Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2008-25

Burlington Northern Santa Fe (BNSF)
Cottage Crove, MN
March 5, 2008

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

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File # HQ-2008-25

1.Name of Railroad Operating Train #1: BNSF Rwy Co. [BNSF]	1a. Alphabetic Code: BNSF	1b. Railroad Accident/Incident No.: XXXXXXXX
2.Name of Railroad Operating Train #2: N/A	2a. Alphabetic Code: N/A	2b. Railroad Accident/Incident No.: N/A
3.Name of Railroad Operating Train #3: N/A	3a. Alphabetic Code: N/A	3b. Railroad Accident/Incident No.: N/A
4.Name of Railroad Responsible for Track Maintenance: BNSF Rwy Co. [BNSF]	4a. Alphabetic Code: BNSF	4b. Railroad Accident/Incident No.: XXXXXXXX
5. U.S. DOT_AAR Grade Crossing Identification Number:	6. Date of Accident/Incident: Month 03 | Day 05 | Year 2008	7. Time of Accident/Incident: 03:33:00 ☐ AM ☑ PM

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

9. Cars Carrying HAZMAT	10. HAZMAT Cars Damaged/Derailed	11. Cars Releasing HAZMAT	12. People Evacuated	13. Division
9	1	1	0	CHICAGO

14. Nearest City/Town	15. Milepost *(to nearest tenth)*	16. State Abbr	16. State Code	17. County
COTTAGE GROVE	408.6	N/A	MN	WASHINGTON

18. Temperature (F) *(specify if minus)*	19. Visibility *(single entry)* 1. Dawn 2. Day 3.Dusk 4.Dark — Code	20. Weather (single entry) 1. Clear 2. Cloudy 3. Rain 4. Fog 5.Sleet 6.Snow — Code	21. Type of Track 1. Main 2. Yard 3. Siding 4. Industry — Code
19 F	2	1	1

22. Track Name/Number	23. FRA Track Class (1-9, X) — Code	24. Annual Track Density *(gross tons in millions)*	25. Time Table Direction 1. North 2. South 3. East 4. West — Code
SINGLE MAIN LINE	2	41.9	3

OPERATING TRAIN #1

26. Type of Equipment Consist *(single entry)* 1. Freight train 2. Passenger train 3. Commuter train 4. Work train 5. Single car 6. Cut of cars 7. Yard/switching 8. Light loco(s). 9. Maint./inspect.car — A. Spec. MoW Equip. Code	27. Was Equipment Attended? 1. Yes 2. No — Code	28. Train Number/Symbol
1	2	HNTWGALI05

29. Speed *(recorded speed, if available)* R - Recorded E - Estimated — Code	31. Method(s) of Operation *(enter code(s) that apply)*	31a. Remotely Controlled Locomotive?
17 MPH — R	a. ATCS; b. Auto train control; c. Auto train stop; d. Cab; e. Traffic; f. Interlocking; g. Automatic block; h. Current of traffic; i. Time table/train orders; j.Track warrant control; k. Direct traffic control; l.Yard limits; m.Special instructions; n. Other than main track; o. Positive train control; p. Other *(Specify in narrative)*	0 = Not a remotely controlled; 1 = Remote control portable; 2 = Remote control tower; 3 = Remote control transmitter - more than one remote control transmitter — 0

30. Trailing Tons *(gross tonnage, excluding power units)*: 11477

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

32. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded *(yes/no)*
(1) First involved *(derailed, struck, etc)*	OWIX15055	75	yes
(2) Causing *(if mechanical cause reported)*	OWIX15055	75	yes

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

Alcohol	Drugs
N/A	N/A

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

35. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	4	0	0	0	0
(2) Total Derailed	0	0	0	0	0

36. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	71	0	64	0	0
(2) Total Derailed	0	0	0	0	0

37. Equipment Damage This Consist	38. Track, Signal, Way, & Structure Damage	39. Primary Cause Code	40. Contributing Cause Code
$3,999.00	$0.00	E29C	N/A

Number of Crew Members

41. Engineer/ Operators	42. Firemen	43. Conductors	44. Brakemen
1	0	1	0

Length of Time on Duty

45. Engineer/Operator	46. Conductor
Hrs 5 Mi 35	Hrs 5 Mi 35

Casualties to:	47. Railroad Employees	48. Train Passengers	49. Other
Fatal	0	0	0
Nonfatal	0	0	0

50. EOT Device? 1. Yes 2. No — 1

51. Was EOT Device Properly Armed? 1. Yes 2. No — 1

52. Caboose Occupied by Crew? 1. Yes 2. No — 2

OPERATING TRAIN #2

53. Type of Equipment Consist *(single entry)* 1. Freight train 2. Passenger train 3. Commuter train 4. Work train 5. Single car 6. Cut of cars 7. Yard/switching 8. Light loco(s). 9. Maint./inspect.car — A. Spec. MoW Equip. Code	54. Was Equipment Attended? 1. Yes 2. No — Code	55. Train Number/Symbol
N/A	N/A	N/A

56. Speed *(recorded speed, if available)* R - Recorded E - Estimated — Code	58. Method(s) of Operation *(enter code(s) that apply)*	58a. Remotely Controlled Locomotive?
N/A MPH — N/A	a. ATCS; b. Auto train control; g. Automatic block; h. Current of traffic; m.Special instructions; n. Other than main track	0 = Not a remotely controlled; 1 = Remote control portable

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57. Trailing Tons *(gross tonnage, excluding power units)* N/A

c. Auto train stop
d. Cab
e. Traffic
f. Interlocking
i. Time table/train orders
j.Track warrant control
k. Direct traffic control
l.Yard limits
o. Positive train control
p. Other *(Specify in narrative)*
Code(s) N/A N/A N/A N/A N/A

2 = Remote control tower
3 = Remote control transmitter - more than one remote control transmitter N/A

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

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

Alcohol	Drugs
N/A	N/A

61. Was this consist transporting passengers? (Y/N) N/A

62. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	N/A	N/A	N/A	N/A	N/A
(2) Total Derailed	N/A	N/A	N/A	N/A	N/A

63. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	N/A	N/A	N/A	N/A	N/A
(2) Total Derailed	N/A	N/A	N/A	N/A	N/A

64. Equipment Damage This Consist N/A

65. Track, Signal, Way, & Structure Damage N/A

66. Primary Cause Code N/A

67. Contributing Cause Code N/A

Number of Crew Members

68. Engineer/ Operators	69. Firemen	70. Conductors	71. Brakemen
N/A	N/A	N/A	N/A

Length of Time on Duty

72. Engineer/Operator Hrs N/A Mi N/A

73. Conductor Hrs N/A Mi N/A

Casualties to:	74. Railroad Employees	75. Train Passengers	76. Other
Fatal	N/A	N/A	N/A
Nonfatal	N/A	N/A	N/A

77. EOT Device? 1. Yes 2. No N/A

78. Was EOT Device Properly Armed? 1. Yes 2. No N/A

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

OPERATING TRAIN #3

80. Type of Equipment Consist *(single entry)*
1. Freight train
2. Passenger train
3. Commuter train
4. Work train
5. Single car
6. Cut of cars
7. Yard/switching
8. Light loco(s).
9. Maint./inspect.car
A. Spec. MoW Equip.
Code N/A

81. Was Equipment Attended? 1. Yes 2. No Code N/A

82. Train Number/Symbol N/A

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

84. Trailing Tons *(gross tonnage, excluding power units)* N/A

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

85a. Remotely Controlled Locomotive?
0 = Not a remotely controlled
1 = Remote control portable
2 = Remote control tower
3 = Remote control transmitter - more than one remote control transmitter N/A

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

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

Alcohol	Drugs
N/A	N/A

88. Was this consist transporting passengers? (Y/N) N/A

89. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	N/A	N/A	N/A	N/A	N/A
(2) Total Derailed	N/A	N/A	N/A	N/A	N/A

90. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	N/A	N/A	N/A	N/A	N/A
(2) Total Derailed	N/A	N/A	N/A	N/A	N/A

91. Equipment Damage This Consist N/A

92. Track, Signal, Way, & Structure Damage N/A

93. Primary Cause Code N/A

94. Contributing Cause Code N/A

Number of Crew Members

95. Engineer/ Operators	96. Firemen	97. Conductors	98. Brakemen
N/A	N/A	N/A	N/A

Length of Time on Duty

99. Engineer/Operator Hrs N/A Mi N/A

100. Conductor Hrs N/A Mi N/A

Casualties to:	101. Railroad Employees	102. Train	103. Other
Fatal	N/A	N/A	N/A
Nonfatal	N/A	N/A	N/A

104. EOT 1. Yes 2. No N/A

105. Was EOT Device Properly 1. Yes 2. No N/A

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

Highway User Involved

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

108. Vehicle Speed *(est. MPH at impact)* N/A

109. *geographical)* Code N/A
1.North 2.South 3.East 4.West

Rail Equipment Involved

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

112. Position of Car Unit in N/A

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110. Position 1.Stalled on Crossing 2.Stopped on Crossing 3.Moving Over Crossing 4. Trapped	Code N/A	113. Circumstance 1. Rail Equipment Struck Highway User 2. Rail Equipment Struck by Highway User	Code N/A
114a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? 1. Highway User 2. Rail Equipment 3. Both 4. Neither	Code N/A	114b. Was there a hazardous materials release 1. Highway User 2. Rail Equipment 3. Both 4. Neither	Code N/A
114c. State here the name and quantity of the hazardous materials released, if any. N/A			

115. Type Crossing Warning 1.Gates 2.Cantilever FLS 3.Standard FLS 4.Wig Wags 5.Hwy. traffic signals 6.Audible 7.Crossbucks 8.Stop signs 9.Watchman 10.Flagged by crew 11.Other *(spec. in narr.)* 12.None	116. Signaled Crossing *(See instructions for codes)*	Code	117. Whistle Ban 1. Yes 2. No 3. Unknown	Code
Code(s) N/A N/A N/A N/A N/A N/A N/A		N/A		N/A

118. Location of Warning 1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach	Code N/A	119. Crossing Warning with Highway Signals 1. Yes 2. No 3. Unknown	Code N/A	120. Crossing Illuminated by Street Lights or Special Lights 1. Yes 2. No 3. Unknown	Code N/A

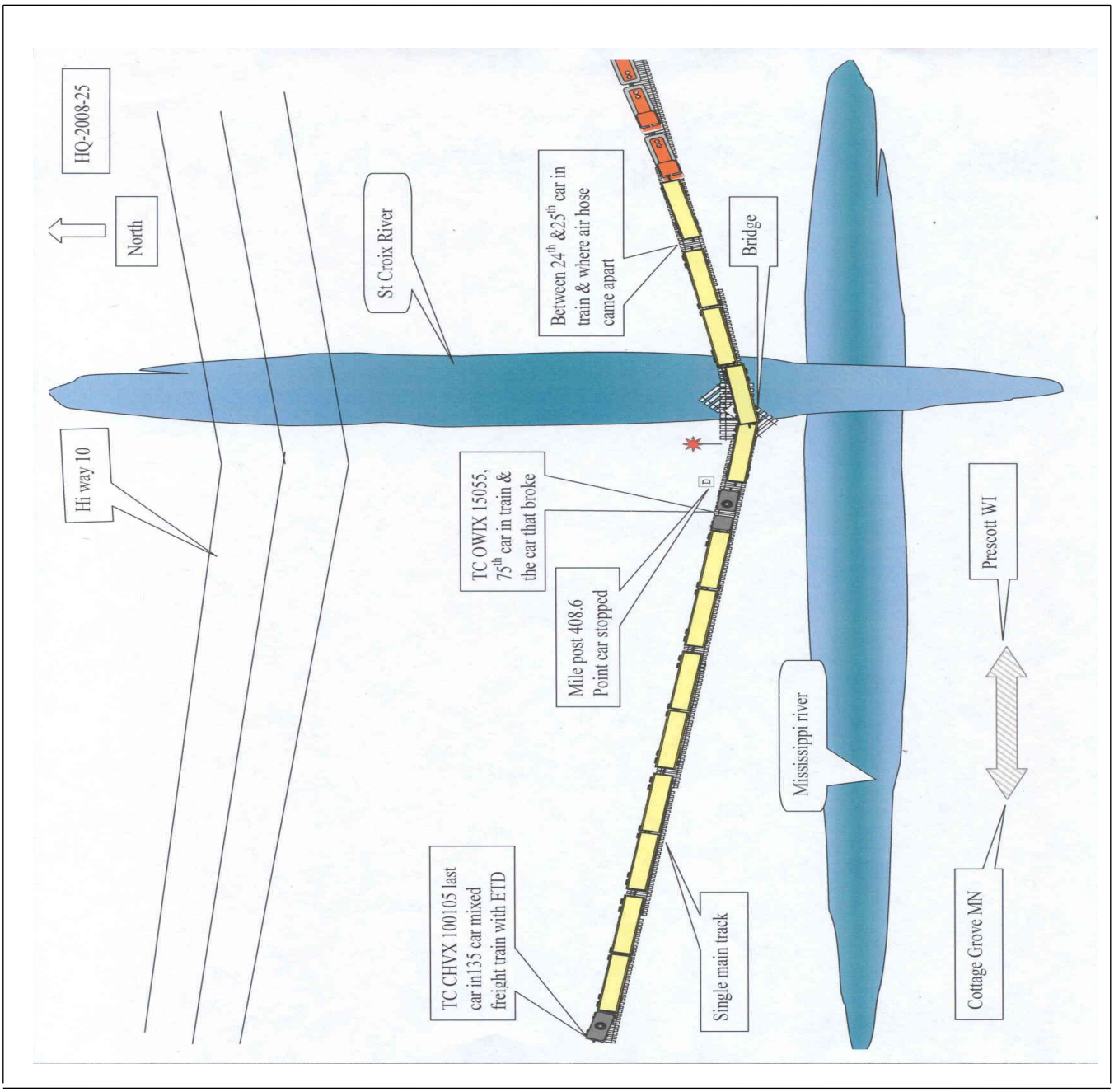
121. Age N/A	122. Driver's Gender 1. Male 2. Female	Code N/A	123. Driver Drove Behind or in Front of and Struck or was Struck by Second Train 1. Yes 2. No 3. Unknown	Code N/A	124. Driver 1. Drove around or thru the Gate 2. Stopped and then Proceeded 3. Did not Stop 4. Stopped on Crossing 5. Other *(specify in narrative)*	Code N/A

125. Driver Passed Highway Vehicle 1. Yes 2. No 3. Unknown	Code N/A	126. View of Track Obscured by *(primary obstruction)* 1. Permanent Structure 2. Standing Railroad Equipment 3. Passing Train 4. Topography 5. Vegetation 6. Highway Vehicle 7. Other *(specify in narrative)* 8. Not obstructed	Code N/A

Casualties to:	Killed	Injured	127. Driver 1. Killed 2.Injured 3. Uninjured	Code N/A	128. Was Driver in the Vehicle? 1. Yes 2. No	Code N/A
129. Highway-Rail Crossing Users	N/A	N/A	130. Highway Vehicle Property Damage *(est. dollar damage)*	N/A	131. Total Number of Highway-Rail Crossing Users *(include driver)*	N/A

132. Locomotive Auxiliary Lights? 1. Yes 2. No	Code N/A	133. Locomotive Auxiliary Lights Operational? 1. Yes 2. No	Code N/A
134. Locomotive Headlight Illuminated? 1. Yes 2. No	Code N/A	135. Locomotive Audible Warning Sounded? 1. Yes 2. No	Code N/A

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



137. SYNOPSIS OF THE ACCIDENT

On March 5, 2008, at 3:33 p.m., CST, eastbound BNSF Railway (BNSF) Train HNTWGALI-05 operating on BNSF's Chicago Division, St. Croix Subdivision's single main track, experienced an undesired emergency brake application. The air hoses between the 24th and 25th cars separated. The accident occurred on the Minnesota side of the St. Croix River. Prescott, Wisconsin is approximately one half mile east of the accident site and on the east side of the St. Croix River.

During the emergency train brake application, tank car OWIX 15055, containing Ethylene Glycol (UN 3282) broke in two. As a result of the broken tank, product was released into the St. Croix River. The St. Croix River flows into the Mississippi River a short distance from this location. The release occurred at milepost 408.6 on the single main track.

There was no derailment, fire, or evacuation, however 20,000 gallons of Ethylene Glycol was released. U.S. Route 10, which is directly north of the BNSF at this location, was closed as a precaution for approximately four and one half hours. The tank car was a total loss and BNSF reported the tank car damage as $3999.29.

The temperature was 19 °F, the weather was clear. There were no injuries to the train crew or the public. BNSF elected not to require the crew to submit to toxicological testing.

The probable cause of the incident was the complete failure of the tank car. The failure occurred due to the presence of two pre-existing fatigue cracks, which were located at the inboard terminations of the welds joining the extended stub sill cradle pad to the tank. These cracks propagated in a brittle manner completely around the tank causing it to fracture into two seperate halves. This was a result of the dynamic forces imposed by the trailing cars as they ran toward the head end cars, which had been slowed by the air hose separation at the 24th and 25th cars in the train.

138. NARRATIVE

CIRCUMSTANCES PRIOR TO THE ACCIDENT

The train crew of BNSF HNT-05 consisted of a locomotive engineer and a conductor. They reported for duty at 11 a.m., on March 5, 2008, at BNSF's Northtown Yard in Minneapolis, Minnesota. Both crew members had more than 12 hours off duty prior to reporting for duty.

The assigned freight train consisted of four locomotives, 71 loads and 64 empties. BNSF Train HNT-05 was 7,982 feet long and weighed 11,477 tons. Per BNSF rules, two of the locomotives were cut out, and the other two were de-rated to 95% of their nominal rating. The train was scheduled to travel to La Crosse, Wisconsin.

BNSF Train HNT-05 received the required Class 1 initial terminal air brake test, and departed Northtown Yard at 1:40 p.m. The crew stated the trip was uneventful prior to the incident. The St. Croix Subdivision has one main track at the location of the release. The single main track extends from CP Prescott, milepost 407.6, to CP Burns, milepost 407.8. East of CP Prescott and west of CP Burns there are two main tracks. The timetable direction of BNSF Train HNT-05 was east. Geographically the train was going virtually east. Timetable directions are used thru-out this report.

The single main track crosses the St. Croix River on the Prescott Bridge. BNSF has classified the single main track in the area of the incident as FRA Class 2. BNSF has designated a 25 mph permanent speed restriction from milepost 407.4 to 408.1.

THE ACCIDENT:

BNSF Train HNT-05 was operating at 17 mph at the time of the accident. The speed was recorded by the event recorder of the controlling locomotive. BNSF Train HNT-05 experienced an undesired emergency application of the train air brake system when the air hoses between the 24th and 25th cars separated.

Tank car OWIX was the 75th head car of the 136 car consist of BNSF Train HNT-05. Tank car OWIX broke

in two shortly after BBNSF Train HNT-05 stopped. Tank car OWIX then released its product into the St. Croix River.

The conductor left the locomotive and began to walk towards the west to find the cause of the air brake application and subsequent train separation. The conductor received a phone call from a BNSF Road-master, who was in the area, and was told to return to the locomotive and be prepared to give the BNSF Train Hazardous Material Emergency Information to first responders.

The United States Environmental Protection Agency (EPA) responded to the accident. Their report states that all the material discharged onto the ground along the tracks and flowed directly into the St. Croix River. It was determined that the material would eventually dissipate in the river water. The EPA may have additional activity at the site concerning soil sampling, runoff sampling, and bank restoration.

Also responding to the incident were the Hastings, Minnesota, Fire Department, Minnesota Pollution Control Agency, Minnesota Department of Transportation, and the U. S. Coast Guard. The U. S. Army Corps of Engineers will be consulted concerning the damages to the river bank and its restoration. The Hastings Fire Department's Assistant Chief made the decision to close U. S. Route 10.

An EPA responder said there were no water intakes downstream for the next 100 miles. No drinking water related emergency was declared. Hulcher Inc. responded to the incident and used absorbent pads to collect about 100 gallons of the material.

ANALYSIS AND CONCLUSIONS:

ANALYSIS - FATIGUE:

FRA obtained fatigue related information, for the 10-day period preceding this incident including the 10-day work history (on duty/off duty cycles) for all of the employees involved.

CONCLUSION:

Upon analysis of that data information FRA concluded that fatigue was not probable for any of the crew members.

ANALYSIS - TRACK:

BNSF required FRA track inspection records, BNSF geometry car data, and BNSF internal rail flaw records were reviewed by FRA. No exceptions were taken.

CONCLUSION:

Track was not a causal factor to the incident.

ANALYSIS - TRAIN HANDLING:

FRA reviewed the data from the event recorder of the lead locomotive and took no exception to the performance of the locomotive engineer.

CONCLUSION:

Train handling was not a causal factor.

LONGITUDINAL FORCES STATEMENT:

BNSF requested an analysis of in-train forces for BNSF Train HNT-05 from Rail Sciences Inc. (RSI). RSI used two locations in the train where the undesired emergency application may have occurred, the 76th car, the tank car that broke in two, and the 22nd car, close to where a hose separation occurred. In the 22nd car scenario the maximum draft force exceeded 350,000 lbs. (350 kip). In a 76th car scenario the draft forces on the 76th car would have been more than 400,000 lbs. (400 kips).

TANK CAR OWIX STATEMENT

The tank car failure originated at two fatigue cracks at the inboard terminations of the welds on the A-end of the tank car at the extended stub sill cradle pad. Rust indicated a pre-existing condition in the form of the cracks in the parent metal of the inner tank. This condition indicates the cracks had existed sometime prior to the emergency brake application of BNSF Train HNT-05.

Tank car OWIX had been repaired in 1999. Cracks at the inboard terminations of the welds joining the original stub sill cradle pad were repaired and the stub sill cradle pads were extended at both ends of the car. A head pad extension and head brace also were installed to both ends of the car. The drawings for these repairs are in the attachments.

The two tank car tank halves of car OWIX were shipped to Kansas City, Missouri, for metallurgical tests at Bodycote Testing Group. The test protocols are in the attachments.

The findings of Bodycote are as follows:

“In the opinion of Bodycote Testing Group Inc., two separate high cyclic fatigue cracks originated at the termination toe of the fillet welds joining the cradle pad to the tank. Corrosion on the fatigue fracture surface is consistent with arrestment of the fatigue cracks at their present size long enough to corrode. Determination of the time of formation of the initial fatigue cracks is not possible from this material evidence. Brittle fractures initiated (from an over stress event) at the edge of both arrested fatigue cracks and propagated around the tank causing the tank to separate. Multiple brittle fracture initiation sites are consistent with an impact force incident.”

PROBABLE CAUSE AND CONTRIBUTING FACTORS:

The probable cause of the incident was the complete failure of OWIX’s tank car tank. This occurred due to the presence of two pre-existing fatigue cracks, which were located at the inboard terminations of the welds joining the extended stub sill cradle pad to the tank. These cracks propagated in a brittle manner completely around the tank causing it to fracture into two halves. This was a result of the dynamic forces imposed by the trailing cars as they ran toward the head end cars, which had been slowed by the air hose separation at the 24th and 25th cars in the train.