Evaluation of Compliance with Batam VTS Center Standards in Class I Type A Navigation District Tanjungpinang

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Abstract. The purpose of this study was to evaluate the fulfillment of human resource and equipment standards at the Batam VTS Center in the Class I Tanjungpinang Type A Navigation District, Riau Islands Province. This study uses a descriptive quantitative method and data analysis techniques using gap analysis by conducting an analysis based on the suitability between education and expertise certificates held and the equipment of the Batam VTS Center with the regulations set by the Ministry of Administrative and Bureaucratic Reform and the Directorate General of Sea Transportation of the Ministry of Transportation, namely in terms of the suitability of Education, expertise certificates and equipment of the Batam VTS Center. The results of the study indicate that the Education, expertise certificates and equipment of the Batam VTS Center are partly in accordance with applicable regulations, but there are still some that need to be fixed and improved, namely not all VTS staff have the required certificates such as VTS certificates and Education qualifications required in accordance with the Decree of the Minister of State Apparatus Empowerment and Bureaucratic Reform of the Republic of Indonesia, as well as equipment that needs to be repaired and improved so that the duties and functions of the Batam VTS Center can run optimally. Based on the research results, it is recommended that the Tanjungpinang Class I Type A Navigation District motivate the Batam VTS Center staff to fulfill the Education and expertise certificates, propose an increase in the number of training participants, and repair and improve the equipment at the Batam VTS Center.

Keywords: Human Resources, Vessel Traffic Service (VTS), Equipment

1. INTRODUCTION

In 2015, there were 5 cases of crime, one of which was the tragedy of the hijacking of the Orkim Harmony tanker and in 2016 to 2019 there was a very significant decline because there was not a single case in the Malacca Strait. This is directly proportional to the number of water crimes in Indonesia in 2015 there were 108 crimes and in 2016 there were 49 crimes where the number of crimes in Indonesian waters decreased by

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more than 50%. In 2017 there were 43 crimes, in 2018 there were 36 crimes and in 2019 there were 25 armed robbery attacks in Indonesian ports.

Dialogue and coordination between the Indonesian Water Police and IMB have led to a regional decline, according to the report VTS Batam as a ship traffic service agency, plays a role in maintaining security in the Malacca Strait by supervising ships entering and leaving the Indonesian border in the Malacca Strait.

One example of the role of VTS in improving shipping safety is when the Tanjung Uban Sea and Coast Guard Base (PLP) helped rescue three passengers of a sunken boat in the waters of Pulau Putri Batam on Sunday night, March 14, 2021. The Head of the Tanjung Uban PLP Base, Capt. Handry Sulfian, stated that the evacuation was successful thanks to fast information from the Batam VTS Center station, Class I Tanjungpinang Type A Navigation District, which immediately reported the incident to the Batam KSOP and forwarded the information to the base on patrol. This shows the importance of VTS in maintaining shipping safety and security.

The VTS Center must have a sufficient number of VTS personnel to ensure that VTS operations can be carried out efficiently and safely in all conditions, while still paying attention to navigation safety within the VTS area. Each VTS center must be managed by personnel who have the appropriate qualifications for the tasks required, and in a number that is appropriate to the size of the VTS center and the VTS area to be managed.

In terms of VTS usage, there are rules described and discussed in the IALA VTS Manual to be used as a guideline in implementing VTS, in planning and managing VTS staff regulated in the International Maritime Aids to Navigation and Lighthouse Authority (IALA) Guideline G1045 Staffing Levels At VTS Centers. Qualifications of VTS personnel/staff internationally are regulated based on the IALA Guideline G1156 Recruitment, Training, and Certification of VTS Personnel in national regulations regulated in the Regulation of the Minister of Transportation Number PM 4 of 2023 concerning the Implementation of Shipping Telecommunications and the minimum qualifications and certificates required in accordance with the Decree of the Minister of State Apparatus Empowerment and Bureaucratic Reform of the Republic of Indonesia Number 11 of 2024 concerning the Position of State Civil Apparatus Executives in Government Agencies. In optimizing the implementation of the VTS Center, adequate equipment is needed to support its duties and functions, namely the standardization of VTS Center equipment which has been regulated in the Decree of the Director General of Sea Transportation Number KP. 287/DJPL/2020 concerning technical instructions for standardization of VTS equipment so that several important factors need to be reviewed regarding the qualifications and certificates of VTS personnel/staff, the need for human resources in implementing 24-hour VTS monitoring and the current condition of the Batam VTS Center equipment.

The formulation of the problem based on the background above is: Has the Batam VTS Center station been operated by personnel/staff in accordance with the provisions in the Decree of the Minister of State Apparatus Empowerment and Bureaucratic Reform of the Republic of Indonesia Number 11 of 2024 concerning the Position of State Civil Apparatus Executives in Government Agencies? How much human resources are needed in implementing 24-hour monitoring of the Batam VTS Center? Is the Batam VTS Center equipment in accordance with the provisions in the Decree of

the Director General of Sea Transportation Number KP. 287/DJPL/2020 concerning technical instructions for standardization of VTS equipment?

In order to meet the educational qualifications and expertise certificates in accordance with the provisions of Kemenpan RB Number 11 of 2024 concerning the Position of State Civil Apparatus Executives in Government Agencies, the Tanjungpinang Type A Class I Navigation District as the organizer (VTS provider) of the Batam VTS Center can provide motivation and study permits for Batam VTS Center staff or recruit employees who have met the requirements of Kemenpan RB Number 11 of 2024, and propose to the Director General of Sea Transportation as the authority (VTS authority) to be able to increase the number of training participants provided by the Ministry of Transportation so that Batam VTS Center operators can have the required skills. To meet the need for human resources in the implementation of VTS Cen monitoring.

2. METHOD

The method used by the researcher is a type of quantitative method that uses data in the form of numbers and is analyzed using statistics. This method involves the process of translating data into numbers for the evaluation of research results, as well as conducting data analysis that produces numerical statistics. In this study, the data studied included analysis of educational qualifications and certificates of VTS personnel/staff, analysis of the number of human resource needs in 24-hour VTS monitoring, analysis of the suitability of VTS equipment. The data consists of primary data obtained from interviews, observations and documentation in the form of information regarding existing conditions at the Batam VTS Center. The secondary data used is supporting data obtained from the Type A Class I Tanjungpinang Navigation District, Batam VTS Center and the Batam City Central Statistics Agency. This study uses observation and interview instruments. The analysis used is gap analysis or gap analysis by comparing existing conditions on certificates and education owned and existing equipment with regulations governing it and the number of VTS personnel/staff with the needs according to the IALA Guideline G1045 staffing levels at VTS centers formula.

3. RESULT AND DISCUSSSION

Based on the survey results during the implementation of field work practice activities, the author tried to analyze the problems and collect the required data so that conclusions can be drawn later and can be used as solutions or problem solving for the VTS stations studied.

3.1. Educational qualifications and certifications of VTS staff

The data used is based on Indonesian Nautical Chart No. 42 of 2020, 16th edition, and the Decree of the Minister of Transportation Number KP 775 of 2018 concerning the Shipping Lane into Batam Port. The current dimensions of the shipping channel entrance to Batu Ampar Port can be seen in Table 1 below:

Table 1. Dimensions of the Shipping Channel into Batu Ampar Port under Current Conditions

No	Dimensions of the Shipping Channel into Batu Ampar Port under Current Conditions		
1	Depth of the Navigation Channel		7,9 mLWS
2	Width of the Navigation Channel		160 m
3	Length of the Navigation Channel	West	11.343 km
		East	5.244 km
4	Anchorage Area	North	1.609,3 ha
		South	811,66 ha
5	Docking Basin Area		18 ha
6	Turning Basin Area		18 ha

3.2. Analysis of the maximum ship dimensions that can navigate the entrance channel of Batu Ampar Port under current conditions.

The data needed to calculate the maximum ship dimensions that can pass through the inbound shipping lanes of Batu Ampar Port in the current conditions is to use the large data of the dimensions of existing shipping flows.

3.2.1. Maximum ship draft

$d = \frac{H}{1,10}$ With the depth-voyage of H=7,9 mLWS then:

$d = \frac{7,9}{1,10} = 7,18$ m

Information:

d = draft kapal

H = depth-funnel

3.2.2. Maximum ship width

W = 7B+30m

7B = W-30m

7B = 160 m- 30m

7B = 130 m

$B = \frac{130}{7} = 18,57$ m

Information:

W = Sail-groove width

B = Ship width

3.2.3. Maximum vessel length

W = 1,5 x L

$L = \frac{W}{1,5}$

$L = \frac{160}{1,5} = 106,67$ m

Information:

W = Sail-groove width

L = Length of the vessel

The following is an illustration of the maximum depth, width and length of ships that can pass through the inbound shipping channel of Batu Ampar Port in figures 1 and 2 as follows:

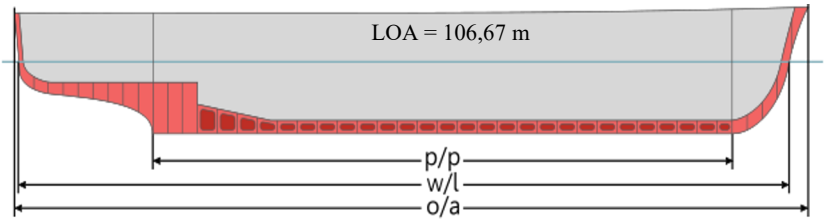

Figure 1. Maximum Ship LOA Dimensions

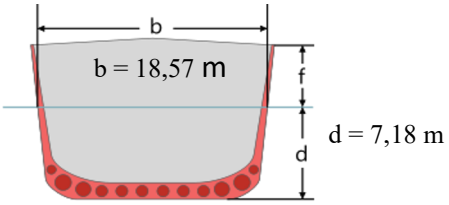

Figure 2. Maximum Ship Width and Draft Dimensions

The maximum ship dimensions with details in table 2 are as follows:

Table 2. Maximum ship dimensions that can pass through the inbound shipping channel of Batu Ampar Port

No	Maximum ship dimensions that can pass through the groove	
1	Maximum ship draft	7,1 m
2	Maximum vessel width	18,57 m
3	Maximum vessel length	106,67 m

3.3. Analysis of the percentage of time duration in a year for each type of ship to pass through the inbound shipping lanes of Batu Ampar Port

3.3.1. Duration curve of seawater depth in Batu Ampar Port

So the following are the results of processing the duration curve data for 1 year in table tabel 3:

Table 3. Seawater tide data processing at Batu Ampar Port in 2024

Bottom depth (h)	Depth-sail H = h + 7,9 mLWS	Frequency	Number of Frequencies	Percentage of Duration (%)
3,3	11,2	1	1	0,011
3,2	11,1	22	23	0,262
3,1	11	49	72	0,820
3	10,9	82	154	1,753
2,9	10,8	129	283	3,222

Bottom depth (h)	Depth-sail H = h + 7,9 mLWS	Frequency	Number of Frequencies	Percentage of Duration (%)
2,8	10,7	152	435	4,952
2,7	10,6	180	615	7,001
2,6	10,5	200	815	9,278
2,5	10,4	236	1051	11,965
2,4	10,3	229	1280	14,572
2,3	10,2	243	1523	17,338
2,2	10,1	272	1795	20,435
2,1	10	298	2093	23,827
2	9,9	261	2354	26,799
1,9	9,8	306	2660	30,282
1,8	9,7	343	3003	34,187
1,7	9,6	375	3378	38,456
1,6	9,5	427	3805	43,317
1,5	9,4	464	4269	48,600
1,4	9,3	512	4781	54,429
1,3	9,2	501	5282	60,132
1,2	9,1	472	5754	65,505
1,1	9	454	6208	70,674
1	8,9	472	6680	76,047
0,9	8,8	466	7146	81,352
0,8	8,7	413	7559	86,054
0,7	8,6	361	7920	90,164
0,6	8,5	285	8205	93,408
0,5	8,4	240	8445	96,141
0,4	8,3	147	8592	97,814
0,3	8,2	104	8696	98,998
0,2	8,1	68	8764	99,772
0,1	8	20	8784	100,000

Below is Figure 3 showing the sea water depth duration curve at Batu Ampar Port for the year 2024.

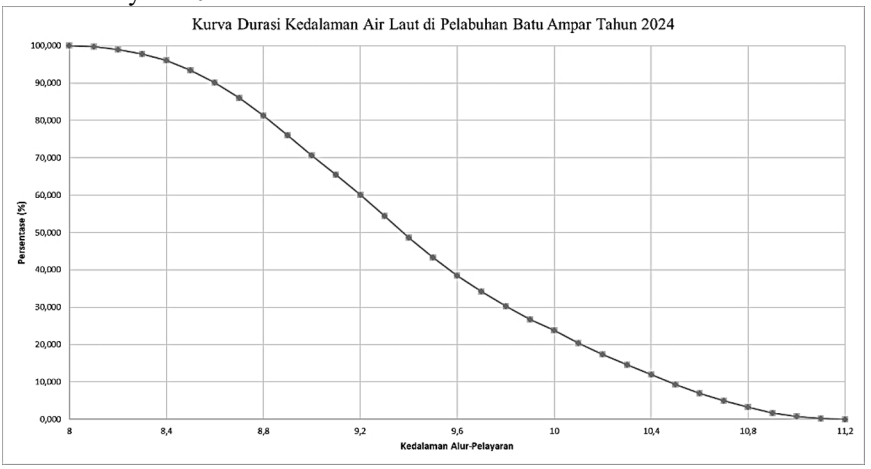

Figure 3. Sea Water Depth Duration Curve at Batu Ampar Port for the Year 2024

Based on Figure 3 above, with the X-axis representing sea water depth (in meters) and the Y-axis representing the percentage of time (in percent), the points on the graph reflect the distribution of time when the sea water depth is at certain levels. This curve or graph illustrates the tidal pattern at Batu Ampar Port, identifying that a depth of 8 meters with a tidal range of 0.1 meters occurs 100% of the time, while a depth of 11.2 meters with a tidal range of 3.3 meters occurs 0.011% of the time over the course of a year.

3.3.2. Duration of time that different types of ships can pass through the shipping channel into Batu Ampar Port

Below is the maximum draft of ships based on the types of vessels docking at Batu Ampar Port, as shown in Table 4 below:

Table 4. Maximum Draft of Ships Based on Ship Types at Batu Ampar Port

No	Vessel Type	Maximum Ship Draft (meters)
1	Barge	5,80
2	Bulk Carrier	10,30
3	Container	8,50
4	General Cargo	7,20
5	Sailing ship	5,95
6	Motor Boats	3,40
7	Tanker	9,50
8	Tugboat	6,00

Source: Badan Usaha Pelabuhan (BUP) BP Batam

Next, an interpretation of the depth of the shipping channel into Batu Ampar Port is conducted to determine the percentage of time that different types of ships with maximum drafts can pass through the channel, as shown in Table 5 below:

Tabel 5. Persentase durasi waktu melewati alur-pelayaran berdasarkan jenis-jenis kapal dengan draft maksimal

No	Vessel Type	Maximum Ship Draft (meters)	Groove Depth Requirements (meters)	Percentage of time can pass through the pipeline (%)
1	Bulk Carrier	10,30	11,33	0,010
2	Tanker	9,50	10,45	7,935
3	Container	8,50	9,35	45,685
4	General Cargo	7,20	7,92	82,355
5	Tugboat	6,00	6,60	100
6	Sailing ship	5,95	6,55	100
7	Barge	5,80	6,38	100
8	Motor Boats	3,40	3,74	100

The percentage duration graph for the types of ships that can pass through the shipping channel into Batu Ampar Port can be seen in Figure 4 below.

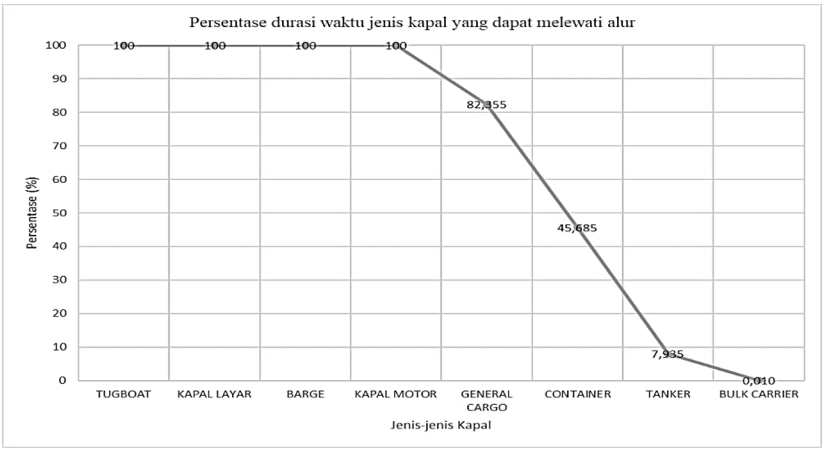

Figure 4. Percentage Duration of Time for Ship Types That Can Pass Through the Shipping Channel into Batu Ampar Port

From Figure 4, related to the analysis of the duration of time ships can pass through the shipping channel into Batu Ampar Port, with a focus on ship types based on maximum draft, the following results were obtained.

a) *Bulk Carrier* with a maximum draft of 10.30 meters
   (1) Percentage duration of time to pass through the shipping channel into Batu Ampar Port: 0.010% or equivalent to 90 minutes per year.
   (2) This condition indicates that bulk carriers with this maximum draft have a significant risk of running aground if navigating the channel outside of the available tide data.
b) Tanker, *container* and *general cargo*:
   (1) Percentage duration of time to pass through the shipping channel into Batu Ampar Port, with percentages of 7.935%, 45.685%, and 82.355%, respectively.
   (2) These ships have better capability to pass through the shipping channel into Batu Ampar Port.
c) Tugboats, sailing ships, barges, and motorboats:
   (1) The percentage duration of time that these types of ships can pass through the shipping channel into Batu Ampar Port is 100%.
   (2) These ships can navigate the channel without obstruction throughout the year.

3.4. Analysis of the required dimensions of the shipping channel based on planned ship sizes that can pass through the channel into Batu Ampar Port

Analysis of the required dimensions of the shipping channel based on the planned Gihon Mas vessel with characteristics or ship particulars shown in Figure 5 and Table 6 as follows:

Figure 5. Gihon Mas

Table 6. Ship Particulars of Gihon Mas

SHIP PARTICULAR GIHON MAS	
Ship Name	Gihon Mas
Call Sign/MSI	YDGB3/525121063
Ship Type	*Heavy Load Carrier*
Year of manufacture	2022
Speed	339.6°/0.0 Kn
LOA	131 m
Breath	28 m
DWT	10000 tons
Draft	11,5 m
Operating status	*Active*

3.4.1. Required depth of the shipping channel

$d = 11{,}5\ m$

Therefore:

$H = 1{,}10\ d$

$$H = 1{,}10\ x\ 11{,}5\ m$$
$$H = 12{,}6\ m$$

Explanation:

d = *draft* of the ship

H = depth of the shipping channel

Thus, the safe depth of the shipping channel for the Gihon Mas vessel to navigate through the channel into Batu Ampar Port is 12,6 meters.

3.4.2. Required width of the shipping channel

$L = 131\ m$

Therefore:

$$W = 1{,}5\ x\ L$$
$$W = 1{,}5\ x\ 131\ m = 196{,}5\ m$$

Explanation:

L = *length* of the ship

W = width of the shipping channel

Therefore, the safe width of the shipping channel for a vessel navigating through the channel into Batu Ampar Port is 196,5 meters.

3.4.3. Required water area for anchorage

$A_l = \pi R^2$

$R = L + 6(H) + 30\ Meter$

Where:

$L = 131\ m$

$H = water\ depth\ (LWS) + 1 = 7{,}9 + 1 = 8{,}9\ m$

$R = L + 6(H) + 30\ Meter$

$= 131 + 6(8{,}9) + 30 = 214{,}4\ m$

$A_l = \pi R^2$

$= 3{,}14\ x\ 214{,}4^2 = 114.337{,}51\ m^2$

$Atot = Ax20$

$= 114.337{,}51\ x\ 20 = 2.886.750{,}21\ m^2$

$Atot = 288{,}675\ h$

Explanation:

A_l= Area of the anchorage

R = Radius

L = Length of the ship

H = Depth of the shipping channel

Based on the calculations above using the Gihon Mas vessel, the anchorage area required is 288,675 ha.

3.4.4. Required dimensions of the docking basin

$A_s = (1{,}5s/d\ 1{,}8)L\ x\ (1{,}2\ s/d\ 1{,}5)L$

$L\ = 131\ m$

$A_s = 1{,}8L\ x\ 1{,}5\ L$

$= 1{,}8\ (131)x\ 1{,}5\ (131) = 46.334{,}7m^2$

$A_s = 4{,}63347\ h$

Explanation:

A_s= Anchorage Area

L = Length of the ship

Based on the above calculation, the area required for docking at the quay is $4{,}63347\ h$.

3.4.5. Required area for the turning basin

$A_k = \pi R^2$

Where

$L\ = 131\ m$

$D\ = turning\ basin\ dimenter = 2L = 2\ x\ 131 = 262\ m$

$R\ = D/2 = 262/2 = 131\ m$

$A_k = \pi R^2$

$= 3{,}14\ x\ 131^2$

$= 53.885{,}54\ m^2 = 5{,}388554\ h$

Explanation:

A_k= Area of the turning basin

R = Radius

L = Length of the ship

D = turning basin dimenter

Therefore, the area required for the turning basin, based on the size of the Gihon Mas vessel, is $5{,}3885\ h$a times the size of the largest ship.

3.5. Discussion

3.5.1. Comparison between existing conditions and calculated results according to PP 001/5/2/DJPL-2017

Here is the comparison between the current condition of the shipping channel and the evaluation results:

Table 7. Comparison of Current Shipping Channel Conditions with Evaluation Results

No	Facilities	Flow-Shipping Conditions		Information
		Excision	Calculation in accordance with PP 001/5/2/DJPL-2017	
1.	Area Labuh	North: 1,609.3 ha South: 811.66 ha	288,675 ha	It is appropriate. The berth area is good where Batu Ampar Port has too wide waters and international standards for the berthing area have been grouped according to the type of ship at anchor.
2.	Leaning pool	18 ha	4.63347 ha	It is appropriate. The berth pool can be done by 2 ships where it is monitored well and meets the minimum required berth pool.
3.	Swivel pool	18 ha	5.3885 ha	It is appropriate. The rotary pool is well monitored by meeting the minimum of the existing rotary pool.
4.	Depth-Groove	7.9 mLWS	12,6 m	Not yet. It is necessary to dredge the depth of the ship-groove if you want to increase *the draft* of the ship to avoid running aground on the navigable ship.
5.	Funnel-Width	160 m	196,6 m	Not yet appropriate. There needs to be a widening of the shipping flow if you want to increase the draft of ships or it can be done to regulate the flow of ship traffic through optimizing the function of *the Batam Vessel Traffic Service* (VTS) Center.

3.5.2. Proposed Solutions

To enhance the effectiveness of the shipping channel into Batu Ampar Port, based on the opinions of navigation authorities and the analyzed data, the following measures can be taken.

a) Conduct maintenance dredging to deepen the shipping channel and anchorage areas, thereby increasing the draft capacity of vessels that can navigate the channel into Batu Ampar Port.

Based on the depth dimension of the navigation channel for the planned ship on the obtained bathymetric map, the points where dredging can be carried out are shown in the following Figure 6.

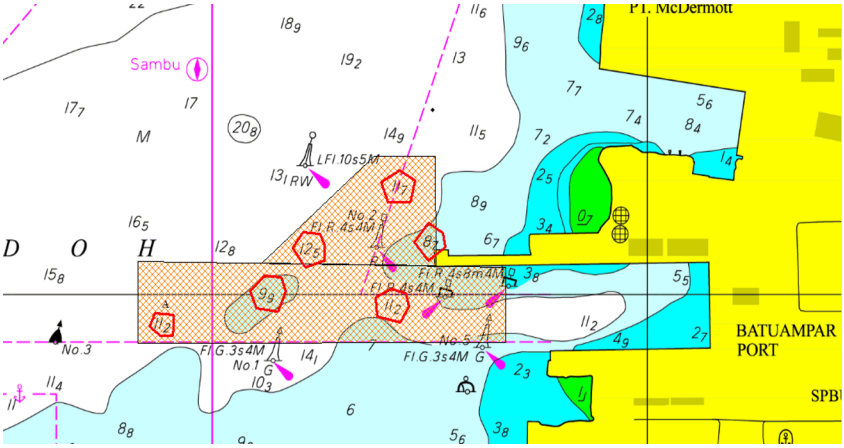

Figure 6 Bathymetric Map of the Batu Ampar Port Navigation Channel

From the above bathymetric map, several areas of the navigation channel have been identified where dredging can be performed to increase the ship's draft capacity, taking into account ship maneuvering and accurate slope calculations to minimize risks. Based on these points, calculations can be made regarding the dredging volume for the planned channel depth of 12.6 meters, as shown in the following Table 8.

Table 8 Dredging Depth of the Planned Channel Area

No	Existing Depth	Dredging Depth		Average Dredging Depth	Total Dredging Area	Total Dredging Volume
		H planned channel depth – existing depth	Total			
1	11,2 m	12,6 m – 11,2 m	1,4 m	1,73 m	551.800 m^2	954.614 m^3
2	9,9 m	12,6 m – 9,9 m	2,7 m			
3	11,2 m	12,6 m – 11,2 m	1,4 m			
4	12,5 m	12,6 m – 12,5 m	0,1 m			
5	8,7 m	12,6 m – 8,7 m	3,9 m			
6	11,7 m	12,6 m – 11,7 m	0,9 m			

Thus, the total volume of dredging required is 954,614 m³.

b) Ensure the reliability of Navigation Aids (SBNP) in the shipping channel leading to Batu Ampar Port to support navigation safety and security.

c) Improve maritime telecommunications through Vessel Traffic Service (VTS) to prevent accidents during vessel navigation.

4. COMPETING INTERESTS

Conclusion

1. The dimensions of the shipping channel into Batu Ampar Port under current conditions are as follows: minimum depth of 7.9 meters LWS, two-lane width of 160 meters, western channel length of 11.343 km, and eastern channel length of 5.244 km.
2. The largest vessel that can operate in the shipping channel into Batu Ampar Port under current conditions has a maximum draft of 7.1 meters, a maximum width of 18.57 meters, and a maximum Length Over All (LOA) of 106.67 meters, allowing for safe navigation. The percentage of vessels that can navigate through the shipping channel into Batu Ampar Port is as follows.
   a. Bulk carriers with a maximum draft of 10.30 meters have a duration percentage of 0.010%.
   b. Bulk carriers with a maximum draft of 10.30 meters have a duration percentage of 0.010%.
   c. Bulk carriers with a maximum draft of 10.30 meters have a duration percentage of 0.010%.
3. Measures to increase the capacity and effectiveness of the shipping channel into Batu Ampar Port can include:
   a. Performing maintenance dredging to enhance the depth of the shipping channel.
   b. Maintaining Navigation Aids (SBNP) to ensure their reliability.
   c. Improving communication with Vessel Traffic Service (VTS) to ensure smooth operations in the shipping channel into Batu Ampar Port.

4.2. Recommendations

1. The Type A Class I Tanjungpinang Navigation District can conduct surveys to check the dimensions of the shipping channel into Batu Ampar Port, including the depth and width, to maintain a safe navigational condition.
2. The Port Authority, BP Batam Port Business Entity (BUP) can design ship capacities and coordinate with relevant authorities regarding the maximum vessel dimensions under the existing channel conditions.
3. The Port Authority, BP Batam Port Business Entity (BUP) can evaluate the arrival time duration for each type of vessel based on the existing channel dimensions.
4. The Port Authority, whether BP Batam Port Business Entity (BUP) or PT Pelindo, can perform maintenance and dredging to improve the draft capacity of vessels navigating through the shipping channel into Batu Ampar Port. Regular maintenance of Navigation Aids (SBNP) in the shipping channel can also support the safety and security of navigation.

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