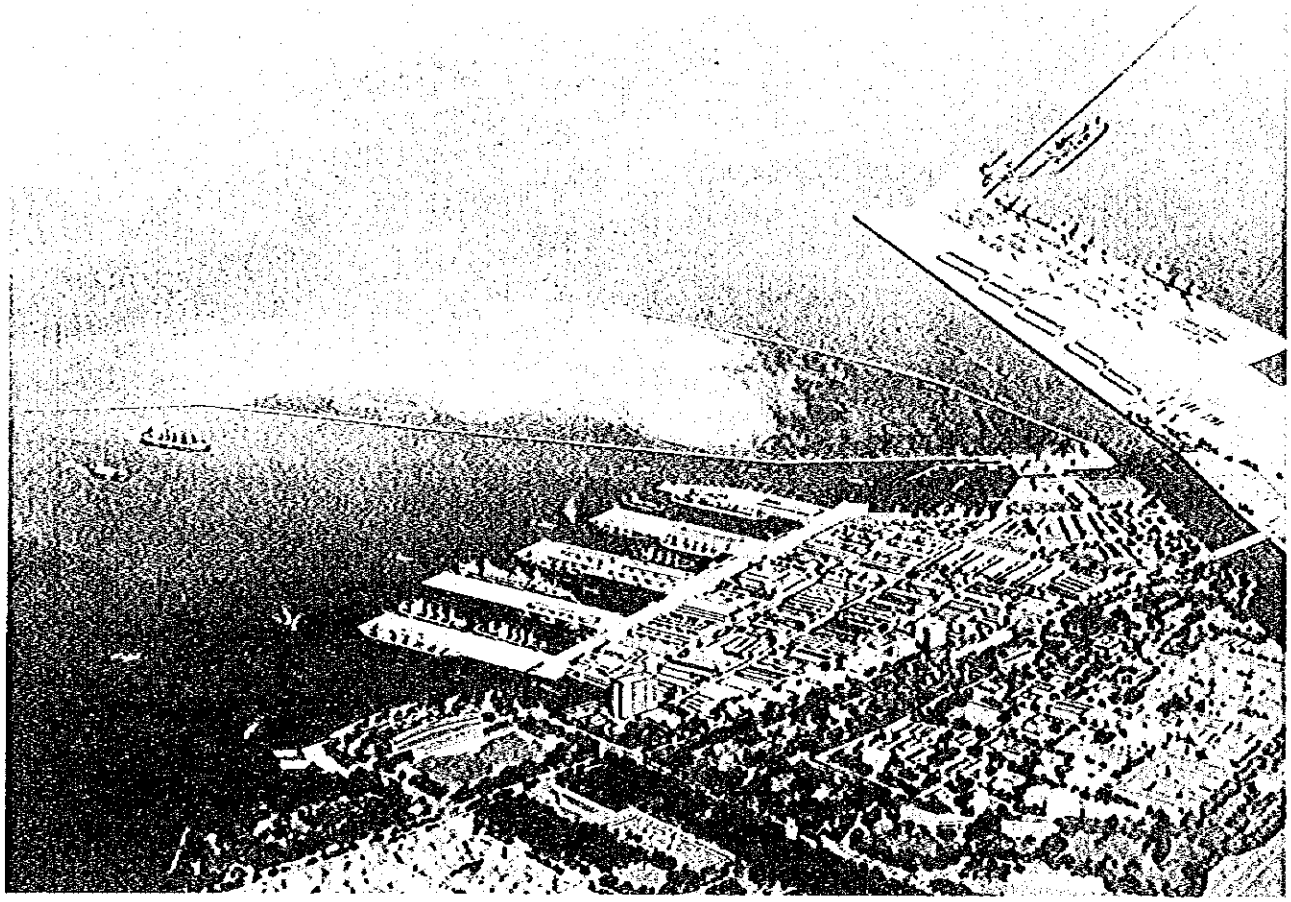
社会開発協力部報告書

VOLUME 3 APPENDICES

MANILA SOUTH PORT REHABILITATION PROJECT

REPUBLIC OF THE PHILIPPINES



FEASIBILITY STUDY

FINAL REPORT

JUNE 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

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Appendix 2.2.1 Future Population Projections

Philippine population projections for the period 1980 to 2030 have been prepared by the Population/Development Planning and Research Project of NEDA. Population estimates are based on the revised projections prepared by NCSO.

Three alternatives, that is high, medium and low projections, are based upon different assumptions about fertility, mortality and migration. The assumptions used for the three alternative forecasts are as follows:

Low Assumption:	Rapid fertility decline and moderate mortality decline.
Medium Assumption:	Moderate fertility decline and moderate mortality decline.
High Assumption:	Slow fertility decline and moderate mortality decline.

Rapid fertility decline means that fertility will decline from its 1980 level so that an NRR (Net Reproduction Rate) of one (1) will be achieved by the year 2000. Moderate fertility decline means that fertility will decline from its 1980 level so that an NRR of one (1) will be achieved by the year 2010. Slow fertility decline means that fertility will decline from its 1980 level so that an NRR of one (1) will be achieved by the year 2020.

As for migration, the foregoing study adopted only one set of migration assumptions on account of the difficulty of projecting future migration patterns. The projections assume that international migration will have little effect on the national population due to strict immigration laws, but that the inter-regional net migration rate will continue the present pattern of population redistribution though at a progressively diminishing rate. The inter-regional net migration rates used for the projections are as follows:

Region	Net Migration Rate, 1975-1980
Metropolitan Manila Area	3.70
Region I	-1.79
II	-0.17
III	0.25
IV	1.43
V	-2.25
VI	-1.97
VII	-2.08
VIII	-3.13
IX	-0.47
X	1.69
XI	1.07
XII	0.99

Appendix 2.4.1 Existing Road Network by System Classification and Surface Type: 1979-1984

TOTAL

YEAR	ALL TYPES	EARTH	MACADAM	BITUMINOUS	CONCRETE	MISC.
1979	147,608.83	52,354.67	67,809.55	17,483.47	9,961.14	-
1980	151,918.76	53,914.64	70,284.71	17,634.41	10,085.00	-
1981	153,528.08	55,210.82	70,581.52	17,475.51	10,260.23	-
1982	154,473.30	10,417.04	124,595.72	11,106.41	8,354.13	-
1983	155,671.06	9,953.13	125,901.97	11,273.6	8,542.40	-
1984	157.139.10	9,580.17	127,531.31	11,298.51	8,729.11	-

NATIONAL

YEAR	ALL TYPES	EARTH	MACADAM	BITUMINOUS	CONCRETE	MISC.
1979	23,552.21	767.40	12,784.91	4,821.95	5,177.95	-
1980	23,641.10	856.47	12,668.54	4,906.35	5,209.74	-
1981	23,488.72	928.12	12,324.98	4,912.88	5,322.74	-
1982	23,783.45	886.40	12,431.35	4,918.44	5,547.26	-
1983	24,140.47	594.94	12,755.73	5,078.66	5,711.14	-
1984	25,116.75	651.19	13,419.89	5,316.35	5,729.32	-

LOCAL

YEAR	ALL TYPES	EARTH	MACADAM	BITUMINOUS	CONCRETE	MISC.
1979	124,056.62	51,587.27	55,024.64	12,661.52	4,783.19	-
1980	128,277.66	53,058.17	57,616.17	12,728.06	4,875.26	-
1981	130,039.36	54,282.70	58,256.54	12,562.63	4,937.49	-
1982	130,689.85	9,530.64	112,164.24	6,187.97	2,806.87	-
1983	131,530.59	9,358.19	113,146.24	6,194.90	2,831.26	-
1984	132,022.35	8,928.98	114,111.42	5,982.16	2,999.79	-

Source: Philippine Statistical Yearbook 1985

Appendix 2.4.2 PNR Railways and Motor Service Rolling Stock Inventory 1978-1983

INVENTORY	1978	1979	1980	1981	1982	1983
Train Service	1,767	1,727	1,659	1,600	1,547	1,334
Passenger cars and baggage cars	218	259	218	217	206	218
Diesel rail cars	125	125	147	146	127	108
Diesel engine locomotives	101	109	109	109	111	84
Freight Cars	1,323	1,234	1,185	1,128	1,103	924
Motor Service	233	161	174	160	101	101
Revenue vehicles	211	145	160	148	83	86
Buses	202	142	157	147	83	85
First Class	31	17	12	16	13	13
Air-conditioned	16	12	12	16	12	12
Mini-bus	3	3	-	-	1	1
Tourist	12	2	-	-	-	1
Third class	171	125	145	131	70	72
Freight trucks & tankers	9	3	3	1	-	1
Non-revenue vehicles	22	16	14	12	18	15
Automobiles	3	3	3	2	-	-
Jeeps	14	9	6	6	17	12
Ambulances	2	1	2	2	-	1
Wreckers	3	3	3	2	1	2

Source: Philippine Yearbook 1985

Appendix 2.4.3 Traffic Volume and Revenue for Railways (PNR): 1950-1985

YEAR	PASSENGERS CARRIED (Thousand)	PASSENGER REVENUE (Thousand Pesos)	REVENUE PER PASSENGER	FREIGHT TONS CARRIED (Thousand)	FREIGHT REVENUE (Thousand Pesos)	REVENUE PER FREIGHT TON (Pesos)	EXPRESS TONS CARRIED (Thousand)	EXPRESS REVENUE (Thousand Pesos)	REVENUE PER EXPRESS TON (PESOS)
1950	6,430.0	7,025.6	1.09	787.2	6,812.0	8.65	44.3	1,674.6	37.79
1955	7,104.1	8,229.4	1.16	1,130.8	7,357.4	6.51	48.9	1,975.7	40.40
1960	9,546.5	13,684.3	1.43	1,337.1	8,441.0	6.31	59.6	2,344.6	39.39
1965	8,088.0	15,945.8	1.97	837.3	5,263.8	6.29	61.6	2,421.6	39.30
1970	5,628.4	24,785.1	4.40	277.7	4,512.1	16.25	100.3	4,415.9	44.04
1971	4,794.0	28,816.9	6.01	378.8	5,146.7	13.59	68.5	3,587.5	52.37
1972	3,955.0	26,301.3	6.65	204.8	2,981.4	14.56	69.9	3,582.8	51.26
1973	6,162.6	33,822.8	5.49	257.0	4,304.2	16.75	83.3	4,649.4	55.82
1974	8,116.9	48,305.2	5.95	331.8	8,215.5	24.76	104.5	8,224.8	78.86
1975	8,723.3	52,012.8	5.96	280.6	9,383.7	33.44	69.4	8,036.5	115.80
1976	9,683.4	47,179.6	4.87	208.6	6,073.7	29.12	56.4	5,736.6	101.71
1977	12,796.4	48,264.9	3.77	194.3	6,740.4	34.75	51.3	5,267.6	102.68
1978	9,581.8	43,103.1	4.50	158.7	5,152.2	32.46	37.2	3,802.9	102.22
1979	8,531.6	38,546.1	4.52	145.5	5,783.4	39.88	34.2	4,381.5	128.11
1980	7,423.4	48,833.4	6.58	141.9	6,440.5	45.39	24.8	4,288.5	172.94
1981	7,808.8	41,502.6	5.31	115.8	6,729.9	58.12	18.2	3,411.0	187.42
1982	5,652.0	34,967.6	6.19	79.2	5,440.3	68.69	15.8	3,642.0	230.51
1983	6,517.7	45,698.0	7.01	65.3	5,377.6	82.35	17.1	3,989.0	233.27
1984	6,018.2	61,471.7	10.21	72.1	8,851.4	122.72	21.6	6,878.3	318.44
1985	1,315.8	17,639.8	13.41	13.0	2,086.6	160.51	5.36	1,974.3	368.34

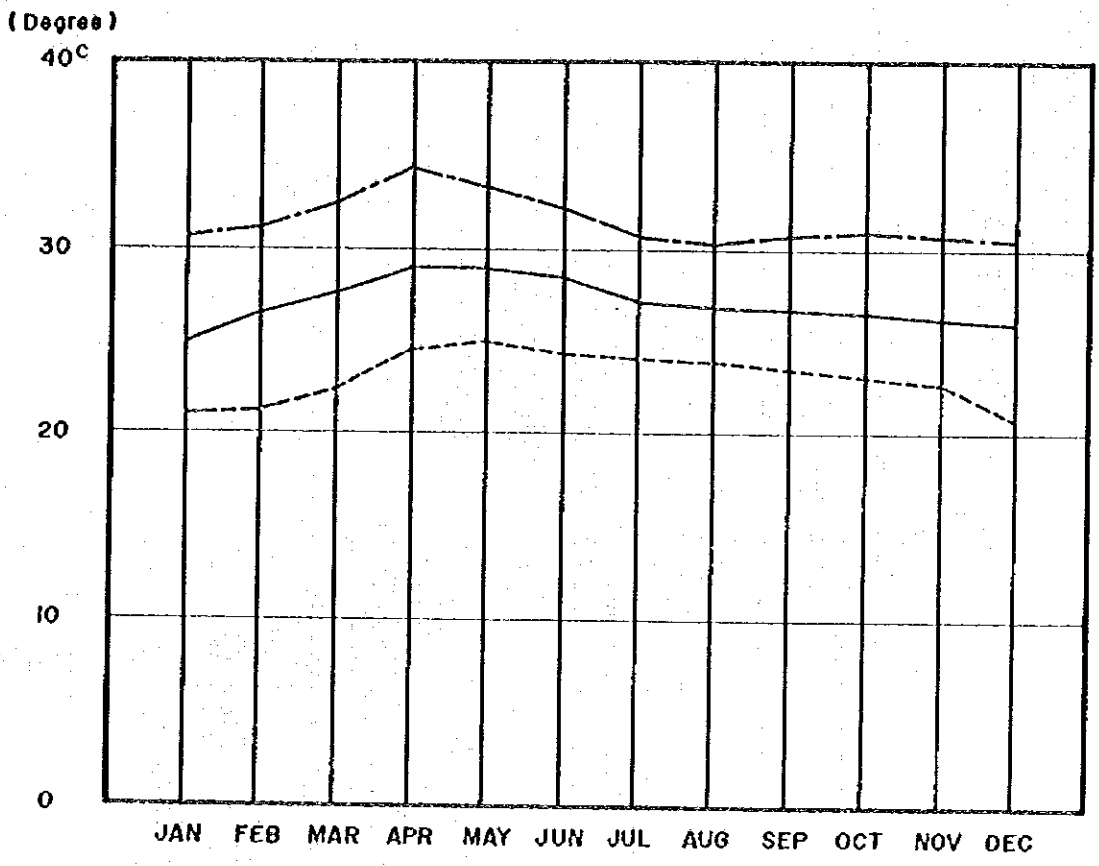
Source: Philippine Statistical Yearbook 1985

Appendix 3.1.1 Data Sheet - Termperature in Degrees (1977-1982)

YEAR / MONTH	ITEM	1977	1978	1979	1980	1981	1982	TOTAL	6 YEAR AVERAGE
J A N .	Mean	26.6	25.9	26.1	27.1	24.7	24.2	154.6	25.8
	Max.	30.7	30.5	30.7	31.8	29.7	29.7	183.1	30.5
	Min.	22.5	21.4	21.4	22.3	19.7	18.7	126.0	21.0
F E B .	Mean	26.6	26.2	27.6	27.4	25.5	25.3	158.6	26.4
	Max.	31.0	30.7	32.6	32.5	30.5	31.5	188.8	31.5
	Min.	22.1	21.6	22.6	22.2	20.5	19.1	128.1	21.4
M A R .	Mean	27.3	28.9	28.5	28.2	26.1	27.5	166.5	27.8
	Max.	32.7	34.0	33.8	33.3	31.7	33.8	199.3	33.2
	Min.	21.9	23.9	23.3	23.0	20.4	21.3	133.8	22.3
A P R .	Mean	29.3	29.9	29.8	29.8	28.1	29.0	175.9	29.3
	Max.	34.4	35.3	34.2	35.0	33.2	34.7	206.8	34.5
	Min.	24.3	24.5	25.5	24.6	22.9	23.3	145.1	24.2
M A Y	Mean	29.4	30.2	29.0	29.7	28.1	29.6	176.0	29.3
	Max.	33.8	35.0	33.0	34.2	32.5	35.1	203.6	33.9
	Min.	25.0	25.5	24.9	25.3	23.7	24.0	148.4	24.7
J U N .	Mean	29.5	28.5	28.7	-	25.4	29.1	141.2	28.2
	Max.	33.6	31.4	32.5	-	29.1	33.9	160.5	32.1
	Min.	25.3	25.6	25.0	-	21.7	24.3	121.9	24.4
J U L .	Mean	27.9	27.6	27.7	27.3	26.6	27.1	164.2	27.4
	Max.	31.6	31.0	31.1	30.2	30.1	30.7	184.7	30.8
	Min.	24.3	24.3	24.3	24.3	23.1	23.6	143.9	24.0
A U G .	Mean	27.9	26.8	27.2	27.4	26.3	27.3	162.9	27.2
	Max.	31.5	29.0	30.4	30.3	29.5	31.1	181.8	30.3
	Min.	24.3	24.5	24.1	24.5	23.1	23.5	144.0	24.0
S E P .	Mean	27.4	27.0	27.9	26.4	27.1	27.2	163.0	27.2
	Max.	30.6	29.5	32.0	29.2	30.7	31.0	183.0	30.5
	Min.	24.3	24.5	23.8	23.6	23.4	23.3	142.9	23.8
O C T .	Mean	28.1	26.9	27.4	27.0	25.5	27.1	162.0	27.0
	Max.	32.1	29.7	31.1	30.6	29.7	32.1	185.3	30.9
	Min.	24.1	24.2	23.6	23.4	21.2	22.2	138.7	23.1
N O V .	Mean	26.9	26.4	27.8	27.0	25.9	26.6	160.6	26.8
	Max.	30.5	30.1	31.9	30.8	30.1	31.9	185.3	30.9
	Min.	23.3	22.6	23.8	23.1	21.6	21.4	135.8	22.6
D E C .	Mean	26.1	26.9	26.1	26.0	24.8	26.2	156.1	26.0
	Max.	30.8	31.0	31.0	30.1	29.3	30.9	183.1	30.5
	Min.	21.3	22.8	21.2	21.8	20.3	21.4	128.8	21.5

Source: (PAGASA, Manila International Airport)

Appendix 3.1.2 Monthly Temperature in Degrees (1977-1982)



Source: (PAGASA, Manila International Airport)

Legend:
——— Mean
— — — Maximum
------ Minimum

Appendix 3.1.3 Data Sheet - Rainfall (1) (1977-1982)

(mm)

YEAR / MONTH	ITEM	1977	1978	1979	1980	1981	1982	6 YEAR AVERAGE	GREATEST 24 HR. RAINFALL IN 6 YRS.
JAN.	TOTAL	34.9	0	0	0	1.0	1.5	6.10	
	GRTST 24 h	10.9	0	0	0	1.0	1.4		10.9
	NO.OF DAYS	11.0	0	0	0	1.0	2.0	2.33	
FEB.	TOTAL	10.4	0	0.8	0	3.0	0.7	2.48	
	GRTST 24 h	7.1	0	0.8	0	3.0	0.4		7.1
	NO.OF DAYS	3.0	0	1.0	0	1.0	2.0	1.17	
MAR.	TOTAL	8.9	0	0	43.9	0	28.6	13.57	
	GRTST 24 h	6.1	0	0	24.1	0	28.4		28.4
	NO.OF DAYS	3.0	0	0	5.0	0	2.0	1.67	
APR.	TOTAL	0.0	5.8	60.3	0	3.3	48.0	19.57	
	GRTDT 24 h	0.0	5.3	34.3	0	3.3	32.2		34.3
	NO.OF DAYS	0	2.0	3.0	0	1.0	3.0	1.50	
MAY	TOTAL	105.9	155.9	161.3	41.9	26.3	75.9	94.53	
	GRTST 24 h	38.9	41.7	86.0	32.5	20.0	29.4		86.0
	NO.OF.DAYS	10.0	7.0	15.0	4.0	5.0	10.0	8.50	
JUN.	TOTAL	78.9	149.0	169.9	-	419.3	191.2	201.66	
	GRTST 24 h	44.0	35.7	24.9	-	69.8	38.4		69.8
	NO.OF.DAYS	8.0	14.0	16.0	-	23.0	15.0	15.2	
JUL.	TOTAL	419.4	320.5	299.1	364.6	399.0	611.9	392.42	
	GRTST 24 h	101.3	83.3	41.1	75.6	69.7	121.6		121.6
	NO.OF DAYS	21.0	16.0	19.0	18.0	17.0	24.0	19.17	
AUG.	TOTAL	347.2	734	363.5	213.0	247.6	423.0	388.05	
	GRTST 24 h	199.0	115.9	104.0	31.8	76.4	72.8		199.0
	NO.OF DAYS	15.0	24.0	19.0	20.0	16.0	28.0	20.33	
SEP.	TOTAL	591.3	774.0	291.0	312.4	231.2	321.3	420.20	
	GRTST 24 h	197.2	135.2	94.8	87.0	68.2	53.6		197.2
	NO.OF DAYS	20.0	22.0	14.0	19.0	12.0	25.0	18.67	
OCT.	TOTAL	66.4	558.5	89.0	162.5	196.4	106.9	196.61	
	GRTST 24 h	30.5	274.5	22.2	78.5	46.0	31.0		274.5
	NO.OF DAYS	8.0	18.0	12.0	10.0	15.0	11.0	12.33	
NOV.	TOTAL	240.1	86.4	32.3	261.4	175.0	109.1	150.71	
	GRTST 24 h	121.7	37.1	16.1	78.4	65.2	38.4		121.7
	NO.OF DAYS	12.0	10.0	7.0	11.0	12.0	15.0	11.17	
DEC.	TOTAL	18.1	23.3	12.8	21.6	48.0	49.9	28.95	
	GRTST 24 h	17.6	9.8	12.8	7.0	33.4	16.4		33.4
	NO.OF DAYS	2.0	5.0	1.0	5.0	4.0	10.0	4.50	
ANNUAL TOTAL	RAINFALL (mm)	1921.5	2807.4	1480.0	-	1690.1	1968.0		
	NO.OF DAYS	113.0	118.0	107.0	-	107.0	147.0		

Source: (PAGASA, Manila International Airport)

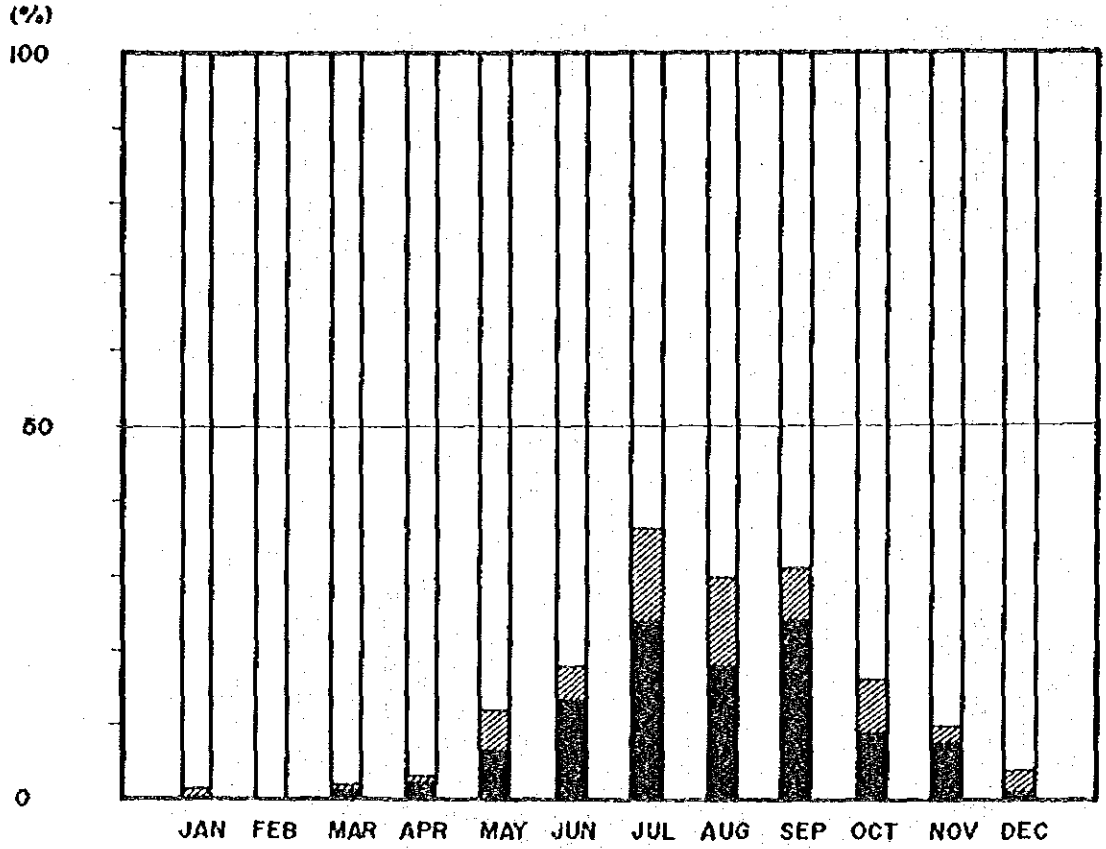
Appendix 3.1.4 Data Sheet - Rainfall (2) (1977-1982)

(Days)

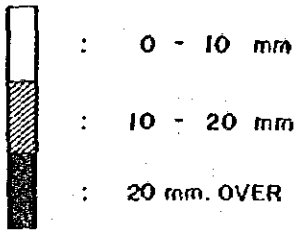
YEAR / MONTH	(mm) RANGE	1977	1978	1979	1980	1981	1982	6 YEAR AVERAGE	%
JAN.	0-10	30	31	31	31	31	31	30.83	99.5
	10-20	1	0	0	0	0	0	0.16	0.5
	20-	0	0	0	0	0	0	0	0
FEB.	0-10	28	28	28	29	28	28	28.17	100.0
	10-20	0	0	0	0	0	0	0	0
	20-	0	0	0	0	0	0	0	0
MAR.	0-10	31	31	31	29	31	30	30.50	98.4
	10-20	0	0	0	1	0	0	0.16	0.5
	20-	0	0	0	1	0	1	0.3	1.1
APR.	0-10	30	30	27	30	30	28	29.17	97.2
	10-20	0	0	1	0	0	1	0.30	1.1
	20-	0	0	2	0	0	1	0.50	1.7
MAY	0-10	27	27	26	30	30	27	27.83	89.8
	10-20	2	0	3	0	1	3	1.5	4.9
	20-	2	4	2	1	0	1	1.67	5.3
JUN.	0-10	28	26	24	-	20	25	24.6	82.0
	10-20	1	1	1	-	4	1	1.6	5.3
	20-	1	3	5	-	6	4	3.8	12.7
JUL.	0-10	18	21	22	20	22	17	20.0	64.5
	10-20	6	3	2	2	4	6	3.83	12.4
	20-	7	7	7	9	5	8	7.17	23.1
AUG.	0-10	25	15	22	21	22	21	21.0	67.8
	10-20	2	6	3	8	4	4	4.5	14.5
	20-	4	10	6	2	5	6	5.5	17.7
SEP.	0-10	17	14	25	24	24	20	20.67	68.9
	10-20	5	1	1	0	2	5	2.33	7.8
	20-	8	15	4	6	4	5	7.0	23.3
OCT.	0-10	28	23	27	28	25	27	26.33	84.9
	10-20	2	2	3	0	3	2	2.0	6.5
	20-	1	6	1	3	3	2	2.67	8.6
NOV.	0-10	26	28	29	24	27	27	26.83	89.5
	10-20	1	1	1	2	0	1	1.0	3.3
	20-	3	1	0	4	3	2	2.17	7.2
DEC.	0-10	30	31	30	30	29	29	29.83	96.3
	10-20	1	0	1	1	1	2	0.83	3.2
	20-	0	0	0	0	1	0	0.16	0.5

Source: (PAGASA, Manila International Airport)

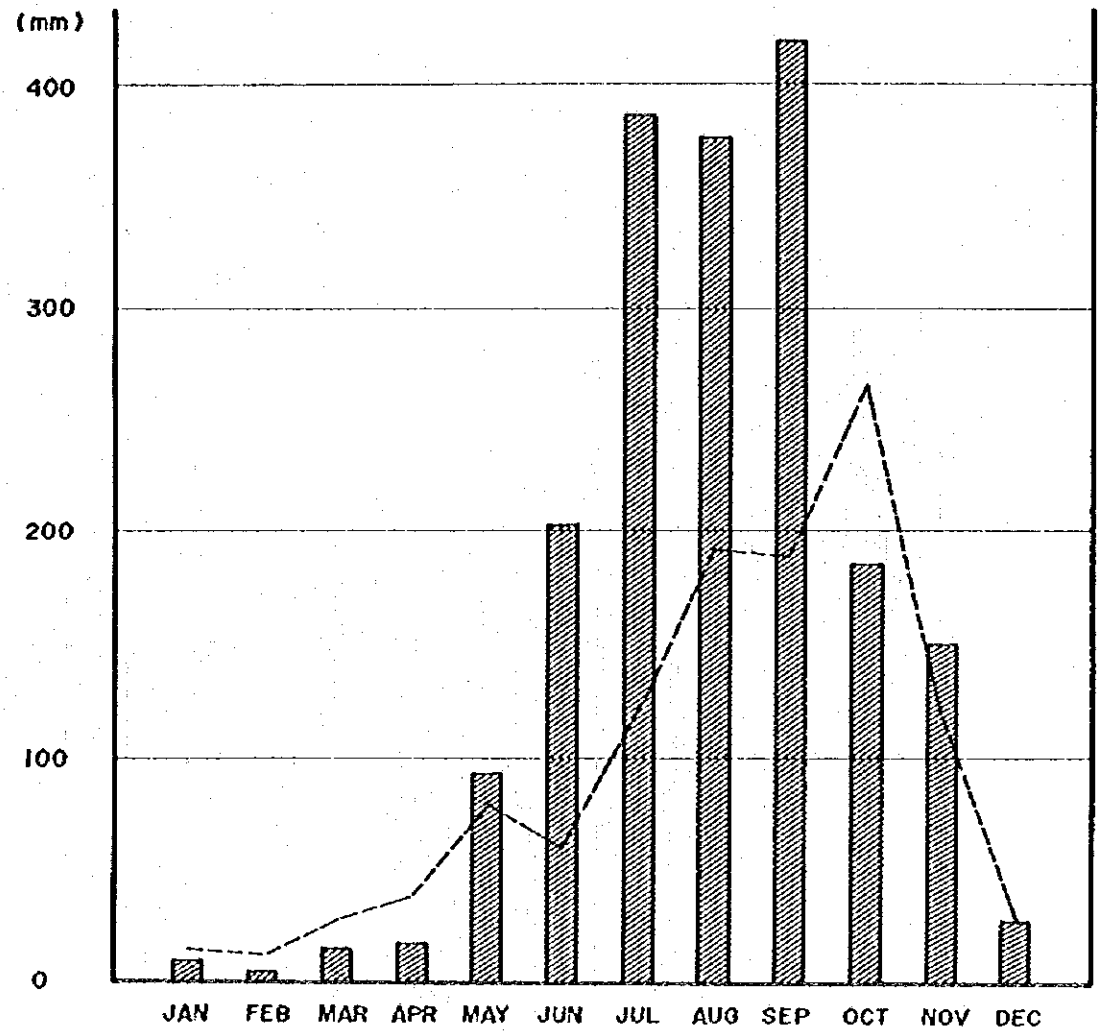
Appendix 3.1.5 Monthly Mean Range of Rainfall in Percentages (1977-1982)



Source: (PAGASA, Manila International Airport)



Appendix 3.1.6 Monthly Mean Rainfall in mm (1977-1982)



Source: (PAGASA, Manila International Airport)

Legend

: Monthly Mean Rainfall (mm)

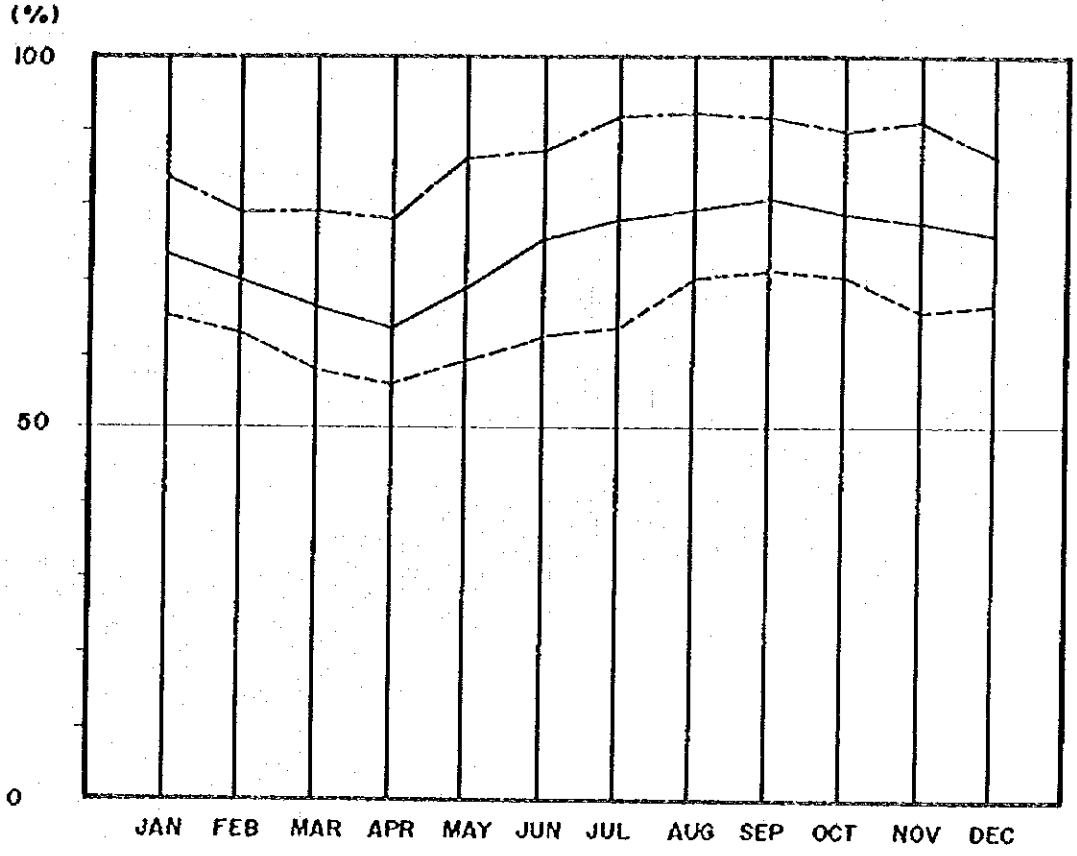
----- : Greatest 24 hour Rainfall (mm)

Appendix 3.1.7 Data Sheet - Humidity in Percentages (1977-1982)

YEAR / MONTH	ITEM	1977	1978	1979	1980	1981	1982	TOTAL	6 YEAR AVERAGE
J A N .	Mean	76.0	71.0	71.0	72.0	73.0	76.0	439.0	73.17
	Max.	84.0	81.0	80.0	87.0	82.0	93.0	507.0	84.50
	Min.	69.0	65.0	60.0	63.0	67.0	69.0	393.0	65.50
F E B .	Mean	68.0	67.0	68.0	71.0	76.0	70.0	420.0	70.00
	Max.	80.0	75.0	77.0	80.0	82.0	83.0	477.0	79.50
	Min.	60.0	60.0	61.0	68.0	72.0	61.0	382.0	63.67
M A R .	Mean	61.0	64.0	63.0	69.0	74.0	64.0	395.0	65.83
	Max.	69.0	72.0	69.0	91.0	93.0	84.0	478.0	79.67
	Min.	54.0	59.0	57.0	62.0	68.0	53.0	353.0	58.83
A P R .	Mean	58.0	62.0	65.0	64.0	71.0	67.0	387.0	64.50
	Max.	63.0	73.0	92.0	78.0	85.0	79.0	470.0	78.33
	Min.	54.0	54.0	58.0	56.0	61.0	58.0	341.0	56.83
M A Y	Mean	65.0	68.0	74.0	65.0	72.0	72.0	416.0	69.33
	Max.	78.0	94.0	88.0	91.0	81.0	86.0	518.0	86.33
	Min.	54.0	58.0	57.0	54.0	66.0	59.0	348.0	58.00
J U N .	Mean	69.0	78.0	77.0	-	80.0	77.0	381.0	76.20
	Max.	79.0	89.0	86.0	-	90.0	91.0	435.0	87.00
	Min.	60.0	66.0	60.0	-	69.0	63.0	318.0	63.60
J U L .	Mean	74.0	80.0	82.0	78.0	75.0	84.0	473.0	78.83
	Max.	87.0	92.0	97.0	93.0	90.0	94.0	553.0	92.17
	Min.	61.0	53.0	66.0	66.0	65.0	73.0	384.0	64.00
A U G .	Mean	75.0	86.0	81.0	76.0	77.0	84.0	479.0	79.83
	Max.	91.0	98.0	94.0	92.0	87.0	92.0	554.0	92.33
	Min.	68.0	75.0	68.0	66.0	70.0	77.0	424.0	70.67
S E P .	Mean	83.0	87.0	79.0	80.0	77.0	84.0	490.0	81.67
	Max.	95.0	94.0	94.0	89.0	86.0	95.0	553.0	92.17
	Min.	76.0	76.0	66.0	68.0	67.0	74.0	427.0	71.17
O C T .	Mean	76.0	85.0	79.0	80.0	81.0	78.0	479.0	79.83
	Max.	91.0	97.0	91.0	90.0	88.0	87.0	544.0	90.67
	Min.	68.0	76.0	68.0	66.0	74.0	69.0	421.0	70.17
N O V .	Mean	78.0	82.0	75.0	77.0	80.0	80.0	472.0	78.67
	Max.	93.0	93.0	91.0	93.0	92.0	87.0	549.0	91.50
	Min.	69.0	71.0	67.0	66.0	62.0	66.0	401.0	66.83
D E C .	Mean	75.0	76.0	75.0	76.0	81.0	80.0	463.0	77.17
	Max.	81.0	87.0	91.0	88.0	87.0	89.0	523.0	87.17
	Min.	66.0	67.0	66.0	66.0	70.0	67.0	402.0	67.00

Source: (PAGASA, Manila International Airport)

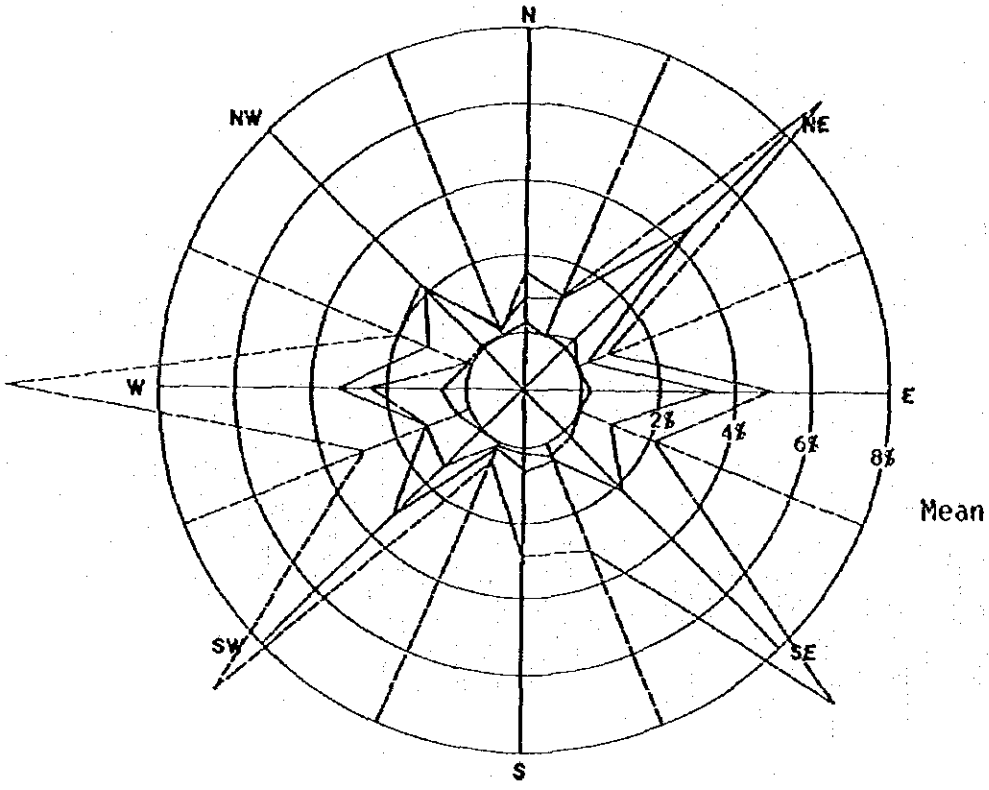
Appendix 3.1.8 Monthly Humidity in Percentages (1977-1982)



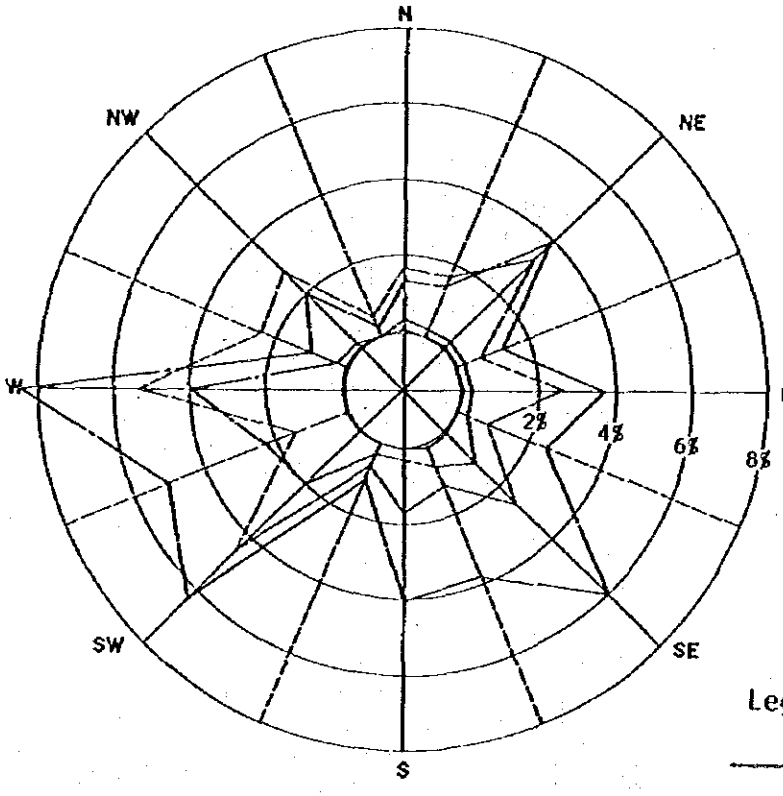
Source: (PAGASA, Manila International Airport)

Legend
——— Mean
– – – – Maximum
----- Minimum

Appendix 3.1.9 Annual Occurrence Frequency of Wind Speed and Wind Direction
(1971-1978, 1982-1983)



Mean



Maximum

Legend:

(MPS)

0 - 2

3 - 5

6 - 10

10 -

Source: (PAGASA, Manila Port Area)

Appendix 3.1.10 Data Sheet - Occurrence Fequency of Mean Wind Speed and Wind Direction
(1 of 2) (1971-1978, 1982-1983)

MONTHLY OCCURRENCE FREQUENCY OF MEAN WIND SPEED IN PERCENTAGES													
DIRECTION	RANK	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
N	I	.7	.8	0	0	0	.4	1.0	1.0	2.6	1.2	1.1	1.9
	II	3.0	1.6	.7	0	.4	.7	2.1	.7	1.8	1.9	1.5	4.2
	III	.4	0	.3	0	.4	0	.4	0	0	.8	.8	0
	IV	0	0	0	0	0	0	0	0	0	0	0	0
		4.1	2.4	1.0	0	.8	1.1	3.5	1.7	4.4	3.9	3.4	6.1
NNE	I	3.0	.4	.3	0	0	0	.7	.7	1.1	1.2	1.5	3.1
	II	3.0	.4	1.0	0	.4	.4	0	.3	0	1.2	3.4	3.5
	III	0	0	0	0	0	0	0	0	0	0	0	0
	IV	0	0	0	0	0	0.3	0.3	0	0	0	.7	0
		6.0	.8	1.3	0	.4	.4	1.0	1.0	1.1	2.4	5.6	6.6
NE	I	4.8	3.6	1.0	.7	.7	1.4	2.4	1.3	4.4	6.0	17.7	18.5
	II	20.7	15.1	7.0	5.1	4.3	1.4	2.5	2.3	5.1	5.8	21.5	24.3
	III	.4	0	1.0	.4	.4	0	0	.4	0	.4	0	1.2
	IV	0	0	0	0	0	0	0	0	0	0	.4	0
		25.9	18.7	9.0	6.2	5.4	2.8	4.9	4.0	9.5	12.2	39.6	44.0
ENE	I	0	0	0	0	0	0	.3	0	.4	2.3	.4	0
	II	3.0	.4	0	.4	0	0	0	.4	0	.8	1.1	1.1
	III	0	0	0	0	0	0	0	0	0	0	0	0
	IV	0	0	0	0	0	0	.4	0	0	0	0	0
		3.0	.4	0	.4	0	0	.7	.4	.4	3.1	1.5	1.1
E	I	5.5	4.0	2.1	.4	.7	1.8	1.4	3.4	1.1	12.0	4.9	3.1
	II	7.4	7.5	8.7	8.1	3.2	1.4	1.7	2.0	.7	7.7	5.3	5.8
	III	0	0	1.0	.4	0	0	0	0	.4	.4	0	.4
	IV	0	0		0	.4	0	0	0	0	0	0	0
		12.9	11.5	11.8	8.9	4.3	3.2	3.1	5.4	2.2	20.1	10.2	9.3
ESE	I	1.5	1.2	1.0	1.8	.7	.3	1.0	1.7	.7	.8	.7	.4
	II	3.0	3.6	5.2	5.9	2.9	.7	.7	.3	.7	1.5	.4	1.5
	III	0	0	0	0	0	0	.4	0	0	0	0	0
	IV	0	0	0	0	0	0	0	0	0	0	0	0
		4.5	4.8	6.2	7.7	3.6	1.0	2.1	2.0	1.4	2.3	1.1	1.9
SE	I	1.8	2.8	3.1	.7	1.8	2.1	1.4	.7	4.3	3.5	1.5	2.0
	II	5.5	20.6	30.1	30.9	15.5	6.1	2.8	1.7	4.3	4.7	4.5	1.5
	III	0	0	.7	1.0	.7	0	.3	0	0	.4	0	0
	IV	0	0	0	0	0	0	0	0	0	0	0	0
		7.3	23.4	33.9	32.6	18.0	8.2	4.5	2.4	8.6	8.6	6.0	3.5
SSE	I	2.2	.8	0	.4	.4	.4	.7	.7	.4	.8	0	.4
	II	3.0	6.7	5.9	7.7	5.4	2.9	1.7	.7	1.4	1.2	1.1	0
	III	0	0	1.0	1.1	1.4	0	.4	0	0	.4	0	0
	IV	0	0	0	0	0	0	0	0	0	0	0	0
		5.2	7.5	6.9	9.2	7.2	3.3	2.8	1.4	1.8	2.4	1.1	.4
S	I	.4	.4	1.4	.7	.7	0	1.0	.3	1.4	.8	.4	.8
	II	1.1	1.2	3.1	4.8	7.2	5.4	2.5	1.7	2.9	4.3	.7	.8
	III	0	0	0	.4	0	.4	0	.3	0	.4	0	0
	IV	0	0	0	0	0	0	0	0	0	0	0	0
		1.5	1.6	4.5	5.9	7.9	5.8	3.5	2.3	4.3	5.5	1.1	1.6

Note RANK I; 0-2m/s
RANK II; 3-5m/s
RANK III; 6-10m/s
RANK IV;Over 11m/s

Source:(PAGASA, Manila Port Area)

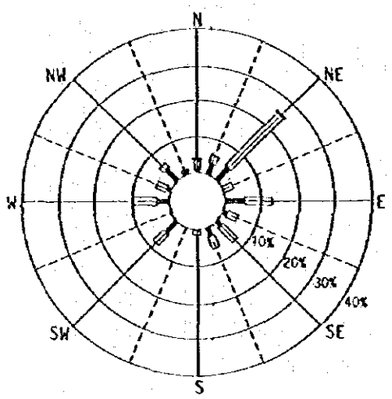
Data Sheet - Occurrence Fequency of Mean Wind Speed and Wind Direction
(2 of 2) (1971-1978, 1982-1983)

MONTHLY OCCURRENCE FREQUENCY OF MEAN WIND SPEED IN PERCENTAGES													
DIRECTION	RANK	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
SSW	I	0	0	.3	0	.4	0	.3	0	.7	.4	0	0
	II	0	0	.4	.7	.7	.7	.4	1.0	2.5	.4	0	.0
	III	0	0	0	0	0	0	0	0	.4	.3	0	0
	IV	0	0	0	0	0	.4	0	0	0	0	.4	0
		0	0	.7	.7	1.1	1.1	.7	1.0	3.6	1.1	.4	0
SW	I	4.1	1.6	1.4	.4	2.0	4.0	1.1	1.7	6.5	4.0	6.8	5.8
	II	4.1	6.0	4.2	9.2	12.3	22.2	12.8	18.8	13.0	3.1	3.4	5.0
	III	0	0	0	0	0	2.5	1.4	7.0	4.0	.8	0	0
	IV	0	0	0	0	0	.4	0	0		0	0	0
		8.2	7.6	5.6	9.6	14.3	29.1	15.3	27.5	23.5	7.9	10.2	10.8
WSW	I	.4	.4	.3	.7	.4	1.8	4.2	1.3	2.9	1.5	0	.4
	II	0	.4	.4	1.5	5.1	5.7	10.4	4.0	4.7	1.2	0	.4
	III	0	0	0	0	0	.7	5.2	6.4	1.1	.8	0	0
	IV	0	0	0	0	1.8	0	1.4	.7	0	0	0	0
		.4	.8	.7	2.2	7.3	8.2	21.2	12.4	8.6	3.5	0	.8
W	I	3.0	3.2	1.4	.4	3.2	2.5	4.5	5.0	6.1	3.8	3.8	1.5
	II	6.6	7.5	10.4	9.2	15.2	21.5	13.9	16.1	14.4	11.6	6.4	4.6
	III	0	0	0	1.1	2.2	4.6	5.6	9.7	4.3	.4	.4	0
	IV	0	0	0	0	0	0	3.8	2.0	0	1.5	0	0
		9.6	10.7	11.8	10.7	20.6	28.6	27.8	32.8	24.8	17.3	10.6	6.1
WNW	I	1.1	1.0	.3	.7	1.1	1.1	3.8	1.0	1.1	0	.4	1.5
	II	3.0	2.4	2.4	1.5	4.3	1.1	1.4	1.0	2.1	1.5	.4	2.0
	III	0	0	.4	0	.4	0	.7	0	0	0	.4	0
	IV	0	0	0	0	0	0	0	0	0	0	0	0
		4.1	3.4	3.1	2.2	5.8	2.2	5.9	2.0	3.2	1.5	1.2	3.5
NW	I	4.1	3.6	.7	0	1.1	2.1	2.1	2.3	1.1	4.3	4.2	.8
	II	1.8	2.8	2.8	3.7	1.4	2.9	.7	1.4	1.1	3.5	3.0	3.1
	III	0	0	0	0	.4	0	.3	0	0	.4	0	0
	IV	0	0	0	0	0	0	0	0	0	0	0	0
		5.9	6.4	3.5	3.7	2.9	5.0	3.1	3.7	2.2	8.2	7.2	3.9
NNW	I	.7	0	0	0	0	0	0	0	.4	0	.8	.4
	II	.7	0	0	0	.4	0	0	0	0	0	0	0
	III	0	0	0	0	0	0	0	0	0	0	0	0
	IV	0	0	0	0	0	0	0	0	0	0	0	0
		1.4	0	0	0	.4	0	0	0	.4	0	.8	.4
OBSERVATION NUMBER		271	252	289	272	277	279	288	298	278	258	265	259

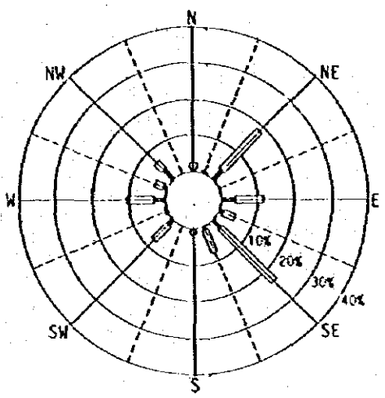
Note RANK I; 0-2m/s
RANK II; 3-5m/s
RANK III; 6-10m/s
RANK IV;Over 11m/s

Source:(PAGASA, Manila Port Area)

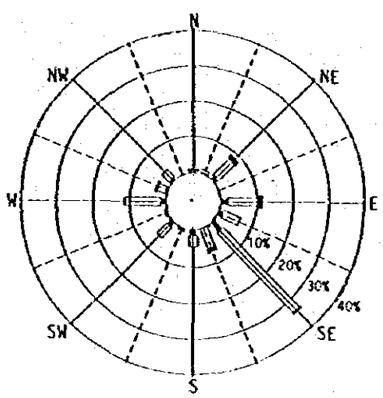
Appendix 3.1.11 Occurrence Frequency of Mean Wind Speed and Wind Direction
(1971-1978, 1982-1983)



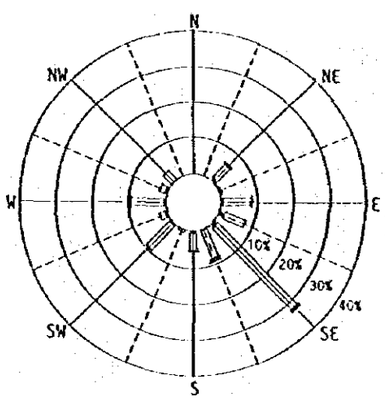
JANUARY



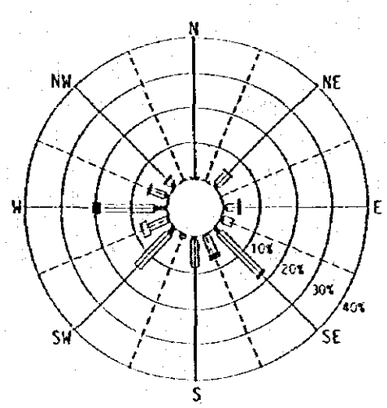
FEBRUARY



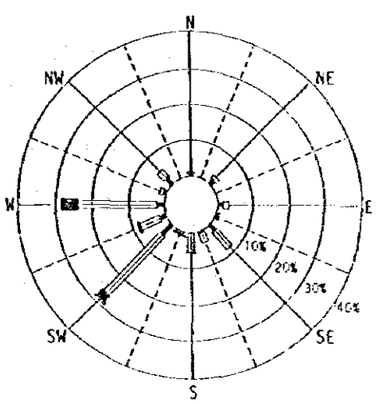
MARCH



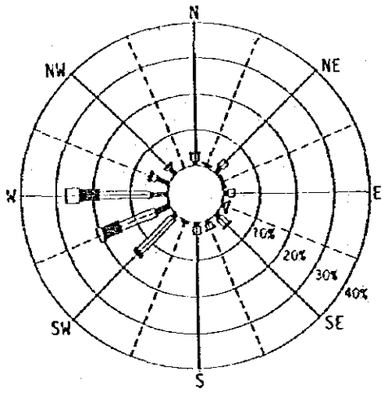
APRIL



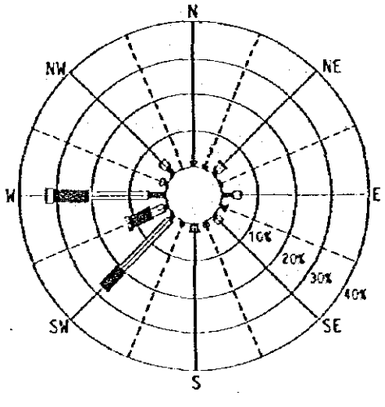
MAY



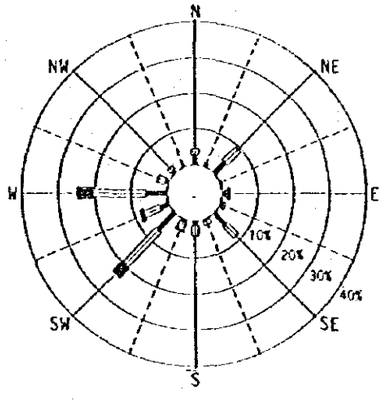
JUNE



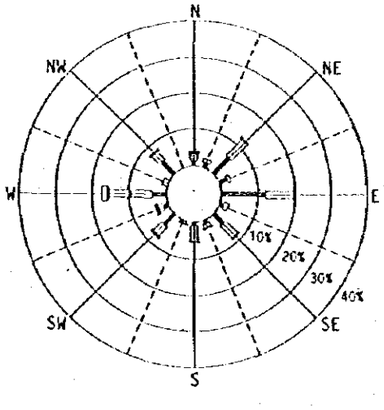
JULY



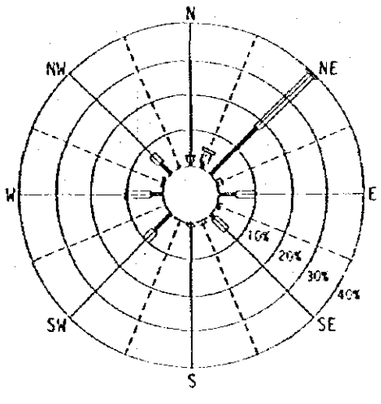
AUGUST



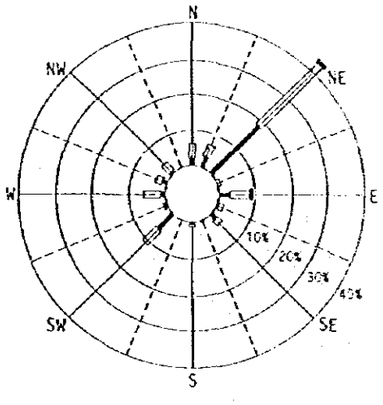
SEPTEMBER



OCTOBER



NOVEMBER



DECEMBER

Source: (PASAGA, Manila Port Area)

Range (symbol) 0-2 3-5 6-10 over11 (MPS)

Appendix 3.1.12 Deta Sheet - Occurence Frequency of Maximum Wind Speed and Wind Direction
(1 of 2) (1971-1978, 1982-1983)

MONTHLY OCCURRENCE FREQUENCY OF MAXIMUM WIND SPEED IN PERCENTAGES													
DIRECTION	RANK	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
N	I	0	0	0	0	0	0	0	0	.3	0	.3	0
	II	1.3	2.1	.6	.3	0	.7	2.0	1.6	1.7	.7	5.0	3.9
	III	2.9	2.5	0	0	1.0	.3	1.3	1.3	1.3	1.3	1.0	3.2
	IV	0	0	0	0	.3	0	.6	0	0	.3	1.0	1.6
		4.2	4.6	.6	.3	1.3	1.0	3.9	2.9	3.3	2.3	7.3	8.7
NNE	I	0	0	0	0	0	0	0	0	0	0	0	0
	II	1.6	.7	1.0	0	.3	.3	.6	1.0	.7	3.0	5.0	4.8
	III	2.3	.4	2.3	0	.6	0	0	.3	.7	2.0	3.7	4.8
	IV	0.7	0	0	0	.3	0	.6	0	0	.3	.3	.3
		4.6	1.1	3.3	0	1.2	.3	1.2	1.3	1.4	5.3	9.0	9.9
NE	I	0	0	0	0	0	0	0	0	0	0	.3	0
	II	5.9	2.1	1.0	.7	2.0	1.0	1.0	1.6	3.7	2.9	9.0	9.0
	III	7.8	6.8	3.2	2.3	2.0	.7	1.0	.7	2.0	2.0	7.3	11.6
	IV	0.3	.4	.3	.4	0	.3	0	0	0	0	.4	.6
		14.0	9.3	4.5	3.4	4.0	2.0	2.0	2.3	5.7	4.9	17.0	21.2
ENE	I	0	0	0	0	0	0	0	0	0	0	0	.3
	II	1.0	1.1	.3	.4	.7	0	0	0	.7	.6	3.0	1.3
	III	4.2	.7	1.6	.7	.3	0	.6	.6	.3	2.9	2.3	2.0
	IV	0.7	.7	0	.3	0	.4	0	0	.3	0	.4	0
		5.9	2.5	1.9	1.4	1.0	.4	.6	.6	1.3	3.5	5.7	3.6
E	I	0	0	0	0	.6	0	0	0	0	0	0	.3
	II	4.2	2.8	1.0	2.4	1.0	1.4	1.0	1.0	.7	6.8	5.3	3.9
	III	4.9	8.2	8.1	5.0	2.6	1.0	1.0	.6	1.0	3.2	3.3	5.2
	IV	0.3	1.4	.3	.3	0	0	.6	.3	0	0	0	0
		9.4	12.4	9.4	7.7	4.2	2.4	2.6	1.9	1.7	10.0	8.6	9.4
ESE	I	0	0	0	0	0	0	0	0	0	0	0	0
	II	0.3	2.1	.6	0	.6	.3	0	1.3	.3	2.0	2.0	.6
	III	3.6	5.0	6.1	4.7	2.0	1.0	.3	1.3	.3	2.9	2.0	2.0
	IV	0		2.3	.7	.6	.4	0	0	0	.3	0	0
		3.9	7.1	9.0	5.4	3.2	1.7	.3	2.6	.6	5.2	4.0	2.6
SE	I	0	.4	0	0	0	0	0	0	.3	0	0	0
	II	5.6	4.3	2.6	3.3	2.2	2.0	.3	1.6	2.7	3.5	.7	3.5
	III	3.6	11.0	15.5	19.7	5.8	4.0	1.6	1.0	2.0	2.6	3.7	2.6
	IV	0.7	1.8	4.5	3.3	2.0	0	1.3	0	.3	0	0	0
		9.9	17.5	22.6	26.3	10.0	6.0	3.2	2.6	5.3	6.1	4.4	6.1
SSE	I	0.3	0	0	0	0	0	0	0	0	0	0	0
	II	2.3	.7	.3	1.0	1.0	1.3	1.6	.3	.3	1.3	.7	3.5
	III	1.6	5.7	9.7	13.7	5.5	2.3	1.0	2.0	1.7	1.6	1.3	.7
	IV	1.0	1.1	1.3	3.0	.6	.4	0	0	0	1.0	0	0
		5.2	7.5	11.3	17.7	7.1	4.0	2.6	2.3	2.0	3.9	2.0	4.2
S	I	0	0	0	0	0	0	0	0	0	0	0	0
	II	2.3	1.8	2.3	2.4	1.3	1.3	.6	1.0	2.3	3.2	1.3	1.0
	III	2.0	4.0	12.0	7.7	9.7	4.4	2.6	1.3	2.0	1.3	.7	1.3
	IV	0	0	0	1.3	.6	1.0	0	.6	0	.3	0	0
		4.3	5.8	14.3	11.4	11.6	6.7	3.2	2.9	4.3	4.8	2.0	2.3

Note RANK I; 0-2m/s
RANK II; 3-5m/s
RANK III; 6-10m/s
RANK IV; Over 11m/s

Source: (PAGASA, Manila Port Area)

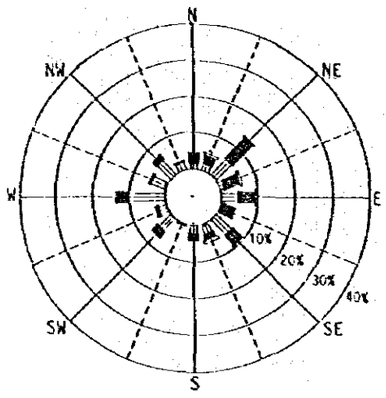
Deta Sheet - Occurence Frequency of Maximum Wind Speed and Wind Direction
(2 of 2) (1971-1978, 1982-1983)

MONTHLY OCCURRENCE FREQUENCY OF MAXIMUM WIND SPEED IN PERCENTAGES													
DIRECTION	RANK	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
SSW	I	0	0	0	0	0	0	0	0	0	0	0	0
	II	0	.7	1.0	.7	.3	.7	.6	1.0	1.0	.6	.3	.6
	III	0.7	.4	.6	.7	1.6	1.3	1.6	1.0	3.3	1.0	.3	0
	IV	0	0	0	.3	.6	0	.6	.3	1.7	1.3	0	0
		0.7	1.1	1.6	1.7	2.5	2.0	2.8	2.3	6.0	2.9	.6	.6
SW	I	0	0	0	0	.3	0	0	0	0	.6	0	0
	II	4.9	5.0	3.0	2.0	3.5	3.0	3.5	2.6	4.7	3.5	9.3	7.4
	III	2.0	3.0	4.5	5.3	9.4	12.0	6.8	14.3	9.3	3.9	1.4	3.9
	IV	0	0	0	.7	3.9	4.7	4.2	5.2	5.0	1.0	0	0
		6.9	8.0	7.5	8.0	17.1	19.7	14.5	22.1	19.0	9.0	10.7	11.3
WSW	I	0	0	0	0	0	0	0	0	0	.3	0	0
	II	2.3	1.1	.3	.7	.6	1.0	2.2	1.3	1.0	1.6	3.0	2.3
	III	1.0	1.4	3.5	3.3	6.1	14.7	10.6	8.1	7.7	4.2	0	0
	IV	0	0	0	.3	2.6	2.7	9.4	8.5	2.0	1.6	0	0
		3.3	2.5	3.8	4.3	9.3	18.4	22.2	17.9	10.7	7.7	3.0	2.3
W	I	0	0	0	0	0	0	0	0	0	.3	0	.3
	II	10.1	3.6	3.5	2.7	3.2	2.0	6.8	2.9	7.0	8.7	6.0	4.8
	III	3.6	3.6	2.3	5.7	15.5	16.0	13.2	16.0	15.3	5.5	4.0	1.0
	IV	0	0	.3	1.3	2.0	9.0	13.8	12.6	3.4	3.2	1.3	0
		13.7	7.2	6.1	9.7	20.7	27.0	33.8	31.5	25.7	17.7	11.3	6.1
WNW	I	0.3	0	0	0	.3	0	0	0	0	0	0	.3
	II	3.9	4.6	1.3	0	2.0	2.3	2.0	.3	4.7	4.5	1.0	2.9
	III	0.7	.4	.6	0	2.0	1.0	.6	2.3	2.0	1.3	.3	1.3
	IV	0	0	0	1.0	.3	.7	1.0	.6	.3	0	.4	0
		4.9	5.0	1.9	1.0	4.6	4.0	3.6	3.2	7.0	5.8	1.7	4.5
NW	I	0	0	0	0	0	.3	0	0	0	0	0	0
	II	5.2	4.0	.3	.7	.3	2.4	2.0	1.0	2.7	5.5	5.7	4.5
	III	1.6	4.0	1.0	1.0	1.6	1.3	.6	2.0	1.7	3.5	5.0	2.0
	IV	0	0	.6	0	0	.4	0	.3	.6	.3	.3	0
		6.8	8.0	1.9	1.7	1.9	4.4	2.6	3.3	5.0	9.3	11.0	6.5
NNW	I	0	0	0	0	0	0	0	0	0	0	0	0
	II	2.0	.4	.3	0	.3	0	.6	.3	.7	1.3	.7	0
	III	0.3	0	0	0	0	0	.3	0	.3	.3	1.0	0
	IV	0	0	0	0	0	0	0	0	0	0	0	.7
		2.3	.4	.3	0	.3	0	.9	.3	1.0	1.6	1.7	.7
OBSERVATION NUMBER		306	281	310	300	310	299	310	308	300	310	300	310

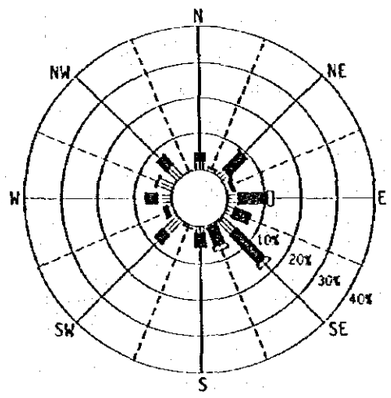
Note RANK I; 0-2m/s
RANK II; 3-5m/s
RANK III; 6-10m/s
RANK IV; Over 11m/s

Source: (PAGASA, Manila Port Area)

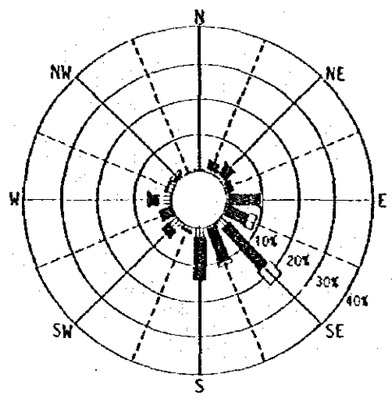
Appendix 3.1.13 Occurrence Frequency of Maximum Wind Speed and Wind Direction
(1977-1978, 1982-1983)



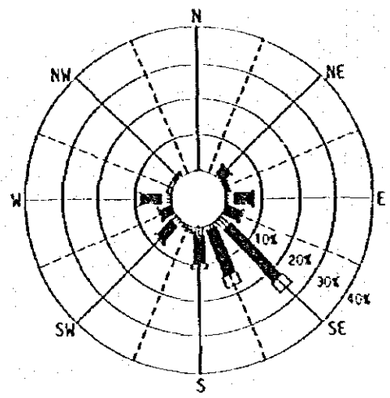
JANUARY



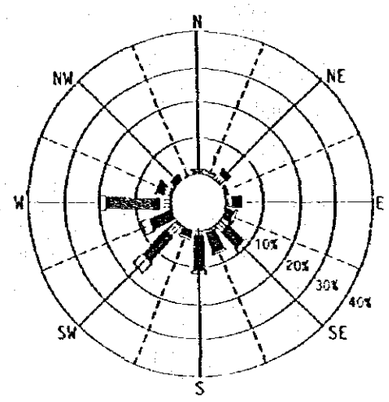
FEBRUARY



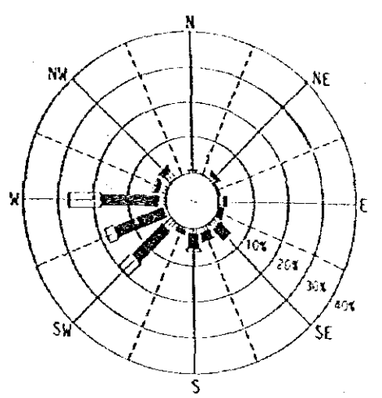
MARCH



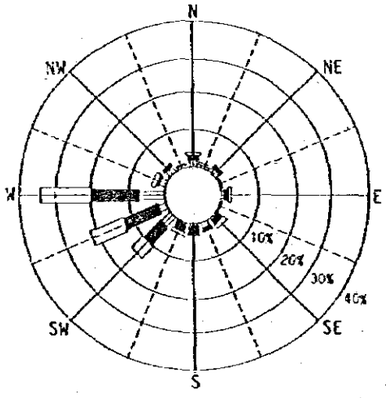
APRIL



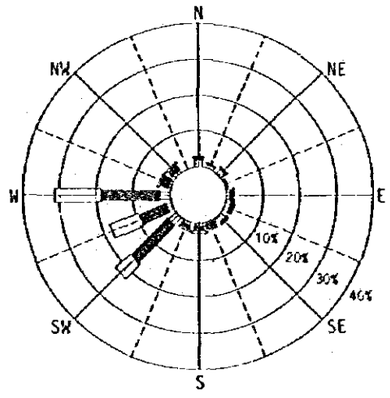
MAY



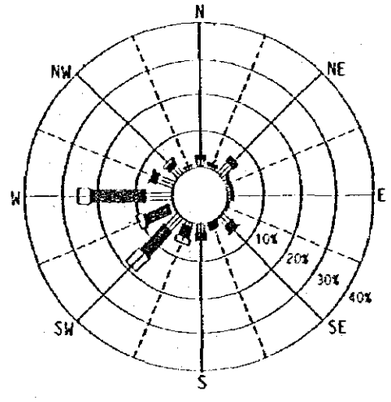
JUNE



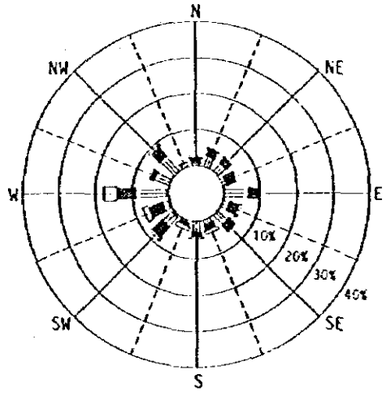
JULY



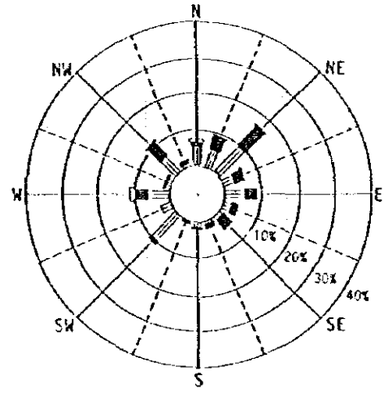
AUGUST



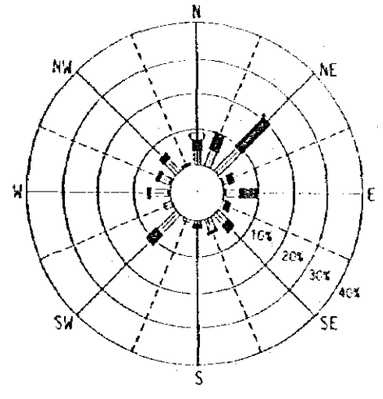
SEPTEMBER



OCTOBER

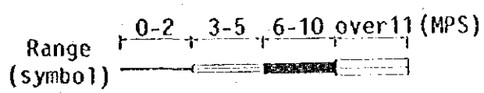


NOVEMBER



DECEMBER

Source: (PAGASA, Manila Port Area)



Appendix 3.1.14 Typhoon List (1 of 2)

Year	Typ-No.	Atmospheric Pressure (mb) Multiply by 100 (10 9.5 9.0)	Min-Pre. of typ.	Pre. at LUZON I.	Point of Min-Pre.* (A,B,C)	Directly Passed Over Manila Bay or not	Selected Typhoon
1955	-		-	-	-	-	
1956	3		935	990	B	No	
	5		990	1000	B	No	
	19		975	990	B	Yes	
	22		990	1000	B	No	
1957	18		1000	1002	A	No	
1958	24		1000	1004	A	No	
1959	17		1000	1004	A	No	
1960	1		990	1000	A	No	
	5		950	980	B	Yes	
	22		970	980	C	No	
	23		940	990	B	No	
1961	21		992	1000	A	No	
1962	20		985	1007	A	No	
1963	10		930	980	B	No	
	22		994	995	A	No	
1964	3		968	980	A	Yes	
	8		997	1004	B	No	
	23		980	985	A	No	
	34		900	990	B	No	
1965	-		-	-	-	-	
1966	2		972	990	B	Yes	
	3		974	990	C	No	
	33		976	990	B	No	
1967	35		908	965	B	Yes	○
1968	-		-	-	-	-	
1969	-		-	-	-	-	
1970	19		905	970	C	Yes	○
	25		910	925	B	Yes	○
1971	11		975	975	C	Yes	
	30		980	985	A	No	
	31		965	985	A	No	

Typhoon List (2 of 2)

Year	Typ. No.	Atmospheric Pressure (mb) Multiply by 100 (10 9.5 9.0)	Min-Pre. of typ.	Pre. at LUZON I.	Point of Min-Pre.* (A,B,C)	Directly Passed Over Manila Bay or not	Selected Typhoon
1971	32		990	985	A	Yes	
1972	5		980	985	C	No	
1973	18		960	980	A	No	
1974	5		965	980	C	No	
	10		950	960	C	No	○
	24		975	980	A	No	
	30		940	980	B	No	
1975	11		970	985	A	No	
1976	5		940	985	C	No	
	7		935	970	A	No	○
1977	3		970	990	A	Yes	
	19		920	955	B	Yes	○
1978	14		965	985	A	No	
1979	14		985	1000	B	Yes	
	24		994	994	C	No	
1980	9		910	950	B	No	○
	21		925	970	B	No	○
1981	6		975	998	A	Yes	
	7		985	995	A	No	
	26		905	970	B	No	○
1982	8		985	980	C	No	
	14		960	960	C	No	○
	17		950	990	A	No	
1983	3		965	980	B	Yes	
	14		975	998	A	No	
1984	-		-	-	-	-	

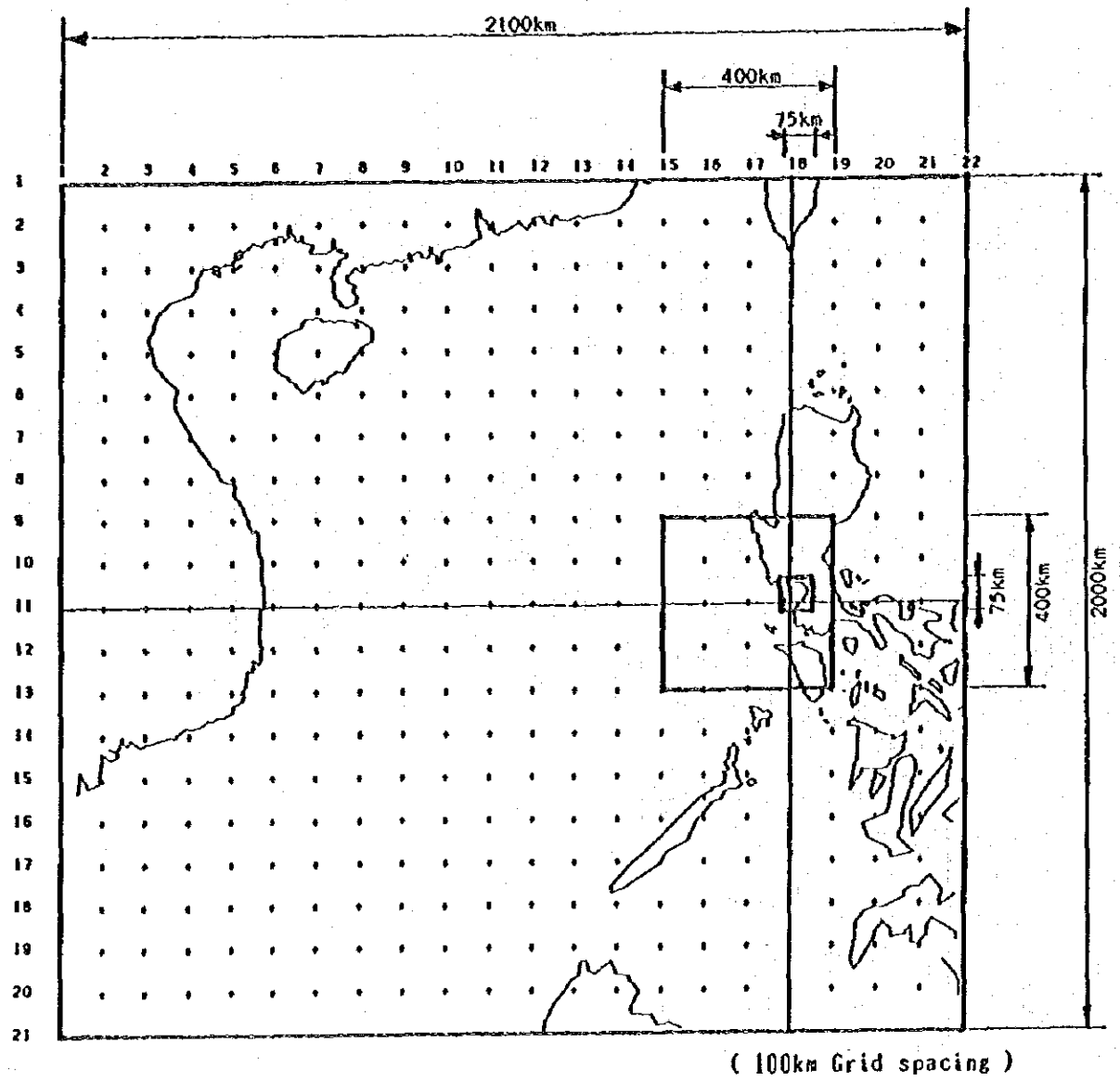
* Minimum pressure was occurred

A: after the typhoon passed LUZON Is.

B: before the typhoon passed LUZON Is.

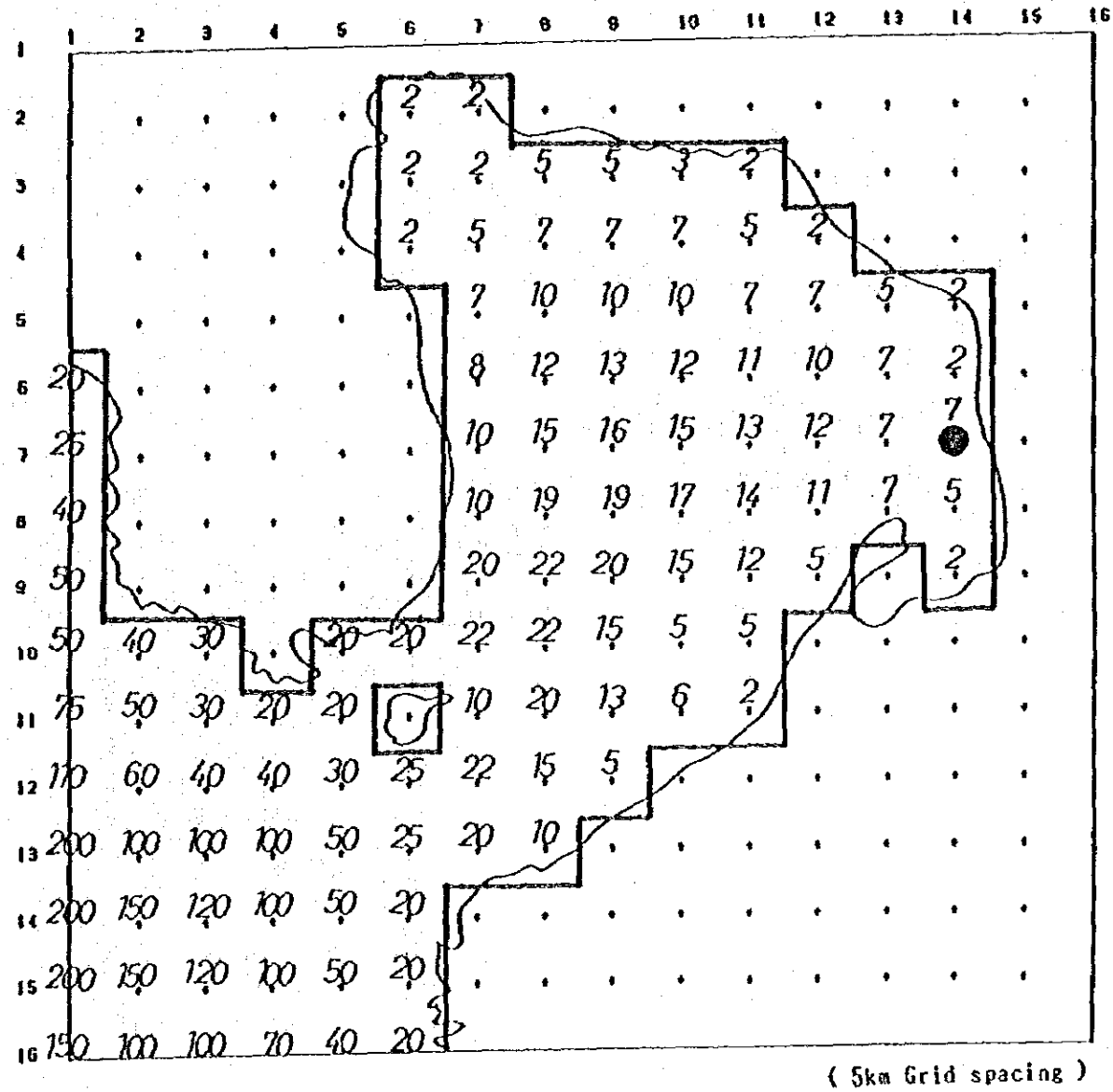
C: while the typhoon passed over LUZON Is.

Appendix 3.1.15 Calculation Area for Wave Hindcasting (Large Area)



Apendix 3.1.16 Calculation Grid and Boundary Conditions for Wave Hindcasting

(Manila Bay)



(5km Grid spacing)

Legend

Boundary Line

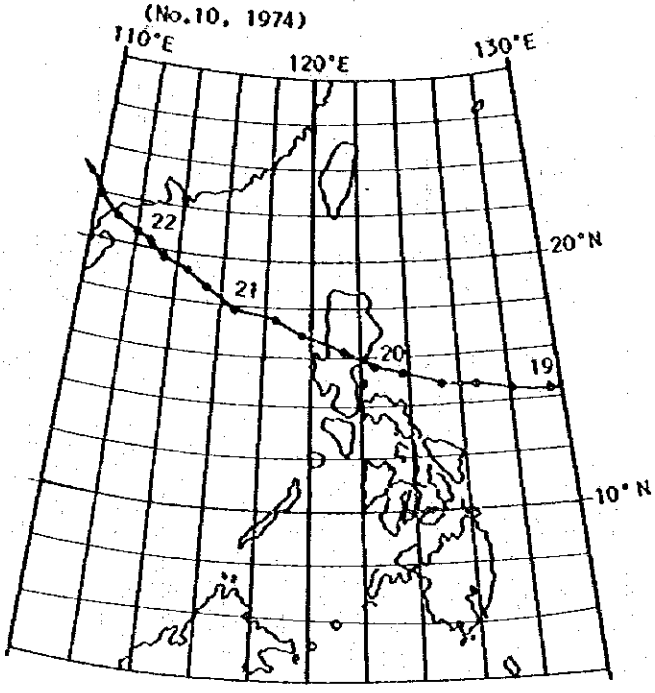
(20) Sea Depth in Meters

+ Calculated Point

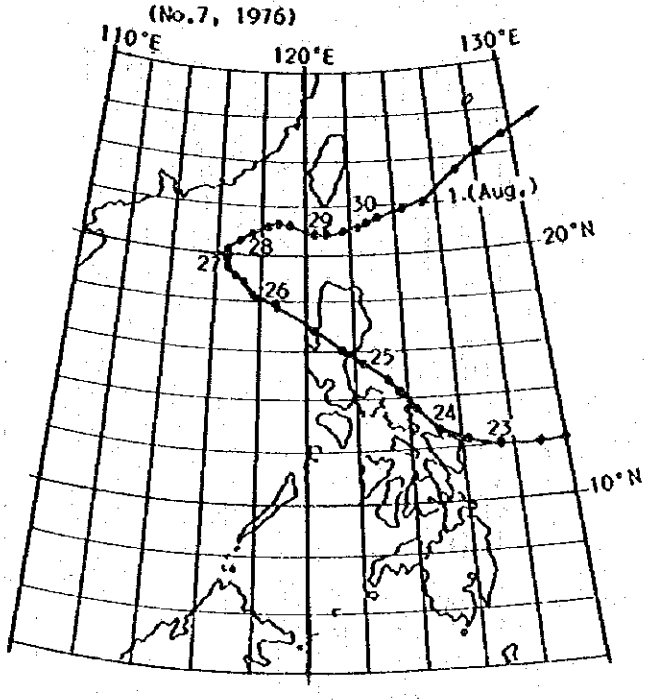
Manila Port

Appendix 3.1.17 Typhoon Course

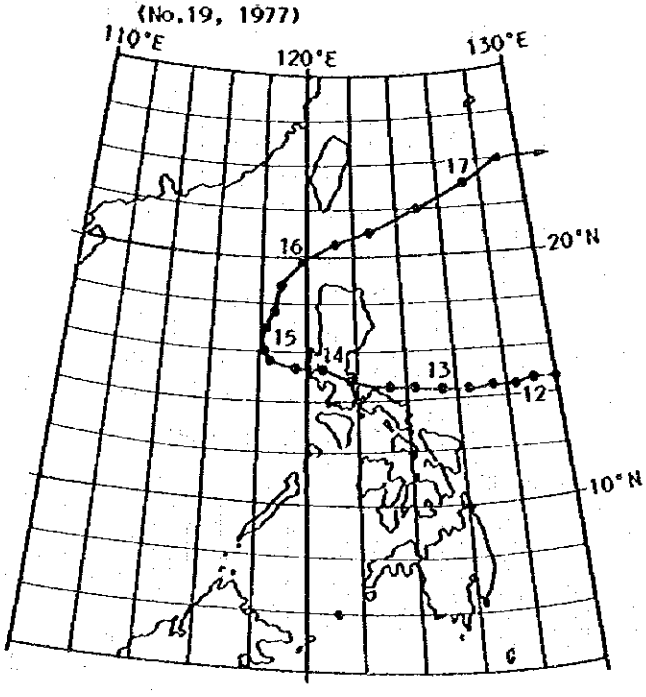
T7410 JUL.



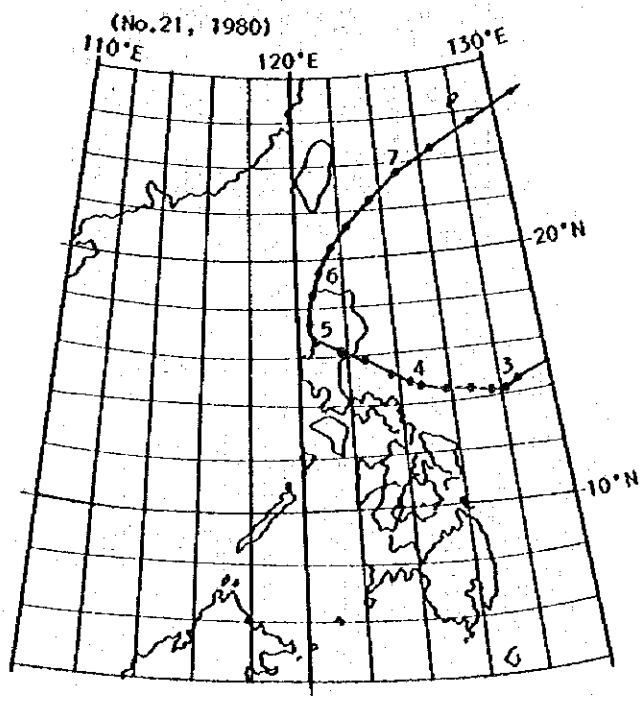
T7607 JUN.

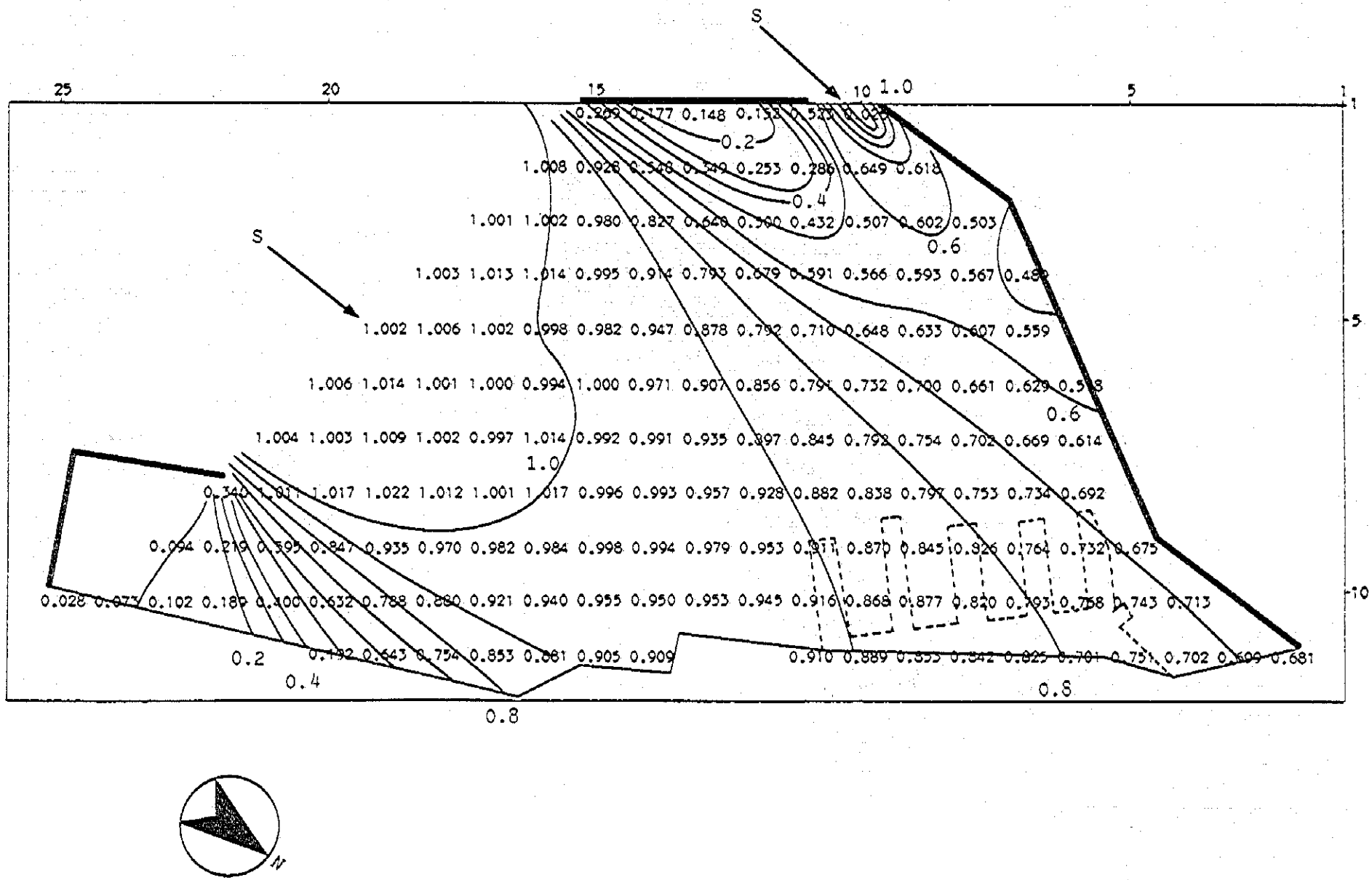


T7719 NOV.

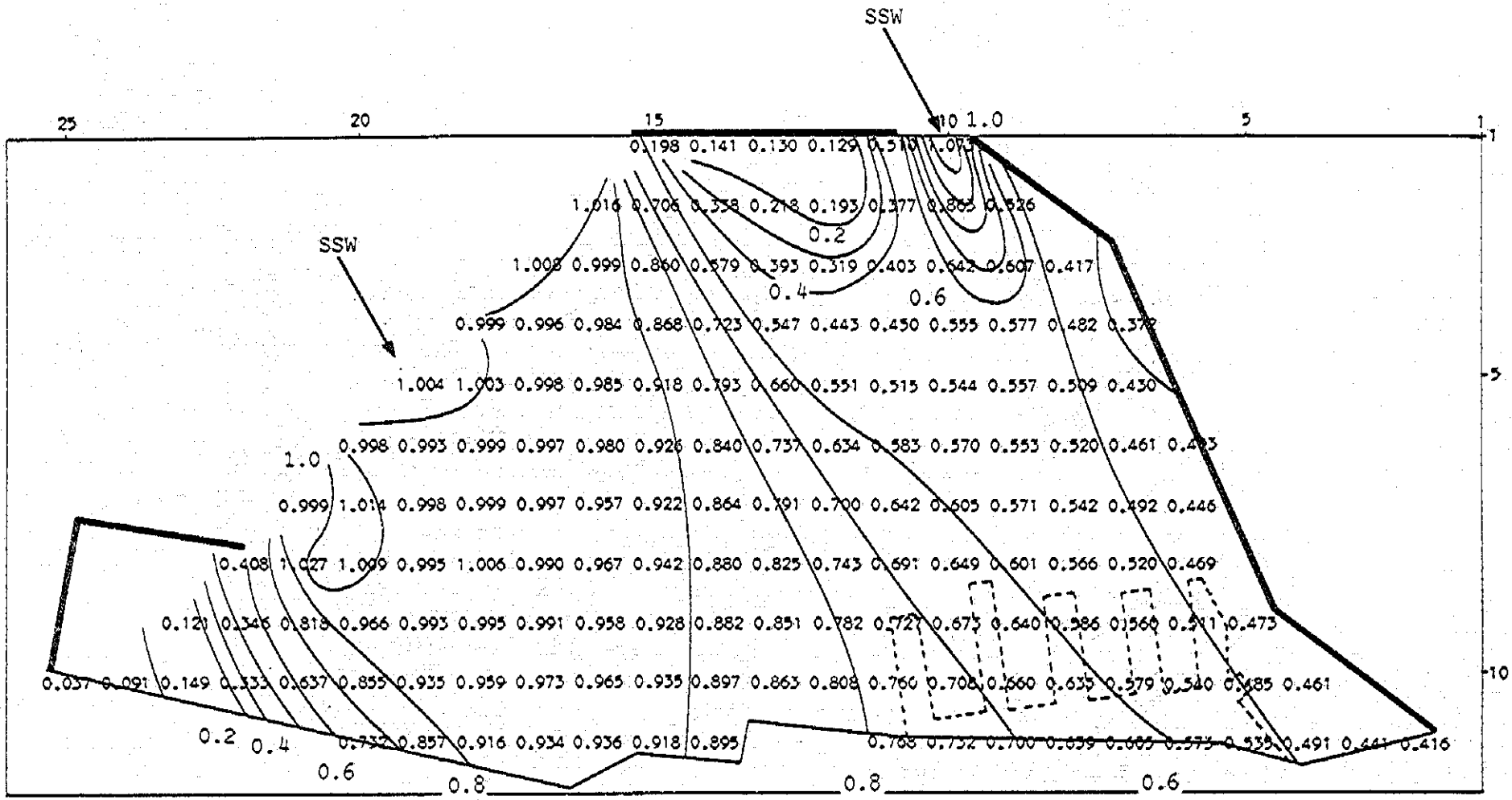


T8021 OCT.

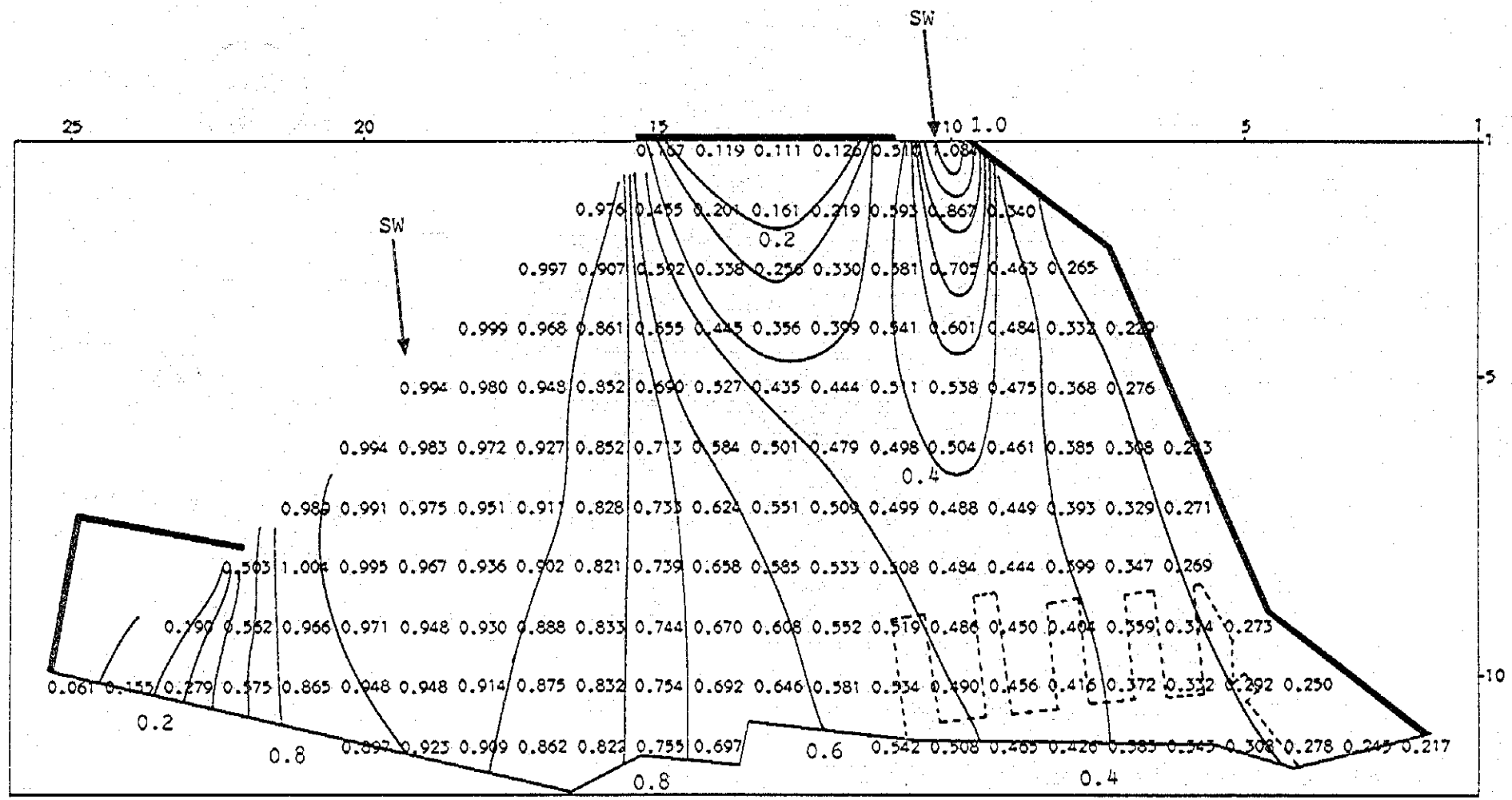




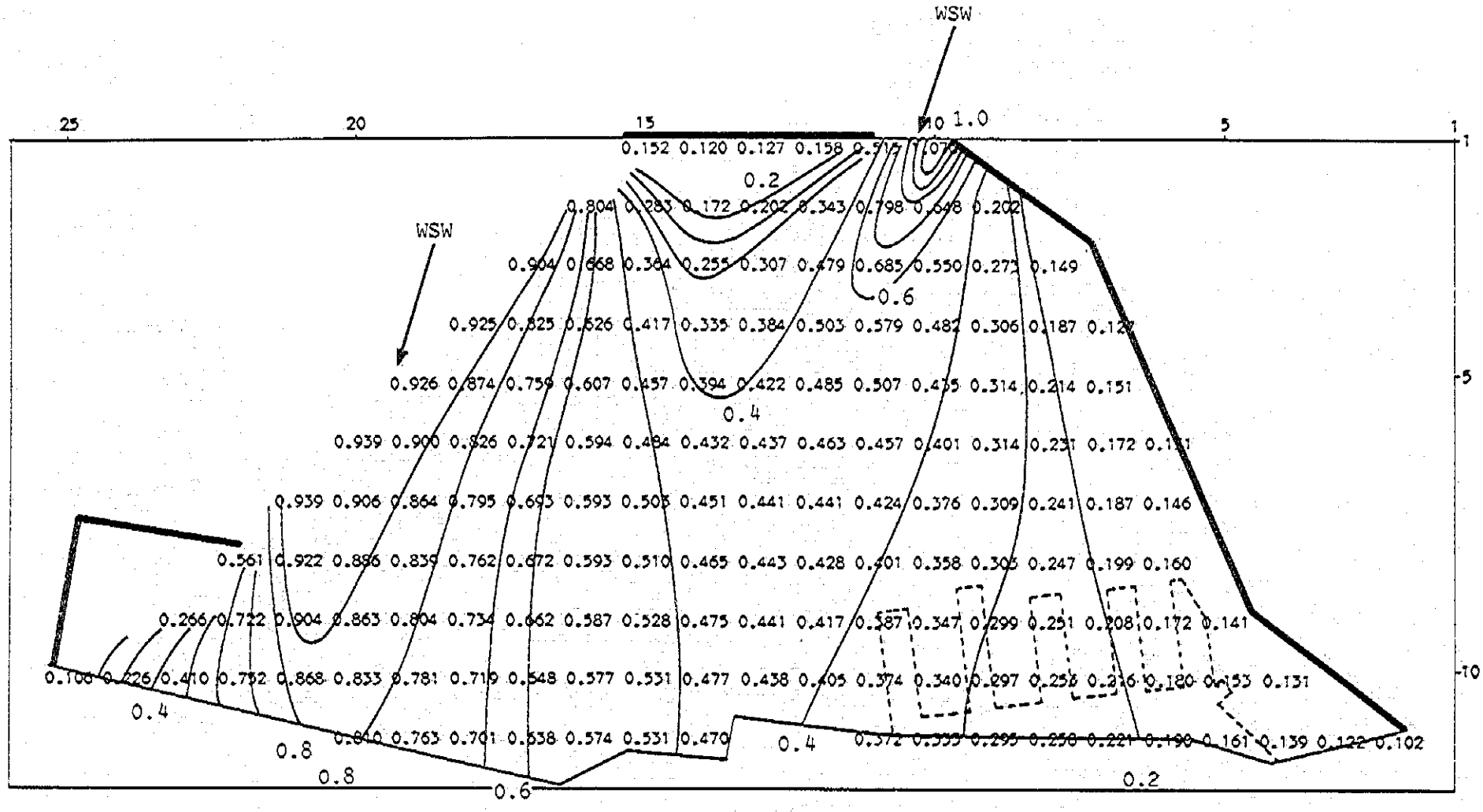
Appendix 3.1.18 Diffraction Coefficient (S direction wind) (1 of 5)



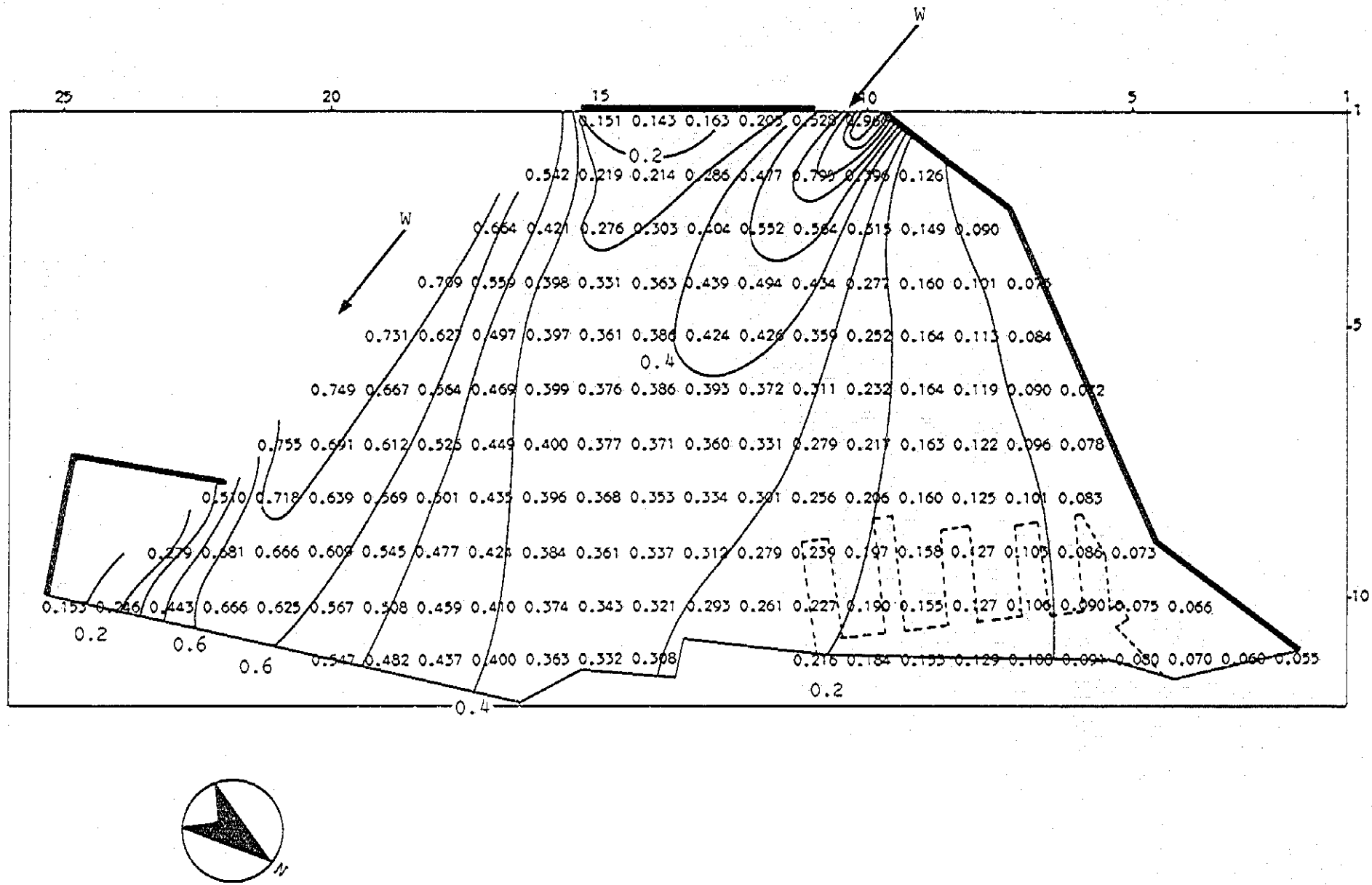
Diffraction Coefficient (SSW direction wind) (2 of 5)



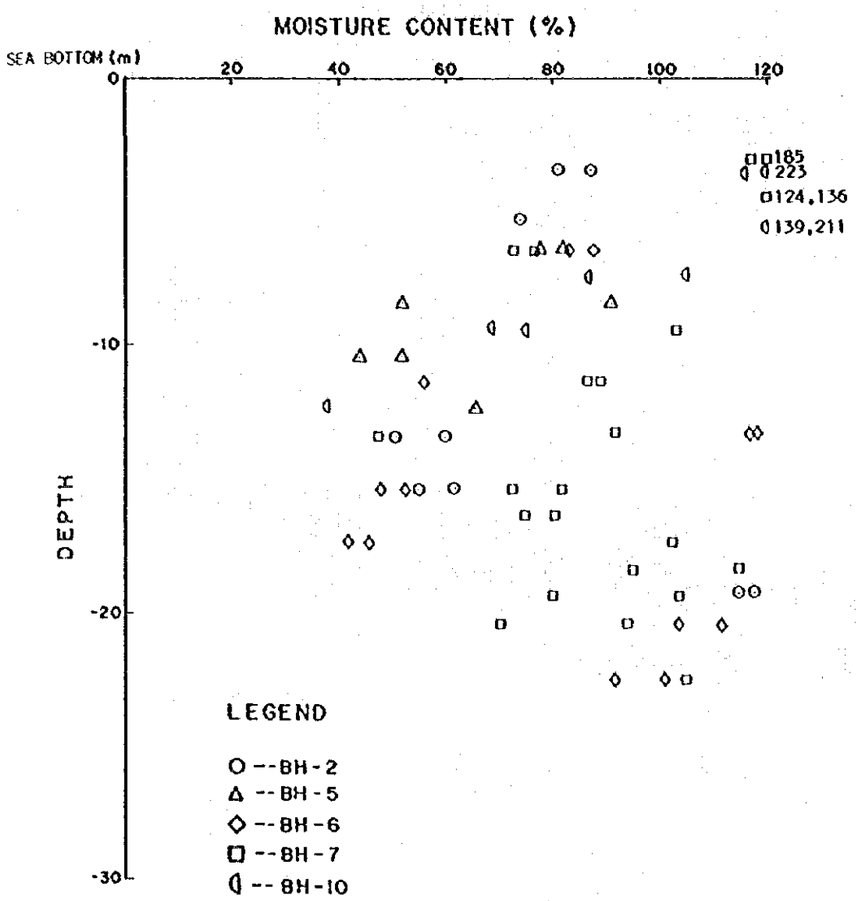
Diffraction Coefficient (SW direction wind) (3 of 5)



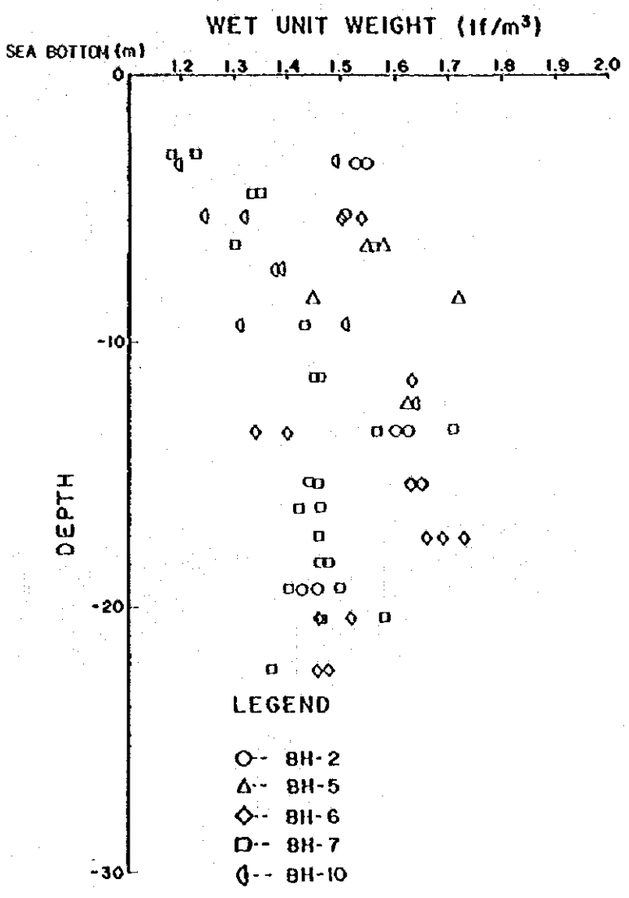
Diffraction Coefficient (WSW direction wind) (4 of 5)



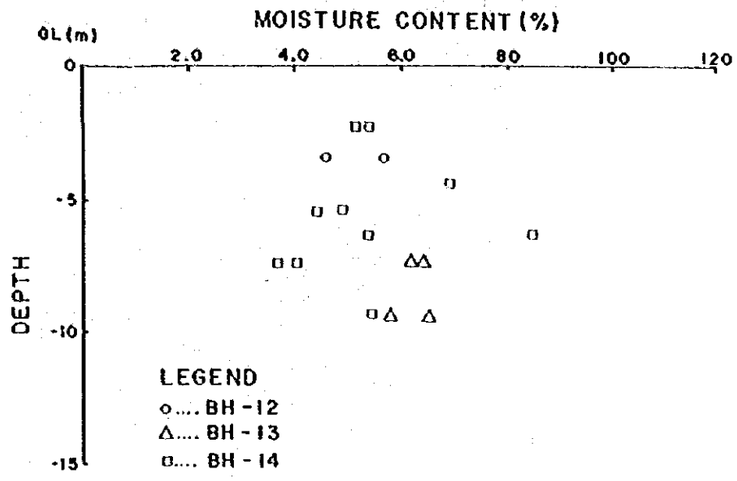
Diffraction Coefficient (W direction wind) (5 of 5)



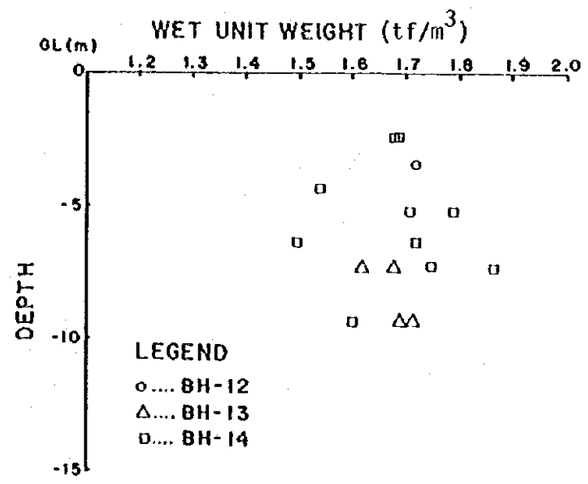
Relationship between Moisture Content and Depth in South Harbor (JIS A 1203)



Relationship between Wet Unit Weight and Depth in South Harbor (JSSMFE)

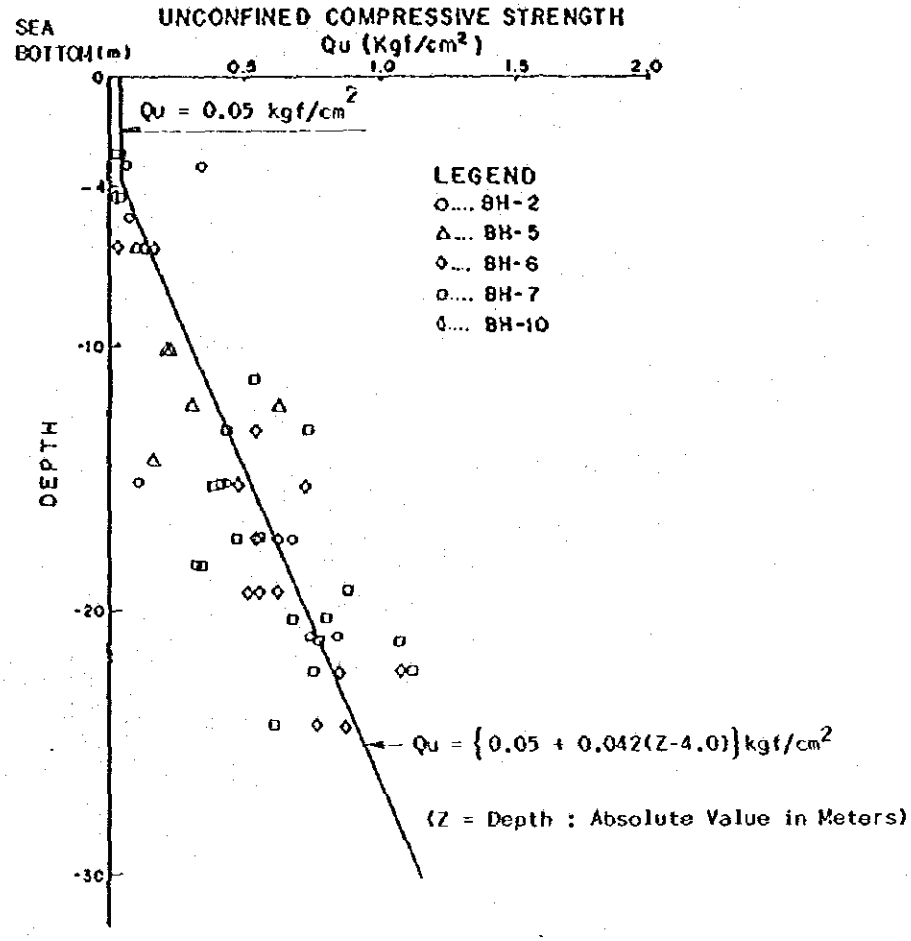


Relationship between Moisture Content and Depth in North Harbor (JIS A 1203)

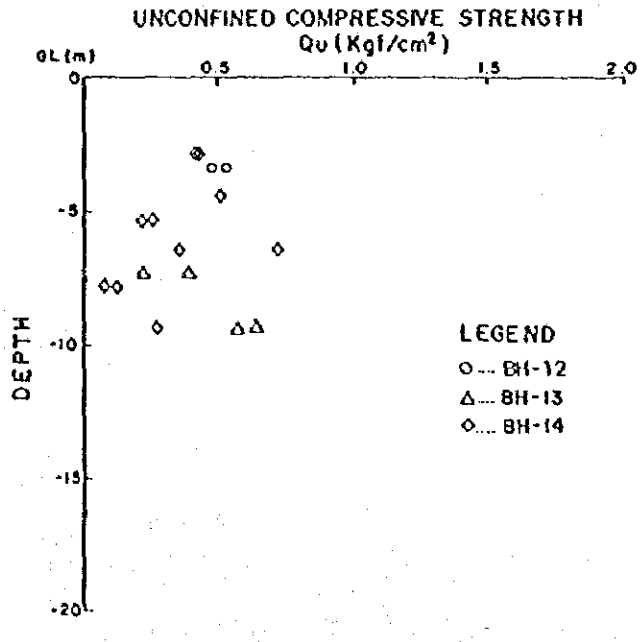


Relationship between Wet Unit Weight and Depth in North Harbor (JSSMFE)

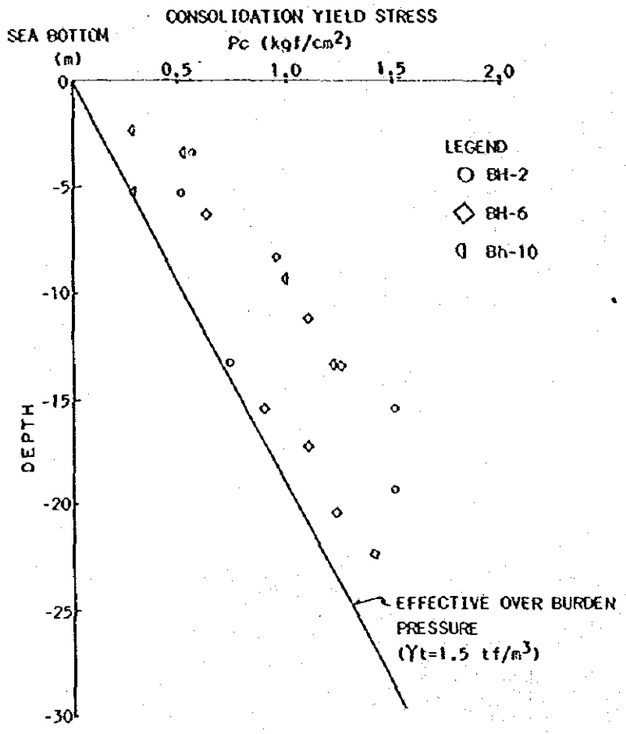
Appendix 3.1.20 Shear Characteristics of Soil in Investigation Area



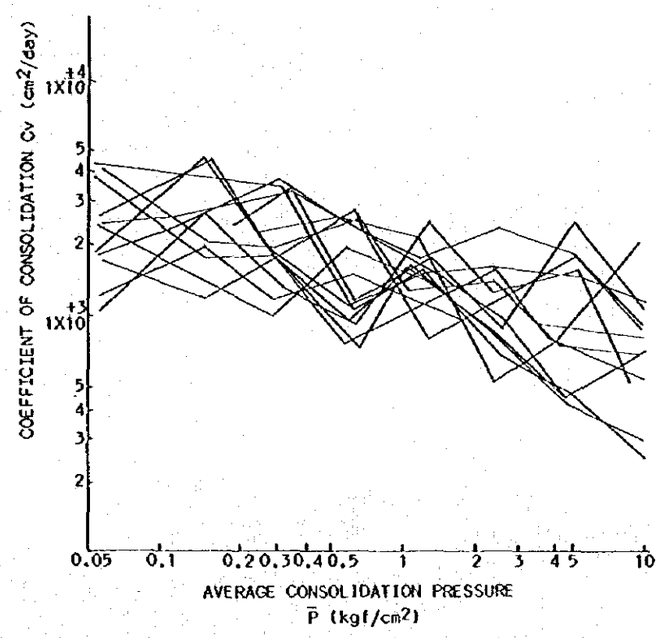
Relationship between Unconfined Compressive Strength and Depth in South Harbor (JIS A 1216)



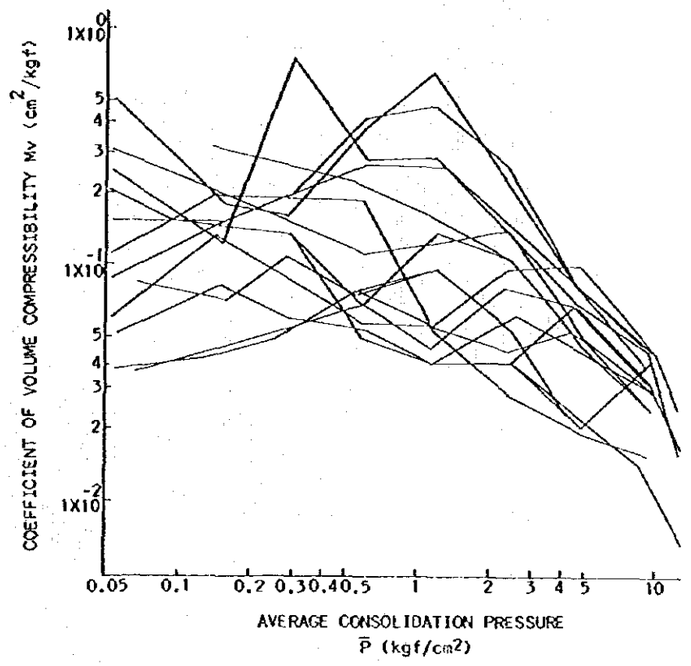
Relationship between Unconfined Compressive Strength and Depth in North Harbor (JIS A 1216)



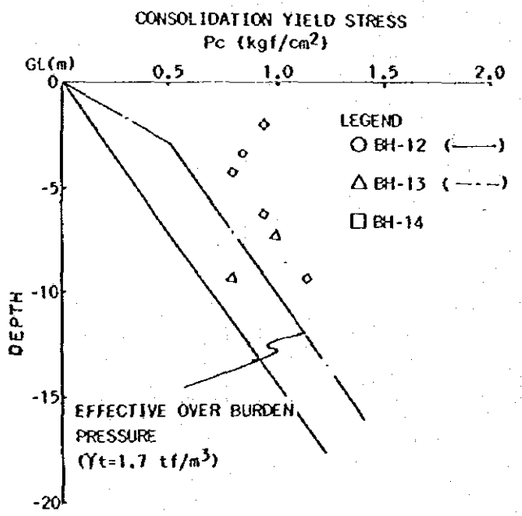
Relationship between Consolidation Yield Stress and Depth in South Harbor (JIS A 1217)



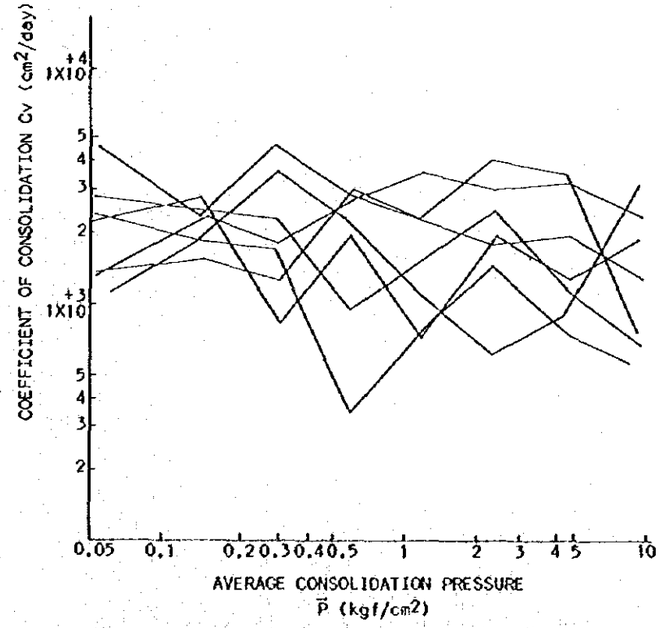
Relationship between Coefficient of Consolidation and Average Consolidation Pressure in South Harbor (JIS A 1217)



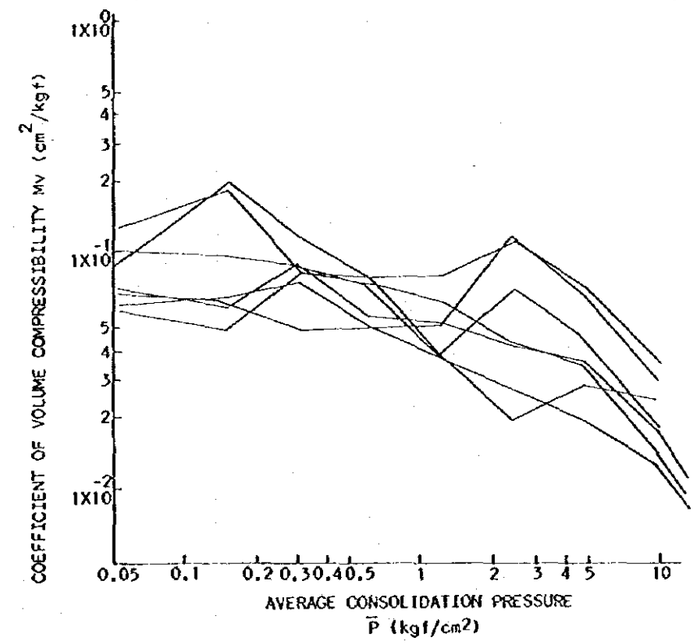
Relationship between Coefficient of Volume Compressibility and Average Consolidation Pressure in South Harbor (JIS A 1217)



Relationship between Consolidation Yield Stress and Depth in North Harbor (JIS A 1217)



Relationship between Coefficient of Consolidation and Average Consolidation Pressure in North Harbor (JIS A 1217)



Relationship between Coefficient of Volume Compressibility and Average Consolidation Pressure in North Harbor (JIS A 1217)

Appendix 3.1.22 Plate Bearing Test

Plate bearing tests were conducted in North and South Harbors in conformity with JIS A 1215. The settlement at 0.125 cm for the coefficient of bearing capacity (K-value) was used on concrete paved roads. The results of the plate bearing tests are shown in Table A.

Table A Results of Plate Bearing Tests

Test Pit No. PBT	Depth (m)	K (kgf/cm^3)	Settlement (cm)	Density (tf/cm^3)		Moisture Content (%)	Remarks
				Wet	Dry		
1	0.63	10.4	0.125	1.44	1.04	32.4	South Harbor Road
2	0.80	4.9	- do -	1.55	1.05	32.3	South Harbor Container Yard (CY-2)
3	0.45	8.6	- do -	1.79	1.40	28.1	- do -
4	0.55	12.8	- do -	1.73	1.30	33.0	- do -
5	1.15	6.4	- do -	1.83	1.39	31.4	South Harbor Road
6	0.45	6.2	- do -	1.71	1.29	30.9	South Harbor Container Yard (CY-1)
7	0.95	6.3	- do -	1.81	1.42	42.9	- do -
8	0.70	5.6	- do -	1.75	1.31	33.2	- do -
9	0.65	5.6	- do -	1.84	1.39	32.6	South Harbor Road
10	0.85	27.6	- do -	1.81	1.58	14.4	North Harbor Road
11	0.75	37.6	- do -	1.81	1.30	37.6	- do -
12	0.85	26.3	- do -	2.09	1.65	26.3	- do -

On the other hand, the design coefficient of bearing capacity is calculated as follows.

$$\text{Design K-value} = \text{Average K-value} - \frac{(K_{max.} - K_{min.})}{d}$$

The d-values are shown below.

Table B d-values

Test Number	3	4	5	6	7	8	9	10 above
d	1.91	2.24	2.48	2.67	2.84	2.96	3.08	3.18

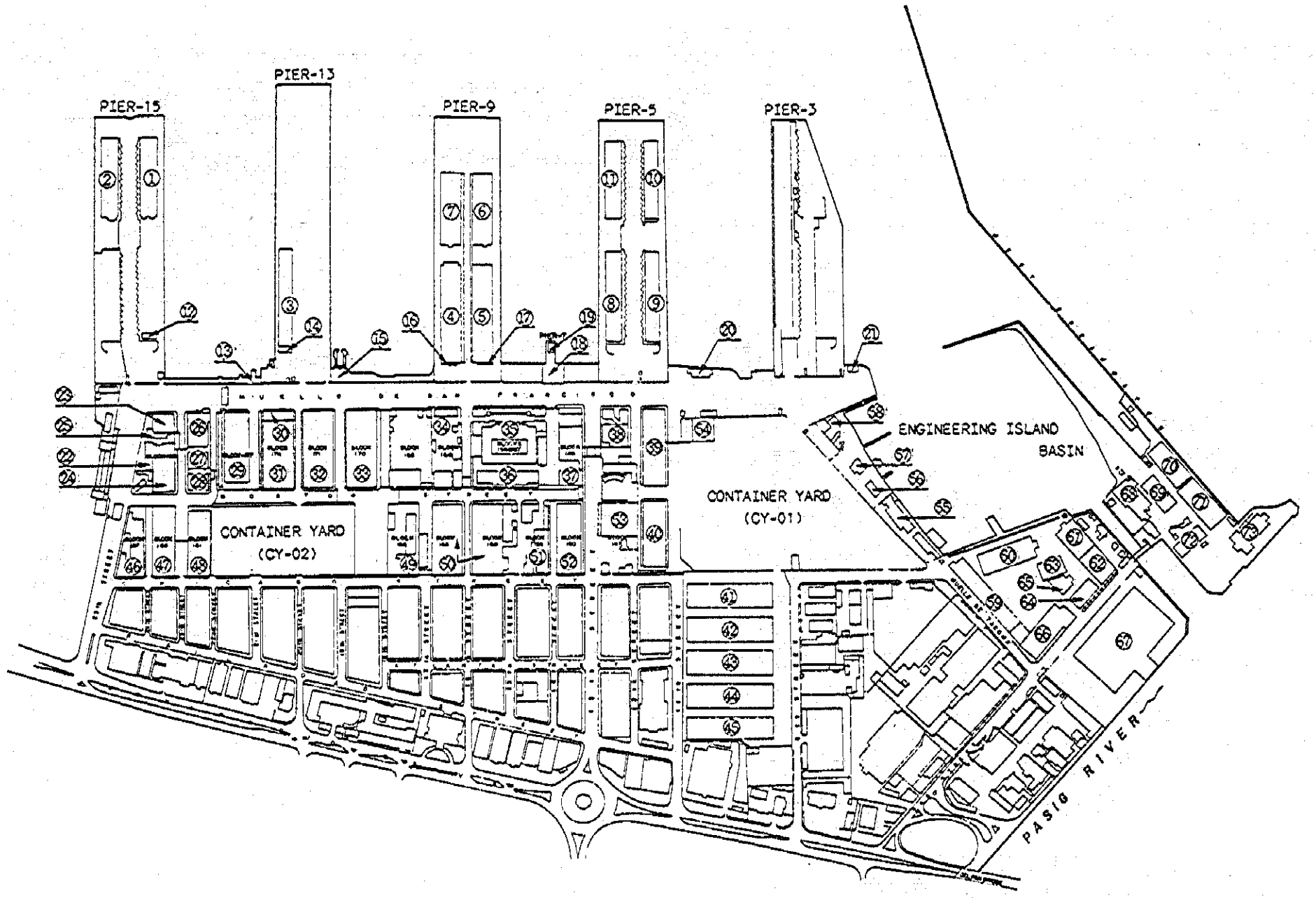
CBR tests were performed to obtain Modified K-values for the cohesive subgrade soils. Two CBR tests were carried out in South Harbor. The results of the CBR tests are shown in Table C. The modified K-values are obtained using the following formula.

$$\text{Modified K-value} = \text{K-value} \times \frac{\text{CBR(soaked)}}{\text{CBR(natural)}}$$

The design coefficient of bearing capacity is presented in Section 3.1.5.4, Table 3.1.9.

Table C Results of CBR Tests

Test Pit No. PBT	CBR (%)		Coefficient of Modification (soaked/natural)	Area
	Natural	Soaked		
8	2.28	2.25	0.99	Container Yard (CY-1)
11	1.48	1.35	0.91	North Harbor Road



Appendix 3.2.1 Location of Existing Facilities in South Harbor

Appendix 3.2.2 List of Sheds and Buildings on Piers and Slips

No.	Location	Application	Area (m^2)	Type of Structure	Condition of Facility	Remarks
1	Pier 15	Transit Shed N	2,875	One story concrete framed building with hollow-block walls, corrugated aluminum sheet, roofing on steel frame, plain cement finish concrete floor, and sliding steel plate doors.	B	
2	- do -	Transit Shed M	2,875	- do -	B	
3	Pier 13	Transit Shed E	3,102.60	- do -	B	
4	Pier 9	Transit Shed A	4,056	- do -	B	
5	- do -	Transit Shed B	- do -	- do -	B	
6	- do -	Transit Shed C	3,350.88	- do -	B	
7	- do -	Transit Shed D	- do -	- do -	B	
8	Pier 5	Transit Shed I	3,400	- do -	B	
9	- do -	Transit shed J	3,400	- do -	B	

No.	Location	Application	Area (m^2)	Type of Structure	Condition of Facility	Remarks
10	Pier 5	Transit Shed K	2,932.50	One story concrete framed building with hollow-block walls, corrugated aluminum sheet, roofing on steel frame, plain cement finish concrete floor, and sliding steel plate doors.	C	
11	- do -	Transit Shed L	2,932.50	- do -	C	
12	Pier 15	Office Building	192	One story timber framed building with concrete hollow-block wall, corrugated iron sheet roofing on timber frame.	A	Old Building
13	Slip 14		42.3	One story timber framed building, with hollow-block walls, corrugated galvanized iron sheet roofing on timber frame.	A	
14	Pier 13	Terminal Operation Office	12.0	One story building with wooden columns, sidings and flooring, corrugated G.I. sheet roofing on wooden frame and plywood ceiling.	A	

No.	Location	Application	Area (m^2)	Type of Structure	Condition of Facility	Remarks
15	Slip 10-12	Ro-Ro Ramp Landing	--	8 m wide and 12 m long constructed of reinforced concrete tubular piles, steel and concrete frame and steel deck.	A	
16	Pier 9	Office Building	790.50	Three story concrete framed building with hollow-block walls, corrugated aluminum sheet roofing on timber frame.	B	Only use the first floor.
17	- do -	- do -	1,255.50	- do -	B	- do -
18	Slip 8, Pier 7, Slip 6	Passenger Terminal Warehouse and Office	3,770	Two story concrete framed structure with hollow-block walls, corrugated iron sheet roofing on timber frame, plywood ceiling. Two one story concrete framed structures on its left and right wings with hollow-block walls and iron sheet roofing on steel frame.	A	

No.	Location	Application	Area (m^2)	Type of Structure	Condition of Facility	Remarks
19	Pier 7	Bureau of Customs, Fire Boat Station	368	Two story concrete framed building with hollow-block walls, RC slab roofing, vinyl tile finish, concrete second floor and unglazed tile finish concrete ground floor.	B	
20	Slip 4	Security and Dental Office	363	- do -	A	
21	Slip 2	Open Shed	110.7	One story steel framed structure with corrugated iron sheet roofing on steel frame.	A	

Appendix 3.2.3 List of Warehouses and Buildings Behind Pier

No.	Location	Application	Area (m^2) (Land)	Type of Structure	Condition of Facility	Remarks
22	Block 183	PPA, Engineering Building	1,932	Two story timber framed building with concrete hollow blocks, ground floor walling and wooden second floor siding on wooden frame.	A	
23	- do -	National Customs Police	360.0	One story concrete bungalow with concrete hollow-block walls, corrugated galvanized iron sheet on timber frame, plain cement finish concrete floor.	A	
24	- do -	Customs Motorpool	346.80	One story timber frame with concrete hollow-block walls, corrugated galvanized iron sheet roofing on timber frame.	A	
25	- do -	Police Quarters	158.80	One story timber frame with concrete hollow-block walls, corrugated galvanized iron roofing on timber frame.	B	

No.	Location	Application	Area (m^2) (Land)	Type of Structure	Condition of Facility	Remarks
26	Block 182	Travel Agency (Marshman Building)	11,875 (3,901)	Five story concrete framed building with reinforced concrete walls, corrugated galvanized iron sheet roofing on timber frame, reinforced concrete slab on second, third and fourth floors.	A	Burned in 1975
27	- do -	Warehouse	1,120	One story steel frame building with concrete hollow blocks and corrugated iron sheet roofing on steel frame.	A	
28	- do -	Rental Office	1,920	Two story concrete framed building with concrete walls, corrugated iron sheet roofing on timber frame, reinforced concrete slab second floor.	A	
29	Block 177	Motor Pool	2,804 (5,479)	One story steel framed building with cyclone wire and concrete hollow-block walls, aluminum sheet roofing on steel frame.	A	

No.	Location	Application	Area (m^2) (Land)	Type of Structure	Condition of Facility	Remarks
30	Block 176	PMU Office		Four story reinforced concrete building	A	
31	- do -	Court and Office	6,412 (5,479)	Reinforced concrete walls, corrugated iron shhet roofing on steel frame.	A	Previously Warehouse
32	Block 171	Warehouse 11	5,600 (5,479)	One story steel frame building with corrugated aluminum sheet and hollow-block walls, corrugated aluminum sheet roofing on steel frame.	A	
33	Block 170	Warehouse 1	5,600 (5,479)	- do -	A	
34	Block 164	Quarantine Service	1,279 (5,474)	Two story concrete framed building with concrete walls and partitions corrugated iron sheet roofing on timber frame, plain cement finish concrete ground floor, T & G finish concrete second floor.	A	

No.	Location	Application	Area (m^2) (Land)	Type of Structure	Condition of Facility	Remarks
35	Block 156, 157	Bureau of Customs	28,476 10,774	Four story concrete frame building	A	Old, massive structure
36	- do -	Federation of Customs Brokers		Two story concrete frame building	A	
37	Block 149	Computer Center		Two story concrete frame building	A	New Structure
38		Metroport Service Office		One story reinforced concrete building	A	New Structure
39	Block 141	Warehouse 2	3,528	One story concrete steel framed building, with concrete hollow-block walls, corrugated iron sheet roofing on steel frame.	C	Not usable
40	Block 142	Warehouse 3	3,528	- do -	A	
41		Warehouse 6	4,420 (40,050)	One story steel framed building with corrugated aluminum sheets and hollow-block walls, corrugated aluminum sheet on steel frame.	A	

No.	Location	Application	Area (m^2) (Land)	Type of Structure	Condition of Facility	Remarks
42		Warehouse 7	4,420 (40,050)	One story steel framed building with corrugated aluminum sheets and hollow-block walls, corrugated aluminum sheet on steel frame.	A	
43		Warehouse 8	- do -	- do -	A	
44		Warehouse 9	- do -	- do -	A	
45		Warehouse 10	- do -	- do -	A	
46	Block 187	Bureau of Quarantine	2,832 (2,278)	Two story reinforced concrete building	A	
47	Block 184	Shops and Warehouse	3,570 (4,251)	One story concrete steel framed building with concrete hollow-block walls, corrugated galvanized iron sheet roofing on steel frame.	A	
48	Block 181	- do -	- do -	- do -	A	

No.	Location	Application	Area (m^2) (Land)	Type of Structure	Condition of Facility	Remarks
49	Block 166	Red Cross, Warehouse	500 (5,002)	One story concrete steel framed building with hollow-block walls, corrugated iron sheet roofing on timber frame.	C	
50	Block 163, 158	Bureau of Printing	29,232 (10,005)	Three story concrete framed building with reinforced concrete walls and partitions, corrugated iron sheet on steel frame, plain cement finish concrete ground floor, reinforced concrete second and third floors.	B	Large scale structure, converted from warehouse to factory
51	Block 155	MPWH, Equipment Service	(5,002)	---	C	Very old
52	Block 150	Office	9.560 (3,904)	Three story R.C. framed building with hollow-block walls, roofing on timber frame.	B	not used

No.	Location	Application	Area (m^2) (Land)	Type of Structure	Condition of Facility	Remarks
53	Block 147	Port Personnel Training Center	4,012 (4,410)	Two story concrete framed building with hollow blocks, corrugated iron sheet roofing on timber frame, plain cement finish on ground floor, vinyl tile finish concrete second floor.	A	
54	--	Motor Pool and Machine shop	--	One story steel framed building with cyclone wire and concrete hollow-block walls, corrugated iron sheet roofing on timber frame.	C	

Appendix 3.2.4 List of Warehouses and Buildings around Engineering Basin

No.	Location	Application	Area (m^2)	Type of Structure	Condition of Facility	Remarks
55	Along Mulle de Tacoma	Office and Motor Pool	--	Two story reinforced concrete office and one story motor pool, corrugated galvanized iron sheet roofing supported by steel frame.	C	Not used
56	- do -	Customs Police	--	One story wooden structure	B	
57	- do -	Storage	--	Semi-arc, corrugated iron sheet roofing on wooden frame.	C	Not used
58	- do -	Bureau of Custom, Office	--	Two story reinforced concrete office building.	B	
59	- do -	NMC Office	--	One story, partially two story, R.C. walls, galvanized iron sheet on timber frame.	A	
60	- do -	Warehouse 2B	2,550	One story steel frame structure with galvanized iron sheet wall and roof.	C	Severely worn

No.	Location	Application	Area (m^2)	Type of Structure	Condition of Facility	Remarks
61	Along Mulle de Tacoma	Warehouse 3A	3,300	One story steel frame structure with galvanized iron sheet wall and roof.	A	Newly rebuilt structure
62	- do -	- do -		- do -	C	Severely worn
63	- do -	Warehouse 4	990	- do -	B	
64	- do -	Warehouse 5	990	- do -	B	
65	- do -	NFA Office	--	Two story R.C., partially three story building	B	Usable but worn
66	- do -	Warehouse 1B	2,800	One story steel frame structure with galvanized iron sheet wall and roof.	B	
67	Along Pasig River	Warehouse	11,040	Steel frame with galvanized iron sheet wall and roof.	A	
68	BASECO	Materials Building	--	One story wooden frame with galvanized iron sheet wall and roof.	C	Not used, severely worn
69	- do -	E.I.S. Office	--	- do -	C	Not used

No.	Location	Application	Area (m^2)	Type of Structure	Condition of Facility	Remarks
70	BASECO	Plant and Angle Shop	--	One story steel frame, with galvanized iron sheet wall and roof.	B	Not used
71	- do -	Machine Shop	--	One story wooden frame, with galvanized iron sheet wall and roof.	C	- do -
72	- do -	--	--	One story steel frame, with galvanized iron sheet wall and roof.	C	- do -
73	- do -	Office	--	Two story reinforced concrete building.	A	

Appendix 3.2.5 Navigation Aids

A. Existing Navigational Situation at South Harbor Basin

1. South Harbor and its navigation environs encompass the main study area of the South Port District (Piers 3,5,9,13 and 15), the adjacent areas of the North Port District (piers 2,4,6,8,10,12,14, and 16) and the Manila International Container Terminal, the latter at a location nearly equidistant from the two port districts.

2. The South Harbor basin is normally protected from inclement weather and rough sea conditions by two breakwaters, West and South, with lengths of 2,300 and 880 meters respectively.

B. Navigational Problems Identified

Per a discussion with Mr. Gregorio Gayac, commandant of CG-10, Philippine Coast Guard, the following navigational problems at South Harbor and adjacent areas have been noted:

1. Absence of light and weak intensity lights at the mooring buoys and lighthouses positioned at the quarantine and anchorage areas, mainly due to the stealing of expensive lighthouse batteries by fishermen.

2. Inadequate lighthouses and mooring buoys especially in shallow and risky areas such as the entrance to the Pasig River and the barge pool basin alongside West Breakwater, where maneuvering is very difficult.

3. No permanent berthing place for many small craft plying the South Harbor area. Thus, berthing is variable and poses some obstruction to navigation.

4. A major problem, however, is the presence of numerous fishing pens off the anchorage areas which pose dangers and hazards to navigation.

5. The entrance or channel to the South Harbor basin is quite narrow, thus affecting the maneuverability of vessels. However, the water depth is sufficient.

C. PCG Recommendations

The following recommendations from PCG have been spelled out by Mr. Gayac:

1. Installation of stronger intensity lights for the mooring buoys and lighthouses to assure visibility from far distances.

2. Possible use of wave activated buoys to prevent stealing.

3. Sufficient quantities of filling materials are needed at the breakwater to prevent the collapse of the lighthouse structure.

4. Installation of additional lighthouses in shallow, dangerous and risky areas.

5. Extension of South Breakwater by 100 meters.

6. Provision of a water basin for small craft either between Pier 3 and 5 or between Pier 3 and the area adjacent to the Engineering Island.

7. Restricting Pasig River navigation to smaller vessels with lower drafts.

8. Installation of additional mooring buoys from West and South Breakwaters towards Rizal Park.

9. Removal of the barge pool area since it is hardly utilized and navigation there is very dangerous.

10. Removal of fishing pens off the anchorage areas. Presently, the PCG is starting some demolition of the fishpen structures.

11. Possible moving of South Breakwater from its existing location for increased maneuverability.

Appendix 3.2.6 List of Navigation Aids

Headquarters Philippine Coast Guard
25th Street, Port Area
Manila

FIRST COAST GUARD DISTRICT

No.	LIGHT STATION/LOCATION	LIGHT CHARACTERISTICS	MANNING	POWER SOURCE	STATUS		REMARKS
					OPTG	NOT OPTG	
1.	LS CABRA, Lubang, Occ Mindoro	Grp Fl 2W ev 10 secs	5	3 DEG PHI 220 VAC		X	Broken Fuel Line
2.	LS CAPONES, San Antonio, Zamoales	Grp Fl 4W ev 15 secs	3	1 DEG PHI		X	Defective Generator
3.	LS CORREGIDOR, Cavite	Grp Fl 4W ev 25 secs	4	3 DEG PHI			Manila Bay Area
4.	LS CUSTOM TOWER, Manila	Fl R ev 5 secs	2	Local Elec 10A lead Batt			Manila Bay Area
5.	LS EL ERAJIE, Tarnate, Cavite	Fl W ev 5 secs	none	10 Solar Panel			Manila Bay Area
6.	LS HERMAN MAYOR, Sta. Cruz, Zambales	Grp Fl 3 W ev 5 secs	2	24 SMIL Batt			
7.	LS LA MONJA, Mariveles, Battan	Fl R ev 5 secs	none	10 ALCAD 4 Solar		X	Defective Battery
8.	LS Mla Jetty Nr 1, Manila	Fl G ev 5 secs	none	10 ALCAD 6 Solar			Manila Bay Area
9.	LS Mla. Jetty Nr 2, Manila	Fl 2R ev 5 secs	none	6 Willard Batt 6 Solar			Manila Bay Area
10.	LS Mla. Jetty Nr. 3 Manila	Fl G ev 5 secs	none	6 Solar 10 A lead			Manila Bay Area
11.	LS Mla. Jetty Nr 4, Manila	Grp Fl R ev 5 secs	none	10 ALCAD Batt			Manila Bay Area
12.	LS Mla. Jetty Nr 5, Manila	Fl 3 G ev 10 secs	none	6 SMIL Batt 1 HAMC M/C			Manila Bay Area
13.	LS MARIVELES, Bataan	Fl R ev 5 secs	1	2 SMC BATT			
14.	LS NAPINDAN, Taguig Rizal	Fl R ev 5 secs	2	2 Willard 6V			

No.	LIGHT STATION/LOCATION	LIGHT CHARACTERISTICS	MANNING	POWER SOURCE	STATUS		REMARKS
					OPTG	NOT OPTG	
15.	LS PALUIG, Zambales	GRP Fl 2 W ev 10 secs	3	1 DEC ABI 24 SMIL Batt			
16.	LS PASIG RIVER, Parola Manila	Fl W ev 5 secs	maintained by Military	6 Willard Batt 4 Solar			Manila Bay Area
17.	LS PTO. AZUL, Tarnate, Cavite	Fl R ev 5 secs	maintained by Military	6 A lead			Manila Bay Area
18.	LS SANGLEY PT, Cavite	Alt Fl W&R ev 10 secs	maintained by HANC	Local Elec			Manila Bay Area
19.	LS SAN NICOLAS Rosario, Cavite	Fl R ev 5 secs	none	6 Solar 10 A lead		X	Manila Bay Area
20.	LS SISIMAN COVE, Mariveles	Fl W ev 5 secs	none	1 HANC M/C SMG Batt		X	Manila Bay Area
21.	LS SESTE PT., Subic, Zambales	Fl W ev 5 secs	4	3 DEC ABI			
22.	LS TANAY, Tanay, Rizal	Fl W ev 5 secs	municipal maintained	Local Elec			
23.	LS TARNATE Tarnate, Cavite	Fl R ev 5 secs	none	2 Batt			Manila Bay Area
24.	LS TILIK, Lubang, Occ. Mindoro	Fl R ev 5 secs	1	2 SMG Batt			
25.	LS IP CMNL LIGHT, Manila	Fl R ev 5 secs	none	10A lead 4 Solar Panel			Manila Bay Area
26.	LS IP CMNL LIGHT, Manila	Fl G	none	6 A lead Batt 4 Solar Panel			Manila Bay Area
27.	LS IP CMNL LIGHT, Manila	Fl R	none	4 Solar		X	No Tower Mla., Bay Area

Appendix 3.2.7 Water and Oil Supply

Results of the interview with Harbor Systems and Supply Inc.
(Pier 8, North Harbor)

Number of barges used in water supply - 2 (300MT and 260 MT)

Water supply demand depends on the frequency of vessel calls and the kind of vessels that call at the port. Usually, water and oil demand concentrates during the peak tourist season. Passenger vessels require more water than cargo vessels.

The company charges for a minimum delivery of 90 tons of water which they bill at thirty-five pesos (P.35.00) to forty pesos (P.40.00) per ton if it is delivered at South Harbor or Anchorage, and at twenty-eight pesos (P.28.00) to thirty pesos (P.30.00) per ton at North Harbor.

The water sources of this company are located at Pier 8 and 2 in North Harbor, and at the foot of Quezon bridge in Quiapo. At North Harbor, the company uses a pump to obtain the volume of water needed to fill the barge, while at Quiapo where the water pressure is high, they rely on gravity to fill up the barge.

The only big problem with the barge transport on the Pasig River is the low clearance which during high tide makes it impossible for barges to pass under the bridge.

Oil Supply for Vessels

The results of the interview with C.B. NAZAL Trading, Inc. (Navotas, Metro Manila) are as follows:

Business:
Oil and petroleum delivery to vessels at South Harbor, Anchorage and North Harbor.

Number of Barges:
Two (2) compartment barges with total carrying capacity of 220,000 liters and 290,000 liters.

System:

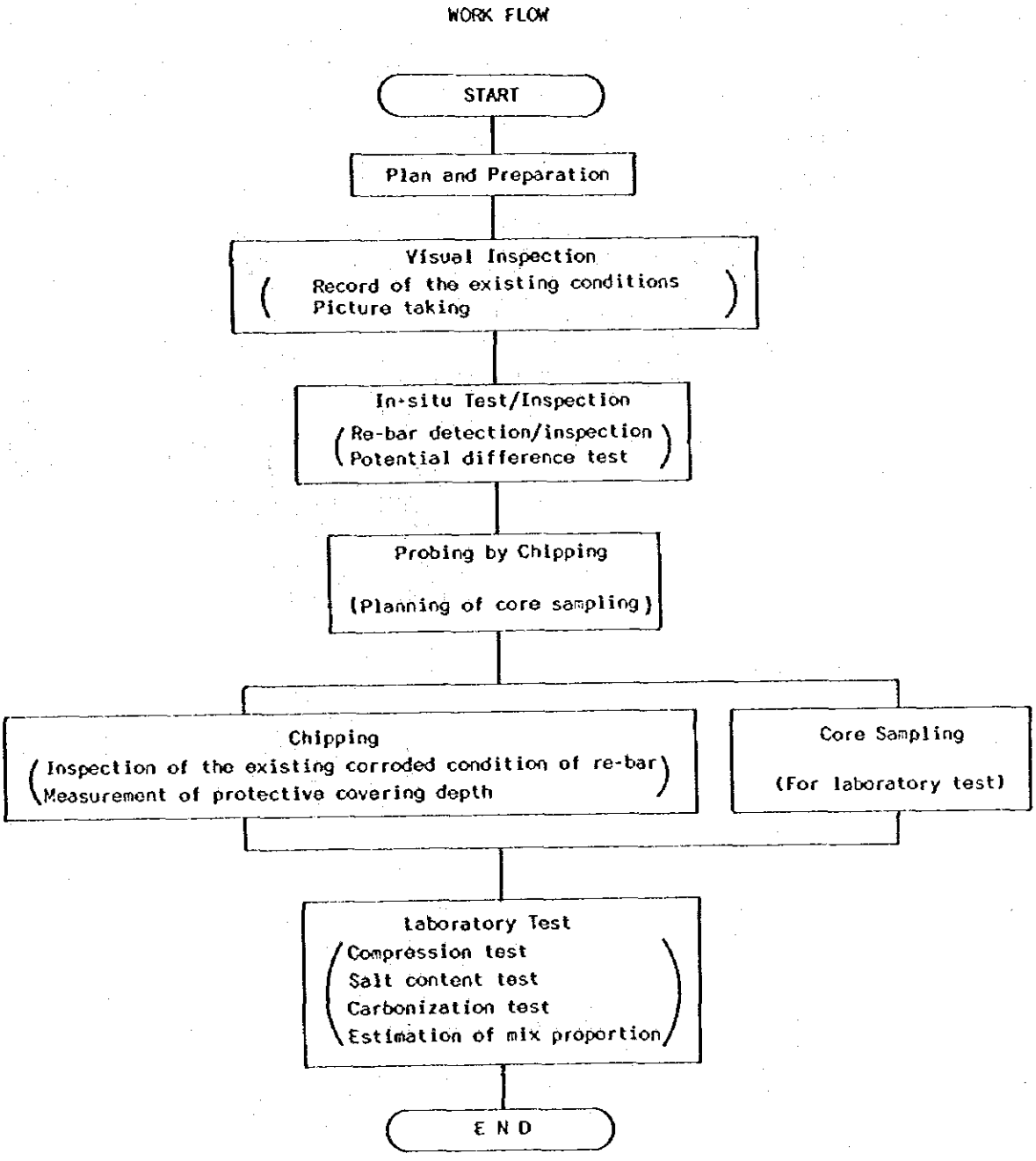
Oil and petroleum products orders are placed in advance to the oil depot (Caltex Philippines). The time of arrival and departure of vessels is also given. The oil company then advises the hauling company (NAZAL). During the stay of the vessel, the hauling company supplies the products using their barges at North Harbor which can be reached by radio. Oil is pumped up by the vessel. NAZAL charges P.O. 55/ℓ for hauling oil and petroleum products.

The problem with this system is also the low clearance of the bridge during high tide.

Factors that can affect demand include varying prices and the quality of the products.

Appendix 3.3.1 Investigation/Survey Flow

The following is the flow of the Investigation.



Appendix 3.3.2 Visual Inspection Results

1) Figs. A through E (damage degree maps) show the results of inspection for all beams, slabs and piles using the symbols given in Table A.
2) Fig. 3.3.1 is based on the damage degree map (Figs. A through E) where symbols are replaced by panels patterned differently based on the degree of damage as specified in Table B.
3) Table C and Figs. F through H show the overall results of the visual inspection.
   Tables D and E and Figs. I and J show further results for slabs and beams to be inspected item by item.
4) Table F shows the results of the underwater survey for piles.

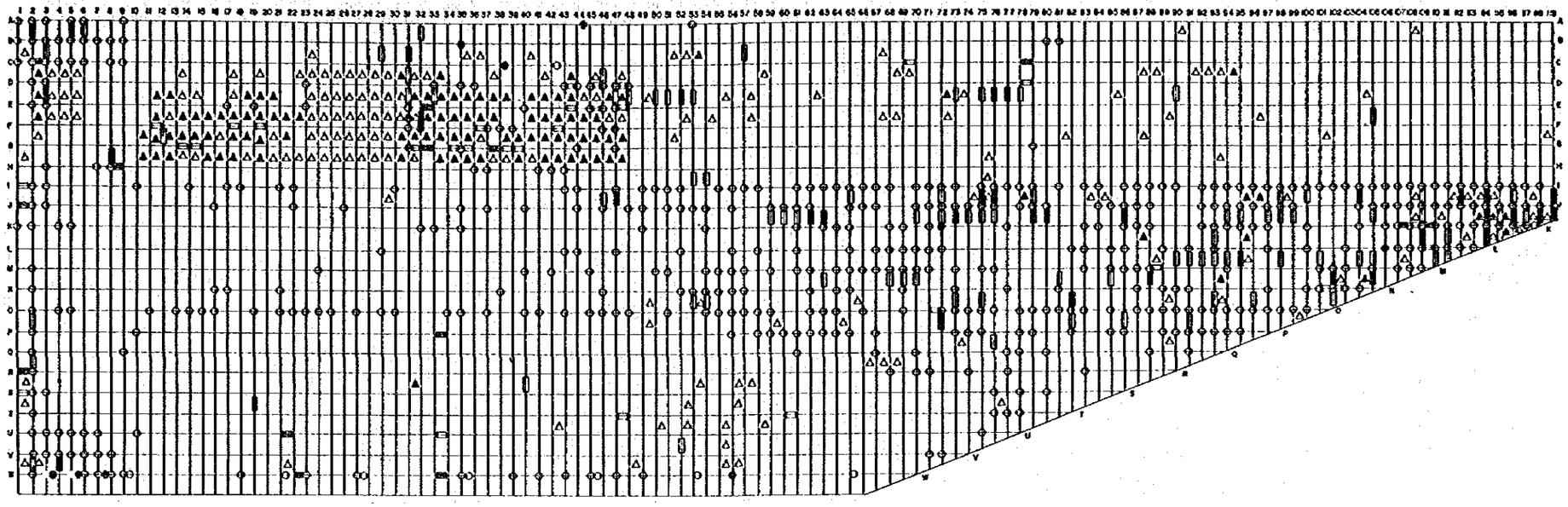
Table A Damage Symbols

SERIOUSLY DAMAGED	SLAB	▲
	BEAM	▬
	PILE	●
SLIGHTLY DAMAGED	SLAB	△
	BEAM	▭
	PILE	○

Table B Damage Color Symbols

Item	Symbol	Colored Mapping in Terms of Panels
Pile	●	All the four adjacent panels are deemed to be unreliable or "seriously damaged," though the slabs are structurally sound. —► Red color
	○	The degree of damage of the four adjacent panels is decided individually based on the structural conditions of the relevant beams/slabs connected with the pile.
Beam	▬	Panels on both sides of the beam are deemed to be unreliable or "seriously damaged," though the slabs are structurally sound —► Red color
	▭	The degree of damage of the two adjacent panels depends on the soundness of the relevant slabs. —► Yellow or Red color
Slab	▲	The said panel is regarded as "seriously damaged"—► Red color
	△	The said panel is regarded as "slightly damaged" —► Yellow color

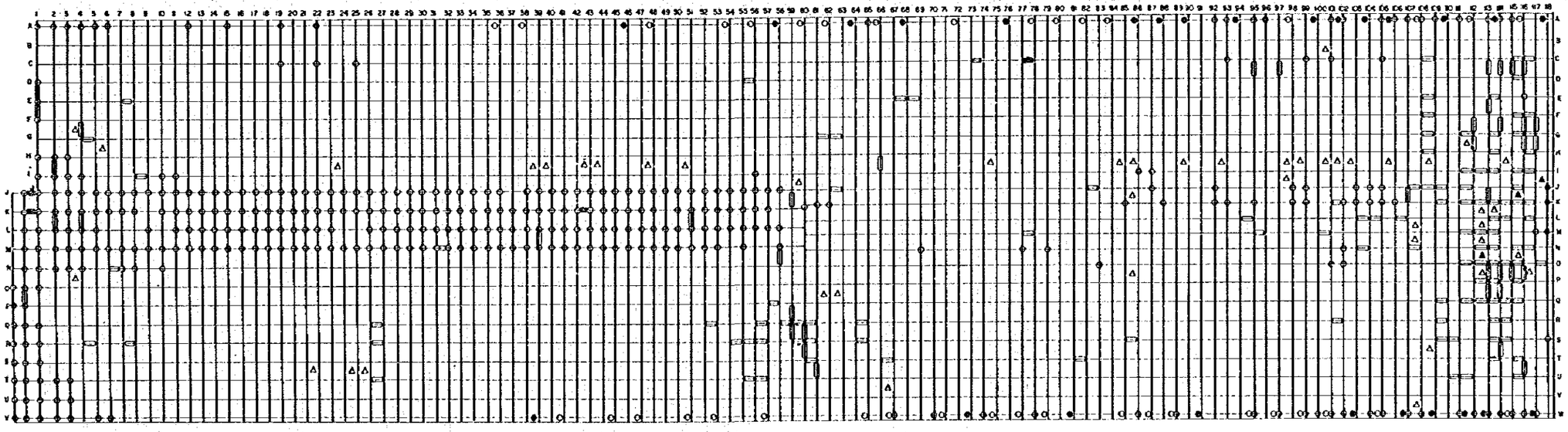
Land Side



Sea Side

Fig. A Damage Degree Map of Pier 3

Land Side



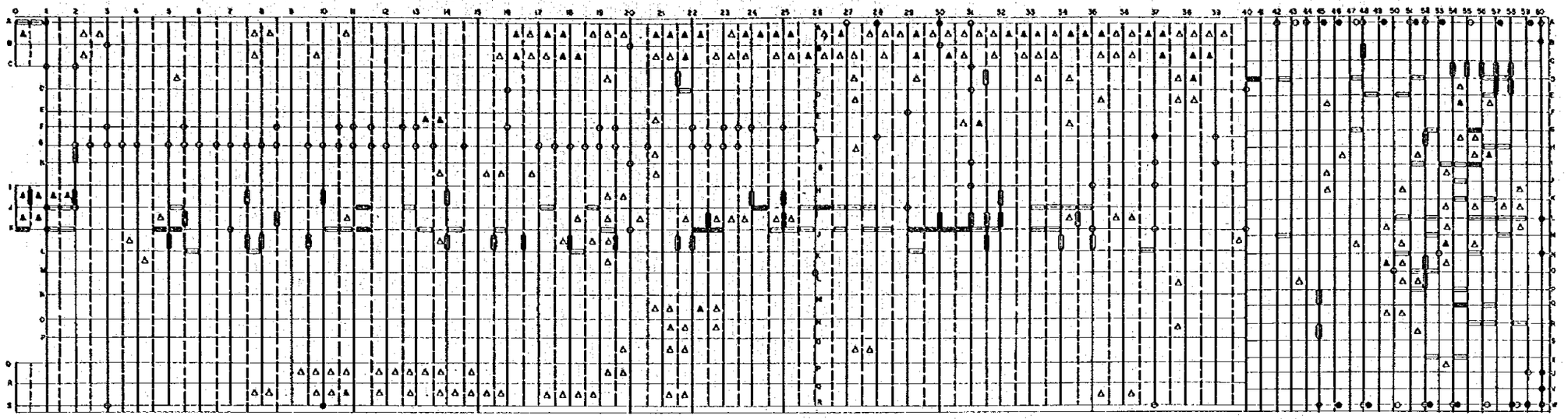
Sea Side

Fig. B Damage Degree Map of Pier 5

LEGEND

SERIOUSLY DAMAGED	SLAB	▲
	BEAM	▬
	PILE	●
SLIGHTLY DAMAGED	SLAB	△
	BEAM	▭
	PILE	○

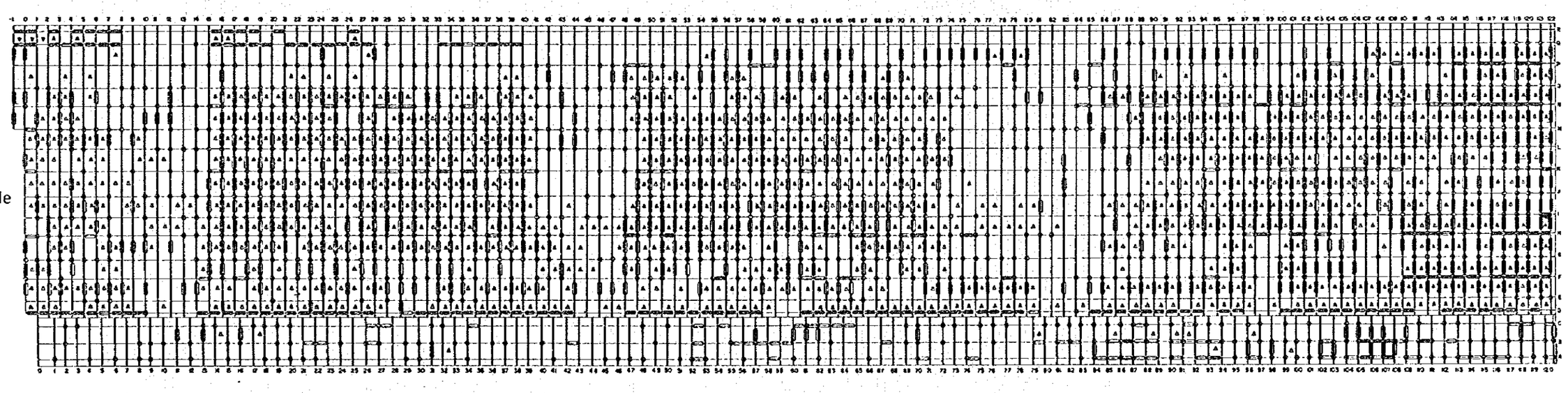
Land Side



Sea Side

Fig. C Damage Degree Map of Pier 9

Land Side



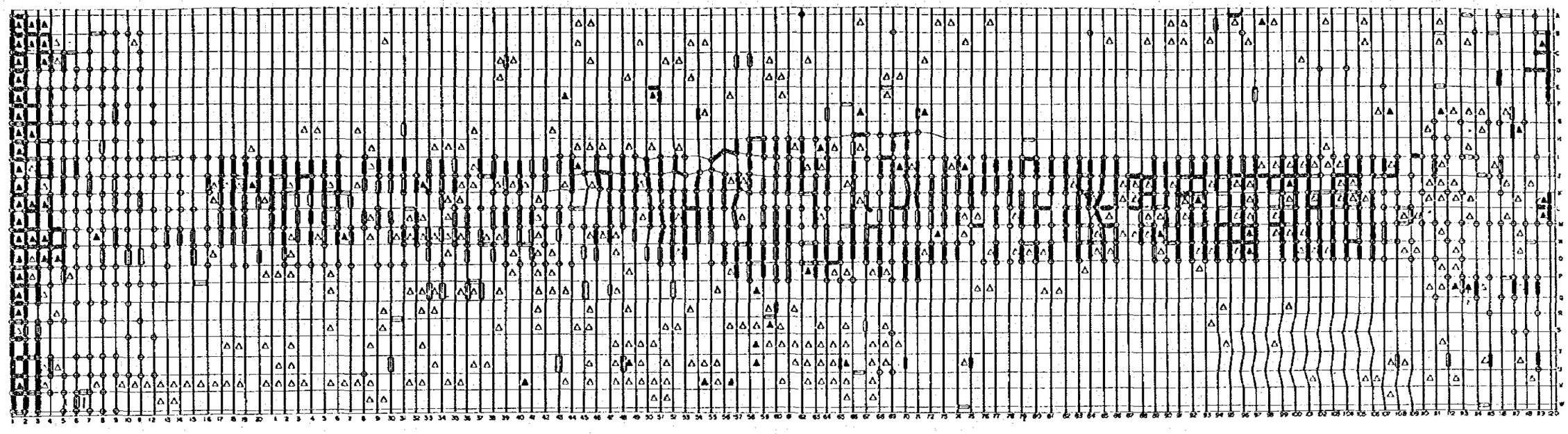
Sea Side

Fig. D Damage Degree Map of Pier 13

LEGEND

SERIOUSLY DAMAGED	SLAB	▲
	BEAM	▬
	PILE	●
SLIGHTLY DAMAGED	SLAB	△
	BEAM	▭
	PILE	○

Land Side



Sea Side

Fig. E Damage Degree Map of Pier 15

LEGEND

SERIOUSLY DAMAGED	SLAB	▲
	BEAM	▬
	PILE	●
SLIGHTLY DAMAGED	SLAB	△
	BEAM	▭
	PILE	○

Table C Overall Damage Evaluation

	Pier No.	3			5			9			13			15		
	Symbol	Total		Rate	Total		Rate	Total		Rate	Total		Rate	Total		Rate
SLABS	○	2,117		84.7	2,481		97.9	1,587		87.7	962		49.0	2,147		82.0
	△	187	2,500	7.5	48	2,534	1.9	180	1,811	9.9	465	1,964	23.7	406	2,618	15.5
	×	196		7.8	5		0.2	44		2.4	537		27.3	65		2.5
BEAMS	○	4,929		95.9	5,047		96.9	3,394		95.7	2,059		63.1	4,526		84.2
	△	149	5,141	2.9	158	5,211	3.0	128	3,548	3.6	617	3,262	18.9	420	5,374	7.8
	×	63		1.2	6		0.1	26		0.7	586		18.0	428		8.0
PILES	○	2,191		82.5	2,322		84.3	1,123		91.0	1,039		41.0	2,026		71.7
	△	449	2,657	16.9	394	2,756	14.3	83	1,234	6.7	1,493	2,532	59.0	794	2,827	28.1
	×	17		0.6	40		1.4	28		2.3	0		0	7		0.2

○ : Sound
△ : Slightly Damaged
× : Seriously Damaged

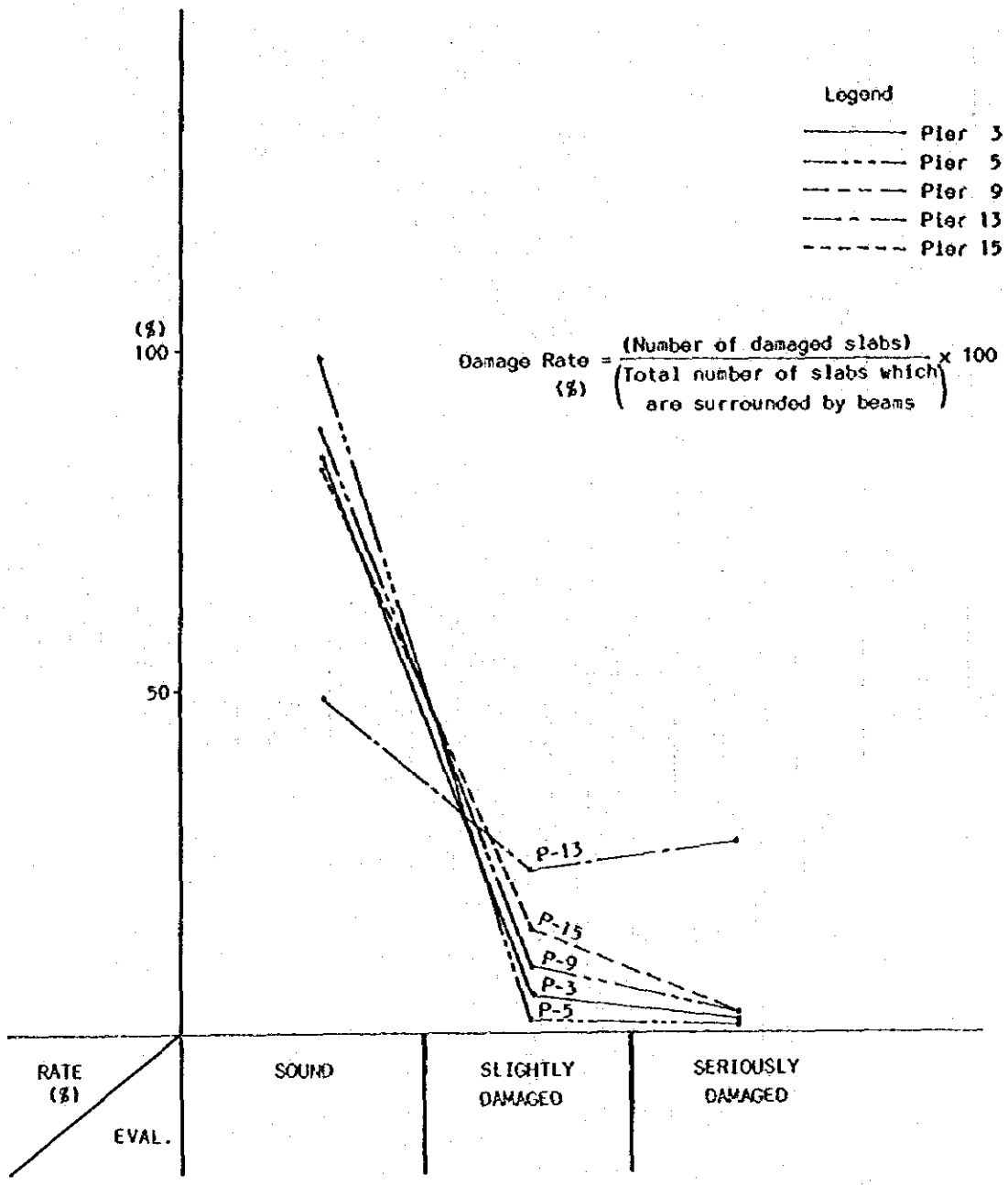


Fig. F Damage Rate of Slabs

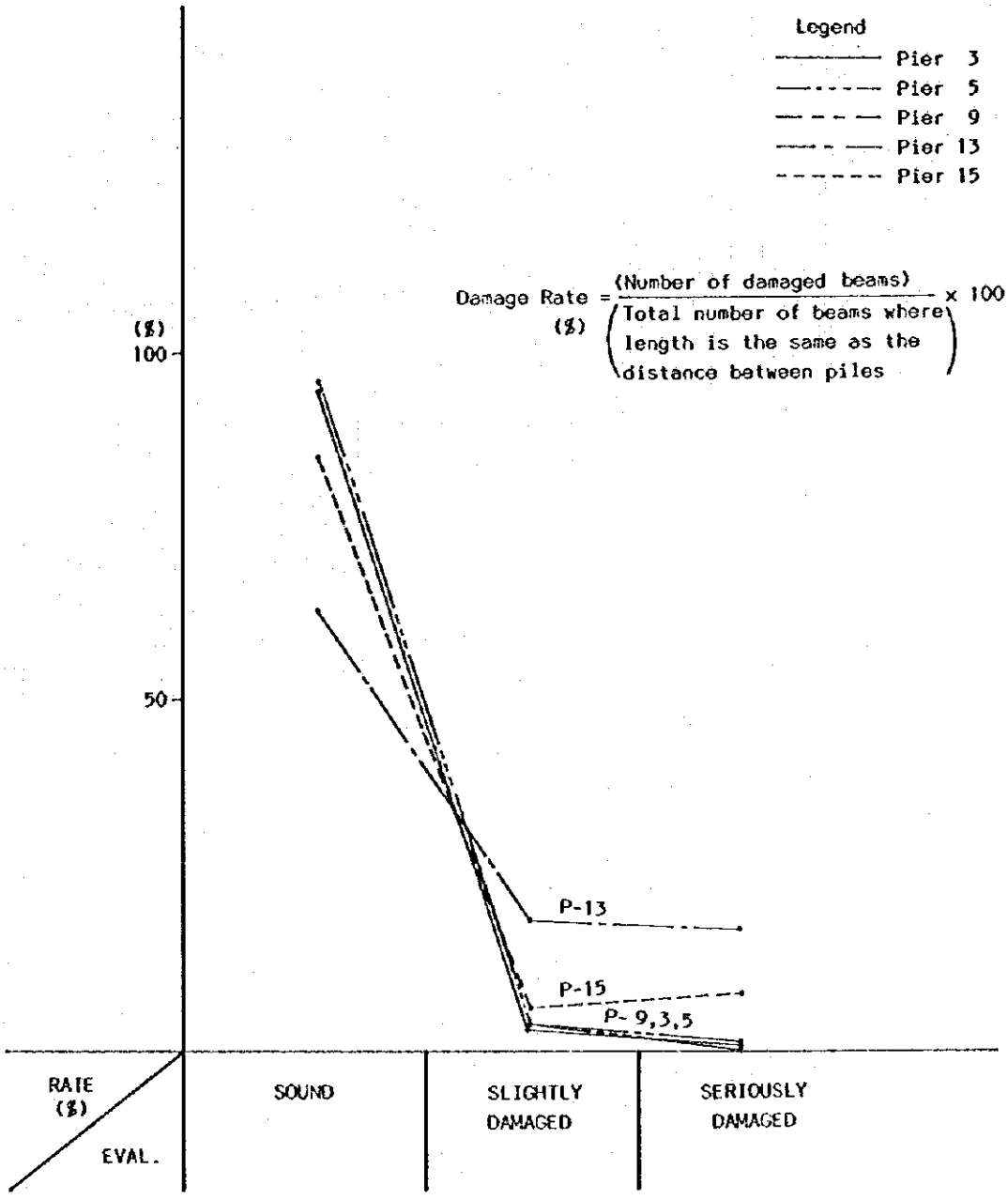


Fig. G Damage Rate of Beams

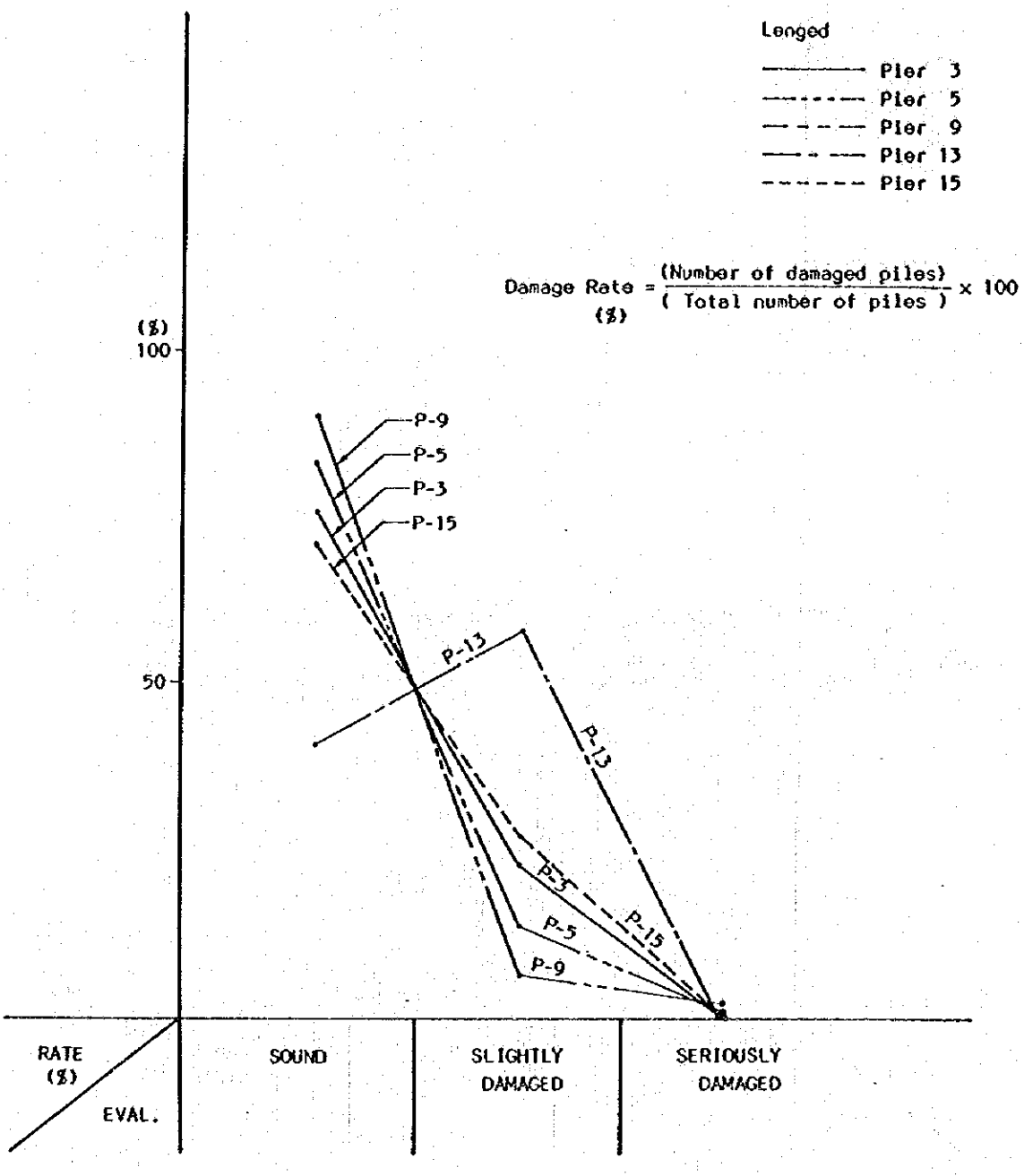


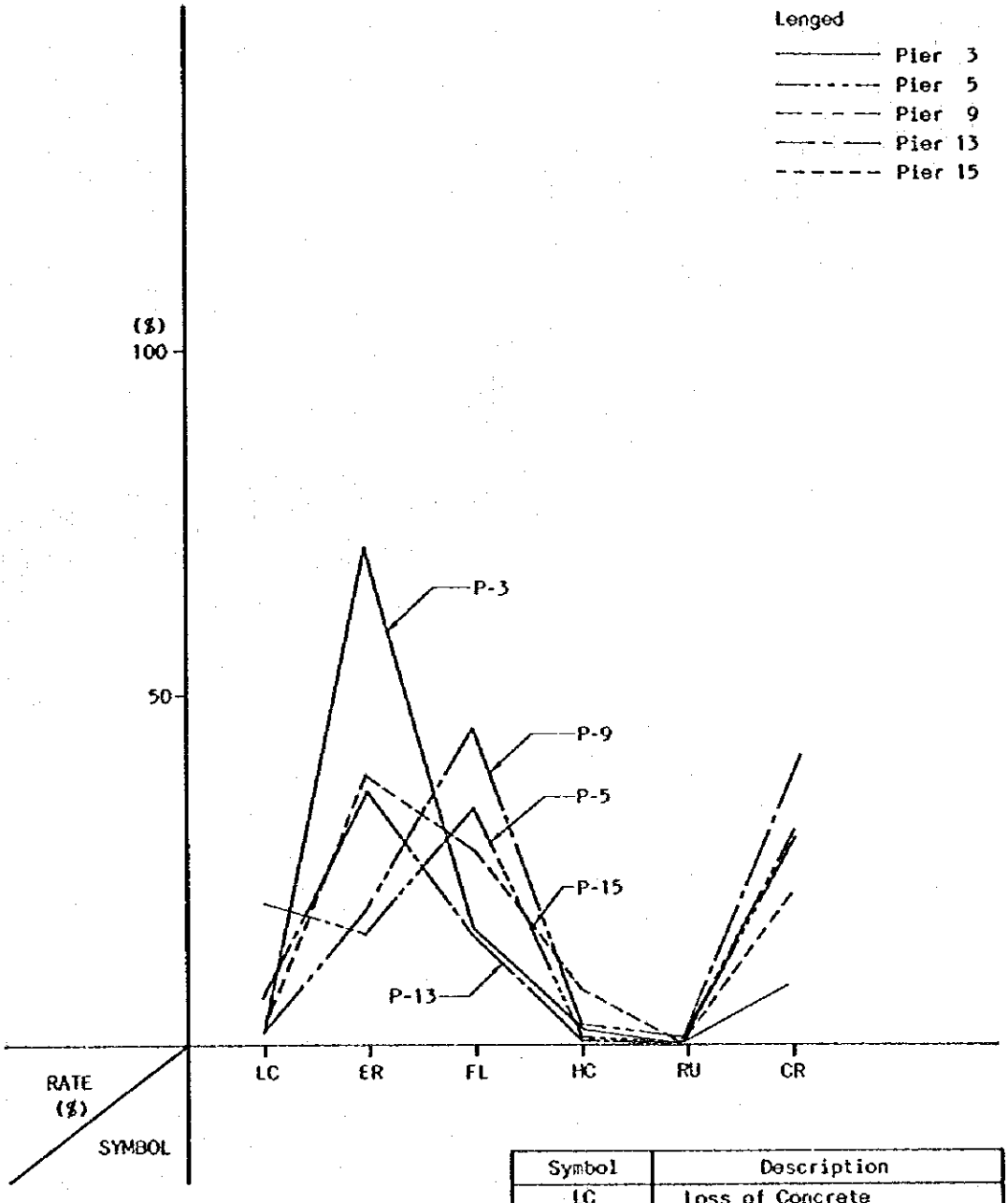
Fig. H Damage Rate of Piles

Table D Rate of Damage (Slabs)
(Item by Item Inspection)

Description \ Pier No.		3		5		9		13		15	
		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate
Loss of Concrete		2	0.5	12	22.6	3	1.4	46	6.6	6	1.4
Exposure of Reinforcement		270	71.6	9	17.0	40	18.5	258	36.7	170	39.0
Free Lime		63	16.7	18	34.0	98	45.4	113	16.1	126	28.9
Honeycombing		9	2.4	0	0	9	4.2	0	0	38	8.7
Rust		1	0.3	0	0	0	0	0	0	0	0
Cracks		32	8.5	14	26.4	66	30.5	285	40.6	96	22.0
Total		377	100	53	100	216	100	702	100	436	100
No Symbol	Damaged	6	-	0	-	8	-	300	-	37	-
	Sound	2,117	-	2,481	-	1,587	-	962	-	2,147	-
Grand Total		2,500	100	2,534	100	1,811	100	1,964	100	2,620	100

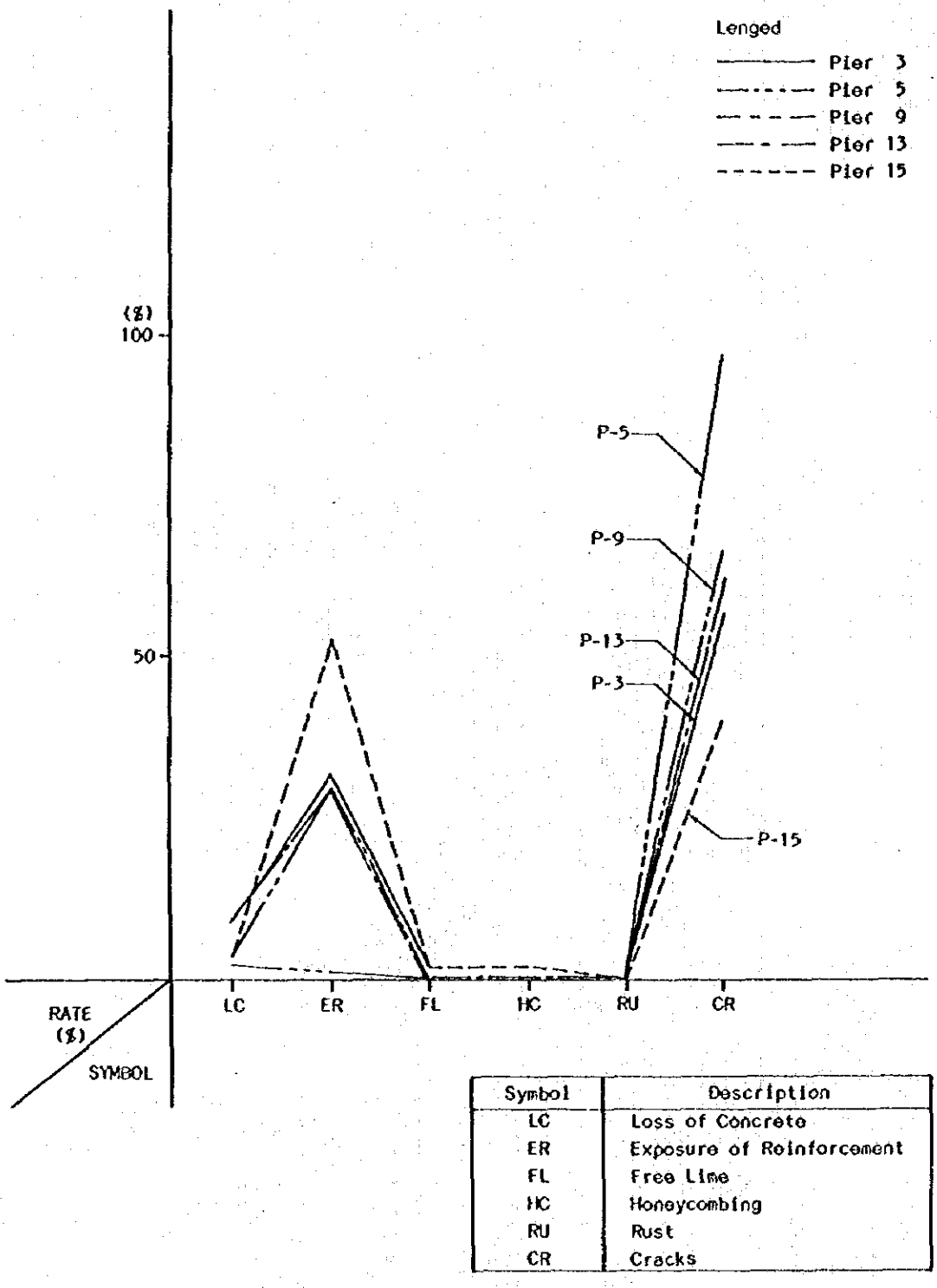
Table E Rate of Damage (Beams)
(Item by Item Inspection)

Description \ Pier No.		3		5		9		13		15	
		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate
Loss of Concrete		18	8.8	4	2.5	5	3.4	86	9.1	25	3.5
Exposure of Reinforcement		63	30.9	3	1.8	41	28.1	263	27.9	379	52.6
Free Lime		4	2.0	0	0	1	0.7	3	0.3	5	0.7
Honeycombing		1	0.5	0	0	0	0	7	0.8	14	1.9
Rust		0	0	0	0	0	0	0	0	0	0
Crack		118	57.8	155	95.7	99	67.8	582	61.9	298	41.3
Total		204	100	162	100	146	100	941	100	721	100
No Symbol	Damaged	8	-	1	-	8	-	262	-	127	-
	Sound	4,929	-	5,047	-	3,394	-	2,059	-	4,526	-
Grand Total		5,141	100	5,210	100	3,548	100	3,262	100	5,374	100



Symbol	Description
LC	Loss of Concrete
ER	Exposure of Reinforcement
FL	Free Lime
HC	Honeycombing
RU	Rust
CR	Cracks

Fig. I Rate of Damage by Item for Slabs



Symbol	Description
LC	Loss of Concrete
ER	Exposure of Reinforcement
FL	Free Lime
HC	Honeycombing
RU	Rust
CR	Cracks

Fig. J Rate of Damage by Item for Beams

Table F Results of Underwater Survey of Piles

Classification \ Pier No.	3	5	9	13	15
Number of Damaged Piles (A)	8	16	36	46	1
Number of Sumples (B)	593	672	290	546	690
Rate of Damage $(\frac{A}{B} \times 100)$ %	1.4	2.4	12.4	8.4	0.1