



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

***Accident Investigation Report  
HQ-2019-1340***

***Union Pacific Railroad Company (UP) Derailment  
Stanwood, Iowa  
June 6, 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 June 6, 2019, at 4:57 a.m., CDT, Union Pacific Railroad Company (UP) eastbound train CBTOK 03 (Train 1), with 141 loads, 0 empties, weighing 20,163 tons, and 7,909 feet in length, derailed at Milepost (MP) 51.20 on the Great Lakes Service Unit/Clinton Subdivision, in Stanwood, Iowa. The train was operating in double main track territory on Main Track No. 2. The method of operation at this location is Traffic Control System (TCS), supplemented by a Positive Train Control (PTC) overlay and an Automatic Train Control (ATC) system.

UP reported \$1,832,923 in equipment damage, and \$100,800 in track and signal damage.

Weather at the time of the derailment was dark and clear, with a temperature of 66°F.

The Federal Railroad Administration (FRA) investigation determined the probable cause of the accident was H702 – Switch improperly lined.

Additionally, FRA identified contributing factors of the accident were S003 – Automatic train control system inoperative.

**TRAIN SUMMARY**

1. Name of Railroad Operating Train #1 Union Pacific Railroad Company	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 0619GL008
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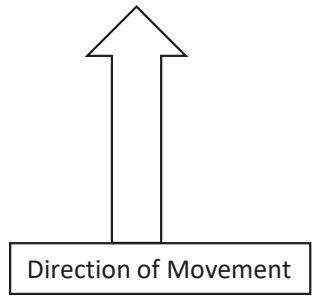
**GENERAL INFORMATION**

1. Name of Railroad or Other Entity Responsible for Track Maintenance Union Pacific Railroad Company	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 0619GL008
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 6/6/2019	4. Time of Accident/Incident 4:57 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 UNION PACIFIC RAILROAD C
11. Nearest City/Town Stanwood	12. Milepost (to nearest tenth) 51.4	13. State Abbr. IA
		14. County CEDAR
15. Temperature (F) 66 °F	16. Visibility Dawn	17. Weather Clear
		18. Type of Track Main
19. Track Name/Number Main Track No 2	20. FRA Track Class Freight Trains-60, Passenger Trains-80	21. Annual Track Density (gross tons in millions) 79.5
		22. Time Table Direction West
23. PTC Preventable No	24. Primary Cause Code [H702] Switch improperly lined	25. Contributing Cause Code(s) S003

**OPERATING TRAIN #1**

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes			3. Train Number/Symbol CBTOK03				
4. Speed (recorded speed, if available) R - Recorded 47.0 MPH E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 20163		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: <u>Signaled</u> Method of Operation/Authority for Movement: <u>Signal Indication</u> Supplemental/Adjunct Codes: <u>Q, J</u>												
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 ( <i>derailed, struck, etc.</i> )		UP7356	1					0	0			
(2) Causing ( <i>if mechanical, cause reported</i> )					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		e. Caboose	
		b. Manual	c. Remote	d. Manual	e. Remote		a. Freight	b. Pass.	c. Freight	d. Pass.		
(1) Total in Train	2	0	0	0	2	(1) Total in Equipment Consist	141	0	0	0	0	
(2) Total Derailed	2	0	0	0	0	(2) Total Derailed	35	0	0	0	0	
12. Equipment Damage This Consist 1832923		13. Track, Signal, Way & Structure Damage 100800										
Number of Crew Members						Length of Time on Duty						
14. Engineers/Operators 1		15. Firemen 0		16. Conductors 1		17. Brakemen 0		18. Engineer/Operator Hrs: 8 Mins: 27		19. Conductor Hrs: 8 Mins: 27		
Casualties to:		20. Railroad Employees		21. Train Passengers		22. Others		23. EOT Device? No		24. Was EOT Device Properly Armed? N/A		
Fatal		0		0		0		25. Caboose Occupied by Crew?		N/A		
Nonfatal		0		0		0						
26. Latitude 41.891964000				27. Longitude -91.145083000								

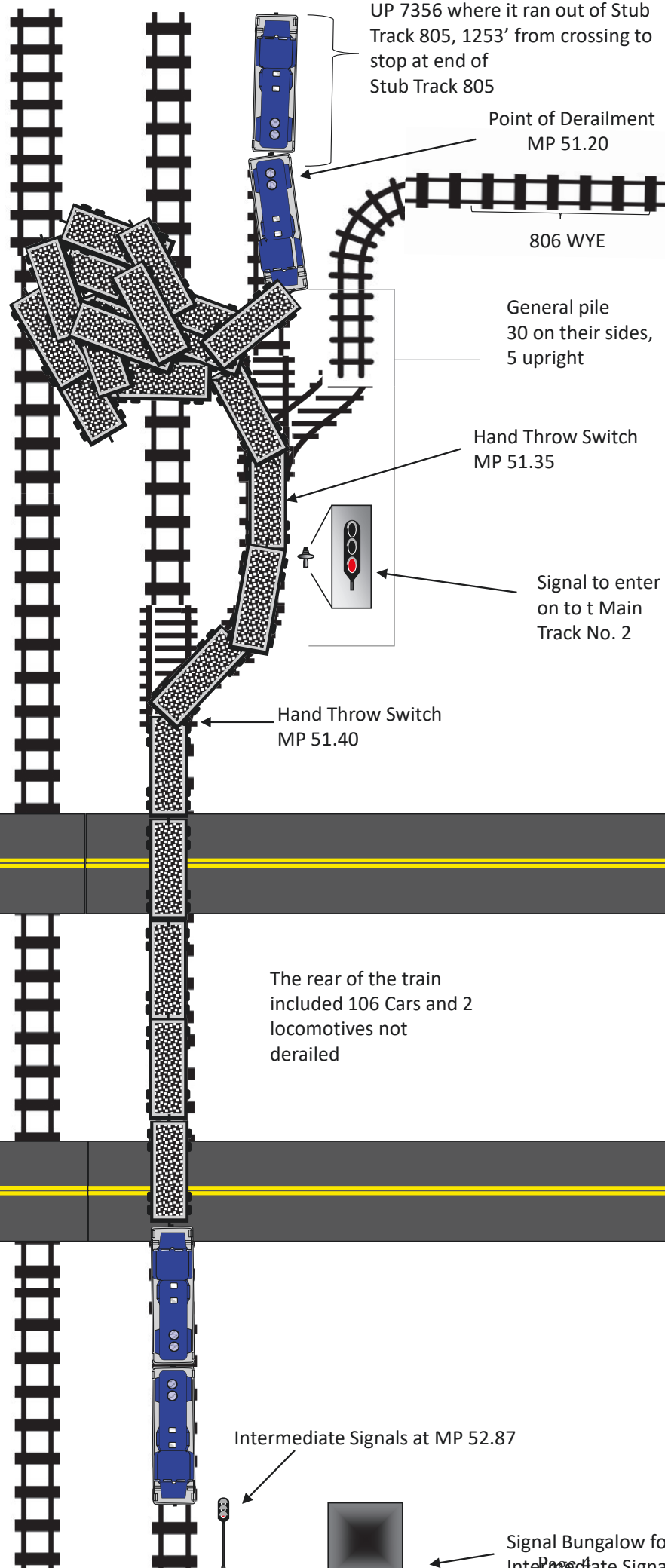
138th Street



Maple Street crossing/Track Repeater Bungalow

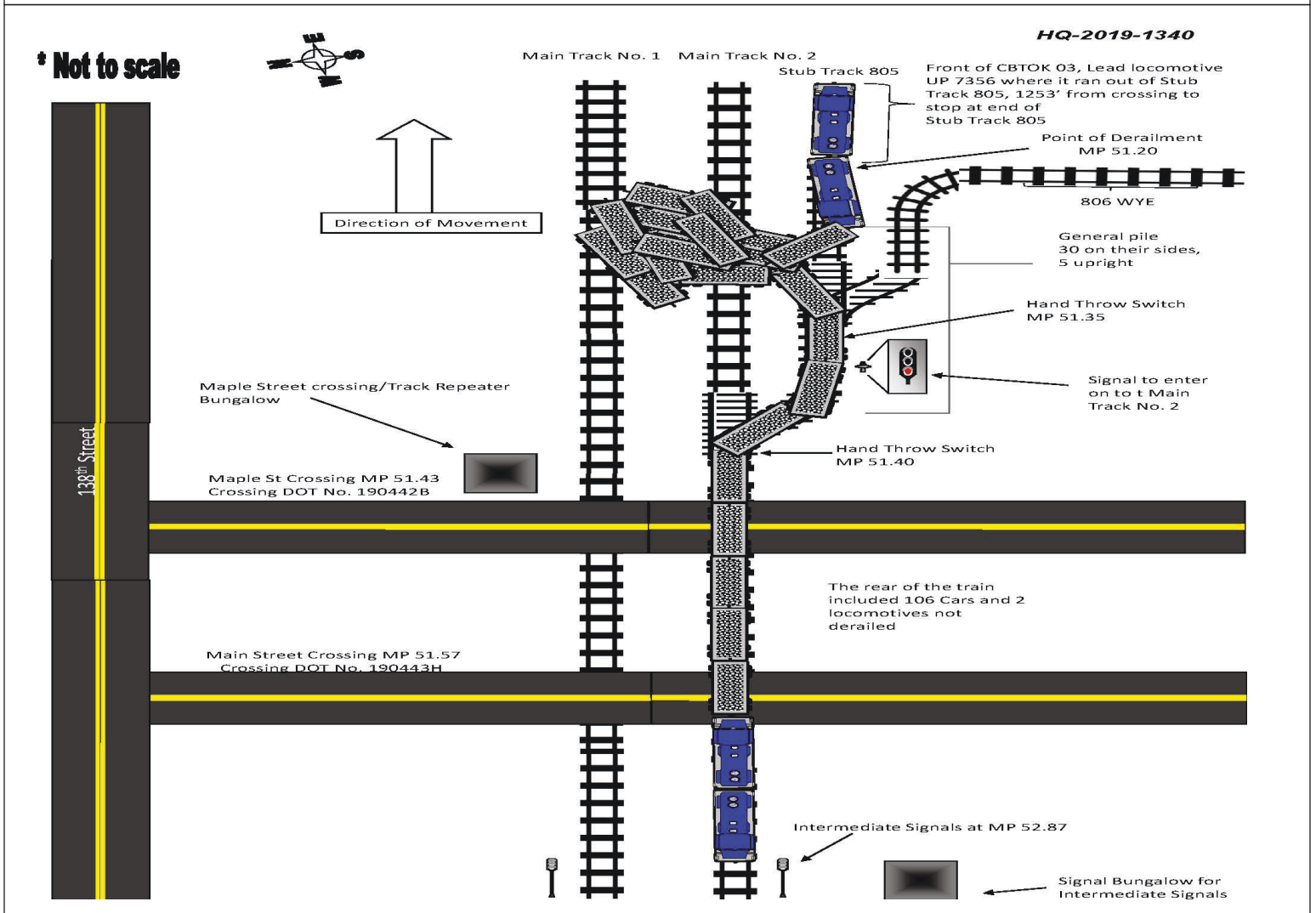
Maple St Crossing MP 51.43  
Crossing DOT No. 190442B

Main Street Crossing MP 51.57  
Crossing DOT No. 190443H



SKETCHES

Sketch - Stanwood derailment diagram-sketch (JPEG)



## NARRATIVE

**Circumstances Prior to Accident**

Union Pacific Railroad Company (UP) eastbound unit train CBTOK 03 (Train 1) consisted of 4 locomotives, 2 on the head end and 2 distributive power (DP) locomotives on the rear of the train, with 141 loads, and 0 empties. The train was 7,909 feet in length and 20,163 trailing tons. Train 1 originated at Black Thunder Mine, Wyoming, on June 3, 2019, with a destination of Oak Creek, Wisconsin. The railroad performed the regulatory required mechanical inspection and Class I air brake test by UP mechanical personnel at North Platte, Nebraska, with no exceptions noted.

The train crew consisted of a locomotive engineer and a conductor. The train crew went on duty at 8:30 p.m., CDT, on June 5, 2019, in Boone, Iowa. This was the home terminal for all crew members, and all crew members had received their regulatory statutory off-duty period prior to reporting for duty. The locomotive engineer was seated at the controls on the right side of the lead locomotive and the conductor was seated on the left side.

The accident occurred on UP's Great Lakes Service Unit, Clinton Subdivision, in Stanwood, Iowa. The Clinton Subdivision travels geographic and timetable direction west. Timetable direction will be used in this report. The area of the accident consists of two main tracks with a maximum authorized speed of 70 mph. UP System Special Instruction No. 2F required all trains that exceed 120 tons per operative brake, not to exceed 50 mph. Train 1 was operating with 143 tons per operative brake, and was therefore restricted to 50 mph. The method of operation on the Clinton Subdivision is by a Traffic Control System (TCS), supplemented by a Positive Train Control (PTC) overlay and an Automatic Train Control (ATC) system. Approaching the accident area from the west, the track is tangent with an ascending grade of 0.26 degrees.

Prior to the derailment, the Employee-in-Charge (EIC) assigned to a rail grinder was issued track and time Permit Number 27-05 on Main Track No. 1 at 3:03 a.m., CDT, on June 6, 2019, for work to occur west of Stanwood between control point (CP) A074 and CP A061. At 4:45 a.m., CDT, a second track and time Permit Number 37-78 was issued to the UP EIC for movement through the crossover at CP A061 from Main Track 1 to Main Track 2, and for movement on Main Track 2 between CP A061 and CP A050, following Train 1 with lead Locomotive No. UP 7356. A job briefing was conducted by radio with UP welders and contractors at CP A061 regarding movement of the rail grinder to its tie-up location prior to receiving track and time Permit Number 37-78. It was discussed in the job briefing and understood that Train 1 would pass the hand throw switch first, with the rail grinder to follow. The crew of Train 1 was not contacted or job briefed concerning a track and time permit, but they did report hearing the dispatcher tell the rail grinder EIC they could get a track and time permit after the coal train passed them.

At approximately 4:45 a.m., CDT, Train 1 cleared CP A061, on Main Track 2, and the rail grinder traversed the crossover at CP A061, moving from Main Track No. 1 to Main Track No. 2 to follow Train 1. The rail grinder intended to clear the main tracks, by going into a stub track at Milepost (MP) 51.40.

A UP Welder positioned himself on the south side of Main Track No. 2 at the hand throw switch at MP 51.4, to line the rail grinder into the siding.

### **The Accident**

At approximately 4:55 a.m., CDT, Train 1 was traveling at a speed of 46 mph as it passed the intermediate signal at MP 52.87 on Main Track No. 2, which was displaying a proceed indication. Sixteen seconds after Train 1 passed the intermediate signal at MP 52.87, the UP Welder working with the rail grinder lined the hand throw switch at MP 51.4 on Main Track No. 2 to the reverse position. The UP Welder did not contact Train 1 to determine its location, and believed Train 1 had already passed the switch at MP 51.4.

Upon reaching the Main Street crossing at MP 51.57 in Stanwood, the Engineer noticed red reflective striping on the back of a pickup, south of the switch on Main Track No. 2. The Engineer then noticed the target on the hand throw switch stand indicated a reverse switch. The Engineer then told the Conductor to “hold on” and initiated an emergency brake application. Train 1 subsequently traversed the turnout at an estimated speed of 47 mph and continued off the end of the stub track at MP 51.2.

Immediately following the accident, the train crew contacted the UP train dispatcher to request assistance. The UP train crew then exited the locomotive, checked for any injuries, and examined the damage to relay to the dispatcher. The dispatcher contacted the UP Response Management Communication Center (RMCC) which in turn notified all local and state emergency response authorities.

Cedar County Sheriff’s Department arrived around 5:11 a.m., CDT, and advised UP RMCC that state environmental authorities were on their way due to the possible release of diesel fuel.

UP reported \$1,832,923 in equipment damage, and \$100,800 in track and signal damage.

### **Post-accident Investigation**

On June 6, 2019, the Federal Railroad Administration (FRA) began an investigation of this accident. Upon commencing its investigation, FRA investigators inspected the accident site, toxicology analysis, fatigue analysis of the train crew, and rules compliance. Also, FRA conducted interviews with the employees involved.

After their on-site inspection and investigation, FRA investigators participated in a PTC/ATC functional test on-board a UP locomotive. FRA’s investigators also requested and received all records, forms, and other documentation necessary to conduct their final analysis and draw conclusions concerning the pertinent facts of the accident.

The following analysis and conclusions, as well as any contributing factors and the probable cause in this report, represent the findings of FRA’s investigation.



## **Analysis and Conclusions**

Analysis Toxicology: FRA post-accident toxicological testing was performed on both train crew members and the UP Welder.

Conclusion: FRA determined drugs and alcohol did not contribute to the cause or severity of the derailment.

Analysis - Fatigue: FRA uses an overall effectiveness rate of 72 or less for 80 percent or more of the time as the baseline for fatigue analysis. This is the level at which the risk of a human factors-related accident is calculated to be equal to chance. Below this baseline, fatigue was not considered 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 work history, for all train operating employees involved in this accident. Based on the Fatigue Audit InterDyne (FAID) analysis, fatigue was not probable for any of the crew members involved in the accident.

Conclusion: FRA concluded fatigue did not contribute to the cause or severity of this accident.

Analysis-Operating Practices - Crew: The lead locomotive No. UP 7356 was equipped with a speed indicator, an event recorder, and a forward-facing video camera (TIR). The relevant event recorder data, and TIR video were downloaded by the UP officials at the accident site and analyzed, then sent to FRA for analysis. A graph format and table format of the event recorder was requested; only the graph format was provided to FRA by UP.

The TIR video captured from the lead locomotive, UP 7356, was viewed by FRA Investigators at the UP Headquarters Building, located in Omaha, Nebraska. UP's Senior Analyst of Safety Systems and another UP employee also observed.

The accident occurred on June 6, 2019. The recording start time for that date began at 4:52 a.m. CDT. The train was moving on Main Track No. 2 eastbound when it went by an intermediate signal with the top roundel being lit. The signal stayed dark on the adjacent track and was not lit at the passing of this train, which indicates side by side lighting doesn't exist at this location. As the video continued, it showed the train passing three active crossings. Next, an open switch was confirmed, due to the switch stand target being in the incorrect position, along with the normal side of the switch points, which had a gap just prior to the train's arrival to the switch. The video ended with the camera detecting the train leaving the end of a track and coming to a stop into some weeds or vegetation.

This video was created at dawn, when lighting was limited and was filmed in black and white, which made it impossible to distinguish the color of the intermediate signal, but the color of the top roundel was verified to be green during the investigation of the derailment.

Conclusion: FRA determined the actions of the train crew did not contribute to the cause or severity of the accident.

Analysis: Railroad Operational Testing: UP provided the Human Factors Detailed Reports for all train crew members and the UP Welder. FRA reviewed the previous six months' operational testing records for rules compliance.

FRA concluded UP had properly monitored its employees in the field, and inadequate operational testing was not an issue.

Conclusion: FRA determined railroad operational testing did not contribute to the cause or severity of the accident.

Analysis: Rules Compliance: The FRA investigation reviewed all the available data, audio recordings, interviews, and event recorder data leading up to the derailment to determine if any carrier rules were violated.

The train crew was determined to have followed applicable railroad operating and train-handling requirements. The UP Welder was determined to have violated multiple rules to include:

1.6 Conduct

8.2 Position of Switches

70.3 Job Briefing

FRA concluded the UP Welder lined the hand-throw, main line switch without ensuring that he was operating the switch for the correct train movement. This caused Train 1 to be directed down the stub-end track, causing the accident.

Conclusion: FRA determined the improperly lined switch was the cause of the accident. (Cause Code: H702)

Analysis-Simulation: The consist, operating information, and track profile for Train 1 was used by FRA to create a simulation of the accident.

The scenario begins with the train approaching MP 53.0 with ATC cut-in. Train 1 passes the signal at MP 52.87 at 48 mph. The simulation indicated the Engineer would have received a warning approximately 19 seconds after passing the signal at MP 52.8. In response to the warning, the Engineer in the simulation makes a full-service application as called for in UP train-handling rules.

Because of the ATC warning, Train 1 comes to a stop in the simulation at or about MP 51.35. Multiple scenarios, including a suppression brake application met with similar results. Results of each simulation indicate the train would have come to a stop prior to the point of derailment.

Conclusion: FRA determined through the use of the simulation that the ATC system being inoperative was a contributing cause of the accident. (Cause Code: S003)

Analysis: - PTC: On June 13, 2019, FRA and UP officials conducted a review of the PTC validation testing and the functional testing of the PTC system. This test was conducted with an eastbound single locomotive on Main Track No. 2 between CP A061 and CP A050. This test was not conducted with the lead and controlling locomotive of Train 1, but was conducted with an eastbound single locomotive that had a successful initialization of its PTC. The single locomotive operated on Main Track No. 2 between CP A061 and CP A050. Testing was conducted with the locomotive being both west and east of the Approach Signal at MP 52.87. This test included a simulation of the hand throw switch at MP 51.40 being opened.

The testing of the PTC system revealed that as designed and installed, when the open switch reenactment was initiated, the PTC system did display a zero-speed target (red fence) when the locomotive was west of the Approach Signal at MP 52.87. When the open switch reenactment was initiated with the locomotive east of the Approach Signal at MP 52.87, the PTC did not display a red fence. This is due to PTC not monitoring the switch point position at MP 51.40.

The FRA reenactment concluded that when Train 1 was east of the approach signal at MP 52.87, and the hand throw switch was opened, the on-board PTC system would not display a red fence.

The hand throw switch at MP 51.40 and the track code repeater location at MP 51.43, do not have a Wayside Interface Unit (WIU) which is the communication to the PTC system. Instead the WIUs are located at signals in advance of the switch. Based on UP's PTC configuration plan, UP chose to not have a standalone WIU for the hand throw switch at this location. The switch is only monitored in the normal position. When the switch is opened, it interrupts the track code generator (electro code) causing the approaching signals to go red, which are in communication with the PTC system. Switch indication was no longer provided to the onboard PTC system once the signal in advance of the switch was passed.

FRA's investigation has revealed that at the time of the accident, UP was monitoring the switch position per a 2009 Railroad Safety Advisory Committee (RSAC) decision. This allowed for signal circuits to be used to verify route integrity to prevent train movement through a switch that has been left in the wrong position. This method of monitoring hand-operated switches does not provide an equivalent level of safety as an Automatic Train Control System. As a result of this accident, UP has agreed to instrument hand-operated switches in ATS/ACS territory not already equipped with an electric lock so that their position is indicated to the PTC system by WIU.

Conclusion: FRA determined PTC did not contribute to the cause or severity of the accident.

Analysis Traffic Control System: A review was conducted of the data logs and downloads from the intermediate signal at MP 52.87 on Main Track No. 2 and Maple Street Crossing/Track Repeater at MP

51.43, on June 6, 2019, in Stanwood. The data log at the intermediate signal at MP 52.87 did indicate a proceed signal at the time Train 1 passed the Approach Signal at MP 52.87. Approximately 16 seconds later, the data log at MP 51.43, shows the loss of the normal switch indication for the hand throw switch on Main Track No. 2 at MP 51.40.

Conclusion: FRA determined the Traffic Control System did not contribute to the cause or severity of the accident.

Analysis ATC System: On November 2, 2016, UP filed a petition with FRA seeking relief from the provisions of Title 49 Code of Federal Regulations (CFR) Subsection (§) 236.566 (Waiver FRA-2016-0108). Union Pacific's Positive Train Control (PTC) Implementation Plan identifies its goal of supplanting cab signals (ATC/ACS) with PTC technology. Furthermore, UP believes the potential confusion to the train crew of having two train control systems in simultaneous operation is avoided in the proposed operation.

The petition states "As a first step in demonstrating the feasibility of that goal, Union Pacific is submitting this petition for waiver from Title 49 CFR §236.566 (Locomotive of each train operating in train stop, train control or cab signal territory; equipped) for operation on a portion of its Portland subdivision...."

UP later added the balance of its ATC/ACS territories to an extension of the waiver on April 26, 2017, which included the area of the derailment on the Clinton Subdivision. UP chose to operate trains with PTC cut in, which is an overlay of the existing traffic control system and ATC was previously a part of that system cut out. FRA Waiver No. FRA-2016-0108 permitted UP to operate with ATC cut-out.

Conclusion: FRA determined the ATC system being cut out contributed to the cause of the accident. (Cause Code: S003)

Analysis-Track: The track in the area where the derailment occurred is constructed of control cooled (CC), 136-lb. rail, rail section American Railway Engineering Association (RE), and was continuous-welded rail (CWR). The rail is set on 7-inch by 8.5-inch by 9-foot wood crossties that are box anchored every other crosstie and had no visible longitudinal movement in either direction. It is fastened with cut-spikes and seated in 8-inch by 14-inch, double shoulder tie plates.

The overall condition of the ballast and geometry in the derailment area was compliant with all standards for FRA Class 4 Track. The overall crosstie conditions met the minimum regulatory standards for sufficient number of crossties required in 39 feet and they were distributed effectively, with the rail joints in the area also being well supported. Overall, the components of the track structure appeared to be well maintained and of suitable construction.

Conclusion: FRA determined track structure did not contribute to the cause or severity of the accident.

Analysis: - Mechanical and Safety Devices: The train received a Class I brake test -- initial terminal

inspection at North Platte, Nebraska. The lead locomotive was equipped with a headlight, auxiliary lights, and audible warning device, as required by Federal regulations. The train's brakes and the locomotive safety devices were in full compliance with Federal requirements.

Conclusion: FRA determined mechanical and safety devices did not contribute to the cause or severity of the accident.

Overall Conclusion: FRA review of locomotive downloads and signal data logs clearly reflects the hand throw switch at MP 51.40 was improperly lined in front of Train 1.

The UP Traffic Control System was operating as intended. The PTC system was operating as designed and installed. However, due to the UP PTC configuration plan, UP chose to not have a standalone WIU, or an electric lock switch at this location. Instead, the hand throw switch is only monitored in the normal position. When the switch is opened, it interrupts the track code generator (electro code) causing the approaching signals to go red, instead of communicating directly with the PTC system.

The UP ATC system was cut-out on Train 1. UP was granted a waiver which allowed for Train 1 to operate with ATC cut-out, when PTC is operative and successfully initialized. Testing concluded that when Train 1 was east of the approach signal at MP 52.87, and the hand throw switch was opened, the on-board ATC system would have alerted the crew and required immediate action.

### **Probable Cause and Contributing Factors**

The FRA investigation determined the probable cause of the accident was H702 – Switch improperly lined.

Additionally, FRA identified contributing factors of the accident were S003 – Automatic train control system inoperative.