Survey Of The Musi River Navigation Course On Ship Safety

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The Musi River is a vital shipping lane for Indonesia. It has varying depths and widths that can impact the safety of passing vessels. To determine the river's depth, a bathymetric survey is required. Primary data collection was conducted by mapping the shipping lane using a Single Beam Echosounder (SBES) installed on a survey vessel. Data processing was performed using Civil 3D and Global Mapper software. The research results show that the river has a depth variation of 4 to 17 meters with a minimum width of 181 meters. The lowest depth is at STA 0+300, which is 4.11 meters, at STA 0+000, which is 5.31 meters, and the highest depth is at STA 3+000, which is 16.28 meters from the Mean Water Level (MSL). The maximum draft is 3 meters with a maximum ship width of 45.2 meters (Normal Shipping Channel), a ship width of 60.3 m (Narrow Shipping Channel) and a ship width of 90.5 meters (Single Shipping Channel) taking into account the depth of the shipping channel. Every ship that will dock/undock using the assistance of a tugboat and ships with a length of >70 meters or GT > 500 are required to use a pilot in the Musi River area.

Keyword: depth, bathymetry, shipping lanes

1. INTRODUCTION

The navigation route in this river serves not only as a means of transportation for goods and passengers but also plays a significant role in supporting the local economy. The characteristics of the navigation route in the Musi River are quite unique, with variations in depth and width that can impact the safety of vessels passing through (Ilham, 2024). The volume of goods transported has increased by 15% annually (Sugeng, 2010). While this increase positively affects the economy, it also comes with heightened potential risks of accidents, which can be triggered by various factors such as weather conditions, river currents, and vessel traffic density. Therefore, a comprehensive analysis of navigation safety in the Musi River route is necessary.

One of the main characteristics to consider is the irregular depth of the navigation route, which can fluctuate depending on the season and rainfall. Nugroho (2015) noted that this variation in depth can create challenges in navigation, especially for larger vessels. Thus, a good understanding of the route characteristics is crucial to ensure navigation safety.

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M. A. Rohman et al. (eds.), *Proceedings of the International Conference of Inland Water and Ferries Transport Polytechnic of Palembang on Law, Economic and Management (IWPOSPA-LEM 2025)*, Advances in Economics, Business and Management Research 396,
https://doi.org/10.2991/978-94-6239-729-3_9

In research conducted by Budiman et al. (2020), it was explained that the riverbed morphology also significantly influences the navigation route. Changes in the shape and depth of the river can occur due to sedimentation and erosion processes, often influenced by human activities such as mining and infrastructure development. Strong currents can make it difficult for vessels to maneuver, especially when entering turns or passing other vessels. Ilham (2024) emphasized that understanding current patterns in the Musi River is vital for captains when planning their journeys.

Weather conditions are another factor that must not be overlooked in the context of navigation safety. Heavy rain and fog can reduce visibility, which in turn can increase the risk of accidents. Sugeng (2010) noted that many vessel accidents in the Musi River occur under poor weather conditions. Therefore, it is essential to provide accurate and up-to-date weather information to sailors so they can take necessary preventive measures.

One important aspect to consider is bathymetric mapping, which can provide accurate information about the depth and morphology of the riverbed. Kusumawati et al. (2015) explained that good bathymetric mapping can contribute to the planning and management of navigation routes, thus minimizing the risk of accidents. With accurate data, authorities can take necessary preventive actions to maintain navigation safety.

2. METHODOLOGY

This research was conducted by collecting primary data through field surveys, including bathymetric surveys at the research location using survey vessels and monitoring water levels during the survey period. River depth mapping was performed using a Single Beam Echosounder (SBES). Data processing was then carried out by compiling data using Microsoft Excel and contour mapping using Global Mapper and Civil 3D software.

3. DISCUSSION

The Musi River is one of the longest rivers located in South Sumatra, stretching approximately 750 km. This river flows through several districts/cities in South Sumatra up to the estuary of the Musi River. The research location is situated in the waters of the Musi River, Banyuasin Regency (behind Salah Nama Island).

Figure 1. Research Location

a. Characteristics of the Navigation Route

The navigation route is one of the essential elements in the maritime transportation system. The existence of a good and safe navigation route significantly affects the efficiency and safety of navigation activities.

The following is a graph of Water Level (TMA) at the observation point at the Politeknik Transportasi Sungai, Danau, dan Penyeberangan Palembang dock during the survey period.

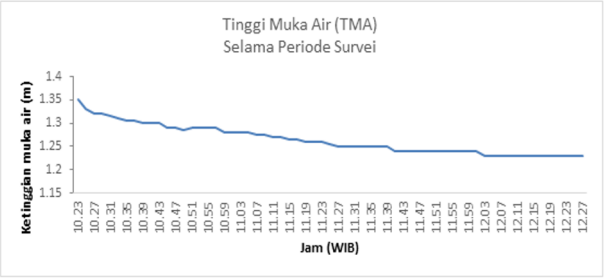

Figure 2 Water Level During the Survey Period

Based on the observations of the Water Level (TMA) during the survey period, the water level from the initial reference datum shows a maximum water level of 1.35 m and a minimum water level of 1.23 m

Figure 3 River Depth Contour (interval 0.5m)

b. Longitudinal and Cross Sections of Survey Results

The results of the bathymetric survey were created by dividing the river into sections (STA). River sections started by dividing the river into STA segments with a distance of 50 meters between each STA, from STA 0+000 to STA 3+000. STA 0+000 is located upstream in the survey area, while STA 3+000 is located downstream. The following is the division of the river STA and the longitudinal profile in the survey area.

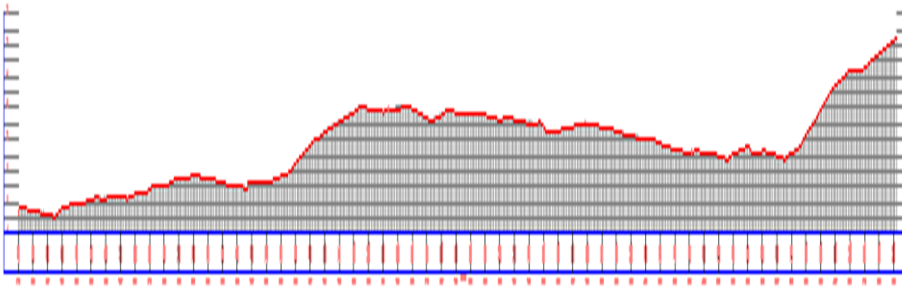

Figure 4 Longitudinal Profile of the River in the Survey Area

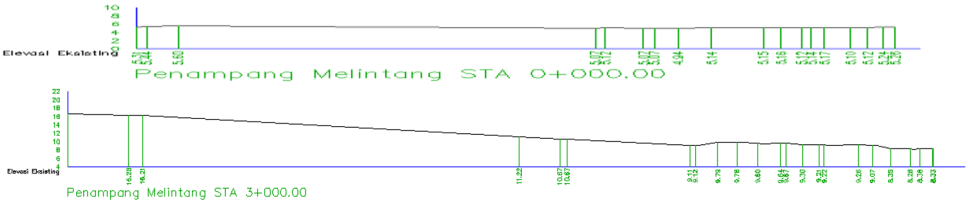

Figure 5 Cross Section of the River in the Survey Area

Based on Figure IV.7, the cross-section of the route in the survey area from STA 0+000 to STA 3+000 yielded the following results: a. Low depth (less than 7 meters) at the survey location from STA 0+000 to STA 0+500, with the lowest depth (less than 5 meters) located on the left side of the channel from MSL. b. The lowest depth is found at STA 0+250, which is 4.71 meters, and at STA 0+300, which is 4.11 meters. c. The highest depth is at STA 3+000, measuring 16.28 meters.

c. Dimensions of Vessels that Can Operate in the Research Area

To determine the dimensions of vessels that can operate in the research area, we can use the low water level (LWL) of 1.19 meters and MSL of 2.3 meters. To determine the dimensions of vessels that can operate in the research area, we will use the low water level (LWL). The following are the water depths during the survey based on the Low Water Level (LWL).

Figure 6 River Depth Contour at Low Water Level (LWL)

Based on Figure 6, the lowest depth is: a. The lowest depth is found on the left side of the island, with depths ranging from 3 to 5 meters. b. The lowest depth used for navigation (middle of the river) is 4.5 meters on the left side of the island. To find the draft of vessels that can operate on the left side of the island for navigation, we can calculate:
h = 1.5 x d 4.5 m = 1.5 x d d = 3 meters
Based on the observations, the narrowest navigation channel is found in front of the island, measuring 181 meters. To find the maximum width (B) of vessels that can navigate: a. Normal Navigation Channel (two vessels can pass each other)
W/B = 4 181/B = 4 B = 45.2 meters
Thus, the maximum width of vessels that can navigate is 45.2 meters, but it is important to consider the depth conditions in the survey area. b. Narrow Navigation Channel (two vessels can pass each other with caution)
W/B = 3 181/B = 3 B = 60.3 meters
Thus, the maximum width of vessels that can navigate is 60.3 meters, but it is important to consider the depth conditions in the survey area. c. Very Narrow Navigation Channel (only 1 vessel can pass) W/B = 2 181/B = 2 B = 90.5 meters
Thus, the maximum width of vessels that can navigate is 90.5 meters, but it is important to consider the depth conditions in the survey area.

4. CONCLUSION

The characteristics of the navigation route in the waters of the Musi River indicate that the depth of the navigation route is between 6-8 meters, with a minimum depth of 4 meters and a width of 181 meters. Vessels that can operate in the research area have a maximum draft of 3 meters with a maximum vessel width of 45.2 meters (Normal Navigation Channel), a vessel width of 60.3 meters (Narrow Navigation Channel), and a vessel width of 90.5 meters (Single Navigation Channel) while considering the depth of the navigation route.

Acknowledge

Thankyou for kepada Politeknik Transportasi Sungai, Danau dan Penyeberangan Palembang and all parties involved in this research

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