

## **APPENDICES**

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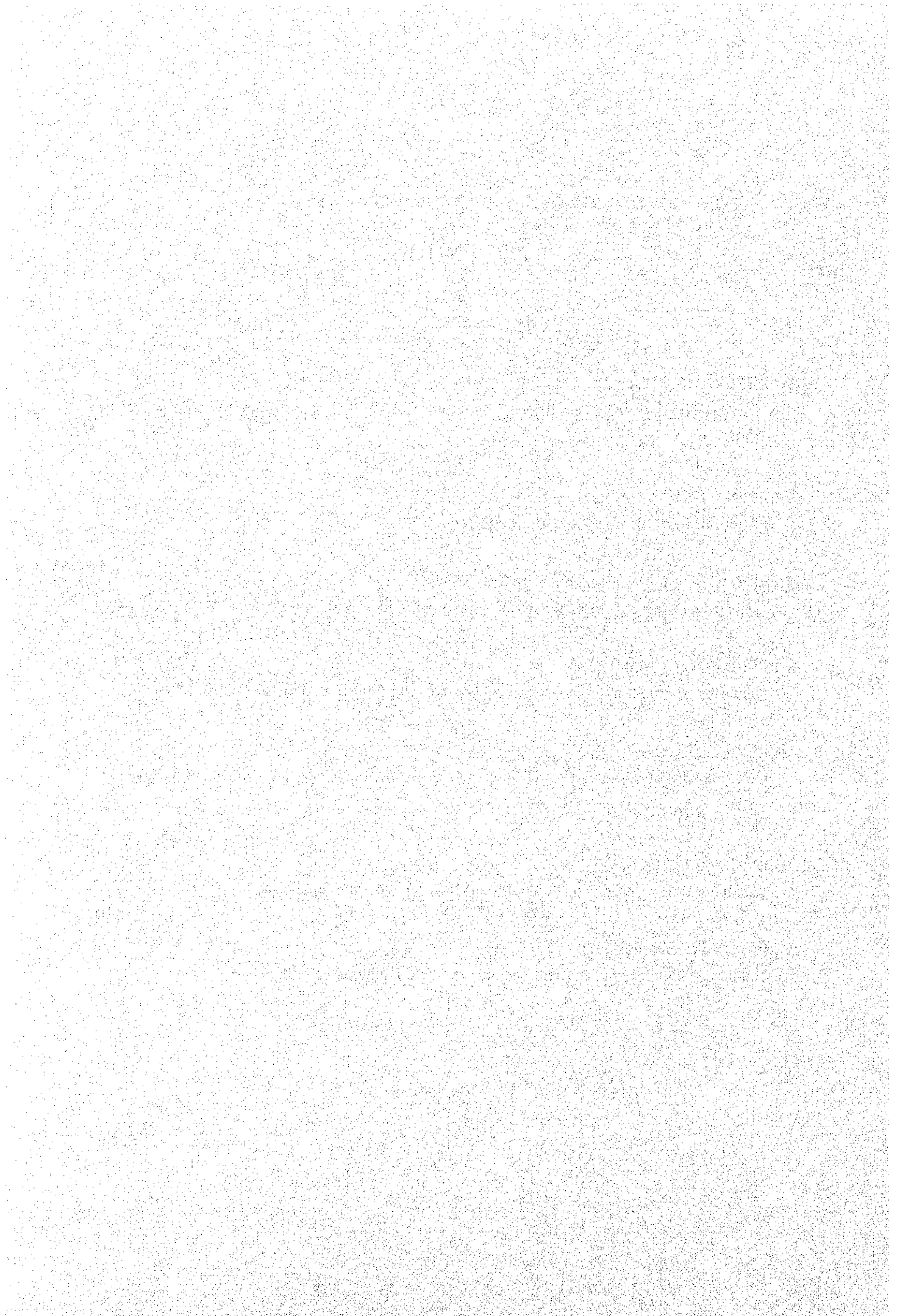
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### **Appendix F (Chapter 7.3):**

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Numerical simulation of the sedimentation at the fishing port in Village No. 2



## Appendix A (Please refer to 2.2):

### Comparison between the forecast and the realized cargo volume by commodity in 1996

The cargo volume actually handled at Sihanoukville Port in 1996 is estimated from the record from January through October 1996, and is compared with the forecast volume for 1996.

It is observed that the actual cargo volumes handled in 1996 were slightly smaller than forecast volumes both for import and export.

Appendix : (2. Cargo traffic forecast)

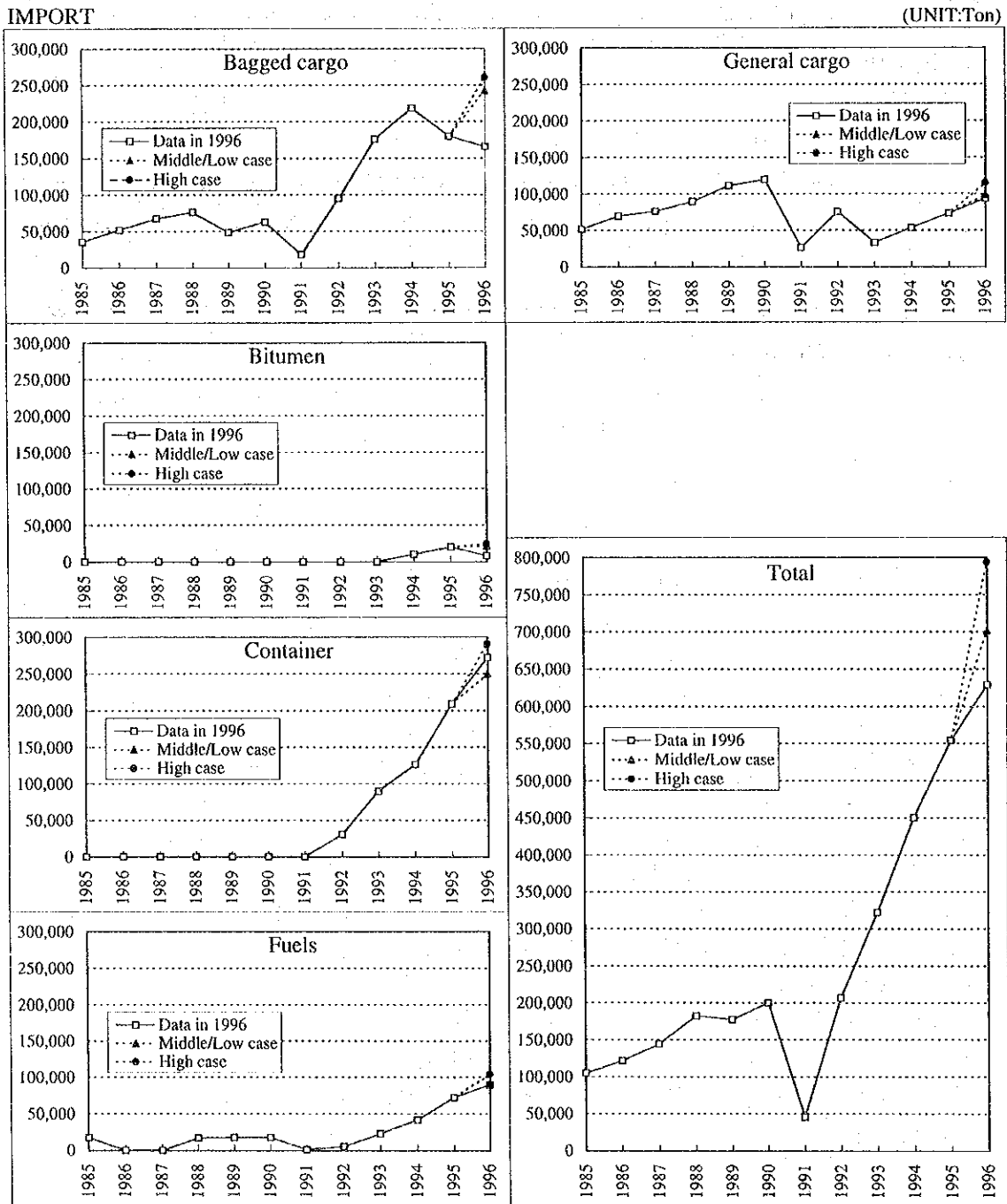


Figure A-2.1 (a) Comparison with actual data and forecasted volume (IMPORT)

Appendix : (2. Cargo traffic forecast)

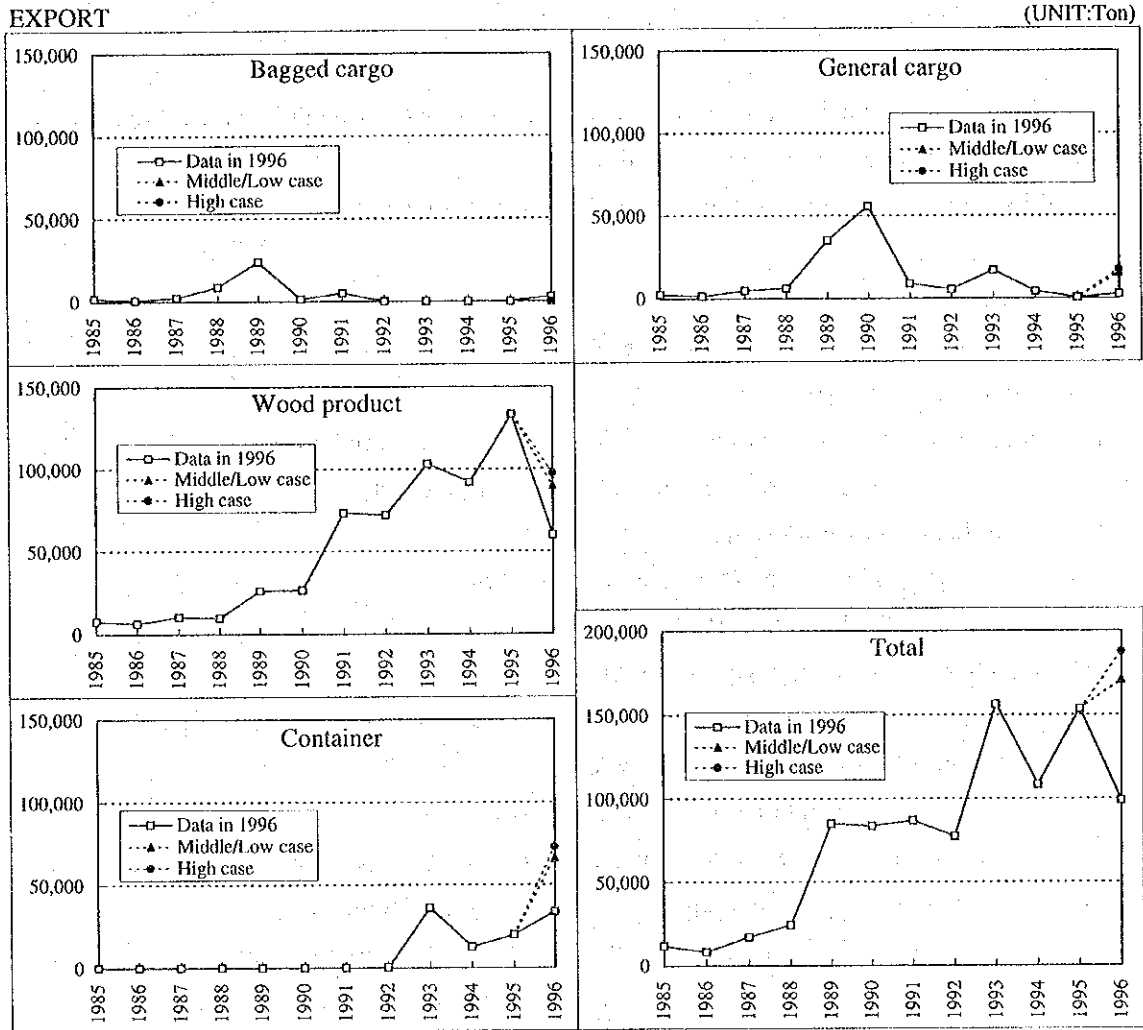


Figure A-2.1 (b) Comparison with actual data and forecasted volume (EXPORT)

## Appendix B (Chapter 3.2):

### Calculation of Number of Berth Required

The number of berths required in each year from 1995 through 2015 are calculated with the use of the Tables attached in this Appendix.

The conditions and assumptions for the calculation are as follows:

- (1) Cargo Volume;  
Forecast cargo volume on the basis of Middle Economic Growth Scenario,
- (2) Total working days per year; 320 days,
- (3) Ship size and cargo handling efficiencies for various commodities;  
As shown in **Table - 3.2.1** in Volume 3 of the report,
- (4) Load factor for calling ships;  
From 1995 through 2004, Load Factor = 0.6  
From 2005 through 2015, Load Factor = 0.8,
- (5) Number of container cargoes in terms of TEU;  
Total TEU handled per year =  $2 \times (\text{Import container cargo volume in TEU})$ ,  
Import Container Cargo Volume in TEU  
=  $(\text{Import Container Cargo Volume in ton})/10$ ,  
where Average weight of import container per TEU is assumed to be 10 tons,
- (6) Berth time per ship is calculated by the following equation;  
Berth Time per ship = Berth Time needed for cargo handling  
+ Time needed for docking and releasing a ship,  
where Time needed for docking and releasing is assumed to be three hours, i.e.  
0.125 days/ship.
- (7) Berth Occupancy Rate(BOR);  
BOR is calculated by the following equation,  
$$\text{BOR} = (\text{Total Berth Time Needed})/(\text{Number of Berths} \times \text{Total Working Days})$$
- (8) For each year, two alternative berth plans are examined. Of the two berth plans, the one which yields the berth occupancy rate being closer and no larger than 0.7 was chosen as the plan for the year, which is shown with a shade in the attached tables.

Total Working Days per Year =

Table with columns: 1987 Middle Commodity, Cargo Vol, Ship Size, Ld. Factor, Ave. Load, Ship Cells, L/d/Berth, Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth, Work time Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth.

Table with columns: 1987 Middle, Day-Berth, No. of Bth, Length, T. Length, Depth, No. of Bth, Length, T. Length, No. of Bth, Length, T. Length, Berth Plan 2, No. of Bth, Length, T. Length.

Total Working Days per Year =

Table with columns: 1987 High, Cargo Vol, Ship Size, Ld. Factor, Ave. Load, Ship Cells, L/d/Berth, Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth, Work time Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth.

Table with columns: 1988 Middle Commodity, Cargo Vol, Ship Size, Ld. Factor, Ave. Load, Ship Cells, L/d/Berth, Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth, Work time Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth.

Table with columns: 1988 Middle, Day-Berth, No. of Bth, Length, T. Length, Depth, No. of Bth, Length, T. Length, No. of Bth, Length, T. Length, Berth Plan 1, No. of Bth, Length, T. Length, Berth Plan 2, No. of Bth, Length, T. Length.

Total Working Days per Year =

Table with columns: 1988 Middle Commodity, Cargo Vol, Ship Size, Ld. Factor, Ave. Load, Ship Cells, L/d/Berth, Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth, Work time Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth.

Total Working Days per Year =

Table with columns: 1985 Existing Commodity, Cargo Vol, Ship Size, Ld. Factor, Ave. Load, Ship Cells, L/d/Berth, Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth, Work time Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth.

Table with columns: 1985 Existing Comd., Day-Berth, No. of Bth, Length, T. Length, Depth, No. of Bth, Length, T. Length, No. of Bth, Length, T. Length, Berth Plan 1, No. of Bth, Length, T. Length, Berth Plan 2, No. of Bth, Length, T. Length.

Total Working Days per Year =

Table with columns: 1985 Existing Commodity, Cargo Vol, Ship Size, Ld. Factor, Ave. Load, Ship Cells, L/d/Berth, Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth, Work time Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth.

Table with columns: 1986 Middle Commodity, Cargo Vol, Ship Size, Ld. Factor, Ave. Load, Ship Cells, L/d/Berth, Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth, Work time Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth.

Table with columns: 1986 Middle, Day-Berth, No. of Bth, Length, T. Length, Depth, No. of Bth, Length, T. Length, No. of Bth, Length, T. Length, Berth Plan 1, No. of Bth, Length, T. Length, Berth Plan 2, No. of Bth, Length, T. Length.

Total Working Days per Year =

Table with columns: 1986 Middle Commodity, Cargo Vol, Ship Size, Ld. Factor, Ave. Load, Ship Cells, L/d/Berth, Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth, Work time Day/Ship, Berth/Ship, Day/Ship, Total B.T. Day/Berth.











Total Working Days per Year = 320

2015 Middle Bulk Commodity	Cargo Volume	Ship Size	Ld. factor	Avg. Lead	Ship Cells	L/d/berth	Handling		Work time		Berth Time		Total B.T.
							Day/Ship	Day/Berth	Day/Ship	Day/Ship	Day/Ship	Day/Berth	
(1) Fertilizer	1,108,877	7000	0.8	5900	47.0	1613	3.47	3.60	0.125	3.60	3.60	188.8	
a. Fertilizer	282,852	7000	0.8	5900	81.1	2980	1.84	2.07		2.07	167.6		
b. Cement	404,316	7000	0.8	5900	202	1286	4.32	4.45		4.45	89.7		
c. Rice	12,895	7000	0.8	5900	89.8	564	4.83	4.75		4.75	32.1		
d. Sugar	279,427	5000	0.8	4000	40.6	10900	0.37	0.50		0.50	20.1		
(2) Equipment	82,000	5000	0.8	4000	40.6	10900	0.37	0.50		0.50	20.1		
(3) General Cargo	188,988	7000	0.8	5900	35.6	1670	3.35	3.48		3.48	117.0		
a. Machinery	217,428	7000	0.8	5900	38.8	1728	3.24	3.37		3.37	130.7		
b. Steel Product	37,046	5000	0.8	4000	83	1152	3.47	3.60		3.60	33.3		
c. Wood Prod.	223,159	7000	0.8	5900	39.7	756	7.41	7.53		7.53	288.6		
d. General Cargo	181,188	7000	0.8	5900	39.7	756	7.41	7.53		7.53	288.6		
G.C. (Unord)	30,973												
S.C. (Unord)	1,837,303												
(4) Container Import (Ton)	1,893,022	7000											
(TEU)	378,604				600	6310	898.4	0.60	0.79	458.1			
Export (Ton)	380,205												
Total Cargo ton	4,190,550					1011.2						1818.7	

2015 Middle Bulk	Required Berths			Berth Plan 1			Berth Plan 2		
	Day	No. of Bth	T. Length	Day	No. of Bth	T. Length	Day	No. of Bth	T. Length
Bulk Terminal	398.9	139	232.0	8.0	2	150	300	2	150
7000 Berth	538.2	2.84	150	6.5	3	150	450	4	600
6000 Berth	385.4	1.83	120	7.5	2	120	240	2	120
3000 Berth	498.1	0.00	100	6.5	0	100	0	0	0
Container Berth	1818.7	8.11	1107.9	7.0	3	150	450	3	150
				10.1	10	1440.0	11	11	1380.0
							0.67		0.32

Berth occupancy Rate		2015 Middle Bulk	
Bulk Terminal	0.558	10 berths	0.558
7000 DWT	0.663	3 berths	0.487
5000 DWT	0.571	0.626	0.522
Container berth	0.477	0.570	0.477
Wharf berths	0.568	0.568	0.518

## Appendix C (Chapter 3.2.2):

### Evaluation of wave disturbance in the water area inside breakwaters

#### 1. Numerical simulation of waves within the breakwaters

The waves in the port was examined by the numerical simulation, which analyzes the wave on the basis of the equilibrium equation of wave energy. The incident waves at the opening of the breakwater are assumed to have a directional spectrum.

The wave height in the port (water area inside breakwaters) is exhibited in terms of percentile of the wave height at the opening of the breakwater, where the wave height is assumed to be 100. With the wave height distribution in the port, the magnitude of effect of the proposed new wharves on the harbour tranquility was examined.

#### 2. Conditions for wave simulation

##### (1) Wave direction and period at the opening of the breakwaters

According to the wave climate in Compong Som Bay given in the **Appendix A** of Volume 2 of this Final Report, the wave occurrence at the opening of the breakwaters of Sihanoukville Port is expected to have the following characteristics:

- a. Even rough seas, wave height experienced so far is less than 1.25 m.
- b. The probability of occurrence of large waves having heights larger than 1.0 m is 0.3%,
- c. The predominant wave direction is west and the second and the third are north and northwest, respectively: the probability of occurrence is 36.5% for west, 31.1% for north, and 16.3% for northwest directions.
- d. The probability of occurrence of wave period is the highest for the wave having periods between 1.00 and 1.99 seconds, and the waves having wave periods of this class encompass 52%. The average wave height of the waves having the period of this class is less than 0.24m
- e. The probability of occurrence of wave period for the waves having wave height of 0.5 m or larger is 5.6% for the waves having wave periods of 2.00 to 2.99 sec., 2.2% for the waves having wave periods of 3.00 to 3.99 sec. and 0.1% for the waves having wave periods 4.00 sec. or longer.

According to the above mentioned characteristics of incident waves, the conditions employed in the wave simulation are chosen as follows:

Wave direction; N, NW and W

Wave period; 2.5 sec.

(2) Boundary conditions

(Layout of the wharves and the wave reflection coefficients)

The wave simulation was carried out for the following three stages of port development:

- a. Existing situation,
- b. Short-term development plan, and
- c. Long-term development plan.

The reflection coefficients are chosen in accordance with the type of the structure as shown in **Table - c1**.

**Table - c1** Structure type and wave reflection coefficient r

Structure Type	Ref. Coefficient r
Vertical wall such as wharves of concrete blocks	0.9
Rubble mound structure such as breakwaters, revetment and deck on pile type	0.4
Natural beach	0.2

The boundary conditions employed for the three stages of the development are shown in **Figs. -c.1(1), (2) and (3)**: the present situation, the Short-term Development Plan and the Long-term Development Plan, respectively. The simulation was carried out for three wave directions for each stage of the development, and thus, the total nine cases were examined.

(3) Area covered by the numerical model

The numerical model covers the water area within the breakwaters only. The grid size of the computation is 50 m.

3. Results of the simulation

(1) Exhibits of the results of simulation

The results of the simulation are exhibited in the figures indicated in **Table - c2**.

**Table -c2** Figure numbers for respective conditions

Wave direction	North	Northwest	West
Present situation	Fig. - c2(1)	Fig. - c3(1)	Fig. - c4(1)
Short-term Development Plan	Fig. - c2(2)	Fig. - c3(2)	Fig. - c4(2)
Long-term Development Plan	Fig. - c2(3)	Fig. - c3(3)	Fig. - c4(3)

The waves in the port are summarized as shown in **Table- c3**.

**Table - c3** Summary of the results of simulation

Wave Direction	Stage of development	Wave attenuation rate (%)		
		In front of G.C. wharf	In front of Container wharf	North part of Basin
North	Present situation	60 - 70	30 - 45	25 - 35
	Short-term Development Plan	70 - 90	30 - 45	25 - 40
	Long-term Development Plan	40 - 80	15 - 20	10- 30
Northwest	Present situation	25 - 100	55 - 90	20 - 50
	Short-term Development Plan	25 - 100	55 - 90	25 - 60
	Long-term Development Plan	25 - 90	40 - 70	20 - 50
West	Present situation	10 - 60	55 - 60	30 - 70
	Short-term Development Plan	10 - 60	55 - 65	30 - 70
	Long-term Development Plan	10 - 60	55 - 60	25 - 60

(2) Brief analysis of the results

a. North wave direction (see **Figs. - c2 (1), (2) and (3)**)

The construction of the new general cargo wharf (renovation of existing revetment over 400 m) at the stage of the Short-term Development Plan causes the agitation in front of the same general cargo wharf. The agitation at other water areas remain almost the same as at present. However, at the stage of the Long-term Development Plan, the agitation in front of the general cargo wharf decreased due to the extension of the North Breakwater.

b. Northwest wave direction (see **Figs. - c3 (1), (2) and (3)**)

At the stage of the Short-term Development Plan, the reflected waves from the 400m new general cargo wharf causes a slight increase of wave agitation in the north part of the basin. However, the extension of the breakwaters reduces the wave height in the north part of the basin considerably.

c. West wave direction (see **Figs. - c4 (1), (2) and (3)**)

The wave height in the port remain the same regardless of the stage of the development.

The extension of the North Breakwaters contributes to reduce the wave height in the north part of the basin.

(3) Recommendations

At the stage of the Short-term Development Plan, waves in the basin is amplified due to the reflection of the new general cargo wharf. Therefore, it is desirable to choose such structural type for the general cargo wharf that has wave energy function.

The extension of the North Breakwater, which is included in the Long-term Development Plan is fairly effective to reduce the wave heights in the basin, especially for the waves coming from the north and northwest.



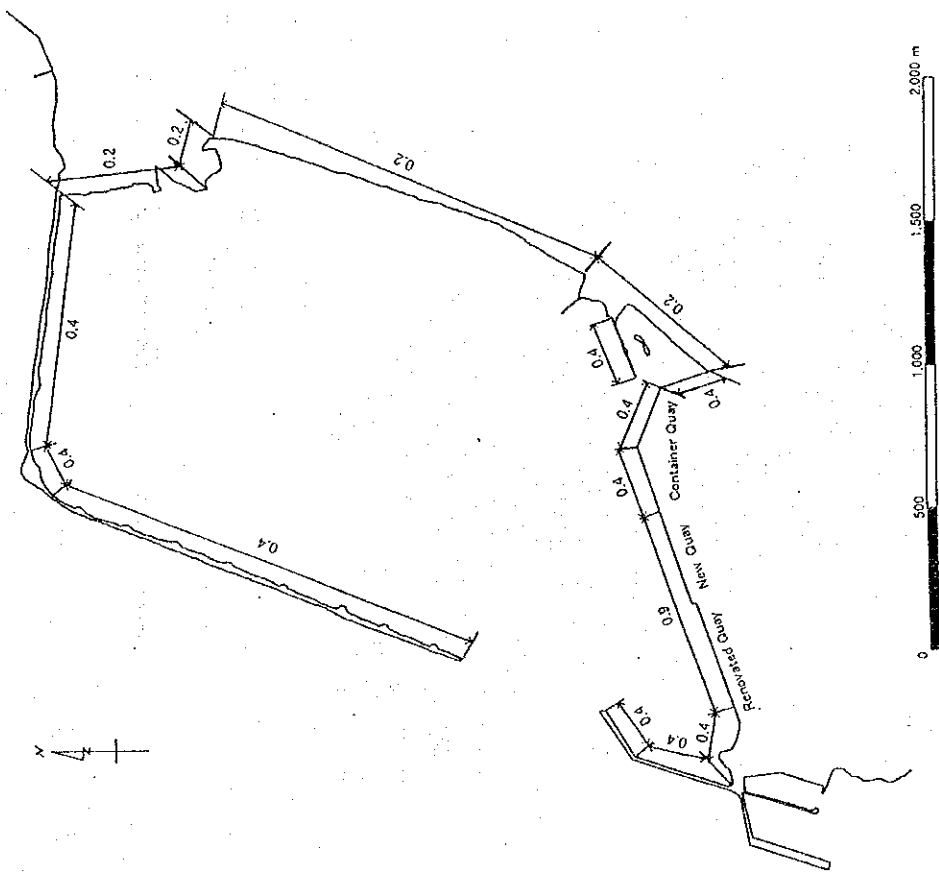


Fig. - c1(2) Boundary condition and reflection coefficient  
(Short-term Development Plan, 2005)

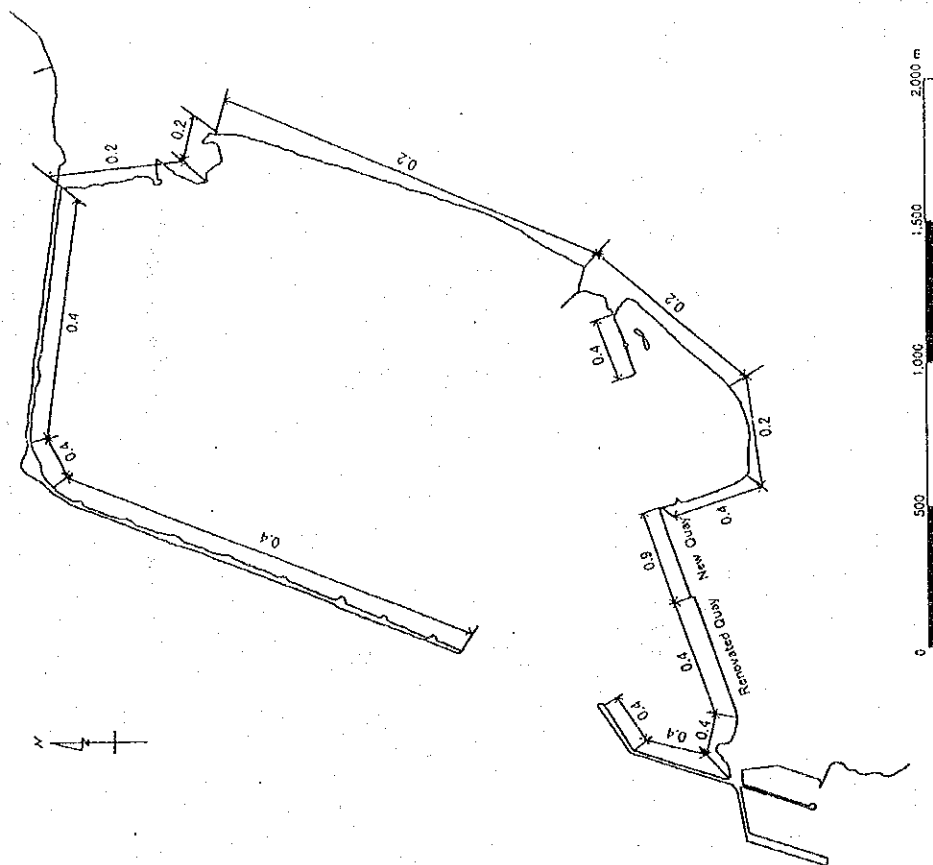


Fig. - c1(1) Boundary condition and reflection coefficient  
(Present Situation)

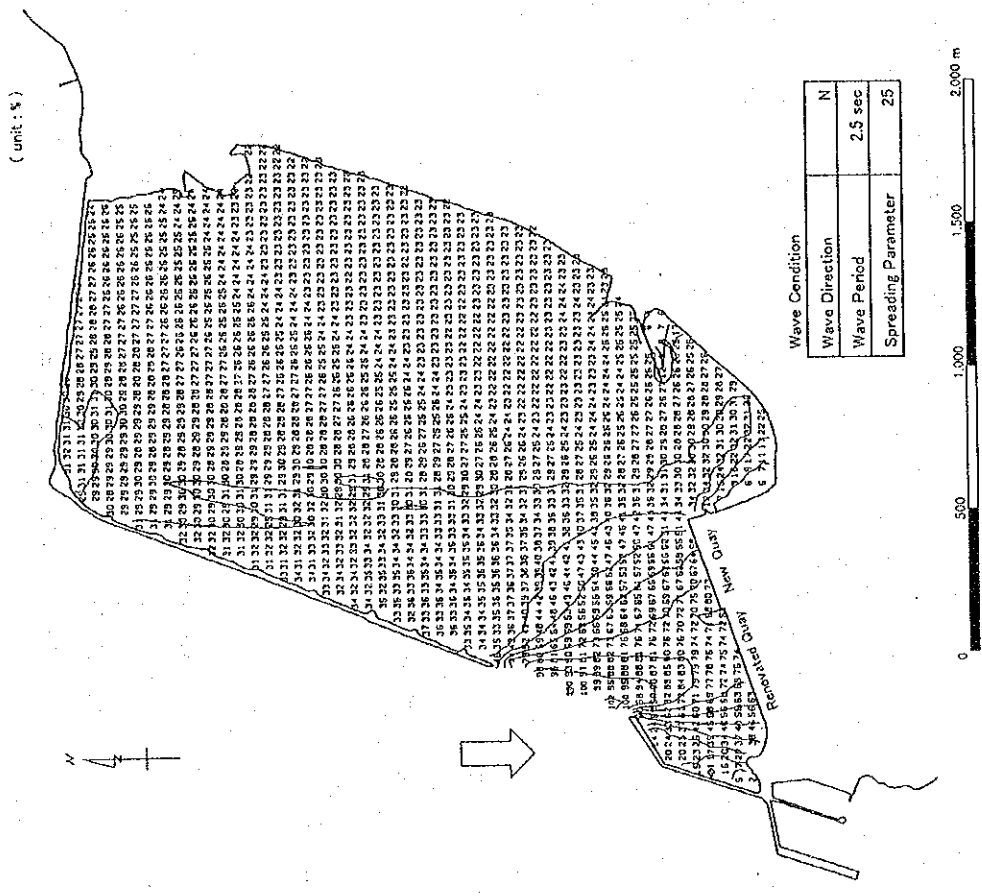


Fig. - c2(1) Wave height distribution(Direction of wave: North)  
(Present Situation)

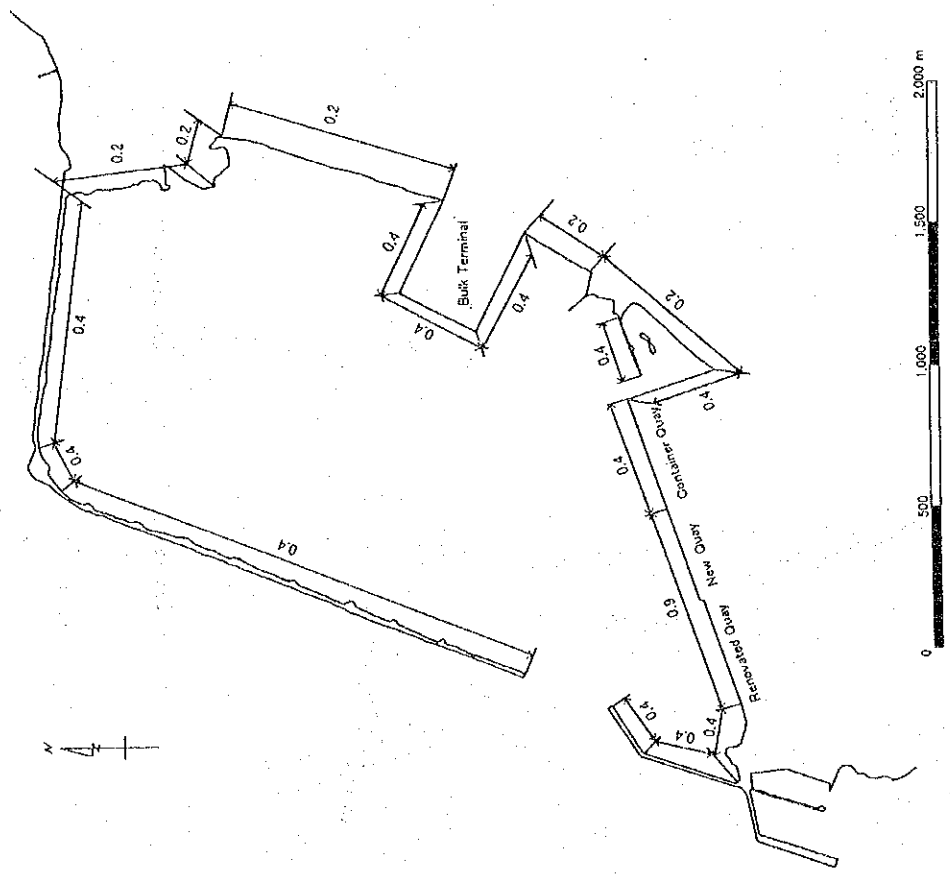


Fig. - c1(3) Boundary condition and reflection coefficient  
(Long-term Development Plan, 2015)

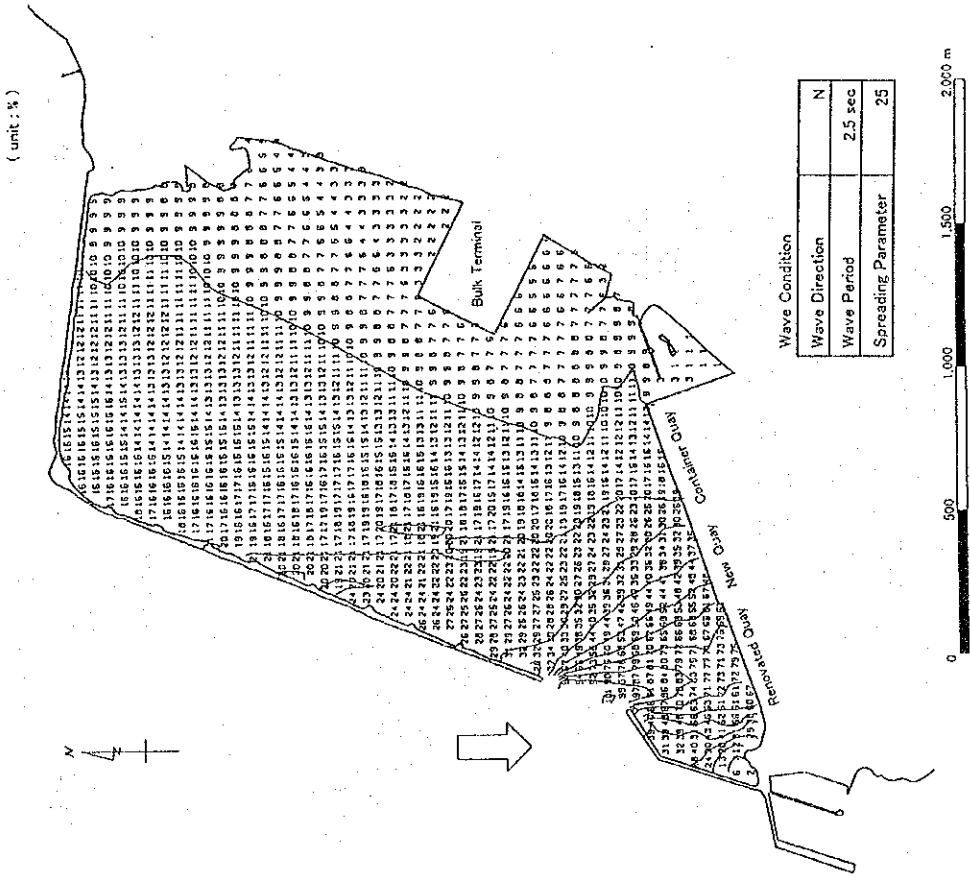


Fig. - c2(3) Wave height distribution (Direction of wave: North)  
(Long-term Development Plan, 2015)

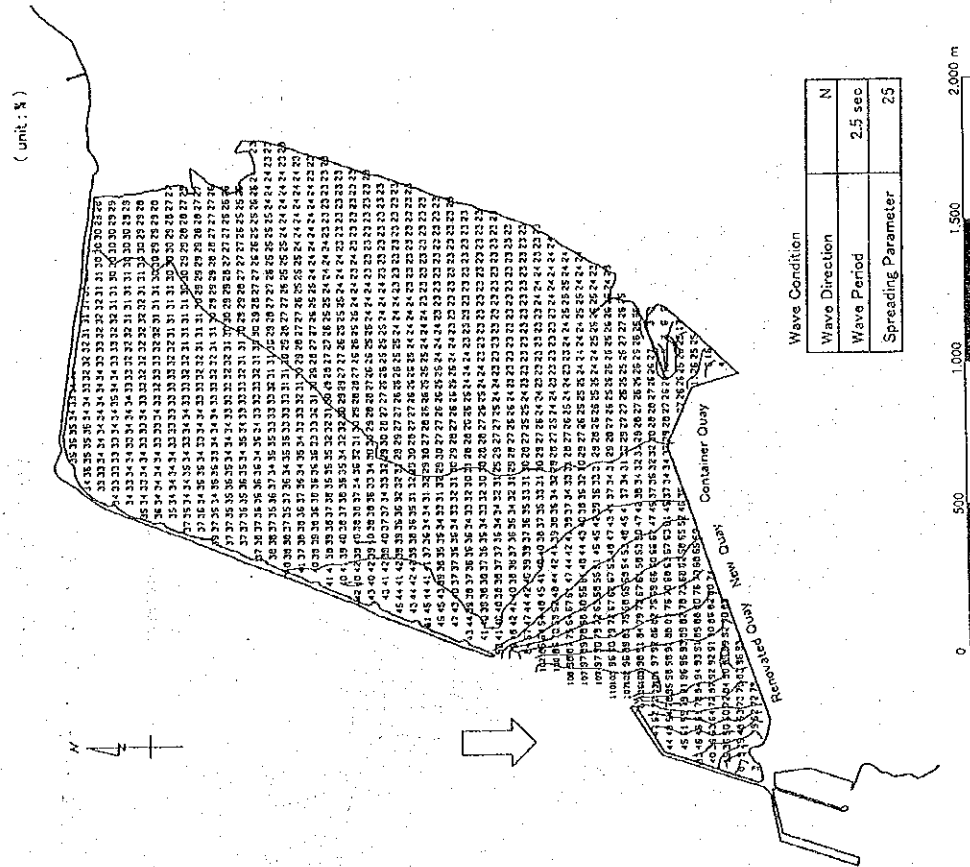


Fig. - c2(2) Wave height distribution (Direction of wave: North)  
(Short-term Development Plan, 2005)

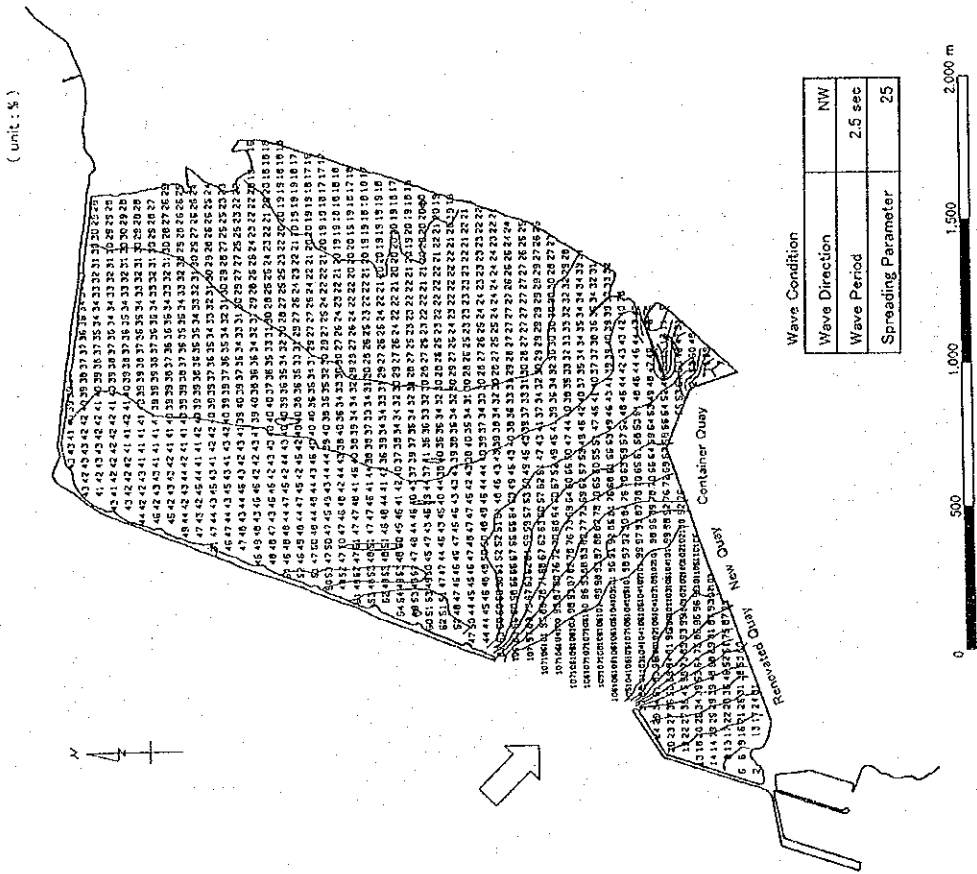


Fig. - c3(2) Wave height distribution (Direction of wave: Northwest)  
(Short-term Development Plan, 2005)

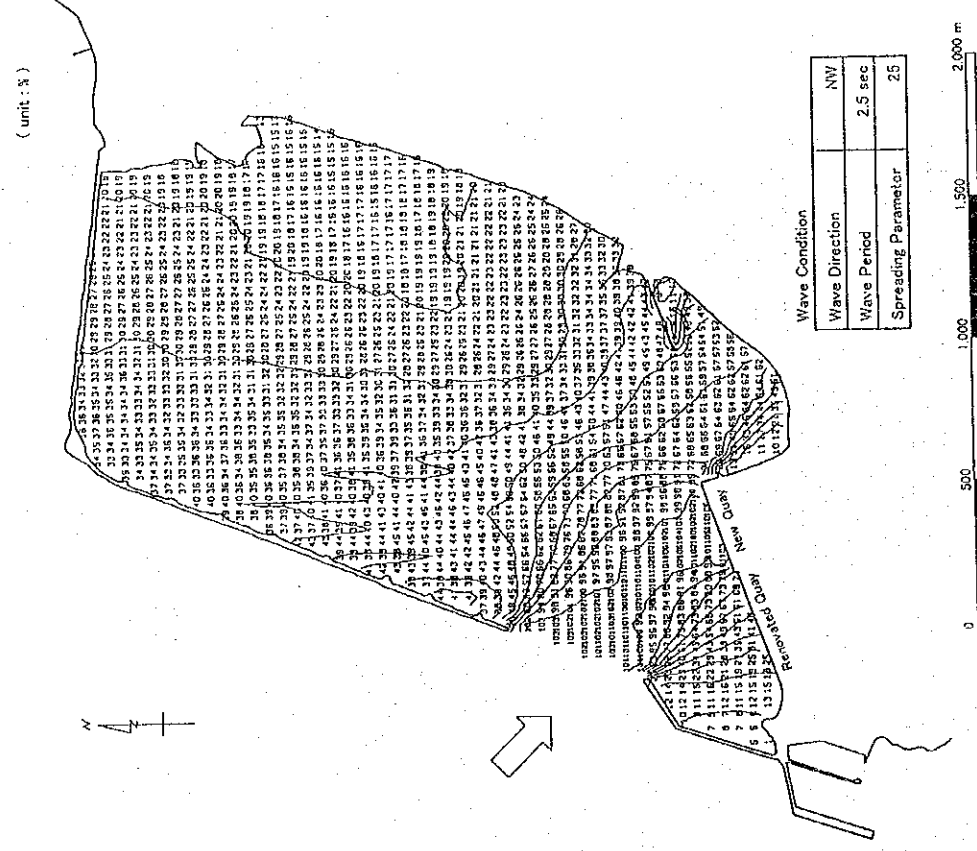


Fig. - c3(1) Wave height distribution (Direction of wave: Northwest)  
(Present Situation)

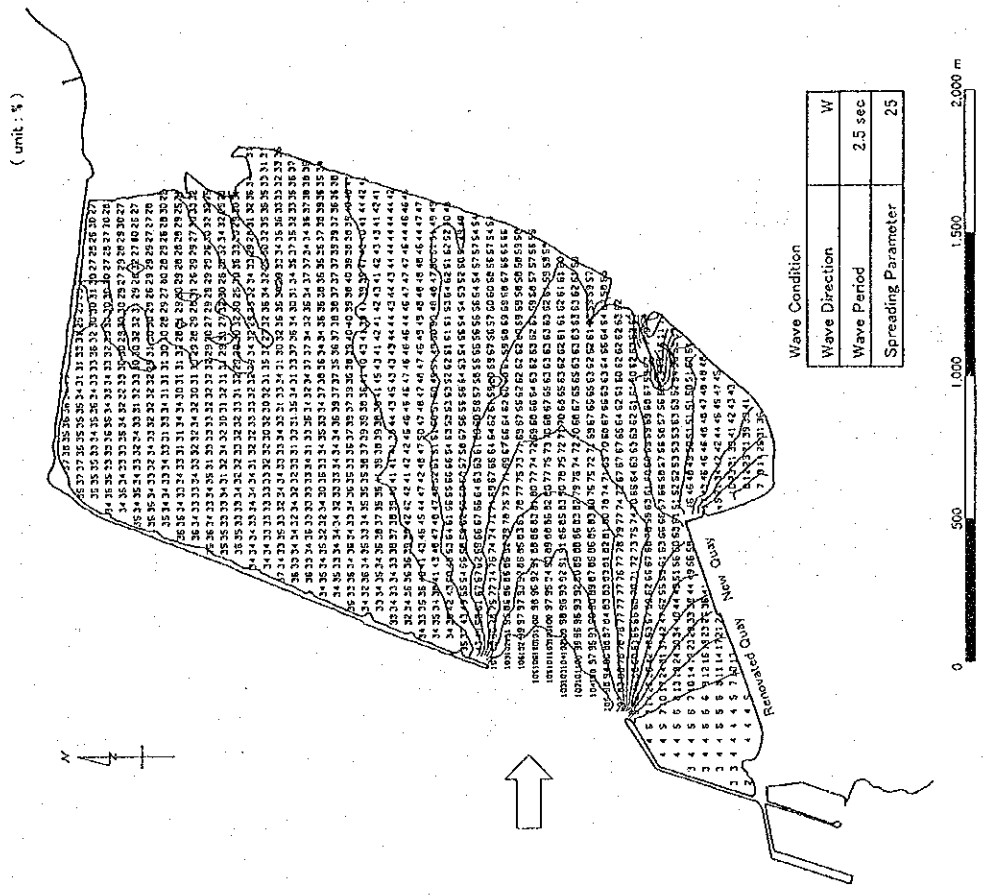


Fig. - c4(1) Wave height distribution(Direction of wave: West)  
(Present Situation)

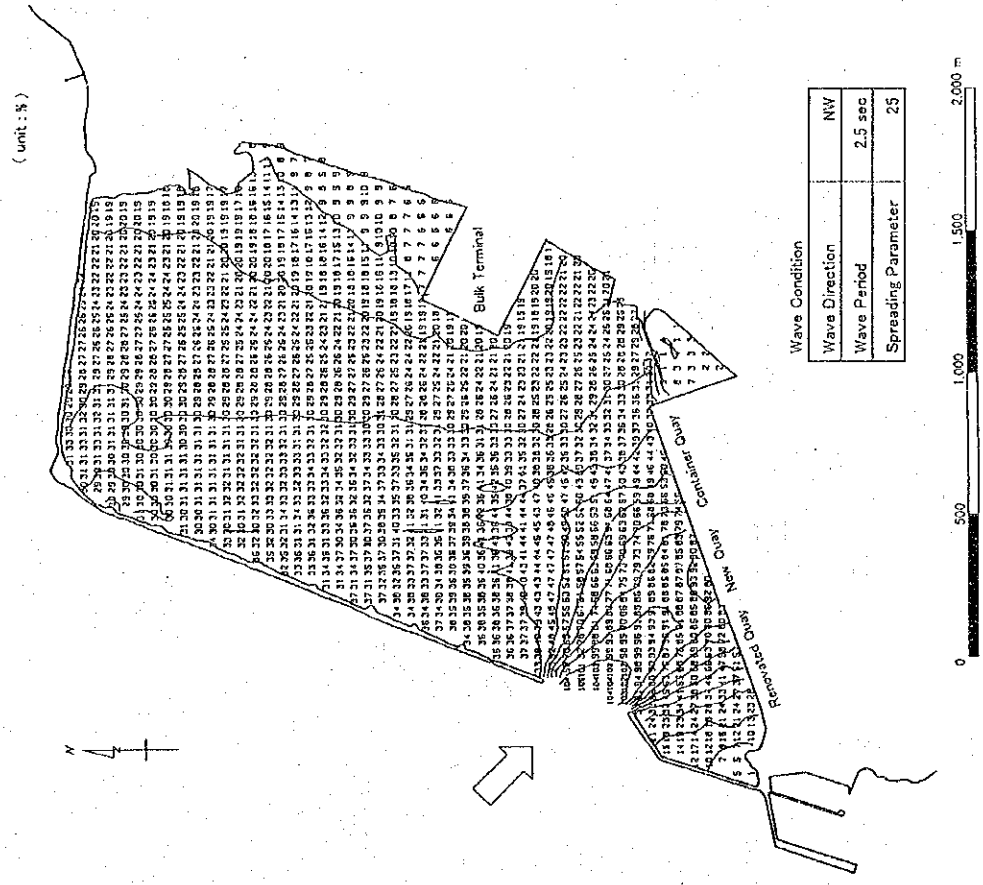


Fig. - c3(3) Wave height distribution(Direction of wave: Northwest)  
(Long-term Development Plan, 2015)

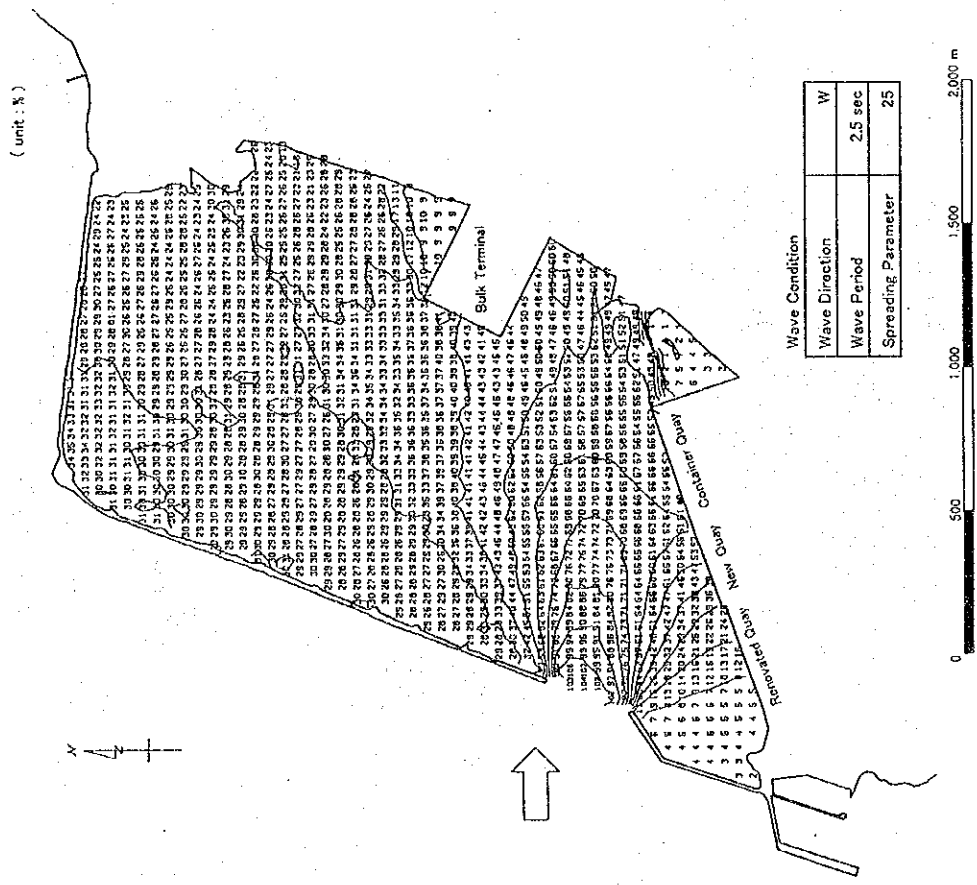


Fig - c4(3) Wave height distribution(Direction of wave: West)  
(Long-term Development Plan, 2015)

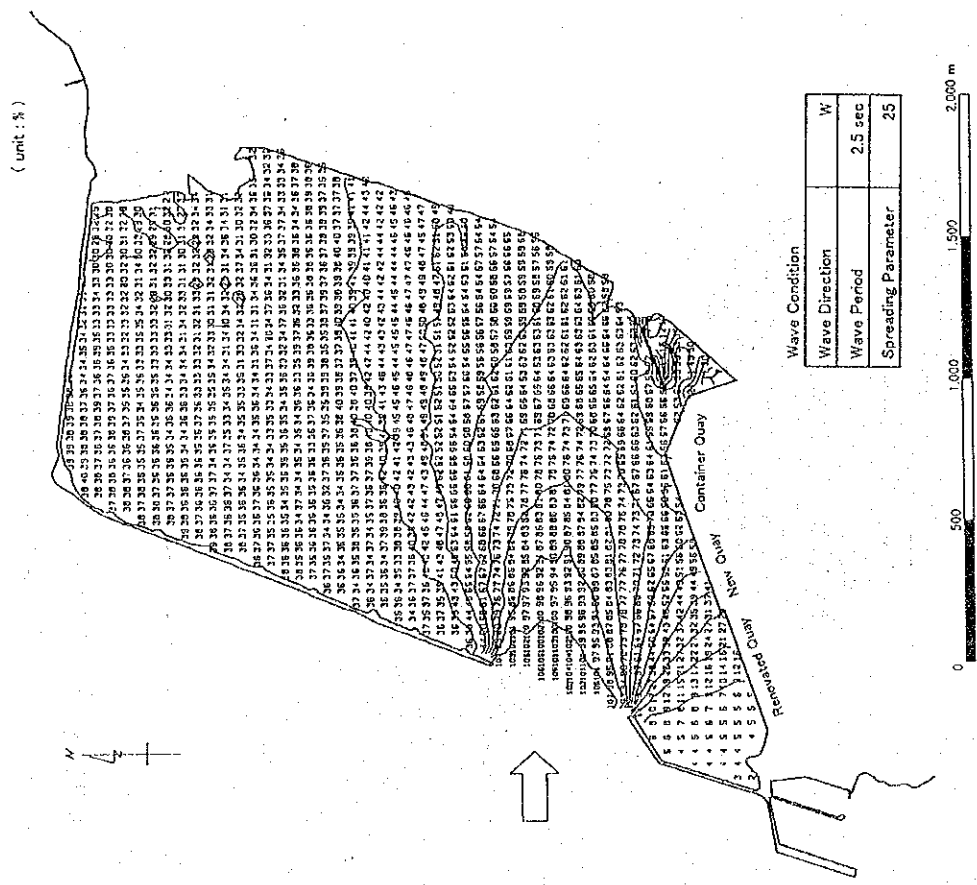


Fig - c4(2) Wave height distribution (Direction of wave: West)  
(Short-term Development Plan, 2005)

## Appendix D (Chapter 7.2.4):

### Numerical simulation of dispersion of disposed soil (dredged materials)

#### 1. Numerical simulations of dispersion of suspended soil (SS)

The extent of the suspended soil after the disposal of dredged materials was examined with the use of numerical model.

(1) The conditions and assumptions for the computation are as follow:

a. Dumping volume per day (Q);  $Q=6,000 \text{ m}^3/\text{day}$

b. Medium Grain Size and sedimentation rate

Medium Grain Size ( $d_{50}$ )= 0.004 mm (result of soil test),

Sedimentation Rate ( $v$ ) = 0.57 cm/sec(given by the Stokes' Eq.)

Stokes' Eq.  $v=2/9gr^2(\rho' - \rho)/(\rho\nu)$

where,  $\nu$ : viscosity of water,  $\rho'$ :density of soil,  $\rho$ :density of water,

$r$ : medium grain size,  $g$ : acceleration of gravity,

c. Load volume, i.e., the volume of suspended soil generated by disposal of dredged material per day

$$\text{Load volume} = W \times (R_0 / R) \times Q = 245.6 \text{ ton/day}$$

where  $W$  denotes the rate of generation of suspended soil per  $\text{m}^3$  of the disposal of dredged material and  $R_0/R$  denotes the percentile of silt or finer material of the disposed material.

d. Method of dumping of dredged material

The dredged material is disposed three times a day with an interval of four hours. The tidal current is one cycle a day, and northward current last longer than southward current. Thus, the following two cases are examined;

**Case - 1,** Three consecutive disposal in the north of Dek Koul Island during northward current,

**Case - 2,** Two consecutive disposals in the south of Dek Koul Island during southward current and one disposal in the north of Dek Koul Island after the tidal current alternates to northward.

#### (2) Numerical Model

One layer current simulation model is employed. The grid size is 200 m, and the topography of the sea bed given in the chart was employed.

### (3) Results

#### a. Examination of the validity of the numerical simulation

The tidal current field was cross-checked with the current observation data. Fifteen-day current surveys were conducted at three locations, i.e. C1, C2 and C3, shown in Fig.- d.1. The comparison between the simulated and the observed tidal current ellipses is shown in Fig. - d.2. Except the location C2 where the sea bed topography is quite complicated, the results of calculation well simulated the observed current ellipses.

#### b. Tidal current field

The tidal current fields during flood tide and the ebb tide simulated in the numerical model are exhibited in Figs. - d.3 and - d.4, respectively.

#### c. Location of dumping site and evaluation stations

Figure - d.5 shows the locations of dumping sites, which are marked with circles, i.e., ●D1(the north dumping site) and ●D2(the south dumping site). The evaluation stations are also shown in the same figure with squares, i.e., ■E1(north shore of Dek Koul Island), ■E2(south shore of the Island), ■E3(west shore of Kaoh Poah Island), ■E4(south dumping site) and ■E5(north dumping site).

#### d. Results of dispersion of suspended soil

The mean density over 12 hours of working period and the maximum density of the suspended soil are calculated for Case - 1. The results are shown in Fig.- d.6 (daily mean) and Fig. - d.7(maximum). The daily mean density is below 1 ppm except the dumping site(Fig. - d.6). The extent of the 1 ppm contour line of the maximum density is about 1.5 km at the longest(Fig. - d.7).

Figures - d.8 and - d.9 are drawn for the Case - 2 in the same manner. The same as is observed for Case - 1 remains true for Case - 2.

#### e. Density variation of suspended soil at the evaluation stations

The time variations of the density of suspended soil at the evaluation stations E1, E2, and E5 are shown in Fig. - d.10 for Case - 1. At the Stations E1 and E2, i.e., north and south shore of Dek Koul Island, respectively, change of density occurs one hour after the dumping at D1. However the density is minimal. It is also observed in Fig. - d.10 that, at the dumping sites, the density once reaches 70 ppm but it decreases quite rapidly.

Incidentally, no change was observed at the station E3(west shore of Kaoh Poah Island).

The time variation of the density for Case - 2 is shown in Fig. - d.11. Above discussion for Case - 1 remains true for Case - 2.



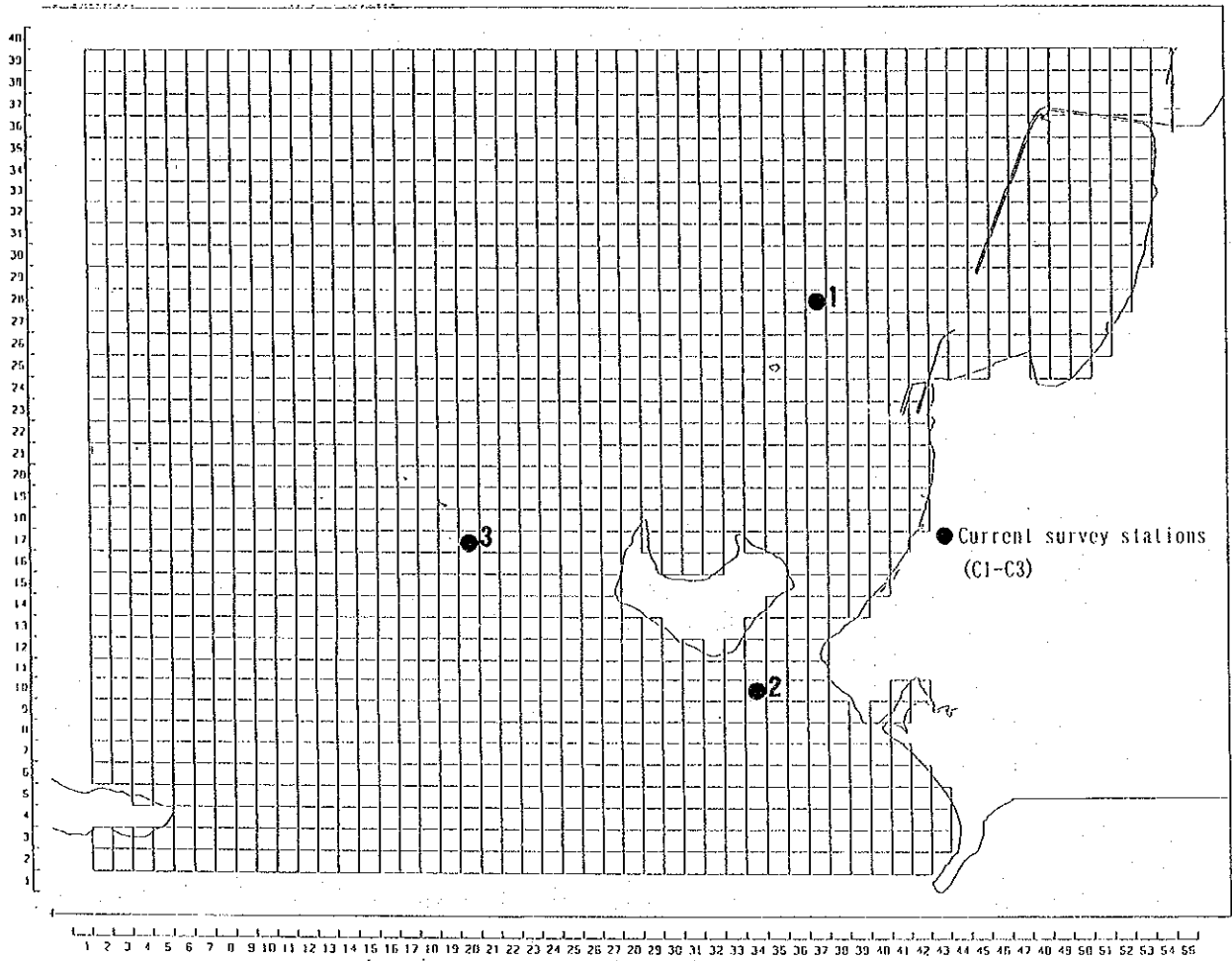


Fig. - d1 Locations of current measurement stations

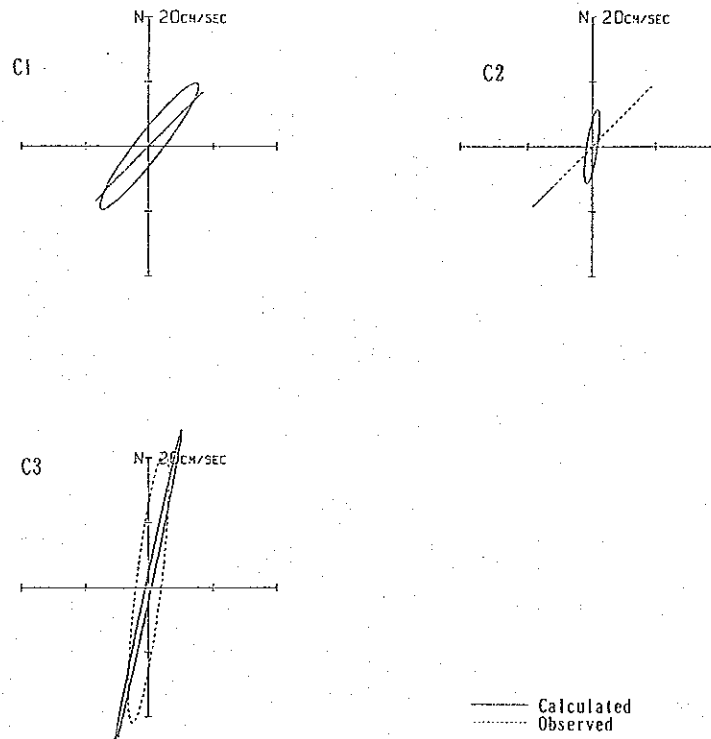


Fig. - d2 Comparison between observed and simulated current ellipse

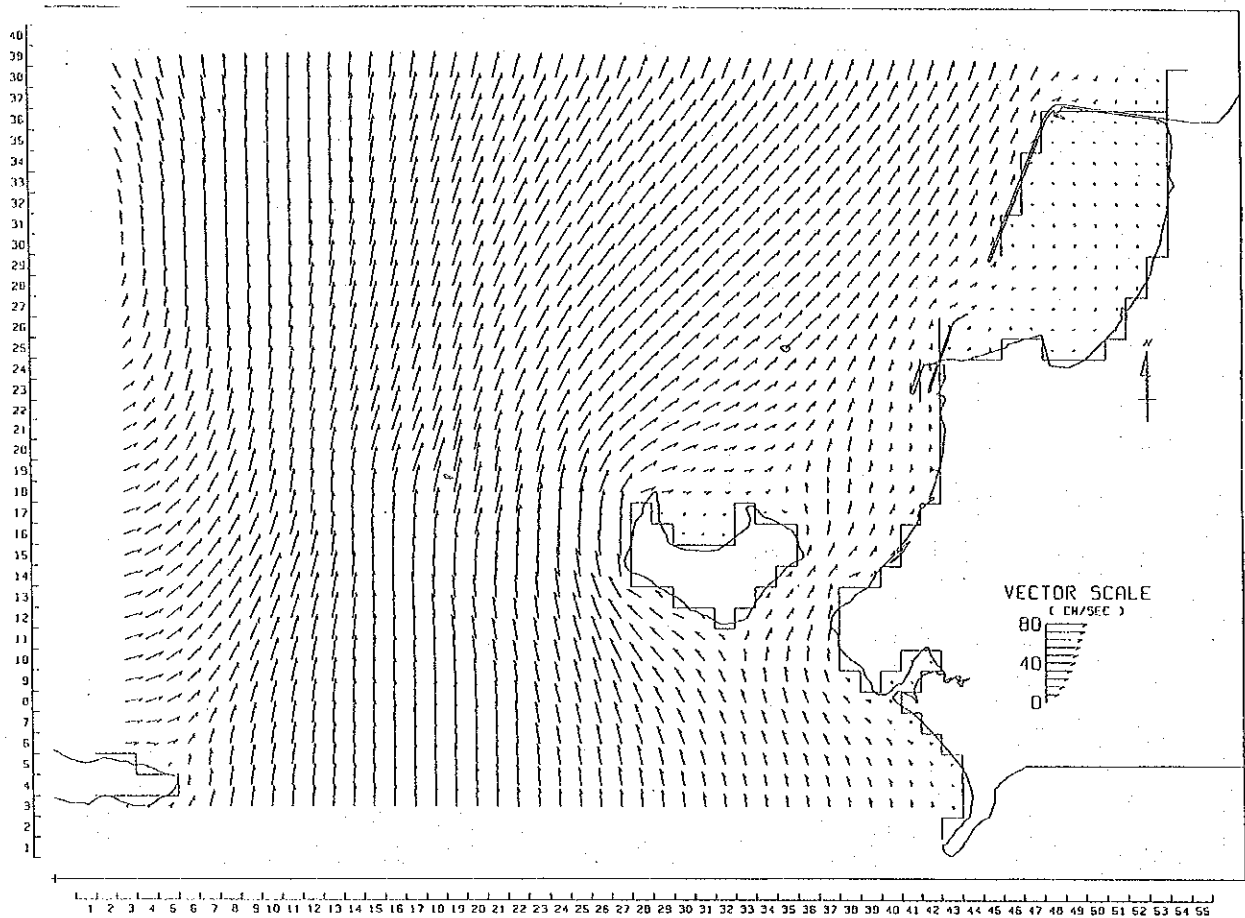


Fig. - d3 Simulated tidal current field during flood tide

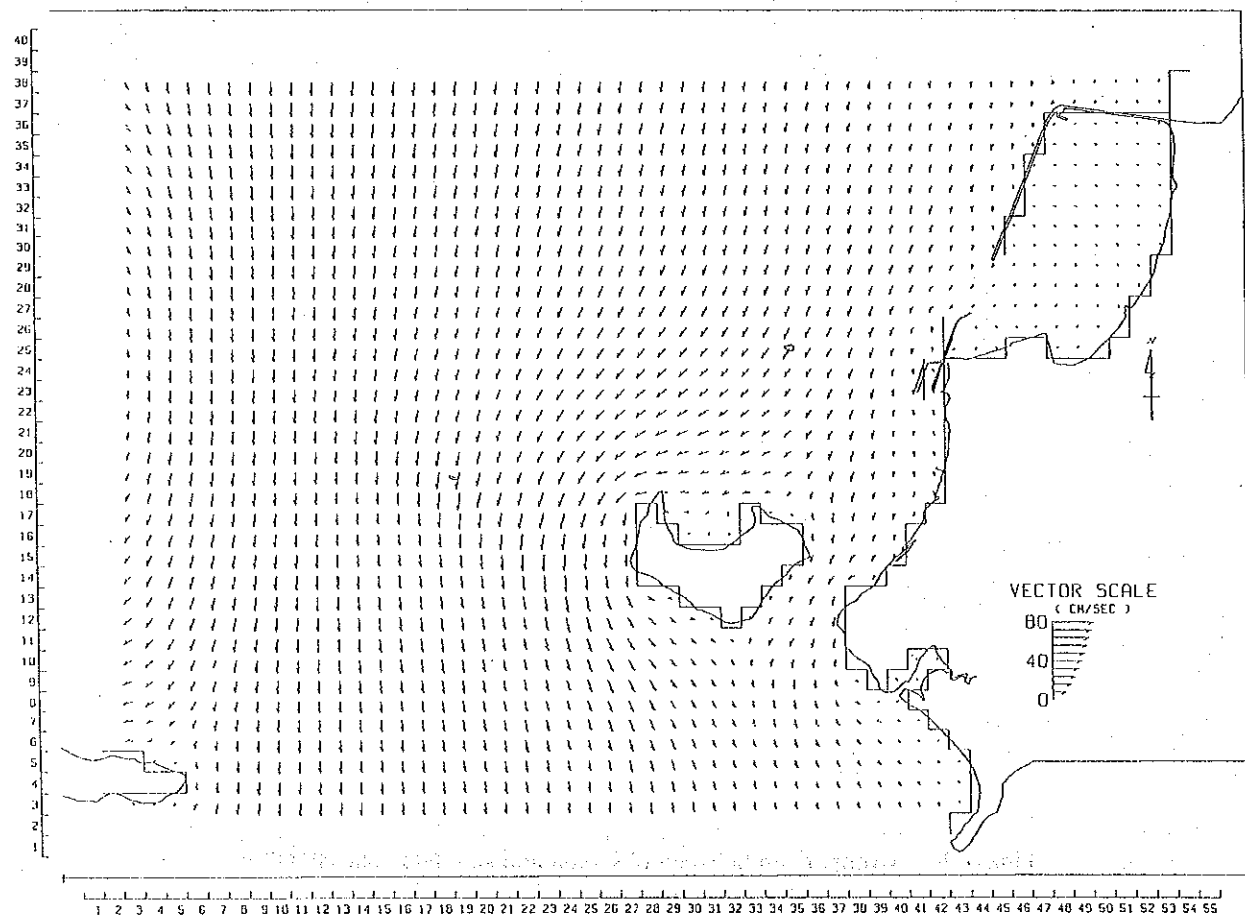


Fig. - d4 Simulated tidal current field during ebb tide

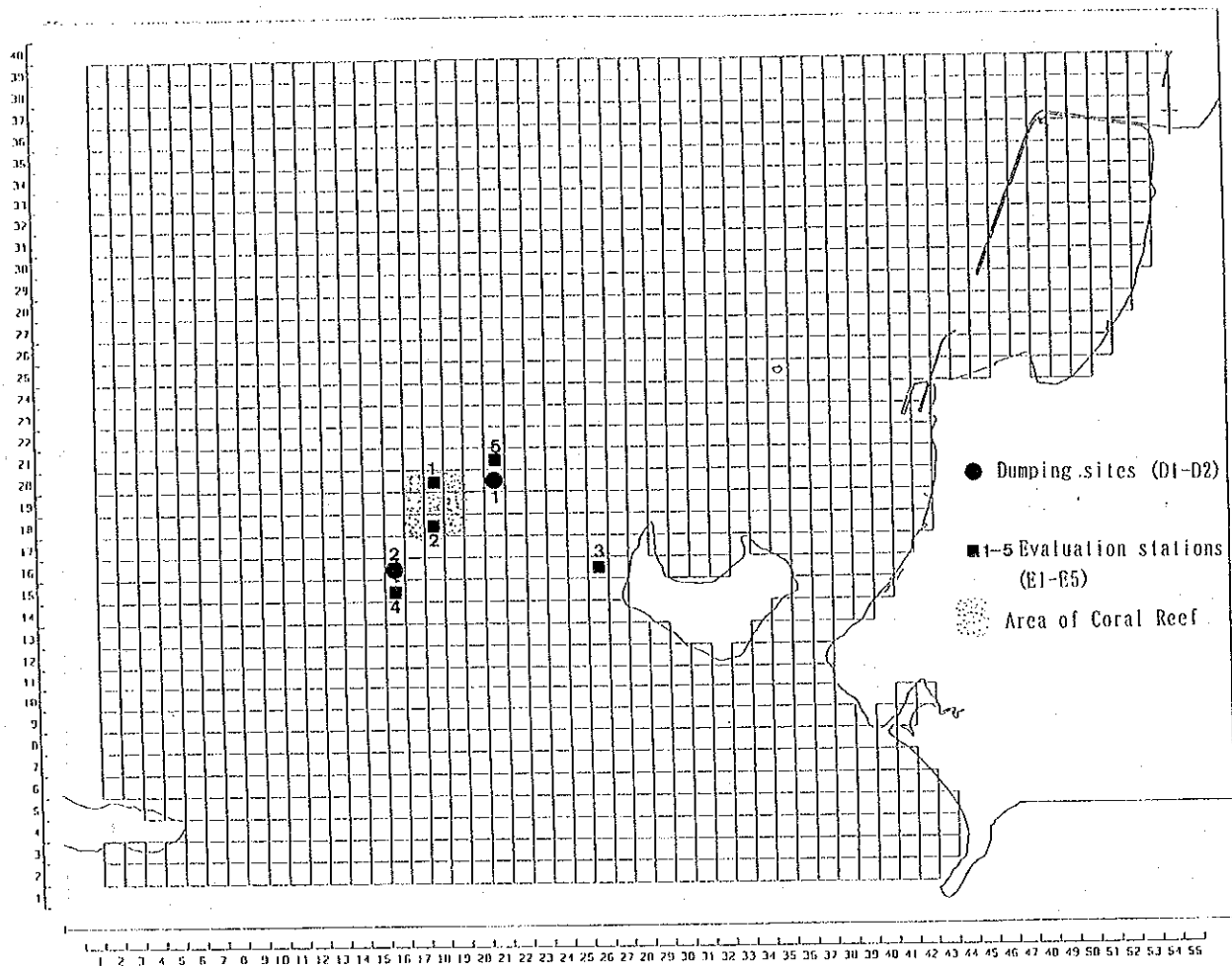


Fig. - d5 Location of dumping sites and points of interest for the evaluation

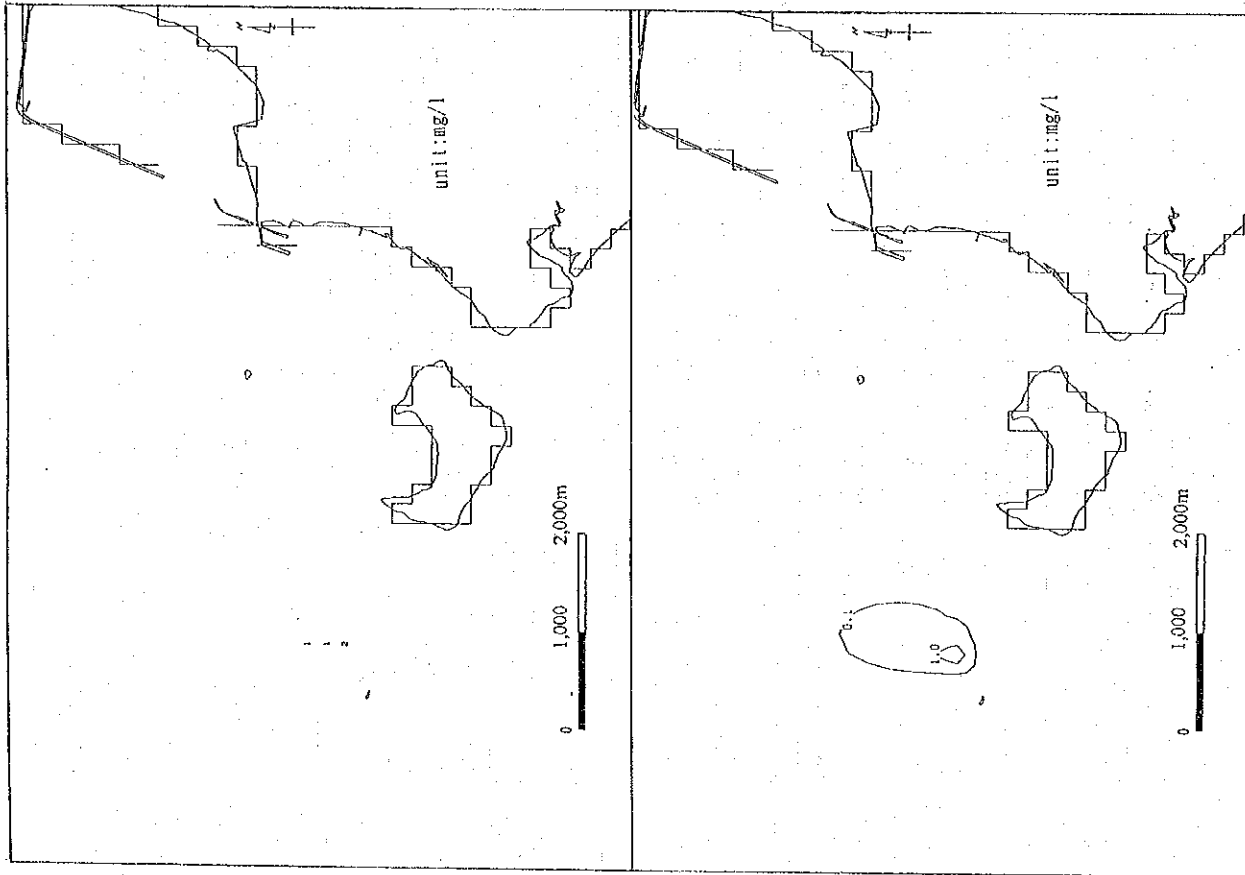


Fig. - d7 Daily mean SS density when soil is disposed three times at dumping site 1

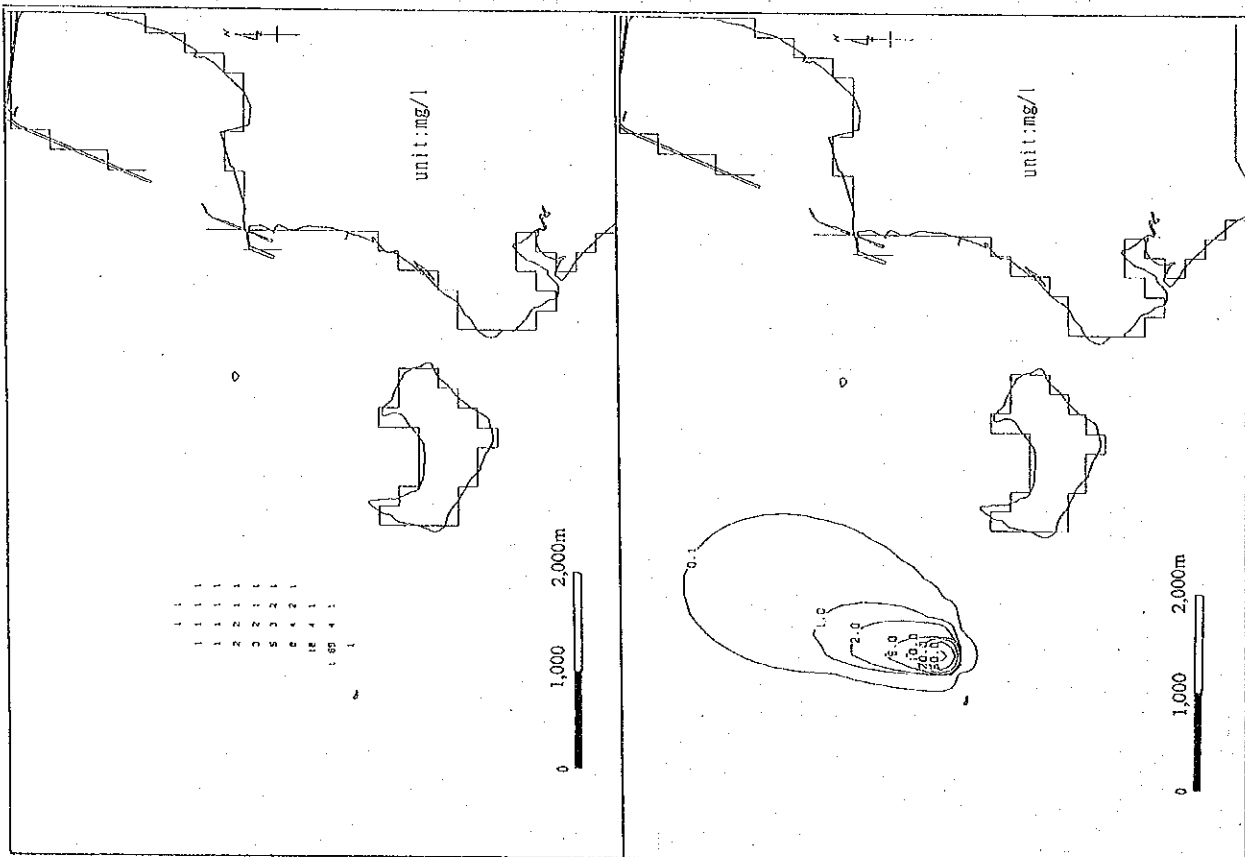


Fig. - d6 Maximum SS density of a day when soil is disposed three times at dumping site 1

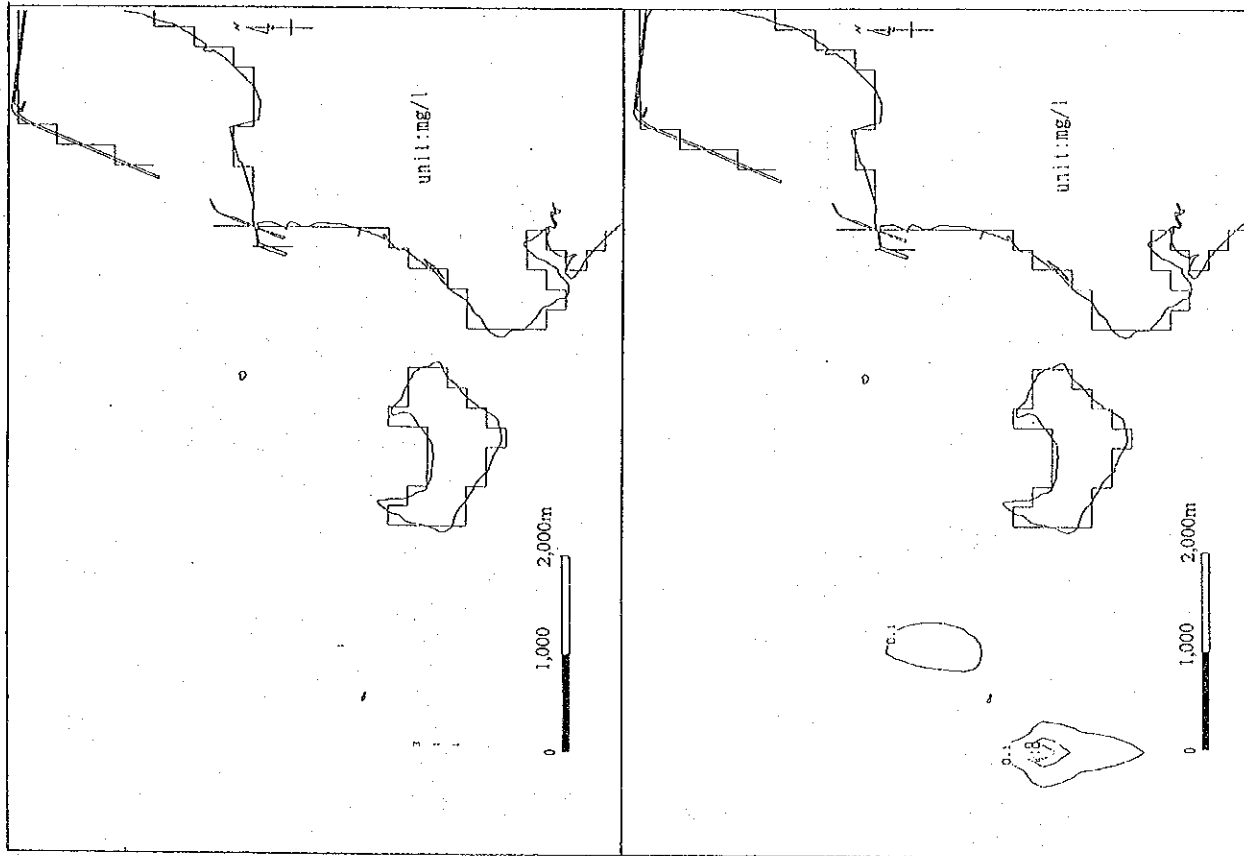


Fig. - d9 Daily mean SS density when soil is disposed once at dumping site 1 and twice at dumping site 2

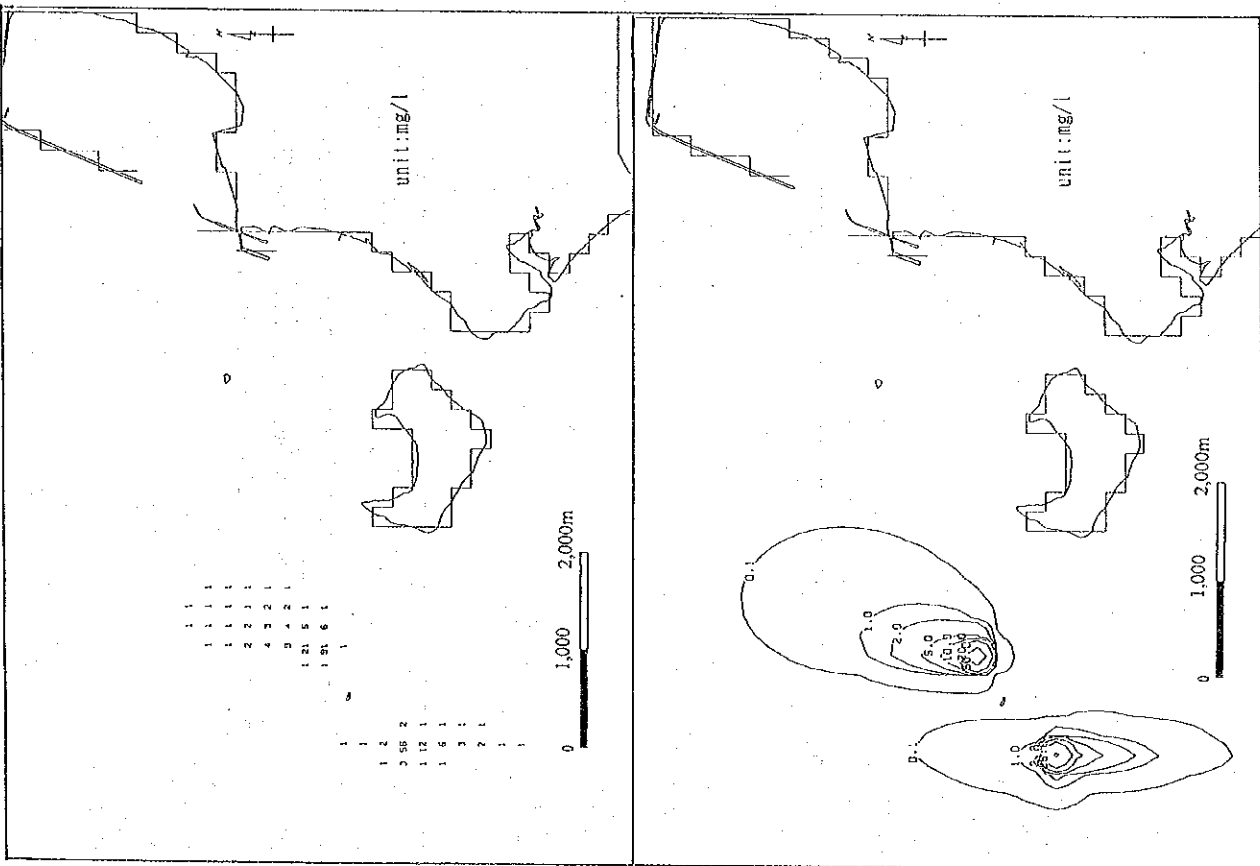


Fig. - d8 Maximum SS density of a day when soil is disposed once at dumping site 1 and twice at dumping site 2

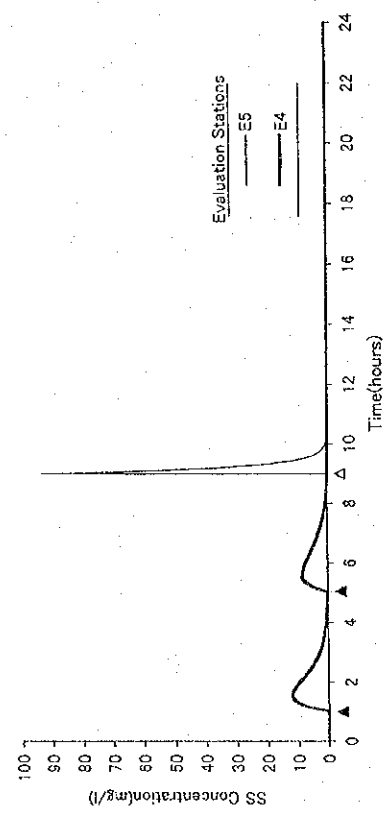
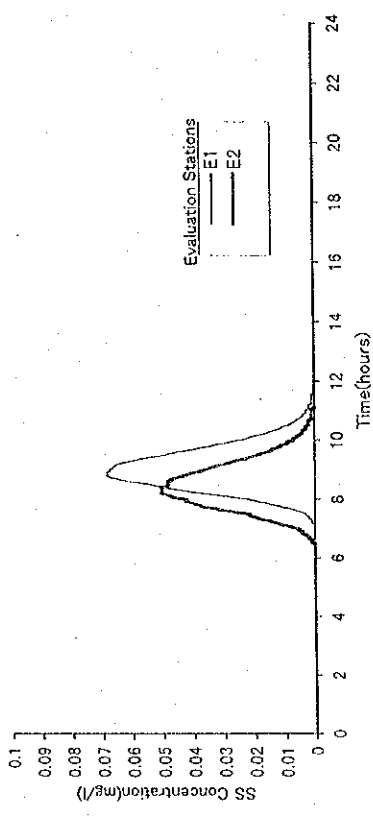


Fig. - d11 Daily SS density variation at Stations E1 - E5 when dumping is done once at Site 1 and three times at Site 2  
 ▲: Dumping time (twice at site 2 during ebb tide)  
 △: Dumping time (once at site 1 during flood tide)

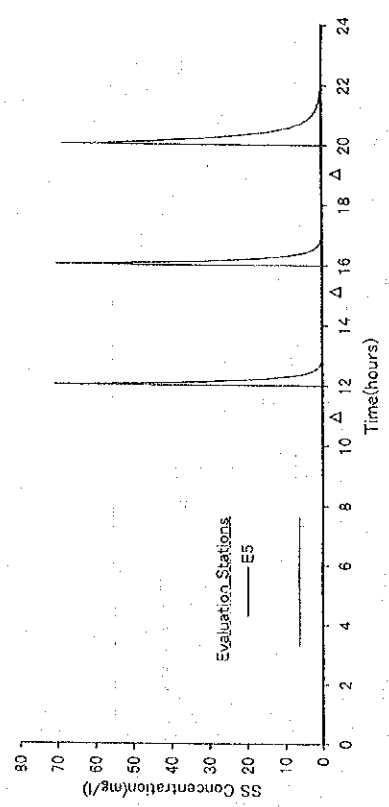
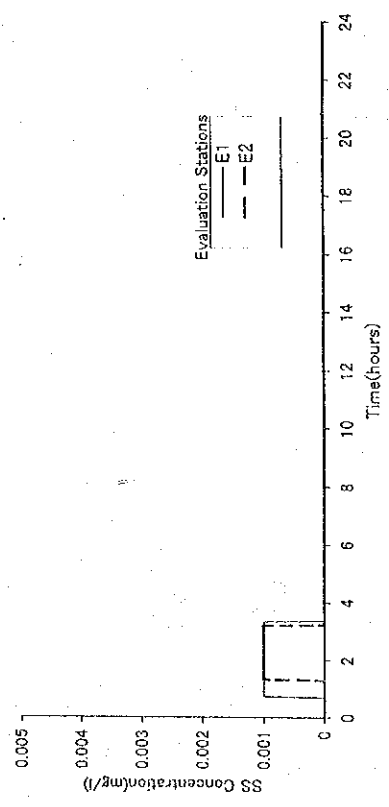


Fig. - d10 Daily SS density variation at Stations E1 - E5 when dumping is done three times at Site 1  
 △: Dumping time (three times at site 1 during flood tide)

## Appendix E (Chapter 7.3):

Questionnaire of the interview to the owners of fishing boats and the residents of Village No. 2

The Questionnaire was translated into Cambodian language. This appendix shows the English version of the questionnaire and the summary of the answers.

Questionnaire

for those who moor their fishing boats at the jetty in Village 2

Sample 1. Yes \_\_\_\_\_, 2. No \_\_\_\_\_ to be filled with a mark.  
( ) to be described briefly.

I. Question to the user/owner of each ship moored at the Jetty.

Ship Identification ( )  
Mooring point (please mark on Map-3)

1. The ownership of the ship.

(1) Who is the owner of the ship?

- (i) Yourself 72, (ii) Parent 4, (iii) Other relative 13,
- (iv) Co-owner 2, (v) You rent/lease 2,
- (vi) Other (None ).

(2) If your answer is (i), how many ships do you own? (One ship Only: 92, two ships: 1).

What is the type of your ship?

Ship	Type of ship	Burden capacity
1st ship	a. Power boat <u>92</u> , b. Non-power boat <u>1</u> , (1 - 5 persons)	
2nd ship	a. Power boat <u>0</u> , b. Non-power boat <u>0</u> , ( persons)	

(Please skip to Question 2.)

(3) If your answer is (v) in Question 1 - (1),

How much you pay for the lease per month? (No answer)

2. The purpose of owning or renting the boat.

(1) To catch fish? (i) Yes 87, (ii) No 6.

If your answer is "(i) Yes":

(1) - 1 Where is the location of your main fishing area, please indicate in the attached maps (MAP-1 and MAP-2)?

Area A: 32, Area B: 44, Area C: 7, Area D: 4

(1) - 2 Do you pay any charge or tax for the permission to catch fish at the fishing site you indicated above?

(i) Yes 21,  
Riel/Month: 300 - 500; 5, 500 - 1,000; 1  
1,000 - 2,000; 3, Over 2,000; 12

(ii) No 0, No answer 72.

(1) - 3 What are the major type of fish you catch?

- (i) Shrimp 59, (ii) Fish 40, (iii) Crab 1,
- (iv) Squid / Octopus 0, (v) Shell fish 0,
- (vi) Others 0 ( ).

(1) - 4 How do you sell the fish you catch?

- (i) you sell to a broker 81,
  - (ii) yourself or your family themselves sell in the city 1,
  - (iii) Other (None ), (iv) No answer 11.
- (Please skip to question 3)

(2) For transportation business (i) Yes 13, (ii) No 80.

(2) - 1 If your answer is "Yes",

(i) what is the route of your service ?



Sihanoukville - Village No. 1 : 4  
 Sihanoukville - Kohron Is. : 9

If your answer is "(i) Village 2", please answer Questions 4. If your answer is (ii) No, please skip to Question 5.

(ii) On the average, how many passengers do you carry at a time?  
 ( less than 50 ) 13

(3) For tourism business (i) Yes 1, (ii) No 92,

If your answer is "Yes", please answer the following questions.

(3)-1 What is your major field of activity?  
 (i) pleasure fishing 0, (ii) diving 0,  
 (iii) water skiing 0, (iv) sightseeing(cruising) 1.

(3)-2 Frequency of your service per week.  
 (i) Almost every day 1, (ii) Weekends only 0,  
 (iii) On season only 0, (iv) Other (None) 0.

(3)-3 How many passenger, on the average, do you carry at a time?  
 (less than 50) 1  
 (Please skip to Question 3.)

(4) For safeguard/security business  
 (i) Yes 14, (a. for private property 14, b. for public property 0 ).  
 (ii) No 79  
 (Please skip to Question 3.)

(5) for other purpose ( No answer )  
 (Please skip to Question 3.)

3. Location of the permanent mooring of the boat.

(1) Do you permanently use this village to moor your ship?  
 (i) Yes 87, (ii) No 6

4. To those who permanently moor their ship in Village No. 2

(1) The reason you moor your ship(s) in Village No. 2. ( Duplicated answers)

- (i) There is no other place allowed to moor the ship 45  
 (ii) For the convenience: a. to sell fish 78  
 b. to buy oil, food 66  
 c. to maintain, repair fishing gear 46  
 d. to maintain, repair the ship 41  
 e. to live (your house is near) 31

(2) How often do you operate your ship per week?

- (i) Almost every day ( more than 5 days ) 59,  
 (ii) 3 - 4 days 24, (iii) 1 - 2 days 8,  
 (iv) Less than one day (several times a month) 1.

(3) What time do you usually start working (does your boat leave the village)?

- (i) Early in the morning 00:00 - 06:00 11,  
 (ii) In the morning 06:00 - 11:00 9,  
 (iii) About noon time 11:00 - 14:00 2,  
 (iv) Afternoon 14:00 - 17:00 57,  
 (v) Evening 17:00 - 20:00 5,  
 (vi) Late evening 20:00 - 24:00 7.

(7) In addition to mooring your ship, what do you do with your ship in Village No. 2.

- (Duplicate answers)
- (i) Washing ship 66, (ii) Supply of fuel and water 79,
  - (iii) Supply of food 71, (iv) Selling fish you catch 63,
  - (v) To live on the ship 40,
  - (vi) Maintenance and repair of fishing gear 44,
  - (vii) Maintenance and repair of your ship 26,
  - (viii) Other ( None ).

(4) What time do you usually return to the village?

- (i) Early in the morning 00:00 - 06:00 34,
- (ii) In the morning 06:00 - 11:00 30,
- (iii) About noon time 11:00 - 14:00 17,
- (iv) Afternoon 14:00 - 17:00 7,
- (v) Evening 17:00 - 20:00 5,
- (vi) Late evening 20:00 - 24:00 0.

(5) How long have you been using the jetty for mooring the boat?

Over the period:

- (i) 1 year or less 28, (ii) 2 - 3 years 53, (iii) 4 - 5 years 9,
- (v) 6 - 10 years 3, (v) Longer than 10 years 0.

(6) Where did you moor your boat before?

- (i) Other place within the New Port area of Sihanoukville Port 10,
- (ii) The New Port area: in Village No. 1 14,
- (iii) The New Port area: in Village No. 3 0,
- (iv) Out side of New Port area:

- a. North of Sihanoukville 3,
  - b. South of Sihanoukville 6,
  - c. Out side of Sihanoukville:
- c-1 Other place of main land 2, c-2. Island 2.

(8) Please indicate your main access route to Village No. 2 (the passage inside and outside of the New Port area) in the attached maps. Please indicate in the Map.

(9) How often do you use the mooring facilities in Village No. 1?

- (i) Never use 18,
- (ii) Sometimes (once to 2 times a week) 28,
- (iii) Often use (3 to 5 times a week) 9,
- (iv) Frequently (6 or more times a week) 1.

(10) If your answer is (i), please skip to (11)

What is your purpose to visit Village No. 1?

- (i) For supply of oil, food, water, etc. 11,
- (ii) To sell the fish you catch 21,
- (iii) To see your relatives or friend 16,
- (iv) Other purpose 1 ( no specify).

(11) In case you use the mooring facilities in Village 1, do you have to pay any charge for mooring your ship there?

(i) Yes 20 ,  
Amount(Riel/Day): 100 - 150; 7 , 250 - 300; 7 ,  
500 ; 2 1,000 ; 3 .

to which agency: (*Agriculture Company, Reamey Bopear Co.,  
Fishery Department, Thmorso Port Contractor*),

(ii) No 22 .

(12) Do you have your house in Village No. 2?

(i) Yes 36 , (ii) No 57 .

A-33

If your answer is (i) "Yes", please answer Question II. If your answer is (ii) No, please answer the following question.

(13) Where is your house to live?

- (i) On the ship 38 ,  
(ii) Within or near Sihanoukville Port area other than Village No. 2 6 ,  
(iii) In Sihanoukville City 16 , (iv) Outside Sihanoukville City 2 .

Please Skip to Question III.

5. To those who moor their ships temporarily in village No. 2.

(1) Where is the your permanent mooring place?

- (i) The New Port area: in Village No. 1 5 ,

(ii) The New Port area: in Village No. 3 0 ,

(iii) Out side of New Port area:

- a. North of Sihanoukville 0 ,  
b. South of Sihanoukville 0 ,  
c. Out side of Sihanoukville;  
c-1. Other place of main land 0 , c-2. Island 1 .

(2) What is the purpose you moor your ship in Village No. 2? (Duplicate answer)

- (i) to sell fish 5 , (ii) to buy oil, food 5 ,  
(iii) to maintain, repair fishing gear 5 ,  
(iv) to maintain, repair the ship 6 ,  
(v) to visit your family or relatives (their houses are in the Village) 3 ,  
(vi) Other purpose ( None ) .

(3) How often you visit village No. 2 by your ship?

- (i) Frequently (3 or more times a week) 3 ,  
(ii) Often use (once or two times a week) 2 ,  
(iii) Sometimes (few times a month) 1 ,  
(iv) Occasionally (few times a year) 0 .

II. Question to the owner of the house in Village No. 2.

House Identification ( )  
 Location (please mark on the Map-1)

- (v) To run restaurant \_\_\_\_\_ 0 \_\_\_\_\_
- (vi) Selling of goods other than fish, shrimp, crab, etc. caught \_\_\_\_\_ 0 \_\_\_\_\_
- (vii) Maintenance and repair of boat \_\_\_\_\_ 0 \_\_\_\_\_
- (viii) Security guard for the ship \_\_\_\_\_ 0 \_\_\_\_\_
- (ix) Other use ( None ) \_\_\_\_\_

1. How long have you owned your house in this Village?

- (i) for 1 year or less \_\_\_\_\_ 10 \_\_\_\_\_
- (ii) for about 2 - 3 years \_\_\_\_\_ 15 \_\_\_\_\_
- (iii) for about 4 - 5 years \_\_\_\_\_ 5 \_\_\_\_\_
- (iv) for 6 years or longer \_\_\_\_\_ 11 \_\_\_\_\_

(2) If your answer to the Question (1) above is (i), how many persons live in your house?

- (i) One (you alone) \_\_\_\_\_ 2 \_\_\_\_\_, please answer Question 4,
- (ii) 2 - 5 persons(you and your family) \_\_\_\_\_ 35 \_\_\_\_\_,
- (iii) More than two families \_\_\_\_\_ 1 \_\_\_\_\_.

2. Where was your house before you moved in this place?

(Please skip to Question III)

- (i) Other place in the port area of Sihanoukville Port \_\_\_\_\_ 6 \_\_\_\_\_,
- (ii) In the port area of Sihanoukville Port (inland) \_\_\_\_\_ 6 \_\_\_\_\_,
- (iii) Other place in Sihanoukville ( Coast ) \_\_\_\_\_ 1 \_\_\_\_\_,
- (iv) Other place in Sihanoukville (inland) \_\_\_\_\_ 6 \_\_\_\_\_,
- (v) Outside of Sihanoukville City \_\_\_\_\_ 21 \_\_\_\_\_

(Phnom Penh; 4, Kompot; 9, Battambang; 2, Pursat; 1, Takeo; 2, Steng Hao; 1, Siem Peap; 1, Prey Hup; 1)

(3) If your answer to the Question (1) above is other than (i), where is your living place?

- (i) Other place in Village No. 2 \_\_\_\_\_ 0 \_\_\_\_\_,
- (ii) In the port area outside of Village No. 2 \_\_\_\_\_ 0 \_\_\_\_\_,
- (iii) In downtown in Sihanoukville City \_\_\_\_\_ 2 \_\_\_\_\_,
- (iv) Other place ( None ) \_\_\_\_\_

(4) If your answer to the Question (1) above is (iv) Buying fish, where do you sell the fish you buy here?

- (i) For household consumption \_\_\_\_\_ 3 \_\_\_\_\_,
- (ii) To the food processing factory \_\_\_\_\_ 0 \_\_\_\_\_,
- (iii) In the downtown of Sihanoukville \_\_\_\_\_ 3 \_\_\_\_\_,
- (iv) In other cities: \_\_\_\_\_

a. Phnom Penh \_\_\_\_\_ 1 \_\_\_\_\_, b. Other place ( None ) \_\_\_\_\_

(Please skip to Question III)

3. Purpose of house use

(1) What is the major use of the house?

- (i) To live \_\_\_\_\_ 37 \_\_\_\_\_,
- (ii) Vending fishing equipment (net, float, cage, etc.) \_\_\_\_\_ 2 \_\_\_\_\_,
- (iii) Selling fish \_\_\_\_\_ 0 \_\_\_\_\_,
- (iv) Buying fish \_\_\_\_\_ 2 \_\_\_\_\_,

4. In the case that your family live separately from you, where does your family live?

- (i) In Village No. 2 31,
- (ii) Within Sihanoukville Port area 1,
- (iii) Within Sihanoukville City 4,
- (iv) Outside of Sihanoukville City 5.

**III. For reference**

if you do not mind, would you please answer the following questions:

1. May we have your name please?

( ) )

2. How many personnel are living with your family?

- (i) Adults ( ) , (ii) Children ( ) .

Total answer 39

Number	1	2	3	4	5	6	7	8
Adults	6	24	2	2	2	3	0	2
Children	11	8	7	4	2	2	0	0

3. What are the occupations of your family members?

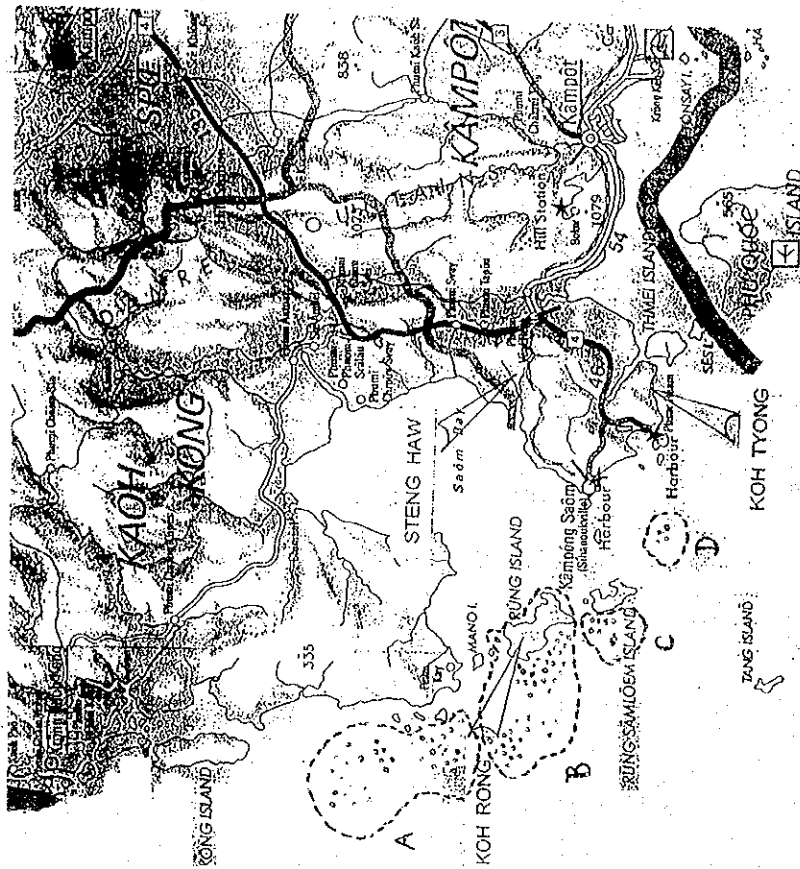
(Please mark all your family members' occupation.)

- (i) Fishery 17,
- (ii) Public service 3; a. Education 0, b. Health 0,
- (iii) Agriculture 0,
- (iv) Manufacturer 0, Type of business ( )
- (v) Shop owner 2,
- (vi) Employee 13, Type of business( Nobody specified )
- (vii) Others 2.

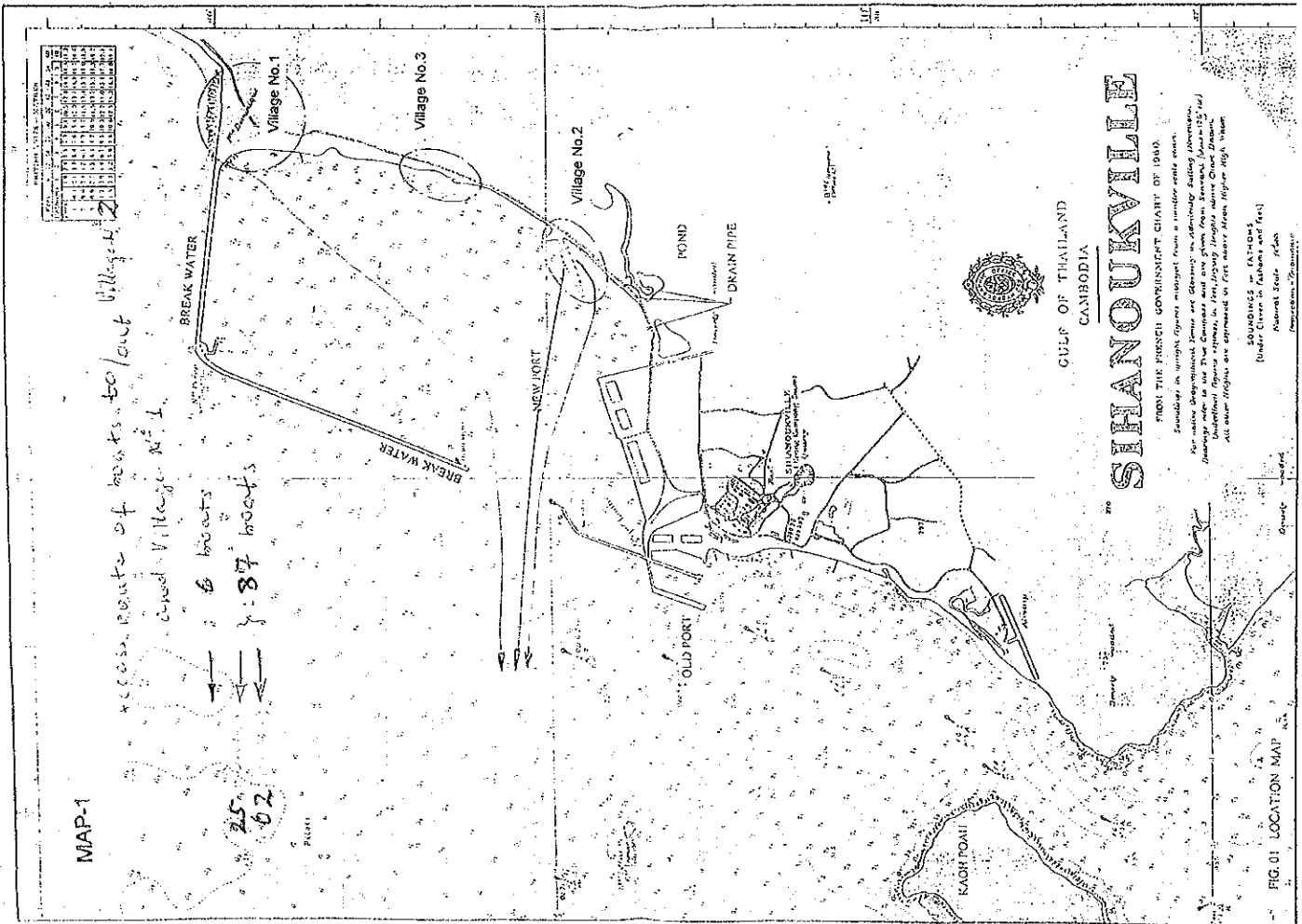
4. How long have you and your family lived in Sihanoukville?

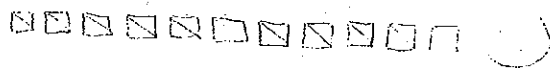
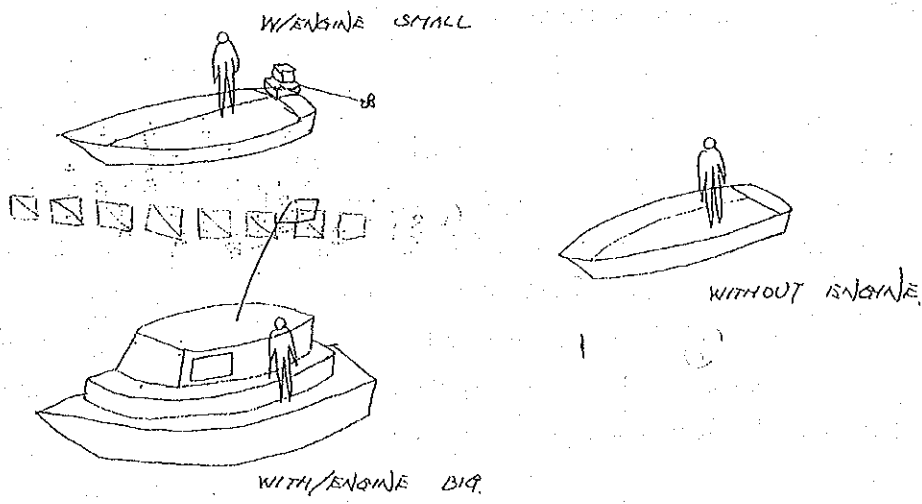
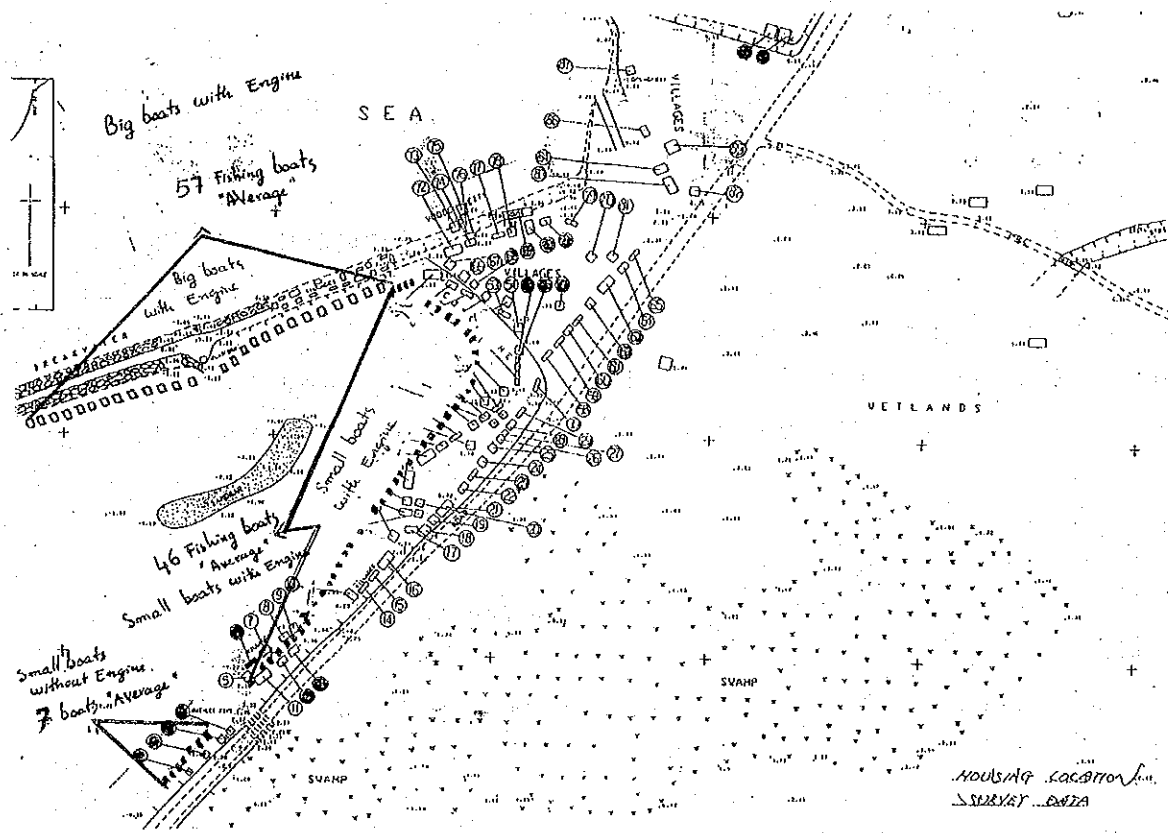
- (i) Less than 1 year 7, (ii) Over 1 and less than 3 years 8,
- (iii) Over 3 and less than 5 years 3,
- (iv) Over 5 years less than 10 years 10, (v) Over 10 years 10.

MAP-2



MAP-1





TYPE OF SHIP.

## Appendix F (Chapter 7.3):

### Results of traffic survey on National Road No. 4 and the municipal road

#### 1. General

Traffic survey was conducted on December 19(Thursday)-20(Friday), 28(Saturday), 29(Sunday), 30(Monday),1996. Though the survey was conducted during year end, the traffic observed during the period, except some traffic generated by tourists enjoying New Year's holidays, seemed to be similar to that would e observed in other season, since, in Cambodia, January the 1st is ordinary one-day national holiday and no special programs performed.

#### 2. Methodology

##### (1) Selection of the survey location

As shown in **Fig. - f.1**, two locations, which are called Point A and B were chosen on National Road No. 4 and Point B on the municipal road, respectively. Point A is located at the junction of National Road No. 4 and a municipal road to the town area of Sihanoukville city.

Point B is located at the Village No. 2, which is located next to New Quay of the Sihanoukville Port. Point A is the entrance to Central Sihanoukville City and all the traffic to and from the Center of the city, Sihanoukville Port, the municipal ports, fishing ports and Oil Port passes through this point. At Point B, traffic is diverted from National Road No. 4 and going to and coming from the municipal ports, fishing ports and Oil Port.

##### (2) Traffic surveys

First, preliminary traffic survey was conducted over 24 hours from 9:00 a.m. on Thursday through 9:00 a.m. on the following Friday morning. All types of four-wheel cars were counted by traffic counters. The results of this first survey showed that the traffic during the night ( 9:00 p.m. through 5:00 a.m.) is less than 5% of daily traffic.

On the basis of the results of the preliminary survey, another traffic survey was conducted over three consecutive days: Saturday through Monday, from 5:00 a.m. through 9:00 p.m. During the survey, traffic of motorcycles is also observed.

#### 3. Results

##### (1) Summary tables

The results of the series of traffic surveys are summarized in **Table - f.1(1)** through - **f.1(8)** and **Table - f.2 (1)** through - **f.2(4)**.

The series of **Tables - f.1(1)** through - **f.1(8)** show the hourly number of cars of various categories and motorcycles passed at Point A and B.

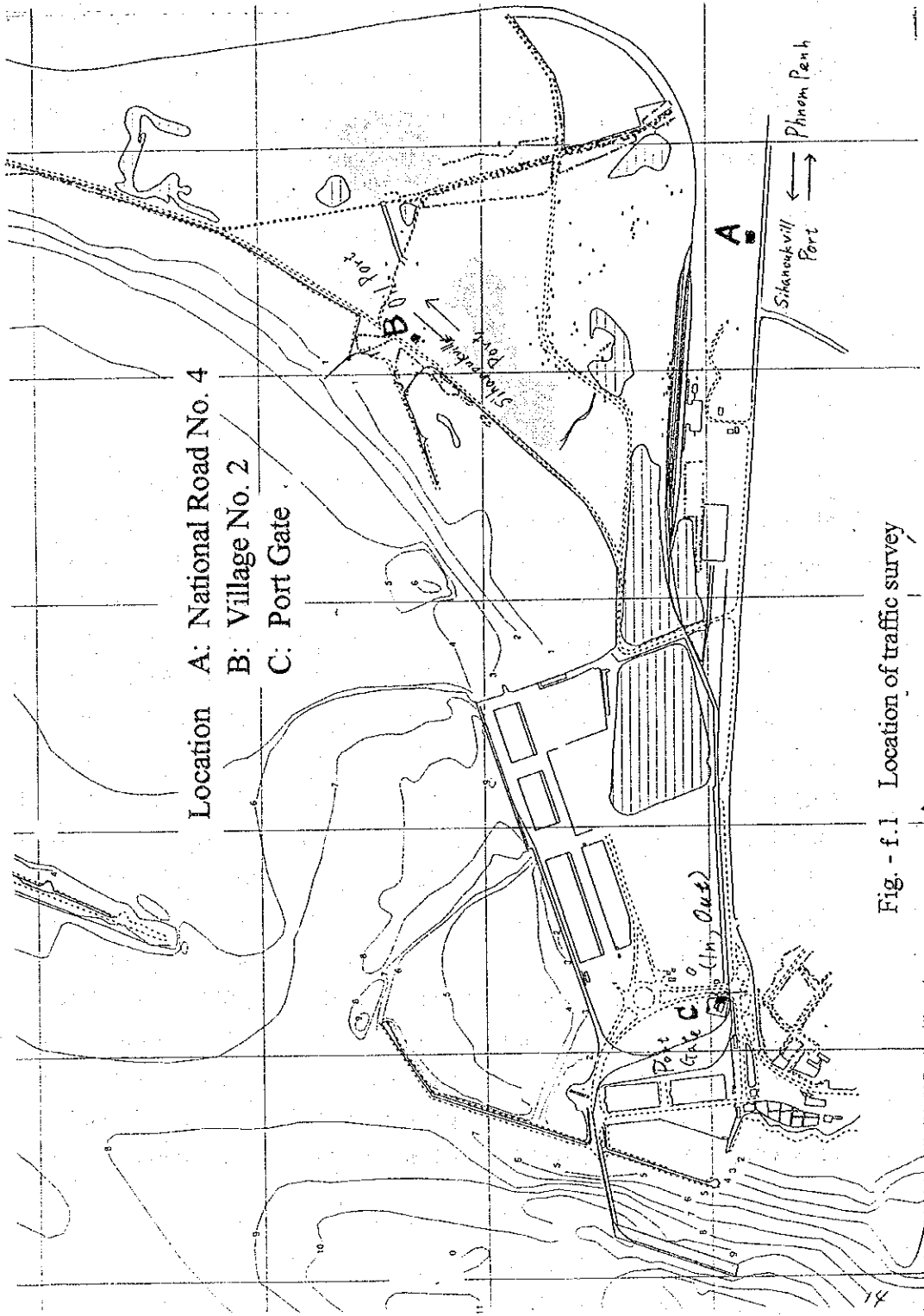
The series of **Tables - f.2(1)** through - **f.2(4)** show daily total number of cars at Point A,



B and C (Port Gate).

(2) Exhibits

- Fig. - f.2(1): Hourly variation of traffic (Point A, Phnom Penh - Sihanoukville)
- Fig. - f.2(2): Hourly variation of traffic (Point B, Oil Port - Sihanoukville Port)
- Fig. - f.3(1): Hourly variation of traffic by day of the week  
(Point A, Phnom Penh - Sihanoukville)
- Fig. - f.3(2): Hourly variation of traffic by day of the week  
(Point B, Oil Port - Sihanoukville Port)
- Fig. - f.4(1): Traffic volume by day of the week  
(Point A, Phnom Penh - Sihanoukville)
- Fig. - f.4(2): Traffic volume by day of the week  
(Point B, Oil Port - Sihanoukville Port)
- Fig. - f.5(1): Share by type of car (Point A, Phnom Penh - Sihanoukville)
- Fig. - f.5(2): Share by type of car (Point B, Oil Port - Sihanoukville Port)
- Fig. - f.6(1): Time variation of traffic (Thursday, Phnom Penh to Sihanoukville)
- Fig. - f.6(2): Time variation of traffic (Thursday, Sihanoukville to Phnom Penh)
- Fig. - f.6(3): Time variation of traffic (Thursday, Oil Port to Sihanoukville Port)
- Fig. - f.6(4): Time variation of traffic (Thursday, Sihanoukville Port to Oil Port)
- Fig. - f.7(1): Time variation of traffic (Saturday, Phnom Penh to Sihanoukville)
- Fig. - f.7(2): Time variation of traffic (Saturday, Sihanoukville to Phnom Penh)
- Fig. - f.7(3): Time variation of traffic (Saturday, Oil Port to Sihanoukville Port)
- Fig. - f.7(4): Time variation of traffic (Saturday, Sihanoukville Port to Oil Port)
- Fig. - f.8(1): Time variation of traffic (Sunday, Phnom Penh to Sihanoukville)
- Fig. - f.8(2): Time variation of traffic (Sunday, Sihanoukville to Phnom Penh)
- Fig. - f.8(3): Time variation of traffic (Sunday, Oil Port to Sihanoukville Port)
- Fig. - f.8(4): Time variation of traffic (Sunday, Sihanoukville Port to Oil Port)
- Fig. - f.9(1): Time variation of traffic (Monday, Phnom Penh to Sihanoukville)
- Fig. - f.9(2): Time variation of traffic (Monday, Sihanoukville to Phnom Penh)
- Fig. - f.9(3): Time variation of traffic (Monday, Oil Port to Sihanoukville Port)
- Fig. - f.9(4): Time variation of traffic (Monday, Sihanoukville Port to Oil Port)



Location A: National Road No. 4  
 B: Village No. 2  
 C: Port Gate

Fig. - f.1 Location of traffic survey

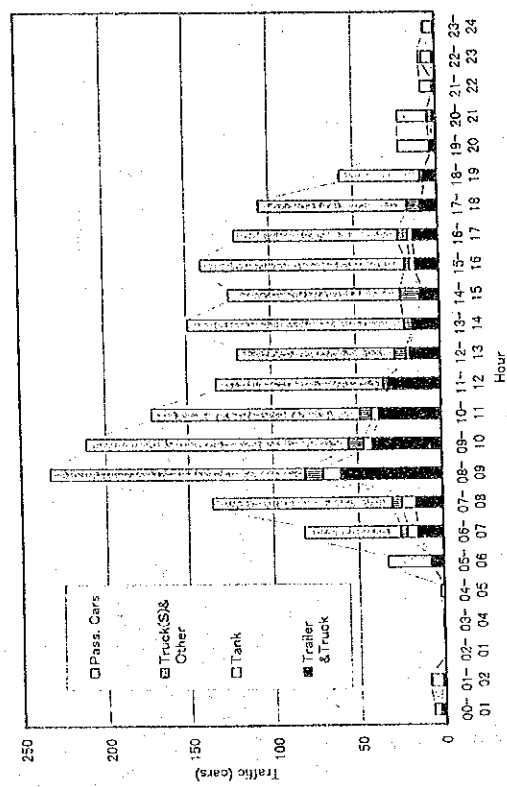


Fig. - f.2(1) Traffic on National Road No. 4, Location A  
(Dec. 19 - 20, 1996, Phnom Penh - Sihanoukville)

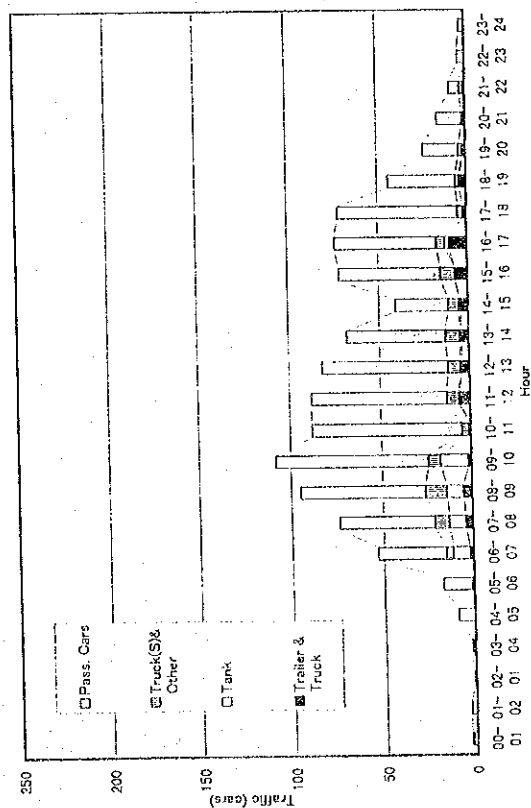


Fig. - f.2(2) Traffic on Municipal Road, Location B  
(Dec. 19 - 20, 1996, Oil Port - Sihanoukville Port)

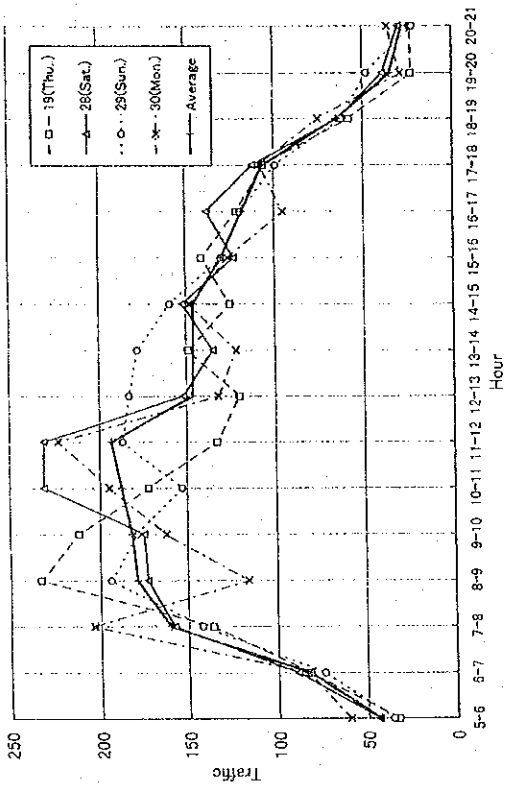


Fig. - f.3(1) Time variation on National Road, Location A  
(Phnom Penh - Sihanoukville)

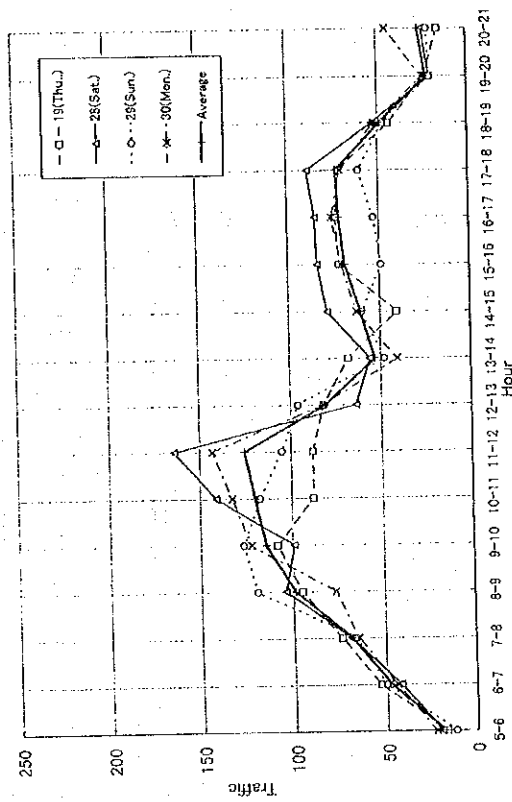


Fig. - f.3(2) Time variation on Municipal Road, Location B  
(Oil Port - Sihanoukville Port)

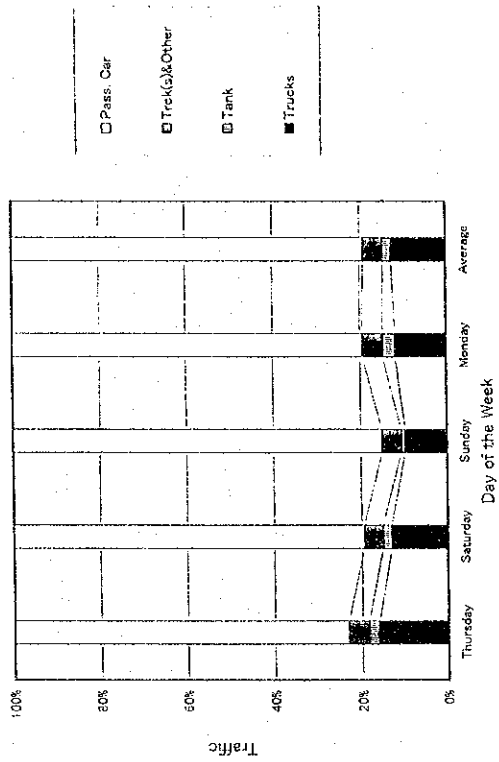


Fig. - f.5(1) Share of type of vehicles on National Road

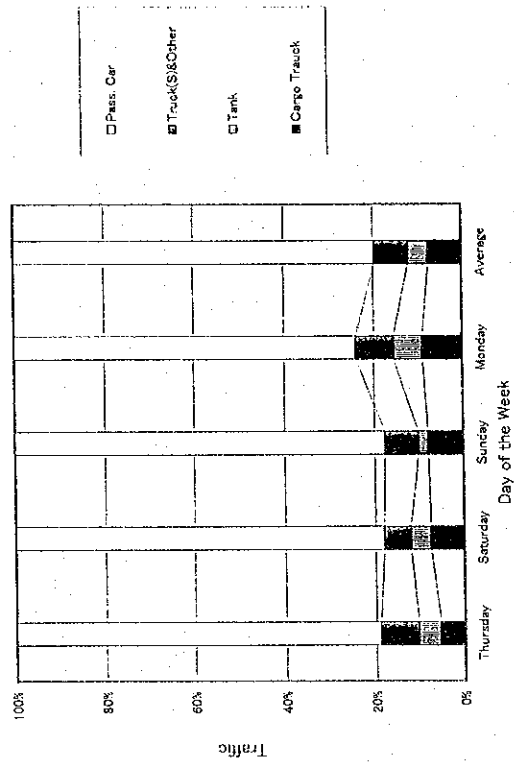


Fig. - f.5(2) Share of type of vehicles on Municipal Road

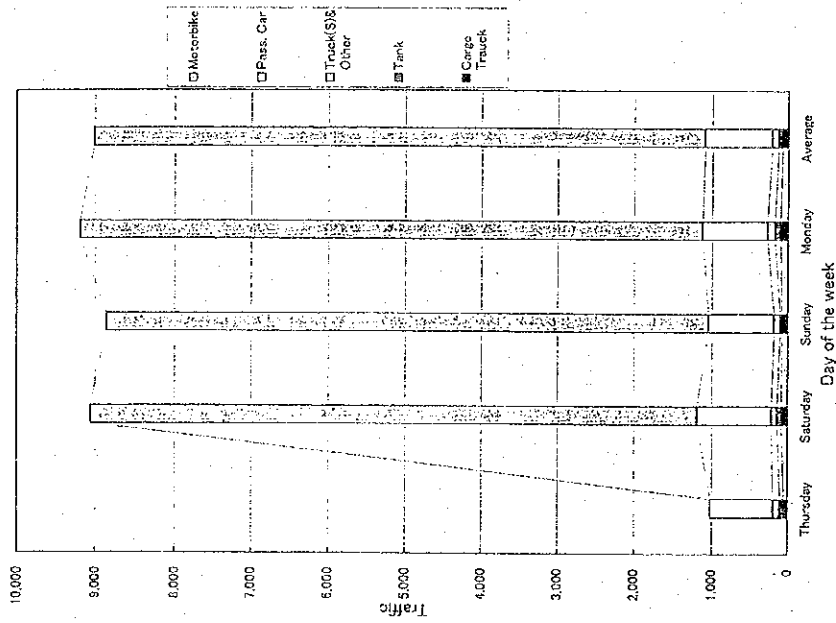


Fig. - f.4(2) Composition of vehicle types on Municipal Road

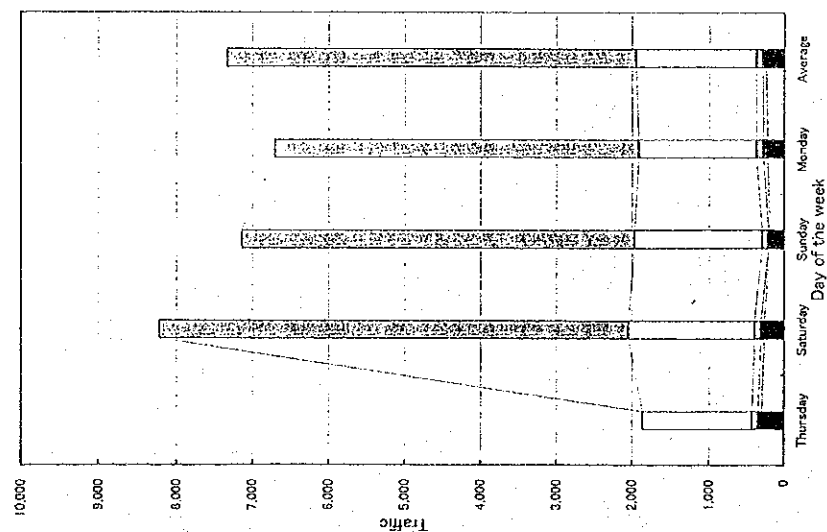


Fig. - f.4(1) Composition of vehicle types on National Road

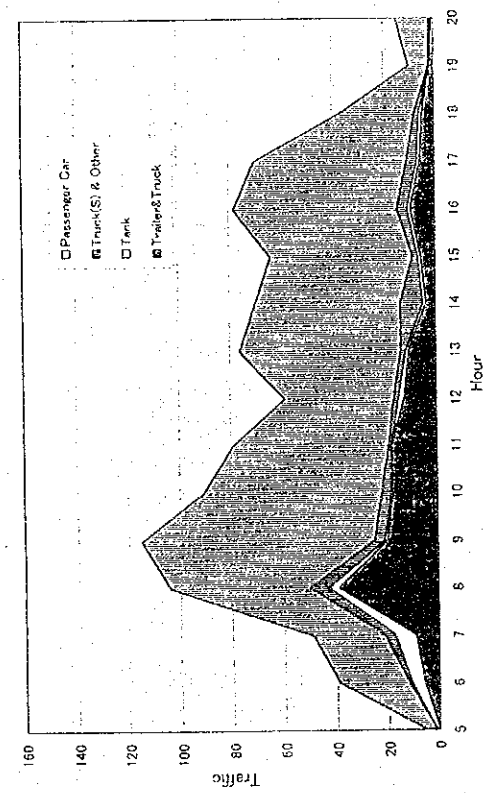


Fig. - f.6(1) Time variation of traffic on National Road (Thursday, from Phnom Penh to Sihanoukville)

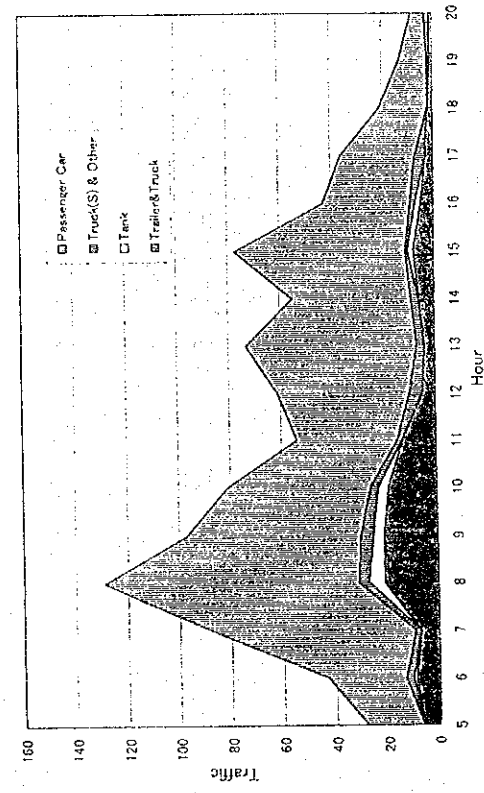


Fig. - f.6(2) Time variation of traffic on National Road (Thursday, from Sihanoukville to Phnom Penh)

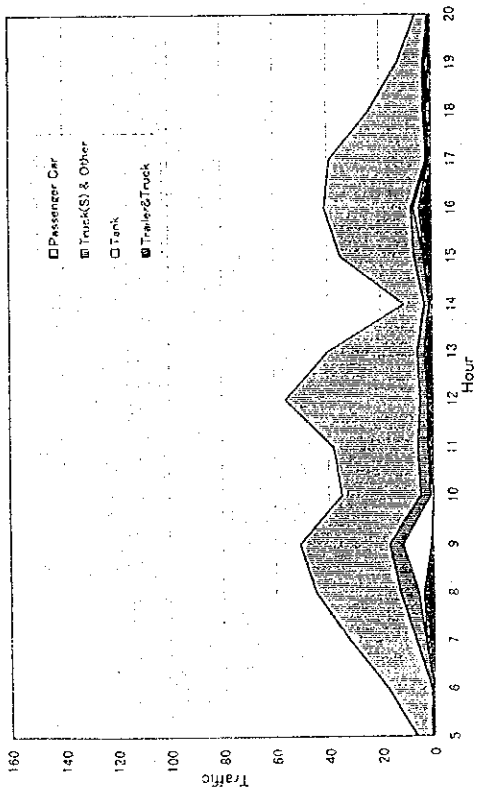


Fig. - f.6(3) Time variation of traffic on Municipal Road (Thursday, from Oil Port to Sihanoukville Port)

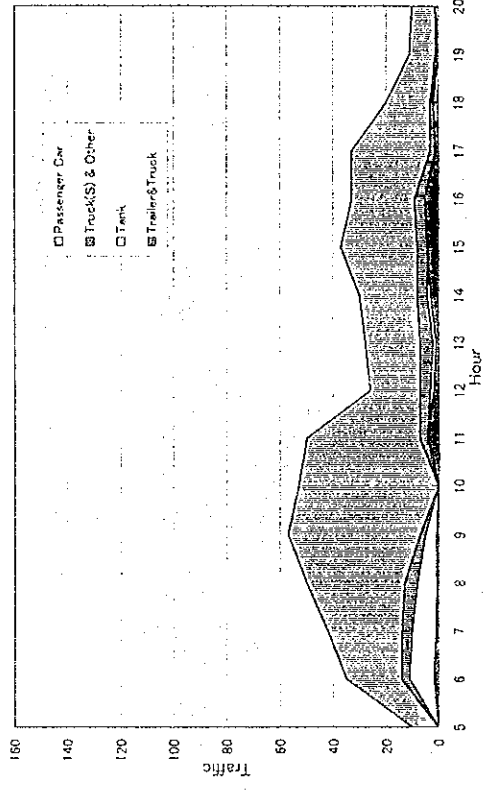


Fig. - f.6(4) Time variation of traffic on Municipal Road (Thursday, from Sihanoukville Port to Oil Port)

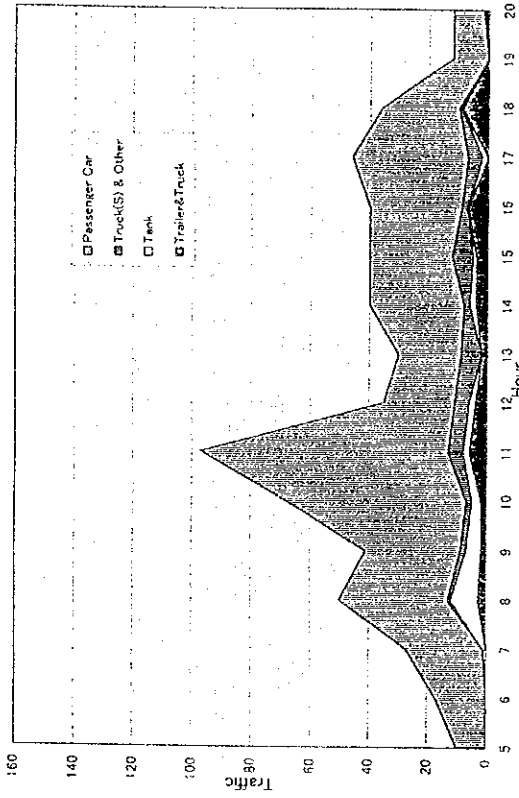


Fig. - f.7(3) Time variation of traffic on Municipal Road (Saturday, from Oil Port to Sihanoukville Port)

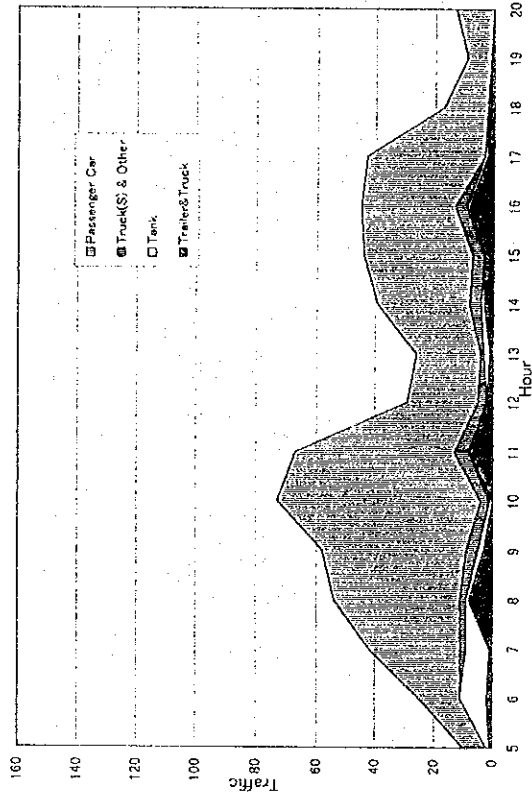


Fig. - f.7(4) Time variation of traffic on Municipal Road (Saturday, from Sihanoukville Port to Oil Port)

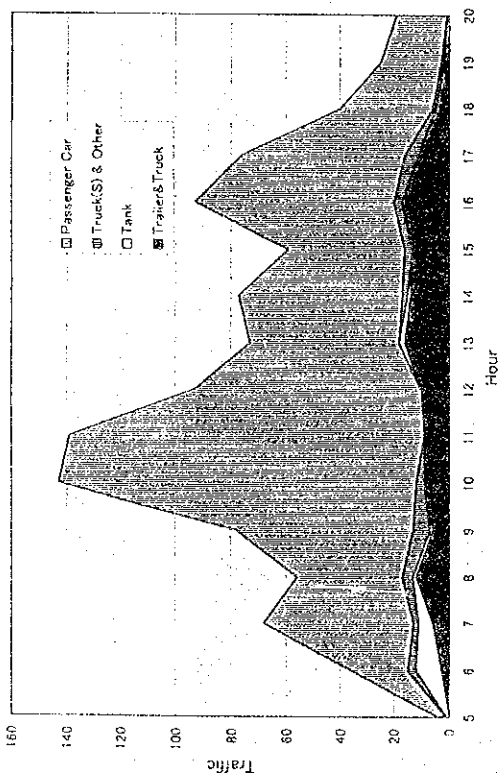


Fig. - f.7(1) Time variation of traffic on National Road (Saturday, from Phnom Penh to Sihanoukville)

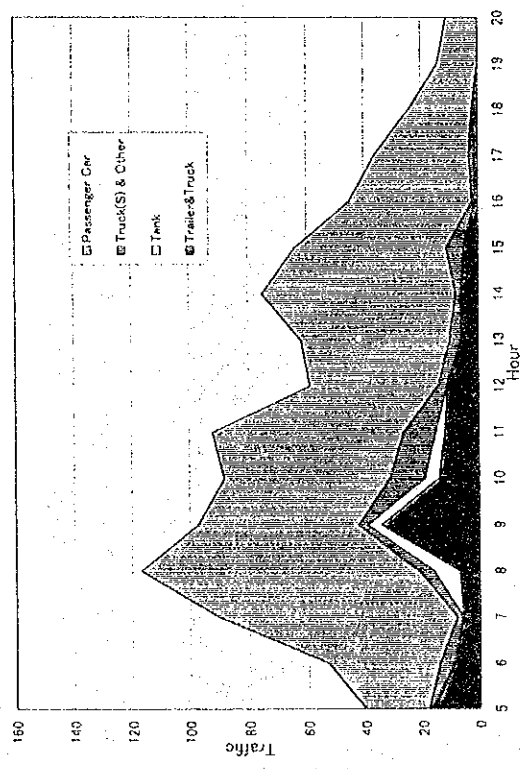


Fig. - f.7(2) Time variation of traffic on National Road (Saturday, from Sihanoukville to Phnom Penh)

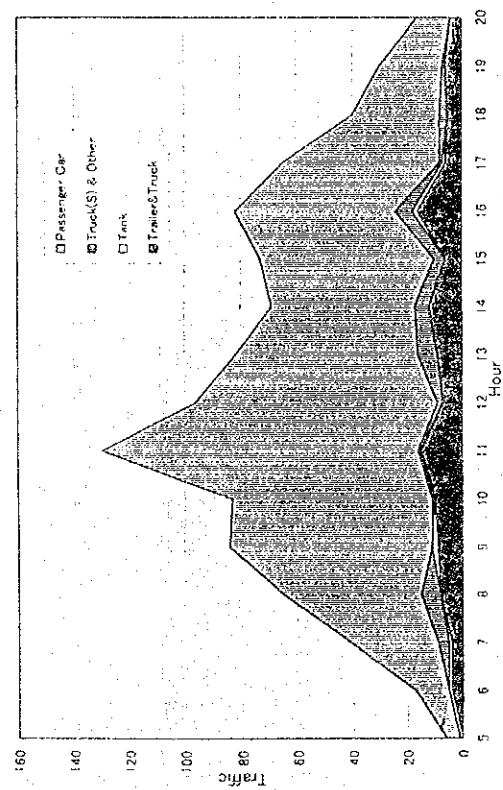


Fig. - f.8(1) Time variation of traffic on National Road  
(Sunday, from Phnom Penh to Sihanoukville)

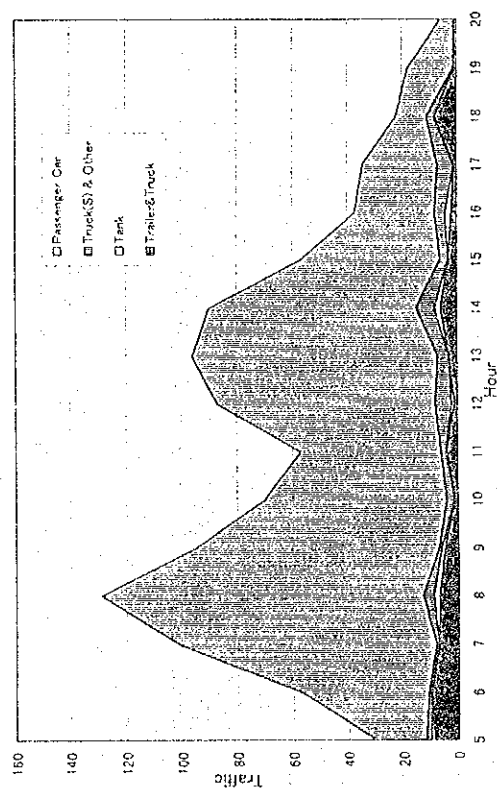


Fig. - f.8(2) Time variation of traffic on National Road  
(Sunday, from Sihanoukville to Phnom Penh)

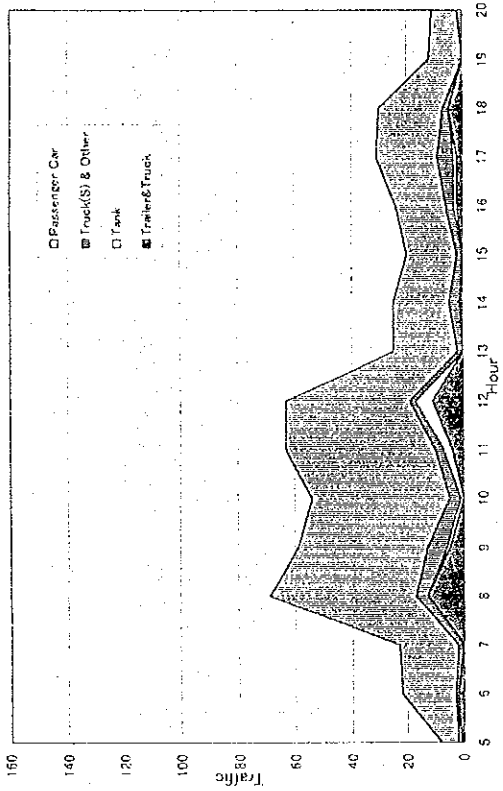


Fig. - f.8(3) Time variation of traffic on Municipal Road  
(Sunday, from Oil Port to Sihanoukville Port)

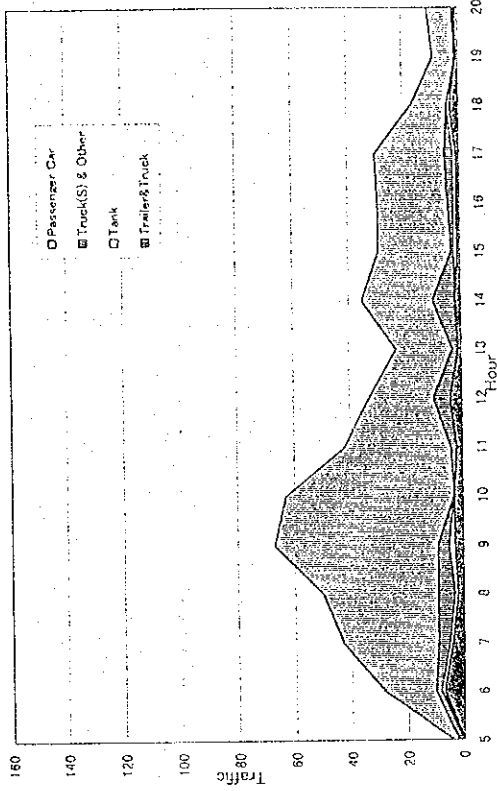


Fig. - f.8(4) Time variation of traffic on Municipal Road  
(Sunday, from Sihanoukville Port to Oil Port)

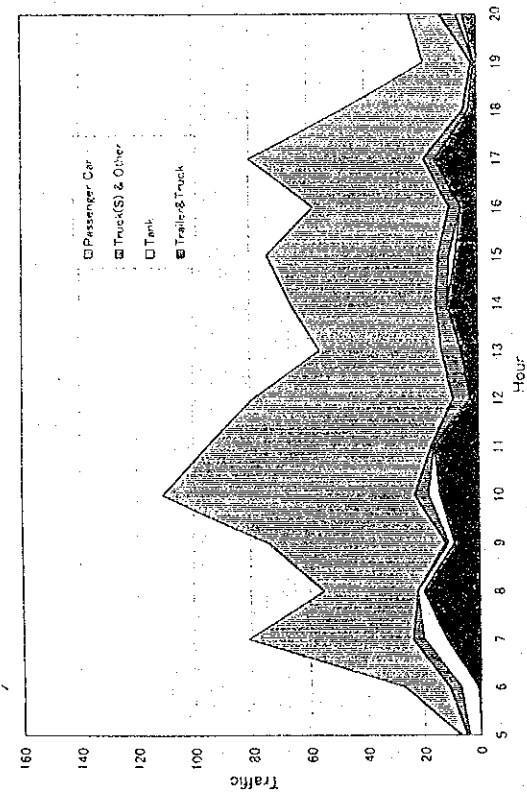


Fig - f.9(1) Time variation of traffic on National Road (Monday, from Phnom Penh to Sihanoukville)

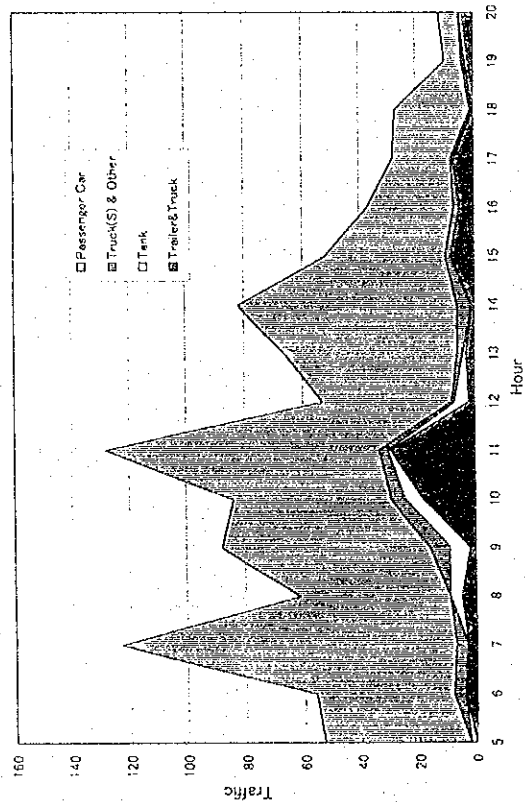


Fig - f.9(2) Time variation of traffic on National Road (Monday, from Sihanoukville to Phnom Penh)

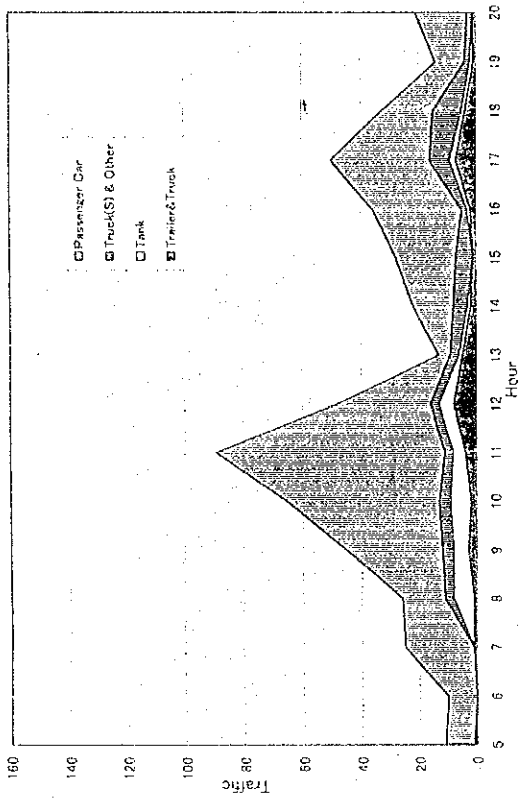


Fig - f.9(3) Time variation of traffic on Municipal Road (Monday, from Oil Port to Sihanoukville Port)

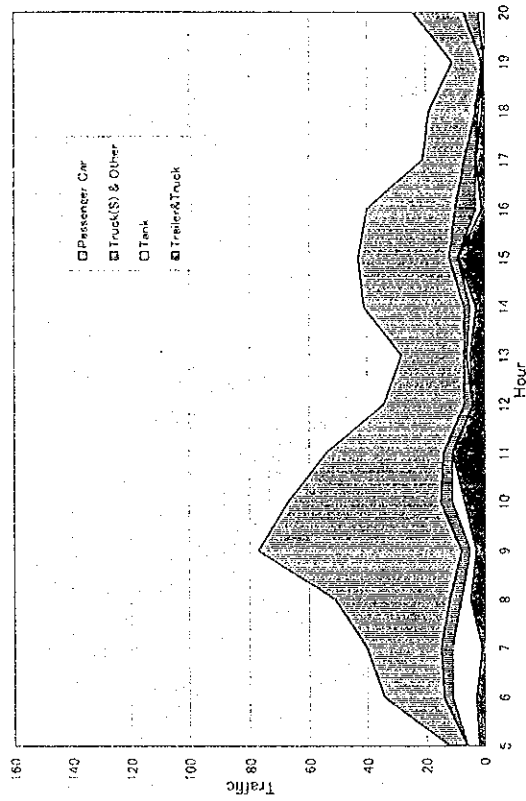


Fig - f.9(4) Time variation of traffic on Municipal Road (Monday, from Sihanoukville Port to Oil Port)