

Chapter 4 Wave Calmness Study

4.1 Introduction

One of the important aspects in the port layout planning is that all the vessels in the port should be provided with a good and protected maneuvering route and berthing place for smooth cargo handling operation. The non-operating days (or down time), as caused by heavy waves or whatever else, should be limited to a low level.

The Short Term Development Plan includes construction of two new terminals at the South Port: namely, the Barge Terminal and the Grain Terminal. The purpose of the wave calmness study is to quantitatively verify the proposed physical schemes proposed in Chapter 2 considering the wave occurrence probability over the Limit Wave Height. Thus the work of this wave study is:

- 1) To estimate Workability of the Terminals, by means of the estimation of down time
- 2) To know how the shape of breakwater affects down time

This study aims at verifying the planned North Breakwater Extension by MOT. Hence, this section does not intend in any means to undertake a new breakwater design.

4.2 Alternative Layouts and Wave Calmness Analysis

The port is protected by breakwaters. Extension works are continuing to form the final alignment of the North breakwater. The influencing breakwaters to the wave calmness are the North Breakwater, South Breakwater and South Groin of the Artificial Island.

Figure 4.1 indicates the drawing that shows all the physically related parts of the wave calmness study including breakwaters. In order to select the best possible breakwater layout, four alternative plans were formulated.

- PLAN 1: Existing Condition**
- PLAN 2: North Breakwater: One km extension to the South.**
- PLAN 3: South Breakwater: One km extension to the North.**
- PLAN 4: South Breakwater: One km extension to the North and Removal of the Mid-island Groins.**

Among these, Plan 1 indicates the present condition in 2001. The remaining three plans are future breakwater alternatives. Plan 2 is the one scheduled by MOT to be a 1 km extension of the North Breakwater.

Four wave observation points were traced from particular points at the present South approach channel. Addition to these two points were set along the existing wet basin in front of the quays

(namely the west quay and east quay of new south pier No.3) where the container or grain cargo handling will be undertaken.

Downtime indicates the annual non-operational days of vessels at berths by wave condition. The proposed target is a high standard such as 2.5% or less of 365 days since the port is the only port which handles the maritime cargoes in Romania. Limiting waves are set forth by the design vessel size, berth usage, cargo handling method, namely 0.3m for the inland water barges and 0.5m for ocean-going vessels.

4.3 Conclusion and Recommendation

Wave calmness study results were summarized and evaluated in order to select the better breakwater alignments in the future. Figure 4.3 shows the estimated down time under the specified wave limits at six observation points.

Comments to the breakwater arrangement are as follows:

- (1) A breakwater extension will be required in any case.
- (2) If the island groin can be removed, PLAN 4 looks better.
- (3) If the groin can not remove, PLAN 2 is the choice.
- (4) PLAN 3 is not recommended due to too many turning requirements for maneuvering which may cause trouble to vessels.
- (5) Another alternative is a middle-joint scheme between PLAN 2 and PLAN 4. A 500m extension for both the North and South Breakwater.

Although a further detailed study should be undertaken during the detailed design phase, the proposed site of the Grain Terminal is considered as an acceptable location that is under ship maneuvering and safety cargo handling operation.

It is proposed to pursue the extension of North Breakwater as scheduled. It is also recommended, however, to undertake a detailed study comparing between PLAN 2 and PLAN 4.

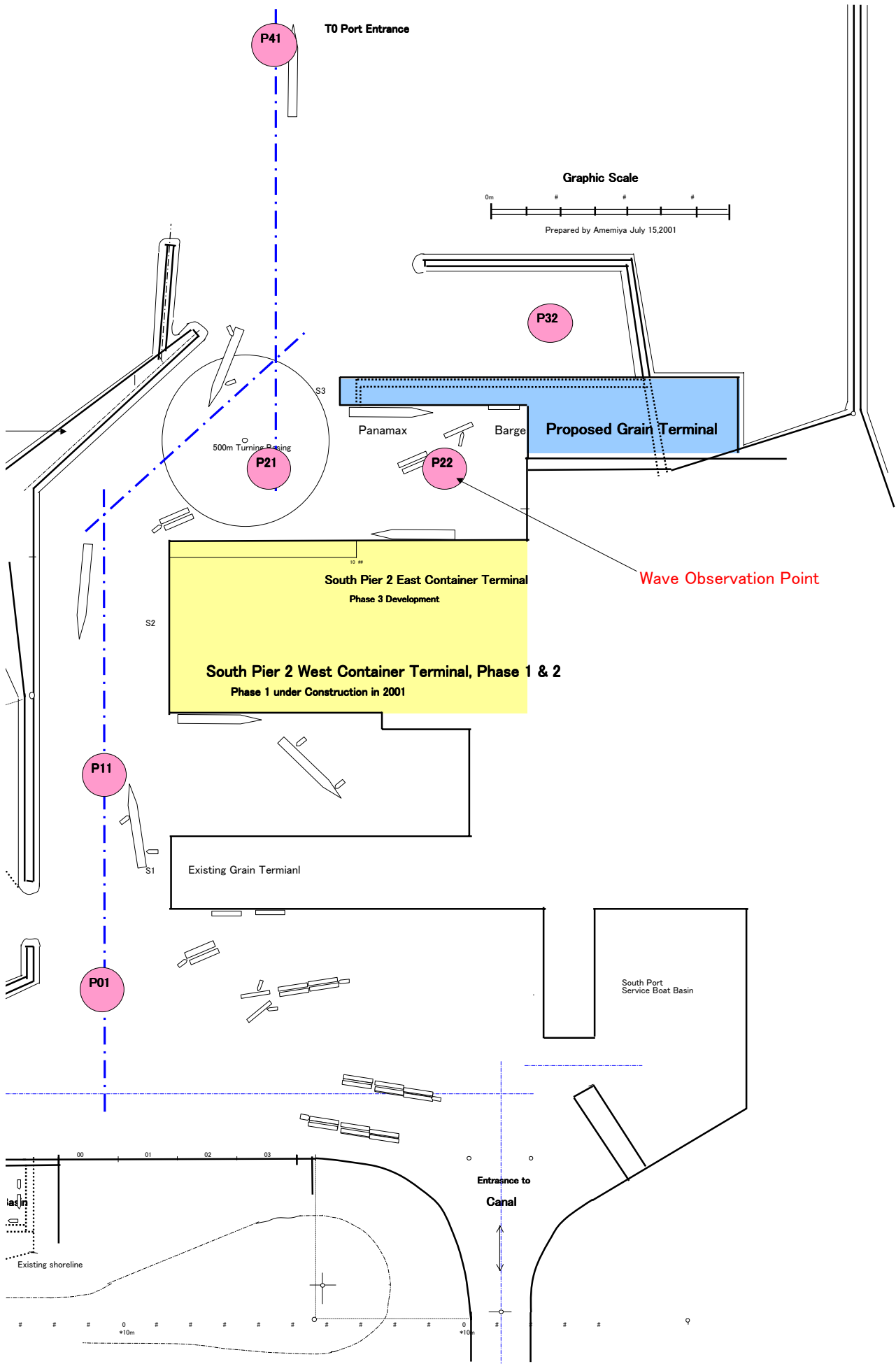


Figure 4.1 General Layout of South Channel and Terminals

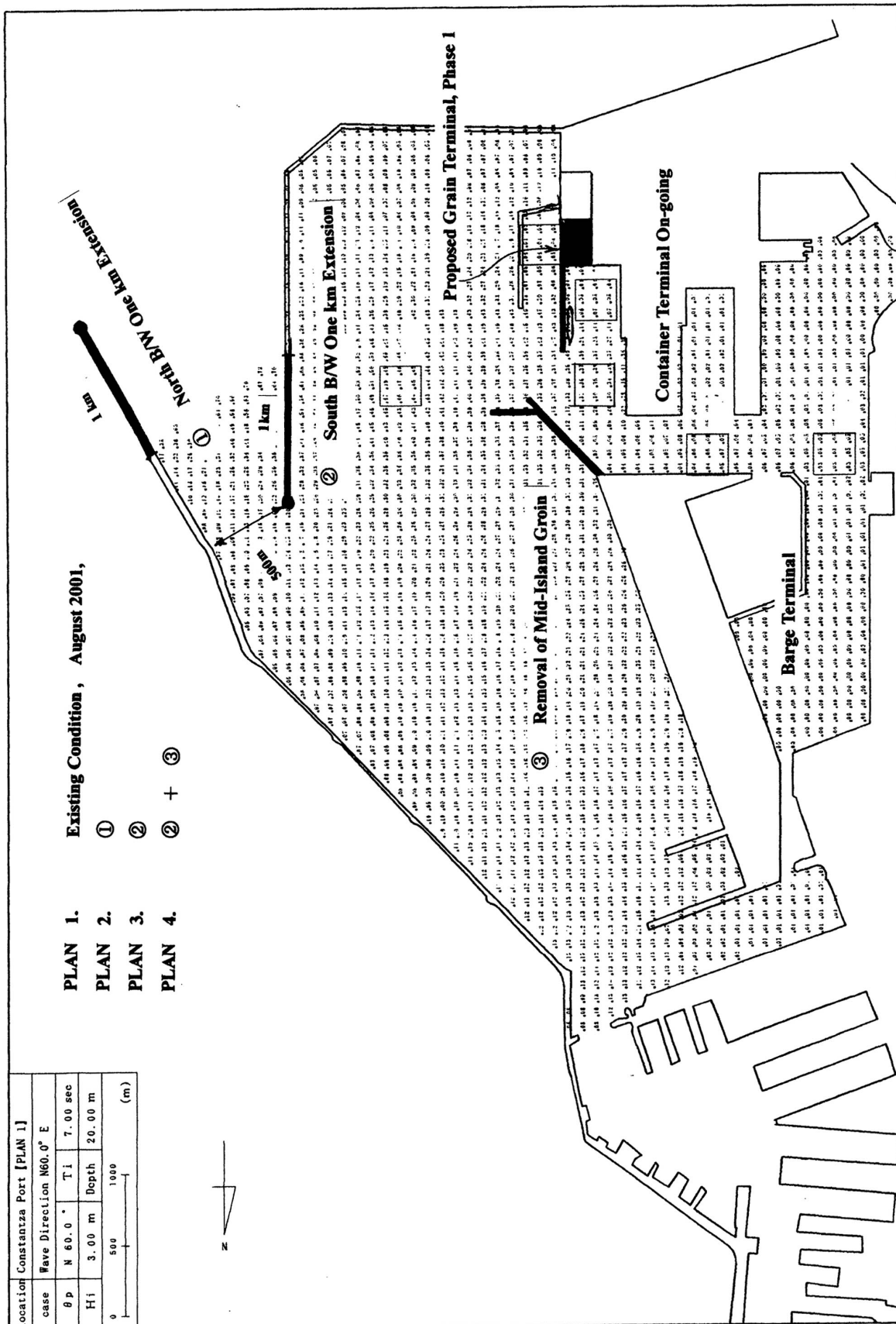


Figure 4.2 Possible Breakwater Combination in Alternative Plans

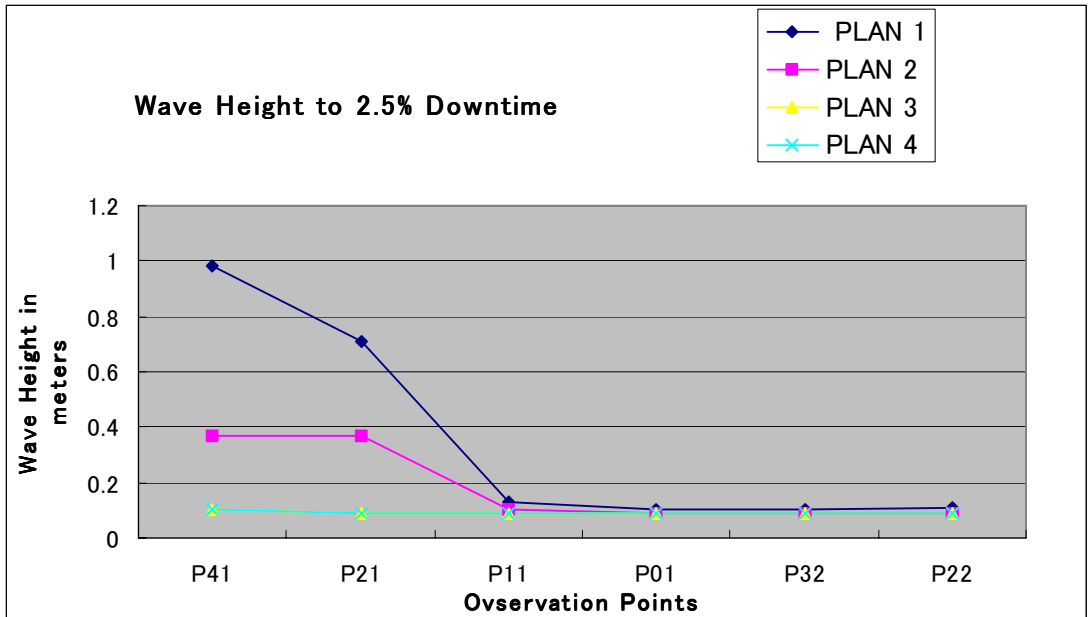
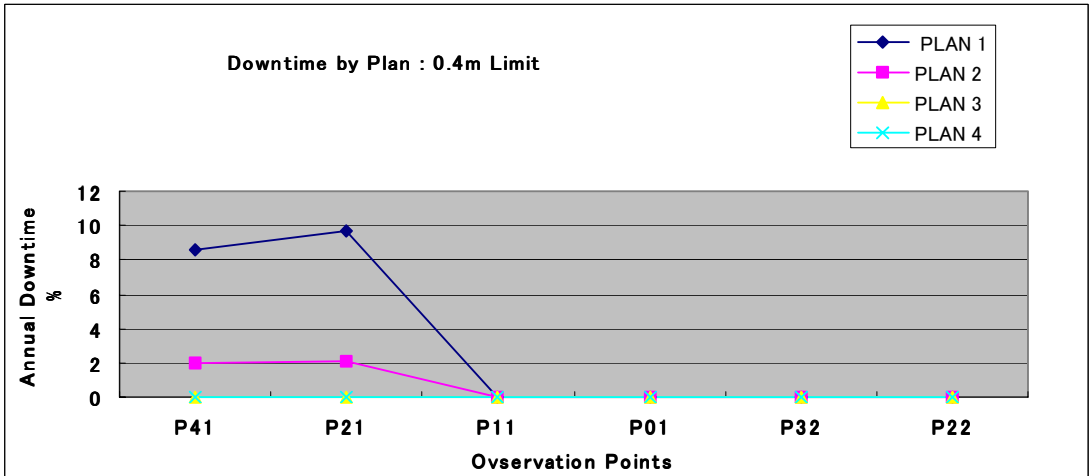
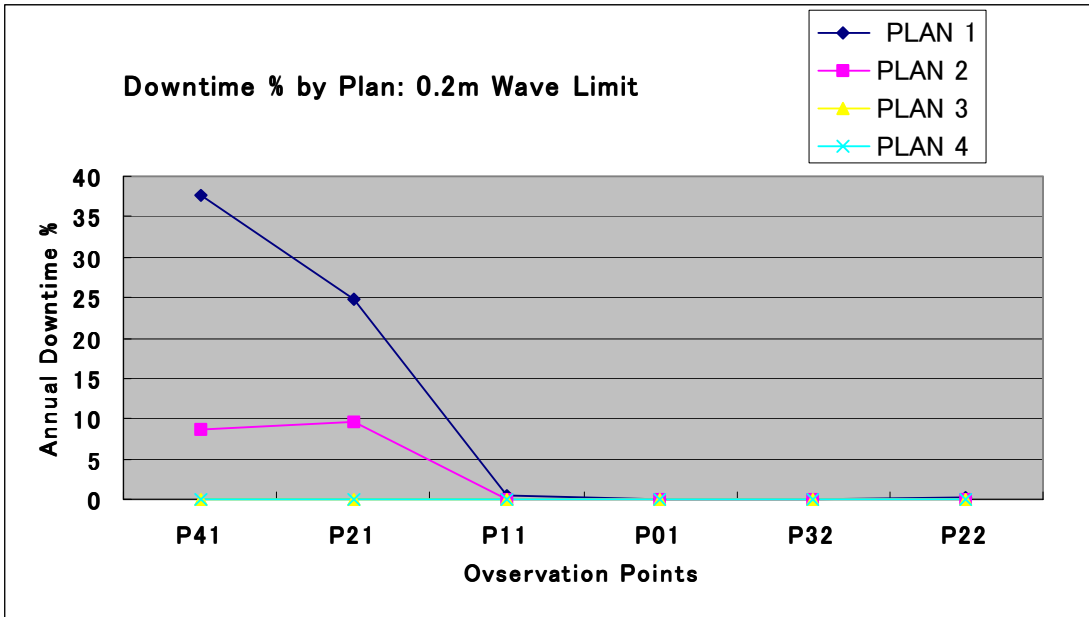


Figure 4.3 Downtime at Observation Points by Breakwater Plan