



***Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch***

***Accident Investigation Report
HQ-2019-1368***

***Norfolk Southern Railway Company (NS) Derailment
Perry, Georgia
October 9, 2019***

Note that 49 U.S.C. §20903 provides that no part of an accident or incident report, including this one, 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.

SYNOPSIS

On October 9, 2019, at approximately 12:25 p.m., EDT, a southbound Norfolk Southern Railway Company (NS) freight Train 32109 (Train 1) derailed at Milepost (MP) 28.3G on the NS Georgia Division, Macon District near Perry, Georgia. Train 1 was traveling at a recorded speed of 42 mph, when a DP-configured locomotive and 32 cars derailed in an accordion-style general pile up at the Mossy Creek OH bridge.

The derailment ruptured a natural gas pipeline that runs perpendicular to the track on the west side. Approximately 2,282,000 cubic feet of natural gas was released into the atmosphere. No evacuation was ordered; however, investigators and railroad personnel were kept clear of the area until the gas line was secured. Railroad damages were estimated to be \$4,817,327 for equipment and \$316,743 for track, totaling \$5,134,070.

At the time of the derailment, it was daylight, clear, and 86 F.

The Federal Railroad Administration (FRA) determined the probable cause of the derailment to be E7AL - On-board computer -- failure to respond (Locomotive).

Additionally, FRA identified a contributing factor of H504 -- Buffing or slack action excessive; train makeup.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 Norfolk Southern Railway Company	1a. Alphabetic Code NS	1b. Railroad Accident/Incident No. 1260693
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GENERAL INFORMATION

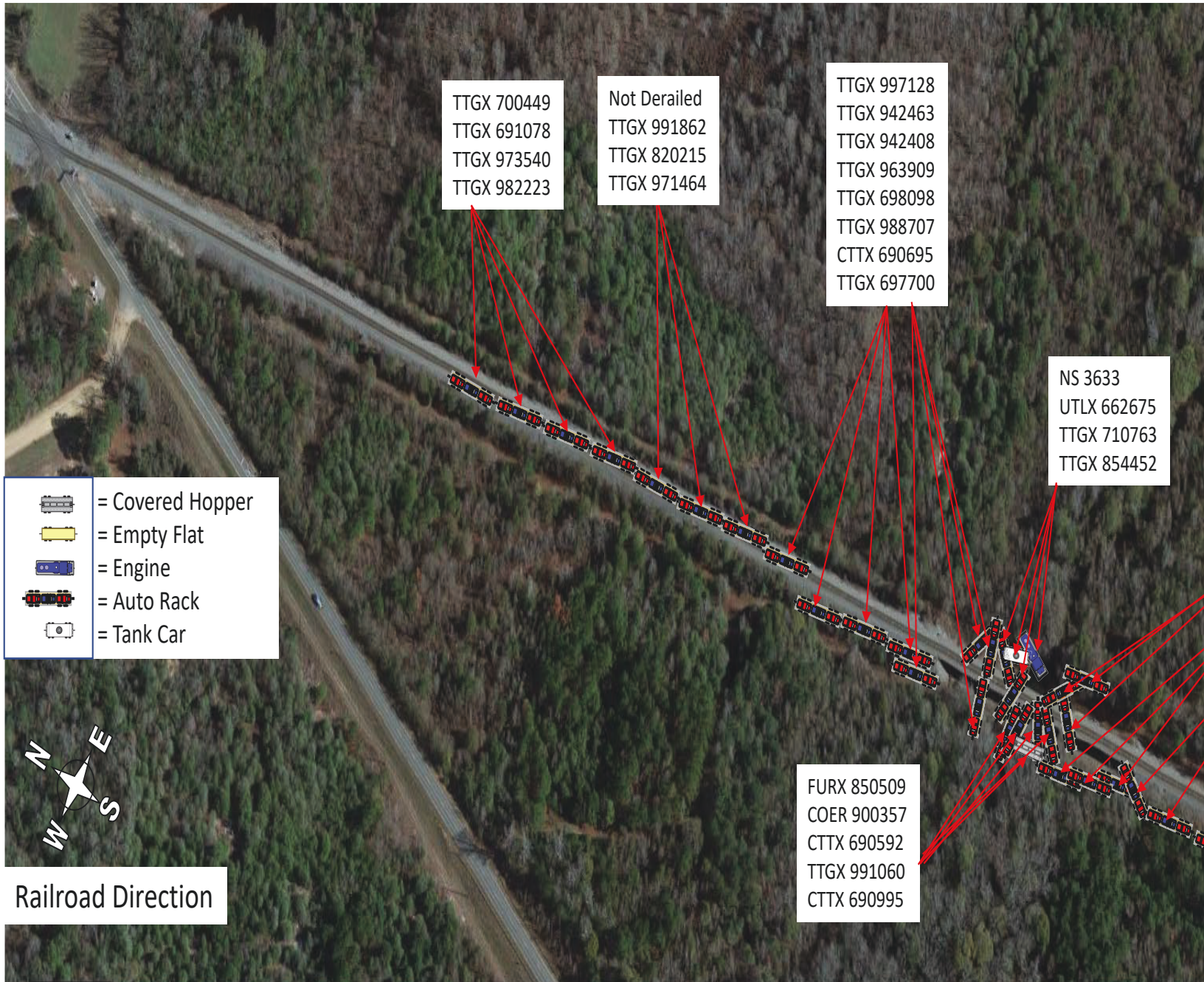
1. Name of Railroad or Other Entity Responsible for Track Maintenance Norfolk Southern Railway Company	1a. Alphabetic Code NS	1b. Railroad Accident/Incident No. HQ-2019-1368
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 10/9/2019	4. Time of Accident/Incident 12:25 PM
5. Type of Accident/Incident Derailment		
6. Cars Carrying HAZMAT 3	7. HAZMAT Cars Damaged/Derailed 0	8. Cars Releasing HAZMAT 0
	9. People Evacuated 0	10. Subdivision NORFOLK SOUTHERN CORPC
11. Nearest City/Town Perry, GA	12. Milepost (to nearest tenth) 28.3G	13. State Abbr. GA
		14. County HOUSTON
15. Temperature (F) 86 °F	16. Visibility Day	17. Weather Clear
		18. Type of Track Main
19. Track Name/Number Single Main Track	20. FRA Track Class Freight Trains-60, Passenger Trains-80	21. Annual Track Density (gross tons in millions) 30
		22. Time Table Direction South
23. PTC Preventable No	24. Primary Cause Code [E7AL] On-board computer - failure to	25. Contributing Cause Code(s) H504

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes			3. Train Number/Symbol 321G309			
4. Speed (recorded speed, if available) R - Recorded 42.0 MPH E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 14651		6a. Remotely Controlled Locomotive? 0 = Not a remotely controlled operation 1 = Remote control portable transmitter 2 = Remote control tower operation 3 = Remote control portable transmitter - more than one remote control transmitter					Code 0	
6. Type of Territory Signalization: <u>Signaled</u> Method of Operation/Authority for Movement: <u>Signal Indication</u> Supplemental/Adjunct Codes: <u>J</u>											
7. Principal Car/Unit		a. Initial and Number	b. Position in Train	c. Loaded (yes/no)	8. 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.)		TILX 519541	61	no				0	0		
(2) Causing (if mechanical, cause reported)		NA	0	no	9. Was this consist transporting passengers?			No			
10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train		Rear End		11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded		Empty		e. Caboose
		b. Manual	c. Remote	d. Manual	e. Remote		a. Freight	b. Pass.	c. Freight	d. Pass.	
(1) Total in Train	2	0	1	0	0	(1) Total in Equipment Consist	124	0	6	0	0
(2) Total Derailed	0	0	1	0	0	(2) Total Derailed	29	0	3	0	0
12. Equipment Damage This Consist 4817327		13. Track, Signal, Way & Structure Damage 316743									
Number of Crew Members						Length of Time on Duty					
14. Engineers/Operators 1		15. Firemen 0		16. Conductors 1		17. Brakemen 0		18. Engineer/Operator Hrs: 5 Mins: 10		19. Conductor Hrs: 5 Mins: 10	
Casualties to:		20. Railroad Employees		21. Train Passengers		22. Others		23. EOT Device? Yes		24. Was EOT Device Properly Armed? Yes	
Fatal		0		0		0		25. Caboose Occupied by Crew?		N/A	
Nonfatal		0		0		0					
26. Latitude 32.448310000				27. Longitude -83.622571000							

SKETCHES

Sketch - Perry derailment sketch



NARRATIVE

Circumstances Prior to the Accident

Norfolk Southern Railway Company (NS) southbound freight train 321G309 (Train 1) consisted of 2 locomotives on the head end; 73 mixed freight cars (68 loads, 5 empties); a single distributive power (DP) locomotive; and 57 additional mixed-freight cars (56 loads, 1 empties). Train 1 was 8,544 feet in length, had 14,651 trailing tons, and originated at NS Brosnan Yard in Macon, Georgia, with a destination of Jacksonville, Florida. NS mechanical personnel performed the required regulatory mechanical inspection and initial terminal Class I air brake test at Brosnan Yard. No special restrictions applied to the train.

The crew of Train 1 consisted of a locomotive engineer and conductor. The crew went on duty at 7:15 a.m., EST, October 9, 2019, at NS Brosnan Yard, the home terminal for both crew members. Both crew members had received the statutory off-duty period prior to reporting for duty.

The derailment occurred on the NS Georgia Southern and Florida Line, Georgia Division, Macon District near Perry, Georgia. The Georgia Division, Macon District travels geographic north and south, and timetable direction is south. Timetable direction will be used in this report. The area of the derailment is a single main track with a maximum authorized speed of 50 mph for freight. The method of operation for the Macon District is a Traffic Control System (TCS) with an integrated Automatic Block Signal overlay. Approaching the accident site from the north, the track is tangent with a descending grade until MP 28.3G where the grade transitions to a 1.18-percent ascending grade. North of the accident site at MP 27.8G, there is a road crossing (DOT #729192).

Before departing, both crew members were trained on the use of distributed power by a Road Foreman of Engineers as this was both crewmembers' first trip utilizing distributed power. After departing the yard, at approximately 11 a.m., EST, Train 1 went into an undesired emergency 21 miles south of NS Brosnan Yard, near Milepost (MP) 21G due to an air hose separation on car line No. 44 (BNSF 791316) and a broken knuckle on the 48th car in the train (BNSF 781632). Once the car was repaired, the train continued southbound.

At the time of the derailment, it was daylight, clear, and 86 F.

The Accident

On October 9, 2019 at approximately 12:25 p.m., Train 1 was traveling south near MP 28.3G at a recorded speed of 42 mph then it experienced an undesired emergency brake application. The Conductor exited the locomotive and began walking north to inspect the train while the Engineer reported the situation to the dispatcher. The conductor noticed several derailed cars, beginning with line 64, and notified the Engineer, who then notified the dispatcher. The Conductor stated that he smelled gas so he was instructed to return to the head of the train to a place of safety.

Approximately 750 feet south of road crossing DOT 729192, cars 61 – 88, and 92 – 95 derailed. Cars 61 - 62 remained upright, while cars 64 - 87, including the DP locomotive, derailed in an accordion-style. Additionally, cars 88 and 92 - 95 derailed and remained upright, totaling 32 cars and 1 locomotive derailed. The first 3 cars derailed were empties and the remaining 29 were loaded. None of the cars derailed contained hazardous material. One tank car line No. 74 (UTLX 662675) was punctured,

releasing approximately 2,000 gallons of animal tallow (animal fat) into Mossy Creek, and the DP locomotive (NS 3633) spilled approximately 500 gallons of diesel fuel into the creek.

The derailment ruptured a natural gas pipeline that runs perpendicular to the track on the west side. Approximately 2,282,000 cubic feet of natural gas was released into the atmosphere. No evacuation was ordered; however, investigators and railroad personnel were kept clear of the area until Warner Robins Utilities representatives could shut down the gas line, and Georgia Department of Public Safety deemed it safe. No injuries were reported as a result of the derailment.

A Lieutenant with the Houston County Sheriff's Department was dispatched to the scene; however, the Sheriff's Department did not investigate and no reports were prepared. Railroad wrecking contractors RJ Corman and Hulcher Services were on the scene to clear the derailed equipment. HEPACO Environmental Services was also brought in for cleanup of the diesel fuel and animal tallow. Railroad damages were estimated to be \$4,817,327 for equipment and \$316,743 for track, totaling \$5,134,070. Norfolk Southern opened the track back up for service on October 11, 2019 at 10:05 a.m.

Post-Accident / Incident Investigation

Federal Railroad Administration (FRA) investigators reviewed all records, forms, and other documentation necessary to conduct an investigation into the probable cause of the derailment. The following analysis and conclusions represent the findings of FRA's investigation.

Analysis and Conclusions

Analysis – Toxicology: The accident met the criteria for Title 49 Code of Federal Regulations (CFR) Part 219 Subpart C, Post-Accident Toxicological Testing. Both train crew members were tested under this authority with negative results.

Conclusion: FRA determined that drug and alcohol did not contribute to the cause or severity of the accident.

Analysis – Locomotive Event Recorder / Simulator: During the investigation, FRA discovered NS has had several issues with undesired emergencies traversing the 321-train route while using locomotives equipped with Trip Optimizer (TO). TO is an onboard train control system that optimizes fuel consumption based on a specific train's makeup and route. The system calculates the optimum speed profile by considering factors such as train length, weight, and track profile, and then automatically controls throttle and dynamic brake accordingly as the Engineer monitors the operation.

The locomotive event recorder data from the lead locomotives and mid-train distributive power unit (DPU) were downloaded by NS and analyzed by FRA. In addition, NS conducted a computer-based simulator analysis of the accident. At the time of the derailment, Train 1 was being operated entirely by TO, under the supervision of the Engineer. TO operated the train within authorized timetable speeds. The event recorder data from all three locomotives revealed the TO was controlling the lead units fenced off from the DPU, and commanded the DPU to apply shoving forces against the lead unit's braking force to maintain consistent speed.

Train 1 was coming to the bottom of a hill and beginning to climb the next hill. While working to maintain timetable speed, TO was controlling the lead locomotive (NS 4005) by applying dynamic braking while the DPU (NS 3633) was shoving from the middle of the train under power. NS 4005 (lead) was in dynamic braking notch 3, generating 22,000 pounds of dynamic braking force. Simultaneously, NS 3633 (DPU) was shoving in notch 6 generating 30,000 pounds of force. When the DPU got to the bottom of

the hill, with 4 of the 6 empty cars (60-63) directly in front of it, the opposing forces at that part of the train allowed the wheels of TILX 519541 (empty) car #61 to be lifted off the rail momentarily (wheel lift). Any lateral movement or track variation in this situation would prevent the wheels from returning to a normal running (on the rail) condition, thus causing a derailment. The derailment happened at a speed of 42 mph, and the train continued for about 2,800 feet before stopping. In addition, there was 6,211 tons behind the DPU generating additional force against the train cars that were derailing. Furthermore, there was excessive cushion slack positioned between tonnage blocks and limited loading capability by Trip Optimizer Smart HPT which resulted in a 360-kip run-in event.

Conclusion: FRA determined the excessive buff forces created from opposing dynamic braking and shoving, while operating on a descending grade, was the probable cause of the derailment. (Cause code E7AL)

Analysis –Train Make-up: Train 1 consisted of 124 loads and 6 empties. The first car derailed was an empty car 61 from the head end (TILX 519541) behind the lead locomotives. Four of the train's six empty cars were at line 60-63, and the DPU locomotive was between cars 73 and 74 with 6,211 trailing tons behind it. Of the 130 total cars, 32 cars were equipped with end-of-car cushion units placed in the train between line 58-95. Unlike standard rail cars with the draft gear and coupler, the end-of-cushion unit cars have at least 15 inches of travel on each end of the car creating additional slack and buff action. Although the train was predominantly loads and built-in compliance with NS rules, the existing train makeup along with the functionality of TO contributed to the derailment.

Conclusion: FRA determined the existing train makeup with the excessive buffing and slack action was a contributing factor to the accident. (Contributing cause code H504)

Analysis – PTC Systems: Train 1 was operating with a functioning PTC system. FRA reviewed all PTC components and found them to be working as intended.

This derailment was not PTC preventable.

Conclusion: FRA determined PTC did not contribute to the cause or severity of the derailment.

Analysis – Track: FRA obtained track inspection records from NS from July 2019 to the date of derailment. An observation of the track structure by FRA inspectors ahead of and behind the derailment location did not identify any exceptions to the track standards. NS inspected this segment of track above the frequency requirements of the Title 49 CFR Part 213-Track Safety Standards.

Conclusion: FRA determined the track and track structure did not contribute to the cause or severity of the derailment.

Overall Conclusion

Train 1 was operating in TO prior to and during the derailment. The FRA investigation concluded that TO was not handling the train and the distributed power unit, the way an engineer would have handled the train while it was descending grade as the lead locomotives were coming out of dynamic braking and begin to ascend the grade. This caused excessive buff forces which pinched the empty car (TILX 519541) off the track, causing the derailment.

Additionally, Train 1 was built with 4 of the train's 6 empty cars at line No. 60-63. The distributed power locomotive was positioned between car line numbers 73 and 74. When the distributed power locomotive was being commanded by TO to push in notch 6 while the head end was in dynamic braking, the much lighter empty freight cars were lifted off the rail by the excessive buff forces.

Probable Cause

FRA determined the probable cause of the derailment to be E7AL -- On-board computer -- failure to respond (Locomotive).

Additionally, FRA identified a contributing factor of H504 -- Buffing or slack action excessive; train makeup.