



***Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch***

***Accident Investigation Report
HQ-2014-20***

***Union Pacific Railroad Company (UP)
Belden, CA
November 25, 2014***

Note that 49 U.S.C. §20903 provides that no part of an accident or incident report, including this one, 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.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 Union Pacific Railroad Company	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 1114RS024
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GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance Union Pacific Railroad Company	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 1114RS024
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 11/25/2014	4. Time of Accident/Incident 2:05 AM
5. Type of Accident/Incident Derailment		
6. Cars Carrying HAZMAT 0	7. HAZMAT Cars Damaged/Derailed 0	8. Cars Releasing HAZMAT 0
		9. People Evacuated 0
10. Subdivision Canyon		
11. Nearest City/Town Belden	12. Milepost (to nearest tenth)	13. State Abbr. CA
		14. County PLUMAS
15. Temperature (F) 35 °F	16. Visibility Dark	17. Weather Cloudy
18. Type of Track Main		
19. Track Name/Number Main	20. FRA Track Class Freight Trains-25, Passenger Trains-30	21. Annual Track Density (gross tons in millions) 30.7
		22. Time Table Direction West

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train				2. Was Equipment Attended? Yes		3. Train Number/Symbol GSG5TR-20								
4. Speed (recorded speed, if available) R - Recorded E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 14394		6a. Remotely Controlled Locomotive? 0 = Not a remotely controlled operation 1 = Remote control portable transmitter 2 = Remote control tower operation 3 = Remote control portable transmitter - more than one remote control transmitter				Code 0					
6. Type of Territory Signalization: Signaled Method of Operation/Authority for Movement: Supplemental/Adjunct Codes:														
7. Principal Car/Unit		a. Initial and Number	b. Position in Train	c. Loaded (yes/no)	8. 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.)		UP94301	36	yes			0	0						
(2) Causing (if mechanical, cause reported)		UP94301	36	yes	9. Was this consist transporting passengers?		No							
10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)		a. Head End	Mid Train		Rear End		11. Cars (Include EMU, DMU, and Cab Car Locomotives.)		Loaded		Empty			
			b. Manual	c. Remote	d. Manual	e. Remote			a. Freight	b. Pass.	c. Freight	d. Pass.	e. Caboose	
(1) Total in Train		2	0	0	0	1	(1) Total in Equipment Consist		102	0	0	0	0	
(2) Total Derailed		0	0	0	0	0	(2) Total Derailed		12	0	0	0	0	
12. Equipment Damage This Consist 640049			13. Track, Signal, Way & Structure Damage 85768											
14. Primary Cause Code T207 - Broken Rail - Detail fracture from shelling or head check														
15. Contributing Cause Code T207 - Broken Rail - Detail fracture from shelling or head check														
Number of Crew Members							Length of Time on Duty							
16. Engineers/Operators		17. Firemen		18. Conductors		19. Brakemen		20. Engineer/Operator			21. Conductor			
2		0		1		0		Hrs: 3 Mins: 20			Hrs: 3 Mins: 20			
Casualties to:		22. Railroad Employees		23. Train Passengers		24. Others		25. EOT Device?			26. Was EOT Device Properly Armed?			
Fatal		0		0		0		Yes			Yes			
Nonfatal		0		0		0		27. Caboose Occupied by Crew?			N/A			
28. Latitude 40.008231000				29. Longitude -121.188422000										

CROSSING INFORMATION

Highway User Involved		Rail Equipment Involved	
1. Type		5. Equipment	
2. Vehicle Speed (<i>est. mph at impact</i>)	3. Direction (<i>geographical</i>)	6. Position of Car Unit in Train	
4. Position of Involved Highway User		7. Circumstance	
8a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials?		8b. Was there a hazardous materials release by	
8c. State here the name and quantity of the hazardous material released, if any.			
9. Type of Crossing Warning 1. Gates 4. Wig wags 7. Crossbucks 10. Flagged by crew 2. Cantilever FLS 5. Hwy. traffic signals 8. Stop signs 11. Other (<i>spec. in narr.</i>) 3. Standard FLS 6. Audible 9. Watchman 12. None		10. Signaled Crossing Warning	11. Roadway Conditions
12. Location of Warning		13. Crossing Warning Interconnected with Highway Signals	14. Crossing Illuminated by Street Lights or Special Lights
15. Highway User's Age	16. Highway User's Gender	17. Highway User Went Behind or in Front of Train and Struck or was Struck by Second Train	18. Highway User
19. Driver Passed Standing Highway Vehicle		20. View of Track Obscured by (<i>primary obstruction</i>)	
Casualties to:	Killed	Injured	21. Driver was
23. Highway-Rail Crossing Users		24. Highway Vehicle Property Damage (<i>est. dollar damage</i>)	22. Was Driver in the Vehicle?
26. Locomotive Auxiliary Lights?		25. Total Number of Vehicle Occupants (<i>including driver</i>)	
28. Locomotive Headlight Illuminated?		27. Locomotive Auxiliary Lights Operational?	
		29. Locomotive Audible Warning Sounded?	

10. Signaled Crossing Warning

- 1 - Provided minimum 20-second warning
- 2 - Alleged warning time greater than 60 seconds
- 3 - Alleged warning time less than 20 seconds
- 4 - Alleged no warning
- 5 - Confirmed warning time greater than 60 seconds
- 6 - Confirmed warning time less than 20 seconds
- 7 - Confirmed no warning
- N/A - N/A

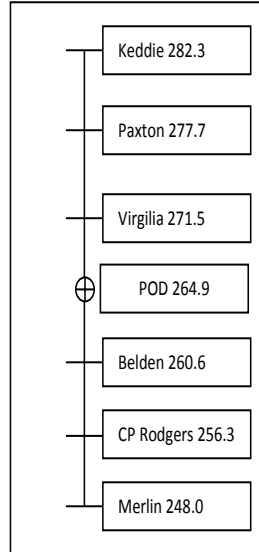
Explanation Code

- A - Insulated rail vehicle
- B - Storm/lightning damage
- C - Vandalism
- D - No power/batteries dead
- E - Devices down for repair
- F - Devices out of service
- G - Warning time greater than 60 seconds attributed to accident-involved train stopping short of the crossing, but within track circuit limits, while warning devices remain continuously active with no other in-motion train present
- H - Warning time greater than 60 seconds attributed to track circuit failure (e.g., insulated rail joint or rail bonding failure, track or ballast fouled)
- J - Warning time greater than 60 seconds attributed to other train/equipment within track circuit limits
- K - Warning time less than 20 seconds attributed to signals timing out before train's arrival at the crossing/island circuit
- L - Warning time less than 20 seconds attributed to train operating counter to track circuit design direction
- M - Warning time less than 20 seconds attributed to train speed in excess of track circuit's design speed
- N - Warning time less than 20 seconds attributed to signal system's failure to detect train approach
- O - Warning time less than 20 seconds attributed to violation of special train operating instructions
- P - No warning attributed to signal systems failure to detect the train
- R - Other cause(s). Explain in Narrative Description

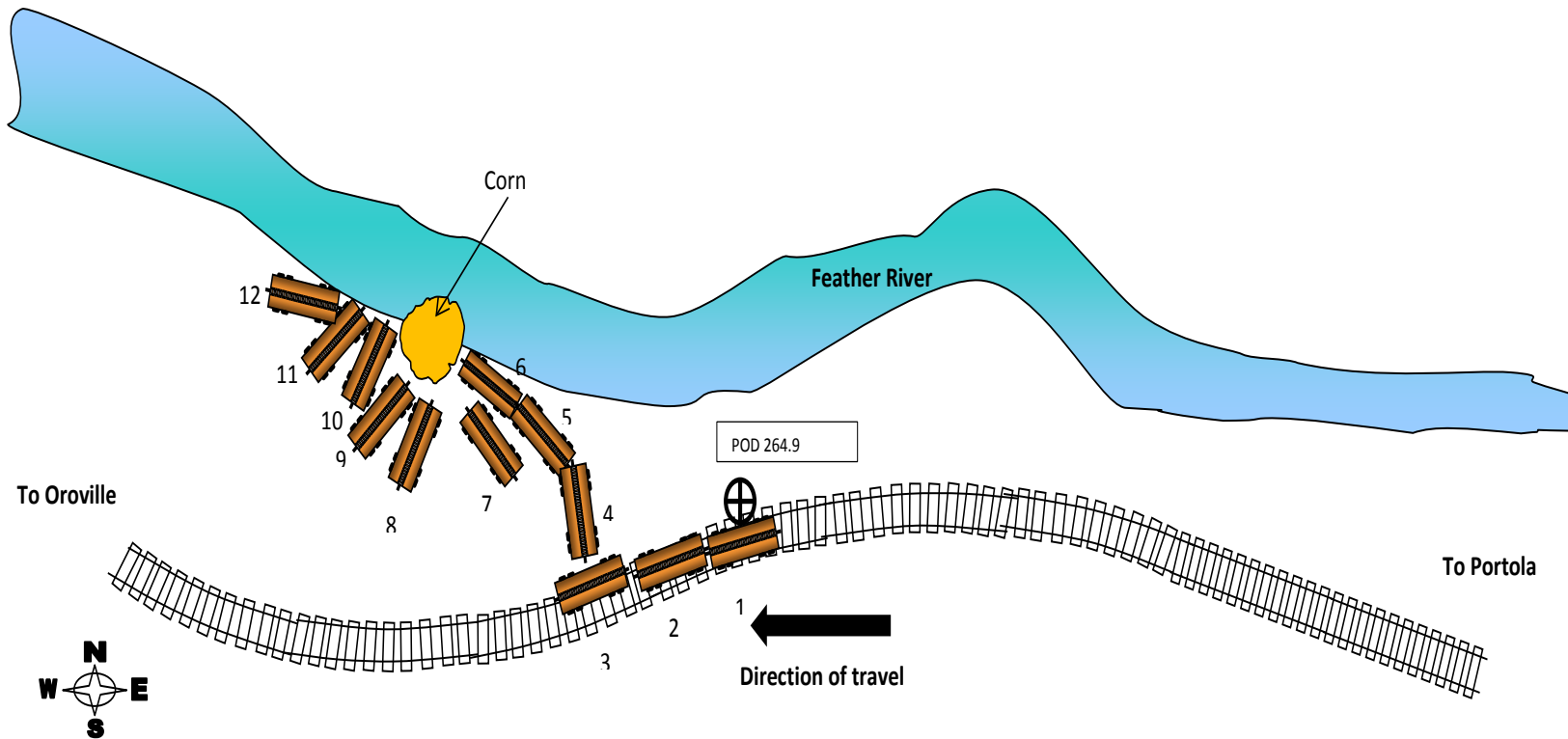
SKETCHES

Belden HQ-2014-20

1. AOK 67160
2. CHTT 720577
3. CITX 701124
4. CNW 174769
5. UP 92509
6. CMO 21215
7. UP 221401
8. CTRN 100366
9. CMO 21687
10. CTRN 100030
11. CHTT 720905
12. UP 93401



Highway 70



SYNOPSIS

Synopsis

On Tuesday, November 25, 2014, at approximately 2:05 a.m. PST, a westbound Union Pacific Railroad (UP) freight train GSG5TR-20 traveling at a recorded speed of 23 miles per hour (mph) derailed 12 hopper cars of feed corn at milepost (MP) 264.9 on single main track about 4 miles east of Belden, California. The accident occurred on UP's Roseville Service Unit, Canyon Subdivision. Movements in this part of the railroad are under a Traffic Control System (TCS) operated by a UP dispatcher located in Omaha, Nebraska.

The train consisted of two head-end locomotives and one distributed power unit (DPU) at the rear and 102 loaded hopper cars of feed corn, weighed approximately 14,394 tons, and was 6,337 feet in length. The train originated in North Platte, Nebraska, and its destination was Stockton, California.

The weather at the time of the accident was dark and cloudy with a temperature of 35 degrees Fahrenheit.

Equipment damage was estimated at \$640,049 and track damage at \$85,768. There was no damage to the signal system or structures.

The probable cause of the derailment was a broken rail, detailed fracture from shelling or head-check.

NARRATIVE

Circumstances Prior to the Accident

For the purpose of this report, timetable directions will be used.

Train #1 - Union Pacific Train GSG5TR-20

The crew of westbound UP train GSG5TR-20, consisting of a locomotive engineer, a pilot and a conductor, reported for duty at 10:45 p.m. PST on November 24, 2014, at their away from home terminal in Portola, California. The engineer, pilot and conductor had the statutory off-duty time prior to reporting for duty. Their assigned train was made up of two leading locomotives and one DPU at the rear, 102 loads, 14,394 tons, 6,337 feet in length, and was scheduled to travel between Portola and Stockton, California.

After reporting for duty, the conductor and engineer reviewed their track warrants and consist, updated notices and held a job briefing to discuss any and all pertinent information affecting the movement of their train. After their job briefing, they relieved the inbound crew and boarded their train positioned outside of the Portola Yard Office.

They performed a Class 2 set and release air brake test and departed Portola under signal indication at approximately 11:55 p.m. They traveled on the UP Canyon Subdivision heading timetable west. All crew members stated that their train held the main track for approximately 57 miles from their originating station to the accident scene with no switching work performed while en route.

The pilot was seated at the controls on the west side of the leading locomotive, and the conductor and engineer were sitting on the east side of the leading locomotive. The conductor stated that he was observing signals and writing the aspect of those signals on his signal awareness form. The engineer was observing the pilot operating the train.

The pilot stated that he was in dynamic braking and traveling at a recorded speed of 23 mph and had recently activated his whistle for a private road at-grade crossing. All crew members said the train was handling normally with no exceptions.

The train was on a descending 1 percent grade, and the pilot had a minimum set of air 6-8 lbs. operating the dynamic brakes at throttle 3 position. The head of the train was on tangent track and had just traversed the Rich Bar private at-grade crossing when the train experienced an undesired application of the brakes and came to a smooth stop.

The Accident

At approximately 2:05 a.m. PST, on November 25, 2014, the train went into undesired emergency (UDE) west of MP 264.9. Based on the nature of the stop, the crew initially thought they had either broken an air hose connection or a knuckle was broken.

The conductor donned his personal protective equipment and walked back to the site and discovered the railcars behind the 35th car were missing and from his vantage point, were down the embankment towards the Feather River. At approximately 2:30 a.m., one of the crew members called the train dispatcher to report the derailment. The conductor obtained the car numbers for the last car on the head portion and the lead car on the rear portion. He then secured those cars. The crew then took the head portion of the train to Pulga, a siding west of the Rich Bar crossing to secure it. They tied down the locomotives and about 20 cars and performed a securement release test to ensure the train was secured.

Twelve cars, lines 36 through 47 from the head end of the train, derailed. Nine of the 12 derailed cars rolled down the embankment towards the Feather River. One car was upright, and two cars were leaned on their side. At least one car released a quantity of feed corn into the river. The train derailed on a 2-degree, 22-minute curve. The superelevation on the curve was 3/4 of an inch. This track is listed in the timetable as Class 2 with a maximum speed of 25 mph for freight trains.

There were no injuries to the crew and no release of hazardous materials in the accident. There were no adverse impacts to roadways. However, some feed corn breached the Feather River, which raised concerns for wildlife from California's Fish and Game Department.

Post-Accident Investigation

Following the accident, UP managers and railroad workers, inspectors from the Federal Railroad Administration (FRA) and the California Public Utilities Commission, and personnel from Placer County Sheriff's Department, Plumas County, the California Department of Fish and Game, and the California Department of Forestry reported to the derailment site.

Accident investigators discovered a section of broken rail at MP 264.9, and identified its location as the site and cause of the derailment. They determined an approximately 10 percent detail fracture had failed under dynamic train forces.

FRA's investigation into the accident included interviews of the train crew, and their statements were substantiated by a review of event recorder data and dispatcher logs. The investigators also reviewed track inspection records and equipment maintenance inspection records, as well as crew training, testing and certification records.

As the investigation progressed, the conductor stated the train had passed a clear signal at MP 264.5, indicating the train could proceed at timetable speed. His signal awareness form confirmed a clear signal at MP 264.5. The signal aspect was also verified by FRA investigators.

A review of the locomotive event recorder download indicates that train handling was not a contributing factor to the accident.

Federal post-accident toxicological testing did not meet FRA's criteria. UP conducted company drug and alcohol testing on the train crew.

Analysis and Conclusions

Analysis-Track

FRA reviewed track inspection records for the UP Canyon Subdivision derailment location and noted no exceptions. UP's last inspection of this track was conducted on November 21, 2014 by a UP track supervisor. No FRA defective conditions were noted during this inspection. Track measurements were taken ahead of and after the point of derailment.

The track measurements obtained were as follows:

- Rail size 133RE, roll year-1985, by KRUPP. Rail was on concrete ties with Safe Lock One Fasteners.
- Ballast, Type D, size 2 inches plus, depth under tie 8 inches, width beyond tie is 18 inches, distance below top of tie is 10 inches, and ballast section in cribs is full.
- Subgrade soil type is rock.
- There was no instability evidenced by moisture; drainage and ditching were described as good. There was no evidence of previous slurry injection, and the slope stability was described as good.
- The point of derailment (POD) occurred in a spiral of a 2-degree, 22-minute curve between MPs 264.98 and 264.96.

The 15 track geometry measurement stations before the POD measured:

- Alignment Midordinate at 62-foot chord, measured between 2 ¼ inches and 2 ¾ inches.
- Track gage measurements, measured between 56 5/8 inches and 56 ¾ inches.
- Unloaded cross level measured between 3/16 and 7/8 inch.
- Loaded cross level measured between 3/16 inch and 7/8 inch.

- Loaded cross level measured between 3/16 inch and 7/8 inch.
- Calculated warp measured with a 62-foot chord measured between 1/16 inch and 7/16 inch.
- Calculated load measured with a 31-foot chord measured between 1/16 inch and 3/8 inch.

A Track Geometry Survey conducted on December 4, 2014 by the Federal Geometry Car DOTX 220 detected no exceptions on the part of the railroad.

The location of this rail defect was situated in an area of four previously identified defective rail cutouts, which were repaired by field welds. Because these defective conditions were similar in nature, UP replaced the rail at this location and is in the process of replacing the rail between MP 259.99 and MP 273.0 with 141 lbs. rail.

Conclusions-Track

The post-accident track measurements were within FRA's Track Safety Standards.

As a result of this derailment:

1. UP will test the rail for defects six times per year versus one time per year as required by FRA.
2. When the rail wear (head loss) reaches one-half inch, that segment of rail will be in a program for replacement.
3. UP is working on a rail project that will eliminate rail older than the year 2000. This would remove all the 133 lbs. rail in the Feather River Canyon to be replaced by 141 lbs. rail.
4. Districts in curve territories, including the Canyon, Donner Pass and Tehachapi, will be overseen by a UP assistant manager of track maintenance and an additional five people. Crude oil is transported over these locations. The plan intends to add 70 people over a five-year period.

Analysis-Operations

A review of all available records of tests, inspections and certifications of the train crew showed they were in compliance with Federal rail safety regulations. The records included operating rules training and testing, efficiency testing, hours of service, engineer certification, rules examinations and other training records.

Conclusions-Operations

FRA's review of all the data received indicated the train was in compliance with all applicable Federal Regulations and UP's Operating & Safety Rules. Based on its investigation, FRA determined that train handling operations and the actions of the crew were not contributing factors to the accident.

Analysis-Signal and Train Control

FRA conducted post-accident tests and examined test and maintenance records. Signal and Centralized Traffic Control log events downloaded found that the signal system functioned as intended before the derailment. No defects were observed or noted, and the signal system was in compliance with applicable Federal regulations.

Conclusions-Signal and Train Control

Based on its investigation, FRA determined that no signal or train control issues were a contributing factor to the accident.

Analysis-Mechanical

FRA reviewed the locomotive event recorder downloads, which indicated Train #1 was operating at a speed of 23 miles per hour at the time of the derailment.

The following cars derailed:

UP Train #1 GSG5TR-20

UP 93401
CHTT 720905
CTRN 100030
CMO 21687
CTRN 100366
UP 221401
CMO 21215
UP 92509
CNW 174769
CITX 701124
CHTT 720577
AOK 67160

Conclusions-Mechanical

Based on its investigation, FRA determined that no mechanical issues were a contributing factor to the accident.

Analysis-Fatigue

FRA uses an overall effective rate of 77.5 percent as the baseline for fatigue analysis, which is equivalent to blood alcohol content (BAC) of 0.05. At or above this baseline, FRA does not consider fatigue as probable for an employee. Software sleep settings vary according to information obtained from each employee. If an employee does not provide sleep information, FRA uses the default software settings.

FRA obtained fatigue-related information, including a 10-day work history, for the crew members assigned to Train #1:

(E1) Locomotive engineer assigned to Train #1:

Sleep Setting Excellent
Overall Effectiveness 71.47
Lapse Index 6.92
Reaction Time 139.91 percent
Chronic Sleep Debt 7.00
Hours of Continuous Wakefulness 5.37
Time of Day 2:05 a.m.
BAC Equivalent > 0.08

Conclusion: Fatigue was probable for the engineer.

(C1) Conductor assigned to Train 1:

Sleep Setting Excellent
Overall Effectiveness 69.25
Lapse Index 5.58
Reaction Time 144.4 percent
Chronic Sleep Debt 7.23

Chronic Sleep Debt 7.23
Hours of Continuous Wakefulness 4.85
Time of Day 2:05 a.m.
BAC Equivalent > 0.08

Conclusion: Fatigue was probable for the conductor.

(E2) Engineer Pilot assigned to Train #1

Sleep Setting Excellent
Overall Effectiveness 70.68
Lapse Index 5.08
Reaction Time 141.49 percent
Chronic Sleep Debt 7.35
Hours of Continuous Wakefulness 4.02
Time of Day 2:05 a.m.
BAC Equivalent > 0.08

Conclusion: Fatigue was probable for the engineer pilot.

Conclusions – Fatigue

FRA concluded fatigue was probable for the crew assigned to Train #1 but was not a contributing factor in the derailment. This accident did not meet criteria for FRA post-accident drug and alcohol testing.

Overall Conclusions

No non-complying FRA defects were found in operating, mechanical, track or signal and train control.

Probable Cause and Contributing Factors

FRA determined the probable cause of the derailment was a broken rail, detailed fracture from shelling or head check.