Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch

Accident Investigation Report
HQ-2019-1370

Norfolk Southern Railway Company (NS) Collision
Georges Station, Pennsylvania
November 8, 2019

SYNOPSIS

On November 8, 2019, at 2:17 p.m., EST, Norfolk Southern (NS) westward Train Z7XC107 (Train 1) struck the rear-end of stopped NS westward Train 21VC108 (Train 2) at Milepost (MP) PT 318.7 on Main Track 2 of NS's Pittsburgh Subdivision near the rural community of Georges Station in Westmoreland County, Pennsylvania. The three rear intermodal cars on Train 2 and two Train 1 locomotives derailed. The Train 1 lead engine fouled the adjacent track derailing eight intermodal cars of NS eastward train 20QC207 (Train 3) on the adjacent Main Track.

Total equipment damage was estimated at $1,167,412; and track and signal damage was estimated at $308,175. Signal damage was minimal and consisted of replacing track bond wires. No injuries were reported by the crews, or public because of the derailment.

Weather at the time of the collision was daylight, clear, and 36 F.

The Federal Railroad Administration's (FRA) investigation determined the probable cause of the accident was cause code (H222) -- Automatic block or interlocking signal displaying other than a stop indication -- failure to comply by the Train 1 crew.

Additionally, FRA's investigation determined a contributing cause of the accident to be cause code (H605) -- Failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal.

U.S. Department of Transportation Federal Railroad Administration	**FRA FACTUAL RAILROAD ACCIDENT REPORT**	FRA File # HQ-2019-1370

TRAIN SUMMARY

1. Name of Railroad Operating Train #1	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
Norfolk Southern Railway Company	NS	136152
2. Name of Railroad Operating Train #2	2a. Alphabetic Code	2b. Railroad Accident/Incident No.
Norfolk Southern Railway Company	NS	136152
3. Name of Railroad Operating Train #3	3a. Alphabetic Code	3b. Railroad Accident/Incident No.
Norfolk Southern Railway Company	NS	136152

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
Norfolk Southern Railway Company	NS	136152
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident	4. Time of Accident/Incident
	11/8/2019	2:17 PM

5. Type of Accident/Incident
Rear End Collision

6. Cars Carrying HAZMAT	7. HAZMAT Cars Damaged/Derailed	8. Cars Releasing HAZMAT	9. People Evacuated
2	1	0	0

10. Subdivision
NORFOLK SOUTHERN CORPORATION - PITTSBURGH

11. Nearest City/Town	12. Milepost *(to nearest tenth)*	13. State Abbr.	14. County
Georges Station	PT 318.7	PA	WESTMORELAND

15. Temperature (F)	16. Visibility	17. Weather	18. Type of Track
36 ˚F	Day	Clear	Main

19. Track Name/Number	20. FRA Track Class	21. Annual Track Density *(gross tons in millions)*	22. Time Table Direction
Double Main # 2 Track	Freight Trains-60, Passenger Trains-80	47	West

23. PTC Preventable	24. Primary Cause Code	25. Contributing Cause Code(s)
No	[H222] Automatic block or interlockin	H605

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OPERATING TRAIN #1

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	Z7XC107

4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	5. Trailing Tons (gross excluding power units)	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
16.0 MPH	R	4100		0

6. Type of Territory

Signalization: Signaled

Method of Operation/Authority for Movement: Signal Indication

Supplemental/Adjunct Codes: Q, A

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.)*	NS 9549	1	no		0	0
(2) Causing *(if mechanical, cause reported)*				9. Was this consist transporting passengers?		No

10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End e. Remote	11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	2	0	0	0	0	(1) Total in Equipment Consist	0	0	102	0	0
(2) Total Derailed	2	0	0	0	0	(2) Total Derailed	0	0	0	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
62673	308175

Number of Crew Members				Length of Time on Duty	
14. Engineers/Operators	15. Firemen	16. Conductors	17. Brakemen	18. Engineer/Operator	19. Conductor
1	0	1	0	Hrs: 9 Mins: 12	Hrs: 9 Mins: 12
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	27. Longitude
40.317328000	-79.489320000

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FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File # HQ-2019-1370

OPERATING TRAIN #2

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	21VC108

4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	5. Trailing Tons (gross excluding power units)	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
0.0 MPH	R	2762		0

6. Type of Territory

Signalization:
Signaled

Method of Operation/Authority for Movement:
Signal Indication

Supplemental/Adjunct Codes:
Q, A

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.)*	DTTX 475762	18	yes		0	0
(2) Causing *(if mechanical, cause reported)*				9. Was this consist transporting passengers?		No

10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End e. Remote	11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	2	0	0	0	0	(1) Total in Equipment Consist	16	0	0	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	3	0	0	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
306487	0

Number of Crew Members				Length of Time on Duty	
14. Engineers/Operators	15. Firemen	16. Conductors	17. Brakemen	18. Engineer/Operator	19. Conductor
1	1	1	0	Hrs: 5 Mins: 12	Hrs: 5 Mins: 12

Casualties to:	20. Railroad Employees	21. Train Passengers	22. Others	23. EOT Device?	24. Was EOT Device Properly Armed?
				Yes	Yes
Fatal	0	0	0	25. Caboose Occupied by Crew?	N/A
Nonfatal	0	0	0		

26. Latitude	27. Longitude
40.317328000	-79.489320000

U.S. Department of Transportation
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FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File # HQ-2019-1370

OPERATING TRAIN #3

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	20QC207

4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	5. Trailing Tons (gross excluding power units)	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
28.0 MPH	R	11386		0

6. Type of Territory

Signalization: Signaled

Method of Operation/Authority for Movement: Signal Indication

Supplemental/Adjunct Codes: Q, A

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.)*	DTTX 680210	51	yes		0	0
(2) Causing *(if mechanical, cause reported)*				9. Was this consist transporting passengers?		No

10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End e. Remote	11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	3	0	0	2	0	(1) Total in Equipment Consist	82	0	0	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	8	0	0	0	0

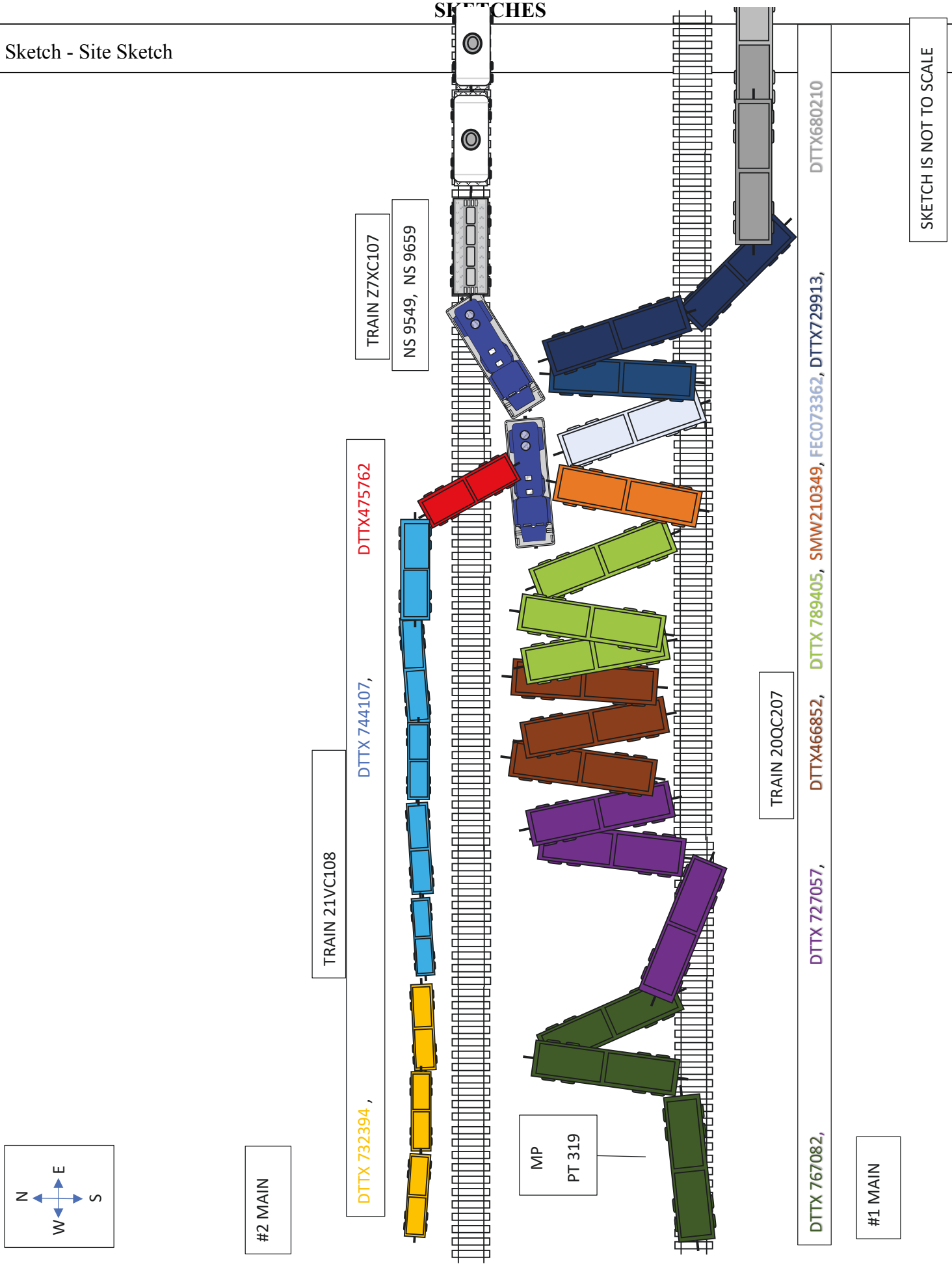
12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
798252	0

Number of Crew Members				Length of Time on Duty	
14. Engineers/Operators	15. Firemen	16. Conductors	17. Brakemen	18. Engineer/Operator	19. Conductor
1	0	1	0	Hrs: 5 Mins: 12	Hrs: 5 Mins: 12
Casualties to:	20. Railroad Employees	21. Train Passengers	22. Others	23. EOT Device? Yes	24. Was EOT Device Properly Armed? No
Fatal	0	0	0	25. Caboose Occupied by Crew?	N/A
Nonfatal	0	0	0		

26. Latitude	27. Longitude
40.317328000	-79.489320000

SKETCHES

Sketch - Site Sketch



NARRATIVE

CIRCUMSTANCES PRIOR TO THE ACCIDENT

Train Z7XC107 (Train 1)

Norfolk Southern Railway Company (NS) freight train Z7XC107 (Train 1) consisted of 2 head end locomotives, 100 empty tank cars, and 2 empty buffer cars. It was 6,210 feet long, had 4,100 trailing tons, and last contained crude oil. Train 1 received a Class 1 brake test at Reybold, Delaware, on November 8, 2019, and departed at 12:02 a.m. with a destination of Alberta, Canada. After being recrewed at Harrisburg, Pennsylvania, Train 1 departed Harrisburg on November 8, 2019, at 7 a.m., EST.

The crew of Train 1 consisted of an engineer and conductor who were called for duty at 5:05 a.m., EST. Harrisburg was the away-from-home terminal for both employees, and both received the statutory off-duty rest period prior to reporting for duty. The Engineer was seated at the controls, on the right side, and the Conductor was seated at the console on the left side of the lead locomotive.

Train 21VC103 (Train 2)

NS freight train 21VC108 (Train 2) consisted of 2 head end locomotives and 16 loaded cars. It was 2,641 feet in length, with 2,762 trailing tons, with cars carrying intermodal containers. Train 2 received a Class 1 brake test at Harrisburg on November 8, 2019, at 12:02 a.m., with a destination of Chicago, Illinois. The outbound Train 2 crew departed Harrisburg at 8:30 a.m., EST.

The crew of Train 2 consisted of an engineer, qualifying engineer, and conductor who were called for duty at 7:30 a.m., EST. Harrisburg was the away-from-home terminal for the employees; all three had received the statutory off-duty period prior to reporting for duty. The Engineer was seated at the controls on the right side; the Assistant Engineer was seated in the center seat; and the Conductor was seated at the console on the left side of the lead locomotive.

Train 20QC207 (Train 3)

NS freight train 20QC207 (Train 3) consisted of 3 head end locomotives, 82 loaded cars, and two manual helper locomotives. It was 12,834 feet in length, had 11,386 trailing tons, with cars carrying intermodal containers. Train 3 received a Class 1 brake test at Chicago, Illinois, on November 7, 2019, and departed Chicago at 2:45 p.m., CST, with a destination of Morrisville, Pennsylvania. After being recrewed at Conway, Pennsylvania, Train 3 departed Conway on November 8, 2019, at 11:15 a.m., EST.

The crew of Train 3 consisted of an engineer and conductor who were called for duty at 9:05 a.m., EST. Conway is the home terminal for both employees, and both received the statutory off-duty rest period

prior to reporting for duty.

Train 3 stopped at Trafford, Pennsylvania, to pick up a 2-locomotive end-of-train helper to assist the train on the heavy eastbound mountain grade. Train 3 departed Trafford at 1:30 p.m., EST.

The Engineer was seated at the controls, on the right side, and the Conductor was seated at the console on the left side of the lead locomotive.
The accident occurred on the NS Pittsburgh Line near the small community of Georges Station at Milepost (MP) PT 318.7. NS Traffic Control Signal Rules and Cab Signal System Rules are in effect. Maximum track speed is 60 mph. The railroad right-of-way consists of Main Tracks # 1 and # 2. Timetable direction for Trains 1 and 2 is west.

Beginning at MP PT 317.0 the track is tangent with an ascending grade of .92 percent until MP PT 317.5 where the grade becomes descending at 0.11 percent. At MP PT 317.2 there is a 0.5-degree left hand curve until MP PT 317.6, followed by a 0.5-degree right hand curve between MP PT 317.7 to PT 317.9. A defect detector is located at MP PT 317.8. The track is tangent again until entering a 1.5-degree left-hand curve at MP PT 318.7 that continues through the accident location to MP PT 319.4. At about MP PT 318.6 there is an overhead bridge, about 960 feet prior to the point of impact (POI). The track at the POI is cut into a hill creating a barrier on both sides of the track.
At about 2:05 p.m., EST, Train 2 was operating westbound on a restricting indication and stopped at MP PT 319.7 due to a train ahead. At about 2:10 p.m., EST, Train 1 was operating westbound at 50 mph and received an approach signal at MP PT 315 indicating a train in the block ahead. At about 2:11 p.m., EST, Train 3 was traveling eastbound at 24 mph, and began past Train 2 at MP PT 319.7. The Engineer of Train 1 remained in throttle position 7, but was slowing due to the ascending grade. Train 1 slowed to 22 mph by the time it reached MP PT 318.6 at about 2:13 p.m., EST, where he received a restricting indication and began to reduce from throttle position 7 to idle. At about 2:16 p.m., EST, Train 1 was traveling 21 mph in idle when the rear end of the stopped Train 2 came into view.

THE ACCIDENT

The Engineer of Train 1 transitioned from idle to dynamic braking, and then placed the train into emergency at about 2:17 p.m., EST, before impacting the rear of Train 2 at 16 mph.

The two lead locomotives of Train 1, and rear three cars of Train 2, derailed to the outside of the curve. The locomotives of Train 1 then struck Train 3, which was traveling 28 mph, derailing 8 cars positioned 48 through 55 cars from the head end. A total of 53 containers were on the derailed cars from Trains 2 and 3, with many of them coming to rest in a general pile up on the right-of-way.

Total equipment damage was estimated at $1,167,412; and track and signal damage was estimated at $308,175. Signal damage was minimal and consisted of replacing track bond wires.

No injuries were reported by the crews, or public because of the derailment. The Hempfield Township

Emergency Response Team and Fire Department were on-site for about four hours' post-accident until it was determined that no hazardous material cars or containers were damaged or leaking.

POST-ACCIDENT INVESTIGATION

The Federal Railroad Administration (FRA) began an on-site investigation starting November 8, 2019. FRA Inspectors reviewed train make-up, consist and HAZMAT information, event recorder downloads, track wayside signal equipment and engine signal system equipment; they also reviewed track condition and inspection records, locomotive and car condition, and associated inspection records. FRA Inspectors also reviewed fatigue analysis of all crew members, toxicology analysis for Train 1 employees and all employee training and certification records including operational testing to check for compliance with Federal regulations and carrier operating rules. FRA interviewed employees from each crew. FRA requested and received records and other documentation needed to conduct a final analysis and develop conclusions on the relative facts concerning the collision.

ANALYSIS AND CONCLUSIONS

Analysis - Evaluation and Testing of Equipment: FRA conducted an on-site inspection of all engines and cars involved from Train 1.
FRA reviewed periodic and daily locomotive inspection records to see that they were current. The lead engine Train 1 RailView Camera had a hardware failure and no pictures were recorded. This is not covered by Title 49 Code of Federal Regulations (CFR) 229 and is not mandatory for freight rail.

Car repair records were examined for Train 1. Class 1 Airbrake Tests for all trains were current. Downloads from equipment detectors prior to collision location indicated no defects. Car issues were the result of the collision.

Conclusion: FRA concluded the mechanical and operating condition of the locomotives and rail cars were not a factor in the collision.

Analysis - Toxicology: The two Train 1 crew members underwent FRA Post Accident Testing. No other crews were tested because of not meeting the criteria for testing.

Conclusion: Testing results were negative. FRA determined alcohol and drug use did not contribute to the cause or severity of the accident.

Analysis - Crew Fatigue: FRA obtained hours of service (HOS) and fatigue-related information for the two-week period preceding the rear-end collision of the two westbound trains on # 2 Main Track and subsequent derailment of equipment on the eastbound train on # 1 Main Track. All employees had received their statutory off-duty rest periods.

FRA uses an overall effectiveness rate of 72 or less for 80 percent or more of the time as the baseline for

fatigue analysis. This is the level at which the risk of a human factors-related accident is calculated to be equal to chance. The higher the FAID score, the higher fatigue exposure. Below this baseline, fatigue was not considered as probable for an employee. Software sleep settings vary according to information obtained from each employee. If an employee does not provide sleep information, FRA uses the default software settings. FRA obtained fatigue-related information, including work history, for all train operating employees involved in this accident.

Conclusion: FRA determined fatigue did not contribute to the cause or severity of this accident.

Analysis-Operating Practices: FRA reviewed carrier operating rules, train handling and equipment rules, timetable special instructions, speed and signal rules, and train-operating bulletins.

NS Defect Detector Rules require a train to be stopped and all railcars be inspected if train speed drops below 8 mph while passing over a detector and a 'DEFECT' message is received. The Train 1 crew was attempting to maintain a constant speed while moving over the detector at MP PT 317.8. The Engineer and Conductor explained in post-accident interviews they were using the equipment bungalow at MP PT 318.5 as a reference to slow the train. Due to Train 3 passing on the adjacent track, and the topography of the area, the crew's visibility was limited which resulted in the misjudgment of an appropriate speed. The employees overlooked the requirement of restricted speed to be able to stop within one half the range of vision. The length of Train 1 was longer than the distance between the equipment detector and the location of the collision at MP PT 318.7. Event recorder data shows the crew of Train 1 failed to comply with a restricted speed cab signal and failed to operate at a speed where the train could be stopped short of stopped equipment.

FRA reviewed certification records for all crew members. NS provided employee career records, national and state driving records, vision and hearing exams, knowledge tests, skill tests, annual monitoring rides, and previous six months of carrier efficiency testing for each employee.

The Engineer of Train 1 was promoted to engineer on August 22, 2019, and had made 17 trips since being qualified. He entered the NS Engineer Training Program February 11, 2019, and received a promotion ride with a Road Foreman of Engineers (RFE) on August 22, 2019; he scored a 100 percent grade on the qualification run. The Engineer of Train 1 also had RFE monitoring/check rides on July 3, 2019, and July 24, 2019. Supervisor Coach Interviews on rules and train-handling procedures were conducted on March 4, June 11, and July 24, 2019. The Locomotive Engineer's Trainee log shows 66 hands-on training days and 1 simulator training day. Previously, he had been certified as a conductor since December 12, 2011. His last hearing and vision testing was on January 22, 2019, prior to entering the engineer training program.

The Conductor of Train 1 was certified on November 17, 2014, and was recertified on November 1, 2019. He underwent vision and hearing tests on August 23, 2019, Knowledge Test Assessment on August 20, 2019, and Rule Certification on August 22, 2019.

Engineer certification and training for all engineers and conductors was current and in compliance with Title 49 Code of Federal Regulations (CFR) Part 240 and (CFR) Part 242.

FRA reviewed the previous six months of carrier operational tests and observations for all crew members involved in the accident.
The Engineer of Train 1 received a total of 96 tests/observations with no failures recorded. Testing included 9 speed checks, 14 signal compliance, 2 cab signal observations, and 5 communication checks. Of the 29 tests for speed, signal control, and communication, 18 were via train ride and 11 were recorded as observation tests.

The Conductor of Train 1 had a total of 47 tests/observations with no failures recorded. Testing included 2 speed checks, 6 signal compliance observations, 1 cab signal check, 2 communication, and 1 calling of signals via radio. Of the 11 tests, 8 were via train ride and 3 were recorded as observation tests.

Operational testing followed Norfolk Southern Guidelines for operational testing.

Conclusion: FRA determined the failure by the crew of Train 1 to comply with the restricting signal indication was the probable cause of the accident. (Cause Code H222)

Additionally, the failure of the crew of Train 1 to operate at restricted speed contributed to the cause of the accident. (Cause code H605)

Analysis - Signal System: The signal system in this territory is a Traffic Control System (TCS) supplemented by Cab Signals (No intermediate or distant wayside signals are in this territory). FRA inspected the three Signal Interruption Points (SIPs) prior to the collision location; they are designated SIP 316.7, SIP 317.6 and SIP 318.5.

FRA observed multiple tests being performed including: a visual check of signal equipment and insulated joints, track circuits, grounds, software management, and rolled shunts to simulate train movements. FRA verified all possible Cab Signal Aspects. Test records for the three SIP locations were reviewed; no exceptions were taken. FRA also attempted to test on-board equipment from the Train 1 lead locomotive at the NS Altoona Shops. The equipment was not operational due to damage received in the accident.

FRA reviewed download logs from SIPs 316.7, 317.6, and 318.5. The logs follow along with the downloaded log from the Train 1 lead locomotive. The information shows that Train 1 was being sent an Approach Cab Signal indication while moving in a west direction to SIP 316.7 and continued receiving an approach Cab Signal Indication up to SIP 317.6. Train 1 was sent a Restricted Cab Signal Indication while moving from SIP 317.6 up to the SIP 318.5 location. Train 1 continued to be sent the Restricted Cab Signal Indication up to the point of impact with the rear-end of Train 2 at MP 318.7.

Conclusion: FRA's inspection of the signal system found the system to be working as intended and did

not contribute to the accident. No wayside signal equipment was damaged.

Analysis – Track: This portion of Norfolk Southern, Pittsburgh Division, Pittsburgh Line consists of double main track. Norfolk Southern documents indicate approximately 46.9 million gross tons of freight moved over the route in 2018.

FRA recorded post-accident track notes at the derailment site and reviewed six months of NS track inspection records, Sperry Car testing, FRA Inspection Car testing, and NS geometry survey car testing.

Conclusion: FRA took no exception to the track conditions near the point of derailment. After reviewing the track notes and measurements along with all Norfolk Southern-provided documentation, FRA determined that track conditions were not a causal or contributing factor to the derailment.

OVERALL CONCLUSIONS

The Train 1 crew failed to comply with the requirements of a restricting cab signal indication and was moving at a faster speed then the engineer was able stop short of equipment ahead as the train was moving over an equipment detector with forward view restricted by Train 3 moving east on the adjacent track. The crew lost situational awareness while trying to maintain a constant speed when passing over the defect detector.

PROBABLE CAUSE AND CONTRIBUTING FACTORS

The FRA's investigation determined the probable cause of the accident was cause code (H222) -- Automatic block or interlocking signal displaying other than a stop indication -- failure to comply by the Train 1 crew.

Additionally, FRA's investigation determined a contributing cause of the accident to be cause code (H605) -- Failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal.