4.6 Allowable Inflow Load in Patos Lake

4.6.1 Estimation Method and Calculation Cases

The allowable inflow load in Patos Lake will be calculated and is referred to as the attainable inflow load based on the water quality parameters established in the previous section.

The allowable inflow load is evaluated using the parameters for nutrient salt in view of its impacts on eutrophication. Phosphorous will be used as the parameter instead, however, as the comparison of the nitrogen and phosphorous levels in the lake, particularly in the northern and southern water sections, shows that phosphorous tends to be excessive.

For water quality calculations, the conditions were similar to that of the present. Wind conditions were based on data in the past year: southwesterly and northwesterly winds with a 5m/s velocity blow alternately each for a period of 4 days. For river inflow load, the annual mean river flow and load of 1996 and 1997 was used in consideration of the fact that the level targeted for water quality preservation is an annual average. Other calculation conditions were also similar with the present conditions, in that averages in summer and winter were calculated to derive the annual average.

Under these calculation conditions, the river load will be reduced by 10%, 20% and through a roughly attainable inflow load, the allowable load was considered as the water quality preservation target. **Table 4.6-1** shows the calculation cases.

In the calculation of the allowable load, provisional water quality target levels of TP were established as shown in **Fig. 4.6-2**. These levels are separate from those (**Fig. 4.6-1**) established in the previous section.

The levels in half of the northwestern lake section and the southern lake section – sections strongly influenced by inflow load – exceed the established water quality parameter. Nonetheless, there is a strong demand to improve the water quality in these lake sections so they can be used for recreation and fishing. Based on their present state, considerable measures need to be taken to improve the water quality in these sections.

Although further detailed site surveys are required to analyze the state of the coastal area in view of the disparity in its present water quality and the established parameter, none will be carried out under this study.

Table 4.6-1   Calculation Cases for Allowable Inflow Load Estimation

| Case	Inflow Load Reduction Rate (%)	
	Main Three Rivers	Other Rivers
Present Conditions	-	-
Case 1	10	10
Case 2	20	20
Case 3	20	50
Case 4	50	50

4.6.2   Calculation Results

Fig. 4.6-3 shows the results of the comparison of the TP level for every calculation case for the representative stations shown in **Fig. 4.6-4**.

In the figure, the bold solid lines represent the target level values and the bold broken lines the provisional target level values. Case 1 and Case 2 show a number of stations/points where the provisional target level has not been attained. Except for stations/points 3, 4 and 9 which are close to the inflow sections, the provisional target level in most of the stations in Case 3 has been attained.

Fig. 4.6-5 shows the present TP distribution, while **Fig. 4.6-6** presents the TP distribution in Case 3 (reduction rate: 20% for main rivers and 50% for other rivers). **Figs. 4.6-7** and **4.6-8** show the comparison of the present concentration and the provisional target level, and the concentration of Case 3 and the provisional target level for TP, respectively. The comparison shows that the TP level in the northern water section and the southeastern half of the central water section is roughly in accordance with the value of the provisional target level. In addition, except for the vicinity of the estuary, the TP level in the northwestern coastal area and the southern coastal area – sections that are strongly influenced by the inflow load – also roughly coincided with the value of the provisional target level.

Based on the above investigations, the allowable load (BOD, COD, TN, TP) in Patos Lake as seen from the assessed TP level is 20% lower than the present for the three main rivers. For other rivers, the level is 50% lower, and the breakdown is calculated as follows as shown in **Table 4.6-2**: 354.9t/day for BOD, 3270.8t/day for COD, 227.1t/day for TN, and 44.4t/d for TP.

DAY = 83   HOUR = 0

T-P

	0.09
	0.09
	0.05
	0.05
	0.03
	0.03

0   20

UNIT:mg/l

D_a_003_cs_ki.Ptp
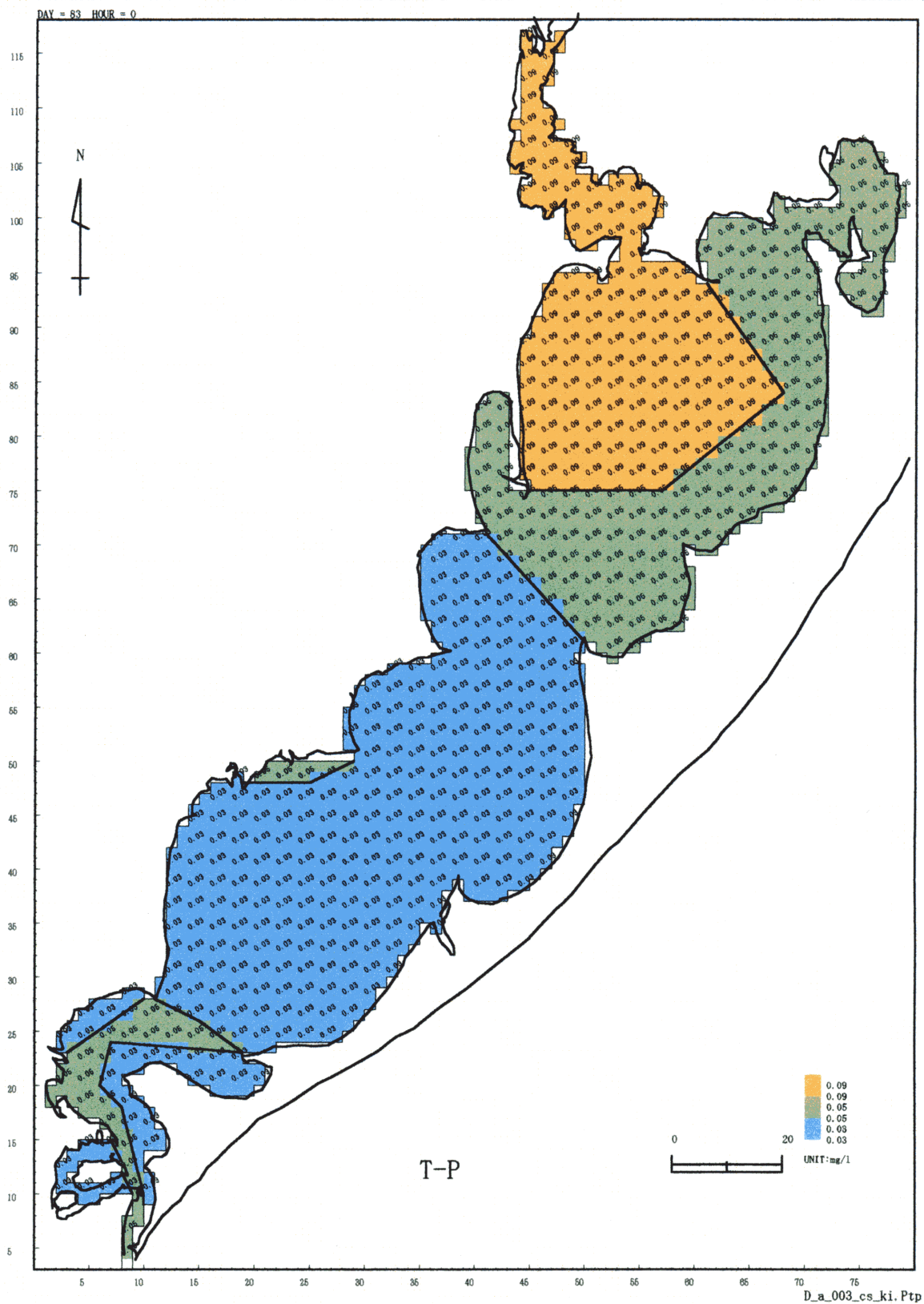
THE STUDY ON THE ENVIRONMENTAL MANAGEMENT	**Fig.4.6-1**
OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES	
IN THE FEDERATIVE REPUBLIC OF BRAZIL	
JAPAN INTERNATIONAL COOPERATION AGENCY KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL	**Target Level of T-P**