NATIONAL TRANSPORTATION SAFETY BOARD

Office of Railroad, Pipeline and Hazardous Materials Investigations
Washington, DC

RRD18FR006

Amtrak Roadway Worker Fatality

Bowie, Maryland Factual Report
April 24, 2018

ACCIDENT

Date of Accident:	April 24, 2018
Time of Accident:	8:57 a.m. (EST)
Railroad Owner:	National Rail Passenger Corporation (Amtrak)
Train Operator:	Amtrak
Revenue Passenger Train:	Train No. 86
Maintenance of Way Crew:	Welding Gang
Fatalities:	1
Injuries:	0
Type of Accident:	Roadway Worker Fatality
Location of Accident:	Bowie, Maryland

Contents

Accident Summary:

On April 24, 2018, at 8:58 a.m. eastern daylight time[1], northbound Amtrak (ATK) train 86 with lead locomotive ATK-625 and eight trailing passenger cars traveling at 98 mph struck and killed an Amtrak roadway maintenance worker on Amtrak's Northeast Corridor. Train 86 departed from Union Station in Washington, DC around 8:40 a.m. and was destined for Penn Station in New York City.

The stuck employee was assigned as a watchman and was providing train approach warning (TAW) protection to a welding gang at the time of the accident. The accident occurred on Amtrak's Northeast Corridor on track 1 at milepost PW119.2[2], just north of Bowie State train station[3].

The BWI weather site reported at 8:54 a.m., wind from the east at 11- mph with few clouds. The temperature was 55° F.

Parties to the investigation are the National Railroad Passenger Corporation (Amtrak), Federal Railroad Administration (FRA), Brotherhood of Maintenance-of-Way Employes[4] Division (BMWED) and the Brotherhood of Locomotive Engineers and Trainmen (BLET).

[1] All times noted in this report are eastern daylight times
[2] PW stands for Philadelphia-Washington line.
[3] *GPS coordinates: 39° 6' 60" N/76° 45' 25" W*
[4] Employes is the correct spelling used by the BMWED

Circumstances Prior to the Accident:

Track 2 was under the protection of a continuous track outage from March 9, 2018 to June 14, 2018 according to Amtrak's Site-Specific Safety Work Plan (SSSWP). The continuous track outage was scheduled for out-of-face production undercutting operations. The protective limits were over eight miles long, and extended from Bowie Interlocking; milepost 120.5 to Grove Interlocking; milepost 112.4.

The watchman was headquartered and lodging at the Holiday Inn in Jessup, Maryland, along with the other track maintenance workers. Amtrak leases rooms at hotels near worksites to house large maintenance work groups awarded per diem jobs. On April 24, 2018, around 6:00 a.m. the watchman, along with the remaining track crew met downstairs in the hotel lobby, boarded an Amtrak bus, and was shuttled to the Bowie State Train Station. The hotel lobby is used as the group gathering location before departing out to the job location.

At around 7:00 a.m., the crews arrived at Bowie State train station and the gang foreman conducted his first job safety briefing with the work gang. The briefing was conducted in the stations parking lot. The safety focus points of the job briefing covered the work site details, personal protective equipment requirements, job duties, and the daily safety rule. The foreman's briefing sheet included a written summary of daily safety rule 4138 which states: *"Gang watchman will, if practical, be stationed clear of all tracks at a point where he will have the best view of approaching trains in both directions"*. The present members of the work group acknowledged their understanding of the briefing by signing the foreman's briefing sheets.

At around 7:50 a.m., the gang foreman received a text message from the Roadway Worker In-Charge (RWIC) allowing the foreman to start work. The message also included a photographed

copy of the Form D[5]. A postaccident review of the Form D revealed an effective time of 7:23 a.m., and a cancellation time of 12:35 p.m., on April 24, 2018.

At approximately 8:00 a.m., the gang foreman conducted his on-track safety briefing with the work gang. According to the gang foreman's interview, the main focus of the on-track job safety briefing was the placement of watchman. The gang foreman stated *"there was going to be three plus the gentlemen who were here for. So, four in total"*[6]. The safety points of the briefing discussed were track outage details, track number, work protective limits and shunt locations, on-track safety methods, adjacent track speeds, protecting the adjacent tracks, whistle board signage locations, number of watchman/lookouts to be used, and the predetermined place(s) of safety (PPOS). After the on-track briefing, the present members of the work group acknowledged their understanding of the briefing by signing the foreman's briefing sheets. At no time did any of the employees make a good faith challenge[7], as to whether the on-track safety procedures were correct, safe, and compliant.

After completing the on-track safety briefing, the gang foreman assigned three watchmen/lookouts and one relief person to rotate watchman duties with the employee. The gang foreman noted on his on-track safety briefing sheet that the designated "predetermined place of safety" for the work crews and watchman were in the gauge of track 2 and along the field sides of tracks 1 and 3. The gang foreman stated in his interview; "*the gentleman in question, Luke, he was the gang watchman for the welding truck. That was his sole duty. He was going to move with*

[5] Form D or Movement Permit Form D is issued by the dispatcher in written form or copied form to restrict or authorize movements of trains and equipment or issued to convey instructions in situations not covered in the operating rules. Form D's are also issued to copied to/by RWIC's as referenced in this report.
[6] Amtrak gang foreman interview- page 6; lines 10-12.
[7] Defined in 49CFR Part 214.311(b)- Each employer shall guarantee each employee an absolute right to challenge in good faith whether the on-track safety procedures to be applied at the job location comply with the rules of the operating railroad, and to remain clear of the track until the challenge is resolved.

them, clear up when they cleared. When they needed him, he was going to go back out there[8]*".* According to the gang foreman, *"as I mentioned Luke – I didn't, I did not post Luke since he was going to be posted just with the welders whenever they went out there. So, he was going to go out there with them and clear up with them"*[9].

The gang foreman assigned and positioned two watchman; one on the northbound platform at Bowie State, and the second watchman along the ballast shoulder of track 1. Their duties were to provide TAW for trains and equipment operating on the two outside adjacent tracks. The third watchman (deceased) was posted along the ballast shoulder at MP119.2, directly across for where the rail welding crew was performing work. The watchmen/lookouts were placed at the following locations:

- Southern most watchman was positioned on the northbound station platform at Bowie State
- Middle watchman was positioned 3 catenary poles north of the platform watchman
- Northern most watchman (the deceased) was positioned 2 ½ catenary poles north of the middle watchman.

The rail welding foreman indicated that the struck watchman was serving as the gang watchman for the welding crew. He said that it was necessary to have a gang watchman specially assigned to the welders because the processes of cutting and grinding rail is noisy – masking the sound of incoming trains. He also indicated that he positioned the gang watchman at the start of the shift, but did not closely monitor where he was standing after that.

[8] Amtrak gang foreman interview- page 6; line 12-15.
[9] Amtrak gang foreman interview- page 7; lines 8-11

Train Movements Prior to the Accident:

Due to the work limits and Bowie State rail station, southbound train traffic was routed to track 3, and northbound train traffic was routed to track 1. Two northbound MARC (MK) trains, MK-610 at 8:21 a.m. and MK-612 at 8:42 a.m. serviced the northbound station at Bowie State prior to Amtrak (ATK) trains 86 arrival at 8:58 a.m. There was 16 minutes in between the last northbound train operating through the work zone on track 1, and ATK-86 striking the watchman/lookout. Two Amtrak trains operated southbound through the work zone on track 3, ATK-111 at 8:32 a.m. and ATK-2103 at 8:51 a.m., prior to the accident. The two Amtrak trains did not service the southbound station stop at Bowie State, and operated through the work zone at MAS.

Train MK-421 was scheduled to service the southbound station stop at Bowie State at 8:58 a.m., according to Amtrak's NEC train schedule. Prior to the accident, MK-421 approached the work zone traveling southbound on track 3, and was decelerating to service the station at Bowie State. The watchman/lookout (the deceased) detecting the train, provided train approach warning to the roadway workers on track 2 as MK-421 operated through the work zone. As the last three cars of MK-421 passed the roadway workers, northbound ATK-86 approached from the north on track 1, striking the watchman as he continued to provide train approach warning for the passing MARC train. At the time of the collision, the watchman was standing at the east field side of track 1, with both feet positioned on the outside concrete tie ends, fouling the track.

Accident Site Description:

The accident site at milepost 119.2, consists of three main tracks that run parallel in a timetable north-south direction. For trains traveling north, the tracks are oriented in a left-hand curve (curve 404), and are numbered in a right to left perspective. Track 1 is to the east (track right), track 2 is in the center, and track 3 is to the west, (track left). The accident occurred in a left-hand curve[10] with various degrees of curvature ranging between 0.48° to 0.56°. The super-elevation varied in the curve between 1.97- inches to 2.36- inches, and the track grade varied between -0.82% to -1.09% to the north. The track centers[11] between tracks 1 and 2 at the at the site were measured at 13' 2 ½", and the track centers between tracks 2 and 3 were measured at 13' 1".

To the far eastside of track 1, a right-of-way access road runs parallel to the tracks. To the far west side of track 3, a right-of-way access road with a vehicle access gate runs parallel to the tracks. The east ballast shoulder was 36 inches wide measured from the east tie ends. A horizontal plane measurement taken from the top surface of the running rail, to the bottom of the ballast slope measured to be roughly 10 feet.

The running rail section consisted of 136-pound "vacuum treated[12]" (VT) continuous welded rail (CWR). The rails were fastened to concrete crossties measuring 8.5-inches by 10.5-inches by 8-feet 6-inches long, spaced 24 inches on center (nominal). These elastic clip fasteners secure the rails to the ties and are used to maintain proper track gauge and track alignment. These

[10] Curves, in relationship to railroad curves, are designated "left-hand" or "right-hand". Curve 404 is taken in reference as to standing in the gauge of track 1 and look north, the curve bends or travels to the left or counter-clockwise.
[11] Track centers is a measurement taken between the center of a track to the center of the immediate adjacent track.
[12] Vacuum treated or vacuum degassed rail is used for critical applications that require rail with an exceptionally high degree of structural uniformity, internal soundness and other characteristics that may be impaired by the effects of uncontrolled amounts of dissolved gases. Vacuum degassing treatments, along with various de-oxidation practices, are specified to control the amounts of dissolved gases in the rail.

elastic clip fasteners also serve as rail anti-creepers that assist in restraining longitudinal movement of the continuous welded rail due to train dynamic forces and temperature changes. The track was supported by AREMA[13] #4 granite rock ballast with a standard ballast section.

Figure 1- photo taken from Bowie State platform looking north into curve 404. Track 1 is the track to the right of the picture.

[13] AREMA- American Railway Engineering and Maintenance-of-Way Association

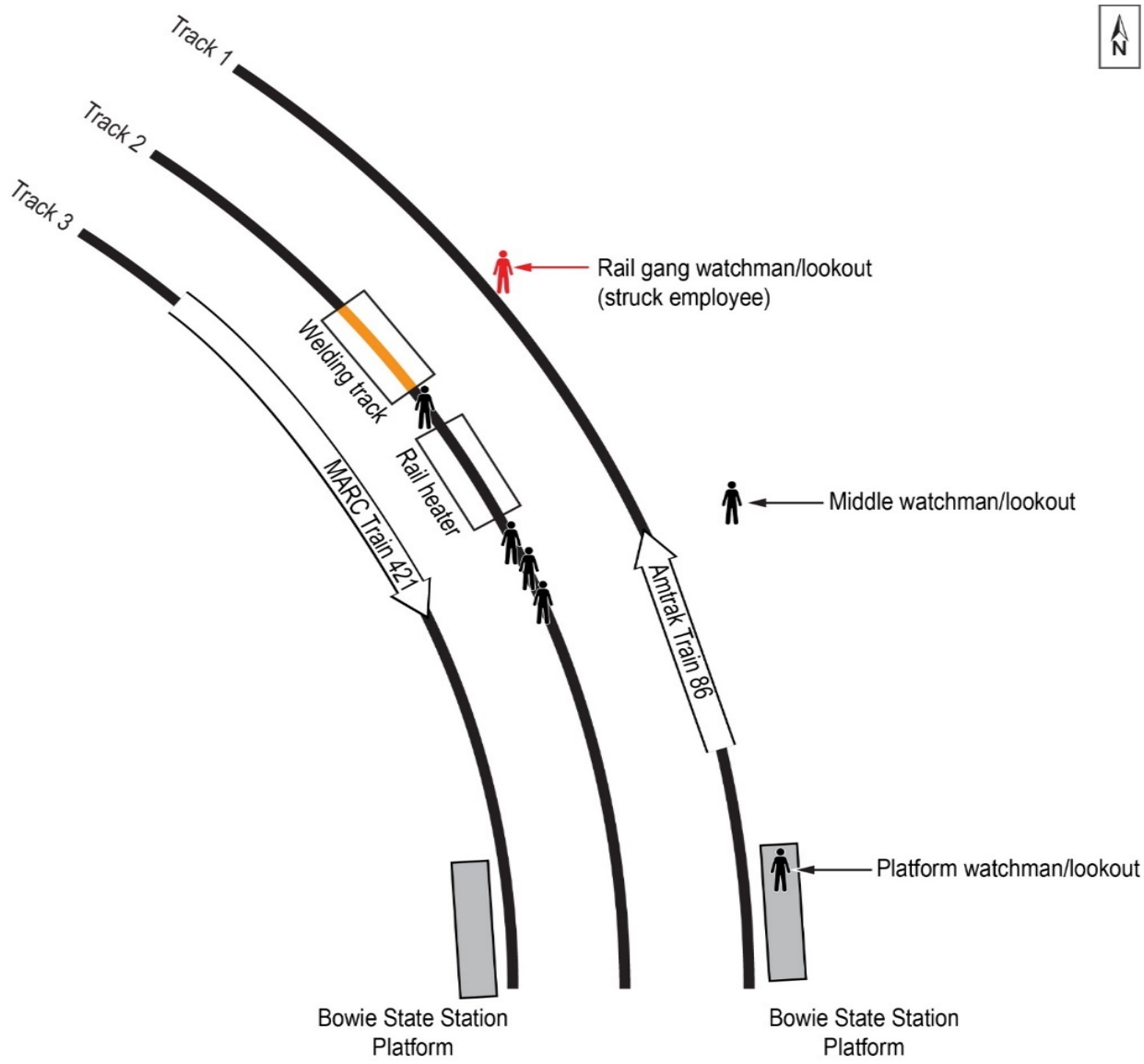

Figure 2- graphic of accident

Postaccident Investigative Work:

Train Approach Warning

Train Approach Warning (TAW), also referred to as watchman/lookouts, allows trains to operate at maximum authorized speeds through or past active work sites with no established working limits, and without the authority of the roadway worker in-charge. TAW is a form of on-track protection that requires roadway workers, when alerted, to move out of the way of an approaching train at least 15 seconds prior to that train passing the location of the roadway worker(s). TAW protection is provided by assigned watchmen/lookouts that, at all times, must be devoting their full attention to the detection of approaching trains, and without error, and must communicate a warning to the roadway workers to move out of the way, and to a place of predetermined safety.

Amtrak's Speed Distance Chart for Watchman Placement

Amtrak's Roadway Worker Protection rules and FRA regulations requires that employees and equipment clear the track 15 seconds prior to the arrival of a train. The following speed distance chart aides' employees in calculating the time and distance needed to ensure compliance with the 15 second rule.

Train Speed in MPH	Train Travel- Feet Per Second	Feet in 15 Seconds
60	88	1,320
65	96	1,440
70	103	1,545
75	110	1650
80	118	1,770
85	125	1,875
90	132.0	1,980
95	140	2,100
100	147	2,205
105	154.0	2310
110	162	2,430
115	169	2,535
120	176	2640
125	184	2,760

Point of Impact- TAW Sight Distance Observation (Watchman looking south)

Investigators conducted a TAW sight distance observation on track 1, where the rail gang watchman was struck and killed by Amtrak train 86. The observation was conducted to determine federal compliance with FRA's minimum 15 second rule as spelled out in *49 CFR Part 214.329, (a).* This observation was conducted for trains approaching the work zone on tracks 1 and 3, traveling in a ***north*** direction at maximum authorized speed.

Trains Approaching Northbound- Track 1		
Watchman Sight Distance	**Maximum Authorized Speed of Train**	**Warning Time in Seconds**
5,300 feet	105 mph	34 seconds
Trains Approaching Northbound- Track 3		
Sight Distance in Feet	**Maximum Authorized Speed of Train**	**Warning Time in Seconds**
5,300 feet	125 mph	28 seconds

Point of Impact- TAW Sight Distance Observation (Watchman looking north)

Investigators conducted a TAW sight distance observation on track 1, where the rail gang watchman was struck and killed by Amtrak train 86. The observation was conducted to determine federal compliance with FRA's minimum 15 second rule as spelled out in *49 CFR Part 214.329, (a).* This observation was conducted for trains approaching the work zone on tracks 1 and 3, traveling in a ***south*** direction at maximum authorized speed.

Trains Approaching Southbound- Track 1		
Watchman Sight Distance	**Maximum Authorized Speed of Train**	**Warning Time in Seconds**
4,770 feet	105 mph	30 seconds
Trains Approaching Southbound- Track 3		
Sight Distance in Feet	**Maximum Authorized Speed of Train**	**Warning Time in Seconds**
4,770 feet	125 mph	25 seconds

TAW Sight Distance Observation- Watchman Standing Clear of Track

Investigators conducted a TAW sight distance observation standing clear of track 1, at the bottom of the east ballast shoulder. This observation was conducted to determine federal compliance with FRA's minimum 15 second rule as spelled out in *49 CFR Part 214.329, (a).* This observation was conducted for trains approaching the work zone on tracks 1 and 3, traveling in a ***south*** direction at maximum authorized speed.

Trains Approaching Southbound- Track 1		
Watchman Sight Distance	**Maximum Authorized Speed of Train**	**Warning Time in Seconds**
3,445 feet	105 mph	22 seconds
Trains Approaching Southbound- Track 3		
Sight Distance in Feet	**Maximum Authorized Speed of Train**	**Warning Time in Seconds**
3,445 feet	125 mph	18 seconds

Train 86 Mechanical Inspections

Train 86 was terminated at the accident site so that investigative downloads and inspections could be carried out. A comprehensive inspection was performed on train 86 by FRA Motive Power and Equipment inspectors. All mechanical systems were inspected including the horn, headlight, and auxiliary lights (ditch lights). FRA test records were also reviewed. All systems inspected were found to be working as intended and in compliance with federal regulations.

The FRA Signal and Train Control Inspector inspected the onboard cab signal system and the Advanced Civil Speed and Enforcement System[14] (ACSES positive train control system) on locomotive ATK-625. The systems were inspected for proper operation and compliance to FRA federal regulations. The inspector also reviewed FRA required test records for both systems. Both systems were found to be working as intended and in compliance with federal regulations.

Once investigators were complete with the consist of train 86, it was released to go back to Washington, DC's Ivy City Maintenance Facility for additional investigative and mechanical compliance inspections by FRA and Amtrak investigators. A review of mechanical records indicated that no mechanical defects were found on consist of train 86.

Train 86 train consisted of 2 locomotives and eight railcars:

- Head-End Locomotive No. 625
- Trailing locomotive No. 52
- Passenger Coach No. 82666
- Passenger Coach No. 82780
- Passenger Coach No. 82550

[14] Advanced Civil Speed Enforcement System (ACSES) is a positive train control cab signaling system designed to prevent train-to-train collisions, protect against overspeed, and protect work crews with temporary speed restrictions.

- Passenger Coach No. 82782
- Café Car No. 43351
- Passenger Coach No. 82591
- Quiet Car No. 82803
- Business Class Car No. 81544

The following damage and equipment replacement cost for Amtrak train 86:

Unit	Labor	Material	Total	Description
625	$50.00	$500.00	$550.00	Replace F-End E/S grab iron
625	$50.00	$300.00	$350.00	Replace E-End E/S 480v receptacle
Total	**$100.00**	**$800.00**	**$900.00**	

Interview Summaries

Investigators conducted 13 interviews with Amtrak management and BMWED represented employees. Officials from the NTSB, FRA, Amtrak, BMWED, BLET assisted in the interviews.

- Interview from thermite welder 1: The interviewee stated that prior to the incident, the struck watchman had been standing "right on the edge of the tie 1- track field side," which was the "same spot that he basically was standing in the beginning." He indicated that there is a steep grade at the location, and thus "that's really the only place you can stand and be able to visually see both ways, you know, to give approach warnings for trains." The butane welder indicated that if the gang watchman had opted to stand on the access road, which is adjacent to the track and level, but also lower than the track, then catenary poles would have been obstructing his view. He indicated that it was key that the struck watchman be able to warn the workers about trains coming from the north, because there was "nobody

north of him at all." He stated that in the vicinity of where the struck watchman was standing, it was necessary to stand "right on the edge of the tie", because the "serious grade" of the ballast" made it too difficult to stand there. He suggested that platforms be built to mitigate the safety hazard of unstable footing for watchmen.

- Interview from watchman 1 (middle watchman): The interviewee indicated that prior the accident, "for the most part" the struck watchman was not fouling the track as he was watching, but rather was "down a little bit." He said that the struck watchman had been "stepping up for the trains to see better." He said that he had to do the same thing – standing "halfway down the bank" to stay safely in the clear. Thus, he took no exception to the behavior of the watchman to his north prior to the incident. Just prior to the collision, as the Amtrak train approached from the south, the middle watchman reported that he tried to get the struck watchman's attention. However, he said that the struck watchman was "clearly looking north," and "never once looked back." He also indicated that the ballast was uncomfortable to stand on and slippery. He further stated that rolling chunks of ballast were an issue in the area of the incident because of the hill. When investigators asked him about safety suggestions to improve footing, he indicated that it would be helpful for small platforms to be built near each catenary pole. He also thought that trains should be slowed "down a lot more than they are."
- Interview from the Amtrak train engineer: The interviewee said that he did not see the gang watchman until he reached Bowie Station. He stated that when he came around the curve at the location it was "only a matter of seconds" before the train reached the gang watchman. He said that the gang watchman was fouling the track and not looking in the direction of his train. He said that the struck watchman "just seemed like he was focused

on that MARC train." The engineer described the area as "real tight," and a "bad spot," observing that due to the slope of the ballast there is "not a lot of room" for the watchmen to maneuver. The engineer indicated that speed restrictions around construction zones are a useful safety control. In fact, he said that he would take it upon himself to slow down more than what was required because it makes him "feel better" to help prevent a collision with a worker. For example, he said that when the undercutter was in use, trains could proceed at 80 mph, but he "might do it at 75 or 70." He said that he didn't think that 80 mph was slow enough, "but that's the best they do for them." With respect to the day of the accident, the engineer said that as he approached the curve, which has a 105 mph speed limit, he started slowing down. He said that he gets "a little antsy around those guys," and tends to proceed around work zones "slower than normal." He expressed concern for the safety of the workers, noting that he "couldn't do" what they do, and that they were "better men than me."

- Interview from the manager of engineering: The interviewee said that the undercutter was very noisy, and restricting train speeds in the areas where they have been used increased safety. When asked why such speed restrictions were not used in other noisy construction scenarios, he said "That's a good question. I can't answer that for you." He also said, "why wouldn't you have an 80-mile slow-by for a big undercutting unit?" However, he also said that he did not believe the train speed was a factor if the rules were followed. He also stated that Amtrak management had provided him with no instructions to issue speed restrictions. However, he indicated that increased train speeds could be mitigated by using more watchmen. He said that it was important to use advance watchmen, especially when working on an inside track due to the "double bubble" hazard (two trains approaching at

the same time).

- Interview from the assistant production engineer: The interviewee was the assistant supervisor at the time of the incident, and has been promoted to a management level position. The interviewee said that "slowing trains down could help the situation." However, he said that it was "out of my control," and that he was not empowered to make decisions on whether to slow trains down. He also said that "obviously, if a train is coming through the work area at 125… [you have] so many seconds to clear…, but if it's coming through at 60 you may have double that." He stated that if he attempted to apply a speed restriction, he would likely have the transportation department calling him asking "why is there a speed restriction out here."

Employee History

Train 86- Head-End Video Review

A review of the video from the Amtrak locomotive showed that there were three watchmen in the area at the time of the incident. The southernmost watchman was stationed on the platform at Bowie Station. The middle watchman was tucked behind the third catenary pole (north side of the pole) from the platform to the north. The struck watchman was located between the 5th and 6th catenary pole to the north of the platform. Footage from the head-end camera of ATK-86 showed that the watchman never looked south and was completely unaware that the northbound train was approaching. The video shows the watchman visible and to the east of track 1. The watchman was standing still outside the gauge with his feet on the ties. His left arm was extended holding an orange warning disk aloft over the right rail. He was standing directly across from working track equipment on track 2. He was positioned 2 ½ catenary poles north of the middle (second) watchman. The video footage also showed that the other watchman located south of the deceased

were providing train approach warning (TAW) for the approaching northbound train. The downloads from ATK-86 showed that the engineer rang the train bell and sounded the horn five times prior to striking the watchman.

Post-Accident Toxicology Testing

FRA post-accident toxicology testing was conducted. Substances screened for included amphetamines, barbiturates, benzodiazepines, cocaine and marijuana metabolites, methadone, methaqualone, MDA-analogues, opiates, 6-acetylmorphine, oxycodone's, opiates, phencyclidine, and propoxyphene. The results were negative for the presence of the aforementioned drugs. Impairment by drugs or alcohol by the deceased watchman/lookout was not a factor in this accident.

Cell Phone Usage

Video from the Amtrak train revealed no evidence to suggest that the struck watchman was talking on a cell phone or using a portable electronic device.

Training

The first work assignment with Amtrak for the deceased was with the Y112 gang, with an effective work date of August 10, 2017. His most current work assignment with Amtrak was with the Z181 gang, with an effective work date of March 19, 2018. Amtrak records indicated the following training history for the employee between July 31, 2017 – February 16, 2018. The dates are listed chronologically:

- 2- week new hire class
- Initial NORAC training

- Initial watchman training program
- 3301 (watchman qualifications signature form) submitted
- Watchman qualified- card issued and entered into SAP-EIM[15]
- Annual RWP qualifications
- NORAC re-qualifications

Employee Work Hours

According to Amtrak records, the employee worked 40 straight time hours between April 16 – 19, 2018, with an additional 10 overtime hours in the same week. The employee had 3 straight rest day between April 20 – 21 – 22, 2018. The employee worked 10 straight time hours on April 23, 2018, with an additional 1.5 overtime on the same date.

[15] SAP-EIM- stands for Strategic Asset Management Program-Employee Information Management

Roadway Workplace Safety Regulations:

Train Approach Warning

The FRA defines train approach warning under 49CFR Part 214.329 as *"a method of establishing on-track safety by warning roadway workers of the approach of a train in ample time for them to move to or remain in a place of safety".* Part 214 further clarifies train approach warning provided by watchmen/lookouts as the following:

Roadway workers in a roadway work group who foul any track outside of working limits shall be given warning of approaching trains and engines by one or more watchmen/lookouts in accordance with the following provisions:

a) *Train approach warning shall be given in sufficient time to enable each roadway worker to move to and occupy a previously arranged place of safety not less than 15- seconds before a train moving at the maximum speed authorized on that track can pass the location of the roadway worker.*
b) *Watchmen/lookouts assigned to provide train approach warning shall devote full attention to detecting the approach of trains and communicating a warning thereof, and shall not be assigned any other duties while functioning as a watchman/lookout.*
c) *The means used by a watchman/lookout to communicate a train approach warning shall be distinctive and shall clearly signify to all recipients of the warning that a train or other on-track equipment is approaching.*
d) *Every roadway worker who depends upon the train approach warning for on-track safety shall maintain a position that will enable him or her to receive a train approach warning communicated by a watchman/lookout at the time while on-track safety is provided by train approach warning.*

e) *Watchman/lookouts shall communicate train approach warnings by a means that does not require a warned employee to be looking in any particular direction at the time of the warning, and that can be detected by the warned employee regardless of noise or distraction of work.*

f) *Every roadway worker who is assigned the duties of a watchman/lookout shall first be trained, qualified, and designated in writing by the employer to do so in accordance with provisions of Part 214.349.*

g) *Every watchman/lookout shall be provided by the employer with the equipment necessary for compliance with the on-track safety duties which the watchman/lookout will perform.*

Predetermined Place of Safety

The Federal Railroad Administration (FRA) in 49CFR Part 214.336 defines a "predetermined place of safety (PPOS)" as *"a specific location that an affected roadway worker must occupy upon receiving a watchman/lookout's warning of approaching movement(s) ("warning") or a roadway worker in-charges ("RWIC's") notification of pending movement(s) on an adjacent track ("notifications"), as designated during the on-track safety job briefing required by Part 214.315. The PPOS may not be on a track; unless the track has working limits on it and no movements permitted within such working limits by the RWIC. Thus, under these circumstances, the space between the rails of the occupied track may be designated as a place to remain in position or to otherwise occupy upon receiving a warning or notification. The RWIC must determine any change to a PPOS, and communicate such change to all affected roadway workers through an updated on-track safety job briefing".*

Fouling Track

Fouling a track is defined under 49CFR Part 214.7- as *"the placement of an individual or an item of equipment in such proximity to a track that the individual or equipment could be struck by a moving train or on-track equipment, or in any case is within four feet of the field side of the near running rail".*

Exclusive Track Occupancy

FRA defines exclusive track occupancy under 49CFR Part 214.321as "a method of establishing working limits on controlled track in which movement authority of trains and other equipment is withheld by the train dispatcher or control operator, or restricted by flagmen"

Safety Risk Management:

Amtrak Site Specific Safety Work Plan

Amtrak developed a 12-page SSSWP for the undercutter project in collaboration with management, supervision, craft employees and the safety department. The SSSWP's objective was to identify existing or potential hazards and determine the steps and responsibilities necessary to eliminate, control, or reduce all associated hazards to an acceptable level of risk. The SSSWP describes that various aspects and elements of the work being assessed that must be evaluated to answer the following questions: (1) what work is to be completed, (2) how the work will be completed, (3) what is the worst that can happen, and (4) how to prevent it from happening. A completed SSSWP contains a description of the work to be performed, a phone listing of Amtrak managers, supervisors and safety representatives, a hazard assessment worksheet, and personal protective equipment requirements.

One of the hazards identified for the undercutter project was "Impact Sources" and it was checked as a "yes" on the hazard assessment worksheet. The mitigation of the identified hazard was: *"Be aware of the possibility of falling objects whether tools, material or debris. Protection against trains will comply with all RWP rules and procedures."* Another identified hazard was "On-Track Protection," and it also was checked as a "yes" on the hazard assessment worksheet. The mitigation for this identified hazard was: *"Comply with all RWP rules and procedures"* However, the SSSWP did not contain any detailed language as to the type of on-track safety to be utilized for adjacent on-track protection, specifically; the use of TAW was not mentioned as a system of on-track safety to be used on adjacent tracks.

The SSSWP did specifically address the undercutting between MP 120.5 and MP 112.2, stating that the project was starting in a 'hot spot" territory, where extra watchmen would be required to effectively provide the required RWP protection to the roadway workers.[16] "Hot spots" is a term used to identify locations along the railroad where additional on-track safety is required due to watchmen line of sight issues, obstructions, work zone characteristics, close clearing/no clearing points, and work zone noise levels. The SSSWP did not define and provide guidance on what a "hot spot" is, the open risk to roadway workers when working within a "hot spot" territory, and the risk mitigations to implement when working within a "hot spot" territory. Moreover, in 2014, some four years prior to this accident, Amtrak removed all training on "hot spots" from its RWP curriculum and all references of "hot spot" from its current 2017 edition RWP manual. Though not defined, the term is referenced within the undercutter project SSSWP and Amtrak's job safety and on-track job safety briefing forms.

[16] See page 5 of Amtrak's SSSWP

Regarding the guidance on the use of foul time, the SSSWP states: "*We will need as much FOUL time as possible on # 1 and 3 tracks Bowie to Grove*."[17] In the next section, different guidance is proffered: "*There will be intermittent fouls on adjacent tracks when needed.*"[18] The SSSWP does not explain how "when needed" comports with "as much foul time as possible." At the time of the accident, working limits were not established on tracks 1 and 3 via the use of foul time. Investigators spoke with the RWIC who indicated that it would have been challenging to obtain a foul in the vicinity and time of the accident.[19]

Train Slow-By Speed Restriction

At the time of this accident, Amtrak had speed restrictions available per Special Instruction No. 175.S2; "80 MPH SLOW-BY" SPEED RESTRICTION" but it was not implemented. This special instruction directs train dispatchers to issue an 80 MPH SLOW-BY SPEED RESTRICTION to trains operating next to where the Track Laying Machine (TLM) is performing work. This instruction does not automatically apply to trains operating on tracks next to where the undercutter is working. It is only in effect when requested by the MOW employee-in-charge. This rule was based on the acute hazards of construction work using these two machines. That is, operations using this equipment create noisy work areas, where roadway workers may be unable to hear approaching trains, warning sounds, and verbal communications. The 80 MPH SLOW By

[17] (a) See page 5 of Amtrak's Engineering Production Dept Production Undercutting Site Specific Safety Work Plan. (b) Foul time is a method of establishing working limits on controlled track in which a roadway worker is notified by the train dispatcher or control operator that no trains will operate within a specific segment of controlled track until the roadway worker reports clear of the track.
[18] See page 6 of Amtrak's Engineering Production Dept Production Undercutting Site Specific Safety Work Plan.
[19] See discussion in RWIC Interview on pages 43-46. Key quotes on page 44 include: "Honestly, that time in the morning down there, you ain't getting a foul." See also on page 44: "It's not easy to get foul."

SPEED restriction was available as a safety enhancement for the work zone, and was mentioned for usage in the Undercutter Project Site Specific Safety Work Plan (SSSWP) but was not used.

On December 13, 2018, investigators interviewed the RWIC regarding the employee's understanding of this rule modification. While the employee had some knowledge of the change, he stated *"I'm not exactly sure. I haven't seen nothing written on how this works"*[20]. Investigators asked if he had seen the new rule; the employee responded *"no"* and continued by saying *"I was told by somebody that it, actually it's just the manager's discretion. So, the undercutter and the track-laying machine (TLM) that used to have to have them are now manager's discretion"*[21].

Postaccident Actions:

Train Slow-By Speed Restrictions

In response to this accident, Amtrak modified it's "80 mph Slow By" with a new Rules Alert No. 2018-01, dated June 12, 2018. This modified rules alert is titled *"60 MPH SLOW-BY" SPEED RESTRICTION.* The rules modification states: "as an enhancement to safety, the existing "80 MPH Slow-By" restriction in the NEC[22] Special Instructions and Train Dispatcher's Manual requirements will change". The following changes are outlined:

- The 80 MPH speed restriction will become 60 MPH.
- This speed restriction will apply not only when the TLM[23] and Undercutter[24] are working, but during larger "continuous and planned track outages".
    - The instruction will apply to larger-scale projects where a track will be

[20] Amtrak RWIC interview- page 41; lines 24-25
[21] Amtrak RWIC interview- page 42; lines 2, 4-5, 7-9
[22] NEC- Northeast Corridor
[23] TLM- Track Laying Machine is a piece of railroad equipment that performs work associated with track maintenance. It's a very large and very loud piece of equipment that replaces old track to new conventional track.
[24] Undercutter is a piece of railroad equipment that performs work associated with track maintenance. It's a very large and very loud piece of equipment that has digging mechanisms that removes ballast from under the track.

under a continuous outage and adjacent track protection is needed due to the size, scale, and number of employees on a project.

- Nightly planned outages for surfacing, tie replacement, welding, etc., will generally not meet the criteria for a Slow-By restriction.

Parties to the Investigation - Acknowledgment Signatures

The undersigned designated Party to the Investigation representatives attest that the information contained in this report is a factually accurate representation of the information collected during the investigation, to the extent of their best knowledge and contribution in this investigation.

_____/s/_____ Date 03/12/2019
Troy A. Lloyd, NTSB

_____/s/_____ Date 03/12/2019
James Hurley, FRA

_____/s/_____ Date 03/12/2019
John Defrancesco, Amtrak

_____/s/_____ Date 03/12/2019
Steve Stern, BMWED

_____/s/_____ Date 03/12/2019
Carl Fields, BLET