



National Transportation Safety Board

Marine Accident Brief

Barge Breakaway and Contact with Webbers Falls Dam

Accident type	Contact	No. DCA19FM035
Vessel name	<i>Barges MTC 7256 and LTD 11140</i>	
Location	Arkansas River, mile 367; Webbers Falls, Oklahoma ¹ 35°33.22' N, 095°10.19' W	
Date	May 23, 2019	
Time	1200 central daylight time (coordinated universal time – 5 hours)	
Injuries	None	
Property damage	\$4,751,249 est.	
Environmental damage	None	
Weather	Mostly cloudy skies with visibility at 10 miles, winds southwest at 5.6 mph with gusts up to 17.0 mph, air temperature 78.6°F, pressure 29.73 in	
Waterway information	The Arkansas River is part of the McClellan-Kerr Arkansas River Navigation System. The Grand River meets the Arkansas River in Muskogee at mile 394.2. At the time of the initial breakaway on May 22, 2020, the Arkansas River gage near Muskogee was over 38 feet and the current was about 7 mph. (Flood stage was in effect at 28 feet.)	

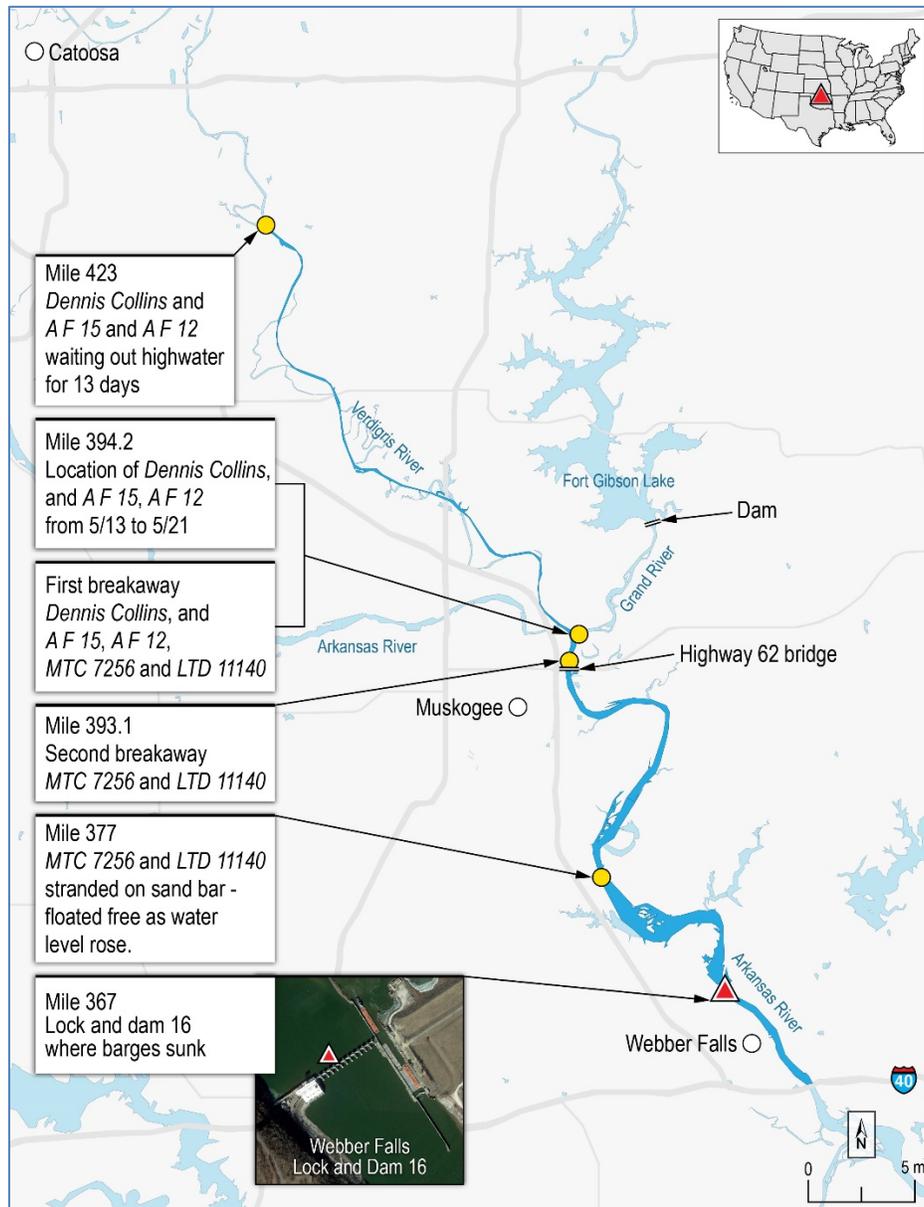
About 1200 local time on May 23, 2019, two loaded barges, the *MTC 7256* and *LTD 11140*, struck the Webbers Falls Dam. The barges had broken away the previous day from a fleeting area on the Grand River in Muskogee, Oklahoma, during historic flood waters and high river current. The two barges were total constructive losses. No pollution was reported. Total damages exceeded \$4.7 million, including the amount spent to remove the barges and repair the dam (\$3,956,249).



Barges *MTC 7256* and *LTD 11140* shortly before striking Webbers Falls Dam. (Source: KJRH-TV)

¹ All miles in this report are statute miles.

Barge Breakaway and Contact with Webbers Falls Dam



Map of area of the McClellan-Kerr Arkansas River Navigation System. Inset: Where the MTC 7256 and LTD 11140 struck the Webbers Falls Dam, as indicated by the red triangle. (Background source: ESRI; bottom inset: Google Earth Pro)

Background

The McClellan-Kerr Arkansas River Navigation System became operational in 1970. The 445-mile waterway has 18 locks and dams, 13 in Arkansas and 5 in Oklahoma, that step the water levels up a total of 420 feet in elevation between the Mississippi River and the head of navigation at Catoosa, Oklahoma. The US Army Corps of Engineers maintains a minimum 9-foot channel depth. The Grand River, also known as the Neosho River, meets the Arkansas River in Muskogee, Oklahoma.

Accident Events

On April 30, 2019, the towing vessel *Dennis Collins*, a 94.8-foot-long, 1,800-horsepower (hp) vessel fitted with two main and four flanking rudders, departed the Tulsa Port of Catoosa, Oklahoma, at mile 442 on the Verdigris River. Its two barges, *A F 15* and *A F 12*, were loaded with anhydrous ammonia. From April 30 to May 21, very heavy rainfall in excess of 15 inches fell in southern Kansas and northern Oklahoma saturating soil and resulting in major and record flooding for many rivers. While the Muskogee, Oklahoma, area, where the casualty occurred, had a lower rainfall, the area still experienced severe flooding because the Upper Arkansas, Verdigris, and Neosho river basins, which merge into the Arkansas River in Muskogee, all received heavy rainfall.

The *Dennis Collins* captain was concerned by the river's high water, so he pushed the tow into the bank at mile 423 on the Verdigris River, a remote section upriver of the Newt Graham Lock and Dam 18. He stayed upriver waiting for the river conditions to improve, but lacking "access to water, fuel [including fuel for the barge cargo tank refrigeration system, powered by diesel engines and], groceries," the captain and the vessel's port captain agreed to move the vessel to Muskogee on May 13. At the time, the river in Muskogee was near flood stage and had a current of 3 knots.² Using shore wires, the *Dennis Collins* and its two barges moored in the barge fleeting area on the left descending bank at mile 394 of the Grand River, where it met the Arkansas River.



River stage and flow for the Arkansas River near Muskogee Oklahoma. Arrow indicates where the river hit the second highest level on record. (Source: National Weather Service)

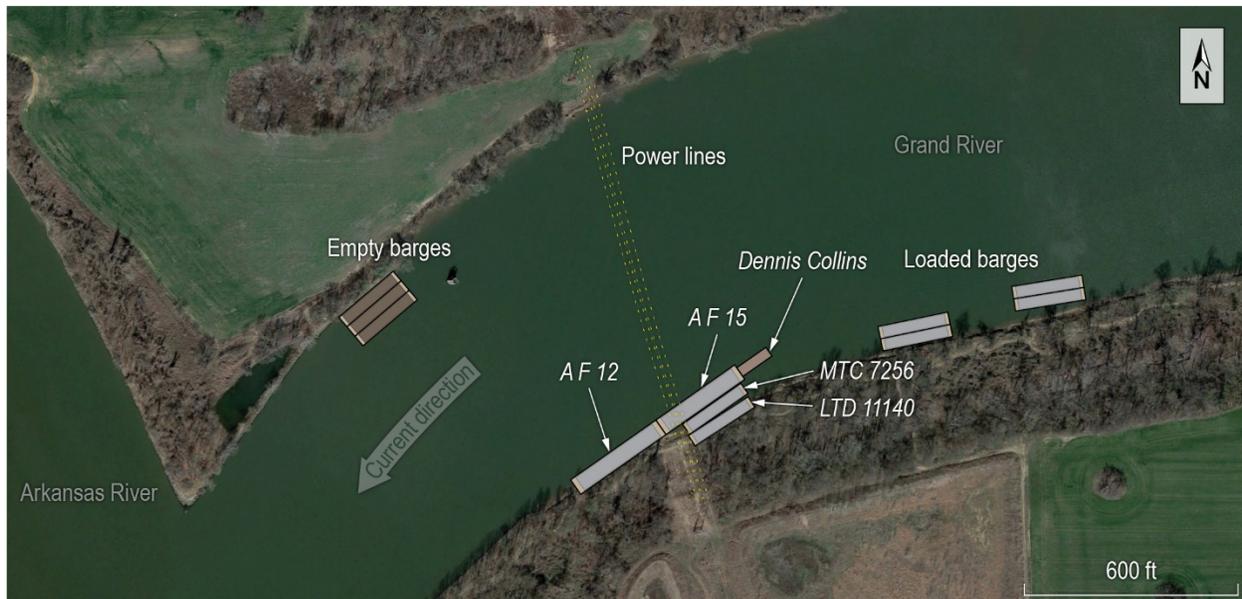
Early in the morning on May 21, the Arkansas River near Muskogee rose above flood stage of 28 feet, and the captain of the *Dennis Collins*, concerned with an eddy current that pushed the head of his tow into the river, was permitted to move farther up the Grand River. At 0805, the crew of the *Dennis Collins*, with the assistance of the towing vessel *Legacy*, backed up about 1,000 feet into the Grand River and attached two lines from the *A F 15* to the barge *MTC 7256*. The *MTC 7256* was secured abreast of the *LTD 11140*; both were loaded with diammonium phosphate. The *LTD 11140* was secured to a mooring cell anchored in the riverbank, near the power lines that crossed the Grand River, with two fleet mooring wires, one at each shoreside corner. The *Dennis*

² Additional river stage and flow data for the Arkansas River at Muskogee and the Fort Gibson Lake (dam) available at <https://www.swt-wc.usace.army.mil/webdata/gagedata/MKGO2.20190521.html>.

Barge Breakaway and Contact with Webbers Falls Dam

Collins crew supplemented the *LTD 11140* mooring by running a third line from the *LTD 11140* midships cleat to a tree trunk.

The Arkansas River and the Grand River continued to rise, and both rivers rose above major flood stage early morning on May 22. The captain noticed that the third line they had added was not long enough, so the crew removed it and replaced it with a third fleet wire, marked with a floating propane cylinder. The captain also brought the towing vessel's engines on line and kept them in reverse at clutch speed in order to reduce the current's strain on the fleet mooring wires as, he told investigators, the flow of water in the Grand River "got real bad."



Graphic showing approximate locations of vessels in the Grand River fleeting area. At the time of the breakaway on May 22, the shorelines shown here were under approximately 9 feet of water. (Background source: Google Maps)

At 1213, all three shore wires securing the *LTD 11140* to the mooring cell broke. The captain, who was in the wheelhouse at the time of the breakaway, increased the engine speed to full astern to hold the barges in, but despite his efforts, the *Dennis Collins* and all four barges slowly moved down river. The *Dennis Collins* stern swung to starboard and into the river, and the captain ordered the crew to let go the lines connecting the *AF 15* with the *MTC 7256*. Within about 3 minutes, the *Dennis Collins*' antennas struck the power lines, disabling wheelhouse equipment, including the electronic chart system, radios, and AIS transmitter. The captain maneuvered the *Dennis Collins* and its two barges across the river and successfully tied up to three empty barges already moored near the mouth of the Grand River on the opposite bank. The *MTC 7256* and *LTD 11140* continued to drift downriver.

Using the vessel's cell phone, the pilot of the *Dennis Collins* called the port captain for the Muskogee Oakley Terminal on the Arkansas River and asked if he would "catch" the barges that had been let go. At 1232, the port captain went to the towing vessel *Legacy*, got it underway, and, at 1237, caught the barges just above mile 393 on the Arkansas River, across from the terminal. With the water on the Arkansas River in Muskogee at 37.76 feet (nearly 10 feet above the 28 foot flood stage) and a current of about 7 miles per hour (mph), the port captain on the *Legacy* first

Barge Breakaway and Contact with Webbers Falls Dam

attempted to moor the two barges using a wire located on the left descending bank, across from the Oakley Terminal. When the line “snapped,” the port captain then pushed the barges over the flooded bank and into the trees on the left descending bank of the Arkansas River west of the Highway 62 bridge. With the *Legacy* pushing the barges against trees, the crew of the *Legacy* wrapped two lines around tree trunks, securing the lines to the *MTC 7256* at the shoreside upriver corner and mid-point. At 1300, the *Legacy* left the barges to return to the Oakley Terminal.

On May 22 at 2000, about 7 hours later, with the river stage at 39.94 feet, the *MTC 7256* and *LTD 11140* broke away a second time, carrying the mooring lines and trees they had previously been moored to down the Arkansas River, passing under the Highway 62 bridge. The barges were not seen again until 0348 on May 23, when an Oklahoma National Guard aircraft located them at mile



***MTC 7256* and *LTD 11140* on a sand bar at Arkansas River mile 377. (Source: KOCO)**

377 stranded on a sand bar. The Corps of Engineers wanted to send personnel to secure the barges but decided not to because the roads were flooded in the vicinity and high-water conditions prevented boat access. At 1040, with the Arkansas River level rising to 42

feet, the barges floated free of the sand bar and drifted down river. At 1118, Oklahoma highway patrol officers observed the barges at mile 373 and estimated their speed at 8 to 9 mph. Within the hour, at 1200, May 23, the barges struck the Webbers Falls Lock and Dam 16. Both barges were pinned against four of the dam gates, and the rushing river forced the upriver sides of the hopper barges downward, filling them with water until each sank.

Salvage was delayed until the water level of the Arkansas River receded. Removal of the wrecked barges began on August 10, 2019. The *LTD 11140* was removed from the dam on August 27 and the *MTC 7256* on September 4. Steel and concrete repairs to the dam were completed on September 10. The accident resulted in the constructive total loss of both barges, valued at \$795,000, and the loss of both barges’ cargo, valued at \$963,404. Damage to the dam was over \$60,000 in repair costs and nearly \$3.9 million in salvage costs to remove the wrecked barges.

Additional Information

The towing vessel *Legacy* was a 56-foot-long, 1,320-hp vessel fitted with two main and four flanking rudders. The barges *A F 12* and *A F 15* measured 293 feet long by 50 feet wide, and 270 feet long by 50 feet wide. They carried anhydrous ammonia, a liquefied compressed ammonia, and were regulated by the liquid hazardous material cargo requirements for barges. Diammonium phosphate, a feed additive that *MTC 7265* and *LTD 11140* carried, was not subject to hazardous material transportation regulations.

After the *Legacy* secured *MTC 7256* and *LTD 11140* to trees at 1300 on May 22, the Oakley Terminal manager sent it astern of another towing vessel in the Oakley Terminal to assist in keeping 13 barges from breaking away. When the *MTC 7256* and *LTD 11140* again broke free at 2000, the port captain told investigators that he did not attempt to retrieve them because the river was running fast, he did not think he could clear the Highway 62 bridge, he had only one deckhand, and if he did catch them, there was no place, terminal, or fleeting area to secure them. In addition, the Oakley Terminal company policy, *Barge Handling in Fast Current and High Waters*, stated that “During high

Barge Breakaway and Contact with Webbers Falls Dam

water and fast current, extreme caution needs to be taken when moving barges ... Do not take any unnecessary chances.”

The heavy rainfall filled the three reservoirs in the Neosho River basin to capacity. According to the Corps of Engineers, reservoirs are designed to manage rainwater to protect people and property downstream, but when a reservoir is full, additional flow must be let out to protect the structure of the dam. As more water flowed into the Fort Gibson Lake (reservoir), managers at the Fort Gibson Dam discharged the excess water into the Grand River.

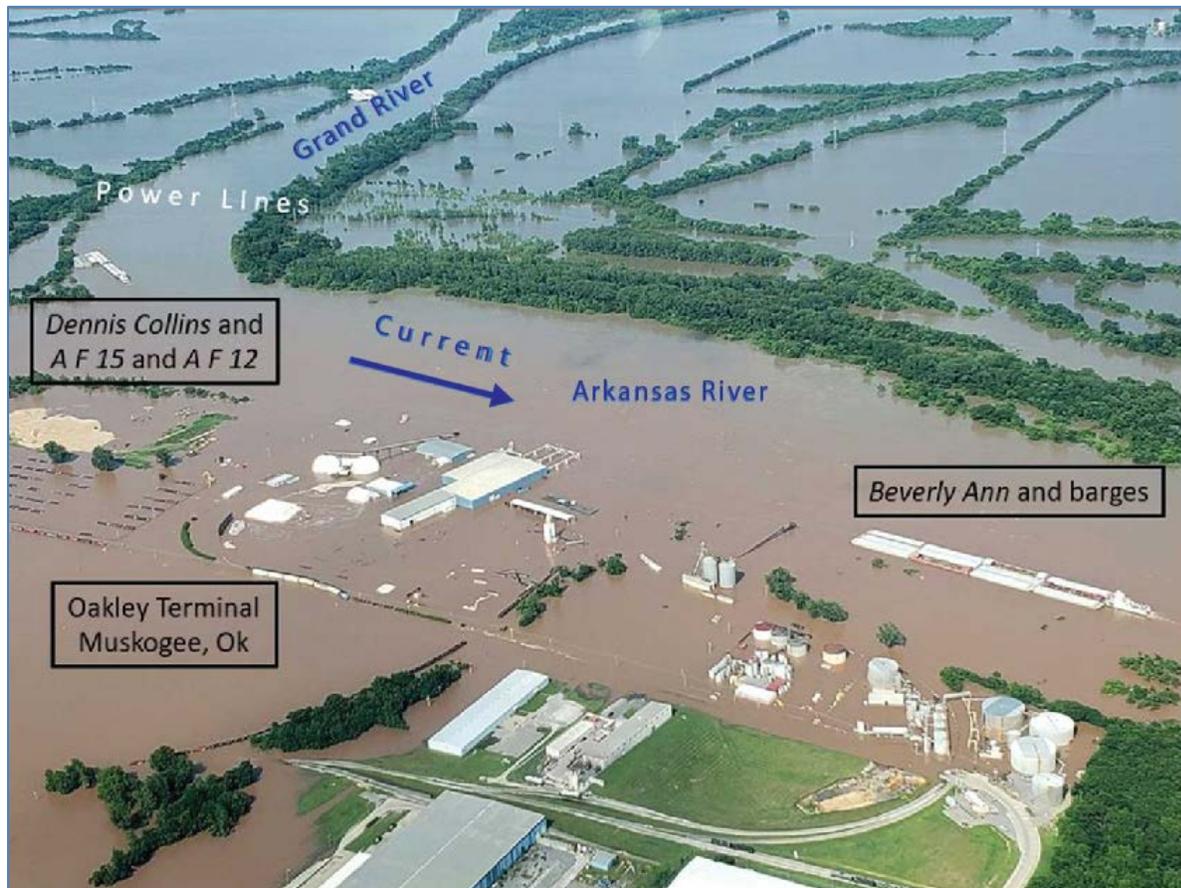
Waterway users use the volume of water flow rates to estimate the velocity of currents. The Corps of Engineers tracks this volume of water flow as cubic feet per second (cfs). A river’s current is affected by its width and depth (cross-sectional area): Generally, an increased water flow at any point in the river is associated with a faster river current. The current velocities in this brief were calculated from cfs based on the *Guide to the McClellan-Kerr Arkansas River Navigation System*, Little Rock Engineer District, 1981. The current load—the force from the water that acts on moored ships and barges—is a function of the current’s speed and the area of the ship or barge affected (in the water). The river near where the *MTC 7256* and *LTD 11140* were moored went from averaging 26,436 cfs on May 21 to 164,130 on May 22 and 205,598 on May 23.

There were two pairs of loaded barges moored just upriver of the *MTC 7256* and *LTD 11140*, each with two mooring wires, that did not break away. Each mooring line used in the Grand River fleet area consisted of a 1-inch diameter wire from its mooring anchor, buried in the earth and connected to a tire for flexibility, and a 7/8-inch diameter wire from the tire to its end that would be attached to a barge. The 7/8-inch wire had a minimum breaking strength of 79,600 pounds.



The bank of the fleeting area with a wire line arrangement like the one used by the *Dennis Collins*. One end of the wire line was anchored to buried timbers and secured to a tire. Another wire was secured to the tire and then to the barge.

Barge Breakaway and Contact with Webbers Falls Dam



Muskogee, Oklahoma, where the Grand River meets the Arkansas River. Photograph taken three days after the breakaway, at 1600 on May 25 when the Arkansas River stage and flow in Muskogee were 46.28 feet and 595,000 cfs. (Source: Coast Guard)

Analysis

Heavy rains led to historic floods, which increased the water level in the area's flood control reservoirs and forced a release of the excess water by the Corps of Engineers. When the *Dennis Collins* moved up the Grand River at 0800 on May 21, 2019, the nearby gage on the Arkansas River at Muskogee reported a river level of 28.88 feet and a flow of 130,727 cfs. In the 26 hours after the *Dennis Collins* moored upriver with the four barges, water was released from the Fort Gibson Dam, causing the Grand River level to rise by at least 9 feet, and the flow rate (at the dam) to increase by 196,000 cfs. At the time of the breakaway at 1213 on May 22, the nearby Muskogee gage reported a level of 37.76 feet and a flow of 378,432 cfs, almost three times the initial flow present when the captain of the *Dennis Collins* decided to move the tow upriver, equating to a current of at least 6.8 mph.

The rising water and increasing current increased the current load (force) acting on the barges: The current was acting on the surface area below the water on all the vessel exposed to it, as formed by the box end of the *MTC 7256*, the raked bow of the *LTD 11140*, the stern of the *Dennis Collins*, and the barge stern of the *A F 15* ahead of the *Dennis Collins*. This force significantly strained the fleet moorings of the *LTD 11140*, which were the only moorings holding the two barges, the *Dennis Collins*, and its tow to shore.

Barge Breakaway and Contact with Webbers Falls Dam

When the vessels broke free, the pilot and captain of the towing vessel *Dennis Collins* observed the upriver wire holding the *LTD 11140* parting first and the other wires parting seconds later. After the accident, investigators found parted cables attached to the mooring anchors. It is likely that the strain was not distributed evenly between the three wires, resulting in one line taking a large portion, or all the load, if the others had become slack. Once one line failed, the strain would be placed on the next line with the least amount of slack, which would also fail, until the breakaway occurred.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the barge breakaway and contact with the Webbers Falls Dam was the force of the river current acting on the moored vessels at the Grand River fleeting area, which exceeded the capacity of the mooring wires, due to the extreme rise and flow of water in the Grand River as the Fort Gibson dam released major amounts of water in a short period of time.

Barge Breakaway and Contact with Webbers Falls Dam

Vessel Particulars

Vessel	<i>MTC 7256</i>	<i>LTD 11140</i>
Owner/operator	East West Bank	Mizuho America Leasing LLC
Port of registry	St. Louis, Missouri	St. Louis, Missouri
Flag	US	US
Type	Barge	Barge
Year built	2009	2011
Official number (US)	1220334	1233977
IMO number	N/A	N/A
Classification society	N/A	N/A
Construction	Steel	Steel
Length	200 ft (61.0 m)	200 ft (61.0 m)
Beam/width	35 ft (10.7 m)	35 ft (10.7 m)
Draft	9 ft (2.7 m)	9 ft (2.7 m)
Tonnage	764 GRT	764 GRT
Engine power; manufacturer	N/A	N/A
Persons on board	None	None

NTSB investigators worked closely with our counterparts from Coast Guard Marine Safety Detachment Fort Smith, Arkansas, throughout this investigation.

For more details about this accident, visit www.nts.gov and search for NTSB accident ID DCA19FM035.

Issued: July 13, 2020

The NTSB has authority to investigate and establish the probable cause of any major marine casualty or any marine casualty involving both public and nonpublic vessels under Title 49 *United States Code*, Section 1131(b)(1). This report is based on factual information either gathered by NTSB investigators or provided by the Coast Guard from its informal investigation of the accident.

The NTSB does not assign fault or blame for a marine casualty; rather, as specified by NTSB regulation, “[NTSB] investigations are fact-finding proceedings with no formal issues and no adverse parties . . . and are not conducted for the purpose of determining the rights or liabilities of any person.” Title 49 *Code of Federal Regulations*, Section 831.4.

Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by conducting investigations and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report. Title 49 *United States Code*, Section 1154(b).