Collision Between Two BNSF Railway Company Freight Trains Near Gunter, Texas May 19, 2004

Railroad Accident Report

NTSB/RAR-06/02

PB2006-916302
Notation 7793A

National Transportation Safety Board
Washington, D.C.

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Adopted June 13, 2006

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

National Transportation Safety Board. 2006. *Collision Between Two BNSF Railway Company Freight Trains Near Gunter, Texas, May 19, 2004.* Railroad Accident Report NTSB/RAR-06/02. Washington, DC.

Abstract: About 5:46 p.m., central daylight time, on May 19, 2004, two BNSF Railway Company freight trains collided head on near Gunter, Texas. The southbound train, BNSF 6789 South, was traveling about 37 mph, and the northbound train, BNSF 6351 North, was traveling about 40 mph when the collision occurred. The trains were being operated under track warrant control rules on non-signaled single track. The collision resulted in the derailment of 5 locomotives and 28 cars. About 3,000 gallons of diesel fuel were released from the locomotives and resulted in a fire. The southbound train engineer was killed, and the southbound train conductor was airlifted to a hospital in Dallas with serious burns. The crewmembers on the northbound train were transported to a local hospital, where they were admitted. Estimated property damages exceeded $2 million.

The safety issues discussed in this report are the issuance of track warrant authority that contains an after-arrival stipulation and the informal communication of proposed meeting locations for trains in non-signaled territory.

As a result of its investigation, the National Transportation Safety Board makes safety recommendations to the Federal Railroad Administration, the BNSF Railway Company, the Association of American Railroads, and the American Short Line and Regional Railroad Association.

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Acronyms and Abbreviations

BNSF	BNSF Railway Company
CFR	*Code of Federal Regulations*
CPAP	continuous positive airway pressure
EAP	Employee Assistance Program
FRA	Federal Railroad Administration
GCOR	*General Code of Operating Rules*
MP	milepost
NORAC	Northeast Operating Rules Advisory Committee
PTC	positive train control

Executive Summary

About 5:46 p.m., central daylight time, on May 19, 2004, two BNSF Railway Company freight trains collided head on near Gunter, Texas. The southbound train, BNSF 6789 South, was traveling about 37 mph, and the northbound train, BNSF 6351 North, was traveling about 40 mph when the collision occurred. The trains were being operated under track warrant control rules on non-signaled single track. The collision resulted in the derailment of 5 locomotives and 28 cars. About 3,000 gallons of diesel fuel were released from the locomotives and resulted in a fire. The southbound train engineer was killed, and the southbound train conductor was airlifted to a hospital in Dallas with serious burns. The crewmembers on the northbound train were transported to a local hospital, where they were admitted. Estimated property damages exceeded $2 million.

The National Transportation Safety Board determines that the probable cause of the May 19, 2004, collision near Gunter, Texas, was the southbound train (BNSF 6789 South) crew's failure to adhere to an after-arrival track warrant requiring them to stay at Dorchester until the northbound train (BNSF 6351 North) arrived. Contributing to the accident was the BNSF Railway Company's use of after-arrival track warrant authority in non-signaled territory, and the Federal Railroad Administration's failure to prohibit the use of such authority. Also contributing to the accident was the train dispatcher's informal communications regarding planned train meeting locations.

In its investigation of this accident, the Safety Board examined the following safety issues:

- The issuance of track warrant authority that contains an after-arrival stipulation and
- The informal communication of proposed meeting locations for trains in non-signaled territory.

As a result of its investigation of this accident, the National Transportation Safety Board makes safety recommendations to the Federal Railroad Administration, the BNSF Railway Company, the Association of American Railroads, and the American Short Line and Regional Railroad Association.

Factual Information

Accident Synopsis

About 5:46 p.m.[1] on May 19, 2004, two BNSF Railway Company (BNSF) freight trains collided head on near Gunter, Texas. (See figure 1.) The southbound train, BNSF 6789 South, was traveling about 37 mph, and the northbound train, BNSF 6351 North, was traveling about 40 mph when the collision occurred. The trains were being operated under track warrant control rules on non-signaled single track. The collision resulted in the derailment of 5 locomotives and 28 cars. About 3,000 gallons of diesel fuel were released from the locomotives and resulted in a fire. The southbound train engineer was killed, and the southbound train conductor was airlifted to a hospital in Dallas with serious burns. The crewmembers on the northbound train were transported to a local hospital, where they were admitted. Estimated property damages exceeded $2 million.

Figure 1. Map showing accident site.

[1] Unless otherwise noted, all times in this report are central daylight time.

The accident occurred at milepost (MP) 661.9 on the Madill Subdivision. (See figure 2.) BNSF 6351 North had 4 locomotives and 65 empty cars. BNSF 6789 South had 3 locomotives and 65 cars loaded with rock. The dispatching plan called for the two trains to meet at Dorchester siding, about 3 1/2 miles north of the collision site, with BNSF 6789 South holding the main track and BNSF 6351 North entering the siding. BNSF 6789 South left Dorchester before BNSF 6351 North arrived. The data for both trains show an emergency brake application initiated from the control stand at, or just before, impact. The collision took place on straight track, just south of a 1 1/2°-curve with a 0.50-percent grade descending to the south.

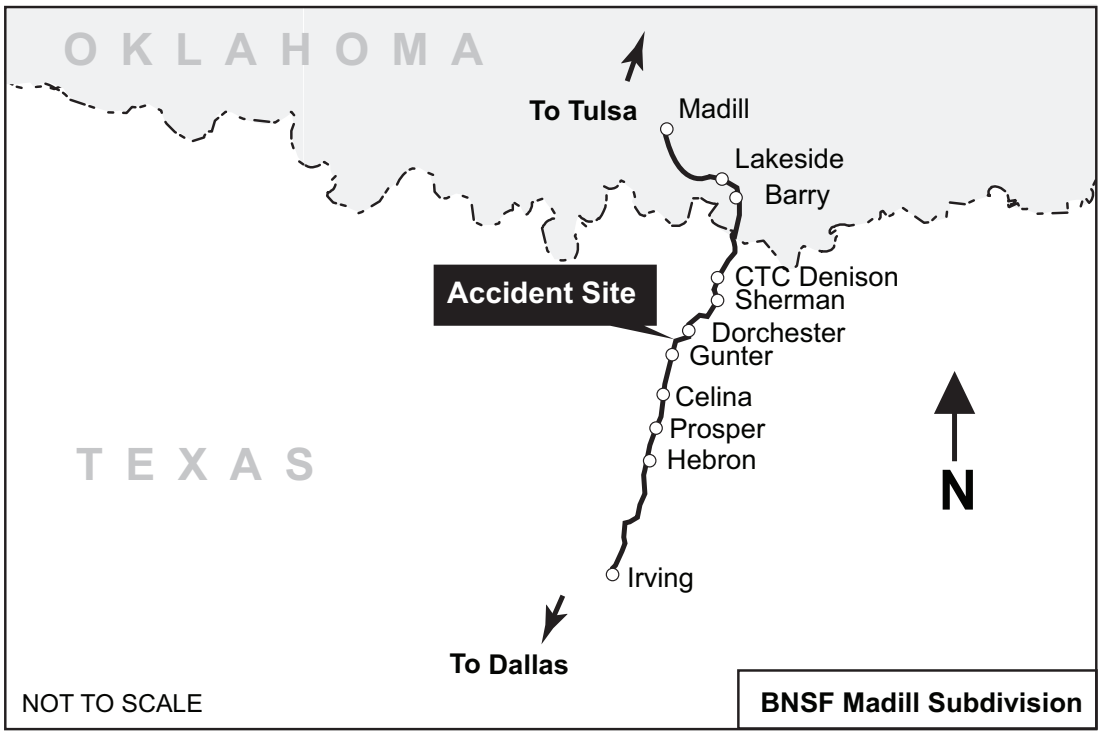


Figure 2. Madill Subdivision map.

Accident Narrative

Preaccident Events

Prior to the collision, three BNSF trains were operating on the Madill Subdivision between Irving and Sherman, Texas: two northbound trains and one southbound train. The first northbound train, BNSF 2917 North, was not involved in the collision. The second northbound train, BNSF 6351 North, was struck by the third train, BNSF 6789 South. In the time leading up to the accident,[2] each train crew received track warrants and discussed train movements with the train dispatcher concerning potential meeting locations with the

[2] See appendix B for a complete time line of accident events.

other trains. According to radio transcripts and voice recordings,[3] each of the three train crews used the radio while taking track warrants and talking with the train dispatcher. There were no indications that the communications systems were not working properly.

As the trains approached each other, they were in different radio tower ranges, which can affect a train crew's ability to hear all of the dispatcher's conversations with or instructions to other crews. The only information available to the train crews about the dispatcher's communications was either overheard on the radio or issued via track warrants.

First Northbound Train/BNSF 2917 North[4]

The crew of the first northbound train, BNSF 2917 North, reported for duty about 7:00 a.m. in Sherman, Texas. BNSF 2917 North had two locomotives and nine freight cars. This train was also sometimes referred to in transcripts as the Sherman Switcher, the R TEX 641, the 641 Job, the 641, or the Switcher.[5] On the day of the accident, the BNSF 2917 North crew departed from and worked in and around Sherman Yard before traveling south to Celina, Texas. About 4:37 p.m., after the BNSF 2917 North crew had completed its work at Celina, it was issued a track warrant authorizing movement from Celina[6] to the north siding switch at Dorchester.

About 4:40 p.m., the train dispatcher had a discussion with the BNSF 2917 North crew concerning possible meeting points. The train dispatcher advised the BNSF 2917 North crew that he might hold BNSF 6789 South at Dorchester for two trains. He said the meeting locations depended on how the Sherman Rock Train, BNSF 6351 North, was running.

Although it was authorized to proceed on the main track to the north switch at Dorchester, BNSF 2917 North had only a few cars, and the crew offered to head in at the south siding switch and release its main track authority. The dispatcher said he appreciated the offer because BNSF 6789 South had indicated some engine trouble and it was approaching the north switch on an upgrade.

About 5:12 p.m., the BNSF 2917 North crew reported that it was clear of the main track in Dorchester siding. The crew aligned the south siding switch behind it for the main track. The dispatcher then issued a track warrant to the BNSF 6789 South crew authorizing further movement on the main track to the south siding switch at Dorchester. Because BNSF 2917 North was in the siding and had released its track warrant authority,

[3] The dispatching office's radio and phone communications are recorded. The Safety Board obtained all relevant transcripts pertaining to this accident. At the time of the accident, radio communications between trains were not being recorded.

[4] The BNSF designates timetable directions on the Madill Subdivision as north and south. Timetable direction may vary from actual compass direction.

[5] See appendix C for more information regarding the identification of the three trains discussed in this report.

[6] Between CTC Denison and Irving, train movements are authorized through a computerized track warrant control system.

the dispatcher did not need to issue a track warrant to BNSF 6789 South to meet BNSF 2917 North at Dorchester.

BNSF 2917 North and BNSF 6789 South passed each other at Dorchester. BNSF 2917 North crewmembers said that both trains radioed each other that their respective rear markers[7] were in place. The BNSF 2917 North engineer told Safety Board investigators that he also advised the BNSF 6789 South crew when the southbound train was clear of the north siding switch. During the investigation, the BNSF 2917 North engineer stated the following regarding the communication of engine numbers:

> Investigator: In the normal process of communication, you identified yourself by locomotive number, BNSF 2917?
>
> BNSF 2917 North Engineer: I don't think so.
>
> Investigator: Did, did he [BNSF 6789 South] ever contact you and ask specifically your engine number?
>
> BNSF 2917 North Engineer: No.

About 5:18 p.m., the BNSF 2917 North crew was authorized to depart for Sherman, after the arrival of BNSF 6789 South. BNSF 2917 North was not involved in the collision. It was in Sherman when the accident occurred.

Second Northbound Train/BNSF 6351 North

The crew of the second northbound train, BNSF 6351 North, reported for duty about 7:00 a.m. in Sherman Yard, Texas. The three-person crew departed Sherman about 8:50 a.m. Their assignment, also referred to in transcripts as the Sherman Rock Train, the Sherman Clark Rock Train, and the Am Rock, involved taking a loaded rock train south to an unloading facility near Irving, Texas, and then returning with empty cars to Sherman. They arrived in Irving about 11:32 a.m. The BNSF 6351 North crew began its northbound return trip about 4:27 p.m. with track warrant authority to the north siding switch at Prosper.

About 5:06 p.m., the train dispatcher radioed the BNSF 6351 North crew and discussed issuing a track warrant to meet BNSF 6789 South at Prosper. The dispatcher advised BNSF 6351 North that BNSF 6789 South was experiencing power problems at Dorchester and he was afraid the train might stall out. The dispatcher said:

> So, if I can make this meet at Prosper it will probably make it easier on him [BNSF 6789 South], over. Ya'll go ahead and copy another one, put you in the hole[8] at Prosper, over.

[7] *Rear marker* refers to a device placed on the last car indicating the end of the train. The marker displays a reflector during the day and a light illuminated during darkness.

[8] *In the hole* means to clear the main track by entering a siding.

The BNSF 6351 North conductor advised the dispatcher that if they were held at Prosper, they might not have time[9] to return to Sherman by 7:00 p.m. At this point, the dispatcher said to "hang on," and he contacted the BNSF 6789 South crew. He asked: "Hey engineer on BNSF 6789 South, can you hold between the switches there at Dorchester, over?" The BNSF 6789 South engineer responded: "That's correct, over." The dispatcher then repeated this question, and the BNSF 6789 South engineer again responded: "That is correct."

The train dispatcher then issued the BNSF 6351 North crew a track warrant authorizing it to proceed as far as MP 659, which was between Dorchester and Prosper. About 5:21 p.m., the BNSF 6351 North crew was issued another track warrant authorizing it to proceed to the south siding switch at Dorchester and to enter the siding to meet BNSF 6789 South. BNSF 6351 North continued north, passing through the town of Gunter, 4 miles south of the accident site about 5:40 p.m.

Southbound Train/BNSF 6789 South

The crew of the southbound train, BNSF 6789 South, reported for duty about 10:15 a.m. in Alliance Yard near Fort Worth, Texas. The crew traveled by taxi to Madill, Oklahoma, where they boarded their locomotives and departed Madill about 1:15 p.m. They proceeded south to the siding at Lakeside, Oklahoma, where they picked up their train of 65 cars loaded with rock. In transcripts, BNSF 6789 South is also referred to as the Doni Rock, the Doni Madill, and the Doni Train.

About 2:36 p.m., BNSF 6789 South departed Lakeside headed to Irving. Between Lakeside and CTC Denison, the dispatcher authorized train movements through the wayside signals of a centralized traffic control system. Beyond CTC Denison, train movements were authorized through a track warrant control system.

About 3:17 p.m., the train dispatcher issued the BNSF 6789 South crew a track warrant authorizing movement from CTC Denison (the end of centralized traffic control and the beginning of track warrant control) to the south siding switch at Sherman. The conductor had difficulty correctly repeating the track warrant information back to the train dispatcher. According to radio transcripts, the conductor made multiple attempts to copy and read back the track warrant to the train dispatcher. The dispatcher slowed the pace of his communications, and the track warrant was OK'd[10] at 3:17 p.m. At that time, the dispatcher requested that the engineer call him on the phone.

[9] Railroad operating crews are limited to 12 hours on duty by regulations at 49 *Code of Federal Regulations* Part 228.

[10] The dispatcher uses the term *OK* as a formal confirmation that the crewmember has read back the track warrant instructions correctly. A track warrant is not considered in effect until the OK time is recorded.

About 4:02 p.m., the BNSF 6789 South engineer contacted the train dispatcher by cellular phone. The dispatcher said:

> Hey, do me a favor; I want you to work close with your conductor. Make sure he is using proper radio procedures, especially when it comes to spelling out words and his directions. It's not a criticism. I can tell he's new and I'll certainly go slowly. Make sure he gets it right, if you could. Back him up, and make sure he's doing it right. I sure would appreciate it.

During this cellular phone conversation, the BNSF 6789 South engineer asked the dispatcher if he was going to hold them at Sherman. The dispatcher replied: "No, what I'm going to do is roll up[11] the . . . 641 Job [641 Job was one of the names used for the BNSF 2917 North] and have you meet them at Dorchester." The engineer said: "Sounds good."

About 4:47 p.m., the dispatcher again advised the BNSF 6789 South crew that they would meet the 641 at Dorchester. About 4:51 p.m., a second track warrant was issued to the BNSF 6789 South crew authorizing movement from the south siding switch at Sherman to the north siding switch at Dorchester. Following the OK on this track warrant, the dispatcher advised the BNSF 6789 South crew that the dispatching plan was to meet one train at Dorchester and then proceed to Prosper to meet a second northbound train:

> Dispatcher: Yes sir, that's correct on that repeat, and ah, Sherman Switcher is going to clear up for you, and we'll just take you to Prosper to meet the Sherman Clark Rock Train, OK, over.
>
> BNSF 6789 South: Copy, ah, meet one at Dorchester.

About 5:05 p.m., the BNSF 6789 South engineer called the dispatcher and asked: "Were we going in the hole there [north siding switch at Dorchester] or what?" The dispatcher answered:

> No, no, no, you're going to hold there till the Sherman Rock, excuse me, until the Sherman Switcher[12] clears up at Dorchester. Then I'll take you guys on south to Prosper to meet the Sherman Rock Train.

The BNSF 6789 South engineer responded: "OK, we don't have the best power, that north switch is right on the hill there. Anyway, we can go to the south switch?" The dispatcher advised the BNSF 6789 South engineer to "hang on a second."

About 5:06 p.m., the BNSF 2917 North crew advised the dispatcher that it was entering the siding at the south end of Dorchester. The dispatcher in turn advised the BNSF 6789 South crew to "slow up a little bit," and he said, "they're dragging in the siding right now." Just after this, the train dispatcher gathered additional information that resulted in a decision to change the meeting locations from what he had just radioed the BNSF 6789 South crew. The dispatcher radioed the BNSF 6351 North crew to determine their location and what time they had to be off duty. About 5:10 p.m., after being told that

[11] As trains release portions of their authority, it is referred to as *rolling up* their authority.

[12] The Sherman Switcher was BNSF 2917 North. The Sherman Rock was BNSF 6351 North.

the BNSF 6351 North crew might exceed their maximum hours-of-service times before getting to Sherman if they were held at Prosper, the dispatcher issued the BNSF 6351 North crew a track warrant authorizing movement to MP 659, which is north of Prosper.

About 5:16 p.m., after BNSF 2917 North (the first northbound train) entered Dorchester siding and released its track warrant authority on the main track at Dorchester, the BNSF 6789 South crew was issued a track warrant authorizing movement on the main track to the south end of Dorchester. (See figure 3.) About 5:21 p.m., the dispatcher issued a track warrant to the BNSF 6351 North (the second northbound train) crew, authorizing it to proceed to the south siding switch at Dorchester with an instruction to clear the main track (enter the siding).

BNSF 6789 South was stopped at the south end of Dorchester on the main track about 5:39 p.m., when the dispatcher issued a track warrant (No. 3598) authorizing its movement from the south siding switch at Dorchester to the south siding switch at Hebron, after the arrival of BNSF 6351 North (the second northbound train). (See appendix D for a copy of the track warrant.) Prior to issuing the track warrant, the dispatcher checked twice with the BNSF 6789 South crew to ensure that they could "hold between switches at Dorchester."

The last series of communications between the BNSF 6789 South engineer[13] and the train dispatcher was as follows:

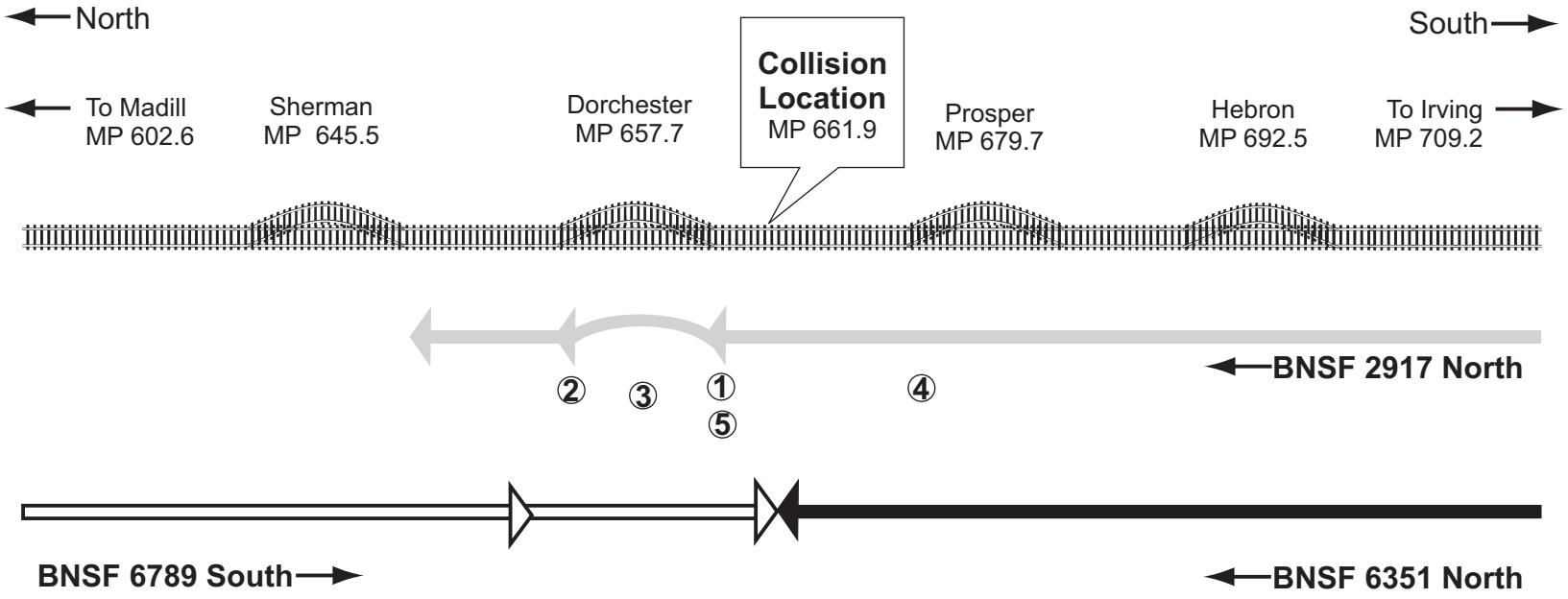
> BNSF 6789 South Engineer: Track Warrant No. 3598, with the box 7 not in effect till after the arrival of BNSF 6351 at south, s-o-u-t-h, siding switch Dorchester is OK'd at seventeen thirty-nine, 1-7-3-9. WHM,[14] over.
>
> Dispatcher: OK, that's correct, hey ah, what time should I have you guys a taxi at, at ah, Irving back to Fort Worth for, over?
>
> BNSF 6789 South Engineer: Ah, probably about 7:30.
>
> Dispatcher: Nineteen thirty, OK. I'll call you back to confirm, OK, over.
>
> BNSF 6789 South Engineer: All right. I'll report, ah, south siding switch Dorchester restored to normal.
>
> Dispatcher: OK, ah, I can't, I can't, ah, normal it, ah, because ah, I can't show it normal because the ah, that Rock Train,[15] the Sherman Switcher's[16] got a box 7 on you, OK, over.
>
> BNSF 6789 South Engineer: OK. After we get by, we'll let you know.
>
> Dispatcher: Here we go, dispatcher out.

[13] The dispatcher said that he recognized the engineer's voice after listening to the recorded communications.

[14] WHM are the dispatcher's initials.

[15] The Rock Train was BNSF 6351 North.

[16] The Sherman Switcher was BNSF 2917 North.



Approximate Time of Events

① 5:12 p.m. BNSF 2917 North clears main track in Dorchester siding and releases track warrant authority.

② 5:16 p.m. BNSF 6789 South receives track warrant authority on main track to south siding switch Dorchester.

③ 5:20 p.m. BNSF 2917 North and BNSF 6789 South pass at Dorchester. BNSF 6789 South crew does not verify engine number of train passing in siding using radio.

④ 5:21 p.m. BNSF 6351 North receives track warrant authority on main track to south siding switch Dorchester.

⑤ 5:39 p.m. BNSF 6789 South receives track warrant authority on main track to Hebron with stipulation "after-arrival of BNSF 6351 North" and immediately departs Dorchester.

Schematic view only-Not to scale

Figure 3. Train operations schematic.

This last radio exchange was made about 5:40 p.m., following the completion of the track warrant that required BNSF 6789 South to wait for BNSF 6351 North to enter the siding at the south siding switch at Dorchester before departing. However, as soon as this track warrant was OK'd, BNSF 6789 South departed Dorchester and accelerated to 40 mph.

The Collision

About 5:46 p.m., 7 minutes after the track warrant requiring BNSF 6789 South to wait at Dorchester until after the arrival of BNSF 6351 North was issued, the two trains collided head on about 3 1/2 miles south of the Dorchester siding. The point of collision occurred at MP 661.9 near the intersection of Fallon Road and State Highway 289, north of the town of Gunter. Most of this area was undulating agricultural land. The track was relatively straight with occasional curves, one of which was the 1 1/2° curve[17] at the accident site. (See figure 4.)

Trees restrict the view as trains round this curve, and the BNSF 6351 North conductor and engineer said that they first noticed the southbound train through the trees as they approached the curve. The conductor and engineer, who were on the leading locomotive, exited the cab and jumped off the train. A brakeman was riding in a trailing locomotive, where he remained until after the collision. According to a BNSF official, who arrived at the accident site shortly after the collision, the BNSF 6351 North brakeman told him that the BNSF 6789 South engineer had jumped out the window before the collision. However, the brakeman said that he could not remember this account when later interviewed by Safety Board investigators. The BNSF 6789 South conductor told the BNSF official that he had jumped out the window and that he thought the engineer had attempted to get out, but he was not sure how the engineer had exited the train.

Event recorder data indicate that both trains were placed into emergency braking just before the collision. BNSF 6351 North was placed into emergency braking at about 40 mph with the throttle in position 4 (of 8). BNSF 6789 South was placed into emergency braking as it was moving about 37 mph with the throttle in the idle, 1, or 2 position.[18]

[17] This was a right-hand curve as viewed from the northbound train, BNSF 6351 North.

[18] The event recorder does not distinguish between these three throttle positions. Also, the southbound train was descending a 0.50-percent grade. Throttle and braking actions just prior to the collision were consistent with maintaining the allowed speed of 40 mph.

Figure 4. Aerial photo of accident scene.

Emergency Response

Records indicate that about 5:49 p.m., the Grayson County Communications Center began receiving multiple phone calls about the accident. One of the calls was placed from the BNSF 6351 North brakeman's cellular phone. The Grayson County Communications Center in turn notified the Gunter Volunteer Fire Department by pager. The Gunter Volunteer Fire Department chief told the Safety Board that he was the first responder to arrive on scene, about 6 minutes after receiving the page. En route to the scene, he said that he activated mutual aid from surrounding jurisdictions and requested that two medical helicopters be put on standby. As he approached the accident site, he observed some of the injured crewmembers and radioed a request to dispatch the helicopter from Sherman. The BNSF 6789 South conductor received serious burns and was transported by helicopter to a hospital burn center in Dallas. The other surviving crewmembers were transported to a local hospital in Sherman, Texas, a short time later.

A BNSF official arrived on scene about 6:00 p.m. and assisted rescue workers as they accounted for the crewmembers. He advised them that the BNSF 6789 South engineer had not been located. After searching the wreckage site, responders found the engineer's body on the west side of the tracks.

Two locomotive fuel tanks ruptured, resulting in a fire immediately following the collision. Fire department personnel extinguished the fire. Later in the evening during clean up efforts, a foam truck arrived from the Grayson Airport Fire Department, located in Grayson, Texas, about 20 miles north of Gunter. The foam truck was placed on standby as a precaution. In all, seven other jurisdictions assisted the Gunter Volunteer Fire Department during the accident.

At the time of the accident, the Gunter Volunteer Fire Department consisted of 21 volunteer firefighters and 7 fire explorer scouts. The chief stated that during the year prior to the accident, the department had participated in training on chemical response and railroad operations and also had taken part in a tabletop exercise with BNSF. The chief stated that this previous training proved helpful when responding to the Gunter accident.

Injuries

The BNSF 6789 South engineer was killed. The BNSF 6789 South conductor was seriously burned. All three of the BNSF 6351 North crewmembers were injured and taken by ambulance to a hospital in Sherman.

Damages

During the collision, both trains were extensively damaged. A total of 28 cars were derailed. BNSF 6789 South had three locomotives, all of which were derailed and

destroyed. BNSF 6351 North had four locomotives. The lead locomotive and the second locomotive were derailed and destroyed. The third and fourth locomotives also sustained extensive damage; however, they were not derailed.

BNSF provided the following damage estimates: $2,039,791 for equipment (locomotives and cars); $50,000 for track; $52,867 for lading and environmental clean up; and $18,800 for wreck clearing. Total estimated property damages were $2,161,458.

Personnel Information

BNSF 6351 North Engineer

The BNSF 6351 North engineer was hired in August 1979. Prior to the accident, the engineer's last annual checkride took place in April 2004. He had completed a rules examination in March 2003, and his engineer's certification was current. He had regularly worked on the Madill and Creek Subdivisions as an engineer during the 12 months before the accident. When the accident occurred, he had been on duty for about 10 hours 50 minutes. The engineer had worked the previous day, going off duty about 8:00 p.m. He had been off duty for 11 hours when he reported for work on May 19.

BNSF 6351 North Conductor

The BNSF 6351 North conductor was hired in April 1998. He had completed a rules examination in April 2003. He had regularly worked on the Madill and Fort Worth Subdivisions as a conductor during the 12 months prior to the accident. The conductor had been on duty for about 10 hours 50 minutes when the accident occurred. He had worked the previous day, going off duty about 8:00 p.m. He had been off duty for 11 hours before reporting for work on May 19.

BNSF 6351 North Brakeman

The BNSF 6351 North brakeman was hired in July 2001. He had completed a rules examination in October 2003. He had regularly worked on the Madill and Fort Worth Subdivisions as a trainman during the 12 months before the accident. He had been on duty for about 10 hours 50 minutes when the accident occurred. The brakeman had worked the previous day, going off duty about 8:00 p.m. Prior to reporting for work on May 19, he had been off duty for 11 hours.

BNSF 6789 South Engineer

The BNSF 6789 South engineer was hired as a conductor in October 1994. He was promoted to engineer in May 1997. Prior to the accident, the engineer's last annual checkride took place in July 2003. He had completed a rules examination in April 2004, and his engineer's certification was current. He had regularly worked on the Madill Subdivision as an engineer during the 12 months before the accident. He had been on duty for about 7 hours 35 minutes when the accident occurred. The engineer had last worked on May 17. He had been off duty for 50 hours 30 minutes before reporting for work on May 19.

The engineer's records show he was dismissed on March 24, 2000, for being absent from duty without proper authority. He was reinstated on October 29, 2001, after an arbitrator determined that the charges against him were valid and that he had violated carrier rules. The ruling required him to consult with BNSF's Employee Assistance Program (EAP) and follow a program on attendance devised by the EAP.

BNSF 6789 South Conductor

The BNSF 6789 South conductor was hired in August 2001. Prior to the accident, he had completed a biennial rules examination in June 2003 and an annual train ride in September 2003. The conductor had been on duty for about 7 hours 35 minutes at the time of the accident. He had last worked on May 17, and he had been off duty for 50 hours 30 minutes when he reported for work on May 19.

The conductor had recently transferred to a road service pool[19] assignment covering the Madill Subdivision. This was his second trip. He had worked a yard assignment for several months before taking the pool assignment. On the yard assignment, he had not been required to work with a train dispatcher copying track warrants over the radio. The BNSF official in charge of field operations on the Madill Subdivision stated that the conductor was qualified to work as a conductor on the day of the accident based on normal qualification procedures.

Train Dispatcher

The train dispatcher was hired in July 1999. He had completed biennial rules training in December 2003. He had regularly dispatched the Madill Subdivision during the 12 months prior to the accident. The dispatcher was working a regular 3:00 p.m. to 11:00 p.m. shift and had been on duty for about 2 hours 45 minutes at the time of the accident. He had gone off duty the previous evening about 11:00 p.m. He had been off duty about 16 hours when he reported for work on May 19.

Train Information

BNSF 6789 South consisted of 3 locomotives and 65 rock cars. The train weighed 9,044 tons and was 2,871 feet in length (3,066 feet with locomotives). It was a unit train[20] identified by BNSF with the symbol U MADDON1 19A.

BNSF 6351 North consisted of 4 locomotives and 65 empty rock cars. The train weighed 1,996 tons and was 2,847 feet in length (3,119 feet with locomotives). It was a unit train identified by BNSF with the symbol U SHTIRB1 19A.

[19] A *road service pool* consists of personnel working on-call assignments in rotation.

[20] A *unit train* is a set of dedicated equipment that is operated between a loading and unloading facility.

Track and Site Information

The collision occurred about 3 miles north of Gunter, a town about 45 miles north of Dallas. Track structure in the area of the collision consisted of a single main track. The rail was composed of 115-pound[21] continuous welded rail fixed to treated timber crossties in crushed stone ballast. The track was designated Class 4 track[22] that had a maximum allowable speed of 49 mph. There was a temporary speed restriction of 40 mph from MP 656.2 to MP 680.1 due to crosstie conditions.

Method of Operation

Movement of Trains

Train operations on the Madill Subdivision were governed by the *General Code of Operating Rules* (GCOR) dated April 2, 2002; BNSF "Texas Division Timetable Number 5" issued on January 20, 2002; BNSF "System Special Instructions Number 8" issued on July 13, 2003; the BNSF *Train Dispatcher, Operator, Control Operator Manual* dated July 13, 2003; and various other bulletins and notices issued periodically.

A train dispatcher at the BNSF Network Operations Center managed and directed train movements on the Madill Subdivision. During a typical 24-hour period around the date of the accident, there were about 26 train movements on the Madill Subdivision and 7 or 8 train movements on other territories that the Madill train dispatcher handled. The Madill Subdivision consisted of both centralized traffic control and track warrant control territory. Between Sherman and Irving, the Madill Subdivision was non-signaled single track with designated passing tracks (sidings). Within this dark territory,[23] the dispatcher issued mandatory directives for trains to proceed from point to point and to make meets and passes of other trains via track warrants.

The BNSF official in charge of this territory described typical train movements between Sherman and Irving as unit rock trains and a turn-around local freight assignment. Loaded rock trains moved south, and empty trains moved north. He described train movements as "pretty much a scheduled thing," and he stated that crews that regularly work the Madill Subdivision usually know which trains are running.

[21] Rail is measured in weight per linear yard.

[22] Railroads determine how they will classify various segments of their track. As the class designation increases, the track must meet increasingly higher Federal standards for construction, maintenance, and inspection. Federal regulation also establishes maximum train speeds for each class of track. *Class 4 track* has a maximum allowable speed of 60 mph for freight trains and 80 mph for passenger trains. The railroad may restrict the speed further (as was the case near Gunter).

[23] Non-signaled track is often referred to as *dark territory* in the railroad industry.

Track Warrants

Track warrants are mandatory directives that convey authority for trains to occupy and operate on the main track between specific locations. When a track warrant is issued, the dispatcher also enters it into the computerized track warrant control system. The track warrant control system is designed to assist the train dispatcher and to identify potential conflicting movements. As the train dispatcher issues a track warrant by radio to the train crew, a crewmember writes the information on a preprinted track warrant form.

The BNSF track warrant form has 19 items (1–17 and 21–22) that are checked off as needed by the train dispatcher to regulate the movement of trains. (See figure 5.) As the dispatcher issues the track warrant instructions, a crewmember checks off the boxes and enters other information as directed. Box 7 is the item that must be checked by the train dispatcher and the train crew when an after-arrival track warrant is issued. The train crew reads the track warrant back to the train dispatcher, and providing the read back is correct, the dispatcher advises that it is OK and issues a time.

Track-warrant rules require that personnel identify trains by railroad initials, engine number, and direction in a track warrant (for example, BNSF 6789 South or BNSF 6351 North). The BNSF made a distinction between how trains are identified in formal track warrant directives (railroad initials, engine number, and direction) and how they are referred to in less formal information exchanges (the 641 Job, the Sherman Rock, etc.). A senior BNSF manager explained the distinction:

> Investigator: OK. Another thing is, whenever the train dispatcher is talking to a job, I know that when you issue a track warrant, you do it by initial, number, and direction, like BNSF 6125 northbound. But you also have train symbols that the train dispatchers are using a lot. In this Gunter case, we see where the train dispatcher has talked about the same train and used at least four different identifications in it. Is that a concern that we need to look at?
>
> BNSF Manager: I don't believe so. From a traffic planning standpoint, when meets and passes occur that have strict operational requirements regarding main track authority moves, I think that certainly there's a level of communications and expectations that we have for those communications.
>
> I think that outside of those, that some short identifications are actually more telling, I guess, for a train crew as far as who they're meeting, such as you're going to meet a Road Switcher or Rock Train or some of those type of things versus actually getting into alpha-numeric symbol abbreviations that the train crews will do a translation themselves anyway.

BNSF procedures required that employees copying track warrants state their name before instructions were transmitted. Before the transmittal of the last track warrant to BNSF 6789 South, the engineer stated that the conductor was copying the track warrant. After listening to the tapes, the train dispatcher recognized the engineer's voice as the person who had read the instructions back and OK'd the track warrant for BNSF 6789 South to wait at Dorchester. BNSF officials stated that they took no exception to one crewmember copying and a different crewmember repeating the instructions back to the dispatcher.

TRACK WARRANT

No: _____ Date: _____ 20____

To: _____ At: _____ (on _____ Subdiv)

1 ☐ Track Warrant No _____ is void.
2 ☐ Proceed from _____ to _____ on _____ track.
3 ☐ Proceed from _____ to _____ on _____ track.
4 ☐ Work between _____ and _____ on _____ track.
5 ☐ Not in effect until _____
6 ☐ This authority expires at: _____
7 ☐ Not in effect until after arrival of: _____ _____ _____ at _____
8 ☐ Hold main track at last named point.
9 ☐ Do not foul limits ahead of: _____
10 ☐ Clear main track at last named point.
11 ☐ Between _____ and _____ make all movements at restricted speed. Limits occupied by train.
12 ☐ Between _____ and _____ make all movements at restricted speed. Limits occupied by men or equipment.
13 ☐ Do not exceed _____ MPH between _____ and _____
14 ☐ Do not exceed _____ MPH between _____ and _____
15 ☐ Flag protection not required against following trains on the same track.
16 ☐ Track Bulletins in effect: _____, _____, _____, _____, _____, _____.
17 ☐ Other specific instructions: (joint with) _____ _____

20 ☐ Be prepared to stop at following switch(es) until known to be in normal position: _____

21 ☐ Permission to leave following switch(es) in reverse position: _____

This warrant has _____ boxes marked: _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____.

OK _____ Dispatcher _____
Relayed to _____ Copied by _____

Figure 5. BNSF track warrant form.

After-Arrival Track Warrants

To comply with an after-arrival track warrant, the train crew that receives the box 7 track warrant must wait until the train listed has arrived at the designated location before any movement is made. The conductor and engineer on BNSF 6789 South were jointly responsible for complying with these requirements.[24]

BNSF track warrant instructions required that the train to be met be identified by railroad initials, engine number, and direction. The instructions further required that the meeting crew know that the opposing train passed the point of restriction. Additionally, in non-signaled territory, the meeting train was required to make positive radio contact with the train to be met in order to confirm the identity of the passing train. If the crew that was restricted by the box 7 track warrant could not reach the train identified in box 7, then the train dispatcher was to be contacted to confirm the identity of the train that they met. BNSF procedures also included a requirement that both the engineer and the conductor of the train restricted by the box 7 track warrant record the time and location on their track warrant form, indicating that they had identified the train listed in box 7 of their track warrant.

When the track warrant was issued requiring that the trains meet at the Dorchester siding (see figure 6), it was a formal directive issued by the dispatcher with a read-back by the crew, which provided confirmation of communication and understanding. Earlier informal discussions between the dispatcher and crews regarding potential meeting points were informational rather than directive. The BNSF viewed these informal information exchanges as important for operational planning to address issues, such as fuel conservation, and to avoid extended blocking of road crossings. A BNSF senior manager explained:

> I think there's balance in providing that information and that think aloud, you know, think out loud taking place may be good, and there's other cases that it may set an expectation that when the plan change (sic). You know, it gets back to what is an obligation to go back and to what I'll call correct that information that was originally transmitted because operation plans do change.

As a result of this accident, on May 28, 2004, the BNSF issued "System General Order Number 45," amending the after-arrival track warrant procedures. The changes, which took effect on June 1, 2004, established a three-step process in non-signaled territory:

1. Dispatcher advises the train that will receive the box 7 track warrant of the identification of train(s) that will be listed in box 7 (by railroad initials, engine number, and direction);

2. The train that will receive the box 7 track warrant establishes the location of the train(s) that will be listed in box 7 (by railroad initials, engine number, and direction), advising the dispatcher that direct communication has been made and the location of the train(s) contacted; and

3. The train crew to receive the box 7 track warrant has stopped at the meeting point and has notified the dispatcher that they are stopped.

[24] GCOR Rule 1.47, "Duties of Trainmen and Enginemen."

An additional condition was implemented requiring that crews turn in their track warrants at the completion of each trip.

On May 28, 2004, the BNSF also issued "Job Briefing Number 24" to all dispatchers and chief dispatchers, further explaining the revised communication requirements and expectations regarding the after-arrival track warrant process. The briefing also stated that the BNSF was attempting to minimize the number of trains listed in track warrant box 7.

Figure 6. South siding switch at Dorchester

Postaccident Changes in After-Arrival Track Warrant Volumes

The BNSF monitored track warrant volumes, comparing the period from January 1 to May 20, 2004, with the period from June 6 to July 14, 2004. The comparison showed that the number of after-arrival track warrants issued decreased on a systemwide basis from a monthly average of 2,559.2 (5.88 percent of total track warrants) to 649 (1.13 percent of total track warrants) after the accident and after the revisions to the after-arrival track warrant procedures. On the Madill Subdivision, the number of after-arrival track warrants decreased from a monthly average of 90.9 (5.03 percent of total track warrants issued) to 14 (0.67 percent). The BNSF has continued to monitor after-arrival track warrant volumes and has told the Safety Board that the monthly average remains about the same. During calendar year 2005, an average of about 13 after-arrival track warrants were issued per day in non-signaled territory on the BNSF system. BNSF representatives advised the Board that a number of these after-arrival track warrants were issued solely to monitor compliance with BNSF procedures in non-signaled territory.

Meteorological Information

The report from the Collin County Regional Airport (about 20 miles south of Gunter) at the time of the accident indicated that the weather was dry and clear, and the temperature was 86° F. There were no weather-related impediments to visibility.

Medical and Toxicological Information

Toxicological specimens were obtained from the surviving BNSF 6789 South conductor, the three BNSF 6351 North crewmembers, and the BNSF dispatcher on duty at the time of the accident. The coroner provided specimens taken from the deceased BNSF 6789 South engineer. All of the specimens were screened for the following substances: cannabinoids, cocaine, opiates, amphetamines, methamphetamines, phencyclidine, barbiturates, benzodiazepines, and ethyl alcohol. All of the test results were negative for the presence of alcohol and drugs.

Information obtained from the medical records maintained by the personal physician of the deceased BNSF 6789 South engineer indicated that he had been diagnosed with severe obstructive sleep apnea in 1999 and he had been prescribed a continuous positive airway pressure (CPAP) device. The diagnosis was based on a sleep study that indicated the engineer had a sleep latency[25] period of 2 minutes. According to notes in the physician's records, the engineer began using the CPAP and reported: "More energy! Less fatigued/feels well." A physician's note from January 2002 stated that the engineer had discontinued using the CPAP and that he was sleeping well and had "no daytime somnolence." Further notes from 2003 and 2004 exams stated that the engineer had not resumed use of his CPAP device.

Medical records maintained by the BNSF from July 2001 indicated that the deceased BNSF 6789 South engineer had been diagnosed with diabetes and hypertension and his condition was described as "stable." Medications prescribed were listed in the records as follows: Glucophage [metformin], 1000 mg twice a day; felodipine, 10 mg a day; Amaryl [glimepiride], 4 mg a day; Avandia [rosiglitazone], 4 mg a day; Accupril [quinapril]; and Zocor [simvastatin]. His recommended work status was described as "Full Duty." The engineer's personal physician's name and signature appeared on the form. No additional details were provided regarding the engineer's diabetes and hypertension, and there was no mention in the BNSF's records of a diagnosis of, or treatment for, obstructive sleep apnea. There is no Federal regulation that requires locomotive engineers or their personal physicians to report an obstructive sleep apnea diagnosis to employers.

[25] *Sleep latency* is the amount of time it takes a person to fall asleep. The sleepier someone is, the shorter the person's sleep latency will be. A person with a sleep disorder such as obstructive sleep apnea often has a very short sleep latency.

No additional requests for information regarding the engineer's diabetes or hypertension had been made by the BNSF, and no other medical examinations were documented in the BNSF's records.

The BNSF's records did reflect that the engineer's last required vision evaluation indicated that he had normal color vision. The evaluation also indicated distant vision of 20/30 in the left eye and 20/20 in the right eye. His near vision was recorded as 20/30 in each eye.

Medical records for the BNSF 6789 South conductor did not contain information about any potentially performance impairing medical conditions.

Tests and Research

Track and Mechanical Tests and Inspections

Track in the area of the collision was inspected, and no defects were noted. Undamaged cars on both trains were inspected. All brakes had applied on BNSF 6789 South. One car (FURX 911139) on BNSF 6351 North had inoperative airbrakes. The engineer on BNSF 6351 North told investigators that the train handled as expected, and he took no exception to the train's performance or braking.

Both trains were given airbrake tests prior to departing their originating locations. No exceptions were noted. Each locomotive from both trains was within all inspection parameters required by the Federal Railroad Administration (FRA).

Recovered Track Warrants

Track warrants were recovered from the locomotives involved in the accident. The track warrants documenting the meet between BNSF 6789 South and BNSF 6351 North are provided in appendix D. There is no indication on Track Warrant No. 3598, the after-arrival track warrant issued to BNSF 6789 South, showing that either the engineer or the conductor recorded the identifying information (time and location) for the train that was listed in box 7.

Event Recorder Data

Event recorder data were produced using the Safety Board's data analysis software in Washington, D.C.[26] The data were verified for accuracy by examining operating characteristics of the locomotives that had been previously recorded. The data were consistent and within the operating range and limitations of the locomotives.

[26] Locomotive event recorders typically record information that includes time, speed, distance, and throttle and brake settings.

Sight-Distance Observations

Sight-distance observations were conducted on May 21, 2004, to approximate the conditions that the crews experienced prior to the collision. The observations were conducted using similar locomotives to those involved in the accident. The weather at the time of the sight-distance observation testing was dry and cloudy, and the temperature was 87° F, which was similar to the accident conditions.

During the testing, both locomotives stopped at the point of collision at MP 661.9 and backed away from each other in 100-foot increments until they were 1,700 feet apart. Both locomotives were then moved 25 feet farther apart until the southbound locomotive was backed into the curve and lost sight of the northbound locomotive. At 875 feet from the point of collision, personnel on each locomotive lost sight of the other locomotive. The distance between the two locomotives measured 1,750 feet. (See figure 7.) The sight-distance observations and the event recorder speed data indicate that the crewmembers in the control cabs had about 15 seconds to recognize the impending collision, apply the emergency brakes, and jump from the moving trains before impact.

Figure 7. Collision site as viewed from southbound train (BNSF 6789 South).

Use of Cellular Phones by Operating Crews

The GCOR and the BNSF "System General Order Number 37" dated March 7, 2004, restricted the use of cellular phones and other electronic devices. Cellular phones were not to be used by crewmembers while the train or engine was moving. However,

cellular phone use was allowed while the train or engine was stopped, providing that such use did not interfere with required duties.

Safety Board investigators obtained records that showed the number and duration of cellular phone calls made by crewmembers on both trains between 1:50 p.m. and the time of the accident. (See table 1.) During this time, a total of 25 cellular phone calls were made and/or received by the 5 crewmembers on both trains while the trains were in motion. Three of these calls were railroad business related. The BNSF 6789 South engineer made two of the business related calls, and the BNSF 6351 North conductor made the third.

Table 1. Summary of crew cellular phone activity between 1:50 p.m. and collision.

Crewmember	Number of Calls	Duration of Calls	Calls While Train in Motion	Calls While Track Warrant Authority Was Being Issued	BNSF Business Related Calls
BNSF 6789 South Engineer	16	36 minutes	7	1	2
BNSF 6789 South Conductor	7	16 minutes	1	0	0
BNSF 6789 South Total	**23**	**52 minutes**	**8**	**1**	**2**
BNSF 6351 North Engineer	20	37 minutes	12	0	0
BNSF 6351 North Conductor	6	22 minutes	3	0	1
BNSF 6351 North Brakeman	12	91 minutes	2	0	0
BNSF 6351 North Total	**38**	**150 minutes**	**17**	**0**	**1**
Combined Total	**61**	**202 minutes**	**25**	**1**	**3**

The BNSF 6789 South engineer's cellular phone record showed activity between 3:12 p.m. and 3:16 p.m. This time period coincides with the time that track warrant authority was being received by the BNSF 6789 South conductor. (Track Warrant No. 3583 was OK'd at 3:17 p.m.) BNSF track warrant procedures required the receiver (the BNSF 6789 South conductor in this case) to repeat back verbatim certain critical portions of the track warrant. In this instance, the track warrant had to be repeated back to the dispatcher several times before it was considered correct.

Following the 3:17 p.m. OK on Track Warrant No. 3583, the dispatcher asked the BNSF 6789 South engineer to use his cellular phone to call him at the Network Operations Center. The engineer had to call the dispatcher twice because of poor transmission/reception during the first call. The first call to the dispatcher was made at 3:22 p.m., and the second call was made at 4:02 p.m. Both calls were recorded. The dispatcher asked the engineer to provide additional assistance to the conductor in future track warrant communications. Event recorder data indicate that both calls were made while the train was in motion.

The BNSF 6351 North conductor's cellular phone records showed a call to the BNSF work order reporting line[27] at 5:04 p.m. Event recorder data indicate that the train was in motion at that time.

No cellular phone activity was recorded for either train crew during the time the BNSF 6789 South crew was receiving the after-arrival track warrant authority at Dorchester, which required them to wait for the arrival of BNSF 6351 North (OK time 5:39 p.m.). The last cellular phone activity for the BNSF 6789 South crew was recorded at 5:31 p.m. The call lasted about 2 minutes while the train was stopped. The last cellular phone activity for the BNSF 6351 North crew before the collision was recorded at 5:24 p.m. The call lasted about 3 minutes while the train was moving. A 911 call originated from the BNSF 6351 North brakeman's cellular phone at 5:48 p.m.

Management Oversight

Operational Testing Program

Operational testing[28] is one of the methods used to monitor the effectiveness of, and compliance with, the operating rules. The Federal Railroad Safety Act of 1970 requires that railroads have a program of operational tests and inspections. Regulations at 49 *Code of Federal Regulations* (CFR) Part 217. 9 (a) require that a railroad:

> Conduct operational tests and inspections to determine the extent of compliance with its code of operating rules, timetables, and timetable special instructions in accordance with a written program retained at its system headquarters and at the division headquarters for each division where the tests are conducted.

The BNSF described the program as providing "an opportunity to verify that employees are working safely and in compliance with all company rules, policies, instructions and procedures." According to managers interviewed, the BNSF established a goal of conducting at least 80 tests per month per manager. Operational testing statistics are maintained and provided to the division general manager.

[27] The BNSF has a system where crewmembers can call in information to a centralized database concerning work performed en route, such as railroad cars removed from or added to a train.

[28] *Operational testing* involves management observations of employees, as well as structured scenarios, to verify that rules and procedures are followed.

Several of the tests in the BNSF program are related to track warrants, although the BNSF official assigned to the Madill Subdivision stated that box 7 requirements were difficult to test:

> I have never had a violation with a box 7 track warrant, and in fact, again, they are difficult to catch because, I mean, you just have to be in the right spot at the right time.

BNSF operational testing records for the 12 months prior to the accident showed that about 1,119 operational tests were performed on the Madill Subdivision. Of that number, 167 were specific[29] to track warrant control operations, and 5 of those were recorded as failures. The five failures were recorded for test 612, which covers the requirement that crews operating in non-signaled territory make a radio transmission 2 miles in advance of a siding or junction, stating the engine number, direction, speed, and location.

Train dispatchers in the Network Operations Center also monitor the safe operations of trains. If dispatchers become aware of an operating rule violation, they are expected to notify the chief dispatcher. Such a notification would result in followup action. If the rule violation were serious (for example, a "de-certifiable"[30] event, such as a train exceeding its movement authority), the dispatcher would typically stop the train and notify a supervisor to contact the crew.

BNSF Operational Testing of Personnel

Records indicate that the BNSF conducted 184 operational tests of the five crewmembers involved in the collision during the 12 months prior to the accident. The BNSF 6789 South engineer was tested eight times. None of the tests was related to track warrant authority. The engineer failed one test related to derail position, and he was verbally counseled. The BNSF 6789 South conductor was tested 69 times. He passed all of the tests; however, none of them were related to track warrant authority.

The BNSF 6351 North engineer was tested 41 times. Two of the tests were related to track warrant authority. The engineer failed three tests, all of which were related to fuel conservation procedures. The BNSF 6351 North conductor was tested 46 times. Three of the tests were related to track warrant authority. He failed two tests pertaining to the use of personal protective equipment. The BNSF 6351 North brakeman was tested 20 times. One test was related to track warrant authority. He passed all of the tests.

[29] These tests included 209, 608, 612, 613, and 614 in the BNSF *Operations Testing Guide* dated December 15, 2003.

[30] The FRA requires railroads to certify locomotive engineers. Certain serious rule infractions can result in *de-certification* under 49 CFR 240.

In the 12 months prior to the accident, the BNSF tested the train dispatcher 43 times. He failed two tests because he did not follow proper procedures when authorizing a train to pass a stop signal.

Testing on After-Arrival Track Warrant Rules

Prior to the Gunter collision, the BNSF did not have a specific line item test for compliance with box 7 track warrant requirements. However, there were line item tests for other aspects of track warrant control compliance, and testing officials could enter test results for box 7 compliance. As a result of this accident, the BNSF established a line item test specifically for box 7 after-arrival authorities, which required the tester to ensure communication and documentation requirements were being met.

On May 28, 2004, the BNSF issued "Operations Management Instruction Number 19" to its operations managers, detailing changes to the *Operations Testing Reference Guide*. These changes added a specific test on after-arrival track warrant compliance. The test procedure addressed each of the three steps required to issue a box 7 track warrant in non-signaled territory, as well as the requirement for crews to turn in their track warrants at the completion of each trip.

Train Crew Qualification and Familiarization Training Trips

The BNSF official responsible for the Madill Subdivision described the familiarization process for a conductor transferring to the subdivision as making a minimum of one round trip.[31] There were also provisions for additional training trips. He explained:

> If the person says, yes, I made my qualifying trip, but, I don't have a clue where I am at, and I don't understand the track warrant stuff and what have you, we will, yeah, we will get them with somebody. And in fact, we will put them on a road switcher, a local out there every day so they get plenty practice at it, I will. But, but, as far as standard qualification trips, that is just one trip.

As a result of this accident, the BNSF increased the number of conductor familiarization trips required. On June 21, 2004, the BNSF issued a general notice to Texas Division employees regarding changes to the policy on familiarization trips. On the Madill Subdivision, the policy required an increased numbered of minimum familiarization trips for conductors, as described in table 2. These additional trips provide new employees, or employees new to track warrant control territory, more practice with track warrants before they are qualified to work in this territory.

[31] Prior to the Gunter accident, a conductor made this single trip as a working conductor. After the accident, the BNSF established a policy requiring that familiarization trips be made with another qualified conductor present.

Table 2. BNSF minimum number of familiarization trips for conductors working on the Madill Subdivision.

Fort Worth Conductor Extra Board*
1 round trip Fort Worth to Oklahoma City
1 round trip Irving to Madill on local freight assignments
3 trips Fort Worth to Irving on Trinity Railway Express passenger trains
1 trip on U-SHTIRB (same train symbol as BNSF 6351 North)
1 trip on U-SHTCAK (Sherman, Texas, to Clark, Oklahoma)
Madill Conductor Extra Board*
1 round trip Madill to Tulsa
1 round trip Madill to Irving
1 trip on U-SHTCAK (Sherman, Texas, to Clark, Oklahoma)
1 trip on Madill Road Switcher

***** These familiarization trips are also required for pool freight conductors.

Also as a result of this accident and the BNSF 6789 South conductor's difficulties with reading back a track warrant, the BNSF implemented a new policy limiting the number of read-back attempts allowed before management intervention. On June 1, 2004, the BNSF issued "System General Notice Number 515" to all operating employees and managers explaining a new policy on repeating authorities. The notice stressed the importance of repeating authorities precisely as transmitted and advised that if an authority was not repeated correctly after three attempts, the dispatcher would stop the authority and a supervisor would be contacted for followup.

On June 3, 2004, the BNSF issued "Operations Management Instruction Number 20" to managers explaining their responsibilities under the three-strikes policy. Additionally, the BNSF created a presentation on the policy to be used during dispatcher training. The presentation offered the following guidance to train dispatchers:

- Use Consistency in Delivery
- Discuss Conditions and Restrictions BEFORE issuing
- Require a FULL repeat to verify clear understanding
- Issue at a SPEED at which it can be copied
- Issue in a professional manner
- Stop and START OVER any authorities in which conversation occurs
- Do not use CONFIRMATION of limits at beginning as a reason to STOP listening to repeat of limits later
- If necessary, STOP train and have engineer copy authority
- After 3 attempts, END issuance

Additional Data/Information

Various aspects of BNSF operations fall under the regulatory authority of the FRA, as outlined in 49 CFR Parts 200-299. Texas Railroad Commission personnel also enforce FRA regulations in a state participation program, as outlined under 49 CFR Part 212. The FRA was designated as a party to this investigation, and Texas Railroad Commission personnel assisted the FRA.

Use of After-Arrival Track Warrants

Over a period of time, some railroads have discontinued the use of after-arrival movement authorities. Rules promulgated by the Northeast Operating Rules Advisory Committee[32] (NORAC) have not allowed the use of after-arrival movement authorities for at least 17 years. CSX Transportation uses a proprietary rulebook that does not allow after-arrival authorities. However, rules promulgated by the GCOR Committee[33] do allow the use of after-arrival movement authorities. Norfolk Southern Railroad uses a proprietary rulebook on the majority of its system, which also allows after-arrival authorities.

After the Safety Board investigated a head-on collision of two Union Pacific Railroad trains at Devine, Texas, in June 1997,[34] the Board recommended that the Union Pacific Railroad:

> R-98-25
>
> Discontinue permanently the use of after-arrival orders in dark (nonsignalized) territory.

This recommendation was classified "Closed—Acceptable Action" on July 23, 2001, after Union Pacific Railroad stated that it would stop using after-arrival track warrants in non-signaled track warrant control territory. In May 2002, Union Pacific Railroad issued instructions to its operating employees that again allowed the use of after-arrival track warrants, providing the train that was issued such instructions had already stopped to wait for the arrival of the opposing train.

After the Safety Board investigated a head-on collision of two BNSF trains at Clarendon, Texas, in May 2002,[35] the Board recommended that the FRA:

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[32] More than 50 railroads operate under NORAC rules, including Amtrak (North-East Corridor), Conrail, and portions of the Norfolk Southern.

[33] More than 150 railroads operate under the GCOR, including Amtrak (Western locations); BNSF; Canadian National; Kansas City Southern; and Union Pacific.

[34] National Transportation Safety Board, *Collision and Derailment of Union Pacific Railroad Freight Trains 5981 North and 9186 South in Devine, Texas, June 22, 1997*, Railroad Accident Report NTSB/RAR-98/02 (Washington, DC: NTSB, 1998).

[35] National Transportation Safety Board, *Collision of Two Burlington Northern Santa Fe Freight Trains Near Clarendon, Texas, May 28, 2002*, Railroad Accident Report NTSB/RAR-03/01 (Washington, DC: NTSB, 2003).

R-03-2

> In territory not equipped with a positive train control system, restrict the issuance of track warrant authority that contains an after-arrival requirement to trains that have stopped at the location at which they will meet the opposing train.

The FRA declined to implement Safety Recommendation R-03-2, responding in a letter dated October 3, 2003, that:

> Most railroads in the Nation do have sufficient operating rules and instructions already in place to address the Safety Board's concern regarding restrictions placed on the issuance of "after-arrival" orders without the intrusiveness of regulatory intervention by FRA.

Based on this response, Safety Recommendation R-03-2 was classified "Closed—Unacceptable Action" on August 6, 2004.

After the Clarendon accident, the BNSF changed its operating rules to allow the use of after-arrival track warrants in non-signaled territory only after the train that was issued these instructions had stopped at the point at which it was to wait for the arrival of the opposing train. The BNSF instructions for train dispatchers[36] in effect at the time of the Gunter collision read:

> For movement in nonsignaled territory, issue track warrant containing Box 7 (Not in Effect Until After the Arrival of_____ at _____) only after the train to receive the track warrant containing Box 7 is stopped at the meeting point where opposing train will be met.

After the Gunter accident, the BNSF modified its track warrant procedures by adding more communication requirements in non-signaled territory. The new requirements went into effect on June 1, 2004, and read:

> In non-signaled territory, a train may only be granted a Box 7 "Not in Effect Until After the Arrival of _____" track warrant, after the following requirements have been completed:
>
> 1. Dispatcher advises the train that will receive the Box 7 track warrant of the identification of train(s) that will be listed in Box 7 (by initials, engine number and direction).
> 2. The train that will receive the Box 7 track warrant establishes the location of the train(s) that will be listed in Box 7 (by initials, engine number and direction), advising the dispatcher that direct communication has been made and the location of the train(s) contacted.
> 3. The train to receive the Box 7 track warrant has stopped at the meeting point and has notified the dispatcher that they are stopped.

[36] BNSF *Train Dispatcher's and Control Operator's Manual* issued July 13, 2003.

4. In nonsignaled territory after the meet has occurred, the train with Box 7 must establish positive radio contact with the train listed in Box 7 to confirm the identity of the passing train. If radio communication cannot be established, the train dispatcher must be contacted to provide the required confirmation. The train identification, time passed, location passed, or current time and location must be written on the track warrant form by both the conductor and engineer of the train being so restricted.

As a result of the Devine, Texas,[37] collision, the Safety Board made two recommendations to the FRA:

R-98-26

Revise 49 *Code of Federal Regulations* 220 to address track warrants and other current railroad operating practices.

R-98-27

Require railroads to discontinue permanently the use of after-arrival orders in dark (nonsignalized) territory.

In a February 4, 1999, letter in response to Safety Recommendation R-98-26, the FRA notified the Safety Board that it had issued a final rule, effective January 4, 1999, modifying 49 CFR 220 as requested. Accordingly, the Board classified Safety Recommendation R-98-26 "Closed—Acceptable Action" on June 29, 1999.

In the same February 1999 letter, the FRA also stated that it had issued a safety directive addressing safety practices in direct train control territory. The directive recommended that in those instances in which a train movement instruction includes a train meet, the dispatcher specifically state in the movement authority, "this track warrant includes a requirement to meet another train." The second recommendation in the directive required that railroads review their operating rules and practices pertaining to operations in non-signaled territory to determine what further enhancements were warranted to improve safety. These considerations included possibly eliminating the use of after-arrival orders. The letter further stated that FRA audits had determined that the "overwhelming majority" of railroads had eliminated the use of these orders in non-signaled direct train control territory. Although the letter stated that the FRA would continue to review these safety critical procedures during future dispatcher audits, the FRA stopped short of prohibiting the use of after-arrival orders in non-signaled territory. Based on this response, the Safety Board classified Recommendation R-98-27 "Closed—Unacceptable Action" on June 29, 1999.

[37] NTSB/RAR-98/02.

Analysis

Exclusions

The track, the locomotives, and the railcars were inspected and tested to the extent possible after the accident. No defects were identified. Further, both trains had received initial terminal airbrake inspections on the day of the accident, and no discrepancies were noted. Neither crew reported any problems with their respective trains.

On the day of the accident, the weather was dry, the temperature was 86° F, and visibility was clear.

The train dispatcher and the surviving crewmembers on both trains provided toxicological specimens that were screened for drugs and alcohol. The coroner provided specimens taken from the deceased engineer. All of the test results were negative for drugs and alcohol.

The BNSF 6789 South crewmembers had been on duty for about 7 hours 35 minutes at the time of the accident. They had been off duty for more than 50 hours before beginning the trip. The train dispatcher had been on duty for about 2 hours 45 minutes, and he had been off duty for 16 hours before beginning his shift.

The Safety Board concludes that the following were not factors in this accident: the condition of the track, locomotives, or railcars; the weather; drug or alcohol use; and work schedules.

First Northbound Train/BNSF 2917 North

BNSF 2917 North originally had main track authority to the north siding switch at Dorchester. Because BNSF 2917 North entered the Dorchester siding at the south switch and reported clear of its main track authority, it was not necessary for the dispatcher to issue a track warrant for BNSF 6789 South to meet BNSF 2917 North at Dorchester. BNSF 2917 North and BNSF 6789 South passed each other at Dorchester, and the BNSF 2917 North subsequently was authorized to continue north. Because the BNSF 6789 South crew did not verbally confirm the train identification of BNSF 2917 North by radio when the trains passed, they most likely assumed that BNSF 2917 North was the single train that the dispatcher had told them they would meet at Dorchester. After the trains passed, BNSF 6789 South was issued the track warrant authorizing it to proceed south from Dorchester after the arrival of BNSF 6351 North. The BNSF 6789 South crew likely assumed that this was the train they had just passed at Dorchester.

The Safety Board concludes that the BNSF 6789 South crewmembers' failure to verify the engine number listed on their track warrant against the engine number of the train in the siding, combined with the expectation that they would proceed south after meeting a single train at Dorchester, resulted in the BNSF 6789 South crewmembers likely assuming that they had met BNSF 6351 North at Dorchester.

Second Northbound Train/BNSF 6351 North

At the time of the collision, BNSF 6351 North was proceeding at the allowed track speed with valid track warrant authority to travel north on the main track from milepost (MP) 678 to the south siding switch at Dorchester.

Southbound Train/BNSF 6789 South

The BNSF Railway Company (BNSF) had a number of procedures in place to address the circumstances of this accident. The BNSF 6789 South crew was required to note on their track warrant form the engine number, the time, and the location when they met BNSF 6351 North. There was also a procedure requiring them to make positive radio contact with the train listed in the after-arrival track warrant and to verify the engine number. According to the BNSF 2917 North engineer, there was no radio request for engine number verification when the two trains passed or afterwards. Had either of the BNSF 6789 South crewmembers made such a call, they would have learned that they had not yet met BNSF 6351 North and the accident might have been averted.

The BNSF 6789 South crew departed Dorchester immediately after receiving Track Warrant No. 3598 requiring them to wait for BNSF 6351 North, which had yet to arrive. The Safety Board concludes that had the BNSF 6789 South crew complied with their track warrant, they would not have left Dorchester and the accident would not have occurred.

Both crewmembers were responsible for the safe operation of the train, and they were required to hold a job briefing to discuss the track warrant they received. The conductor had limited experience with track warrants and had demonstrated difficulty copying and repeating track warrant authorities earlier in the day. The dispatcher had asked the engineer to help the conductor and "make sure he's doing it right." Helping the conductor complete this task added to the engineer's responsibilities. Although the engineer was experienced with track warrants on this territory, it is possible that helping the conductor distracted his attention from verifying which train they were to meet at Dorchester, particularly given the expectation that likely was established by earlier informal communications with the dispatcher that indicated they would meet a single train at Dorchester and a second train farther south.

Dispatcher Communications

In the hours leading up to the accident, there were two types of communication between the dispatcher and the BNSF 6789 South crew. Communications transmitting mandatory directives (track warrant authorities) consisted of a formal process in which trains were referred to by their operational identification (for example, BNSF 6789 South), and an accurate read back was required to confirm the directives. Other communications between the dispatcher and the BNSF 6789 South crew were more informal as the dispatcher discussed future train movements and meeting points. Trains were referred to by various nicknames; sometimes several different nicknames were used for the same train. (See appendix C.)

Safety Board investigators listened to audio recordings of the radio transmissions between the dispatcher and the BNSF 6789 South crew when the after-arrival track warrant was issued. The dispatcher transmitted the track warrant word for word as entered into the dispatch center computer. The BNSF 6789 South engineer[38] repeated the track warrant incorrectly, adding a box 1[39] entry that the dispatcher had not stated. The dispatcher caught the error, and the engineer acknowledged that there was no box 1 instruction on the track warrant. The rest of the text read back by the BNSF 6789 South crew was correct, including the repetition of the after-arrival stipulation.

The track warrant form recovered from the BNSF 6789 South wreckage had a number of incorrect entries. Box 1 was checked, then blacked out, and "3593" was entered on the box 1 line, reflecting the error that was made and corrected during the read back. Boxes 2, 7, and 20 were marked with an "X." The box 2 line had several words crossed out in the "Proceed from" space, and the entry was not legible. The entry in the box 7 line read, "B6351 North South SS Dorchester." The line 20 box was marked with an "X," and no switch was listed. Box 21 (permission to leave a switch in reverse) was checked, and "SSS DOR" was entered on that line. (See appendix D.)

The BNSF 6789 South crew was informed on four separate occasions that they would meet a single train at Dorchester. During the last two occasions, they were also informed that they would be traveling beyond Dorchester to meet a second train. When the plan changed, the dispatcher asked the BNSF 6789 South crew if they could fit between siding switches at Dorchester. He asked this question to ensure that BNSF 6789 South could clear the switches without blocking a road crossing. However, the dispatcher did not explain that he was changing the original plan and that BNSF 6789 South would then meet a second train at Dorchester.

The Safety Board recognizes that some informal communication may be useful (for example, to avoid blocked crossings, to keep trains moving on heavy grades, or to

[38] The dispatcher said that he recognized the engineer's voice after listening to the recorded communications.

[39] *Box 1* is used when a previously issued track warrant is made void. See figure 5 for an example of the BNSF track warrant form.

pace trains for fuel conservation). However, such informal communication can establish expectations that may not be resolved when plans change and a mandatory directive is issued, as likely occurred in this accident. The use of train nicknames can add further confusion. On two occasions, the dispatcher first referred to BNSF 2917 North as the Sherman Rock Train or the Rock Train before correcting himself. (BNSF 6351 North—the train overlooked by the BNSF 6789 South crew—was the Sherman Rock Train, and the majority of trains on the Madill Subdivision carried rock cars.) Therefore, the Safety Board concludes that had the dispatcher consistently referred to all of the trains by their engine numbers—the identification mechanism required in mandatory directives—it would have reinforced the need to verify engine numbers when the trains met.

In the very last radio communication that followed the dispatcher's OK on the after-arrival track warrant issued to BNSF 6789 South at Dorchester, the BNSF 6789 South crew reported the south siding switch at Dorchester as restored to normal.[40] The dispatcher replied: "I can't show it normal because that Rock Train, the Sherman Switcher's got a box 7 on you." This was potentially confusing because the dispatcher used two names to describe the northbound train; and while the Sherman Switcher (BNSF 2917 North) did have a box 7 track warrant naming BNSF 6789 South, that track warrant authorized movement from the Dorchester north siding switch, not the south siding switch. The other train name the dispatcher used, the Rock Train (BNSF 6351 North, the train that never reached Dorchester), did not have a box 7 marked on its track warrant. However, BNSF 6351 North did have a box 21 marked, allowing it to leave the south siding switch at Dorchester in reverse position when it entered the siding. The BNSF 6789 South crew had been issued a track warrant with box 20 checked, advising them to be prepared to stop at that switch if it was aligned for the siding after they met BNSF 6351 North. If the BNSF 6789 South crew believed that they had met BNSF 6351 North at Dorchester, it was appropriate for them to report the switch as normal.

Another factor that may have resulted in confusion involved BNSF 2917 North reporting clear of its track warrant authority and, therefore, not being listed on any of the track warrants issued to BNSF 6789 South. BNSF 6789 South crewmembers were told (on four occasions) that they would meet one train at Dorchester. They received an after-arrival track warrant requiring them to meet one train at Dorchester, and they did pass one train at Dorchester. However, it was not the train listed on the after-arrival track warrant they were issued.

The after-arrival portion of the track warrant was transmitted and read back correctly, and the BNSF 6789 South crew should have waited at Dorchester. However, the BNSF 6789 South crewmembers were never specifically advised of the dispatcher's change in plans. Train dispatchers should be acutely aware of how informal communications can create expectations that do not always correspond with the dispatchers' intentions. The dispatcher involved in this accident might have

[40] *Normal* is aligned for movement on the main track, as opposed to reverse, which is aligned for a movement into or out of the siding.

further reinforced incorrect expectations by frequently using the phrase "here we go"[41] as a closing salutation, when after his last communication it was necessary for BNSF 6789 South to remain in place. Therefore, the Safety Board concludes that informal communications between the dispatcher and train crews regarding authority limits, train names, and meeting or stopping points may lead to misunderstandings and errors. The Safety Board believes that the BNSF should use the Gunter collision as a case study in train crew and dispatcher training and retraining to illustrate how informal communications can lead to misunderstandings and errors.

The Safety Board is also concerned about the use of informal communications on other railroads. Therefore, the Board will inform the railroad industry about the circumstances of this accident and will advise the industry of the importance of training and retraining employees to recognize how informal communications regarding authority limits, train names, and meeting or stopping points can lead to misunderstandings and errors.

After-Arrival Track Warrants in Non-Signaled Territory

Non-signaled (dark) territory presents a unique problem for rail safety. In dark territory there are no signals to warn trains as they approach each other, and the avoidance of collisions relies solely on dispatchers and train crews adhering to operating procedures. Issuing after-arrival track warrants under these conditions only exacerbates an already potentially tenuous and contingent work situation. While the railroad industry contends that after-arrival track warrants facilitate the expedient and efficient movement of trains and reduce the amount of wasted resources, and the Federal Railroad Administration (FRA) sees merit in the industry's logic,[42] ultimately, the role of human error and the cost of human casualties also must be considered in this equation. The FRA acknowledges that "until positive train control can be fully achieved, we need to take those steps that will decrease the risk of collisions that may occur as a result of employee error."[43] Yet, the FRA has not taken the proactive steps to address this issue as the Safety Board has recommended.

The Safety Board has investigated a number of accidents involving track warrants in non-signaled territory. In 1996, in Smithfield, West Virginia,[44] the Board investigated a head-on collision between two CSX Transportation freight trains. CSX Transportation subsequently discontinued the use of after-arrival authorities in non-signaled territory. In

[41] A review of dispatcher communication transcripts between 3:11 p.m. and the time of the collision showed that the dispatcher ended his conversations with BNSF 6789 South with "here we go" on six occasions.

[42] FRA letter to the Safety Board dated October 3, 2003.

[43] FRA letter to the Safety Board dated October 3, 2003.

[44] National Transportation Safety Board, *Head-On Collision, Trains Q317-19 and Q316-18, CSXT Railroad, Smithfield, West Virginia, August 20, 1996,* Railroad Accident Brief NTSB/RAB-98/13 (Washington, DC: NTSB, 1998).

1997, the Board investigated a collision between two Union Pacific Railroad freight trains in Devine, Texas.[45] As a result of the Devine investigation, the Board issued Safety Recommendation R-98-27, which advised the FRA to permanently discontinue the use of after-arrival orders in non-signaled territory. Safety Recommendation R-98-27 was classified "Closed—Unacceptable Action" on June 29, 1999.

In 2002, the Safety Board investigated a collision between two BNSF trains in Clarendon, Texas.[46] In its accident report, the Board issued Safety Recommendation R-03-2, which advised the FRA to limit the use of after-arrival orders in non-signaled territory to trains that have stopped at the location at which they will meet the opposing train. Safety Recommendation R-03-2 was classified "Closed—Unacceptable Action" on August 6, 2004. In Safety Recommendation R-03-3, the Board also recommended that the General Code of Operating Rules (GCOR) Committee add language to its track warrant rules to ensure the same. In response to the Clarendon investigation, the BNSF established procedures requiring a train to stop before receiving an after-arrival track warrant and to make positive radio contact with the train to be met in non-signaled territory. After the Gunter collision, the BNSF further strengthened these procedures by requiring more communication between the restricted train, the train(s) to be met, and the dispatcher.

The FRA has declined to implement either of the Safety Board's recommendations (R-98-27 and R-03-2) regarding after-arrival track warrants that were developed in response to the Devine and Clarendon, Texas, accidents. The FRA's final written response to Safety Recommendation R-03-2, dated October 3, 2003, indicated that disallowing after-arrival orders in non-signaled territory would reduce flexibility and hinder the efficient movement of trains. The FRA also stated that like the industry, it expects that railroad employees will adhere to all applicable operating rules. Unfortunately, expecting employees to always adhere to all applicable rules is more often an ideal than a reality. The Board has investigated too many railroad accidents in which the avoidance of a collision depended on the use of an operating rule or standard practice that proved to be insufficient to prevent accidents caused by human error.

Even though the BNSF strengthened its procedures for after-arrival track warrants after the Clarendon accident, the BNSF 6789 South crew still did not make positive radio contact to verify that the train they were passing was the train listed on their track warrant. In the Gunter accident, the BNSF 6789 South crew had already stopped at the location where they were to meet the opposing train, BNSF 6351 North. Therefore, the circumstances of this accident also raise concerns regarding the effectiveness of limiting the issuance of after-arrival orders to trains that have already stopped at the location at which they will meet the opposing train. Regardless of how the after-arrival order is implemented, this practice places full responsibility for ensuring a proper meet on the crew involved. When a crew does not follow procedures in non-signaled territory, as occurred in the Gunter accident, there are no additional warnings to either train. By contrast, when after-arrival track warrants are used in territory with automatic block

[45] NTSB/RAR-98/02.

[46] NTSB/RAR-03/01.

signals, both trains receive restrictive signals requiring the trains to slow and eventually stop short of a collision point. Although there may be some circumstances where the use of after-arrival orders in non-signaled territory is beneficial, the accident record has demonstrated that any use of these procedures increases the risk of train collisions.

The Safety Board recognizes that unless an automated collision avoidance system is in place, there is no assurance that a collision will not occur. The Board remains convinced that the ultimate safety goal is positive train control (PTC). However, even if PTC becomes more widely adopted, the current non-signaled areas of the U.S. railroad network will probably be among the last to be outfitted with PTC for the same reasons they remain non-signaled now—train volume and type of traffic. Consequently, non-signaled territories will remain higher risk areas for collisions. The incremental steps taken to date by the BNSF and other railroads have not been sufficient. The Safety Board concludes that the use of after-arrival track warrants for train movements in dark (non-signaled) territory creates an unacceptable risk of collision.

The Safety Board is also concerned about the FRA's failure to prohibit or limit the use of after-arrival track warrants in non-signaled territories as previously recommended by the Board. Staff from the Board and the FRA met on March 17, 2004, to discuss open recommendations related to railroad safety. Safety Recommendation R-03-2 was specifically addressed at the meeting, and FRA staff stated that although it shared the Board's concerns about the problems with after-arrival orders, it was reluctant to prohibit their use at that time. However, the FRA staff did state that if another accident occurred because of an after-arrival order, it would issue an emergency order. The Gunter accident occurred on May 19, 2004, and the FRA has yet to take action to address this continuing problem. The Safety Board concludes that had the FRA required railroads to permanently discontinue the use of after-arrival orders in dark territory as advised in Safety Recommendation R-98-27, this accident would not have happened.

The Safety Board has investigated several accidents involving after-arrival orders in non-signaled territory and believes that the FRA has delayed action too long. The Safety Board believes that the FRA should prohibit the use of after-arrival track warrants for train movements in dark (non-signaled) territory not equipped with a PTC system. The Safety Board also believes that the BNSF should discontinue the use of after-arrival track warrants for train movements in dark (non-signaled) territory not equipped with a PTC system. Further, the Safety Board believes that the Association of American Railroads and the American Short Line and Regional Railroad Association should encourage their members to discontinue the use of after-arrival track warrants for train movements in dark (non-signaled) territory not equipped with a PTC system.

As noted above, the Safety Board issued Safety Recommendation R-03-3 to the GCOR Committee as a result of the Clarendon, Texas, accident investigation.[47] Specifically, the Board recommended that the committee:

[47] NTSB/RAR-03/01.

R-03-3

Add language to the track warrant rules to ensure that in territory not equipped with a positive train control system, track warrant authority that contains an after-arrival requirement is issued only to trains that have stopped at the location at which they will meet the opposing train.

However, as a result of its investigations, the Board now believes that the use of after-arrival track warrants in non-signaled territory not equipped with a PTC system should be prohibited. The Board also recognizes that the GCOR Committee was not the appropriate recipient for this recommendation because its rules are not mandatory. Accordingly, Safety Recommendation R-03-3, which was previously classified "Open—Unacceptable Response," is now reclassified "Closed—Reconsidered."

BNSF 6789 South Engineer's Fitness for Duty

The BNSF 6789 South engineer had been diagnosed with severe obstructive sleep apnea through a formal sleep study almost 5 years before the accident. Obstructive sleep apnea is a chronic medical condition that prevents those affected by it from obtaining restful, uninterrupted sleep. The engineer had been prescribed and had successfully used a continuous positive airway pressure (CPAP) device with excellent results to treat the obstructive sleep apnea, but apparently he had discontinued use of the CPAP more than 2 years before the accident. The BNSF was unaware of his obstructive sleep apnea or his noncompliance with treatment. The Safety Board obtained this latter information from the records of his personal physician and the results of the sleep study he underwent.

The engineer can be heard communicating with the dispatcher about 5:39 p.m., 10 minutes before the collision. Event recorder data suggest that the engineer was actively involved in operating the train and that his manipulations of the locomotive controls were appropriate. Therefore, it seems likely that he, and the conductor, mistook BNSF 2917 North for BNSF 6351 North as the train they were supposed to meet according to the after-arrival track warrant.

Neither the engineer nor his personal physician informed the BNSF of the sleep apnea diagnosis. They were not required to inform the railroad company. FRA guidance pertaining to medical certification is limited to regulations concerning medications and minimum vision and hearing standards. In its investigation of the collision between Union Pacific Railroad and BNSF freight trains in Kelso, Washington,[48] the Safety Board found that crew medical conditions, of which the railroad was unaware, were contributing factors in the accident. As a result of its earlier investigation into a collision between two

[48] National Transportation Safety Board, *Side Collision of Burlington Northern Santa Fe Railway Train and Union Pacific Railroad Train near Kelso, Washington, November 15, 2003*, Railroad Accident Brief NTSB/RAB-05/03 (Washington, DC: NTSB, 2005).

Canadian National Railroad freight trains near Clarkston, Michigan,[49] the Board recommended that the FRA develop a standard medical examination form, requiring that certain conditions, including sleep apnea, be reported to the railroad and prohibiting safety-sensitive work until those conditions could be appropriately evaluated (R-02-24, -25, and -26). As a result of these previous recommendations, the FRA is currently reviewing the findings of a study commissioned to evaluate possible medical certification protocols. The status of these recommendations remains classified as "Open—Acceptable Response."

Emergency Response

Emergency responders arrived on scene within 6 minutes of initial notification. While en route, the first responder placed two air ambulance services on standby and activated mutual aid from surrounding jurisdictions. It is noteworthy that the accident occurred in a rural area and that the Gunter Volunteer Fire Department is an all volunteer operation, as are most of the surrounding fire departments. The Safety Board concludes that the emergency response was prompt and appropriate to the accident.

Use of Cellular Phones

As a result of its investigation into the Clarendon, Texas, collision, the Safety Board found that the accident was caused in part by the "engineer's use of a cell phone during the time he should have been attending to the requirements of the track warrant his train was operating under…." Consequently, the Board made the following recommendation to the FRA regarding the use of cellular telephones by operating crews:

> R-03-1
>
> Promulgate new or amended regulations that will control the use of cellular telephones and similar wireless communication devices by railroad operating employees while on duty so that such use does not affect operational safety.

On October 3, 2003, the FRA advised the Safety Board that it believed that railroad operating and safety rules were adequate to address cell phone use by operating crews. Further, during a meeting on March 17, 2004, the FRA informed the Board that its inspectors would watch for unauthorized use of cell phones but that a regulation would be almost impossible to enforce. On August 19, 2004, the Board advised the FRA that it remained concerned that the risks of complacency and attention deficiencies associated

[49] National Transportation Safety Board, *Collision of Two Canadian National/Illinois Central Railway Trains Near Clarkston, Michigan, November 15, 2001*, Railroad Accident Report NTSB/RAR-02/04 (Washington, DC: NTSB, 2002).

with cell phone use are not sufficiently understood or recognized and that cell phone use has the potential to distract crewmembers for a considerable length of time, and is avoidable. Pending the FRA's assessment of additional information to determine the proper direction the FRA should take, Safety Recommendation R-03-1 was classified "Open—Acceptable Response."

BNSF 6789 South crewmembers were not using cellular phones at the time the last track warrant requiring them to wait at Dorchester was issued or at the time they departed Dorchester without authority. However, the BNSF 6789 South engineer received a call on his personal cellular phone while the conductor was having difficulty reading back Track Warrant No. 3583, which was only OK'd after he had made multiple read-back attempts. The Safety Board notes that inappropriate use of cellular phones has been a factor in other accidents. The frequent use by all crewmembers on the two accident trains while the trains were in motion indicates that BNSF rules prohibiting such use are ineffective. The Board remains concerned that the inappropriate use of cellular phones by crewmembers may pose a risk to the safety of railroad operations.

Positive Train Control

For more than 30 years, the Safety Board has investigated train collisions that could have been prevented through the deployment of a PTC system. Over the years, the Board has issued a series of relevant recommendations, and PTC has remained on the Board's Most Wanted Transportation Safety Improvements list since 1990. The most recent safety recommendation relating to PTC, Safety Recommendation R-01-6, was issued to the FRA as a result of the Board's investigation of a fatal train collision in Bryan, Ohio.[50] Since its adoption by the Board, Safety Recommendation R-01-6 has been reiterated in two other reports about railroad accidents that took place in Placentia, California, in 2002[51] and Chicago, Illinois, in 2003:[52]

> R-01-6
>
> Facilitate actions necessary for the development and implementation of positive train control systems that include collision avoidance, and require implementation of positive train control systems on main line tracks, establishing priority requirements for high-risk corridors such as those where commuter and intercity passenger railroads operate.

[50] National Transportation Safety Board, *Collision Involving Three Consolidated Rail Corporation Freight Trains Operating in Fog at Bryan, Ohio, January 17, 1999*, Railroad Accident Report NTSB/RAR-01/01 (Washington, DC: NTSB, 2001).

[51] National Transportation Safety Board, *Collision of Burlington Northern Santa Fe Freight Train With Metrolink Passenger Train, Placentia, California, April 23, 2002*, Railroad Accident Report NTSB/RAR-03/04 (Washington, DC: NTSB, 2003).

[52] National Transportation Safety Board, *Derailment of Northeast Illinois Regional Commuter Railroad Train 519 in Chicago, Illinois, October 12, 2003*, Railroad Accident Report NTSB/RAR-05/03 (Washington, DC: NTSB, 2005).

Based on a March 27, 2002, letter in which the FRA outlined steps that it had taken toward "achieving the proper atmosphere in the rail industry to allow for the development and implementation of PTC," the Safety Board classified Safety Recommendation R-01-6 "Open—Acceptable Response."

In answer to an April 17, 2003, letter from the Safety Board asking for an update on actions regarding this safety recommendation, the FRA responded, in a May 5, 2003, letter, that it was "moving forward across a broad front to create the conditions under which PTC systems can be more widely deployed on the national rail system." In the letter, the FRA detailed some of the steps the agency was taking in the following areas:

- Providing a radio-navigation infrastructure and ensuring adequate spectrum;
- Facilitating positive train control through regulatory change;
- Supporting the demonstration and deployment of candidate technologies; and
- Analyzing costs and benefits.

The FRA stated that the agency was "doing everything within its power to prepare the way for PTC and encourage its rapid deployment." In the meantime, the majority of railroad operations occur in territory without any automatic means of preventing train collisions.

The Safety Board hosted a seminar on PTC at the NTSB Academy in March 2005, and the Board is aware of several initiatives in the railroad industry to test PTC installations. The BNSF has a pilot installation on its 135-mile Beardstown Subdivision. The BNSF electronic train management system is described as a "safety overlay" working in conjunction with existing train control and signal systems to enforce speed and authority limits. The BNSF has applied to the FRA for an expansion of the electronic train management system to its line from Fort Worth, Texas, to Arkansas City, Kansas. (The Madill Subdivision is not on this line.) The BNSF also has submitted a product safety plan to the FRA that, if approved, would authorize installation of the electronic train management system on the entire BNSF network.

On March 7, 2005, the FRA issued a performance standard for processor-based signal and train control systems, which became effective on June 6, 2005. While it is encouraging that the FRA has moved forward on these performance standards and that other PTC pilot projects are underway, the Safety Board remains concerned that it has taken so long for the FRA to require, and for the railroad industry to develop and implement, such systems.

The Safety Board concludes that had a PTC system with collision avoidance capabilities been in place and operational on the Madill Subdivision at the time of the accident, the collision would not have occurred.

Conclusions

Findings

1. The following were not factors in this accident: the condition of the track, locomotives, or railcars; the weather; drug or alcohol use; and work schedules.

2. The BNSF 6789 South crewmembers' failure to verify the engine number listed on their track warrant against the engine number of the train in the siding, combined with the expectation that they would proceed south after meeting a single train at Dorchester, resulted in the BNSF 6789 South crewmembers likely assuming that they had met BNSF 6351 North at Dorchester.

3. Had the BNSF 6789 South crew complied with their track warrant, they would not have left Dorchester and the accident would not have occurred.

4. Had the dispatcher consistently referred to all of the trains by their engine numbers—the identification mechanism required in mandatory directives—it would have reinforced the need to verify engine numbers when the trains met.

5. Informal communications between the dispatcher and train crews regarding authority limits, train names, and meeting or stopping points may lead to misunderstandings and errors.

6. The use of after-arrival track warrants for train movements in dark (non-signaled) territory creates an unacceptable risk of collision.

7. Had the Federal Railroad Administration required railroads to permanently discontinue the use of after-arrival orders in dark territory as advised in Safety Recommendation R-98-27, this accident would not have happened.

8. The emergency response was prompt and appropriate to the accident.

9. Had a positive train control system with collision avoidance capabilities been in place and operational on the Madill Subdivision at the time of the accident, the collision would not have occurred.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the May 19, 2004, collision near Gunter, Texas, was the southbound train (BNSF 6789 South) crew's failure to adhere to an after-arrival track warrant requiring them to stay at Dorchester until the northbound train (BNSF 6351 North) arrived. Contributing to the accident was the BNSF Railway Company's use of after-arrival track warrant authority in non-signaled territory, and the Federal Railroad Administration's failure to prohibit the use of such authority. Also contributing to the accident was the train dispatcher's informal communications regarding planned train meeting locations.

Recommendations

As a result of its investigation of the May 19, 2004, collision between two BNSF Railway Company freight trains near Gunter, Texas, the National Transportation Safety Board makes the following safety recommendations:

New Recommendations

To the Federal Railroad Administration:

Prohibit the use of after-arrival track warrants for train movements in dark (non-signaled) territory not equipped with a positive train control system. (R-06-10)

To the BNSF Railway Company:

Use the Gunter collision as a case study in train crew and dispatcher training and retraining to illustrate how informal communications can lead to misunderstandings and errors. (R-06-11)

Discontinue the use of after-arrival track warrants for train movements in dark (non-signaled) territory not equipped with a positive train control system. (R-06-12)

To the Association of American Railroads and the American Short Line and Regional Railroad Association:

Encourage your members to discontinue the use of after-arrival track warrants for train movements in dark (non-signaled) territory not equipped with a positive train control system. (R-06-13)

Recommendation Reclassified in This Report

To the General Code of Operating Rules Committee:

R-03-3

Add language to the track warrant rules to ensure that in territory not equipped with a positive train control system, track warrant authority that contains an after-arrival requirement is issued only to trains that have stopped at the location at which they will meet the opposing train.

Safety Recommendation R-03-3, previously classified "Open—Unacceptable Response," is reclassified "Closed—Reconsidered" in the "After-Arrival Track Warrants in Non-Signaled Territory" section of this report.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

Mark V. Rosenker
Acting Chairman

Deborah A. P. Hersman
Member

Kathryn O'Leary Higgins
Member

Adopted: June 13, 2006

Appendix A

Investigation

The National Transportation Safety Board was notified about 7:47 p.m., eastern daylight time, on May 19, 2004, of the collision between two BNSF Railway Company freight trains near Gunter, Texas. The Safety Board launched an investigator-in-charge and other investigative team members from the Board's Washington, D.C., headquarters and the Los Angeles and Atlanta regional offices. Investigative groups were formed to study operations, mechanical equipment, track, and human performance. No Safety Board Member went to the accident site. Follow-up interviews were conducted at the BNSF Network Operations Center in Fort Worth, Texas, on June 29, 2004.

The Federal Railroad Administration, the BNSF Railway Company, the Brotherhood of Locomotive Engineers and Trainmen, and the United Transportation Union assisted the Safety Board in this investigation.

Appendix B

Time Line of Events

7:00 a.m.	Crews of BNSF 6351 North and BNSF 2917 North report on duty at Sherman for southbound trips.
10:15 a.m.	Crew of BNSF 6789 South reports on duty at Alliance Yard, then travels by taxi to Madill, Oklahoma.
1:15 p.m.	BNSF 6789 South begins southbound trip from Madill, Oklahoma.
3:17 p.m.	BNSF 6789 South Track Warrant No. 3583 in effect to proceed on main track from CTC Denison to south siding switch at Sherman. Conductor has difficulty repeating order correctly. Dispatcher asks engineer to telephone him.
3:51 p.m.	BNSF 6351 North begins northbound trip. Track Warrant No. 3586 in effect from north restricted limits Irving to north siding switch at Prosper.
4:02 p.m.	BNSF 6789 South engineer contacts dispatcher by cellular phone and is asked to help conductor with future track warrants. Dispatcher advises they will meet the 641 Job (BNSF 2917 North) at Dorchester.
4:37 p.m.	BNSF 2917 North begins northbound trip. Track Warrant No. 3587 in effect from milepost (MP) 675 to north siding switch at Dorchester.
4:47 p.m.	BNSF 6789 South engineer is again told they will meet the 641 at Dorchester.
4:51 p.m.	BNSF 6789 South Track Warrant No. 3589 in effect to proceed from north siding switch at Sherman to north siding switch at Dorchester. After track warrant is OK'd, dispatcher advises that BNSF 6789 South will meet the Sherman Switcher at Dorchester and the Sherman Clark Rock Train at Prosper.
5:05 p.m.	BNSF 6789 South is again advised by dispatcher that they will meet the Sherman Switcher at Dorchester and the Sherman Rock Train at Prosper.

5:10 p.m.	After checking with BNSF 6789 South that they can fit between switches at Dorchester, dispatcher issues BNSF 6351 North Track Warrant No. 3591 to proceed from MP 685 to MP 659.
5:12 p.m.	BNSF 2917 North reports clear of main track in Dorchester siding and releases Track Warrant No. 3587.
5:16 p.m.	BNSF 6789 South Track Warrant No. 3593 in effect to proceed from MP 652 to south siding switch at Dorchester.
5:18 p.m.	BNSF 2917 Track Warrant No. 3594 in effect to proceed from north siding switch at Dorchester to south siding switch at Sherman, after arrival of BNSF 6789 South.
5:21 p.m.	BNSF 6351 North Track Warrant No. 3593 in effect to proceed from MP 678 to south siding switch at Dorchester and take siding.
5:22 p.m.	Lead locomotives on BNSF 6789 South and BNSF 2917 North pass each other at Dorchester.
5:39 p.m.	BNSF 6789 South Track Warrant No. 3598 in effect to proceed from south siding switch at Dorchester to Hebron, after arrival of BNSF 6351 North.
5:40 p.m.	BNSF 6789 South departs south siding switch at Dorchester, accelerates to 40 mph.
5:46 p.m.	BNSF 6789 South and BNSF 6351 North collide head on at MP 661.9.
5:49 p.m.	Grayson County Communications Center receives first of many calls reporting collision.
5:55 p.m.	First emergency responder on scene.

Appendix C

Train Identifications Used in Communications

Southbound Train/BNSF 6789 South

BNSF 6789 South	Operational Identification
U MAODON1 19	BNSF Train Symbol
Doni Rock	Nickname
Doni Madill	Nickname
Doni Train	Nickname

First Northbound Train/BNSF 2917 North

BNSF 2917 North	Operational Identification
R TEX 6411 19	BNSF Train Symbol
641	Nickname
641 Job	Nickname
Sherman Switcher	Nickname
Road Switcher	Nickname

Second Northbound Train/BNSF 6351 North

BNSF 6351 North	Operational Identification
U SHTIRB1 19	BNSF Train Symbol
Sherman Rock	Nickname
Sherman Rock Train	Nickname
Sherman Clark Rock Train	Nickname
Am Rock	Nickname
Rock Train	Nickname

Appendix D

Recovered Track Warrants

TRACK WARRANT

No: 3598 Date: 5/19

To: BASE 6789 South At: MP 657 (on Main 11

1 ☒ Track Warrant No 3593 is
2 ☒ Proceed from [illegible] to Hen on MAIN
3 ☐ Proceed from _____ to _____ on _____
4 ☐ Work between _____ and _____ on _____
5 ☐ Not in effect until _____
6 ☐ This authority expires at: _____
7 ☒ Not in effect until after arrival of: [illegible] P675 (North South SS Dor Chester
_____ at _____
8 ☐ Hold main track at last named point.
9 ☐ Do not foul limits ahead of: _____
10 ☐ Clear main track at last named point
11 ☐ Between _____ and _____ m movements at restricted speed. Limits occupied by train
12 ☐ Between _____ and _____ m movements at restricted speed. Limits occupied by men or equipment
13 ☐ Do not exceed _____ MPH between _____ and _____
14 ☐ Do not exceed _____ MPH between _____ and _____
15 ☐ Flag protection not required against following trains on the same track.
16 ☐ Track Bulletins in effect: _____, _____, _____, _____, _____
17 ☐ Other specific instructions: (joint with) _____
20 ☒ Be prepared to stop at following switch(es) until known to be in normal positio
21 ☐ Permission to leave following switch(es) in reverse position: SS 5 Dor

This warrant has 3 boxes marked: 2, 7, 20, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____

OK 1739 Dispatcher Wh[illegible]
Relayed to _____ Copied by Smith
Limits reported clear at _____ By _____

TRACK WA

No: 3595 Date:

To: BNSF 63[illegible] N. At: MP 678 (on Mgdill Subc

1 [X] Track Warrant No 3591 is void
2 [X] Proceed from MP 678 to 555 Dorchester on Main track
3 [ ] Proceed from _____ to _____ on _____ track
4 [ ] Work between _____ and _____ on _____ track
5 [ ] Not in effect until _____
6 [ ] This authority expires at: _____
7 [ ] Not in effect until after arrival of: _____
at _____
8 [ ] Hold main track at last named point.
9 [ ] Do not foul limits ahead of: _____
10 [X] Clear main track at last named point
11 [ ] Between _____ and _____ make movements at restricted speed. Limits occupied by train
12 [ ] Between _____ and _____ make movements at restricted speed. Limits occupied by men or equipment
13 [ ] Do not exceed _____ MPH between _____ and _____
14 [ ] Do not exceed _____ MPH between _____ and _____
15 [ ] Flag protection not required against following trains on the same track.
16 [ ] Track Bulletins in effect: _____, _____, _____, _____, _____, _____
17 [ ] Other specific instructions: (joint with) _____
20 [X] Be prepared to stop at following switch(es) until known to be in normal position: ~~555 Dorchester~~
21 [X] Permission to leave following switch(es) in reverse position: 555 Dorchester

This warrant has 4 boxes marked: 1, 2, 10, 21, _____, _____, _____, _____, _____, _____, _____, _____, _____, _____

OK 1721 Dispatcher NHM
Relayed to _____ Copied by _____
Limits reported clear at _____ By _____