Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2007-24

M & B Railroad, LLC
Myrtlewood, AL
May 2, 2007

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File # HQ-2007-24

1.Name of Railroad Operating Train #1: M & B RR LLC [MNBR]	1a. Alphabetic Code: MNBR	1b. Railroad Accident/Incident No.: MBR3407DR
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: M & B RR LLC [MNBR]	4a. Alphabetic Code: MNBR	4b. Railroad Accident/Incident No.: MBR3407DR
5. U.S. DOT_AAR Grade Crossing Identification Number:	6. Date of Accident/Incident: Month 05 | Day 02 | Year 2007	7. Time of Accident/Incident: 08:40: ☑ 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: 01

9. Cars Carrying HAZMAT	10. HAZMAT Cars Damaged/Derailed	11. Cars Releasing HAZMAT	12. People Evacuated	13. Division
9	4	0	0	system

14. Nearest City/Town	15. Milepost *(to nearest tenth)*	16. State Abbr	16. State Code	17. County
Myrtlewood	48.8	N/A	AL	MARENGO

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
65 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 Track		1	4.3		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	1. Yes	1	S100-29

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?
4 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)*: 2352

Code(s): 1 | 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)*	UP8487	1	no
(2) Causing *(if mechanical cause reported)*	0	0	N/A

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

Alcohol	Drugs
0	0

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

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	2	0	0	0	0
(2) Total Derailed	2	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	13	1	0	0	0
(2) Total Derailed	7	1	0	0	0

37. Equipment Damage This Consist	38. Track, Signal, Way, & Structure Damage	39. Primary Cause Code	40. Contributing Cause Code
$260,000.00	$3,000,000.00	T401	T401

Number of Crew Members 41. Engineer/ Operators	42. Firemen	43. Conductors	44. Brakemen
1	0	0	0

Length of Time on Duty 45. Engineer/Operator	46. Conductor
Hrs 4 Mi 30	Hrs 0 Mi 0

Casualties to:	47. Railroad Employees	48. Train Passengers	49. Other
Fatal	0	0	0
Nonfatal	1	0	5

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	1. Yes	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

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 N/A	117. Whistle 1. Yes 2. No 3. Unknown	Code N/A
Code(s)	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

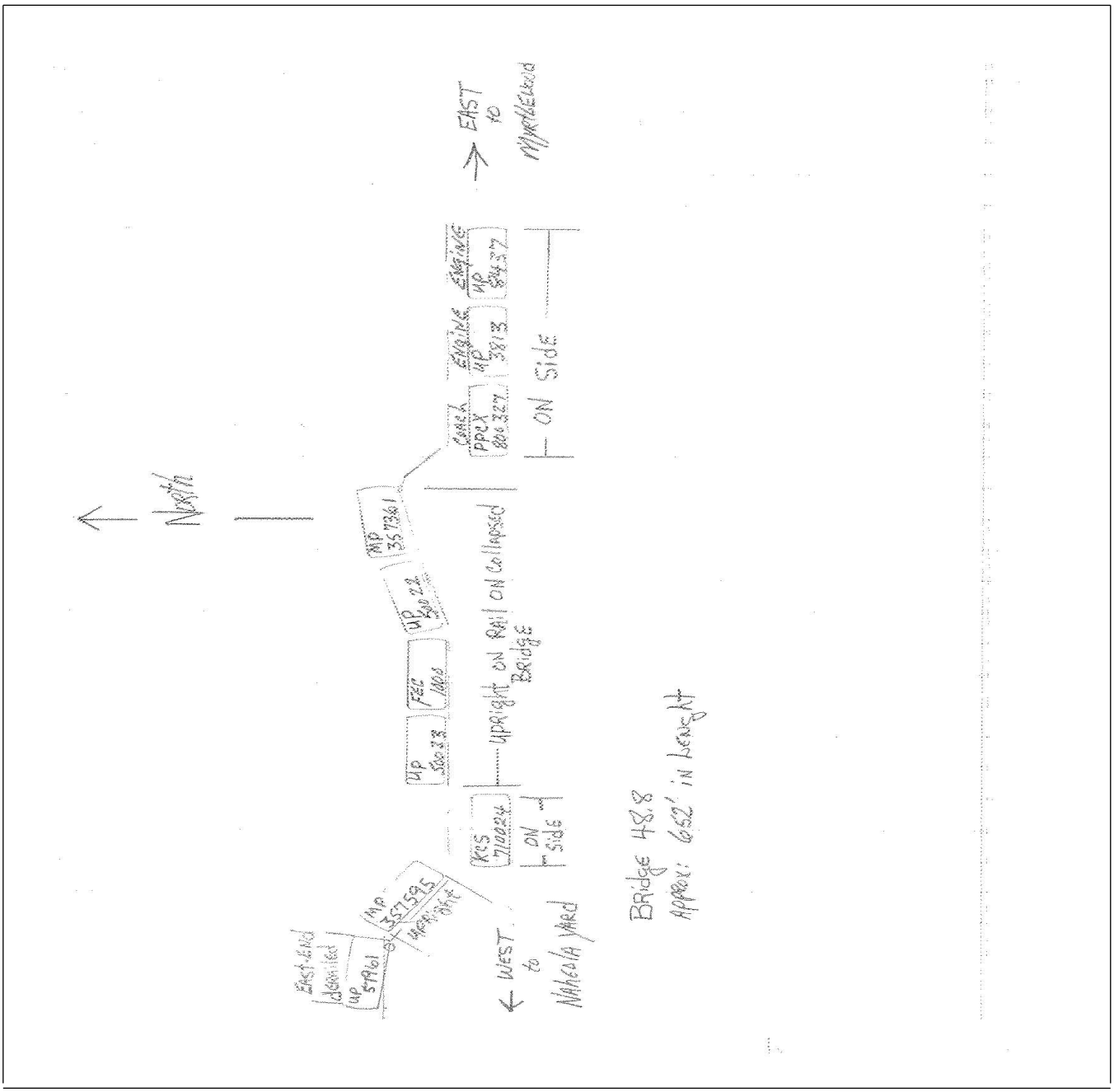
121. Age N/A	122. Driver's Gender 1. Male 2. Female	Code N/A	123. Driver Drove Behind or in Front of and Struck or was Struck by Second Train 1. Yes 2. No 3. Unknown	Code N/A	124. Driver 1. Drove around or thru the Gate 4. Stopped on Crossing 2. Stopped and then Proceeded 5. Other *(specify in narrative)* 3. Did not Stop	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 3. Passing Train 5. Vegetation 7. Other *(specify in narrative)* 2. Standing Railroad Equipment 4. Topography 6. Highway Vehicle 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

At approximately 8:40 a.m. CDT on May 2, 2007, an Meridian & Bigby (M & B Railroad), LLC (MNBR) 652 foot timbered ballast deck bridge collapsed under eastbound MNBR Freight Train S100-29. The accident occurred in Myrtlewood, Alabama (AL) at milepost (MP) 48.8 in the MNBR Naheola Yard Limits. Two locomotives, one passenger coach, four flat cars carrying rocket boosters (hazardous material), and three other freight cars derailed as a result of the bridge collapse. The method of operation in the accident area is Yard Limits.

MNBR Train S100-29 consisted of two locomotives, one passenger coach, and 13 loaded cars, nine of which carried hazardous materials. The train was 888 feet in length with 2,352 trailing tons. The crew consisted of an engineer and five ATK Launch System Employees (NASA Contractors) occupying the passenger coach. The engineer was operating the train at a recorded speed of 4 miles per hour (mph) when he approached the west-end of bridge MP 48.8. The engineer said he heard a loud pop come from behind the locomotives. After hearing the popping sound, sections of the bridge MP 48.8 collapsed under MNBR Train S100-29. Both locomotives, a loaded rocket car, and the passenger coach overturned as the bridge began to collapse. Six other cars derailed, but stayed upright on the bridge.

There was no breach or release of the hazardous material as a result of the bridge collapse or derailed cars.

The engineer and all passengers sustained injuries ranging from minor to serious. Some with minor injuries were treated and released and others admitted into three local hospitals. The major injuries sustained were broken arms, cracked vertebras, dislocated shoulders, collapsed lungs, and torn ligaments, with the minor injuries being cuts and bruises.

The equipment damage was $260,000 with $3,000,000 to track and structures for total damages of $3,260,000.

The weather at the time of the accident was clear and 65 °F.

The accident was caused by the rotation of several of the timber bents of Bridge 48.8, owing to their initial out -of-plumb condition and lack of longitudinal bracing, under a train load that exceeded the nominal capacity of the bridge.

138. NARRATIVE

CIRCUMSTANCES PRIOR TO THE ACCIDENT

Prior to the derailment which occured on May 2, 2007, at approx. 11:00 p.m. CDT on April 29, 2007, a previous MNBR Train C600-29 had reported to the MNBR train dispatcher that they were stopped at the west-end of bridge MP 48.8 because of buckled track that they had observed on the bridge approach. The train dispatcher notified the MNBR roadmaster by phone of this incident, who arrived at the east-end of the bridge about 1:00 a.m. As he walked over the bridge he noticed that some ties on the bridge were shifted and he noticed that the ballast was bunched and disturbed. He began an inspection of the bridge structure and discovered several of the wooden bents, which support the bridge, leaning and racking westward about 18 to 20 inches. He contacted the train dispatcher and took the bridge out of service. MNBR Train C600-29 was instructed to shove west into Naheola Yard. All MNBR westbound trains were stopped and stored in a yard facility located in Myrtlewood until the bridge repairs could be made.

The following day, a MNBR bridge engineer inspected the bridge and completed a temporary repair to get bridge MP 48.8 back in service. The bridge crew constructed seven cribs with standard grade crossties laced together (hog pen style) to form an 8'X 8' square about 10 feet in height. These would support the bridge at spans 29, 32, 38, 42, 44, 49, and 53, also installed longitudinal braces on bents 26 through 52. A bridge contracting company began the repairs on April 30, 2007. They worked continuously under the supervision of the MNBR bridge engineer until May 2, 2007, to complete the temporary repairs. About 7:00 a.m. on May 2, 2007, the MNBR general manager gave permission for a consist of four locomotives, each having six axles, to cross the bridge at MP 48.8. The train crew for these locomotives consisted of a locomotive engineer only. The engineer went on duty in Meridian, Mississippi (MS) at 4:00 a.m. on May 2, 2007, and was dead-headed

to Naheola Yard. The MNBR roadmaster watched this consist over the bridge at five mph and determined the bridge was structurally sound for train service. The MNBR roadmaster went to Naheola Yard and briefed the general manager about the bridge.

The general manager determined MNBR Train S100-29 (Rocket Train) would be the first train to leave Naheola Yard and traverse bridge 48.8. The engineer of the four locomotives consist that tested bridge MP 48.8 was transferred to MNBR Train S100-29. The MNBR general manager briefed and assisted the engineer with MNBR Train S100-29, which consisted of two locomotives (UP 8437 and UP 3813), one passenger coach, and 13 loaded cars, nine of which contained hazardous materials. It was 888 feet in length with 2,352 trailing tons. The engineer received Track Warrant Control (TWC) authority # MB 101 at 8:15 a.m. and TWC authority # MB 102 at 8:16 a.m. via the radio from the MNBR train dispatcher. MNBR Train S100-29 departed the Naheola Yard on the Meridian Subdivision's main line track eastbound in yard-limits toward Myrtlewood. The posted speed for this segment of track is 10 mph, according to the MNBR Timetable No. 1 effective May 7, 2006.

The general manager, roadmaster, and bridge workers positioned themselves on the southwest side of bridge MP 48.8. As the eastbound train approached the accident area, the engineer was seated at the controls on the south-side of the leading locomotive UP 8437. The engineer was operating the train at a recorded speed of four mph approaching the west-end of bridge 48.8. MNBR Train S100-29 was given verbal instructions via the radio to approach bridge MP 48.8 with no brakes applied at a speed of five mph. The engineer said after receiving these instructions he heard a train brake squealing and came to a stop about 200 feet from the west -end of the bridge. He walked back to the passenger coach and saw that the brakes were sticking and manually bled off the air before returning to the locomotive. MNBR Train S100-29 started across bridge MP 48.8 at four mph with no brakes applied, per instructions from the MNBR general manager.

The MNBR timetable direction is east/west and the geographic direction is north/south. MNBR timetable direction is used for this report.

THE ACCIDENT:

MNBR Train S100-29 began crossing bridge MP 48.8 at approximately 8:40 a.m. The engineer stated that he heard a loud "pop" noise from behind the locomotives. He looked back and saw the roadmaster standing in the general area he thought the sound came from. A passenger standing in the vestibule on the west-end of the passenger coach said he was looking west when he heard the popping noise and observed one of the rocket cars begin to sink. Bridge MP 48.8 began collapsing under MNBR Train S100-29. Both locomotives (UP 8487 and UP 3813), one rocket car (KCS 710024), and the passenger coach (PPCX 800327) turned over as the bridge collapsed. Six other cars derailed, but remained upright on the bridge. The general manager, roadmaster, and other observers ran southward to escape the falling bridge and train. The general manager said the cab of the lead locomotive landed about three feet from him. The train speed was recorded at four mph approaching the derailment site and remained at four mph until the derailment occurred. The general manager immediately ran back to the locomotive to check on the engineer and help him out of the locomotive. The general manager called Naheola Yard via a portable radio and reported the incident to the Naheola trainmaster. The trainmaster immediately called 911 for emergency assistance. The general manager, roadmaster, and contract bridge crew assisted the injured passengers with first-aid until the arrival of the emergency personnel.

At 9:20 a.m. Emergency Response Teams from Marengo and Choctaw Counties along with the City of Pennington, AL arrived on the scene. The engineer and five ATK Launch System support personnel sustained injuries and were ground and air transported to different area hospitals. Marengo County Sheriff's Office and the Alabama State Police secured the area. At 10:45 a.m. the general manager and the roadmaster called the MNBR chief engineer, bridge engineer, R J Corman Derailment Services (RJC) and Southern Waste Services (SWS). They also contacted ATK Launch System officials in Huntsville, AL and Kansas City Southern and CSX Railroad about the rocket train derailment.

POST ACCIDENT:

At 1:00 p.m. on May 2, 2007, the derailment site was inspected by the Federal Railroad Administration (FRA), MNBR officials, ATK representatives, and Marengo County Environmental personnel. The Marengo County enviornmental personnel determined that there were no hazardous materials issues with the rocket motors;

however they did begin spill control neutralization and containment procedures due to lube oil leaking from the locomotives. At 4:30 p.m. RJC and SWS arrived at the accident scene and began the clean up process. At 9:50 a.m. on May 3, 2007, RJC re-railed the first locomotive UP 8437. On May 4, 2007, RJC removed the last car from the main track and MNBR, with contract bridge crews, started rebuilding bridge MP 48.8. On May 20, 2007, the main track was back in service.

Under FRA guidelines, MNBR managers arranged for post accident toxicology testing of the engineer at the Demopolis, AL hospital.

ANALYSIS AND CONCLUSION:

THE BRIDGE:

The bridge involved in the accident, Bridge No. 48.8, was a ballast-deck timber trestle bridge consisting of 54 spans, a total length of 652 feet crossing a small stream and its associated depression. The bridge height above ground averaged approximately ten feet through its length. MNBR records indicate the nominal span length as 12 feet, but spans remaining upright after the accident were measured 13 feet 6 inches between centers of caps. The bridge was originally constructed in 1934, but a considerable amount of the original material in the bridge had been replaced in succeeding years.

From carrier records and observation of the remainder of the bridge following the accident, each bent consisted of six timber piles or posts with butt diameters between 12 and 14 inches and one timber cap of 14 inches by 14 inches. Transverse bracing with 3 inch by ten inch timber planks secured with 3/4-inch bolts had been applied to some but not all bents. The bridge revealed no evidence of longitudinal bracing having been applied.

Piles and caps were connected with 3/4-inch diameter drift bolts. The piles were located under the caps and were spaced generally 18, 42, and 66 inches on either side of the centerline of the bridge.

The bents supported timber stringers extending from bent to bent and bearing directly on the caps. The packed stringer groups consisted of three treated pine stringers of 8 inches by 15 inches with the 15-inch sides vertical. The inner face of the inner stringer was approximately 24 inches from the centerline of the bridge. An additional stringer of the same size had been added on each side, centered approximately 51 inches from the centerline of the bridge. Each individual stringer crossed two spans. The stringer joints, or parting lines, were staggered and were located over the alternate supporting bents.

During the life of the bridge, approximately 94 percent of its driven piles had been cut off below the ground line, with the upper portions of the piles replaced with timber posts connected directly to the original pile stubs with 1/2-inch bolts. No sills had been inserted between the pile stubs and the posts. No longitudinal bracing had been applied to restrain these posted bents against longitudinal movement.

RECENT HISTORY OF THE BRIDGE:

An MNBR train crew reported on April 29, 2007, that the track at the west end of the bridge was buckled and misaligned. MNBR removed the bridge from service at that time and began an inspection of the bridge. The inspection revealed many of the pile bents leaning westward as much as 20 inches in a 10 foot height. MNBR placed a helper bent under the stringers immediately west of the east end bent, and built timber cribs constructed from track cross ties under Spans 29, 32, 38, 42, and 44. The condition of the soil under the bridge supporting these cribs was a wet clay with pockets of very soft material.

The bridge repairs were tested by MNBR by observing a consist of four 6-axle locomotives operating over the repaired bridge. MNBR took no exception to the bridge repairs under load and placed the bridge back in service about 7:00 a.m. the morning of the day of the accident.

EFFECT OF MNBR TRAIN S100-29 ON BRIDGE 48.8:

MNBR Train S100-29 consisted of two locomotives and fourteen cars. Weights of these cars and locomotives were obtained from two separate Wheel Impact Load Detector (WILD) sites on the Union Pacific Railroad, which the train had passed on April 25 and 28, 2007. The reported weights of the two locomotives and the

eight 4-axle flat cars corresponded within two percent between the two measuring sites.

The weights in pounds of each locomotive and car in the train, in the two UP WILD measurements are as follows:

CAR N0.	CAR TYPE	WILD 1	WILD 2	AVERAGE
UP 8437	6 Axle Loco	417,800	424,800	421,300
UP 3813	6 Axle Loco	393,000	397,000	395,000
PPCX800327	Pasngr Coach	151,800	148,000	149,900
MP 357361	4-Axle Car	115,000	110,800	112,900
UP 50022	8 Axle Car**	495,800	505,600	500,700
FEC 1000	8 Axle Car**	501,600	509,600	505,600
UP 50023	8 Axle Car**	480,400	490,400	485,400
KCS 710024	8 Axle Car**	485,000	494,400	489,700
MP 357595	4-Axle Car	114,400	108,600	111,500
UP 57961	4-Axle Car	117,400	112,600	115,000
MP 357416	4-Axle Car	115,800	111,400	113,600
UP 50031	8 Axle Car*	464,600	472,200	468,400
UP 50026	8 Axle Car*	463,400	468,600	466,000
UP 50021	8 Axle Car*	459,800	465,800	462,800
UP 50025	8 Axle Car*	459,400	467,000	463,200
MP 357282	4-Axle Car	113,800	108,400	111,100

** Derailed car transporting rocket booster motors.
* Non-derailed car transporting rocket booster motors.

Each of the eight cars carrying rocket booster motors was equipped with eight axles in a span bolster truck arrangement, in which each car was carried on four standard freight car trucks, with the two trucks at each end of the car supporting a span bolster which in turn carried the car body. The gross weights of these eight cars ranged from 462,800 pounds to 505,600 pounds.

The gross weight of a common free-running freight car on four axles is 263,000 pounds, and most large railroads permit the operation of four-axle cars weighing 286,000 pounds. Although the eight heavy cars in this train were carried on eight axles rather than four, the concentration of eight axles within the 65-foot length of each of the cars presents a severe load condition to a bridge.

MNBR Train S100-29 was the first revenue train to operate on the bridge after cribbing had been placed under the intermediate spans. The locomotive engineer reported that when the train's locomotives had entered onto the bridge by about 200 feet from the west, or entering, end of the bridge, he heard a loud "pop." Initial observations and reports by MNBR indicate that the bridge first failed near Bent 20 under three of the 8-axle flat cars carrying the rocket boosters. When that portion of the bridge failed, it appears the stringers to the east of Bent 20 uniformly pulled toward the west, toward the rear of the train, and off of the end bent (Bent 55) cap. That loss of support for the stringers and track on the east end caused the bridge to fail at a second location, under the locomotives, thus derailing the locomotives and the passenger coach. A more definite analysis of the bridge failure was prevented by the destruction of the bridge and its components in the accident.

ANALYSIS AND CONCLUSIONS:

ANALYSIS - TOXICOLOGICAL TESTING:

Federal Railroad Administration (FRA) post-accident toxicological test samples were collected and the results were negative.

CONCLUSION:

FRA concluded intoxication was not a factor.

ANALYSIS:

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

PROBABLE CAUSE AND CONTRIBUTING FACTORS:

A contributing factor to this accident was the initial out-of-plumb condition and lack of longitudinal bracing of the timber bents of Bridge 48.8.

FRA's investigation determined that the probable cause of this accident was bridge failure, caused by the rotation of several of the timber bents of Bridge 48.8, under a train load that exceeded the normal load capacity of the bridge.