



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

***Accident Investigation Report
HQ-2019-1371***

***Norfolk Southern Railway Company (NS)
Head-on Collision
Bonsack, Virginia
November, 21, 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 November 21, 2019 at about 11:15 a.m., EST, a westbound Norfolk Southern Corporation (NS) intermodal train 22AV121 (Train 1) struck an eastbound hi-rail dump truck, Roadway Maintenance Machine 310609, traveling on Main Track 1 at Milepost (MP) N250.3. The hi-rail dump truck was operating on the wrong track. The collision site is one mile east of of Bonsack, Virginia, in Roanoke County. Bonsack, Virginia is an unincorporated community located northeast of the city of Roanoke. The train consisted of 3 locomotives and 45 mixed-freight cars with 40 loaded cars and 5 empty cars. The train was 9,232 feet long with 8,665 trailing tons. No cars derailed. The train had nine hazardous materials cars. No track was damaged from this collision; damage to the lead engine was \$33 and the hi-rail dump truck was \$10,533. The operator of the hi-rail dump truck was taken to Roanoke Memorial Hospital and received seven stitches to close a wound on his forehead.

The weather at the time of the collision, was 48 °F, partly cloudy, winds 3 mph, 61 percent humidity, with visibility of 10 miles.

The Federal Railroad Administration's (FRA) investigation determined the probable cause was cause code H402 -- Motor car or on-track equipment rules, failure to comply. The hi-rail dump truck occupied Main Track 1 track (wrong track), and the operator was unsure as to whether he was occupying Main Track 1 or Main Track 2.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 Norfolk Southern Railway Company	1a. Alphabetic Code NS	1b. Railroad Accident/Incident No. HQ-2019-1371
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GENERAL INFORMATION

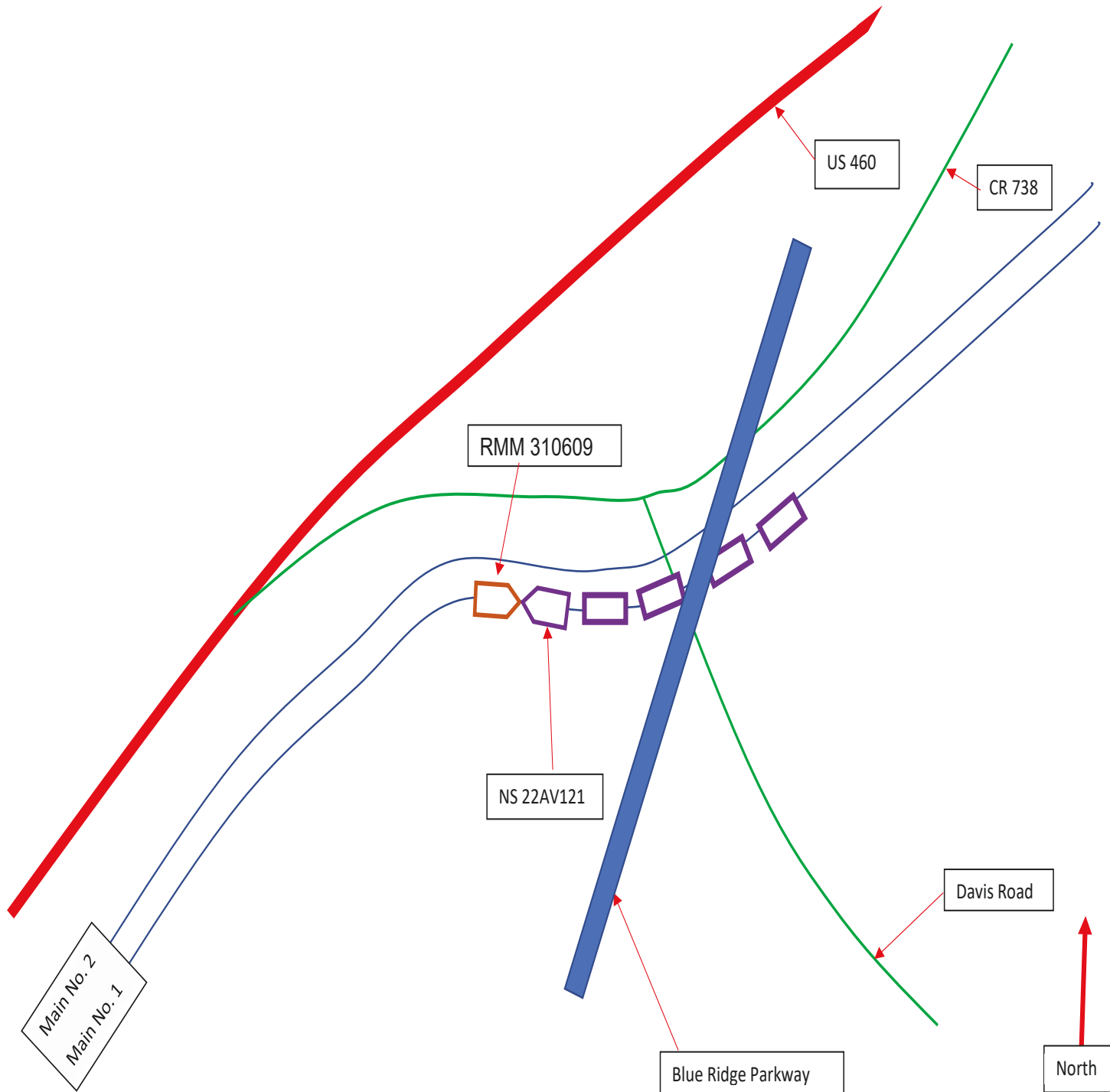
1. Name of Railroad or Other Entity Responsible for Track Maintenance Norfolk Southern Railway Company	1a. Alphabetic Code NS	1b. Railroad Accident/Incident No. HQ-2019-1371
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 11/21/2019	4. Time of Accident/Incident 11:15 AM
5. Type of Accident/Incident Head On Collision		
6. Cars Carrying HAZMAT 10	7. HAZMAT Cars Damaged/Derailed 0	8. Cars Releasing HAZMAT 0
9. People Evacuated 0		
10. Subdivision NORFOLK SOUTHERN CORPORATION - BLUE RIDGE DST		
11. Nearest City/Town ROANOKE	12. Milepost (to nearest tenth) N250.3	13. State Abbr. VA
14. County ROANOKE		
15. Temperature (F) 48 °F	16. Visibility Day	17. Weather Cloudy
18. Type of Track Main		
19. Track Name/Number 1	20. FRA Track Class Freight Trains-40, Passenger Trains-60	21. Annual Track Density (gross tons in millions) 41
22. Time Table Direction West		
23. PTC Preventable No	24. Primary Cause Code [H402] Motor car or on-track equipme	25. Contributing Cause Code(s)

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes		3. Train Number/Symbol 22AV121				
4. Speed (recorded speed, if available) R - Recorded 18.0 MPH E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 8665		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>Q</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 <i>(derailed, struck, etc.)</i>		NS 4156	1	no				0	0		
(2) Causing <i>(if mechanical, cause reported)</i>				yes	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	3	0	0	0	0	(1) Total in Equipment Consist	40	0	5	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	0	0	0	0	0
12. Equipment Damage This Consist 33		13. Track, Signal, Way & Structure Damage 10533									
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: 11 Mins: 20		19. Conductor Hrs: 11 Mins: 20	
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		1		0		0					
26. Latitude 37.335390000				27. Longitude -79.854074000							

SKETCHES

Sketch - Sketch



NARRATIVE

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On Wednesday, November 20, 2019, at 11:55 p.m., EST, the crew of Norfolk Southern Corporation (NS) westbound freight train 22AV121 (Train 1) went on duty at Norfolk, Virginia. Their assigned work for the duty tour was to take the train to Roanoke, Virginia, after making a set off in Lynchburg, Virginia. The crew consisted of a locomotive engineer and conductor, and both crew members received more than the statutorily required rest period prior to being called for duty. Norfolk was the away-from-home terminal for both employees.

Train 1 originated in Norfolk with 46 cars. The train received all the required tests and inspections on November 20, 2019, with no exceptions noted. Train 1 departed Norfolk with the locomotive engineer seated at the controls on the right side of the operating cab and the conductor seated on the left side of the cab. They proceeded to Lynchburg, had a one car set off as scheduled, and departed with three head-end locomotives, and 45 cars (40 loaded and 5 empty). The train was 9,232 feet in length and had 8,665 trailing tons.

At 7 a.m., on Thursday, November 21, 2019, the operator of a hi-rail dump truck, Norfolk Southern Corporation (NS) Roadway Maintenance Machine 310609 went on duty at Lynchburg (RMM operator). The RMM operator was instructed in the 7 a.m. safety meeting to get a load of ballast from Roanoke, and go support the smoothing gang (Force S07) in Bonsack, Virginia.

The collision occurred on the NS Blue Ridge District, near Bonsack. Through the collision area, the Blue Ridge District is comprised of two main tracks that are designated, from south to north, Main Track 1 and Main Track 2. Beginning at Milepost (MP) N249.8 the track curves 2.2-degrees to the right until MP N249.9; the track is tangent westbound to the MP N250.3; then the track curves 3.0-degrees to the right until MP N250.5. There is a 0.67-percent descending grade at MP N250.3. The maximum authorized speed is 40 mph, as designated by Pocahontas Division Operations Bulletin POOPB-68 effective October 25, 2019. Time table direction on the Blue Ridge District is west and will be used throughout the report.

The RMM operator called the smoothing gang foreman over the radio to get a job briefing but was unable to understand the instructions. The foreman instructed the RMM operator to call by phone from the Bonsack House track crossing, Glade Creek Road, DOT 468553S, MP N251.39.

The RMM operator spoke with the foreman via phone from the Glade Creek road crossing and received a job briefing provided from the Engineering Department Track Authority Form TA 1.1 E. The Track Authority held by the foreman read as such: Track Authority No. 2154 to RWIC Lambert at Bonsack. Line No. 3, work between Bonsack, MP N252.5 and Villamont, MP 243.8 on M-2 (Main Track 2). Line No. 5, effective until 11:30 a.m. Copied by Lambert, OK, at 9:22 a.m., Dispatcher SGK.

The RMM operator was instructed to set on Main Track 2 and travel eastbound to meet up with the smoothing equipment. The RMM operator, working by himself, stated that he set on the track that he thought was Main Track 2. and headed eastbound. The hi-rail dump truck was, in fact, heading eastbound on Main Track 1.

At 11:09:40 a.m., as Train 1 passed MP N248.97 on Main Track 1, the PTC onboard locomotive display unit indicated that Automatic Signal 251 dropped to restricting. The recorded speed of Train 1 was 17 mph.

At 11:10:52 a.m., as Train 1 passed MP N249.36 on Main Track 1, the PTC onboard locomotive display unit indicated that Automatic Signal 251 upgraded to clear. The recorded speed of Train 1 was 21 mph.

At 11:11:04 a.m., as Train 1 passed MP N249.44 on Main Track 1, the PTC onboard locomotive display unit indicated that Automatic Signal 251 dropped to restricting. The recorded speed of Train 1 was 20 mph.

At 11:12:08 a.m., as Train 1 passed MP N249.71 on Main Track 1, the PTC onboard locomotive display unit indicated that Automatic Signal 251 upgraded to clear. The recorded speed of Train 1 was 19 mph.

The weather at the time of the collision was 48° F, partly cloudy, winds 3 mph, and 61 percent humidity, with 10 miles of visibility.

THE ACCIDENT

At about 11:14 a.m., the hi-rail dump truck, NS RMM 310609, occupied by one operator, was traveling eastbound on Main Track1 and encountered Train 1 westbound coming around a 3-degree right-hand curve.

Train 1 was traveling westbound at 19 mph on Main Track 1 when the hi-rail dump truck came into view. It was unclear at this initial sighting that the hi-rail dump truck was occupying Main Track 1. The sight view of the hi-rail dump truck and Train 1 was obstructed by vegetation and concrete pillars under the Blue Ridge Parkway overpass (DOT 468550W) on the north side of the track.

Upon realizing that the hi-rail dump truck was, in fact, occupying Main Track 1, the train crew initiated an emergency application of the braking system, and took cover in the cab of the locomotive prior to the collision. The lead locomotive collided with the hi-rail dump truck at MP N250.3 traveling a recorded 18 mph, at about 11:15 a.m., and came to a stop at MP N250.4, approximately 576 feet from point of impact. Upon impact, ballast from the bed of the hi-rail dump truck struck the front windshield of the locomotive; no glass was broken. The RMM operator managed to stop the hi-rail dump truck prior to impact. The RMM operator stayed in the driver's seat of the hi-rail dump truck during the impact. After the impact, the operator stepped down out of the hi-rail dump truck.

The crew called the dispatcher via radio and informed them that they were in emergency and had collided with the hi-rail dump truck. The conductor went to the aid of the RMM operator who was now standing outside of the vehicle. The RMM operator was conscious and alert with a cut across his forehead.

No evacuation occurred, and only one injury was reported because of the collision.

Estimated damage to the lead locomotive (NS 4156) was reported as \$33 and the estimated damage to RMM (310609) was reported as \$10,533.

Emergency first responders were notified, and Botetourt County Fire and EMS responded to the call and treated the RMM operator for a cut to the forehead and then transported the operator to the hospital for further evaluation. The operator was released from the hospital at about 7:30 p.m., after receiving seven stitches to close a wound on his forehead. The train crew received no injuries.

POST-ACCIDENT INVESTIGATION

The Federal Railroad Administration (FRA) performed an investigation to identify the cause of the collision. FRA investigators analyzed physical evidence, took measurements, reviewed inspection and maintenance records, and performed interviews.

The below analysis and conclusions represent the findings of FRA's investigation.

ANALYSIS AND CONCLUSIONS

Analysis - Federal Post Accident Toxicology Testing: The accident met the criteria for Title 49 Code of Federal Regulations (CFR) Part 219 Subpart C, Post-Accident Toxicological Testing. The RMM operator was tested under this authority.

Conclusion - FRA determined drugs and alcohol did not contribute to the cause or severity of the collision.

Analysis – Fatigue: 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.

The locomotive engineer and conductor of Train 1 were above the FAID fatigue tolerance limit of 72 on the day of the accident, therefore fatigue was not probable.

Conclusion - The FRA determined that fatigue did not contribute to the cause of the collision.

Analysis – Crew and Train Operations Information: Train 1 crew went on duty at their away-from-home terminal in Norfolk, on November 20, 2019 at 11:55 p.m. Their hours of service records were examined and did not reveal any issues with excessive service as this crew received the statutory off-duty period of 11 hours and 16 minutes prior to reporting for duty on Train 1.

Train 1 passed multiple hot box and dragging-equipment detectors with no problems recorded. Video provided by NS from the inward-facing camera showed the crew alert, engaged, and with no visual evidence present of any crew member in the possession of an unauthorized electronic device.

The crew observed no unusual occurrences with the train from the time they departed Norfolk. When approaching the accident site, the engineer stated that the PTC screen began to blink and he began to slow the train down in case he had to stop. After providing proper audible warning for a railroad crossing at grade, the hi-rail dump truck came into his view at about five car lengths away and he put the train into emergency and struck the on-track equipment. The crew then called for help over the radio.

Conclusion - FRA determined the crew and train operations did not contribute to the cause or severity of the collision.

Analysis – Mechanical: Train 1 consisted of three head-end locomotives: NS 4156, NS 9640, and NS 8027. No distributed power was assigned to this train at the time of the incident. The three locomotives had their periodic inspection performed and no exceptions were taken to the units. The previous required 33-day mechanical calendar day inspections and the last calendar day inspections were in compliance with Title 49 Code of Federal Regulations (CFR).

A Class 1 Brake Test and mechanical inspection was performed by qualified personnel. The consist departed with no noted defects or issues. No exception was taken to the train by the FRA MP&E inspection to the above equipment. A comprehensive review of the available documentation and records was conducted. This review found no indications of defective equipment in Train 1.

Conclusion - FRA determined the mechanical condition of the locomotives and cars did not contribute to the cause or severity of the collision.

Analysis – RMM Operator Statement: A statement from the operator of the hi-rail dump truck was obtained from the Personal Injury Report, completed on Monday, November 25, 2019. The RMM operator stated that he was instructed in the 7 a.m. meeting to go to Roanoke and get a load of rock and then go support the smoothing gang. The smoothing gang foreman instructed the RMM operator to go to the Bonsack House track crossing and call him for a job briefing. The RMM operator was provided by phone, a job briefing which included the limits of the track authority the foreman had as well as the approaching train on Main Track 1. The RMM operator stated that there were no physical markings at

the track to tell him which track was Main Track 1 or Main Track 2. The RMM operator then stated that he set on the track that he thought was Main Track 2.

Conclusion - FRA determined the actions of the RMM operator was the probable cause of the collision.

Analysis - Operator of MOW Equipment: FRA reviewed NS Roadway Worker qualification records for compliance with Title 49 CFR Part 214.343(d). The qualification record for the RMM operator lacked the required training and qualification designation as per Title 49 CFR Part 214.355. CFR Part 214.343(d) states: Each employer of roadway workers shall maintain written or electronic records of each roadway worker qualification in effect. Each record shall include the name of the employee, the type of qualification made, and the most recent date of qualification. Though the RMM operator was working in the capacity of an operator of roadway maintenance machines, the RMM operator's qualification record did not indicate qualification for this operation as required by Title 49 CFR Part 214.355. FRA took exception to the RMM operator's record.

The RMM operator was instructed via a phone job briefing to set on Main Track 2 at the Bonsack House track crossing and head east. The RMM operator failed to record the track authority on to the prescribed form, Engineering Department Track Authority Form TA 1.1 E. The RMM operator recorded a few elements of the track authority on the back of a piece of paper. The RMM operator copied the following information to the paper: 246.1, 2154, 9:22 a.m., Bonsack, Villamont, M-2, Truck No. 216687, 247. The RMM operator confirmed in his own statement that he thought he was occupying Main Track 2 when, in fact, he set on Main Track 1.

Conclusion - FRA determined that the probable cause of the collision was failure to occupy track as instructed.

Analysis – Signal System & PTC System: All downloads and logs were reviewed. The downloads showed that the signal system and PTC system were both working as intended. The PTC download from the lead locomotive showed that at 11:09:40 a.m., Device ID 149 (AS 251) dropped from a signal group 5 indication (clear) to a signal group 2 indication (restricting). At 11:10:52 a.m. and 11:11:04 a.m., Device ID 149 bounced between signal group 5 and signal group 2, respectively. At 11:12:08 a.m., Device ID 149 indicated signal group 5 and stayed at signal group 5 until 11:25:36 a.m., when the dispatcher put the 4W Signal at Control Point (CP) Bonsack to “stop”. Signal and PTC downloads from AS 251 and CP Bonsack substantiate these occurrences. It was concluded that the hi-rail dump truck was intermittently shunting the track circuit to the west of AS 251, causing the signal and PTC downgrades. No signal equipment was damaged during this collision.

The signal downgrades resulting in the PTC system transitioning between proceed and restricted proceed. While operating under restricted proceed, PTC will enforce only when a train is operating above 20 mph. Since the speed of Train 1 was below 20 mph approaching the accident site, PTC did not enforce a penalty brake application. FRA concluded the active PTC system acted as intended, and the

collision was not PTC preventable.

Conclusion - FRA determined the signal system and PTC system did not contribute to the cause or severity of the collision.

OVERALL CONCLUSIONS

The collision occurred at MP N250.3 due to the RMM operator occupying the wrong track.

PROBABLE CAUSE AND CONTRIBUTING FACTORS

The FRA's investigation determined the probable cause was cause code H402 -- Motor car or on-track equipment rules, failure to comply.

The FRA's investigation determined there were no contributing factors.