



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

***Accident Investigation Report
HQ-2013-31***

***BNSF Railway Company (BNSF)
Casselton, ND
December 30, 2013***

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.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 BNSF Railway Company	1a. Alphabetic Code BNSF	1b. Railroad Accident/Incident No. TC1213-121
2. Name of Railroad Operating Train #2 BNSF Railway Company	2a. Alphabetic Code BNSF	2b. Railroad Accident/Incident No. TC1213-121

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance BNSF Railway Company	1a. Alphabetic Code BNSF	1b. Railroad Accident/Incident No. TC1213-121
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 12/30/2013	4. Time of Accident/Incident 2:11 PM
5. Type of Accident/Incident Derailment		
6. Cars Carrying HAZMAT 104	7. HAZMAT Cars Damaged/Derailed 20	8. Cars Releasing HAZMAT 18
		9. People Evacuated 1500
10. Subdivision KO		
11. Nearest City/Town Casselton	12. Milepost (to nearest tenth) 28.5	13. State Abbr. ND
		14. County CASS
15. Temperature (F) 0 °F	16. Visibility Day	17. Weather Cloudy
18. Type of Track Main		
19. Track Name/Number Main Track No. 1	20. FRA Track Class Freight Trains-60, Passenger Trains-80	21. Annual Track Density (gross tons in millions) 66.48
		22. Time Table Direction West

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train				2. Was Equipment Attended? Yes		3. Train Number/Symbol G-RYLRGT9-26A					
4. Speed (recorded speed, if available) R - Recorded E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 14776		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, N/A</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.)		BNSF486653	47	yes				0	0		
(2) Causing (if mechanical, cause reported)		BNSF486653	47	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		
		b. Manual	c. Remote	d. Manual	e. Remote		a. Freight	b. Pass.	c. Freight	d. Pass.	e. Caboose
(1) Total in Train	2	0	0	0	1	(1) Total in Equipment Consist	112	0	0	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	13	0	0	0	0
12. Equipment Damage This Consist 995494			13. Track, Signal, Way & Structure Damage 0								
14. Primary Cause Code E51C - Broken or bent axle between wheel seats											
15. Contributing Cause Code											
Number of Crew Members					Length of Time on Duty						
16. Engineers/Operators	17. Firemen		18. Conductors		19. Brakemen	20. Engineer/Operator			21. Conductor		
2	0		1		0	Hrs: 1	Mins: 56		Hrs: 1	Mins: 56	
Casualties to:	22. Railroad Employees		23. Train Passengers		24. Others	25. EOT Device?			26. Was EOT Device Properly Armed?		
Fatal	0		0		0	Yes			Yes		
Nonfatal	0		0		0	27. Caboose Occupied by Crew?			No		
28. Latitude 46.901679000			29. Longitude -97.238773000								

OPERATING TRAIN #2

1. Type of Equipment Consist: Freight Train			2. Was Equipment Attended? Yes		3. Train Number/Symbol U-FYNHAY4-05T	
4. Speed (recorded speed, if available) R - Recorded E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 13335		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	
42 MPH					Code 0	

6. Type of Territory

Signalization:
Signaled

Method of Operation/Authority for Movement:
Signal Indication

Supplemental/Adjunct Codes:
Q, N/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 <i>(derailed, struck, etc.)</i>		BNSF 4934	1			0	0
(2) Causing <i>(if mechanical, cause reported)</i>		0	0		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	0	0	1	(1) Total in Equipment Consist	106	0	0	0	0
(2) Total Derailed	2	0	0	0	0	(2) Total Derailed	21	0	0	0	0

12. Equipment Damage This Consist 4794275	13. Track, Signal, Way & Structure Damage 510941
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14. Primary Cause Code
E51C - Broken or bent axle between wheel seats

15. Contributing Cause Code

Number of Crew Members				Length of Time on Duty			
16. Engineers/Operators	17. Firemen	18. Conductors	19. Brakemen	20. Engineer/Operator		21. Conductor	
1	0	1	0	Hrs: 8	Mins: 1	Hrs: 8	Mins: 1
Casualties to:		22. Railroad Employees	23. Train Passengers	24. Others		25. EOT Device?	
Fatal		0	0	0		Yes	
Nonfatal		0	0	0		26. Was EOT Device Properly Armed?	
						Yes	
						27. Caboose Occupied by Crew?	
						No	

28. Latitude 46.901679000	29. Longitude -97.238773000
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CROSSING INFORMATION

Highway User Involved		Rail Equipment Involved	
1. Type N/A		5. Equipment N/A	
2. Vehicle Speed (<i>est. mph at impact</i>)	3. Direction (<i>geographical</i>) N/A	6. Position of Car Unit in Train	
4. Position of Involved Highway User N/A		7. Circumstance N/A	
8a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? N/A		8b. Was there a hazardous materials release by N/A	
8c. State here the name and quantity of the hazardous material released, if any.			
9. Type of Crossing Warning 1. Gates 4. Wig wags 7. Crossbucks 10. Flagged by crew 2. Cantilever FLS 5. Hwy. traffic signals 8. Stop signs 11. Other (<i>spec. in narr.</i>) 3. Standard FLS 6. Audible 9. Watchman 12. None N/A		10. Signaled Crossing Warning	11. Roadway Conditions N/A
12. Location of Warning N/A		13. Crossing Warning Interconnected with Highway Signals N/A	14. Crossing Illuminated by Street Lights or Special Lights N/A
15. Highway User's Age	16. Highway User's Gender	17. Highway User Went Behind or in Front of Train and Struck or was Struck by Second Train	18. Highway User
19. Driver Passed Standing Highway Vehicle		20. View of Track Obscured by (<i>primary obstruction</i>)	
Casualties to:	Killed	Injured	21. Driver was
23. Highway-Rail Crossing Users	0	0	22. Was Driver in the Vehicle?
24. Highway Vehicle Property Damage (<i>est. dollar damage</i>)		25. Total Number of Vehicle Occupants (<i>including driver</i>)	
26. Locomotive Auxiliary Lights? N/A		27. Locomotive Auxiliary Lights Operational? N/A	
28. Locomotive Headlight Illuminated? N/A		29. Locomotive Audible Warning Sounded? N/A	

10. Signaled Crossing Warning

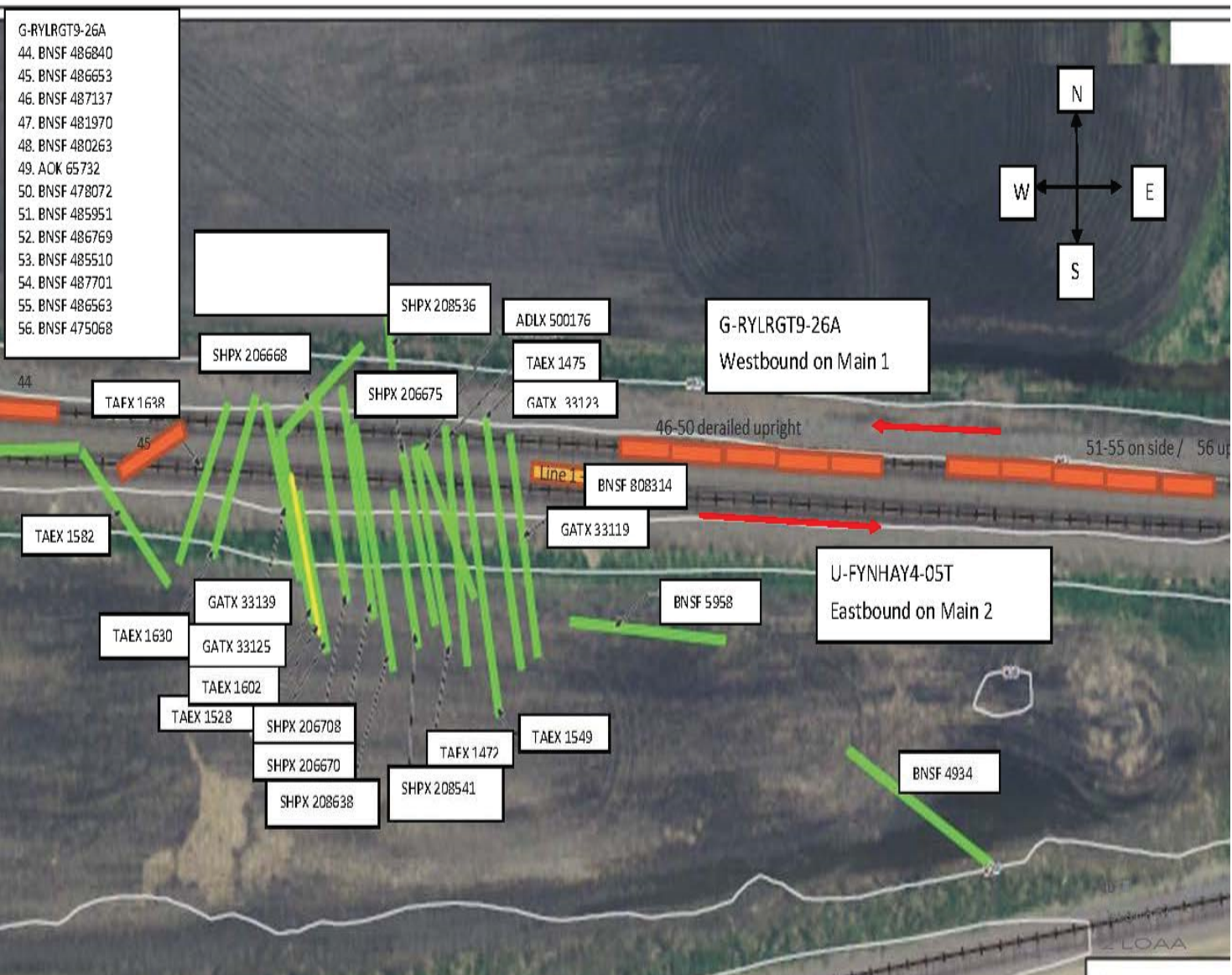
- 1 - Provided minimum 20-second warning
- 2 - Alleged warning time greater than 60 seconds
- 3 - Alleged warning time less than 20 seconds
- 4 - Alleged no warning
- 5 - Confirmed warning time greater than 60 seconds
- 6 - Confirmed warning time less than 20 seconds
- 7 - Confirmed no warning
- N/A - N/A

Explanation Code

- A - Insulated rail vehicle
- B - Storm/lightning damage
- C - Vandalism
- D - No power/batteries dead
- E - Devices down for repair
- F - Devices out of service
- G - Warning time greater than 60 seconds attributed to accident-involved train stopping short of the crossing, but within track circuit limits, while warning devices remain continuously active with no other in-motion train present
- H - Warning time greater than 60 seconds attributed to track circuit failure (e.g., insulated rail joint or rail bonding failure, track or ballast fouled)
- J - Warning time greater than 60 seconds attributed to other train/equipment within track circuit limits
- K - Warning time less than 20 seconds attributed to signals timing out before train's arrival at the crossing/island circuit
- L - Warning time less than 20 seconds attributed to train operating counter to track circuit design direction
- M - Warning time less than 20 seconds attributed to train speed in excess of track circuit's design speed
- N - Warning time less than 20 seconds attributed to signal system's failure to detect train approach
- O - Warning time less than 20 seconds attributed to violation of special train operating instructions
- P - No warning attributed to signal systems failure to detect the train
- R - Other cause(s). Explain in Narrative Description

SKETCHES

HQ-2013-31 Sketch



SYNOPSIS

On Monday, December 30, 2013, at 2:11 p.m., (CST), a westbound BNSF Railway (BNSF) grain train, G-RYLRGT9-26A, carrying soy beans, consisting of two head-end locomotives, one rear distributive locomotive power unit (DPU), and 112 cars derailed 13 loaded cars (consist positions 46 through 58) while traveling on Main Track 1.

1.) The derailment occurred approximately 20 miles west of Fargo, North Dakota, at Milepost 28.5 on the BNSF's KO Subdivision, of the Twin Cities Division in the town of Casselton. The derailment occurred in the middle of the train resulting in one of the grain cars, the 45th railcar (BNSF 486653), which was in consist position 47, derailling in the foul of Main Track 2.

2.) A few seconds after railcar BNSF 486653 derailed and fouled Main Track 2, an eastbound BNSF Crude Oil Train, U-FYNHAY4-05T, consisting of two head-end locomotives, one rear DPU, and 106 loaded cars collided with BNSF 486653 and derailed the two leading locomotives, as well as 21 trailing cars (consist positions 3 through 23). After the collision, an estimated 474,936 gallons of Petroleum Crude Oil, UN 1267, PG 1 (petroleum crude oil) was released from 18 loaded tank cars fueling a fire which caused subsequent explosions as the loaded oil tank cars burned.

Local emergency officials ordered a voluntary evacuation of the town of Casselton. Approximately 1,500 civilians from the town of Casselton were reported to have evacuated.

No civilian injuries were reported. The train crew from U-FYNHAY4-05T, consisting of an engineer and a conductor, escaped from the rear door of the leading locomotive uninjured. The crew from Train G-RYLRGT9-26A was also not injured. The on-scene commander (Cass County Sheriff) lifted the voluntary evacuation recommendation at 3 p.m., on December 31, 2013.

The railroad damages reported were: \$5,789,769 for equipment damages, and \$510,941 for track and signal damages for total reported damages of \$6,300,710. This is not an Amtrak route.

At the time of the accident, it was daylight and cloudy, with a north wind of about 7 MPH. The temperature was -1° F.

The Federal Railroad Administration's (FRA) investigation determined the probable cause of the accident was due to a broken axle between wheel seats of the number four-axle of the 45th railcar (BNSF 486653) in Train G-RYLRGT9-26A-FRA Accident/Incident code E51C.

NARRATIVE

CIRCUMSTANCES PRIOR TO THE ACCIDENT:

BNSF Train G-RYLRGT9-26A -

The crew of westbound BNSF grain train, G-RYLRGT9-26A, went on-duty at 12:15 p.m. (CST), on December 30, 2013, at the BNSF's Dilworth Yard, in Dilworth, Minnesota. The three man crew consisted of an engineer, a conductor and a student engineer (trainee). This was the home terminal of the conductor and trainee; it was the away-from-home terminal for the engineer. All crew members had received more than the statutory off-duty period prior to reporting for duty. A BNSF road foreman of engines (RFE) joined the crew at the Dilworth Yard Office; he was assigned to perform a qualifying check ride with the trainee. After collecting the necessary paperwork, the crew was transported via crew van to the head end of their train located at 27th Street in Fargo, North Dakota. Their assigned freight train consisted of two head-end locomotives, one rear DPU and 112 loaded cars (soybeans). It was 6,840 feet in length, and had 14,776 trailing tons. The crew was assigned to operate the train from Dilworth to Minot, North Dakota, a distance of approximately 203 miles. The train received a FRA Class 1 air brake test-initial terminal inspection at Royal, Nebraska on December 28, 2013.

Upon arriving at the head end of their train the crew was de-briefed by the inbound crew. The in-bound crew instructed them that the two leading locomotives had already been inspected and they had experienced no en route handling problems with the train. After relieving the inbound crew and assuming control of the train they contacted the BNSF dispatcher for permission to depart and departed Fargo at 1:15 p.m. As the westbound train approached the accident area, the trainee was seated at the controls on the north side of the leading locomotive and the RFE was seated in the jump seat behind him. The conductor was seated on the south side in the conductors chair and the engineer was seated behind the conductor.

BNSF Train U-FYNHAY4-05T -

The crew of eastbound BNSF petroleum crude oil Train U-FYNHAY4-05T included a locomotive engineer and a conductor. They went on duty at 6:10 a.m., December 30, 2013 at the Mandan Yard Office in Mandan, North Dakota. This was the home terminal of the conductor and the away-from-home terminal of the engineer. Both crew members had received more than the statutory off-duty period prior to reporting for duty.

Their assigned freight train consisted of two head end locomotives, one rear DPU and 106 loaded cars (104 petroleum crude oil cars and a buffer car on each end). It was 6,536 feet in length and had 13,335 trailing tons. The train was scheduled to travel 201 miles from Mandan to Dilworth, MN with this crew. They reviewed their paperwork, job briefed, safety briefed, verified the air slip and that FRA's Class 1 air brake test-initial terminal inspection had been completed by the Mandan mechanical department and verified the locomotive daily inspection cards were completed. They departed Mandan at approximately 7 a.m. The train had originated (was loaded) at Fryburg Terminal, North Dakota, with a final destination of Hayti, Missouri.

As the eastbound train approached the accident area the locomotive engineer was seated at the controls on the south side of the leading locomotive. The conductor was seated on the north side in the conductor's chair. The BNSF's KO Subdivision is multiple main track territory (Main Tracks 1 and 2); signaled for train movement on either track in either direction. The method of operation in the area of the accident/incident is by signal indications of a Centralized Traffic Control System (CTC) controlled by a BNSF dispatcher located in Fort Worth, Texas. Per the BNSF's Twin Cities Division Timetable No. 5, dated August 22, 2012, in the area of the accident/incident the maximum authorized timetable speed is 60 mph, with a permanent 40 mph head-end-restriction (HER) between MP 27 and MP 28.

The track in the vicinity of the accident site is predominantly composed of rail sections of 132 pound continuous welded rail (CWR). The rail is fastened to conventional wood crossties through double shouldered tie plates with one anchor and one rail spike on each side of the rail. Approaching from the east the track is tangent and the average grade is .1% ascending on the four miles of track prior to accident/incident site. The derailment of BNSF grain train,

G-RYLRGT9-26, occurred in a number 20, 136 pound turnout as the train traversed the tangent (main line) side of the turnout in a trailing move travelling in a westward direction. The railroad timetable direction for the grain train was west and the crude oil train was east. The geographic direction was west for the grain train and east for the crude oil unit train. Timetable directions are used throughout this report.

THE ACCIDENT/INCIDENT:

BNSF Train G-RYLRGT9-26A -

Per post-accident interview statements from the crew of Train G-RYLRGT9-26A; their train had just passed the absolute signal at Control Point (CP) Casselton (MP 28.4) on an Approach Medium Signal Indication (yellow over yellow aspect) which per BNSF rule 9.1.6 required them to proceed prepared to pass the next signal at KO Junction MP 31.1 not exceeding 40 mph and prepared to enter diverging route at prescribed speed. The train was in the process of slowing down in order to come to a stop at the highway/rail grade crossing located at MP 30 to disembark the RFE. As they were slowing their train, they were contacted by a BNSF signal maintainer who was positioned on an adjacent street preparing to obtain track rights to conduct maintenance to the north of Main Track 1 at MP 28.5. The maintainer attempted to make radio contact with the crew to inform them that they were dragging something in the middle of their train and that they were tearing up switch heater covers at CP Casselton. Immediately after receiving the radio transmission from the signal maintainer the crew stated their train experienced an undesired emergency application (UDE) of the train's air brake system. Upon losing the train line air the trainee stated that he moved the automatic brake handle to emergency and actuated the independent brakes. He then increased the independent brake pressure to hold the lead engines in order to control slack action and increase the locomotives' stopping effort. Meantime, the RFE attempted to contact the eastbound train to warn them by radio that their train was in emergency; followed by the conductor calling out emergency three times on radio channel 70. The trainee stated their train was coming to a smooth stop until they had slowed to approximately 10 mph when the brakes began to grab and the leading locomotive began to stop. Once the train had come to a controlled complete stop, he isolated the leading locomotive and placed the generator field switch in the off position. Then the crew heard the crew of the eastbound oil train call out on the radio "we're on fire and we are a key train and on fire and we are leaving." Upon hearing this the crew got off of their train and began to walk west. They met the BNSF employee who had been waiting to pickup the RFE and they temporarily waited in his vehicle.

While waiting at the crossing the westbound train crew was approached by the Assistant Fire Chief of the Casselton Fire Department who asked them to assist the emergency responders by pulling a cut of tank cars from the eastbound train west away from the burning derailed petroleum crude oil tank cars. Upon receiving the request, the RFE consulted with the crew to see if they felt it was safe to move the cars, which they did. The engineer and trainee went to the DPU on the eastbound train and the conductor and RFE went to the east to the nearest grade crossing and made a cut of an estimated 50 tank cars. The engineer and trainee then pulled the cars about a quarter mile west away from the burning train. Approximately 45 minutes after that move was completed, the Assistant Fire Chief met the westbound crew again and asked if additional tank cars from the eastbound train could be moved. The crew made contact with a BNSF trainmaster and communicated the request. The trainmaster told the crew if the move could be completed safely, they could proceed.

The trainee left the locomotive with the Assistant Fire Chief of the Casselton Fire Department and headed east to cut an additional cut of tank cars away from the burning train. The trainee borrowed the Assistant Fire Chief's fire protective clothing and walked within 10 car lengths of the fire and uncoupled approximately 20 additional cars from the burning train; then the engineer coupled to these cars and moved them to the west creating a safety gap of approximately 25 to 30 car lengths from the burning cars. Later, the crew went to Casselton High School where they were then transported to Sanford Medical Center in Fargo for FRA post-accident toxicology testing.

BNSF Train U-FYNHAY4-05T

During interviews with investigators, the eastbound train crew stated after traversing from the Jamestown Subdivision onto the KO Subdivision's Main Track 2 at MP 31.11, they had not yet switched their locomotive radio to the KO Subdivision's operating channel (radio road channel 70), but instead were still on the Jamestown's Subdivision's operating channel (radio road channel 39) as the engineer was attempting to release their track warrant. Train U-FYNHAY4-05T was operating on signal indications and at 2:09 p.m., the eastbound train passed the control signal at CP 30 (MP 30.02) on an Approach Medium Indication (flashing yellow over red aspect). Traveling at a speed of 43 mph the crew stated that snow was being kicked up by a westbound passing train on Main Track 1. They further stated they were not concerned about the limited visibility due to the flying snow because they knew the next highway/rail grade crossing wasn't until they reached Casselton. However as visibility improved the engineer stated he saw what appeared to be a grain car across Main Track 2 ahead of their train. He placed the train into emergency and yelled at the conductor to get down, with an estimation of 4 to 5 seconds before impact, at a recorded speed of 42 MPH. After having braced for impact the crew heard and felt the collision with the grain car. After impact the leading locomotive came to rest on the south side of Main Track 2 in a tilted position. Upon noticing their train was on fire the conductor informed the engineer the train was on fire.

locomotive came to rest on the south side of Main Track 2 in a tilted position. Upon noticing their train was on fire the conductor informed the engineer the train was on fire. Upon hearing this, the engineer told the conductor to "grab your cell phone and run." The engineer then announced over the radio "we're on fire, we are a key train and on fire and we are leaving." The crew attempted to exit the front door, but it was jammed shut. However, they were able to depart the locomotive through the back door located behind the engineer's seat and away from the tilted locomotive. They ran east on Main Track 2 away from the train with the engineer using his cell phone on the run to call 911.

Later, after reaching a safety distance from their train, the crew was picked up by a civilian who took them to Casselton High School. There, the crew met the local sheriff at about 2:30 p.m. at which time they informed him that they were operating a hazardous material train and to get people away from the accident/incident area.

Later the crew was transported via company vehicle to Sanford Medical Center in Fargo for FRA post-accident toxicology testing.

Hazardous Materials-

Below is a list of the 20 petroleum crude oil rail cars that were derailed and the approximate materials released from each rail car.

Line Number	Car Number	Released Volume (GAL)
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2	GATX 33119	27,678
3	GATX 33123	27,674.22
4	TAEX 1549	27,675.48
5	TAEX 1475	21,680.52
6	ADLX 500176	27,676.74
7	TAEX 1472	27,676.32
8	SHPX 206675	27,680.1
9	SHPX 208541	27,694.8
10	SHPX 208638	27,683.04
11	SHPX 206670	27,635.14
12	SHPX 208536	27,872.04
13	TAEX 1528	27,676.74
14	TAEX 1602	27,678
15	SHPX 206708	27,678.42
16	SHPX 206668	26,693.54
17	GATX 33125	27,685.98
18	GATX 33139	23,670.02
19	TAEX 1630	15,226.72
20	TAEX 1638	No Release
21	TAEX 1582	No Release

There were no fatalities or injuries resulting from a direct exposure to the release of the petroleum crude oil.

Emergency Response-Emergency response was almost immediate. The Cass County Sheriff assumed duties as the on-scene commander; the Cass County Sheriff Department along with resources from the North Dakota Highway Patrol and the Casselton Fire Department integrated into the Cass County Incident Command. At 4:14 p.m., the Cass County Sheriff ordered a ¾-mile isolation perimeter around the accident site. At 4:18 p.m., the Tactical Operations Center (TOC) was up and running, including a telephone number for the public to contact the TOC for updated information. At 4:33 p.m. the Casselton Fire Department and Cass County Sheriff's Department began a voluntary evacuation.

Approximately 1,500 people were eventually evacuated. Responders made the decision to let the derailed tank cars burn without implementing any firefighting measures. The on-scene commander lifted the voluntary evacuation at 3 p.m. on December 31, 2013; at which time residents began to return to their homes.

POST ACCIDENT INVESTIGATION:

On December 30, 2013 the Federal Railroad Administration (FRA) began an investigation of this accident/incident. FRA's Region 8 management assigned a Railroad Safety Specialist (Chief Inspector) as Investigator/Inspector-in-charge (IIC) of this investigation. They also sent a Deputy Regional Administrator, two Operating Practices Inspectors, a Hazardous Material Inspector, an MP&E Inspector, a Track Inspector, and a Track Integrity Specialist to assist the IIC. FRA worked in conjunction with the go-team from the National Transportation Safety Board (NTSB) and two inspectors from Pipeline and Hazardous Materials Safety Administration (PHMSA). The following analysis and conclusions as well as any possible contributing factors and the probable cause in this report represent the findings of FRA's investigation.

ANALYSIS AND CONCLUSIONS:

Analysis- FRA Post Accident Toxicological Testing:

The accident/incident met the criteria for FRA Post Accident Toxicology Testing, as required under Title 49 CFR, Part 219, Subpart C.

Conclusion:

Blood and urine specimens from all members of both crews were collected for FRA Post Accident Toxicological Testing at Sanford Medical Center in Fargo, North Dakota. Test results were negative for all crew members of both trains.

Analysis- Crew Fatigue:

FRA obtained fatigue related information, including a 10 day work history, for the members of each train crew.

Conclusion:

Upon analysis of that information FRA concluded that fatigue was not probable for any of the employees.

Analysis- Locomotive Event Recorder:

Downloads of the Locomotive Event Recorder from the leading locomotive of Train G-RYLRGT9-26A and the rear locomotive of the U-FYNHAY4-05T were obtained and analyzed by FRA.

Conclusion:

FRA's analysis of the locomotive event recorder downloads concurred with the BNSF analysis. The speed of the G-RYLRGT9-26A when an UDE was initiated and the ensuing derailment occurred was 28 mph. The speed of the U-FYNHAY4-05T was reviewed from the rear locomotive since the two leading locomotives were destroyed by the fire. The speed of this train when an engineer induced emergency was initiated and the collision occurred with the derailed grain car was 42 mph. FRA's analysis noted that both train crews properly handled their train.

Analysis- Locomotive Camera:

FRA reviewed the locomotive camera download off of the leading locomotive of the U-FYNHAY4-05T.

Conclusion:

FRA verified the 45th car of the westbound grain train was derailed and fouling Main Track 2 and this was the car the eastbound crude oil train impacted which caused the ensuing derailment of train U-FYNHAY4-05T.

Analysis- FRA Track Inspection:

FRA Investigators conducted a thorough walking inspection of the KO Subdivision track from Milepost (MP) 24.5 through MP 30.5.

Conclusion:

Conclusion:

FRA's inspection determined that the Point-Of-Derailment was 96'6" east of the switch point on Main Track One at MP 28.5. The inspection also determined there were no visible track defects which would have contributed to the derailment.

Analysis- FRA Hazardous Materials Inspection:

FRA's Hazardous Materials Inspector conducted a thorough investigation of the paper work and handling of the cars from both the shipper and the railroad.

Conclusion:

BNSF Train U-FYNHAY4-05T was a unit "key train" with a total of 104 tank cars containing petroleum crude oil which is designated by the U.S. Department of Transportation (DOT) as hazardous for commercial transportation purposes. Commercial transport of petroleum crude oil is subject to the regulatory requirements of the Hazardous Materials Regulations (HMR) in Title 49 of the Code of Federal Regulations (CFR).

Despite the original train consist being destroyed in the accident, the investigation determined the train consist matched the physical placement of the cars in the train with no exceptions taken. This was verified by reviewing the automatic equipment identification (AEI) scan taken of the train at the BNSF Mandan Yard and the BNSF AEI/TSS scan comparison report. Twenty (20) hazardous materials tank cars were derailed in the accident. These tank cars were in consist positions 4 through 23 in the train. None of the remaining 84 tank cars containing petroleum crude oil were derailed or breached in the accident. All of the 20 derailed tank cars were general service specification DOT-111A100W1 tank cars that contained petroleum crude oil from the Bakken region of North Dakota. Eighteen (18) of these tank cars were compromised and released an estimated 474,936 gallons of crude oil. While tank cars TAEX 1638 and TAEX 1582 derailed, they were not breached and did not release their contents.

The tank cars in BNSF unit Train U-FYNHAY4-05T originated at the Great Northern Midstream facility (Fryburg Rail Terminal) in Fryburg, North Dakota. Watco Companies LLC loaded the tank cars with petroleum crude oil and performed the pre-transportation examination of the tank cars. Great Northern Gathering and Marketing was the shipper of record that offered the tank cars for transportation. The tank cars were en route to Marquis Energy LLC, in Hayti, Missouri. The petroleum crude oil loaded in the unit train had been sampled and analyzed by Great Northern Midstream prior to their offering it for transportation. PHMSA also sampled three tank cars in the train after the derailment. The results were consistent with the description of hazardous materials on the bill of lading provided by Great Northern Midstream. These results were provided to a joint hazmat team (consisting of representatives from NTSB, FRA, and PHMSA) during the investigation.

Analysis- Emergency Response:

FRA conducted an analysis of the emergency response efforts of BNSF and the local emergency responders.

Conclusion:

The first telephone call came into Cass County 911 at 2:12:04 p.m., reporting a train derailment and fire. At 2:13 p.m., Cass County established a command post. Resources from the North Dakota Highway Patrol, the Casselton Fire Department, and BNSF integrated into Cass County Incident Command as they arrived. At 4:14 p.m., the Cass County Sheriff ordered a ¾ mile isolation perimeter around the accident site. At 4:18 p.m., the Tactical Operations Center (TOC) was up and running including a telephone number for the public to contact. At 4:33 p.m., the on-scene commander in conjunction with the Casselton Fire Department and Cass County Sheriff's Department began a voluntary evacuation. Responders made the decision to let the tank cars burn without implementing any firefighting measures. Therefore a voluntary evacuation was issued as a precautionary action in an effort to ensure the safety of the residents of the town of Casselton. The thick smoke plume coupled with varying and shifting winds that threatened to carry the smoke near the town. Approximately 1,500 people were eventually evacuated. At 5:18 p.m., the command post was moved to the Central Cass County School and at that time the Sheriff's Department, Fire Department and Red Cross personnel were reported to be canvassing the area to notify residents of the evacuation and provide assistance as needed. At 5:25 p.m., the Command Center Public Information Officer (PIO) issued a public announcement for displaced people to go to the Casselton High School to be transported to Discovery Middle School in Fargo for reunification. Weather information was obtained and distributed hourly. At 5:32 p.m., TOC verified that an order to evacuate the city had been sent out and that the residents had complied with the voluntary order.

During the incident several of the derailed tank cars experienced thermal tears that resulted in energetic thermal releases. Hazardous Materials support to the incident was provided by the Casselton and Fargo Fire Departments.

The on-scene commander lifted the recommended voluntary evacuation at 3 p.m. on December 31, 2013 and the residents returned to their homes.

FRA concluded that the emergency response was both immediate and thorough.

Analysis- FRA Mechanical Investigation

All derailed cars from trains G-RYLRGT9-26A and U-FYNHAY4-05T were examined for mechanical defects and possible causal factors.

Conclusion:

FRA's MP&E safety inspector performed an FRA Class 1 air brake test on the remaining freight cars that were neither derailed nor burnt of trains G-RYLRGT9-26A and U-FYNHAY4-05T. This inspection revealed four freight cars on Train G-RYLRGT9-26A failed the air brake test because one car had the air brakes cut out and three cars failed to set the brakes. However, FRA determined the four cars failing the air brake test were not a contributing factor to the accident/incident. All train line brakes on the remaining cars of Train U-FYNHAY4-05T worked as intended.

All trucks and axles from all the derailed cars were inspected and FRA determined the only exception was the broken number four axle on the leading truck of grain car BNSF 486653. Upon further examination and analysis, FRA's MP&E Inspector and investigation team concluded that the damage to the broken axle on rail car BNSF 486653 was sufficient to cause a sudden and unexpected derailment.

Possible Contributing Factors:

FRA's investigators concluded defects in track, signal, hazardous materials, and operating practices (train handling, etc.) were not contributing factors in the cause of this accident/incident. All damages to track and signal structures resulted from the accident/incident.

Probable Cause:

FRA's investigation and analysis of the facts determined the probable cause of the accident/incident was due to a broken axle between wheel seats of the number four axle of the 45th railcar (BNSF 486653) in Train G-RYLRGT9-26A-FRA Accident/Incident Code E51C.