CAI-2010-43

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION

Surface of Underground Mine

Fatal Powered Haulage Accident
August 31, 2010

Dewey's Super Transport, Inc. (Q254)
Spencer, Indiana

at

Freelandville Underground Mine
Triad Underground Mining, LLC
Edwardsport, Knox, Indiana
ID # 12-02316

Accident Investigator
William Faulkner, Lead Investigator
Surface Coal Mine Safety and Health Inspector

Mine Safety and Health Administration
District 8
2300 Willow Street
Vincennes, Indiana 47591
Hubert Payne, District Manager

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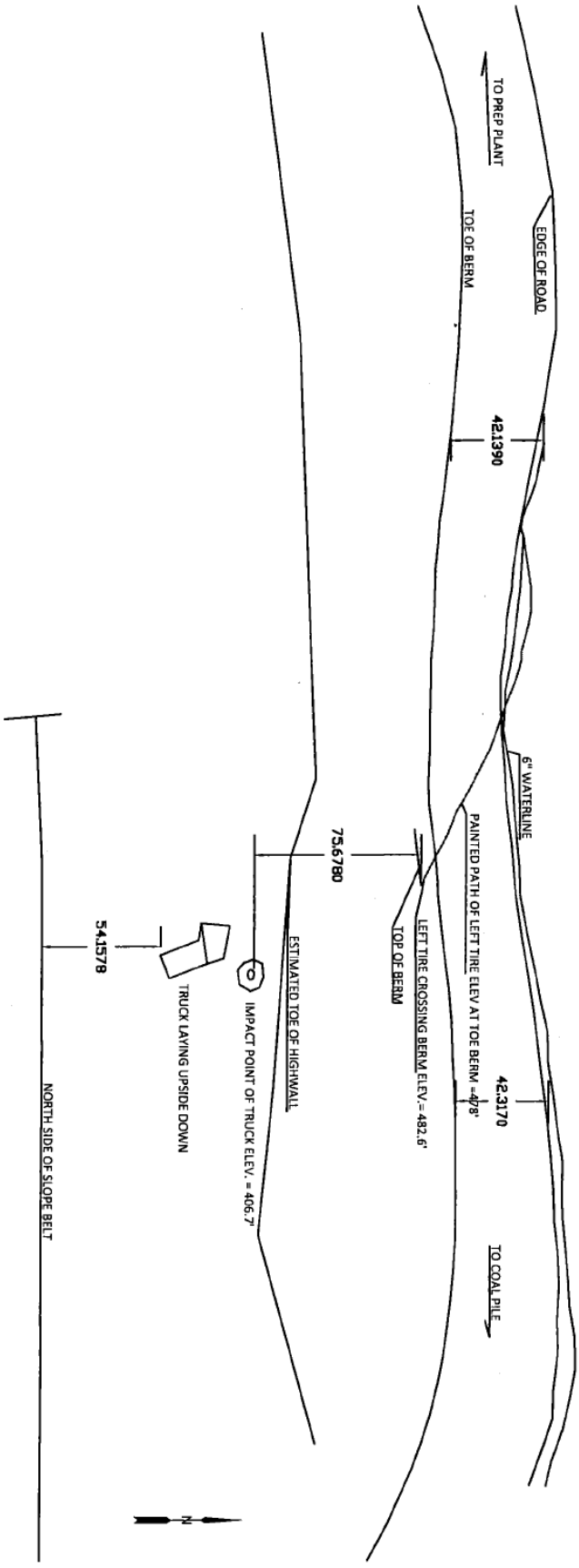
ACCIDENT SCENE SKETCH



OVERVIEW

At approximately 5:20 p.m. on Tuesday, August 31, 2010, a 25-year old truck driver with approximately 16 weeks of mining experience was killed at Triad Underground Mining, L.L.C., Freelandville Underground Mine. The accident involved an A40D Volvo articulating truck which was being driven along the mine haulage road. The truck rounded a slight curve on a 3.5% grade and traveled up the embankment on the left side of the haulage road for 11 feet 6 inches. After impacting the left embankment, the truck veered across the haulage road. The truck impacted the 63-inch high berm located on the right side of the haulage road, traveled over the berm, and fell 72 feet to the mine pit below.

GENERAL INFORMATION

This accident occurred on the surface area of the Freelandville Underground Mine in Edwardsport, Indiana. Coal is produced utilizing a continuous mining machine, battery powered coal haulers, and a belt haulage system to transport coal to the surface. The mine is owned by Triad Underground Mining, L.L.C., a subsidiary of James River Coal Company. The victim was employed by Dewey's Super Transport, Inc., which is contracted to haul coal from the underground mine to the preparation plant.

The principal officers for the mine at the time of the accident were:

John D. Bohnert ..... Mine Superintendent
Sam L. McCord ..... Mine Safety Director

Dewey's Super Transport, Inc., the independent trucking contractor, employed six persons and operated four coal trucks. Dewey Hendrickson was the owner at the time of the accident.

A regular safety and health inspection was ongoing at the time of the accident. The Non-Fatal Days Lost (NFDL) injury incidence rate for the mine in 2009 was 0.00, compared to a National (NFDL) rate of 4.04.

DESCRIPTION OF ACCIDENT

At approximately 4:40 p.m. the victim, Brian W. Mason, arrived at Dewey's Super Transport, Inc.'s parking area behind the preparation plant. He conducted a pre-operation inspection on the A40D Volvo articulating truck, Company Number DS-60. The pre-operational inspection documentation did not identify any defects. At approximately 4:55 p.m. he started his truck and traveled to the underground mine stock pile area. Mason's truck was loaded and he proceeded to the preparation plant where he dumped the load. After dumping the load, Mason proceeded to the preparation plant stock pile area where his truck was fueled. He began his return trip back to the underground stockpile. After traveling on the haulage road approximately 0.3 miles, Mason met a loaded truck. He stopped to let the truck pass. After the truck passed, Mason's truck traveled around a slight curve down a 3.5% grade. At this point the truck traveled up the embankment on the left side of the haulage road for 11 feet 6 inches. After impacting the left embankment, the truck veered across the haulage road impacting the 63-inch high berm, located on the right side of the haulage road, and traveled over the berm, falling 72 feet to the mine pit.

Three underground mine laborers, Timothy Vash, Eric Terrell, and Neil Stakeman were standing at the surface opening of the underground mine. The miners observed the Volvo truck as it came over the highwall and landed in the pit. Vash and Stakeman rushed to the truck, which was lying upside down. Terrell ran to the nearest mine phone and called the dispatcher. Terrell advised the dispatcher that a truck had come over the highwall and to call 911. Terrell then started toward the truck when Vash yelled and told him that the driver was pinned. Terrell called the dispatcher and advised that they would need a rescue unit because the driver was trapped in the truck. Stakeman was the first person to the truck. Access to the truck cab was limited. Stakeman tried to communicate with Mason. Mason did not respond verbally. Stakeman checked the victim for a pulse and found that he had a pulse but was unresponsive. Sean McCarty, End Loader Operator, and Paul Clapp, Truck Driver, arrived on the scene. McCarty and Clapp assisted in the rescue efforts.

Freelandville Fire Department, Edwardsport Fire Department and Knox County EMS arrived on the scene. The Freelandville Fire Department was the first emergency responders to arrive on the scene. They requested Lifeline emergency helicopter, administered oxygen, provided life support, and extricated the victim from the cab of the truck. It took approximately 35 minutes to extricate Mason from the truck. After extrication of the injured, the Knox County EMS transported the victim by ambulance to the awaiting helicopter, which was located at the mine parking lot about one-quarter mile from the accident scene. The Lifeline helicopter transported Mason to the Methodist Hospital in Indianapolis, Indiana, where he later died from the injuries. The autopsy identified the cause of death as blunt-force trauma to the head.

INVESTIGATION OF THE ACCIDENT

At 5:32 p.m. on August 31, 2010, Sam McCord, Safety Director, called the MSHA Emergency Call Center and reported the accident. The Emergency Call Center notified Ron Hayes, District 8 Health Supervisor. At 6:05 p.m., Hayes verbally issued a 103(j) Order to McCord. Accident Investigator William L. Faulkner and Accident Investigation Coordinator Adron Wilson immediately traveled to the mine. The Section 103(j) Order was modified to a Section 103(k) Order, to assure the safety of persons at the mine and preserve the evidence at the accident scene.

Upon arrival at the accident scene, a preliminary examination of the truck and the surrounding area was conducted. Photos and measurements were taken of the haul road, the berm, the truck, and the left embankment in the affected area. MSHA's Technical Support Branch assisted with the investigation.

On September 28, 2010, the on-site portion of the investigation was completed. A list of persons who participated in the investigation is shown in Appendix A. The accident investigation team conducted 14 interviews during the investigation. A list of persons interviewed is shown in Appendix B.

DISCUSSION

Truck Information

The Volvo Model A40D articulated haul truck is a six wheel truck with a manufacturer's empty weight of approximately 69,000 lbs. The truck has a manufacturer's listed payload capacity of approximately 81,600 lbs, resulting in a manufacturer's listed gross vehicle weight rating of approximately 150,600 lbs. Steering of the articulated truck was controlled by two hydraulic cylinders connected between the tractor and trailer. The articulated haul truck was powered by a six cylinder engine. The truck had constant 4-wheel drive, with the axle on the tractor and the front axle on the trailer always engaged. The rear trailer axle could be engaged and disengaged to change the truck between 4-wheel and 6-wheel drive. The truck had a differential locking feature that could be engaged by the operator to provide traction at all wheels. The A40D Articulating Truck is designed to operate in soft or rough terrain. This truck would travel up the embankment and over the 63-inch berm at a low rate of speed with ease. The investigators concluded that the truck was not traveling at a high rate of speed prior to the accident. The slow rate of speed was evidenced by the lack of damage to the embankment, berm, and lack of skidding of the truck.

Hydraulic System

The hydraulic system had eight variable displacement piston pumps. Four pumps were connected to the combination steering and dumping valve which provided the hydraulic flow for the steering and dumping systems. The steering system always had

priority over the dumping system. Two other pumps provided flow for the fan system and one other pump provided flow for the brake system. The other pump was ground driven to provide supplemental emergency steering in case of an engine shutdown or a malfunction in the main hydraulic system

Hydraulic Steering System

The hydraulic steering system of the articulated truck was controlled by two hydraulic cylinders connected between the tractor and trailer. The steering section of the steering and dump valve was manually controlled by turning the steering wheel. The steering wheel was connected to the steering valve through the steering linkage assembly. Four engine driven, variable displacement pumps provided flow to both the steering and dump valves, which in turn, provided the hydraulic flow for both steering of the truck and dumping of the trailer bed. When the engine is started, the four engine driven pumps also start. The system was designed so that the steering section had priority over the dumping section, with the flow entering the steering section first. Steering priority was controlled by the steering valve. When the steering wheel was turned, hydraulic pressure was applied and maintained to the steering circuit first. In addition, the suction line for the hydraulic steering pumps was connected to the hydraulic tank at an elevation lower than any other suction line. This ensures that the hydraulic steering circuit would be the last to lose its supply of hydraulic fluid if a leak were to occur. In the event of an engine-driven pump failure, the truck had a drive-train driven hydraulic pump to provide supplemental emergency steering. The pump was connected to the drive train and was operated by the rotation of the truck wheels.

Since the truck was articulated, an impact of the wheels or the truck with another object can result in a pressure spike in the steering cylinders. This can cause damage to the hydraulic components. To assist in preventing these pressure spikes, a damping cylinder was placed in the steering circuit to absorb the impact pressures. Hydraulic hoses connected the damping cylinder to ports on each steering cylinder.

Brake System Design

The service brake system was a fully-sealed, multi-disc wet brake system with brakes located at each wheel on the truck's three axles. Application of the brake pedal applied pressure to the axle brake units. The brake valve had two sections, which divided the brake system into two circuits. One circuit provided the braking for the tractor and the other circuit provided the braking for the trailer. The pressure to the brake valve was supplied by hydraulic accumulators. Each of the two brake circuits had their own set of accumulators which were separated by check valves. The check valves prevented the loss of hydraulic pressure in one circuit from causing the loss of hydraulic pressure in the other circuit. The hydraulic pressures for the accumulators for both circuits were charged by the brake pump, which was mounted on the end of one of the engine driven pumps in the hydraulic system. The pressure supplied by the foot-activated brake valve was proportional to the amount of pressure applied to the brake pedal, which

resulted in the brake force applied to the truck being increased as the brake pedal was further depressed. The service brake valve reduces the output pressure to the brake units to a range of approximately 1,930 pounds per square inch (psi). With the brake accumulators in the circuit, the service brakes remained operational if the engine was not running until the stored hydraulic pressure in the accumulators was depleted. In order to provide the maximum amount of stored hydraulic pressure for use when the engine was not running or the brake pump was not functioning, the brake accumulator required a nitrogen pre-charge of at least 1,160 psi. The system was designed so that the brake hydraulic pump for the brake system charged the hydraulic pressure in the accumulators to approximately 3,626 psi upon engine start-up. As the hydraulic pressure in the accumulators was reduced by the application of the service brake, the pumps were reactivated to keep the accumulators charged.

The park brake was a lever-activated caliper disc brake, operated by an air operated cylinder with a spring mounted inside. When the park brake was applied, the spring in the cylinder allowed the cylinder to move the lever on the brake caliper into the applied position. This set the park brake mounted on the driveline on the tractor. The park brake was released, when air pressure supplied to the air cylinder compressed the spring in the cylinder, allowing the cylinder to move the lever on the brake caliper to the released position.

Truck Evaluation

When the accident occurred, the first impact the truck encountered was with the embankment on the left side of the road. Visual observation of the tire tracks, left by the truck, leading to the embankment showed no signs of skidding. Because of the abnormal travel path of the truck, special emphasis was placed on checking the steering and braking systems. The damage sustained during the accident prevented the truck from being operated. A number of the components that could have contributed to the accident were examined on the truck, and other components were removed from the truck for evaluation and testing.

Steering Hydraulic System Evaluation

The five hydraulic pumps that provided flow for the steering system were removed and taken to a hydraulic shop for inspection and testing. The four engine driven pumps were disassembled and visually inspected and no contaminants or defects were found. Interviews with other drivers that had driven the truck prior to the accident revealed that hydraulic oil was regularly added to the hydraulic oil tank. As a result of obtaining this information, the inspection of the hydraulic pumps included checking for damage caused by running the pumps with low hydraulic system oil. The inspection of the pump components did not reveal any damage that would have been caused by the pumps being run with low hydraulic system oil.

The pumps were reassembled and tested. The measured flow rates for each of the pumps averaged approximately 9% less than the flow rates listed on manufacturer's specification sheets for new replacement pumps. The testing also revealed that the standby pressures averaged approximately 8% more than pressures listed on specification sheets for new pumps.

The test results were sent to the manufacturer of the truck for their analysis. The manufacturer's representative stated that the flow rates and standby pressures obtained during these tests were sufficient to provide adequate flow for steering the truck. The drive train driven pump which supplied hydraulic flow in case the engine shut down or the other steering pumps failed, could not be tested due to the damage received during the accident. Although the drive train driven pump could not be tested, it was disassembled for visual inspection. No contaminants or defects were found.

Brake System Evaluation

Since the truck could not be operated for testing purposes, the individual components of the brake system were examined for defects that might have contributed to the accident.

A. Service Brake Valve: The service brake valve was removed for testing. Since the service brake system was divided into separate circuits for the tractor and trailer, the foot operated service brake valve had two input ports and two outlet ports. The valve was tested and no defects were found in the operation of this valve.

B. Service Brake Wheel Units: To ensure that the service brake units were providing brake force, each axle of the truck was elevated, and a hydraulic power pack was used to supply pressure to the brake units on each axle. Before pressure was applied to the brake units, the wheel could be turned on each axle. When pressure was applied to the brake units on each axle the wheels could not be turned indicating the brake wheel units were providing brake force. Check of the wear on the disc packs in the service brake wheel units revealed the discs in the disc pack had an adequate thickness for proper operation of the service brake.

C. Brake System Accumulators: The service brake had disposable type accumulators. These accumulators where pre charged at the factory and could not be recharged. According to information from the manufacturer, the brake system accumulators are to be replaced when the nitrogen precharge dropped below 1,160 psi, and the old accumulators are to be disposed. The average precharge pressure in the 4 accumulators mounted on the tractor was 963 psi when checked according to the procedure listed in the truck maintenance manual. The average precharge pressure in the 4 accumulators mounted on

the trailer was 1,050 psi when checked according to the procedure listed in the truck maintenance manual. Although the pre charge pressures in the accumulators were approximately 100 to 200 psi below the manufacturer's recommended minimum pressures, the service brakes were still in operating condition and would still provide adequate braking.

D. Park Brake: The truck was recovered and relocated to conduct the investigation. The park brake held the truck on a grade, indicating the brake was operating correctly.

Retarder and Accelerator Switch

The pedal for the transmission hydraulic retarder and the pedal for the truck's accelerator both operate an electrical switch. The switches for both pedals are the same design. The switches were provided with a 5-Volt direct current (DC) electrical input by the truck's electrical system. As the pedals are depressed, the output voltage varies and provides the signal necessary to operate the functions controlled by the switches. To test the switches, a five volt power supply was connected to the switches, the switches were actuated, and the output voltages were observed. The tested output voltages of the switches were slightly different than the voltage range specified by the truck manufacturer. The switches' specification sheet indicated an output range from 3.6 volts direct current (VDC), to 1.2 VDC through the range of pedal actuation. The tested range for the accelerator switch was 4.4 VDC to 1 VDC and was 4.2 VDC to 1 VDC for the retarder switch. The truck manufacturer's representative stated that the output voltages observed from the testing were in a satisfactory range for operation of both the accelerator and the transmission hydraulic retarder.

Computers

The truck involved in the accident had five computers that monitored the truck's operating functions. Three of these computers were mounted under the left side of the dash, one computer, which assisted in monitoring the engine, was mounted on the side of the engine, and another computer was incorporated as part of the dash panel. In addition to monitoring the truck's functions, the computers stored fault codes which indicated malfunctions in the operating and control assemblies. To evaluate the information stored in the computers, the computers were removed from the accident truck and placed in another truck where the computer codes were downloaded by the manufacturer's representative from Rudd Equipment. The damage to the dashboard computer during the accident prevented the codes from being downloaded. The code downloaded from the computers did not provide any information that identified any malfunction that could have contributed to the accident. The dashboard computer functioned to collect information from the other computers and signal the condition or status of the truck components. The fault codes stored on the dashboard computer would be available from the other four computers. The information from the

computers did not identify a malfunction that would have contributed to the fatal accident.

Warning Light and Buzzers

The truck had a system of primary warning lights to warn the driver of possible malfunctions in the truck's operating systems. The primary warning lights were also connected to a buzzer and a larger red warning light in the center of the dash. This larger red warning light had the word "stop" on it. This was to inform the truck driver he should stop the truck until the system with the possible malfunction was checked and repaired. The driver of the subject truck on the shift prior to the accident stated that the primary steering warning light came on several times during his shift. The physical examination, testing, and inspection of the steering components did not reveal any defects contributing to the accident. The investigating team and MSHA Technical Support concluded the steering components did not fail and cause the accident. Possible causes for illumination of the warning light are: a short in the wiring harness and previous fault codes not cleared from the computer. Fault codes were stored in the computer memory for several years and clearly after the condition had been corrected (e.g. addition of fluid). The owner did not request a service call from Rudd truck service and thus, did not have the program to clear the faults. The driver on the prior shift also stated that the warning light with the word "stop" was on during the shift, but that the warning buzzer did not sound. The driver also stated the stop warning light has been on for approximately 3 months. Examination of the fuse and relay panel revealed that the fuse and relay for the warning buzzer had been removed from the truck. Noncontributory citations were issued for these conditions.

Cab

The cab area of the truck received extensive damage and was examined for extraneous material or other driver distraction. After the accident a cell phone was located in the victim's pocket. The phone's call log was examined and a call log was obtained from the carrier. No calls were received or placed during the time of the accident.

Pre-Operational Examination

Records for the pre-operational examinations were reviewed. The examinations for the date of the accident had been completed and were recorded. The record of the pre-operational examination did not identify any defects. During the interviews with the drivers of Dewey's Super Transport, Inc., it was determined that safety hazards, such as warning lights from the truck fault system, were being identified by the equipment operators, but not always recorded or reported to the mine operator. A non contributory citation for an unwarrantable failure was issued for this condition. The management structure at the mine location for Dewey's Super Transport, Inc. consisted of Dewey Hendrickson. He did not maintain a daily presence at the mine location. Items reported in the pre-operational examination were not always reviewed by Hendrickson. On occasion, the individual truck drivers would communicate

information from the pre-operational examinations or maintenance to a mechanic. However, a mechanic was not always employed. A truck driver with the most longevity had assumed a role of mentor to the other drivers. The mentor/mechanic was utilized by other drivers to communicate information to Dewey Hendrickson. The mentor/mechanic was aware the stop warning light was on for three months. An examination of his duties did not reveal any management function. The mentor/mechanic was not empowered to direct the other drivers and made no decisions concerning work rules or work assignments. He did not review the pre-operational checks. He did communicate with Dewey Hendrickson concerning the availability of coal for transportation. At times he delivered information to other drivers from Dewey Hendrickson.

Seat Belt

The investigation indicated that the victim, operator of the truck, was in the seat of the truck when found. A lap type seat belt was provided and functioned properly when checked. The seat belt was attached to the seat only, and the seat was fastened to the floor of the operator's cab. During the investigation, it was revealed that the operator's seat had sheared the seat mounting bolts on the floor of the cab. The evidence indicated that the seat belt was in use at the time of the accident.

Entrance Door to Cab

The entrance door to the operator's cab had the catch for the door latch missing. The door was being held shut with a tarp strap. A noncontributory citation was issued for this condition.

Training

The review of the victim's training records indicated the training was up to date.

Experience

Brian W. Mason had 16 weeks and 3 days experience with Dewey's Super Transport Inc. This is also Mason's total mining experience. Mr. Mason had a total of 44 hours of experience operating the Volvo A40D truck.

Weather Conditions

The accident occurred at approximately 5:20 p.m. On the day of the accident, the weather report for Freelandville, IN, was a high temperature of 93 degrees, low of 66 degrees, and sunshine with clear skies.

ROOT CAUSE ANALYSIS

An analysis was conducted to identify the most basic causes of the accident that were correctable through reasonable management controls. During the analysis, causal factors were identified that, if eliminated, would have either prevented the accident or mitigated its consequences.

Listed below is a causal factor identified during the analysis and its corresponding corrective action implemented to prevent a recurrence of the accident:

1. *Root Cause:* The operator of the truck failed to maintain control of the truck, while traveling to the underground mine's coal stockpile.

   Corrective Action: All employees of Dewey's Super Transport, Inc. were required to be retrained on the safe operation of the Volvo A40D Articulating Trucks. The retraining included special emphasis on control of the truck when in motion.

CONCLUSION

The operator lost control of the vehicle, striking the left embankment and then veered across the haulage road, traveling over the berm on the opposite side. The vehicle continued over the highwall landing in the pit 72-feet below. The accident occurred because the operator failed to maintain full control of the Volvo A40D Articulating Truck while in motion. In addition, the operator of the truck was not trained adequately to control the truck when in motion.

Approved By:

Hubert Payne
District Manager

2/28/2011
Date

ENFORCEMENT ACTIONS

Order No. 8429210
A 103 (j) Order was issued verbally at 18:05 hours on 08/31/2010, to preserve the accident scene and to protect the safety of all persons on site, including those involved in rescue and recovery operations or investigations of the accident. This order was issued to cover the haul road and the area surrounding the Volvo articulating truck. This was reduced to writing and modified to a 103 (k) Order at 19:50 hours.

A 104 (a) Citation was issued to Dewey Hendrickson/ Dewey's Super Transport, Inc. (ID-Q254), 30 CFR, § 77.1607(b): As a result of a fatal accident investigation at the Freelandville Underground Mine, it has been determined that the truck operator failed to maintain control of the Volvo A40D Articulating Truck, while traveling on the haul road toward the underground mine's coal stockpile. Mobile equipment operators shall have full control of the equipment, while in motion.

APPENDIX A

Persons Participating in the Investigation

Triad Mining/Mine Operator

Name	Title
Sam McCord	Underground Safety Director
Steve Price	Surface Safety Director
John Bohnert	Mine Superintendent
Donald W. Arrowsmith	President

Dewey's Super Transport, Inc./Contractor

Name	Title
Dewey Hendrickson	Vice President

Rudd Equipment/Labor

Name	Title
Tom Goedde	Surface Technician

State Agency

Name	Title
Don McCorkle	Deputy Commissioner, Bureau of Mines

Mine Safety and Health Administration

Name	Title
Hubert L. Payne	District Manager, District 8
William L. Faulkner	Coal Mine Safety and Health Inspector, Accident Investigator
Adron Wilson	Accident Investigation Coordinator
James Henshaw	Coal Mine Safety and Health Inspector
Gene Hennen	MSHA Mechanical Engineering and Safety Division

Volvo Manufacturing

Name	Title
John C. Bartz	Director, Product Assurance

APPENDIX B

Persons Interviewed

Name	Title
Tim Vash ……	Underground Miner
Neil Stakeman……..	Underground Miner
Eric Terrell……...	Underground Miner
Josh Davis……..	Truck Driver
Travis St. John……	Truck Driver
Parker Hendrickson……...	Truck Driver
Paul Randall Kilgore……..	Truck Driver
Wayne Taylor……..	Truck Driver
Jim Hendrickson…….	Truck Driver
Jerry Padgett…..…….	Truck Driver
Paul Clapp……...	Truck Driver
Josh Lundy……..	Truck Driver
Sean McCarthy…….	Front-End Loader Operator
Dewey Hendrickson……...	Vice President Dewey's Super Transport, Inc

APPENDIX C

Photograph