



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date:

In reply refer to: P-98-26 and -27

Mr. John W. Somerhalder
President
Tennessee Gas Pipeline Company
1001 Louisiana Street
Houston, Texas 77002

About 4:50 a.m. central daylight time on October 23, 1996, in Tiger Pass, Louisiana,¹ the crew of the Bean Horizon Corporation (Bean) dredge *Dave Blackburn* dropped a stern spud² into the bottom of the channel in preparation for continued dredging operations. The spud struck and ruptured a 12-inch-diameter submerged natural gas steel pipeline owned by Tennessee Gas Tennessee Gas.³ The pressurized (about 930 psig) natural gas released from the pipeline enveloped the stern of the dredge and an accompanying tug, the *G.C. Linsmier*. Within seconds of reaching the surface, the natural gas ignited.⁴ The resulting fire destroyed the dredge and the tug. All 28 crewmembers from the dredge and tug escaped into the water or onto nearby vessels.⁵

The National Transportation Safety Board determined that the probable cause of this accident was the failure of Tennessee Gas Pipeline Company to accurately locate the company's pipeline across Tiger Pass before that location was dredged. Contributing to the accident was the revocation by the Research and Special Programs Administration of Federal requirements for all pipeline operators to install and maintain markers to identify the locations at which their pipelines cross navigable waterways.

In the view of the Safety Board, responsibility for correctly identifying the location of the Tennessee Gas pipeline through Tiger Pass belonged to Tennessee Gas. The Safety Board is

¹Tiger Pass is a channel through the Mississippi River delta near Venice, Louisiana, that connects the Mississippi River with the Gulf of Mexico. The channel extends partially into the Gulf of Mexico, where the sides of the pass are defined by rock jetties.

²A spud is a large steel shaft that is dropped into the river bottom to serve as an anchor and a pivot during dredging operations.

³At the time of the accident, Tennessee Gas was a division of Tenneco, Inc. Since the accident, it has become a subsidiary of El Paso Energy Corporation.

⁴The ignition source could not be determined but could have been any of a number of electromechanical devices located on the dredge in the area of the escaping gas.

⁵For more information, read Pipeline Accident Summary Report--*Natural Gas Pipeline Rupture and Fire During Dredging of Tiger Pass, Louisiana, October 23, 1996* (NTSB/PAR-98/01/SUM).

therefore concerned about the imprecise method used by Tennessee Gas to locate its pipeline, particularly in a case involving a dredging operation that would, of necessity, have to pass directly over the pipeline, placing the pipeline in jeopardy of being punctured or even severed. Tennessee Gas representatives relied on the location of two pilings to determine the location of its pipeline through Tiger Pass, even though company officials, after the accident, could not determine the purpose of the two pilings or explain why company representatives believed they marked the pipeline location.

The actual dredging machinery passed over the pipeline without incident, and had the dredge not, by chance, dropped a spud into the pipeline, the erroneous identification of the pipeline location might have gone unnoted. As the accident revealed, however, the efforts of Tennessee Gas to ensure the safety of its pipeline were inadequate. Those Tennessee Gas employees responsible for making the dredging company aware of the exact location of the company's pipeline did not employ precise means of locating the pipeline, such as surveying or probing, nor did company procedures require that they do so. The Safety Board concluded that Tennessee Gas took inadequate steps to precisely identify and mark the location of its pipeline through Tiger Pass before dredging operations were undertaken in the pipeline area.

Even had Tennessee Gas attempted to use a probe to determine the location of its Tiger Pass pipeline, the company may have encountered a delay in locating the pipeline because of the absence of any markings to indicate the approximate pipeline location. The two pilings that were thought, erroneously, to be markers were about 300 feet from the pipeline location. Permanent and correctly positioned markers indicating the presence and location of the pipeline would have allowed the correct safety zone to be established on either side of the pipeline. Permanent markers would have served the additional purpose of making commercial and recreational boaters aware of the presence and location of the pipeline, which would reduce the risk of damage to the pipeline caused by vessel anchoring or other activities in which communication with the pipeline operator would not be required or expected. The Safety Board notes that, after the accident, Tennessee Gas took steps to ensure that its pipelines crossing navigable waterways are clearly and permanently marked, but the Board is disappointed that these actions came only after an accident that, under only slightly different circumstances, could have resulted in multiple serious injuries or fatalities.

Over the years, many gas and hazardous liquid pipeline companies have voluntarily installed pipeline markers at navigable waterway pipeline crossings in order to reduce the possibility of pipeline damage by activities such as anchoring, dredging, pile driving, or spud mooring. In 1970, the U.S. Department of Transportation adopted 49 *Code of Federal Regulations* (CFR) 195.410, which required that hazardous liquid pipeline companies place and maintain line markers over each buried pipeline. The regulation specified the minimum information to be included on the marker and the size and presentation of the information. The regulation required that markers at navigable waterway crossings contain the additional wording "Do Not Anchor or Dredge." In 1975, provisions were added to 49 CFR 192.707 requiring the marking of gas pipelines (in addition to hazardous liquids pipelines) that crossed navigable waterways.

In 1983, despite arguments presented by the Safety Board, the U.S. Coast Guard, and the U.S. Army Corps of Engineers, the Research and Special Programs Administration (RSPA) of the

Department of Transportation revoked the marking requirements as unnecessary in light of the permit requirements of the Corps of Engineers and the voluntary practices of the pipeline industry.

As shown by other fatal accidents investigated by the Safety Board that involved damage to pipelines traversing navigable waterways,⁶ underwater pipelines represent a risk for both recreational and commercial vessels. In light of this accident, RSPA's 1983 revocation of Federal requirements for marking pipeline crossings of navigable waterways appears to have been ill-advised. Even though Tennessee Gas clearly recognized the need for marking the company's underwater pipelines, it had not marked the Tiger Pass crossing, notwithstanding the fact that its own company procedures required it. While Tennessee Gas would probably have eventually marked the crossing in any case, the pipeline would likely have already been marked if Federal requirements for markings had not been eliminated by RSPA in 1983. The Safety Board therefore concluded that, had RSPA not revoked Federal requirements for installing and maintaining markings of pipeline crossings of navigable waterways, the pipeline involved in this accident may have been accurately marked, and this accident may not have occurred. The Safety Board has therefore made the following safety recommendation to RSPA:

Require pipeline system operators to precisely locate and place permanent markers at sites where their gas and hazardous liquid pipelines cross navigable waterways.
(P-98-25)

The Safety Board notes that about 30 minutes elapsed from the time of the rupture until Tennessee Gas became aware that one of its pipelines may have ruptured, and more than an hour passed before the pipeline was shut down. A check valve downstream of the rupture closed automatically after the break to limit the backflow of product to the rupture, but the supervisory control and data acquisition (SCADA) system used by Tennessee Gas did not report the check valve's closing to pipeline controllers. Had it done so, or had the company's SCADA system been equipped with an alarm that would respond to a change in pressure over a period of time, the pipeline controllers may have been alerted to an anomaly within a certain segment of the pipeline, and the flow of gas feeding the fire in Tiger Pass may have been terminated more quickly than it was.

Insufficient evidence was available to indicate what effect, if any, the earlier shutoff of the gas flow would have had on this accident. Clearly, however, one of the first priorities in any accident involving the release of natural gas should be to curtail the escape of the product. The Safety Board concluded that the delay in recognition by Tennessee Gas that it had experienced a pipeline rupture at Tiger Pass was due to its piping system's dynamics during the rupture and the design of its SCADA system.

⁶In addition to the accident report referenced above involving the *C.L. Dill 10*, see Pipeline Accident Report--*Fire on Board the F/V Northumberland and Rupture of a Natural Gas Pipeline in the Gulf of Mexico Near Sabine Pass, Texas, October 3, 1989* (NTSB/PAR-90/02).

The National Transportation Safety Board therefore makes the following safety recommendations to Tennessee Gas Pipeline Company:

Develop formal, written company procedures for identifying the precise locations of your pipelines that traverse navigable waterways before dredging or similar activities are commenced in the pipeline area. (P-98-26)

Review your supervisory control and data acquisition system and make the modifications necessary to increase the likelihood that any critical event involving the company's pipelines is quickly and accurately reported to pipeline controllers, allowing them to take timely action to correct or limit the effects of any failure in the pipeline system. (P-98-27)

Also, the Safety Board issued Safety Recommendations P-98-25 to the Research and Special Programs Administration; M-98-123 to Bean Horizon Corporation; M-98-124 to the Western Dredging Association; P-98-28 to the Interstate Natural Gas Association of America; and P-98-29 to the American Petroleum Institute.

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations P-98-26 and -27 in your reply. If you need additional information, you may call (202) 314-6469.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By: Jim Hall
Chairman