DCA-06-FR-004

Norfolk Southern Rear-end Collision Derailment

Train No. 226 & Train No. 22R

Lincoln, AL

January 18, 2006

Factual Report

47 pages, including cover

National Transportation Safety Board

Office of Railroad, Pipeline, and Hazardous Materials Investigations
Washington, D.C. 20594

Railroad Accident Investigation

Factual Report

Rear-end Collision of NS Train No. 226A117 & NS Train No. 22R
near Lincoln, Alabama
on January 18, 2006

NTSB File Ref.: DCA-06-FR-004

Prepared by: Richard A. Hipskind, Date: September 11, 2006
Investigator-in-Charge, NTSB

The Accident:

Location:	Lincoln, Alabama
Date of Accident:	January 18, 2006
Time of Accident:	4:17 p.m. Central Standard Time
Railroad Involved:	Norfolk Southern Railway
NTSB Accident Ref.	DCA-06-FR-004 Rear end collision of two freight trains

Accident Synopsis:

On January 18, 2006, at about 4:17 p.m., Central Standard Time (CST), eastbound Norfolk Southern Railway (NS) freight train No. 226A117 (train 226) derailed its 3 locomotives and 7 head cars and the rear three cars of eastbound NS train No. 22R at about milepost 757.95**,** when it collided with eastbound NS train 22 R, which was stopped in the Coosa siding. The collision occurred in Lincoln, Alabama in Talladega County. The 226 train crew consisted of an engineer, conductor and a conductor trainee. Train 226 had 3 locomotives units pulling 23 cars, all intermodal containers. Train 22R's crew consisted of an engineer, conductor and an engineer trainee. Train 22R had 2 locomotives with 81 cars of miscellaneous freight. The three crewmembers of train 226 were injured as a result of the collision and were transported to a hospital in Talladega, AL, where they received medical attention. The 22R crewmembers were not injured in the incident.

The incident occurred while train 226, which was operating at about 53 mph, entered the west switch of Coosa siding located at about milepost 757.95 on NS's Alabama Division, East End District. The timetable authorized speed for the curves between MP 763.2 and MP 758.0, which is west of the siding switch, is 55 mph for intermodal freight trains. The authorized speed through the turnout onto the siding is 30 mph. According to the crew of train 226, the engineer

was operating on a "clear" signal at Riverside, which is the first signal located west of the switch at Coosa. A clear signal indication would have permitted the train to operate at authorized timetable speed.

At about 4:20 p.m., emergency responders were notified and arrived on-scene about four to five minutes later. A fire ensued after the collision and spread to the rear auto rack cars of train 22R. Additionally, the fire spread to train 226's containers carrying rolls of paper. Fire suppression efforts ceased upon notification of potential presence of sodium cyanide in the wreckage.

The incident commander was advised of hazardous materials in train 226's consist. The conductor advised him that 12 intermodal containers were hauling hazardous materials. It was later determined that as a result of the collision, two intermodal containers on train 226 were breached. Most of the breached sodium cyanide material remained in the intermodal container. A second container (TPHU 681321), which was positioned on the same car No.VTTX 097567, was breached and some briquettes were released onto the ground where it came to rest. After moving the container to the designated area for trans-loading and upon orienting the container in an upright position, several drums fell from the intermodal container and some of the spilt material in the container was released onto the ground.

NS estimated that a total of about 285 pounds of sodium cyanide was released. An estimated 7,000[1] gallons of diesel fuel were released at the accident site. The fire consumed a large amount of the fuel.

[1] NS's figured that 7,236 was the maximum amount of fuel available to be released based upon when and where the locomotives were last fueled and at a 3 gallon/mile consumption rate.

NS's estimated total damages are $5,213,343. This damage estimate does not include accounting for all lading, car, and environmental and wrecking costs.

The derailment occurred during bright daylight hours, in sunny, clear skies, with light winds from the west or southwest at 6—8 mph and a temperature of about 53°F. The relative humidity was recorded at the Anniston Airport at 35% at 3:53 p.m. and at 39% at 4:53 p.m.

The following parties are part of the investigation: Norfolk Southern, Federal Railroad Administration (FRA), Lincoln Fire and Rescue Department (LFRD), United Transportation Union (UTU) and Brotherhood of Locomotive Engineers and Trainmen (BLET).

Location of the Accident and Description of Track:

The derailment occurred on NS's East End District of their Alabama Division in the Coosa siding track located at milepost (MP) 757.95. The switch is located near Lincoln, Alabama, within the limits of Talladega County. In the area of the derailment, the track was oriented geographically in an east/west direction and by timetable in an eastward/westward direction. The milepost numbering decreases in the timetable direction and the direction of both train movements--eastbound.

The Coosa River and Logan Martin Lake are located about ¾ of a mile west of Coosa siding switch. Coosa River is the boundary between St. Clair (west of) and Talladega Counties (east of). U. S. highway 78 runs parallel to the railroad about 1700 feet south of the main track. A private road crossing, Stein Lane (DOT No. 726839X), crosses both the siding and main track at about milepost 757.8. One residence is located south of the private road crossing, while several other homes are located north of the crossing nearer the lake. East of the accident site, at about milepost 757.4, Lomar Drive crosses the tracks leading into Lomar Villa, a residential

subdivision north of the main track with about 24 homes. The Honda industrial plant access switch is located about 3 miles east of the accident site.

The main track is owned, inspected, maintained, and operated by NS, however, Amtrak operates two trains daily per passenger schedules over this territory. In addition to the two Amtrak trains, NS typically operates about 32--35 freight trains[2] daily over this portion of the district. The maximum allowable operating timetable speed for the main track in the area of the derailment is 55 mph for passenger and freight trains, designating it as FRA Class 4, however there is a 30 mph permanent speed restriction while traversing the turnout side of the switch at Coosa.

Track Characteristics and Track Field Notes Measurements:

The main track prior to the point of collision (POC) and throughout the area consisted of 132-pound[3] continuous welded rail[4] (CWR) seated in 18 by 7 3/4 inch double shoulder tie plates[5]. The rails are fastened to the crossties with 6 inch cut track spikes. The CWR was placed on 8 foot 6 inch wooden crossties with an average spacing of 19 ½ inch or 23 crossties per 39' rail length. The track preceding the derailment footprint is box anchored[6] with Unit spring anchors[7] on every crosstie. There was no evidence of rail movement on the track structure.

The rails in the switch area consisted of 132 pound Sampson switch points fitted against 132-pound stock rails. The adjacent rails were 132 pound. Track geometry measurements were sampled west of the switch area. Evidence of movement was added to the unloaded

[2] These numbers are averages provided by NS and that include the local switchers as part of the count.
[3] Rail weight classification is determined by the weight of a three-foot section of rail.
[4] CWR is determined by rail that has been welded together in lengths of 400 feet or more.
[5] Tie plates are on-track-materials placed between the bottom of the rails and the top of the crossties, in order to protect the crosstie and form a connection between the rail and fasteners. The shoulders form edges on each side of the base of the rail, the rail sits in-between the shoulders, hence double shoulder.
[6] Box anchoring places rail anchors on both rails across from each other on each side and against the side of a tie.
[7] Rail anchors are designed to transfer the longitudinal forces developed in the rail to the ties and ballast.

measurements. Gage measurements on non-disturbed track west of the switch ranged between 56 ¼ to 57 inches. The maximum FRA gage allowable for FRA Class 4 track is 57.50 inches[8]. Investigators did not observe any crosslevel exceptions in the tangent or 3 degree curve track preceding the switch. The maximum FRA crosslevel variation for Class 4 track is 1.25 inches[9].

An engineering drawing of the accident scene was developed depicting the derailment footprint, car arrangement, relative distances and signal data.

Injuries:

The three crewmembers of train 226 stated that they assisted each other in exiting the lead locomotive. Each of the three crewmembers was able to walk to the private crossing east of the impact area, where they waited for emergency personnel. When emergency personnel arrived, the engineer and conductor were initially examined and transported to Citizens Baptist Medical Center located in Talladega, AL, where they received further medical treatment and held for observance. The conductor trainee was also transported to Citizens Baptist Medical Center, where he received medical treatment and was released.

Emergency Response and Hazardous Materials:

About 4:20 p.m. on the day of the incident, local emergency responders were notified and were on-scene 4--5 minutes later. A fire ensued after the collision and spread to the rear autorack cars of train 22R. Additionally, the fire spread to train 226's intermodal containers carrying rolls of paper. Upon arrival, the Lincoln Fire and Rescue Department began to suppress the fire on the rear cars of train 22R, the automobiles. But when the conductor of train 226

[8] See FRA Track Safety Standards (TSS) under Part 213.53, Gage, table for FRA Class of track and corresponding gage measurement requirements.
[9] See FRA TSS under Part 213.63, Track Surface, table for FRA Class of track and corresponding geometry measurement requirements.

informed the incident commander that their train was carrying sodium cyanide, the incident commander ceased the fire suppression efforts and immediately pulled everyone back from that area until a hazardous materials team assessed the situation. The incident commander decided to establish a precautionary evacuation of ½ mile. A hazmat team initially reported that none of the hazardous material containers were breached and that no product was released.

The pre-cautionary evacuation zone was later increased to 1 mile. A representative from Talladega County's Emergency Management Agency provided investigators with figures that describe the number of homes within the evacuation zone. Those figures indicate that about 224 households were within the zone in Talladega County and that an estimated population of 560[10] persons potentially was evacuated. However, these figures do not include residents in St. Clair County that were within the one-mile evacuation distance, which was directed by the Alabama Department of Emergency Management. The City of Riverside is included in the one-mile distance.

It was later determined that as a result of the collision, two intermodal containers on train 226 were breached. Twelve containers were hauling hazardous materials. A small amount of sodium cyanide was spilled on the ground near derailed container MSCU 376266. Most of the breached sodium cyanide material remained in the intermodal container. A second container (TPHU 681321), which was positioned on the same car No.VTTX 097567, was breached and some briquettes were released onto the ground where it came to rest. After moving the container to the designated area for trans-loading and upon orienting the container in an upright position, several drums fell from the intermodal container and some of the spilt material in the container was

[10] Estimated population in Talladega County based on 224 houses or campers with an average of 2 ½ persons per structure.

released onto the ground. NS estimated that a total of about 250 pounds of sodium cyanide was released from this container.

On-scene recovery operations continued and hazardous materials specialists were able to move, inspect and transload intact containers for shipment. The material from breached containers was repacked as necessary. NS said that 100% of the product was recovered. The entire amount of sodium cyanide was removed from the area by 2 a.m. Saturday morning**.**

Sodium Cyanide:

The sodium cyanide (material) was in a solid form, shaped into small white briquettes, similar in size to a charcoal briquette. The material was packaged in the intermodal containers in various containers, in 30-gallon drums, boxes and intermediate bulk containers (IBC's). The IBC's are designed to carry about 2,200 pounds of product. Where the material was released, the briquettes were recovered by hand.

Waybill document information indicates that two cars on train 226 were carrying sodium cyanide, which is identified as 6.1, UN 1689, PG I RQ. When water is added to sodium cyanide it will produce hydrogen cyanide gas, which creates a poisonous gas. The following is the breakdown of the hazardous material loads of train 226 determined in the investigation:

Car DTTX 750538:

Car DTTX 750538, an articulated multi-unit 5 pack, was located as the sixth car back from the locomotives. It had ten 20-foot intermodal containers fully loaded with sodium cyanide on it. Nine of the containers were not damaged in the accident. Those nine containers were inspected, loaded on trucks, and transported back to the Du Pont plant in Memphis, TN. The container numbers are as follows:

- CAXU 638867; GLDU 219380; INBU 333906; MSCU198628; MSCU 245373; MSCU 324513; MSCU 368735; MSCU 611236; ITLU 682024.

The tenth intermodal container was too badly damaged for onward transportation (MSCU 609649). There was no release from the packages inside the container; however, packages were trans-loaded and trucked back to Dupont in Memphis, TN.

VTTX 97567:

Car VTTX 97567, a flat car, was the fourth car back from the locomotives that held two intermodal containers (20 feet. each): MSCU 376266 and TPHU 681321.

Container No. MSCU 376266 had one IBCs damaged in the derailment. There was a small release of sodium cyanide both on ground and inside the container. The total amount of release was enough to fill several five-gallon buckets (about 35 pounds).

Container No. TPHU 681321 carried 165 drums each with a 30-gallon capacity, each weighing about 220 lbs. Some drums were damaged in the derailment and material was released onto the ground where the container came to rest. The container was moved to the staging area and righted to allow for trans-loading, in the process some drums fell out of the container. There was a release of product both inside the container and on the ground. The damaged or breached drums were placed in over packs and transported back to Du Pont plant in Memphis, TN. Estimated total material released 250 lbs.

Damages:

As a result of the derailment, a total of about 350 feet of the main/side track was either disturbed or destroyed, which required the installation of 8 track panels. The following damages figures were provided:

- **Track** **45,000**
- **Signal** **35,000**
- **Mechanical** **1,362,299 (locomotives)**
- **Car** **972,056**
- **Other** **2,798,988 (autos on rear of train 22R)**

Total **$5,213,343**

The railroad estimated that total damages were about $4,775,000, but this did not include the costs for the re-railing or "wrecking", all of the lading, intermodal containers, environmental clean-up and delays to operations or detour of traffic.

Personnel Information:

Crew - Train 226:

The locomotive engineer was hired on May 5, 1978, as a brakeman on the Alabama Division. He was promoted to a locomotive engineer on April 21, 1997. The engineer last completed operating rules classes in 2005.

The conductor was hired on April 18, 2005, as a conductor trainee. He was promoted to conductor on September 19, 2005. The conductor last completed operating rules classes in 2005.

The conductor trainee was hired on the Alabama Division on October 20, 2005. He was working in that capacity when the collision occurred. He was in training status at the time of the accident and had not taken the operating rules class for 2006.[11]

Train Dispatcher:

The train dispatcher was hired on February 8, 1985 as a clerk in Jacksonville, Florida. She was promoted to a train dispatcher in Birmingham, Alabama on October 24, 1997, and she was working in that position when the accident occurred. She last attended operating rules classes in 2005.

[11] The incident occurred on January 18, 2006, (18 days into the new year) and the engineer, conductor, dispatcher also had not taken NS' annual Operating Rules class for 2006.

Train History: Train 22RA116 (22R):

NS train 22R originated in New Orleans and was re-crewed in Birmingham, destined for Atlanta. Train 22R, which was stopped in the Coosa siding, consisted of 2 locomotives, 81 cars (73 loads and 8 empties) and an end-of-train device, 6,046 trailing tons, 8,277 feet in length. The three rear cars, bi-level auto racks, containing automobiles were derailed as a result of the collision. The rear four cars caught fire and the lading was destroyed, however the fourth rear car did not derailed. The EOT device was not located in the wreckage and was assumed destroyed.

Train 226A117 (226):

Train 226 originated in Los Angeles, CA, routed through Memphis, TN and was also re-crewed in Birmingham, destined for Atlanta. Train 226 consisted of 3 locomotives, 23 cars (22 loads, 1 empty) and an end-of-train device, 3,582 trailing tons and 4,580 feet in length. The three locomotives and first 7 cars in the train were derailed. Of the 7 cars derailed, the 1st, 3rd, and 6th cars were multi-unit articulated cars consisting of 5 platforms each. The 5th car was articulated, consisting of 3 platforms; the 2nd, 4th and 7th cars were single platform type cars. The following information describes the number of intermodal containers carried by each car:

- The first car was loaded with 10 containers (5 platforms---2 containers per platform)
- The second car was loaded with 2 containers
- The third car was loaded with 6 containers (3 platforms—2 containers per platform)
- The fourth car was loaded with 2 containers
- The fifth car was loaded with 4 containers (3 platforms—two containers on one & single containers on the other two)
- The sixth car was loaded with 10 containers (same as first car)
- The seventh car had the east truck derailed and was loaded with 1 trailer

Method of Operation:

The accident occurred on NS's Alabama Division, East End District, part of the Western Region, at Coosa Siding, MP 757.9 on the territory between Birmingham, Alabama and Atlanta, Georgia, near Lincoln, Alabama. Trains operate on the East End District under NS current operating rules that went into effect on November 15, 2005. They are in use along with bulletins and orders that are effective daily that governs the operations of trains on the division. Additionally, the Division Superintendent issues special instructions and bulletins. The NS Alabama Division Timetable No. 15 was made effective on Sunday, July 13, 2003.

The train dispatcher located in Birmingham, Alabama controls the territory. Trains are routed over the track by a traffic control system (TCS). The train dispatcher controls the signal system by selecting the routes for the train traffic. The train dispatcher manages the system by operating the control points of the TCS, between these control points there are intermediate automatic block signals, which govern the speed of trains by signal indication, and operating rule definitions.

The train dispatcher's console recording machine indicated that train 22R headed into the siding at Coosa at 4:03:45 p.m. on January 18, 2006. The console showed a track light at 4:17:31 p.m. on the main track between Coosa and Embry, which indicated that something out of the ordinary, had fouled the track.

According to the Chief Train Dispatcher in Birmingham, Alabama on January 21, 2006, there was no indication of improper signals displayed on the train dispatchers console for train 22R or train 226 as they approached Coosa siding prior to the collision.

Metrological Data:

The derailment occurred during bright daylight hours, in sunny, clear skies, with light winds from the west or southwest at 6—8 mph and a temperature of about 53°F. The relative humidity was recorded at the Anniston Airport at 35% at 3:53 p.m. and at 39% at 4:53 p.m. The sunset was at 5:30 p.m., which was about 1 hour and 13 minutes after the incident occurred.

Post-accident Inspection:

Investigators inspected and photographed the equipment, track structure and signals within the derailment footprint in the area of the west switch of Coosa siding and noted the following:

- The approximate lead engine location for train 22R was identified.

- A measurement from the stopped position of train 22R was made toward the west switch of Coosa siding based upon the length of train identified on train 22R's consist (8,277').

- The consensus POC was located at MP 757.95, which is located about 84 feet west of the insulated joints on the Coosa siding (This would be where the leaving end of the O/S for the direction of travel for train 22R would be).

- The lead axle of the lead truck of lead locomotive of train 226 or rear car of train 22R likely derailed first upon impact.

- The three locomotives and head seven cars of train 226's cars derailed in an accordion like manner covering the track and right-of-way in the vicinity of the west switch.

- The rear three cars of train 22R were derailed on or near the siding track.

- The rear of train 22R was not clear of the track circuit that allows the dispatcher to line the switch and signal for the main track movements.

Track Inspections and Track Data:

The track was last inspected on January 17, 2006, by a NS track inspector qualified under F RA's Track Safety Standards Part 213. The record did not indicate any exceptions to the track structure in the vicinity of the collision. An automated track geometry measurement was last conducted on August 8, 2005. No exceptions were noted in the immediate accident location. The last internal rail flaw detection test was conducted on November 10, 2005. No defects found in the immediate accident area.

The area last received a crosstie and surface maintenance program in May of 2004. The only work that has been performed at the switch includes routine frog welding, dates unknown.

Pre-accident Tests and Inspections

At Memphis, TN, train 226 received a Class I train air brake inspection on January 17, 2006. No exceptions were noted. Train 22R originated at New Orleans, LA, where it received Class I train air brake inspection on January 16, 2006. No exceptions were noted.

Post-accident Mechanical Inspections:

On January 19, 2006, at approximately 3:45 am, investigators conducted a brake inspection at the accident site of the remaining cars from train 226A117 that were not damaged in the accident. One multi-unit car was unable to be inspected due to being on a trestle (rear of train). Brake conditions and measurements were noted with no exceptions taken. All wheels exhibited good contour with no indications of unusual wear, overheating discoloration, flat spots, shelling, or other defective indications or conditions.

On January 20th, maintenance and inspection paperwork was retrieved from the two trailing locomotives of train 226A117 and the two locomotives of train 22RA116.

Train 226A117 (226):

Train 226 had three locomotives, NS 7137 (lead), NS 7138, NS 7143. Investigators could not locate the F6180.49a form and other paperwork on locomotive NS 7137, as a result of fire. Secondary records were requested and provided. Upon receiving the paperwork, no exceptions taken with the F6180.49a forms for the 3 locomotives. No exceptions were taken with calendar day inspection records on board NS 7143 and NS 7138. The records list both locomotives were inspected at 2:00 a.m. 1/18/06 at location 547A.

Train 22RA116 (22R):

Train 22R had two locomotives, UP 4562 (lead), NS 9795 (trailing). No exceptions were taken to the electronic F6180.49a form listing periodic inspections for locomotives UP 4562 and NS 9795. No exceptions were taken with calendar day inspection records on board UP 4562 and NS 9795. The records list both locomotives were inspected at 1:45 am 1/18/06 at McClure, AL.

Investigators found Two Class I air brake slips onboard the lead locomotive of train 22RA116. FRA took exception to the Class I brake test slip from New Orleans (originating location) dated 1/17/06 where the number of cars brake tested is missing from the form (NS form 1043-BT).

Event Recorder Description:

Train 22R had two locomotives that were both equipped with a Quantum Engineering solid-state event recorder. NTSB retained custody of both recorder downloads. Train 226 had three locomotives that all were equipped with a Quantum Engineering solid-state recorder. The recorder on the lead unit of train 226 was damaged in post-accident fire. The recorder case was recovered but the fire consumed all electronic boards and memory. The recorders on the second

and third units were recovered and downloaded. Wheel measurements used for downloads were acquired from NS maintenance records. The data files from downloads are at the NTSB recorder laboratory in Washington, DC.

Event Recorder Data:

Event recorder data from Train 226 indicates the train was moving at approximately 29 mph with the throttle in notch 7 when it traveled past the intermediate signal at Pell City at milepost 763. At approximately 4:10 p.m., the train speed was down to 5 mph around milepost 761. The speed fluctuated before beginning to increase at approximately 4:12. Data indicates train 226 was moving at around 18 mph when going past the intermediate signal at Riverside, milepost 760.6. The train speed continued increasing and reached a maximum of 53 mph. At approximately 4:17 near milepost 758.01, with the train speed indicating 53 mph, the brake pipe pressure dropped from 90 lbs (fully charged) to 8 lbs. At milepost 757.9, the train speed indicates dropping from 53 mph to 45 mph. Review of the data indicates that the train had been placed into emergency from the control stand of the locomotive.

Signal System Description:

Train movements are authorized by the timetable instructions, and the signal indications of a traffic control system. Trains are dispatched using the signal system from the dispatch center in Irondale, Alabama. The traffic control system utilizes three aspect color-light signals and electronic coded track circuits. Signals are arranged for movement in either direction.

Signal Data Description

Signal data indicates that at 2:35 p.m. on January 18, 2006, a route was lined from milepost 787.7 (CP Lovick) to milepost 733.4 (CP Lardent) for train 22R on the main line. At 3:17 p.m.,

a following route was requested for train 226 to follow train 22R. At 3:48 p.m., the dispatcher removed the stored route for train 226 and put the signal at CP Coosa to red to run time and request a route into the siding track at CP Coosa. At 4:03 p.m., data indicates Train 22R occupied the OS circuit at CP Coosa. At 4:04 p.m., the siding track at CP Coosa indicates occupied.

At log time 4:06 p.m., train 226 indicates going past the intermediate signal at Pell City. At 4:11 p.m., the dispatcher stores a request for a straight move at CP Coosa, following train 22R. At 4:17 p.m., a track occupancy light indicates on the main line east of CP Coosa.

Post Accident Signal Testing:

All signals and cases were found locked and secured by investigators. Initial inspection of the signal system found no evidence of tampering or vandalism. The switch at CP Coosa was found lined for the siding track. Following the collision, all signal equipment was secured and was not opened until investigators were on scene. Relay positions were recorded and were found to be in accordance with the location of track occupancy.

NS signal personnel, in the presence of FRA and NTSB investigators, opened the signal heads for inspection, and lamp voltage readings were recorded. No exceptions were noted to the condition of the signals. Relays were tested at CP Coosa, the intermediate signal at Riverside and at the intermediate signal at Pell City. Cables were meggered and the westbound signals destroyed at CP Coosa were replaced. Track circuits were verified and timers were checked. No exceptions were noted to the condition or operation of the signal devices at each location.

The insulated joints at the Coosa switch and preceding signals were inspected. Investigators did not take exception to their condition.

Locking tests were conducted and were found to be working as designed. The signal system was returned to service at approximately 8:30 p.m., on the 21st of January. Additional electronic tests were scheduled at the request of FRA and NTSB and performed in conjunction with sight distance tests. Maintenance records and post accident records were reviewed, as well as, trouble call records for signals in the vicinity of the accident. No exceptions were noted.

Upon completion of postaccident testing of the signal equipment, GE Transportation Systems Global Signaling, LLC (GETS GS), the manufacturer of the Electro Code IIC equipment, was requested to perform a technical review of the equipment at Riverside and Coosa. GETS GS engineers reviewed the electronic components and circuits on the PC board assemblies and performed a track circuit analysis. The electronic components were validated to meet the minimum mod level requirements. The track circuit analysis indicated the code pulses applied to the rails met original factory specifications. The GETS GS engineers determined the signal equipment was operating as intended.

Sight Distance Tests:

On January 24 and 25, 2006, investigators conducted sight distance testing on NS's East End District between Pell City and Coosa siding to observe three consecutive signals on the territory: 1) Pell City intermediate; 2) Riverside intermediate; and 3) control point at Coosa. The sight distance testing was conducted using locomotive NS 7121 (Model GP 60), which is a similar model of the lead locomotive (NS 7137) on accident train 226. Locomotive 7121 was operated with the short hood forward, which is the way the accident train's locomotive was positioned. Representatives for NTSB, NS, FRA, and a professional photographer rode the test locomotive during the sight distance testing. Other party representatives boarded the locomotive

on-scene at Riverside to view the intermediate signal from the locomotive cab while it was stopped in advance (west of) of the signal.

The testing was conducted under bright and clear skies conditions on both dates. On the day of the accident, the skies were sunny and bright with little or no clouds.

The signal system conditions used for the test were with no routes requested, but with direction of traffic established. The switch at Coosa was lined and locked in the reverse position and the eastbound control point signal at Coosa at STOP with a .06 shunt applied to the OS circuit 84 feet from the leaving signal.

The initial "pre-test" run on January 24th began at about 3:00 p.m. from Pell City operating in an eastward direction toward the first intermediate signal located at MP 762.8, the Pell City intermediate signal, which was set to display a "restricting" signal. A dragging/defective equipment and hotbox detector is located alongside the Pell City intermediate. A "number plate" denoting the approximate milepost location is affixed to the Pell City signal.

Pell City: (for eastbound movement)

The investigative team in the locomotive cab observed a restricting signal (a single red aspect lit) on the pre-test run at about 3:00 p.m. The signal aspect was in focus, illuminated and aligned. The signal aspect could be seen and the meaning (indication) of the signal determined.

On the test run, which occurred later in the afternoon at about 4:08 p.m., the same signal location was observed displaying an approach (a single yellow aspect lit), which was the signal that the crew and signal data logs indicate was displayed on the accident date. The location of the first preview of the signal was marked and later measured to be 811 feet. The investigative team observed that the signal was in focus, illuminated and aligned. The signal aspect could be seen and the meaning (indication) of the signal determined.

After making the signal observation, the test locomotive continued to operate eastward toward Riverside governed by the respective signal observed during each of the tests.

Riverside:

The pre-test arrival time for the test locomotive at this location was approximately 3:35 p.m. The locomotive was operated at a slow advance toward the Riverside signal during the pre-test run and while continuing its eastward movement in the curve west of Riverside, the locomotive was stopped at the first observed point for the preview of the signal. Investigators first observed two red aspects and then had the locomotive move 43 feet east to a second stop. Each of the locations was marked. All of the members of the investigative team observed that a green aspect could be seen from the second location, which was later measured at 1,189 feet from the signal (insulated joint location on the track). The green aspect was located in the top aspect of the upper signal head. The upper green aspect was not being energized. The signal coded for the test would not have energized the upper green aspect. The locomotive pulled up and the green became more visible or prominent. The red aspect in the same signal head was energized and visible to those in the locomotive cab.

The signal at Riverside is equipped with two heads—an upper head with three aspects (green, yellow, red—in order from top to bottom), which is in alignment with the signal mast, and a lower head with two aspects (green, red), which is offset to the left of the vertical signal mast. Both of the signal heads display their aspects for eastbound movement. The signal was set for a restricting indication, so the upper and lower signal heads were energized and displaying two red aspects (one each for each signal head). The upper head had two aspects that appeared lit or illuminated—one green above the one red. The lower signal head displayed a single red

aspect during the tests. No exceptions were taken to the overall signal focus or alignment of either signal head.

As the locomotive moved closer to the signal and before it passed the signal, the upper signal head's upper aspect continued to display a green aspect as the locomotive passed its location.

During the test run at Riverside, the signal continued to display two aspects on the upper signal head—a green over a red within the same signal head. The green aspect appeared as before during the pre-test run. The test run arrival time was at 4:19:58 p.m.[12] The locomotive and investigators arrived slightly before the above time and stayed in the area until the signal and crossing area became shaded. The top green disappeared when shade fell covered the area.

Investigators who were on the ground at Riverside had observed the green aspect prior to the pre-test run and during the test run. All parties wishing to make observation from the locomotive were permitted to do so while the locomotive was standing still. Each party representative was permitted to view the Riverside signal from a position behind the locomotive engineer's seat, as well as, while seating in that seat. All of the investigators made the same comment that they could see the green aspect with a red aspect below it in the upper signal head and a red aspect on the offset lower signal head.

Photographs were taken at each location and on each run from various positions in the locomotive cab and at various distances, both moving and standing still.

[12] The arrival time was met well in advance of the calculated "sun" time that the accident train passed the signal on the accident date. Investigators accessed calculations made by a local assistant professor of physics, who provided the corrected sun times to ensure that the signal and surrounding area would be receiving sunlight from the approximate same angle as the accident date and time. Professor Duane Pontius, Jr.., Ph. D., assistant professor of physics at Birmingham-Southern College. Prof. Pontius has been a member of the faculty since 1999 after a career in theoretical space physics research. His PhD. is in space physics and astronomy from Rice University.

Coosa (Control Point):

The locomotive was operated eastward toward Coosa, which is located at MP 758.0. During the pre-test run, the locomotive slowly traversed the curve and stopped upon first sight of the signal, which displayed a STOP indication or "all red." The signal mast was equipped with three signal heads with one red aspect energized per signal head. All of the investigative team on board agreed that the signal displayed three red aspects, one per signal head. This location was marked and later measured by NS engineering personnel. The locomotive proceeded eastward around the curve towards the switch until investigators could see the left-hand switch point (the reverse switch point) was closed. This location was marked and later measured. The locomotive was moved forward until the open switch point or right-hand point could be observed. This location was marked and measured, as well.

The switch and signal were observed for a second time during the test run with no changes or differing comments.

Sight distance tests measurements

Table No. 1

Signal Name & Type	**Milepost**	**Distance 1st observed to Signal—line-of-sight**	**Distance 1st observed—linear—track feet**
Pell City Intermediate	**762.8**	**811 feet**	**812 feet**
Riverside Intermediate	**760.4**	**1230 feet**	**1231.4 feet 1189' (move forward)**
`Tree branch	**760.55**	**N/A**	**909 feet**
West Coosa Control Point	**758.0**	**847 feet**	**856 track feet**
Switch closed	**758.0**	**420 feet (LH switch point)**	**420 track feet--*[13]**
Switch open	**758.0**	**361 feet (RH switch point)**	**361 track feet--***

[13] The asterisk indicates that both the "track feet" and "chord measurement" are nearly the same figure for both locations—within inches.

On January 25, 2006, investigators repeated the same series of sight distance tests and made radio transmissions at specific locations to determine the receiving quality of the local radio towers/repeaters for that area.

Pell City:

No exceptions were taken at the Pell City signal location. The signal functioned as designed. Occupants in the locomotive cab did not have a problem seeing the signal or discerning its meaning.

Riverside:

Investigators spent most of the sight distance testing time at this location to accommodate those party participants not present on the first day's testing in the observance of the signal. Observations were made by investigators looking over the shoulder of the engineer and while seating in the engineer's chair. Several run-bys were conducted to photographically document the appearance of the signal. Additionally, investigators set the signal at "clear," "approach" and "restricting." As with the previous tests on January 24th, investigators made observations from the locomotive while stopped and moving.

Investigators agreed that the signal displayed the same descriptions as noted in the January 24th testing. The upper aspect in the upper signal head appeared green, the lower aspect in the same signal head as the green was displayed as red and energized and the lower aspect of the lower signal head displayed a single aspect--red.

During the sight distance testing on January 25, 2006, at the Riverside intermediate signal, investigators observed a branch from a tree to the left or north of the single main track, which was lying on the north embankment protruding in the line of vision of the signal, as seen

from the conductor's seat (left side of the locomotive cab). The branch obstructed the view of the red aspect located on the upper head when the observer's position allowed for that alignment of branch and upper signal head (the red aspect). It was estimated that the obstructed view lasted for approximately 1 to 1 ½ seconds, which was dependent upon the seating position and angle of the viewer while traveling eastward on the main track towards the signal. The limb measured about three inches in diameter and was approximately 11 feet 6 inches above the top of rail, although off to the left (north side) of the track. The measurement from the north rail to the embankment was approximately 27 feet 4 ½ inches. The measurement from the tree limb to the intermediate signal was 909 feet.

Coosa:

The locomotive was operated eastward to Coosa, where the investigators observed the Coosa control point signal. The observations were the same as the previous day's notes. The locomotive returned to the Riverside location, where further observations were conducted as noted above.

Throughout the movements of the locomotive during the testing, investigators monitored the radio transmissions made from locomotive 7121. Those observations are addressed in the "Radio Transmissions" section of this report.

NS Post accident Action:

Following post accident testing, a dispatcher's bulletin was issued restricting eastbound train movements at Riverside. The NS also had communication and signal (C&S) officers monitor all eastbound signal indications at Riverside. After the sight distance tests were completed, NS replaced the eastbound intermediate signals at Riverside. The top three-unit and

bottom offset two-unit heads were replaced with color light signals that included 35-inch backgrounds, snow hoods and anti-phantom screens[14]. Additionally, C&S personnel monitored the location for an additional 24 hours after the dispatcher's bulletin was rescinded. The NS also installed signal event loggers to monitor relay contacts at Riverside and Coosa.

Signal Identification:

NS operating rule No. 27 instructs employees what to do when they observe an "imperfectly displayed" signal. The rule states, in part, the following:

> 27. A signal imperfectly displayed, a signal functioning erratically, the absence of a light at a place where a signal is usually shown, must be regarded as the most restrictive indication that can be given by that signal and must be promptly reported to the Dispatcher, Control Station, or Yardmaster.
>
> EXCEPTIONS:
>
> - If the top unit is illuminated on a color light signal and one or more lower units are dark, the dark lower units will, except as noted, be considered to be displaying red. NOTE: On Norfolk and Western if a three unit color light signal displays red on the top unit, yellow on the middle unit, and the bottom unit is dark, the signal will be regarded as displaying red over yellow, "Restricting." For illustration of a color light signal, see Aspect B, Rule 282, or Aspect A, Rule 302.

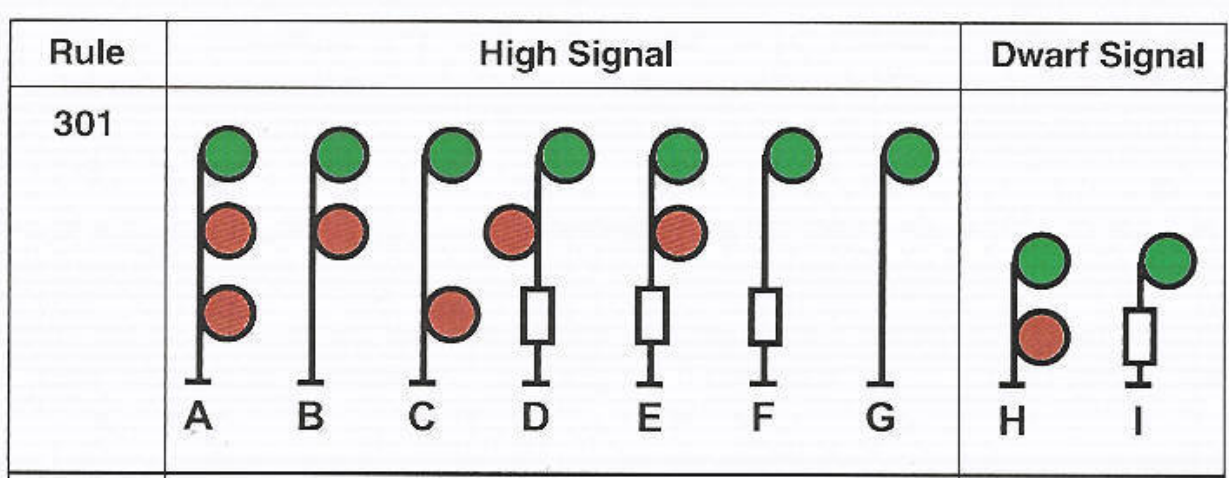
On February 1, 2006, investigators interviewed the engineer and conductor of train 226 in Birmingham, AL, and asked them to identify the signal that they observed at Riverside. They indicated that they had observed a "Clear" signal at Riverside on the day of the incident. The engineer described that he saw a "green over red" at the intermediate

[14] Anti-phantom screens are inserts, positioned between inner and outer lenses of signals, designed to minimize external light sources from being reflected by the optical system of the signal.

signal. He also stated that he was amazed that it had a number plate on it. The engineer said that he observed the signal as the train approached it position and that the signal did not change as he passed it. The engineer was asked to identify the signal that he observed from Rule 301 in NS's Operating Rule Book . The engineer initially chose illustration "D", but later said that it was either "D or E." The engineer said that he recalled seeing a "red over a green" and that the signal had an upper and lower signal head. He stated that the lower signal head was offset but he could not recall the signal aspect for the offset signal head. The graphic below depicts the illustration that the engineer and conductor referenced.

Norfolk Southern Railway
Automatic Block, Interlocking, TC and Remote Control Signals
Illustration No. 1

Name: CLEAR **Indication: Proceed at authorized speed**



The conductor was asked in a separate interview what he observed and which depiction contained in Rule 301 described the signal at Riverside. The conductor took time to reference Rule 301. After selecting the "Clear" signal illustrations, he said that the signal he observed was

"green over red." He further stated that he saw a signal like illustration "A." He did not agree that "D" was the signal that he observed, but rather that he saw an "in-line" signal like "A" with three separate bulbs and no offset. However, he stated that he did not see a "green over a red over a red", just a "green over red."

NS Signal Training:

The NS conducts their training based on rules and procedures from their operating rulebook. During training at McDonough, GA, NS' training facility, employees might not have the same signals on the working territories that they experience in training. NS instructors have employees use a computer with the signals displaying the same as they are in the book. NS training officials teach the signals and definitions from the book and then send the employee out on the road to learn the territory and the difference between an intermediate and a control signal from the regular crews.

The track and operating environment (training) at NS's facility is used to teach normal switching procedures, such as hand signals and getting on and off of equipment. In addition, they do not set up any type of a false signal in the training. However, they do set signals with lights out or flickering, to teach them an improperly displayed signal. Since the collision at Lincoln, NS training procedures have remained the same or unchanged.

The Code of Federal Regulations, under Part 217, subsection 217.9, states, in part, and requires that each railroad "periodically conduct operational tests and inspections to determine the extent of compliance with its code of operating rules, timetables, and timetable special instructions." Additionally, the railroads are required to retain their efficiency testing program, tests and inspections for review by FRA.

Radio Transmissions & Operating Rule No. 34:

Investigators requested and received tapes and transcripts of the radio transmissions for the day of the accident to review what radio transmissions were recorded from the train crews and dispatcher prior to the incident. NS Operating Rule No. 34 states, in part, the following:

> The engineer must comply with the indications of each block, interlocking And other signals that affects the movement.
>
> Crew members located in the operating compartment must occupy a window seat when available, and must maintain a vigilant lookout for signals conditions along the track that affect movement. Crewmembers located in the operating compartment who cannot avail themselves of a window seat must maintain a vigilant lookout for signal along the track, within their view, that affect the movement.
>
> Employees located in the operating compartment of an engine must communicate to each other in an audible and clear manner by its name the indication of each signal affecting movement of their train or engine as soon as the signal is clearly visible or audible. Each signal must be called (1) as soon as it is clearly visible or audible and (2) again, if other than a stop signal, just before the signal is passed. It is the responsibility of the Engineer to have each employee comply with these requirements.
>
> The Conductor or Conductor trainee or trainman in the absence of the Conductor, when riding on the controlling locomotive will communicate by radio the name and location of each signal affecting its movement as soon as the signal become visible. When there is no conductor, conductor trainee, or trainman the Engineer trainee will communicate the signal information.

The following table is a listing of the signals from Lovick to Coosa, the location of the incident. The table lists the type of signal at each signal location, whether it is a control point (CP) or an intermediate signal and the train identification for the recorded transmissions and the signal indication called.

Radio Transmissions Data

Table No. 2

Signal Name	Type & Milepost	Train 22R Response	Train 226 Response
Lovick	CP 787.7	Clear - NS	Clear – NS
Cahaba River	Intermediate 785.5	Clear - NS	
Henry Ellen	CP 783.7	Clear - NS	Clear
Central	CP 782.7	Clear – NS	Clear
Leeds	CP 781.9	Clear – NS	Clear
Rock	Intermediate 780.3	Clear	Clear
Coleman	CP 778.1	Clear	None
Brompton	CP 776.2	Clear	Approach
Prescott	Intermediate 774.0	Clear	None
Cook Springs	Intermediate 771.6	Clear	None
Roberts	CP 768.8	Clear	Clear
Holt	CP 767.8	Clear	Approach
Eden	Intermediate 765.4	Called Inaudible	Approach
Pell City	Intermediate 762.8	Called Inaudible	Approach
Riverside	Intermediate 760.4	None	None[15]
Coosa	CP 758.0	Diverging approach	Oh Lord

The crew of train 226 stated to investigators that the engineer was seated in the right hand seat at the controls of the lead locomotive, the conductor was seated across from him in the locomotive compartment in the left hand seat behind a window and that the conductor trainee was in a standing position looking over the engineer through his window at the signal, when they approached Riverside. Each employee stated that they had a clear view of the signal at Riverside.

Postaccident, during the sight distance testing on January 24th and 25th, NS's Division Road Foreman of Engines (DRFE), who was operating the locomotive, made routine and required radio transmissions at several signal locations to determine whether the radio transmission tower located nearby were picking up the transmissions and recording them accurately. The stand-

[15] Interviews with crewmembers of 22R indicated that they heard 226 call out a "Clear" at Riverside.

alone-detector (SAD) at Pell City also made automated announcements about train movement. Investigators requested a transcript of the taped radio conversations recorded on channel No. 1 for the "Bald Rock" radio tower. The transmissions written in the locomotive cab during the sight distance testing appeared on the transcript. The transcripts included transmissions made by DRFE from Pell City, Riverside, and Coosa, as well as, the Pell City SAD. Additionally, radio checks were conducted throughout the testing and they too were recorded.

Interviews:

After the accident on January 19, 2006, investigators took brief initial recorded interviews from personnel involved in the accident. The train crew and others related to the accident were interviewed. Staff conducted interviews with the following personnel over the course of the on-scene investigation:

- The crew of train 22R, the struck train, which included the engineer, engineer trainee and conductor.
- The Road Foreman of Engines for the East End District.
- The dispatcher for the East End District at the time of the incident.
- The engineer, conductor and conductor trainee of the striking accident train.

On January 20, 2006, investigators interviewed the following personnel:

- Train 226's conductor trainee;
- Train 226's engineer.

On January 21, 2006 the conductor on Train No. 226 was interviewed. In addition the investigators toured the train dispatchers' office in Birmingham, Alabama, and observed the operations of the train dispatchers' office.

Initial interview of Crew for Train 226:

According to the engineer, conductor and conductor trainee on board, they were aware that train 22R was ahead and they were going to run-around train 22R at Coosa. They (train 226) were operating a locomotive with the short hood forward and had windows across the front of the engine in bright daylight with good visibility ahead.

As train No. 226 reached the portion of track prior to approaching the accident site, they stated that they had an "approach" signal at Pell City. The crew called out the signal on the radio as an approach indication. Pell City is the 3rd signal back from where train 22R was stopped in Coosa siding (1st at the switch—absolute for Coosa; 2nd—intermediate at Riverside; 3rd at Pell City intermediate). Train 226's engineer slowed his train at Pell City on the approach signal in compliance with operating rules.

As train 226 reached the signal at Riverside, the crew reported to investigators that it was displaying a clear signal. The engineer and his crew each stated that they called out the signal as clear and the train resumed track speed of 50 mph as they move toward the Coosa siding.

The crew on train 226 stated that as they rounded the curve at Coosa, they saw the track switch lined for the siding and braced for the collision. The engineer stated that his train was moving fast when he placed the train into emergency braking.

The engineer stated that he did not see the signal; however, the conductor stated that it was clear as they rounded the curve at Coosa. The train was moving about 50 mph when the engineer and conductor hit the floor. The conductor trainee stated that his arm got caught in the armrest of his seat and could not jump to the floor and rode out the collision.

Initial Interview of Train Dispatcher:

During post accident interviews the train dispatcher stated that she had not had any signal problems reported in the operations of her dispatching duties on the day of the incident. However, at some time in the past, she stated that the board "locked up" on her, and she could not clear it until she ran a train over the territory on a restriction. According to NS, it was determined that she had entered the data into the system before it could respond and it locked the dispatchers station until the train operated over it and cleared the system. There were no defects noted in the system when checked by the signal department.

Medical Factors:

Toxicology

Pursuant to 49 Code of Federal Regulations (CFR) 219, Subpart C, "Post-Accident Toxicological Testing," toxicological specimens were obtained from eight NS employees. Testing was conducted by Northwest Toxicology, 2282 South President's Drive, West Valley City, UT 84120. Substances screened for included cannabinoids, cocaine, opiates, amphetamines, methamphetamines, phencyclidine, barbiturates, benzodiazepines, and ethyl alcohol. The results were negative for the presence of alcohol and the aforementioned drugs in five employees: the conductor and CT of train 226, as well as the engineer, conductor and a Road Foreman of Engine[16] on board train 22R.

[16] The Road Foreman was conducting a "check ride" as he had the regular conductor bring his vehicle to where he would de-train.

Analysis of specimens provided by three employees was positive for the following drugs only, as indicated:

Position	Specimen	Drug	Quantified level
Engineer Trainee of 22R	blood	amphetamine[17]	92 ng/ml[18]
	urine	amphetamine	10,076 ng/ml
Engineer of 226	blood	temazepam[19]	91 ng/ml
	urine	temazepam	7,114 ng/ml
Dispatcher	blood	amphetamine	81 ng/ml
		diazepam[20]	24 ng/ml
		nordiazepam[21]	29 ng/ml
	urine	amphetamine	6463 ng/ml
		nordiazepam	130 ng/ml

The following is a synopsis of interviews conducted by members of the on-scene investigative team and during follow-up interviews conducted on January 31 and February 1, 2006.

Engineer of NS train 226:

Staff conducted an initial interview of the engineer on January 20, 2006. The engineer recalled he received an "approach" signal indication at Pell City[22], and that he reduced speed to about five miles per hour (mph). The engineer stated that the next signal aspect at Riverside[23]

[17] Amphetamines belong to the group of medicines called central nervous system (CNS) stimulants.
[18] Denotes nanograms per milliliter.
[19] Temazepam is used on a short-term basis as an aid to falling and staying asleep.
[20] Diazepam is used to relieve anxiety, muscle spasms, and seizures and to control agitation caused by alcohol withdrawal.
20 Nordiazepram is a metabolite of diazepam.
[22] Milepost 762.8.
[23] Milepost 760.4

was green over red, and that both he and the conductor called the signal "clear" in the cab and over the radio.

On February 1, 2006, the engineer was re-interviewed by investigators. The engineer said he was initially hired as a trainman in May of 1978, became a conductor in 1980 and promoted to engineer in 1995. He was most recently re-certified as an engineer in 2005.

The engineer said that the day of the accident was his first trip back to work after being off for two and one half months due to broken ankle. With respect to use of medications, the engineer indicated that he had been prescribed Motril[24] and Ziac[25], which he characterized as high blood pressure medications, taken once daily, and Pravachol[26] for high cholesterol, also taken once a day. He further stated that while he was off duty with a broken ankle he was taking Lortab[27], a pain medication. The engineer said he discontinued the use of this medication approximately five to six days before the accident. He also said that prior to the accident he had been taking another medication, Doxazosin[28], to treat high blood pressure, but no longer took this. He denied the use of illegal drugs or alcohol before the accident. The engineer reported that with the exception of his broken ankle his health was good. His most recent complete physical exam occurred on January 12, 2006.

[24] No drug consistent with Motril for treatment of hypertension was able to be located. Quite possibly refers to Motrin, a non-steroidal anti-inflammatory drug used to relieve some symptoms caused by arthritis (rheumatism), such as inflammation, swelling, stiffness, and joint pain. .
[25] A beta-adrenergic is a blocking agent (more commonly, beta-blockers) and thiazide diuretic combinations, which belong to the group of medicines known as antihypertensives (high blood pressure medicine).
[26] A drug used to lower levels of cholesterol and other fats in the blood, which may help prevent medical problems caused by cholesterol clogging the blood vessels.
[27] Lortab consists of a combination of medicines containing narcotic analgesics and acetaminophen used to relieve pain
[28]Doxazosin is used to treat the symptoms of an enlarged prostate (benign prostatic hyperplasia or BPH), which include difficulty urinating, painful urination, and urinary frequency and urgency. It is also used alone or in combination with other medications to treat high blood pressure.

With regard to his work/rest schedule, the engineer recalled that he slept eight hours the night before the accident. He reported for duty on the day of the accident at 11:15 a.m. He said he felt rested when he reported to work.

The engineer provided information pertaining to the events that preceded the accident. He recalled that his speed was about five mph as the train approached Riverside. He added that the CT had stepped outside the cab to smoke during that time, and that he had commented to the conductor that he didn't want the CT outside and wished he had stayed inside the cab to smoke.

The engineer recalled, "…as we came around to Riverside, we had a clear signal." He further stated, "I looked at it for the last time, and we still had a clear signal. I called it again in the cab, still clear, and at that time I called it over the radio." He characterized the signal he viewed as "…green over red" and that he observed that signal for "…probably a minute." He noted nothing unusual about the signal itself. He said that after they passed the signal at Riverside the train's speed was 50 mph, that he then saw the other train ahead of them, and that he placed the train into emergency braking.

The engineer stated that he did not have any problems with any of his equipment, and said that visibility conditions were good before the accident. He said that he was not distracted from his duties that day. He also stated he had previously worked with the conductor, but that this trip was his first working with the CT.

The engineer stated that on most occasions his train would bypass train 22R, which was normally ahead of his train as it was on the day of the accident. This was due to the fact that train 22R generally went into the siding and did work at the local Honda plant. Specifically, he said that on those occasions when he worked train 22R, he generally worked the Honda plant,

and that the train would leave the main track and enter the siding at Coosa,[29] and that other trains would then pass by train 22R.

The engineer recalled hearing the dispatcher say over the radio that when his train cleared train 22R, that train was to come out of the siding and travel down the mainline. He also said that a "clear" signal indication at Riverside indicates to him "that 22R is cleared up."

Conductor of NS train 226:

Staff conducted an initial telephonic interview of the conductor on January 20, 2006. The conductor stated he began his railroad career in April 2005.

The conductor said that on the day of the accident he went on duty at 1:15 p.m. The weather was clear with the temperature between 55 and 60 degrees. He recalled the dispatcher informing the train ahead of them, 22R that she was going to "…head them into Coosa and let us run around them…" He added he heard the crew of 22R on the radio call "diverging approach," and knew they had already entered the siding at Coosa.

The conductor recalled he was seated in the second seat on the conductor's side of the locomotive cab on the day of the accident. He said his crew was presented with an "approach" signal aspect at Pell City, followed by a "clear" signal aspect at Riverside. He further stated that as their train came around a corner approaching Coosa they saw the train they ultimately struck. He said he observed the signal aspect at Riverside to be green over red, and that the engineer and CT verified that signal to be clear.

On February 1, 2006, the conductor was re-interviewed by investigators. With regard to his work/rest history, the conductor said he had been off 24 hours prior to reporting for duty on the day of the accident, and had worked each day for the seven days before that. He said he

[29] Milepost 759.9

normally obtained eight to nine hours of sleep per rest period. He stated that he did not use any medications, and when asked about his health stated that he was in "…good shape." His most recent physical examination before the accident was conducted in April 2005.

When questioned about the events pertaining to the accident, the conductor characterized the day as a normal one. He recalled hearing the dispatcher tell train 22R that she was going to "...run them in the siding at Coosa so we could go around them. We were on a priority train." He said he asked the CT what the signal (at Riverside) was, and that he responded clear. The conductor said the engineer increased the speed of their train as they approached Coosa, and that he (the engineer) then shouted that the switch was open, at which point he (the engineer) placed the train into emergency braking. The conductor estimated the speed of the train at that point at between 40 and 50 mph.

With respect to the signal at Riverside, the conductor said it displayed a "…green over red." He further stated there was no confusion amongst the crew about calling signals, and added, "I know what I saw." The conductor stated he operates over this territory at least every other day, and that he normally is presented with a clear signal at Riverside. He said the last radio conversation before the accident was his engineer calling the signal at Riverside.

Conductor Trainee of NS train 226:

Staff conducted an initial telephonic interview of the CT on January 20, 2006. The CT said that the day of the accident was his first day back from training, and his second trip on this division.

On January 31, 2006, the CT was re-interviewed by investigators. The CT said he was hired at the end of October or early November 2005. He said he normally obtained about eight hours

of sleep per rest period, and recalled he retired for the evening before the accident at 10:00 p.m. and was called for his train at 2:00 p.m. the following day. The CT stated that he was not taking medications, and that his vision and hearing were satisfactory when he was hired.

With respect to events preceding the accident, the CT said that the crew had an early problem with a signal after departing the yard in Birmingham. He recalled receiving a "clear" signal indication at Riverside after receiving an "approach" at Pell City specifically that it appeared as a green over red. He stated, "…there's no doubt in my mind that that was a clear signal." He added, "We discussed clear" [at that signal location]. He stated there was no reflection from the sun at the Riverside signal. The CT said he initially called the signal clear, and that the engineer called the signal clear as well. He said he knew that 22R was ahead of them, and that their train (226) was a "hot train."[30]

The CT said that the day of the accident was the first time he had worked with the engineer and conductor, and added he did not even know their names. He also stated there were no distractions in the cab that day.

NS Dispatcher:

Staff interviewed the dispatcher on January 18, 2006. The dispatcher said she was initially hired in 1985 as a clerk, and has been a dispatcher since October 1997. She dispatches trains between Birmingham, AL and Atlanta, GA and Birmingham, AL and Chattanooga, TN Wednesday through Friday, and that additional territory is added between Birmingham and Columbus, GA on the weekends.

The dispatcher said she went on duty the day of the accident at 2:00 p.m. When questioned about events surrounding the accident, the dispatcher said the first indication she had that

[30] Railroad vernacular meaning a priority train.

something was wrong was when a track light[31] on her computer appeared between Coosa and Embry, which was a "concern." She said she then contacted train 22R to determine if there was a problem, to which they responded there was not. However, she stated she "…felt like there was something wrong with 226." However, the engineer of train 226 ultimately did contact her and informed her that they had in run into the back of 22R. She stated that she kept talking with both he and the conductor, adding that she never spoke with the CT. The dispatcher recalled the 226 engineer telling her that they had proceeded on a clear (signal), and that they subsequently were lined in on 22R. She said that she informed him that his train should have stopped at Coosa. The dispatcher said she then contacted 22R and advised them not to move their train. She added the crew of that train acted as if they were not aware they had been struck.

NS Director of Medical Services (DMS):

Staff interviewed the DMS on June 21, 2006, in Norfolk, VA. The DMS was initially questioned about NS's policy pertaining to employees using prescription and over-the-counter (OTC) medications before the accident. He responded, "…it's been a longstanding practice that employees in safety sensitive positions are instructed to report their use or change in prescription drugs to their supervisor, who either the supervisor or the employee directly will contact the Medical Department and obtain approval for taking that medication and working."[32] However, he said there were no specific policy instructions pertaining to this matter, although a general rule exists that he believed required all employees to disclose an injury or illness.

When questioned as to whether the NS required employees to inform their physician of their duties, the DMS said there was no directive to his knowledge that addressed this. He added that

[31] An indicator used to convey the condition of a given track section.
[32] Page 5, lines 19 – 24 of the transcript.

letters are issued to employees when his office becomes aware an employee is taking medications, particularly prescription medications. Specifically, he stated an employee's physician needs to be aware of that employee's job duties so that they in turn can respond back to (NS) that they are aware of said duties, and the employee can safely take the medication at the prescribed dose. The DMS further said that if an employee's physician performs an assessment of how medications or treatment would affect their ability to perform their duties, his office would "…certainly would instruct him to provide any appropriate medical records related to a particular condition. Say they were injured off the job, for us to do a proper assessment, we often instruct employees to provide those things, but it would be a case-by-case determination."[33]

When questioned as to what extent, if any, he became involved when an employee has been prescribed medications and/or provided treatment by their physician, the DMS responded only when he received a call concerning that matter. However, he would also become involved if the employee underwent a company physical examination wherein they disclosed use of medications, or the presence of a drug was manifested during a drug screen for another reason. If this occurred, the employee would be instructed to provide information from their physician concerning that, and a fitness for duty assessment would then be conducted. A discussion with the employee's physician, if needed, might also ensue. This may be particularly relevant if the employee's physician had prescribed a narcotic, as in the case for someone with chronic back pain. As NS prohibits the use of narcotics for safety-sensitive employees, the DMS would attempt to work with a physician to determine if an alternative to narcotics could be identified for use by the individual.

[33] Page 7, lines 3 – 7 of the transcript.

When questioned as to whether he had been contacted by an employee's physician, the DMS said he receives calls from them about various medical conditions, often in response to NS's request seeking information about a condition an employee disclosed to them. The DMS stated that rarely does he receive an unsolicited call from a physician volunteering information. He said he believed it would be useful to have information from the employee's physician that would enable him "…to review it and determine if we do or do not have an issue regarding fitness for duty."[34]

The DMS said he did not know if the physicians who prescribed medications to the three NS employees that tested positive for various drugs were aware of their respective duties before the accident, but that they certainly were after the accident. He indicated that in two of the three cases, he determined the employees had a legitimate reason to possess and use their respective medications, and "…that some – they've been on some of them [medications] for a lengthy period of time and were stable."[35] However, that was not the case with the engineer of train 226. He added, "I don't believe we discerned the specific reason that the drug had been prescribed. We simply instructed him that he couldn't take it within eight hours of reporting to work once we learned that he was on it."[36]

The DMS said that he contacted all three employees after the accident regarding their use of medications. Concerning the engineer trainee of train 22R, the DMS determined he was legitimately taking Adderall, an amphetamine. In the case of the engineer trainee, the DMS's final determination for his postaccident test was negative. The DMS clarified that there was no

[34] Page 9, lines 17 – 18 of the transcript.
[35] Page 10, lines 14 –15 of the transcript.
[36] Page 10, lines 7 – 10 of the transcript.

indication or record of the engineer trainee taking this medication before the accident. Additionally, the DMS said that the engineer trainee failed to fulfill their unwritten policy.

Likewise, the DMS stated that the engineer of train 226 also did not fulfill the medication reporting requirements, adding that he, the DMS, was not aware of the medication being used by the engineer. The DMS said he spoke with the engineer about this matter on February 3, 2006, at which time he disclosed he was taking Restoril. When asked if the engineer would have been required to inform the medical department of this use before the accident, the DMS responded, "Technically no, if he were not taking it while he was working. I mean he could be at home and take the medication and may be one of those situations where it's none of the company's business if he does not come to work under its influence."[37] He added that had the engineer been "..taking it inappropriately or using it on, you know, while he was around work then, yes, he would be violating the rule."[38] The DMS indicated the engineer furnished him with a prescription for the medication that disclosed it was originally prescribed on November 28, 2005, and refilled on January 21 [2006]. The DMS said that when all the postaccident test results came in, he reviewed the engineer's file and noted that he had been off duty, and that a number of medications were listed in the file, but none for Restoril. The engineer underwent a return-to-duty physical sometime near January 13, 2006, and Restoril was not listed on his medical form at that time. The DMS indicated the engineer should have listed it on the medical form at that time, as "There's a box that says list medications currently taken."[39] However, the DMS raised the possibility that the engineer may have misinterpreted the form in that he "…didn't take it the day

[37] Page 19, lines 10 –14 of the transcript.
[38] Page 19, lines 16 – 18 of the transcript.
[39] Page 21, lines 24 –25 of the transcript.

of the exam or that kind of thing…certainly could be open to interpretation, I suppose."[40] However, the DMS said that the engineer did not disclose the use of the medication, as he would have expected him to. The DMS stated that his final determination pertaining to the engineer's postaccident test results was that they were medically negative.

The DMS discussed the postaccident test results of the third and final employee tested, the dispatcher. As was the case with the other two crewmembers, the DMS said he was not aware that the dispatcher had been taking any of her various medications, adding that she should have informed him of said use. When he contacted her, she disclosed she was taking Adderall for the previous two or three years before the accident. She stated she was taking Valium as needed, but that she did not take that medication on the day of the accident. He said his records contained a pharmacy sheet that indicated a Valium prescription was initially prescribed on January 13, 2006.

The DMS said that it was his understanding that Norfolk Southern guidelines prohibited the use of diazepam, or valium, within six hours of reporting for duty or while on duty. He added, "It's my belief she can comply with these guidelines, and I know of no instance where she did not comply in the past."[41] He also said there was a follow-up call with the dispatcher's' physician, who confirmed the "sensitive nature" of her position as a train dispatcher. He was unable to state if her physician was aware of her duties before the accident, but certainly was after the accident.

He also said he conducts a medical advisory (i.e., a discussion of medications), when not to take them before work, etc. with an employee when he becomes aware of a medication they are taking. This could occur either when a physical exam was conducted or when obtaining medical reports related to a claim

[40] Page 22, lines 6 – 8 of the transcript."
[41] Page 331, lines 18 – 20 of the transcript.

where the employee has been injured on the job. Each was conducted on a case-by-case basis "…particularly the hour interval that somebody can't take it and work varies by medication."[42] He said he avoids dispensing general information "…because a lot of the things are case specific and vary by drug and vary by personal response."[43]

The DMS stated that he "…would have certainly hoped that our employees would be more disclosing about things that they've taken."[44] He cited and read General Rule G which, in part, essentially prohibits an employee for reporting "…for duty under the influence of alcohol or other intoxicant, cannabis in any form, an amphetamine, a narcotic drug, a hallucinogenic drug, any controlled substances as defined by federal law or a derivative or combination of any of these…".[45] He also noted General Rule N, which pertained to off-duty employee injuries/illnesses and the need to report these to their supervisor. With respect to the three employees who tested positive after this accident, he added, "Why these three did not, I don't – I can't explain it. Yes, it is cause for concern."[46] He stated his biggest concern "…is getting the employee and personal physician to accept a larger role or ultimate responsibility really for the issue of drugs and working on the front end. We're here on the back end, and it really needs to happen on the front end."[47] The DMS also said that in terms of educating employees about use of medications, "…periodically we do some articles and things like that and different publications. It's been quite awhile since we've done anything on drugs, and where it's probably timely that we do. We have some other media now that we didn't use[d] to have, and

[42] Page 35, lines 3 – 5 of the transcript.
[43] Page 35, lines 19 – 21 of the transcript.
[44] Page 37, lines 19 - 20 of the transcript.
[45] Page 40, lines 21 – 25 of the transcript.
[46] Page 38, lines 2 – 3 of the transcript.
[47] Pages 51, lines 23 through page 52 line1of the transcript.

that's the Internet. And we can certainly post those things, you know, post some advice and things like that I think would be useful."[48]

The DMS concluded the discussion of all three employees who tested positive for medications after the accident that it was his determination that all of them were prescribed medication for legitimate uses, and that in each case there was no indication that the employee was abusing their medications. In other words, all three were rules medically negative, information that was also conveyed to the FRA. He said that since the accident there have been no changes to the policy on use of medications by employees.

[48] Page 54, lines 9 – 15 of the transcript.

Parties to the Investigation - Acknowledgment Signatures for the Factual Report.

The undersigned designated *Party to the Investigation* representatives attest that the information contained in this Factual Report is a factually accurate representation of the information collected during the investigation, to the extent of their best knowledge and contribution in this investigation.

_____

_____//s//_____ Date _____11/7/06_____
Richard A. Hipskind, NTSB

_____//s//_____ Date _____11/9/06_____
John L. Wagner, NS

_____//s//_____ Date _____11/13/06_____
Patrick Plumb, FRA

_____//s//_____ Date _____11/8/06_____
Joey Callahan, LFRD

_____//s//_____ Date _____11/12/06_____
Ben Blissett, BLET

_____//s//_____ Date _____11/7/06_____
Curtis A. Wall, UTU