APPENDIX H

BWTT's Offshore Pipeline Construction Preliminary Vessel Anchoring Plan

OFFSHORE PIPELINE CONSTRUCTION
PRELIMINARY VESSEL ANCHORING PLAN
BLUEWATER SPM PROJECT

I. INTRODUCTION

At the request of the U.S. Coast Guard (USCG) and in response to Information Request #141, Bluewater Texas Terminal, LLC (BWTT) has prepared the enclosed Preliminary Offshore Pipeline Construction Vessel Anchoring Plan for the proposed offshore pipeline construction activities associated with the Bluewater SPM Project (Project). The techniques that will be used to install the proposed offshore pipeline infrastructure will be determined during detailed engineering of the Project and upon selection of individual contractors and equipment. The construction and installation of the proposed offshore pipeline infrastructure discussed herein is defined as the approximate 26.06 miles (137,684 feet) of two (2) 30-inch-diameter pipelines extending from the horizontal directional drill (HDD) 10 exit location to SPM Buoy 1, and from SPM Buoy 1 to SPM Buoy 2.

The discussion below represents BWTT's currently envisioned potential installation techniques and equipment to be used during offshore pipeline construction.

II. OFFSHORE PIPELINE CONSTRUCTION TECHNIQUES

The traditional method for installing offshore pipelines in relatively shallow water is commonly referred to as the S-Lay method. This is due to the elongated "S" profile and shape of the pipe as it moves in a horizontal plane from the welding and inspection stations on the lay barge across the stern of the barge and then to the ocean floor. Refer to Figure 1 for a depiction of S-Lay method.

Figure 1: S-Lay Pipeline Installation Method

Source : https://www.huismanequipment.com/en/products/pipelay

When laying down the pipe on the seabed, the pipelay vessel needs to continuously move forward as the pipe is laid down from the vessel's stern. To accomplish this, there are two commonly used methods/techniques for controlling the position, speed, and orientation of the pipelay vessel during

construction. These techniques include conventionally moored pipelay and dynamic positioning (DP) methods.

A. CONVENTIONAL MOORING

The term “conventionally moored” means that the location or position of the pipelay vessel is maintained through anchors, associated anchor chains, and/or cables. The number and configuration of the anchors utilized for this method is dependent on environmental forces (i.e., wind, wave, current) and vessel size/weight. Separate anchor handling tugs (AHT) are utilized to deploy and retrieve the anchors as the pipelay vessel continuously moves forward as pipe is laid down on the seafloor. The number of anchor relocations per mile of offshore pipeline constructed will be dependent upon the size of the vessel, the water depth, ocean floor conditions in the vicinity of the pipeline installation, and the amount of anchor line that can be stored, deployed, and retrieved by the pipelay vessel.

B. DYNAMIC POSITIONING

The term "dynamically positioned" means that the location or position of the pipelay vessel is maintained by the vessel's very specialized propulsion and station-keeping system which, instead of or in addition to the conventional propeller-rudder system at the stern, employs a system of hull-mounted thrusters near the bow, at midship, and at the stern. When in the station-keeping mode, these thrusters, which have the capability to rotate 360 degrees in a horizontal plane, are controlled by a shipboard computer system that usually interfaces with a satellite-based geographic positioning system.

C. PROPOSED OFFSHORE PIPELINE CONSTRUCTION TECHNIQUE

As previously stated, the techniques to be used in installing the proposed offshore pipeline infrastructure will be determined during detailed engineering of the Project and upon selection of individual contractors and equipment. For the offshore pipeline construction, a suitable vessel would be selected based on Project constraints and equipment availability and may include either a DP pipelay vessel or a conventionally moored pipelay vessel. BWTT proposes the use of a DP pipelay vessel if determined suitable and available for the offshore pipeline installation. The use of a DP pipelay vessel would minimize anchoring and use of associated chains and lines during construction. If during detailed engineering it is determined that conventionally moored pipelay methods is required for a portion of the offshore pipeline alignment, BWTT proposes to utilize a combination of conventional and DP pipelay methods, where appropriate, to minimize anchoring and the described associated impacts during construction. As such, BWTT has prepared the following preliminary vessel anchoring plan assuming the use of a conventionally moored pipelay vessel due to a DP pipelay vessel not being available or not suitable based on detailed engineering.

III. PRELIMINARY VESSEL ANCHORING PLAN ASSUMPTIONS

When utilizing a conventional pipelay vessel, the lay barge will need to move continuously forward as the pipe is laid down on the seabed from the vessel’s stern. Each conventional pipelay vessel has unique specifications such as number and configuration of anchors, maximum length of anchor mooring line available, and anchor size. The development of a preliminary vessel anchoring plan requires assumptions to be made as to these specifications. For the purposes of this preliminary vessel anchoring plan, specifications from Morison Energy’s DLB Super Chief pipelay vessel was utilized. The following sections detail the assumptions used in the development of this preliminary anchoring plan.

A. ANCHOR NUMBER AND CONFIGURATION

The pipelay vessel needs to continuously move forward as the pipe is laid down from the vessel’s stern while controlling the position, speed, and orientation of the vessel with respect to the pipeline alignment. To

accomplish this, the anchor lines at the bow will be pulled in while the anchor lines at the stern will be gradually let out. A typical mooring configuration of a S-Lay barge utilizes an eight (8) anchor system, four (4) of which are positioned off the bow and four (4) off the stern. The first two (2) anchors located on the bow would be set to the maximum length of mooring line available ahead of the vessels direction of travel and offset to achieve lateral station keeping. The first two (2) anchors located on the stern would be set near the bow of the vessel, also offset to maintain lateral station keeping. When laying down the pipeline on the seabed off the vessel's stern, the vessel would continuously move forward by pulling on the mooring lines on the bow and gradually letting out mooring lines off the stern. As the vessel reaches the anchors set off the bow, a AHT would set two (2) anchors ahead of the vessel's direction of travel to the maximum length of mooring line available. Likewise, as the maximum length of mooring line has been paid out to the anchors set off the bow, a AHT would set two (2) anchors near the bow of the vessel and retrieve the two anchors previously set. This systematic leap-frog process of setting and retrieving anchors allows for the continuous movement of the pipelay vessel along the pipeline alignment. As such, the described eight (8) anchor mooring configuration was utilized as the assumed anchor number and configuration for this preliminary vessel anchoring plan for the installation of the approximate 26.06 miles (137,684 feet) of two 30-inch-diameter pipelines.

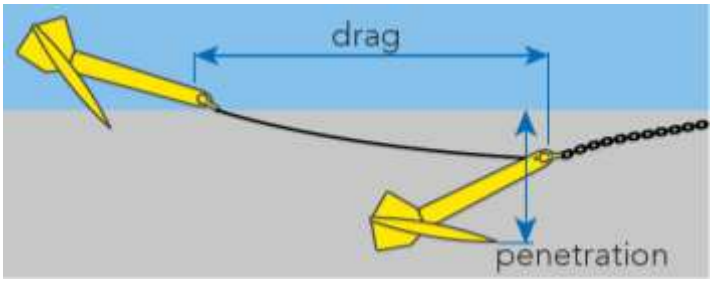
B. ANCHOR MOORING LINE

There is a maximum length of mooring line available onboard the pipelay vessel. As such, anchors will need to be moved and reset periodically as the pipelay vessel continuously moves as pipe is being laid. The number of times a pipelay vessel will need to reset anchors is depended on the length of the pipeline to be laid and the length of the anchor mooring lines available on the pipelay vessel. For the purposes of this preliminary vessel anchoring plan, mooring line specifications from Morison Energy's DLB Super Chief pipelay vessel was utilized. The DLB Super Chief utilizes mooring lines that are approximately 2 inches in diameter and 1,200 meters (4,000 feet) in length. As such, an anchor mooring line length of 4,000 feet was utilized for this preliminary vessel anchoring plan for the installation of the offshore pipelines. Additionally, it was assumed that a maximum length of 1,000 feet of anchor mooring line would lay on the seafloor during an anchor set and would have a maximum sweeping distance of 50 feet.

C. ANCHOR SIZE

Conventionally moored pipelay vessels utilize high holding power anchors like Delta Flipper, Stevin, Stevpris, and Bruce. A typical anchor size and weight utilized by pipelay vessels in the Gulf of Mexico is the Delta Flipper 6.8-ton anchor. However, some pipelay vessels utilize anchors up to and exceeding 15 tons, depending on the size of the vessel and operator's preference. The larger anchors are commonly used in greater water depths and larger pipelay vessels. The anchor drag distance and depth of penetration is dependent on the load force, anchor type, anchor weight, and soil conditions of the seabed. Refer to Figure 2 for a depiction of what is defined as anchor drag and penetration.

Figure 2: Anchor Drag and Penetration

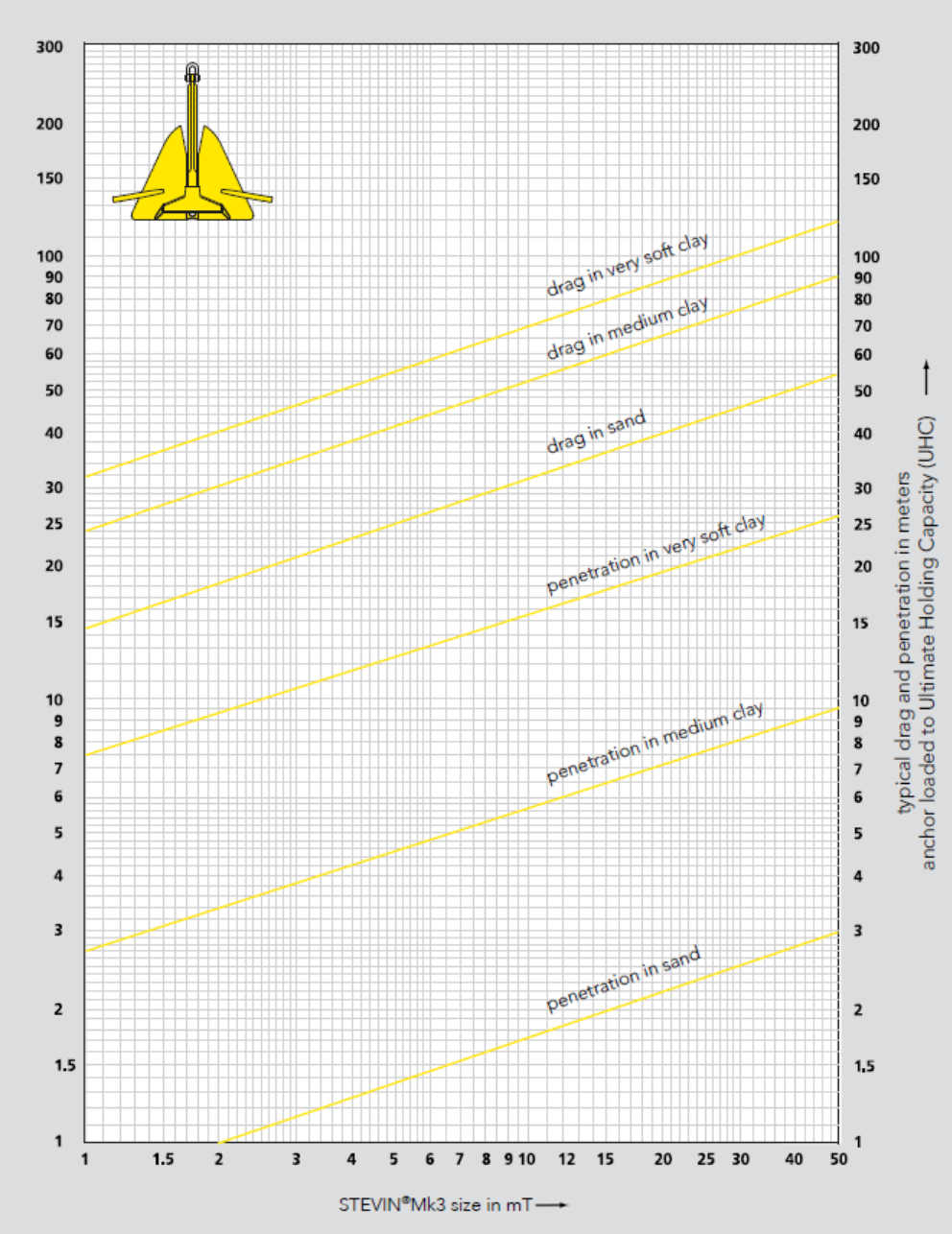


View text description of Figure 2.

Source: Vryhof Manual, The Guide to Anchoring, 2018

Anchor manufactures have developed performance charts for various anchor types as a tool for estimating anchor drag distance and penetration. The Vryhof Stevin Mk3 is a common anchor utilized for these applications. As such, the performance characteristics of the Vryhof Stevin Mk3 were utilized for the purpose of this preliminary vessel anchoring plan. The Vryhof Stevin Mk3 performance chart takes into consideration the weight of the anchor and the seabed sediment composition. As such, the anchor specifications from Morison Energy's DLB Super Chief pipelay vessel is 6.8 metric tons, which was utilized for this analysis. Additionally, the previously completed geotechnical analysis was utilized to characterize the seabed sediment composition along the proposed offshore pipeline route. Based on the geotechnical analysis, the top 10 feet of sediment primarily consisted of medium dense clay with sand. Provided as Figure 3 is the anchor drag and penetration chart for the Vryhof Stevin Mk3.

Figure 3: Vryhof Stevin Mk3 Anchor Drag and Penetration Chart



Source: Vryhof Manual, The Guide to Anchoring, 2018

Based on the Vryhof Stevin Mk3 Anchor Drag and Penetration Chart, a 6.8 metric ton anchor in medium dense clay would penetrate approximately 5 meters (16.4 feet) and have 46 meters (150.9 feet) of drag. The Vryhof Stevin Mk3 measures approximately 200 inches in width. Based on these values, each anchor set during the construction and installation of the offshore pipeline infrastructure would impact 2,515 square feet (0.057 acre). It should be noted that the drag distance and penetration depth provided in Figure 3 assumes the anchor is loaded to the Ultimate Holding Capacity (UHC). These values are conservative as it is highly unlikely that the operator will pull the anchor to the UHC load each time it is set. As such, the anchor drag distance and penetration depths shown in Figure 3 is an overestimation of what is common practice and what would be anticipated for the Project.

IV. PRELIMINARY VESSEL ANCHORING PLAN

Utilizing the assumptions discussed above, BWTT developed a preliminary vessel anchoring plan for the installation of approximate 26.06 miles (137,684 feet) of two (2) 30-inch-diameter pipelines extending from the horizontal directional drill (HDD) 10 exit location to SPM Buoy 1, and from SPM Buoy 1 to SPM Buoy 2. Provided in Table 1 are details related to the anticipated anchoring activities as a result of the offshore pipeline installation. Table 1 assumes that the entirety of the offshore pipeline infrastructure would be installed via a conventionally moored pipelay vessel. However, BWTT proposes the use of a DP pipelay vessel if determined suitable and available for the offshore pipeline installation. If during detailed engineering it is determined that conventionally moored pipelay methods is required for a portion of the offshore pipeline alignment, BWTT proposes to utilize a combination of conventionally moored pipelay and DP pipelay methods where appropriate to minimize anchoring during construction.

Table 1: Preliminary Conventionally Moored Pipelay Anchoring Plan

	Pipeline Length (Feet)	Example Vessel Type	Number of Days Moored	Number of Anchors on Vessel	Maximum Mooring Line Length (Feet)	Number of Anchor Sets (4-anchor set)	Total Number of Anchor Drops	Maximum Anchor Drag (Feet)	Maximum Anchor Penetration (Feet)	Area of Impact Per 4-Anchor Set (Acres)	Total Area of Impact from Anchor Drag (Acres)	Mooring Line Sweep Width (Feet)	Area of Potential Impact from Mooring Line Sweep (Acres)	Substrate Type
Pipeline 1	137,684	DLB Super Chief	77	8	4,000	35	140	150.9	16.4	0.23	8.05	50	40.17	Medium Clay
Pipeline 2	137,684	DLB Super Chief	77	8	4,000	35	140	150.9	16.4	0.23	8.05	50	40.17	Medium Clay
TOTALS	275,368	N/A	154	N/A	N/A	70	280	150.9	N/A	N/A	16.1	N/A	80.34	N/A

Notes

Table 1 assumes the use of a conventual mooring pipeline installation methods. However, DP installation methods may be used, if possible, as determined during detailed engineering of the proposed Project.

Assumed that a maximum of 1,000 ft. of mooring line would lay on the on the seafloor per anchor set.

Assumed a maximum of 50 feet of mooring line sweep width.

N/A = total value not categorically applicable

Figure 2 508 Description

Figure 2 is a depiction of what is characterized as anchor drag and penetration along the seafloor. Anchor drag is classified as the horizontal distance along the seafloor from where the anchor initially touches the seafloor to where the anchor is drug and set. Anchor penetration is classified as the vertical distance below the seafloor which the anchor penetrates the bottom while being drug and set in place.