44 00281

Fatality Files

70-0280 A

COAL NONFATAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

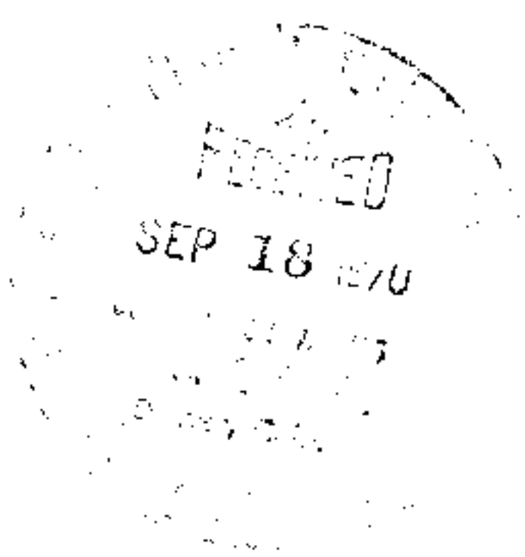
DISTRICT C

REPORT OF NONFATAL COAL MINE BUMP ACCIDENT
MOSS NO. 2 MINE
CLINCHFIELD COAL COMPANY
CLINCHFIELD (P. O. DANTE), RUSSELL COUNTY, VIRGINIA

July 30, 1970

by

J. L. Gilley
Mining Engineer



Originating Office - Bureau of Mines
Norton, Virginia 24273
J. S. Malesky, District Manager
Coal Mine Health and Safety District C

Gas

REPORT OF NONFATAL COAL MINE BUMP ACCIDENT
MOSS NO. 2 MINE
CLINCHFIELD COAL COMPANY
CLINCHFIELD (P. O. DANTE), RUSSELL COUNTY, VIRGINIA

July 30, 1970

by

J. L. Gilley
Mining Engineer

INTRODUCTION

This report is based on an investigation made in accordance with the provisions of the Federal Coal Mine Health and Safety Act of 1969 (83 Stat. 742).

A coal mine outburst (bump) occurred in the inby or fourth pillar in No. 10 room off 8 left 3 north in the Moss No. 2 Mine at 5:15 p.m., July 30, 1970, and caused serious injuries to Clyde McCoy, continuous miner helper, and John Salyers, timberman. James Bostic, continuous miner operator and Robert Minton, timberman, received only slight injuries. Four other employees, including the section foreman, on the section at the time of the outburst, were not injured, and assisted with the recovery of and administered first-aid to the injured workmen who subsequently were transported to hospitals for examination and treatment.

McCoy, age 28, with 4 years mining experience, received hip and back injuries and accompanying contusions and bruises. Salyers, age 44, with 3 years mining experience suffered multiple fractures of the right leg. Bostic, age 24, with 7 years mining experience and Minton, age 49, with 8 years mining experience, received minor bruises and contusions, and after examination at the hospital, were released and returned to work without lost time.

Two bumps of considerable magnitude and intensity occurred at approximately 6-hour intervals prior to the subject bump without incurring injuries or property damage, except to several temporary stoppings in the area involved. The origin or focus of these bumps was the chain pillars and contingent goaf areas intervening between the previously mined 6 left longwall panel and the 7 left and the 8 left panels. Inasmuch as these two bumps were considered relevant to the liability of the subsequent bump accident they are therefore included in this report.

The Bureau of Mines was promptly notified of the occurrence by an official of the company; an investigation was started the following day and was concluded August 5, 1970.

Related data on conditions and sequence of events prior to this outburst and operational procedures in progress at the time of the occurrence, were obtained from statements of company officials and witnesses, and by detailed examinations of the areas involved, including the scene of accident which had remained undisturbed.

GENERAL INFORMATION

The Moss No. 2 Mine at Clinchfield, Virginia, on State Route 621, consists of a main slope and 3 air shafts and operates in the high-volatile Tiller coalbed, which varies from about 40 to 65 inches in current mining areas. A total of 403 men, 351 underground and 52 on the surface, is employed on three coal-producing shifts daily, 5 days a week. The daily production averaged 5,200 tons of coal, all loaded with ripper-type continuous miners, and was transported by shuttle cars, belt conveyors and electric trolley locomotive haulage systems.

The mine is projected on a multiple-entry system, and pillar extraction follows a room-and-pillar method of development. Extraction of pillars is primarily by a split-and-fender method. The plans for the development of entries and the extraction of pillars in the 7 and 8 left panels in 3 north, the area primarily involved in this report, are indicated in Figures 2 and 3. The 3-entry system used in the 7 and 8 left panels was originally projected for longwall mining and after the panel entries were advanced to the predetermined distance in 7 left, longwall mining was started. However, after an extensive cave-in occurred along the longwall face after it had retreated 150 feet from the starting point, the longwall system was discontinued and the current room-and-pillar method of extraction was initiated in the area. The 7 and 8 left panel entries were projected three abreast on 75-foot centers and 20 feet in width with crosscuts also on 75-foot centers; rooms and room crosscuts were projected on 75-foot centers, thus forming pillars about 55 feet square. The distance between the sets of panel entries was 300 feet, and the chain pillars between panels were left unmined to provide bleeder returns for the gob areas.

The current method of extracting the individual pillars in 7 and 8 left panels is accomplished by mining a "split" 20 feet in width through the pillar from the crosscut side of the room pillars and/or from the entry side of the entry pillars (Step A), then extracting the wings or fenders "B" and "C" in succession, as indicated in Figure 2. The adopted pillar-mining plan in the 7 and 8 left sections requires that the pillars be mined individually, in succession, from left to right across the entries to establish a flat extraction line. Maximum development outby the extraction line currently is limited to 3 rooms in the panel, as indicated in Figure 2. The relative positions of the 7 and the 8 left extraction lines at the time the bumps occurred are shown in Figure 3.

The natural conditions in the 3 north territory primarily favor the liability of occurrence of bumps. The topography of the terrain overlying the area is rugged, and some of the mountains crest at 2,960 feet in elevation and exceed 1,400 feet in relief. The cover in the 6, 7, and 8 lefts 3 north area ranged from about 1,350 to a maximum of 1,450 feet. Information from logs of 4 boreholes nearest the scene of the accident area indicated that the main, secondary, and immediate roof structure intervening between the Tiller and the superjacent Jawbone coalbed was sandstone, 51 feet or more, in thickness.

The immediate floor was a hard, dense sandy shale and siltstone that resisted heaving, and very little heaving was in evidence in 8 left, except in the entries between panels. The coal is structurally strong but brittle and shatters readily from a blow or stress. Face-and-butt cleavage planes of the coal are discernible but are not pronounced in the 7 and 8 left panel sections.

The adopted roof support plans in the 7 and 8 left panel sections consist of roof bolts on 4 foot centers in development and posts set on specified patterns during retreat mining. Roof bolts also are used to support the roof in mining pillar splits where required. Cribs supplemented bolts and posts at various locations.

Members of the investigating committee were:

CLINCHFIELD COAL COMPANY

James Justice	Group Vice President
Henry Kiser	Division Superintendent
Willie B. Couch	Mine Superintendent
Edward A. Coffey	Mine Inspector

UNITED MINE WORKERS OF AMERICA

McNeil Brooks	Safety Committee Local Union #1098
Edward Gilbert	Safety Coordinator, District 28

Persons questioned, who furnished information during this investigation:

Howard Sproles	Mining Engineer
Delmar Broyles	Assistant General Mine Foreman
Richard Light	General Mine Foreman
Willie B. Couch	Mine Superintendent
James Nixon	Section Foreman, 8 lt. (Evening Shift)
Tivis Fields	Section Foreman, 8 lt. (Day Shift)

Otis Patrick	Section Foreman, 7 1t. (Day Shift)
Ulyses C. Rhea	Section Foreman, 8 1t. (Morning Shift)
Robert Minton	Timberman (Evening Shift)
John Bostic	Continuous Miner Operator (Evening Shift)
Maynard Heaton	Shuttle Car Operator, 8 1t. (Evening Shift)

UNITED STATES BUREAU OF MINES

J. L. Gilley	Mining Engineer
W. R. Stewart	Coal Mine Inspection Supervisor
W. H. Sutherland	Mining Engineer

DESCRIPTION OF ACCIDENT

On the day of the accident, the 8 left panel evening-shift crew, comprising 7 workmen and James Nixon, section foreman, arrived on the section about 4:35 p.m., and after examination of the face regions, the foreman assigned specific duties to members of the crew. The first mining cycle was started soon thereafter with the CM 28-E Lee-Norse Continuous Miner and a 6-SC Shuttle Car in the fourth or last inby pillar in the No. 10 room (listed as No. 3 room in Figure 2). From Figure 2, it will be noted that mining in the last pillar of each room intersecting the 7 left air course or bleeder entry, was confined to slabbing the front side of the pillars to a depth of about 16 feet; the remainder of these pillars was left unmined along with the 7 left entry chain pillars to form part of the bleeder system for the 7 and 8 gob areas. The miner was in the process of mining the slab along the front side of the pillar and the fourth shuttle car of coal was being loaded when the outburst occurred spontaneously at 5:15 p.m.

The locations of the workmen and equipment and the extent of mining in the pillar at the time of the outburst are indicated in Figure 1. The active area in 8 left section, the extent of development and extraction and the cave line prior to and at the time of occurrence are indicated in Figure 2.

The outburst had considerable amplitude and was violent in nature. Coal was expelled forcefully from the ribs of the pillar involved, especially from the front and back of the pillar, and coal was shaken from one or more sides of 2 adjacent pillars. The stress release was sufficiently intense to thrust the cutterhead end of the continuous miner outward (sidewise) 8 feet from its original operating position prior to the outburst, as indicated in Figure 1. Expulsion of coal left a void between the roof and coal, 2 to 8 inches in height, 4 to 9 feet in depth, and extended the width of the opening being mined when the bump occurred. The roof and floor in the immediate vicinity of the accident were not affected appreciably, but, reportedly, the roof and floor in the surrounding area stressed for some time following its occurrence.

From interrogations of eye witnesses, the 4 workmen involved in the accident were at the approximate locations prior to and following the coal burst, as indicated in Figure 1. It will be noted that Minton, Salyers, and McCoy were positioned about 5 feet apart and between the miner and rib line of the outby pillar and therefore, were vulnerable in the event of an outburst. Reportedly, Minton, Salyers, and McCoy were engaged in placing the miner cable in the clear of traffic when the outburst occurred. Bostic, the miner operator, was partly thrown out of the deck of the miner but escaped injury, except for slight bruises. Minton, who was farther outby, also escaped with only miner bruises. Salyers received multiple fractures of the right leg, bruises and contusions when he was caught between the miner which was thrust outward by the forces of the stress-relief wave and the expulsion of coal, and from coal shaken from the rib of the outby pillar. McCoy was found lying in a prone position across the top of the miner and incurred hip and back injuries, bruises and contusions. Notwithstanding the fact that company safety standards prohibit any work or travel by employees or officials inby the continuous miner in a pillar place in which mining operations are in progress, 3 workmen entered and were permitted to perform work in the place while the miner was operating, and, unfortunately, were injured.

A dense cloud of dust was thrown into suspension, impairing visibility for a few minutes in the area, but, reportedly, no methane was detected with a flame safety lamp in the vicinity of the outburst. At least 4 temporary stoppings were damaged or knocked out. Considerable damage was incurred to some of the mechanical and hydraulic components of the continuous miner. The circuit breaker of the continuous miner was opened by the shcok from the outburst and promptly cut off the power from the machine. A workman, who was near the power circuit switches, cut off the power from the section within a short time after the outburst. Recovery operations were conducted and first-aid administered to the injured by the section foreman, the uninjured members of the crew and by other personnel who arrived on the section soon after the occurrence.

Reportedly, no unusual conditions or manifestations of an impending outburst were observed by officials or workmen prior to the accident; however, two outbursts of considerable magnitude and with sufficient amplitude to be recorded at the Seismological Observatory at Blacksburg, Virginia, 135 miles from the epicenter of the bumps, occurred within a 12-hour period prior the accident at 5:15 p.m. The first bump, which occurred at 4:40 a.m. in the 8 left panel area, registered 3.5 on the Richter Scale. About 6 hours later, at 11:15 a.m., the second bump occurred. This bump was greater in magnitude and affected both the 7 and the 8 left panel areas, and registered 4.5 on the Richter Scale at the Seismic Station. Although these bumps were very violent and their effects indicated that a large amount of energy was expended, no injuries nor property damages were incurred other than to several temporary brattice-cloth and plastic stoppings in the 7 and 8 left sections. After ventilation was restored, and after thorought examinations were made throughout the affected areas, mining operations were resumed in these sections.

The 7 left panel section was idle when the first bump occurred at 4:40 a.m., but the 8 left panel was operating. The 7 and the 8 left panel sections, however, were operating when the second bump occurred at 11:15 a.m. Figure 3 shows the relative positions of the development and extraction in the respective areas and the specific locations where mining operations were in progress in the respective sections when these 2 bumps occurred. Categatorically, these two bumps were very similar in character and manner to the bump that occurred in the adjacent 6 left longwall panel at 8:50 a.m., January 8, 1970.

From inspection of the overlay map, Figure 4, incorporating the areas involved in the bumps, on July 30, 1970 and the corresponding areas in the superjacent Upper Banner coalbed, it will be noted that the extraction line in 7 left panel had recently retreated from underneath a large boundary of unmined pillars in the superjacent coalbed and that the extraction line in the 8 left panel was nearing the point of passing from underneath this boundary of unmined pillars. The bump on the 6 left longwall panel occurred under very similar circumstances, as will be noted in Figure 4. The interval between the 6, 7, and 8 left panel area, and the unmined pillars in the superjacent coalbed is 850 feet. The maximum cover over the Tiller and the Upper Banner coalbeds in these areas is 1,450 and 600 feet, respectively.

An interval of 850 feet comprising several stratum of sandstone ranging from 31 to 70 feet in thickness should be sufficiently competent to nullify effects of pressures being transmitted from the unmined pillars in the overlying coalbed to the 6, 7, and 8 left area. However, it is possible, in combination with other basic factors for this to take place. It is thought that the additive effect of the pressures induced by the superimposed pressure arch abutment zones, viz., the normal abutments of the arches over the 7 and 8 left extraction line's (and goaves) and that of the unmined pillars in the overlying coalbed, very likely could have been a major factor in the series of bumps that have occurred in the 6, 7, and 8 left panel areas. Furthermore, the unmined pillars intervening between the various panels and unmined pillar remnants in the goaves, probably caused the caving to terminate at different horizons in the goaves. This restrictive caving inturn probably resulted in the formation of comparatively flat arches to act as flat beams or plates across the unmined chain pillars situated in zones of superimposed abutment pressures within the maximum pressure arch. It followed that the loads on the pillars affected increased progressively by build-up of pressures from the dimensional increase of the gob area following retreat of the respective extraction lines.

It was determined that a total of 28 pillars was affected by the bumps in 8 left at 4:40 a.m. and 11:15 a.m., and in 7 left at 11:15 a.m. The magnitude of these bumps resulted in coal being expelled violently and in sufficient quantities to completely or partially fill the surrounding openings of the affected pillars. Resultant lowering of the chain pillars and subsequent cantilevering of the massive sandstone roof subjected the pillars within the active extraction zones nearest the bumped areas, to

compounded abutment loading. The pillar involved in the accident at 5:15 p.m., July 30, was situated within a pillar-line point area, probably highly stressed, and therefore, vulnerable. This pillar, as will be noted in Figure 3, was one of the group of pillars affected by the two previous bumps in 8 left prior to the accident. These two bumps caused reduction in height of the pillars affected and convergence of roof and floor in the adjacent openings.

Information from this investigation of the bumps on July 30, 1970, suggests a relationship between them; however, the relationship between the bumps at 4:40 a.m. and 11:15 a.m. in 8 left is improbable to differentiate and, therefore, the resultant magnitude, including the difference in the degree of violence and degree of stress release at specific locations, must be considered as a composite of the two bumps. The fact that the bump at 11:15 a.m. incorporated areas in both the 7 and the 8 left panels presents the probability that this occurrence could have been the product of several bumps, perhaps occurring at fractional-second intervals.

CAUSE OF ACCIDENT

This coal outburst accident was the result of a cumulative process, and factors believed to have contributed to the occurrence include:

1. Natural conditions which favor the liability of outburst, consisting of as much as 1,450 feet of cover, a thick, massive sandstone roof that contacted the coal, and a hard, dense sandy siltstone floor material that resisted yielding, were present.

2. Pillars left to provide the bleeder systems were incapable of withstanding the superimposed shock loads (elastic rebound).

3. The additive effects of weight transmission from mining in the superjacent coalbed could have caused flexure and bed separation of members of the massive overlying strata and altered distribution of abutment loading, especially at locations where caving terminated at variable elevations in the goaf.

4. The pillar involved possessed considerable load-carrying capacity and was situated within the pillar-line point area (within but not the absolute pillar-line point) and was subjected to additional loading following the successive bumps at 4:40 a.m. and 11:15 a.m.

5. Convergence of roof and floor increased progressively in areas inby this pillar (scene of accident) following the series of outbursts prior to the accident.

6. Mining coal from the rib line of a highly stressed pillar was being done prior to and at the time of the coal burst in a manner that was almost certain to initiate a bump under existing conditions.

7. From observation, unmined pillar remnants at some locations in 7 left had prevented clean, sharp caving of the immediate and the main roof sufficiently close to the bleeder pillars flanking the 7 left panel gob, and stress was evident at these locations.

8. The company's safety rule prohibiting persons from entering and/or performing work in a place in which mining operations with a continuous miner were in progress, or entering and/or performing work in a place immediately adjacent thereto, was not followed. The fact that three workmen, in violation of this rule, entered and performed work in the pillar place where a continuous miner was operating contributed to the seriousness of this accident.

RECOMMENDATIONS

Compliance with the following recommendations may prevent accidents of a similar nature.

1. Partial extraction (slabbing) of the inby room pillars in 8 left panel, those projected as part of the bleeder system between 7 and 8 lefts, should be discontinued. (This practice was discontinued promptly.)

2. Future mining projections should eliminate, insofar as possible, the number of vulnerable areas such as encountered in 8 left. (Projections for 8 left were changed promptly to provide a 100-foot barrier of coal to be left as a continuing "buffer zone" between the active mining and the vulnerable bleeder entry pillars intervening between 7 and 8 left).

3. Plans for future mining should take into consideration the degree to which effects of previous mining in superjacent coalbeds will contribute to potential outbursts in the lower coalbed. (Overlay maps have been prepared by the companys engineering department to aid in this program.)

4. Complete extraction of pillars should be strived for and pillar remnants that can be mined safely should not be left in the gob to form "island abutments". Pillar remnants capable of considerable load-carrying capacities are likely to impede caving and, therefore, spontaneous failure is possible in a manner that likely could initiate a shock bump in the active pillaring area.

5. The company's safety rule prohibiting work or travel by all persons in pillar places in areas vulnerable to coal outbursts in which a continuous miner is operating or in openings immediately adjacent thereto, should be strictly complied with by all concerned.

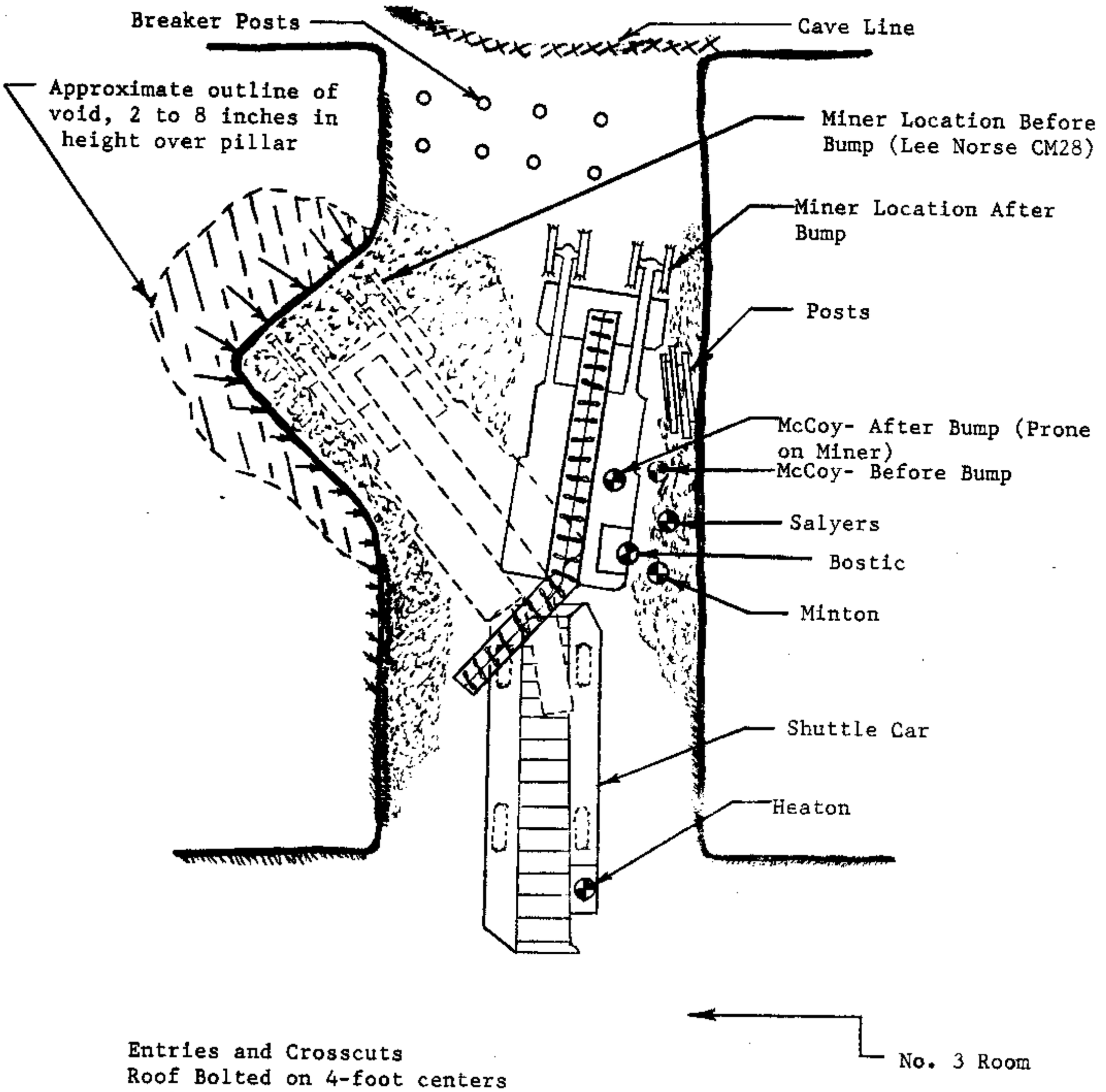
ACKNOWLEDGMENT

The cooperation of the company officials and employees, and representatives of the United Mine Workers of America during this investigation is gratefully acknowledged.

Respectfully submitted,

/s/ J. L. Gilley

J. L. Gilley
Mining Engineer



NONFATAL COAL MINE BUMP ACCIDENT
MOSS NO. 2 MINE
CLINCHFIELD COAL COMPANY
CLINCHFIELD (P. O. DANTE), RUSSELL COUNTY, VIRGINIA
July 30, 1970

FIGURE 1

SCALE: 1" = 10'

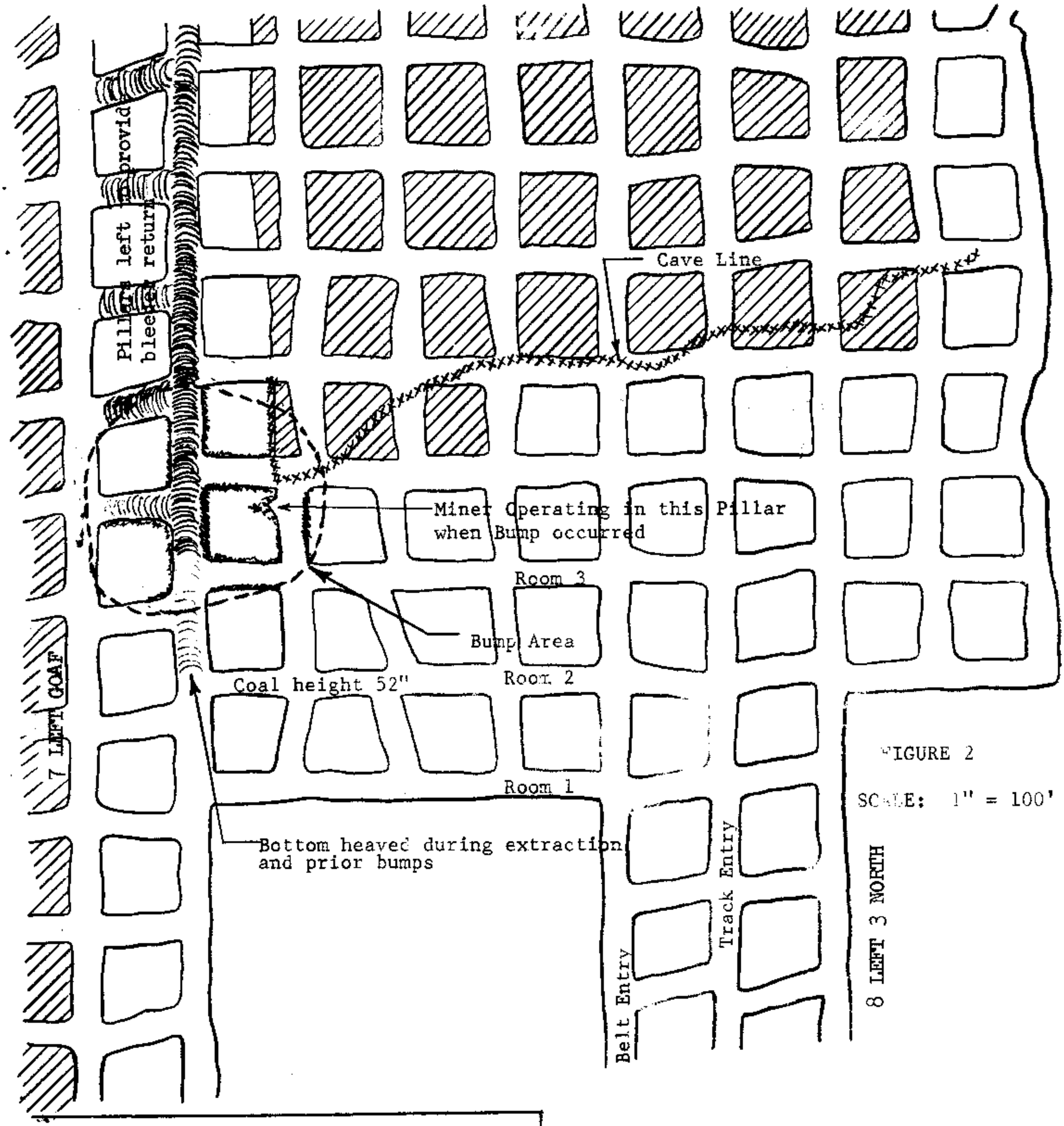
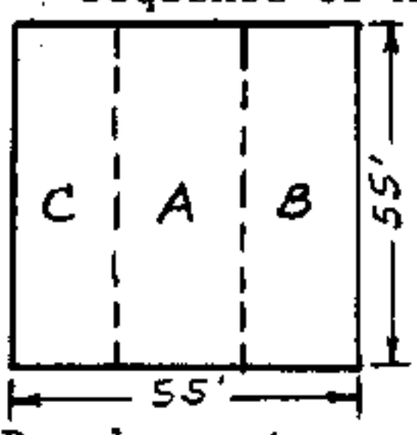


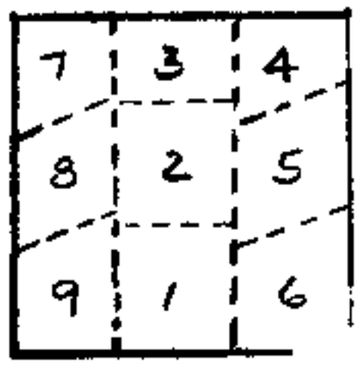
FIGURE 2

SCALE: 1" = 100'

Sequence of Mining Pillars in 8 left panel



Development sequence
Split A

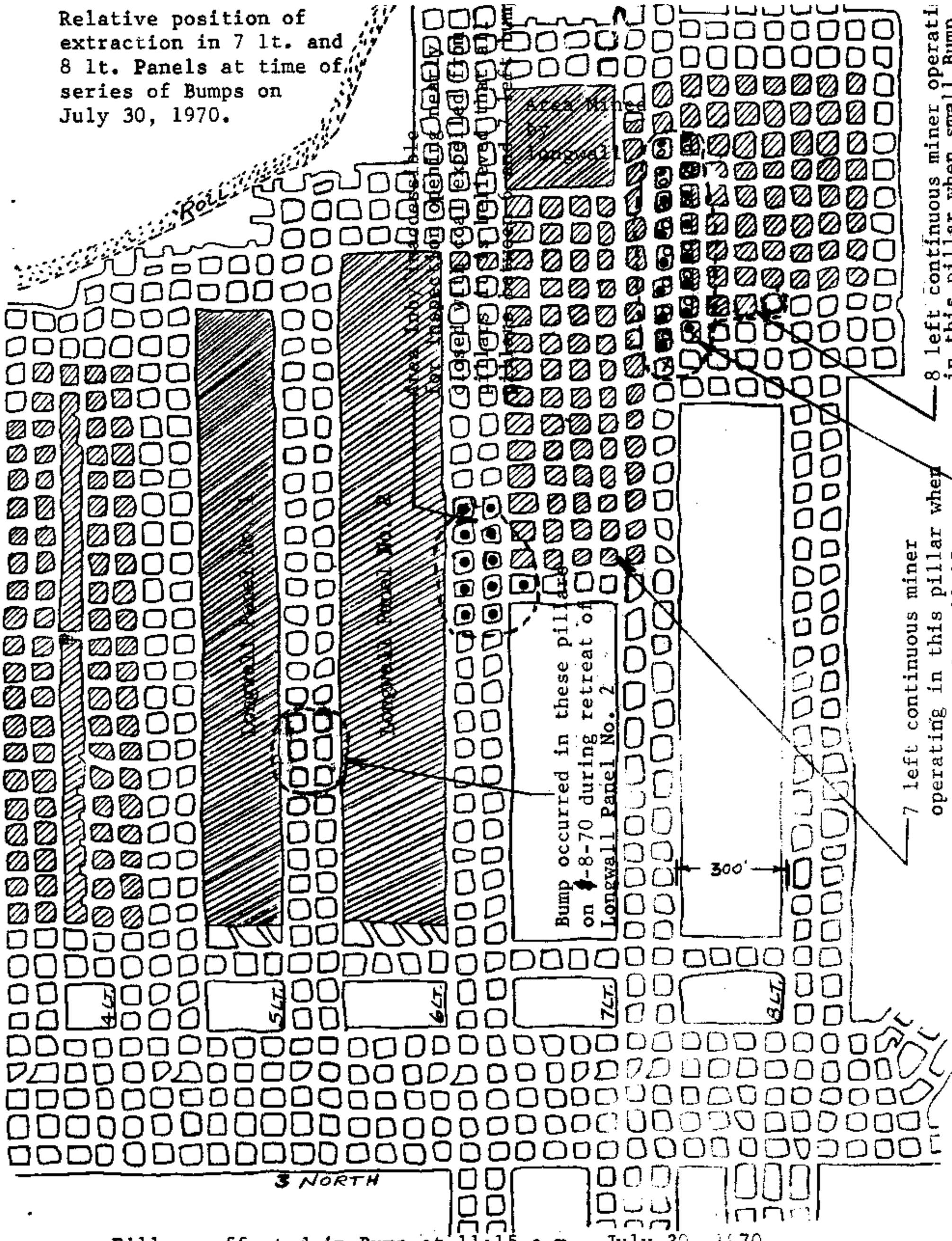


Mining sequence of wings B and C following completion of Split A

NONFATAL COAL MINE BUMP ACCIDENT
MOSS NO. 2 MINE
CLINCHFIELD COAL COMPANY
CLINCHFIELD, RUSSELL COUNTY, VIRGINIA
P. O. DANTE

July 30, 19[illegible]

Relative position of extraction in 7 lt. and 8 lt. Panels at time of series of Bumps on July 30, 1970.



● Pillars affected in Bump at 11:15 a.m., July 30, 1970

○ Pillars affected in Bump at 4:40 a.m., July 30, 1970

X Pillars affected in Bump at 5:15 p.m., July 30, 1970

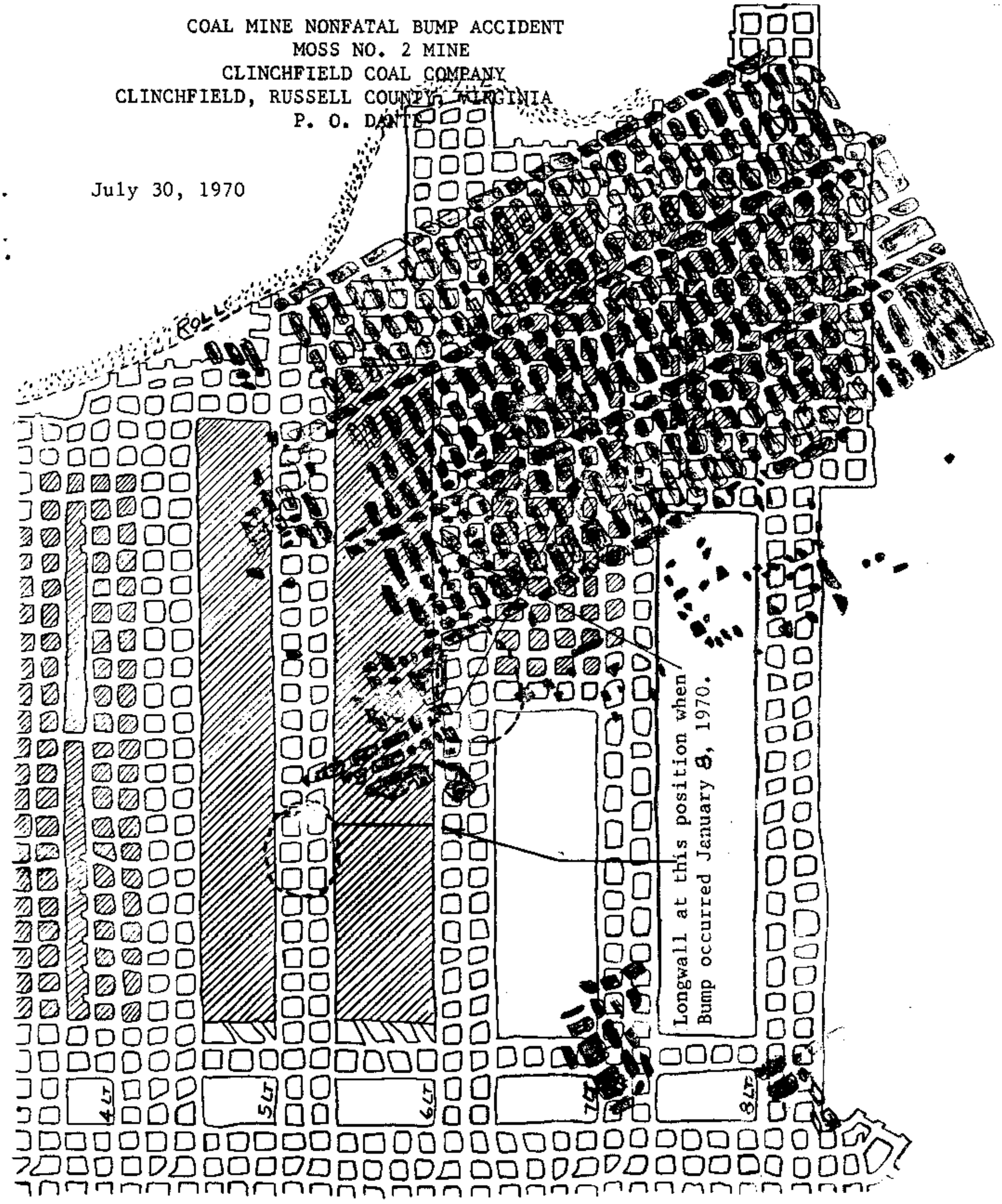
Bump Area

FIGURE 3

SCALE: 1" = 400'

COAL MINE NONFATAL BUMP ACCIDENT
MOSS NO. 2 MINE
CLINCHFIELD COAL COMPANY
CLINCHFIELD, RUSSELL COUNTY, VIRGINIA
P. O. DANTE

July 30, 1970



Shaded pillars indicates unmined pillars in the superjacent Upper Banner coalbed.

Legend:

Bump Areas

SCALE: 1" = 400'

FIGURE 4

NOT TO SCALE

Prospect Hole No. 339

Dark Shale	45'-7"
Sandy Shale	5'-2"
Sandstone	67'-3"
Gray Shale	1'-11"
Jawbone Coalbed	
Gray Sandstone	51'-4"
Tiller Coalbed	0'-3"
Shale	0'-3½"
Coal	1'-6"
Sandy Shale	

Prospect Hole No. 229

Gray Shale	49'-0"
Gray Sandstone	56'-4"
Gray Shale	7'-3"
Jawbone Coalbed	
Gray Sandstone	47'-9"
Tiller coalbed	
Gray Shale	0'-7"
Sandstone w/shale streaks	2'-3"
	2'-7"

NONFATAL COAL MINE BUMP ACCIDENT
MOSS NO. 2 MINE
CLINCHFIELD COAL COMPANY
CLINCHFIELD (P. O. DANTE), RUSSELL COUNTY, VIRGINIA

July 30, 1970

FIGURE 5