

Federal Railroad Administration Office of Safety Headquarters Assigned Accident Investigation Report HQ-2007-33

Burlington Northern Santa Fe (BNSF) Casco, Minnesota June 4, 2007

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 FEDERAL RAILR	OF TRA	ANSPORT DMINIST	ATI RAT	ON ION	FRA FA	ACTUA	LRA	ILR	ROAD AG	CCI	DENT RI	EPORT		F	FRA Fil	e #]	HQ-200	7-33
1.Name of Railroad Operating Train #1									1a. Alphabetic Code					1b. Railroad Accident/Incident No.				
BNSF Rwy Co. [BN 2 Name of Pailroad C	2-	A 1-1-1	BNSI	F		TC0607101												
N/A	N/A					20. F	2D. Kaliroad Accident/Incident No. N/A											
3.Name of Railroad C	3a. Alphabetic Code					3b. I	3b. Railroad Accident/Incident No.											
4 Name of Railroad B	49	Alphabetic	Code	<u> </u>		4h 1	IN/A											
BNSF Rwy Co. [BN	NSF]		K Ivia	internari						BNSI	F		40.1	TC0607101				
5. U.S. DOT_AAR G	6. M	Date of Acc	ident	/Incident av 04 Yea	ur 2007	7.1	ime of Ac 03·45	cident/I	ncide	nt AM	РМ							
8. Type of Accident/I	ndicent	1. Derailı	nent		4. Side c	ollision		7	. Hwy-rail c	rossir	ng 10. E	xplosion-	deton	ation 13.	Other]	Code
(single entry in code box) 2. Head on collision 5. Raking collision									8. RR grade crossing 11. Fire/violent rupture (describe in narrative)							I	I	
9 Core Corrying		3. Rear er	nd col	ision	6. Broke	n Train co	ollision	9	. Obstruction	n	12. Other impact				narrat			01
HAZMAT		10. HAZI Damaged	27/1	11.0 HA2	Cars Rel ZMAT	easir	ng		12. People Evacuated				13. Divi	sion		7.0		
	0	-			N/A	15. Mile	epost		N/A		toto	17		0			'IN CITI	ES
14. Nearest City/Town	n					(to r	nearest to	enth)	1) 10.		Abbr	Code	17. County		CT.			
19. Town out on (E)			11.4.	(cinc	ale entry)	Code	20.1	90.0	J.U		N/A MN		 		51			Cala
(specify if minus))	19. visio 1. l	Dawn	(311 <u>8</u> 3.D	usk	Couc	20. W	. Clear 3. Rain			ntry) Code			1. Main 3. S			g	Code
48	F	2.1	Day	4.I	Dark	4	2	. Clo	Cloudy 4. Fog		6.Snow 1		2. Yar		ard 4.1	rd 4. Industry		1
22. Track Name/Nu	mber					23. FRA	Track	D	Code 24. Annual Track Densi		Density	25. Time Ta		e Table	able Direction		Code	
		SIN	GLEN	IAIN	LINE	Clas	ss (1-9, 2	S)	4	millions) 25.08			8		2. South	1 3. 1 4.	East	3
							OPER	AT	ING TRA	IN #	1							
26. Type of Equipme	ent 1.	. Freight tra	in	4. W	ork train 7.	Yard/swi	itching	А	. Spec. MoV	V Equ	ip. Code	27. Was l	Equip	ment C	Code	28. T	rain Nun	nber/Symbo
Consist (single er	ntry) 2.	. Passenger	train	5. Sir	ngle car 8.	Light loc	co(s).				1	Atten	ded?					
20 Speed (1.1	r	m anda(a) t	hata		1. 1	res	2. No 1 ODKWALL134											
R - Recorded	ente	block	mat a m.Sp	ecial instruct	ions		0 = Not a remotely controlled											
E - Estimated	45	MPH	R	b	. Auto train o	control h	. Curren	t of t	traffic	n. Otl	her than mair	ı track		1 = Remo	ote contr	ol po	rtable	
30 Trailing Tops (gross toppage c. Auto train stop i. Time ta									rain orders	o. Po	sitive train c	ontrol	. 、	2 = Remo	ote contr	ol tov	wer	
excluding power units) d. Cab j.Track v									ic control	p. 01	Code(s)	in narrat	ive)	transmi	tter - mo	ore the	an one	
		24581		f	. Interlocking	g 1	.Yard lin	nits	[e	N/A N/A	A N/A	N/A	remote o	control t	ransn	nitter	0
32. Principal Car/Unit	t	a. Initial a	and Nu	ımber	b. Positio	on in Traiı	n c. l	Load	ed(yes/no)	33.	If railroad en	nployee(s) teste	d for drug	/alcohol	use,		
(1) First involved		BNS	E 981	37		8			Vec		enter the nu	mber that	were	positive in	n		Alcohol	Drugs
(derailed, struck, e	etc)		.1 901	52			_		905	the appropriate box.							00	00
(2) Causing (if mec cause reported)	chanical)	1	0			0		1	N/A	34	I. Was this co	onsist tran	sporti	ng passen	gers? (Y	'/N)		N
35. Locomotive Unit	ts	a. Head		Mid 7	Frain	Re	ar End		36. Cars				Lo	aded		Empt	ty I D	-
(1) Total in Trair		End	b. Ma	nual	c. Remote	d. Manua	1 c. Rei	mote	(1) Total i	in Fa	uinment Con	a. Fr	eight	D. Pass.	c. Freig	gnt c	1. Pass.	e. Caboose
		2		0	0	0	1		(1) 10(a)	in Lq	uipinent con		84	00	00		00	00
(2) Total Deraile	d	0		0	0	0	0		(2) Total I	Derai	led	,	72	00	00		00	00
37. Equipment Dama	ige	3654142		38. Tra	ick, Signal, V	Vay,	39429	2	39. Prima	ary Cause				40. Contributing Cause				
This Consist		Number		& a	Structure Da	mage			Code			T299	th of '	Code N/A				
41. Engineer/	42. Fir	emen		43. Co	onductors	44. Bra	44. Brakemen		45. Engineer/Operator			Lengui or		46. Conductor				
Operators 1 00					1	0	00		Hrs 7 Mi 4			Mi 45	Hrs 7			7	Mi 45	
Casualties to:	Casualties to: 47. Railroad Employees 48				in Passenger	49. Other			50. EOT Device?			51. Was EOT Device Properly Armed?				Armed?		
Fatal		00	00	00			1. Yes 2. No 2					1. Yes 2. No N/A						
									52. Caboose Occupied by Crew?			Crew?						
Nonfatal 00 00 00							00			1.	Yes	2.	No					N/A
						0	PERAT	ΓIN	G TRAIN	#2								
53. Type of Equipme	nt 1.	Freight tra	in troin	4. Wo	ork train $\overline{7}$.	Yard/swi	tching	A.	Spec. MoW	V Equ	ip. Code	54. Was I	Equip	ment C	ode	55. Ti	rain Nun	ber/Symbo
Consist (single en	try) 2. 3.	Commuter	train	5. Sin 6. Cu	t of cars 9	Maint /in	o(s). spect car	r			N/A	Attend 1 N	leu ? Zes	2 No N/A N/A			A	
56. Speed (recorded	speed, if	available)	Code	58	. Method(s)	of Operati	on (ente	er code(s) t	hat a	apply)	1. 1		58a. Rem	otely Co	ontrol	led Loco	motive?
R - Recorded	• , -	1		a.	ATCS	g	g. Autom	atic	block	m.Sp	ecial instruct	ions		0 = Not a remotely controlled				
E - Estimated	N/A	MPH	N/A	b	. Auto train o	control h	. Curren	t of t	traffic	n. Otl	her than mair	1 track		1 = Rem	ote cont	rol po	ortable	

DEPARTMENT FEDERAL RAILF	OF TRAI ROAD AI	NSPORT DMINIST	TATIO RATI	ON ON	FRA FA	CTUAL	RAILR	OAD AC	CIDENT REPO	ORT	F	RA File	# <u>HQ-200</u>	07-33		
57. Trailing Tons (gross tonnage, excluding power units)					c. Auto train stop i. Time table/tr d. Cab j.Track warrani e. Traffic k. Direct traffic				ain orders o. Positive train control t control p. Other (Specify in narrative) c control Code(s)				2 = Remote control tower 3 = Remote control transmitter - more than one			
N/A					f. Interlocking 1.Yard				N/A N/A N/A 1	remote control transmitter			N/A			
59. Principal Car/Unit a. Initial and Nu				umber	b. Positio	n in Train	c. Load	led(yes/no)	60. If railroad emp	loyee(s) tes	ted for dru					
(1) First involved (derailed structure ato) N/A				N/A	A	1	V/A	enter the numb	er that were	e positive in Alcohol			Drugs			
(derailed, struck, etc)				-				61 Was this sonsi	ot transmort	N/A			N/A			
cause reported) N/A		N/A	N/A		. N		N/A	61. was this consi	ing passengers? (1/N)			N/A				
62. Locomotive Units		a. Head End	b. Ma	Mid T mual	rain c. Remote	emote d. Manual		63. Cars		Lo a. Freight	b. Pass. c. Freight		Empty ht d. Pass.	e. Caboos		
(1) Total in Train		N/A	1	N/A	N/A	N/A	N/A	(1) Total in Equipment Co		N/A	N/A	N/A	N/A	N/A		
(2) Total Deraile	ed	N/A	N	/A	N/A	N/A	N/A	(2) Total Derailed			N/A	N/A	N/A	N/A		
64. Equipment Dama This Consist	age	N/A	· · ·	65. Tra & S	ck, Signal, W Structure Dar	'ay, nage	N/A	66. Primary Cause Code N/A			67. Contributing Cause Code N/A					
	I	Numbe	r of Cr	ew Mei	mbers	inge				Length of	Time on D					
68. Engineer/	69. Fire	men		70. Co	nductors	71. Brak	emen	72. Engin	eer/Operator		73. Con	ductor				
Operators N/	1	N/A			N/A	N/A			Hrs N/A M	i N/A		Hrs	S N/A	Mi N/A		
Casualties to:	74. Railro	oad Emplo	oyees 7	75. Trai	n Passengers	76. Othe	/6. Other		Device? Yes 2. No j	N/A	78. Was	78. Was EOT Device Propert				
Fatal		N/A			N/A	1	N/A	79. Caboo	se Occupied by Crev	/?						
Nonfatal		N/A			N/A	1	N/A		1. Yes	2. No		N/A				
20 Tons of Emission		7		4 117-1	1- turiu 7 X	OF	PERATIN	G TRAIN	#3 Farria - Carta 81 V	Vac Equipr	nent C	- 1- 0	2	-1/C11		
Consist (single en	 80. Type of Equipment 1. Freight train 4. Work train 7. Yard/switching A. Consist (single entry) 2. Passenger train 5. Single car 8. Light loco(s). 3. Commuter train 6. Cut of cars 9. Maint (inspect car) 								N/A 1. Yes 2. No N/A N/A							
83. Speed (recorded	83. Speed (recorded speed, if available) Code 85. Method(s) of Operation (enter								at apply)		85a. Remo	otely Con	ntrolled Loco	omotive?		
R - Recorded a. ATCS g. Automatic l								olock ⁿ	 Other than main tra 	ck	0 = Not a 1 = Remo	remotely	controlled			
				- c.	Auto train	stop i. T	'ime table/ti	rain orders	. Positive train contr	ol	2 = Remo	te contro	ol tower			
excluding powe	84. Trailing Tons (gross tonnage, excluding power units)								Code(s)	arrative)	3 = Remo	ote contro	ol e than one			
I N/A					I rame	к. 1 1.Y	ard limits	c control		N/A N/A	remote c	ontrol tra	ansmitter	N/A		
86 Principal Car/Unit a Initial and Nu					b Positio	n in Train	c Load	ed(ves/no)	87. If railroad empl	ovee(c) test	ed for drug	a/alcohol	1164			
(1) First involved					0. T OSILIO		C. Loud		enter the numb	er that were	e positive i	n	Alcohol	Drugs		
(derailed, struck, etc) N/A		N/A		IN/	A		N/A	the appropriate	box.			N/A	N/A			
(2) Causing (if mechanical cause reported) N/A					N/	A]	N/A	88. Was this consi	st transport	ing passen	gers? (Y	/N)	N/A		
89. Locomotive Uni	its	a. Head	h Ma	Mid Train nual L c. Remoted		Rear End		90. Cars		Lo a. Freight	aded b. Pass.	E c. Freig	Empty ht d. Pass.	e. Caboose		
(1) Total in Train	n	N/A	N N	//A	N/A	N/A	N/A	(1) Total in	Equipment Consist	N/A	N/A	N/A	N/A	N/A		
(2) Total Deraile	ed	N/A	N	/A	N/A	N/A	N/A	(2) Total E	Derailed	N/A	N/A	N/A	N/A	N/A		
91. Equipment Dama	age		- -	92. Tra	ck, Signal, W	′ay,		93. Primar	y Cause Code		94. Contributing Cause					
This Consist		N/A		& S	Structure Dan	nage	N/A	N/A Code N/A								
95 Engineer/	96 Fire	men	rorCr	97. C	onductors	98. Brak	emen	99. Engin	eer/Operator	Length of	100 Conductor					
Operators N/A	30.1110	N/A	97. Collac N/A		N/A	N	J/A	yyı zingin	Hrs N/A M	i N/A	Hrs N/A Mi N/A					
Casualties to:	Casualties to: 101. Railroad Employees				Гrain	103. Oth	103. Other				105. Was EOT Device Properly					
Fatal		N/A			N/A		N/A		1. Yes 2. No N/A 1. Yes 2. No							
Nonfatal N/A				1	N/A M			106. Cabo	1. Yes 2. No 1 N/2							
Highway User Involved									Rail Equipment Involved							
107.	Frailer -	, D.		0.1	Motor V 1	1.	Code	111. Equipment Code								
A. Auto D. Pick-Up Truck G. School Bus K. Pedestri							N/A	1. Train(units pullig) 4. Car(s) (moving) 7. Light(s) (standing) 2. Train(units pullig) 5. Car(s) (moving) 7. Light(s) (standing)								
108. Vehicle Speed		109.	a. Othe	geographic	al)	Code	112. Position of Car Unit in)			
(est. MPH at impact) N/A 1.North 2.South 3.East 4.West N/A									N/A							

DEPARTMENT OF TRANSPORTATION FRA FACTUAL RAILROAD ACCIDENT REPORT FRA File # HQ-2007-33 FEDERAL RAILROAD ADMINISTRATION FRA FACTUAL RAILROAD ACCIDENT REPORT FRA File # HQ-2007-33													.33		
110. Position Code 113. Circumstance													Code		
1.Stalled on Crossing 2.Stopped on Crossing 3.Moving Over Crossing 1. Rail Equipment Struck Highway User 4. Trapped N/A													N/A		
114a. Was the	e highway user	and/or ra	uil equi	pment	involved		Code	114b. Wa	s there a haza	rdous mate	rials rel	lease		Code	
in the impact transporting hazardous materials?												4 Neither	N/A		
1. Highway User 2. Rail Equipment 3. Both 4. Neither												1			
114c. State here the name and quantity of the hazardous materials released, if any.															
115. Type 1.Gates 4 Wig Wags 7 Crossbucks 10 Flagged by crew 116 Signaled Crossing Code 117 Whistle												Code			
Crossing 2.Cantilever FLS 5.Hwy. traffic signals 8.Stop signs 11.Other (spec. in narr.) (See instructions for codes) 1. Yes															
Watting 3.Standard FLS 6.Audible 9.Watchman 12.None 2. No 3. Unknown											3. Unknown				
Code(s)	N/A	N/A	N	/A	N/A	N/A N/A N/A N/A N/A								IN/A	
118. Location of Warning Code 119. Crossing Warning Code 120. Crossing Illuminated by Street												by Street	Code		
1. Both Sid	les				With	n Highway Si	gnais		Lig	nts or S	pecial Lig	nts			
2. Side of Vehicle Approach 1. Yes 2 No								2. No					1		
3. Opposite Side of Vehicle Approach N/A 3. Unl									N/A 3. Unknown					N/A	
121.	122. Driver's	Gender	Code	123.	Driver Drov	e Behind o	or in Front of	Code	124. Driv	Driver					
Age	1. Male				and Struck o	r was Struc	k by Second	Train	1. Drov	e around o	r thru th	ne Gate	4. Stopped on Crossing		
N/A	2. Female	e I	NI/A		1. Yes	2. No	3. Unknown	¹	2. Stopp	bed and the	n Proce	eded	5. Other (specify in parrative)		
			IN/A					N/A	3. Dia i	lot Stop			narrative)	N/A	
125. Driver Pa	ssed	Coc	e 12	6. Vie	w of Track C	bscured by	(primary ob	struction)						Code	
Highway V	ehicle	N/		1. P	ermanent Str	ucture	3. Passi	ng Train 5.	Vegetation	7. Ot	her (s	specify in 1	narrative)		
1. Yes 2. No	3. Unknown	11/	n	2. S	tanding Raili	oad Equipi	nent 4. Topo	graphy 6. l	Highway Vehi	cle 8. No	ot obstru	icted		N/A	
Casualties to: Killed Injured 127. Driver								Cod	ne Vehicle?						
							d 2.Injured 3.	Uninjured IN/A		121	1. Yes 2. No				
129. Highway-Rail Crossing Users N/A N/A							dollar damag	ge)	N/A N/A (include driver) N/A						
132. Locomotive Auxiliary Lights? Code 133. Locomotive Auxiliary Lights Operational?												Code			
1. Yes 2. No							N/A 1. Yes 2. No					N/A			
134. Locomotive Headlight Illuminated? Code 135. Locomotive Audible Warning Sounded?												Code			
1. Yes 2. No N/A									1. Yes 2. No					N/A	



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

137. SYNOPSIS OF THE ACCIDENT

On June 4, 2007, at 3:45 a.m., c.d.t, an eastbound BNSF Railway Company (BNSF) taconite train U-BRMALL1-54 (U-BRMALL1 -54), derailed. The accident occurred at milepost 90 on the BNSF Twin Cities Division, Casco Subdivision, single main track near Casco, Minnesota. BNSF 98132, the 46th car from the head end, was the first car to derail. This caused the 47th through 117th car to derail in a general pile up on the north side of the roadbed. A total of 72 loads of taconite were derailed. There was no release of hazardous materials, no evacuation, and no injuries to the train crew.

The total estimated damages were \$4,048,434. Estimated equipment damage was \$3,654,142 and estimated track damage was \$394,292.

At the time of the accident it was dark, the weather was clear, and it was 48 °F.

Probable cause of the derailment was a broken rail.

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138. NARRATIVE

CIRCUMSTANCES PRIOR TO THE ACCIDENT

The crew of U-BRMALL1-54 consisted of a locomotive engineer and a conductor. They went on duty at 8:00 p.m. on June 3, 2007, at Allouez Yard, in Superior, Wisconsin. Allouez Yard is the home terminal for both crew members. When they went on duty they had received their statutory off duty period. The engineer was seated at the controls located on the right (south) side of the leading locomotive. The conductor was seated opposite the engineer on the left (north) side of the locomotive cab.

The train was scheduled to travel from Superior with 184 empty taconite ore cars as train U-ALLBRM1-54 and return to Superior after being loaded as train U- BRMALL1-54. There were two locomotives in the lead position of the train and one Distributed Power (DP) unit at the rear. The loading process took approximately 2 hours and 45 minutes. Before departing Allouez Yard, the engineer inspected the DP unit at the rear of the train. The engineer found that the rear locomotive, BNSF 4051, was properly linked to the lead locomotive and that the daily inspection was current. The engineer then checked the lead locomotives, BNSF 7702 and EMD 9022, which were coupled long nose to long nose. The daily inspections were current. The Class 1 Terminal Air Brake Test and Inspection was completed on June 3, 2007, at 6:45 p.m. by BNSF car inspectors and the train remained charged on air until departure. The engineer acknowledged that the air brake test slip was current and departed from Allouez Yard at 8:15 p.m.

U-ALLBRM1-54's movement from Superior to the Hibbing Taconite mine at Broeker, Minnesota, was uneventful. The engineer recalls using the automatic brake one or two times and the dynamic brake one or two times and took no exceptions to the operation of the two brake systems. U-ALLBRM1-54 arrived at the Hibbing Taconite mine at 11:20 p.m. Their train was loaded moving at seven tenths of a mile per hour, utilizing the pace setter feature on the locomotives.

On June 4, 2007, at 2:40 a.m., the U-BRMALL1-54 departed the Hibbing Taconite mine, with 184 loads, no empties and 24,581 trailing tons. At 3:00 a.m., the train arrived at Kelly Lake, Minnesota, milepost 107, and entered the Casco Subdivision. The method of operation is Traffic Control (TC). The maximum authorized speed for loaded taconite ore trains is 45 mph. There were no slow orders in effect that day on the Casco Subdivision. The BNSF Twin Cities Division Timetable No. 2 effective 0800 Wednesday, November 17, 2004, was in effect. The timetable and geographic direction of the train was east.

As U-BRMALL1-54 approached milepost 105 the engineer made a seven pound air brake reduction, using the automatic brake valve, in order to maintain their speed at 45 mph. During the eastbound movement, the engineer took no exceptions to the response of the brake system on U-BRMALL1-54.

THE ACCIDENT

As U-BRMALL1-54 approached the point of derailment (POD), the engineer was operating under a clear signal at a recorded

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speed of 45 mph. At the point of derailment the single main track is tangent with a slight uphill grade. The locomotive was operating in the No. 8 throttle position. At 3:27 a.m., the emergency air brakes applied to the train and the engineer observed on his computer display that the emergency brake on the DP unit also applied.

The conductor walked back and reported that there were two cars derailed, then later reported that there were many more cars. The conductor observed no fire, smoke, or any unusual odors. The engineer notified the train dispatcher over the radio of the derailment. A total of 72 taconite loads were derailed with 5 cars upright and 67 cars in a general pile up. Most of the 67 cars derailed were derailed to the north side of the roadbed. Neither the engineer or the conductor felt anything abnormal such as bumps, dips in the track, or slack action prior to the emergency brake application.

ANALYSIS AND CONCLUSION

This accident met the criteria prescribed in Title 49 CFR, Part 219, Subpart C, Post Accident Toxicological Testing. A BNSF official transported the train crew to St. Mary Hospital in Duluth, Minnesota, for mandatory FRA drug and alcohol screening. The test results were negative.

The first three cars (45th thru 47th) of the 72 loads to derail were upright and approximately 3 tenths of a mile to the east of the general pile up (48th thru 115th). The last two cars, 116th and 117th, were also upright. An inspection of the data printout from the BNSF 7702 event recorder indicated no unusual events related to train handling.

The initial derailed car, BN 98132 as well as the remainder of the train that did not derail, were inspected by an FRA Motive Power and Equipment Inspector. The rear 67 cars and the DP unit were inspected at Kelly Lake. There were no exceptions taken to the DP unit and one Railroad Safety Appliance Standards exception to the 67 cars. The head two locomotives and 45 cars, including the 45th car that was derailed, were taken to Allouez Yard and inspected. The two locomotives had been detached from the train and sent to the service track. The 45 loads of taconite ore had been unloaded but the cars were still coupled together. The two locomotives were reattached to the 45 cars. The inspection revealed four Locomotive Safety Standard exceptions and one Railroad Safety Appliance Standards exception to the cars. These exceptions did not contribute to the cause of the derailment.

The initial car to derail had two horizontal marks on the wheel tread, indicating that the car may have derailed due to a broken rail. The rail was 115 lb. 1958 continuous welded rail. The track was in the middle of a wet lands area. The BNSF last required FRA track inspection was performed on May 30, 2007, and no defects were noted. The last mechanized geometry inspection was on August 10, 2006, and there were no defects in the vicinity of the POD. During an ultrasonic rail test on March 23, 2007, at milepost 89.5 a crushed rail head was detected and repaired the same day. Some of the rail in the POD area was not recovered and some that was recovered was damaged due to the derailment or the cleanup process.

PROBABLE CAUSE

The first car to derail, BN 98132, had what looks to be like horizontal rail marks on the wheel tread and although no suspect rail was found, all investigative indicators lead to a broken rail.

The probable cause of the derailment, as determined by an FRA investigation, was a broken rail.