１５．The Planning of DOW Pipeline Reconstruction near the Estuary Areas of the Chi-Ben River in Taitung County of Taiwan

°Jin-Yuan Liu（劉金源）[1], Chan-Fu Chan（詹成富）[2] and Ying-Chen Chen（陳盈貞）[2]

([1]Chair Professor of Department of Electrical and Computer Engineering, and Director of Center for Ocean and Undersea Technology Research, Tamkang University, New Taipei City, Taiwan, R.O.C.; Board member of Taiwan Society of Deep Ocean Water Resource Application; [2] Yu Cheng Engineering Consultant Co., Ltd., Taiwan, R.O.C.)

The purpose of this presentation is to discuss the planning and relevant engineering issues relating to the reconstruction of a deep ocean water (DOW) pipeline near the estuary areas of the Chi-Ben River in Taitung County of Taiwan. In 2012, the DOW pipeline constructed for the Eastern Taiwan Deep Sea Water Innovation & Research Center (ETDIC) collapsed after typhoon activity and has been unable to supply DOW since then, resulting in severe adverse effects to DOW industrial development in Eastern Taiwan. Due to the fact that ETDIC had been established and operated since 2009 by the Ministry of Economic Affairs (MOEA), and had played an important role for DOW development, MOEA has decided to reconstruct the pipeline. Currently, planning and execution are underway.

After a thorough investigation by the use of underwater acoustic instruments including side-scan sonar and the multi-beam system (shown in Figure 1) and/or remotely-operated vehicle (ROV), it has been concluded that the failure of the DOW pipeline was caused by the following two factors:

1. Environmental Factors: the large amount of sand and silt carried by the Chi-Ben River after the typhoon rain may have resulted in a large deposit and sediment movement beyond the safety factor set by the design limits.

2. Design and Construction Factors: ROV images have shown that the connectors between pipelines were displaced, and the pipelines themselves were too far away from the planned route, indicating that the techniques on pipeline connectors and positioning of pipeline laying are very important.

In view of aforementioned problems, the new project has been proposed as follows:

1. In response to the environmental factor, two new routes, route A and B, are under investigation and planning (Figure 2). Route A is about 1.5-2.5 km away from the south of the Chi-Ben River mouth, and the seabed slope is relatively smooth and stable in comparison with all five routes surveyed. The seabed consists mostly of pebbles. The other alternative route B under consideration is about 2.5-3.2 km south of the Chi-Ben River mouth. In addition, there are many factors that need to be considered.

2. In response to the pipeline design and construction method problems, it is necessary to carefully choose the materials used for the pipeline construction, e.g., HDPE with pull strength higher than 230 kg/m^2 and bend strength of 350 kg/m^2. The approaches employed for laying down the pipeline and the positioning of the pipeline are of utmost importance.

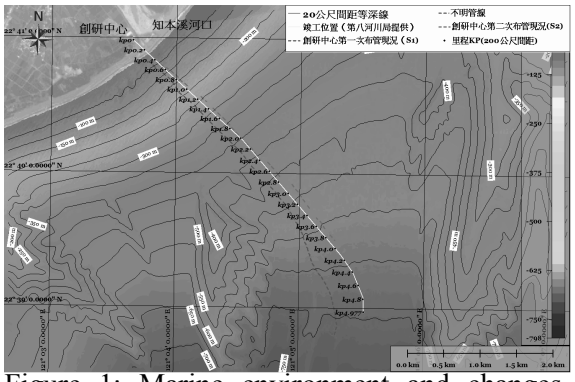

Figure 1: Marine environment and changes near the estuary areas of the Chi-Ben River, conducted by the Agency of Water and Hydraulics of the Ministry of Economic Affairs (MOEA).

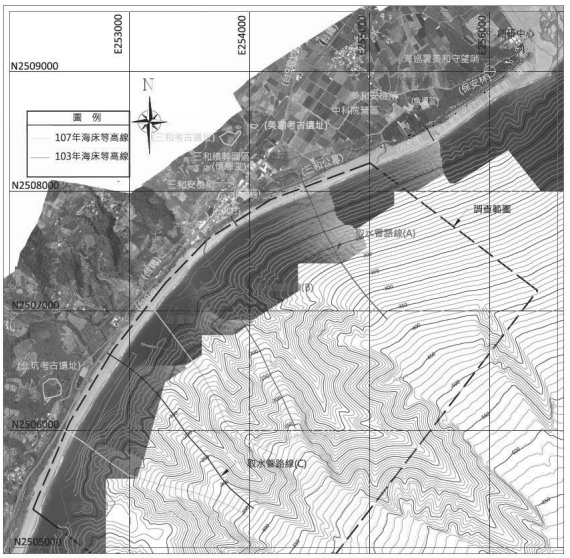

Figure 2: Surveyed Routes.