

**NATIONAL TRANSPORTATION SAFETY BOARD**  
**Virtual Meeting of December 7, 2021**  
**(Information subject to editing)**

**Hazardous Liquid Pipeline Strike and Subsequent Explosion and Fire**  
**Aboard Dredging Vessel *Waymon Boyd***  
**EPIC Marine Terminal, Corpus Christi Ship Channel, Corpus Christi,**  
**Texas**  
**August 21, 2020**  
**DCA20FM026**

This is a synopsis from the NTSB's report and does not include the Board's rationale for the findings, probable cause, and safety recommendations. NTSB staff is currently making final revisions to the report from which the attached findings and safety recommendations have been extracted. The final report and pertinent safety recommendation letters will be distributed to recommendation recipients as soon as possible. The attached information is subject to further review and editing to reflect changes adopted during the Board meeting.

## **Executive Summary**

### **What Happened**

On August 21, 2020, about 0802 central daylight time, the US-flagged dredge *Waymon Boyd* struck a submerged 16-inch liquid propane pipeline during dredging operations in Corpus Christi, Texas. A geyser of propane gas and water erupted adjacent to the vessel. Shortly thereafter, propane gas engulfed the vessel and an explosion occurred. Fire damaged the vessel and surrounding shoreline. A total of 18 personnel employed by Orion Marine Group were working or resting on the dredge and assist boats (tender boats, anchor barges, booster barges, and a supply barge) on the day of the accident. Three crewmembers aboard the *Waymon Boyd* and one on an adjacent anchor barge died in the explosion and fire. Six crewmembers aboard the dredge were injured, one of whom later died from his injuries. The *Waymon Boyd*, valued at \$9.48 million, was a total loss. The cost of pipeline damage was \$2.09 million. The cost of physical damage to the EPIC facility was \$120,000.

### **What We Found**

The accident occurred because the *Waymon Boyd's* rotating cutterhead struck Enterprise Products' pipeline TX219, breaching the pipeline, which allowed propane gas to escape, surround the dredge, and ignite within the engine room, causing the

explosion. Inadequate planning and risk management by the dredging company, Orion Marine Group, meant that not enough controls were in place to mitigate the risk of the cutterhead breaching pipeline TX219.

We also found that the engineering drawings for the dredging project were deficient, which led to the Orion Marine Group project engineer misinterpreting information within the drawings and communicating incomplete and inaccurate information during the one-call (call before you dig) process, which dissuaded Enterprise Products from protecting pipeline TX219 in accordance with the company's damage prevention program.

Pipeline protection measures specific to dredging, such as greater collaboration between pipeline operators and dredging companies, sharing GPS coordinates of pipelines, improved marking requirements, and tolerance zones for dredging, could have prevented this accident.

### **Probable Cause**

We determined that the probable cause of this accident was Orion Marine Group's inadequate planning and risk management processes, which failed to identify the proximity of their dredging operation to Enterprise Products' pipeline TX219 and resulted in the absence of effective controls to prevent the dredge's cutterhead from striking the pipeline. Contributing to the accident were deficient dredging plans provided by Schneider Engineering and Consulting, which resulted in incomplete and inaccurate information communicated to Enterprise Products by Orion Marine Group during the one-call process, which resulted in insufficient measures to protect the pipeline from excavation damage.

### **What We Recommended**

As a result of this investigation, we made recommendations to the companies involved in the accident to implement or update policies and procedures for dredging near pipelines. We also made recommendations to a federal regulator and industry organizations about developing additional guidance and training specific to pipeline protection for marine dredging projects and establishing tolerance zone guidance for marine construction and dredging projects near pipelines.

### **Findings**

1. None of the following were safety issues for the accident: (1) experience and qualifications of the vessel and pipeline personnel; (2) fatigue; (3) distraction from cell phone use; (4) vessel mechanical and electrical systems failures; (5) environmental conditions; (6) leak detection systems on pipeline TX219; (7) pipeline operating history and operating pressure; (8) pipeline integrity; (9)

transport of non-odorized propane in the pipeline; or (10) pipeline depth of cover.

2. Enterprise's pipeline TX219 was struck by the dredge *Waymon Boyd's* rotating cutterhead, causing a breach in the line that allowed propane to escape and form a gas cloud that surrounded the dredge.
3. Propane gas that had released from pipeline TX219 was drawn into the *Waymon Boyd's* engine room by the ventilation fans and was ignited, causing the explosion.
4. The Enterprise pipeline controller's and pipeline technicians' actions to secure the pipeline were appropriate and facilitated a timely shutdown.
5. Given the GPS margin of error, potential inaccuracies in the dredging configuration information, and the resolution of the DREDGEPACK display, the dredging area specified in the Schneider Engineering and Consulting plans was too close to pipeline TX219 for safe excavation using a cutterhead dredge.
6. Orion Marine Group did not have adequate procedures to require that pipelines be identified and included in DREDGEPACK; thus, the *Waymon Boyd's* leverman was unaware how close he was operating the cutterhead to the pipeline.
7. Orion Marine Group's planning and risk management process was inadequate, which resulted in their failure to identify and mitigate the risk of a cutterhead impact with pipeline TX219.
8. The Schneider Engineering and Consulting plans provided to Orion Marine Group for the EPIC dock project were deficient because they did not clearly depict the extent of the dredging area or the pipeline location in all drawings, which resulted in the Orion Marine Group project engineer misinterpreting the information, overestimating the distance between the dredging area and pipeline TX219, and communicating incomplete and inaccurate information during the one-call process, which dissuaded Enterprise from protecting pipeline TX219 in accordance with the company's damage prevention program.
9. Marine dredging projects require a greater level of collaboration and review between pipeline operators and dredging companies than the one-call process provides because of the challenges associated with marking marine pipelines and the lack of precision associated with dredging operations.
10. Third-party damage prevention efforts would be improved if dredging companies obtained accurate location data from pipeline operators for

pipelines within and near dredging project boundaries to incorporate into dredge control software files.

11. Although Enterprise courtesy-marked the pipelines with cane poles, the markers did not meet pipeline excavation damage protection standards, nor were they required to based on the incorrect information provided by Orion, and therefore were insufficient to visually warn the leverman of the danger of the pipeline.
12. Project boundary marking requirements for dredging projects (equivalent to land-based white-lining requirements) would provide utility operators with additional visual information about the location of dredging projects to confirm any encroachment of the proposed project on pipelines.
13. The clearance required by existing state-regulated tolerance zones is not adequate for large-scale dredging activities because of the inherent inaccuracies associated with operating a cutterhead dredge.
14. The Enterprise damage prevention program did not provide for an adequate tolerance zone for dredging projects.
15. Written policies and procedures could have eliminated confusion about the pipeline TX219 location and minimum tolerance distances for pipeline damage prevention.
16. Because Schneider Engineering and Consulting did not have company specifications, quality control measures, or best practices for including pipeline hazards and tolerance zones in their engineering plans and drawings, the engineering plans and drawings did not clearly reflect the proximity of the pipeline to the full dredging area.
17. The dredge crew lacked function-specific pipeline safety training and emergency procedures that could have prepared them to react quicker and more effectively to the gas pipeline strike.

## **Recommendations**

### **To Pipeline and Hazardous Materials Safety Administration:**

1. In collaboration with Coastal and Marine Operators and the Council for Dredging and Marine Construction Safety, develop recommended practices and processes for pipeline operators and dredging companies to obtain and use accurate pipeline location data during planning and one-call locating activities for pipelines both in and near project locations.

2. In collaboration with Coastal and Marine Operators and the Council for Dredging and Marine Construction Safety, develop guidance for excavators to clearly identify proposed dredging boundaries for dredging projects before notifying one-call centers by either physically marking the boundaries where practicable, or identifying the boundary with accurate location data.
3. Include criteria for minimum tolerance or safety zones for dredging in state pipeline safety program evaluation guidelines.

**To Coastal and Marine Operators:**

4. Modify the existing *Working Safely Near Underwater Pipelines* online pipeline safety training to incorporate lessons learned from this accident.

**To Coastal and Marine Operators and the Council for Dredging and Marine Construction Safety:**

5. Work with the Pipeline and Hazardous Materials Safety Administration to develop recommended practices and processes for pipeline operators and dredging companies to obtain and use accurate pipeline location data during planning and one-call locating activities for pipelines both in and near project locations.
6. Work with the Pipeline and Hazardous Materials Safety Administration to develop guidance for excavators to clearly identify proposed dredging boundaries for dredging projects before notifying one-call centers by either physically marking the boundaries where practicable or identifying the boundary with accurate location data.

**To Orion Group Holdings:**

7. Require Orion Marine Group to, for all future dredging projects, conduct a formal, documented risk assessment with risk analysis, such as a risk matrix, before starting work, and based on the risk assessment, develop a hazard control plan.
8. Require Orion Marine Group to develop standardized, written policies and procedures for planning dredging operations near pipelines that include pipeline operator engagement on pipeline avoidance measures, minimum tolerance zones, minimum requirements for marking and verifying pipelines, and uploading of pipeline information into DREDGEPACK or other navigation software.

9. Require Schneider Engineering and Consulting to develop specifications and quality control measures to ensure pipeline and other hazard data is included and clearly represented in engineering plans and drawings, to include depicting tolerance distances from underwater pipelines.

**To Enterprise Products:**

10. Revise your damage prevention program guidelines to include a larger tolerance zone for dredging operations.