NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorders Division
Washington, D.C. 20594

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

On Board Video Recording

DCA11FR004

by

Douglass P. Brazy
Mechanical Engineer

Warning
The reader of this report is cautioned that the transcription of a video recording is not a precise science but is the best product possible from an NTSB group investigative effort. The transcript, or parts thereof, if taken out of context, could be misleading. The attached transcript should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the transcript as the sole source of information.

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October 28, 2011

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Group Chairman's Factual Report
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NTSB Accident Number
DCA11FR004

1. ACCIDENT

Location:	Mineral Springs, NC
Date:	May 24, 2011
Time:	0335 Eastern Daylight Time
Operator:	CSX Transportation
Vehicle:	Train Q19423 (Northbound--striking) with Train Q61822 (Northbound – struck)

2. GROUP

Chairman:	Douglass P. Brazy Mechanical Engineer National Transportation Safety Board
Member:	Mark Jones Deputy Division Chief- Railroad Division National Transportation Safety Board
Member:	Tom A. McFarlin Staff Director, Signal and Train Control Office of Safety Federal Railroad Administration
Member:	Douglas H. Taylor Staff Director – Operating Practices Federal Railroad Administration

Member:	James V. Grupposo Manager, Train Accident Prevention CSX Transportation
Member:	Kimble L. Jackson Safety Task Force Brotherhood of Locomotive Engineers and Trainmen
Member:	James P. Herndon General Chairman, GO-436 Transportation Safety Team Member United Transportation Union
Member:	Mark J. Ciurej Vice President West Brotherhood of Railroad Signalmen

3. SUMMARY

On May 24, 2011, at about 3:35 a.m., eastern daylight time, northbound CSX Transportation Monroe Subdivision train Q19423, struck the rear of northbound CSX Transportation train Q61822, which had stopped at milepost SG 314.0. The accident occurred in Mineral Springs, North Carolina, approximately eight miles south of the CSXT Monroe Yard. The striking train Q19423 consisted of twelve intermodal cars and the struck train Q61822 consisted of nine general manifest cars. Each train had two crewmembers—a train engineer and train conductor both located at the front of the lead locomotive. The engineer and conductor of the striking train were killed; the conductor and engineer of the struck train incurred minor injuries. The accident resulted in a fire of the two Q19423 locomotives and also included an equipment fire of the striking train. There were no hazardous materials in either train's consist. Total monetary damages were estimated at about $1.6 million.

The Safety Board's Vehicle Recorder Division received a recording from a digital video/audio/data system that was installed on a General Electric model CW40-8 Locomotive (CSX #7783). The recording system captured video from a forward facing camera with a view ahead of the locomotive, audio from an externally mounted (outside the locomotive cab) microphone, and some parametric data similar to that recorded by the locomotive's event recorder.

4. DETAILS OF INVESTIGATION

4.1. Item(s) Received

On May 27, 2011 the Safety Board's Vehicle Recorder Division received a hard disk drive (s/n 1073638R1) from a General Electric (GE) LocoCAM video recording system.

4.2. Download and Recorder Details

The contents of the disk drive were downloaded using a GE readout station appropriate for this particular model of recorder. This process extracts proprietary files from the drive, which can then be viewed using a GE supplied viewer program. The system captures data to a series of individual files, each containing 12 seconds of audio, video, and data. These files are loaded into the viewer which can play back theses 3 types of information synchronously. The images recorded from from the camera were approximately 600 x 380 pixels in size, and were recorded at a frame rate of approximately 15 frames per second.

The system also captured Global Positioning System (GPS) time of day, and location (latitude and longitude) at 1 second intervals. Figure 1 is an example of the viewer program interface (the video image has been redacted).

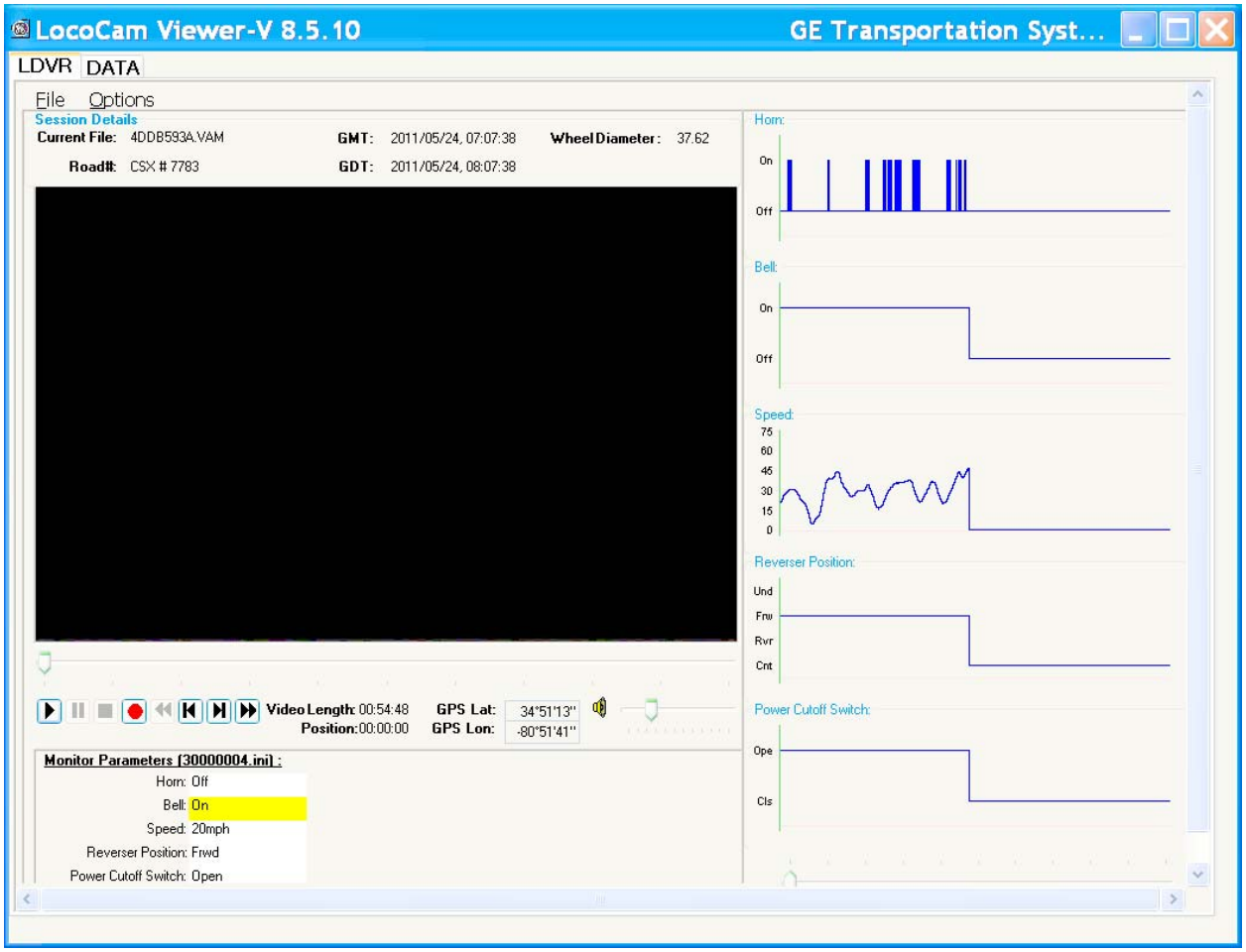

Figure 1 - Playback Viewer Program

4.3. Recording Timing

The LocoCAM recorder captured GPS time of day, which was synchronized to the event recorder data[1] by comparing the sound of the horn as heard on the LocoCAM recording, to the parametric data for the horn operation captured on the event recorder. The following relationship was established:
Event Recorder Time + 1314 seconds = Video Recorder Time

Recording Duration

Start of Recording: May 18, 2001 15:07:26 Eastern Daylight Time
End of Recording: May 24, 2011 17:07:48 Eastern Daylight Time

The recording is not continuous over this period. Most notably, the recording stops approximately 26 seconds (about 1840 feet) before the collision, based on the time synchronization with the event recorder. The recording then resumes about 1 hour and 4 minutes later. At the time the video resumes, the locomotive is on its side, and emergency responders can be seen walking in front of the locomotive.
With the exception of this interruption, the recording is continuous from 23:07:35 on May 23 2011, until to the End of Recording.

Prior to this time, there are several interruptions in the recording ranging in length from about 1 hour, to 32 hours.

[1] For more information about the event recorder data, see the Locomotive Event Recorder - Specialist's Factual Report for this investigation.

4.4. Description of Recording Contents

The video portion of the recording system captured a view through the windshield of the locomotive. The area in front of the locomotive could be seen, as illuminated by the locomotive headlight. Wayside signals and grade crossing equipment were visible. The audio included sounds from the locomotive's engines, pneumatic systems, as well as the horn and bell.

The video Group made the following observations from the recording:

The north end Waxhaw Approach signal was displaying a yellow aspect. The train passed this signal at video time 3:26:43.

Approximately 50 seconds before passing the intermediate signal at milepost (MP) 316, the train began accelerating from 21 Miles Per Hour (MPH). About 20 seconds prior to the signal, as the train approached the Collins Road grade crossing, the silver signal box (bungalow) was visible in the video.[2] The signal was not illuminated. The train had reached approximately 31 MPH as it passed the signal at MP316 at video time 03:31:49.

Acceleration continued up to about 46 mph, when the video recording was interrupted at video time 3:34:01.

Based on the synchronization with the locomotive event recorder data, the video recording ends about 26 seconds (about 1840 feet) prior to the collision.

[2] This is consistent with the results of sight distance testing performed by the Operations Group, which determined that the bungalow was visible at a distance of 964 feet. For more information, see the Operations Group Factual Report for this investigation.

4.5. Additional Information

Figures 2 and 3 depict selected observations from the video recording as well as sight distance test information, overlaid onto the charts of event recorder data.[3] These include:

- Location of yellow signal at North Waxhaw (MP318)
- Sight distance to the signal mast at MP316 (964 feet prior to mast)
- Signal mast at MP316
- Engineer sight distance to the point of collision (450 feet)
- "Reflection sight distance" - Location where a reflection of the End of Train device light can be seen on the rails, from conductor's side of the locomotive (419 feet)
- Conductor sight distance to the point of collision (364 feet)

The sight distance overlays were calculated based on the distance and references provided by the Operations Group, and comparing them to the distance travelled data from the locomotive event recorder. However, the event recorder data do not explicitly indicate when or where the collision occurred within the dataset. A review of the data indicated that the collision most likely occurred between 3:34:27 and 3:34:28, (video recorder time) based on a rise in traction motor current during this interval, and the subsequent loss of pressure in the automatic brake system, as well as a throttle state change from "off to idle". Using this timeframe as the point of collision, a reference for the sight distance lengths could be calculated using the event recorder distance travelled values. It should be noted that at the locomotive's speed of 48 MPH, the 1 second of uncertainty in the time of the collision equates to about 71 feet travelled. The sight distance overlays shown in Figures 2 and 3, have this same uncertainty.

[3] These charts and the data in the Locomotive Event Recorder Factual Report use the video recorder time as a timescale. The independent clock used by the event recorder was 1314 seconds behind (earlier in time) the video recorder's GPS clock.

The video observation overlays were located using the time values from the video recording. For example, the locomotive passed the signal at MP318 at 3:26:43 video recorder time, as observed in the video recording. This overlay was placed on the charts in Figures 2 and 3, using that time value.

Douglass P. Brazy

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NTSB Vehicle Recorder Division

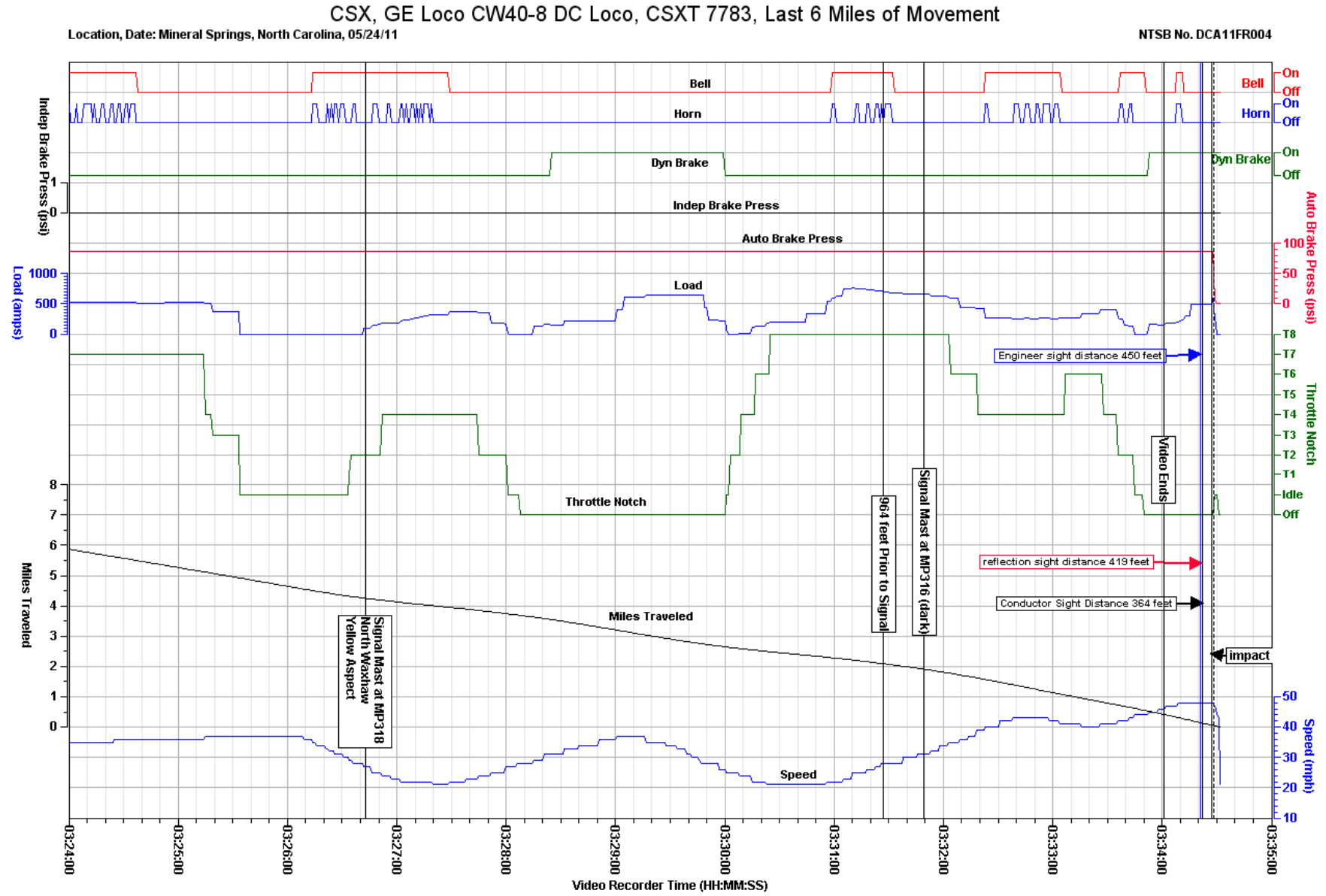

Figure 2 - Event Recorder Data with Overlays - Last 6 Miles

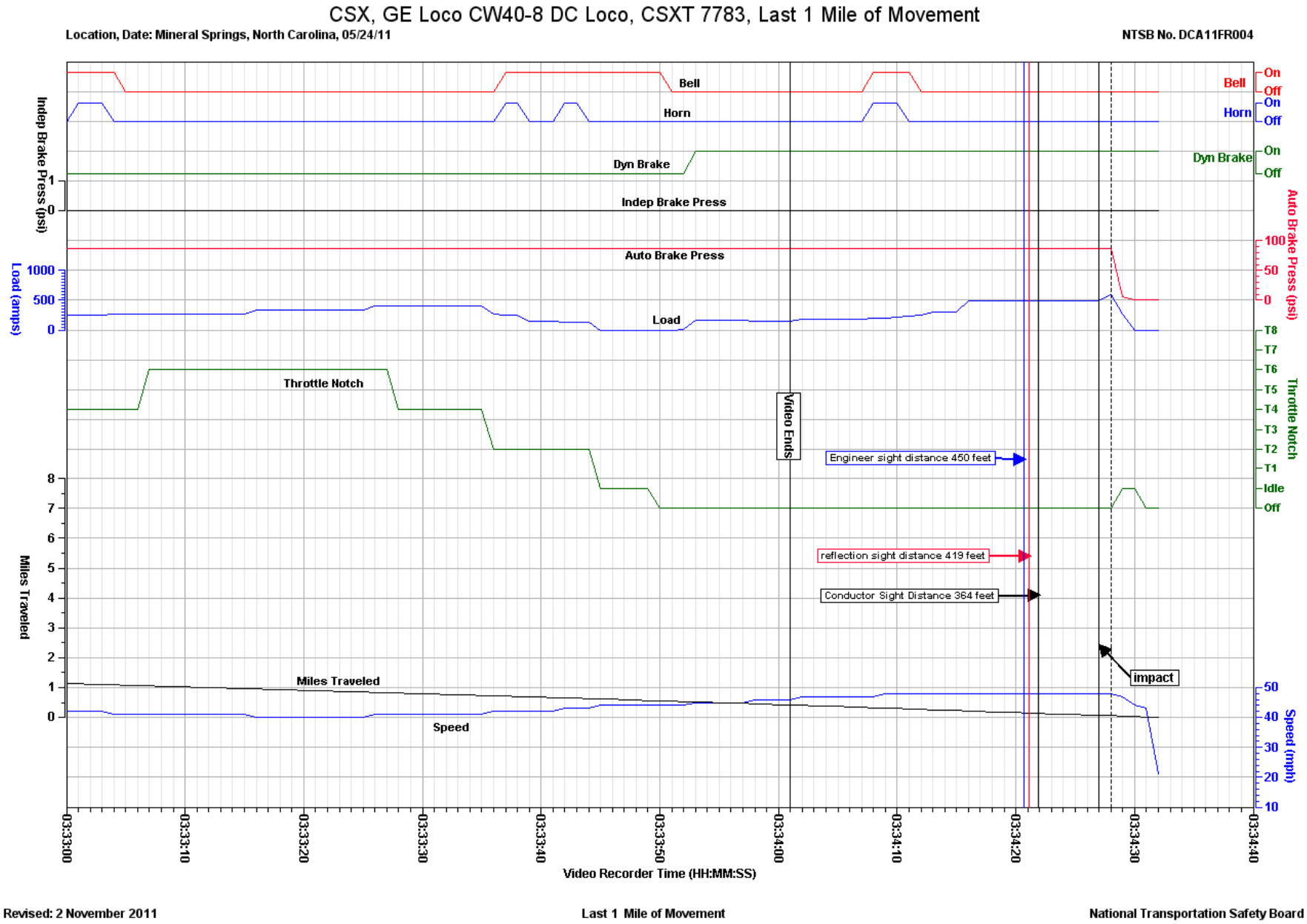

Figure 3 - Event Recorder Data with Overlays - Last 1 Mile