Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch

Accident Investigation Report
HQ-2019-1359

Union Pacific Railroad Company (UP) Derailment
Hillsboro, Texas
August 19, 2019

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.

SYNOPSIS

On August 19, 2019, at approximately 3:21 p.m., CDT, a Union Pacific Railroad Company (UP) southbound freight train, MFWSA-19, with 129 loads, 19 empties and 5 locomotives, moving at a recorded speed of 48 mph, derailed 32 cars at Milepost (MP) 199.4.

The derailment occurred on the UP's Fort Worth Subdivision, approximately 3.5 miles north of Hillsboro, in Hill County, Texas. The Fort Worth Subdivision is dispatched under Centralized Traffic Control (CTC). Timetable direction for the Fort Worth Subdivision is south. Timetable direction will be used throughout this report. Per UP's Dallas/Fort Worth Area Timetable No. 5, effective September 28, 2015, the maximum authorized speed for the Fort Worth Subdivision is 60 mph. The maximum authorized speed for Train 1 was 50 mph – due to speed restrictions (not associated with defects) on two entrained cars.

No injuries to the crew or to the public occurred and no hazardous materials were involved.

UP reported damages of $1,594,553, which included $162,239 in track and $1,432,314 in equipment damages.

At the time of the derailment it was daylight, clear and the temperature was 98º F.

The Federal Railroad Administration determined the probable cause to be H504 Buffing or slack action excessive, train make-up.

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2019-1359

TRAIN SUMMARY

1. Name of Railroad Operating Train #1	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
Union Pacific Railroad Company	UP	0819TO029

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
Union Pacific Railroad Company	UP	0819TO029

2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident	4. Time of Accident/Incident
	8/19/2019	3:21 PM

5. Type of Accident/Incident
Derailment

6. Cars Carrying HAZMAT	7. HAZMAT Cars Damaged/Derailed	8. Cars Releasing HAZMAT	9. People Evacuated	10. Subdivision
0	0	0	0	UNION PACIFIC RAILROAD C

11. Nearest City/Town	12. Milepost *(to nearest tenth)*	13. State Abbr.	14. County
Hillsboro	199.4	TX	HILL

15. Temperature (F)	16. Visibility	17. Weather	18. Type of Track
98 ˚F	Day	Clear	Main

19. Track Name/Number	20. FRA Track Class	21. Annual Track Density *(gross tons in millions)*	22. Time Table Direction
Single Main	Freight Trains-60, Passenger Trains-80	22.5	South

23. PTC Preventable	24. Primary Cause Code	25. Contributing Cause Code(s)
No	[H504] Buffing or slack action excessi	

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OPERATING TRAIN #1

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	MFWSA-19

4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	5. Trailing Tons (gross excluding power units)	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
48.0 MPH	R	17817		0

6. Type of Territory

Signalization: Signaled

Method of Operation/Authority for Movement: Direct Train Control

Supplemental/Adjunct Codes: Q

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.)*	WWUX4757	32	yes		0	0
(2) Causing *(if mechanical, cause reported)*				9. Was this consist transporting passengers?		No

10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End e. Remote	11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	3	0	0	0	2	(1) Total in Equipment Consist	129	0	19	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	20	0	12	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
1432314	162239

Number of Crew Members				Length of Time on Duty	
14. Engineers/Operators	15. Firemen	16. Conductors	17. Brakemen	18. Engineer/Operator	19. Conductor
2	0	1	0	Hrs: 4 Mins: 50	Hrs: 4 Mins: 50

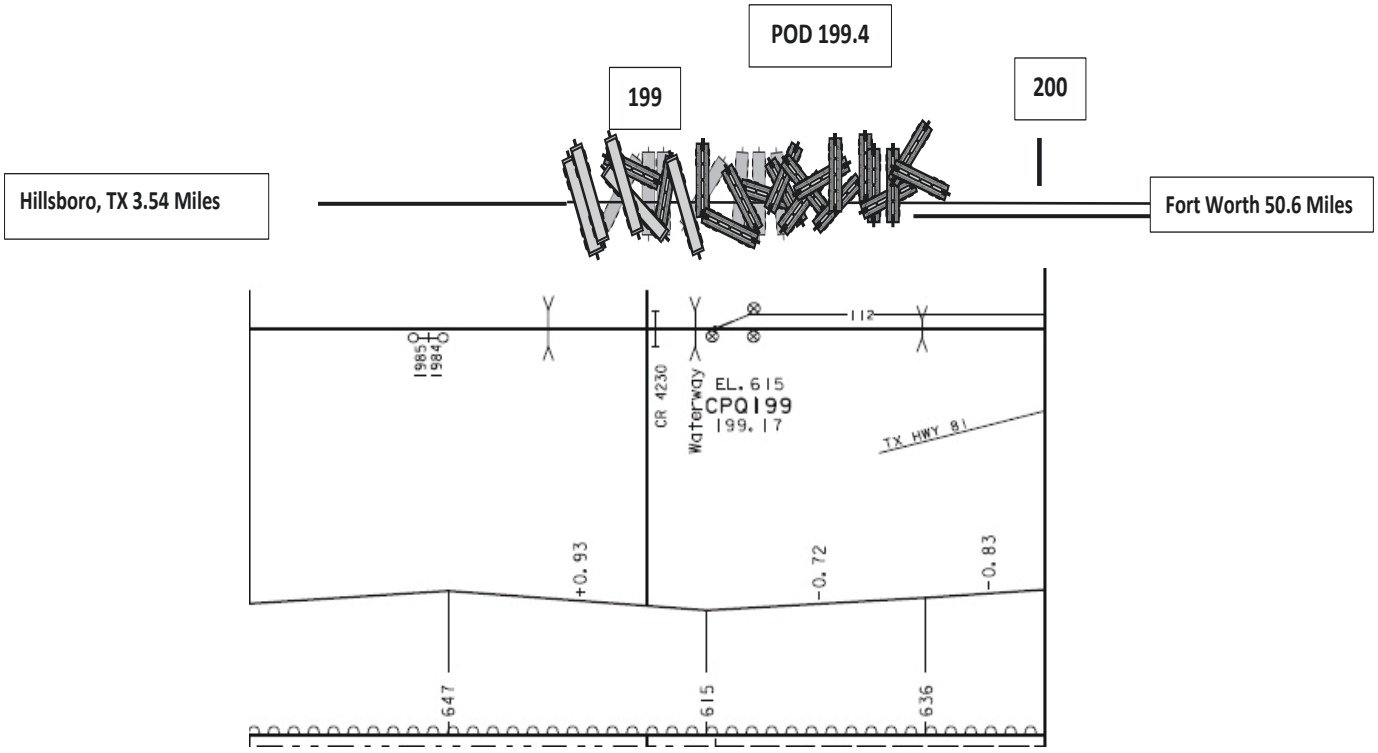
Casualties to:	20. Railroad Employees	21. Train Passengers	22. Others	23. EOT Device?	24. Was EOT Device Properly Armed?
				Yes	Yes
Fatal	0	0	0	25. Caboose Occupied by Crew?	N/A
Nonfatal	0	0	0		

26. Latitude	27. Longitude
32.056950000	-97.126147000

SKETCHES

Sketch - Sketch

UP MFWSA-19 Derailment Hillsboro, TX, August 20, 2019 **HQ-2019-1359**



Line	Car ID	Type	Location to HE	L/M	AT	AF	Line	Car ID	Type	Location to HE	L/M	AT	AF	Line	Car ID	Type	Location to HE	L/M	AT	AF
49	UP 961505	B	100	L	6079	2465	39	ARMN 170757	B	110	L	5050	1860	29	WWUX4757	H	120	L	3800	1334
50	UP 961253	B	99	L	6130	2534	40	WAMX 475146	H	109	L	5178	1920	30	AOK495464	H	119	L	3926	1376
51	FTTX 971326	F	98	E	6165	2629	41	WAMX 476065	H	108	L	5306	1980	31	TILX328107	H	118	L	4069	1418
52	FTTX 971071	F	97	E	6200	2723	42	WAMX 475628	H	107	L	5433	2040	32	TILX337062	H	117	L	4212	1460
53	FTTX 940773	F	96	E	6231	2817	43	SRIX 45348	H	106	L	5561	2095	33	CRDX23548	H	116	L	4355	1502
54	FTTX 993322	F	95	E	6266	2912	44	WAMX 178673	H	105	L	5689	2153	34	AOKX481515	H	115	L	4498	1544
55	FTTX 963245	F	94	E	6296	3006	45	FURX 829464	H	104	L	5816	2213	35	AOKX494386	H	114	L	4641	1586
56	FTTX 963408	F	93	E	6326	3100	46	CW 6075	F	103	L	5947	2285	36	CEFX12160	H	113	E	4672	1644
57	FTTX 961337	F	92	E	6360	3194	47	WFRX 409611	H	102	E	5975	2327	37	TTZX 863528	F	112	L	4794	1724
58	FTTX 1617	F	91	E	6389	3288	48	NKCR 65524	B	101	L	6027	2396	38	KCS 720217	G	111	L	4926	1777
59	FTTX 963882	F	90	E	6417	3382														
60	FTTX 972726	F	89	E	6450	3476														

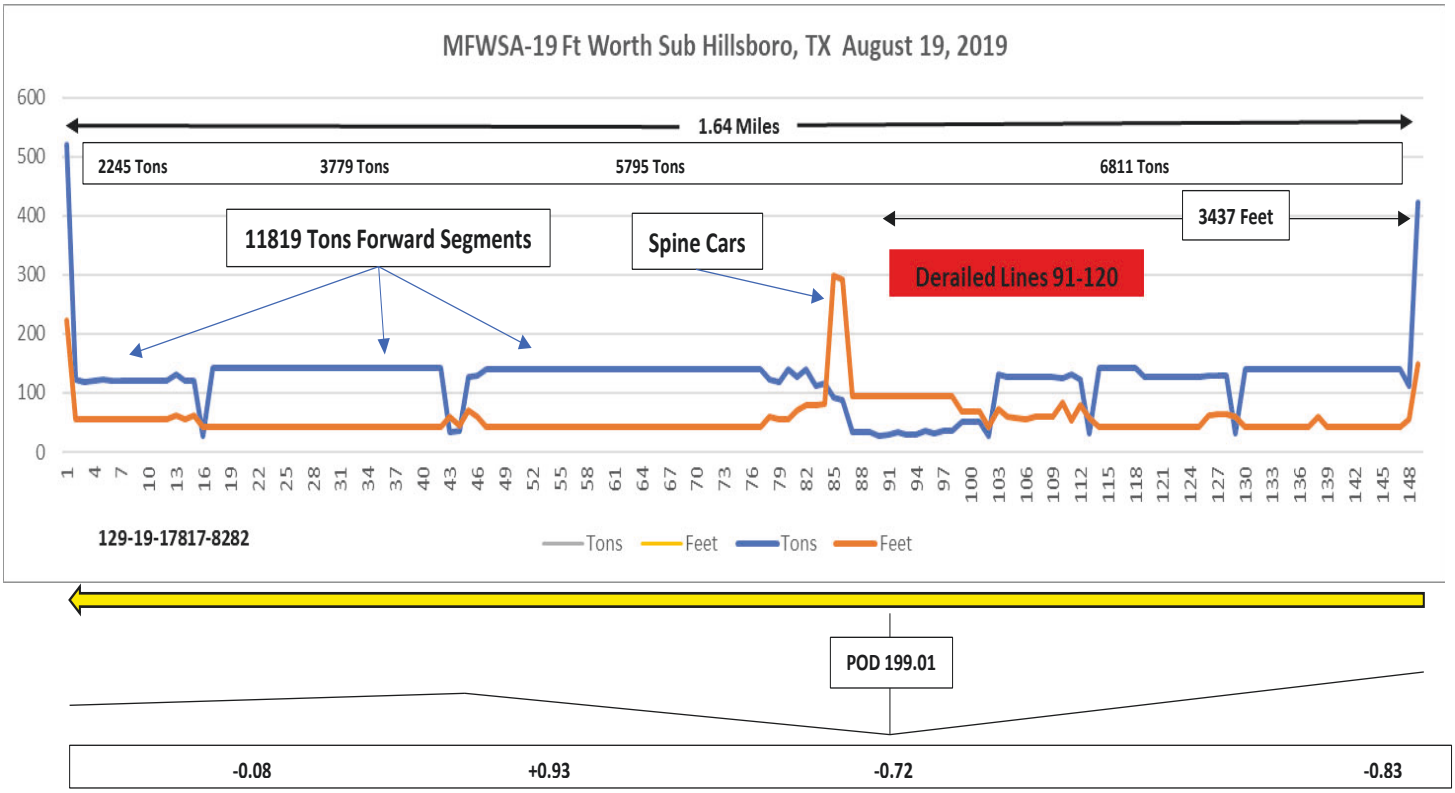
NOT TO SCALE

NORTH

SKETCHES

Sketch - MFWSA Analysis

Train Make-Up Analysis *HQ-2019-1359*



UP 8758 WRE RECORDER Data Analysis – 1 Minute Graph Data

SPEED @ MP 199 = App 51 MPH due to run-in push from rear.

No Air Brakes Applied

Throttle = T2, T1, IDLE

Dynamic Brake Set-up @ MP 199

Dynamic Brake % @ MP 199 = 45-50%

DPU Rear Throttle = MP 200 T4, MP 199 T5

Hypothesis: The H/E was fenced from the Rear DPU's – with the H/E in Dynamic Brake / the rear pushing T4-5 – as the heavier H/E started uphill – the rear ran into a wall creating excessive buff forces creating vertical lift in the empty flat cars. The forces would certainly be well beyond the acceptable range of 160K Draft and 105K Buff forces.

NARRATIVE

Circumstances Prior to the Accident

Union Pacific Railroad Company (UP) freight train MFWSA-19 (Train 1) was a mixed-freight train, consisting of 3 locomotives on the head end and 2 on the rear (DPU), 129 loads with 19 empties. Train 1 was 8,282 feet in length and had 17,817 trailing tons. All required tests and inspections were completed in Fort Worth, Texas, on August 19, 2019, at 9:10 a.m., CDT, with no exceptions taken.

A crew, consisting of an engineer, conductor, and student engineer was placed on duty on August 19, 2019, at 10:30 a.m., CDT, at Fort Worth, Texas. Fort Worth was the home terminal for all employees involved, and all employees involved had received more than the statutory time off prior to being called for duty.

The derailment occurred on the UP's Fort Worth Subdivision, approximately 3.5 miles north of Hillsboro, in Hill County, Texas. The Fort Worth Subdivision is dispatched under Centralized Traffic Control (CTC). Timetable direction for the Fort Worth Subdivision is south. Timetable direction will be used throughout this report. Per UP's Dallas/Fort Worth Area Timetable No. 5, effective September 28, 2015, the maximum authorized speed for the Fort Worth Subdivision is 60 mph. The maximum authorized speed for Train 1 was 50 mph – due to speed restrictions (not associated with defects) on two entrained cars.

Traveling south on the Fort Worth Subdivision, approaching the point of derailment (POD), the southbound train traversed approximately 800 feet of tangent track before entering a 1-degree, 43-minute left-hand curve that measures approximately 1,212 feet in-length, Milepost (MP) 201.34 to MP 201.17, on an ascending track grade of 0.93 percent. The train then exited the curve and traversed approximately 3,802 feet of tangent track, MP 201.17 to MP 199.40, with a descending track grade of -0.83 percent. The investigation determined the POD to be at MP 199.40, where the train was traversing a long segment of tangent track.

Train 1 was operating southbound on the single main track at a recorded speed of 48 mph. The Engineer was seated at the controls on the right side of the leading locomotive, and the Conductor and Student Engineer were seated on the left side. The crew did not report any issues with the train prior to the derailment, and the train consist had not been changed.

At the time of the derailment it was daylight, clear and the temperature was 98º F.

The Accident

The Engineer was operating Train 1 with dynamic brakes on the head-end, and power pushing on the rear DPU of the train. No air brakes were applied. The train was moving south at a recorded speed of 48 mph when an undesired emergency brake application (UDE) occurred at 3:21 p.m., CDT. The UDE was caused when lines 29 (WWUX 4757) - 60 (FTTX 972726) of the train list derailed -- totaling 32 cars (20 loads / 12 empties) at MP 199.4. No injuries to the crew or to the public occurred and no hazardous materials were involved.

UP reported damages of $1,594,553, which included $162,239 in track and $1,432,314 in equipment damages.

Post-Accident Investigation

The accident was investigated by the Federal Railroad Administration (FRA) in conjunction with UP. The

following analysis and conclusions is a summary of the FRA investigation.

Analysis & Conclusions

Analysis Toxicology: This accident met the minimum requirements of Title 49 Code of Federal Regulations (CFR) §219, and toxicological testing was performed on both crew members of Train 1. FRA Post-Accident Forensic Toxicology Result Reports indicate the three employees tested each had negative test results.

Conclusion: FRA determined that neither drugs nor alcohol contributed to the cause or severity of the accident.

Analysis – Operating Practices: The Engineer and Conductor were found to be compliant with all applicable FRA Regulations, railroad operating and train-handling rule tolerances and requirements. The relevant event and video recorder data was downloaded by the UP-Manager of Operating Practices and analyzed by FRA, and UP officials with no exceptions noted.

Conclusion: FRA determined operating practices did not contribute to the cause or severity of the derailment.

Analysis – Computer Simulations: UP ran multiple computer simulations to test the train make-up over the profile approaching and into the derailment area. After running multiple simulations from 160K to 102K, using both conventional and distributed powered (DPU) with the train's current make-up, buff forces were always present at the derailment site -- when the rear end crests MP 200. However, running at 45 mph with dynamics position 2 - 4 on the head-end and throttle 1 on the rear (with minimal air set) allows reaching MP 198 without a major buff force event. Buff and draft forces range between 250K and 460K with major spikes with the DPU still in dynamic 2 at MP 200. Lowering the speed to 35 mph or 40 mph through this area will reduce the buff and draft forces. Keep in mind, the territory lends naturally to speed gain throughout without having to slow the train's max speed using air and dynamics. This will cut the entrain forces, both draft and buff by half (draft = 160K / buff = 105K).

The Accident Group in Omaha, Nebraska, will continue running simulations relative to the accident location to determine if additional restrictions are warranted. A Superintendent's Bulletin was issued modifying train-handling procedures to mitigate train make-up in train forces across this territory.

Conclusion: FRA, in conjunction with UP Management, has determined that in-train forces due to the train's make-up was the primary cause of the derailment. (Cause code H504)

Analysis – Mechanical: The derailment involved consist lines 29-60 (inclusive) or 32 cars with all cars turned over or jackknifed. No exceptions were noted by the FRA, or the UP Mechanical Department on any of the derailed cars following inspection.

Conclusion: FRA determined the mechanical condition of the equipment did not contribute to the cause or severity of the derailment.

Analysis – Track & Structures: The UP Fort Worth Subdivision consists of 150.20 miles of main track with 13 passing sidings. The Fort Worth Subdivision extends timetable south between South Tower 55 / Fort Worth, Texas, (MP 250.48) to Valley Junction / Hearne, Texas (MP 100.30). Trains and/or equipment operating on the Fort Worth Subdivision utilize Centralized Traffic Control (CTC) as listed in Special Instructions SI-01; Main Track Authority. Approximately 18 trains traverse the Fort Worth Subdivision daily (average 6,570 trains on a yearly basis). UP EFMS - 2018 Tonnage Reports list the tonnage on the Fort Worth Subdivision (segment 7555-0 – MP 197.13 to MP 243.27) to be 50.59 million

gross tons / MGT.
Traveling timetable south on the Fort Worth Subdivision, prior to POD at North Hill Siding Switch, the southbound train traversed approximately 800 feet of tangent track before entering a 1°, 43-minute left-hand curve that measured approximately 1,212 feet in-length (MP 201.34 to MP 201.17), on an ascending track grade of 0.93 percent. The train then exited the curve and traversed approximately 3,802 feet of tangent (straight) track (MP 201.17 to MP 199.40) with a descending track grade of -0.83 percent. The investigation / investigators determined the point of derailment (POD) to be at MP 199.40, where the train was traversing a long segment of tangent track. Three locomotives, 28 cars continued south over the point of derailment, with the locomotives coming to a stop at MP 198.42 and/or 5,174 feet south of the point of derailment.
Note: The description noted within this report was obtained by inspecting the track from MP 201.45 to MP 199.17 in a southward direction, working toward the derailment site. From MP 199.35 headed south to MP 199.21, the track structure was destroyed by the resulting derailment and was removed to help aid the car removal and repair efforts.
The Fort Worth Subdivision's track structure is constructed with 9-inch by 7-inch standard timber crossties measuring 8-foot 6-inch long and spaced on 24-inch centers (nominal). The running rail section consisted of 133-pound RE continuous welded rail (CWR) manufactured in 1991. The running rails were fastened to the crossties through double shoulder tie plates with standard cut spikes to secure the track gauge. The spike pattern consisted of one rail hold spike and one anchor holding spike on the field side of the rail and two rail holding spikes in the gauge of the rail. Every other crosstie was box anchored with single and double shoulder anchors / anti-creepers that assist in restraining longitudinal movement of the continuous welded rail. The track structure was supported with AREMA No. 4 granite rock ballast.
Investigators measured out 15 track geometry stations at 15.6 feet intervals in the undisturbed track to document and show the actual track geometry measurements prior to the accident / derailment. Measurement stations were laid out from MP 199.35 (+232.5-feet headed north). Track gauge, alignment, cross-level and profile measurements were recorded at every 15.6-foot station. Track gauge measurements ranged between 56.25" (56 ¼") to 56.75" (56 3/4") at the measured stations.
Investigators noted no lateral track movement, good crossties with a uniform spike and anchor patterns. Cross-level (dynamic) measurements ranged between .25" (1/4") to .50" (1/2") at the measured stations. Alignment measurements ranged between .0" to .125" (1/8") at the measured stations. Profile (dynamic) measurements ranged between 0.00" to .375" (3/8") on either rail at the measured stations. No longitudinal rail movement was noted along the rail base and/or anchor / anti-creeper areas.
Investigators noted that all track geometry measurements were within the engineering design range of UP's track profile / charts.
Conclusion: FRA determined track condition did not contribute to the cause or severity of the derailment.

Overall Conclusion

FRA's investigators concluded that defective track conditions (ex: Geometry, Ballast, Crossties, Rail, etc.), Operating Practices (train handling, etc.), and locomotive/car mechanical were not the primary or contributing factors to the cause of this derailment. Based on the simulations conducted by UP, train make-up was the primary cause.

Probable Cause and Contributing Factors

FRA determined the probable cause to be H504 -- Buffing or slack action excessive, train make-up.