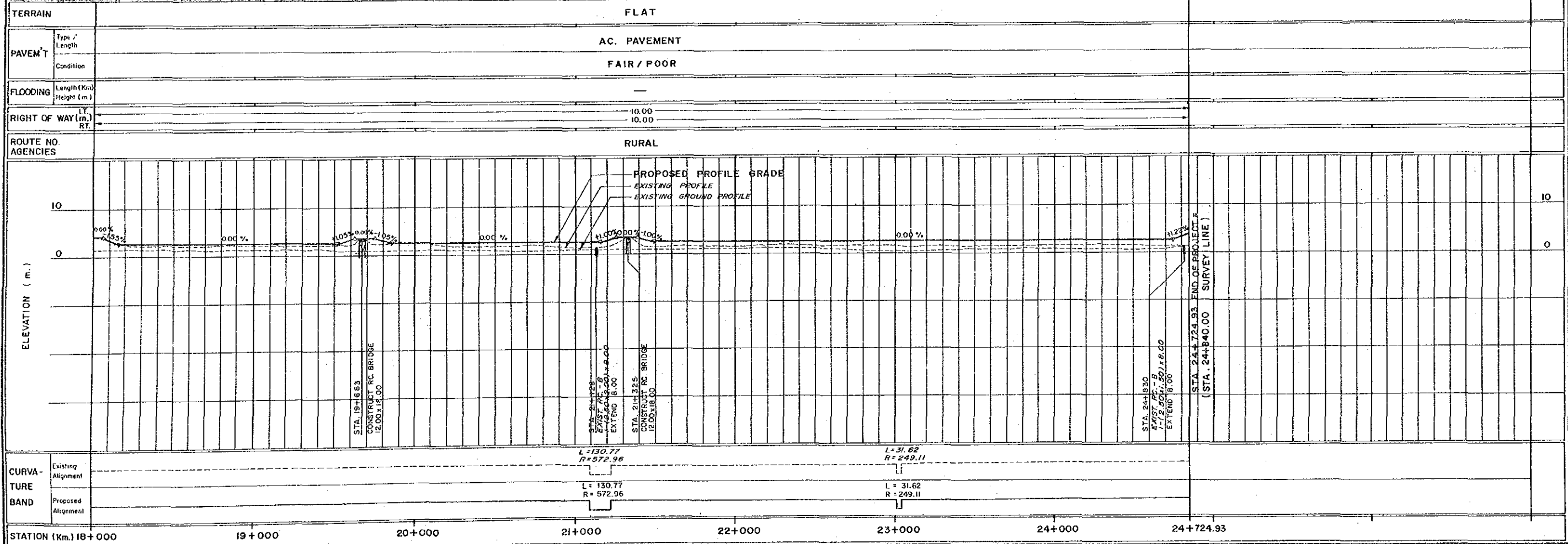




STA. 24+724.93 END OF PROJECT
 STA. 18+250 OF ROUTE NO. 304



STA. 19+663
 CONSTRUCT RC BRIDGE
 12.00x18.00

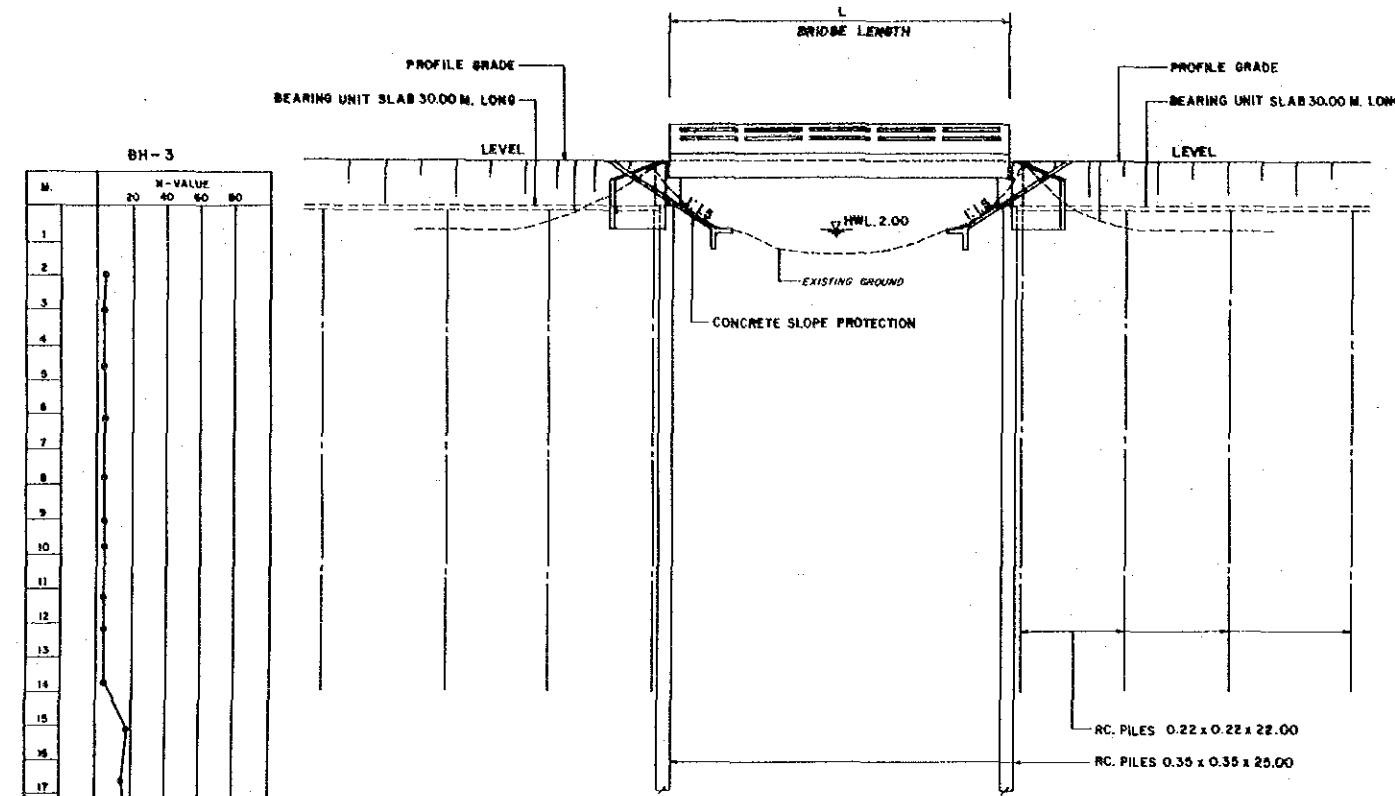
STA. 21+325
 CONSTRUCT RC BRIDGE
 12.00x18.00

STA. 24+830
 CONSTRUCT RC BRIDGE
 12.00x18.00

L = 130.77
 R = 572.96

L = 31.62
 R = 249.11

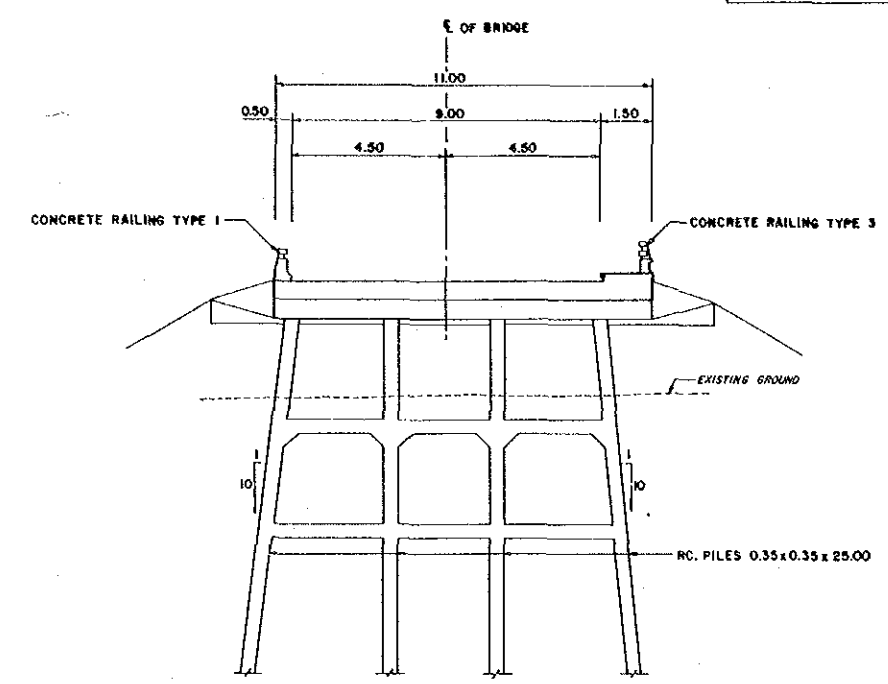
STA. 24+724.93 END OF PROJECT
 (STA. 24+840.00 SURVEY LINE)



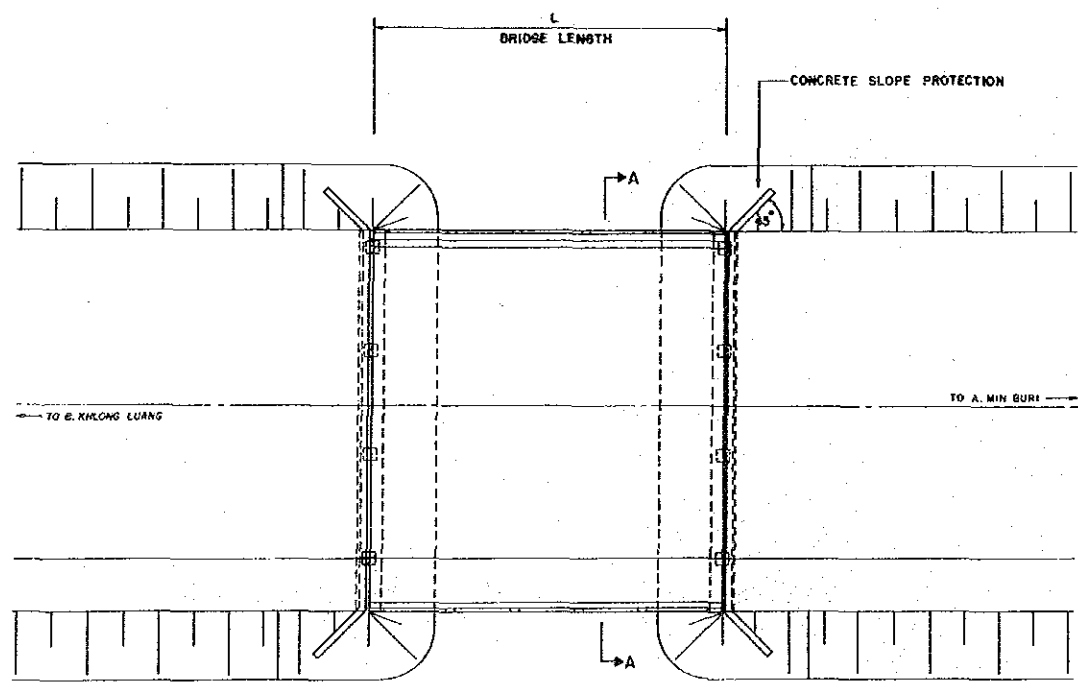
GENERAL ELEVATION
 SCALE 1 : 100

BH-3

M.	N-VALUE
	20 40 60 80
1	
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SECTION A-A
 SCALE 1 : 100



GENERAL PLAN
 SCALE 1 : 100

TABLE OF SUPERSTRUCTURE

STA. NO.	BRIDGE LENGTH	NUMBER OF SPAN	TYPE	THICKNESS	ELEVATION	HWL	EXISTING BRIDGE
13+395	8	1	RC SLAB	0.43	3.40	-	7x8
13+598	8	1	RC SLAB	0.43	4.00	2.00	7x8
15+916	10	1	RC SLAB	0.53	4.00	2.00	7x10
17+999	10	1	RC SLAB	0.53	4.00	2.00	7x10

ITEM	UNIT	QUANTITY				TOTAL
		STA. 13+395	STA. 13+598	STA. 15+916	STA. 17+999	
1. CONCRETE						
CLASS B (1 1/2) FOR BRIDGE DECK	M ³	44	44	68	68	224
CLASS B (1 1/2) FOR PILE BENT PIER & ABUTMENT	M ³	46	48	48	48	192
CLASS SPECIAL B (1 1/2) FOR BEARING UNIT SLAB	M ³	216	216	216	216	864
2. STEEL REINFORCEMENT	T	22	22	28	28	100
3. RC PILE 0.22 x 0.22 M.	LM	1936	1936	1936	1936	7744
4. RC PILE 0.35 x 0.35 M.	LM	262	262	262	262	1048
5. CONCRETE RAILING TYPE 1	LM	8	8	10	10	36
CONCRETE RAILING TYPE 3	LM	8	8	10	10	36
6. CONCRETE SLOPE PROTECTION	M ²	70	70	105	135	380

LIST OF EXISTING BRIDGES

STA. NO.	WIDTH & LENGTH (M.)	WITHDRAW (M ³)
13+395	7.0 x 8.0	24
13+598	7.0 x 8.0	24
15+916	7.0 x 10.0	37
17+999	7.0 x 10.0	37
TOTAL		122

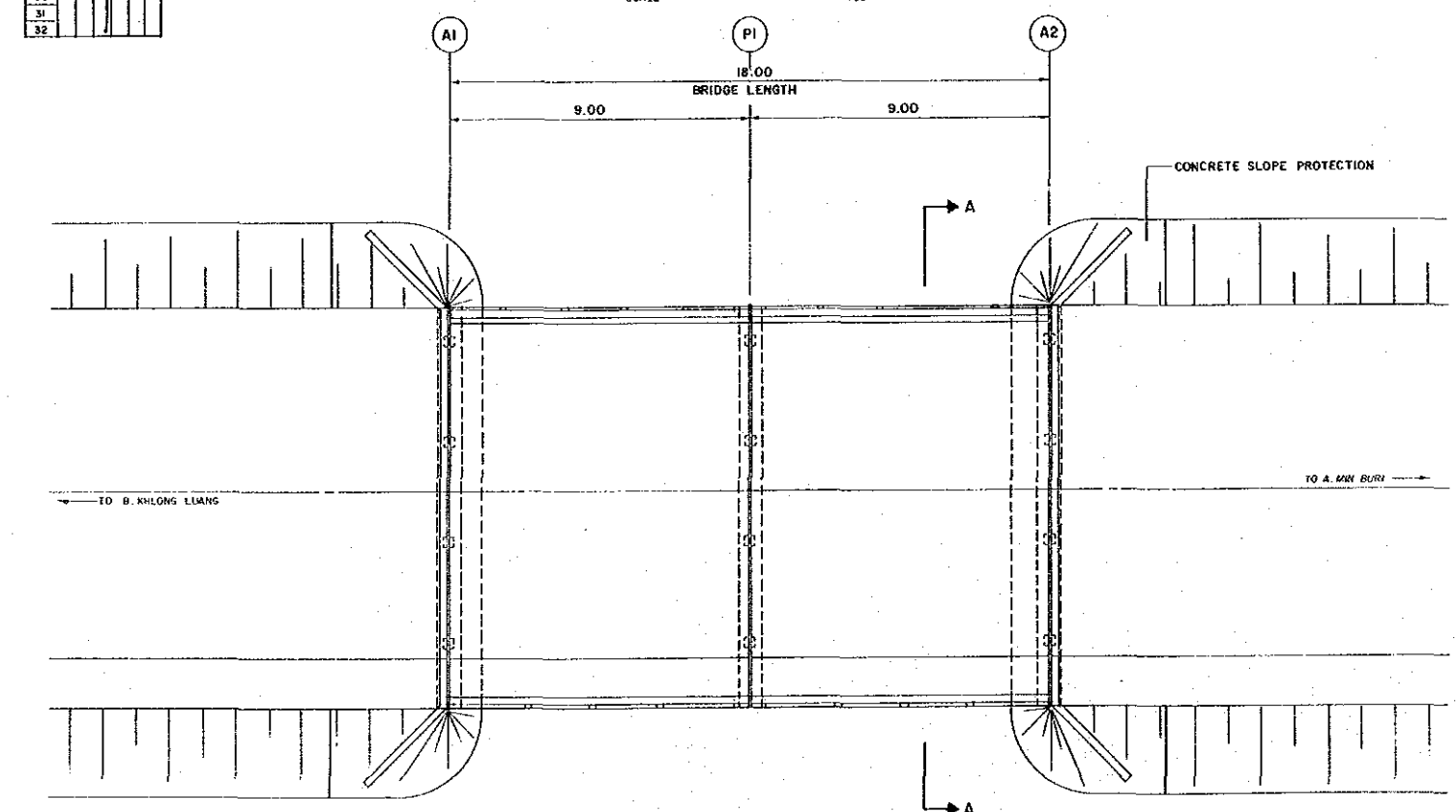
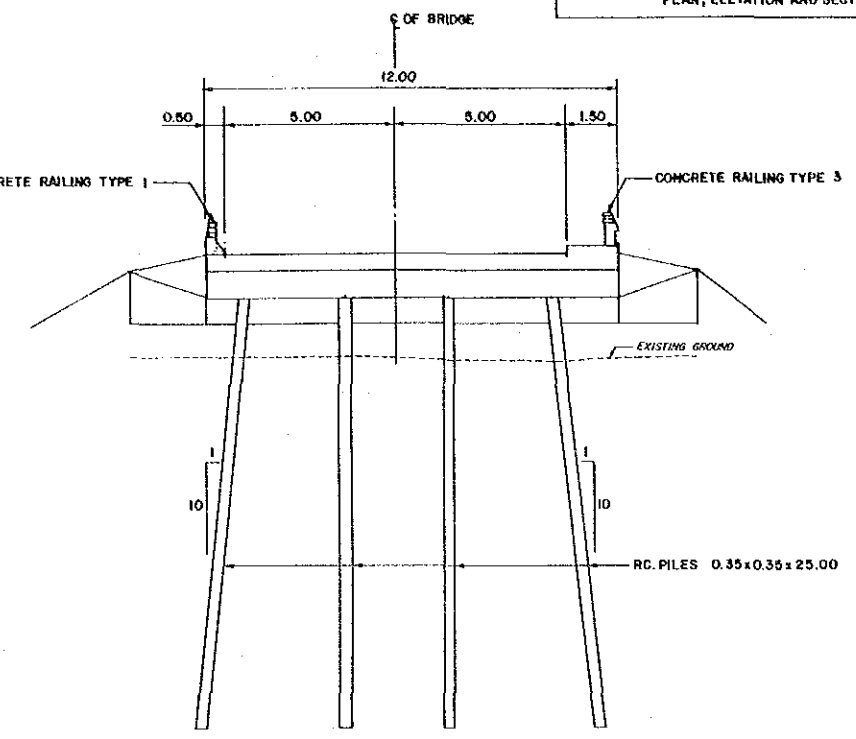
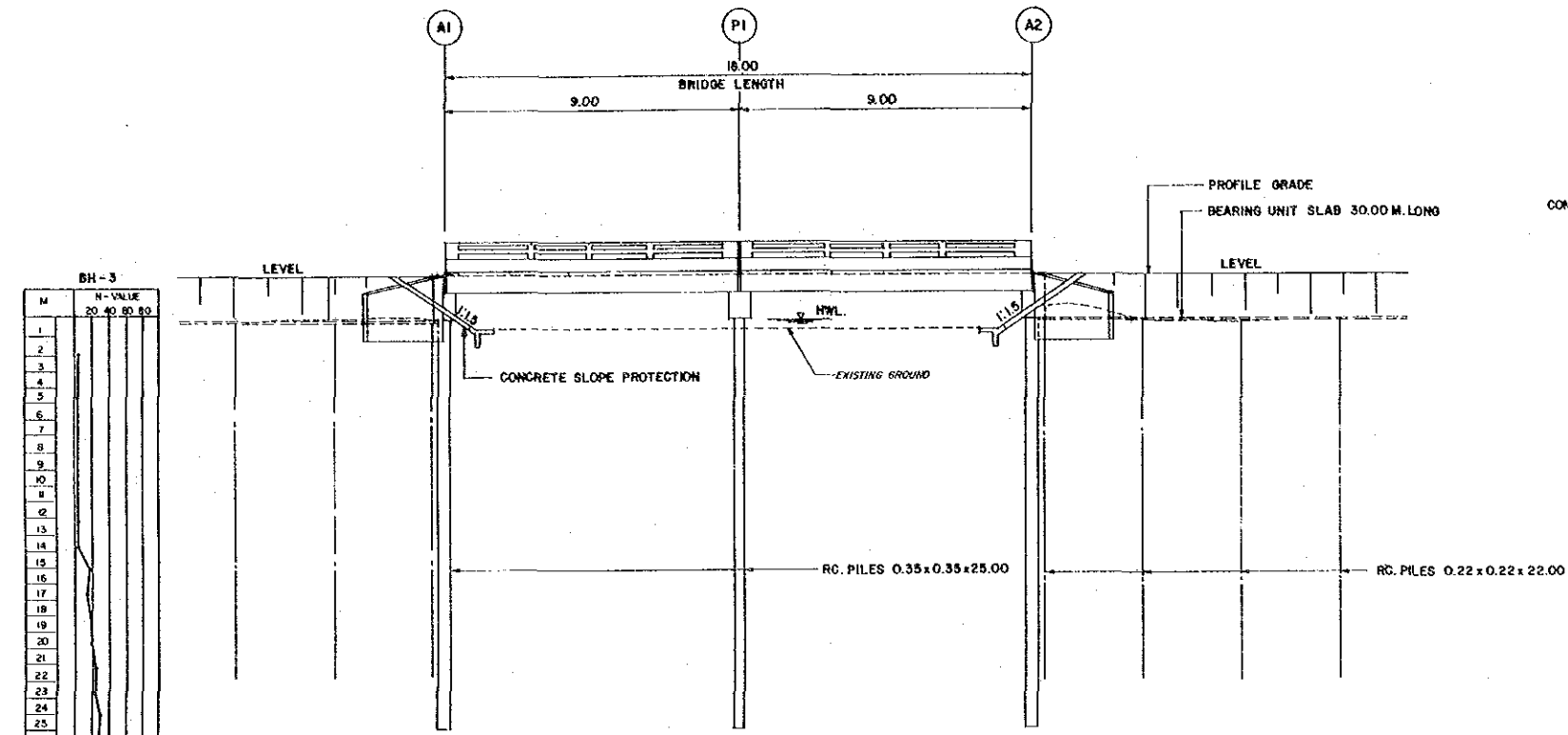


TABLE OF SUPERSTRUCTURE

STA. NO.	BRIDGE LENGTH	NUMBER OF SPAN	TYPE	THICKNESS	ELEVATION	EXISTING BRIDGE
19+683	18	2@9.00x18.00	RC. SLAB	0.47 M.	3.60	7 x 18
21+325	18	2@9.00x18.00	RC. SLAB	0.47 M.	3.60	7 x 18

ITEM	UNIT	QUANTITY		TOTAL
		STA. 19+683	STA. 21+325	
1. CONCRETE CLASS B (1/2) FOR BRIDGE DECK	M ³	110	110	220
CLASS B (1/2) FOR PILE BENT PIER & ABUTMENT	M ³	70	70	140
CLASS SPECIAL B (1/2) FOR BEARING UNIT SLAB	M ³	216	216	432
2. STEEL REINFORCEMENT	T	44	44	88
3. RC. PILE 0.22 x 0.22 M.	LM	1936	1936	3872
4. RC. PILE 0.35 x 0.35 M	LM	393	393	786
5. CONCRETE RAILING TYPE-1	LM	18	18	36
TYPE-3	LM	18	18	36
6. CONCRETE SLOPE PROTECTION	M ²	120	120	240

LIST OF EXISTING BRIDGES

STA. NO.	WIDTH & LENGTH (M.)	WITHDRAW (M ³)
19+683	7.0 x 18.0	59
21+325	7.0 x 18.0	59
TOTAL		118

PROJECT IM - 16

Changwat : Pathum Thani

A. Lam Luk Ka - B. Khlong 16

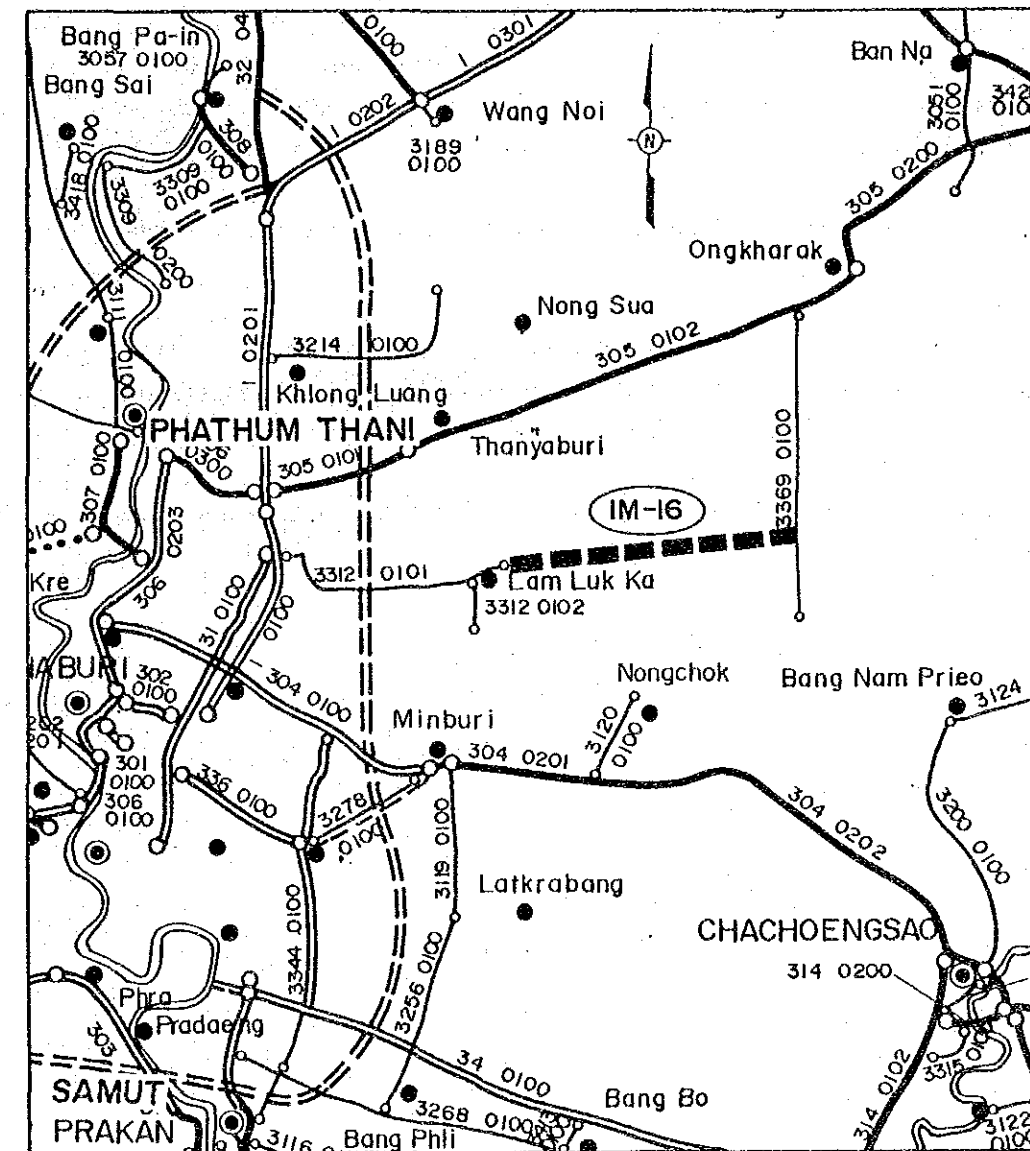
Length : 20.8 km

SUMMARY

PROJECT IM-16

ITEM	DESCRIPTION
Changwat	Pathum Thani/Nakhon Nayok
Origin	A. Lam Luk Ka
Destination	B. Khlong 16
Route No.	Rt. 3312
Project Length	20.80 km
Standard	
- Existing	—
- Proposed	F3
Traffic	
- Base	274 ~ 540
- 2000	600 ~ 1,200
- 2008	1,000 ~ 1,900
Pavement Type	
- Existing	Laterite
- Proposed	AC pavement (t=5)
Bridges	
- New Construction	9 sites, 337 m
- Replacement	—
Construction Costs	
- Financial	118,251,000 Baht
- Economic	104,355,000 Baht
Economic Evaluation	
- IRR	19.9%
- B/C	1.76

LOCATION OF PROJECT ROUTE



SCALE
5 0 10 Km.

LEGEND :

- ▬▬▬▬ PROJECT ROUTE
- ▬▬▬▬ DIVIDED HIGHWAYS
- ▬▬▬▬ NATIONAL HIGHWAYS
- ▬▬▬▬ PROVINCIAL HIGHWAYS
- ▬▬▬▬ PROVINCIAL HIGHWAYS (Unpaved)
- , ● CHANGWAT, AMPHOE

1. GENERAL

The proposed route lies in Changwat Pathum Thani and Changwat Nakhon Nayok.

It originates at the end of paved Route 3312 in Amphoe Lak Lum Ka, runs eastward crossing eight khlongs and ends in Ban Khlong Sib Hok with a total length of 20.8 km.

Out of the eight khlongs located at about 2.5 km intervals, three (Khlongs 9, 10 and 11) are equipped with wooden bridges (W = 400 m, L = 4,400 m) sufficient for motor vehicles. One khlong has only a 2 m wide wooden bridge limited to passenger cars and motorcycles. The remaining four khlongs have no bridges and vehicles are forced to make detours to go to the other side.

The surrounding area is well cultivated with paddy and houses are densely built along the khlongs. The existing road is entirely of laterite.

In terms of horizontal alignment few problems exist along this route. However, new concrete bridges are required for all eight khlong crossings. The road surface needs to be raised as H.W.L. in this area is 1.80 m, about the same level as the existing road surface.

Upon completion of the proposed road, accessibility of area residents to Bangkok will be greatly improved.

2. TRAFFIC FORECAST

Base Traffic Volume

(Unit: Vehicles/Day)

Project Code	Section	Year	Traffic Volume							ADT
			MC	PC	LB	HB	LT	MT	HT	
IM-16	3312	1988	355	50	39	51	344	37	19	540
	PWD	1988	151	7	77	0	148	7	35	274

Traffic Growth Rate

(Unit: Percent)

Project Code	Section	Period	MC	PC	LB	HB	LT	MT	HT
			IM-16	3312	-1993	6.78	8.30	5.70	5.73
		1994-2000	5.95	6.65	5.09	5.05	4.99	4.45	5.71
		2000-2008	6.67	7.39	5.86	5.87	5.63	5.62	5.70
PWD		-1993	6.78	8.30	5.70	5.73	5.66	6.62	3.47
		1994-2000	5.95	6.65	5.09	5.05	4.99	4.45	5.71
		2000-2008	6.67	7.39	5.86	5.87	5.63	5.62	5.70

Induced Traffic Volume

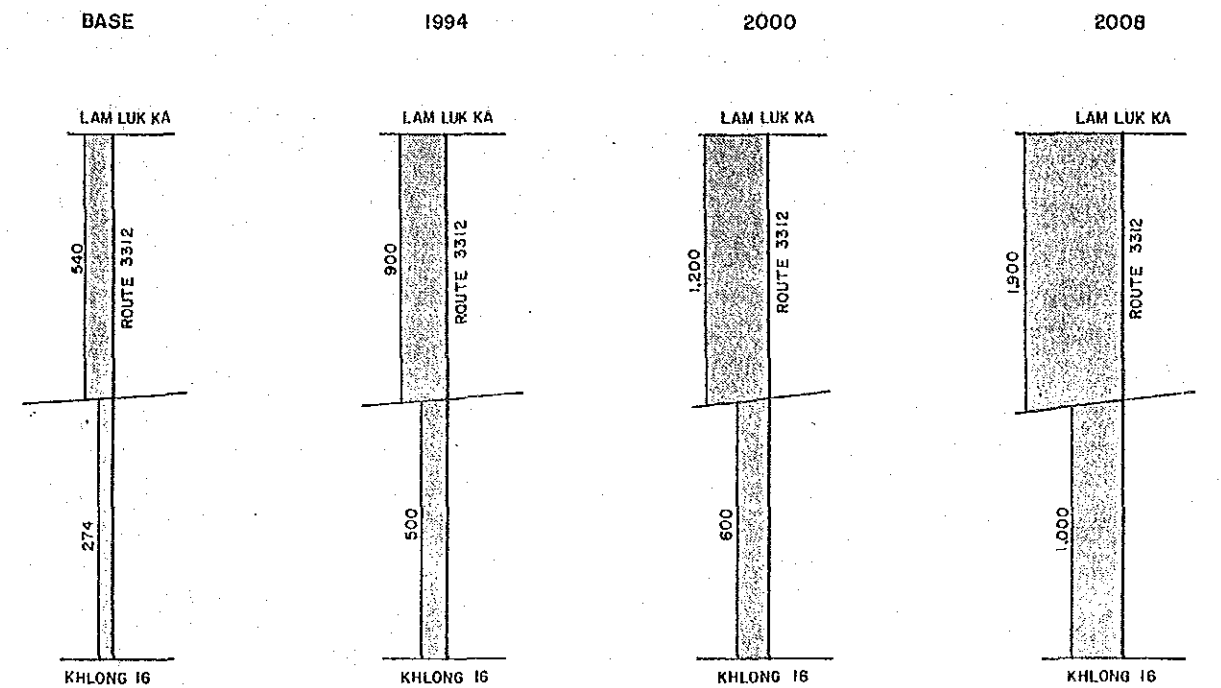
(Unit: Vehicles/Day)

Project Code	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
			IM-16	3312	1994	103	18	13	10	109
		2000	146	26	17	13	146			202
		2008	245	46	27	21	226			320
PWD		1994	47	5	27	0	48			80
		2000	66	8	36	0	64			108
		2008	111	14	57	0	99			170

Future Traffic Volume

(Unit: Vehicles/Day)

Project Code	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
			IM-16	3312	1994	626	97	67	81	585
		2000	884	143	90	108	783	69	33	1226
		2008	1483	253	142	171	1213	107	52	1938
PWD		1994	269	27	133	2	243	10	44	459
		2000	380	40	180	2	325	13	61	621
		2008	637	72	284	3	503	20	95	977



UNIT: VEHICLE / DAY

PROJECT IM - 16

3. ENGINEERING

3.1 Materials and Boring Results

(1) Materials

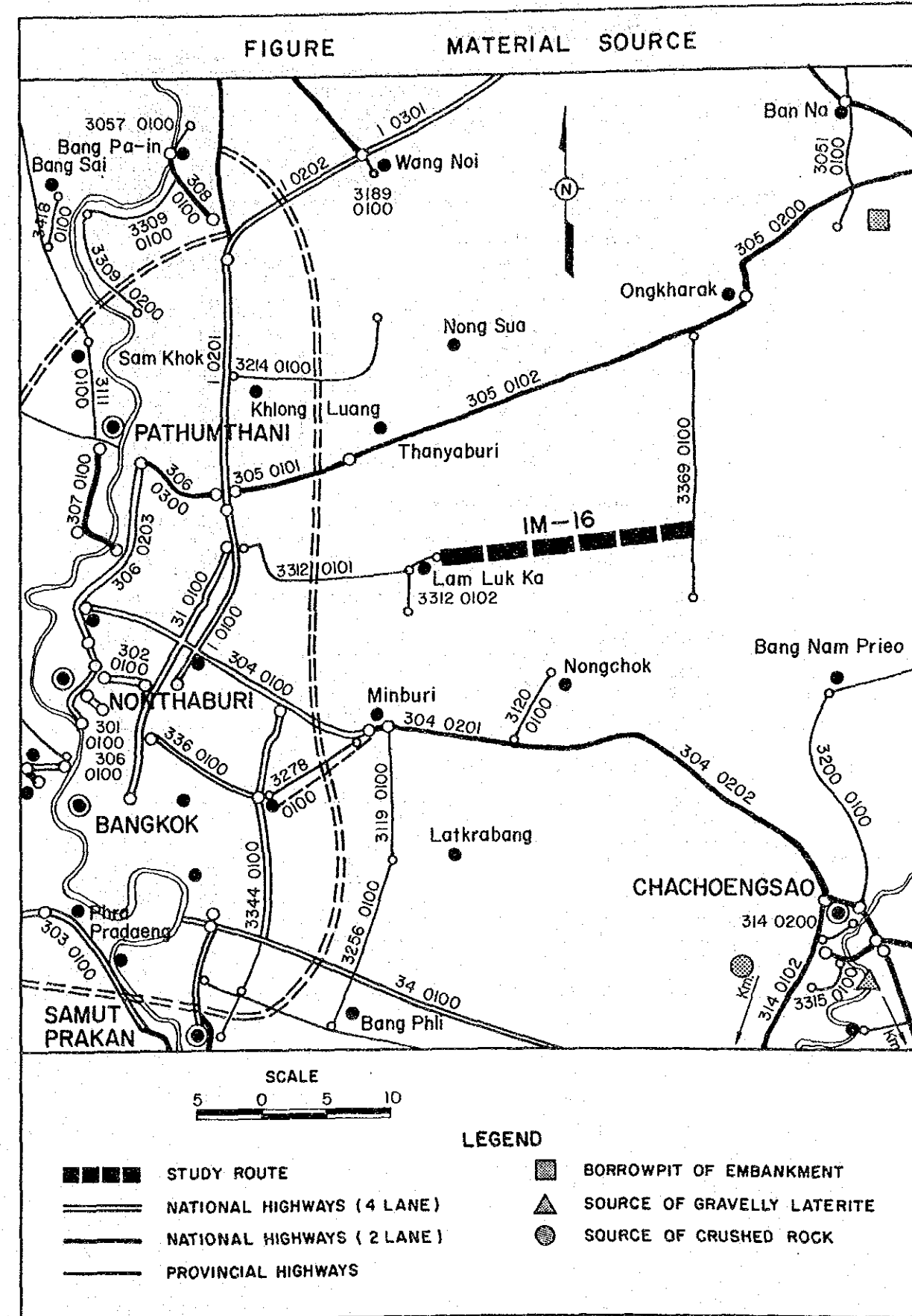
DESCRIPTION OF MATERIAL SOURCES

Material	Source	Description of Sample	Estimated Quantity cu.m.	Hauling Distance (km)
Soil	Route 305 Km 37+000 Left Side 0.3 Km	Silty Clayed Fine Sand	Plentiful	25
Laterite	Route 2 Km 118+000 Left Side 3.6 Km	Gravelly Laterite	Plentiful	82
Crushed Rock	Route 1 Km 129+500 Both Sides	Lime Stone	Plentiful	97

RESULTS OF LABORATORY TESTS

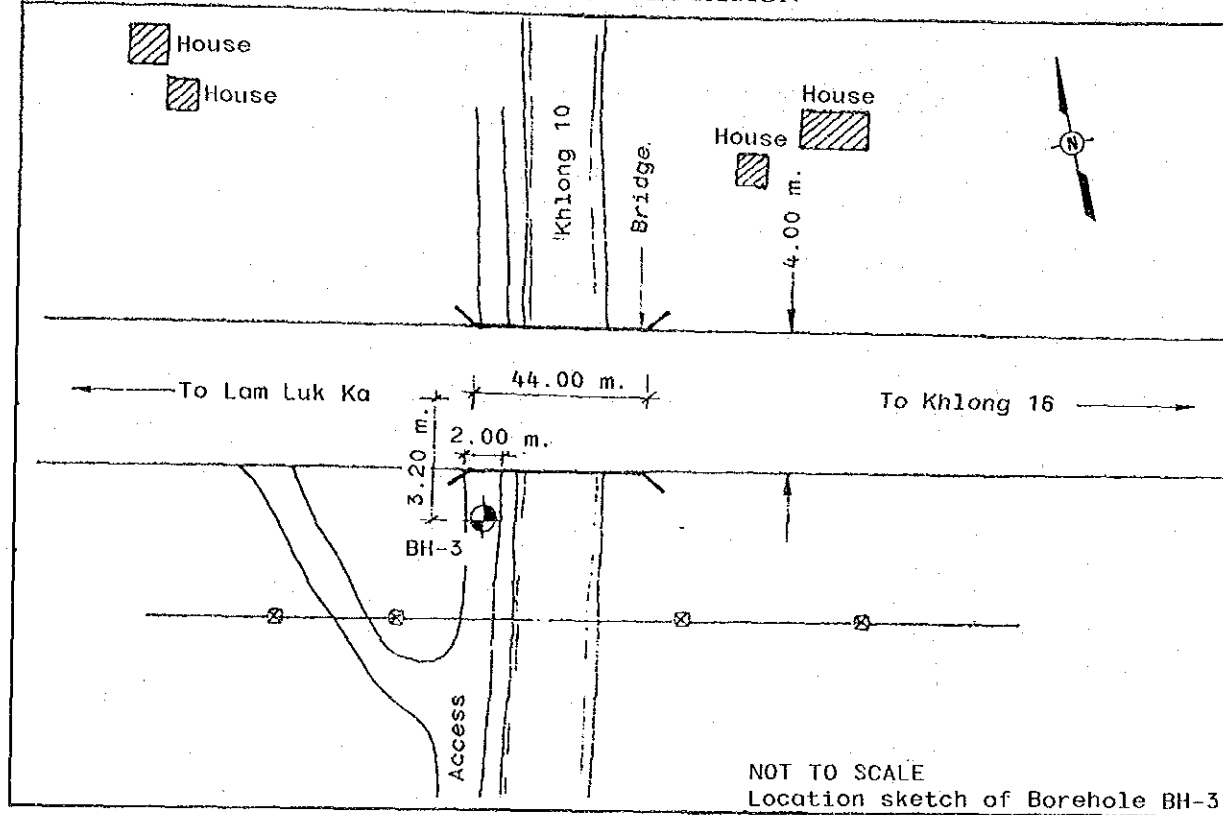
	Sieve Analysis % Passing								Plasticity		Comp. DH-T Stand.		Lab. C.B.R.	
	50.0	25.0	19.0	9.5	#4	#10	#40	#200	LL	PI	Opt. 95%	gn/cc	CBR 95%	Swell %
Soil					100	96	84	34	22.0	9.1	10.3	2.00	6.0	0.1
Laterite	100	93	86	62	39	27	8	24.3	8.2	6.8	2.06	43	-	
Crushed Rock												>80		

Note : Abrasion test result of Crushed Rock 22.6 %



(2) Boring Results

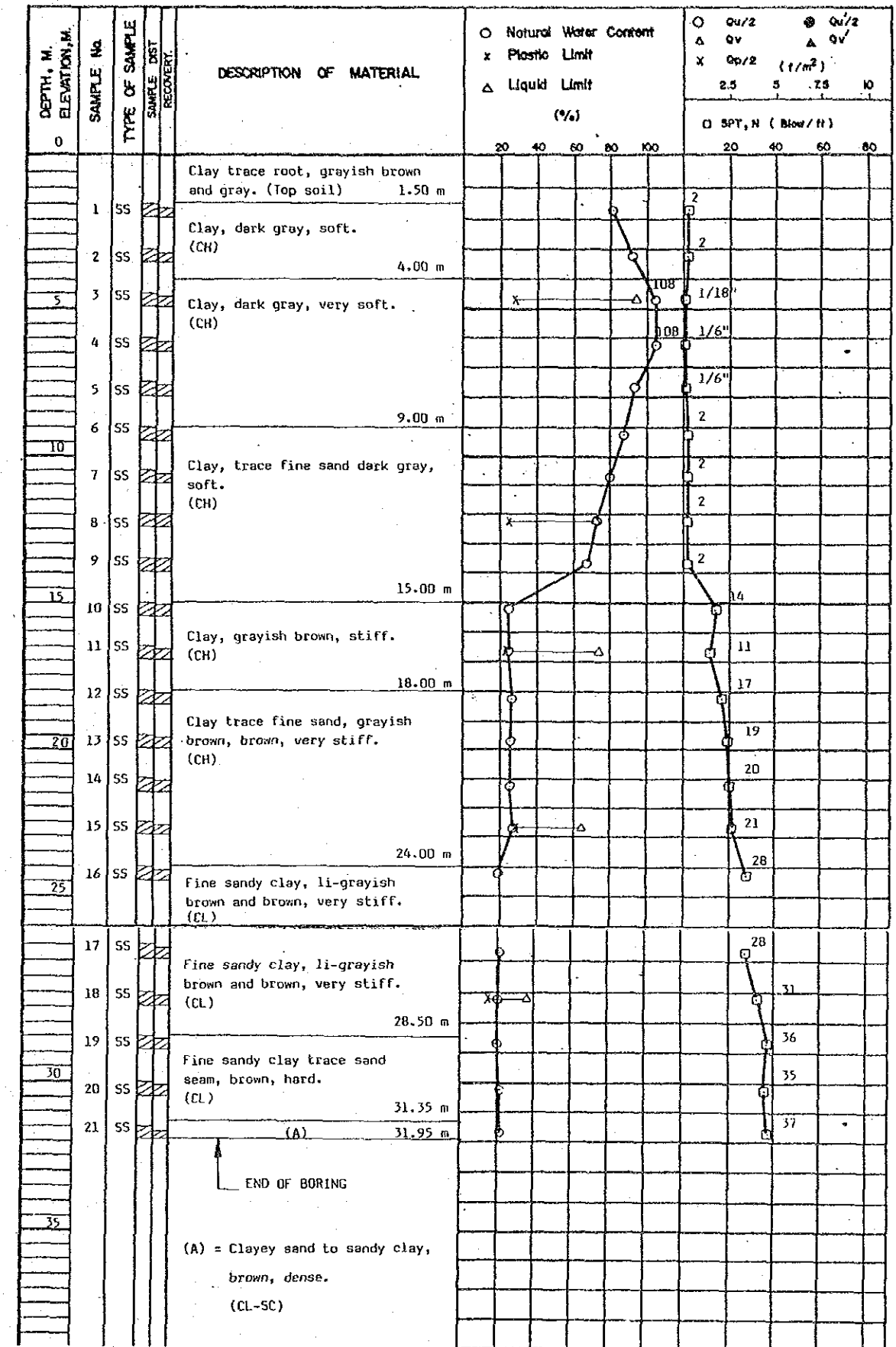
BOREHOLE LOCATION



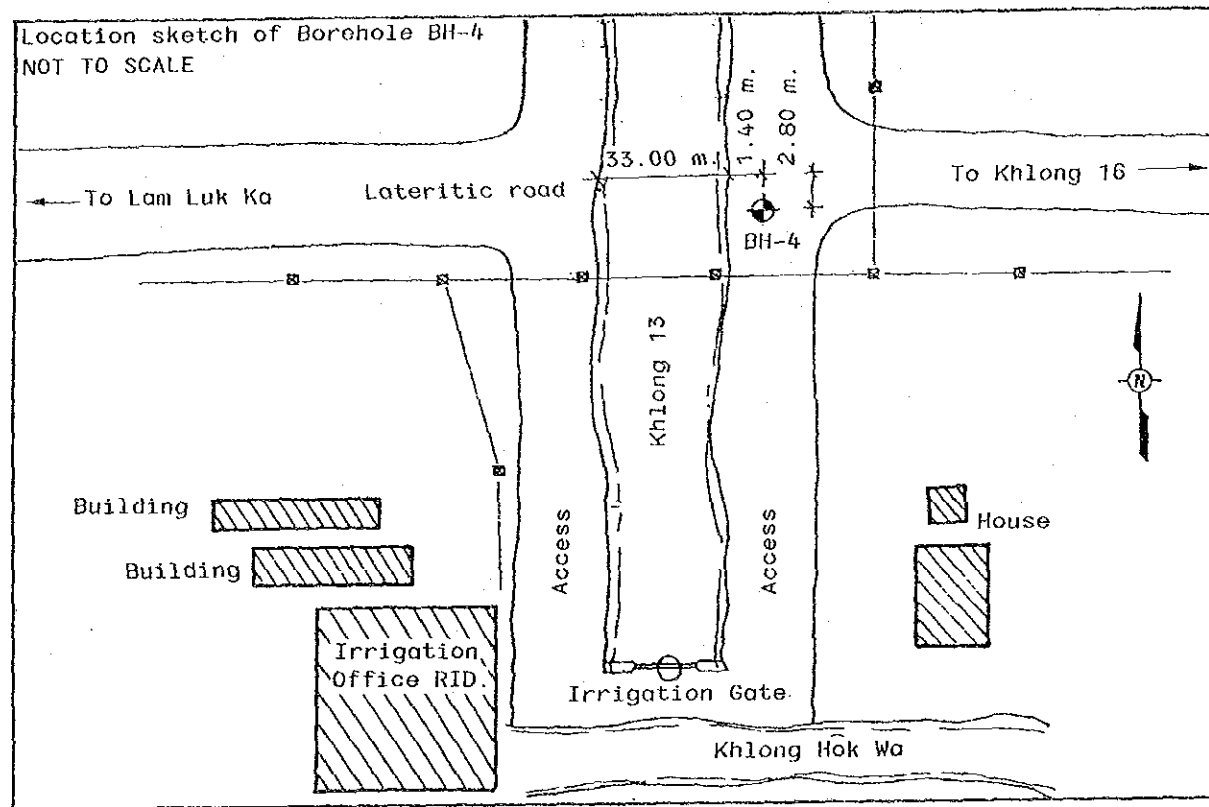
SUMMARY OF TEST RESULTS

SAMPLE No.	DEPTH M.		WATER CONTENT %	ATTERBERG LIMIT %			WET UNIT WEIGHT γ_{w, m^3}	SIEVE ANALYSIS % FINER					CLASSIFICATION	UNDRAINED SHEAR STRENGTH γ_{m^2}				STANDARD PENETRATION (N)
	FROM	TO		LL	PL	PI								UNCONFINED SHEAR		FIELD VANE SHEAR		
								No. 3/8"	No. 4	No. 10	No. 40	No. 200		Qu2	Qu/2	Qv	Qv'	
SS-1	1.50	1.95	81.3				1.57		100	99	98	CH						2
SS-2	3.00	3.45	91.1				1.50					CH						2
SS-3	4.50	4.95	107.6	75.1	28.8	46.3	1.46					CH					1/18"	
SS-4	6.00	6.45	107.5						100	99	97	CH					1/6"	
SS-5	7.50	7.95	93.4				1.43					CH					1/6"	
SS-6	9.00	9.45	88.3				1.50					CH					2	
SS-7	10.50	10.95	79.7									CH					2	
SS-8	12.00	12.45	72.5	72.3	25.3	47.0	1.60					CH					2	
SS-9	13.50	13.95	68.9				1.63			100	90	CH					2	
SS-10	15.00	15.45	24.7				2.00					CH					13.7	
SS-11	16.50	16.95	24.7	74.0	24.1	49.9	1.98			100	99	CH					15.0	
SS-12	18.00	18.45	25.5				2.01					CH					22.5	
SS-13	19.50	19.95	25.3									CH					22.5	
SS-14	21.00	21.45	25.4				2.00			100	99	96	CH				22.5	
SS-15	22.50	22.95	25.6	64.3	26.7	37.6	1.97					CH					21	
SS-16	24.00	24.45	19.2				2.14					CL					28	
SS-17	25.50	25.95	21.4							100	98	98	97	67	CL		28	
SS-18	27.00	27.45	20.1	37.0	16.3	20.7	2.10					CL					31	
SS-19	28.50	28.95	20.0							100	99	98	64	CL			36	
SS-20	30.00	30.45	20.5									CL					35	
SS-21	31.50	31.95	20.9							100	99	52	CL-S				37	

BORING LOG



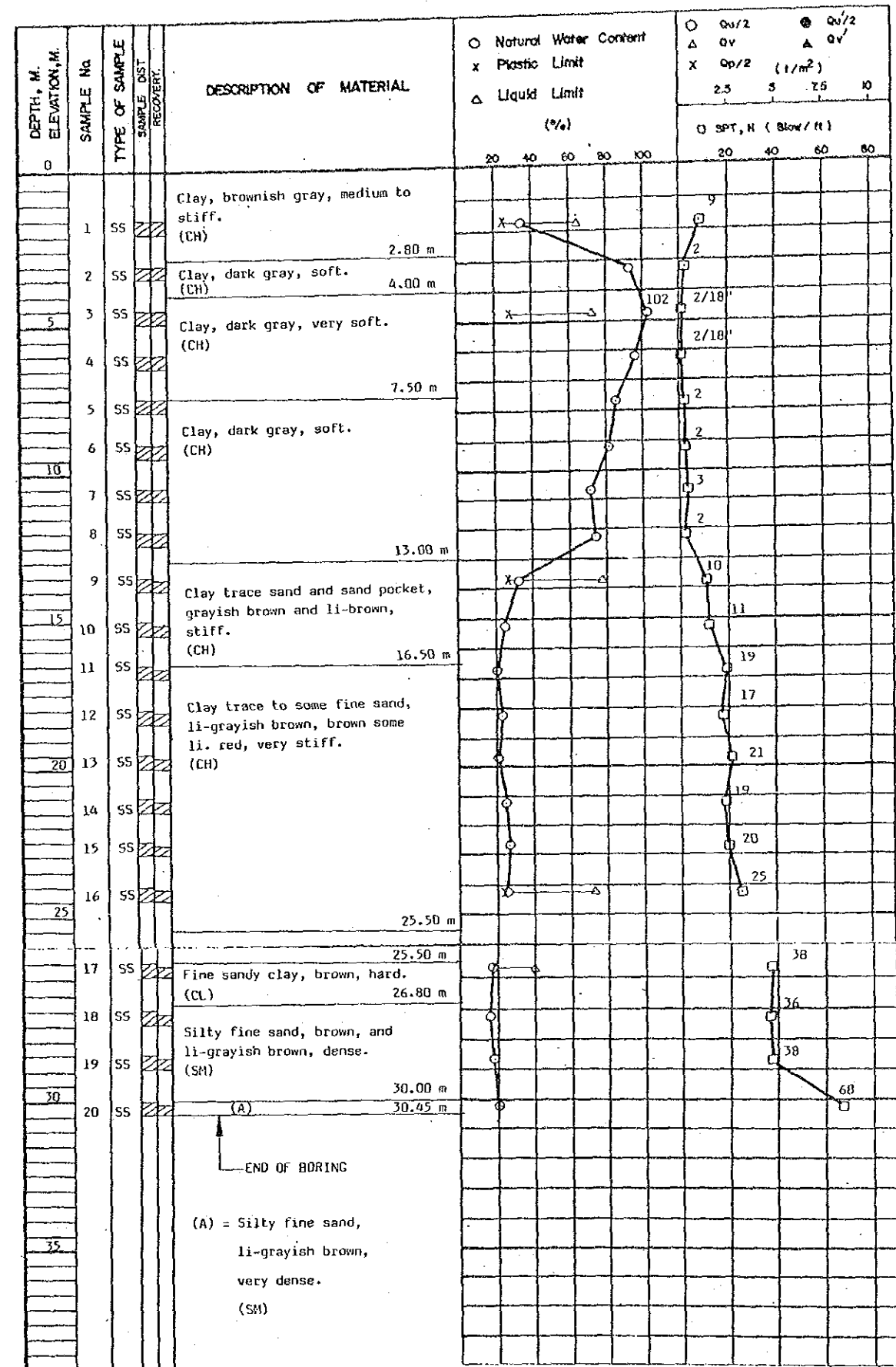
BOREHOLE LOCATION



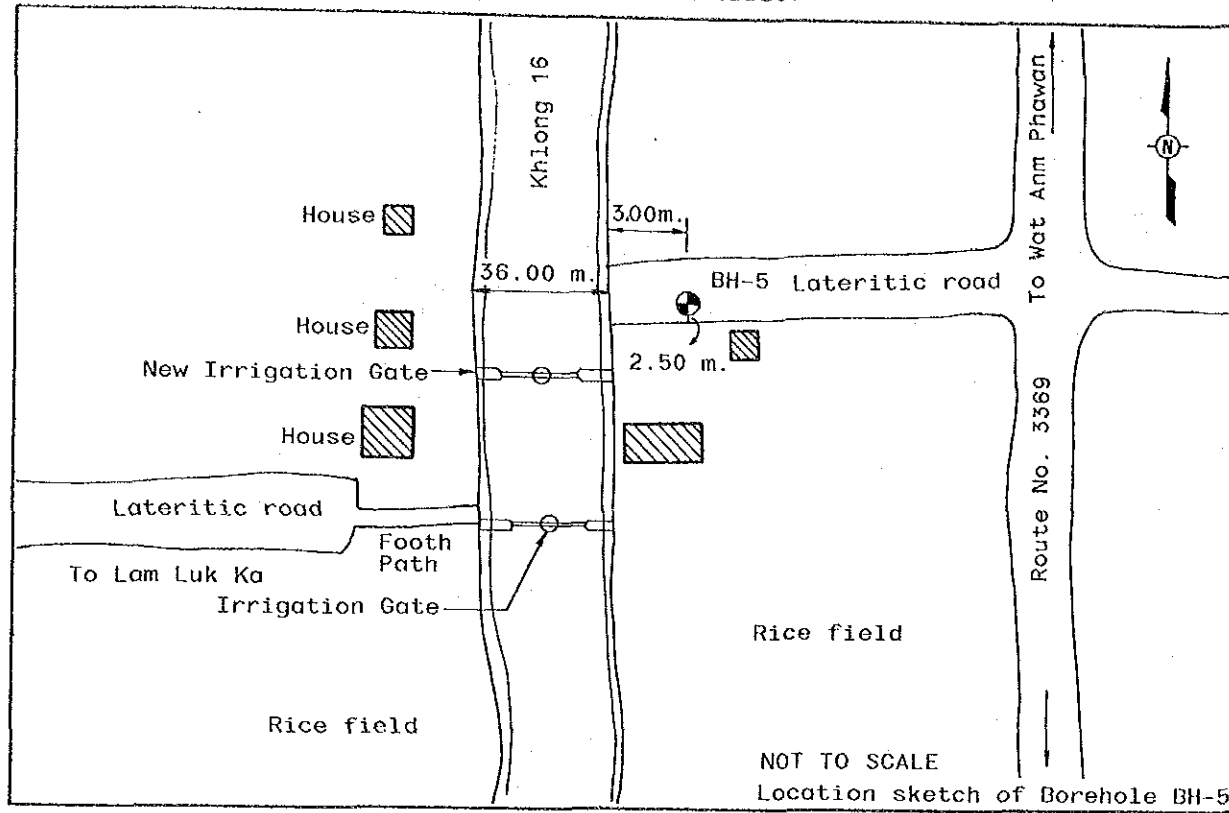
SUMMARY OF TEST RESULTS

SAMPLE No.	DEPTH M.		WATER CONTENT %	ATTERBERG LIMIT %			WET UNIT WEIGHT γ_{m^3}	SIEVE ANALYSIS % FINER					CLASSIFICATION	UNDRAINED SHEAR STRENGTH kg/cm^2				STANDARD PENETRATION (N)
	FROM	TO		LL	PL	PI		No. 3/8"	No. 4	No. 10	No. 40	No. 200		UNCONFINED SHEAR		FIELD VANE SHEAR		
														Q_u	$Q_u/2$	Q_v	Q_v'	
SS-1	1.50	1.95	32.9	65.4	24.9	40.5	1.79		100	99	99	CH					6.2	9
SS-2	3.00	3.45	91.0				1.51					CH					1.2	2
SS-3	4.50	4.95	101.9	73.2	28.0	45.2						CH				-	2/18"	
SS-4	6.00	6.45	97.3				1.46		100	99		CH				1.2	2/18"	
SS-5	7.50	7.95	85.5				1.54					CH				2.5	2	
SS-6	9.00	9.45	80.9									CH				2.5	2	
SS-7	10.50	10.95	71.3				1.59					CH				2.5	3	
SS-8	12.00	12.45	74.3				1.56		100	99	98	CH				2.5	2	
SS-9	13.50	13.95	32.7	78.4	28.1	50.3	1.88					CH				13.7	10	
SS-10	15.00	15.45	24.7				1.96		100	99	93	CH				18.7	11	
SS-11	16.50	16.95	20.2				2.01					CH				18.7	19	
SS-12	18.00	18.45	22.3				2.05		100	99	98	CH				22.5	17	
SS-13	19.50	19.95	20.8				2.09					CH				22.5	21	
SS-14	21.00	21.45	24.5				2.00					CH				21.2	19	
SS-15	22.50	22.95	26.7									CH				-	20	
SS-16	24.00	24.45	26.3	70.9	24.9	46.0						CH					25	
SS-17	25.50	25.95	18.4	40.2	18.5	21.7	2.11	100	99	93	79	CL					38	
SS-18	27.00	27.45	15.3						100	87	25	SM						36
SS-19	28.50	28.95	18.3									SM						38
SS-20	30.00	30.45	19.8						100	99	84	29	SM					68

BORING LOG



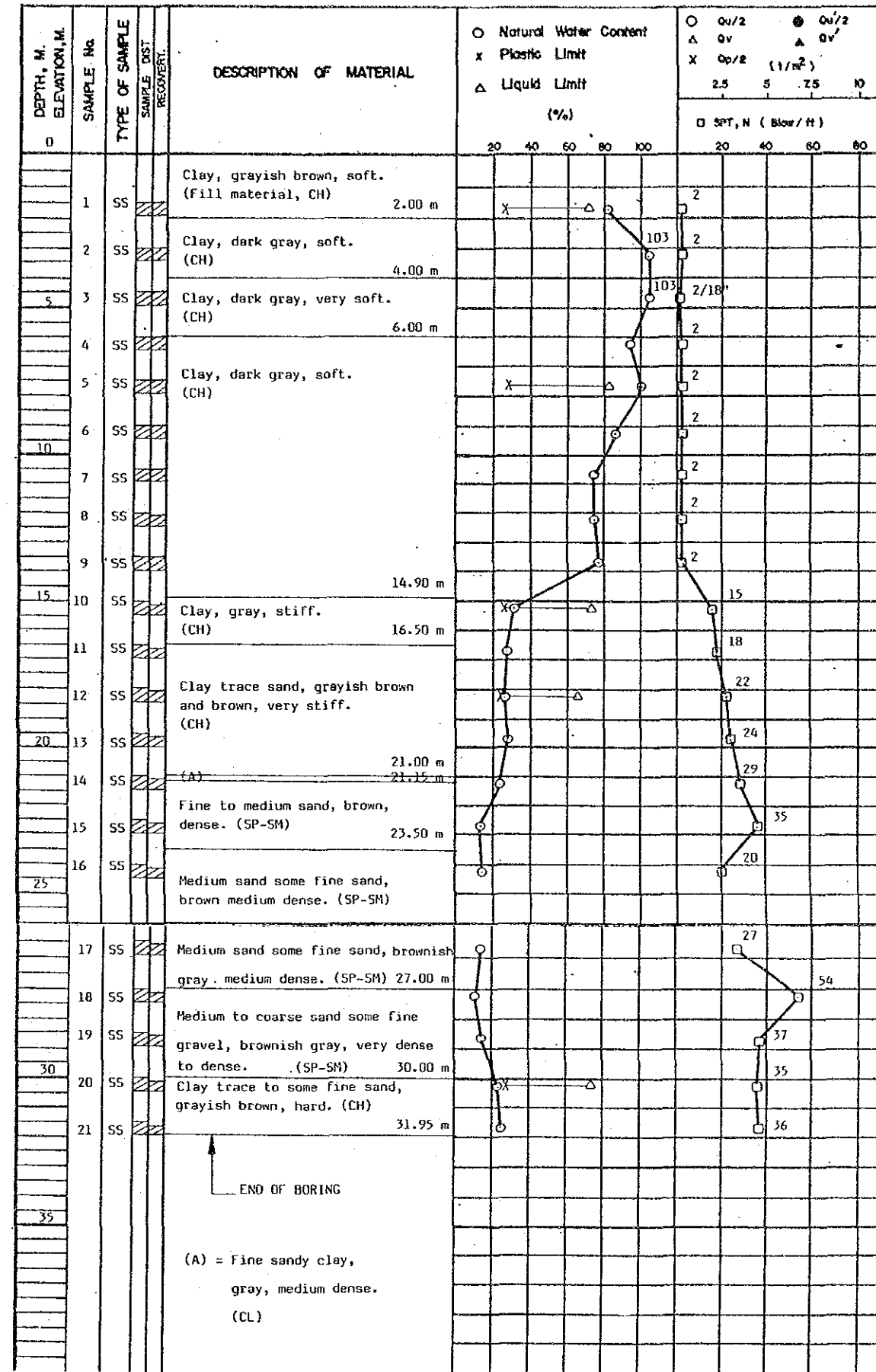
BOREHOLE LOCATION



SUMMARY OF TEST RESULTS

SAMPLE No.	DEPTH M.		WATER CONTENT %	ATTERBERG LIMIT %			WET UNIT WEIGHT γ_{wet}	SIEVE ANALYSIS % FINER					CLASSIFICATION	UNDRAINED SHEAR STRENGTH γ_{un}				STANDARD PENETRATION (N)	
	FROM	TO		LL	PL	PI								UNCONFINED SHEAR		FIELD VANE SHEAR			
						No. 3/8"		No. 4	No. 10	No. 40	No. 200	$Q_{u/2}$		$Q_{u/2}$	Q_v	Q_v'			
SS-1	1.50	1.95	80.7	70.8	25.7	45.1	1.56					100	CH					5.0	2
SS-2	3.00	3.45	102.7										CH					3.7	2
SS-3	4.50	4.95	102.8				1.45						CH					1.2	2/18"
SS-4	6.00	6.45	93.8				1.49					100	CH					1.2	2
SS-5	7.50	7.95	100.1	82.0	27.6	54.4	1.46						CH					2.5	2
SS-6	9.00	9.45	85.7										CH					2.5	2
SS-7	10.50	10.95	75.4				1.57					100	CH					2.5	2
SS-8	12.00	12.45	75.4										CH					3.7	2
SS-9	13.50	13.95	78.4				1.55						CH					3.7	2
SS-10	15.00	15.45	30.0	72.5	26.1	46.4							CH					13.7	15
SS-11	16.50	16.95	26.7				1.94				100	99	98	CH				15.0	18
SS-12	18.00	18.45	26.1	66.1	25.3	40.8	1.97						CH					21.2	22
SS-13	19.50	19.95	26.6				1.88						CH					22.5	24
SS-14	21.00	21.45	23.0								100	55	CL					-	29
SS-15	22.50	22.95	12.6										SP-SM					-	35
SS-16	24.00	24.45	14.2					100	96	79	32	11	SP-SM						20
SS-17	25.50	25.95	12.1										SP-SM						27
SS-18	27.00	27.45	10.4					94	73	44	20	10	SP-SM						54
SS-19	28.50	28.95	12.2										SP-SM						37
SS-20	30.00	30.45	22.3	74.2	24.7	49.5	2.04				100	99	86	CH					35
SS-21	31.50	31.95	23.8				1.99						CH						36

BORING LOG

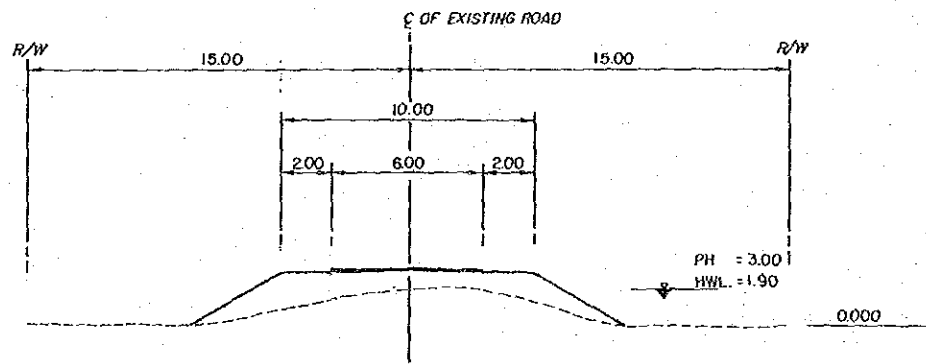


3.2 Preliminary Design

(1) Geometric Design Criteria

Design Standard : F-3
 Design Speed : 70-90 km/h
 Geometric Design Criteria

Description	Design Speed (km/h)		
	70	80	90
Minimum Radius & Curvature (m)	160	210	280
Minimum Stopping Sight Distance (m)	90	115	140
Maximum Gradient (%)	7	6	5



TYPICAL CROSS SECTION
 IM-16 ROAD CLASS F3

(2) Pavement Design

Design CBR of Subgrade	Cumulative No. of ESA W18 x 10 (10 years)	Thickness of Pavement Structure (cm)	
4.0	280	Surface	5.0
		Base	20
		Subbase	15

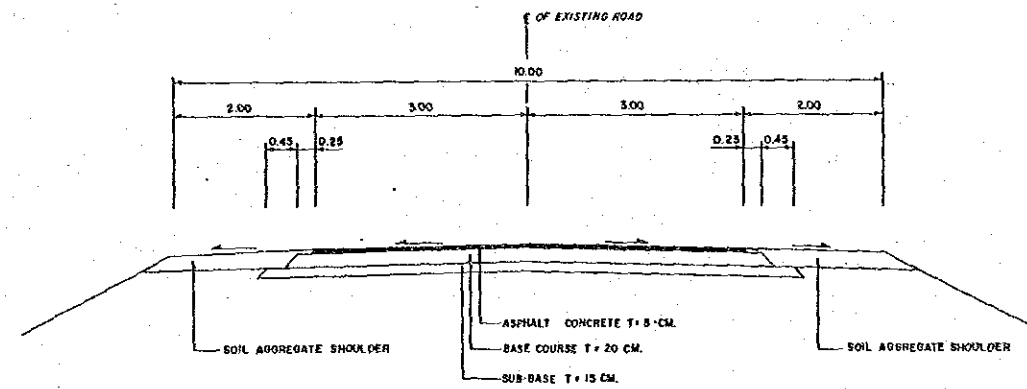


FIGURE TYPICAL PAVEMENT STRUCTURE FOR FLEXIBLE PAVEMENT IM-16

(3) Culverts

NO.	CHAINAGE	EXISTING CULVERT	NEW CULVERT
1	18+700	-	RCP 1-Dia 1.00x12.00
2	18+893	-	BOX 1-2.00x3.00x11.00
3	19+150	-	RCP 1-Dia 1.00x12.00
4	19+559	-	BOX 1-2.00x3.00x11.00
5	19+814	RCP 1-Dia 0.40x 8.30	RCP 1-Dia 1.00x12.00
6	20+029	RCP 1-Dia 0.60x11.00	EXTEND 1-0.60x 2.00
7	20+064	RCP 1-Dia 0.60x10.00	EXTEND 1-0.60x 4.00
8	20+105	RCP 1-Dia 0.60x12.00	EXTEND 1-0.60x 2.00
9	20+344	RCP 1-Dia 1.00x10.30	EXTEND 1-1.00x 4.00
10	20+395	RCP 1-Dia 1.00x10.40	EXTEND 1-1.00x 2.00
11	20+543	RCP 1-Dia 0.60x11.00	EXTEND 1-0.60x 4.00
12	20+589	RCP 1-Dia 0.60x13.00	EXTEND 1-0.60x 2.00
13	21+049	-	BOX 1-2.00x3.00x11.00
14	21+378	RCP 1-Dia 0.60x10.00	EXTEND 1-0.60x 4.00
15	21+427	RCP 1-Dia 0.60x10.40	EXTEND 1-0.60x 4.00
16	21+598	RCP 1-Dia 0.30x 9.00	RCP 1-Dia 1.00x10.00
17	21+805	RCP 1-Dia 0.60x10.50	EXTEND 1-0.60x 2.00
18	21+902	RCP 1-Dia 0.60x10.40	EXTEND 1-0.60x 2.00
19	22+007	RCP 1-Dia 0.60x 8.00	EXTEND 1-0.60x 4.00
20	22+120	RCP 1-Dia 0.60x 9.00	EXTEND 1-0.60x 2.00

NO.	CHAINAGE	EXISTING CULVERT	NEW CULVERT
21	22+198	RCP 1-Dia 0.60x10.00	EXTEND 1-0.60x 2.00
22	22+468	-	BOX 1-2.00x3.00x11.00
23	22+750	RCP 1-Dia 0.60x11.90	EXTEND 1-0.60x 2.00
24	22+891	RCP 1-Dia 0.60x11.00	EXTEND 1-0.60x 2.00
25	22+992	RCP 1-Dia 0.60x 9.00	EXTEND 1-0.60x 4.00
26	23+095	RCP 1-Dia 0.60x10.30	EXTEND 1-0.60x 2.00
27	23+497	RCP 1-Dia 0.60x13.20	EXTEND 1-0.60x 2.00
28	23+750	-	RCP 1-Dia 1.00x12.00
29	23+954	RCP 1-Dia 1.00x11.50	EXTEND 1-1.00x 2.00
30	24+172	RCP 1-Dia 0.60x 9.00	EXTEND 1-0.60x 2.00
31	24+383	-	BOX 1-2.00x3.00x11.00
32	24+623	RCP 1-Dia 0.30x 8.50	RCP 1-Dia 1.00x12.00
33	24+717	RCP 1-Dia 0.30x 9.50	RCP 1-Dia 1.00x12.00
34	24+908	RCP 1-Dia 0.30x 9.00	RCP 1-Dia 1.00x12.00
35	25+116	RCP 1-Dia 0.30x12.00	RCP 1-Dia 1.00x13.00
36	25+367	-	BOX 1-2.00x3.00x11.00
37	25+527	RCP 1-Dia 0.30x10.20	RCP 1-Dia 1.00x12.00
38	25+568	RCP 1-Dia 0.30x10.20	RCP 1-Dia 1.00x12.00
39	25+800	-	RCP 1-Dia 1.00x11.00
40	26+350	-	RCP 1-Dia 1.00x12.00

NO.	CHAINAGE	EXISTING CULVERT	NEW CULVERT
41	26+794	RCP 1-Dia 0.30x 9.80	RCP Dia 1-1.00x12.00
42	27+018	RCP 1-Dia 0.60x10.60	EXTEND 1-Dia 0.60x 2.00
43	27+612	RCP 1-Dia 0.60x10.20	EXTEND 1-Dia 0.60x 4.00
44	27+858	RCP 1-Dia 0.60x 9.50	EXTEND 1-Dia 0.60x 2.00
45	28+175	-	RCP 1-Dia 1.00x12.00
46	28+920	-	RCP 1-Dia 1.00x12.00
47	29+129	RCP 1-Dia 0.30x 8.10	RCP 1-Dia 1.00x12.00
48	29+195	RCP 1-Dia 1.00x11.30	EXTEND 1-Dia 1.00x 2.00
49	29+401	RCP 1-Dia 0.60x 8.20	EXTEND 1-Dia 0.60x 4.00
50	29+526	RCP 1-Dia 0.60x 9.00	EXTEND 1-Dia 0.60x 4.00
51	29+637	RCP 1-Dia 0.30x 7.00	RCP 1-Dia 1.00x14.00
52	29+806	RCP 1-Dia 0.30x 8.90	RCP 1-Dia 1.00x12.00
53	29+962	RCP 1-Dia 0.50x 6.00	RCP 1-Dia 1.00x12.00
54	30+167	RCP 1-Dia 0.50x 7.00	RCP 1-Dia 1.00x12.00
55	30+355	RCP 1-Dia 0.30x 5.80	RCP 1-Dia 1.00x12.00
56	30+609	RCP 1-Dia 0.60x,6.50	EXTEND 1-Dia 0.60x6.00
57	30+999	RCP 1-Dia 0.30x12.00	RCP 1-Dia 1.00x13.00
58	31+115	RCP 1-Dia 0.30x 7.50	RCP 1-Dia 1.00x12.00
59	31+316	RCP 1-Dia 0.30x 8.50	RCP 1-Dia 1.00x14.00
60	31+564	RCP 1-Dia 0.30x 8.00	RCP 1-Dia 1.00x13.00
61	31+720	RCP 1-Dia 0.30x 8.70	RCP 1-Dia 1.00x14.00

NO.	CHAINAGE	EXISTING CULVERT	NEW CULVERT
62	32+398	RCP 1-Dia 0.40x11.00	RCP 1-Dia 1.00x14.00
63	32+567	RCP 1-Dia 0.30x12.00	RCP 1-Dia 1.00x14.00
64	32+806	RCP 1-Dia 0.40x19.00	RCP 1-Dia 1.00x14.00
65	33+002	RCP 1-Dia 0.40x11.00	RCP 1-Dia 1.00x13.00
66	33+161	RCP 1-Dia 0.40x 9.50	RCP 1-Dia 1.00x13.00
67	33+418	RCP 1-Dia 0.40x12.00	RCP 1-Dia 1.00x12.00
68	33+422	RCP 1-Dia 0.40x10.90	RCP 1-Dia 1.00x12.00
69	33+478	RCP 1-Dia 0.40x18.00	RCP 1-Dia 1.00x14.00
70	33+596	RCP 1-Dia 0.40x 9.00	RCP 1-Dia 1.00x12.00
71	34+456	RCP 1-Dia 0.30x 8.00	RCP 1-Dia 1.00x12.00
72	34+664	RCP 1-Dia 0.30x 8.00	RCP 1-Dia 1.00x12.00
73	34+812	RCP 1-Dia 0.30x 8.70	RCP 1-Dia 1.00x12.00
74	34+904	RCP 1-Dia 0.30x 8.00	RCP 1-Dia 1.00x14.00
75	35+109	RCP 1-Dia 0.30x 8.00	RCP 1-Dia 1.00x13.00
76	35+415	RCP 1-Dia 0.40x 9.00	RCP 1-Dia 1.00x13.00
77	35+618	RCP 1-Dia 0.40x10.50	RCP 1-Dia 1.00x13.00
78	35+898	RCP 1-Dia 0.30x 8.00	RCP 1-Dia 1.00x13.00
79	36+874	RCP 1-Dia 0.30x 6.40	RCP 1-Dia 1.00x11.00
80	37+023	RCP 1-Dia 0.30x 7.00	RCP 1-Dia 1.00x11.00

NO.	CHAINAGE	EXISTING CULVERT	NEW CULVERT
81	37+116	RCP 1-Dia 0.30x 8.00	RCP 1-Dia 1.00x11.00
82	37+274	RCP 1-Dia 0.40x10.40	RCP 1-Dia 1.00x12.00
83	37+489	RCP 1-Dia 0.40x 9.00	RCP 1-Dia 1.00x13.00
84	37+878	RCP 1-Dia 0.30x 8.40	RCP 1-Dia 1.00x14.00
85	38+088	RCP 1-Dia 0.30x 7.90	RCP 1-Dia 1.00x14.00
86	38+193	RCP 1-Dia 0.30x 9.00	RCP 1-Dia 1.00x14.00
87	38+432	RCP 1-Dia 0.30x 9.00	RCP 1-Dia 1.00x11.00

(4) Bridges

NO.	CHAINAGE	EXISTING BRIDGE	PROPOSED BRIDGE
1	18+893	4.00x 4.70 WOOD TYPE	-
2	19+559	4.00x 4.00 WOOD TYPE	-
3	20+828	4.00x40.00 WOOD TYPE	10.00x40.00 SLAB TYPE
4	21+049	4.00x 4.50 WOOD TYPE	-
5	22+468	4.00x 4.10 WOOD TYPE	-
6	23+343	4.00x44.00 WOOD TYPE	10.00x44.00 SLAB TYPE
7	24+383	4.00x 4.00 WOOD TYPE	-
8	25+367	4.00x 4.00 WOOD TYPE	-
9	26+150	4.50x44.00 WOOD TYPE	10.00x44.00 SLAB TYPE
10	27+425	5.00x21.30 WOOD TYPE	10.00x21.00 SLAB TYPE
11	28+657	1.50x37.00 WOOD TYPE	10.00x37.00 SLAB TYPE
12	31+980	(Pedestrian)	10.00x40.00 SLAB TYPE
13	34+095	-	10.00x46.00 SLAB TYPE
14	36+400	4.50x29.85 WOOD TYPE	10.00x30.00 SLAB TYPE
15	39+020	-	10.00x35.00

3.3 Quantities and Construction and Road Maintenance Costs

(1) CONSTRUCTION QUANTITIES AND COSTS

(Project IM-16 Length=20.8 km)

Item	Unit	Financial	Quantity	Financial	Economic Cost		Residual Value		
		Unit Rate Baht		Total Cost 1000 Baht	%	1000 Baht	%	1000 Baht	
EARTHWORK									
Clearing & Grubbing	ha	10,000	19	190	85	162	90	146	
Roadway Excavation (Unclassified)	m ³	18	8,000	144	84	121	90	109	
Roadway Excavation (Classified Unsuitable Material below Grade)	m ³	51	-	-	84	-	90	-	
Embankment (Common)	m ³	33	-	-	86	-	90	-	
Embankment (Borrow)	m ³	115	171,300	19,700	86	16,942	90	15,248	
Removal of Existing Structure	each	60,000	-	-	84	-	90	-	
Sub Total				20,034		17,225		15,503	
SUBBASE and BASE COURSES									
Subbase	m ³	229	27,100	6,206	83	5,151	50	2,576	
Aggregate base	m ³	357	29,400	10,496	84	8,817	50	4,409	
Shoulder (Soil Aggregate)	m ³	264	13,300	3,511	83	2,914	50	1,457	
Sub Total				20,213		16,882		8,442	
SURFACE COURSES									
Asphaltic Prime Coat	m ²	11	143,100	1,574	93	1,464	50	732	
Asphaltic Tack Coat	m ²	5	122,600	613	93	570	50	285	
Double Bituminous Surface Treatment	m ²	33	-	-	91	-	50	-	
Asphalt Concrete Surfacing	ton	928	28,900	26,819	90	24,137	50	12,069	
Portland Cement Concrete Pavement	m ³	1,694	-	-	90	-	50	-	
Sub Total				29,006		26,171		13,086	
STRUCTURES (Equivalent)									
RC Pipe Culvert (D=1.00 m)	m	1,800	840	1,512	88	1,331	50	666	
RC Box Culvert (2-2.40x 2.40 m)	m	10,000	35	350	90	315	50	158	
RC Bridge (W=10.0 m)	m	60,000	337	20,220	87	17,591	50	8,796	
PC Bridge (W=10.0 m)	m	87,300	-	-	87	-	50	-	
Bearing Unit	m ²	1,600	-	-	87	-	50	-	
Sub Total				22,082		19,237		9,620	
Total (a)				91,335		79,515		46,651	
Miscellaneous Work ((a) x 7%)				1s	6,393	87	5,562	0	0
CONTRACT AMOUNT (b)				97,728		85,077		46,651	
PHYSICAL CONTINGENCIES ((b) x 10%) (c)				1s	9,773		8,508		4,665
ENGINEERING AND SUPERVISION (((b) + (c)) x 10%) (d)				1s	10,750	100	10,750	0	0
LAND ACQUISITION									
Developed Land	ha	100,000	-	-					
Less Developed Land	ha	-	-	-					
Total (e)				0	100	0	100	0	
PROJECT COST ((b) + (c) + (d) + (e))				118,251		104,335		51,316	
AVERAGE COST PER KM				5,685					

(2) Road Maintenance Costs

(Unit : Baht/Year)

	Without Project	With Project
1994	254,745	191,619
2004	267,254	330,671

3.4 Construction Schedule

Year and Month	1992												1993											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Land Acquisition																								
Preparatory Works	■	■	■	■																				
Earth Works					■	■	■	■			■	■												
Pavement Works											■	■	■	■	■	■	■	■	■	■	■	■	■	
Bridge Works					■	■	■	■			■	■	■	■										
Miscellaneous Works											■	■	■	■	■	■	■	■	■	■	■	■	■	
Clearing - up																					■	■	■	
Percentage of Disbursement (%)	35												50											

4. BENEFITS

ROAD CONDITIONS

(unit : km)

Section	Road Length	Without Project						With Project							
		Paved			Laterite			No. of Narrow Bridge	No. of Wooden Bridge	Road Length	Road Paved	No. of Narrow Bridge	No. of Wooden Bridge		
		Good	Fair	Poor	Good	Fair	Poor								
3321	10.3	-	-	-	-	-	-	10.3	-	-	11	10.3	10.3	-	-
PWD	10.5	-	-	-	-	-	-	10.5	-	-	1	10.5	10.5	-	-

VOC AND TIME SAVINGS

(1000 BAHT)

Year	VOC Savings			Time Savings			Total Savings		
	Normal Traffic	Induced Traffic	Total	Normal Traffic	Induced Traffic	Total	Normal Traffic	Induced Traffic	Total
1994	14,848	1,086	15,933	3,935	2,255	6,190	18,783	3,340	22,123
2000	20,196	1,480	21,675	5,360	3,081	8,441	25,556	4,561	30,117
2008	32,060	2,352	34,412	8,618	4,908	13,526	40,678	7,260	47,938

5. ECONOMIC EVALUATION

COST AND BENEFIT STATEMENT







(1000 BAHT)

YEAR	COST		BENEFITS		TOTAL	DISCOUNTED (12%)	
	CONST. COST	VOC SAVING	TIME SAVING	MAINT. SAVING		COST	BENEFIT
1992	36,517				0	45,807	0
1993	67,818				0	75,956	0
1994		15,933	6,190	63	22,186	0	19,809
1995		16,890	6,565	54	23,509	0	18,741
1996		17,847	6,940	45	24,832	0	17,675
1997		18,804	7,316	36	26,156	0	16,623
1998		19,761	7,691	27	27,479	0	15,592
1999		20,718	8,066	18	28,802	0	14,592
2000		21,675	8,441	9	30,125	0	13,627
2001		23,268	9,077	0	32,345	0	13,064
2002		24,860	9,712	(9)	34,563	0	12,464
2003		26,452	10,348	(18)	36,782	0	11,843
2004	13,434	28,044	10,984	(27)	39,001	4,325	11,212
2005		29,636	11,619	(36)	41,219	0	10,580
2006		31,228	12,255	(45)	43,438	0	9,955
2007		32,820	12,890	(54)	45,656	0	9,342
2008	(51,316)	34,412	13,526	(63)	47,875	(10,500)	8,747
TOTAL	66,453	362,348	141,620	0	503,968	115,588	203,866

NET PRESENT VALUE : 88,278
 BENEFIT COST RATIO : 1.76
 INTERNAL RATE OF RETURN : 19.9%
 FIRST YEAR RATE OF RETURN : 16.3%

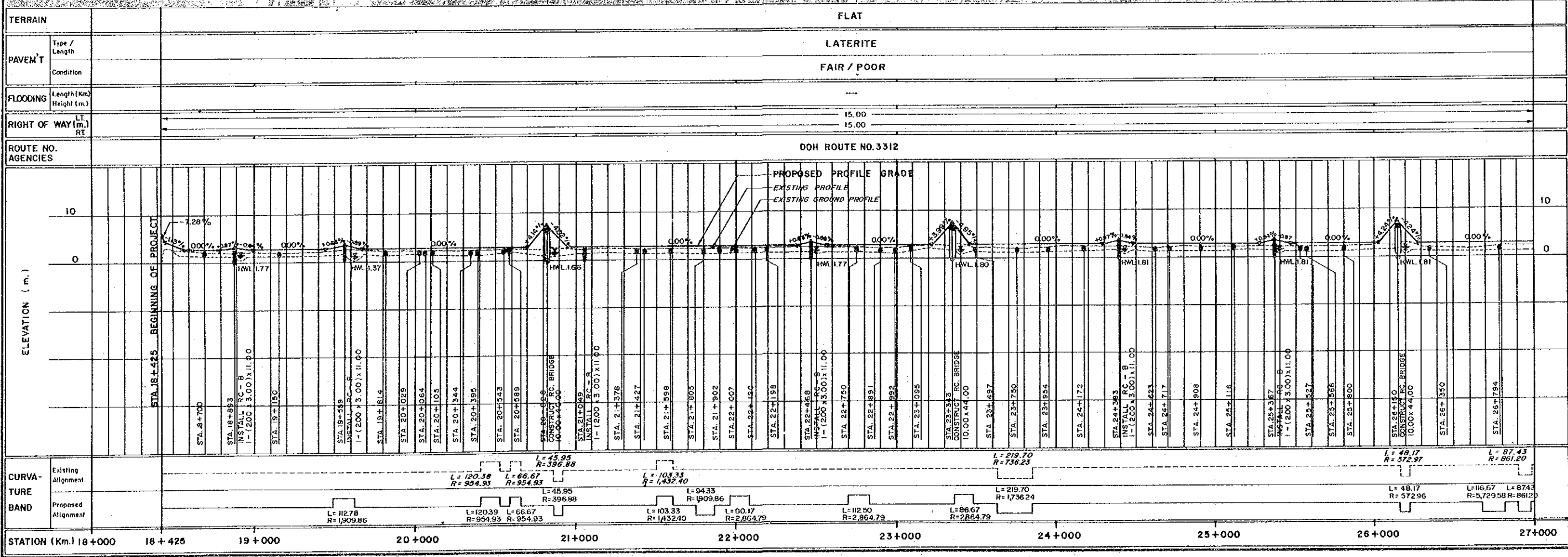
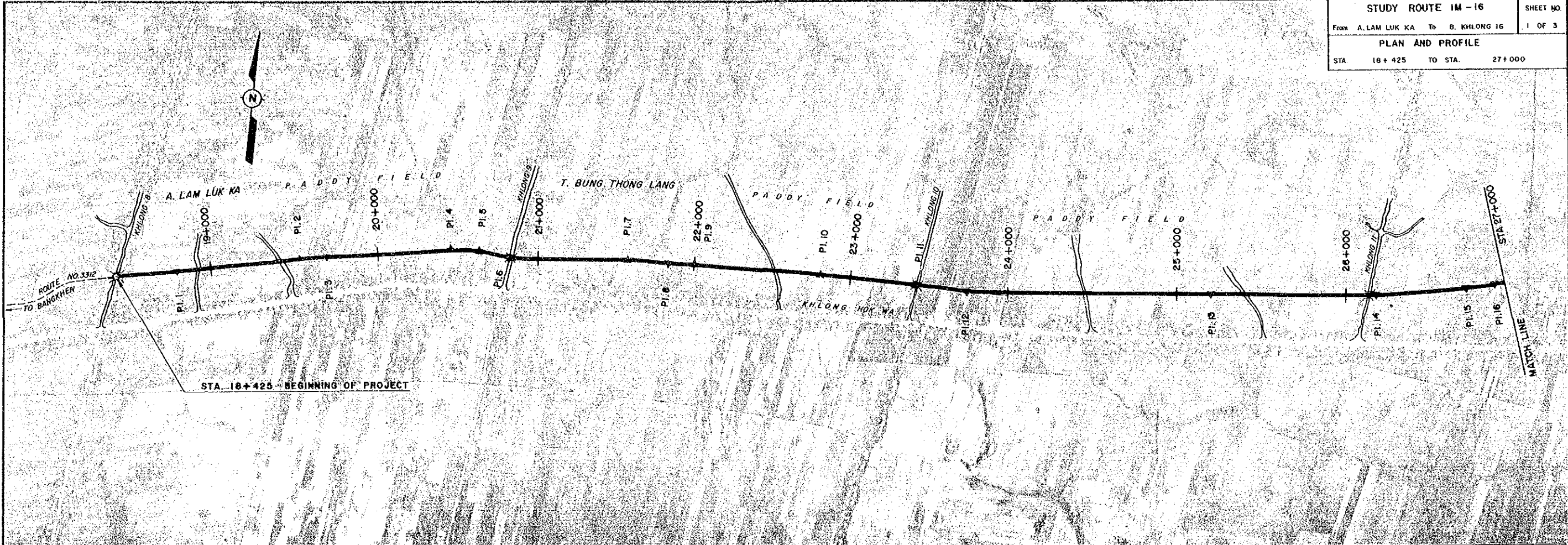
6. DRAWINGS

ABBREVIATIONS and SYMBOLS for PLAN and PROFILE

	NEW CONSTRUCTION SECTION OF STUDY ROUTE
	IMPROVEMENT SECTION OF STUDY ROUTE
	BRIDGE (PROPOSED, EXISTING)
	BOX CULVERT (PROPOSED, EXISTING)
	PIPE CULVERT (PROPOSED, EXISTING)
	HIGH WATER LEVEL

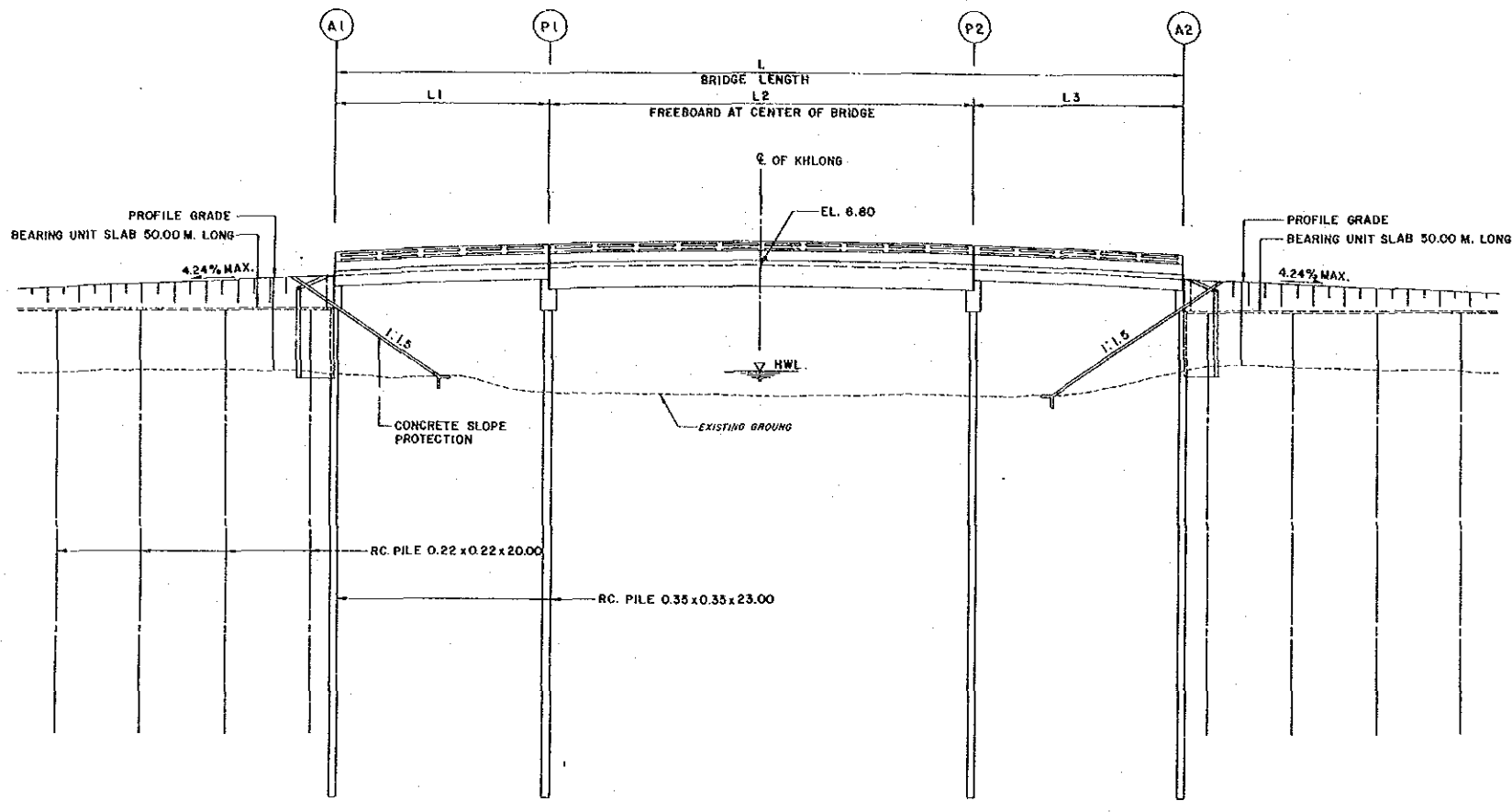
HWY	HIGHWAY
PI	POINT OF HORIZONTAL INTERSECTION
NO. or #	NUMBER
Δ	DEFLECTION ANGLE
R	RADIUS OF CURVATURE
T	TANGENT LENGTH
L	LENGTH OF CURVE
RT	RIGHT
LT	LEFT
EXIST.	EXISTING
EXTD.	EXTEND

RC-P-n- $\phi a \times l$	PIPE CULVERT, n (ROW), ϕa (DIAMETER, m), l (LENGTH, m)
RC-B-n-a $\times b \times l$	BOX CULVERT, n (NO. OF CELLS), a $\times b \times l$ (CLEAR SPAN \times DEPTH \times LENGTH, m)
BR-T-a $\times l - n$	TIMBER BRIDGE, a $\times l$ (WIDTH \times LENGTH, m), n (NO. OF SPANS)
BR-RC-a $\times l - n$	CONCRETE BRIDGE, a $\times l$ (ROADWAY WIDTH \times LENGTH, m) n (NO. OF SPANS)





TERRAIN	FLAT	
PAVEM'T	Type / Length	LATERITE
	Condition	FAIR / POOR
FLOODING	Length (Km) Height (m.)	-
RIGHT OF WAY (m.)	LT	15.00
	RT	15.00
ROUTE NO. AGENCIES	DOH ROUTE NO. 3312	
ELEVATION (m.)	PROPOSED PROFILE GRADE EXISTING PROFILE EXISTING GROUND PROFILE	
	(Detailed profile graph showing elevation vs. stationing with various grades and bridge structures)	
CURVA-TURE BAND	Existing Alignment	L=143.65 R=861.20 L=111.67 R=818.51 L=105.83 R=2,864.79 L=129.67 R=286.47 L=136.62 R=298.17 L=64.53 R=1,041.54 L=78.07 R=931.97 L=141.79 R=931.97 L=126.67 R=2,864.79 L=129.67 R=286.48 L=136.62 R=298.17 L=64.53 R=1,041.54 L=67.83 R=572.96 L=141.79 R=931.97 L=143.64 R=861.20 L=111.67 R=818.51 L=78.08 R=931.97 L=114.10 R=1,145.92
	Proposed Alignment	L=143.64 R=861.20 L=111.67 R=818.51 L=105.83 R=2,864.79 L=136.62 R=298.17 L=129.67 R=286.48 L=136.62 R=298.17 L=67.83 R=572.96 L=141.79 R=931.97 L=78.08 R=931.97 L=114.10 R=1,145.92
STATION (Km.)	27+000	28+000 29+000 30+000 31+000 32+000 33+000 34+000 35+000 36+000



BH-5

M.	N-VALUE
1	20
2	40
3	60
4	
5	
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7	
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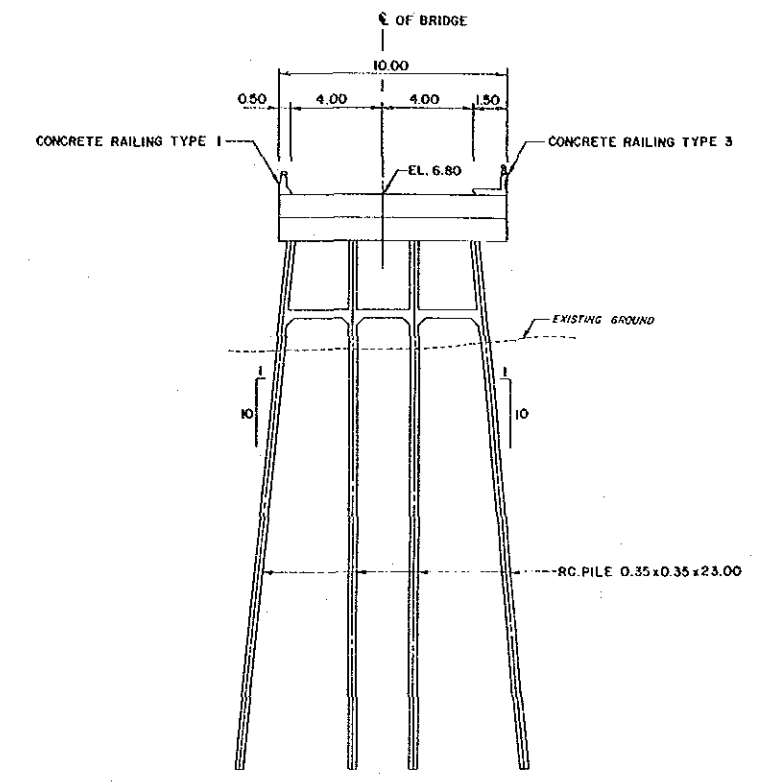
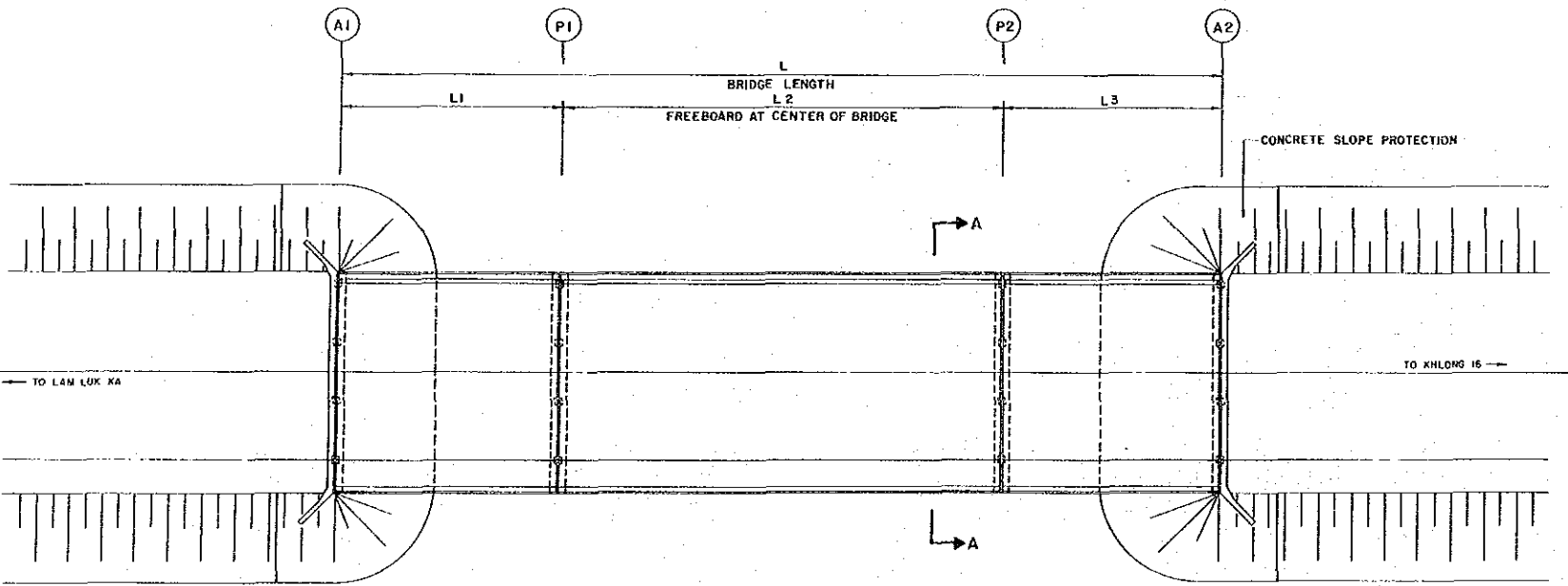


TABLE OF SUPERSTRUCTURE

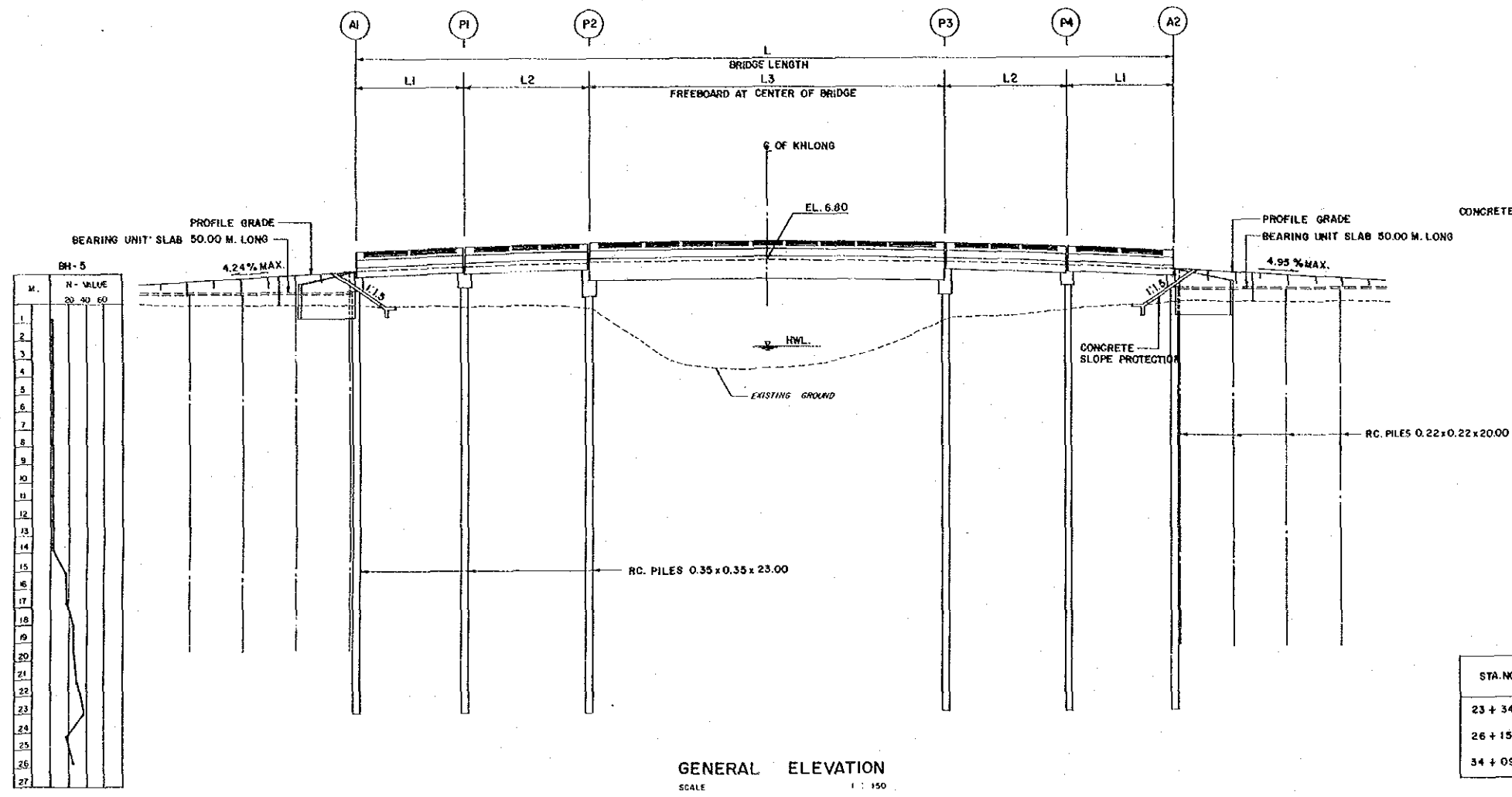
STA. NO.	BRIDGE LENGTH	SPAN LENGTH			THICKNESS			TYPE	ELEV.	HWL.	EXISTING BRIDGE
		L1	L2	L3	L1	L2	L3				
20+828	40.00	10.00	20.00	10.00	0.53	1.05	0.53	RC. SLAB	6.80	1.66	4.0 x 40.0
27+425	21.00	7.00	7.00	7.00	0.39	0.39	0.39	RC. SLAB	6.80	1.42	5.0 x 21.30
28+657	37.00	8.50	20.00	8.50	0.47	1.05	0.47	RC. SLAB	6.80	1.90	1.5 x 37.0
31+980	40.00	10.00	20.00	10.00	0.55	1.05	0.53	RC. SLAB	6.80	2.00	-
36+400	30.00	5.00	20.00	5.00	0.32	1.05	0.32	RC. SLAB	6.80	2.09	4.5 x 29.85
39+020	35.00	7.50	20.00	7.50	0.43	1.05	0.43	RC. SLAB	6.80	2.15	-

LIST OF EXISTING BRIDGES

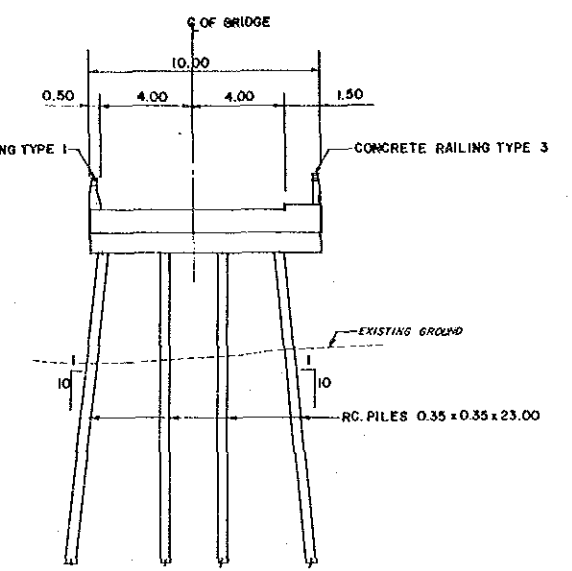
STA. NO.	WIDTH & LENGTH (M.)	WITHDRAW (M ³)
20+828	4.0 x 40.0	85
27+425	5.0 x 21.30	57
28+657	1.5 x 37.0	29
36+400	4.5 x 29.85	71
TOTAL		242



ITEM	UNIT	QUANTITY						TOTAL
		STA. 20+828	STA. 27+425	STA. 28+657	STA. 31+980	STA. 36+400	STA. 39+020	
1. CONCRETE								
CLASS B (1 1/2) FOR BRIDGE DECK	M ³	334	92	307	334	296	291	1614
CLASS B (1 1/2) FOR PILE BENT PIER & ABUTMENT	M ³	82	81	82	82	81	82	490
CLASS SPECIAL B (1 1/2) FOR BEARING UNIT SLAB	M ³	300	180	300	300	300	300	1680
2. STEEL REINFORCEMENT	T	100	42	94	100	81	70	607
3. RC. PILE 0.22 x 0.22 M.	LM	2720	1760	2720	2720	2720	2720	16360
4. RC. PILE 0.35 x 0.35 M.	LM	477	477	477	477	477	477	2862
5. CONCRETE RAILING TYPE - 1	LM	40	21	37	40	30	35	203
TYPE - 3	LM	40	21	37	40	30	35	203
6. CONCRETE SLOPE PROTECTION	M ²	245	315	315	354	280	315	1824



GENERAL ELEVATION
SCALE 1 : 150



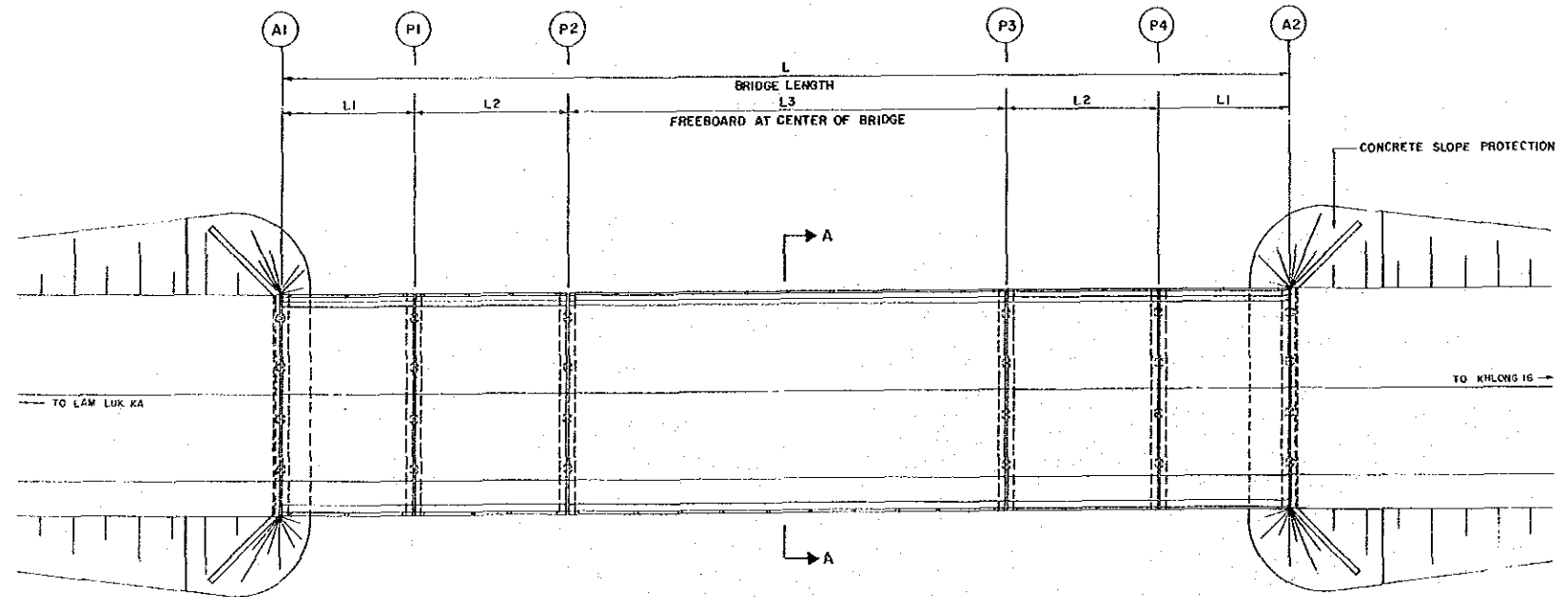
SECTION A-A
SCALE 1 : 150

TABLE OF SUPERSTRUCTURE

STA. NO.	BRIDGE LENGTH	SPAN LENGTH			THICKNESS			TYPE	ELEV.	HWL.	EXISTING BRIDGE
		L1	L2	L3	L1	L2	L3				
23 + 343	44.00	6.00	6.00	20.00	0.36	0.36	1.05	RC. SLAB	6.80	1.80	4.0 x 44.0
26 + 150	44.00	6.00	6.00	20.00	0.36	0.36	1.05	RC. SLAB	6.80	1.81	4.5 x 44.0
34 + 095	44.00	6.00	7.00	20.00	0.36	0.39	1.05	RC. SLAB	6.80	1.82	-

LIST OF EXISTING BRIDGES

STA. NO.	WIDTH & LENGTH (M.)	WITHDRAW (M.)
23+343	4.0 x 44.0	94
26+150	4.5 x 44.0	105
TOTAL		199



GENERAL PLAN
SCALE 1 : 150

ITEM	UNIT	QUANTITY			
		STA. 23+343	STA. 26+150	STA. 34+095	TOTAL
1. CONCRETE CLASS B (1/2) FOR BRIDGE DECK	M ³	317	317	329	963
CLASS B (1/2) FOR PILE BENT PIER & ABUTMENT	M ³	121	121	121	363
CLASS SPECIAL B (1/2) FOR BEARING UNIT SLAB	M ³	300	300	300	900
2. STEEL REINFORCEMENT	T	105	105	108	318
3. RC. PILE 0.22 x 0.22 M.	LM	2,720	2,720	2,720	8,160
4. RC. PILE 0.35 x 0.35 M.	LM	716	716	716	2,148
5. CONCRETE RAILING TYPE - 1	LM	44	44	46	134
TYPE - 3	LM	44	44	46	134
6. CONCRETE SLOPE PROTECTION	M ²	315	315	350	980

PROJECT IM - 17

**Changwat : Bangkok/Samut Prakan/
Chachoengsao**

A. Lat Krabang - B. Khlong Tha Thua

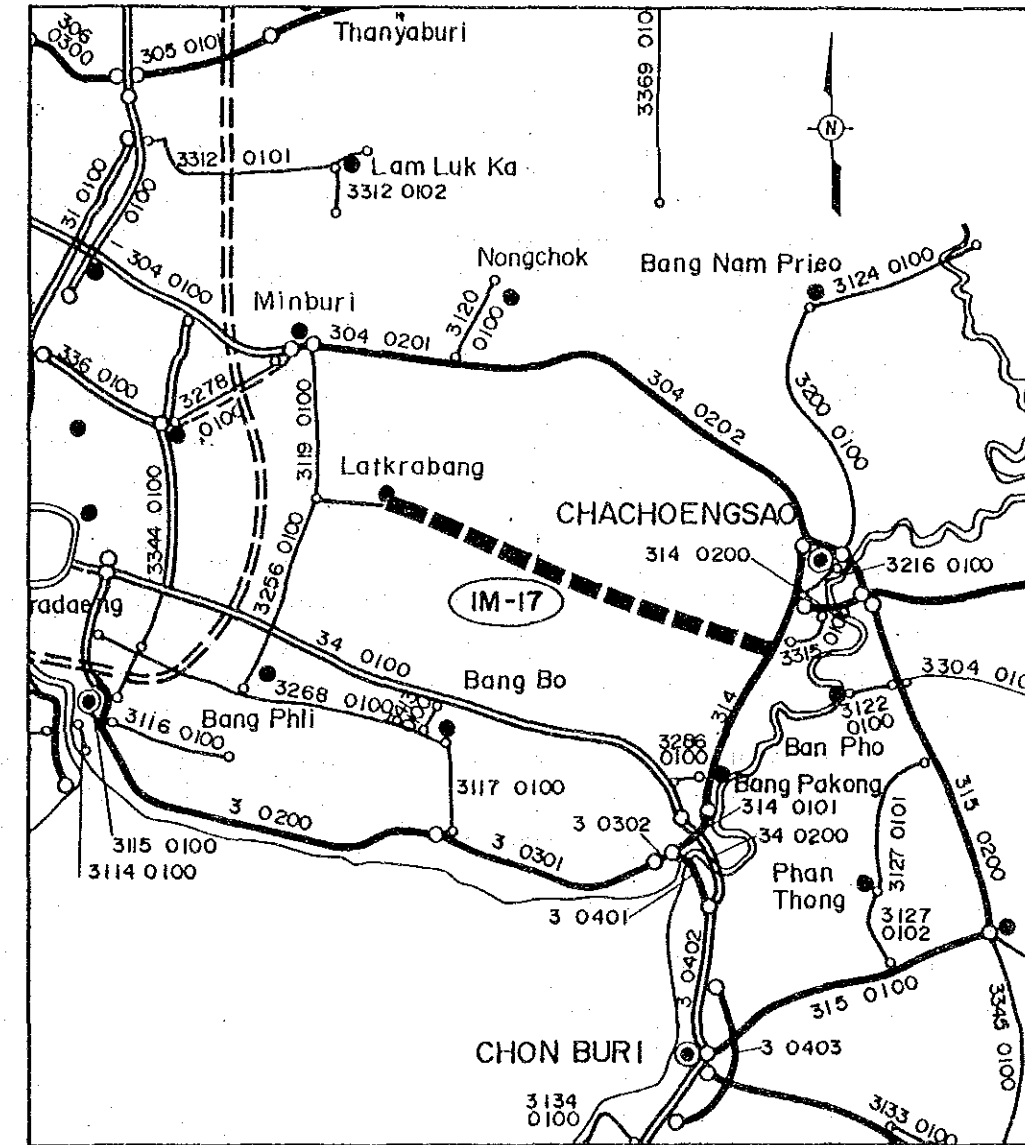
Length : 28.7 km.

SUMMARY

PROJECT IM-17

ITEM	DESCRIPTION
Changwat	Bangkok/Samut Prakhan/Chachoengsao
Origin	A. Lat Krabang
Destination	B. Khlong Tha Thua (Rt. 304)
Route No.	PWD
Project Length	28.70 km
Standard	
- Existing	—
- Proposed	F2
Traffic	
- Base	201 ~ 1,167
- 2000	400 ~ 2,100
- 2008	700 ~ 3,300
Pavement Type	
- Existing	SBST/Laterite
- Proposed	AC pavement (t=7.5)
Bridges	
- New Construction	3 sites, 65 m
- Replacement	—
Construction Costs	
- Financial	97,534,000 Baht
- Economic	85,744,000 Baht
Economic Evaluation	
- IRR	27.7%
- B/C	2.69

LOCATION OF PROJECT ROUTE



SCALE
5 0 10 Km.

LEGEND :

- ▬▬▬▬ PROJECT ROUTE
- ▬▬▬▬ DIVIDED HIGHWAYS
- ▬▬▬▬ NATIONAL HIGHWAYS
- ▬▬▬▬ PROVINCIAL HIGHWAYS
- ▬▬▬▬ PROVINCIAL HIGHWAYS (Unpaved)
- , ● CHANGWAT, AMPHOE

1. GENERAL

The proposed route is located in the three Changwats of Bangkok, Samut Prakhon and Chachoengsao.

The route originates in Amphoe Lat Krabang, runs eastward through or beside about 15 villages and ends at an intersection with Route 314 in Chachoengsao. Its total length is 28.7 km.

The existing road runs parallel to a major RID canal for its entire length at a distance of 200 – 300 m. The improved road is proposed to follow the existing alignment. Both sides of the road are rice paddies except for houses, which are frequent. The terrain is flat. Existing embankment is low, about 0.3 m, and evidence of submergence during the rainy season was observed. Because the road has to cross many canals running north-south, there are a large number of bridges and culverts. Three wooden bridges in the first two-thirds have longitudinal sections not suitable for heavy vehicles and are questionable in durability. Four concrete bridges have been completed including one at Km 9 + 000 of 120 m in length and 8 m in width. PWD completed work on widening and paving the carriage-way and the construction of four bridges in the last one-third section (Km 19.0 to the end) in October 1988. This section will require no further work.

The first section from the origin to Km 9.0 is paved with DBST but has a low profile with about the same height as H.W.L. and requires raising. The middle section from Km 9.0 to Km 19.0 is of laterite with a narrow width and low profile, requiring raising and widening. No problem requiring correction was found in the horizontal alignment.

This route runs parallel to and between the two east-west national highways of Routes 34 and 304 and will provide an alternate route to these two existing heavily trafficked routes. With relatively industrialized areas at both ends, it is expected that the route will be heavily used by industrial traffic.

2. TRAFFIC FORECAST

Base Traffic Volume

(Unit: Vehicles/Day)

Project Code	Section	Year	Traffic Volume							ADT
			MC	PC	LB	HB	LT	MT	HT	
IM-17	PWD-W	1988	529	69	281	7	558	164	88	1167
	PWD-M	1988	99	54	16	0	103	24	4	201
	PWD-E	1988	238	53	24	19	317	131	129	673

Traffic Growth Rate

(Unit: Percent)

Project	Section	Period	MC	PC	LB	HB	LT	MT	HT
IM-17	PWD-W	-1993	3.78	5.30	3.93	5.45	4.14	1.34	1.43
		1994 -2000	6.19	6.72	6.56	5.43	5.89	5.19	5.84
		2000 -2008	6.06	6.66	6.32	4.99	5.34	5.56	5.62
	PWD-M	-1993	3.78	5.30	3.93	5.45	4.14	1.34	1.43
		1994 -2000	6.19	6.72	6.56	5.43	5.89	5.19	5.84
		2000 -2008	6.06	6.66	6.32	4.99	5.34	5.56	5.62
	PWD-E	-1993	3.78	5.30	3.93	5.45	4.14	1.34	1.43
		1994 -2000	6.19	6.72	6.56	5.43	5.89	5.19	5.84
		2000 -2008	6.06	6.66	6.32	4.99	5.34	5.56	5.62

Induced Traffic Volume

(Unit: Vehicles/Day)

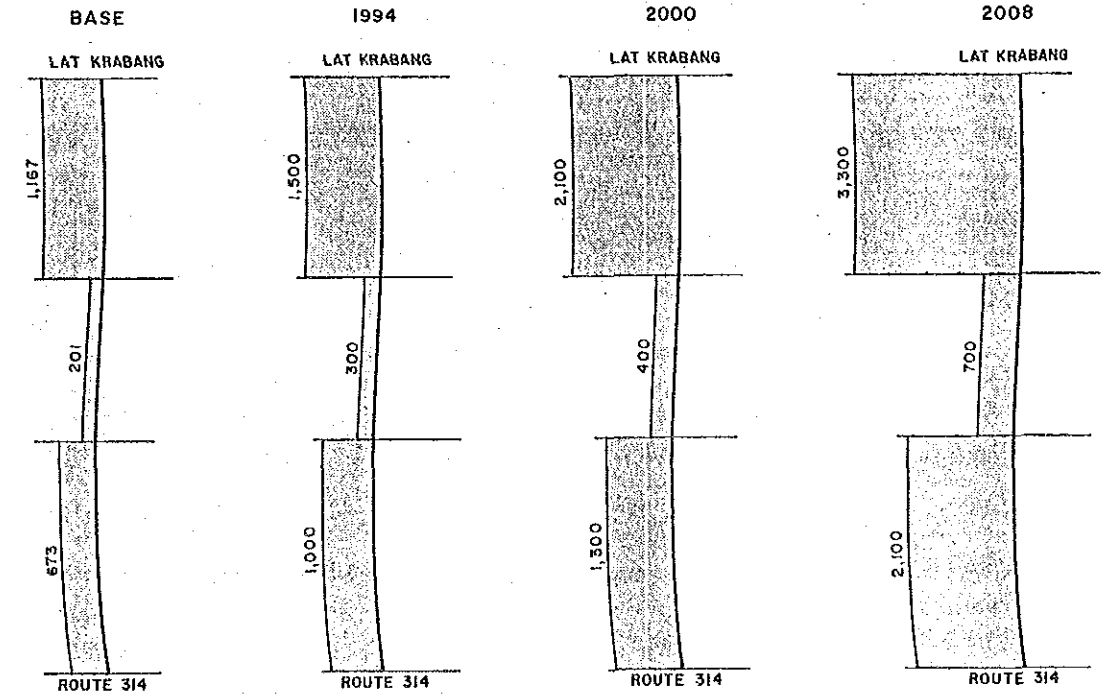
Project	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-17	PWD-M	1994	25	16	5	0	31			52
		2000	36	24	7	0	43			74
		2008	58	41	12	0	65			118
	PWD-E	1994	44	16	7	4	94			121
		2000	64	24	11	5	133			173
		2008	102	40	17	7	201			265

Future Traffic Volume

(Unit: Vehicles/Day)

Project	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-17	PWD-W	1994	676	95	363	10	724	184	100	1476
		2000	970	141	532	13	1020	250	141	2097
		2008	1552	236	868	20	1547	385	218	3274
	PWD-M	1994	152	91	26	2	164	27	5	315
		2000	217	135	37	2	231	37	6	448
		2008	349	225	61	3	351	56	10	706
	PWD-E	1994	348	89	38	30	505	147	147	956
		2000	500	132	56	41	712	200	206	1347
		2008	800	221	92	60	1080	308	319	2080

Note. W: West section M: Middle section E: East section



PROJECT IM - 17

UNIT : VEHICLE / DAY

3. ENGINEERING

3.1 Materials and Boring Results

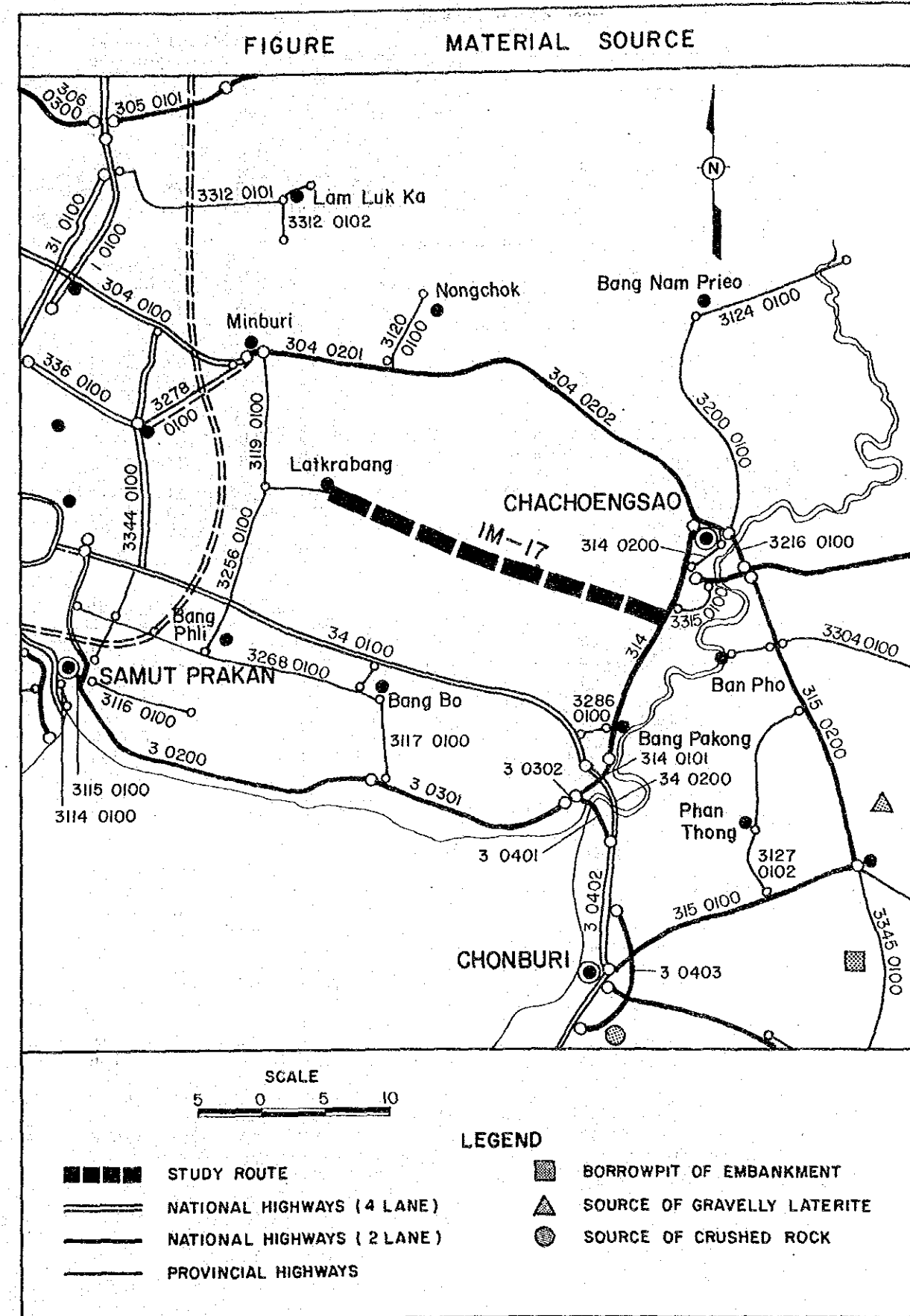
(1) Materials

DESCRIPTION OF MATERIAL SOURCES

Material	Source	Description of Sample	Estimated Quantity cu.m.	Hauling Distance (km)
Soil	Route 331 Km 18+500 Left Side 0.3 Km	Clayey Gravel	Plentiful	44
Laterite	Route 315 Km 19+900 Left Side 5.0 Km	Gravelly Laterite	Plentiful	51
Crushed Rock	Route 3 Km 99+150 Left Side 2.1 Km	Lime Stone	Plentiful	64

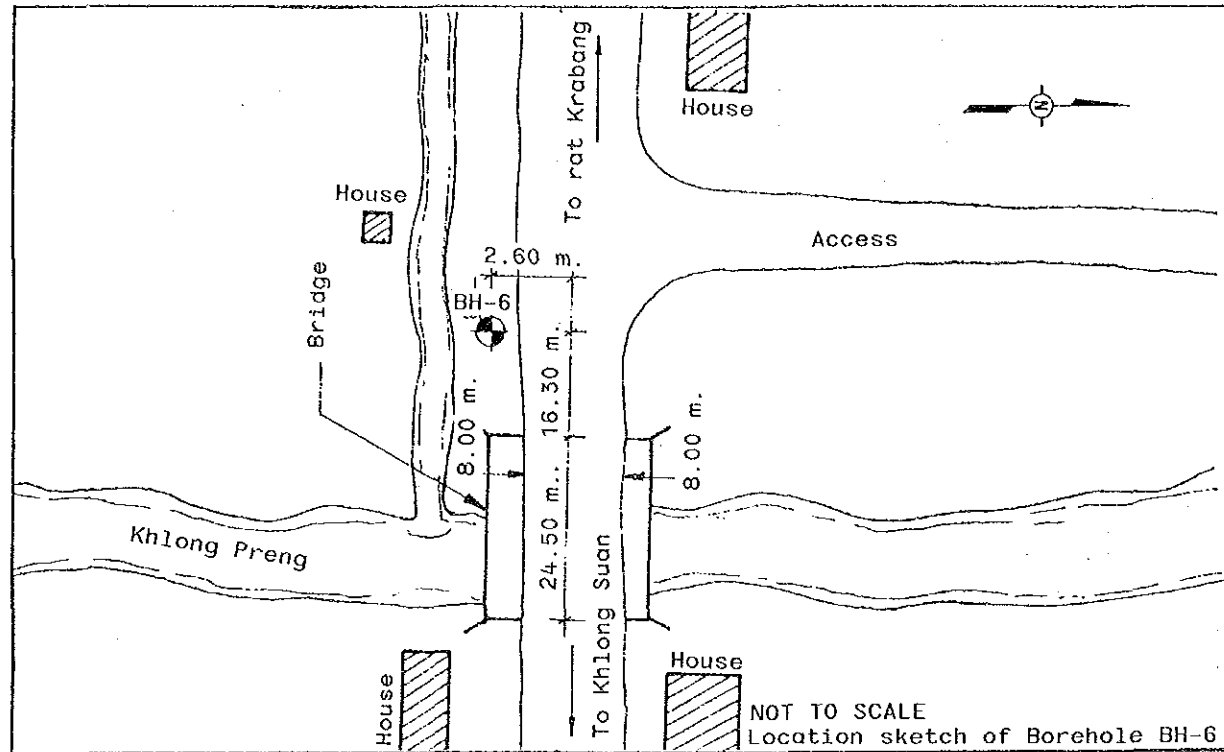
RESULTS OF LABORATORY TESTS

	Sieve Analysis % Passing							Plasticity		Comp. DH-T Stand.		Lab. C.B.R.		
	50.0	25.0	19.0	9.5	#4	#10	#40	#200	LL	PI	Opt. 95%	gn/cc	CBR 95%	Swell %
Soil	100	79	59	36	32	28		34.3	14.2	7.5	2.19	14	0.4	
Laterite	100	96	93	77	51	26	17	13	29.8	8.8	7.4	2.21	37	-
Crushed Rock												>80		



(2) Boring Results

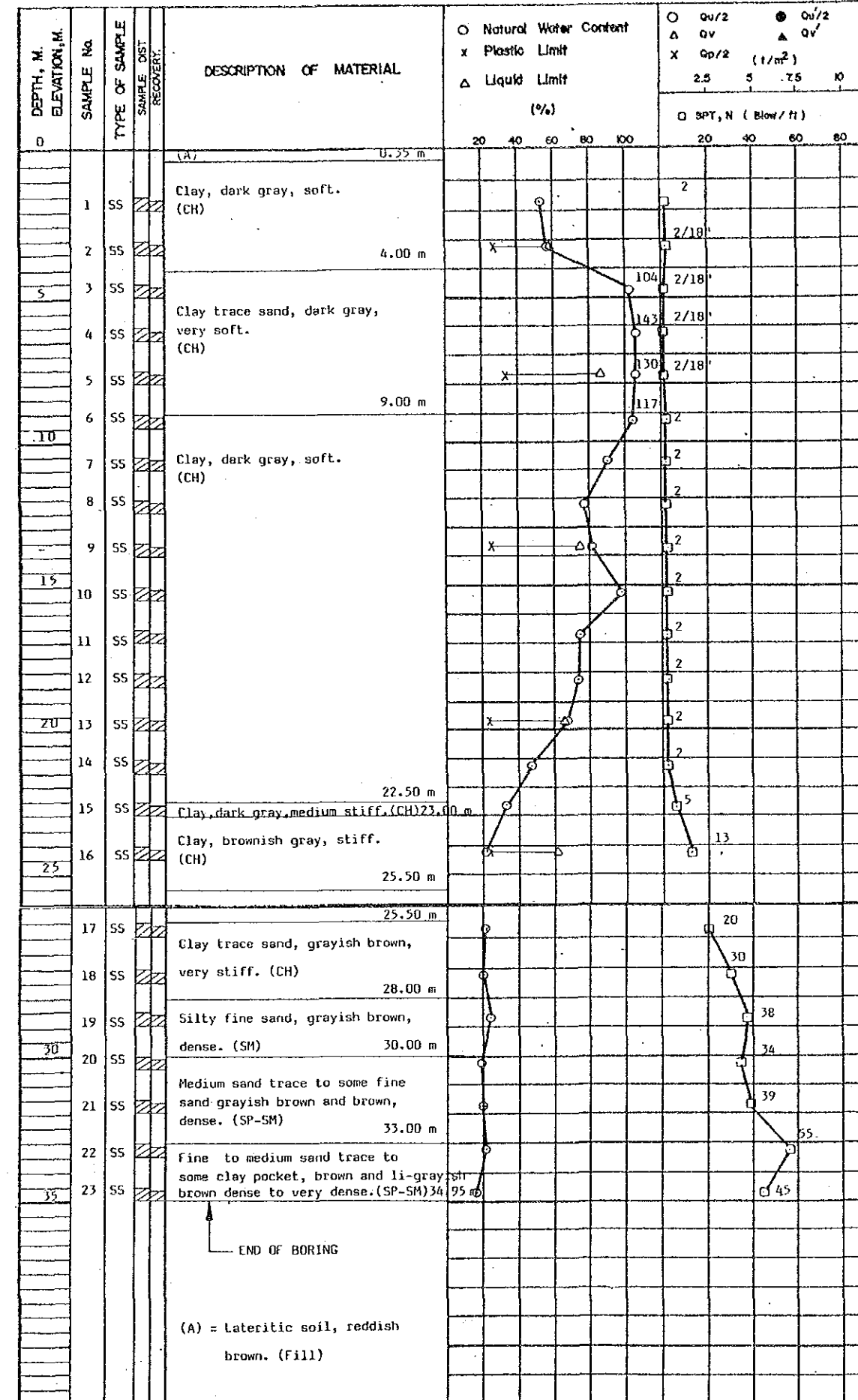
BOREHOLE LOCATION



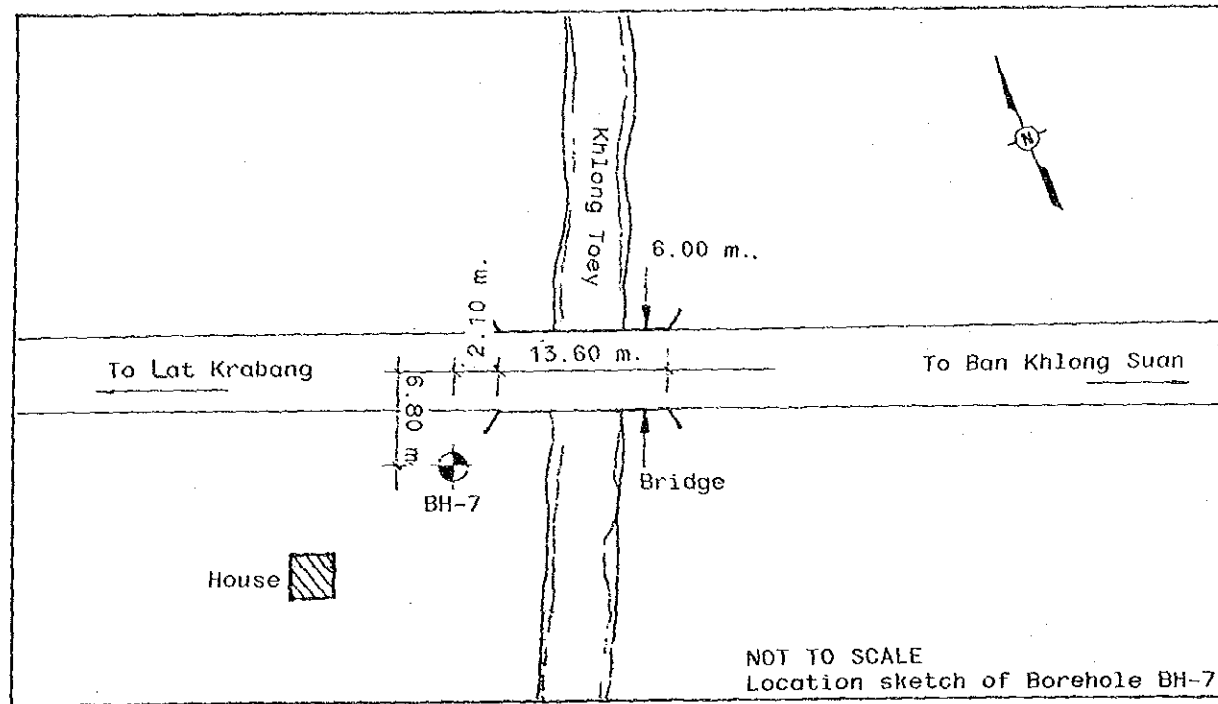
SUMMARY OF TEST RESULTS

SAMPLE No.	DEPTH M.		WATER CONTENT %	ATTERBERG LIMIT %			WET UNIT WEIGHT γ_{w, m^3}	SIEVE ANALYSIS % FINER					CLASSIFICATION	UNDRAINED SHEAR STRENGTH $\gamma_{m, 2}$				STANDARD PENETRATION (N)		
	FROM	TO		LL.	PL.	PI.		% FINER						UNCONFINED SHEAR $Q_{u/2}$	FIELD VANE SHEAR		POCKET PENETRATION $\frac{1}{2} Q_p$			
	No. 3/8"	No. 4		No. 10	No. 40	No. 200		$Q_{u/2}$	$Q_{v/2}$	Q_v	Q_v'									
SS-1	1.50	1.95	50.8				1.68				100	97	CH				1.2	2		
SS-2	3.00	3.45	56.6	57.7	27.8	29.9							CH				-	2		
SS-3	4.50	4.95	104.1				1.45						CII				1.2	2/18"		
SS-4	6.00	6.45	143.1								100	99	98	94	CH			1.2	2/18"	
SS-5	7.50	7.95	129.6	87.4	34.2	53.2	1.41						CII				1.2	2/18"		
SS-6	9.00	9.45	116.5										CH				-	2		
SS-7	10.50	10.95	90.1				1.50						CH				2.5	2		
SS-8	12.00	12.45	78.8										CII				2.5	2		
SS-9	13.50	13.95	80.8	75.4	25.6	49.8	1.55					100	99	CII			2.5	2		
SS-10	15.00	15.45	78.0										CII				3.7	2		
SS-11	16.50	16.95	72.6				1.57						CH				3.7	2		
SS-12	18.00	18.45	71.4				1.59						CII				3.7	2		
SS-13	19.50	19.95	69.0	68.4	23.5	41.3						100	99	CH			3.7	2		
SS-14	21.00	21.45	47.7				1.77						CII				5.0	2		
SS-15	22.50	22.95	31.1				1.89						CH				7.5	5		
SS-16	24.00	24.45	20.7	60.8	22.7	38.1	2.00						CH				17.5	13		
SS-17	25.50	25.95	21.0				2.04					100	99	94	CII				20	
SS-18	27.00	27.45	20.0				2.11						CII						30	
SS-19	28.50	28.95	22.8					100	98	95	83	15	SM						38	
SS-20	30.00	30.45	19.2										SP-SH							34
SS-21	31.50	31.95	19.8						100	99	26	9	SP-SH							39
SS-22	33.00	33.45	21.3										SP-SM							55
SS-23	34.50	34.95	16.9										SP-SM							45

BORING LOG



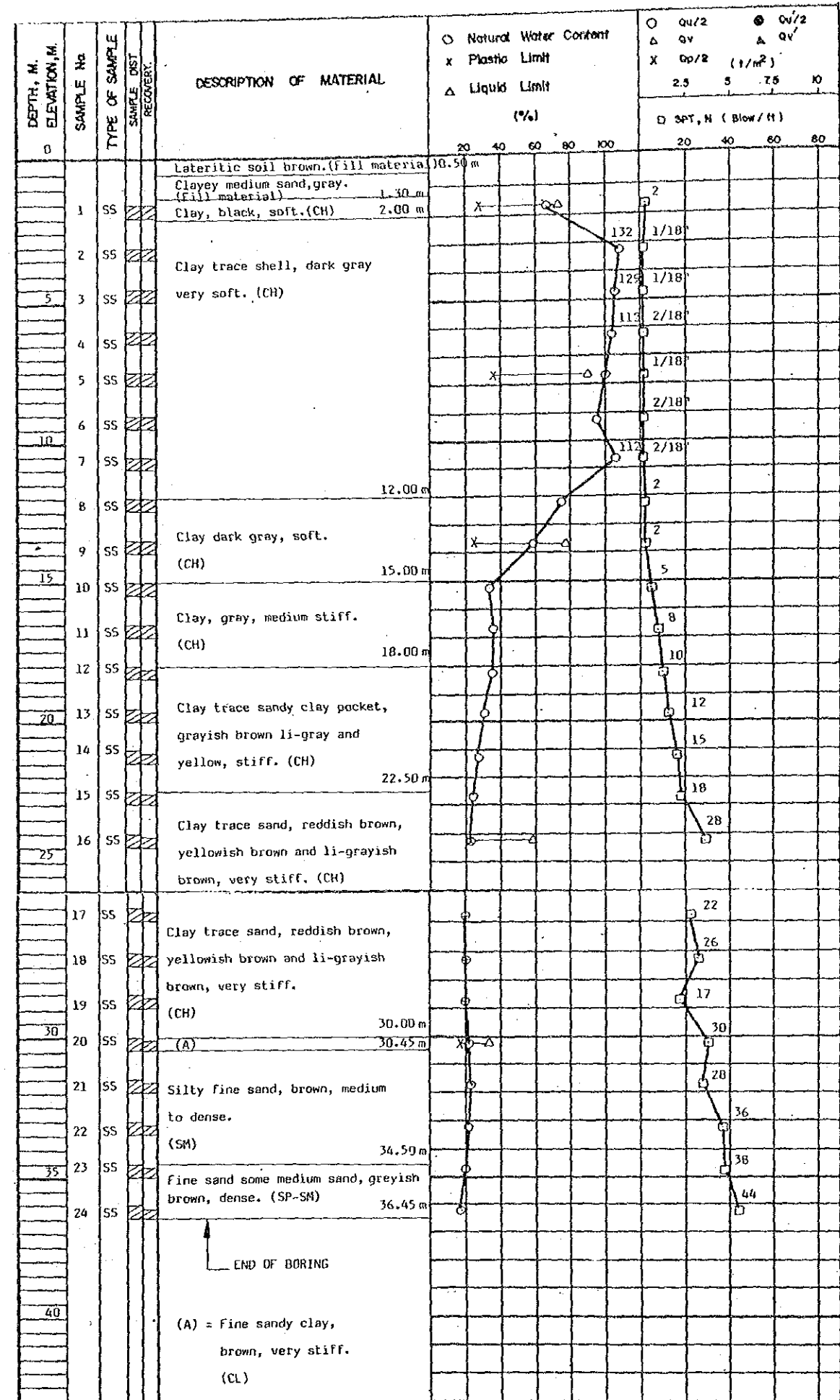
BOREHOLE LOCATION



SUMMARY OF TEST RESULTS

SAMPLE No.	DEPTH M.		WATER CONTENT %	ATTERBERG LIMIT %			WET UNIT WEIGHT γ_{wet}	SIEVE ANALYSIS % FINER					CLASSIFICATION	UNDRAINED SHEAR STRENGTH γ_{un}				STANDARD PENETRATION (N)
	FROM	TO		LL.	PL.	PI.		% FINER						UNCONFINED SHEAR		FIELD VANE SHEAR		
								No. 3/8"	No. 4	No. 10	No. 40	No. 200		$Q_{u/2}$	$Q_{u/n}$	Q_v	Q'_v	
SS-1	1.50	1.95	66.7	71.4	28.9	42.5	1.63					CH					5.0	2
SS-2	3.00	3.45	132.4									CH					-	1/18"
SS-3	4.50	4.95	128.9				1.40					CH					1.2	1/18"
SS-4	6.00	6.45	112.1				1.44			100	99	CH					1.2	2/18"
SS-5	7.50	7.95	100.1	90.4	36.9	53.5						CH					1.2	1/18"
SS-6	9.00	9.45	96.2				1.48					CH					1.2	2/18"
SS-7	10.50	10.95	111.5									CH					2.5	2/18"
SS-8	12.00	12.45	73.7				1.57			100	99	CH					2.5	2
SS-9	13.50	13.95	58.3	78.2	24.7	53.5	1.66					CH					3.7	2
SS-10	15.00	15.45	34.1				1.82					CH					-	5
SS-11	16.50	16.95	36.4							100	99	CH					12.5	8
SS-12	18.00	18.45	34.7				1.84					CH					17.5	10
SS-13	19.50	19.95	29.5									CH					-	12
SS-14	21.00	21.45	26.8				1.96			100	99	CH					-	15
SS-15	22.50	22.95	24.4				2.02					CH					22.5	18
SS-16	24.00	24.45	22.0	59.4	21.7	37.7	2.05					CH					22.5	28
SS-17	25.50	25.95	20.2				2.08			100	95	CH					22.5	22
SS-18	27.00	27.45	19.7				2.06					CH						26
SS-19	28.50	28.95	20.1				2.07					CH						17
SS-20	30.00	30.45	20.5	33.1	18.2	14.9				100	99	CL						30
SS-21	31.50	31.95	21.6									SM						28
SS-22	33.00	33.45	21.4							100	92	15	SM					36
SS-23	34.50	34.95	20.3									SP-SM						38
SS-24	36.00	36.45	18.3							100	99	68	11	SP-SM				44

BORING LOG



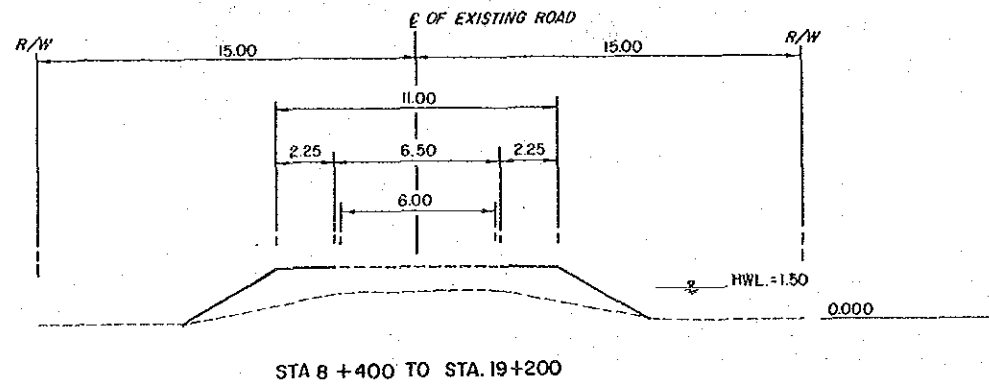
3.2 Preliminary Design

(1) Geometric Design Criteria

Design Standard : F-2
 Design Speed : 70-90 km/h

Geometric Design Criteria

Description	Design Speed (km/h)		
	70	80	90
Minimum Radius & Curvature (m)	160	210	280
Minimum Stopping Sight Distance (m)	90	115	140
Maximum Gradient (%)	7	6	5



(2) Pavement Design

Design CBR of Subgrade	Cumulative No. of ESA W18 x 10 (10 years)	Thickness of Pavement Structure (cm)
4.0	810	Surface 7.5 Base 20 Subbase 15

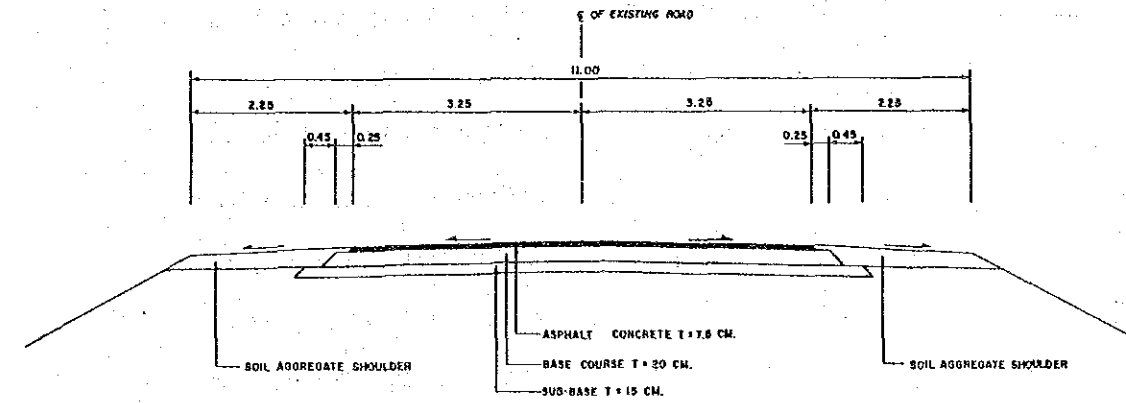


FIGURE TYPICAL PAVEMENT STRUCTURE FOR FLEXIBLE PAVEMENT IM-17

(3) Culverts

NO.	CHAINAGE	EXISTING CULVERT	NEW CULVERT
1	1+184	BOX 1-2.20x2.20x10.00	EXTEND 1-2.20x2.20x1.00
2	1+805	RCP 1-Dia 0.60x9.50	EXTEND 1-Dia 0.60x 6.00
3	2+710	BOX 1-2.50x2.50x10.20	EXTEND 1-2.50x2.50x1.00
4	3+543	BOX 1-2.10x2.10x10.00	EXTEND 1-2.10x2.10x2.00
5	5+651	BOX 1-2.35x2.20x10.00	EXTEND 1-2.35x2.20x1.00
6	6+682	BOX 1-2.30x2.50x 9.80	EXTEND 1-2.30x2.50x1.00
7	7+439	BOX 1-2.00x2.30x 9.85	EXTEND 1-2.00x2.30x1.00
8	13+614	RCP 1-Dia 0.60x13.00	EXTEND 1-Dia 0.60x2.00
9	13+712	RCP 1-Dia 0.60x13.00	EXTEND 1-Dia 0.60x2.00
10	14+235	RCP 1-Dia 0.60x12.70	EXTEND 1-Dia 0.60x2.00
11	14+412	RCP 1-Dia 0.60x13.70	EXTEND 1-Dia 0.60x2.00
12	15+118	BOX 1-2.50x2.50x 6.00	EXTEND 1-2.50x2.50x5.00
13	15+512	RCP 1-Dia 0.60x13.00	EXTEND 1-Dia 0.60x4.00
14	15+853	BOX 1-2.50x2.50x 6.50	EXTEND 1-2.50x2.50x5.00
15	17+466	RCP 1-Dia 0.60x14.70	EXTEND 1-Dia 0.60x2.00

(4) Bridges

NO.	CHAINAGE	EXISTING BRIDGE	PROPOSED BRIDGE
1	4+866	8x41.00 SLAB TYPE W/LIFT CENTRAL SPAN	REMAIN
2	6+223	8x41.00 SLAB TYPE W/LIFT CENTRAL SPAN	REMAIN
3	8+338	7x15.00 SLAB TYPE W/LIFT CENTRAL SPAN	REMAIN
4	9+075	8x120.00 SLAB TYPE	REMAIN
5	11+584	4x15.00 WOOD TYPE	11x19.00 SLAB TYPE
6	13+080	6x24.00 WOOD TYPE	11x28.00 SLAB TYPE
7	16+431	4x14.50 WOOD TYPE	11x18.00 SLAB TYPE

3.3 Quantities and Construction and Road Maintenance Costs

(I) CONSTRUCTION QUANTITIES AND COSTS

(Project IM-17 Length = 19.2 km)

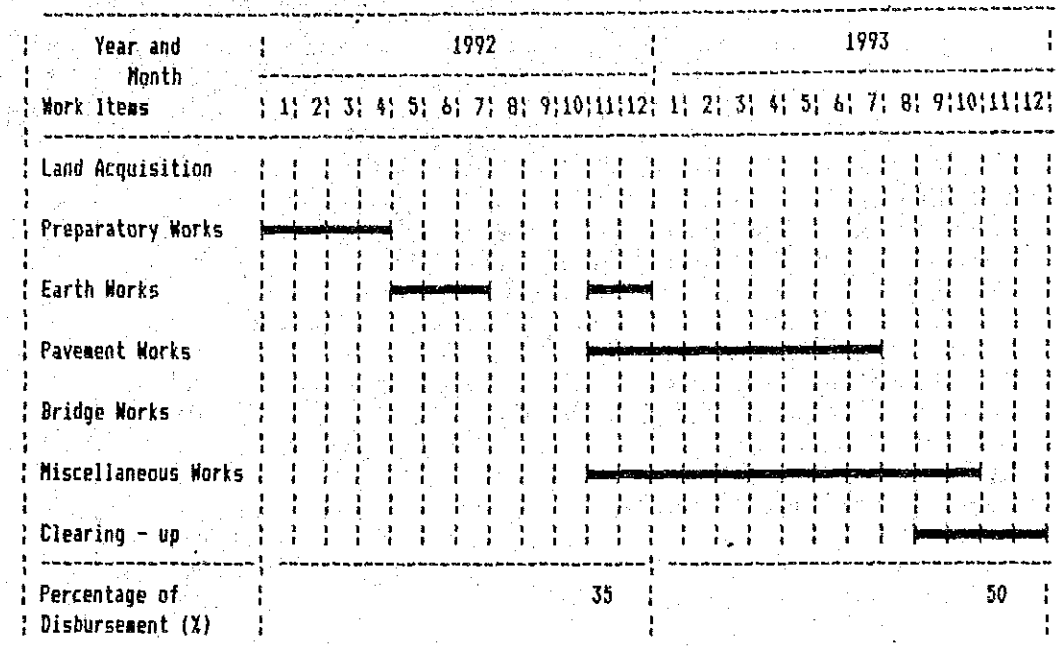
Item	Unit	Financial Unit Rate Baht	Quantity	Financial Total Cost 1000 Baht	Economic Cost		Residual Value		
					%	1000 Baht	%	1000 Baht	
EARTHWORK									
Clearing & Grubbing	ha	10,000	29	290	85	247	90	222	
Roadway Excavation (Unclassified)	m ³	18	2,100	38	84	32	90	29	
Roadway Excavation (Classified Unsuitable Material below Grade)	m ³	51	-	-	84	-	90	-	
Embankment (Common)	m ³	33	-	-	86	-	90	-	
Embankment (Borrow)	m ³	150	205,800	30,870	86	26,548	90	23,893	
Removal of Existing Structure	each	60,000	-	-	84	-	90	-	
Sub Total				31,198		26,827		24,144	
SUBBASE and BASE COURSES									
Subbase	m ³	201	24,000	4,824	83	4,004	50	2,002	
Aggregate base	m ³	340	29,100	9,894	84	8,311	50	4,156	
Shoulder (Soil Aggregate)	m ³	234	14,000	3,276	83	2,719	50	1,360	
Sub Total				17,994		15,034		7,518	
SURFACE COURSES									
Asphaltic Prime Coat	m ²	11	142,100	1,563	93	1,454	50	727	
Asphaltic Tack Coat	m ²	5	-	-	93	-	50	-	
Double Bituminous Surface Treatment	m ²	33	-	-	91	-	50	-	
Asphalt Concrete Surfacing	ton	924	21,600	19,958	90	17,962	50	8,981	
Portland Cement Concrete Pavement	m ³	1,674	-	-	90	-	50	-	
Sub Total				21,521		19,416		9,708	
STRUCTURES (Equivalent)									
RC Pipe Culvert (D=1.00 m)	m	1,800	10	18	88	16	50	8	
RC Box Culvert (2-2.40x 2.40 m)	m	13,000	9	117	90	105	50	53	
RC Bridge (W=11.0 m)	m	69,000	65	4,485	87	3,902	50	1,951	
PC Bridge (W=11.0 m)	m	105,000	-	-	87	-	50	-	
Bearing Unit	m ²	1,600	-	-	87	-	50	-	
Sub Total				4,620		4,023		2,012	
Total (a)					75,333		65,300		43,382
Miscellaneous Work ((a) x 7%)				1s	5,273	87	4,588	0	0
CONTRACT AMOUNT (b)					80,606		69,888		43,382
PHYSICAL CONTINGENCIES ((b) x 10%) (c)				1s	8,061		6,989		4,338
ENGINEERING AND SUPERVISION (((b) + (c)) x 10%) (d)				1s	8,867	100	8,867	0	0
LAND ACQUISITION									
Developed Land	ha	1,250,000	-	-					
Less Developed Land	ha	625,000	-	-					
Total (e)				0	100	0	100	0	
PROJECT COST ((b) + (c) + (d) + (e))					97,534		85,744		47,720
AVERAGE COST PER KM					5,080				

(2) Road Maintenance Costs

(Unit : Baht/Year)

	Without Project	With Project
1994	388,190	294,730
2004	442,208	504,228

3.4 Construction Schedule



4. BENEFITS

ROAD CONDITIONS

(unit : km)

Section	Without Project									With Project					
	Road Length	Paved			Laterite			No. of Narrow Bridge	No. of Wooden Bridge	Road Length	Road Paved	No. of Narrow Bridge	No. of Wooden Bridge		
		Good	Fair	Poor	Good	Fair	Poor							Good	Fair
PWD-W	9.0	-	-	-	5.0	4.0	-	-	-	-	-	9.0	9.0	-	-
PWD-M	10.2	-	-	-	1.0	0.8	-	-	8.4	-	3	10.2	10.2	-	-

VOC AND TIME SAVINGS

(1000 BAHT)

Year	VOC Savings			Time Savings			Total Savings		
	Normal Traffic	Induced Traffic	Total	Normal Traffic	Induced Traffic	Total	Normal Traffic	Induced Traffic	Total
1994	19,833	1,400	21,233	4,474	1,894	6,368	24,307	3,294	27,601
2000	27,991	1,991	29,982	6,379	2,701	9,080	34,370	4,692	39,062
2008	43,416	3,153	46,568	10,025	4,307	14,332	53,441	7,460	60,901

5. ECONOMIC EVALUATION

COST AND BENEFIT STATEMENT







(1000 BAHT)

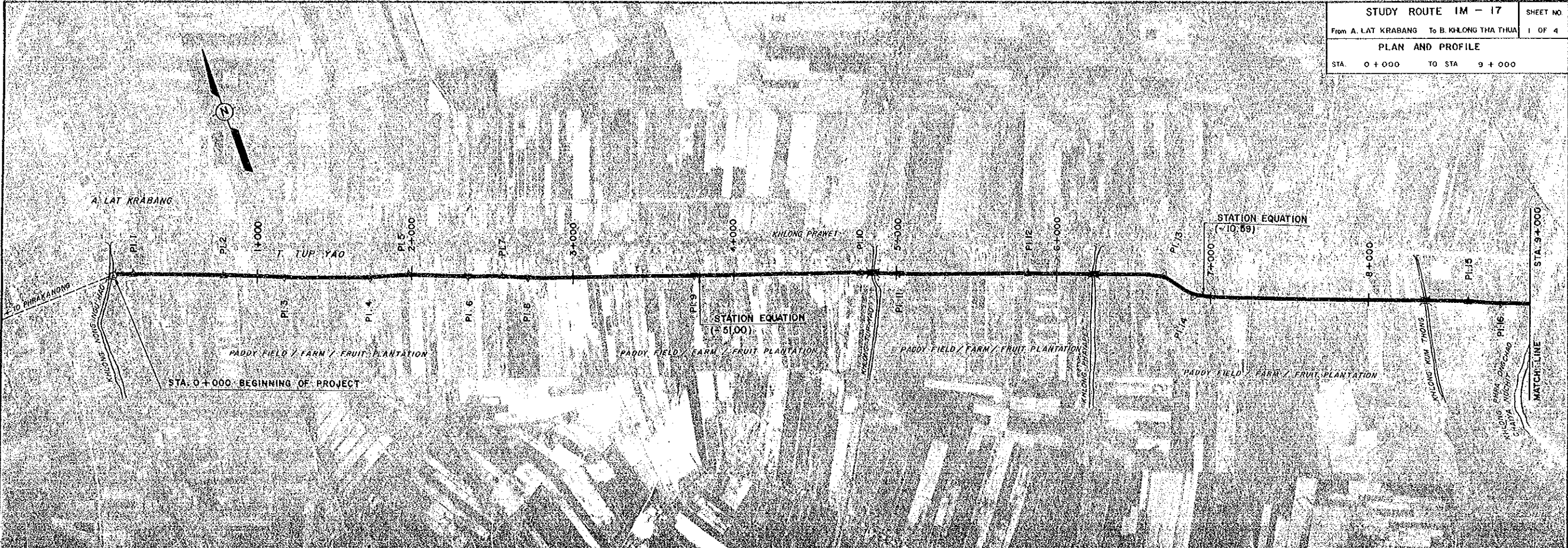
YEAR	COST		BENEFITS			DISCOUNTED (12%)	
	CONST. COST	VOC SAVING	TIME SAVING	MAINT. SAVING	TOTAL	COST	BENEFIT
1991					0	0	0
1992	30,010				0	37,645	0
1993	55,734				0	62,422	0
1994		21,233	6,368	93	27,694	0	24,727
1995		22,691	6,820	82	29,593	0	23,591
1996		24,150	7,272	71	31,493	0	22,416
1997		25,608	7,724	60	33,392	0	21,221
1998		27,066	8,176	49	35,291	0	20,025
1999		28,524	8,628	38	37,190	0	18,842
2000		29,982	9,080	27	39,089	0	17,682
2001		32,056	9,736	16	41,808	0	16,886
2002		34,129	10,393	5	44,527	0	16,057
2003		36,202	11,050	(6)	47,246	0	15,212
2004	19,995	38,275	11,706	(17)	49,964	6,438	14,363
2005		40,349	12,363	(28)	52,684	0	13,523
2006		42,422	13,019	(39)	55,402	0	12,697
2007		44,495	13,676	(50)	58,121	0	11,893
2008	(47,720)	46,568	14,332	(62)	60,838	(9,764)	11,115
TOTAL	58,019	493,750	150,343	239	644,332	96,741	260,250

NET PRESENT VALUE : 163,509
 BENEFIT COST RATIO : 2.69
 INTERNAL RATE OF RETURN : 27.7%
 FIRST YEAR RATE OF RETURN : 24.7%

6. DRAWINGS

ABBREVIATIONS and SYMBOLS for PLAN and PROFILE

	NEW CONSTRUCTION SECTION OF STUDY ROUTE
	IMPROVEMENT SECTION OF STUDY ROUTE
	BRIDGE (PROPOSED, EXISTING)
	BOX CULVERT (PROPOSED, EXISTING)
	PIPE CULVERT (PROPOSED, EXISTING)
	HIGH WATER LEVEL
HWY	HIGHWAY
PI	POINT OF HORIZONTAL INTERSECTION
NO. or #	NUMBER
Δ	DEFLECTION ANGLE
R	RADIUS OF CURVATURE
T	TANGENT LENGTH
L	LENGTH OF CURVE
RT	RIGHT
LT	LEFT
EXIST.	EXISTING
EXTD.	EXTEND
RC-P-n- $\phi a \times l$	PIPE CULVERT, n (ROW), ϕa (DIAMETER, m), l (LENGTH, m)
RC-B-n-a $\times b \times l$	BOX CULVERT, n (NO. OF CELLS), a $\times b \times l$ (CLEAR SPAN \times DEPTH \times LENGTH, m)
BR-T-a $\times l - n$	TIMBER BRIDGE, a $\times l$ (WIDTH \times LENGTH, m), n (NO. OF SPANS)
BR-RC-a $\times l - n$	CONCRETE BRIDGE, a $\times l$ (ROADWAY WIDTH \times LENGTH, m) n (NO. OF SPANS)



TERRAIN	FLAT	
PAVEM ^T	Type / Length	SBST
	Condition	POOR FAIR / POOR
FLOODING	Length (Km) Height (m)	-
RIGHT OF WAY (m.)	LT	15.00
	RT	15.00
ROUTE NO. AGENCIES	RURAL	
ELEVATION (m.)		
	<p>PROPOSED PROFILE GRADE EXISTING PROFILE EXISTING GROUND PROFILE</p>	
CURVA- TURE BAND	Existing Alignment	L = 172.86 R = 872.14 L = 190.44 R = 11,459.16 L = 257.18 R = 8,700.30 L = 132.14 R = 2,079.91 L = 145.13 R = 3,761.58 L = 35.64 R = 553.36 L = 251.09 R = 2,254.50 L = 139.78 R = 1,628.92 L = 120.91 R = 4,061.01 L = 101.23 R = 288.16 L = 125.11 R = 197.29 L = 128.85 R = 3,459.13 L = 231.41 R = 7,438.32
	Proposed Alignment	L = 172.85 R = 872.14 L = 190.44 R = 11,459.16 L = 257.13 R = 8,700.30 L = 132.14 R = 2,079.41 L = 145.12 R = 3,761.52 L = 55.64 R = 553.56 L = 139.76 R = 1,628.92 L = 120.91 R = 4,061.01 L = 181.23 R = 288.16 L = 125.11 R = 197.29 L = 128.85 R = 3,459.13 L = 231.41 R = 7,438.32
STATION (Km.)	0 + 000	1 + 000 2 + 000 3 + 000 4 + 000 5 + 000 6 + 000 7 + 000 8 + 000 9 + 000