Table G-11 PROPERTIES OF SOILS (P1)

Boring P1
Elevation 3.02 m

DEPTH	GRADATION (%)			NATURAL MOISTURE	CONSISTENCY			CLASSIFICATION
(m)	FINE	SAND	GRAVEL	CONTENT (%)	LL (%)	PL (%)	PI	
0.75	4	93	3	4.7		NP		SP
1.75	6	93	1	7.7		NP		S-M
2.75	61	35	4	36.4	35.1	22.3	12.8	CL
3.75	23	69	8	21.6		NP		SM
4.75	11	82	7	21.0		NP		S-M
5.75	12	87	1	20.1		NP		S-M
6.75	1	99	0	14.1		NP		SP
7.75	1	99	0	16.2		NP		SP
8.75	21	54	25	12.2		NP		SM
9.75	0	28	72	8.5		NP		GW
10.75	60	22	18	24.9	58.2	33.6	24.6	MH
11.75	97	3	0	56.2	41.0	28.4	12.6	ML
12.75	99	1	0	52.0	48.1	28.1	20.0	ML
13.75	82	9	9	47.6	51.0	31.9	19.1	MH
14.75	90	9	1	48.7	47.0	29.8	17.2	ML
15.75	32	18	50	45.0	51.2	31.4	19.8	GM
16.75	41	4	55	46.8	58.2	31.9	26.3	GM
17.75	62	6	32	46.8	58.2	35.4	22.8	MH
18.75	74	5	21	49.0	51.8	33.7	18.1	MH
19.75	93	7	0	48.8	54.5	31.9	22.6	MH

Table G-12 PROPERTIES OF SOILS (P2)

Boring P2
Elevation 2.62 m

DEPTH	GRADATION (%)			NATURAL MOISTURE	CONSISTENCY			CLASSIFICATION
(m)	FINE	SAND	GRAVEL	CONTENT (%)	LL (%)	PL (%)	PI	
0.75	6	60	34	5.1		NP		S-M
1.75	21	58	21	18.6		NP		SM
2.75	8	60	32	18.2		NP		S-M
3.75	91	9	0	54.2	49.0	34.4	14.6	ML
4.75	14	83	3	18.4		NP		S-M
5.75	9	86	5	22.5		NP		S-M
6.75	1	86	13	21.6		NP		SP
7.75	3	87	10	16.5		NP		SP
8.95	22	66	12	17.5		NP		SM
9.75	10	36	54	13.2		NP		G-M
10.75	1	50	49	13.5		NP		SW
11.75	36	64	0	31.7		NP		SM
12.75	48	50	2	32.3		NP		SM
13.75	34	65	1	31.0		NP		SM
14.75	84	16	0	45.6	37.4	25.0	12.4	ML
15.75	98	2	0	55.3	62.1	26.0	36.1	CH
16.75	96	4	0	46.4	53.1	34.8	18.3	MH
17.75	86	14	0	43.2	37.7	29.2	8.5	ML
18.75	71	29	0	48.1	37.9	24.8	13.1	CL
19.75	98	2	0	43.3	44.4	31.1	13.3	ML

Table G-13 PROPERTIES OF SOILS (P3)

Boring P3
Elevation 3.57 m

DEPTH	GRADATION (%)			NATURAL MOISTURE	CONSISTENCY			CLASSIFI-
(m)	FINE	SAND	GRAVEL	CONTENT (%)	LL (%)	PL (%)	PI	CATION
0.75	3	94	3	6.3		NP		SP
1.75	3	66	31	7.8		NP		SW
2.75	24	76	0	26.9		NP		SM
3.75	78	22	0	59.1		NP		ML
4.75	8	90	2	25.9		NP		S-M
5.75	7	91	2	23.3		NP		S-M
6.75	8	92	0	27.5		NP		S-M
7.75	12	78	10	14.5		NP		S-M
8.75	7	53	40	12.1		NP		S-M
9.75	8	64	28	13.3		NP		S-M
10.75	6	83	11	15.4		NP		S-M
11.75a	10	73	17	16.1		NP		S-M
11.75b	59	40	1	33.0		NP		ML
12.75	48	52	0	26.5		NP		SM
13.75	47	53	0	31.8		NP		SM
14.75	91	9	0	62.8	62.5	36.4	26.1	MH
15.75	80	20	0	51.2	59.4	30.2	29.2	CH
17.25	98	2	0	58.6	60.5	36.7	23.8	MH
18.25	85	15	0	55.0	54.1	34.5	19.6	MH
19.25	98	2	0	68.6	67.3	35.7	31.6	MH
20.25	98	2	0	55.6	63.0	36.4	26.6	MH
22.25	99	1	0	61.5	76.5	42.5	34.0	MH
23.25	98	1	1	53.4	62.3	35.3	27.0	MH
24.25	99	1	0	47.9	48.2	31.1	17.1	ML
25.25	99	1	0	45.5	48.0	32.1	15.9	ML
26.25	98	1	1	56.4	57.7	36.1	21.6	MH
27.25	99	1	0	55.2	56.6	31.4	25.2	MH
28.25	100	0	0	51.2	50.6	32.9	17.7	MH
29.25	97	3	0	50.8	53.5	34.3	19.2	MH
30.25	18	82	0	25.5		NP		SM
31.25	29	71	0	21.9		NP		SM
32.25	10	88	2	19.0		NP		S-M
33.25	7	91	2	21.0		NP		S-M

Table G-14 PROPERTIES OF SOILS (P4)

Boring P4
Elevation 3.26 m

DEPTH	GRADATION (%)			NATURAL MOISTURE	CONSISTENCY			CLASSIFI-
(m)	FINE	SAND	GRAVEL	CONTENT (%)	LL (%)	PL (%)	PI	CATION
0.75a	99	1	0	58.8	87.8	42.4	45.4	MH
0.75b	9	77	14	8.1		NP		S-M
1.75a	74	26	0	29.4	38.7	23.8	14.9	CL
1.75b	16	74	10	10.3		NP		SM
2.75	22	34	44	21.9	34.5	26.5	8.0	GM
3.75	30	65	5	38.2		NP		SM
4.75	5	93	2	18.9		NP		S-M
5.75	3	96	1	13.8		NP		SP
6.75	2	97	1	25.9		NP		SP
7.75	1	98	1	24.3		NP		SP
8.75	2	93	5	24.3		NP		SP
9.75	12	78	10	18.3		NP		S-M
10.75	7	80	13	16.9		NP		S-M
11.75	4	85	11	22.6		NP		SP
12.75	3	64	33	15.9		NP		SW
13.75	13	67	20	36.0		NP		S-M
14.75	96	3	1	52.8	67.7	38.0	29.7	MH
15.75	10	66	24	14.4		NP		S-M
16.75	7	92	1	21.6		NP		S-M
17.75	8	90	2	15.7		NP		S-M
18.75	4	71	25	17.1		NP		SW
19.75	11	87	2	18.6		NP		S-M

Table G-15 PROPERTIES OF SOILS (P5)

Boring P5
Elevation 3.40 m

DEPTH	GRADATION (%)			NATURAL MOISTURE	CONSISTENCY			CLASSIFI-
(m)	FINE	SAND	GRAVEL	CONTENT (%)	LL (%)	PL (%)	PI	CATION
0.75	5	78	17	5.5		NP		S-M
1.75	46	53	1	47.3		NP		SM
2.75	86	14	0	48.1		NP		ML
3.75	39	58	3	33.1		NP		SM
4.75	6	78	16	22.7		NP		S-M
5.75	0	94	6	32.8		NP		SP

Table G-16 ULTIMATE BEARING CAPACITY (Df = 0 m)

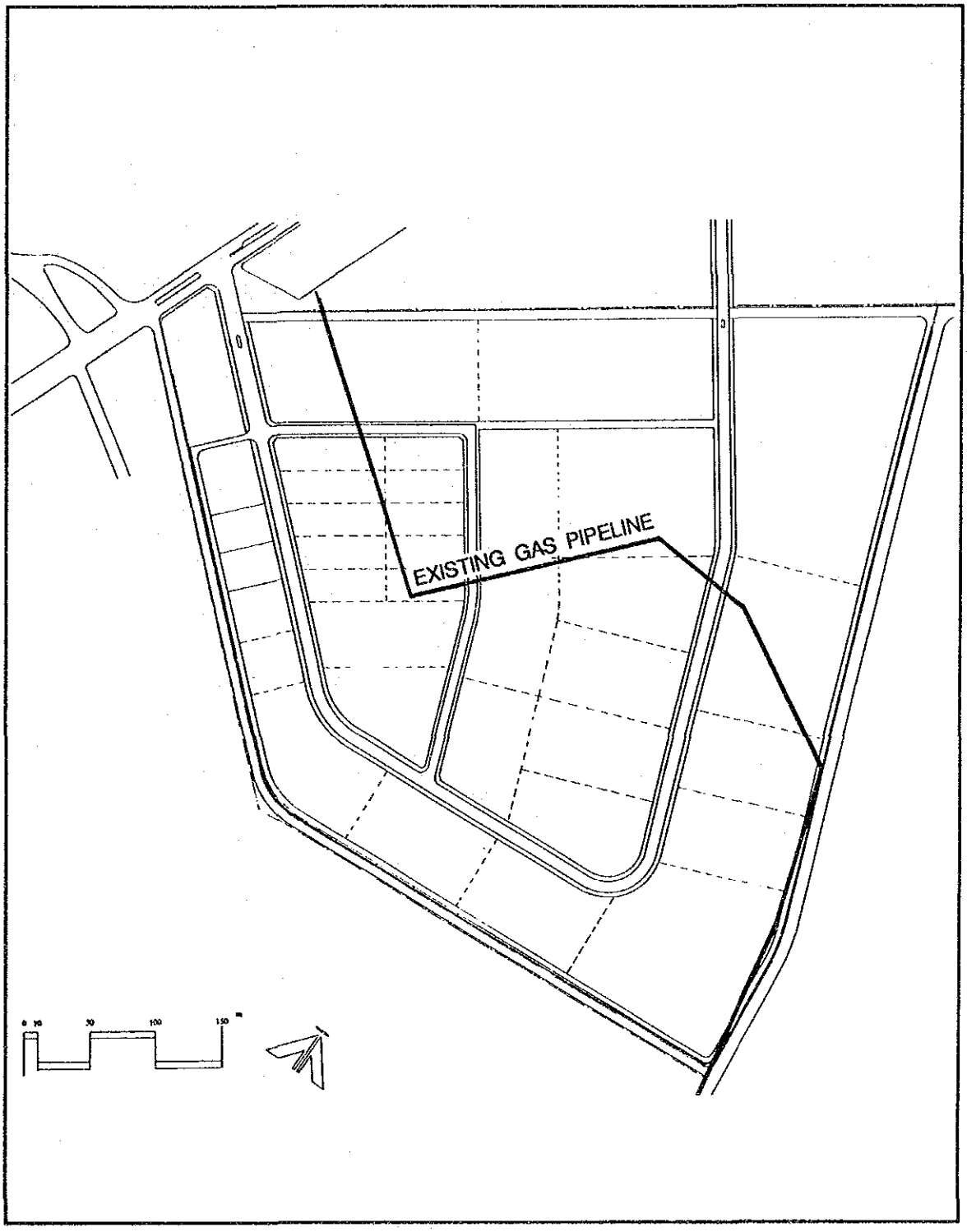
Strata	Sand with gravel	Sandy silt	Silty sand & Silt
N value	10	2	5
Cohesion (tf/m2)	0.0	1.3	3.1
Internal friction angle	31.0	0.0	0.0
Wet density (tf/m3)	1.8	1.8	1.8
Submerged density (tf/m3)	0.85	0.85	0.85
Depth of foundation (m)	0.0	0.0	0.0
Thickness of stratum (m)		2.0	17.0
Bearing capacity factor	Nc = 30.15 Nr = 20 Nq = 19		Nc = 5.14 Nr = 0 Nq = 1
Width of foundation (m)	Ultimate bearing capacity (tf/m2)		
10	87.0	12.3	51.0
11	93.8	12.4	48.3
12	100.6	12.5	46.0
13	107.4	12.7	44.1
14	114.2	12.9	42.4
15	121.0	13.0	41.0
16	127.8	13.2	39.7
17	134.6	13.5	38.6
18	141.4	13.7	37.6
19	148.2	13.9	36.7
20	155.0	14.2	36.0
22	168.6	14.7	34.6
24	182.2	15.2	33.4
26	195.8	15.7	23.2
28	209.4	16.3	22.8
30	223.0	16.9	22.6
32	236.6	17.4	22.4
34	250.2	18.0	22.3
36	263.8	18.6	22.1
38	277.4	19.2	22.1
40	291.0	19.8	22.0
44	318.2	21.0	22.0
48	345.4	22.2	22.0
52	372.6	23.4	22.1
56	399.8	24.6	22.2
60	427.0	25.8	22.3
64	454.2	27.0	22.5
68	481.4	28.3	22.7
72	508.6	29.5	23.0
76	535.8	30.7	23.2
80	563.0	31.9	23.4
84	590.2	33.2	23.7
88	617.4	34.4	24.0
92	644.6	35.7	24.2
96	671.8	36.9	24.5
100	699.0	38.1	24.8

Table G-17 ULTIMATE BEARING CAPACITY (Df = 1 m)

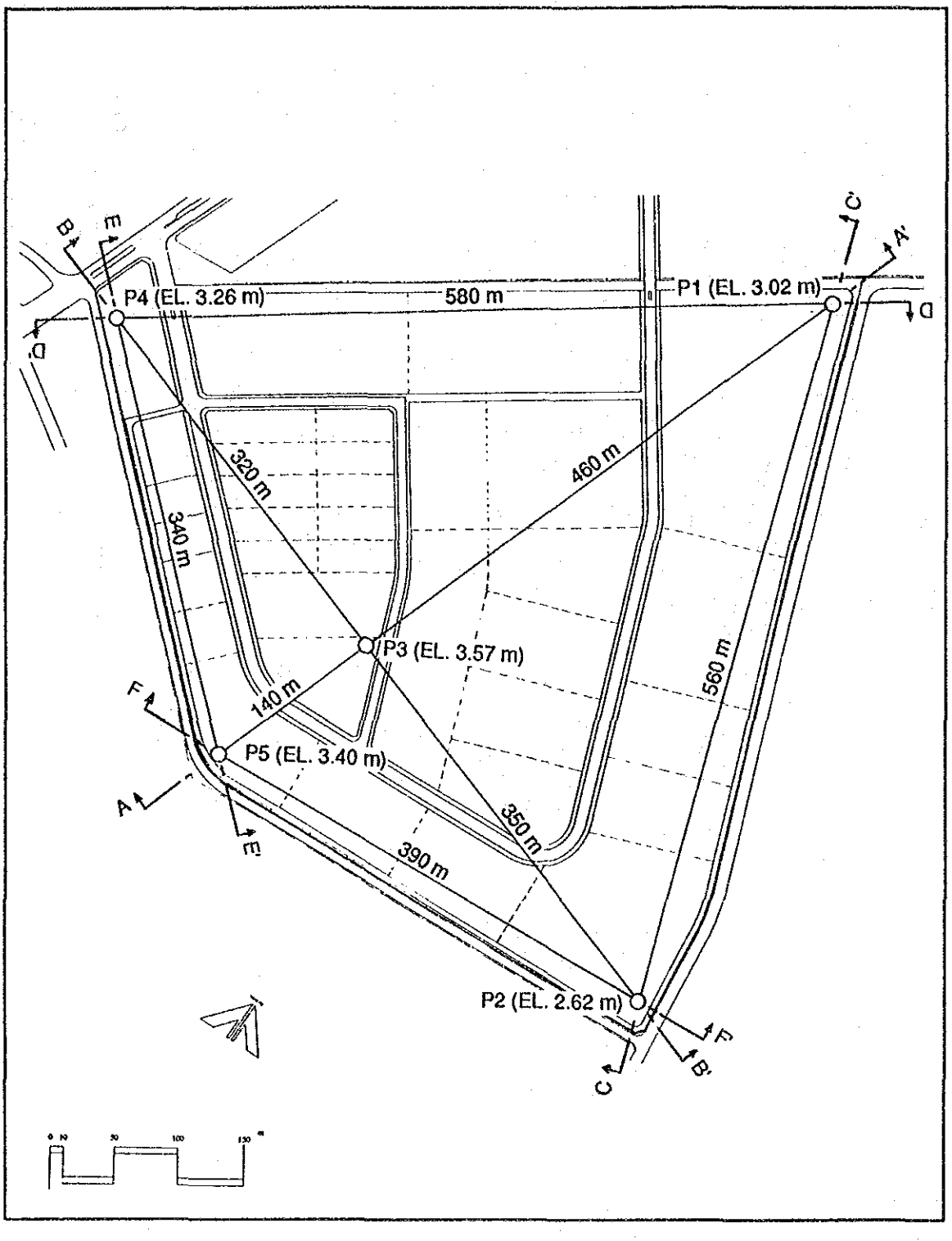
Strata	Sand with gravel	Sandy silt	Silty sand & Silt
N value	10	2	5
Cohesion (tf/m2)	0.0	1.3	3.1
Internal friction angle	31.0	0.0	0.0
Wet density (tf/m3)	1.8	1.8	1.8
Submerged density (tf/m3)	0.85	0.85	0.85
Depth of foundation (m)	1.0	1.0	1.0
Thickness of stratum (m)		2.0	17.0
Bearing capacity factor	Nc = 30.15 Nr = 20 Nq = 19		Nc = 5.14 Nr = 0 Nq = 1
Width of foundation (m)	Ultimate bearing capacity (tf/m2)		
10	121.2	11.4	52.8
11	128.0	11.5	50.1
12	134.8	11.7	47.8
13	141.6	11.9	45.8
14	148.4	12.1	44.2
15	155.2	12.3	42.8
16	162.0	12.5	41.5
17	168.8	12.8	40.4
18	175.6	13.0	39.4
19	182.4	13.3	38.5
20	189.2	13.5	37.7
22	202.8	14.1	36.4
24	216.4	14.6	35.2
26	230.0	15.2	22.5
28	243.6	15.7	22.2
30	257.2	16.3	22.0
32	270.8	16.9	21.8
34	284.4	17.5	21.7
36	298.0	18.1	21.6
38	311.6	18.7	21.6
40	325.2	19.3	21.5
44	352.4	20.5	21.5
48	379.6	21.7	21.6
52	406.8	22.9	21.7
56	434.0	24.1	21.8
60	461.2	25.3	22.0
64	488.4	26.6	22.2
68	515.6	27.8	22.4
72	542.8	29.0	22.6
76	570.0	30.3	22.9
80	597.2	31.5	23.1
84	624.4	32.8	23.4
88	651.6	34.0	23.7
92	678.8	35.2	24.0
96	706.0	36.5	24.3
100	733.2	37.7	24.6

Table G-18 ULTIMATE BEARING CAPACITY (Df = 2 m)

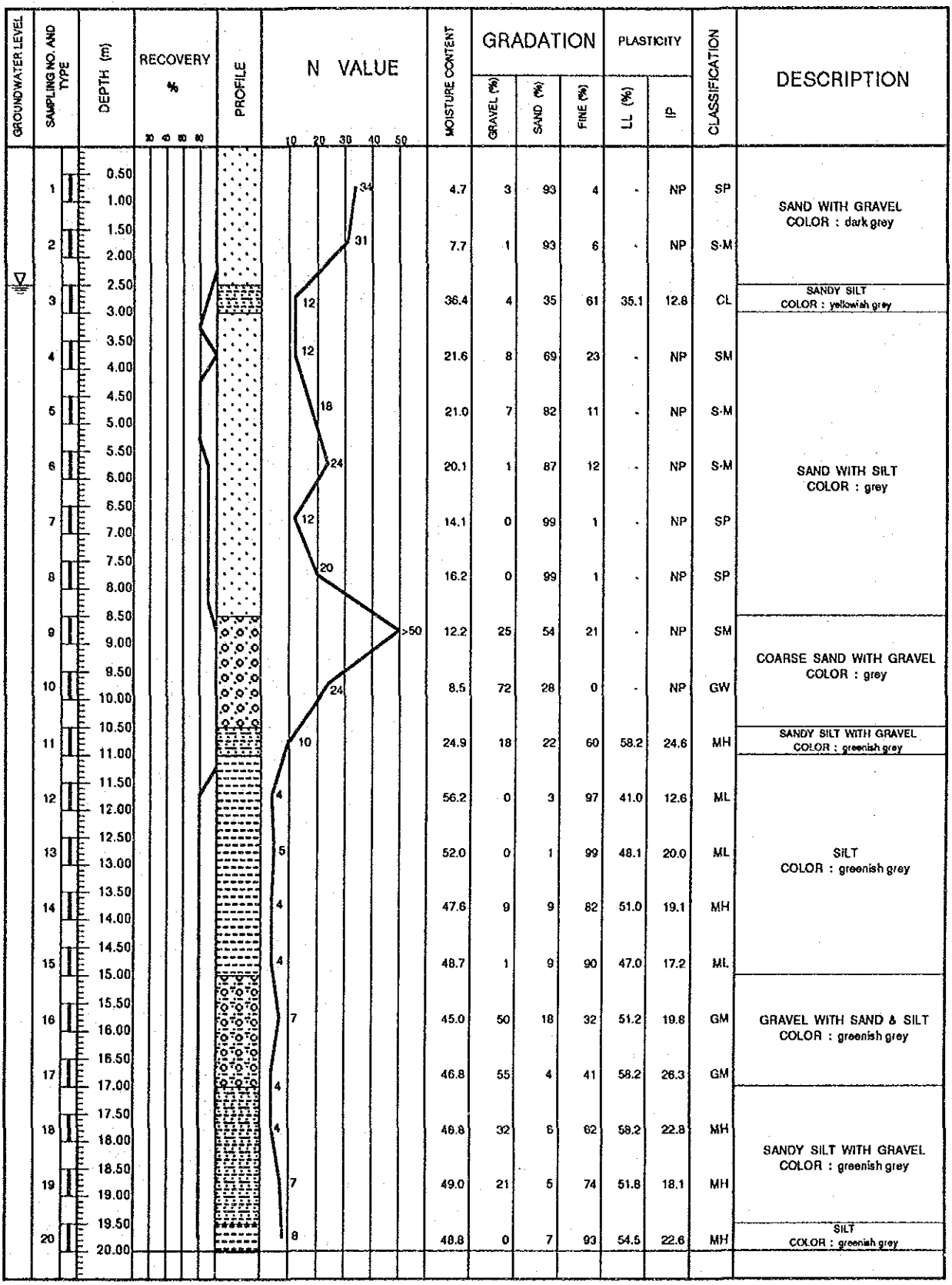
Strata	Sand with gravel	Sandy silt	Silty sand & Silt
N value	10	2	5
Cohesion (tf/m2)	0.0	1.3	3.1
Internal friction angle	31.0	0.0	0.0
Wet density (tf/m3)	1.8	1.8	1.8
Submerged density (tf/m3)	0.85	0.85	0.85
Depth of foundation (m)	2.0	2.0	2.0
Thickness of stratum (m)		2.0	17.0
Bearing capacity factor	Nc = 30.15 Nr = 20 Nq = 19		Nc = 5.14 Nr = 0 Nq = 1
Width of foundation (m)	Ultimate bearing capacity (tf/m2)		
10	155.4	10.5	54.2
11	162.2	10.7	51.5
12	169.0	10.9	49.2
13	175.8	11.1	47.3
14	182.6	11.3	45.7
15	189.4	11.6	44.3
16	196.2	11.8	43.0
17	203.0	12.1	41.9
18	209.8	12.3	41.0
19	216.6	12.6	40.1
20	223.4	12.9	39.3
22	237.0	13.4	38.0
24	250.6	14.0	36.8
26	264.2	14.6	21.8
28	277.8	15.2	21.6
30	291.4	15.8	21.4
32	305.0	16.4	21.3
34	318.6	17.0	21.2
36	332.2	17.6	21.1
38	345.8	18.2	21.1
40	359.4	18.8	21.1
44	386.6	20.0	21.1
48	413.8	21.2	21.2
52	441.0	22.4	21.3
56	468.2	23.7	21.5
60	495.4	24.9	21.7
64	522.6	26.1	21.9
68	549.8	27.4	22.1
72	577.0	28.6	22.3
76	604.2	29.8	22.6
80	631.4	31.1	22.9
84	658.6	32.3	23.1
88	685.8	33.6	23.4
92	713.0	34.8	23.7
96	740.2	36.1	24.0
100	767.4	37.3	24.3



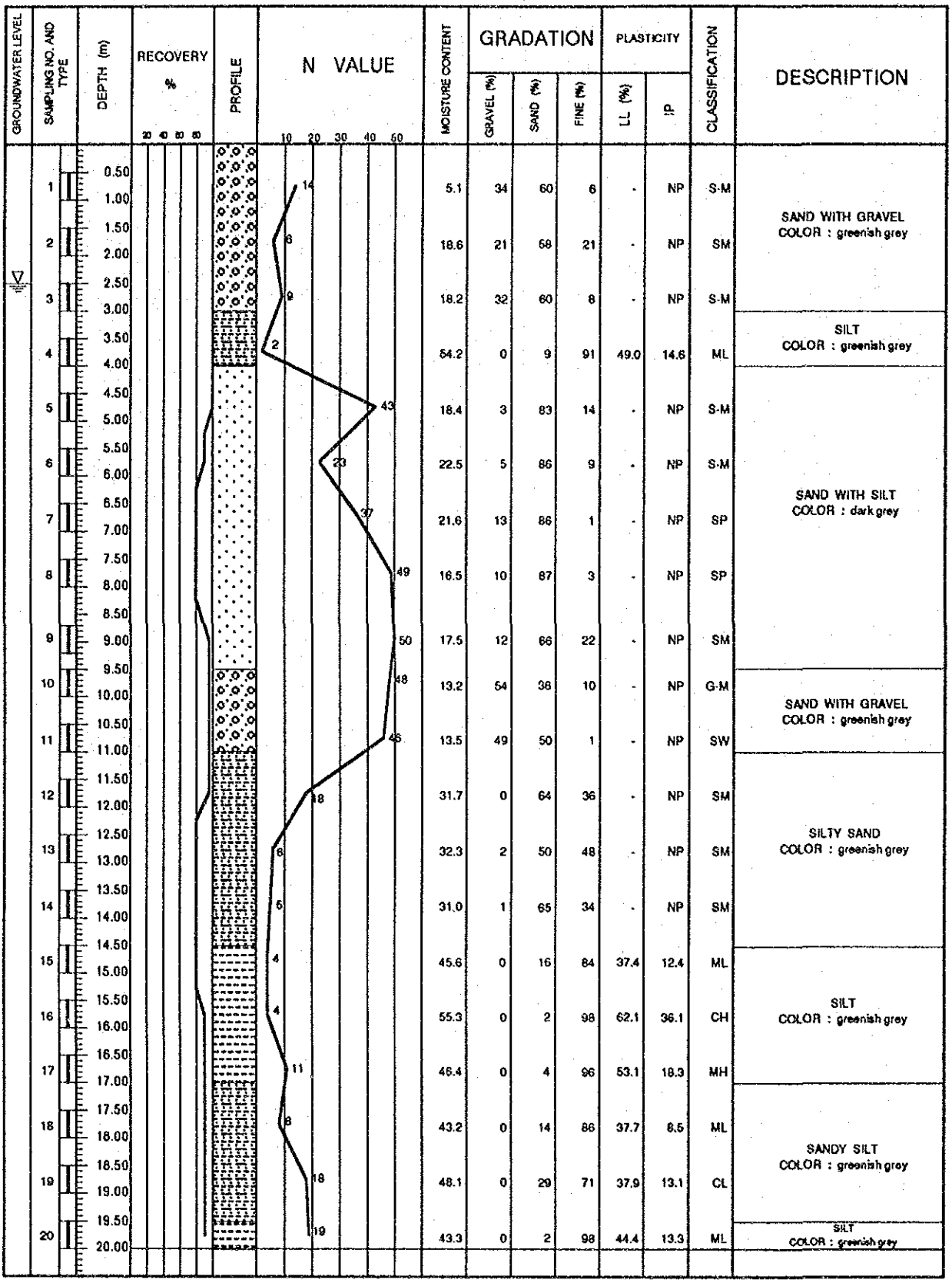
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-1 Existing Gas Pipeline
	JAPAN INTERNATIONAL COOPERATION AGENCY



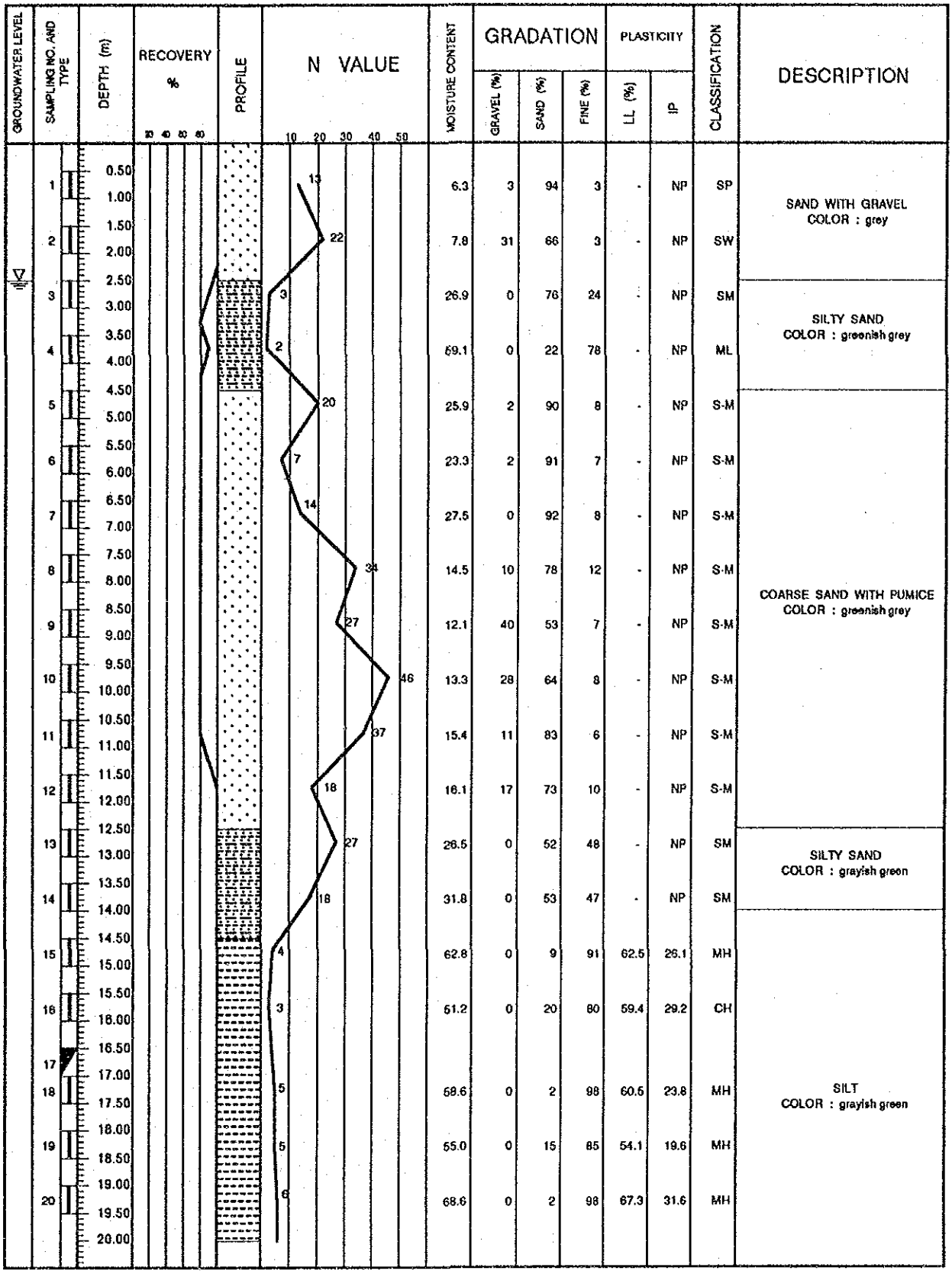
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-2 Locations of Bore Holes
	JAPAN INTERNATIONAL COOPERATION AGENCY



ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	DISTURBED SAMPLING (SPT) UNDISTURBED SAMPLING ROTATION CORE	BORING P-1 ELEVATION 3.02 m	Fig. G-3 Boring Log of P1



ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	DISTURBED SAMPLING (SPT) UNDISTURBED SAMPLING ROTATION CORE	BORING P-2 ELEVATION 2.62 m	Fig. G-4 Boring Log of P2



1	0.50–1.00	13	6.3	3	94	3	-	NP	SP	SAND WITH GRAVEL COLOR : grey
2	1.50–2.00	22	7.8	31	66	3	-	NP	SW	
3	2.50–3.00	3	26.9	0	76	24	-	NP	SM	SILTY SAND COLOR : greenish grey
4	3.50–4.00	2	69.1	0	22	78	-	NP	ML	
5	4.50–5.00	20	25.9	2	90	8	-	NP	S-M	COARSE SAND WITH PUMICE COLOR : greenish grey
6	5.50–6.00	7	23.3	2	91	7	-	NP	S-M	
7	6.50–7.00	14	27.5	0	92	8	-	NP	S-M	
8	7.50–8.00	34	14.5	10	78	12	-	NP	S-M	
9	8.50–9.00	27	12.1	40	53	7	-	NP	S-M	
10	9.50–10.00	46	13.3	28	64	8	-	NP	S-M	
11	10.50–11.00	37	15.4	11	83	6	-	NP	S-M	
12	11.50–12.00	18	16.1	17	73	10	-	NP	S-M	
13	12.50–13.00	27	26.5	0	52	48	-	NP	SM	SILTY SAND COLOR : grayish green
14	13.50–14.00	18	31.8	0	53	47	-	NP	SM	
15	14.50–15.00	4	62.8	0	9	91	62.5	26.1	MH	SILT COLOR : grayish green
16	15.50–16.00	3	51.2	0	20	80	59.4	29.2	CH	
17	16.50–17.00									
18	17.00–17.50	5	68.6	0	2	98	60.5	23.8	MH	
19	18.00–18.50	5	55.0	0	15	85	54.1	19.6	MH	
20	19.00–19.50	6	68.6	0	2	98	67.3	31.6	MH	

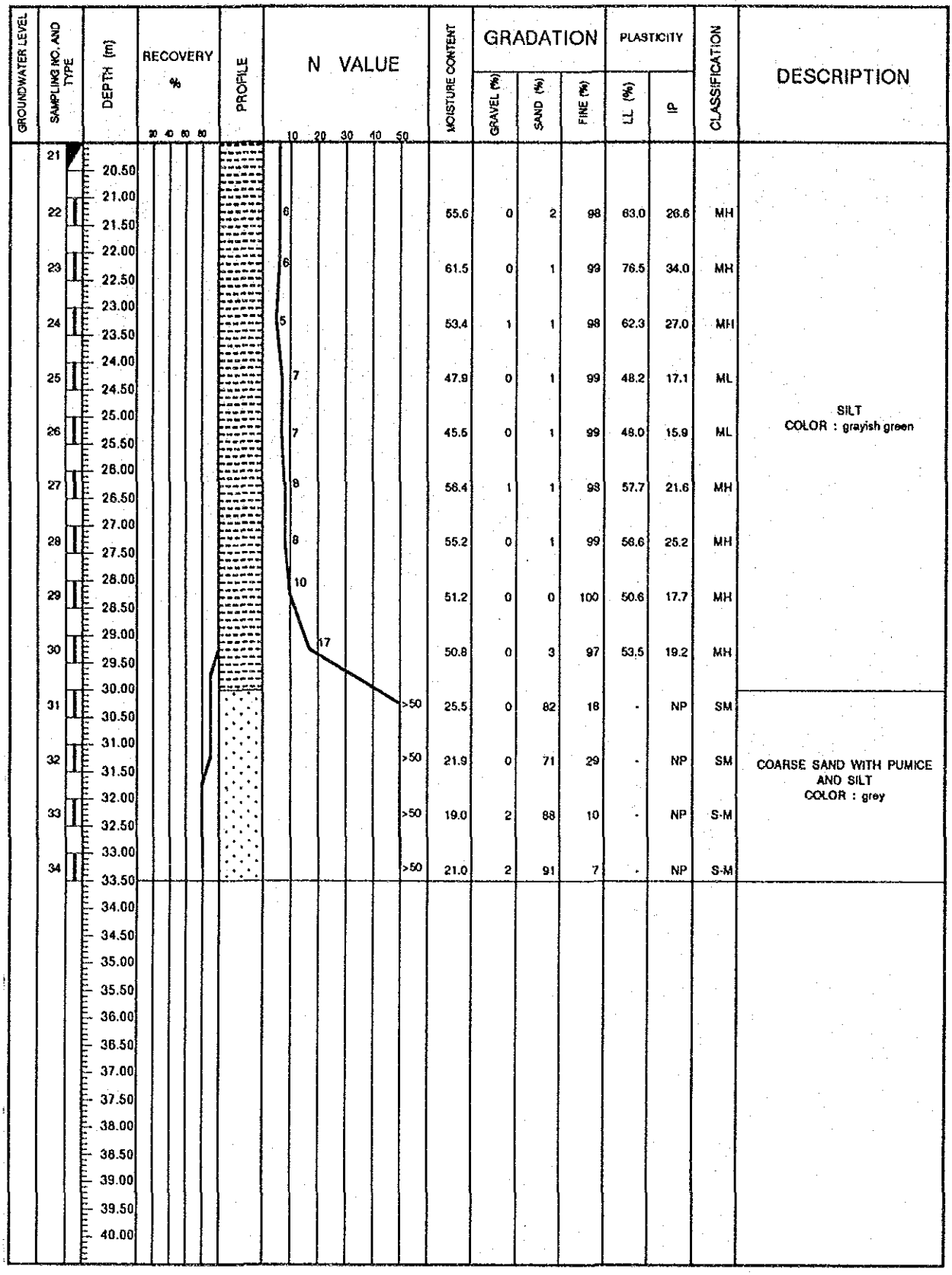
ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

DISTURBED SAMPLING (SPT)
UNDISTURBED SAMPLING
ROTATION CORE

BORING P-3
ELEVATION 3.57 m

Fig. G-5-1
Boring Log of P3 (1/2)



SAMPLING NO. AND TYPE	DEPTH (m)	N VALUE	MOISTURE CONTENT	GRAVEL (%)	SAND (%)	FINE (%)	LL (%)	IP	CLASSIFICATION
21	20.50								
22	21.00	6	55.6	0	2	98	63.0	26.6	MH
23	21.50	6	61.5	0	1	99	76.5	34.0	MH
24	22.00	5	53.4	1	1	98	62.3	27.0	MH
25	22.50	7	47.9	0	1	99	48.2	17.1	ML
26	23.00	7	45.5	0	1	99	48.0	15.9	ML
27	23.50	8	56.4	1	1	98	57.7	21.6	MH
28	24.00	8	55.2	0	1	99	56.6	25.2	MH
29	24.50	10	51.2	0	0	100	50.6	17.7	MH
30	25.00	17	50.8	0	3	97	53.5	19.2	MH
31	25.50	>50	25.5	0	82	18	-	NP	SM
32	26.00	>50	21.9	0	71	29	-	NP	SM
33	26.50	>50	19.0	2	88	10	-	NP	S-M
34	27.00	>50	21.0	2	91	7	-	NP	S-M
	27.50								
	28.00								
	28.50								
	29.00								
	29.50								
	30.00								
	30.50								
	31.00								
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	37.50								
	38.00								
	38.50								
	39.00								
	39.50								
	40.00								

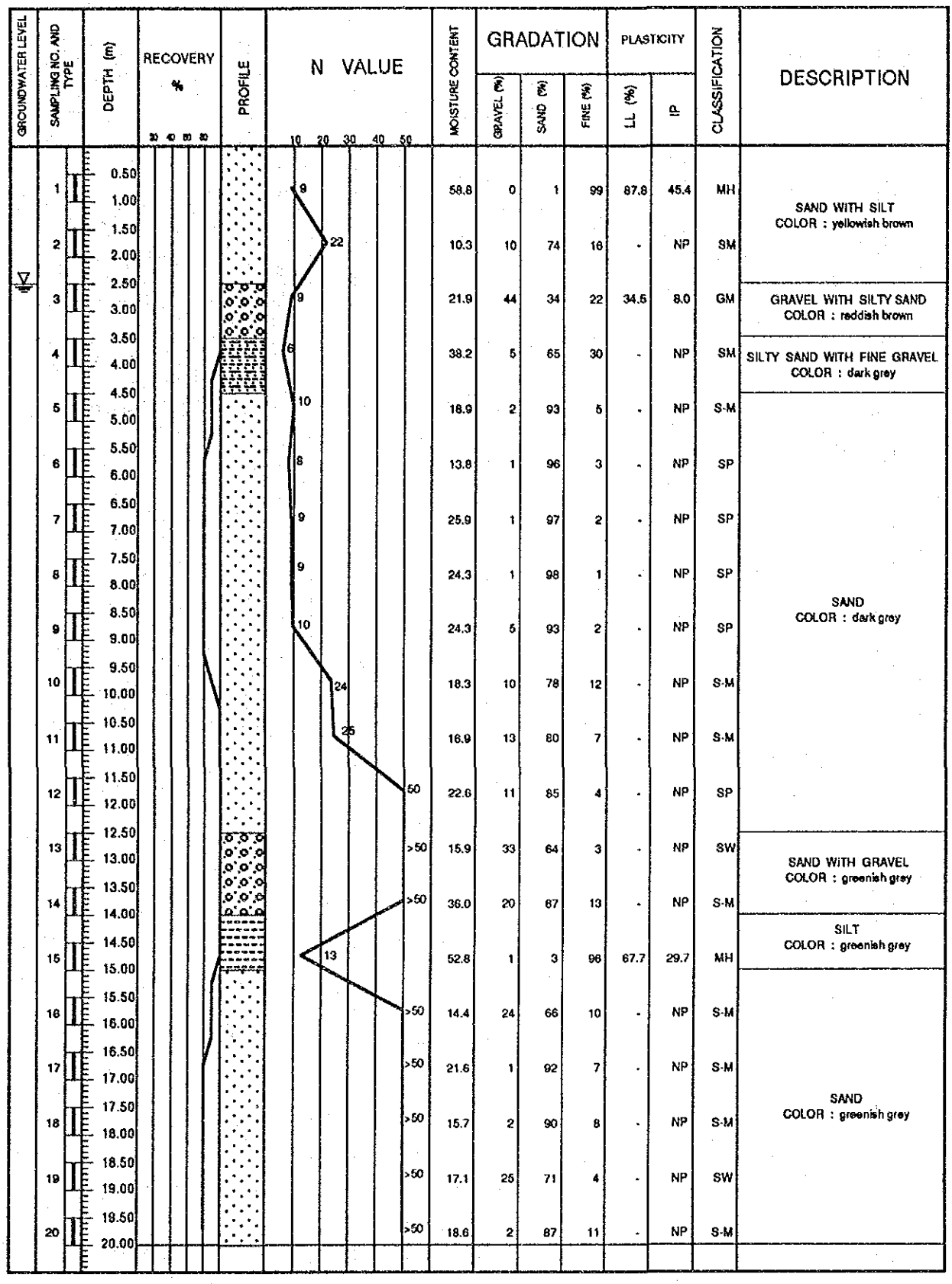
ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

DISTURBED SAMPLING (SPT)
UNDISTURBED SAMPLING
ROTATION CORE

BORING P-3
ELEVATION 3.57 m

Fig. G-5-2
Boring Log of P3 (2/2)



1	0.50–1.00	9	58.8	0	1	99	87.8	45.4	MH	SAND WITH SILT COLOR : yellowish brown
2	1.50–2.00	22	10.3	10	74	16	-	NP	SM	
3	2.50–3.00	9	21.9	44	34	22	34.5	8.0	GM	GRAVEL WITH SILTY SAND COLOR : reddish brown
4	3.50–4.00	6	38.2	5	65	30	-	NP	SM	SILTY SAND WITH FINE GRAVEL COLOR : dark grey
5	4.50–5.00	10	18.9	2	93	5	-	NP	S-M	
6	5.50–6.00	8	13.8	1	96	3	-	NP	SP	
7	6.50–7.00	9	25.9	1	97	2	-	NP	SP	
8	7.50–8.00	9	24.3	1	98	1	-	NP	SP	
9	8.50–9.00	10	24.3	5	93	2	-	NP	SP	SAND COLOR : dark grey
10	9.50–10.00	24	18.3	10	78	12	-	NP	S-M	
11	10.50–11.00	25	16.9	13	80	7	-	NP	S-M	
12	11.50–12.00	50	22.6	11	85	4	-	NP	SP	
13	12.50–13.00	>50	15.9	33	64	3	-	NP	SW	SAND WITH GRAVEL COLOR : greenish grey
14	13.50–14.00	>50	36.0	20	67	13	-	NP	S-M	
15	14.50–15.00	13	52.8	1	3	96	67.7	29.7	MH	SILT COLOR : greenish grey
16	15.50–16.00	>50	14.4	24	66	10	-	NP	S-M	
17	16.50–17.00	>50	21.6	1	92	7	-	NP	S-M	
18	17.50–18.00	>50	15.7	2	90	8	-	NP	S-M	SAND COLOR : greenish grey
19	18.50–19.00	>50	17.1	25	71	4	-	NP	SW	
20	19.50–20.00	>50	18.6	2	87	11	-	NP	S-M	

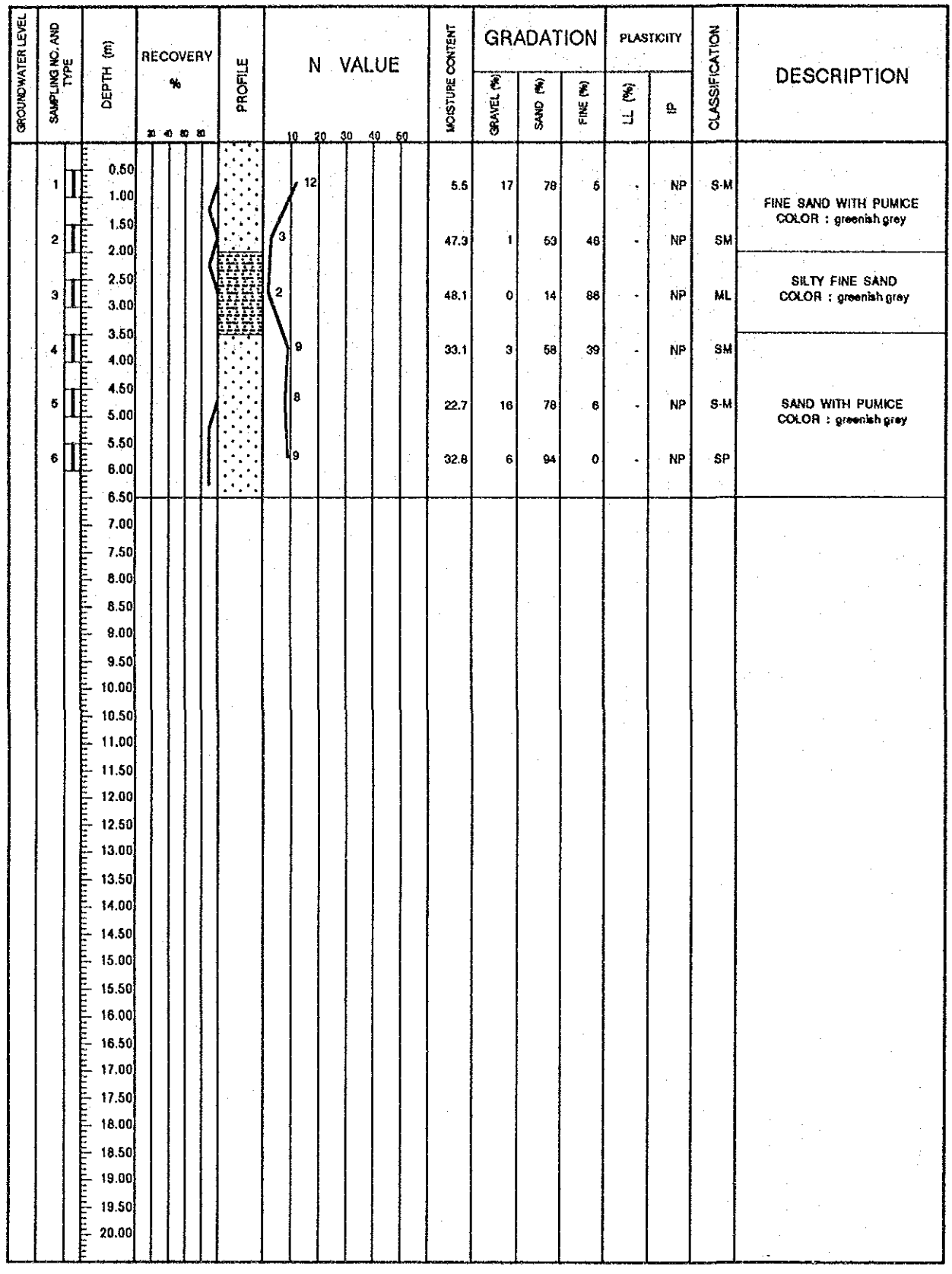
ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

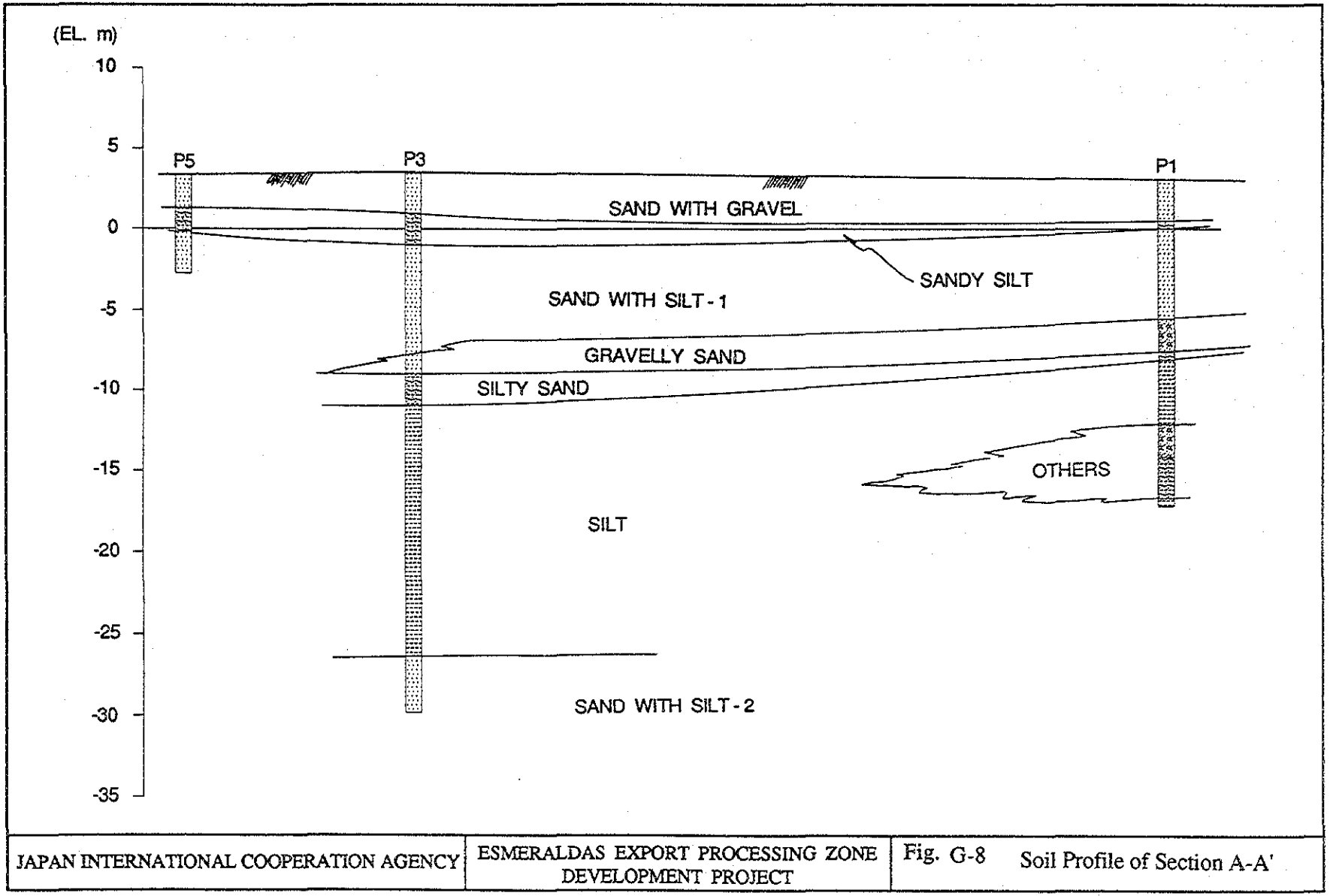
DISTURBED SAMPLING (SPT)
UNDISTURBED SAMPLING
ROTATION CORE

BORING P-4
ELEVATION 3.26 m

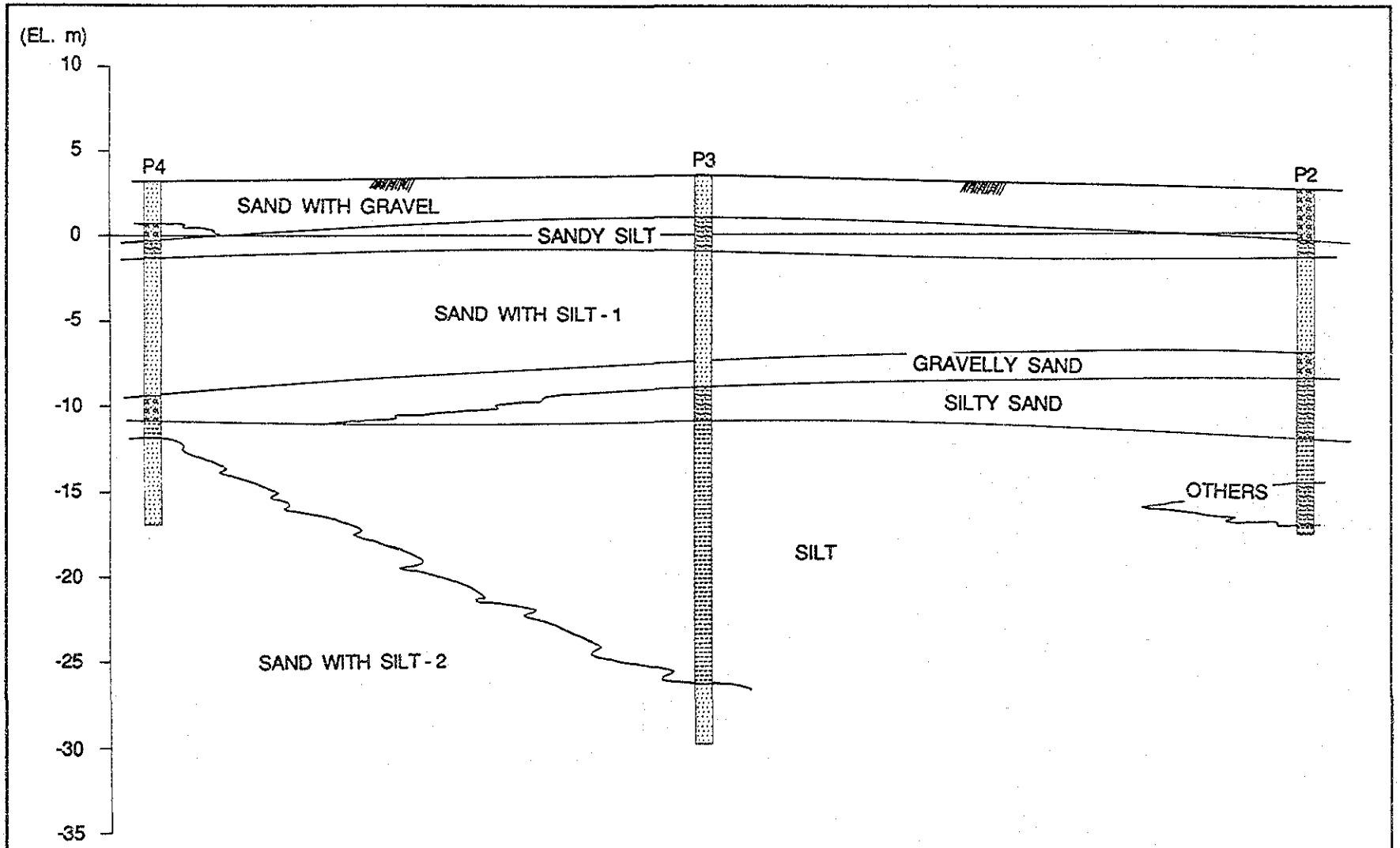
Fig. G-6
Boring Log of P4



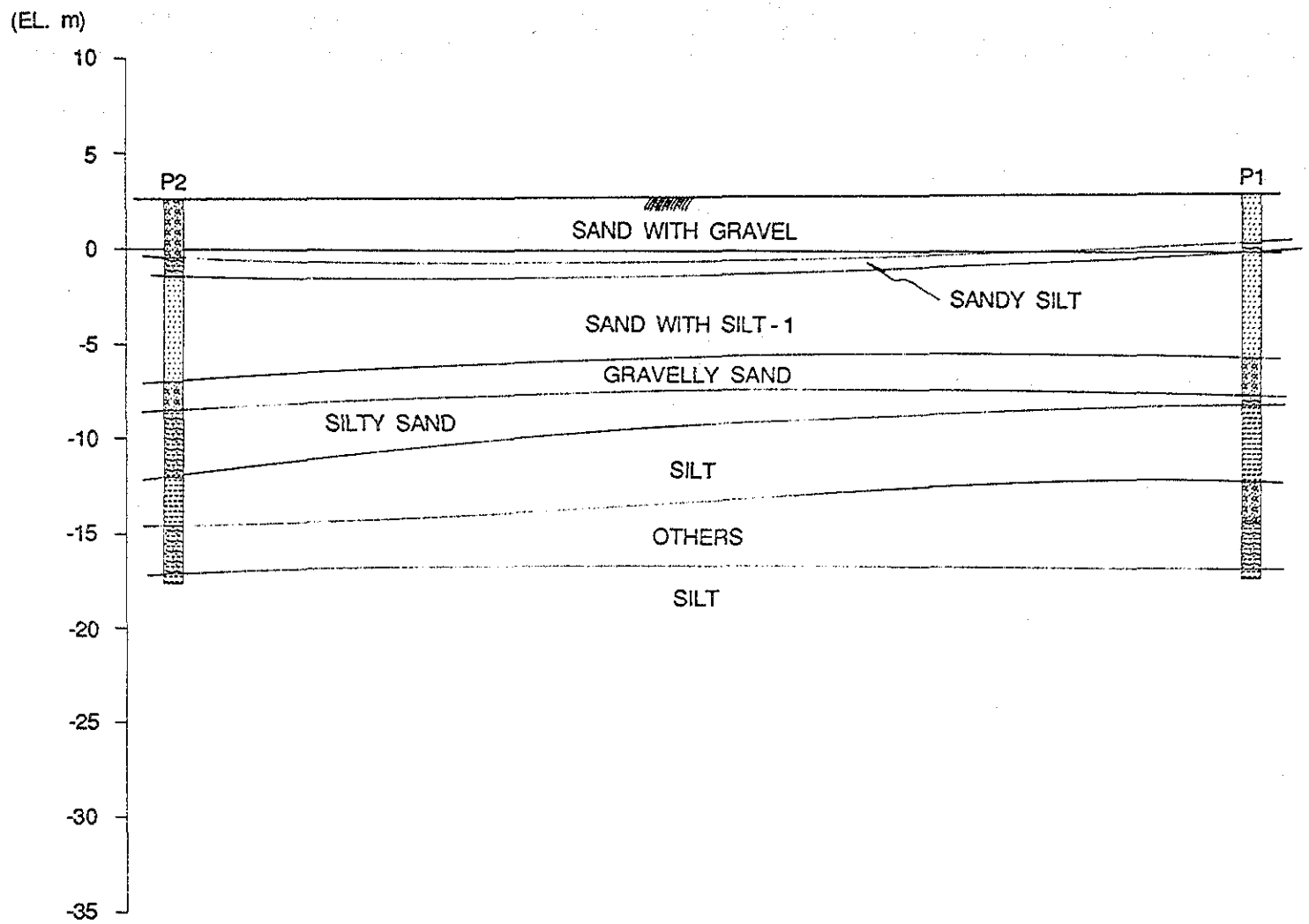
ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	DISTURBED SAMPLING (SPT) UNDISTURBED SAMPLING ROTATION CORE	BORING P-5 ELEVATION 3.40 m	Fig. G-7 Boring Log of P5



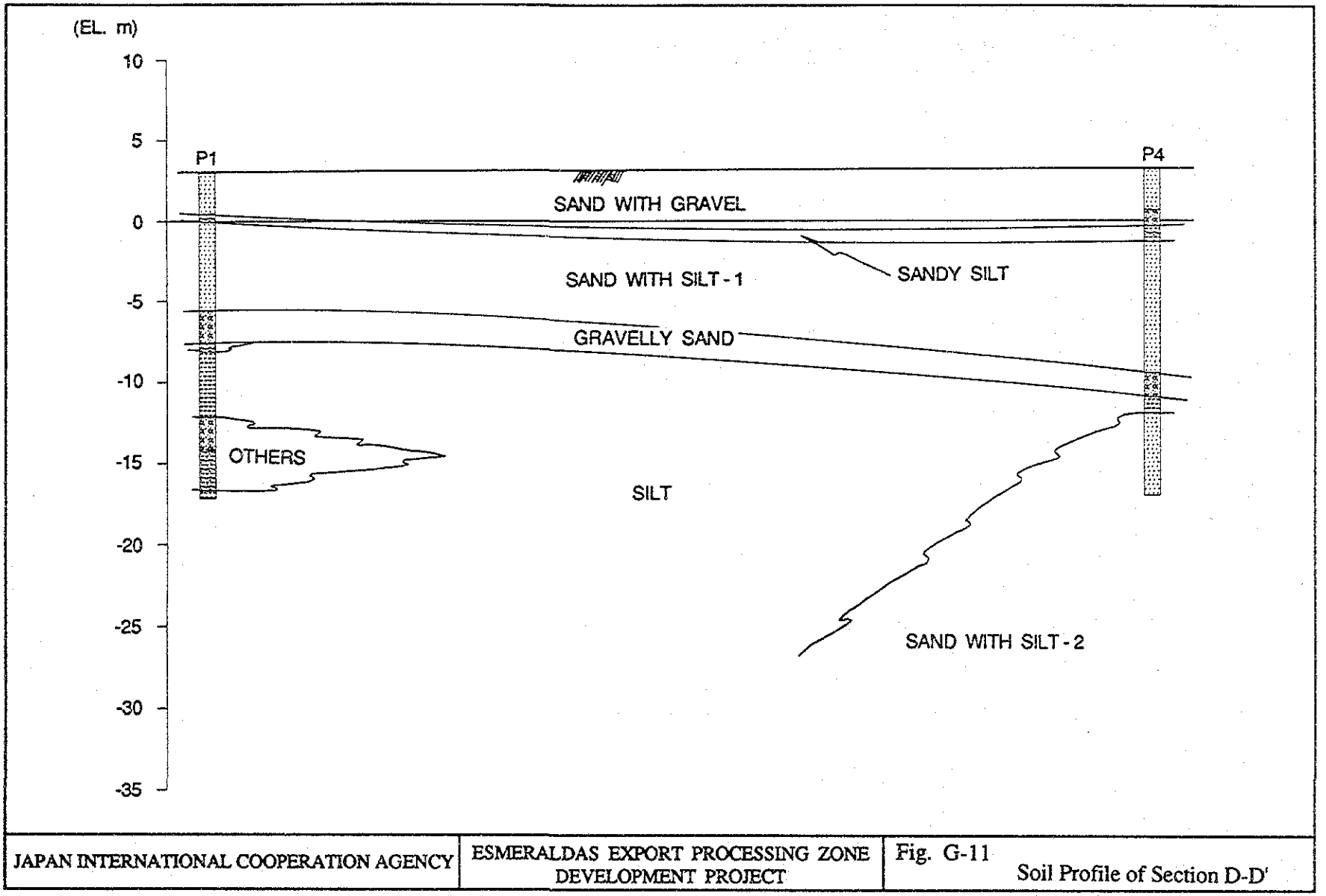
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-8 Soil Profile of Section A-A'



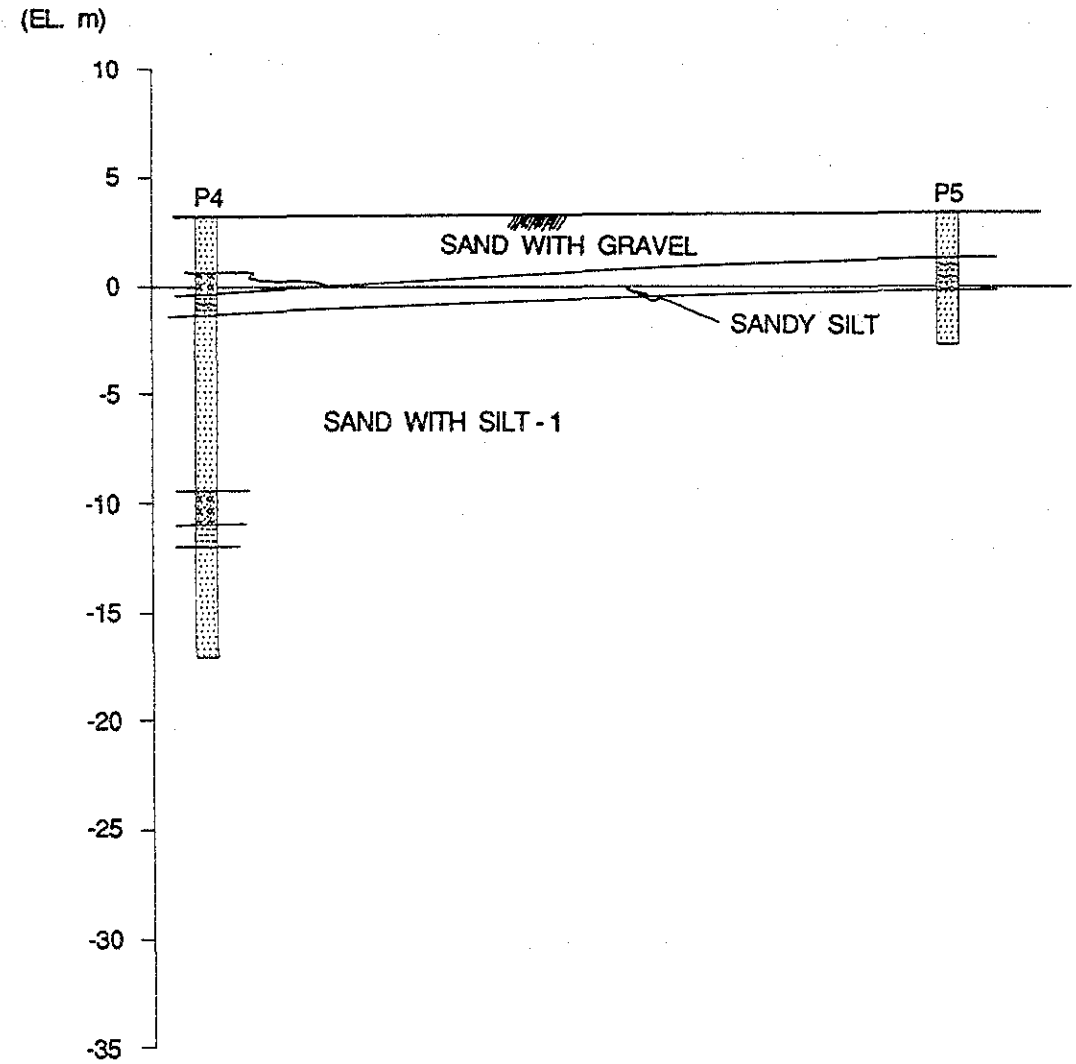
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-9 Soil Profile of Section B-B'



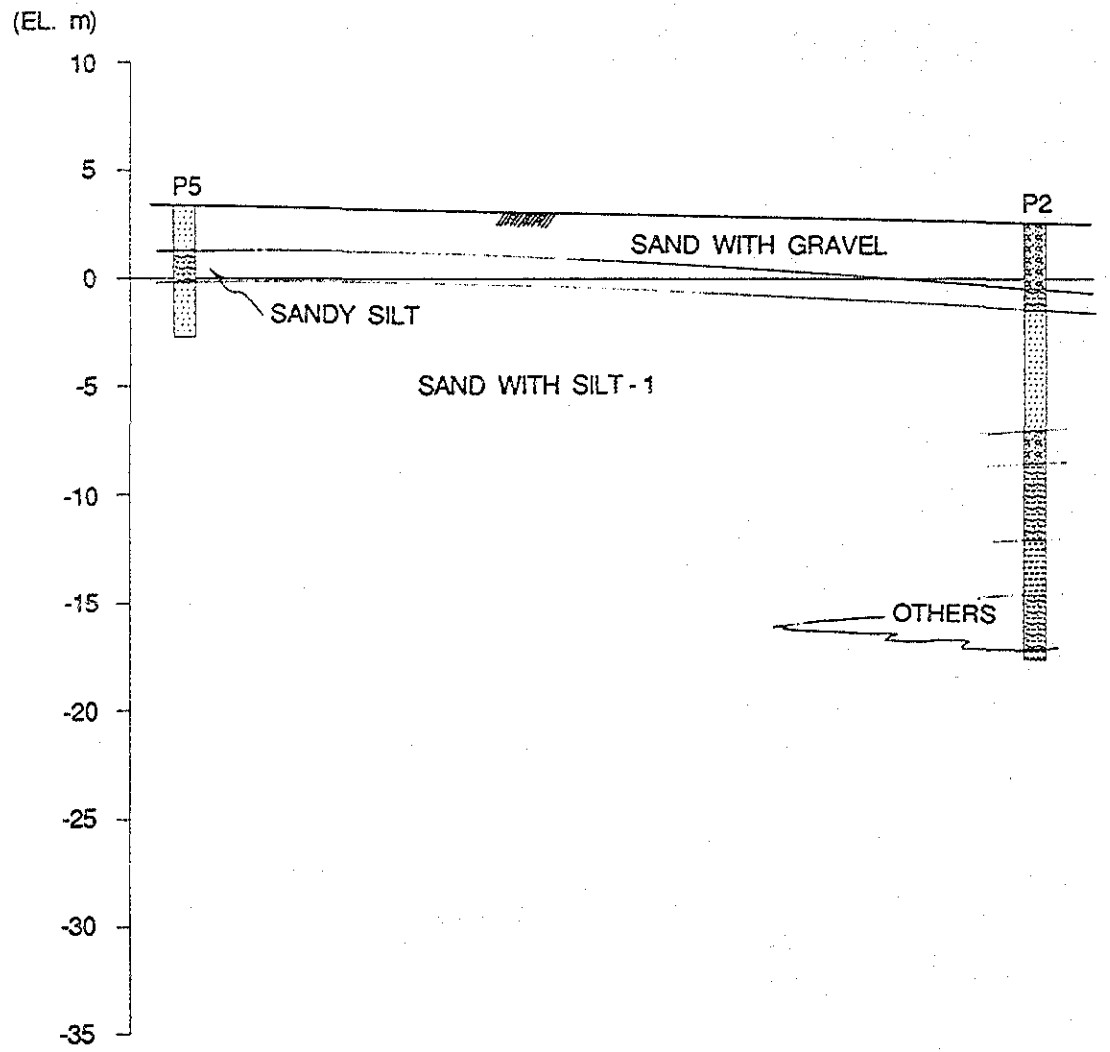
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-10 Soil Profile of Section C-C'



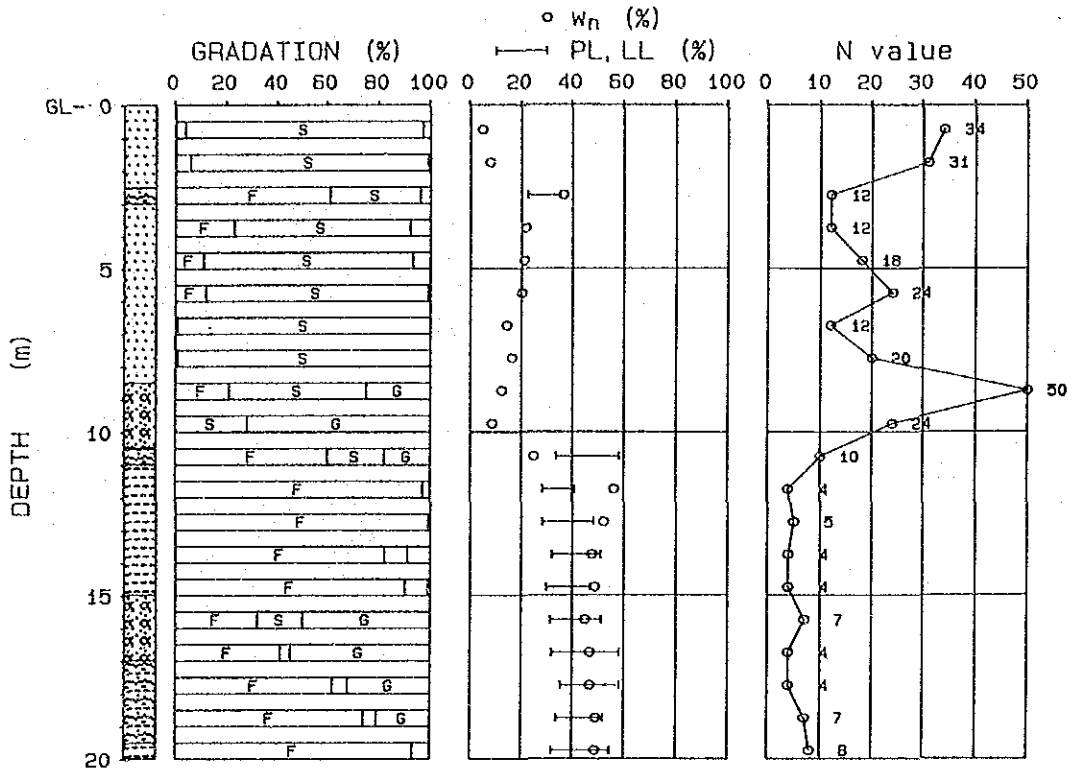
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-11 Soil Profile of Section D-D'



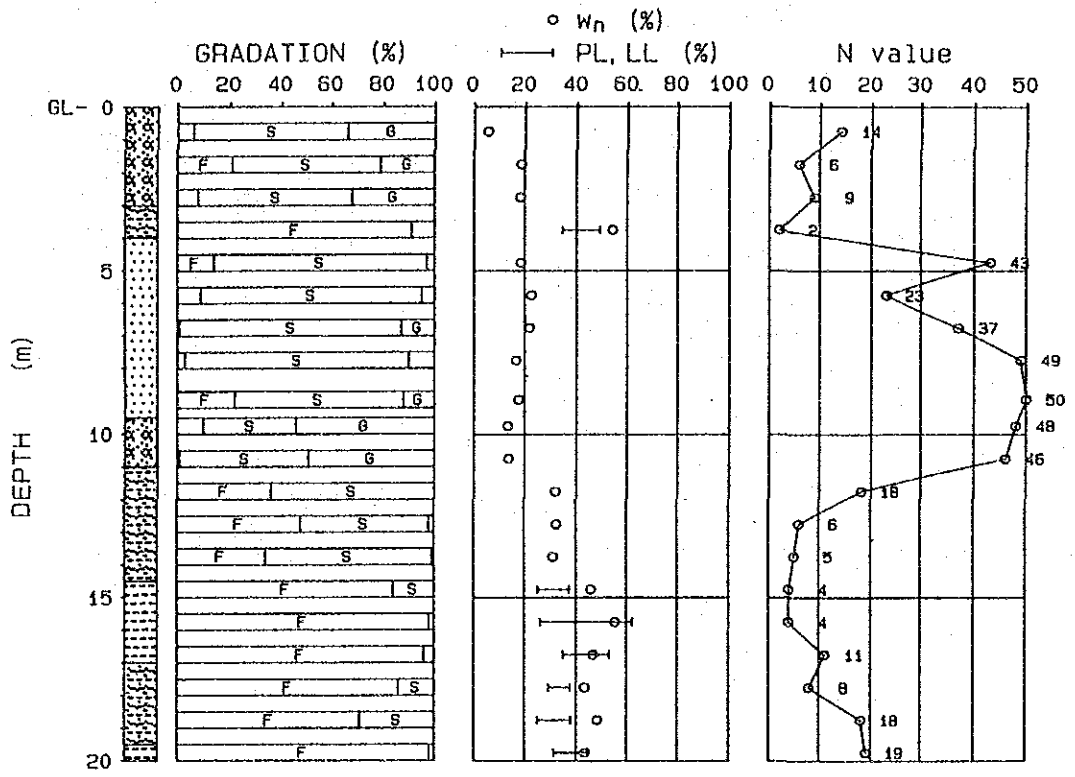
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-12 Soil Profile of Section E-E'



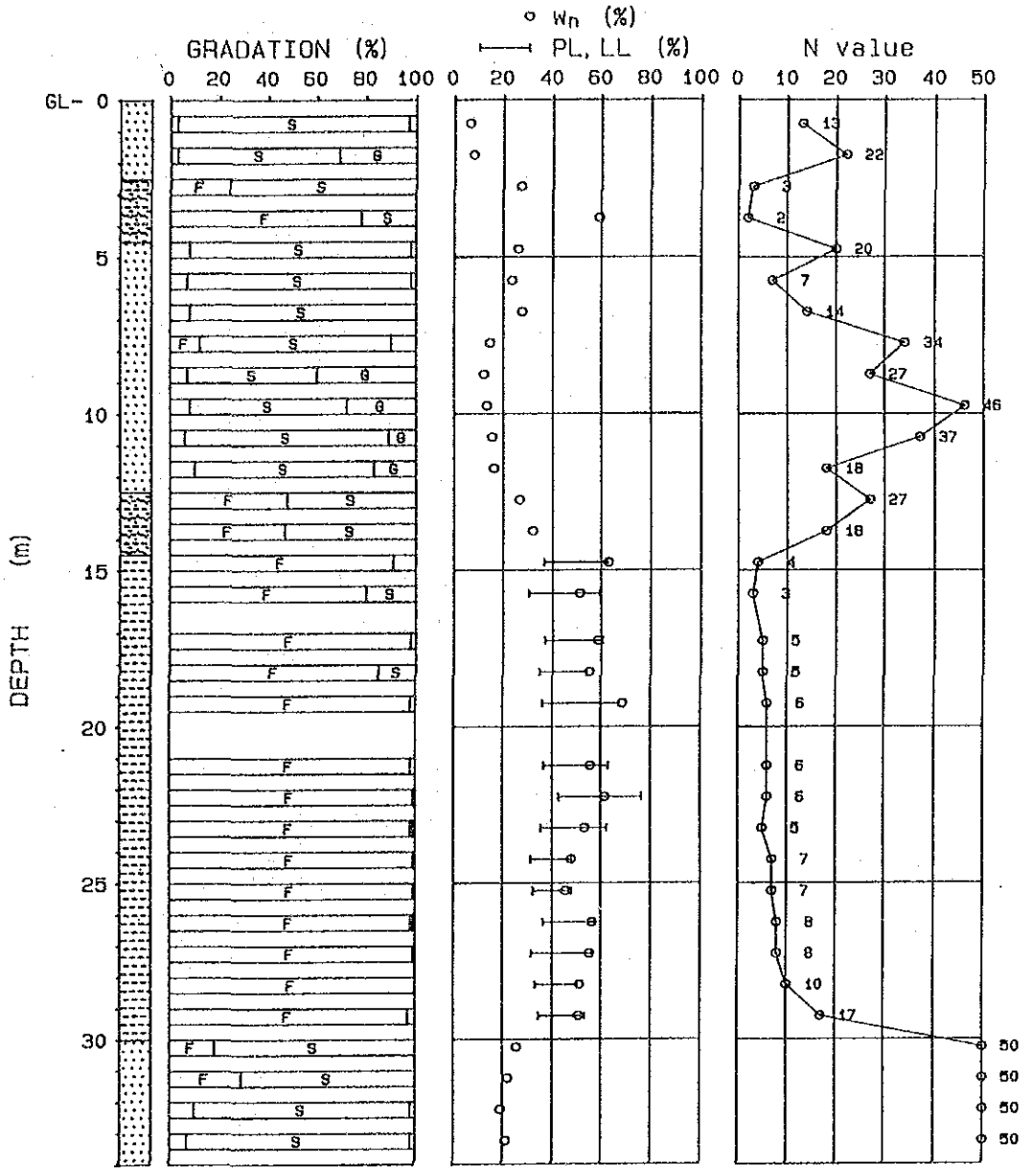
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-13 Soil Profile of Section F-F'



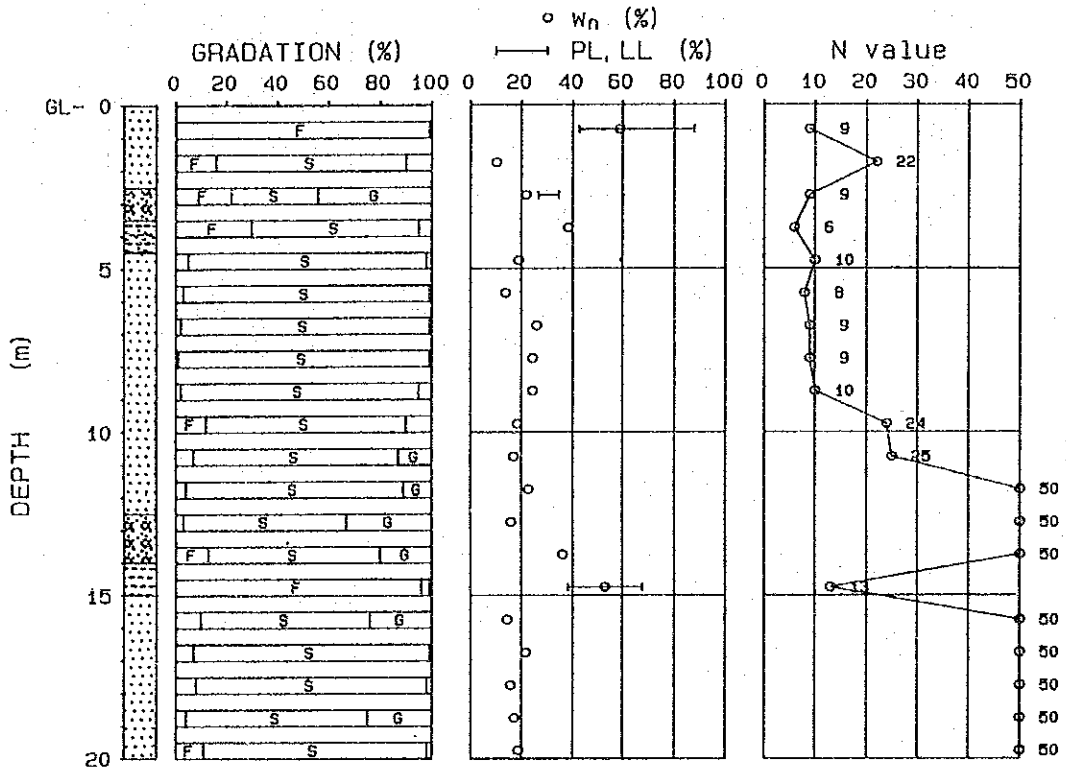
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-14 Soil Property Chart of P1
	JAPAN INTERNATIONAL COOPERATION AGENCY



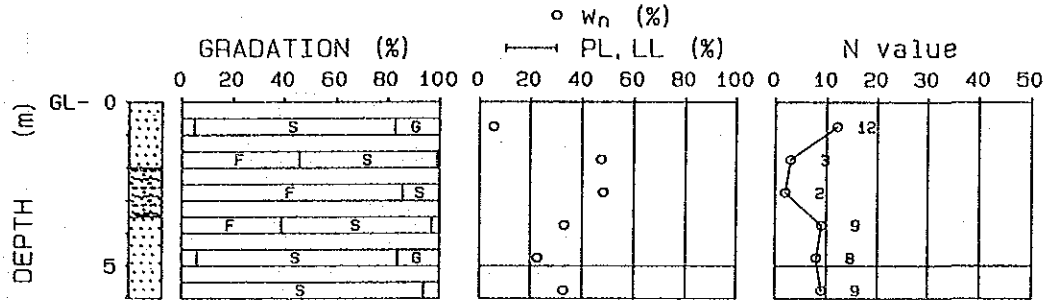
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-15 Soil Property Chart of P2
	JAPAN INTERNATIONAL COOPERATION AGENCY



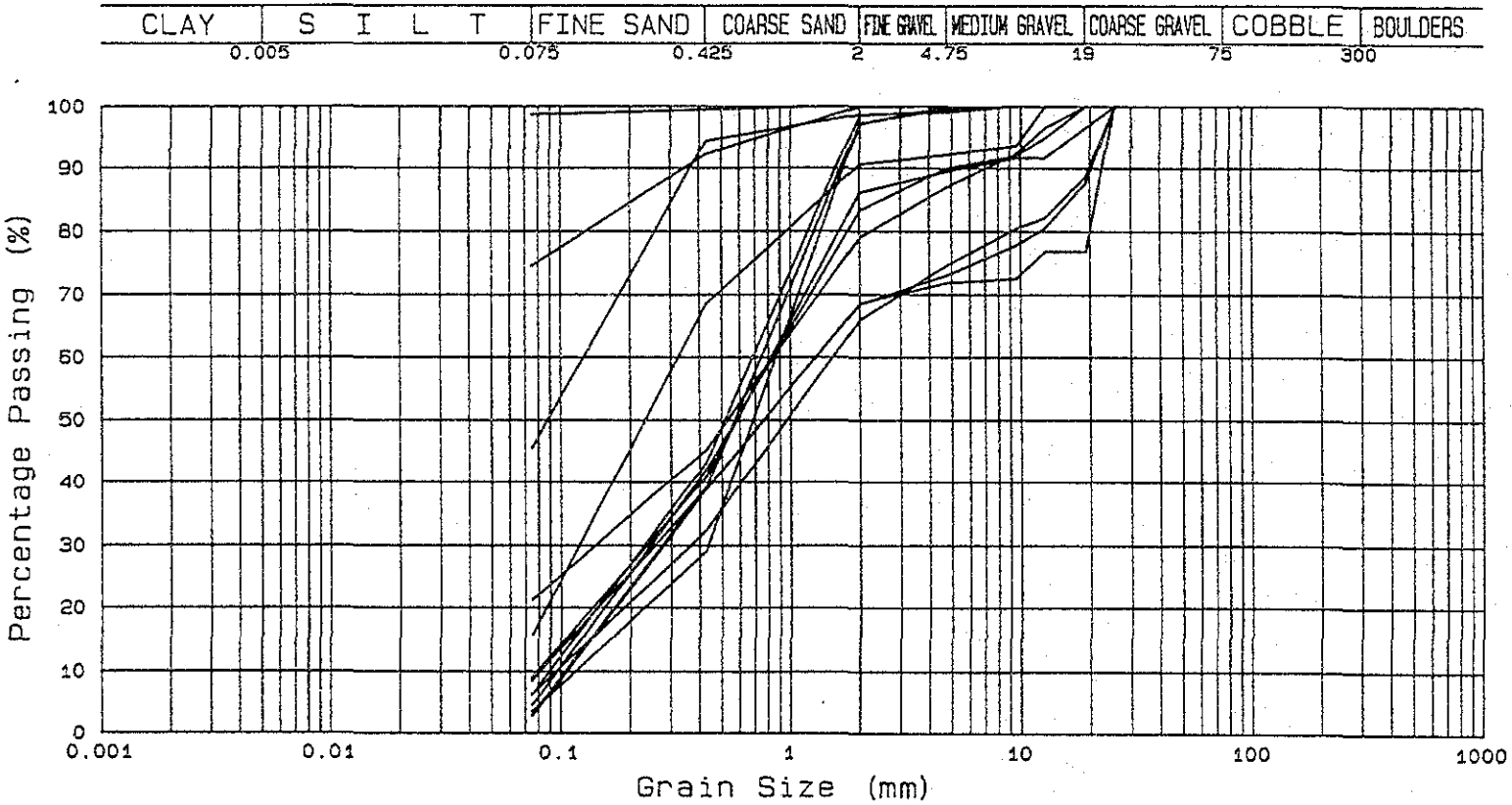
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-16 Soil Property Chart of P3
	JAPAN INTERNATIONAL COOPERATION AGENCY



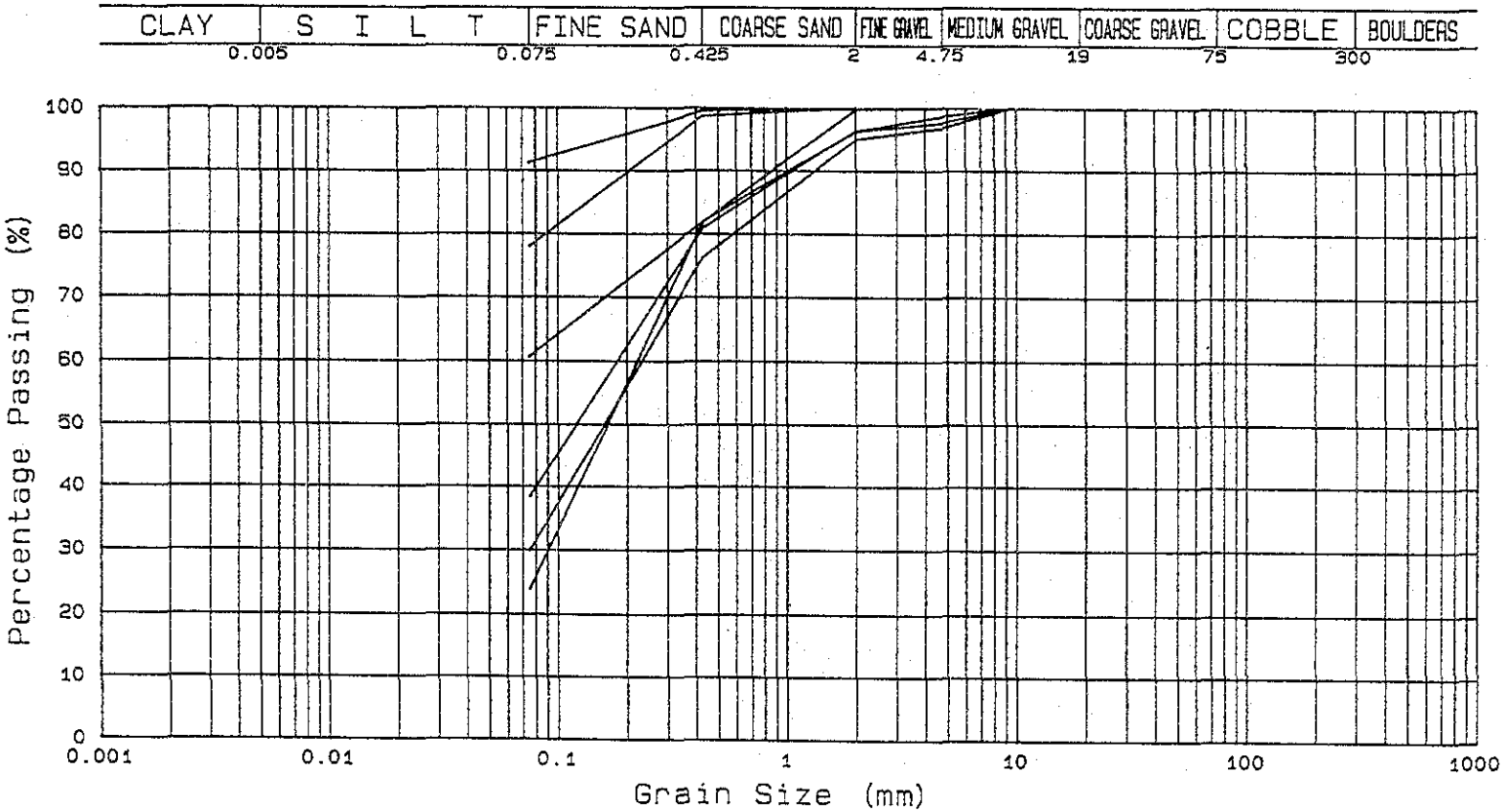
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-17 Soil Property Chart of P4
	JAPAN INTERNATIONAL COOPERATION AGENCY



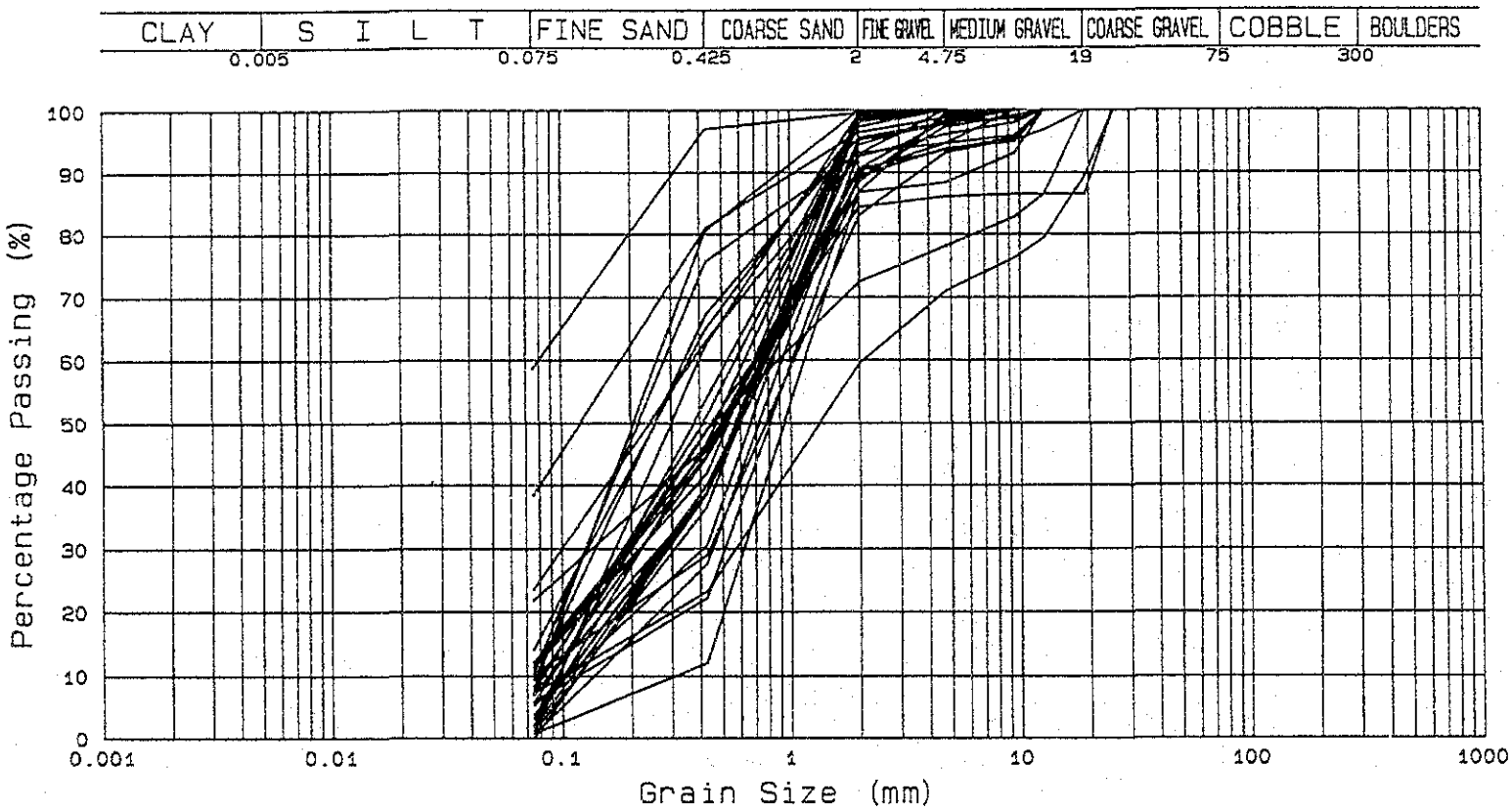
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-18 Soil Property Chart of P5
	JAPAN INTERNATIONAL COOPERATION AGENCY



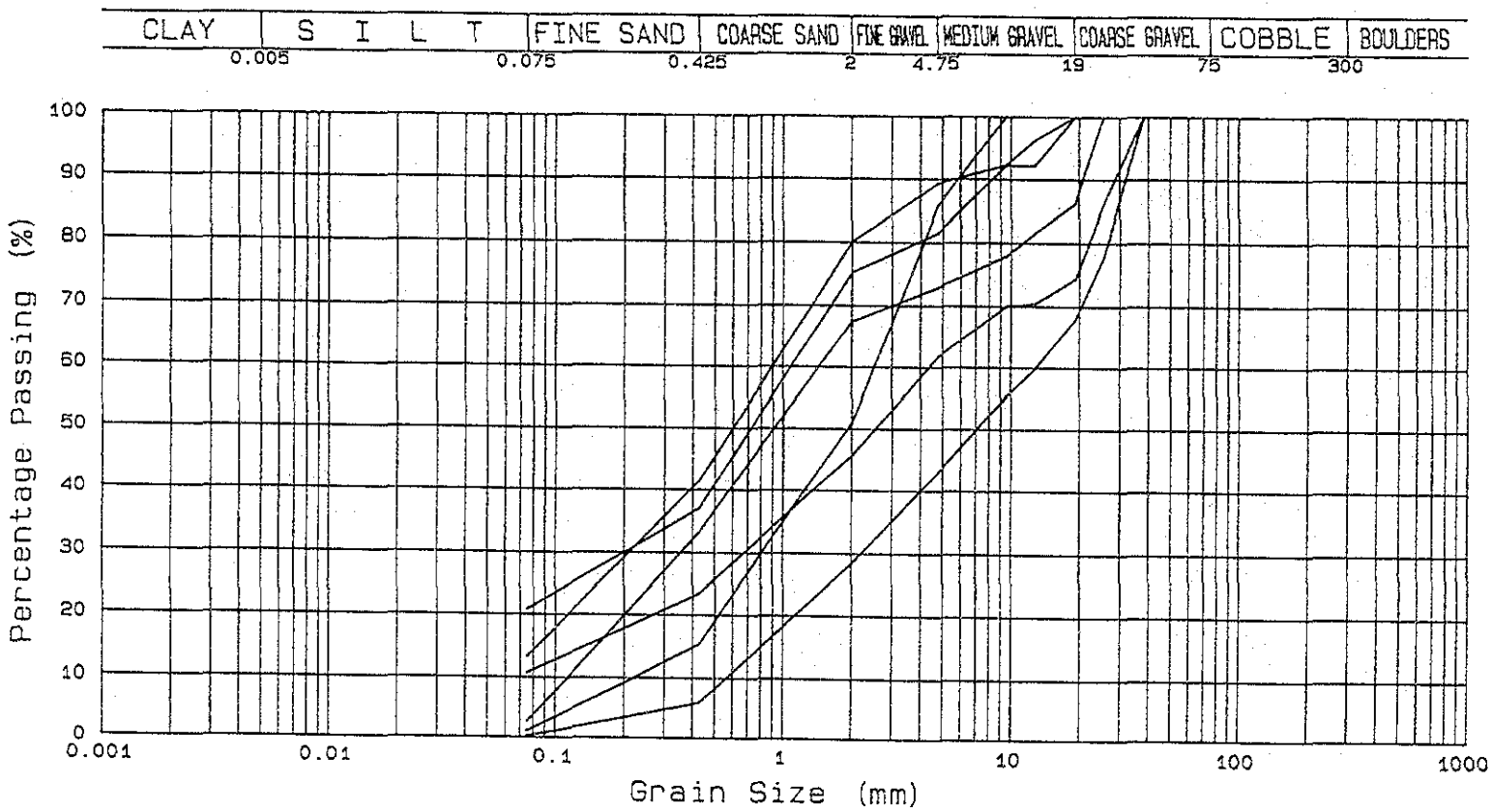
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-19	Grading Curve of Sand with Gravel Stratum



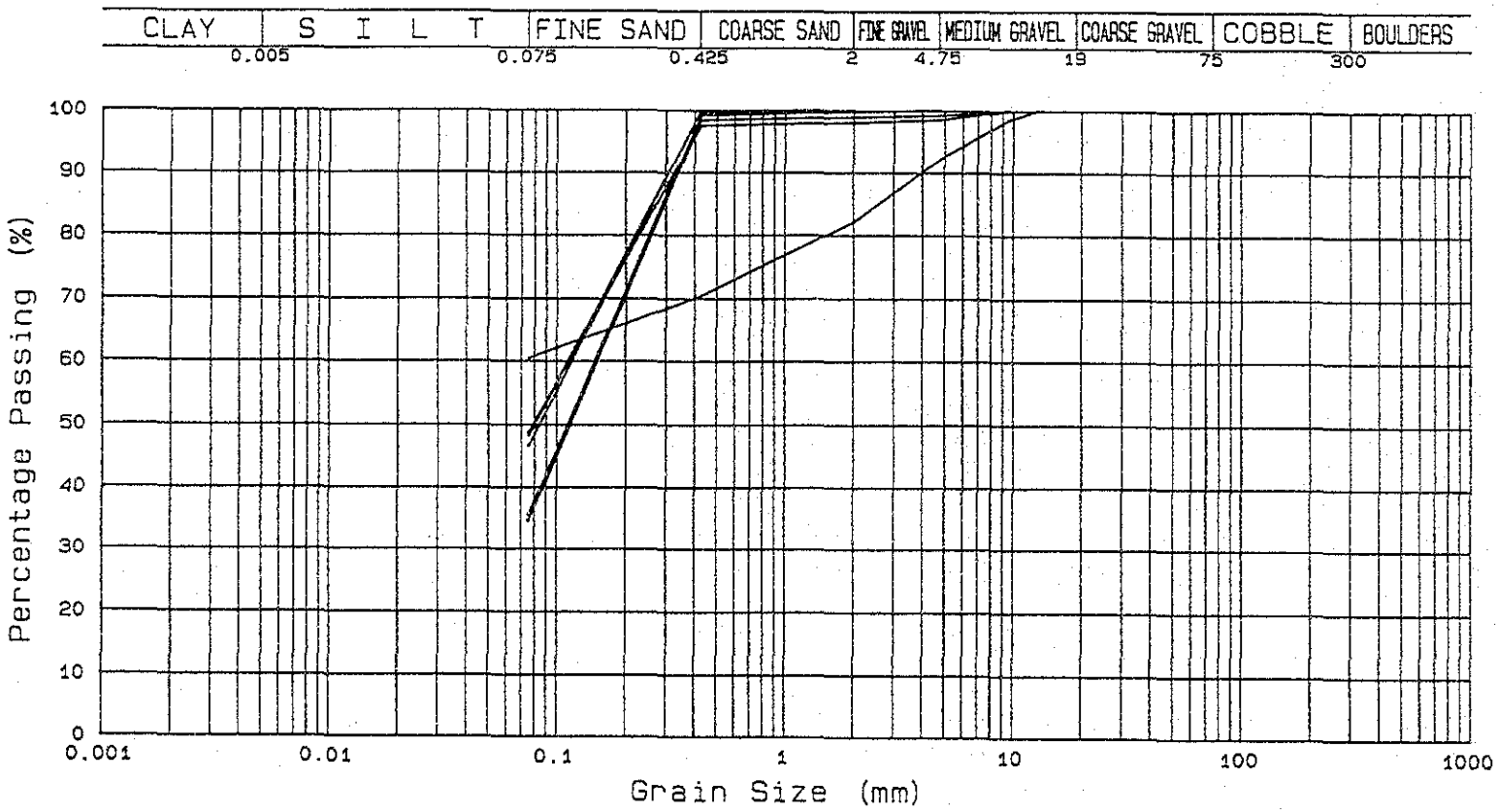
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-20 Grading Curve of Sandy Silt Stratum



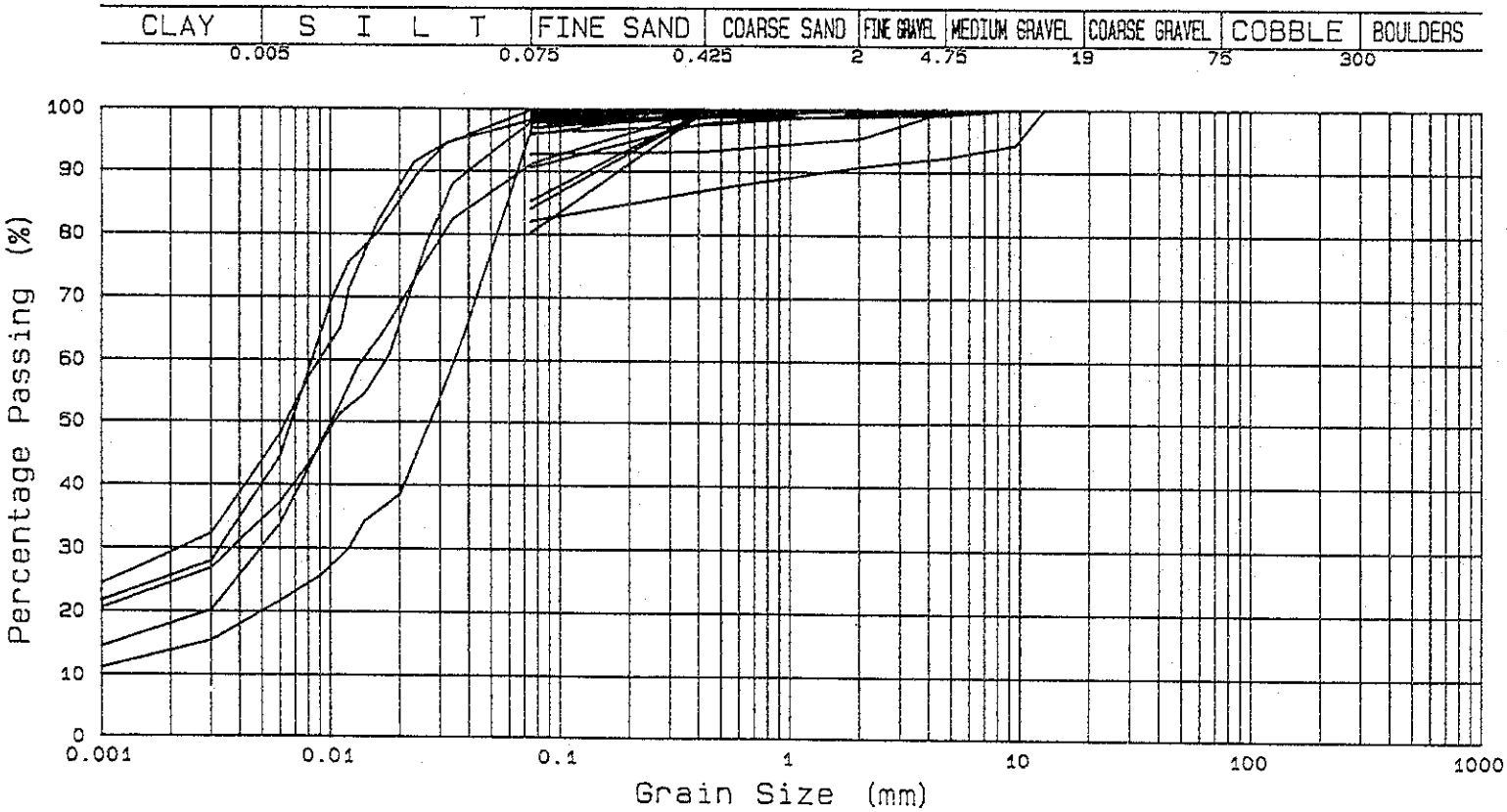
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-21	Grading Curve of Sand with Silt - 1 Stratum



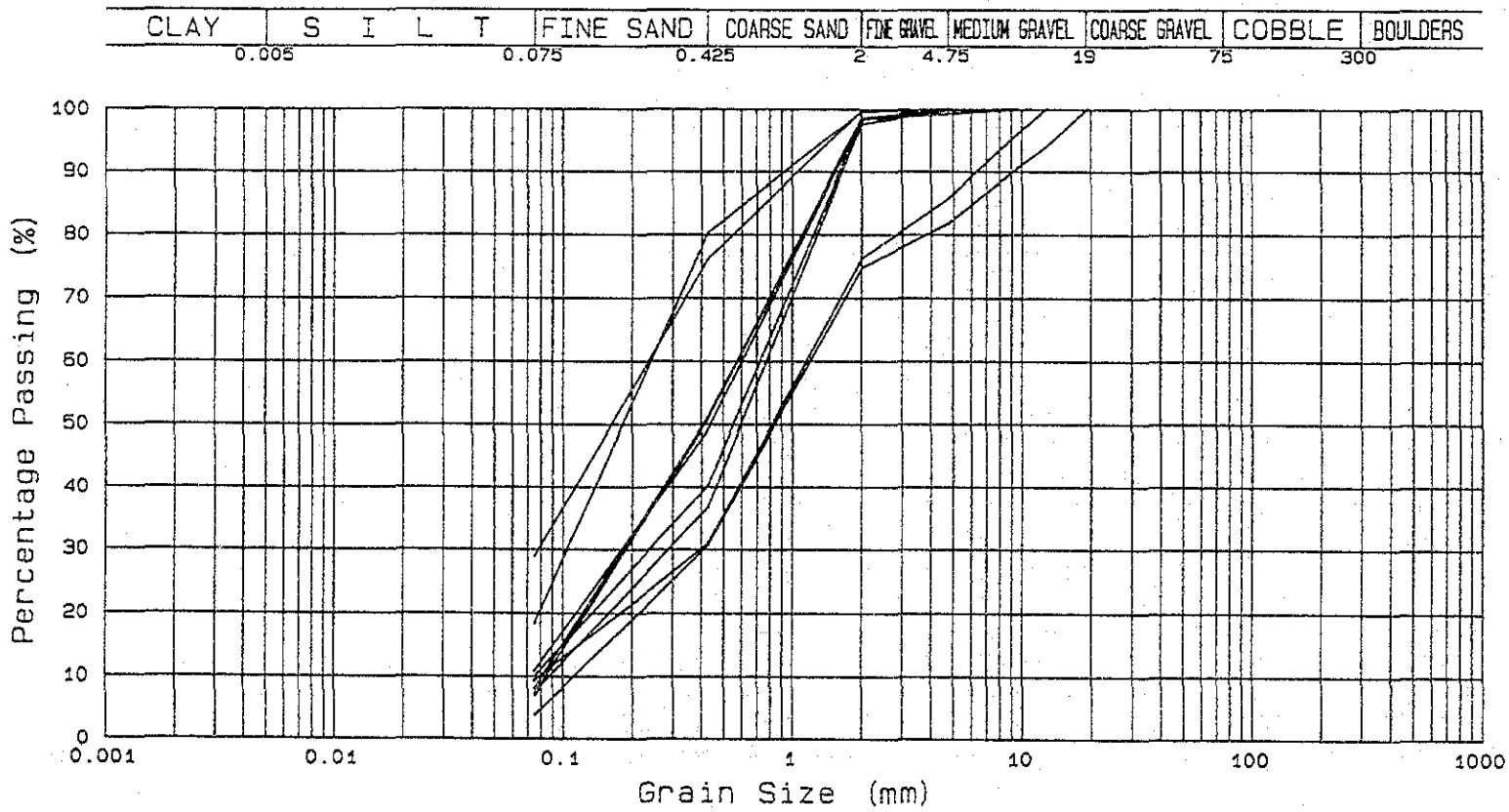
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-22	Grading Curve of Gravelly Sand Stratum



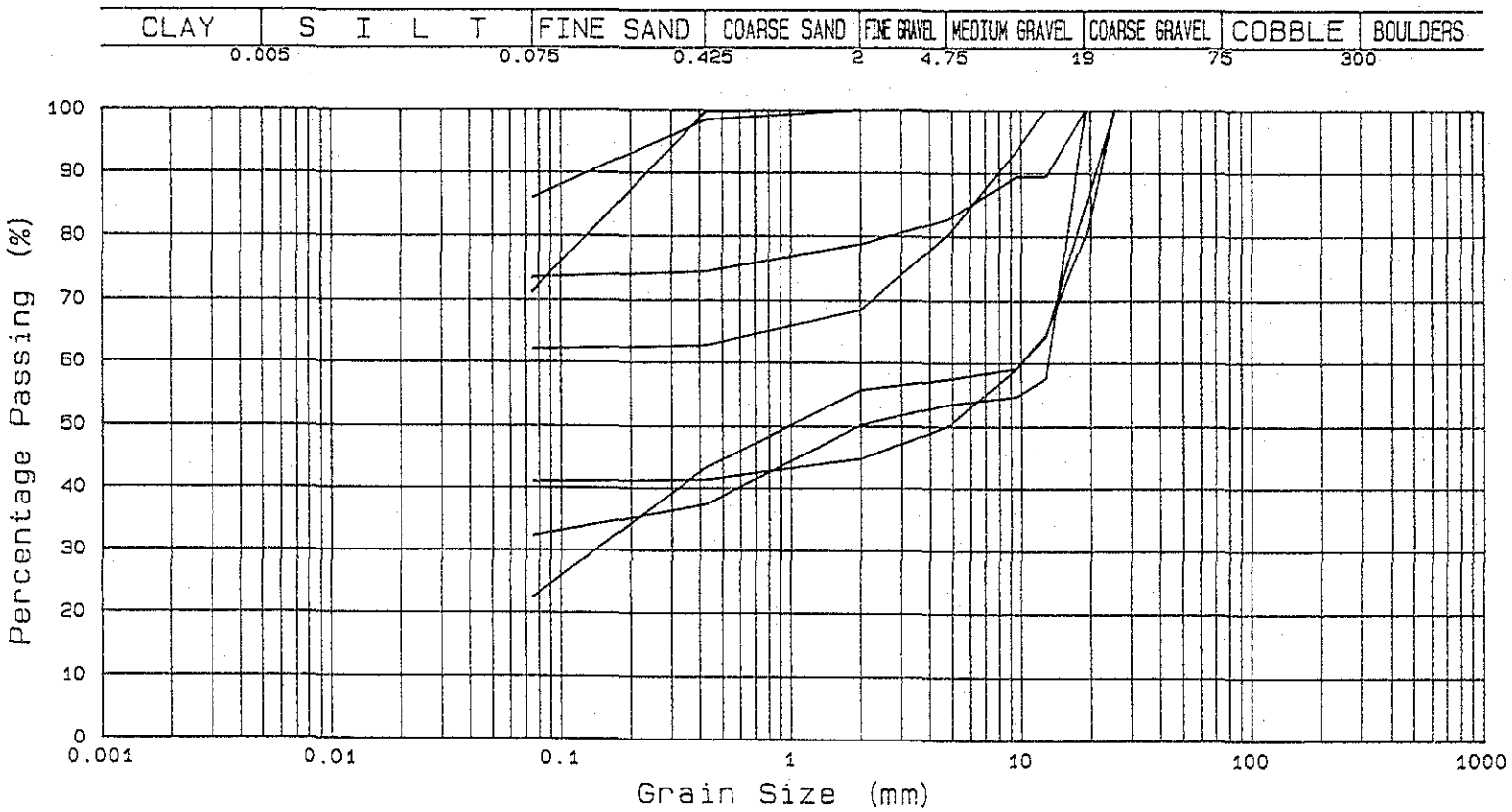
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-23	Grading Curve of Silty Sand Stratum



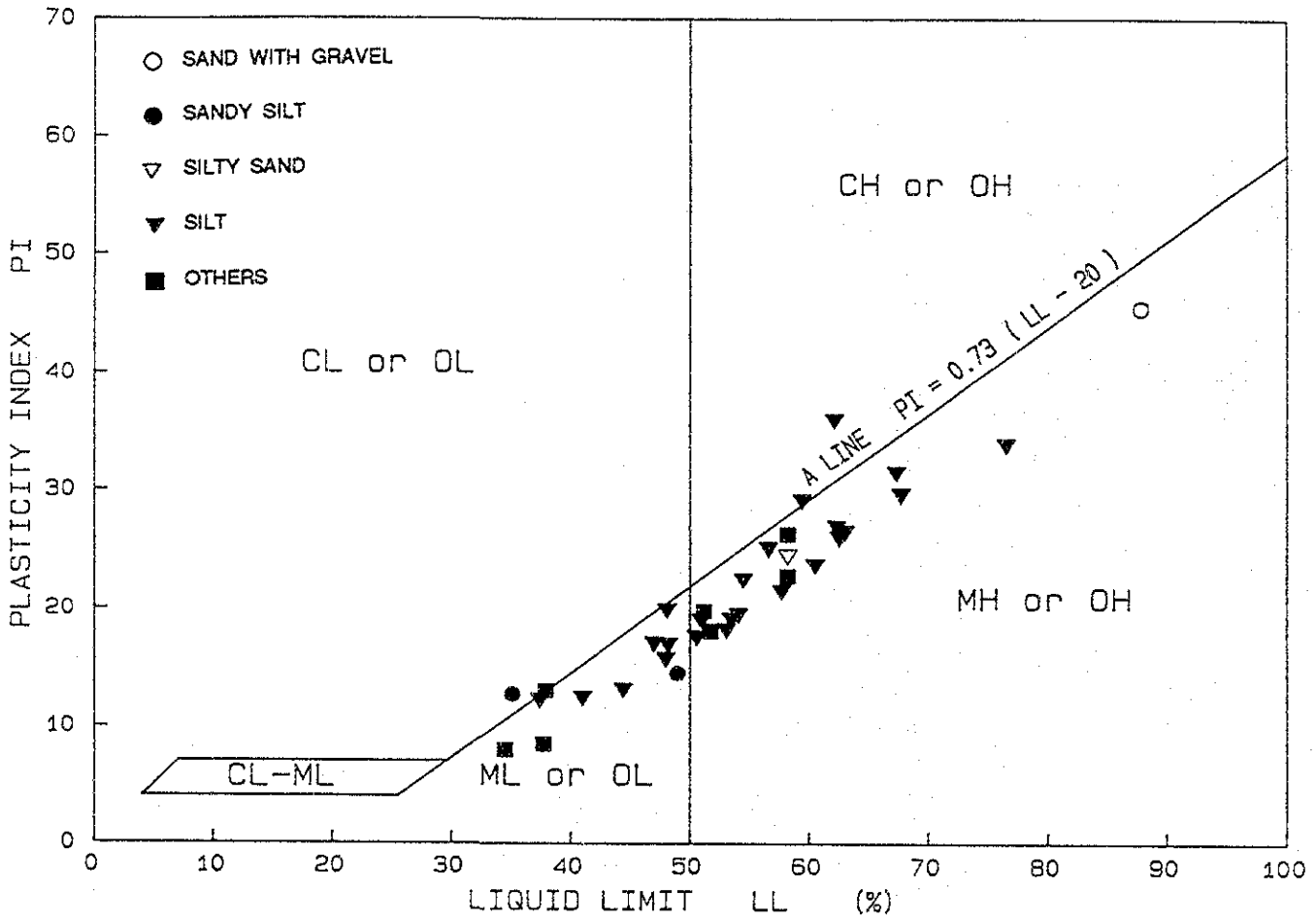
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-24	Grading Curve of Silt Stratum



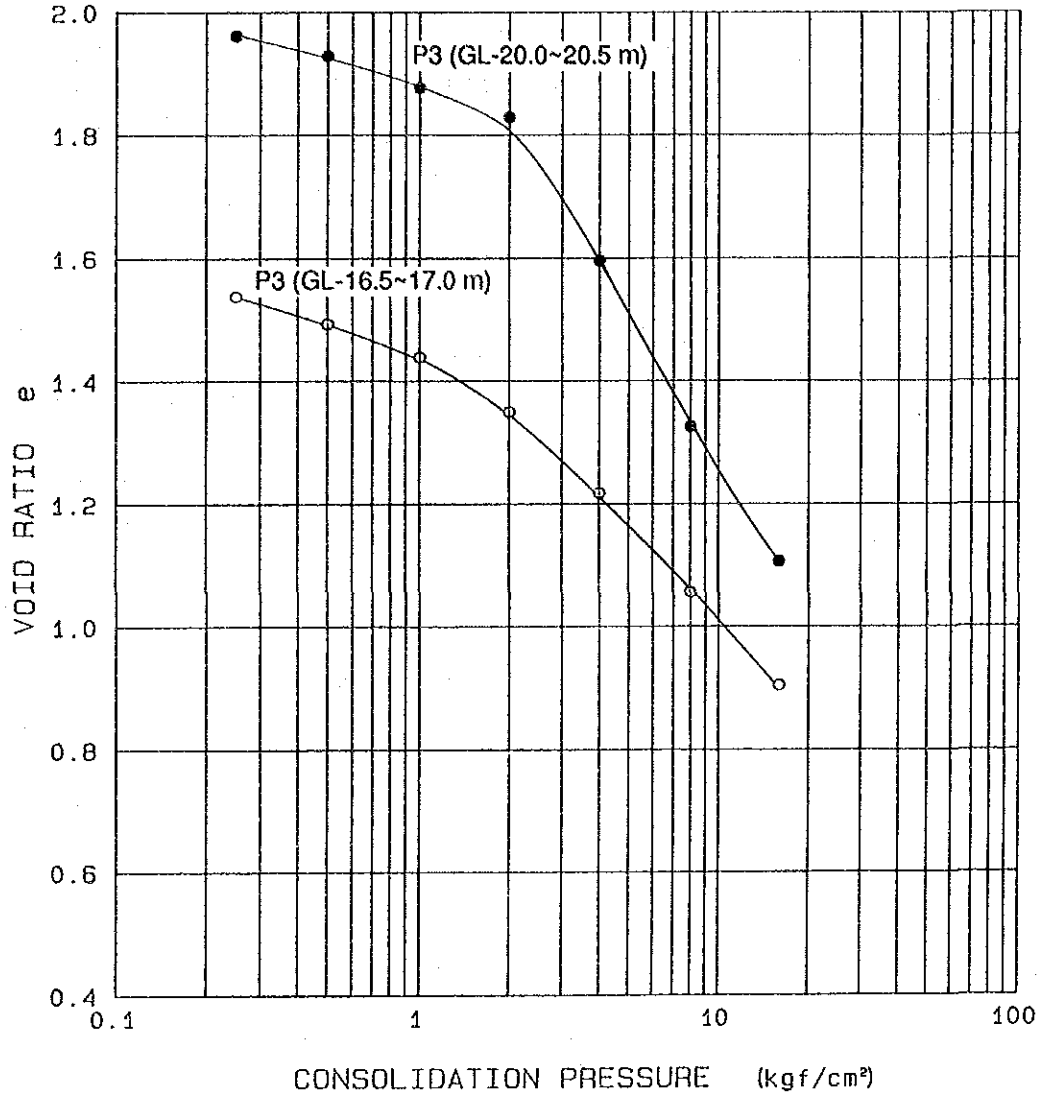
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-25	Grading Curve of Sand with Silt - 2 Stratum



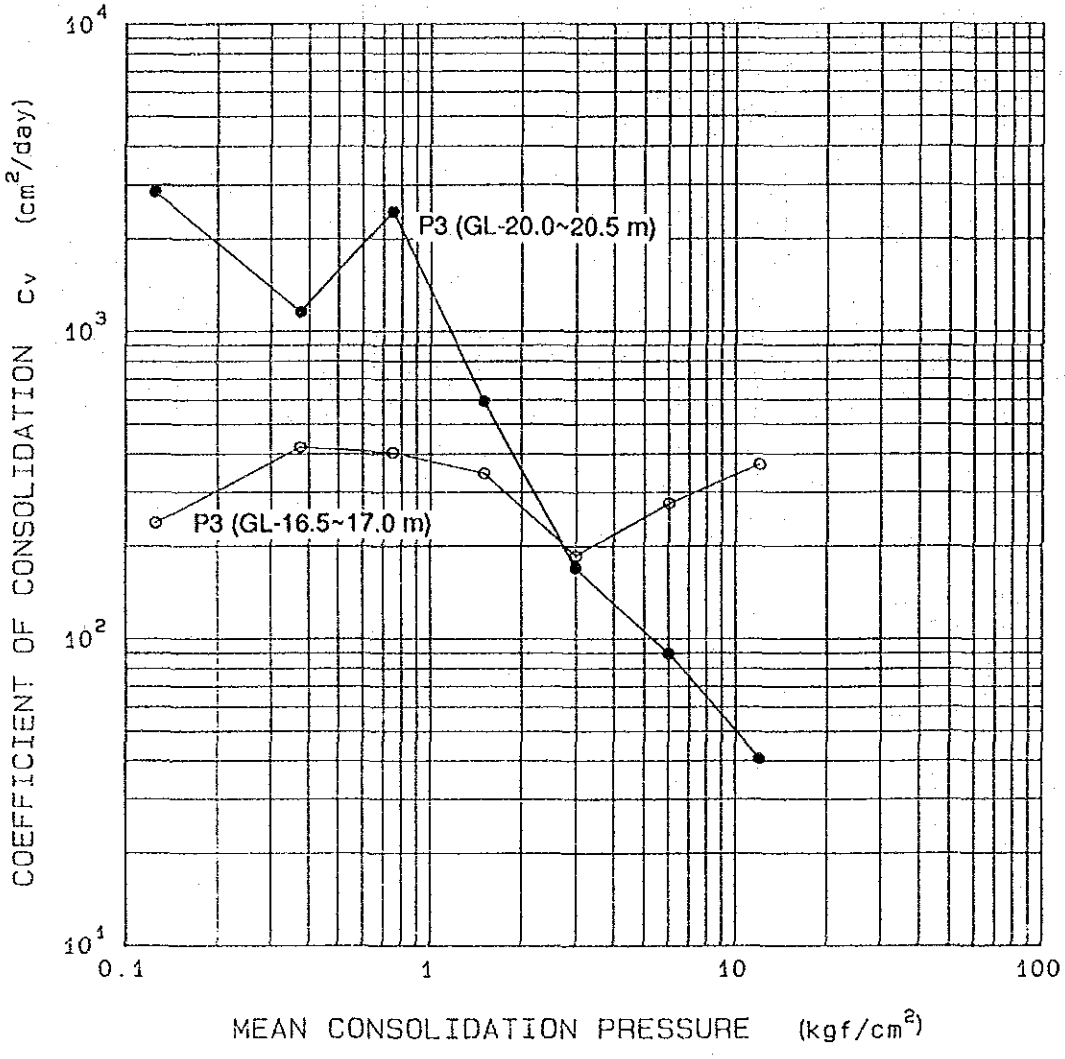
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-26 Grading Curve of Other Materials



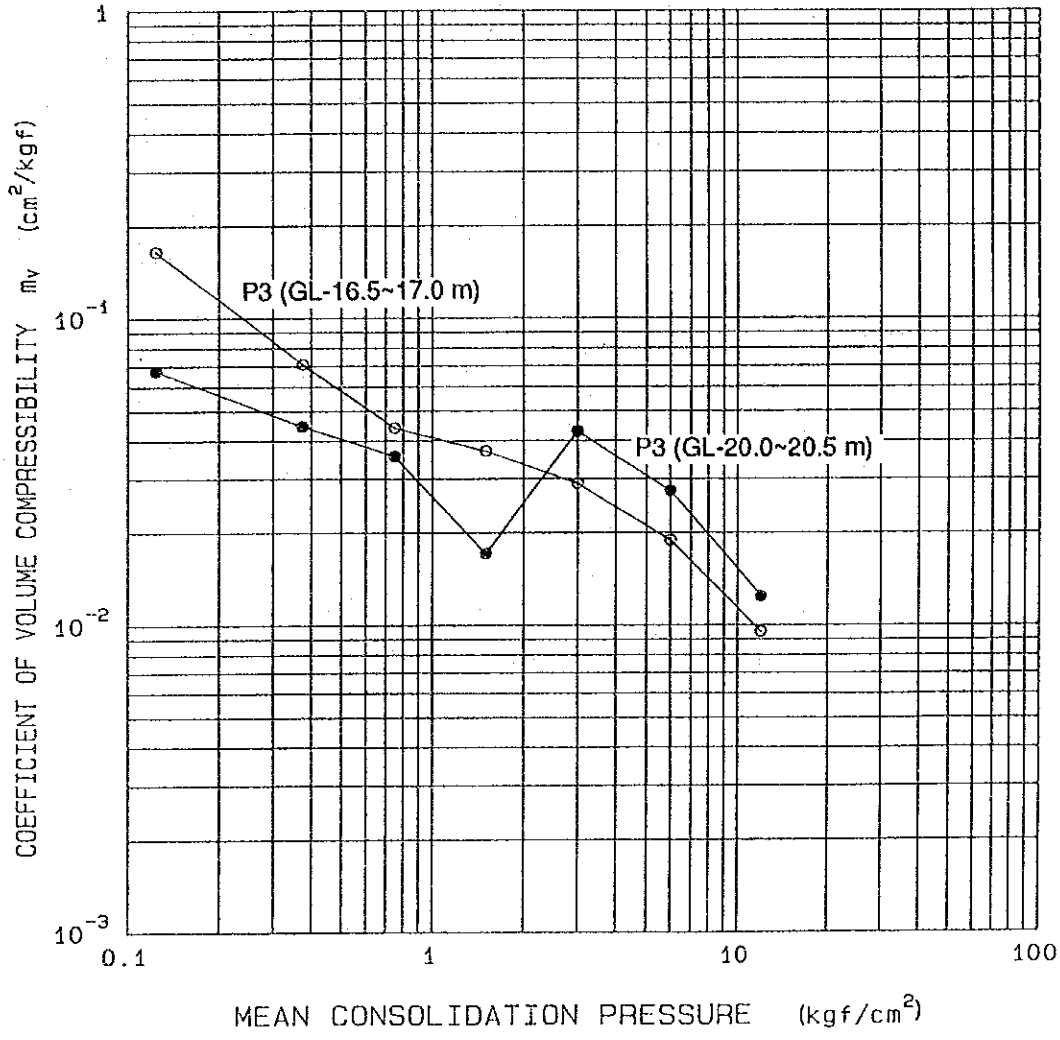
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-27 Plasticity Chart



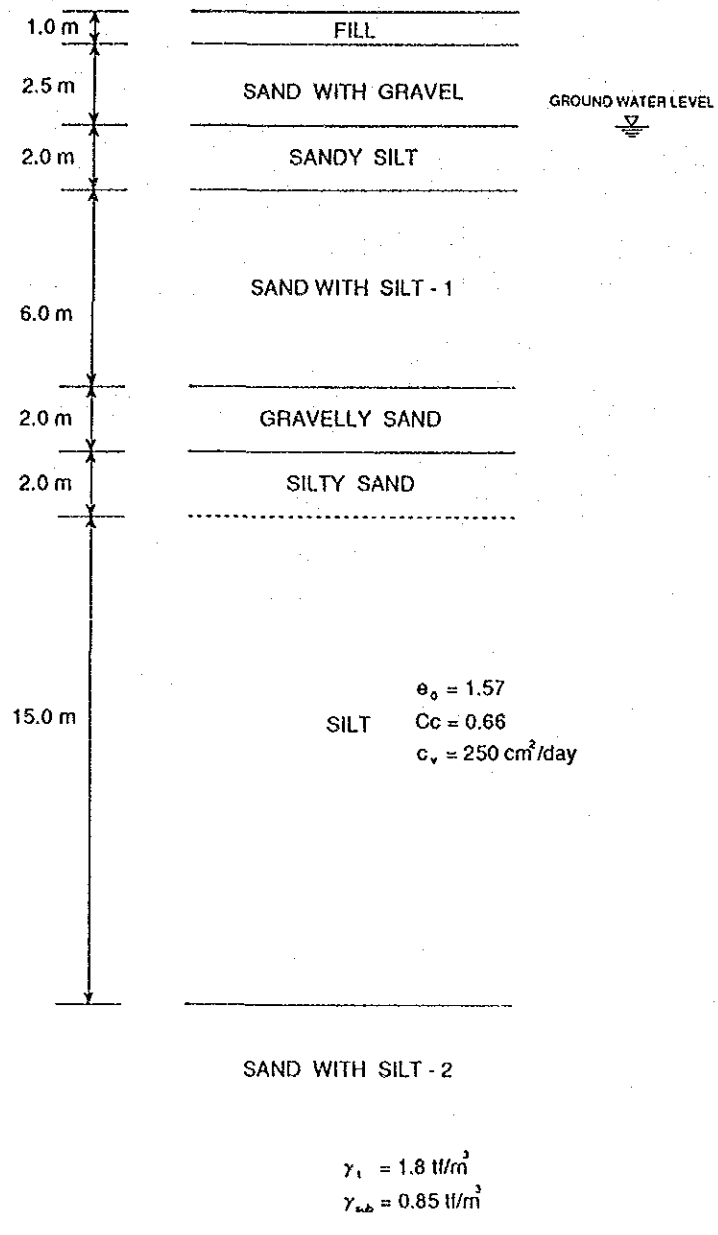
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-28 Relation between Consolidation Pressure and Void Ratio
	JAPAN INTERNATIONAL COOPERATION AGENCY



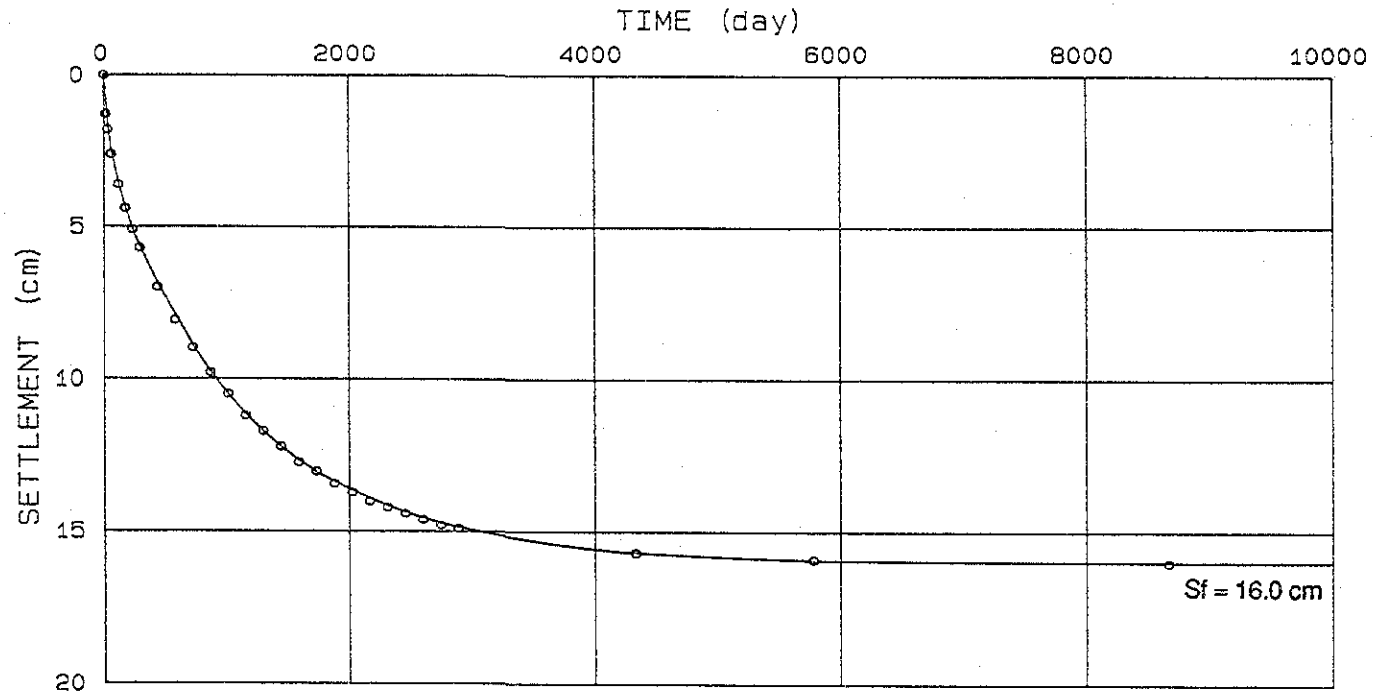
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-29 Relation between Mean Consolidation Pressure Coefficient of Consolidation
	JAPAN INTERNATIONAL COOPERATION AGENCY



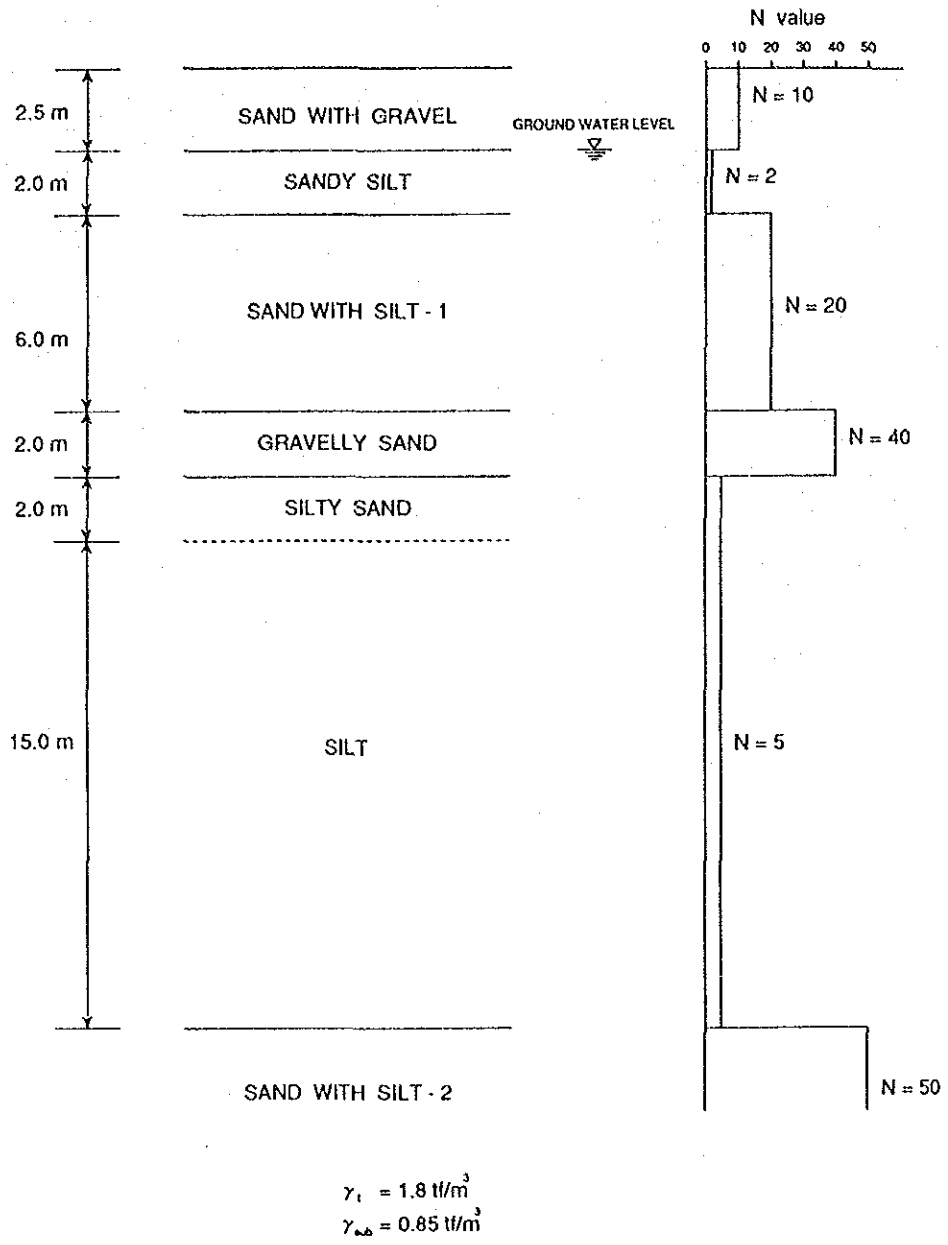
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-30 Relation between Mean Consolidation Pressure Coefficient of Volume Compressibility
	JAPAN INTERNATIONAL COOPERATION AGENCY



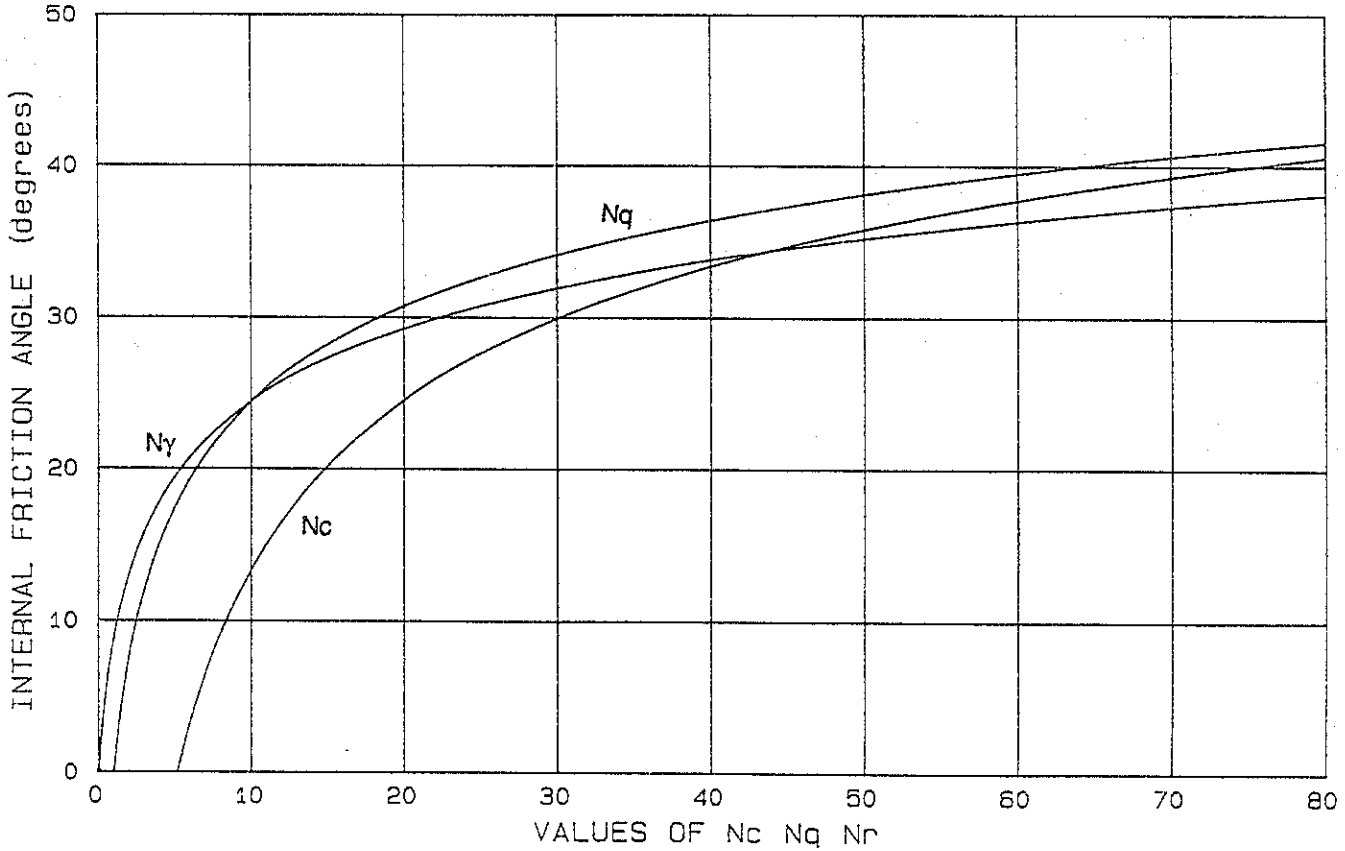
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-31 Analyzed Model for Settlement
	JAPAN INTERNATIONAL COOPERATION AGENCY



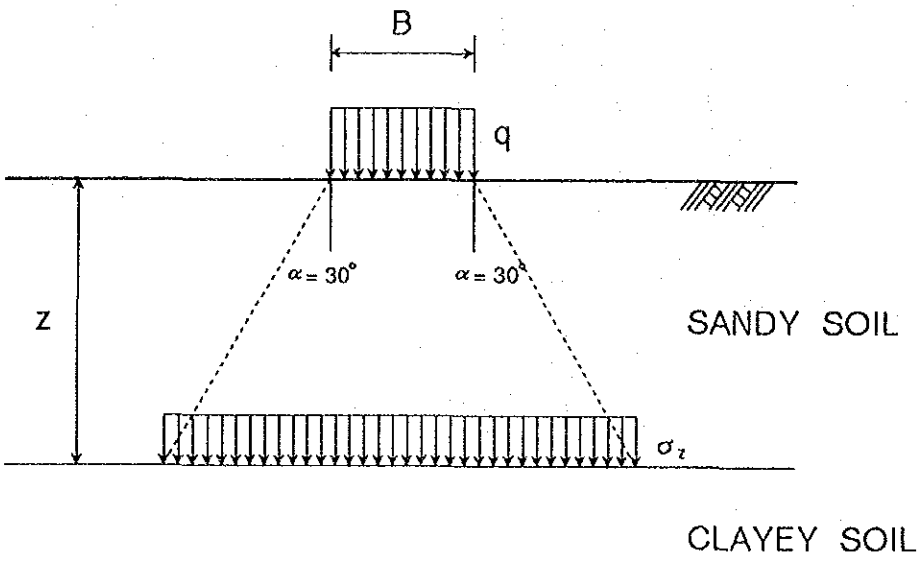
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-32 Relation between Time and Settlement



	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-33 Analyzed Model for Bearing Capacity
	JAPAN INTERNATIONAL COOPERATION AGENCY

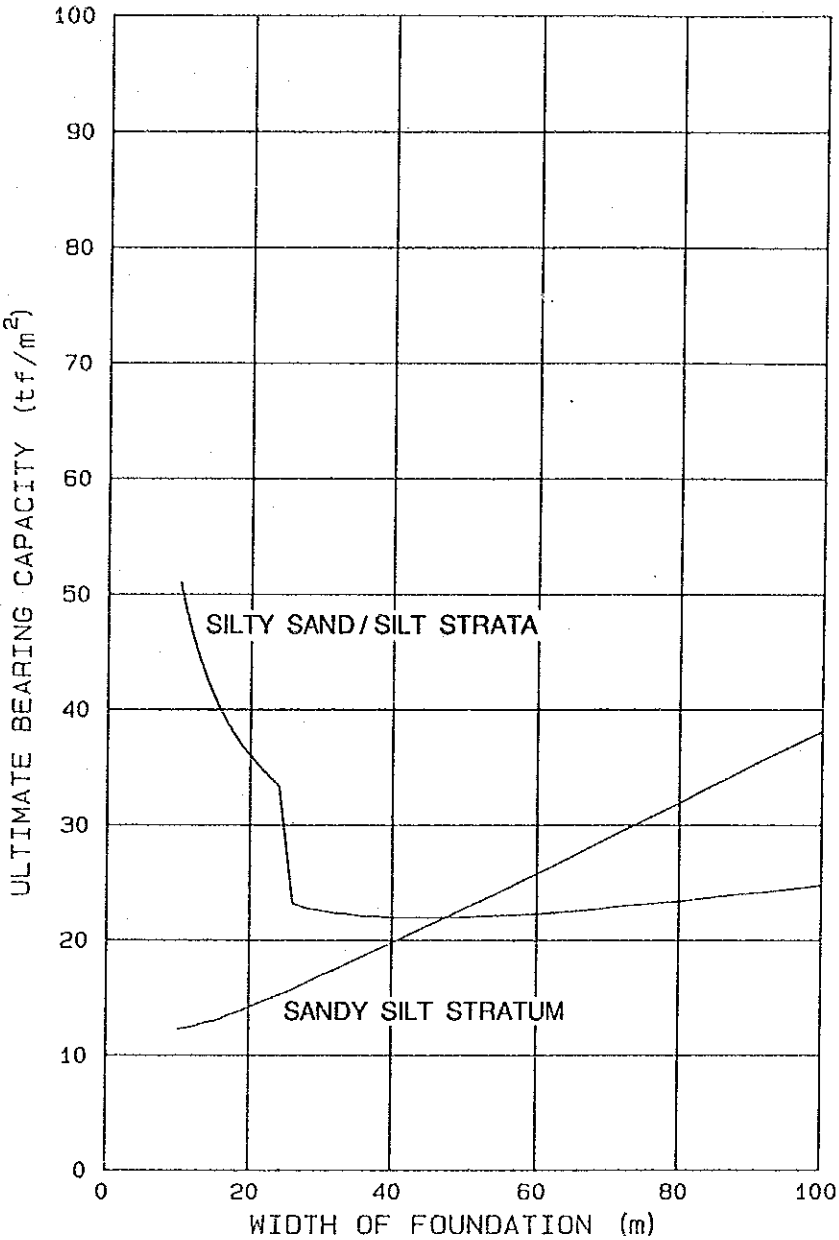


JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. G-34 Relation between Bearing Capacity Factors and Internal Friction Angle

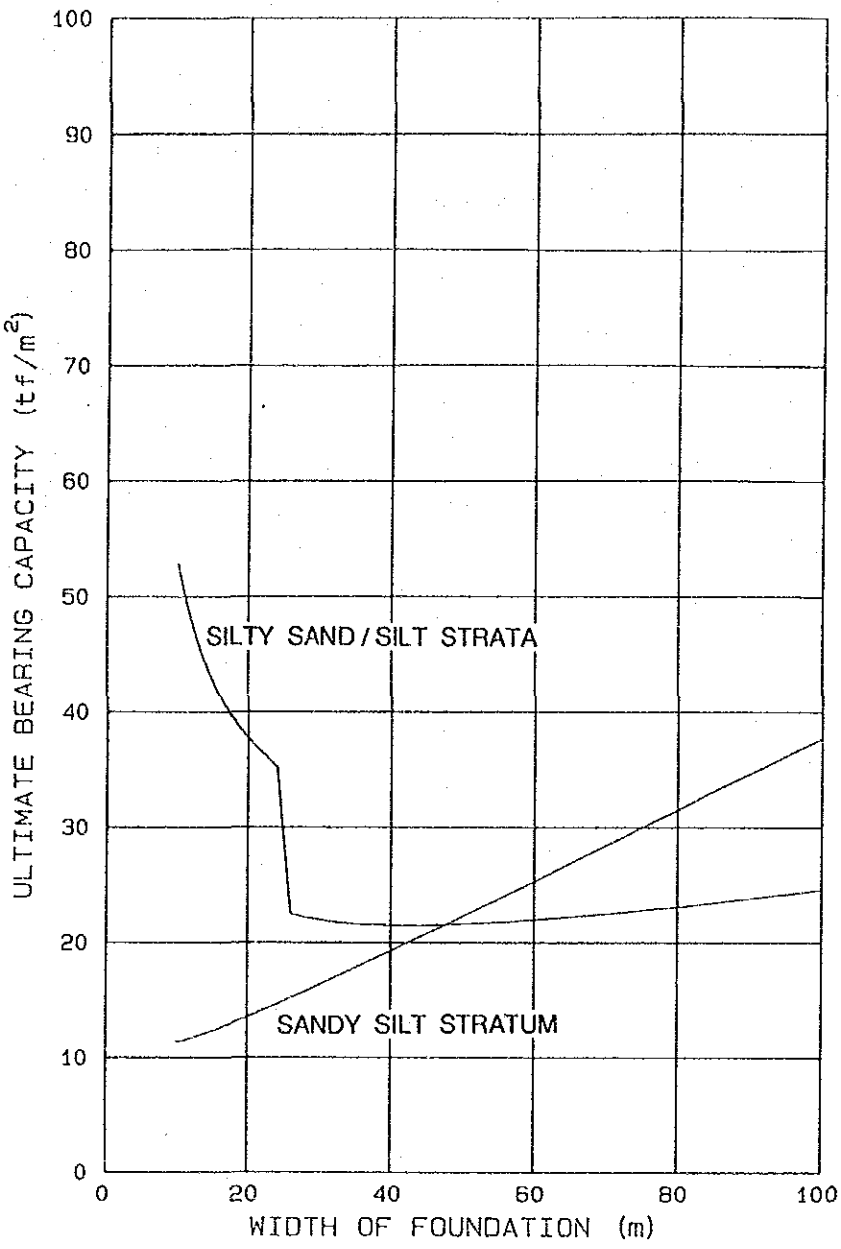


$$\sigma_Z = \frac{q}{1 + \left(\frac{Z}{B}\right) \tan \alpha}$$

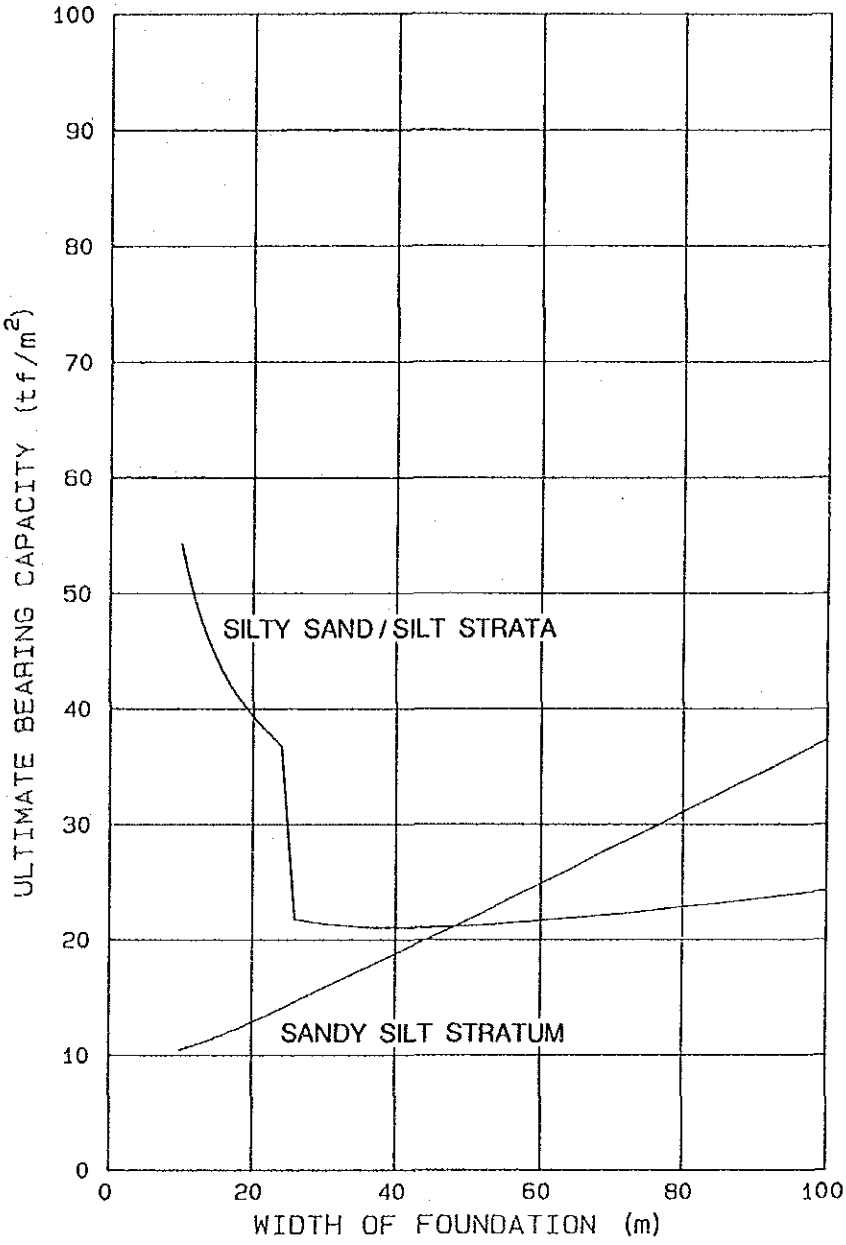
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-35 *Load Distribution Method* (Boston Code Method)
	JAPAN INTERNATIONAL COOPERATION AGENCY



	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-36 Relation between Width of Foundation and Ultimate Bearing Capacity (Df = 0 m)
	JAPAN INTERNATIONAL COOPERATION AGENCY



	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-37 Relation between Width of Foundation and Ultimate Bearing Capacity (Df = 1 m)
	JAPAN INTERNATIONAL COOPERATION AGENCY



	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. G-38 Relation between Width of Foundation and Ultimate Bearing Capacity (Df = 2 m)
	JAPAN INTERNATIONAL COOPERATION AGENCY

ANNEX H

LAND USE PLAN AND LAYOUT

ANNEX-H

LAND USE PLAN AND LAYOUT

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H.1 GENERAL

This Annex-H presents the results of studies on 1) land use plan, 2) factory lot distribution plan, 3) plan of road and 4) plan of relevant facilities, including the standard factory.

In the land use plan, a preliminary land use plan formulated through the Preliminary Study by CENDES in 1984 has been reviewed and the alternative land use plans have been analyzed and studied.

In the factory lot planning, such basic parameters as lot size, lot formation and lot distribution have been planned.

In the road plan, traffic to and from the Esmeraldas EPZ has been estimated, and six types of roads have been designed in the light of the traffic volume.

In the planning of facilities relevant to the establishment of the Esmeraldas EPZ, standard factories, administrative facilities, service facilities and other facilities such as park, bus terminal, etc. have been planned and designed preliminarily.

It is noted that the land use plan has been formulated to make utmost use of the land readily available for ZOFREE, or approximately 22.7 hectares. Possibility for expansion of this land in the surrounding area is physically limited, and the study and plan formulation will be concentrated to this available land. Judging from the prospects on potential investors studied in other Sections of this Study, expansion to the detached areas will not be expectable in the foreseeable future.

H.2 LAND USE PLAN

H.2.1 Review of Preliminary Study

The Preliminary Study by CENDES in 1984 presented a sophisticated but functional land use plan for the establishment of the Esmeraldas EPZ. It is, however, observed that the following amendments will be necessary on this CENDES plan.

1) Land use configuration

The area of factory lot was planned to be 12.9 hectares, accounting for 58.3% of the total area of the Esmeraldas EPZ as shown in table below. Judging from the existing EPZ in various developing countries, it appears desirable to design that the ratio of factory lots to the total area should be more than 70%, in order to increase the land use and thus decrease the unit cost for land lease, so as to keep the competitive position against the other EPZs in Central and South America.

Land Use Plan by CENDES

Land Use	(ha)	%
1. Factory lot	12.9	58.3
2. Administrative facility	2.7	12.0
3. Road	3.0	13.4
4. Green & recreation facility	3.6	16.3
5. Total	22.2	100.0

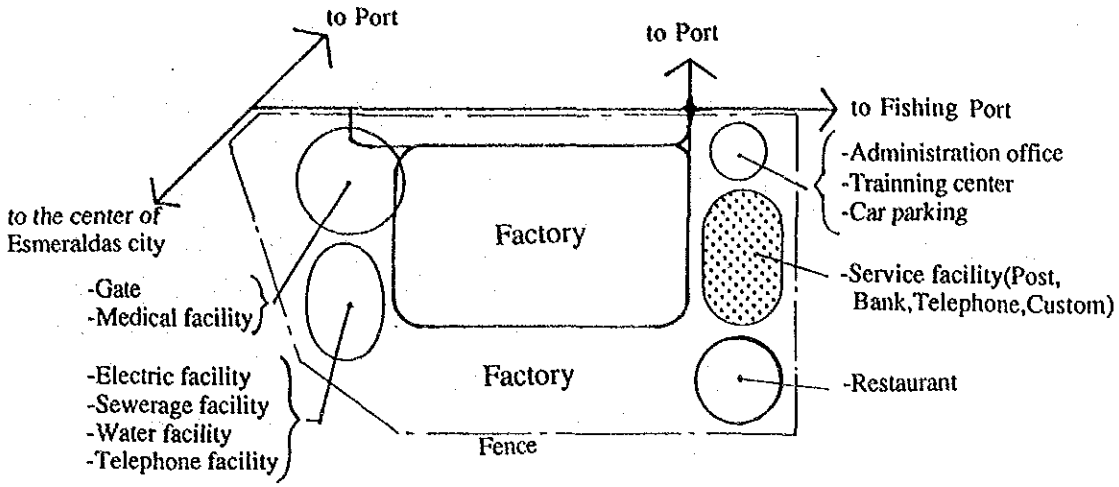
Source: Estudio de Factibilidad para la Instalacion de la Zona Franca en Esmeraldas, Julio 1984, CENDES

2) Factory lot design

Although forty-four (44) plots were planned in the CENDES Preliminary Study, the size of plot was designed to be uniform with an area of 0.5 ~ 0.7 hectares per plot. The investor will apparently require various size of plot, as demonstrated by the investment demand survey. It is desirable that various lot size between 0.1 ha and 2.0 ha would be offered to meet the demand of investors.

3) Plan of facility

The configuration and distribution of facilities were proposed in the CENDES Preliminary Study as schematically illustrated hereunder.



The idea of configuration and distribution of the facilities was basically correct. However, following minor amendments should better be taken into account:

(1) Each service facility was located in independent building and took larger area in the Preliminary Study. In view of the development size of the Esmeraldas EPZ, development area of the service facilities should be reduced as much as possible. An integrated building to accommodate various facilities would be desirable in order to minimize the land area needed for the service facilities.

(2) The plan of labor entrance gate will have to be reconsidered. The gate was located so close to the junction that the traffic confusion was afraid to be caused. The flow line of the pedestrian from the bus terminal to factories through the gate is too complicated. The flow lines of private passenger car and bus service for commutation are not considered in the Preliminary Study.

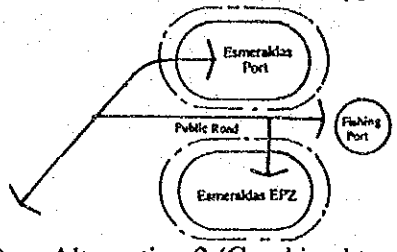
(3) Amusement facilities such as sport facility, park and shopping facility should better be planned in order to create an attractive atmosphere in the Esmeraldas EPZ, not only for workers but also for investors.

(4) Fire station is necessary to counteract any accident.

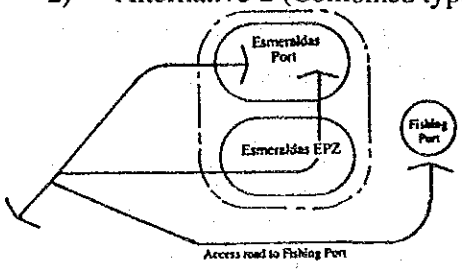
H.2.2 Land Use Alternatives

Two alternatives for the land use plan has been conceived through the Study as follows:

1) Alternative-1 (Separate type): Esmeraldas EPZ is completely detached from the Esmeraldas port. An access road to the fishing port passes between the EPZ and the port and separates both sites. The land use concept of the Alternative-1 is shown in Figure H-1.



2) Alternative-2 (Combined type): Esmeraldas EPZ is combined with the Esmeraldas port and the bonded area is continuous from the port to the EPZ. The access road to the fishing port should be relocated in this Alternative. The land use concept of the Alternative-2 is shown in Figure H-2.



The advantage and disadvantage of two alternatives have been compared in the following manner:

Alternative-1 (Separate Type)

- Advantage:
  - The relocation work of the access road to the fishing port is unnecessary.
- Disadvantage:
  - Since the Esmeraldas EPZ is separated from Esmeraldas port by the public road (access road to the fishing port), the freight between EPZ and the port should be transported by the bonded truck that makes the cargo handling procedure complicated.
  - Due to the relatively heavy traffic volume on the public road (access road to the fishing port), traffic congestion at the entrance of EPZ opened to that road will be caused. A traffic jam and traffic accident will be troublesome.

Alternative-2 (Combined Type)

- Advantage:

  - Since EPZ and Esmeraldas port form a continuous bonded area, the freight could be transferred from the port to EPZ without any intermediate transaction (could be transferred by the power lifter).

  - Traffic confusion on the access road to the fishing port will not be caused.

  - An integrated land use including EPZ and the port could be possible. A part of EPZ site could be temporarily used as a container yard when the port area is congested.

- Disadvantage:

  - The relocation work of the existing access road to the fishing port is necessary. (The length of relocation work is 800 m.)

Through the comparison of advantage and disadvantage of two alternatives as noted above, the combined type (Alternative-2) has been selected as the land use plan recommendable for the Esmeraldas EPZ.

H.2.3 Land Use Plan

The detailed land use plan for the Alternative-2 (Combined Type) has been developed and designed as shown in Figure H-3.

(1) The main road of 16 m in width has been designed to serve factory lots and relevant facilities and to connect EPZ direct to the Esmeraldas port. Likewise, the subroad of 12 m in width has been designed for the access to small factory lots. Further, a short boulevard of 20 m in width is planned at the entrance of the Esmeraldas EPZ.

(2) Various utilities such as water supply facilities, sewage treatment system, electric facilities, etc. have been designed to be fully equipped in the Esmeraldas EPZ.

(3) Administrative facilities, service facilities and such amenities as sport facility have been planned and located adjacent to the entrance of the Esmeraldas EPZ.

(4) The entire area of the Esmeraldas EPZ will be surrounded by the fence and the patrol road for safety control.

(5) The land use configuration of the Esmeraldas EPZ is summarized as shown hereunder. The detailed land use is presented in Table H-1.

Proposed Land Use Plan

Land Use	Area (ha)	(%)
1. Factory lot	16.7 (ha)	73.6 (%)
2. Road	3.9	17.2
3. Administrative facility	0.3	1.3
4. Service facility	0.4	1.8
5. Utility & park	1.4	6.1
6. Total	22.7	100.0

H.3 LOT DISTRIBUTION PLAN

H.3.1 Industrial Category Configuration

A list of the prospective investors to the Esmeraldas EPZ clarified through the investment demand survey presented through ANNEX B to ANNEX D is summarized in Table H-2. The high-probability investors who responded with a detailed investment plan through the interview survey have been selected as summarized hereunder.

High-probability investors

ISIC	Category	Number of Investors
311-312	Food	7
322	Apparel	11
351-352	Chemical (custom etc.)	10
331-332	Wood, Furniture	5
381, 383	Other	8
	Total	41

Although the food and chemical industries demonstrated a stronger interest in the Esmeraldas EPZ through the interview survey, it appears to be less probable that the possibility of investment by these industries is so high as shown in the investment demand survey, in view of the fact that smaller activities of the food and chemical industries are observed in the existing EPZs in other countries and that the water contamination to be caused by these industries will be highly possible.

On the other hand, apparel industries which are more popular in the existing EPZs in other countries will be more expectable than demonstrated through the questionnaire and interview survey. Consequently, following configuration of the industrial category in the Esmeraldas EPZ will be assumed in this Study:

Category		Number of High-probability Investor				Assumed Configuration	
ISIC	Category	Ecuadorian Investor	Foreign Investor	Total	Ratio (%)	Ratio (%)	Number of investor
311-312	Food	7	-	7	17.0 →	15	4 ~ 5
322	Apparel	8	3	11	26.8 →	40	12 ~ 13
351-352	Chemical	10	-	10	24.5 →	15	4 ~ 5
331-332	Wood & Furniture	4	1	5	12.2 →	15	4 ~ 5
381, 383	Others/1	7	1	8	19.5 →	15	4 ~ 5
Total		36	5	41	100.0	100.0	30/2

Remarks: /1 Metal, electrical machinery and transport equipment industry are inclusive.
/2 Thirty (30) lots will be designed by the land use plan.

H.3.2 Lot Size Distribution

The requirements for the lot size indicated by high-probability investors are summarized hereunder.

Demand of High-Probability Investor

(Unit: Investors)

Lot size		Food	Apparel	Chemical	Wood/Furniture	Other/2	Total
Large	2~3ha	2	1	-	-	-	3
	1~2	1	2 (2)/1	-	1	-	4 (2)
Medium	0.2~1	2	3 (1)	5	3 (1)	4 (1)	17 (3)
Small	~0.2	2	5	5	1	4	17
Total		7	11 (3)	10	5 (1)	8 (1)	41 (5)

Remarks: /1 Figures in ( ) represents the number of foreign investors.
/2 Metal, electrical machinery and other industries are inclusive.

Investors who require large scale lots of more than 1.0 hectare are food industries (fish canning and animal feed industry), apparel industries (underwear and sleep wear) and wood industries.

For planning purposes, the Esmeraldas EPZ will be distributed into thirty (30) lots. Through analysis on the results of interview survey with the high-probability investors, it appears reasonable to expect that two apparel industries, two food industries and a wood industry (5 industries in total) would occupy large size lots of more than 1.0 hectare. The distribution of the medium to small size lots has also been planned by referring to the results of interview survey with the potential investors. As a result, the Esmeraldas EPZ will be

distributed into 5 large size lots (more than 1 hectare), 13 medium size lots (0.5 - 0.7 hectare) and 12 small size lots (less than 0.2 hectare). The configuration of the proposed lot size allotment is summarized as shown hereunder.

Lot Size Allotment

(Unit: Investors)

Lot size		Food	Apparel	Chemical	Wood/Furniture	Other/2	Total
Large	2~3ha	1		-	-	-	1
	1~2	1	2 (2)/1	-	1	-	4 (2)
Medium	0.2~1	1	4 (1)	3	2 (1)	3 (1)	13 (3)
Small	~0.2	2	7	1	1	1	12
Total		5	13 (3)	4	4	4	30 (5)

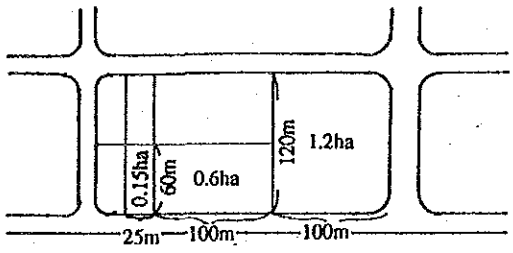
Remarks: /1 Figures in ( ) represents foreign investors.
/2 Metal, electrical machinery and other industries are inclusive.

The lot area by industrial categories, as well as the number of employee by lot size, is shown in more detail in Table H-3 and H-4.

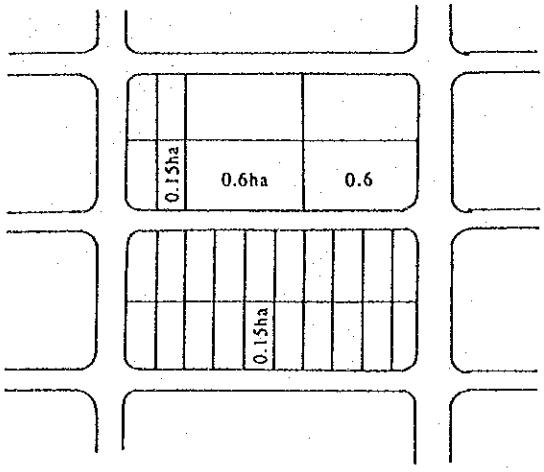
H.3.3 Design of Lot Shape

Four (4) types of the lot shape have been designed in the light of the demand of investors, examples of the existing EPZ and the design example of the existing industrial parks constructed by CENDES, as follows:

Type	Requirement by Investor	Designed Lot Size & Shape	
1. Large lot	2 ~ 3 (ha)	2.4 (ha)	-
2. - dit --	1 ~ 2	1.2	100^m x 120^m
3. Medium lot	0.2~1	0.6	60^m x 100^m or 50^m x 120^m
4. Small lot	~0.2	0.15	25^m x 60^m



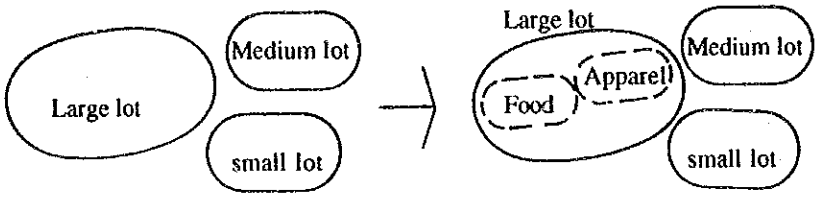
The lot types are designed so as to easily converted it into another lot type, in order to meet the requirement of the investors. For instance, a 1.2 hectare lot and 0.6 hectare lot could be divided into two 0.6 hectare lots and four 0.15 hectare lots respectively as follows:



The design of standard factory building, car parking and the other relevant facilities in the factory lot will be studied in section H.5 hereinafter.

H.3.4 Lot Distribution

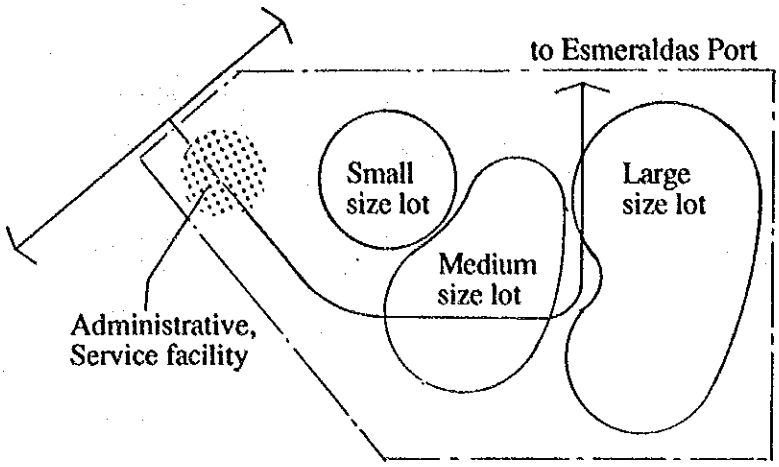
Theoretically the distribution of factory lots is planned in accordance with the grouping of lot size and the grouping of industrial type as demonstrated hereunder. In general, the distribution by lot size grouping is the first step and the distribution by industrial type grouping will follow.



(I. Distribution by lot size group) (II. Distribution by industrial type group)

It is noted, however, that the distribution by grouping of industrial type is not possible in this Study, because the area of the Esmeraldas EPZ is small and the number of lot is too small to enable distribution work. The distribution by grouping of lot size is therefore solely conducted in this Study.

The small lots will be distributed in the area adjacent to the administrative and service facilities, in view of the fact that various administrative help would be necessary for the small investors. On the other hand, the large lots are distributed near the entrance of Esmeraldas port in order to make the large freight handling easy between the port and the factory.



H.4 ROAD PLAN

H.4.1 Traffic Volume Forecast

Three traffic to and from the Esmeraldas EPZ will be considered as follows:

- Cargo traffic: Import raw materials and export products to and from EPZ will be transported by heavy trucks.
- Commuter traffic: Public bus, private bus and passenger car will be utilized for commuter traffic of employee and labors.
- Business traffic: Passenger car will be dominant for the business traffic to and from EPZ.

1) Cargo traffic:

Cargo volume generated through the Esmeraldas EPZ is estimated to be 560 tons/day by applying a multiplier of the lot area and the unit generation volume, as shown in Table H-5. The average load capacity (4 tons/truck) and the load efficiency (60%) are assumed in the estimate.

Cargo traffic (in and out total)
= Cargo volume (ton/day) / Average load capacity (ton/truck) / Load efficiency
= 560 / 4.0 / 0.6
= 230 (trucks/day)

2) Commuter traffic:

It is assumed that ninety (90) percents of employee and labors will commute by bus services and private car, and that ten (10) percents will commute on foot.

- Bus traffic = No. of employee x 0.9 / Bus capacity x 2 (in and out)
  = (2,450 + 130) x 0.9 / 30 x 2
  = 160 (Buses/day)

- Passenger car traffic = No. of factory x 8 (cars/factory) x 2 (in and out)
  = 30 x 8 x 2
  = 480 (cars/day)

Bus capacity of 30 persons is an average of public bus and private factory bus. On the other hand, the unit generation of the passenger car (8 cars/factory) is calculated as follows:

- Number of white color employee:
  10% of employee = 0.1 x (2,450+130) = 260 persons

- Average unit generation of private car:
  260 persons / 30 factory / 1.1 persons/car = 8 cars/factory

3) Business traffic:

Business traffic (in and out)
= Number of employee x unit generation x 2 (in and out)
= (2,450+130) x 0.045 x 2
= 230 (cars/day)

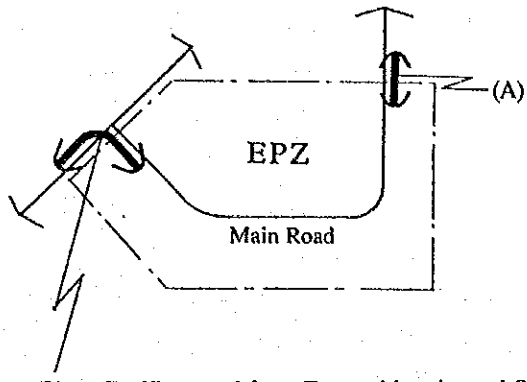
The passenger car will be dominant for the business traffic.

4) Total traffic:

Total traffic of cargo, commuter and business traffic is forecasted to be 1,100 cars/day.

5) Traffic volume by direction:

The traffic by direction is estimated on the assumption that the two thirds of the cargo traffic and the business traffic would utilize the main road to the port, and one third would utilize the main gate to and from Esmeraldas city.



(A) Traffic to and from the port
- Cargo traffic: 150 trucks/day
- Business traffic: 150 passenger cars/day
- Total: 300 cars/day

(B) Traffic to and from Esmeraldas city and Quito through the gate.
- Cargo traffic: 80 trucks/day
- Commuter traffic: 160 buses/day
  480 passenger cars/day
- Business traffic: 80 passenger cars/day
- Total: 800 cars/day

6) Deign traffic volume:

The road pavement thickness is calculated on the basis of the traffic volume of heavy vehicles per day per one direction given by the following formula:

Traffic of heavy vehicles per day per one direction
= (Truck traffic + bus traffic + Passenger traffic/1.75) / 2

Note: Conversion factor of passenger car to heavy vehicle: 1.75

Therefore, the traffic of heavy vehicles by one direction is calculated as follows:

(A) Traffic to and from the port = (150 + 150 / 1.75) / 2 = 120 cars/day

(B) Traffic to and from Esmeraldas city and Quito
= [80 + 160 + (480 + 80) / 1.75] / 2 = 280 cars/day

H.4.2 Road Design

1) Standard section:

Six (6) types of roads have been planned in this study, as follows:

(1) Boulevard: Although the traffic is not heavy, four (4)-lane road with the pedestrian on both sides will be constructed in the entrance area for the length of 150 m from the gate, where the

administrative and service facilities are concentrated, in view of the control of traffic flow in and out of various facilities. The width of the boulevard will be 20 m.

(2) Main road: Main road which passes through the EPZ from the gate to the port will be 16 m in width (2 lanes), with wide pedestrian deck on both sides. This is the main service road to factory lots, particularly to large size lots.

(3) Sub road: Sub road is the access road to small size factory lots. The road width is 12 m (2 lanes) with pedestrian deck on both sides.

(4) Patrol road: 4 m width road will be designed for patrol activity around the EPZ. The existing access road to the fishing port between EPZ and Esmeraldas port will be utilized as the patrol road after the completion of the new access road.

(5) The access road to the fishing port: The same standard as the existing road will be designed at the west and south edge of EPZ. The road width is 7 m (2 lanes) with one side pedestrian deck.

(6) Pedestrian deck: The exclusive pedestrian way connecting the factory lots and the entrance area will be designed to be 6 m in width.

The standard section of each road is shown in Figure H-4.

2) Design standard

The design standard to be applied for the boulevard, the main road and the subroad is planned as follows:

- Design speed: 30 km/hour
- Minimum radius: 30 m
- Minimum corner curve: 12 m (minimum turning radius of heavy truck)

- Pavement thickness: Considering that EPZ site has been constructed by the filling of dredged soil, CBR is assumed to be 4~6. The pavement thickness is designed in the light of the traffic volume and CBR.

• Boulevard and main road	50 cm
• Sub road	35 cm
• Patrol road	35 cm
• Access road to the fishing port	35 cm
• Pedestrian deck	15 cm
	(Sub course 5 cm and brick pavement 10 cm)

H.5 PLAN OF OTHER FACILITIES

H.5.1 General

The various functions will be required by investors in the EPZ. In view of the facilities equipped in other existing EPZs, facilities to be introduced in the Esmeraldas EPZ have been selected as shown in table below.

Facilities in Existing EPZ

Country	EPZ Facility										
	Standard factory	Customs	Bank	Post office	Child care center	Security	Health service	Cafeteria	Sports facility	Housing	Recruitment
1.Colombia	X	-	X	-	-	X	X	X	-	-	X
2.Costa Rica	X	X	X	X	X	X	X	X	X	-	X
3.Rep.Dominica	X	X	X/1	-	-	X/1	X/1	X/1	X/1	X/1	X/1
4.Mexico (Maquiladora)	-	-	-	X	-	X	X	X	X	X	X
Ecuador (EEPZ)	X	X/2	X	X	-	X	X	X	X	-	X

Remarks: /1 Available in some EPZ.
/2 A custom located next to EEPZ is available.

Source: "Study of Industrial Free Zone in the Andean Countries and in Costa Rica, Mexico and Dominican Republic, the Andean Development Corporation, Oct. 1989"
"Consejo Promotor de Inversiones de la Republica Dominicana, January, 1991"
"Centro Para la Promocion de las Exportaciones y de las Inversiones, San Jose, Costa Rica, April 1991"
"Secretaria de Comercio y Fomento Industrial, data provided by Director of Regional Development and Maquila Industry, May 2, 1991 from several Mexican official sources, data as of 1990 for the "maquiladoras" at the US-Mexico border.

Figure H-5 illustrates an integrated layout plan of the building and facility proposed in the Esmeraldas EPZ.

Since the existing custom office located next to the Esmeraldas EPZ site will work effectively for the custom's formalities, a new custom in the EPZ will not be necessary for installation.

H.5.2 Standard Factory

The pre-built factory, so called the standard factory for rental use, has been planned in view of the demand by the investors which has been clarified through the investment demand survey. More than half of prospective investors responded that they require standard factory which would allow investors not only to quickly start the production work but to save the initial investment cost.

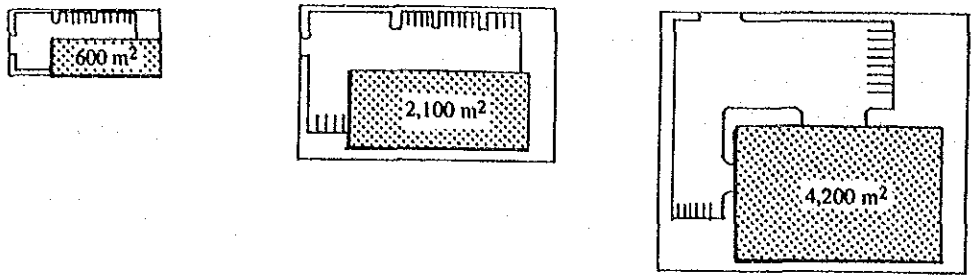
One third of the factory lots will be planned to be ultimately equipped with the standard factory in order to save the investment cost. Consequently, ten (10) lots of factory land will be equipped with the standard factory as shown in Figure H-5.

No	Lot No./1	Category	Lot Area (m^2)	Floor Area of Standard Factory (m^2)
1.	S-1	Food	2,100	750 /2
2.	S-3	Apparel	1,900	750
3.	S-5	Apparel	1,800	750
4.	S-7	Apparel	1,700	750
5.	S-9	Electric device	1,500	600
6.	M-2	Apparel	6,000	2,100
7.	M-3	Sport wear (USA)	6,000	2,100
8.	M-11	Rattan furniture (Mexico)	6,500	2,100
9.	L-1	Underwear (USA)	12,000	4,200
10.	L-2	Sleep wear (USA)	12,000	4,200
Total			51,500	18,300

Remarks: /1 S-small lot, M-medium lot, L-large lot (The location is shown in Table H-3).
/2 Building coverage is 40 % for small lot and 35 % for medium and large lot.

The standard factory will be designed to incorporate the factory building, cargo handling space and parking lot. The typical site plan is presented hereunder, in accordance with three types of lot size.

Small lot (1,500 m^2) Medium lot(6,000 m^2) Large lot(12,000m^2)



The factory building is designed as one storey in order to minimize the construction cost and to prevent the differential subsidence of the structure. One long side building wall is designed for common use with the next building in the small lot. The cost is minimized and land use efficiency is maximized by common wall method. This common wall will be easily removed and the factory floor becomes double if the investor requires more spaces.

The plan of factory building, as well as the section and elevation, are presented in Figure H-6 to Figure H-8.

H.5.3 Administrative Facilities

The office of ZOFREE, conference rooms to be utilized for meeting and events by investors in the Esmeraldas EPZ, as well as the fire station and other facilities are designed as the administrative facility of the Esmeraldas EPZ. They will be distributed next to the gate. The total floor area is 650 m^2. Figure H-9 presents the site plan and elevation of the administration building.

Administrative Facilities

		Floor Area (m^2)	Site Area (m^2)
I.	Administration building		
	1. ZOFREE office	245	
	2. Conference room A	40	
	3. Conference room B	20	
	4. Post office	30	
	5. Public space	165	
	Subtotal	500	2,250
II.	Fire station	150	750
III.	Total	650	3,000

H.5.4 Service Facilities

The service facility is distributed on the west side of the gate. Service building, as well as a gas station and the bus terminal, will be integratedly designed within the floor area of 800 m². Figure H-10 presents the site plan and the elevation of the service building.

The bus terminal is equipped with the bus stop, waiting platform, bus turning area and parking lot.

Service Facilities

	Floor Area (m²)	Site Area (m²)
I. Service building		
1. Lunch service center	150	
2. Kiosk	30	
3. Restaurant	90	
4. Clinic	90	
5. Tenant (Bank, etc.)	150	(5 tenants x 30m²)
6. Public space	170	
Subtotal	680	2,500
II. Gasoline station	120	500
III Bus terminal	-	1,000
IV. Total	800	4,000

H.5.5 Other Facilities

1) Park and sports facilities are desirable as amenity of EPZ. More than 3 % of EPZ area will be planned for this purpose. Area of 4,000 m² and 6,000 m², 4.3 % of EPZ area in total, will be allocated for the park and sports park, in which two tennis courts, a volleyball court and a multi purpose field will be constructed.

   If the demand for factory lots grows stronger in the future, the park of 4,000 m² could be converted into the factory lot. However, 6,000 m² of the sports park will be permanently reserved as the park.

2) The entrance gate and the fence surrounding the Esmeraldas EPZ site will be constructed for the safety and administrative control.

Table H-1 LAND USE CONFIGURATION

	Item	Area (ha)	Ratio (%)	Remarks
I.	Factory lot	(16.70)	73.6	
	1. Small size lot	1.97		
	2. Medium size lot	6.43		
	3. Large size lot	8.03		
II.	Road	(3.91)	17.2	
	1. Boulevard	0.26		
	2. Main road	1.50		
	3. Sub road	0.50		
	4. Pedestrian deck	0.11		
	5. Patrol road	0.99		Inclusive of existing access road to the fishing port (0.33ha)
	6. Access road to the fishing port	0.55		
III.	Administrative facility	(0.30)	1.3	Administration build. and fire station
IV.	Service facility	(0.40)	1.8	Service build., gas station (0.05 ha) and bus terminal (0.1 ha)
V.	Park	(1.00)	4.3	
	1. Sports park	0.60		
	2. Park	0.40		
VI.	Utility	(0.40)	1.8	
	1. Electric sub-station	0.20		
	2. Sewage treatment plant	0.10		
	3. Water supply tank	0.10		
VII.	Total	22.71	100.0	

Table H-2 LIKELY INVESTORS (RESULT OF INTERVIEW SURVEY)

	No	ISIC	Category	Lot size (ha)	Employee	Rental Factory	Remarks
(Food)	1	3114	Canned food	2.4	60	-	*
	2	3121	Fried potato	0.15	15	X	*
	3	3121	Sea food	0.15	15	X	*
	4	3121	Shark's wing	0.6	15	X	
	5	3122	Animal feed	1.2	60	-	
	6	3113	Canned fruit	n.a	15	X	
	7	3113	Canned fruit	0.6	15	n.a	*
	8	3114	Canned shrimp	2.4	60	-	
	9	3121	Banana flour	n.a	300	-	
	10	3112	Cream, sirup	n.a	n.a	-	
	11	3122	Animal feed	n.a	n.a	n.a	
(Apparel)	1	322	Apparel	0.6	60	X	
	2	322	Blanket, etc.	0.15	15	X	
	3	322	Apparel	0.6	60	X	
	4	3219	Labels	0.15	60	X	*
	5	3219	Labels	0.15	60	X	
	6	322	Undershirt	2.4	60	-	
	7	322	Sport wear	n.a	15	X	
	8	321	Textile	n.a	300	X	
	9	322	Sport shirt	n.a	n.a	n.a	
	10	3219	Labels	n.a	15	-	
	11	322	Apparel	0.15	60	X	
	12	321	Textile	0.15	15	X	
	13	322	Panama hat	n.a	15	-	
	14	322	Sport wear	0.6	150	X	(USA)
	15	322	Under wear	1.2	300	X	(USA)
	16	322	Sleep wear	1.2	300	X	(USA)
(Chemical)	1	3523	Cosmetics	0.15	15	-	
	2	356	Plastic film	0.6	15	-	*
	3	3523	Detergent	0.6	15	-	
	4	356	Plastics	0.15	15	-	
	5	356	Plastics	n.a	60	-	
	6	3523	Soap, cream	0.15	15	X	
	7	356	Plastic bottle	n.a	4	X	
	8	356	Plastic shoes	0.15	300	X	
	9	356	Plastics	0.15	300	-	
	10	356	Film	0.6	15	X	
	11	3529	Tooth paste	n.a	4	X	
	12	356	Plastic shoes	0.6	300	X	
	13	3523	Cologne water	0.6	15	-	
(Wood, furniture)	1	3311	Balsa wood	1.2	15	X	
	2	3311	Wood mills	0.6	15	X	
	3	332	Furniture	0.15	300	n.a	
	4	332	Aluminum window	0.6	60	X	
	5	332	Rattan furniture	0.6	150	X	(Mexico)
(Metal)	1	3812	Water taps	0.6	60	-	
	2	3819	Metal coating	0.15	15	-	
	3	3819	Nickel coating	0.15	15	n.a	
(Electric Device)	1	3833	Lamp	0.15	15	X	
	2	3831	Control device	0.6	60	-	*
	3	3833	Wire harnesses	0.5	100	-	(USA)
(Others)	1	324	Leather	n.a	n.a	n.a	
	2		Banana trader	n.a	300	X	
	3		Car repairing	0.6	15	-	
	4		Developer	0.15	4	X	

Remark: * Ecuador and foreign enterprise joint venture

Table H-3 LOT AREA AND NUMBER OF EMPLOYEES BY LOT SIZE

	Lot No.	Industrial Category	Lot Area (m2)	No. of Employee	Rental Factory	Remarks
	S-1	Food(Sea food)	2,100	15	X	*
	S-2	Food(Canned food)	1,500	15	-	*
	S-3	Apparel(Label)	1,900	50	X	*
(Small	S-4	Furniture	1,500	15	-	
Size	S-5	Apparel(Blanket)	1,800	50	X	
Lot)	S-6	Apparel	1,500	40	-	
	S-7	Apparel	1,700	40	X	
	S-8	Apparel	1,500	40	-	
	S-9	Electric(Lamp)	1,500	15	X	
	S-10	Chemical(Cosmetic)	1,500	15	-	
	S-11	Apparel	1,600	40	-	
	S-12	Apparel	1,600	40	-	
		Sub total	19,700	365		
	M-1	Food	5,100	30	-	*
	M-2	Apparel	6,000	150	X	
	M-3	Apparel(Sport wear)	6,000	150	X	(USA)
	M-4	Apparel	6,000	150	-	
(Medium	M-5	Chemical(Plastic film)	6,000	60	-	*
Size	M-6	Chemical (Plastic shoes)	6,000	150	-	
Lot)	M-7	Chemical(Cosmetic)	5,400	50	-	
	M-8	Apparel	5,700	140	-	
	M-9	Electric control device	5,800	60	-	*
	M-10	Metal	5,800	60	-	
	M-11	Furniture(Rattan)	6,500	150	X	(Mexico)
	M-12	Wire harnesses	6,000	100	-	(USA)
	M-13	Wood mills	6,000	15	-	
		Sub total	76,300	1,265		
	L-1	Apparel(Underwear)	12,000	300	X	(USA)
(Large	L-2	Apparel(Sleep wear)	12,000	300	X	(USA)
Size	L-3	Animmal feed	12,000	60	-	
Lot)	L-4	Wood	13,000	60	-	
	L-5	Canned food	22,000	100	-	*
		Sub total	71,000	820		
Total			167,000	2,450	10 Lots	
Administrative & service Facility				130		
Grand total			167,000	2,580		

Remark: *Ecuador and foreign enterprise joint venture

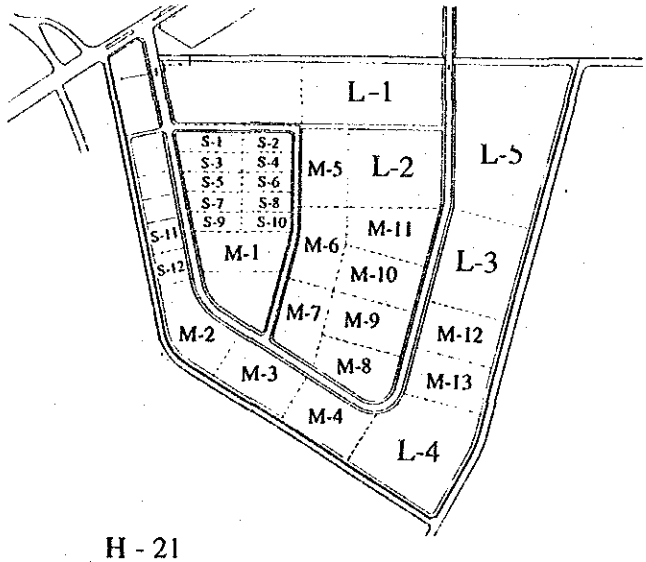


Table H-4 LOT SIZE AND NUMBER OF EMPLOYEES BY INDUSTRIAL CATEGORY

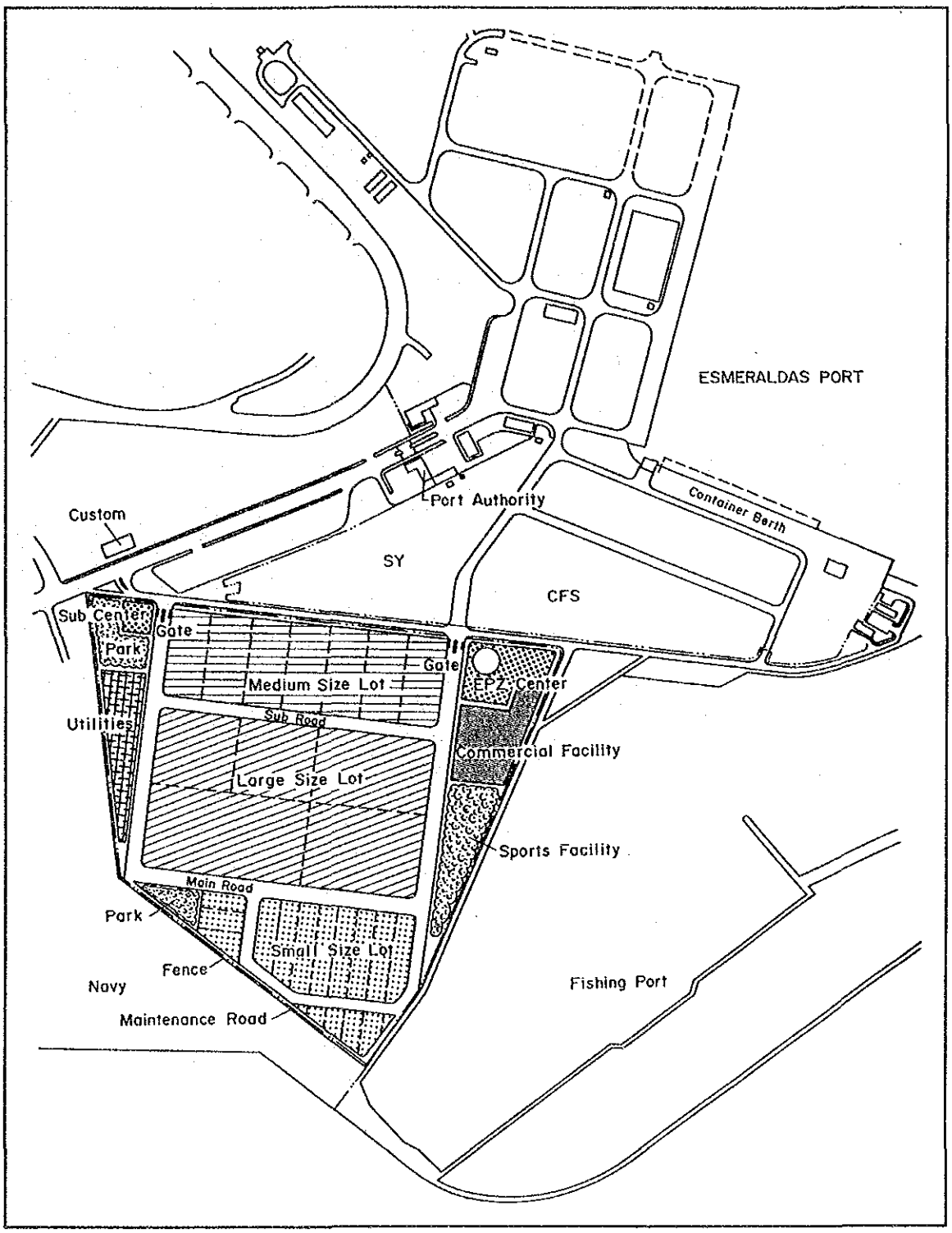
Lot No./1	Industrial Category	Lot Size (m2)	No. of Employee	Rental Factory	Remarks
(311-312 Food manufacturing))					
S-1	Food(Sea food)	2,100	15	X	*
S-2	Food(Canned food)	1,500	15	-	
M-1	Food	5,100	30	-	*
L-3	Animmal feed	12,000	60	-	
L-5	Canned food	22,000	100	-	*
	Sub total	42,700	220		
(322 Wearing apparel)					
S-3	Apparel(Label)	1,900	50	X	*
S-5	Apparel(Blanket)	1,800	40	X	
S-6	Apparel	1,500	40	-	
S-7	Apparel	1,700	40	X	
S-8	Apparel	1,500	40	-	
S-11	Apparel	1,600	40	-	
S-12	Apparel	1,600	40	-	
M-2	Apparel	6,000	150	X	
M-3	Apparel(Sport wear)	6,000	150	X	(USA)
M-4	Apparel	6,000	150	-	
M-8	Apparel	5,700	140	-	
L-1	Apparel(Underwear)	12,000	300	X	(USA)
L-2	Apparel(Sleep wear)	12,000	300	X	(USA)
	Sub total	59,300	1,480		
(331 Wood)					
M-13	Wood mill	6,000	15	-	
L-4	Wood	13,000	60	-	
	Sub total	19,000	75		
(332 Furniture)					
S-4	Furniture	1,500	15	-	
M-11	Furniture(Rattan)	6,500	150	X	(Mexico)
	Sub total	8,000	160		
(351~352 Chemicals)					
S-10	Chemical(Cosmetic)	1,500	15	-	
M-5	Chemical(Plastic film)	6,000	60	-	*
M-6	Chemical (Plastic shoes)	6,000	150	-	
M-7	Chemical(Cosmetic)	5,400	50	-	
	Sub total	18,900	275		
(381 Fabricated metal products)					
M-9	Electric control device	5,800	60	-	*
M-10	Metal	5,800	60	-	
	Sub total	11,600	120		
(383 Electrical machinery)					
S-9	Electric(Lamp)	1,500	15	X	
M-12	Wire harnesses	6,000	100	-	(USA)
Total		167,000	2,450	10 Lots	

Remark: /1 S- Small lot, M- Medium lot, L- Large lot
* Ecuador and foreign enterprise joint venture

Table H-5 FORACAST OF TRAFFIC VOLUME

Lot No.	Industrial Category	Lot Size (m2)	Unit Volume (Ton/m2/year) /2	Cargo Volume/1 (Ton/day)
(Small Size Lot)				
S-1	Food(Sea food)	2,100	1.49	15.6
S-2	Food(Canned food)	1,500	1.49	11.2
S-3	Apparel(Label)	1,900	0.16	1.5
S-4	Furniture	1,500	0.50	3.8
S-5	Apparel(Blanket)	1,800	0.16	1.4
S-6	Apparel	1,500	0.16	1.2
S-7	Apparel	1,700	0.16	1.4
S-8	Apparel	1,500	0.16	1.2
S-9	Electric(Lamp)	1,500	0.28	2.1
S-10	Chemical(Cosmetic)	1,500	0.26	2.0
S-11	Apparel	1,600	0.16	1.3
S-12	Apparel	1,600	0.16	1.3
(Medium Size Lot)				
M-1	Food	5,100	1.49	38.0
M-2	Apparel	6,000	0.16	4.8
M-3	Apparel(Sport wear)	6,000	0.16	4.8
M-4	Apparel	6,000	0.16	4.8
M-5	Chemical(Plastic film)	6,000	1.18	35.4
M-6	Chemical (Plastic shoes)	6,000	1.18	35.4
M-7	Chemical(Cosmetic)	5,400	0.26	7.0
M-8	Apparel	5,700	0.16	4.6
M-9	Electric control device	5,800	0.67	19.4
M-10	Metal	5,800	0.67	19.4
M-11	Furniture(Rattan)	6,500	0.50	16.3
M-12	Wire harnesses	6,000	0.28	8.4
M-13	Wood mill	6,000	0.50	15.0
(Large Size Lot)				
L-1	Apparel(Underwear)	12,000	0.16	9.6
L-2	Apparel(Sleep wear)	12,000	0.16	9.6
L-3	Animmal feed	12,000	1.49	89.4
L-4	Wood	13,000	0.50	32.5
L-5	Canned food	22,000	1.49	163.9
Total		167,000	-	557.5

Remarks: /1 Cargo volume(ton/day)
=unit size(m2)xunit volume(ton/m2/year)/200(day) : in and out total.
/2 "Design Standard of Primary Industrial Estate(Draft), Regional Development Center of Japan"

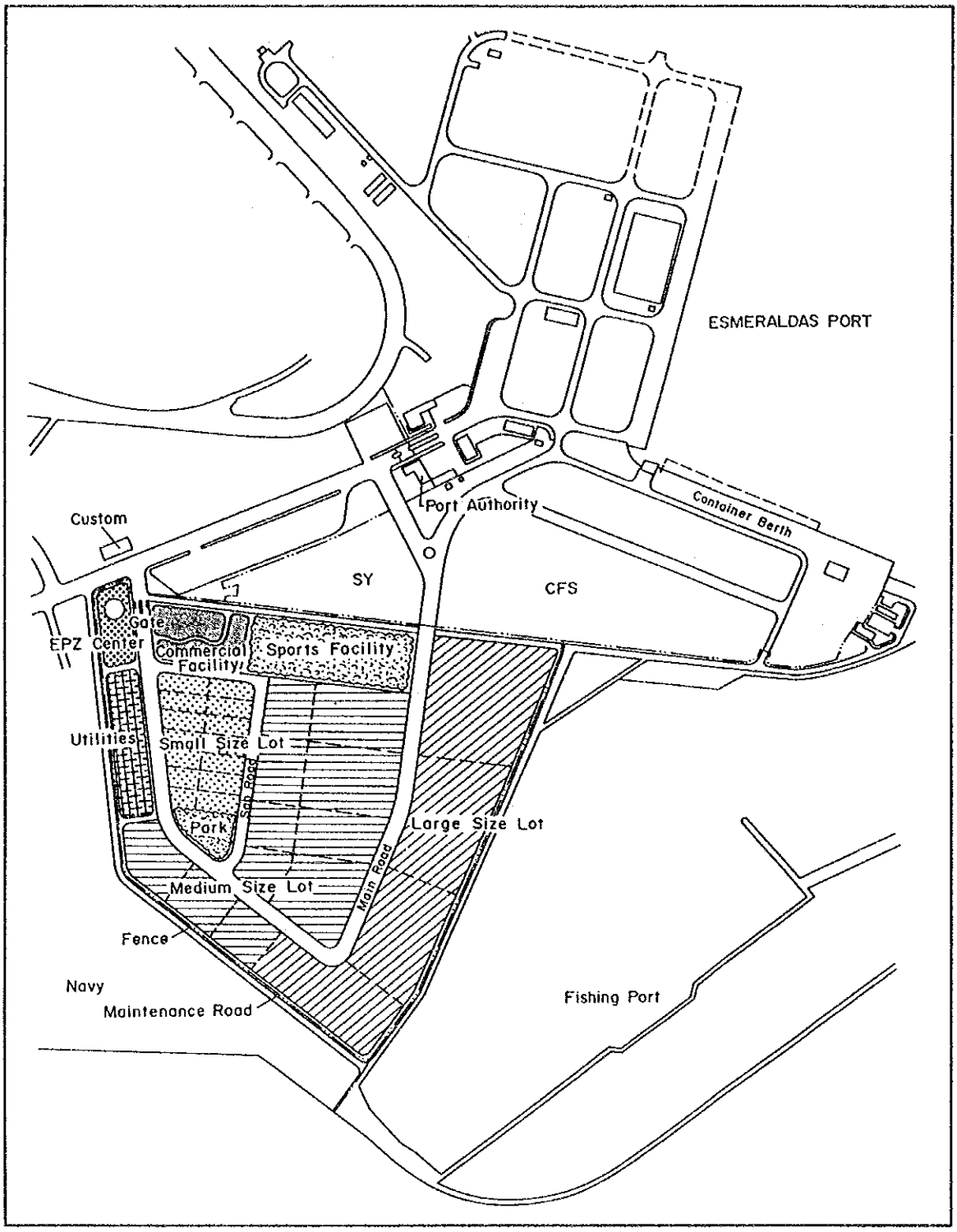


ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT

Fig. H-1

Land Use Alternative-1

JAPAN INTERNATIONAL COOPERATION AGENCY

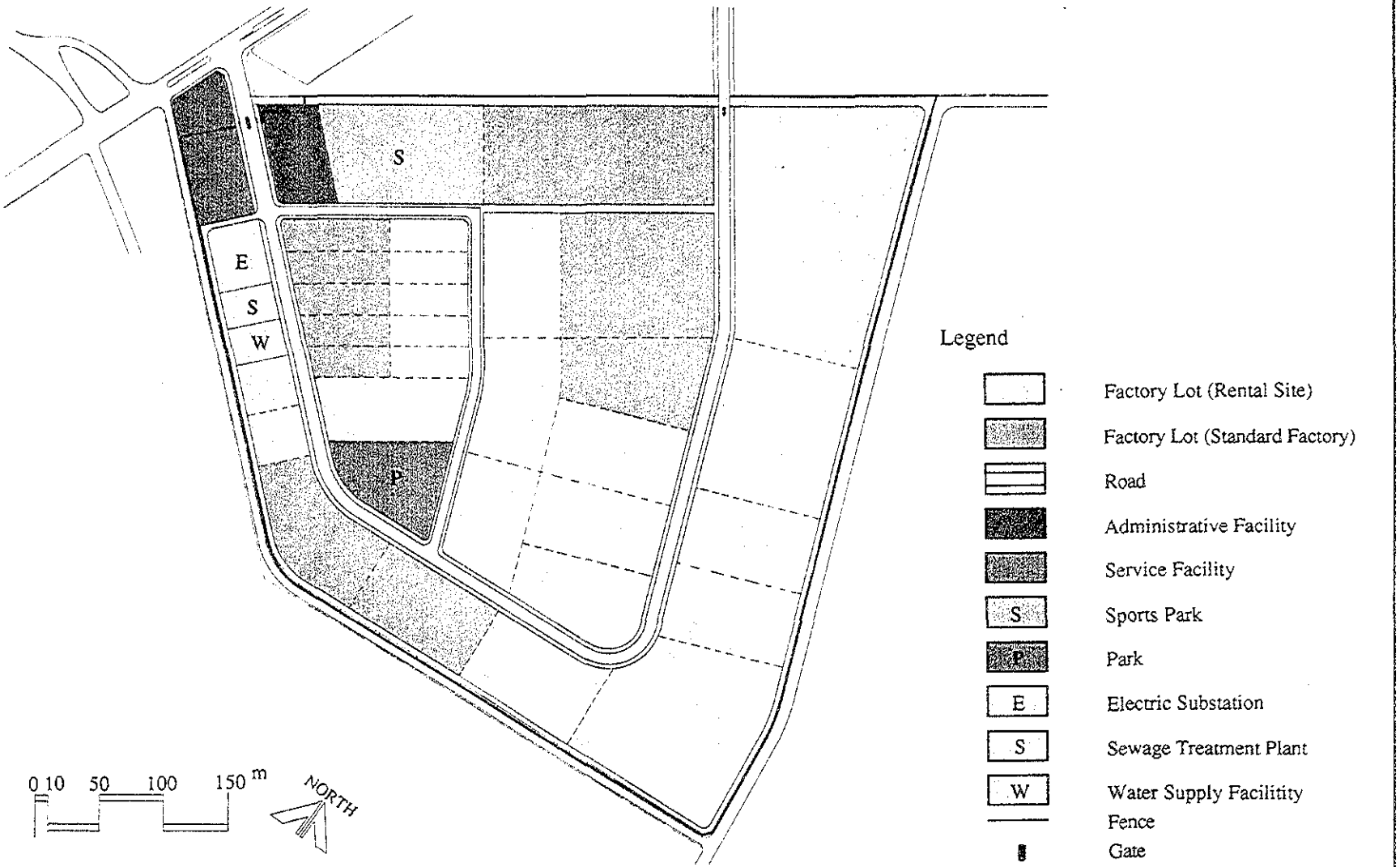


ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT

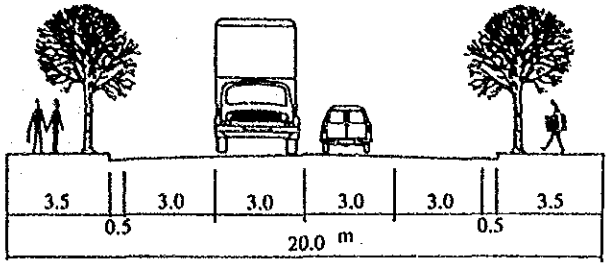
Fig. H-2

Land Use Alternative-2

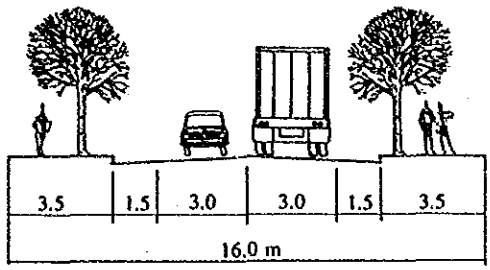
JAPAN INTERNATIONAL COOPERATION AGENCY



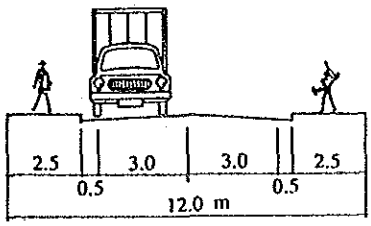
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. H – 3 Land Use Plan



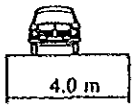
Boulevard



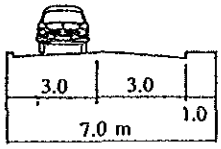
Main Road



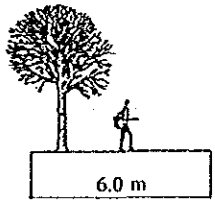
Sub Road



Patrol Road

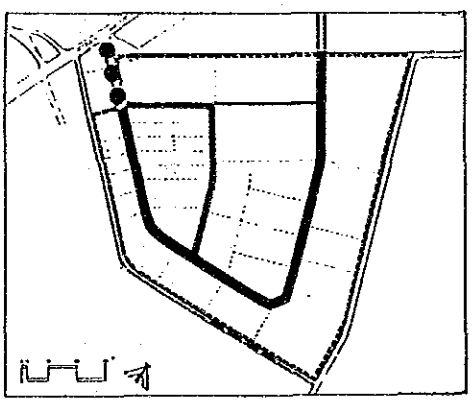


Access Road to Fishery Port



Pedestrian Deck

Boulevard
Main Road
Sub Road
Patrol Road
Access Road to Fishery Port
Pedestrian Deck

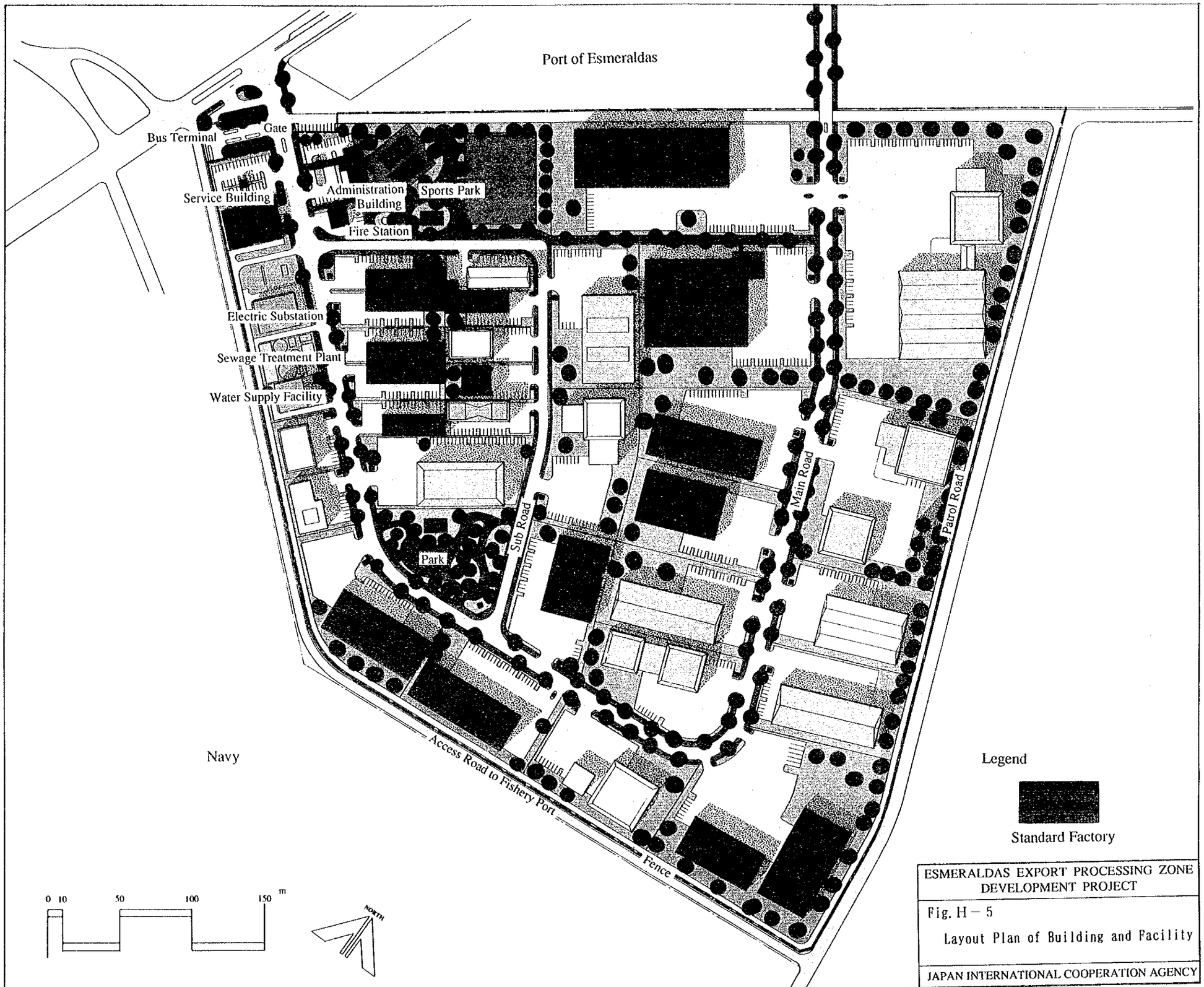


ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT

Fig. H-4

Standard Section of Road

JAPAN INTERNATIONAL COOPERATION AGENCY

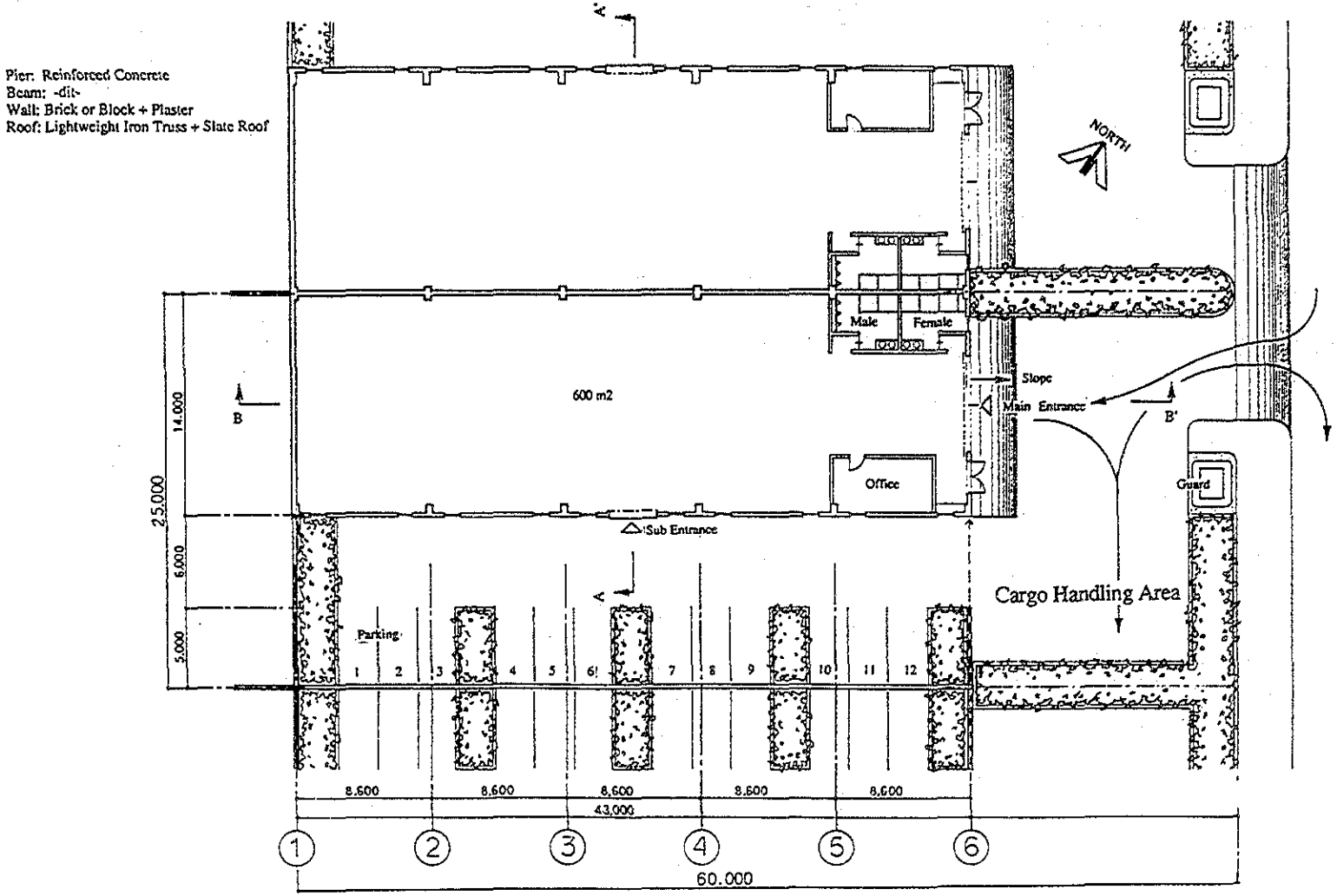


ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT

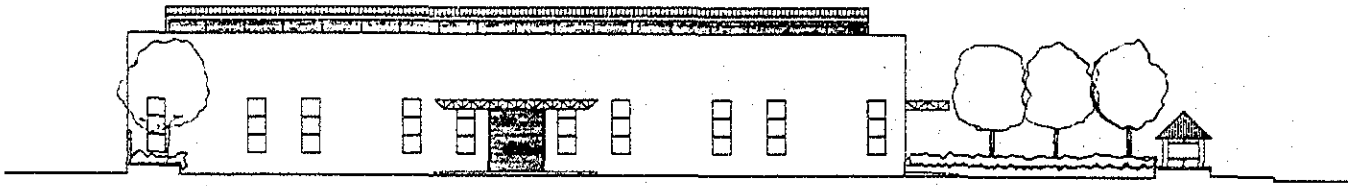
Fig. H – 5

Layout Plan of Building and Facility

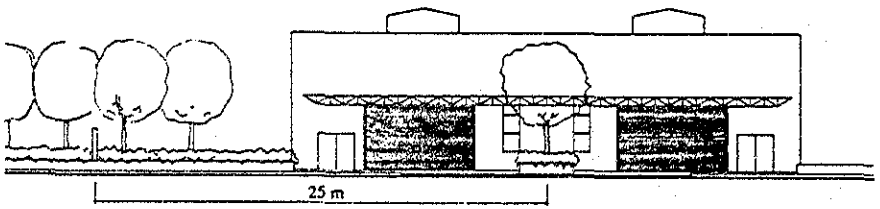
JAPAN INTERNATIONAL COOPERATION AGENCY



JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. H-6 Plan of Standard Factory

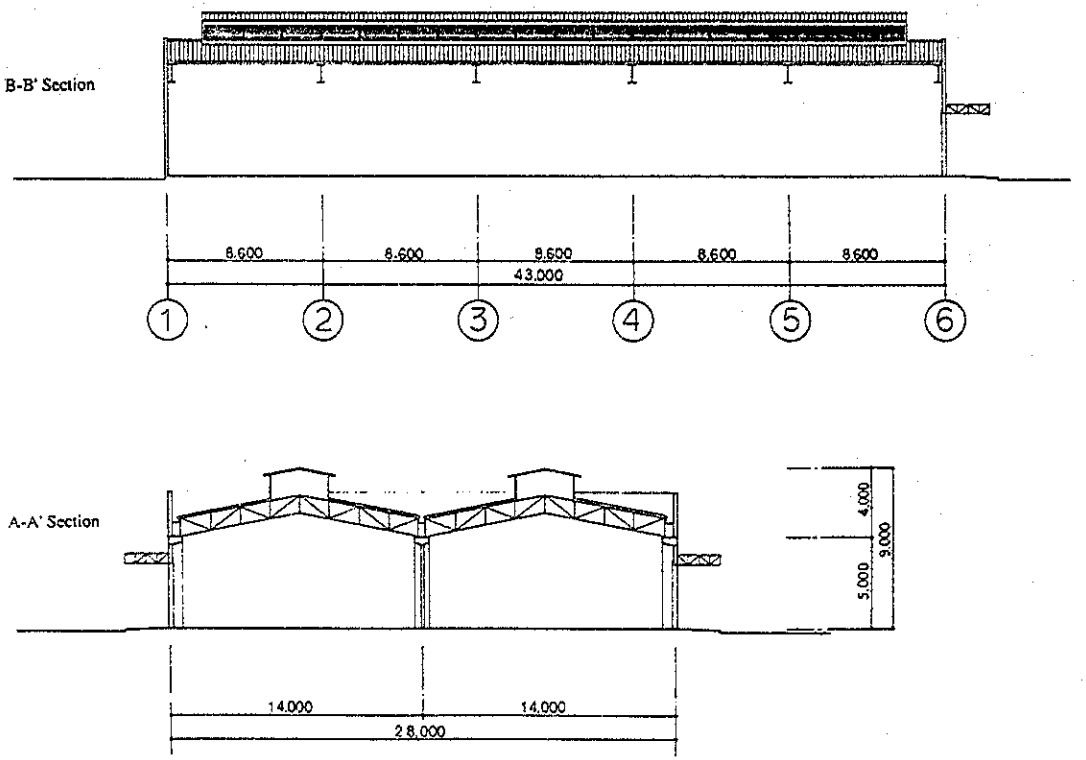


South Side Elevation

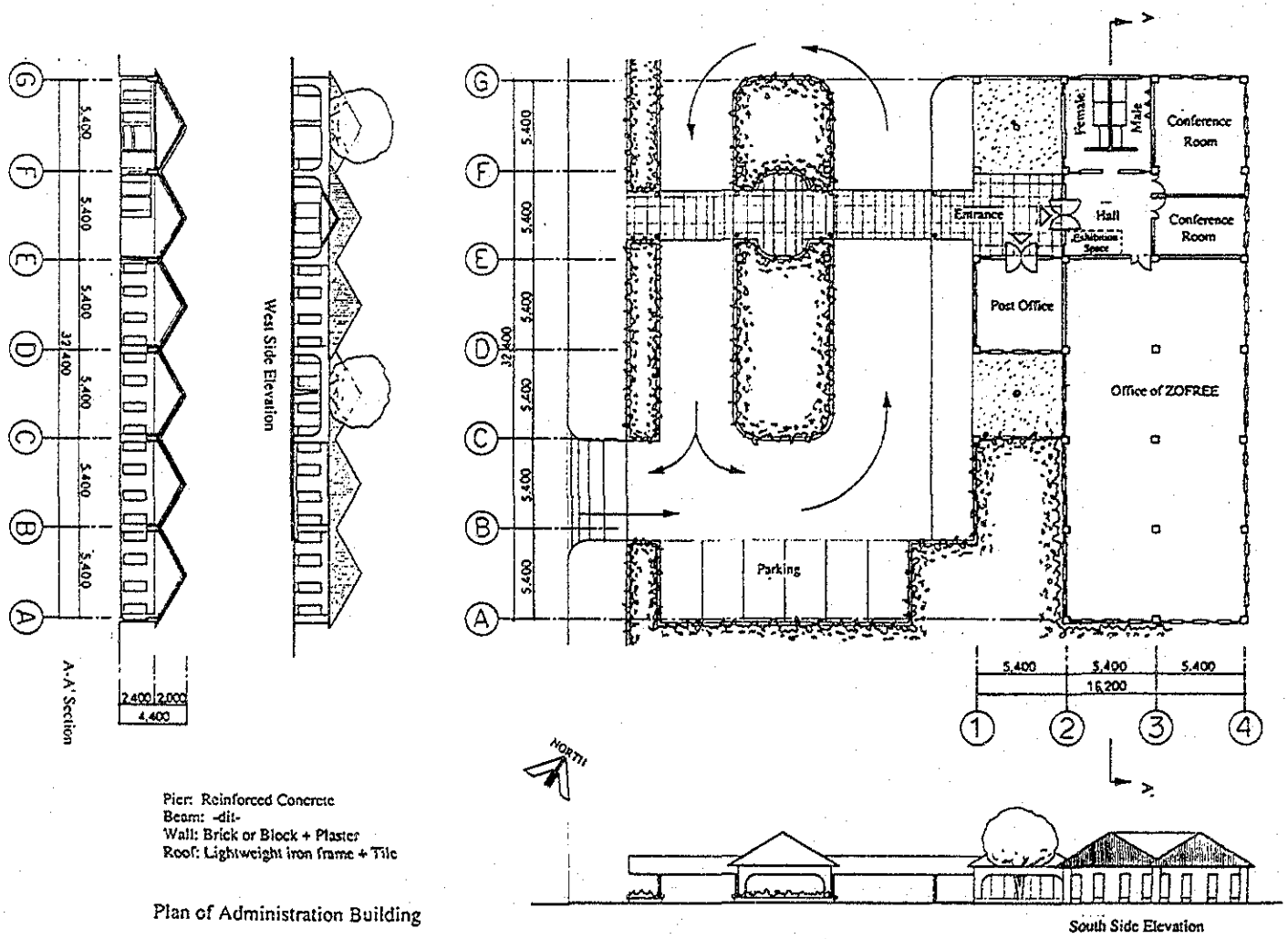


East Side Elevation

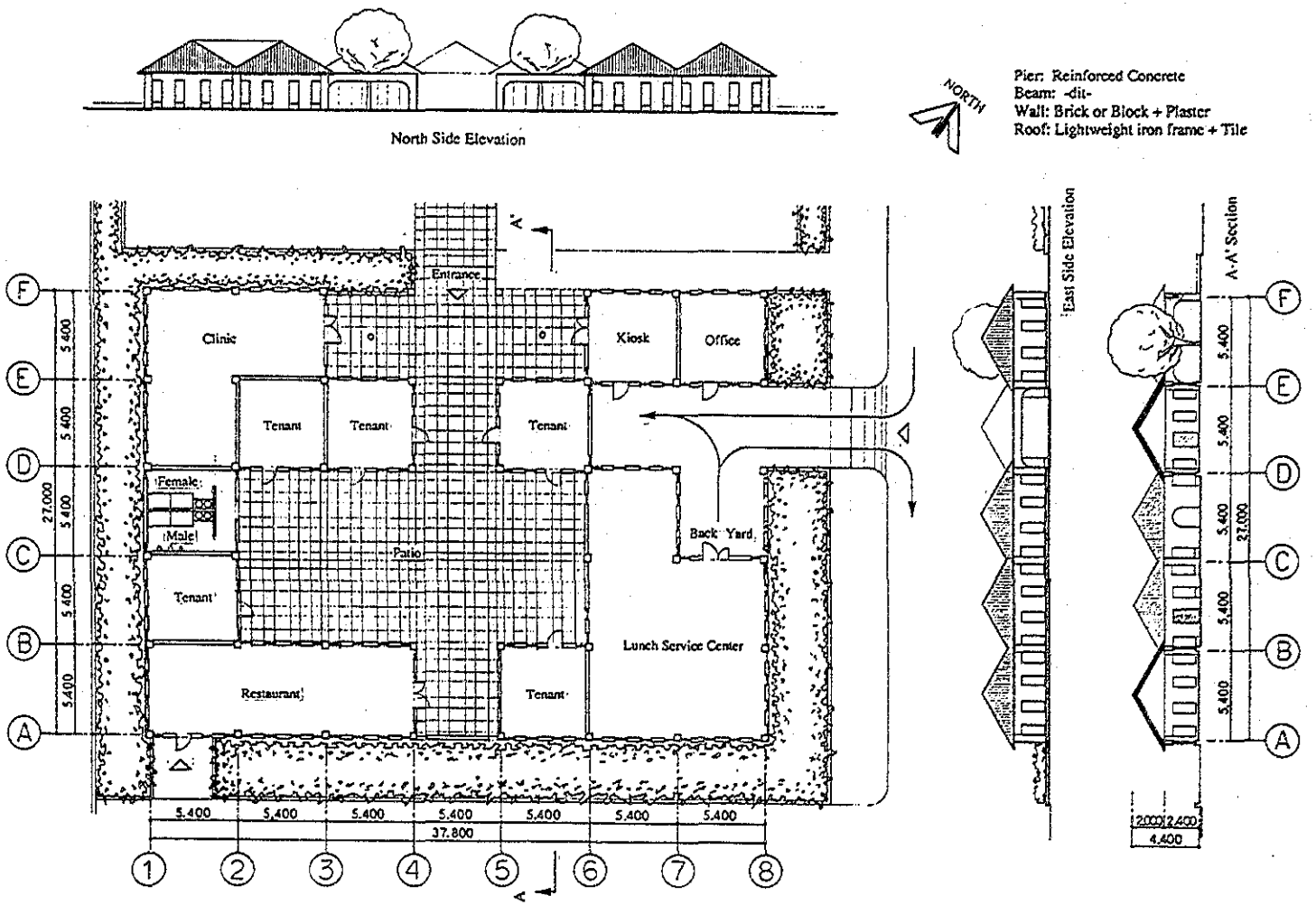
JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. H-7	Elevation of Standard Factory



JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. H-8	Section of Standard Factory



JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. H-9 Plan of Administration Building



JAPAN INTERNATIONAL COOPERATION AGENCY	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. H-10	Plan of Service Building

ANNEX I

ELECTRIC POWER SUPPLY AND TELECOMMUNICATIONS

ANNEX-I

ELECTRIC POWER SUPPLY AND TELECOMMUNICATIONS

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I.1 CURRENT ELECTRIC POWER SYSTEM

I.1.1 Institutions for Electric Power System

The electric power and energy sector of Ecuador is administered by the Ministry of Energy and Mines. Power generation and transmission nationwide is entrusted to the Ecuadorian Institute of Electrification (INECEL), while power distribution is managed by 19 regional electric enterprises (in the case of Esmeraldas province, Esmeraldas Electric Enterprise - EMELESA), as shown in Figure I-1. Outline of these institutions is briefly explained hereunder.

1) Ecuadorian Institute of Electrification (INECEL)

INECEL is wholly-owned and controlled by the Government, through the Ministry of Energy and Mines. Primary task of INECEL is to develop power generation and produce electricity (hydro, thermal, gas and other sources), as well as to transmit electric power on a nationwide basis. INECEL sells most of its generated energy to the regional electric enterprises at provincial level and the electric cooperatives for other areas.

INECEL handed over the electricity distribution activities to the regional electric enterprises in respective provinces in 1961. Likewise, most of the INECEL owned 69 kV transmission lines and substations and 13.8 kV distribution lines throughout the countries were handed over to the regional electric enterprises for effective operation for the consumers.

2) Esmeraldas Electric Enterprise (EMELESA)

EMELESA is a private electric power distribution enterprise and holds the franchise for power distribution in the Esmeraldas province. EMELESA has 7 switching stations and substations (48.3 MVA in total), as well as 69 kV transmission lines (145 circuit-km in total) and 13.8 kV distribution lines.

EMELESA also operated diesel engine generating plant with 2 x 5.52 MVA. EMELESA served power to the oil refinery plant in Esmeraldas for exclusive use, with 2 x 9 MVA substation in capacity.

Power supply to the Esmeraldas EPZ area will be executed by EMELESA, using approximately 5.5 km in length of 69 kV transmission line and 10 MVA in capacity of 69/13.8 kV distribution substation.

I.1.2 Current Situation of Energy and Power

1) Current Energy Situation

The total electric energy consumption of Ecuador in 1989 reached 4,701.7 GWh, of which 30.0 % was residential use, 25.0 % industrial, 12.1 % commercial, 9.5 % other consumption and 24.4 % was station use and losses. The total energy consumption has grown at an average annual rate of 7.3 % during the period from 1987 to 1989. Total installed generating capacity of the country (INECEL grid) as of the end of 1988 was 1,809 MW, consisting of 50.5 % thermal and 49.5 % hydro plants.

In the EMELESA grid, the total electric energy consumption was 9,471.9 MWh in October 1990 or 91,496.3 MWh in total from January to October 1990, which was approximately 2 % of the total INECEL grid consumption. Details on the electric energy consumption of the EMELESA grid in January to October 1990 are shown in Table I-1.

2) Current Power Situation

The national power system is interconnected among the respective enterprises through the 220 kV main transmission lines and 138 kV transmission lines. As shown in the INECEL's power grid map in Figure I-2, most of electric facilities are concentrated into Quito and Guayaquil area.

The total installed generating capacity of Ecuador in 1988 was 1,809 MW and the maximum system demand was 1,023.1 MW. Existing hydro-power plants are mainly located in the Amazon area where hydro potential is abundant.

In the EMELESA grid, the total installed substation capacity was 48.3 MVA at the end of 1990. The maximum demand of the EMELESA system was 29.0 MW, which was recorded in September 1990. The demand factor in the EMELESA system was 60 % in September 1990.

I.1.3 Existing Power Facilities

1) Generating Facilities

The existing generating facilities in the county are shown in Table I-2 and summarized as follows:

Thermal Power Plant	297.0 MW
Hydro Power Plant	725.5 MW
Gas and Diesel Power Plant	78.9 MW
Total	1,101.4 MW

In Esmeraldas, there exists Esmeraldas Thermal Power Plant with an installed capacity of 125 MW, and it is served as a reserve power plant for the whole system.

2) Transmission and Distribution System Facilities

The existing transmission lines of INECEL at the end of 1988 were 1,827 km in total, consisting of 657 km of 230 kV line and 1,170 km of 138 kV line. Further, the regional electric enterprises have transmission and distribution lines as summarized hereunder.

69 kV Sub-transmission line:	2,391 km
46 kV Sub-transmission line:	177 km
34.5 kV Distribution line:	530 km
22 kV Distribution line:	490 km

For power supply to the EMELESA grid and interconnection with the Esmeraldas Thermal Power Plant, 138 kV 2-circuit transmission line is extended from the Santo Domingo substation to the Esmeraldas Power Plant, with a total length of 154 km. At the Santo Domingo substation, 138 kV transmission line from Esmeraldas is interconnected with the 230 kV transmission line system through tie-transformers. The existing power system diagram of the country is shown in Figure I-3.

EMELESA receives power from INECEL at the Esmeraldas Thermal Power Plant through a 138/69 kV auto-transformer (75 MVA) and power is distributed to the provincial area by 69 kV transmission lines.

At present, power for the general customers in Esmeraldas city is supplied from the Santas Vainas substation using 5 feeders of 13.8 kV distribution lines, while power for the Santas Vainas substation is supplied from the substation of the Esmeraldas Thermal Power plant over the single-circuit 69 kV transmission line (approximately 8 km with conductor size of AWG 266.8 MCM).

There are two separate circuits of 13.8 kV distribution lines running along both side of the Esmeraldas EPZ site. These lines are used for the power supply to the general customers in Esmeraldas city in and around the Esmeraldas EPZ site, and it is not possible to use these lines for supply power to the Esmeraldas EPZ, because of its limited capacity. However, it is possible to supply small power for construction use during the construction period.

3) Substation Facilities

INECEL had 27 substations, with a total installed capacity of 4,880 MVA at the end of 1990. Most of these substations are used for step-down from 230 kV to 138 kV and 138 kV to 69 kV. At these primary substations, the secondary voltage is automatically regulated at the specified range by the provision of on-load tap changers. On the other hand, most of the secondary distribution substation in the regional electric enterprises are provided with only no-voltage tap change which will not work automatically voltage for regulation.

In the EMELESA system, there are 7 switching station and distribution substations. Power to all of these substations are supplied through the substation at the Esmeraldas Thermal Power Plant, which is interconnected with the national power grid. The power system diagram of the EMELESA grid is shown in Figure I-4.

For power supply to the customers in the Esmeraldas city, 5 feeders of 13.8 kV distribution lines are provided at the Santas Vainas substation, as well as 2 feeders at the substation of the Esmeraldas Thermal Power Plant. The power supply to the oil refinery plant is made exclusively by EMELESA by means of the exclusive 69 kV transmission line. The single line diagram of Santas Vainas substation is shown in Figure I-5.

I.1.4 Power and Energy Tariff System

INECEL is in charge of regulating power tariff, though tariff is invariably subject to the concurrence of the Government. EMELESA also regulates tariff for its customers in accordance with the instruction from INECEL.

Tariffs of EMELESA issued in March and April 1990 are reproduced in Table I-3.

INECEL tariff is common to the respective regions for industrial use. Average tariff per kWh for the whole categories of the consumers in March 1990 is computed from the Table I-3 to be approximately 6 US Cents.

If the regular tariff are applied to the Esmeraldas EPZ, average tariff for industrial use is 3.86 US Cents per kWh based on the computation from the tariff system issued by EMELESA in March 1990. This tariff is competitive if compared with power supply at the Cartagena EPZ in Colombia which was reported to be 4 US Cents per kWh.

Moreover, there is a case to apply preferential tariff for the specific customers by INECEL. In the event that the preferential tariff is applied for the Esmeraldas EPZ at the same rate as applied to the oil refinery in Esmeraldas, the tariff would be as follows:

(1)	For Demand	1299.00 Sucres/kW
		(Equiv. 12.95 US Cents/kW)
(2)	For Energy consumption	
	i. Up to the first 400 kWh:	29.51 Sucres/kWh
		(2.951 US Cents/kWh)
	ii. Over 400 kWh:	21.09 Sucres/kWh
		(2.109 US Cents/kWh)

The average tariff for energy consumption is 2.53 US Cents per kWh at such a preferencial tariff. When a customer uses the energy of 800 kWh, the average power tariff would be 3 US Cents per kWh. It would be desirable that the preferential tariff is applied for the Esmeraldas EPZ in order to make the investment more attractive at the Esmeraldas EPZ.

I.1.5 System Reliability

From consumers in Esmeraldas, a number of complaints have been reported with respect to the quality of electricity that:

(1) supplied voltage in the system which often drops in excess of 5 % of the value specified, affecting their electronic and electric devices and equipment so that they have to provide own voltage regulators.

(2) system frequency which often fluctuates in excess of 3 % of the allowable extent of their equipment and machines, and

(3) interruptions of power supply which occur frequently so that they have to provide their own stand-by generators.

However, due to the implementation of programme to upgrade transmission and distribution facilities, voltage regulation in the EMELESA System has been improved to be in the allowable range(+/- 5 %). The improvement and upgrading of the systems are continuously in progress so that compliant on the voltage regulation will be resolved in near future.

I.2 EXPANSION OF ELECTRIC POWER SYSTEM

I.2.1 Power and Energy Demand Forecast

INECEL reviews and renews every year its power and energy demand forecast at regional and national levels, on the basis of the latest power records and socio-economic tendency. EMELESA also conducts its forecast for its franchise area and report the forecast result to INECEL timely.

According to the power demand forecast by INECEL in January 1991, the power demand in the entire power system is forecasted to annually increase by 6 % on energy consumption and 5.7 % on maximum demand in the entire power system during the period from 1990 to 1995. The energy consumption and its maximum demand will reach 6,181 GWh/year and 1,430.4 MW in 1995, respectively. This will be a conservative forecast. If the energy consumption and maximum power demand will increase by 6.24 % and 5.57 % respectively, it will reach 6,824.5 GWh/year and 1,560.5 MW in 1995.

In the EMELESA power system, the power demand is forecasted to increase by 3 % per annum conservatively and 4 % per annum optimistically for both the energy consumption and maximum demand. From these assumptions, the energy consumption and maximum demand in 1995 will reach 127.5 GWh/year and 33.6 MW with 3 % annual increase rate, and 133.8 GWh/year and 35.3 MW with 4 % annual increase rate, respectively.

I.2.2 Expansion of Generating System

In order to meet the growing demand in the INECEL power system, a comprehensive development program of the power sources has been prepared by INECEL as summarized in Table I-4.

According to the long-term program (1990 to 1999), hydro power plants will primarily be developed, and rehabilitation of thermal power plant and development of oil-fired thermal power plants will follow gradually. Development of other power sources such as geothermal and biomass power plants are planned in the subsequent steps.

According to the INECEL development program as of 1991, the major development plans are scheduled as follows:

(1)	Paute C-1	Hydro	345 MW	(end/1991)
(2)	Paute C-2	Hydro	230 MW	(mid/1992)

(3)	Daule-Peripa	Hydro	130 MW	(end/1995)
(4)	Rehabilitation	Thermal	134 MW	(end/1991)

Referring to the load forecast and development program of generating plants, annual power and energy balance in the entire power system are examined as shown in Figure I-6 and Figure I-7.

As seen in the Table and Figures, power and energy supply may be firmly achieved by the year around 1995 in the entire power system. After the year 1995, the energy reserve will gradually turn down, but the energy shortage will not occur by completion of the power development program. Therefore, the power and energy will be sufficiently supplied for the power system, including the power supply system to the Esmeraldas EPZ.

I.2.3 Expansion of Transmission System

Construction of new transmission systems and expansion, as well as upgrade of the existing systems, are required to cope with the aforementioned development of the generating plants, and to improve existing system reliability.

INECEL formulated a development program of transmission systems in the entire power system over the period from 1990 to 1999, as summarized in Table I-5. The major transmission system development program in the entire power system is schematically shown in Figure I-8. The highlight of the INECEL's nationwide development program is to interconnect the 230 kV transmission line as a ring formation. This will bring to transfer the system power more easily to the respective regional load centers and to improve the power transmission system reliability.

On the other hand, in the power system of EMELESA, there are plans programmed to construct substations. EMELESA will expand 69 kV transmission line systems in its territory. Included in this development plan is a 69 kV transmission line (single circuit, 5.5 km AWG 2/0 of conductor size) to be constructed from the Santas Vainas substation to the new substation in the Esmeraldas EPZ. The design of this 69 kV transmission line has been finished and all materials have been prepared and stored in the EMELESA's storage. The route of this 69 kV transmission line is shown in Figure I-9. Therefore, it is possible to firmly interconnect the new substation in the Esmeraldas EPZ with the Santas Vainas substation by 69 kV transmission line.

I.2.4 Expansion of Substations

INECEL has a development plan to expand 42 substations in the respective regional centers for the improvement of power supply services. The total capacity to be installed at these substations will be 262.5 MVA.

While, EMELESA has a plan to construct a new substation (10 MVA in capacity) to cope with the increasing power demand of general customers in the port area of Esmeraldas and to meet with the requirement of the Esmeraldas EPZ. The power for the new substation is to be supplied from the Esmeraldas power system which is interconnected with the nationwide power system.

According to EMELESA, construction period of the new substation will be about 4 months after the construction of the foundation and building works.

I.3 PHYSICAL PLAN OF ELECTRIC POWER SUPPLY SYSTEM FOR ESMERALDAS EPZ

I.3.1 Basic Design Conditions and Criteria

Basic design criteria and conditions have been discussed as summarized hereunder.

1) Basic Design Conditions:

(a) Sufficient power supply to the potential users
(b) Highly reliable power supply to the users
(c) Low irregulation (high stability) of supplying voltage

2) Basic Design Criteria

(a)	Voltage regulation	:	±5 % of rated voltage of 220/440V, distribution line to enhance stability
(b)	Power interruption	:	No long-time power interruption to enhance reliability
(c)	Output capacity of substation	:	10 MVA for sufficient power supply
(d)	Regulation and standard	:	INECEL's Regulation, IEC standard for equipment design

I.3.2 Power Demand Forecast for Esmeraldas EPZ

Power demand forecast for the Esmeraldas EPZ has been worked out on the basis of the proposed land use plan at the Esmeraldas EPZ, as well as in the light of possible industries to be located in the EPZ. Detailed computation of the power demand is shown in Table I-6.

Industry	1,600 kW (1.9 MVA)
Administration	1,100 kW (1.9 MVA)
Total	2,700 kW (3.2 MVA)

In due consideration of 5 % allowance in distribution loss and voltage drop, construction of a substation of 5 MVA or more in capacity will be recommended for power distribution.

I.3.3 Proposed Plan of Electric Power Supply System for Esmeraldas EPZ

A basic plan for construction of transmission, substation and distribution network has been formulated by referring to the power demand forecast and specific requirements in the Esmeraldas EPZ. Overall power supply system diagram is shown in Figure I-10. The system is briefly explained as follows:

1) Transmission line

Power is available from INECEL-EMELESA Power Grid. The nearest power tapping point is the Santas Vainas substation, which is located 6 km from the proposed EPZ. The power for the Santas Vainas substation is transmitted from the Esmeraldas substation located near Esmeraldas Thermal Power station, through 8 km long 69 kV transmission line (1 cct). This 69 kV transmission line between the Esmeraldas substation and Santas Vainas substation has 35 MVA in sending capacity. This capacity is sufficient for power supply to the Esmeraldas EPZ, because the existing load at the Santas Vainas substation is 7 MVA at maximum, and power demand in the Esmeraldas EPZ is estimated to be 5 MVA. Under such circumstances, power for the Esmeraldas EPZ should be supplied from the Santas Vainas substation by constructing a new 69 kV transmission line.

Basic design of a new 69 kV transmission line between the Santas Vainas substation and new substation (Las Palmas substation) is proposed to be as follows:

(a)	Line voltage	:	69 kV
(b)	No. of circuit	:	1 circuit
(c)	Line length	:	Approximately 5.5 km in total
(d)	Structure	:	Steel tubular pole or concrete pole
(e)	Insulator	:	Porcelain, Minimum 5 discs
(f)	Conductor	:	AWG 2/0 copper

An alignment of the new 69 kV transmission line is shown in Figure I-11.

2) Substations

For effective use of electric energy, a new substation is planned to be constructed. The new substation receives power from 69 kV transmission line and distributes it to the consumers. Location of the substation is selected at the nearest site from the access road and in an administration area for easy construction and maintenance.

Basic design of the new substations is worked out as follows:

(a)	Type	:	Outdoor conventional type

(b) Capacity : 10 MVA

(c) Arrangement and composition of switchgear:

- 69 and 13.8 kV bus : single bus
- 13.8 kV switchgear : indoor metal-clad type
- Protective relaying : high speed type
- Power transformer : Outdoor type with OLTC

The single line diagram of the new substation, called Las Palmas substation, is shown in Figure I-12.

3) Distribution line

In order to distribute power to the respective consumers, 13.8 kV distribution line is planned and designed so that the line is connected in ring formation with line sectionalizer.

Basic design of 13.8 kV distribution line is proposed to be as follows:

(a) Line voltage : 13.8 kV
(b) No. of line : 3 lines in ring formation
(c) Line length : Approximately 3.5 km
(d) Structure : Steel tubular pole or concrete pole
(e) Insulator : Porcelain
(f) Conductor : 100 mm^2 copper
(g) Operation system : Manual operation

In order to enhance the reliability of power supply to the Esmeraldas EPZ, a new 13.8 kV distribution line will be constructed between the Santas Vainas substation and the new Las Palmas substation.

An alignment of 13.8 kV distribution lines in the Esmeraldas EPZ is shown in Figure I-13.

I.3.4 Construction Works

The extent of the construction works for the Esmeraldas EPZ is summarized as follows:

(1)	69 kV transmission line between the existing Santas Vainas substation and new Las Palmas substation.....	5.5 km
(2)	New substation, 69/13.8 kV outdoor/indoor type switchgear 10 MVA output capacity.....	1 set
(3)	13.8 kV distribution lines, three ring feeders	3.5 km
(4)	Extension of 69 kV feeder bay for outgoing line of 69 kV transmission line at the Santas Vainas substation, including the control and protection system, 1 feeder bay.....	1 lot

I.4 CURRENT TELECOMMUNICATIONS SYSTEM

I.4.1 Institutions for Telecommunications System

The telecommunications system in Ecuador is managed by the Ecuadorian Institute of Telecommunications (IETEL), under supervision of the Ministry of Public Works and Communications (MOPC), as shown in Figure I-14 and Figure I-15. Outline of IETEL and its office in Esmeraldas is briefly explained hereunder.

1) Ecuadorian Institute of Telecommunications (IETEL)

Telecommunications service in Ecuador is offered by the Ecuadorian Institute of Telecommunications (IETEL). IETEL was established on October 16, 1972 in accordance with the Telecommunication Act (Act No. 1175), integrating the state-owned National Telecommunications Corporation (ENTEL), the Quito Telephone Company (North), the Guayaquil Telephone Company (South), the All America Cables and Radio Inc., Provincial Telephone Companies, the National Frequency Department and other organizations. There still remains a telephone company, which is an independent company in Cuenca called ETAPA (Empresa Telefonos, Agua Potable y Alcantarillado), and it is operated by the municipality of Cuenca. IETEL's key roles and functions are described in Table I-7 in a summarized form. Organization of IETEL is shown in Figures I-16.

2) IETEL, Esmeraldas

IETEL, Esmeraldas office is in charge of operation and maintenance of the existing telecommunications station in Esmeraldas, under the control and supervision of IETEL Head Office in Quito. The major function of IETEL Esmeraldas is to maintain the existing telecommunications station and subscribers lines, and to connect new subscribers with the existing switching equipment. However, total system plan and design, as well as procurement of equipment, are carried out by IETEL Head Office in Quito.

I.4.2 Existing Telecommunications Service Situation

IETEL currently operates about 300,000 telephone lines over the country, with a telephone density of 2.8 sets per 100 inhabitants. IETEL has plan to additionally install switching equipment with 295,000 telephone lines in the next four years. The existing switching equipment and telephone set are of analog type.

The current telecommunication services of IETEL cover i) telephone services, ii) facsimile services (A2, Analog), iii) telex services, and iv) tele-message services.

I.4.3 Existing Telecommunications System Situation

The existing network structure of IETEL is two level switching hierarchy with the primary centers at three offices in Quito, Guayaquil and Cuenca. The existing switching hierarchy of telephone network is shown in Figure I-17.

The national network is mainly composed of radio system (microwave and U/VHF) due to the topographical configurations of the Andes mountains that run through the country. The existing transmission routes of microwave, UHF/VHF/HF systems are shown in Figures I-18 and I-19. Four microwave transmission routes, Quito - Guayaquil, North, South and West routes, are established as the trunk radio links, and they transmit telephone and television signal by means of a 6 GHz-960 CH system with 2 operational and 1 standby systems. As for the microwave spur routes, two systems are adopted, i.e. 6 GHz-960 CH system and 2 GHz-300 CH system. The UHF and VHF transmission routes which link small cities with low capacity circuits (60 CH, 24 CH, 12 CH) are interconnected with 61 links in total. In addition, there are 43 links for minor capacity using HF bands for rural application.

For IETEL Esmeraldas, two transmission routes are interconnected between Quito and Esmeraldas with two links of main channel having 6 GHz-960 CH and two links of standby channel having 6 GHz-300 CH. All radio equipment are of analog type. At present, IETEL Esmeraldas has a switching station in Esmeraldas city, with a switching equipment capacity of 6,000 channels. Currently, switching equipment of 5,000 channels out of 6,000 channels have already been occupied by the subscribers. Moreover, applications are filed for more than 1,500 channels. Consequently, a small and limited number of channels for local telephone lines will only be made available for use by the Esmeraldas EPZ under the current systems.

I.4.4 Telecommunications Tariff System

IETEL's telecommunications tariff system has been kept unchanged for the past 30 years. An attempt by IETEL to raise telecommunications tariff was rejected by MOPC in 1984, and the telecommunications tariff is still based on the low standard of 0.3 sucre/per pulse.

I.5 EXPANSION OF TELECOMMUNICATIONS SYSTEM

I.5.1 Expansion of Services

IETEL has a long term development plan, including two improvement plans of telecommunications service systems. One is improvement of the network structure. The network structure is planned to shift the existing two level switching hierarchy into a three level switching hierarchy, and the total primary centers will be increased to eight offices from the existing three offices. These primary centers will be located in Quito, Guayaquil, Cuenca, Ibarra, Ambato, Manta, Machala and Loja. Among these, the Quito center and Guyaquil center will have both functions of primary and secondary centers. By the realization of this improvement, a larger coverage of services of telephone network will be realized.

The other improvement is introduction of digital switching equipment and digital radio systems into the transmission network. All of the switching equipment to be newly installed will be applied with the digital exchanges, except for expansion of a few existing exchanges. By he introduction of digital switching equipment and radio transmission system, trunking speed will be increased, and the channel capacity will be remarkably increased. However, even though the digital network is adopted in the system having three level hierarchy, the existing analog system is still remained with two level hierarchy, and the function of the secondary center will be dependent from the digital exchange. Such a parallel system operation will be improved step by step in future.

The network structure of three level hierarchy is shown in Figure I-20.

I.5.2 Expansion of System Facilities

There are lots of demand for subscription of telecommunication services in the country. To meet with the demand, IETEL commenced an expansion and improvement project with a loan extended by OECF, Japan. According to this plan, 69,950 lines of digital electronic switching equipment will be installed at Quito, Guayaquil and other principal provincial cities interconnected with the existing telecommunications network.

In this development plan, Esmeraldas-2 switching station of 9,000 digital channels is incorporated and it is scheduled for completion towards the end of 1992. Once the Esmeraldas-2 switching station is completed, there would be no problem for the Esmeraldas EPZ in communicating with Quito and overseas. Data communication exchange will also be practicable at that time.

I.6 PHYSICAL PLAN OF TELECOMMUNICATIONS SYSTEM FOR ESMERALDAS EPZ

I.6.1 Basic Design Conditions

1) Demarcation of construction works

IETEL will be responsible for installation of telecommunication equipment in the telephone office and cable laying. Maintenance of the overhead cabling facilities also falls under the responsibility of IETEL.

The installation of wiring within individual buildings or houses, is the responsibility of the respective subscriber.

2) Toll Junction Line

Esmeraldas EPZ will be a local area (LA), which is to be connected to the national network with toll junction lines in telecommunication hierarchy. The nearest group switching center (GSC) of the national network is Esmeraldas Telephone Exchange, located at approximately 4 km from the Esmeraldas EPZ. Toll junction line from GSC is under expansion over the micro wave communication network.

To ensure reliability and expansion of the transmission system, optical fiber digital transmission system is recommended to be adopted for interconnection between the Esmeraldas EPZ and GSC in future.

I.6.2 Telecommunications Demand Forecast for Esmeraldas EPZ

1) Exchange capacity

For basic design of exchange capacity, the total demand of telephone lines is estimated as shown in Table I-8. For the whole area (22 ha) of the Esmeraldas EPZ, the demand is estimated to be about 300 lines.

2) Toll trunk circuit

The traffic from/to the Esmeraldas EPZ subscriber will be mostly long distance calls, including international calls.

I.6.3 Proposed Plan of Telecommunications System for Esmeraldas EPZ

For connection with the Esmeraldas EPZ, two alternative systems would be considered; one is direct connection to factories through a cross connection cabinet, and the other is to construct a small switching station in the EPZ area.

From the telecommunications demand forecast and specific requirements of the Esmeraldas EPZ, telecommunications system is proposed to be arranged by the cross connection cabinet system which is connected from the main switching equipment of IETEL to the respective subscribers through cross connection cabinet. This method is normally applied for small scale telephone line subscribers. The system interconnection diagram is shown in Figure I-21.

1) Cabling plan

"Cross Connecting Cabinet System" provides flexibility for demand, and is a recommendable solution for the demands.

(a) Cross connection cabinet location

As the demand and distribution area is small, the Cross Connection Cabinet is located in the substation area.

(b) Cable route arrangement

Cable route arrangement for the Esmeraldas EPZ is proposed as shown in Figure I-22.

(c) Number of cables

Telephone cable of 300 pairs, 0.5 mm in diameter is required from IETEL Esmeraldas telephone office to the furthest cabinet to reduce transmission loss, instead of ordinary cable of 0.4 mm. Telephone cables of 100 pairs, 50 pairs and 30 pairs, 0.4 mm in diameter, are required for distribution of telephone circuit from the cross connection cabinet to the subscribers.

2) Toll circuit plan

Since more frequent long distance call flow through the GSC (Esmeraldas) is expected, not only the number of circuits on the junction line betwen GSC (Esmeraldas) and the national network, but also the toll switching capacity of GSC (Esmeraldas) and EPAX should be taken into account.

I.6.4 Construction Works

The extent of the construction works of implementation for the Esmeraldas EPZ is as follows:

(1) Toll trunk line between the cross connection cabinet to the switching equipment in IETEL Esmeraldas ..... 3 km

(2) Corss connection cabinet with accessories, 300 line capacity ..... 1 set

(3) Telecommunication cable lines with branch terminal box for subscribers

(1) 100 pairs ..... 500 m
(b) 50 pairs ..... 300 m
(c) 30 pairs ..... 200 m

Table I-1 MONTLY MAXIMUM DEMAND AND ENERGY CONSUMPTION ON EMELESA'S POWER SYSTEM IN 1990

Month	Max. Demand (MW)	Energy Consumption (MWH)	Mean Daily Consumption (MWH)	Mean Peak Demand (MW)
January	22.20	8959.20	289.00	19.18
February	22.30	8709.30	311.04	20.16
March	22.00	9284.40	299.50	19.55
April	22.40	9107.40	303.58	19.48
May	24.00	9073.00	292.67	19.66
June	22.40	9045.00	301.50	19.46
July	28.00	9240.00	298.06	19.79
August	25.20	9442.00	304.58	20.09
September	29.00	9164.10	305.47	20.77
October	24.00	9471.90	305.54	20.49

Source: EMELESA

Table I-2 EXISTING GENERATING FACILITIES

Power Station	Installed Capacity (MW)		Operation Since
	Hyro	Thermal	
Gas-Guayaquil	-	25.6	1976
Diesel-Guangopolo	-	31.6	1977
Pisayambo	69.5	-	1977
Estero Salado No.2	-	73.0	1978
Estero Salado No.3	-	73.0	1980
Gas-Quito	-	47.7	1981
Esmeraldas	-	125.0	1981
Paute-Phase A-B	500.0	-	1983
Agoyan	156.0	-	1987
Total	725.5	375.9	
Grand Total		1,101.4	

Source: INECEL

Table I-3 TARIFF SYSTEM OF EMELESA

Type of Service		March 1991 (Sucre/kWh)	April 1991 (Sucre/kWh)
Residencial			
Minimum	20 KWH	69.00	69.00
Subsequent	30 KWH	3.80/KWH	3.80/KWH
Subsequent	30 KWH	8.64/KWH	8.64/KWH
Subsequent	20 KWH	22.75/KWH	22.75/KWH
Subsequent	20 KWH	29.94/KWH	29.94/KWH
Subsequent	30 KWH	32.57/KWH	32.57/KWH
Subsequent	50 KWH	33.53/KWH	33.53/KWH
Subsequent	100 KWH	34.91/KWH	35.96/KWH
Subsequent	200 KWH	36.60/KWH	37.70/KWH
Subsequent	500 KWH	48.88/KWH	40.05/KWH
Over		41.17/KWH	42.41/KWH
Commercial			
- Without kW			
Minimum	20 KWH	104.00	104.00
Subsequent	60 KWH	12.09/KWH	12.09/KWH
Subsequent	70 KWH	33.81/KWH	34.83/KWH
Subsequent	350 KWH	43.15/KWH	44.44/KWH
Subsequent	500 KWH	45.54/KWH	46.91/KWH
Over		47.94/KWH	49.38/KWH
- With kW			
Demand	KW	1261.00/KW	1299.00/KW
Consumption	KWH	43.15/KWH	44.44/KWH
Official Use			
- Without kW			
MINIMO	20 KWH	104.00	104.00
Subsequent	60 KWH	12.09/KWH	12.09/KWH
Subsequent	70 KWH	32.26/KWH	33.23/KWH
Subsequent	350 KWH	41.17/KWH	42.41/KWH
Subsequent	500 KWH	43.47/KWH	44.77/KWH
Over		45.75/KWH	47.12/KWH
- With kW			
Demand	KW	1204.00/KW	1240.00/KW
Consumption	KWH	41.17/KWH	42.41/KWH
Industrial			
- Artisan			
Minimum	100 KWH	2145.00	2209.00
Subsequent	400 KWH	33.56/KWH	34.56/KWH
Subsequent	500 KWH	37.09/KWH	38.20/KWH
Over		43.65/KWH	44.95/KWH
- With kW - I			
Demand	KW	1135.00/KW	1169.00/KW
Consumption	KWH	39.10/KWH	4.28/KWH
- Won kW Demand - II			
Demand	KW	1261.00/KW	1299.00/KW
Final	200 KWH/KW	39.10/KWH	40.28/KWH
Subsequent	200 KWH/KW	35.20/KWH	36.26/KWH
Over		31.69/KWH	32.64/KWH
Wter Pump			
Demand	KW	1135.00/KW	1169.00/KW
Consumption	KWH	25.23/KWH	25.99/KWH
State Refinery			
Demand	KW	1261.00/KW	1299.00/KW
First	400 KWH/KW	28.65/KWH	29.51/KWH
Over		20.48/KWH	21.09/KWH
Reserve Demand	KW	358.00/KW	368.00/KW
Public Lighting			
Average Price		33.86	34.88

Source: EMELESA

Table I-4 COMPREHENSIVE DEVELOPMENT PROGRAM OF INECEL GENERATING SYSTEM

	Project	Capacity (MW)	Operation From
1.	Under Construction		
	- Paute - Fase C	575	Abr/1991
	- Daule Peripa	130	Oct/1995
	- Thermal Rehabilitacion	134	Oct/1993
	Sub-total	839	
2.	Short-Term		
	- T. Gas-Diesel	85	Oct/1996
	- San Francisco	230	Oct/1997
	- Chespi	167	Oct/1999
	Sub-total	482	
3.	Medium and Long-Term		
	- Sopladora	400	Oct/2000
	- Codo Sinclair	491	Oct/2002
	- Codo Sinclair	491	Oct/2008
	- Lliqua-Muyo	100	Oct/2013
	Sub-total	1,582	
	Grand Total	2,903	

Source: INECEL

Table I-5 DEVELOPMENT PROGRAM OF TRANSMISSION SYSTEM

Transmission Line	Year for Operation
- L/T Pascuales-Policentro, 138 kV, 2 CKT, 477 MCM, 16 km	1990
- L/T Paute - Riobamba, 230 kV, 2 CKT, 1113 MCM, 163 km	1990
- L/T Ibarra-Tulcán, 138 kV, 1 CKT, 477 MCM, 70 km	1992
- L/T Cuenca-Limón, 138 kV, 1 CKT, 266.8 MCM, 70 km	1991
- L/T Pascuales-Trinitaria, 230 kV, 2 CKT, 1113 MCM, 25 km	1993
- L/T Loja-Cumbaratza, 138 kV, 1 CKT, 266.8 MCM, 52 km	1991
- L/T Quevedo-Portoviejo - Ampliación 20 circuito	1991
- L/T Quito-Ibarra - Amplicación 20 circuito	1992
- L/T Paute-Pascuales, 230 kV, 2 CKT, 1113 MCM, 193 km	1993
- L/T Central Daule-Peripa-Derivacion Pichincha, 138 kV, 2 CKT, 397.5 MCM, 15 km	1995
- L/T S. Francisco-Totoras: 230 kV, 2 CKT, 42 km	1997
- L/T Chespi-Quito: 138 kV, 2 CKT, 26 km	1999
- L/T Sopladora-Guayaquil: 230 kV, 2 CKT, 200 km	2000
- L/T Codo Sinclair-Quito: 345 kV, 1 CKT, 132 km - 2 conductores/fase	2003
- L/T Daule Peripa-Portoviejo: 138 kV, 1 CKT, 97 km	2003
- L/T Codo Sinclair-Quito: 345 kV, 1 CKT, 132 km - 2 conductores/fase	2008
- L/T Quito-Guayaquil: 230 kV, 1 CKT, 327 km	2008
- L/T Lligua Muyo-Totoras: 138 kV, 2 CKT, 25 km	2013

Source: INECEL

Table I-6 POWER DEMAND FORECAST AT ESMERALDAS EPZ

Lot No.	Industrial Category	Lot Size (m^2)	No. of Em-ployee	Factory Area (m^2)	Demand Rate (W/m^2)	Required Power (kW)	Contract Power (kW)
S-1	Food (Sea food)	2,100	15	840	22	18.48	20
S-2	Food	1,500	15	600	22	13.20	15
S-3	Apparel (Label)	1,900	50	760	20	15.20	20
S-4	Furniture	1,500	15	600	22	13.20	15
S-5	Apparel (Blanket)	1,800	40	720	20	14.40	15
S-6	Apparel	1,500	40	600	20	12.00	15
S-7	Apparel	1,700	40	680	20	13.60	15
S-8	Apparel	1,500	40	600	20	12.00	15
S-9	Electric (Lamp)	1,500	15	600	22	13.20	15
S-10	Chemical (Cosmetic)	1,500	15	600	24	14.40	15
S-11	Apparel	1,600	40	640	20	12.80	15
S-12	Apparel	1,600	40	640	20	12.80	15
M-1	Food	5,100	30	1,785	22	39.27	40
M-2	Apparel	6,000	150	2,100	20	42.00	50
M-3	Apparel (Sport wear)	6,000	150	2,100	20	42.00	50
M-4	Apparel	6,000	150	2,100	20	42.00	50
M-5	Chemical (Plastic film)	6,000	60	2,100	24	50.40	60
M-6	Chemical (Plastic shoes)	6,000	150	2,100	20	42.00	50
M-7	Chemical (Cosmetic)	5,400	50	1,890	24	45.36	50
M-8	Apparel	5,700	140	1,995	20	39.90	40
M-9	Electric control device	5,800	60	2,030	50	101.50	120
M-10	Metal	5,800	60	2,030	50	101.50	120
M-11	Furniture	6,500	150	2,275	12	27.30	30
M-12	Wire harnesses	6,000	100	2,100	50	105.00	120
M-13	Wood mills	6,000	15	2,100	20	42.00	50
L-1	Apparel (Underwear)	12,000	300	4,200	20	84.00	90
L-2	Apparel (Sleep wear)	12,000	300	4,200	20	84.00	90
L-3	Animmal feed	12,000	60	4,200	12	50.40	60
L-4	Wood	13,000	60	4,550	35	159.25	160
L-5	Canned food	22,000	100	7,700	22	169.40	170
Total		167,000	2,450			1,432.56	1,590
	Water supply (main)					300.00	300
	Water supply (distrib.)					200.00	200
	Sewage treatment plant					400.00	400
	Substation					50.00	50
	Service building			700	10	70.00	70
	Adm. building			650	10	65.00	70
	Fire station			120	10	12.00	20
Grand Total						2,529.56	2,700

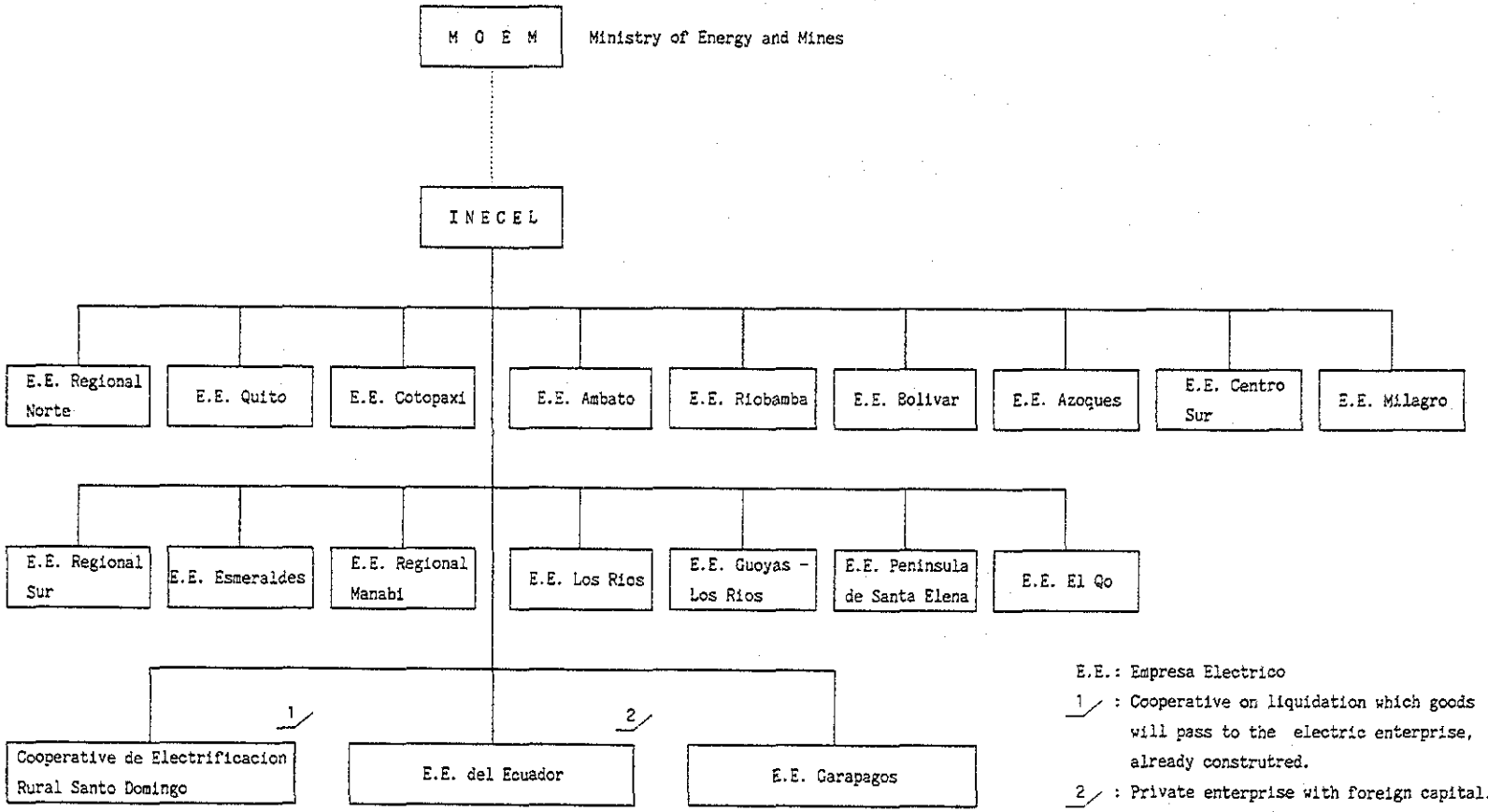
Table I-7 KEY ROLE AND FUNCTION OF IETEL

1. Telephone Service Installations
   (1) Permanent telephone service installations
   (2) Temporary telephone service installations
2. Telephone Calls
   (1) Calls from subscriber telephone or IETEL booths
   (2) Local telephone calls
   (3) National long-distance telephone calls (LDN)
   (4) International long-distance telephone calls (LDI)
3. Telex Service Installations
   (1) Permanent Telex service installations
   (2) Temporary Telex service installations
4. Telex Communications
   (1) National Telex communications
   (2) International Telex communications
   (3) Telex communications from IETEL offices
5. Telegraph Service
   (1) National telegraphy service
   (2) Special telegraphy service
   (3) International telegraphy service
6. Mobile Telephone Service
   (1) Mobile telephone service installations
   (2) Communications
7. Rental Telephone and Telegraph Services
8. Rental Sound and TV Broadcast Circuit Services
9. Review and Approval of by-laws
10. Official Audit Inspections and Reception of Work
11. Telephone House Connection Fees
12. Value of Fees and Rates of Payment

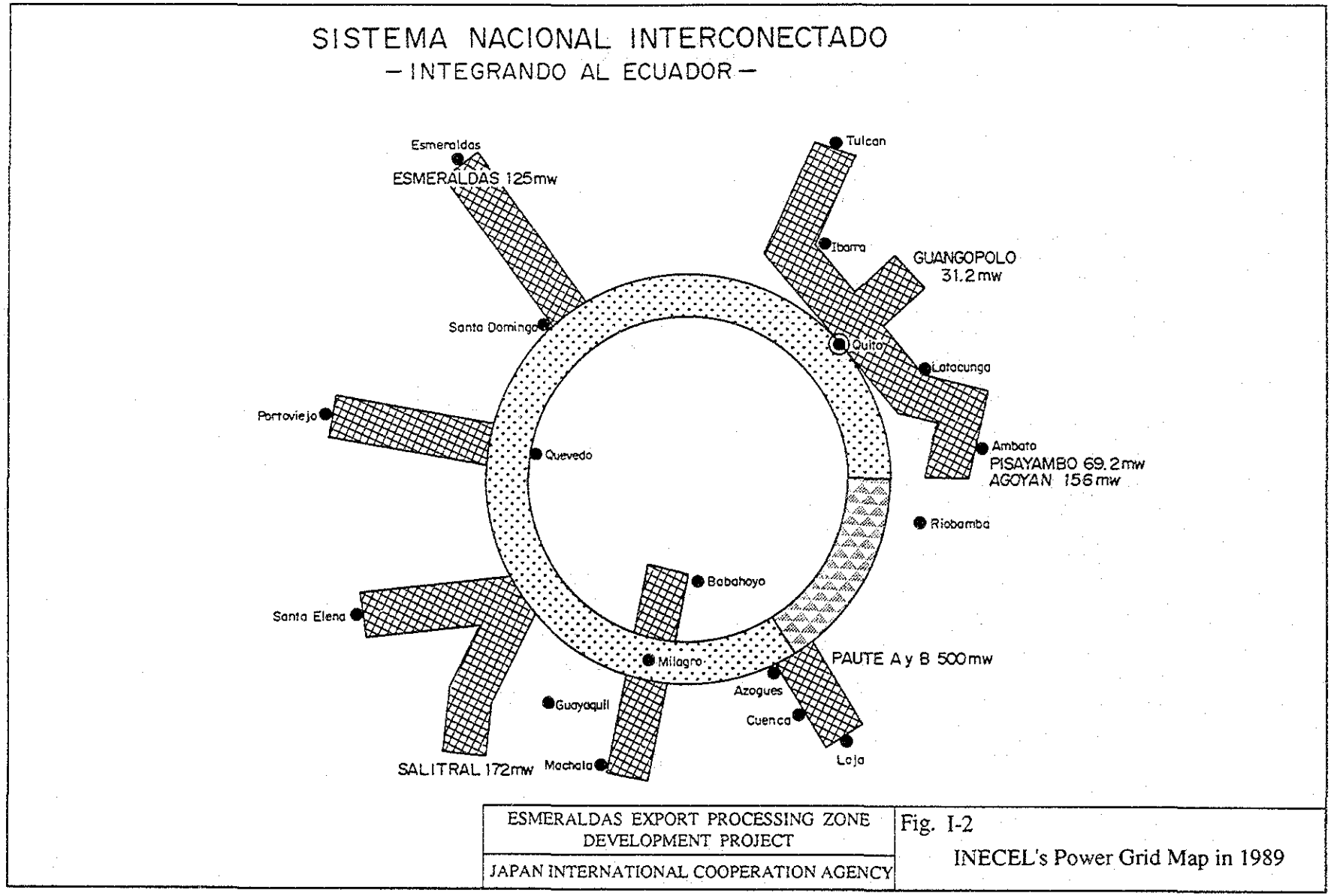
Source: IETEL

Table I-8 TELECOMMUNICATIONS DEMAND FORECAST AT ESMERALDAS EPZ

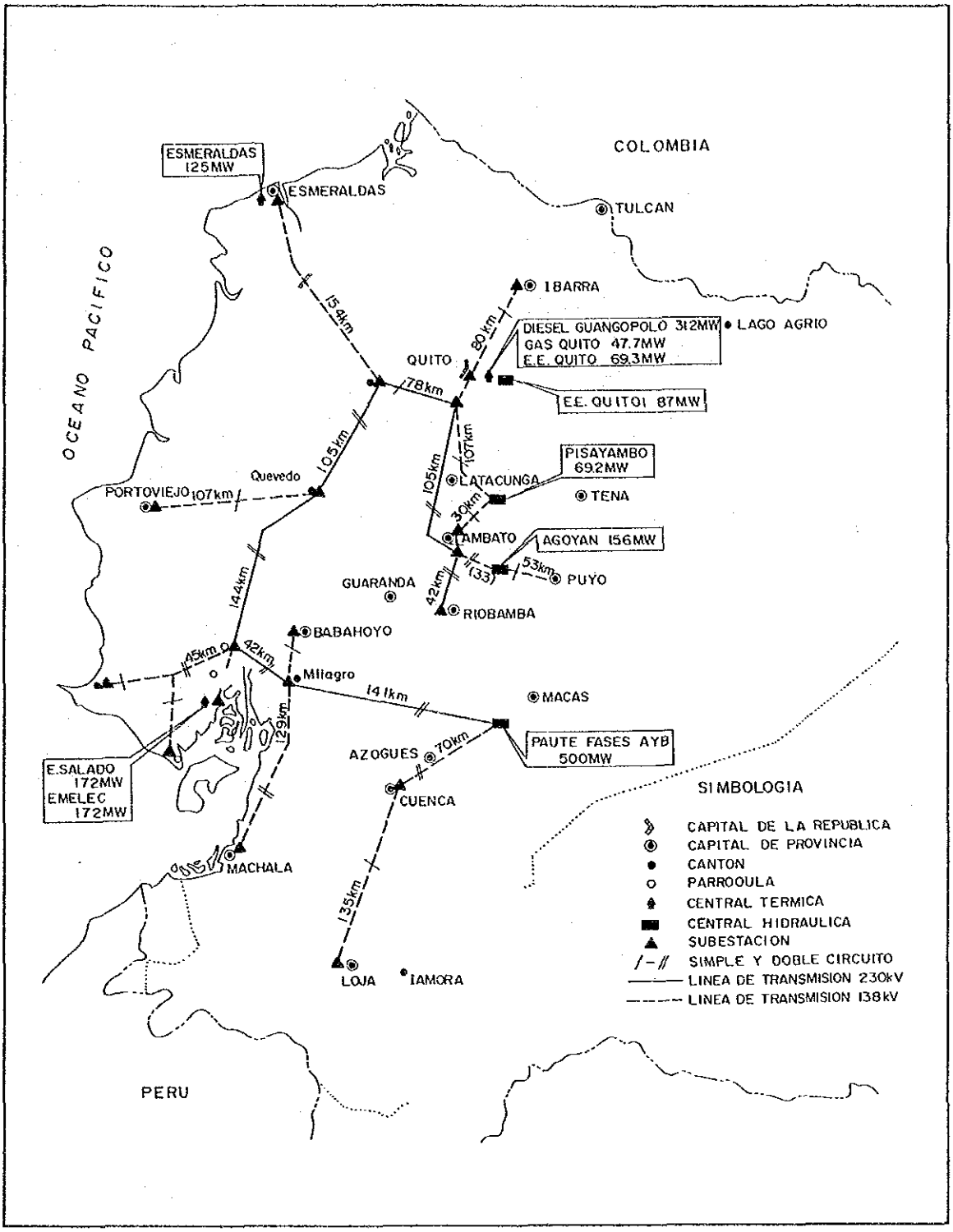
Lot No.	Industrial Category	Lot Size (m^2)	No. of Em-ployee	Factory Area (m^2)	Demand Rate (W/Em-ployee)	Required No.	Contract No.
S-1	Food (Sea food)	2,100	15	840	0.1	1.5	2
S-2	Food	1,500	15	600	0.1	1.5	2
S-3	Apparel (Label)	1,900	50	760	0.1	5.0	5
S-4	Furniture	1,500	15	600	0.1	1.5	2
S-5	Apparel (Blanket)	1,800	40	720	0.1	4.0	4
S-6	Apparel	1,500	40	600	0.1	4.0	4
S-7	Apparel	1,700	40	680	0.1	4.0	4
S-8	Apparel	1,500	40	600	0.1	4.0	4
S-9	Electric (Lamp)	1,500	15	600	0.1	1.5	2
S-10	Chemical (Cosmetic)	1,500	15	600	0.1	1.5	2
S-11	Apparel	1,600	40	640	0.1	4.0	4
S-12	Apparel	1,600	40	640	0.1	4.0	4
M-1	Food	5,100	30	1,785	0.1	3.0	3
M-2	Apparel	6,000	150	2,100	0.1	15.0	15
M-3	Apparel (Sport wear)	6,000	150	2,100	0.1	15.0	15
M-4	Apparel	6,000	150	2,100	0.1	15.0	15
M-5	Chemical (Plastic film)	6,000	60	2,100	0.1	6.0	6
M-6	Chemical (Plastic shoes)	6,000	150	2,100	0.1	15.0	15
M-7	Chemical (Cosmetic)	5,400	50	1,890	0.1	5.0	5
M-8	Apparel	5,700	140	1,995	0.1	14.0	14
M-9	Electric control device	5,800	60	2,030	0.1	6.0	6
M-10	Metal	5,800	60	2,030	0.1	6.0	6
M-11	Furniture	6,500	150	2,275	0.1	1.5	2
M-12	Wire harnesses	6,000	100	2,100	0.1	10.0	10
M-13	Wood mills	6,000	15	2,100	0.1	1.5	2
L-1	Apparel (Underwear)	12,000	300	4,200	0.1	30.0	30
L-2	Apparel (Sleep wear)	12,000	300	4,200	0.1	30.0	30
L-3	Animal feed	12,000	60	4,200	0.1	6.0	6
L-4	Wood	13,000	60	4,200	0.1	6.0	6
L-5	Canned food	22,000	100	7,700	0.1	10.0	10
Total		167,000	2,390				238
	Water supply (main)				0.1	1.0	1
	Water supply (distrib.)				0.1	1.0	1
	Drainage				0.1	1.0	1
	Substation				0.2	2.0	2
	Service building			700	0.2	10.0	10
	Adm. building			650	0.2	5.0	5
	Fire station			120	0.2	2.0	2
Grand Total							*260*



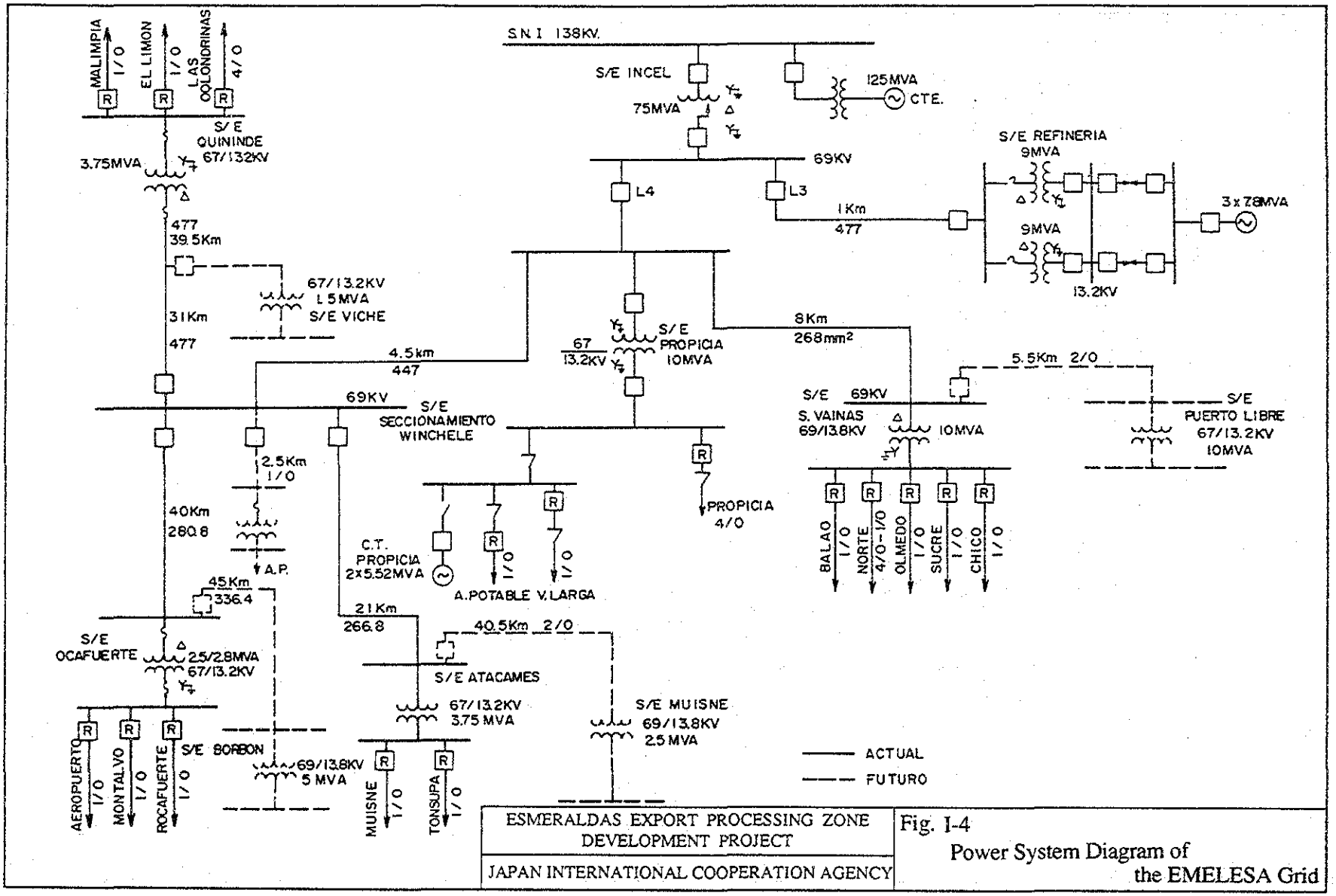
ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. I-1
JAPAN INTERNATIONAL COOPERATION AGENCY	Institutions of Ecuadorian Electrification



ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. I-2
JAPAN INTERNATIONAL COOPERATION AGENCY	INECEL's Power Grid Map in 1989



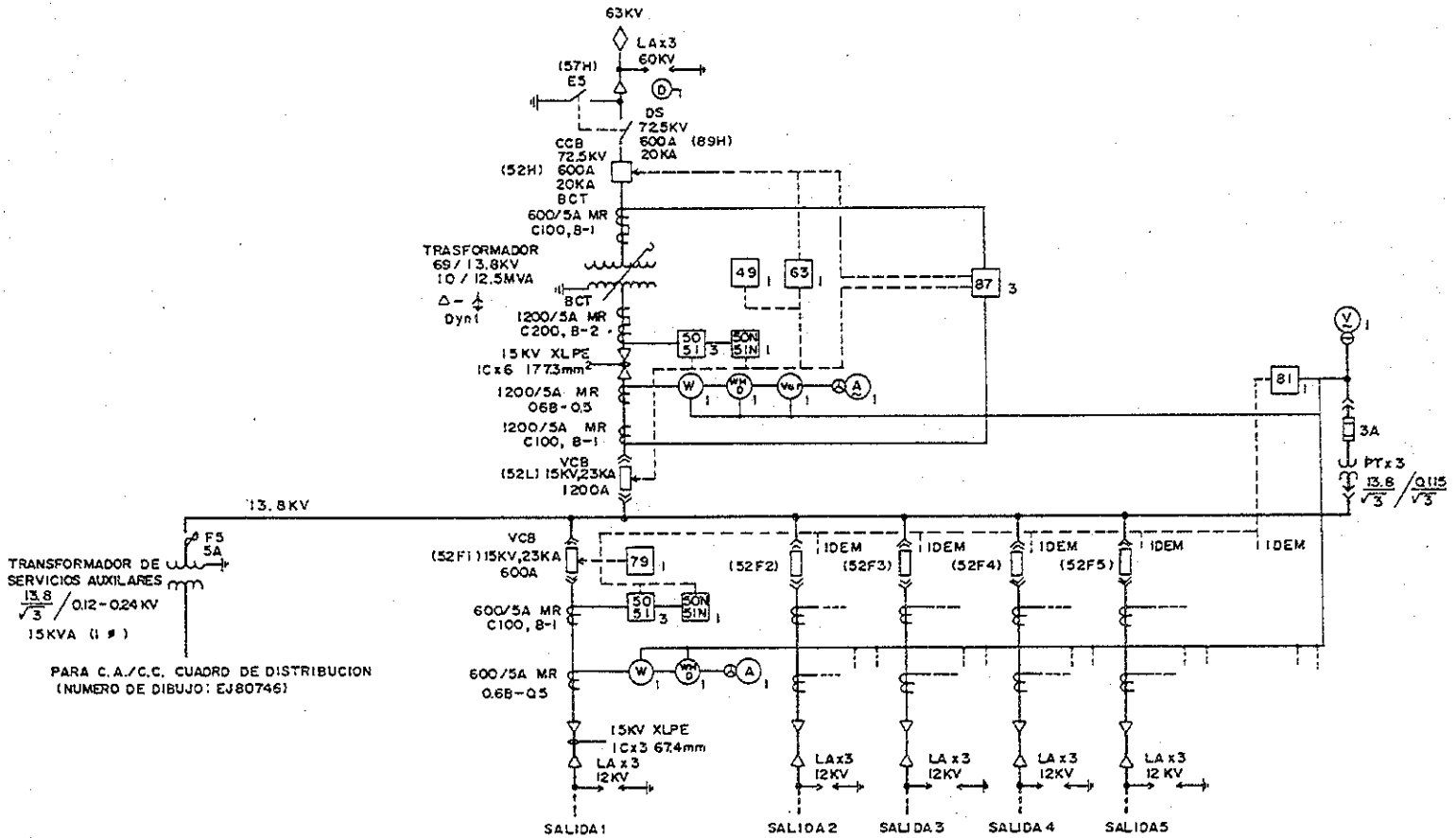
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. I-3 Existing Power System Diagram of the Country
	JAPAN INTERNATIONAL COOPERATION AGENCY



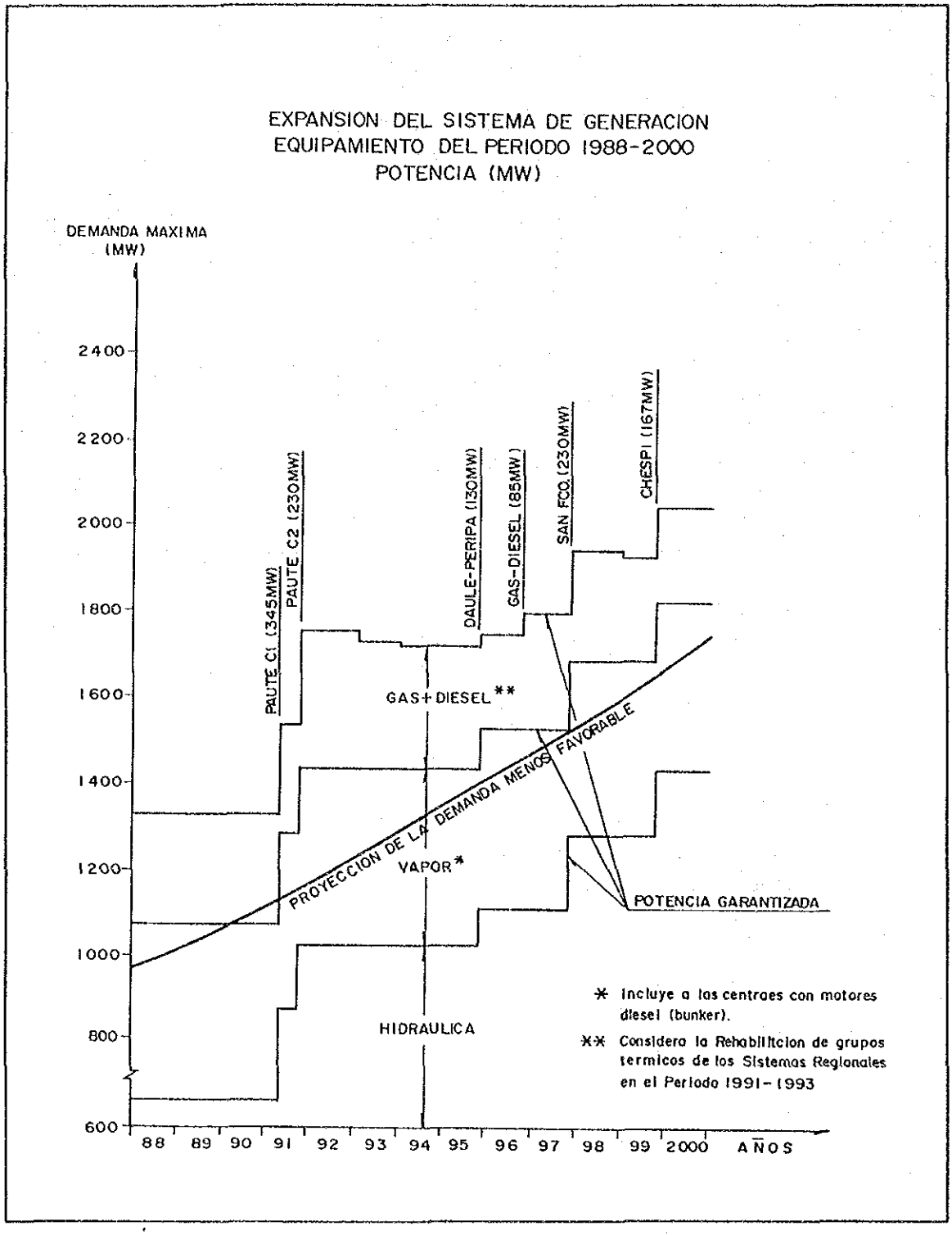
ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. I-4
Power System Diagram of the EMELESA Grid



ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. I-5 Single Line Diagram of Santas Vainas Substation
JAPAN INTERNATIONAL COOPERATION AGENCY	



	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. I-6 Annual Power Balance in Entire Power System
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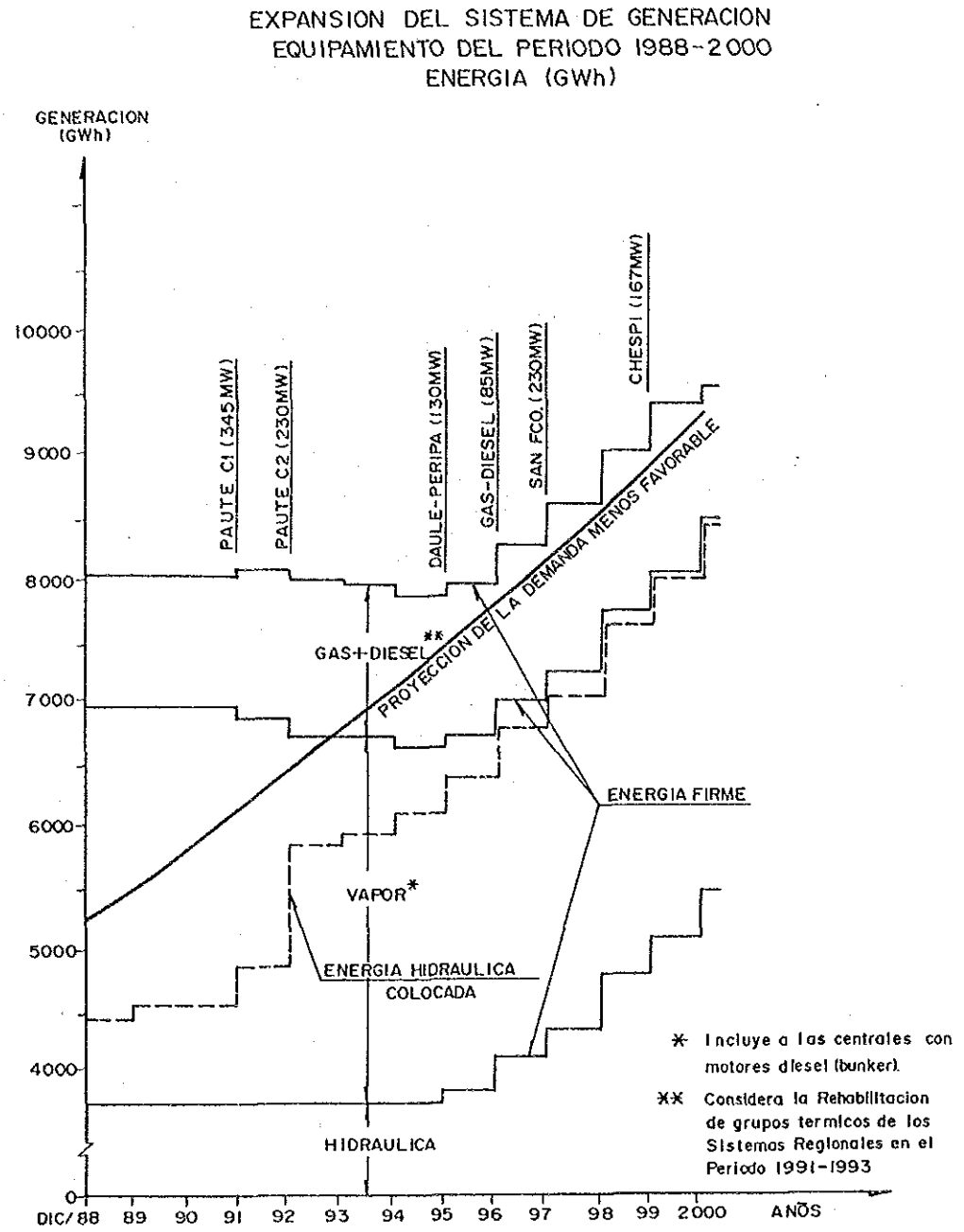
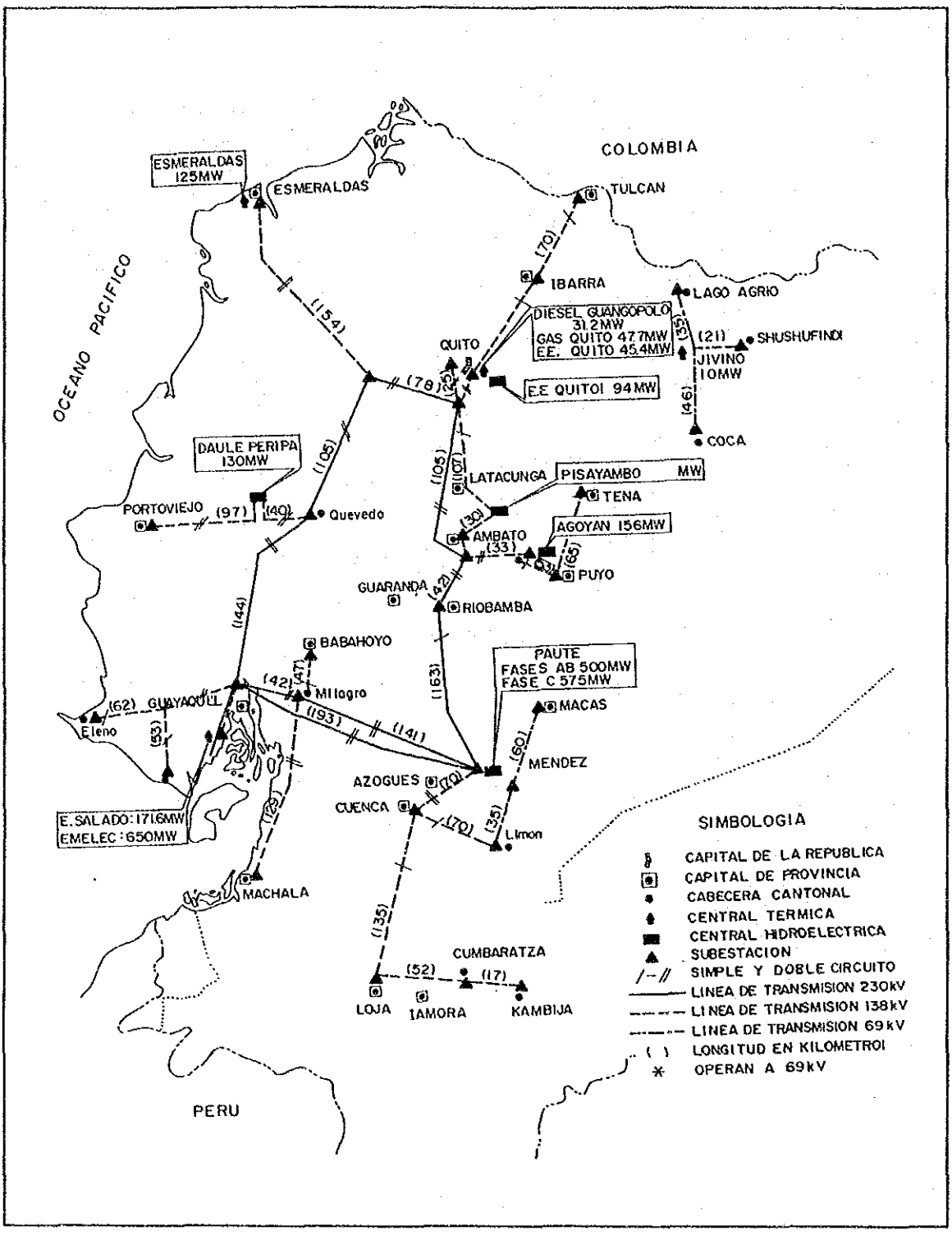
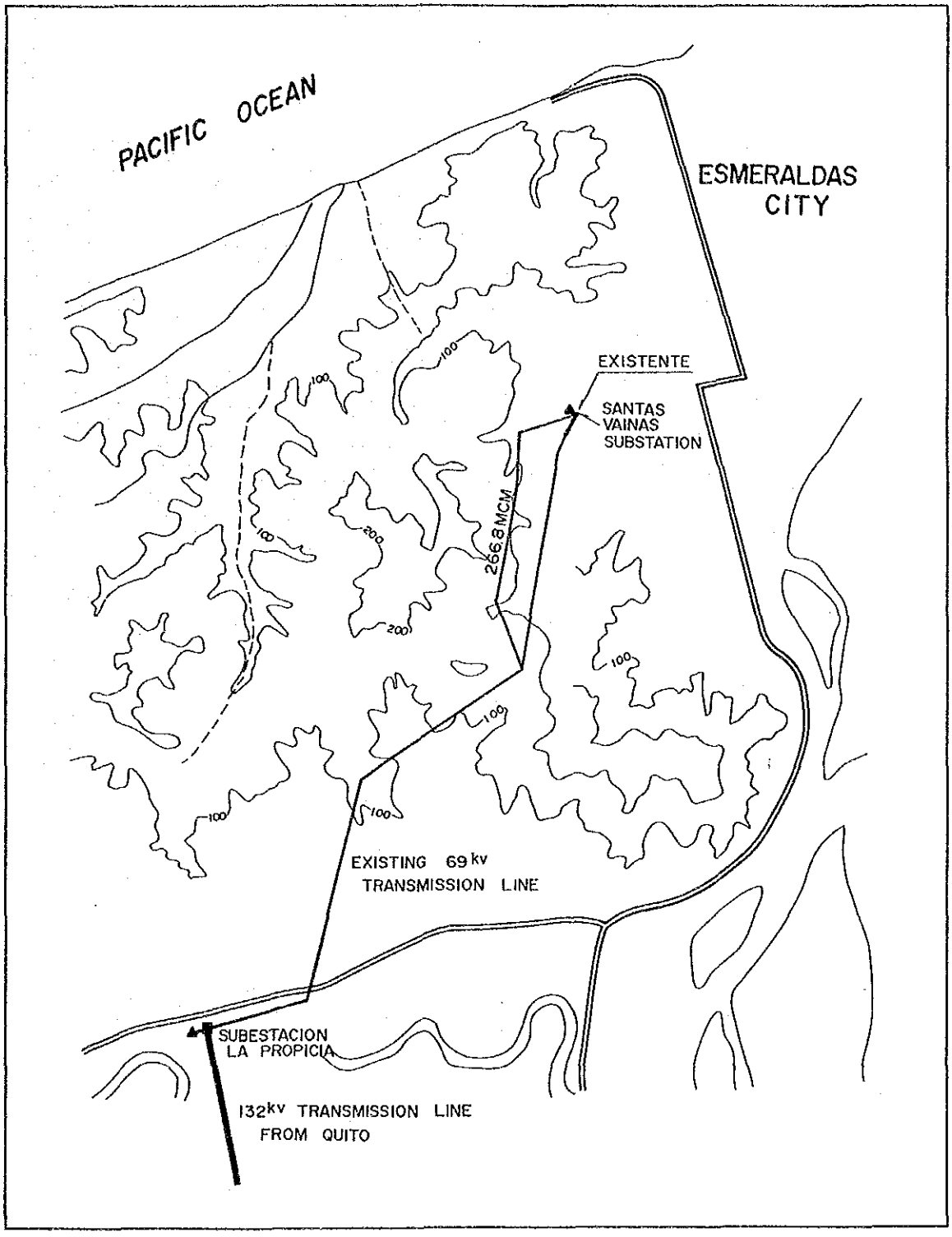


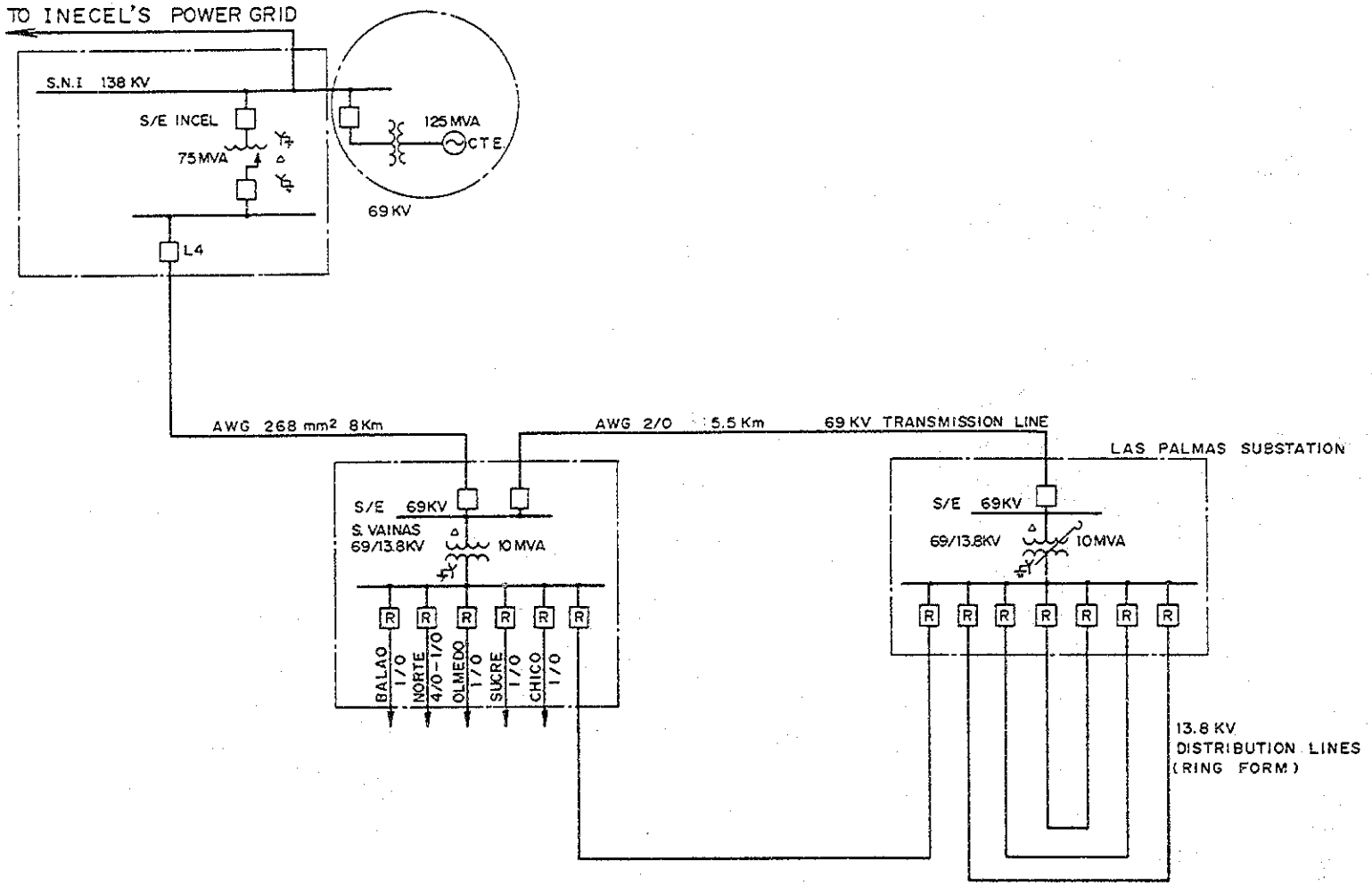
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. I-7 Annual Energy Balance in Entire Power System
	JAPAN INTERNATIONAL COOPERATION AGENCY



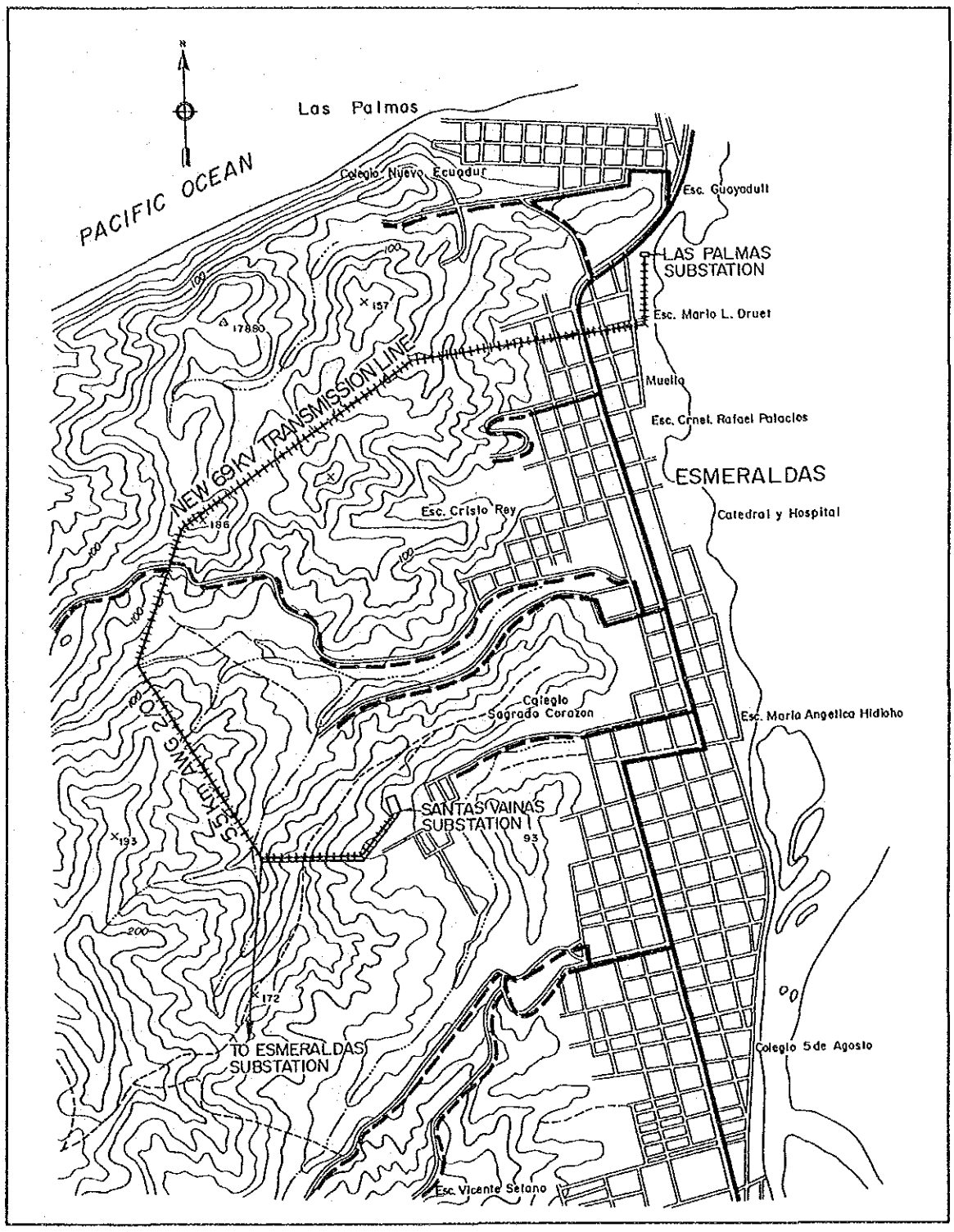
	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. I-8 Transmission System Development Program
	JAPAN INTERNATIONAL COOPERATION AGENCY



	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. I-9 Route Map of Existing 69 kV Transmission Line
	JAPAN INTERNATIONAL COOPERATION AGENCY



ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT	Fig. I-10
JAPAN INTERNATIONAL COOPERATION AGENCY	Overall Power Supply System Diagram



	ESMERALDAS EXPORT PROCESSING ZONE DEVELOPMENT PROJECT
	Fig. I-11 Route Map of New 69 kV Transmission Line
	JAPAN INTERNATIONAL COOPERATION AGENCY