Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2006-15

Burlington Northern Santa Fe (BNSF)
Gillette, Wyoming
March 19, 2006

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-2006-15

1.Name of Railroad Operating Train #1: BNSF Rwy Co. [BNSF]	1a. Alphabetic Code: BNSF	1b. Railroad Accident/Incident No.: PR0306108
2.Name of Railroad Operating Train #2: N/A	2a. Alphabetic Code: N/A	2b. Railroad Accident/Incident: N/A
3.Name of Railroad Responsible for Track Maintenance: BNSF Rwy Co. [BNSF]	3a. Alphabetic Code: BNSF	3b. Railroad Accident/Incident No.: N/A
4. U.S. DOT_AAR Grade Crossing Identification Number:	5. Date of Accident/Incident: Month 03 / Day 19 / Year 2006	6. Time of Accident/Incident: 06:40: ☑ AM ☐ PM

7. 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): 12

8. Cars Carrying HAZMAT	9. HAZMAT Cars Damaged/Derailed	10. Cars Releasing HAZMAT	11. People Evacuated	12. Division
0	0	0	0	Powder River

13. Nearest City/Town	14. Milepost (to nearest tenth)	15. State Abbr	15. State Code	16. County
Rozet	581.4	N/A	WY	CAMPBELL

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

21. Track Name/Number	22. FRA Track Class (1-9, X)	Code	23. Annual Track Density (gross tons in millions)	24. Time Table Direction 1. North 3. East	Code
Main Number 2		3	78.47		4

OPERATING TRAIN #1

25. 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: 8

26. Was Equipment Attended? 1. Yes 2. No: 2

27. Train Number/Symbol: EPAM NAM06 3

28. Speed (recorded speed, if available) R - Recorded E - Estimated: 18 MPH; Code: R

29. Trailing Tons (gross tonnage, excluding power units): N/A

30. 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): e N/A N/A N/A N/A

30a. 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: 0

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

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

Alcohol	Drugs
0	0

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

34. 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	1	0	0	0	0

35. Cars	Loade a. Freight	Loade b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

36. Equipment Damage This Consist: 210000

37. Track, Signal, Way, & Structure Damage: 8000

38. Primary Cause Code: H017

39. Contributing Cause Code: H199

Number of Crew Members

40. Engineer/ Operators	41. Firemen	42. Conductors	43. Brakemen
N/A	N/A	N/A	N/A

Length of Time on Duty

44. Engineer/Operator: Hrs 0 Mi 0

45. Conductor: Hrs 0 Mi 0

Casualties to:	46. Railroad Employees	47. Train Passengers	48. Other
Fatal	0	0	0
Nonfatal	N/A	0	0

49. EOT Device? 1. Yes 2. No: 2

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

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

OPERATING TRAIN #2

52. 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: 1

53. Was Equipment Attended? 1. Yes 2. No: 1

54. Train Number/Symbol: EOKO RWM0 25

55. Speed (recorded speed, if available) R - Recorded E - Estimated: 0 MPH; Code: R

57. Method(s) of Operation (enter code(s) that apply): a. ATCS; b. Auto train control; g. Automatic block; h. Current of traffic; m.Special instructions; n. Other than main track

57a. Remotely Controlled Locomotive? 0 = Not a remotely controlled; 1 = Remote control portable

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56. Trailing Tons (gross tonnage, excluding power units)	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)	2 = Remote control tower 3 = Remote control transmitter - more than one remote control transmitter
3800			e N/A N/A N/A N/A	0

58. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded (yes/no)	59. 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)	BNSF89 51	1	N/A		N/A	N/A
(2) Causing (if mechanical cause reported)	0	0	N/A	60. Was this consist transporting passengers? (Y/N)	N/A	

61. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote	62. Cars	Loade a. Freight	Loade b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	2	0	0	0	2	(1) Total in Equipment Consist	0	0	128	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	0	0	0	0	0

63. Equipment Damage This Consist	64. Track, Signal, Way, & Structure Damage	65. Primary Cause Code	66. Contributing Cause Code
40000	0	H017	H199

Number of Crew Members				Length of Time on Duty	
67. Engineer/ Operators	68. Firemen	69. Conductors	70. Brakemen	71. Engineer/Operator	72. Conductor
1	0	1	0	Hrs 09 Mi 10	Hrs 09 Mi 10

Casualties to:	73. Railroad Employees	74. Train Passengers	75. Other
Fatal	0	0	0
Nonfatal	2	0	0

76. EOT Device? (1. Yes 2. No)	77. Was EOT Device Properly Armed? (1. Yes 2. No)	78. Caboose Occupied by Crew? (1. Yes 2. No)
1	1	N/A

Highway User Involved

79. Type	Code
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)	N/A

80. Vehicle Speed (est. MPH at impact)	81. Direction geographical) 1.North 2.South 3.East 4.West	Code
N/A		N/A

82. Position	Code
1.Stalled on Crossing 2.Stopped on Crossing 3.Moving Over Crossing 4. Trapped	N/A

86a. 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

Rail Equipment Involved

83. Equipment	Code
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)	N/A

84. Position of Car Unit in Train
N/A

85. Circumstance	Code
1. Rail Equipment Struck Highway User 2. Rail Equipment Struck by Highway User	N/A

86b. Was there a hazardous materials release by (1. Highway User 2. Rail Equipment 3. Both 4. Neither)	Code
	N/A

86c. State here the name and quantity of the hazardous materials released, if any.
N/A

87. Type of 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
Code(s)	N/A	N/A		N/A		N/A	N/A			N/A		N/A

88. Signaled Crossing Warning (See instructions for codes)	Code
	N/A

89. Whistle Ban (1. Yes 2. No 3. Unknown)	Code
	N/A

90. Location of Warning (1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach)	Code
	N/A

91. Crossing Warning Interconnected with Highway Signals (1. Yes 2. No 3. Unknown)	Code
	N/A

92. Crossing Illuminated by Street Lights or Special Lights (1. Yes 2. No 3. Unknown)	Code
	N/A

93. Driver's Age	94. Driver's Gender (1. Male 2. Female)	Code
0		N/A

95. Driver Drove Behind or in Front of Train and Struck or was Struck by Second Train (1. Yes 2. No 3. Unknown)	Code
	N/A

96. 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

97. Driver Passed Standing Highway Vehicle (1. Yes 2. No 3. Unknown)	Code
	N/A

98. 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

101. Casulties to Highway-Rail Crossing Users	Killed	Injured
	0	0

99. Driver Was (1. Killed 2.Injured 3. Uninjured)	Code
	N/A

100. Was Driver in the Vehicle? (1. Yes 2. No)	Code
	N/A

102. Highway Vehicle Property Damage (est. dollar damage)
0

103. Total Number of Highway-Rail Crossing Users (include driver)
0

104. Locomotive Auxiliary Lights? (1. Yes 2. No)	Code
	N/A

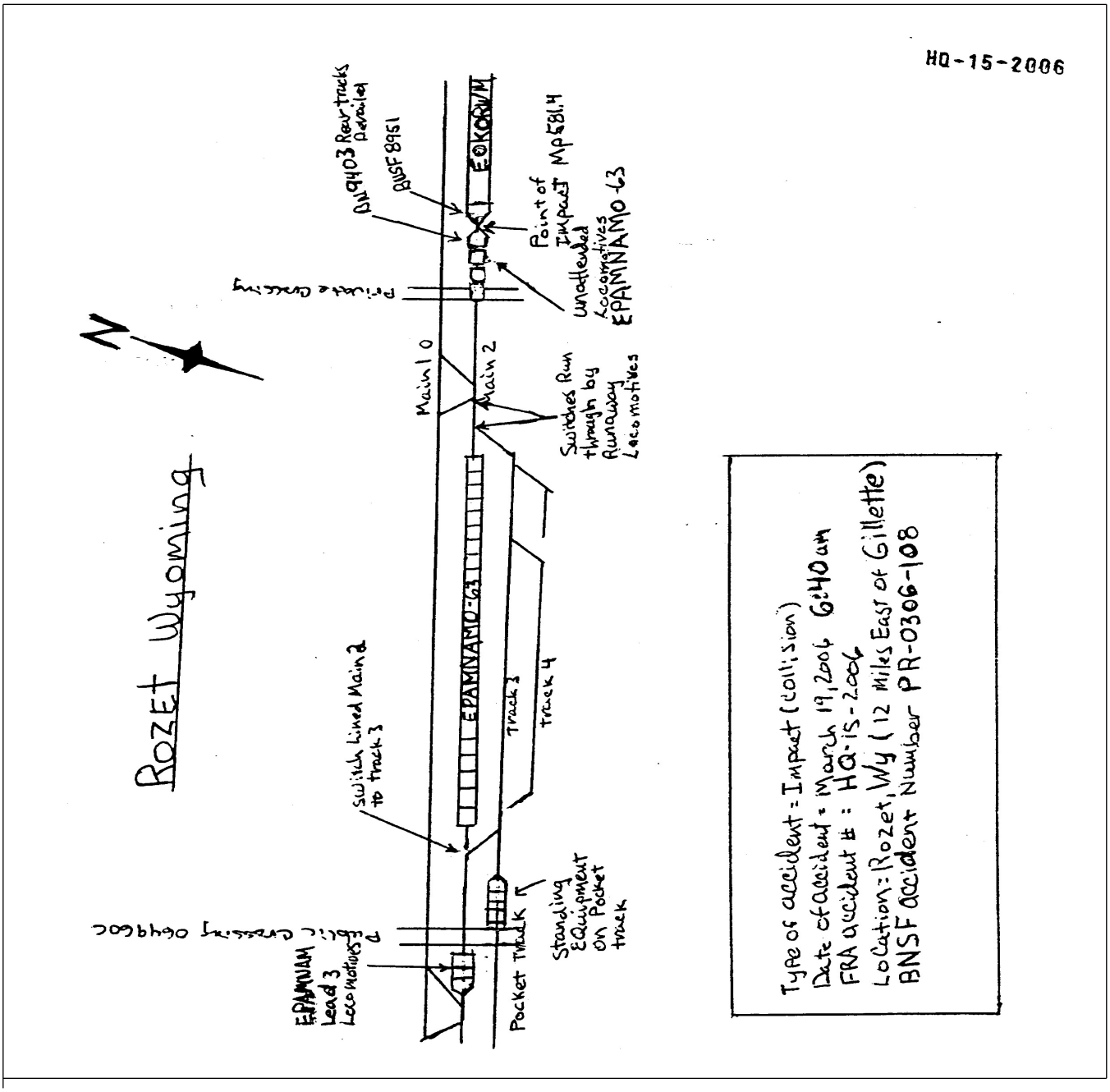
105. Locomotive Auxiliary Lights Operational? (1. Yes 2. No)	Code
	N/A

106. Locomotive Headlight Illuminated? (1. Yes 2. No)	Code
	N/A

107. Locomotive Audible Warning Sounded? (1. Yes 2. No)	Code
	N/A

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

HQ-15-
2006
Sketch.jpg



109. SYNOPSIS OF THE ACCIDENT

At 6:40 a.m. (MST), on March 19, 2006, four unmanned BNSF Railway Company (BNSF) locomotives rolled free and collided with a standing BNSF train on Main Track Number 2 at Rozet, WY. As a result of the impact (18 mph) four locomotives sustained damage and one locomotive was derailed.

Two employees on the standing train jumped from their locomotive and sustained minor injuries.

There was no release of hazardous material or diesel fuel spillage. No evacuation resulted from the incident.

Rozet is approximately 13 miles east of Gillete, WY, and located on the BNSF's Powder River Division, Blackhills Subdivision, at milepost 581.4.

The BNSF estimated track damage of $8,000 and equipment damage of $250,000.

At the time of the accident, it was dawn, with blowing snow and the temperature was 23°F.

The probable cause of the accident was failure to properly secure locomotives by railroad employees.
A contributing probable cause was failure to properly cut-in air brake valves on the locomotives. An additional contributing probable cause was reduced human performance of the engineer and student engineer due to fatigue.

110. NARRATIVE

Circumstances Prior to the Accident

E-PAMNAM0-63

Following off duty periods in excess of the statutory minimum required, a conductor, engineer, and student engineer first went on duty at 8:30 p.m., March 18, 2006, in Edgemont, SD, (home terminal). They were to operate train E-PAMNAM0-63 from Edgemont to Donkey Creek, WY, a distance of 100.3 miles. The train consisted of seven locomotives on the head end, 133 empty coal cars, and a distributed power locomotive on the rear end. The train weighed 3,145 tons and was 7,752 feet in length.

The student engineer operated the train from Edgemont to Rozet, WY, the location where the crew was instructed to set out four of the seven head end locomotives on the pocket track.

In a job briefing it was determined that the conductor would set hand brakes (as required by operating rules) on the empty coal cars, cut off the locomotives from the coal cars, inform the engineer and student engineer when they were clear of highway-rail crossing and line switches for the movement of the locomotives from Main Track Number 2 to Track 3 and then for the pocket track.

The engineer and student engineer would operate the locomotives across the highway-rail grade crossing after being separated from the train, prepare the locomotives to be separated, then operate the four locomotives and place them into the pocket track.

After the conductor applied sufficient hand brakes on the train, he lifted the cut lever between the train and locomotives and instructed the engineer to take the locomotives west. The locomotives crossed the highway-rail crossing and the conductor reported to the engineer that they were beyond the crossing. The conductor then went to the switches and prepared them for the ensuing movement. The engineer and student engineer prepared to cut the four locomotives from the consist. The student engineer went back and removed the multiple unit (MU) cables from between the third and fourth locomotives. The student engineer asked the engineer if the multiple unit switches on the locomotives were properly set. The engineer answered “no,” and showed the student engineer the proper position of the switches.

The engineer then applied hand brakes on the three locomotives that were left on Main Track Number 2. After he completed applying the hand brakes, the engineer noticed there were already four locomotives and a freight car on the pocket track, and there was not enough room on the east end of the track for the locomotives they were instructed to set out.

The engineer and student engineer changed the plan at this point, deciding they would move the equipment on the pocket track to allow room for the four locomotives they would be adding. When the engineer and student engineer left their consist, the trailing four locomotives that were left on Main Track Number 2 did not have hand brakes set and were mechanically separated from the three locomotives that were properly secured.

The engineer and student engineer went to the equipment that was on the pocket track, removed hand brakes and moved the equipment west far enough to allow for addition of their four locomotives. They then secured the equipment on the pocket track again.

When they returned to the locomotives on Main Track Number 2 they saw the rear four locomotives were gone. The engineer thought it was possible the conductor had moved the locomotives and he called asking for his location. The conductor responded he was on the ground adjacent to the yard track switches and the locomotives had just gone by him. Realizing the locomotives were unmanned and rolling free, the conductor began to give chase on foot while the engineer started

after the run away locomotives with the three locomotives left on Main Track Number 2. Both attempts proved unsuccessful. The locomotives rolled through Yard Track Number 3 for approximately 2.9 miles, splitting the east switch and re-entered Main Track Number 2.

E-OKORWM0-25

Following an off duty period in excess of the statutory minimum requirement, a conductor and engineer first went on duty at 9:30 p.m. (MST), March 18, 2006, in Edgemont, SD (home terminal). They were to operate train E-OKORWM0-25 from Edgemont to Donkey Creek, WY, a distance of 100.3 miles. The train consisted of two locomotives on the head end, 128 empty coal cars, and one distributed power locomotive on the rear portion of the train. The train had 3,800 trailing tons and was 7,089 feet in length.

The crew reported the trip was uneventful and stopped their train at East Rozet, WY, behind signal 581.4. The crew was holding a conservation when they noticed locomotives heading their direction. Thinking the locomotives would stop, they monitored the progress. When the locomotive did not stop, and they determined a collision was eminent, they ran out the back door of the locomotive cab, crawled under the walkway railing, and jumped approximately eight feet to ground, then ran across Main Track Number 1 and into the right-of-way ditch.

Approaching the accident site from west, traveling east (direction the runaway locomotives were traveling) the track is tangent for approximately 1.8 miles and leads into a 1-degree, 0-minute left hand curve approximately 1,560 in length, followed by tangent track approximately 9 tenths of a mile in length. The grade descends in the direction of movement between .01 and .60-percent. At the point of impact, milepost 581.4, the grade is .20-percent descending.

In the accident area there are two main tracks governed by a traffic control system controlled by a train dispatcher in Fort Worth, TX. There are several auxiliary tracks in the area, governed by General Code of Operating Rule (GCOR) rule 6.28, that are primarily used for short term equipment storage. Empty coal trains are staged at Rozet for movement to coal mines for loading.

The Accident

The four run-away locomotives traveled approximately 2.9 miles and impacted the standing train E-OKORWM0-25 at 18 mph. When locomotive BN 9403 impacted the lead locomotive (BNSF 8951) on the standing train, it derailed its west set of trucks. Four locomotives sustained damage. All locomotives remained upright. There was no release of diesel fuel.

The conductor and locomotive engineer that jumped from their standing train sustained minor injuries.

Analysis and Conclusion

Both trains received all required equipment tests prior to departure from Alliance, NE.

Analysis of the work rest cycles and circadian rhythm interviews of the engineer and student engineer on train E-PAMNAM0-63 indicate fatigue contributed to the cause of the accident. The engineer and student engineer had worked together for 31 trips prior to the accident.

An analysis of the work/rest schedules, sleep habits, and time of the accident, was conducted with the Fatigue Avoidance and Scheduling Tool. Several sleep scenarios were analyzed for various qualities of sleep and for subjects napping. Following the development of these scenarios, the Human Factors Circadian Rhythms Supplement was used to select the most likely performance indicators. Following are the fatigue indications regarding the engineer:

Overall effectiveness = 69%
Lapse Index = 5.4
Reaction Time = 145%
Chronic Sleep Debt = 9.89
Hours of Continuous Wakefulness = 23.68
Time of Day 0640
BAC Equivalent = > 0.08

An analysis of the work/rest schedules, sleep habits, and time of the accident, was conducted with the Fatigue Avoidance and Scheduling Tool. Following are the fatigue indications regarding the student engineer:

Overall effectiveness = 64%
Lapse Index = 6.8
Reaction Time = 156%
Chronic Sleep Debt =11.49
Hours of Continuous Wakefulness = 23.68
Time of Day 0640
BAC Equivalent = > 0.08

Review of the personnel records of the engineer and student engineer revealed they did not have a pattern of rules infractions, yet on this day, within the span of a few minutes, the crew violated one Federal Safety Regulation and four BNSF operating rules. According to fatigue experts, this is typical of a fatigued employee working within a system that has inadequate threat and error management policies and procedures. Before a series of errors (rules violation) continue along a chain toward an accident, they should be “trapped” by policies, procedures, technology, etc., thereby breaking the chain. These error mitigation factors (policies, procedures, technologies, etc.) did not exist at the time of this collision, therefore fatigued employees were placed in an operating environment in which they where incapable of functioning in a safe manner.

Disclaimer: The Fatigue Avoidance and Scheduling Tool (FAST) is a software tool that uses certain human performance parameters in order to predict performance effectiveness under various work/sleep senerios. Because of these parameters vary from individual-to-individual, the FAST analysis can not predict actual performance of an individual. However, it can be use as an indicator of general performance, relative to a fully rested person.

BNSF subscribes to the General Code of Operating Rules (GCOR), including GCOR rule 6.20 which pertains to securement of locomotives and trains left on the main track. This rule was violated by the crew of E-PAMNAM0-63. BNSF Air Brake and Train Handling Rules (ABTH), rule 1-2.1 and 102.3, pertains to leaving equipment unattended. Both rules were violated by the same crew. Also the crew should have completed a new job briefing before leaving the locomotives on Main Track Number 2 and moving equipment on the pocket track, as required by BNSF's TY&E Safety Supplement, Rule S 1.1.

One Federal Safety Regulation was violated. The locomotives that rolled away were not secured as required by Title 49 CFR, Part 232.

The runaway locomotives also traveled across one public highway-rail grade crossing without sounding the horn or bells, and without ditch lights operating. The event recorder tapes indicated the speed while traversing the crossing was under 10 mph.

The three crew members from train E-PAMNAM0-63 were toxicological tested under FRA Post Accident Toxicology Testing Authority, Title 49 CFR, Part 219, Subpart C. All results were negative.

The crew on train E-OKORWM0-25 was not given toxicological tests.

Probable Cause

The probable cause of the accident was failure to properly secure locomotives by railroad employees.
A contributing probable cause was failure to properly cut-in air brake valves on the locomotives. An additional contributing probable cause was reduced human performance of the engineer and student engineer due to fatigue.

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