



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date:

In reply refer to: P-98-28

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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 Pipeline Company (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.

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).

On September 20, 1996, Bean was awarded a U.S. Army Corps of Engineers contract to dredge portions of Tiger Pass, including areas where several underwater pipelines were located. The Corps of Engineers provided Bean with Corps of Engineers drawings showing the approximate locations of the pipelines. On these drawings, the Tennessee Gas pipeline was shown as crossing Tiger Pass at centerline station 614+20, or 61,420 feet from the point at which Tiger Pass joins the Mississippi River.⁶ A dredging contract provision, with which Bean complied, required Bean to notify pipeline owners by certified mail at least 7 days before dredging within 500 feet of their pipelines and to verify the pipeline locations.

On September 22, 1996, Bean began dredging about 1,000 feet southwest of the location of the pipeline as shown on the Corps of Engineers drawing. The initial dredging operation was to move toward the Gulf of Mexico and away from the pipeline. On October 17, the crew received weather reports predicting rough weather. The supervisor of the dredging operation decided to move the operation to a more sheltered area to the northeast, near the point where the dredging had begun but still southwest of the pipeline. According to the supervisor, the plan was to begin dredging there and then move toward the northeast, toward the pipeline. Tennessee Gas was notified by phone that the dredge would soon be approaching the pipeline. Bean's project engineer on the dredge said he questioned a Tennessee Gas supervisor several times about the pipeline's exact location and was told that the location of the pipeline was marked by two pilings, one near either side of the pass.⁷

About 2 p.m., on October 19, a Tennessee Gas inspector boarded the dredge and, using information and a sketch provided by her supervisor, established a 100-foot safety zone in the area of the two pilings. In order to avoid damage to the pipeline, dredging in that area was to be done with the suction pumps only, without using the cutting head. Bean's daily quality control reports showed that the pipeline location identified by Tennessee Gas personnel did not match the location shown on the Corps of Engineers drawings.

Dredging, using only the suction pumps, proceeded across the area of Tiger Pass where the pipeline was believed to be located. The dredge's daily quality control report indicated that the ladder struck an object believed to be the pipeline about 15 feet southwest of the site identified by the Tennessee Gas inspector. Dredging then continued to the northeast to within about 130 feet of the actual pipeline location. Then, on October 20, 1996, because of improving weather, the dredging supervisor decided to return the operation to the Gulf of Mexico end of the channel where weather conditions had previously halted work. The Tennessee Gas inspector left before the dredge was moved, with an agreement that the gas company would be notified when the dredge returned to work in the area of the pipeline.

On October 22, after completing its work at the lower end of the pass, the dredge returned, at 9:40 a.m., to an area about 140 feet to the northeast of the area previously identified

⁶The junction of Tiger Pass and the Mississippi River was used as a zero reference point by the Corps of Engineers for measuring distances downstream along the center of Tiger Pass. Postaccident measurements determined that the pipeline actually crossed Tiger Pass at station 615+12, or about 92 feet downstream from the Corps of Engineers' approximate location.

⁷These pilings were located at about station 618+10, about 300 feet downstream of the actual pipeline location.

by Tennessee Gas as the pipeline location. The crew began dredging to the northeast, believing that the operation was outside the safety zone and moving away from the pipeline. In reality, the dredge was moving *toward* the pipeline, which was about 100 feet away. By 9:30 p.m., the cutting head had crossed over the pipeline without incident.

On October 23, at 4:50 a.m., after stopping the dredging to clean the cutting head and reset the swing anchors, the crew dropped a stern spud into the river at about station 615+12 and directly into the Tennessee Gas pipeline, rupturing the pipeline and releasing pressurized natural gas.

At the time of this accident, no signs or markers were in place at the Tiger Pass crossing, and Tennessee Gas officials were unable to explain why they believed the location of that pipeline was marked by the two pilings that were 300 feet southwest of the actual pipeline location. After the accident, the company erected signs in Tiger Pass to alert mariners to the location of the crossing.

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 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 damaged or even ruptured. 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. The Safety Board has issued the following safety recommendation to Tennessee Gas:

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)

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 cross navigable waterways.

In 1981, the Department of Transportation’s Research and Special Programs Administration (RSPA) issued an advance notice of proposed rulemaking (ANPRM)⁸ requesting comments on:

the problem of interference with underwater pipeline crossings of navigable waterways, the benefits of installing line markers at these crossings, and the size of markers at these crossings.

The preamble indicated that this rulemaking was part of a RSPA program, in accordance with Executive Order 12291, to review existing regulations and revoke or revise those that were not achieving their intended purpose. The preamble also noted two problems with existing regulations. First, the term “navigable waterway” was not defined, leading to a concern that the U.S. Coast Guard’s interpretation of this term may be:

broader than reasonably necessary to assure safe pipeline crossings. As a result, the current rules may require markers where there is little or no susceptibility to damage from marine activities, for example, at minor stream crossings which have no vessel traffic and where dredging is unlikely to occur.

The second concern was that in order to be visible and legible from vessels passing through wide bodies of water, the signs marking a pipeline crossing must be “larger, until a point of impracticality or strong environmental objection is reached.”

⁸*Federal Register*, Vol. 46, No. 119, June 22, 1981, p. 32287.

In a response to the ANPRM, the Safety Board acknowledged some of the points made by RSPA but stated that:

as a minimum, the MTB⁹] should maintain a requirement for marking the location where pipelines enter or leave navigable waters and that such markers should be similar to those now required for marking the location where pipelines cross roads.

A July 9, 1981, letter from the Corps of Engineers South Atlantic Division in response to the ANPRM stated that division authorities believed that:

crossings [should] be marked on all waterways and streams which have (1) U.S. Coast Guard aids to navigation and (2) regularly scheduled commercial traffic or dredging operations.

The letter stated that some type of marker, as opposed to a legible sign, could be used, but that:

Assuming that dredgers, mariners, and other users of the waterway that have potential to damage the pipeline are forewarned by Corps of Engineers' navigational charts and instructional letters to permittees of the presence of pipeline crossings, these same users will have a need to know the exact vicinity of the crossings.

In January 1983, RSPA issued a Notice of Proposed Rulemaking (NPRM)¹⁰ proposing the revocation of "the regulations that require pipeline operators to place and maintain line markers at locations where gas and hazardous liquids cross navigable waterways." In the preamble to the notice, RSPA referenced the fact that marine navigation charts show the locations of submarine cables and pipelines and that such charts are required to be kept on board all vessels "with sufficient capacity to damage pipelines." The preamble further noted that the Corps of Engineers has the authority to regulate and grant permits for pipeline crossings of navigable waters and for dredging or other activities that might interfere with such crossings.

Thus, the Corps not only furnishes information about pipeline crossings that is used by mariners, but also conducts a case-by-case review of the safety of pipeline crossings of navigable waters, including the need for line markers.^[11] Furthermore, after a crossing is constructed, the Corps' permitting program in regard to dredging and marine construction activities serves to protect the crossing against damage. It follows, therefore, that the present requirements...for marking navigable waterway crossings are to a large extent unnecessary in light of the Corps of Engineers' practices.

⁹The *Materials Transportation Bureau*, which was created in 1975 and subsumed into RSPA when that agency was established in 1977. The MTB was abolished in 1985, with RSPA retaining the MTB's pipeline safety responsibilities.

¹⁰*Federal Register*, Vol. 48, No. 16, January 24, 1983, p. 2987.

¹¹In a written response to a Safety Board query, the Corps of Engineers stated that the agency does not require pipeline operators to install pipeline markers.

RSPA also noted that Federal requirements were not needed because “most pipeline operators will voluntarily install and maintain line markers at crossings where they consider line markers to be helpful.”

The Coast Guard, in its response to the NPRM, stated:

The Coast Guard feels strongly that pipeline crossings under navigable waters should be marked in areas of regular commercial traffic, dredging and other waterside operations. Although charts are helpful for locating pipelines, signs at pipelines more effectively pinpoint the location of a crossing.... The Coast Guard recommends that the requirements for pipeline markings found in 49 CFR 192.707 and 195.410 not be changed.

The Safety Board also responded to the NPRM, stating that the lack of firm data on the effectiveness of markers in preventing damage to underwater pipelines “does not constitute a convincing case that the costs for signing underwater crossings outweigh the safety benefits.” The Safety Board stated that “there is substantial merit...in shoreside signing of underwater crossings which can be damaged by vessels anchoring or other causes.” In support of its position, the Safety Board made reference to an accident in the Mississippi River delta in which four workers drowned attempting to escape a fire that resulted when a crane barge dropped a mooring spud into an unmarked high-pressure natural gas pipeline.¹² The Safety Board response stated that “the premise that voluntary signing will take care of the most exposed pipelines is unrealistic” and cited the NPRM acknowledgement that a substantial portion of the pipeline industry would not object to a continuation of the Federal requirement, if it were more tempered.

In 1983, despite arguments presented by the Safety Board, the Coast Guard, and the Corps of Engineers, RSPA 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,¹³ 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

¹²For more information, see Marine Accident Report--Crane Barge C.L. Dill 10 Fire, Garden Island Bay, Mississippi River Delta, June 5, 1979 (NTSB/MAR-80/9).

¹³In 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).

have been accurately marked, and this accident may not have occurred. The Safety Board has therefore made the following safety recommendation to the 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)

In concert with this objective and in consideration of the delays inherent in the regulatory process, the National Transportation Safety Board makes the following safety recommendation to the Interstate Natural Gas Association of America:

Inform your members of the circumstances of the pipeline rupture and fire in Tiger Pass, Louisiana, and urge them to take the actions necessary to ensure that all their pipelines that cross navigable waterways are accurately located and marked.
(P-98-28)

Also, the Safety Board issued Safety Recommendations P-98-25 to the Research and Special Programs Administration; P-98-26 and -27 to Tennessee Gas Pipeline Company; M-98-123 to Bean Horizon Corporation; M-98-124 to the Western Dredging Association; 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 recommendation in this letter. Please refer to Safety Recommendation P-98-28 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 this recommendation.

By: Jim Hall
Chairman