Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2006-45

Burlington Northern Santa Fe
Grants, NM
June 9, 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-2006-45

1.Name of Railroad Operating Train #1: BNSF Rwy Co. [BNSF]	1a. Alphabetic Code: BNSF	1b. Railroad Accident/Incident No.: SW0606102
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.: SW0606102
4. U.S. DOT_AAR Grade Crossing Identification Number:	5. Date of Accident/Incident: Month 06 / Day 09 / Year 2006	6. Time of Accident/Incident: 06:52: ☑ 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): 01

8. Cars Carrying HAZMAT	9. HAZMAT Cars Damaged/Derailed	10. Cars Releasing HAZMAT	11. People Evacuated	12. Division
5	1	0	0	Southwest

13. Nearest City/Town	14. Milepost (to nearest tenth)	15. State Abbr	15. State Code	16. County
Anzac	87.7	N/A	NM	CIBOLA

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
59 F		2		2		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 Track/Main T-2		4	92.0		3

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	26. Was Equipment Attended? 1. Yes 2. No	Code	27. Train Number/Symbol
	1	1. Yes	1	ZLACK CK108

28. Speed (recorded speed, if available) R - Recorded E - Estimated			Code	30. Method(s) of Operation (enter code(s) that apply)	30a. Remotely Controlled Locomotive?
E - Estimated	56	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

29. Trailing Tons (gross tonnage, excluding power units): 4859

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

31. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded (yes/no)	32. 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)	N/A	5	yes		0	0
(2) Causing (if mechanical cause reported)	0	0	N/A	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	35. Cars	Loade a. Freight	Loade b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	4	0	0	0	0	(1) Total in Equipment Consist	66	0	0	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	8	0	0	0	0

36. Equipment Damage This Consist	37. Track, Signal, Way, & Structure Damage	38. Primary Cause Code	39. Contributing Cause Code
998599	550000	T213	N/A

Number of Crew Members				Length of Time on Duty	
40. Engineer/ Operators	41. Firemen	42. Conductors	43. Brakemen	44. Engineer/Operator	45. Conductor
N/A	0	1	0	Hrs 7 Mi 12	Hrs 7 Mi 12

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: 1

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

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

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	53. Was Equipment Attended? 1. Yes 2. No	Code	54. Train Number/Symbol
	N/A	1. Yes	N/A	N/A

55. Speed (recorded speed, if available) R - Recorded E - Estimated			Code	57. Method(s) of Operation (enter code(s) that apply)	57a. Remotely Controlled Locomotive?
E - Estimated	0	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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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
N/A			N/A N/A N/A N/A N/A	N/A

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)	0	N/A	N/A		N/A	N/A
(2) Causing (if mechanical cause reported)	0	N/A	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	0	0	0	0	0	(1) Total in Equipment Consist	0	0	0	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
0	0	N/A	N/A

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

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

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

Highway User Involved

79. Type — 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)

80. Vehicle Speed (est. MPH at impact): N/A

81. Direction geographical) — Code: N/A
1.North 2.South 3.East 4.West

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

86a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? — Code: N/A
1. Highway User 2. Rail Equipment 3. Both 4. Neither

Rail Equipment Involved

83. 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)

84. Position of Car Unit in Train: N/A

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

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

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

87. Type of Crossing Warning	88. Signaled Crossing Warning (See instructions for codes) Code	89. Whistle Ban Code
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	N/A	1. Yes 2. No 3. Unknown N/A
Code(s): N/A N/A N/A N/A N/A N/A N/A		

90. Location of Warning Code	91. Crossing Warning Interconnected with Highway Signals Code	92. Crossing Illuminated by Street Lights or Special Lights Code
1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach N/A	1. Yes 2. No 3. Unknown N/A	1. Yes 2. No 3. Unknown N/A

93. Driver's Age	94. Driver's Gender Code	95. Driver Drove Behind or in Front of Train and Struck or was Struck by Second Train Code	96. Driver Code
0	1. Male 2. Female N/A	1. Yes 2. No 3. Unknown N/A	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) N/A

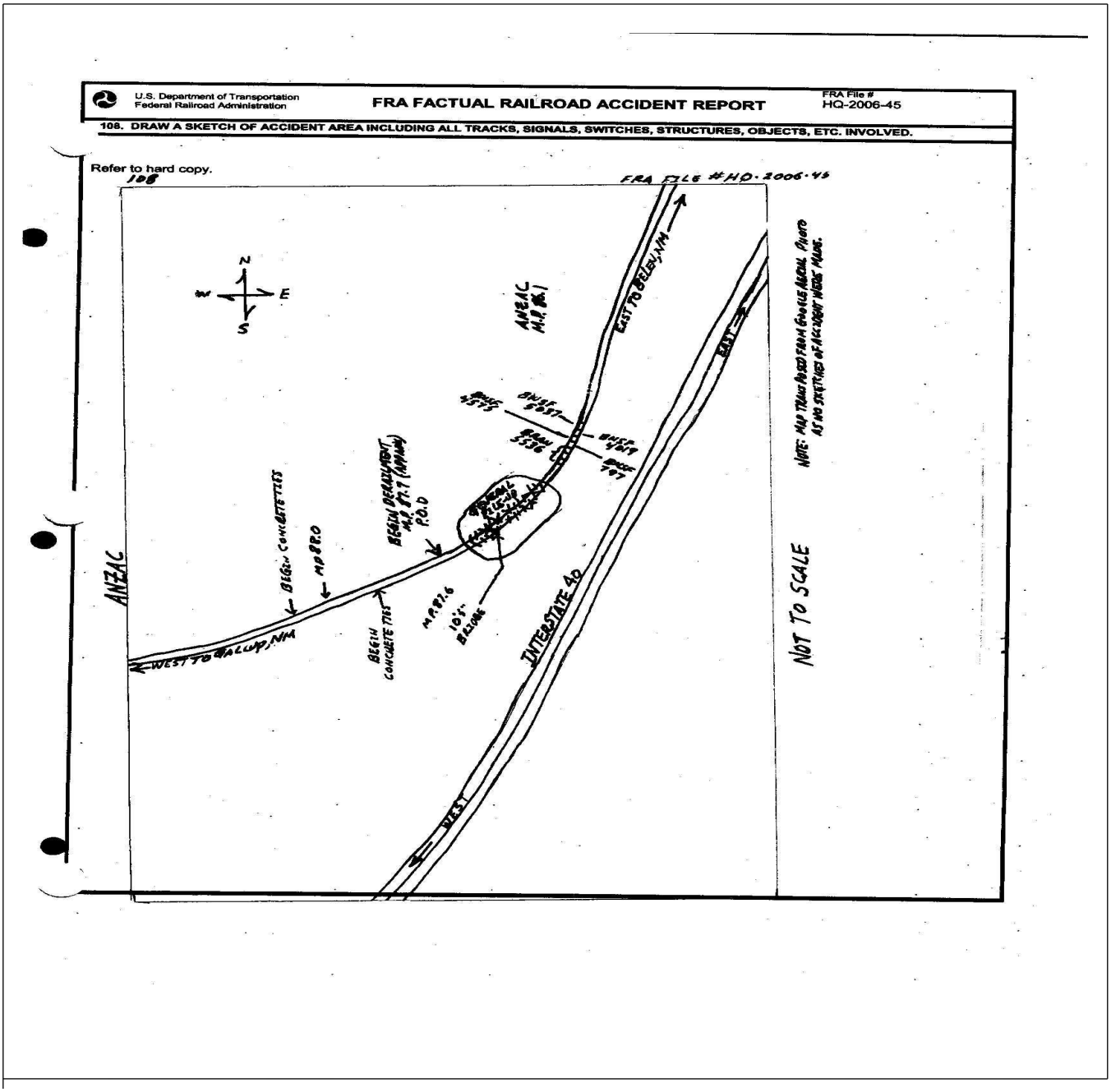
97. Driver Passed Standing Highway Vehicle Code	98. View of Track Obscured by (primary obstruction) Code
1. Yes 2. No 3. Unknown N/A	1. Permanent Structure 2. Standing Railroad Equipment 3. Passing Train 4. Topography 5. Vegetation 6. Highway Vehicle 7. Other (specify in narrative) 8. Not obstructed N/A

101. Casulties to Highway-Rail Crossing Users	Killed	Injured	99. Driver Was Code	100. Was Driver in the Vehicle? Code
	0	0	1. Killed 2.Injured 3. Uninjured N/A	1. Yes 2. No 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? Code	105. Locomotive Auxiliary Lights Operational? Code
1. Yes 2. No N/A	1. Yes 2. No N/A
106. Locomotive Headlight Illuminated? Code	107. Locomotive Audible Warning Sounded? Code
1. Yes 2. No N/A	1. Yes 2. No N/A

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

HQ-45-2006.jpg



109. SYNOPSIS OF THE ACCIDENT

On June 9, 2006, at 6:52 a.m. (MDT), an eastbound Intermodal BNSF freight train, Z-LACKCK1-08A, derailed at mile post 87.7, on Main Track No. 2, at a location referred to as Anzac. This location is approximately 13.4 miles east of Grants, NM, and on the Gallup Sub-division of the Southwest Division. The derailment occurred on the Acoma Indian Reservation.

The first thru eighth freight cars behind the four locomotives at the head end of the train derailed. The eight freight cars were Articulated Cars and consisted of 26 articulated segments. There were no casualties, no release of hazardous materials, nor were there any evacuations in the sparsely populated area. Monetary damages are estimated to be $1,548,599. Monetary cost of lading and for clearing the derailment totaled
$1,560,000. Total costs amounted to $3,108,599.

The temperature, visibility, and weather at 6:52 a.m., on June 9, 2006, was 59 degrees Fahrenheit, daylight, with partly cloudy skies.

Observations of rail batter on the west end rail revealed evidence that rail wheel flanges had been contacting the tops of the compromise joint bars. This condition indicates that the compromised joint broke as a previous opposing west bound train passed this location 40 minutes prior to the derailment of Train Z-LACKCK1-08A. The derailment occurred in an area with solid concrete tie and ballast structure.

110. NARRATIVE

Circumstances Prior to the Accident

The train crew of train Z-LACKCK1-08A, was a two person train crew and consisted of a locomotive engineer and conductor. The train crew went on duty at 11:40 p.m. (MDT), on June 8, 2006, at the BNSF yard, in Winslow, AZ. This was the home terminal for the train crew. Both train crew members had received more than the statutory off duty period prior to reporting for duty and also reported the trip as uneventful prior to the derailment.

The Z-LACKCK1-08A, an intermodal train originating in Hobart Yard, Los Angeles, CA, and terminating in Kansas City, KS, consisted of four locomotives, 66 loaded, and no empty freight cars. The train was 6,687 feet in length and was pulling 4,859 trailing tons. The train was equipped with an armed and functioning Quantum manufactured two-way end-of-train device. The two-way end-of-train device was numbered
BNQ 40380, and was previously calibrated on 5-15-2006, at the Kansas City Central Repair Facility, according to the affixed tag on said device.

The train, Z-LACKCK1-08A, was given a Class I Brake Test-Initial Terminal Brake Test at Hobart Yard, Los Angeles, CA. The initial train crew boarded and began operation of train symbol Z-LACKCK1-08A, at Hobart Yard, Los Angeles, CA, with subsequent crew change locations at Barstow, CA, Needles, CA, and Winslow, AZ. The Winslow, AZ, train crew, was the train crew involved in the derailment.

As the train approached the derailment area from the west, the train was traveling 56 mph (recorded) and in dynamic braking mode. The locomotive engineer was seated on the seat provided near the control stand on the south side of the lead and controlling locomotive. The conductor of the train was seated on the seat provided on the north side and directly across from the locomotive engineer. The distance traveled from the time of the train induced emergency and when the train came to a complete stop, was approximately 1,086 feet.

In this area of the railroad, the track is of 136 lb. CWR (Continuous Welded Rail) and was installed in 1974. The track is tangent for about 600 feet from the west on the parent rail* to the location of the severed compromised joint bar, followed by approximately 100 feet prior to the beginning of spiral into a two degree 56 minute curve to the left. The grade at this location is .43 percent descending.

* The “Parent Rail” is defined as the initially installed rail prior to any replacement of subsequent rail sections.

The railroad timetable direction of train symbol Z-LACKCK1-08A, was east. The geographic direction was southeast. Timetable directions are used throughout this report.

The Accident

The Z-LACKCK1-08A, was being operated at a recorded speed of 56 mph approaching the derailment area and was in dynamic braking according to the event recorder. The train crew's view is obstructed to the left in the direction of travel, by hills and mountains and to the east, by a succession of curves. The crew's view to the right, in the direction of travel, is fairly unobstructed and parallels Interstate 40 East.

The engineer stated that he first became aware of the derailment after the train went into a train induced emergency application of the air brakes. Shortly after notifying the conductor of the emergency air brake application, the engineer stated that he moved the automatic brake valve handle to the “Emergency/Handle Off” position on the automatic brake valve quadrant. The engineer stated that shortly thereafter, he released the locomotive air brakes, by depressing the independent air brake handle, so as to attempt a controlled stop of the remaining portion of the train.*

* The actions taken, as stated by the locomotive engineer, correspond with actions indicated on the event recorder.

The conductor stated that at 6:55* a.m. (MDT), after having felt and having been notified that the Z-LACKCK1-08A, was in a train induced emergency application of the air brakes, he looked to the rear of the train and could see the first car on the ground. The conductor stated that he immediately called the number nine button(emergency number) and notified the number eight train dispatcher(Gallup East).**

* The conductor states that shortly after the derailment he looked at his watch. The time was, according to him, 6:55 a.m. All other documents indicate the time of derailment 6:52 a.m.

** During the conductors interview, he referred to the number eight dispatcher as the Belen dispatcher. The no. eight dispatcher, is actually the Gallup East dispatcher, that handles the territory east from Gallup, NM to Belen, NM.

Both the engineer and conductor, stated they felt no abnormalities on the track or track structure, as the lead locomotive went over the defective compromise joint bar immediately preceding the derailment.

On June 9, 2006, at approximately 6:52 a.m. (MDT), train symbol Z-LACKCK1-08A, derailed on Main Track No. 2, in the vicinity of Anzac at m.p. 87.7, Gallup Sub-division, Southwest Division. The accident occurred on the Acoma Indian Reservation.

The first thru eighth Articulated Cars (26 articulated segments), derailed resulting in the destruction of all but the first Articulated Car (three articulated segments). One of the Articulated Cars, BNSF 253128, was hauling container TRLU 701158. This container was carrying a load of hazardous material (sparkler fireworks), hazard class 1.4, and derailed. The container of sparklers, was never compromised nor was there an evacuation of the sparsely populated area.

The derailment resulted in no injuries to the general public, emergency response personnel, nor railroad employees. The New Mexico State Police, was notified at 7:08 a.m. The Acoma Indian Tribal entities were immediately notified and responded at approximately 7:00 a.m. with fire engines, a hazmat trailer, and ambulance. The Grants, NM, Fire Department was notified at about 7:30 a.m., and shortly thereafter responded with a fire engine, pick-up truck, and equipment trailer. Standby assistance was requested by the Acoma Fire Chief from Cubero, NM, and Laguna, NM, Fire Departments.

The Cibola County Sheriffs Department was notified at 6:55 a.m., via 911, by the use of a cellular phone, by an unknown person(s), and responded shortly thereafter.

Analysis and Conclusions

Immediately following the accident, the determination was made that the FRA's monetary threshold had been met and arrangements were made to conduct toxicological testing under FRA Mandatory Sub-Part C. The urine and blood toxicological results for the locomotive engineer and conductor proved negative.

The event recorder on the lead and controlling locomotive BNSF 5037, a General Electric C44-9W locomotive built in 2004, was unable to be down-loaded after the derailment. A BNSF, Superintendent of Operating Practices, was present to perform the event recorder down load and stated during the process, the event recorder cable on the BNSF 5037, had not been properly connected. The unconnected cable on BNSF 5037, resulted in the down-loading of the event recorder on BNSF 4575, the third of four locomotives being used for the motive power on train symbol Z-LACKCK1-08A. There was no indication the event recorder and/or cable had been altered or tampered with.

On the afternoon of June 10, 2006, I traveled to Grants, NM, to conduct an inspection of the remaining portion of train symbol Z-LACKCK1-08A (See FRA F6180.96 RCG-70). There were 22 remaining Articulated Cars consisting of 78 articulated segments. There were no defects noted on the inspection report other than a comment made indicating the air brakes had bled off of two articulated segments. There were no FRA exceptions noted.

On May 15, 2006, a Herzog rail detector car identified a detail fracture in the North Rail at mile post 87.664, on Main Track No. 2. The identified defect was removed and BNSF welders, were present to insert and weld a section of similar rail, also referred to as a "plug." During the thermal welding process, a failure occurred and the two rail ends never fused or welded. Shortly after, a second plug rail was added at the location. This resulted in two plug rails and three rail joints at that location.

The parent rail, according to a BNSF report, was vertically head worn up to 3/4", 1/16" more than the current relay limits of 11/16". In order to meet joint miss-match requirements, new BNSF approved Chinese* manufactured compromise joints were installed at the three joint locations. The presence of compromise joint bars at this location was the result of a "failed weld." This condition may have been the result of a defective rail mold, improper sealing or packing of the rail ends to be thermally fused, or possibly error on the part of the welders.

* The Chinese manufactured compromise joints in use at the time of derailment met AREMA (American Railway Engineering and Maintenance of Way Association) Standards joint bar chemistry.

In a report provided by the Southwest Region titled 3P Analysis: Root Cause & Corrective Action mentions that the suspect first car that derailed, BNSF 240462, a five-unit segment Articulated, had a WILD (Wheel Impact Load Detector) reading of 79.3 kips (kilo pounds). A wheel impact load detector, measures the wheel impact of the rail wheels against the rail. One kip is equal to 1,000 pounds. Rule 41- Wheels and Axles of the AAR (Association of American Railroads) calls for renewal of a single WILD reading at 90,000 pounds (90 kips) at any time. The BNSF renews impacted wheels at readings at 90 kips at Repair Facilities and will set out suspect wheels in a train following wayside detectors at scans above 120 kips.

While a 79.3 kip reading on L10 wheel of Articulated Car, BNSF 240462, was above the normal reading of 30-50, the reading did not exceed the parameters used by AAR nor BNSF.
Although a forthcoming containment plan identifying changes will be provided by the BNSF Railway, the Southwest Division Engineering Department, has issued instructions concerning head loss, rail mis-match, inspection of rail joint bars, compromise or otherwise, for wheel flange contact, identification of Chinese manufactured compromise joint bars, and the development of "head free" compromise joint bars.

The Federal Railroad Administration's investigation found that the probable cause of the derailment was a severed 132/136 compromise joint bars on the North Rail of Main Track No. 2, in the vicinity of mile post 87.7, due to fatigue cracks in the bottom flanges of compromise joint bar. The fatigue cracks grew to approximately 10 to 20 percent of the total joint bar cross sectional area before rapid failure of the remainder of the bars, which occurred in a single cycle event.