, mine rescue teams are maintained by mining companies in the area and they are available in an emergency.

Self-rescuers, either MSA W-65 or Drager FSR 810, were provided for the underground employees and they had been trained in their use; however, one of the victims did not have a self-rescuer on his person at the time of the explosion.

PART II

EXPLOSION AND RECOVERY OPERATIONS

Participating Organizations

The following is a listing of officials who assisted in directing recovery operations:

P and P Coal Company, Incorporated

Charlie J. Poe	Superintendent
Edward C. Bryson	Mine Foreman
Carl Harber	Section Foreman

United Mine Workers of America

Edward Gilbert	International Safety Director
Donald Dalton	International Safety Instructor
Harold Hartsock	International Safety Inspector
Floyd T. Mullins	Safety Coordinator, District 28
Alonzo Mullins	Assistant Safety Coordinator, District 28

Virginia Division of Mines and Quarries

Frank Linkous	Technical Assistant
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Mine Safety and Health Administration

W. R. Compton	District Manager, Norton, Virginia
M. L. West	Subdistrict Manager, Norton, Virginia
Ray G. Ross	Supervisory Mining Engineer

Employees of P and P Coal Company, Incorporated and inspection personnel of both the Virginia Division of Mines and Quarries and the Mine Safety and Health Administration participated in recovery operations. Two rescue teams from the Stonega Division of Westmoreland Coal Company, Big Stone Gap, Virginia, and one rescue team from Clinchfield Coal Company, Dante, Virginia, participated in the recovery operations. (See Appendix D for list of team members.)

Activities of MSHA Personnel

Charlie J. Poe, President of P and P Coal Company, Incorporated, and Superintendent of the No. 2 Mine, telephoned M. L. West, Subdistrict Manager, Norton, Virginia Subdistrict of MSHA about 10:30 a.m. and reported that a large roof fall had occurred in the mine and that four men were trapped. West, Alfred T. Bowles, Coal Mine Inspection Supervisor, and William J. Taylor, Coal Mine Inspector, departed for the mine immediately thereafter.

Doug Davies and Richard Davis, Surface Coal Mine Inspectors, from MSHA's Harlan, Kentucky office were in the immediate vicinity when they learned of an unusual occurrence at the mine. About 10:45 a.m., they arrived at the mine where they learned the nature of the occurrence. They instructed the mine superintendent to call the MSHA office in Norton and they called their home office in Harlan and personnel there reported the occurrence to T. R. Mark, Subdistrict Manager, Barbourville, Kentucky Subdistrict. Thereafter Davies and Davis remained at the mine and assisted with preparations for recovery.

Mark called the MSHA District Office in Norton and reported the occurrence to be an explosion instead of a roof fall as had been previously reported. He then dispatched six MSHA personnel from the Harlan office and departed for the mine himself.

MSHA officials in Norton reported the occurrence to the Assistant Administrator's Office in Arlington, Virginia, and then began calling coal companies in the area for assistance of mine rescue teams. Two rescue teams were quickly assembled and dispatched from Westmoreland Coal Company, Big Stone Gap, Virginia, and another team from Clinchfield Coal Company, Dante, Virginia, was dispatched thereafter. Other teams from Clinchfield Coal Company; Jewell Smokeless Coal Company, Vansant, Virginia; Jewell Ridge Coal Corporation, Jewell Valley, Virginia; Island Creek Coal Company, Keen Mountain, Virginia; and Beth-Elkhorn Corporation, Jenkins, Kentucky; were placed on standby alert.

West, Bowles, and Taylor arrived at the mine about 11:45 a.m. and quickly learned that an explosion instead of a roof fall had occurred. After contacting the MSHA District Office in Norton and being informed that mine rescue teams were on their way, West took charge of MSHA's activities. A check-in-and-out system was established and MSHA personnel were assigned to monitor the fans and to establish a log of events. West and Taylor entered the mine at 12:15 p.m. via a mine car pulled by a battery-tractor and operated by Glenn Johnson, company employee. They arrived on 3 Left off "C" Mains about 12:43 p.m., departed the mine car and crawled to No. 1 entry 1 Left off "C" Mains where they encountered Bryson, mine foreman, and other workmen restoring ventilation controls in an effort to reach the four missing men.

Donnie F. Short, Federal Coal Mine Inspector, arrived at the mine about 1:00 p.m., and assisted mine management in roping off the area to prevent entry of unauthorized persons. At 1:50 p.m., Short issued a 103(f) Order requiring all persons, except those persons involved in the exploration of the mine, to be withdrawn from, and to be prohibited from entering the mine. Before the Order was issued, eleven of the eighteen men underground were withdrawn from the mine. An Imminent Danger Order, Form 104(a), was issued at 3:00 p.m., by Inspector Short, requiring that all persons be withdrawn from and prohibited from entering the mine, except those persons engaged in recovery operations.

Two oxygen-breathing apparatus-equipped mine rescue teams from Stonega Division of Westmoreland Coal Company arrived at the mine about 1:15 p.m., entered the mine at 1:35 p.m., and arrived on the 3 Left off "C" Mains (002) section about 2:30 p.m.

W. R. Compton, District Manager, and Ray G. Ross, Supervisory Mining Engineer, arrived at the mine about 2:30 p.m. Other MSHA personnel arrived at various times throughout the ensuing afternoon and evening hours. Since the explosion W. R. Compton resigned his position with MSHA and R. G. Ross was appointed District Manager.

Mining Conditions Immediately Prior to the Explosion

The weather was hot and clear on July 7, 1977. Records of the barometric pressure recorded at the Federal Aviation Administration Office at Tri-City Airport, Blountville, Tennessee from 2:00 a.m. until 10:00 a.m., July 7, 1977, are as follows:

<u>Time</u>	<u>Pressure</u>
2:00 a.m.	30.05
4:00 a.m.	30.05
6:00 a.m.	30.06
8:00 a.m.	30.07
10:00 a.m.	30.07

According to statements made during interviews, Eugene Parsons, timberman, and Carl Harber, section foreman, discussed disruptions of ventilation on the active 1 Left off "B" Mains (001) section that occurred on July 6, and 7, 1977, prior to the explosion. Harber stated that the ventilation disruptions were corrected by tightening the temporary (plastic) stoppings separating the intake and return airways on the section.

The underground inspection conducted during the investigation revealed that permanent type stoppings were maintained to within only seven crosscuts of the working face on the 001 working section.

According to statements made by Bobby Ridings, scoop operator, and Randy Fisher, battery-tractor operator: on July 6, 1977, they, along with Harold Wells, Daniel Tester, and Harold Johnson (victims) worked in the 1 Left entries (explosion area) recovering belt structure about four or five crosscuts outby the area where the explosion originated. According to Ridings and Fisher they entered the 1 Left entries as a group and neither Fisher nor Ridings knew whether or not the area had been examined for methane, oxygen deficiency and other hazards prior to their entering. The preshift, onshift, and daily record book bears no record of the 1 Left off "C" Mains having been examined for methane, oxygen deficiency, and other hazards on July 6 and 7, 1977.

On July 7, 1977, as the mantrips entered the mine, the 2-inch water line, which supplied water for two Mark 20 Wilcox continuous mining machines, was found damaged at a location approximately three crosscuts outby 1 Left off "B" Mains (001) section. According to interviews with Edward C. Bryson, mine foreman, Billy Taylor and Carl Lanningham, repairmen, the water from the broken line had run off into a large dip in the mine floor but did not block the mine ventilating current. A thorough examination of the mine airways conducted during this investigation revealed no areas where water had blocked the ventilating current.

The 1 Left entries (explosion area) were developed, with a Wilcox Mark 20 continuous mining machine, three abreast, 28 feet wide, on 50- and 55-foot centers with crosscuts 28 feet wide on 87.5-foot centers for a distance of about 2,100 feet. Bad roof was encountered in the No. 2 belt entry of 1 Left, therefore, mining activities in the 1 Left entries ceased on April 28, 1977, and the mining machine was moved outby approximately 3,600 feet where mining of coal was resumed in the development of 2 Left off "B" Mains. On the day of the explosion, Edward Bryson, according to his statements made during the interview conducted following the explosion, arrived at the mine shortly before 6:00 a.m. and proceeded to make the preshift examination. He returned to the surface and recorded the results of the preshift examination prior to workmen entering the mine. Bryson stated that he did not examine the 1 Left off "C" Mains as part of the preshift examination. Interviews with mine employees indicated that it was not unusual for miners to enter inactive areas to recover equipment. Yet, mine preshift examination books contained no record to indicate that preshift examinations were conducted in such areas prior to miners entering therein to work. One of the victims was certified; however, the investigation disclosed at the time of the explosion, none of the victims had the necessary instruments to make tests for methane or oxygen deficiency.

Explosion

According to information obtained at interviews held to investigate the causes of the explosion, the activities and sequence of events occurred as follows:

On July 7, 1977, Edward C. Bryson, mine foreman, arrived at the mine shortly before 6:00 a.m. and proceeded to conduct a preshift examination; thereafter, he returned to the surface and reported the results of the preshift examination to Charlie James Poe, superintendent, before 7:00 a.m. Bryson did not examine the 1 Left off "C" Mains (explosion area) as part of the preshift examination. The No. 2 Mine, which is normally worked 2 shifts a day, was being operated only one shift per day at the time because about one-half of the employees were taking their annual vacation. Of the 21 present, 20 men, consisting of a production crew for the 001 section, two men to go underground and bring a scoop to the surface that was inoperative due to weak batteries, two repairmen to do work on the Wilcox continuous mining machine on the idle 002 section (3 Left) and four workmen and a foreman to recover the small amount of remaining equipment from the 1 Left off "C" Mains, left the surface about 7:30 a.m., which was approximately 30 minutes later than usual mantrip time. The delay resulted from having to wait for collection of necessary parts to repair the continuous mining machine. Depending upon their work assignments, the men proceeded via mantrips toward the active 001 section and to the idled 002 section. Enroute to their respective work areas, the 2-inch waterline was found damaged approximately three crosscuts outby 1 Left (001) section off "B" Mains. Edward Bryson, who was operating a battery-tractor and following the mantrips underground, stopped and repaired the broken waterline with the assistance of Billy Taylor, one of the persons who had been dispatched to bring the scoop to the surface. While the two men repaired the waterline, the two mantrips proceeded - one consisting of seven section workmen, a motorman, and Carl Harber, foreman, arrived on the 001 production section, about 8:10 a.m. Lester Wade, belt head attendant, had gotten off this mantrip near the belt transfer point located at the intersection of "B" and "C" Mains. The other mantrip, consisting of two repairmen to work on the continuous mining machine on the 002 section, a motorman, four workmen, and Randall R. Wells, foreman, to recover augers and belt structure from the 1 Left off "C" Mains, arrived on the 3 Left (002) section about 8:20 a.m. Normal production activities began on the 001 section and with except of one interruption to tighten check curtain ventilating controls, such activities were continued in a normal manner until the explosion occurred. Upon arrival on the 002 section, Harold R. Wells (victim) foreman, assisted Carl Lanningham, repairman, and Chad Blevins, repairman's helper, in carrying repair parts and in beginning repairs on the Wilcox continuous mining machine. Randy Fisher, battery-tractor operator, Bill Perkins, (victim) jacksetter, Daniel Tester, (victim) timberman, and Harold Johnson, (victim) continuous mining machine helper, began performing work on the 002 section belt conveyor. Upon completing repair of the waterline, Billy Taylor went to the inoperative scoop and found that

it had enough battery power to progress slowly toward the mine portal. Bryson went to the 001 section, thence proceeded by battery-tractor to the 002 section, arriving there about 9:30 a.m.

Shortly thereafter, utilizing the battery-tractor brought to the area by Bryson, Wells, Johnson, Perkins, and Tester loaded into a mine car and with Fisher operating the battery-tractor, they departed the 3 Left (002) section to enter 1 Left off "C" Mains (explosion area). They traveled across 2 Left entries, through the inby connection between 2 Left and 1 Left entries; thence up No. 1 entry and through the last open crosscut of 1 Left; back down No. 2 entry to the second open crosscut outby the face of 1 Left and stopped. At that location, Fisher uncoupled the tractor from the mine car. Wells got out of the mine car and assisted Fisher in attaching a rope from the tractor to one of the Wilcox continuous mining machine augers located in the crosscut. Fisher departed pulling the auger with the tractor, proceeded back down No. 1 entry, through the inby connection between 1 Left entries and 2 Left and continued on to the belt entry of 002 (3 Left) section. At that point, he disconnected from the auger, turned the tractor around, and went to the No. 2 entry of 2 Left and stopped for a short time. He had just gotten back into the control deck of the tractor and traveled a few feet when the explosion occurred.

Forces generated by the explosion raised large quantities of dust extending from 1 Left into 2 Left and 3 Left entries. Fisher felt the concussion and described the dust as being so thick that he could hardly see. Bryson, Lanningham, and Blevins felt the concussion in 3 Left and saw the dust cloud generated by the explosion. The production crew on the 001 section described the explosion as a vibrating, high-frequency sound, piercing to the ears. Lester Wade, belt head attendant, located near the belt transfer point at the intersection of "B" and "C" Mains stated that he was blown down by the explosion. He further indicated that pasteboard boxes, etc., were blown up the belt line, dust was in suspension and a check curtain located near the No. 3 main belt drive was blown down. Bryson immediately called Charlie James Poe, mine superintendent, who was on the surface, and reported the occurrence as a large roof fall. Bryson was instructed to examine the area and call back. He proceeded from 3 Left across 2 Left and met Fisher enroute. He questioned Fisher as to the whereabouts of Wells and crew and Fisher told him that they were in 1 Left. Bryson and Fisher proceeded to the inby connection between 2 Left and 1 Left and tried to advance into 1 Left but they encountered heavy concentrations of smoke, found timbers and stoppings dislodged, and received no answer when they called to the men inby. Bryson returned to the telephone in 3 Left to report to Poe what he had observed and that four men were missing. The production crew in the 001 section called the mine superintendent and were instructed to cease production, proceed to the 1 Left (explosion area) and lend assistance in reaching the four missing men. The miners from the 001 production crew, Bryson, Fisher, Blevins, and Lanningham, continued efforts to reach the missing miners. Manddoors displaced from the stoppings by the

explosion were replaced and temporary stoppings were erected to direct the ventilating current toward the explosion area. This work was in progress when MSHA officials arrived at the scene and directed the miners to withdraw from the area due to the presence of smoke and carbon monoxide.

In interviews conducted during the investigation, Charlie James Poe, mine superintendent, stated that the explosion occurred between 9:45 and 10:05 a.m. Reaven Leonard, jack setter, stated that the explosion occurred about 9:50 a.m.; and Lester Wade, belt head attendant, stated that the explosion occurred at 10:15 a.m. In review of the aforementioned statements, it is concluded that the explosion occurred at approximately 10:00 a.m. on July 7, 1977.

At the time of the explosion, the electrical power distribution system did not extend into the 1 Left entries (explosion area) and there was no electric equipment in the explosion area, except for the permissible-type cap lamps worn by the four victims. Reportedly, the cap lamp worn by one of the victims was destroyed after being removed from the victim. The cap lamps worn by the other three victims were sent to the MSHA Approval and Certification Center for evaluation. The evaluation concluded that none of the submitted lamps were capable of igniting a methane/air or methane/coal dust/air mixture. (See Appendix E).

Recovery Operations

Following the occurrence, Edward C. Bryson called outside and informed Charlie James Poe, mine superintendent, that he thought a large roof fall had occurred and four men were missing. Poe instructed Bryson to investigate further and he immediately telephoned M. L. West, Subdistrict Manager, Norton, Virginia Subdistrict of MSHA, that a large roof fall had occurred in the mine and that four men were trapped and asked for assistance. West told Poe that Eugene Graham, Federal Coal Mine Inspection Supervisor, and Clarence A. Goode, Federal Coal Mine Inspector, were nearby at Big Branch Mining Company. Poe proceeded immediately to Big Branch Mining Company to obtain the assistance of Graham and Goode but they had left the area. When Poe returned to the No. 2 Mine, Doug Davies and Richard Davis, Surface Coal Mine Inspectors from MSHA's Harlan, Kentucky Office, who were in the immediate vicinity, had arrived at the mine. Poe told them what had happened and summoned their assistance. Carl Harber, section foreman on the 1 Left off "B" Mains (001) section, called Poe for instructions and Poe told him to deactivate the 001 section and take his crew to the other section and assist in efforts to find the missing men. Bryson and Harber split the men into two crews - one crew went up No. 1 entry and the other up No. 3 entry of 1 Left. Both crews encountered heavy smoke and difficulty in breathing, and had to return to fresh air. Work was begun immediately to restore ventilation controls in an effort to reach the men who were unaccounted for.

Upon arrival at the mine at 11:45 a.m., M. L. West, Subdistrict Manager, took charge of MSHA's activities. A check-in-and-out system was established and MSHA personnel were assigned to monitor the fans and began a log of events. West and William J. Taylor, Federal Coal Mine Inspector, entered the mine at 12:15 p.m., via mine car and battery-tractor, operated by Glenn Johnson, company employee. Upon arrival in the 1 Left entries, West withdrew the workmen who were restoring ventilation controls from the smoke and carbon monoxide contaminated atmosphere and established a fresh air base in the No. 1 entry, nine crosscuts outby the face.

Ventilation was measured in the fourth open crosscut outby the No. 3 entry face on the 002 section (3 Left) adjacent to the explosion area by William J. Taylor and found to be 9,180 cubic feet of air a minute. Ventilation as measured by Taylor at the fresh air base was found to be only 5,270 cubic feet of air a minute.

Two oxygen-breathing apparatus-equipped mine rescue teams from Stonega Division of Westmoreland Coal Company, arrived at the fresh air base at 2:30 p.m. The teams, captained by Jerry Fritz and Charles Barnette, were designated as No. 1 and No. 2 Team, respectively. (See Appendix D for listing of team members).

Due to high concentrations of carbon monoxide and methane inby the fresh air base, it was decided that mine rescue teams under oxygen would explore for fire or other ignition sources in two crosscut segments inby the fresh air base and that air locks were to be built before ventilation was restored in the area.

At 3:15 p.m., the No. 1 Mine rescue team from Westmoreland Coal Company, wearing oxygen breathing apparatus led by Jerry Fritz, Team Captain, left the fresh air base and began exploration inby. The team returned to the fresh air base at 3:59 p.m. and reported the following atmospheric conditions as measured in the No. 1 entry of 1 Left, two crosscuts (seven crosscuts outby entry face) inby the fresh air base: Carbon monoxide - 1 percent; methane - 5 percent; and oxygen - 19 percent. The No. 2 Mine rescue team from Westmoreland Coal Company led by Charles Barnette, Team Captain, went under oxygen at 4:09 p.m. and constructed air locks in the explored area. After the area was explored and cleared of harmful gases, the fresh air base was moved two crosscuts inby in the No. 1 entry.

While the move was in progress, W. R. Compton, District Manager; Ray G. Ross, Supervisory Mining Engineer; Frank Linkous, Technical Assistant, Virginia Division of Mines and Quarries; and Donald Dalton and Harold Hartsock, United Mine Workers of America representatives, arrived at the fresh air base and assisted in directing the recovery operations.

The procedure of exploring, constructing air locks, and moving up the fresh air base, was repeated until the explosion area was completely explored.

The No. 1 Mine rescue team led by Jerry Fritz, Team Captain, located the bodies of the four victims at 8:30 p.m. near the rubber-tired mine car in the No. 2 entry approximately 125 feet outby the face.

A mine rescue team (designated as No. 3 team) from Clinchfield Coal Company, Dante, Virginia, arrived at the fresh air base at 7:03 p.m., led by Milton Kiser, Team Captain, assisted in exploration and after the area was cleared of harmful gases, assisted in recovery of the victims.

Throughout the afternoon, evening, and night, employees of the company loaded and unloaded supplies, manned and extended the communication system, repaired and improved ventilation controls, operated battery tractors to transport rescue workers and gave willing assistance in every way possible. Also, operators and employees of nearby mines came to the mine and assisted in every way possible.

The four victims were found in the immediate area of the parked mine car. One victim was about four feet to the left front of the mine car and one was about two feet from the right rear of the mine car. The two other victims were at the rear of the mine car. All the victims' bodies were burned, with their clothing partially burned off but their bodies were not torn or mangled. None of the victims had attempted to use his self-rescuer. An open Scripto cigarette lighter was found in the mine car adjacent to the bodies. This lighter was taken and retained as evidence by Ray G. Ross, present District Manager, at 12:38 a.m. on July 8, 1977.

The bodies of the four victims were brought to the surface at 2:04 a.m., July 8, 1977, and transported via ambulance to the Lee General Hospital, Pennington Gap, Virginia, for examination by the county coroner. The bodies were accompanied to the hospital by Eugene Graham, Federal Coal Mine Inspection Supervisor, Clarence A. Goode and Donnie F. Short, Federal Coal Mine Inspectors. Escar C. Smith, Federal Coal Mine Inspector followed the ambulances to the hospital. On arrival at the hospital at 2:30 a.m., the aforementioned persons along with ten rescue squadsmen, and Glen Johnson, brother of one of the victims, witnessed Mrs. Mary Fannon, hospital nurse, and Dr. Henry Kinser, coroner of Lee County, Virginia, remove the victims' clothing and personal effects and examine the bodies. The victims' personal effects were placed in plastic bags and were given to the victims' families. See Appendix B.

MSHA and State representatives remained in the mine and patrolled the explosion area until 8:00 a.m., July 8, 1977, to insure that all harmful and explosive gases had been removed, and other representatives of MSHA re-entered the mine at 8:00 a.m. and again examined the explosion area and other areas of the mine for hazardous conditions. MSHA representatives also remained at the mine 24 hours a day until the underground investigative party entered the mine on Tuesday, July 12, 1977.

Mine Map

The Ventilation System and Methane and Dust Control Plan in effect at the mine was approved by the District Manager on January 4, 1977. The mine map, certified by Charles E. Metcalf, Certificate No. 54-77-3(a)899, Commonwealth of Virginia, with a last posting date of September 10, 1976, was certified on September 13, 1976. As submitted for the January approval, the map did not show mine development extending into 1 Left (explosion area), 2 Left, and 3 Left off "C" Mains.

The wall map in the mine office and the map on the 3 Left (002) working section, used as references during recovery operations, were inaccurate. The map obtained by MSHA personnel on the 3 Left (002) working section had been provided as an escape map for the mine and it was used as a reference map during recovery operations. This escape map was found to be inaccurate in that:

1. Sets of entries designated as 2 Left and 3 Left off "C" Mains were developed only approximately 1,170 and 1,390 feet respectively; however, the escape map indicated that 2 Left and 3 Left entries had been developed about 1,800 and 700 feet, respectively.
2. The inby connecting crosscut between 2 Left and 1 Left entries (explosion area) was the 14th crosscut outby the 1 Left entry faces; however, the map indicated that such crosscut was the fourth crosscut outby the faces.

Due to the lack of survey station(s) in the area, the aforementioned inby connecting crosscut between 2 Left and 1 Left entries (explosion area) was used as a reference point by rescue and recovery personnel. Following exploration of the area, four crosscuts inby such reference point, rescue and recovery personnel realized that the mine escape map was incorrect and were uncertain as to the extent of the unexplored workings inby.

A map, given to Inspector George R. Vass during the Safety and Health Inspection completed June 24, 1977, was represented as being an up-to-date map depicting mine development at that time. However, during MSHA's investigation, the map was found to be erroneous and mine management was asked to provide an up-to-date map for inclusion in this report. The corrected map, received at the mine office by writers of this report on January 31, 1978, is marked as being subject to change because the company's engineer is not certified. Reportedly, before an engineering firm will certify the map, a check survey of the mine will be conducted. Upon completion of the check survey, a certified map of the mine is to be submitted to MSHA to abate violations issued during this investigation. For comparison of the inaccurate map given to Inspector Vass and the corrected map received on January 31, 1978, see Appendix J.

Appendix I is a sketch of the explosion area showing information gathered by investigative personnel. It is presented in this report as a sketch - not a map - in that a certified map of the area was not available for inclusion in this report.

PART III

INVESTIGATION, DISCUSSION, AND EVALUATION

At 10:00 a.m., July 8, 1977, a meeting was held at the mine to discuss investigation of the explosion. Persons attending this meeting were as follows:

P and P Coal Company, Incorporated

Charlie James Poe

Clyde Poe

United Mine Workers of America

Edward Gilbert

Donald Dalton

Harold Hartsock

Virginia Division of Mines and Quarries

Frank A. Linkous

Mine Safety and Health Administration

Joseph O. Cook, Assistant Administrator

W. R. Compton, District Manager, Norton, Virginia

Ray G. Ross, Supervisory Mining Engineer

Edward Green, Special Assistant to Administrator

Robert Phares, Attorney, Solicitor's Office

James O. Carter, Mining Engineer

By implementing activities planned in the above meeting, MSHA, in conjunction with the Virginia Division of Mines and Quarries as part of the investigation, conducted interviews with four company officials and 31 mine workers in the Elementary School at St. Charles, Virginia, on July 13 - 15, 1977. Six mine workers were not able to attend the interviews on the above dates, and were interviewed separately by Merian O'Bryan, MSHA, on July 18, 19, 20, and 21, 1977. Also, at the request of Robert Araujo, Trial Attorney, Office of the Solicitor, Nolan White, Special Investigator, MSHA, conducted additional separate interviews with five employees of the P and P Coal Company, Incorporated on August 3 - 5, 1977. Information obtained through these interviews and the underground investigation is summarized in this report. Full transcripts of the interviews are available for examination at MSHA Headquarters, 4015 Wilson Boulevard, Arlington, Virginia 22203

A detailed examination of the area affected by the explosion was conducted by MSHA on July 12 - 14, 1977. The following persons participated in the investigation:

P and P Coal Company, Incorporated

Charlie James Poe	President and Mine Superintendent
Clyde Poe	Vice President
Joseph E. Wolfe	Attorney
Edward C. Bryson	Mine Foreman
Carl Harber	Section Foreman
Michael Graham	Transitman

United Mine Workers of America

Harold Hartsock	International Safety Inspector
Danny Davidson	International Safety Inspector
Floyd T. Mullins	Safety Coordinator, District 28
Alonzo Mullins	Assistant Safety Coordinator, District 28
Ronald Woodard	Mine Safety Committeeman
Dennis W. Hileman	Attorney, District 28

Virginia Division of Mines and Quarries

Robert D. Perrow	Assistant Attorney General for Commonwealth of Virginia
Frank A. Linkous	Technical Assistant
Lee B. Hughes	District Inspector
Hubert O. White	District Inspector
Edward O. Salyer	District Inspector
Fred Carty	District Inspector

Mine Safety and Health Administration

W. R. Compton	District Manager
M. L. West	Subdistrict Manager
James O. Carter	Mining Engineer
Frank C. Mann	Supervisory Mining Engineer
Elmer Simmons	Supervisory Mining Engineer
Merian O'Bryan	Supervisory Coal Mine Technical Specialist (Accident Prevention)
Frank C. Young	Mining Engineer
Wayland M. Jessee	Coal Mine Inspector
Nolan White	Coal Mine Inspector
Clarence A. Goode	Coal Mine Inspector
Robert Araujo	Trial Attorney, Dept of Labor
David Barbour	Trial Attorney, Dept of Labor

Following initial investigation of the explosion area, personnel of MSHA on July 18 - 22, 25, 26, 28, 29, August 1, 2, 5, 8, 9, 17 - 19, 24, 26, and 30, 1977, continued the investigation to include: A complete survey of the mine ventilation system; an electrical inspection; a safety and health inspection of the mine; and collection of mine dust samples in 1, 2, and 3 Left off "C" Mains. Other MSHA personnel, that were participants in this phase of the investigation are listed in Appendix F. In addition to the 103(f) and 104(a) Orders issued during recovery operations, one 104(c) (1) and seventy-four 104(b) Notices of Violation were issued during the investigation, survey, and inspections. A list of sections of Part 75, Title 30 CFR, that were violated are in Appendix G.

Factors Affecting the Explosion

Ventilation

Starting in November 1976, the 1 Left off "C" Mains (explosion area) was developed until mine management decided to stop the entries on April 28, 1977. Richard Robbins, superintendent of the No. 2 Mine until he resigned near mid-month of June 1977, stated in a July 14 interview that the entry panel was stopped as a result of bad top and low coal. Bad top was observed in the No. 2 entry face area of 1 Left during this investigation. Each active working section was ventilated by a separate split of air. Intake air was coursed through the main entries, consisting of the "A", "B", and "C" Mains to the intake side of each working section. In traversing through the mains, intake air was split just inby the one active overcast, located at the intersection of "B" and "C" Mains, with the left split being directed to the 1 Left off "B" Mains (001 section); thence to the main return on the south side of the mine back to the No. 1 fan. The second intake air split was directed through intake entries from the intersection of "B" and "C" Mains to the 3 Left off "C" Mains (002) section. In 3 Left off "C" Mains, No. 1 entry was utilized for intake, No. 2 entry contained the belt installation, and return air from the face area of 3 Left entries was intended to course across 2 Left off "C" Mains to the face area of 1 Left off "C" Mains (explosion area) and return via No. 3 entry of 1 Left to the main return; thence through returns on the north side of the mine to the No. 2 fan. The condition of the stopping line between No. 2 and No. 3 entry of 1 Left off "C" Mains permitted the air to be "short-circuited" to the return and thereby bypassed and did not adequately ventilate the inby portion of 1 Left entries.

Upon arrival on the 3 Left (002) section at 12:43 p.m., M. L. West, MSHA Subdistrict Manager, William J. Taylor, Federal Coal Mine inspector, and Glen Johnson, company employee, crawled to No. 1 entry 1 Left where they encountered Bryson and other workmen restoring ventilation controls in an effort to reach the men who were unaccounted for. West withdrew the workmen from the smoke and carbon monoxide contami-

nated atmosphere, West and Taylor returned to 3 Left section and measured the air at a location four crosscuts outby the face between Nos. 2 and 3 entries and found 6,288 cubic feet of air per minute passing through the crosscut. At West's direction, the No. 1 mine fan was shut down and a second air reading was taken at the same location and 9,180 cubic feet of air per minute was found passing through the crosscut. This was an increase of 2,892 cubic feet of air per minute. (It should be noted that neither determination established total air quantity being delivered to the 3 Left (002) section.) Based on the measured increase, surface personnel were directed that the No. 1 fan would remain stopped. West and Taylor proceeded to examine 1 Left entries for carbon monoxide, methane, and oxygen deficiency, and they progressed inby in No. 1 entry to a location nine crosscuts from the face of the entries where a fresh air base was established at 2:45 p.m. Examination of the mine atmosphere at the fresh air base revealed 0.10 percent of both methane and carbon monoxide with 5,270 cubic feet of air per minute being coursed through the crosscut. Air quantity to the fresh air base was limited as a result of leakage through temporary stoppings that had been erected and it was necessary to continually check and tighten the temporary stoppings to reduce leakage as recovery operations progressed. After mine rescue teams explored the inby areas of 1 Left off "C" Mains in two crosscut segments, temporary ventilation controls were established and the atmosphere contaminated by carbon monoxide, methane, and smoke was cleared. Upon reaching the victims at 8:30 p.m., lack of adequate air velocity and quantity delayed their recovery until 1:26 a.m., July 8, 1977.

Previous history of methane liberation in relatively small amounts is provided by a record of air samples taken in the immediate return of 002 section on March 31, 1977, which verified that 0.04 percent methane was present with a volume of 5,400 cubic feet of methane being liberated within a 24-hour period from the active 1 Left off "C" Mains. Such findings indicate that methane liberation was minimal when considered with adequate ventilation of the area. However, 5 percent methane was found by Westmoreland Coal Company's No. 1 Mine rescue team at a location seven crosscuts outby the face of No. 1 entry, 1 Left during recovery operations. This amount of methane indicates that the area was not ventilated prior to the explosion.

According to information supplied in an interview with Edward Bryson, mine foreman, the stoppings located between Nos. 2 and 3 entries in 1 Left off "C" Mains (old 002 section) were maintained to direct return air from the active 3 Left off "C" Mains section to ventilate the inby areas of 1 Left entries. Bryson indicated that two of the stoppings were not permanent in that line brattice material was used. During recovery operations and during the investigation, it was found that many stoppings between Nos. 2 and 3 entries in 1 Left had been wholly or partially removed. Some were blown out by explosion forces as evidenced by the position of blocks found in the area; however, some

had been removed prior to the explosion. (In summarizing findings, numbers have been arbitrarily assigned to the stoppings in 1 Left off "C" Mains and reference will be made according to those assigned numbers.) Although they showed no sign of explosive forces, stoppings, numbered as 0, 1, 3, 5, 7, 9, and 14 were only partially in place when examined by members of the investigation committee. Brattice cloth material (new) was found covering some openings; however, the openings at stopping Nos. 0, 3, 5, 7, and 9 were repaired by investigative personnel as they examined the area after the explosion. Further, Paul Bishop, extra man on 3 Left section, stated that the No. 14 stopping (13 crosscuts from the face of 1 Left entries) had been partially removed to retrieve a rock dusting machine from the No. 3 (return air) entry of 1 Left. MSHA investigators found the stopping partially removed. Bishop further stated that line brattice material was used to cover the opening after the machine was removed. It is believed that stoppings Nos. 15 through 20 were blown out by forces of the explosion; however, stoppings numbered 22 through 25 were either constructed of brattice cloth material or were not in place at the time of the explosion in that blocks necessary to reconstruct the stoppings were not found in the area.

The lack of permanent stoppings Nos. 22 through 25, the partial stoppings Nos. 0, 1, 3, 5, 7, 9, and 14, and the presence of methane in excess of 5 percent detected by the mine rescue team during recovery operations confirm that the inby portion of 1 Left off "C" Mains was not ventilated. See Appendix I.

In interviews conducted on July 14, 1977, Carl Harber, section foreman, and Eugene Parsons, timberman, both stated that on July 6, 1977, one day prior to the explosion, an interruption of ventilation was experienced on the 1 Left off "B" Mains (001) section. Further discussion with Harber revealed that the interruption was caused by leakage through the temporary stoppings and the problem was corrected by repairing the temporary stoppings which had been constructed of brattice material.

Methane

Methane was first detected in the mine ventilating current on February 28, 1973, by a bottle sample, collected by Thomas B. Slomp, Coal Mine Inspector, which showed 0.03 percent methane in the immediate return of 2 Right section. Analysis of the sample indicated a liberation of 7,600 cubic feet of methane in 24 hours. On October 15, 1973, Gary E. Baker, Coal Mine Inspector, collected a bottle sample in the immediate return of 1 Left off 2 Right which showed 0.02 percent methane and a liberation of 2,600 cubic feet of methane in 24 hours. Although the 2 Right entries of the mine are about 4,800 feet from the explosion area, a summary of methane findings and subsequent sealing and unsealing of the area is provided. Following the aforementioned methane finds, 2 Right entries were deactivated and mining proceeded to virgin areas inby. A mine atmosphere bottle sample collected by

Gary E. Baker, Coal Mine Inspector, on December 13, 1973, from the abandoned 2 Right entries showed 1.53 percent methane. A bottle sample collected in the immediate return of 4 Right section by Baker on February 5, 1974, showed 0.04 percent methane and a liberation of 9,500 cubic feet of methane in 24 hours.

In February 1974, 2 Right entries were sealed and pipes installed to permit monitoring of the mine atmosphere behind the seals. Air sample analysis and Inspector Baker's detection instrument indicated 1.24 and 2.5 percent methane, respectively, in samples drawn from behind the seals on February 27, 1974. A bottle sample collected in the main return near 4 Right overcast by Baker on February 26, 1974, showed 0.05 percent methane and liberation of 22,000 cubic feet of methane in 24 hours. In discussion between company and MSHA officials, it was decided to ventilate the 2 Right area. After completing this action, subsequent bottle samples in 2 Right bleeder entries indicated methane ranging from 0 to 0.38 percent. A bottle sample taken 50 feet inby the mine fan by Baker on December 16, 1974, showed 0.04 percent methane and a liberation of 57,000 cubic feet of methane in 24 hours.

Recent history of methane liberation on the active working sections indicated that Inspector George R. Vass collected bottle samples of the mine atmosphere from the immediate return of the 2 Left section off "C" Mains on March 24, 1977, and the 1 Left entries section (explosion entries) on March 31, 1977. Analysis of the air samples showed 0.01 and 0.04 percent methane and methane liberations of 1,500 and 5,400 cubic feet within a 24-hour period for the 2 Left and 1 Left sections, respectively. The 1 Left entries (explosion area) were deactivated on April 28, 1977, because of bad roof and low coal according to Richard Robbins, Superintendent, at that time. On June 15, 1977, Vass collected bottle samples from the return side of each working section which contained 0.02 and 0.06 percent methane and methane liberations of 2,800 and 7,900 cubic feet within a 24-hour period for the 3 Left (002) section off "C" Mains and the 1 Left (001) section off "B" Mains, respectively. A bottle sample taken by Vass on June 22, 1977 at the inby end of the line curtain on 3 Left (002) section showed 0.3 percent of methane. Mr. Charlie James Poe, Superintendent, stated that he observed Mr. Vass make methane tests on June 22, 1977, and that he stopped coal production to instruct the workmen about installation of line curtain, including safety talk on dealing with methane.

During recovery operations on July 7, 1977, the No. 1 Mine rescue team from Stonega Division, Westmoreland Coal Company detected 5 percent of methane in No. 1 entry of 1 Left off "C" Mains seven crosscuts outby the entry face. On August 10, 1977, Wayland M. Jessee and Nolan White, Coal Mine Inspectors, visited the 1 Left entries (explosion area) to attempt to make a determination as to the extent of flame generated by the explosion. On this day, only a slight movement of air could be detected as determined by chemical smoke. When tested at a point 12 inches from the roof, face, and rib, by Jessee and White, using a

MSA methane detector, 1.0, 0.8, and 0.2 percent of methane was detected in the inby room neck off No. 1 entry, the No. 1 entry face and the No. 3 entry face, respectively, in the 1 Left entries. Jesse and White discovered a crack in the mine floor, approximately 1-inch in width in the No. 2 entry, eight crosscuts outby the face. When tested by MSA methane detector at a point 12 inches from the mine floor, methane could not be detected; however, when the intake port of the methane detecting device was inserted into the crack in the mine floor, 5 percent of methane was detected.

Preshift examinations of the mine were recorded as being made by a certified examiner before the first operating shift each day. However, such records list only the active working sections and do not show that idle or abandoned areas of the mine are examined before men are permitted to enter and work. According to his statements, Edward C. Bryson, mine foreman and preshift examiner, did not examine the 1 Left entries (explosion areas) as part of the preshift examination on July 7, 1977. One of the victims (Harold R. Wells, foreman) was a certified preshift examiner; however, the investigation disclosed, at the time of the explosion, none of the victims had the necessary instruments to make tests for methane or oxygen deficiency. According to statements of Carl Lanningham, repairman; Chad Blevins, repairman's helper, and Randy Fisher, battery-tractor operator, they, along with the four victims, arrived on the 3 Left (002) section about 8:20 a.m., on the day of the explosion. Harold R. Wells (victim), foreman, assisted Lanningham and Blevins in carrying repair parts and in beginning repairs on the Wilcox continuous mining machine while Fisher, Johnson (victim), Perkins (victim), and Tester (victim) began performing work on the 002 section belt conveyor. All of the aforementioned persons remained on the 002 section until Bryson arrived on the section at about 9:30 a.m. Bryson instructed Wells to take Fisher, Johnson, Perkins, and Tester to the 1 Left entries (explosion area) and recover the continuous mining machine augers and belt structure. According to Fisher, he and the four victims entered the area at the same time, which would indicate that Wells could not have examined the 1 Left section for methane, oxygen deficiency and other hazards before they entered the area. On July 6, 1977, the day prior to the explosion, Randy Fisher and Bobby Ridings, scoop operator, along with Wells, Tester, and Johnson (victims) worked in the 1 Left entries recovering belt structure about four or five crosscuts outby the ignition point. According to statements of Ridings and Fisher, they entered the 1 Left entries as a group and they did not know whether or not the area had been examined for methane, oxygen deficiency and other hazards prior to their entering the area. The preshift, onshift, and daily record book bears no record of the 1 Left entries having been examined on July 6 and 7, 1977. Further, such records were incomplete for June 22, 23, 24, 27, 28, and July 1, 1977, in that the time of the required examinations was not shown. Also according to statements of Charles Coleman and Carl Harber, foremen, weekly examinations for hazardous conditions in idle and abandoned workings had not been made for the period of June 14 through June 28, 1977.

Coal Dust

During the last Federal inspection of the mine, completed June 24, 1977, mine dust samples were not collected because the mine surfaces were "too damp." However, a Notice of Violation of section 75.400, 30 CFR 75, was issued for an accumulation of loose "wet" coal and float coal dust beneath the conveyor belt beginning at the belt drive and extending inby to the belt tailpiece, a distance of about 1,200 feet. During the investigation a total of eight Notices of Violation of section 75.400, 30 CFR 75, were issued for accumulations of loose coal and/or float coal dust at various locations throughout the mine covering distances ranging from 40 to 1,000 feet in length. During the investigation, 146 mine dust samples were collected in the 1 Left, 2 Left, and 3 Left entries. Of these samples, 88 were damp to wet. After the damp and wet samples were dried and analyzed, the average incombustible content was approximately 52 percent. The average incombustible content of the remaining 58 samples was 57 percent (See Appendix K for sample location and analysis). Two Notices of Violation of section 75.403, 30 CFR 75, were issued for inadequate rock dust applications along the No. 2 belt conveyor and the 3 Left (002) section belt conveyor. The mine surface in the 1 Left entries (explosion area) for a distance of about 500 feet outby the faces was wet with from three to six inches of mud on the mine floor. Outby this area, portions of the 1 Left entries were damp. The wet and damp conditions along with rock dust applications prevented the explosion from spreading. Traces of coke in some of the dust samples showed that coal dust entered into the explosion only to a minor degree.

Electric Equipment

Except for permissible-type electric cap lamps manufactured by Koehler Manufacturing Company, Approval No. 6D-30, worn by the victims, no electric equipment was in the explosion area at the time of occurrence. Three lamps worn by the victims, including one having a badly damaged headpiece, were obtained and sent to MSHA's Approval and Certification Center, Triadelphia, West Virginia, for testing. The tests concluded that the lamps were not capable of igniting a methane/air or methane/coal dust/air mixture. A Koehler cap lamp worn by one of the victims appeared to be in good condition when removed from his body by the County Coroner. Reportedly this cap lamp, along with other personal effects of the victim, were destroyed by a member of the victim's family. A copy of the report from the Approval and Certification Center is in Appendix E.

Flame

The presence of heat or flame in the 1 Left off "C" Mains was evidenced by: the burned condition of the bodies, burned and melted brattice material, and scorched pieces of paper rock dust bags.

Nine samples of mine dust collected in the 1 Left entries revealed traces of coke in the Nos. 1, 2, and 3 entries for a distance of about 600,

800, and 380 feet outby the face of each respective entry. The presence of coke in mine dust samples is the criterion by which the extent of flame was fixed. See analysis of mine dust samples in Appendix K.

Forces

Forces from the explosion dislodged timbers in the Nos. 1, 2, and 3 entries in 1 Left beginning at each entry face and extended outby for approximately 600, 650, and 900 feet, respectively, and ten permanent stoppings in 1 Left were blown out. Forces generated by the explosion raised dust clouds which extended from 1 Left into the 2 Left and 3 Left entries off "C" Mains.

Fisher, located in 2 Left about 1,200 feet from origin of the explosion, felt a strong concussion and described the dust as being so thick that he could hardly see. Bryson, Lanningham, and Blevins felt the concussion in 3 Left, about 1,700 feet from the explosion origin, and saw the dust cloud generated by the explosion. Lester Wade, belt head attendant, located at the No. 3 belt drive about 3,500 feet from the explosion origin, stated that he was blown down by the explosion forces. He further stated that pasteboard boxes, etc., were blown up the belt line, that dust was in suspension, and that a check curtain located near the No. 3 main belt drive was blown down. The production crew on the 001 section, about 5,400 feet from the explosion origin, described the explosion as a vibrating, high-frequency sound, piercing to the ears. A slight disruption of ventilation was experienced on the 001 working section.

Smoking

Eugene Parsons and Glen Johnson (employees) stated that they had seen unidentified persons smoke in underground areas of the mine. Further, Edward Phillips (employee) refused to answer questions when asked if he had seen someone smoke in the mine and 16 other workmen stated that they had seen evidence of smoking underground in the form of empty cigarette packs, cigarette butts and/or match stems. Mine record books showed that searches for smokers' articles had been made. However, 14 other employees who had been employed at this mine for periods of time ranging from one month to five years stated that they had never been searched for smokers' articles before going underground. Several other employees stated that a lengthy time period had elapsed since they were last searched for smokers' articles. Recent efforts by the company personnel regarding the searching program consisted of intermittent verbal reminders to the miners to leave smokers' articles outside of the mine.

During the investigation at 12:38 p.m., July 8, 1977, MSHA investigators found an open, burned, soot and carbon-blackened cigarette lighter in the mine car which was in the vicinity where the four victims were

found. This cigarette lighter is in custody at MSHA district headquarters in Norton, Virginia. Also MSHA investigators observed the Lee County coroner, Dr. Henry Kinser, assisted by Mrs. Mary Fannon, nurse, remove the personal effects from the victims. The personal effects of two of the victims included a blue disposable cigarette lighter, five cigarettes and five partially smoked cigarettes. See Appendix B listing personal effects of victims.

The following information obtained during the investigation clearly indicates that smoking underground was a common practice and that the company's searching program designed to prevent smokers' articles from being taken underground was ineffectively conducted:

1. Sixteen workmen stated that they had observed evidence of cigarette packs, cigarette butts and match stems underground.
2. Fourteen workmen stated that they had never been searched for smokers' articles before going underground.
3. Two employees stated that they had observed persons smoking underground.
4. A cigarette lighter was found at the scene of the accident by MSHA investigators.
5. A cigarette lighter, five whole cigarettes, and five partially smoked cigarettes were removed from two of the victims' clothing by the county coroner.

The cigarette lighter found in the mine car located at the scene of the accident was sent to the Federal Bureau of Investigation, Identification Division, Latent Fingerprint Section, Washington, D.C. 20537, for examination for fingerprints. The F.B.I. report is in Appendix C.

Point of Origin

MSHA investigators conclude that the explosion originated at or near the rubber-tired mine car located in the No. 2 entry 1 Left, approximately 125 feet outby the face.

Potential Ignition Sources

MSHA investigators conclude that the most probable ignition source was a cigarette lighter found at the scene of the accident. A search of the accident area revealed no other smoker's articles.

The other potential ignition sources that were considered were as follows:

1. The only source of electric energy in the 1 Left entries at the time of the explosion was four electric (battery-type)

cap lamps that were worn by the victims of the explosion for portable illumination. Three of these electric cap lamps were examined and tested by personnel at MSHA's Approval and Certification Center, Triadelphia, West Virginia. One of the electric cap lamps worn by one of the victims was misplaced and was therefore unavailable for examination and testing. The purpose of such tests was to determine if any of the electric cap lamps could have provided the ignition source. The Approval and Certification Center's findings eliminated the electric cap lamps as an ignition source.

2. Frictional sparks created by metal rubbing against the roof or floor and roof falls striking metal. Except for the rubber-tired mine car, the only metal object found in the explosion area was a 6-foot auger 24 inches in diameter. The investigation did not reveal any evidence to indicate that the auger was being moved at the time the explosion occurred. Roof falls were not observed in the vicinity of the mine car or metal auger. Therefore frictional sparks were eliminated as ignition sources.

PART IV

FINDINGS: SUMMARY OF EVIDENCE

The findings in this Part are derived from the following sources: conditions observed in the mine by MSHA personnel during the recovery operations and the investigation following the explosion; information obtained from the mine rescue teams and other persons taking part in the recovery operations and the investigation; information obtained from special tests conducted by MSHA; information obtained from mine records and previous Federal coal mine inspection reports; and information obtained from company officials and miners by attorneys of the Solicitor's Office through interviews. After analysis of all available evidence, MSHA investigators have summarized their findings below.

1. From information supplied during interviews of company officials and employees, MSHA investigators conclude that the explosion occurred about 10:00 a.m., July 7, 1977.
2. An examination of the mine record books and information obtained in interviews after the explosion revealed that a preshift examination had not been made in the 1 Left off "C" Mains prior to the victims entering the area. One of the victims was certified to make preshift examinations; however, neither a methane detector nor a flame safety lamp was found with or on the victims or in the area.
3. Interviews with mine employees indicated that it was not unusual for miners to enter inactive areas to recover equipment. Mine preshift examination books contained no record to indicate that preshift examinations were conducted in such areas prior to miners entering therein to work.
4. The investigation revealed that weekly examinations for hazardous conditions in idle and abandoned workings had not been made for the period of June 14 through June 28, 1977, as established through interviews with Carl Harber and Charles Coleman, section foremen. Edward C. Bryson, mine foreman, stated that he examined the 1 Left off "C" Mains on July 5, 1977, and did not detect methane or observe any hazardous condition. However, he did not record the results of his examination in mine record books and MSHA investigators were unable to find evidence such as dates, time and initials in the face areas of the Nos. 1, 2 and 3 entries of 1 Left.
5. This occurrence was primarily a methane explosion. Coal dust entered into propagation only to a minor degree as evidenced by traces of coke in nine mine dust samples collected in 1 Left off "C" Mains after the explosion.

6. The mine floor was wet and muddy in the 1 Left off "C" Mains (explosion area) and the roof and ribs were damp.
7. During the last Federal inspection of the mine prior to the explosion, Inspector Vass determined mine surfaces to be "too damp" to conduct a mine dust sample survey.
8. Based on evaluations made underground, the No. 1 mine fan was shut down during recovery operations to increase the quantity of ventilation reaching the explosion area in 1 Left off "C" Mains.
9. Only 5,270 cubic feet of air per minute was available at the fresh air base which was located nine crosscuts outby the faces of the 1 Left entries off "C" Mains.
10. As recovery operations progressed further inby, loss of ventilation by leakage through temporary stoppings further depleted the available air to the extent that only a perceptible movement of air was available to complete the recovery operations.
11. During the last Federal inspection completed June 24, 1977, Inspector George R. Vass determined that 9,882 and 9,100 cubic feet of air per minute was being coursed through the last open crosscut of the 1 Left off "B" Mains (001 section) and 3 Left off "C" Mains (002 section), respectively.
12. All forces emanated from the area of the rubber-tired mine car in No. 2 entry of the 1 Left off "C" Mains.
13. The four victims were found in the immediate area of the parked mine car (See Appendix I). Their bodies and clothing were badly burned. One victim did not have a self-rescuer and none of the three victims carrying self-rescuers had attempted to use them.
14. The 1 Left off "C" Mains was developed about 2,100 feet and abandoned on April 28, 1977, reportedly, because low coal and bad roof were encountered.
15. The victims entered 1 Left off "C" Mains on the morning of July 7, 1977, to recover equipment left behind when the production equipment was removed from the area.
16. Prior to the explosion, several temporary stoppings between the Nos. 2 and 3 entries of 1 Left had been partially removed and permanent stoppings had never existed in the second, third, fourth and fifth open crosscuts outby the face; thereby short-circuiting the air from the face areas of 1 Left section off "C" Mains.

17. In December 1973, a bottle sample of the mine atmosphere taken from the abandoned 2 Right off "A" Mains contained 1.53 percent methane.
18. In February 1974, 2 Right off "A" Mains was sealed. Air sample analysis and the inspector's methane detection instrument indicated 1.24 and 2.5 percent methane, respectively, in samples drawn from behind the seals on February 27, 1974.
19. On June 15, 1977, Inspector George R. Vass collected bottle samples from the return side of each working section containing 0.02 and 0.06 percent methane. These samples indicated that 2,800 and 7,900 cubic feet of methane was liberated within a 24-hour period for 3 Left off "C" Mains (002) and the 1 Left off "B" Mains (001) section, respectively.
20. An air sample taken on June 22, 1977, by Inspector Vass, at the inby end of the line curtain on 3 Left off "C" Mains showed 0.3 percent of methane. During an interview Mr. Charlie James Poe, superintendent, told investigators of having observed Vass making a methane test, finding 0.2 percent methane, and having stopped coal production to instruct workmen about installation of line curtain, including a safety talk on dealing with methane.
21. During recovery operations Westmoreland Coal Company's mine rescue team detected 5 percent methane in No. 1 entry, 1 Left off "C" Mains.
22. During the investigation MSHA investigators detected methane escaping from a crack in the mine floor approximately eight crosscuts outby the face of No. 2 entry, 1 Left off "C" Mains.
23. Company engineering data indicated that from the intersection of 1 Left entries with "C" Mains to a location about 280 feet outby the faces in 1 Left, elevation increased 63.7 feet. Methane, being lighter than air, would, in the absence of adequate ventilation, migrate toward the face areas of 1 Left off "C" Mains.
24. Methane accumulated in the 1 Left entries because the quantity and velocity of air was not sufficient to dilute, render harmless, and carry away the methane being liberated.
25. An open, burned, soot-and-carbon-blackened cigarette lighter was found in the mine car adjacent to the victims. A package containing two cigarettes was found on one of the victims and a blue disposable cigarette lighter, five partially smoked cigarettes and a package containing three cigarettes were found on another of the victims.

26. Apparently smoking underground was a common practice at the No. 2 Mine as the interviews conducted during the investigation revealed that several employees had occasionally found partially smoked cigarettes, empty cigarette packages, and/or match stems in the mine.

27. Eugene Parsons (timberman) stated that he had observed two unidentified persons smoking in the underground portion of the mine. Also, Glenn Johnson stated that he had seen someone smoke underground.

28. Mine record books show that searches for smokers' articles were conducted; however, interviews with employees indicate that many miners had never been searched for smokers' articles before going underground.

29. Except for the battery cap lamps worn by the victims there was no source of electric energy in the 1 Left section off "C" Mains at the time the explosion occurred.

30. Three cap lamps worn by the victims, including one on which the headpiece had been badly damaged, were examined by MSHA's Approval and Certification Center who concluded that none of the lamps were capable of igniting a methane/air or methane/coal dust/air mixture.

PART V

CONCLUSION

MSHA investigators conclude that the explosion resulted from insufficient ventilation in the 1 Left section off "C" Mains. Missing ventilation controls (stoppings) caused the air to be short-circuited three crosscuts outby the faces and allowed methane which was liberating from the faces and from fractures in the mine floor to accumulate in the unventilated areas of the 1 Left section.

Contributing to the explosion were: the failure to conduct a pre-shift examination of the 1 Left section prior to permitting a crew of men to enter the area to recover supplies; failure to conduct an onshift examination for methane in this section on the day of the explosion (July 7, 1977); and evidence indicates that a weekly examination for methane and other hazards was not made in the 1 Left section during the week prior to the explosion. Therefore, the accumulations of methane were not detected but continued to increase and accumulate to the explosive range (5 - 15 percent).

Also a contributing factor was the ineffective manner in which the company's approved searching program was conducted. Evidence indicates that smoking was practiced underground. An open cigarette lighter was found at the scene of the accident and a cigarette lighter and cigarettes were found in the clothing of one of the victims and cigarettes were found in the clothing of another victim.

The explosive methane/air mixture was most probably ignited by the cigarette lighter that was found in the mine car at the scene of the accident.

APPENDIX A

Victims of Mine explosion, P and P Coal Company, Inc .

July 7, 1977

Name and Social Security Number	Age	Sex	Job Classification	Experience at that Job	Total Mining Experience	First Aid Training	Mine Rescue Training
Harold Johnson 228-60-2260	33	M	Miner helper	2 years	7 years	6/11/76	6/11/76
Billy W. Perkins 405-66-8573	30	M	Jack setter	3 years	3 1/2 years	6/11/76	6/11/76
Daniel Tester 230-68-9491	28	M	Timberman	3 years	3 years	6/11/76	6/11/76
Harold R. Wells 229-72-0353	27	M	Foreman	6 months	7 years	----	----

APPENDIX B

LIST OF PERSONAL EFFECTS OF VICTIMS

The bodies of the four victims arrived via ambulance at the Lee General Hospital, Pennington Gap, Virginia, at 2:30 a.m., July 8, 1977. The bodies were taken to the hospital emergency room where Eugene Graham, Coal Mine Inspection Supervisor; Donnie F. Short, Clarence A. Goode, and Escar C. Smith, Coal Mine Inspectors; Jack Edward Warfe, Tom Cooper, James Hensley, David Horner, Edward Kilgore, Larry Holbrook, Kenneth Ellis, Chester Stapleton, Jimmy Osborne, and William Lee Miller, rescue squadsmen; and Glen Johnson, brother of Harold Johnson, victim, witnessed Mrs. Mary Fannon, hospital nurse, and Dr. Henry Kinser, Coroner of Lee County, Virginia, remove the victims' clothing and personal effects, and examine the bodies. Squadsmen Warfe and Holbrook aided Nurse Fannon and Dr. Kinser in removing the victims' clothing. The following is a listing of articles removed from each victim's body:

Billy W. Perkins

Cap Lamp	Handkerchief
Mine belt and identification plate	Billfold
Knee pads	Knife
Boots	Socks
Coveralls	Leg bands
Watch	Pants and shirt
Keys	Shorts
Undershirt	Self-rescuer
Small belt	Five quarters
False teeth	

Harold R. Wells

Knee pads	Mine belt
Boots	Undershirt
Coveralls	Cap lamp
Watch	Shorts

Harold Johnson:

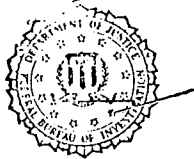
Knee pads	Cap lamp
Name plate	Watch
Socks	Shirt
Coveralls	Gloves
Insulated underpants	Mine belt
Self-rescuer	Boots
2 Kool cigarettes in pack	Pants
Undershirt	Jacket
Ring	

APPENDIX B (continued)

Daniel Tester

Ring	Mine Belt
Boots and socks	Shorts
3 Kent cigarettes in pack	Five partially smoked cigarettes
Knee pads	Self-rescuer
Pants and jacket	T-shirt
Blue disposable cigarette lighter	Cap lamp

The personal effects removed from each body were placed in a separate bag and were given to the victims' families.

**FEDERAL BUREAU OF INVESTIGATION**

Washington, D. C. 20537

REPORT

of the

APPENDIX C

IDENTIFICATION DIVISION**LATENT FINGERPRINT SECTION**

YOUR FILE NO.
FBI FILE NO. 32-21997
LATENT CASE NO. B-50407

August 9, 1977

TO: Office of the Solicitor
Division of Mine Health and Safety
U.S. Department of the Interior
4015 Wilson Boulevard
Arlington, Virginia 22203

RE: Attention: Mr. Moody R. Tidwell
Deputy Associate Solicitor
UNKNOWN SUBJECT(S);
NUMBER 2 MINE
P & P COAL COMPANY
JULY 7, 1977
MINE EXPLOSION

REFERENCE: Letter and specimen delivered to the Latent Fingerprint
Section on August 3, 1977
EXAMINATION REQUESTED BY: Addressee
SPECIMENS: One cigarette lighter

This report confirms and supplements information
furnished by telephone to your department on August 4, 1977.

The lighter was examined, but no latent prints of
value are present or were developed.

The lighter is being returned separately.

Assistant Director, Identification Division

THIS REPORT IS FURNISHED FOR OFFICIAL USE ONLY

APPENDIX D

MINE RESCUE TEAMS THAT PARTICIPATED IN RECOVERY OPERATIONS

The No. 1 mine rescue team, captained by Jerry Fritz, Stonega Division, Westmoreland Coal Company, Big Stone Gap, Virginia, consisted of the following team members:

Wendell Collinsworth	Gerald Tate
Hubert Kimberlin, Jr.	Gale Francis
Louis Henegar	Ray Carnes

The No. 2 mine rescue team, captained by Charles Barnette, Stonega Division, Westmoreland Coal Company, Big Stone Gap, Virginia consisted of the following team members:

Ronnie Willis	Allen Wolfe
Lloyd Robinette, Jr.	Randy Barnette
Matt Smith	Gary Crisp

The No. 3 mine rescue team, captained by Milton Kiser, Clinchfield Coal Company, Dante, Virginia, consisted of the following team members:

Edward Coffey (team trainer)	David Prater
Wayne Fields	Vernon Johnson
Bobby Tompa	Harold Neal Phillips
Steven Stewart	

APPENDIX E

U.S. DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
APPROVAL AND CERTIFICATION CENTER

Box 201B, Route 1
Industrial Park Blvd.
Triadelphia, West Virginia 26059



JUN 19 1978

MEMORANDUM FOR:

RAY G. ROSS
DISTRICT MANAGER, COAL MINE HEALTH
AND SAFETY DISTRICT 5

Steve Sawyer

FROM:

STEPHEN G. SAWYER
CHIEF, APPROVAL AND CERTIFICATION CENTER

SUBJECT:

Evaluation of the ignition capability of three Koehler
cap lamps, Approval No. 6D-30, from the P & P Coal
Company

Our Intrinsic Safety and Instrumentation Branch has completed tests on the subject cap lamps. In a sentence, we conclude that the submitted cap lamps were not capable of igniting a methane-air or methane-coal dust-air mixture. Documentation on the tests we conducted is given below. If you have any technical questions on said tests, feel free to contact Mr. Robert Lenart of the Intrinsic Safety and Instrumentation Branch (phone number: 412-621-4500, Extension 357), under whose direction the tests were conducted.

Since there were no distinguishing marks on these cap lamps, they were arbitrarily numbered when received, as follows:

1. Cap Lamp No. 1, Koehler Manufacturing Company, Approval No. 6D-30. This lamp was being used by Randy Wells on the day of ignition.
2. Cap Lamp No. 2, Koehler Manufacturing Company, Approval No. 6D-30.
3. Cap Lamp No. 3, Koehler Manufacturing Company, Approval No. 6D-30.

VISUAL EVALUATION:

A visual examination of the cap lamps revealed the following findings:

Cap Lamp No. 1:

1. The bulb was intact so that the hot filament was never in contact with an explosive gas or dust mixture.
2. The bulb ejection mechanism was operational. This was made evident by the fact that the bulb had to be pushed into the socket and held there in order to get it to turn on.
3. The switch in the headpiece was operational.
4. The lamp cord was not broken or frayed.

Cap Lamp No. 2:

1. Except for the broken lens on the headpiece and missing bulb, the cap lamp was in operating condition.
2. The bulb ejection mechanism was operational. This was made evident by the fact that a bulb had to be pushed into the socket and held there in order to get it to turn on.
3. The switch in the headpiece was operational.
4. The lamp cord was not broken or frayed.

Cap Lamp No. 3:

1. The cap lamp was in operating condition.
2. The bulb was intact so that the hot filament was never in contact with an explosive gas or dust mixture.
3. The bulb ejection mechanism was operational. This was made evident by the fact that the bulb had to be pushed into the socket and held there in order to get it to turn on.
4. The switch in the headpiece was operational.
5. The lamp cord was not broken or frayed.

IGNITION TESTS:

Even though no spark ignition sources were found, the following tests were conducted on each cap lamp:

Test No. 1 - Bulb Contact Spark Test

In order to determine the ignition potential of a spark which might occur at the bulb contacts when the ejection mechanism operates, the bulb of each cap lamp was repeatedly pushed in and out of the bulb socket, making and breaking the circuit 1000 times in the presence of between eight and nine percent methane-in-air. No visible sparks were produced and no ignitions of the test gas occurred. Since the bulb of cap lamp No. 2 was missing, the bulb from cap lamp No. 1 was used in the headpiece from cap lamp No. 2 for this test.

Test No. 2 - Bulb Contact Spark Test

The bulb was held in contact with the socket terminals and the headpiece switch was operated 1000 times in the presence of between eight and nine percent methane-in-air. No visible sparks were produced, and no ignitions of the test gas occurred. Again the bulb

APPENDIX E Continued

of cap lamp No. 1 was used to test the headpiece of cap lamp No. 2. In both Tests 1 and 2, the sparking contacts were carrying approximately one amp with an open circuit voltage of approximately 4.2 volts.

Test No. 3 - Wire Strand Spark Test

Strands of the cap lamp cord were brushed against each other to simulate a direct short in the lamp cord. At least 1000 sparks were made in eight to nine percent methane-in-air mixtures. No ignitions of the test gas occurred. The batteries were charged before this test was conducted.

Test No. 4 - Headpiece Temperature Test

A five volt source was applied to the cap lamp cord and the lamp was turned on. After approximately one hour, the surface temperature of the headpiece was measured. The highest temperature attained was less than 60 C. This is well below the ignition temperature of a coal dust layer (approx. 150 C). The bulb surface temperature was less than 85 C.

Since the bulb of cap lamp No. 2 was missing, there was a possibility that the bulb envelope was broken and the hot filament exposed to an explosive concentration of methane-in-air. For this reason, an additional test was performed on cap lamp No. 2 to test the effectiveness of the bulb ejection mechanism when the bulb envelope is broken.

Test No. 5 - Bulb Ejection Mechanism (Cap Lamp No. 2 only)

Twenty-five General Electric, BM-30A, bulbs were tested in the following manner:

1. Each bulb was inserted into the headpiece of cap lamp No. 2 and depressed to make electrical contact in the socket.
2. The headpiece was filled with a methane-air mixture ranging from 7.5% to 8.5% methane by volume.
3. The lamp envelope was broken, using care not to damage the lamp filaments.
4. A fully charged battery was used as the power source.

In each test the bulb ejection mechanism functioned properly and no ignitions of the test gas occurred.

Conclusion:

The submitted cap lamps were not capable of igniting a methane-air or methane-coal dust-air mixture.

APPENDIX F

Listing of MSHA personnel that were participants in some phase(s) of the investigation:

Alfred T. Bowles	Coal Mine Inspection Supervisor
William J. Taylor	Coal Mine Inspector
Bernie E. Barnette	Coal Mine Inspector (Ventilation)
James V. Bowman	Supervisory Coal Mine Technical Specialist (Ventilation)
Eugene W. Graham	Coal Mine Inspection Supervisor
James A. Baker	Coal Mine Inspector (Roof Control)
William H. Strength	Coal Mine Inspector
Donnie F. Short	Coal Mine Inspector
Nickie E. Brewer	Coal Mine Inspector
Ralph P. Reasor	Coal Mine Inspector
Kenneth F. Owens	Coal Mine Inspector
Douglas Davies	Surface Coal Mine Inspector (Harlan, Kentucky Field Office)
Richard L. Davis	Surface Coal Mine Inspector (Harlan, Kentucky Field Office)
John W. Stevenson	Supervisory Mining Engineer (Pittsburgh, Pennsylvania)
Michael L. Jackson	Electrical Engineer
Donald L. Collier	Electrical Engineer
Joseph R. Brown, Sr.	Coal Mine Inspector (Electrical)
Jimmy A. Tankersley	Coal Mine Inspector
Daniel G. Bailey	Coal Mine Inspector
Charles R. Reece	Coal Mine Inspector
George R. Vass	Coal Mine Inspector
Kenneth L. Card	Coal Mine Inspector
Arvil C. Gallihar, Jr.	Coal Mine Inspector
Paul Bobrosky	Acting Training Center Chief (Norton, Virginia)
Escar C. Smith	Coal Mine Inspector

APPENDIX G

Type Inspection	Inspection Date(s)	Notice(s)	Order(s)	Section Violated	Date Issued	Date Abated
Spot Safety	1/23/74	104(b)		75.1403	1/23/74	1/30/74
Spot Health & Safety	1/30-31 & 2/5-6/74	104(b) 104(b) 104(b)		75.200 75.403 75.507	1/30/74 1/30/74 2/05/74	1/31/74 1/31/74 2/06/74
Spot Safety	2/15/74					
Spot Health & Safety	2/20, 21, 26, & 27/74	104(b) 104(i)		75.503 70.100(b)	2/20/74 2/27/74	2/21/74 4/05/74
Spot Health & Safety	4/23, 24, 25, & 29/74	104(b) 104(b) 104(b) 104(i)		75.200 75.1103 75.100-2 70.100(b)	4/23/74 4/24/74 4/24/74 4/29/74	4/24/74 1/28/75 7/24/74 5/31/74
Spot Safety	6/3-4/74	104(b)		77.701	6/03/74	6/03/74
Spot Health & Safety	6/6, 10, & 11/74	104(b) 104(b) 104(b)		75.313 75.1101 75.410	6/06/74 6/11/74 6/11/74	6/11/74 8/26/74 6/20/74
Spot Safety	6/20/74	0				
Spot Health & Safety	7/29 & 30/74	104(b) 104(b)		75.313 75.1107	7/29/74 7/29/74	7/30/74 7/30/74
Spot Safety	8/26/74	0				
Spot Health & Safety	8/26-29, & 9/3/74	104(b) 104(b) 104(i)		75.503 75.1600 70.100(b)	8/26/74 8/27/74 9/03/74	8/27/74 8/28/74 10/17/74
Spot Health	9/05 & 09/74	104(b)		70.205	9/05/74	9/09/74
Spot Safety	10/07/74	0				
Complete Electrical	10/23-24 & 29-30/74	104(b) 104(b) 104(b)		75.902 75.803 77.506-1	10/24/74 10/24/74 10/30/74	12/09/74 12/09/74 12/09/74
Spot Safety	11/04/74	104(b)		75.1201	11/04/74	12/11/74
Spot Electrical	11/25/74	0				
Spot Electrical	12/09/74	0				
Complete Health & Safety	12/10-13, 16, 20, & 30-31/74	104(b) 104(b) 104(b) 104(b) 104(b)		70.220(a)3 75.200 75.503 77.400 75.1105	12/10/74 12/10/74 12/12/74 12/12/74 12/13/74	12/11/74 12/11/74 12/12/74 12/16/74 06/23/75
Complete Health & Safety	1/6-8, 21-24, 27-31, & 2/3, 4/75	104(b) 104(b) 104(b)		75.200 75.1106-3 75.1704	1/22/75 1/31/75 1/30/75	1/23/75 1/31/75 1/31/75
Spot Safety	2/25/75	0				
Spot Safety	3/17 & 18/75	0				
Spot Health & Safety	5/1, 2, & 5/75	0				
Complete Health & Safety	5/8-9, 14-16, 30 & 6/2-4/75	104(b) 104(b) 104(b) 104(b) 104(b) 104(b)		75.400 75.1704-2 75.200 75.503 75.1102 75.1725(a)	6/02/75 5/09/75 5/30/75 5/09/75 6/02/75 6/02/75	6/03/75 5/14/75 5/30/75 5/14/75 6/09/75 6/09/75

APPENDIX G (continued)

Type Inspection	Inspection Date(s)	Notice(s)	Order(s)	Section Violated	Date Issued	Date Abated
Spot Health & Safety	6/16 & 18/75	104(b) 104(b)		75.400 75.403	6/18/75 6/16/75	6/18/75 6/18/75
Spot Health & Safety	6/23/75	104(b)		75.200	6/23/75	6/23/75
Spot Health & Safety	7/22/75	0				
Spot Health & Safety	10/07/75	104(b)		75.1704-2-d	10/07/75	10/07/75
Complete Health & Safety	10/10, 14-15/75	104(b)		77.400(a)	10/10/75	10/10/75
Health & Safety Electrical	10/1, 2, 7, 14, 20 & 21/75	0				
Spot Health & Safety	11/19/75	104(b)		70.250	11/19/75	11/21/75
Spot Health & Safety	11/26/75	0				
Spot Health & Safety	12/5 & 8/75	104(b)		70.201	12/05/75	12/08/75
Spot Health & Safety	12/18/75	0				
Spot Health & Safety	12/22/75	0				
Spot Health & Safety	12/31/75	0				
Spot Health & Safety	1/15/76	0				
Spot Health & Safety	1/26/76	0				
Spot Health & Safety	2/11-12 & 17/76	104(b) 104(i)		75.316 70.100(b)	2/11/76 2/17/76	2/11/76 2/24/76
Spot Health & Safety	2/23-24/76	0				
Spot Health & Safety	2/26/76	0				
Spot Health & Safety	3/05/76	0				
Complete Health & Safety	3/10, 11, 15-17, & 24-26/76	104(b) 104(b) 104(b)		75.1101 75.1101 75.1101	3/26/76 3/26/76 3/26/76	6/14/76 6/14/76 7/23/76
Spot Health & Safety	4/14-16/76	104(b)		70.201	4/15/76	4/16/76
Health & Safety Electrical	4/15, 20-22, & 28/ 76	104(b)		75.513-1	4/22/76	4/28/76
Spot Health & Safety	5/03/76	0				
Spot Health & Safety	5/18/76	0				
Spot Health & Safety	5/11 & 14/76	104(b)		75.403	5/11/76	5/14/76
Spot Health & Safety	5/26 & 27/76	0				
Spot Health & Safety	6/10/76	104(i)		70.100(b)	6/10/76	7/26/76
Spot Health & Safety	6/14/76	0				
Spot Health & Safety	6/17/76	104(b) 104(b)		75.200 75.304	6/17/76 6/17/76	6/17/76 6/17/76
Spot Health & Safety	6/24/76	0				
Spot Health & Safety	7/23/76	104(b)		75.1101	7/23/76	7/30/76
Spot Health & Safety	7/30/76	0				
Spot Health & Safety	8/16-17/76	0				

APPENDIX G (continued)

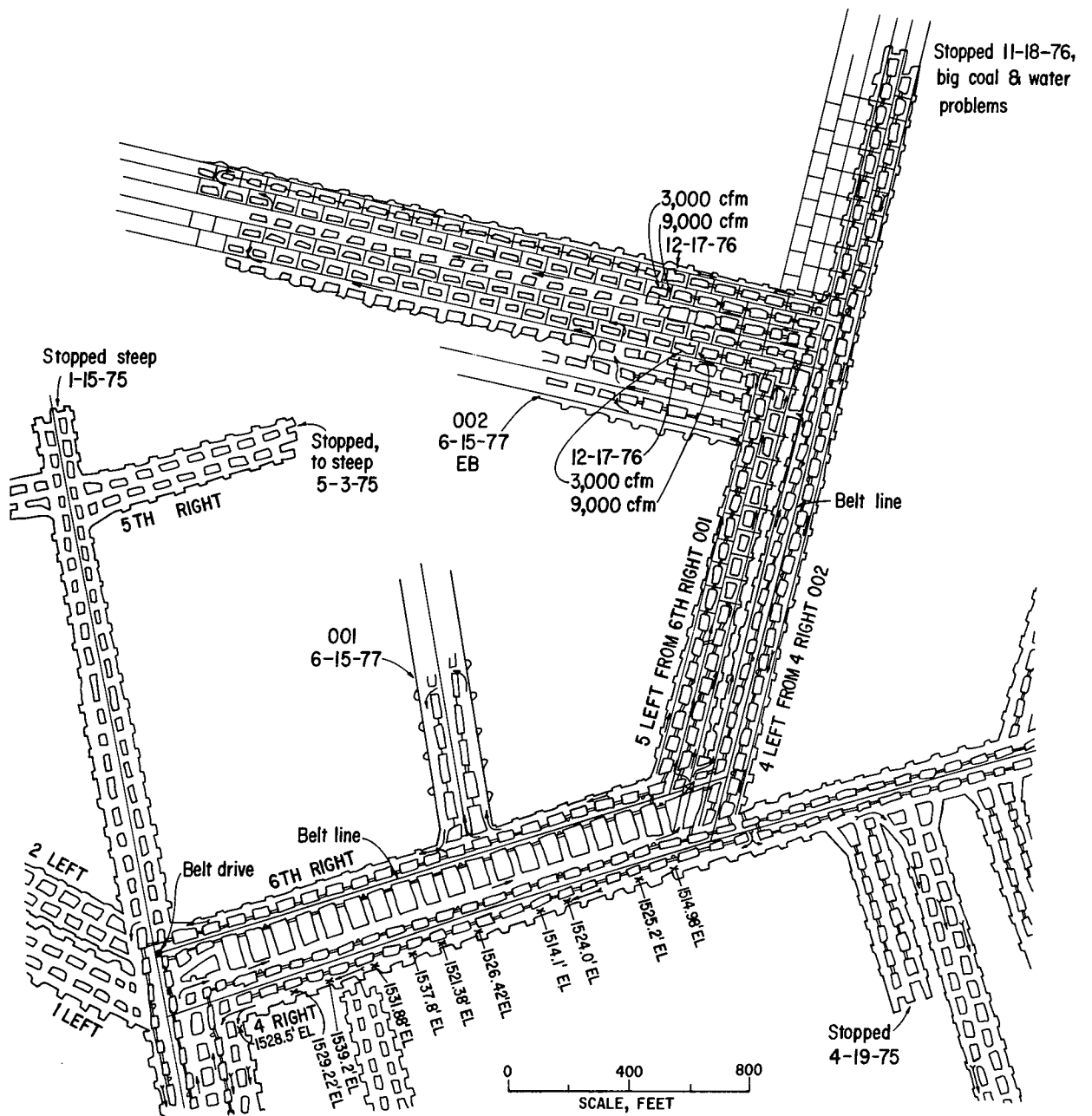
Type Inspection	Inspection Date(s)	Notice(s)	Order(s)	Section Violated	Date Issued	Date Abated
Complete Health & Safety	8/18, 19, 23, 24, & 25/76	104(b) 104(b)		75.1704 75.523	8/18/76 8/18/76	8/23/76 8/19/76
Spot Health & Safety	9/01/76	0				
Spot Health & Safety	9/16/76	0				
Spot Health & Safety	9/30/76	0				
Spot Health & Safety	11/3 & 5/76	104(b)		70.250	11/03/76	11/05/76
Spot Health & Safety	11/10/76	104(b) 104(b)		75.301-1 75.1722	11/10/76 11/10/76	11/10/76 11/10/76
Spot Health & Safety	11/18/76	104(i)		70.100(b)	11/18/76	1/10/77
Spot Health & Safety	11/22/76	0				
Complete Health & Safety	12/1-3 & 7-9/76	0				
Spot Health & Safety	12/17/76	0				
Spot Health & Safety	12/23/76	0				
Health & Safety Technical (Roof Control)	12/28/76	0				
Spot Health & Safety	1/06/77	104(b)		70.250	1/06/77	2/04/77
Spot Health & Safety	1/17/77	0				
Spot Health & Safety	2/22/77	0				
Health & Safety Technical (Ventilation Survey)	3/1-4/77	0				
Spot Health & Safety	3/1 & 2/77	104(b)	104(b)	75.1722 75.1722 77.208 75.512-2 75.323 75.1704-2(e) 75.303 77.400 77.1109(c)(1) 77.400 77.505 77.410	3/01/77 3/02/77 3/01/77 3/01/77 3/01/77 3/01/77 3/01/77 3/01/77 3/01/77 3/01/77 3/01/77 3/01/77	3/02/77 3/01/77 3/02/77 3/01/77 3/02/77 3/02/77 3/02/77 3/02/77 3/02/77 3/02/77 3/02/77 3/30/77
Complete Health & Safety	3/23-25, 30, & 31/77	104(b) Notice to Provide Safeguard 104(b) 104(b) 104(b)		75.1718 75.300-7 75.523-1 75.523-1 75.523-1	3/25/77 3/25/77 3/30/77 3/30/77 3/30/77	3/30/77 3/30/77 4/27/77 4/21/77 4/27/77
Spot Health & Safety	4/12/77	0				
Spot Health & Safety	4/19-21/77	104(b) 104(b) 104(b) 104(b) 104(b)		75.202 75.1103-6 75.302 75.1704 75.403	4/19/77 4/19/77 4/19/77 4/21/77 4/21/77	4/21/77 4/21/77 4/21/77 5/05/77 4/29/77
Spot Health & Safety	4/25/77	0				

APPENDIX G (continued)

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APPENDIX G (continued)

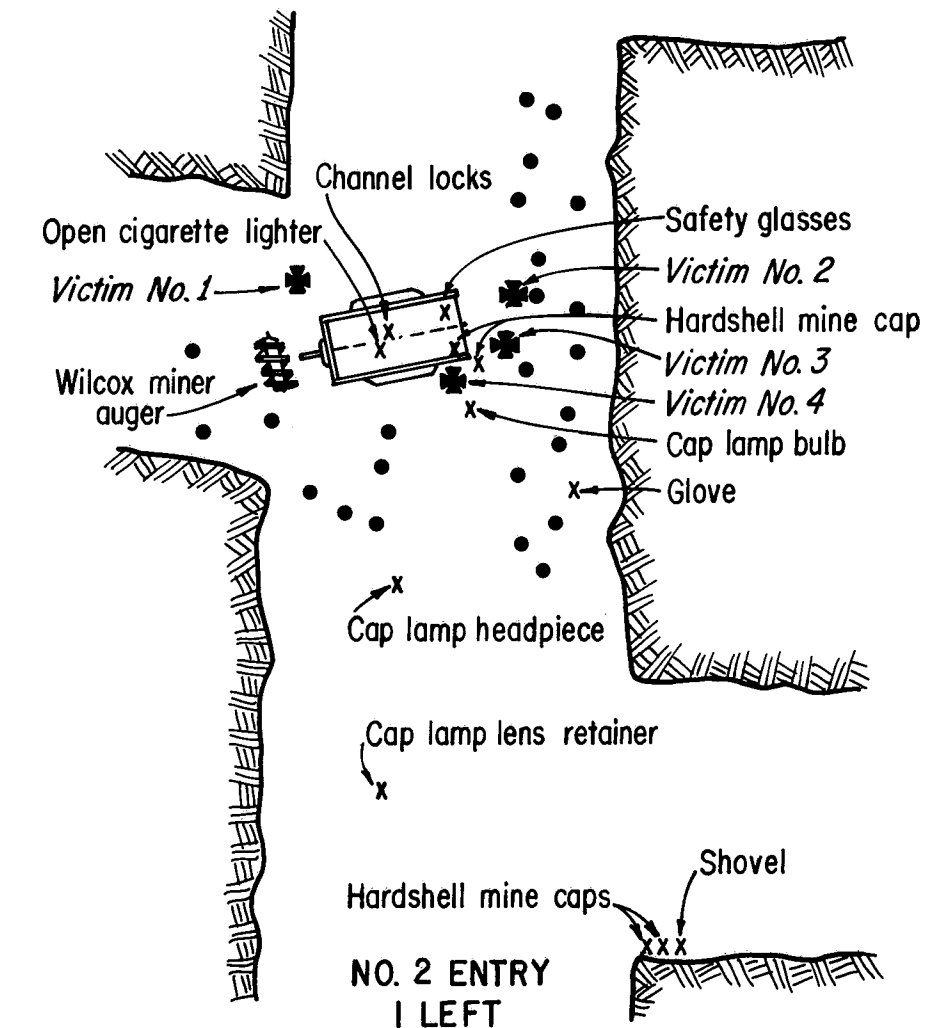
Type Inspection	Inspection Date(s)	Notice(s)	Order(s)	Section Violated	Date Issued	Date Abated
Complete Electrical	7/18-20, 23, 26, & 28/77	104(b)		75.400	7/18/77	8/18/77
		104(b)		75.400	7/19/77	8/18/77
		104(b)		75.400	7/19/77	7/28/77
		104(b)		75.400	7/18/77	8/18/77
		104(b)		75.403	7/19/77	8/18/77
		104(b)		75.403	8/24/77	8/24/77
		104(b)		75.403	7/18/77	8/18/77
		104(b)		75.501-2(2)	7/18/77	7/20/77
		104(b)		75.503	7/18/77	7/26/77
		104(b)		75.503	7/19/77	7/28/77
		104(b)		75.603	7/19/77	7/28/77
		104(b)		75.606	7/18/77	7/26/77
		104(b)		75.807	8/24/77	9/26/77
		104(b)		75.1101-1	7/20/77	8/18/77
		104(b)		75.1100	7/20/77	7/22/77
		104(b)		75.1100-2(b)	7/19/77	8/24/77
		104(b)		75.1100-2(b)	7/19/77	8/17/77
		104(b)		75.1100-2(b)	7/18/77	8/18/77
		104(b)		75.1100-2(b)	7/19/77	8/18/77
		104(b)		75.1101	7/19/77	8/17/77
		104(b)		75.1103	7/18/77	7/26/77
		104(b)		75.1103	7/19/77	8/12/77
		104(b)		75.1103	7/19/77	8/12/77
		104(b)		75.1106-3	7/18/77	7/21/77
		104(b)		75.1200	7/19/77	
		104(b)		75.1200-1(h)	7/19/77	
		104(b)		75.1707	7/19/77	8/12/77
		104(b)		75.1718	7/18/77	7/20/77
		104(b)		75.1722	7/18/77	7/26/77
		104(b)		75.1722	7/20/77	7/23/77
		104(b)		75.515	7/19/77	7/28/77
		104(b)		75.900	7/19/77	9/26/77
		104(b)		75.515	7/19/77	7/28/77
		104(b)		75.902	7/20/77	8/30/77
		104(b)		75.521	7/19/77	7/19/77
		104(b)		75.1722	7/18/77	7/23/77
		104(b)		75.802	7/19/77	7/19/77
		104(b)		75.1725	7/19/77	7/19/77



LEGEND	
	Permanent stopping
	Stopping with man door
	Block curtain
	Mine curtain
	Regulator
	Intake air
	Return air
	Overcast

APPENDIX H
 NO. 2 MINE ID 44 02274
 P & P COAL COMPANY
 ST. CHARLES, LEE COUNTY, VIRGINIA
 COPY OF MAP FOUND IN SECTION 002
 AND USED DURING UNDERGROUND RESCUE
 EFFORT TO RECOVER VICTIMS

5-1189



LEGEND
 • Posts found set
 Height of coalbed-36 in

0 10
 Scale, ft

APPENDIX I
 No. 2 MINE ID 44-02274
 P & P COAL COMPANY, INCORPORATED
 ST. CHARLES, LEE COUNTY, VIRGINIA
 LOCATION OF VICTIMS AFTER EXPLOSION

APPENDIX K

TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED July 14, 1977

MINE _____ No. 2 COMPANY _____ P. and P. Coal Company, Incorporated

COLLECTED BY _____ Daniel Bailey and Charles Reece

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
IGNITION SAMPLES				
sampling area = 3 left off 5 left section zero = 30 feet inby overcast, No. 1 entry				
No. 1 entry (intake)				
1A1	band	0 + 00	None	53
1A2	do	0 + 200	None	51
1A2X	do	0 + 230	None	42
1A3	do	0 + 400	None	57
1A4	do	0 + 600	None	45
1A4X	do	0 + 630	None	57
1A5	do	0 + 800	None	60
1A6	do	0 + 1000 bag 1 of 3, wet	None	58
1A6	do	0 + 1000 bag 2 of 3, wet	None	55
1A6	do	0 + 1000 bag 3 of 3, wet	None	52
1A6X	do	0 + 970 bag 1 of 3, wet	None	53
1A6X	do	0 + 970 bag 2 of 3, wet	None	54
1A6X	do	0 + 970 bag 3 of 3, wet	None	47.1
No. 2 belt entry				
1B1	do	0 + 00	None	75
1B2	do	0 + 200	None	52
1B2X	do	0 + 230	None	53
1B3	do	0 + 400	None	76
1B4	do	0 + 600	None	56
1B5	do	0 + 800	None	48
1B6	do	0 + 1000 bag 1 of 3, wet	None	57
1B6	do	0 + 1000 bag 2 of 3, wet	None	40.3
1B6	do	0 + 1000 bag 3 of 3, wet	None	50.4

APPENDIX K (continued)

Page 2 of 2

TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED _____ July 14, 1977

MINE _____ No. 2 _____ COMPANY _____ P. and P. Coal Company, Incorporated

COLLECTED BY _____ Daniel Bailey and Charles Reece

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE		ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
1B6X	band	0 + 1030	bag 1 of 3, wet	None	55
1B6X	do	0 + 1030	bag 2 of 3, wet	None	55
1B6X	do	0 + 1030	bag 3 of 3, wet	None	57
No. 3 entry (return)					
1C1	do	0 + 00		None	75
1C2	do	0 + 200	bag 1 of 3, wet	None	78
1C2	do	0 + 200	bag 2 of 3, wet	None	78
1C2	do	0 + 200	bag 3 of 3, wet	None	80
1C3	do	0 + 400	bag 1 of 3, wet	None	75
1C3	do	0 + 400	bag 2 of 3, wet	None	80
1C3	do	0 + 400	bag 3 of 3, wet	None	80
1C4	do	0 + 600	bag 1 of 2, wet	None	47
1C4	do	0 + 600	bag 2 of 2, wet	None	55
1C4X	do	0 + 570	bag 1 of 3, wet	None	44
1C4X	do	0 + 570	bag 2 of 3, wet	None	40
1C4X	do	0 + 570	bag 3 of 3, wet	None	37
1C5	do	0 + 800	bag 1 of 2, wet	None	52
1C5	do	0 + 800	bag 2 of 2, wet	None	46
1C6	do	0 + 1000	bag 1 of 3, wet	None	73
1C6	do	0 + 1000	bag 2 of 3, wet	None	64
1C6	do	0 + 1000	bag 3 of 3, wet	None	50
1C6X	do	0 + 1030	bag 1 of 2, wet	None	80
1C6X	do	0 + 1030	bag 2 of 2, wet	None	57

APPENDIX K (continued)

Page 1 of 3

TABLE - ANALYSES OF DUST SAMPLES COLLECTED July 14, 1977

MINE No. 2 COMPANY P. and P. Coal Company, Incorporated

COLLECTED BY George R. Vass

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
IGNITION SAMPLES				
sampling area = 1 left off 4 left zero = 25 feet inby overcast No. 1 entry, 4 left section				
No. 1 entry (return)				
3A1		0 + 00 no sample, not driven		
3A2	band	0 + 200	None	48
3A3	do	0 + 400	None	60
3A3X	do	0 + 430	None	60
3A4	do	0 + 600	None	57
3A5	do	0 + 800	None	57
3A5X	do	0 + 840	None	38
3A6	do	0 + 1000	None	67
3A7	do	0 + 1200	None	67
3A7X	do	0 + 1260	None	85
3A8	do	0 + 1400 bag 1 of 3, wet	None	38
3A8	do	0 + 1400 bag 2 of 3, wet	None	53
3A8	do	0 + 1400 bag 3 of 3, wet	None	53
3A9	do	0 + 1600 bag 1 of 3, wet	None	64
3A9	do	0 + 1600 bag 2 of 3, wet	Trace	55
3A9	do	0 + 1600 bag 3 of 3, wet	Trace	59
3A9X	do	0 + 1600 bag 1 of 3, wet	Trace	61
3A9X	do	0 + 1600 bag 2 of 3, wet	Trace	63
3A9X	do	0 + 1600 bag 3 of 3, wet	Trace	59
3A10	do	0 + 1800 bag 1 of 3, wet	Trace	67
3A10	do	0 + 1800 bag 2 of 3, wet	Trace	62
3A10	do	0 + 1800 bag 3 of 3, wet	Trace	66
3A11	do	0 + 2000 bag 1 of 3, wet	Trace	41
3A11	do	0 + 2000 bag 2 of 3, wet	Trace	42
3A11	do	0 + 2000 bag 3 of 3, wet	None	38

APPENDIX K (continued)

Page 2 of 3

TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED July 14, 1977MINE No. 2 COMPANY P. and P. Coal Company, IncorporatedCOLLECTED BY George R. Vass

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE		ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
3A11X	band	0 + 2020	bag 1 of 3, wet	None	29
3A11X	do	0 + 2020	bag 2 of 3, wet	None	36
3A11X	do	0 + 2020	bag 3 of 3, wet	None	28
No. 2 entry (return)					
3B1	do	0 + 00		None	55
3B2	do	0 + 200		None	70
3B3	do	0 + 400		None	92
3B3X	do	0 + 450		None	53
3B4	do	0 + 600		None	85
3B5	do	0 + 800		None	86
3B5X	do	0 + 860		None	65
3B6	do	0 + 1000		None	73
3B7	do	0 + 1200		None	67
3B7X	do	0 + 1230		None	57
3B8	do	0 + 1400		Trace	70
3B9	do	0 + 1600	damp	Trace	60
3B9X	do	0 + 1650	damp	Trace	36
3B10	do	0 + 1800	damp	Trace	50
3B11	do	0 + 2000	bag 1 of 3, wet	None	42
3B11	do	0 + 2000	bag 2 of 3, wet	None	58
3B11	do	0 + 2000	bag 3 of 3, wet	None	52
3B11X	do	0 + 2000	bag 1 of 3, wet	None	42
3B11X	do	0 + 2000	bag 2 of 3, wet	None	38
3B11X	do	0 + 2000	bag 3 of 3, wet	None	35
No. 3 entry					
3C1	do	0 + 00	bag 1 of 4, dry	None	48
3C1	do	0 + 00	bag 2 of 4, wet	None	34
3C1	do	0 + 00	bag 3 of 4, wet	None	34
3C1	do	0 + 00	bag 4 of 4, wet	None	31

APPENDIX K (continued)

Page 3 of 3

TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED _____ July 14, 1977

MINE No. 2 COMPANY P. and P. Coal Company, Incorporated

COLLECTED BY George R. Vass

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE		ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
3C2	band	0 + 200	bag 1 of 4, dry	None	57
3C2	do	0 + 200	bag 2 of 4, wet	None	77
3C2	do	0 + 200	bag 3 of 4, wet	None	72
3C2	do	0 + 200	bag 4 of 4, wet	None	62
3C3		0 + 400	no sample, 10 inches water		
3C4	do	0 + 600	bag 1 of 2, wet	None	47.9
3C4	do	0 + 600	bag 2 of 2, wet	None	45.6
3C5	do	0 + 800	bag 1 of 3, wet	None	48.6
3C5	do	0 + 800	bag 2 of 3, wet	None	36
3C5	do	0 + 800	bag 3 of 3, wet	None	34
3C6	do	0 + 1000		None	40
3C7	do	0 + 1200		None	50
3C8	do	0 + 1400	bag 1 of 3, wet	None	35
3C8	do	0 + 1400	bag 2 of 3, wet	None	38
3C8	do	0 + 1400	bag 3 of 3, wet	None	37
3C9	do	0 + 1600	bag 1 of 2, wet	None	52
3C9	do	0 + 1600	bag 2 of 2; wet	None	47
3C10	do	0 + 1800	bag 1 of 3, wet	None	78
3C10	do	0 + 1800	bag 2 of 3, wet	Trace	65
3C10	do	0 + 1800	bag 3 of 3, wet	Trace	77
3C11	do	0 + 2000	bag 1 of 3, wet	Trace	72
3C11	do	0 + 2000	bag 2 of 3, wet	None	42
3C11	do	0 + 2000	bag 3 of 3, wet	None	57

TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED July 14, 1977MINE No. 2 COMPANY P. and P. Coal Company, IncorporatedCOLLECTED BY Kenneth L. Card and Ralph P. Reasor

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
IGNITION SAMPLES				
sampling area = 2 left off 5 left section zero = 30 feet inby overcast No. 2 belt entry, 5 left section				
No. 1 entry (return)				
no sample, not mined				
2A1	band	0 + 200	None	34
2A2		0 + 220	None	45
2A2X		0 + 400		
2A3	do	0 + 600	None	77
2A4		0 + 640	None	46
2A4X		0 + 800	None	60
2A5	do	0 + 800	None	53
2A5	do	0 + 800	None	57
2A5	do	0 + 1000	None	40
2A6	do	0 + 1000	None	43.3
2A6	do	0 + 1000	None	35
2A6	do	0 + 1060	None	36
2A6X	do	0 + 1060	None	37
2A6X	do	0 + 1060	None	46
No. 2 belt entry (return)				
2B1	do	0 + 00	None	58
2B2	do	0 + 200	None	84
2B2X	do	0 + 260	None	45
2B3	do	0 + 400	None	65
2B4	do	0 + 600	None	70
2B4X	do	0 + 600	None	46

TABLE - ANALYSES OF DUST SAMPLES COLLECTED July 14, 1977

MINE No. 2 COMPANY P. and P. Coal Company, Incorporated

COLLECTED BY Kenneth L. Card and Ralph P. Reasor

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
2B5	band	0 + 800	None	66
2B6	do	0 + 1000	None	44
2B6X	do	0 + 1030	None	48
		No. 3 entry (return)		
2C1	do	0 + 00	None	43
2C2	do	0 + 200	None	55
2C2X	do	0 + 200		
2C3	do	0 + 400	None	40
2C4	do	0 + 600	None	44
2C4X	do	0 + 600	None	37
2C5	do	0 + 800	None	37
2C6	do	0 + 1000	None	48
2C6X		0 + 1000		
		no crosscut, no sample		