Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2006-18

Norfolk Southern (NS)
Keytesville, Missouri
March 24, 2006

Note that 49 U.S.C. §20903 provides that no part of an accident or incident report made by the Secretary of Transportation/Federal Railroad Administration under 49 U.S.C. §20902 may be used in a civil action for damages resulting from a matter mentioned in the report.

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File # HQ-2006-18

1.Name of Railroad Operating Train #1: Norfolk Southern Corp. [NS]	1a. Alphabetic Code: NS	1b. Railroad Accident/Incident No.: 24625
2.Name of Railroad Operating Train #2: N/A	2a. Alphabetic Code: N/A	2b. Railroad Accident/Incident: N/A
3.Name of Railroad Responsible for Track Maintenance: Norfolk Southern Corp. [NS]	3a. Alphabetic Code: NS	3b. Railroad Accident/Incident No.: N/A
4. U.S. DOT_AAR Grade Crossing Identification Number: 483757R	5. Date of Accident/Incident: Month 03 / Day 24 / Year 2006	6. Time of Accident/Incident: 04:10: ☐ AM ☑ PM

7. Type of Accident/Indicent (single entry in code box): 1. Derailment; 2. Head on collision; 3. Rear end collision; 4. Side collision; 5. Raking collision; 6. Broken Train collision; 7. Hwy-rail crossing; 8. RR grade crossing; 9. Obstruction; 10. Explosion-detonation; 11. Fire/violent rupture; 12. Other impacts; 13. Other (describe in narrative): 07

8. Cars Carrying HAZMAT	9. HAZMAT Cars Damaged/Derailed	10. Cars Releasing HAZMAT	11. People Evacuated	12. Division
0	0	0	0	Illinois

13. Nearest City/Town	14. Milepost (to nearest tenth)	15. State Abbr	15. State Code	16. County
Keytesville	176.1	N/A	MO	CHARITON

17. Temperature (F) (specify if minus)	18. Visibility (single entry) 1. Dawn 2. Day 3.Dusk 4.Dark	Code	19. Weather (single entry) 1. Clear 2. Cloudy 3. Rain 4. Fog 5.Sleet 6.Snow	Code	20. Type of Track 1. Main 2. Yard 3. Siding 4. Industry	Code
50 F		2		1		1

21. Track Name/Number	22. FRA Track Class (1-9, X)	Code	23. Annual Track Density (gross tons in millions)	24. Time Table Direction 1. North 3. East	Code
Main Track		4	19.		4

OPERATING TRAIN #1

25. Type of Equipment Consist (single entry): 1. Freight train; 2. Passenger train; 3. Commuter train; 4. Work train; 5. Single car; 6. Cut of cars; 7. Yard/switching; 8. Light loco(s).; 9. Maint./inspect.car; A. Spec. MoW Equip.	Code	26. Was Equipment Attended? 1. Yes 2. No	Code	27. Train Number/Symbol
	1	1. Yes	1	115D32 3

28. Speed (recorded speed, if available) R - Recorded E - Estimated			Code
E - Estimated	45	MPH	R

29. Trailing Tons (gross tonnage, excluding power units): 4909

30. Method(s) of Operation (enter code(s) that apply): a. ATCS; b. Auto train control; c. Auto train stop; d. Cab; e. Traffic; f. Interlocking; g. Automatic block; h. Current of traffic; i. Time table/train orders; j.Track warrant control; k. Direct traffic control; l.Yard limits; m.Special instructions; n. Other than main track; o. Positive train control; p. Other (Specify in narrative)

Code(s)				
e	N/A	N/A	N/A	N/A

30a. Remotely Controlled Locomotive? 0 = Not a remotely controlled; 1 = Remote control portable; 2 = Remote control tower; 3 = Remote control transmitter - more than one remote control transmitter: 0

31. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded (yes/no)
(1) First involved (derailed, struck, etc)	N/A	1	N/A
(2) Causing (if mechanical cause reported)	N/A	N/A	N/A

32. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box.

Alcohol	Drugs
N/A	N/A

33. Was this consist transporting passengers? (Y/N): N

34. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	2	0	0	0	0
(2) Total Derailed	2	0	0	0	0

35. Cars	Loade a. Freight	Loade b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	69	0	0	0	0
(2) Total Derailed	14	0	0	0	0

36. Equipment Damage This Consist	37. Track, Signal, Way, & Structure Damage	38. Primary Cause Code	39. Contributing Cause Code
1345000	52000	M303	N/A

Number of Crew Members

40. Engineer/ Operators	41. Firemen	42. Conductors	43. Brakemen
N/A	N/A	1	N/A

Length of Time on Duty

44. Engineer/Operator	45. Conductor
Hrs 2 Mi 30	Hrs 2 Mi 30

Casualties to:	46. Railroad Employees	47. Train Passengers	48. Other
Fatal	0	0	0
Nonfatal	N/A	0	0

49. EOT Device? 1. Yes 2. No	50. Was EOT Device Properly Armed? 1. Yes 2. No
1	1

51. Caboose Occupied by Crew? 1. Yes 2. No: N/A

OPERATING TRAIN #2

52. Type of Equipment Consist (single entry): 1. Freight train; 2. Passenger train; 3. Commuter train; 4. Work train; 5. Single car; 6. Cut of cars; 7. Yard/switching; 8. Light loco(s).; 9. Maint./inspect.car; A. Spec. MoW Equip.	Code	53. Was Equipment Attended? 1. Yes 2. No	Code	54. Train Number/Symbol
	N/A	1. Yes	N/A	N/A

55. Speed (recorded speed, if available) R - Recorded E - Estimated			Code
E - Estimated	0	MPH	N/A

57. Method(s) of Operation (enter code(s) that apply): a. ATCS; b. Auto train control; g. Automatic block; h. Current of traffic; m.Special instructions; n. Other than main track

57a. Remotely Controlled Locomotive? 0 = Not a remotely controlled; 1 = Remote control portable

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56. Trailing Tons (gross tonnage, excluding power units)	c. Auto train stop d. Cab e. Traffic f. Interlocking	i. Time table/train orders j.Track warrant control k. Direct traffic control l.Yard limits	o. Positive train control p. Other (Specify in narrative) Code(s)	2 = Remote control tower 3 = Remote control transmitter - more than one remote control transmitter
N/A			N/A N/A N/A N/A N/A	N/A

58. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded (yes/no)	59. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box.	Alcohol	Drugs
(1) First involved (derailed, struck, etc)	0	N/A	N/A		N/A	N/A
(2) Causing (if mechanical cause reported)	0	N/A	N/A	60. Was this consist transporting passengers? (Y/N)	N/A	

61. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote	62. Cars	Loade a. Freight	Loade b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	0	0	0	0	0	(1) Total in Equipment Consist	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	0	0	0	0	0

63. Equipment Damage This Consist	64. Track, Signal, Way, & Structure Damage	65. Primary Cause Code	66. Contributing Cause Code
0	0	N/A	N/A

Number of Crew Members				Length of Time on Duty	
67. Engineer/ Operators	68. Firemen	69. Conductors	70. Brakemen	71. Engineer/Operator	72. Conductor
N/A	N/A	N/A	N/A	Hrs 0 Mi 0	Hrs 0 Mi 0

Casualties to:	73. Railroad Employees	74. Train Passengers	75. Other
Fatal	0	0	0
Nonfatal	0	0	0

76. EOT Device? (1. Yes 2. No)	77. Was EOT Device Properly Armed? (1. Yes 2. No)	78. Caboose Occupied by Crew? (1. Yes 2. No)
N/A	N/A	N/A

Highway User Involved

79. Type	Code
A. Auto B. Truck C. Truck-Trailer. D. Pick-Up Truck E. Van F. Bus G. School Bus H. Motorcycle J. Other Motor Vehicle K. Pedestrian M. Other (spec. in narrative)	C

80. Vehicle Speed (est. MPH at impact)	81. Direction geographical) 1.North 2.South 3.East 4.West	Code
0		2

82. Position	Code
1.Stalled on Crossing 2.Stopped on Crossing 3.Moving Over Crossing 4. Trapped	4

86a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? (1. Highway User 2. Rail Equipment 3. Both 4. Neither)	Code
	4

Rail Equipment Involved

83. Equipment	Code
1.Train(units pulling) 2.Train(units pushing) 3.Train (standing) 4.Car(s) (moving) 5.Car(s) (standing) 6.Light Loco(s) (moving) 7.Light(s) (standing) 8.Other (specify in narrative)	1

84. Position of Car Unit in Train
1

85. Circumstance	Code
1. Rail Equipment Struck Highway User 2. Rail Equipment Struck by Highway User	1

86b. Was there a hazardous materials release by (1. Highway User 2. Rail Equipment 3. Both 4. Neither)	Code
	4

86c. State here the name and quantity of the hazardous materials released, if any.
N/A

87. Type of Crossing Warning	1.Gates	2.Cantilever FLS	3.Standard FLS	4.Wig Wags	5.Hwy. traffic signals	6.Audible	7.Crossbucks	8.Stop signs	9.Watchman	10.Flagged by crew	11.Other (spec. in narr.)	12.None
Code(s)	01	03		06	07	N/A	N/A	N/A				

88. Signaled Crossing Warning (See instructions for codes)	Code
	01

89. Whistle Ban (1. Yes 2. No 3. Unknown)	Code
	2

90. Location of Warning (1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach)	Code
	1

91. Crossing Warning Interconnected with Highway Signals (1. Yes 2. No 3. Unknown)	Code
	2

92. Crossing Illuminated by Street Lights or Special Lights (1. Yes 2. No 3. Unknown)	Code
	2

93. Driver's Age	94. Driver's Gender (1. Male 2. Female)	Code
36		1

95. Driver Drove Behind or in Front of Train and Struck or was Struck by Second Train (1. Yes 2. No 3. Unknown)	Code
	2

96. Driver (1. Drove around or thru the Gate 2. Stopped and then Proceeded 3. Did not Stop 4. Stopped on Crossing 5. Other (specify in narrative))	Code
	5

97. Driver Passed Standing Highway Vehicle (1. Yes 2. No 3. Unknown)	Code
	2

98. View of Track Obscured by (primary obstruction) (1. Permanent Structure 2. Standing Railroad Equipment 3. Passing Train 4. Topography 5. Vegetation 6. Highway Vehicle 7. Other (specify in narrative) 8. Not obstructed)	Code
	8

101. Casulties to Highway-Rail Crossing Users	Killed	Injured
	0	0

99. Driver Was (1. Killed 2.Injured 3. Uninjured)	Code
	3

100. Was Driver in the Vehicle? (1. Yes 2. No)	Code
	2

102. Highway Vehicle Property Damage (est. dollar damage)
86500

103. Total Number of Highway-Rail Crossing Users (include driver)
0

104. Locomotive Auxiliary Lights? (1. Yes 2. No)	Code
	1

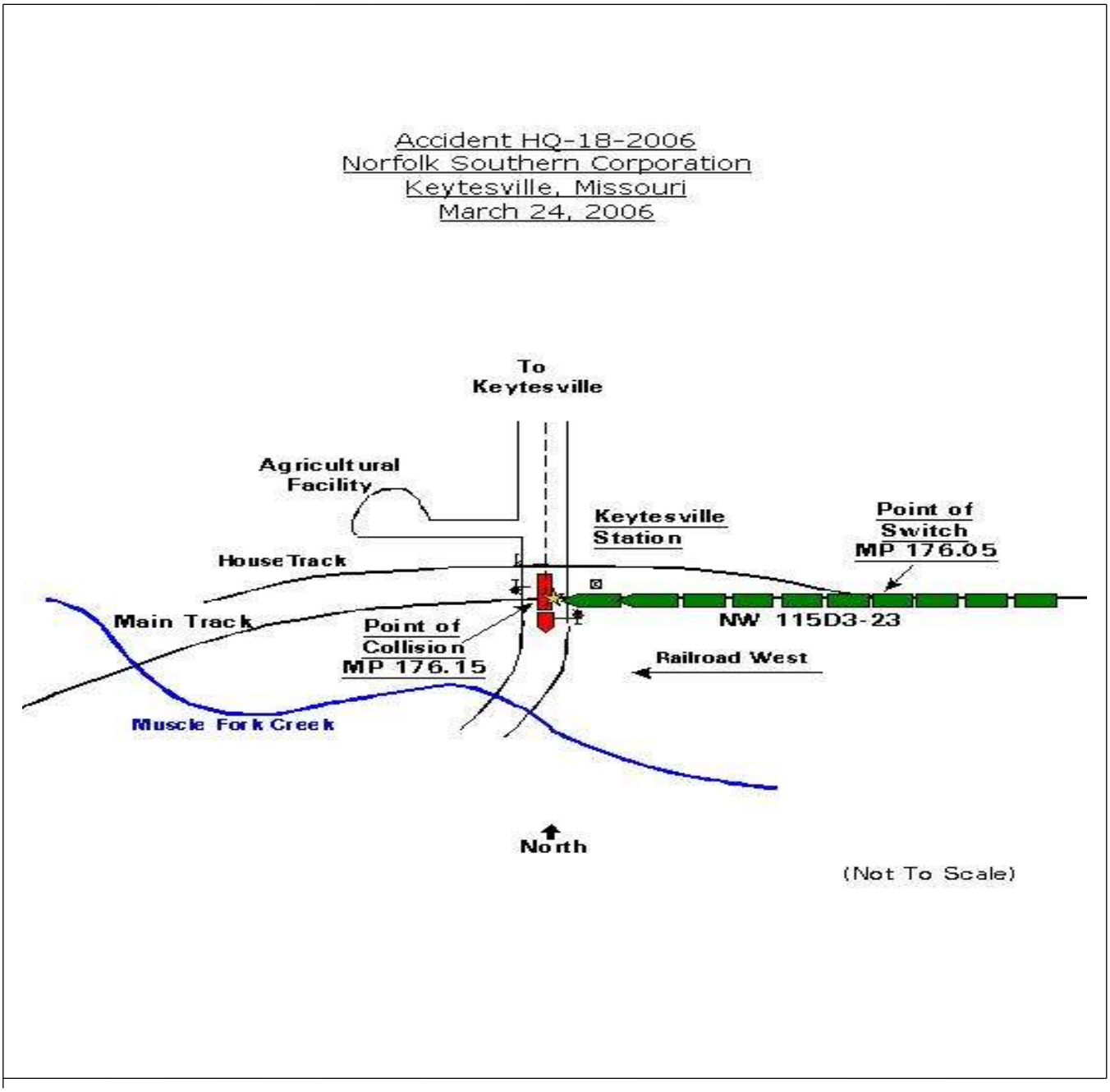
105. Locomotive Auxiliary Lights Operational? (1. Yes 2. No)	Code
	1

106. Locomotive Headlight Illuminated? (1. Yes 2. No)	Code
	1

107. Locomotive Audible Warning Sounded? (1. Yes 2. No)	Code
	1

108. DRAW A SKETCH OF ACCIDENT AREA INCLUDING ALL TRACKS, SIGNALS, SWITCHES, STRUCTURES, OBJECTS, ETC., INVOLVED.

HQ-18-2006 Sketch.jpg



109. SYNOPSIS OF THE ACCIDENT

On March 24, 2006, at 4:04 p.m. CST, westbound Norfolk and Southern Railway Company (NS) Train Symbol 115D3-23, a loaded auto-rack train, operating on an NS main track, collided with a southbound Crown Power and Equipment Company low-boy semi-tractor trailer at the Price Bridge Avenue highway-rail grade crossing, milepost (MP) 176.10, DOT No. 483757R. The engineer made an emergency application of the train air brakes when it became apparent that a collision was imminent, approximately 1,400 feet prior to Price Bridge Avenue, while traveling at approximately 54 mph, timetable authorized 60 mph.

The location of the accident was a crossing near the former site of a railroad depot that is known as Keytesville Station. It is eight-tenths of a mile south of the southeast corner of Keytesville, Missouri, via Highway "K". The single main track is oriented geographically east and west, with the roadway crossing at approximately a 90-degree angle.

The semi-tractor/trailer driver was transporting a crawler-loader from Salisbury, Missouri, to a private citizen south of Keytesville Station on Price Bridge Avenue, County Road VV, No. 419. His semi-tractor just cleared south of the main track as his trailer became high-centered on the roadway surface approach north of the main track.

The driver attempted to move the semi-tractor/trailer combination with the assistance of several other drivers without success. He exited the semi-tractor and ran south on Price Bridge Avenue prior to the accident.

Two railroad locomotives and 14 cars derailed with an estimated $1,397,000 damage to railroad equipment and wayside structures. The trailer and crawler-loader were destroyed as a result of the collision, with an estimated value of $76,000. The semi-tractor damages and repair costs are estimated at $10,500.

Both train crew members suffered minor injuries. No hazardous materials were released and no evacuation order was issued. The driver did not report any serious injuries at the time of the incident. It was day time and the weather was clear, with a calm wind and a temperature of 50 °F.

The accident occurred because the semi-tractor/trailer combination failed to traverse a highway-rail grade crossing completely. The trailer became high-centered and stuck on the roadway surface before crossing the main track.

On March 24, 2006, a westbound NS freight train, Train Symbol 115D3-23, collided with an low-boy tractor-trailer carrying a bulldozer at Price Bridge Avenue highway-rail grade crossing at 4:10 p.m.. The tractor trailer had become high centered on the crossing prior to impact. The Highway-Rail Grade Crossing System (HGCS) was equipped with flashing lights and gates. The1-800 railroad telephonic contact number was posted on the grade crossing signal mast on both sides of the crossing. A citizen simultaneously placed a call to the 1-800 number as the incident occurred.

The semi-tractor trailer driver was not injured. The trailer and bulldozer were completely destroyed. There were minor injuries to the train crew, they were treated and released from the Moberly Regional Hospital, Moberly, the same day. The train's two locomotives derailed onto their sides sustaining heavy damage and 14 loaded auto rack cars were derailed with 6 of them on their side.

At the time of the accident it was daylight and the weather was sunny with a temperature was 39 °F.

The probable cause of the accident was the failure of the motor vehicle operator to check trailer clearance limitations prior to traversing the highway-rail grade crossing.

110. NARRATIVE

Circumstances Prior to the Accident

NS Train Symbol 115D3-23 (Train No. 1)

The assigned loaded auto-rack train consisted of two head-end locomotives (Locomotive Nos. NS 2540 and NS 8423), 69 loads, no empties, 6,613 feet in length, with 4,909 trailing gross tonnage. It originated at Princeton, Indiana, where it received a Class 1 Brake Test-Initial Terminal and was en route to Mira Loma, California. The train departed Moberly, Missouri, at 3:20 p.m., March 24, en route to North Kansas City, Missouri, after receiving another Class 1 brake test that morning at 7:30 a.m., in Moberly.

The train crew consisted of a locomotive engineer and a conductor pilot. They reported for duty on March 24 at 12:05 p.m., in Moberly. Moberly is the home terminal for the conductor and the away-from-home terminal for the engineer. The home terminal for the engineer is North Kansas City. Both crew members had received more than the statutory off-duty period prior to reporting for duty. The engineer has been employed by the NS for 14 years and was promoted to engineer in 1999. The conductor has been employed for 2 years and was promoted in May 2004.

As this westbound train approached the accident area, the locomotive engineer was seated at the controls on the right (north) side of the lead/controlling locomotive. The conductor was seated in the rear seat on the left (south) side of the cab of the lead/controlling locomotive.

Approaching the accident area from the east, the track is tangent from MP 175.0 to MP 176.1, followed by a 3-degree, 3-minute left-hand curve of approximately 2,112 feet to MP 176.5. The collision occurred at MP 176.10, 264 feet after the beginning of the left-hand curve. This trackage is on a relatively level grade.

The trackage through the area of the collision had been inspected the same day by the NS track inspector headquartered in Carrollton, Missouri. No defective conditions were noted. The last time major track maintenance was accomplished in this area was several years ago.

Semi-Tractor/Trailer Combination

The driver had reported to work on March 24 at approximately 7:30 a.m. His place of employment is:
Crown Power and Equipment Company
103 East Highway 24
Salisbury, Missouri
Title - Technician and Truck Driver
Employment Date - 2001
Missouri Commercial Drivers License (CDL) issued - 2001

His first assigned task for March 24 was to deliver some agricultural equipment from the Salisbury facility to St. Joseph, Missouri, using the semi-tractor involved and a different trailer. This task was accomplished and he returned to the Salisbury facility at approximately 2:30 p.m. without incident. The next assignment was to move the crawler-loader involved in the incident from the Salisbury facility to a private citizen south of Keytesville. This piece of rental equipment had been loaded the previous day onto the low-boy trailer involved. The rental agreement had been coordinated by the Crown Power and Equipment facility in Columbia, Missouri. Details of the vehicular equipment involved are as follows:

Tractor

Manufacture - Freightliner
Model - FL12064 -Conventional
Year - 2000
VIN - 1FUYDSEB7YLG17799
Missouri License Plate - 841557

Trailer
Manufacture - Witzco
Model - RG-50
Year - 2001
VIN - 1Y8A11E382S000403
Missouri License Plate - PR3957

Crawler-Loader
Manufacture - Liebherr
Model - LR621C
Year - 1997
Weight - 31,900 lbs.

The driver disconnected from the morning assignment trailer, connected to the incident trailer, and departed the facility at approximately 3:30 p.m. The plan was to meet with the renter at the intersection of Missouri Highways 24 and 5 in Keytesville, where he would provide follow-me directions for the delivery. Keytesville is located 11 miles west of Salisbury, via Highway 24. A blue pickup truck was waiting at the intersection and the driver flagged him to follow at approximately 3:45 p.m. They proceeded west on Highway 24 approximately two blocks and then turned left (south) onto Missouri Highway K. Highway K becomes Price Bridge Avenue soon after departing the City of Keytesville, and is also locally known as the Depot Road.

When the semi driver approached the railroad tracks, he slowed to approximately 4 or 5 mph account of the rough surface. He remembers being in third gear of the truck's 10-speed transmission. He also noted that everyone in the local community slows at this crossing on account of the rough surface. He did not stop, but approached the crossing slowly looking for trains while in the middle of the roadway.

As the semi-tractor proceeded over the main track of the crossing, the entire combination came to an abrupt stop. The driver got out and made a visual inspection. He determined the trailer was high-centered approximately 2 to 3 feet prior to the north rail on the asphalt surface on the north side of the crossing. He returned to the truck, engaged the rear differential limited slip feature, and tried to rock the tractor/trailer free without success. He was aware of the situation and the potential for a train to arrive at anytime.

The Accident

The NS Illinois Division, Kansas City District single main track involved extends from Moberly, MP 148.1, westward to Kansas City, MP 274.8, a distance of 122.7 miles. The method of operation is by signal indication of a Traffic Control System (TCS) supplemented by timetable and special instructions. The maximum timetable authorized speed is 60 mph. This is not an Amtrak route. The TCS is remotely controlled by an NS train dispatcher located in Decatur, Illinois.

In the vicinity of the accident, the NS operates over a single main track. However, there is a paralleling House Track that also extends across Price Bridge Avenue. It is located 64 feet north of the main track at Price Bridge Avenue.

The NS Illinois Division, Western Region Timetable No. 5, with an effective date of January 1, 2004, indicates a maximum authorized speed of 60 mph. A speed restriction of 50 mph is permanently annotated in the timetable from MP 176.2 to 176.5 for the curve at Keytesville.

Missouri State Highway K/Price Bridge Avenue extends southward from the southeast corner of Keytesville, in Chariton County. The roadway is approximately 24 feet wide, with an asphalt surface and a posted speed limit of 55 mph. A sign posted approximately 100 feet north of the House Track for northbound traffic at Keytesville Station identifies that on Highway K, state maintenance begins at that point and continues northward.

From Keytesville Station southward, the roadway locally referred to as "Price Bridge Avenue" and/or "Depot Road.", is a two-lane township road that crosses the track at an approximate 90-degree angle at railroad MP 174.10, DOT No. 483757R. The roadway is approximately 20 feet wide with an asphalt surface for approximately 10 feet south of the main track crossing. At this point, the roadway becomes an unpaved gravel surface. The township identifies this roadway as County Road VV, No. 419. There is no posted speed limit.

The highway-rail grade crossing warning system installation at this crossing consists of one signal mast on each side of the crossing with conventional back-to-back flashing lights, electronic horns, and gates for the main track. The aluminum gate arms are 19 feet in length on the north, 17 feet in length on the south, and positioned by a Safetran Model S-40 gate mechanism on each mast. They are equipped with three gate arm warning lights each. The back-to-back, 12-inch flashing lights on each mast are Safetran Model FLX-12, with incandescent lamps.

The highway-rail grade crossing system (HGCS) train detection equipment on the main track consists of a Safetran GCP 3000 D2 Processor, with approach circuits extending 2,628 feet railroad east and west of the crossing, providing approximately 30 seconds warning time at 60 mph. The island circuit is 120 feet in length and centered on the roadway.

This HGCS was last performance tested on March 20, 2006, with the results indicating that the system was operating as designed and intended.

The House Track has a southbound passive highway-rail grade crossing warning sign consisting of a crossbuck only.

The NS Building and Bridge Department performed a transit profile survey of the Price Bridge Avenue roadway immediately following the accident. Starting at a point 200 feet north of the crossing, the roadway is of a generally descending grade when approaching the crossing from the north to a point 6.72 inches below the track at 40 feet from the track. The road surface from 40 feet to 20 feet was 6.72 inches below the track. Then the roadway ascends to 5.52 inches below the track at 10 feet and level at the center of the track. Continuing southward, the roadway is 2.16 inches below the track at 10 feet, 7.28 inches below at 20 feet, and 11.76 inches below at 30 feet. The roadway continues descending to 41.76 inches at 100 feet south of the crossing.

Station		Profile Elevation in Reference to Track Center
200' North		47.52 inches above
to		
40'	North	6.72 inches below
30'	North	6.72 inches below
20'	North	6.72 inches below
10'	North	5.52 inches below
Track C/L		0.00
10'	South	2.16 inches below
20'	South	7.28 inches below
30'	South	11.76 inches below
40'	South	16.08 inches below

NS Train Symbol 115D3-23

This train was being operated at a decreasing speed from 58 mph to 50 mph while approaching the accident area. At the time of the collision, the train was being operated at 45 mph. The speeds were recorded by the event recorder of the lead/controlling locomotive.

Approaching Keytesville Station, the train crew observed that the semi-tractor/trailer combination was blocking the trackage. The trackage is tangent, approaching the location with an excellent preview. The train crew had been proceeding via a “Proceed” signal indication, displayed at MP 174.0 at 60 mph. The engineer was beginning to use the locomotives dynamic brakes to slow to 50 mph for a curve speed restriction beginning at MP 176.2.

When the train crew realized that an impact was imminent, the engineer made an emergency application of the train air brakes. The train continued westward, impacting the side of the trailer at its mid-point at approximately 45 mph. The lead/controlling locomotive impacted the trailer and initially climbed onto the trailer, separating the crawler-loader from the trailer. The trailer was then ejected from underneath the lead/controlling locomotive. Both the trailer and the crawler-loader came to rest in the northwest quadrant of the crossing.

The conductor braced himself against the seat in front of him for the impact. Upon impact, the conductor was thrown forward, hitting the windshield, then falling to the floor. When the locomotive stopped its forward movement, the conductor was lying in the left-side window well with the engineer on top of him. His clothing was wet with fuel. There were bells sounding in the locomotive, and he could hear sparking in the electrical cabinet.

The engineer and conductor climbed the electrical cabinet, moving toward the engineer’s control stand. The conductor tried to kick the windshield out without success. They opened the engineer’s rear door and exited the cab of the locomotive eastward. They walked along the side of the locomotive toward the rear, using the handrail as support. Once at the rear step area, they climbed down the locomotive and crossed the track structure northward toward an embankment. They proceeded up the embankment into a lightly wooded area. There was a trail that led to a parking lot approximately 500 feet to the north, where they sat down and rested.

This train had continued westward for approximately another 700 feet after the collision before coming to a stop. The two locomotives came to rest on their left (south) sides, having rotated approximately 100 degrees from their normal upright position on the south side of the track structure. The first 14 cars of the consist derailed and were randomly scattered between the crossing and the two locomotives.

The train consist contained no hazardous materials. The locomotive fuel tanks release approximately 800 gallons of fuel into the soil around the locomotives. The remaining fuel in the tanks was pumped into a tanker truck for disposal. A small amount of fuel entered the Muscle Fork Creek located approximately 100 feet south of the locomotives. This fuel was contained and recovered for disposal. The contaminated soil was also collected for disposal. The environmental cleanup process was monitored by the State of Missouri, Department of Natural Resources.

Analysis and Conclusions

Analysis

The NS downloaded the event recorders from the lead/controlling and second locomotives at the accident site. Upon review, no exceptions were noted to locomotive, train performance, or train handling prior to the accident by either crew member.

NS Train Symbol 115D2-23 had received a second Class1 Brake Test-Initial Terminal prior to departing Moberly. The incident train crew did not perform an air brake test prior to departing Moberly and did not note any mechanical exceptions prior to departure.

The performance of the wayside HGCS was tested on April 11, in the presence of the FRA accident Inspector-in-Charge (IIC) and Regional Assistant Grade Crossing Safety and Trespass Prevention Manager. This testing was performed by the NS signal supervisor (Moberly) and the local signal maintainer. The results of this HGCS testing confirmed that the wayside system at the accident site was operating as designed and intended.

The conductor of NS Train Symbol 115D3-23 returned to service on May 5, following his personal physician’s care for a back strain and bruising with no restrictions. The engineer is still under the care of his personal physician undergoing back and neck therapy.

There was no formal investigation conducted by the NS account of the information and witness statements gathered at the accident site.

The NS did not collect toxicological samples from the train crew because the incident did not meet FRA's Post-Accident Toxicological Testing requirements under Title 49 Code of Federal Regulations (CFR) Part 219 Subpart C.

The southbound Price Bridge Avenue roadway profile approaching highway-rail grade crossing is not in accordance with the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets", dated 2004, Fifth Edition, Chapter 9, Intersections, which states:

RAILROAD-HIGHWAY GRADE CROSSINGS

A railroad-highway crossing, like any highway-highway intersection, involves either a separation of grades or a crossing at-grade. The geometrics of a highway and structure that involves the overcrossing or undercrossing of a railroad are substantially the same as those for a highway grade separation without ramps.

The horizontal and vertical geometrics of a highway approaching a railroad grade crossing should be constructed in a manner that does divert driver attention to roadway conditions.

Vertical Alignment

It is desirable from the standpoint of sight distance, rideability, braking, and acceleration distances that the intersection of highway and railroad be made as level as practical. Vertical curves should be of sufficient length to ensure an adequate view of the crossing.

In some instances, the roadway vertical alignment may not meet acceptable geometrics for a given design speed because of restrictive topography or limitations of right-of-way. To prevent drivers of low-clearance vehicles from becoming caught on the tracks, the crossing surface should be at the same plane as the top of the rails for a distance of 0.6 m [2 ft] outside the rails. The surface of the highway should also no~be more than 75 mm [3 in] higher or lower than the top of nearest rail at a point 9 m [30 ft] from the rail unless track superelevation makes a different level appropriate, as shown in Exhibit 9-102. Vertical curves should be used to traverse from the highway grade to a level plane at the elevation of the rails. Rails that are superelevated, or a roadway approach section that is not level, will necessitate a site specific analysis for rail clearances.

The southbound Price Bridge Avenue roadway profile approaching highway-rail grade crossing is not in accordance with the U.S. Department of Transportation, Federal Highway Administration, Manual on Uniform Traffic Control Devices (MUTCD), 2003 edition standards:

Section 8B.17 Low Ground Clearance Highway-Rail Grade Crossing Sign (W10-5)

Guidance: If the highway profile conditions are sufficiently abrupt to create a hang-up situation for long wheelbase vehicles or for trailers with low ground clearance, the Low Ground Clearance Highway-Rail Grade Crossing (W10-5) sign (see Figure 8B-5) should be installed in advance of the highway-rail grade crossing.

Standard: Because this symbol might not be readily recognizable by the public, the Low Ground Clearance Highway-Rail Grade Crossing (W10-5) warning sign shall

be accompanied by an educational plaque, LOW GROUND CLEARANCE. The LOW GROUND CLEARANCE educational plaque shall remain in place for at least 3 years after the initial installation of the W10-5 sign (see Section 2A.13).

Guidance: Auxiliary plaques such as AHEAD, NEXT CROSSING, or USE NEXT CROSSING (with appropriate arrows), or a supplemental distance plaque should be placed below the W10-5 sign at the nearest intersecting highway where a vehicle can detour or at a point on the highway wide enough to permit a U-turn. If engineering judgment of roadway geometric and operating conditions confirms that vehicle speeds across the railroad tracks should be below the posted speed limit, a W13-1 advisory speed plaque should be posted.

In addition, southbound Price Bridge Avenue roadway profile approaching highway-rail grade crossing is not in accordance with Missouri Department of Transportation (MoDOT) Department of Economic Development rules:

4 CSR 265-8—ECONOMIC DEVELOPMENT Division 265—Division of Motor Carrier and Railroad Safety
Oct. 29, 1985. Amended: Filed June 22, 1998, effective Feb. 28, 1999.
*Original authority: 622.027, RSMo 1985, amended 1993, 1995.
4 CSR 265-8.130 Grade Crossing Construction and Maintenance

(B) If practicable, the roadway alignment should intersect the railroad track at or nearly at right angles. The roadway surface shall be in the same plane as the top of rails for a distance of two feet (2') outside of rails for either multiple or single track crossings. The top of the rail plane shall be connected with the grade line of the roadway each way by vertical curves of the length required to provide riding conditions and sight distances normally applied to the roadway. It is desirable that the roadway surface be not more than three inches (3") higher nor six inches (6") lower than the top of the nearest rail at a point thirty feet (30') from the rail, measured at a right angle, unless track superelevation dictates otherwise. Where crossings involve two (2) or more tracks, the top of rails for all tracks shall be brought to the same plane where practicable.
(2) Unless otherwise ordered by the division or by agreement, the railroad corporation shall maintain the road surface over the length of ties and between tracks where adjacent track centers are less than fifteen feet (15').
(A) Unless otherwise ordered by the division, when a railroad corporation makes a track raise within a grade crossing, the runoff along the roadway shall be maintained at not more than two inches (2") in the first ten feet (10') outside the end of ties, not more than six inches (6") in the next ten feet (10') and the remaining run-off shall be brought to the same elevation of the existing grade within an additional ten feet (10') along the roadway.
(B) When a highway authority raises the road surface along an approach to a crossing, the run-off along the roadway shall be not more than two inches (2") in the first ten feet (10') outside the end of ties with the remainder in the next ten feet (10').
AUTHORITY: section 622.027, RSMo 1986.*
Original rule filed Jan. 5, 1989, effective April 27, 1989. Amended: Filed May 2, 1991, effective Dec. 9, 1991.

The Witzco trailer specifications note an unloaded ground clearance of 9 inches on a level surface. With the weight of the loaded crawler-loader estimated at 31,900 pounds, the trailer suspension system would have compressed approximately 1 inch, thus providing only 8 inches of ground clearance. The suspension system compression of approximately 1 inch was confirmed by the trailer manufacturer.

Given the roadway profile and the statement made by the truck driver being high centered approximately 2-to-3 feet prior to the north rail, it is plausible that the roadway approach and highway-rail grade crossing did not provide an adequate clearance for this type of equipment movement.

Conclusions

The wayside HGCS was operating as intended and within the NS and FRA's regulatory guidelines. The incident train's locomotives and consist mechanical functions were operating as intended and within the NS's regulatory guidelines. The incident train crew did not indicate any problems with the train or its performance, nor with the movement authority prior to the accident. A review of the incident train crews recent efficiency testing results indicates compliance with NS's General Code of Operating Rules (GCOR) and company safety rules.

The incident semi-truck combination driver had not indicated any mechanical problems prior to the accident. The onsite law enforcement official did not cite the truck driver for any moving violations.

The roadway approach and highway-rail grade crossing did not provide adequate ground clearance, as outlined in AASHTO, MUTDC and MoDOT standards for low-profile vehicles.

Factors contributing to this accident were:
1. No "Low Ground Clearance Highway-Rail Grade Crossing" sign was posted in advance of the highway-rail grade crossing.
2. The roadway elevation profile did not comply with industry standards for low-profile vehicles.

Applicable Rules and Regulations

American Association of State Highway and Transportation Officials (AASHTO) - "A Policy on Geometric Design of Highways and Streets", dated 2004, Fifth Edition

U.S. Department of Transportation, Federal Highway Administration Manual on Uniform Traffic Control Devices (MUTCD), 2003 edition

Missouri Department of Transportation (MoDOT) Department of Economic Development 4 CSR 265-8—ECONOMIC DEVELOPMENT Division 265
Division of Motor Carrier and Railroad Safety, Oct. 29, 1985. Amended: Filed June 22, 1998, effective Feb. 28, 1999.
*Original authority: 622.027, RSMo 1985, amended 1993, 1995.
4 CSR 265-8.130 Grade Crossing Construction and Maintenance

Probable Cause and Contributing Factors

The investigation conducted by the Federal Railroad Administration showed that the accident occurred because the semi-truck combination did not successfully negotiate the highway-rail crossing of the NS main track and county road Price Bridge Avenue prior to the arrival of westbound NS Train Symbol 115D3-24 at Keytesville Station, Clariton County, Missouri.

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