National Transportation Safety Board

Office of Railroad, Pipeline and Hazardous Materials Investigations

Washington, D.C. 90284

Derailment of U813-18

CSX Transportation Railroad Coal Train

Ellicott City, Maryland

August 20, 2012

Mechanical Group Factual

Accident

NTSB Accident Number:	DCA-12-MR-009
Date of Accident:	August 20, 2012
Time of Accident:	11:56p.m. (EDT[1])
Type of Trains:	U813-18East (Coal Train)
Railroad Owner:	CSX Transportation (CSX)
Train Operator:	CSX
Fatalities:	0
Injuries:	0
Location of Accident:	Ellicott City, MD

Accident Summary

On August 20, 2012, at about 11:56p.m. EDT, an eastbound CSX Transportation (CSX) coal train, identification number U813-18, with two locomotives and 80 cars derailed the lead 21 cars at milepost 12.9 on their Old Main Line Subdivision in Ellicott City, Maryland. The derailed cars included 21 cars full of coal, six of which that fell into a public parking area, positioned about 12-15 feet below the main to the north of the tracks. Other coal cars involved in the derailment were overturned, spilling their content along the north side of the main as was the case for the coal cars on the overpass where two trespassers were located. There were two civilian fatalities associated with this accident. The two individuals were local citizens sitting on the north side of the overpass who were not authorized to access the main.

The initial damage estimates provided by CSX are $2.2 million, which includes environmental remediation. The weather at the time of the incident was cloudy skies with 65 degree temperature and calm winds.

Parties to the investigation include: CSX Transportation, Federal Railroad Administration and the Brotherhood of Maintenance-of-Way Employes[2].

[1] Eastern daylight time
[2] 'Employes' is a spelling from the Old English language.

Figure 1-Aerial Photo of the Derailment

Train Consist

U813-18 consisted of two locomotives units at the head end and 80loaded coal cars. The train weighed 9,873 tons and was 4080 feet in length. The train was hauling coal.

Railroad Equipment Involved in the Derailment

The lead locomotive, CSXT 267, of the derailing train is a General Electric model CW44AC built in 1996. This unit is a six-axle / two-truck, 4400 HP diesel-electric locomotive. His unit is equipped with a GE 7FDL™ engine, a medium-speed turbo-diesel engine. The locomotive unit features six alternating current (AC) traction motors (one fitted to each axle).

The locomotive unit measures approximately 73 ft. (length), by 10 ft. (width), by 15.5 ft. (height), and weighs (fully loaded with fuel, traction sand, etc.) about 416,000 lbs. A fuel tank, having a capacity of about 5,000 gallons, is located (suspended from the underside of the underframe) between a pair of three-axle power truck assemblies.

The second locomotive unit, CSXT 4579, of the derailing train is an Electro Motive Diesels Inc., model SD70AC built in 1998. This unit is a six-axle / two-truck, 4000 HP diesel-electric

locomotive. The locomotive unit measures approximately 74 ft. (length), by 12 ft. (width), by 16 ft. (height), and weighs (fully loaded with fuel, traction sand, etc.) about 425,000 lbs. A fuel tank, having a capacity of about 4800 gallons, is located (suspended from the underside of the underframe) between a pair of three-axle power truck assemblies.

The coal cars behind locomotive U813-18 are open top gondola coal cars manufactured by Freight Car America, Inc., designed with a steel underframe, utility grade stainless steel and aluminum car body, and twin rounded bottom tubs.

The car design is based on a 286,000 pound gross rail load, AAR Plate "B" clearance diagram, and unit train single rotary dump service operating on track meeting the requirements of the Title 49*Code of Federal Regulations*, Part 213.

These cars are designed for a 238,000 pound payload and a max gross vehicle weight of 286,000 lbs. This car is approximately 51 feet long, 10 feet 7 inches wide and 12 feet 7 inches tall. The unloaded weight is approximately 48,000 lbs. Train list data reports the loaded weight of these cars on average to be 240,000 lbs.

Wreckage Description

The locomotives did not derail. The first car behind the locomotive was pitched and rolled approximately 45-degrees to the north with all wheels off the track. The next nine cars were lying on their sides to the north of the track. The 11th car was disconnected at the mechanical coupler from car number 10 and cars 11 through 17 fell into a public parking lot located about 12-15 feet below the main to the north of the track.

Cars 18 through 20 were on their side to the north side of the main. The last car to derail was car number 21. The leading two axles on this car were derailed and the trailing two were still on the rail. The leading end of the car was buried about 3-4 feet into the ballast. See Appendix A. Additionally, the rail under the car was destroyed with several sections lying nearby. Some of the sections of rail had indications of fresh overstress fractures, characterized by a shiny, granular appearance with sharp edges around the freshly exposed metal.

There were also sections of the broken rail in the area under the car that had the appearance of recent longitudinal loading, or impact marks, at the exposed edge of the rail head, consistent with wheel tread impacts.

Equipment Pre-Accident Inspection

CSXT coal train U813-18 originated from Grafton, WV, destined for Baltimore's Curtis Bay Coal Pier. A Class I air brake test was completed by qualified inspectors with no exceptions observed. The train was re-crewed in Cumberland.U813-18 departed Cumberland heading for Baltimore at 5:11pm on August 20, 2012. The train derailed in Ellicott City, MD at MP 12.9.

Equipment Post Accident Inspections

NTSB investigators formed a group of qualified inspectors to evaluate the mechanical condition of the equipment involved in this derailment.

On August 21, 2011, 59 cars from U813-18 that were not derailed were given a Class 1 mechanical inspection near the point of rest by the Mechanical Group. The brakes on all 59 cars applied and released as designed. The original End of Train Device (EOT) from the train was used to complete the inspection on the 59 cars, S/N CSXE 44518. No exceptions were taken with this equipment.

On August 21, 2011, the two locomotives involved in this accident were given a Class 1 mechanical inspection at their point of rest by the Mechanical Group. The brakes on both units applied and released as designed. The group observed very light witness marks on the wheels of the second locomotive that traveled over the north rail. The marks were located on the tread of the wheels perpendicular to the running surface. See Figure 2.

Figure 2-Photograph of Witness Mark on CSXT 4579, Wheel R1

On August 21, 2012, the first ten cars of the train that derailed were examined where they came to rest. With the cars lying on their sides, the group took no exceptions with the conditions of the brake rigging or the side bearing plates on the cars, all appeared to have indications of normal contact wear patterns, consistent with properly steering bogies. The bogie frames and wheels were examined and no abnormal conditions were observed.

Wheels from these cars that traveled over the north rail were observed to have witness marks in their tread, perpendicular to the running surface. Beginning at car numbers one through car ten, the witness marks became increasingly apparent in both size and depth. See Figure 3.

Figure 3-Photograph of Witness Mark on CSXT 398511, Wheel R4

On August 22, 2012 wheel and axle assemblies were recovered from cars 11 through 20 for examination. The group identified and documented all wheels by serial number with information from CSX that allowed loose wheel sets to be matched up with the car they were installed on. No wheel defects were observed.

The group noted the presence of witness marks on many wheels examined, similar in appearance to those previously mentioned. The group located wheels from the 12th car, CSXT 302724, and placed them in position oriented as they would have been when moving through the derailment area. See Figure 4.

Figure 4-Photograph of Wheel Sets from CSXT 302724

Upon close examination, the group observed several lateral strike marks in the wheel tread of the third set of wheels, specifically the wheel that moved over the north rail (R3). See Figure 5. These series of marks were the first marks observed to have a pattern of successive impacts spaced approximately three-inches apart becoming more apparent in size and depth. These series of marks did not appear on the wheels on axles one and two.

Additionally, a corresponding mark, or a mark on the adjacent wheel in the same horizontal plane of reference, was observed on the on the L3 wheel, located on the outside rim of the wheel. See Figure 6.

Figure 5-Photograph of Witness Marks on Wheel R3 from CSXT 302724

Figure 6-Photograph of Corresponding Witness Mark on Wheel L3 from CSXT 302724

Wheel profiles from the wheel sets off of CSXT 302724 were collected at CSX's, Mount Clair rail yard in Baltimore on Wednesday October 17, 2012 using a MiniProf® wheel profile measurement system. MiniProf® is a portable precision measurement tool designed for use in railroad environments and can be used during the on-scene phase of investigations. Wheel and rail profiles are independently captured with specialized measurement instruments that convert the measurement into an electronic format.

Recovered rail from the derailment footprint was assembled into a rail re-build on August 22, 2012. During the project, investigators measured the rail pieces, inventoried and documented each piece recovered. The rails were identified and oriented as they laid in the track as to whether they were north or south rails and laid out in a continuous "in track" positioning[3].

The profile from wheel R3 was overlaid against the profile section of one of the pieces of the high rail (N5)[3] in the area of the POD. See figure 7.

[3] See Track & Engineering Group Chairman Factual Report, DCA-12-MR-009, CSX Transportation Derailment with Non-Railroad Fatalities CSX Train N0. U813-18, Ellicott City, MD August 20, 2012

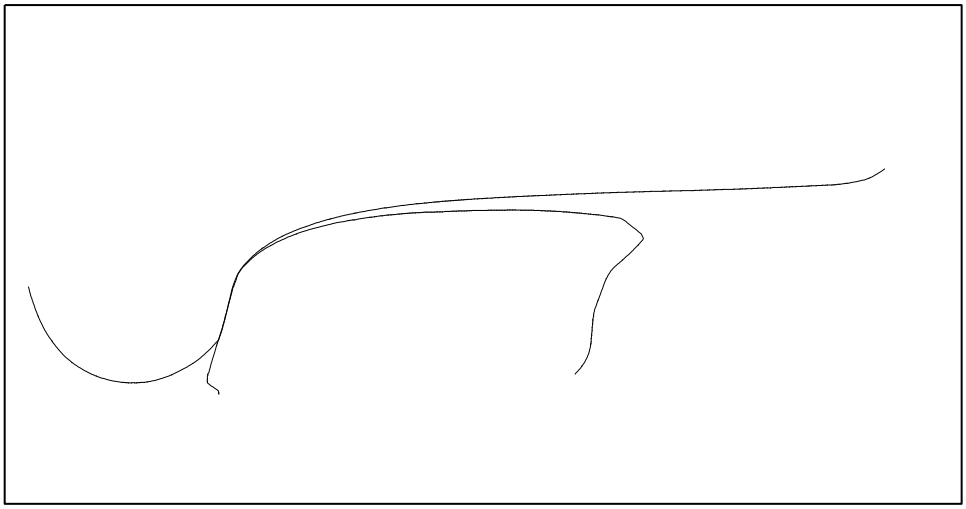


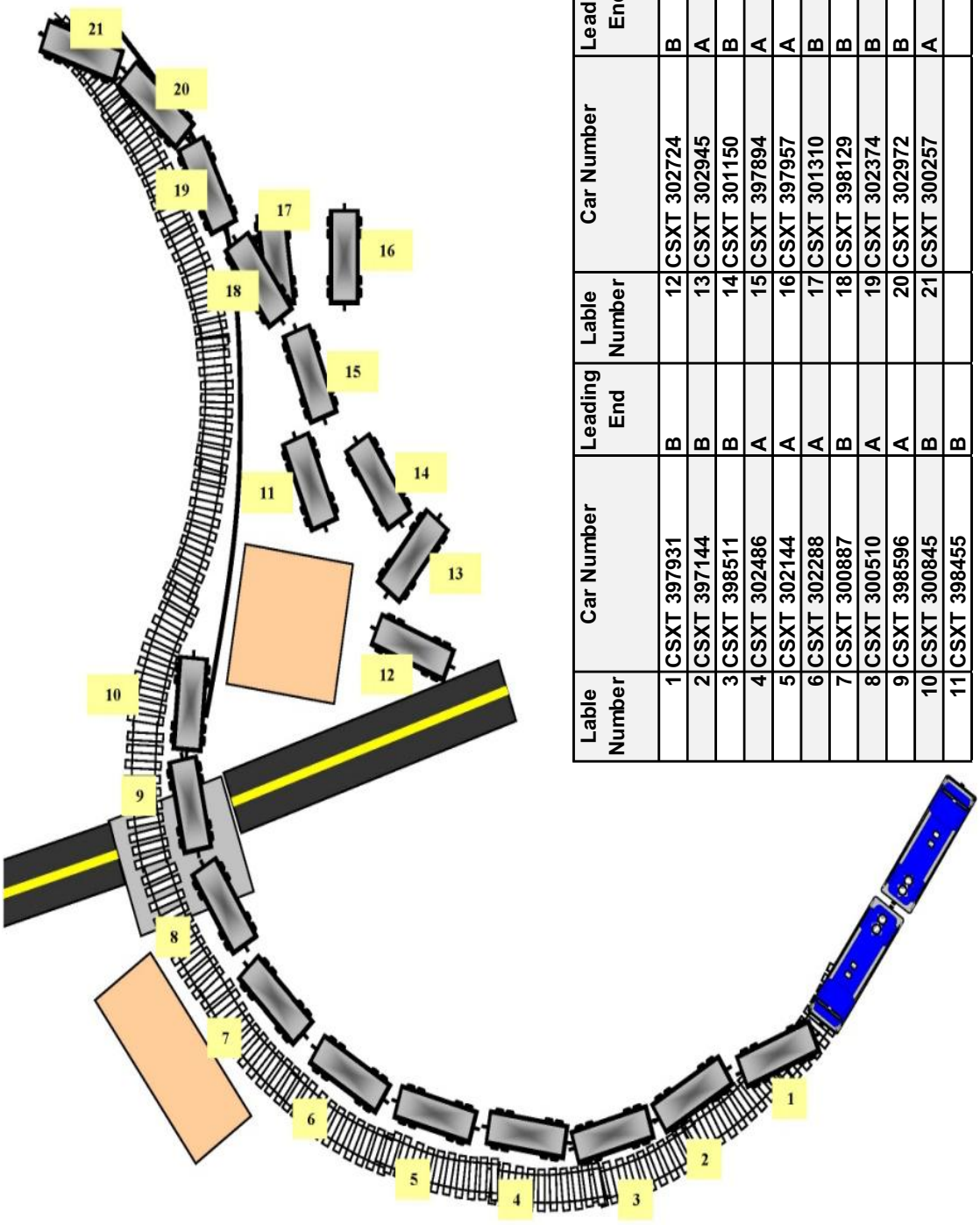
Figure 7-CSXT 302724, Wheel R3 Profile Aligned with High Rail Profile at POD

The alignment represented reflects the wheel and rail interface expected during curving conditions when CSXT 302724 moved through MP 12.9 on the Old Main Line in Ellicott City, MD.

The mechanical coupler assemblies were examined on cars ten eleven and twelve. The mechanical coupler knuckle on the B-end of the 12th car, CSXT 302724, was observed to have been severely loaded and fractured in the upper portion of the face. The fracture surfaces were sharp and showed indications that the knuckle was twisted. See Figure 7.

Figure 8-Photograph of CSXT 302724 B-End Fractured Knuckle Assembly

Appendix A



Lable Number	Car Number	Leading End
1	CSXT 397931	B
2	CSXT 397144	B
3	CSXT 398511	B
4	CSXT 302486	A
5	CSXT 302144	A
6	CSXT 302288	A
7	CSXT 300887	B
8	CSXT 300510	A
9	CSXT 398596	A
10	CSXT 300845	B
11	CSXT 398455	B

Lable Number	Car Number	Leading End
12	CSXT 302724	B
13	CSXT 302945	A
14	CSXT 301150	B
15	CSXT 397894	A
16	CSXT 397957	A
17	CSXT 301310	B
18	CSXT 398129	B
19	CSXT 302374	B
20	CSXT 302972	B
21	CSXT 300257	A