TABLE A.5-4 FUTURE OD TABLE BY VEHICLE TYPE: ROUTE C (1/6) - YEAR 2000 -

M/C

O \ D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	77	46	10	312	2	1	0	2	20	0	0	25	0	71	0	0	566
2	66	0	6	1	4	0	0	0	0	3	0	0	24	0	1	0	0	106
3	43	6	0	11	6	0	0	0	0	4	0	0	0	0	19	0	0	91
4	8	2	9	0	4	0	0	0	0	2	0	2	29	0	1	0	0	57
5	323	5	4	1	173	8	4	1	0	3	0	0	1	0	110	0	0	635
6	2	0	1	0	10	0	17	1	0	0	0	0	0	0	0	0	0	32
7	2	0	1	0	3	21	0	5	0	0	0	0	0	0	0	0	0	33
8	1	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	10
9	2	1	1	0	1	0	0	0	0	7	0	0	0	0	0	0	0	13
10	22	3	4	2	3	0	0	0	7	0	0	0	0	0	3	0	0	45
11	1	0	1	1	1	0	0	0	0	1	0	2	5	0	0	0	0	12
12	0	0	1	3	1	0	0	0	0	0	2	0	37	0	4	0	0	49
13	10	10	17	22	3	2	1	1	2	4	9	41	0	0	1	0	0	123
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	91	1	1	0	117	0	0	0	0	0	0	0	0	0	0	0	0	211
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	571	106	91	52	639	35	33	9	12	45	11	46	122	0	210	0	0	1,982

Light

O \ D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	57	29	6	29	2	0	0	2	17	0	0	4	0	67	0	0	213
2	59	0	4	2	3	0	0	0	0	4	0	0	4	0	0	0	0	76
3	25	4	0	6	2	0	0	0	0	2	0	0	4	0	5	0	0	49
4	6	2	6	0	2	0	0	0	0	2	2	2	5	0	0	0	0	27
5	6	5	2	2	145	7	4	0	0	2	0	0	2	0	84	0	0	260
6	2	0	0	0	4	0	16	2	0	0	0	0	0	0	0	0	0	24
7	0	0	0	0	2	15	0	4	0	0	0	0	0	0	0	0	0	21
8	0	0	0	0	0	2	4	0	0	0	0	0	0	0	0	0	0	6
9	3	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	7
10	17	4	2	2	2	0	0	0	3	0	1	0	2	0	1	0	0	35
11	0	0	0	2	0	0	0	0	0	2	0	4	2	0	0	0	0	10
12	0	0	0	2	0	0	0	0	0	0	3	0	12	0	3	0	0	20
13	3	4	5	5	1	0	0	0	1	1	2	14	0	0	1	0	0	37
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	85	0	0	0	76	0	0	0	0	0	0	0	0	0	0	0	0	162
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	207	76	49	27	267	26	24	6	6	34	8	20	35	0	162	0	0	948

Bus

O \ D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	8	3	2	0	0	0	0	0	3	0	0	2	0	12	0	0	30
2	7	0	2	0	0	0	0	0	0	1	0	0	2	0	0	0	0	12
3	3	1	0	2	0	0	0	0	0	0	0	0	2	0	1	0	0	9
4	2	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	5
5	0	0	0	0	17	2	1	0	0	0	0	0	0	0	17	0	0	37
6	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0	5
7	0	0	0	0	1	3	0	2	0	0	0	0	0	0	0	0	0	6
8	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
9	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
10	3	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	6
11	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	3
12	0	0	0	0	0	0	0	0	0	0	1	0	5	0	0	0	0	6
13	1	1	2	2	1	0	0	0	0	0	2	5	0	0	0	0	0	14
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	14	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	30
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	31	11	9	6	37	5	6	2	2	6	3	6	14	0	30	0	0	169

TABLE A.5-4 FUTURE OD TABLE BY VEHICLE TYPE: ROUTE C (2/6) - YEAR 2000 -

Truck

O \ D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	8	4	1	55	0	0	0	0	3	0	0	2	0	28	0	0	101
2	6	0	2	0	1	0	0	0	0	1	0	0	2	0	0	0	0	12
3	3	0	0	1	0	0	0	0	0	0	0	0	2	0	3	0	0	9
4	2	0	2	0	0	0	0	0	0	0	0	0	2	0	54	0	0	60
5	54	2	0	0	39	3	1	0	0	0	0	0	2	0	37	0	0	139
6	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0	5
7	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	4
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
10	3	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	7
11	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	3
12	0	0	0	0	0	0	0	0	0	0	2	0	5	0	1	0	0	8
13	1	2	2	3	1	0	0	0	0	1	1	6	0	0	0	0	0	17
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	32	0	0	54	39	0	0	0	0	0	0	0	0	0	0	0	14	139
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	14
Total	101	12	10	59	140	5	4	0	2	7	3	8	16	0	139	0	14	521

All Vehicle

O \ D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	150	82	19	396	4	1	0	4	43	0	0	33	0	177	0	0	910
2	138	0	14	3	8	0	0	0	0	9	0	0	32	0	1	0	0	206
3	74	11	0	20	9	0	0	0	0	6	0	0	8	0	29	0	0	158
4	18	4	19	0	6	0	0	0	0	4	2	4	37	0	55	0	0	149
5	383	13	7	3	374	20	10	1	0	6	0	1	5	0	248	0	0	1,071
6	4	1	1	0	18	0	39	3	0	0	0	0	0	0	0	0	0	67
7	2	1	1	0	8	41	0	11	0	0	0	0	0	0	0	0	0	65
8	1	0	0	0	0	2	14	0	0	0	0	0	0	0	0	0	0	18
9	5	1	1	0	1	0	0	0	0	15	0	0	0	0	0	0	0	24
10	45	8	6	4	6	0	0	0	14	0	1	0	2	0	6	0	0	93
11	1	0	1	3	1	0	0	0	0	3	0	9	10	0	0	0	0	28
12	0	0	1	5	2	0	0	0	0	0	8	0	59	0	8	0	0	83
13	15	17	26	32	6	2	1	1	3	6	14	66	0	0	2	0	0	192
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	223	1	1	54	248	0	0	0	0	0	0	0	0	0	0	0	14	542
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	14
Total	909	206	159	145	1,083	71	67	17	22	93	26	80	188	0	541	0	14	3,619

TABLE A.5-4 FUTURE OD TABLE BY VEHICLE TYPE: ROUTE C (3/6) - YEAR 2010 -

M/C

O D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	180	119	24	761	4	3	0	5	51	0	0	48	0	148	0	0	1,344
2	166	0	13	3	8	1	1	0	0	7	0	0	43	0	1	0	0	243
3	114	12	0	24	15	1	1	0	0	11	0	0	0	0	40	0	0	218
4	19	5	21	0	7	1	1	0	0	4	0	7	55	0	1	0	0	121
5	776	12	13	4	371	17	10	3	0	7	0	1	2	0	206	0	0	1,423
6	6	1	1	1	20	0	36	3	0	1	0	0	1	0	0	0	0	70
7	4	1	1	1	10	43	0	14	0	1	0	0	1	0	0	0	0	75
8	2	0	1	0	0	0	20	0	0	0	0	0	0	0	0	0	0	24
9	5	4	2	0	3	0	0	0	0	12	0	0	0	0	1	0	0	27
10	47	6	12	5	7	1	1	0	15	0	0	0	0	0	9	0	0	103
11	2	0	2	2	2	0	0	0	0	2	0	3	10	0	0	0	0	24
12	0	0	2	6	3	0	0	0	0	0	5	0	69	0	5	0	0	91
13	22	22	31	41	9	3	1	1	3	7	15	75	0	0	1	0	0	231
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	191	1	1	1	218	0	0	0	0	1	0	0	1	0	0	0	0	415
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,355	244	219	111	1,435	70	73	22	24	104	21	87	229	0	413	0	0	4,408

Light

O D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	138	76	15	81	5	0	0	5	42	0	0	9	0	138	0	0	509
2	142	0	7	4	5	0	0	0	0	7	0	0	6	0	0	0	0	171
3	68	7	0	13	6	0	0	0	0	5	0	0	7	0	9	0	0	115
4	17	3	12	0	5	0	0	0	0	4	3	4	11	0	0	0	0	59
5	22	12	6	5	348	14	9	0	0	6	0	0	4	0	161	0	0	586
6	7	0	0	0	9	0	31	5	0	0	0	0	0	0	0	0	0	52
7	0	0	0	0	6	31	0	11	0	0	0	0	0	0	0	0	0	48
8	0	0	0	0	0	4	11	0	0	0	0	0	0	0	0	0	0	15
9	5	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	14
10	42	7	5	4	5	0	0	0	7	0	3	0	3	0	3	0	0	79
11	0	0	0	4	0	0	0	0	0	3	0	7	3	0	0	0	0	17
12	0	0	0	4	0	0	0	0	0	0	5	0	24	0	4	0	0	37
13	7	6	8	9	3	0	0	0	2	3	4	24	0	0	2	0	0	68
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	184	0	0	0	135	0	0	0	0	0	0	0	0	0	0	0	0	319
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	494	173	114	58	603	54	51	16	14	79	15	35	67	0	317	0	0	2,091

Bus

O D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	13	7	3	0	0	0	0	0	5	0	0	3	0	24	0	0	56
2	12	0	3	0	0	0	0	0	0	3	0	0	3	0	0	0	0	21
3	4	3	0	3	0	0	0	0	0	0	0	0	3	0	3	0	0	16
4	2	0	3	0	0	0	0	0	0	0	0	0	3	0	0	0	0	8
5	0	0	0	0	27	2	3	0	0	0	0	0	0	0	32	0	0	64
6	0	0	0	0	2	0	5	0	0	0	0	0	0	0	0	0	0	7
7	0	0	0	0	3	5	0	3	0	0	0	0	0	0	0	0	0	11
8	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
9	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
10	5	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	11
11	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	6
12	0	0	0	0	0	0	0	0	0	0	3	0	9	0	0	0	0	12
13	3	2	3	2	2	0	0	0	0	0	3	9	0	0	0	0	0	24
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	29	0	0	0	31	0	0	0	0	0	0	0	0	0	0	0	0	60
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	55	21	16	8	66	7	11	3	3	11	6	12	24	0	60	0	0	303

TABLE A.5-4 FUTURE OD TABLE BY VEHICLE TYPE: ROUTE C (4/6) - YEAR 2010 -

Truck

O D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	15	6	2	98	0	0	0	0	5	0	0	3	0	57	0	0	186
2	11	0	3	0	2	0	0	0	0	2	0	0	3	0	0	0	0	21
3	6	0	0	2	0	0	0	0	0	0	0	0	3	0	5	0	0	16
4	3	0	3	0	0	0	0	0	0	0	0	0	3	0	191	0	0	200
5	94	4	0	0	64	4	2	0	0	0	0	0	3	0	71	0	0	242
6	0	0	0	0	2	0	5	0	0	0	0	0	0	0	0	0	0	7
7	0	0	0	0	4	3	0	0	0	0	0	0	0	0	0	0	0	7
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
10	6	0	0	0	0	0	0	0	3	0	0	0	0	0	3	0	0	12
11	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	6
12	0	0	0	0	0	0	0	0	0	0	3	0	9	0	3	0	0	15
13	2	3	3	5	2	0	0	0	0	2	3	10	0	0	0	0	0	30
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	66	0	0	191	72	0	0	0	0	0	0	0	0	0	0	0	29	358
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	29
Total	188	22	15	200	245	7	7	0	3	12	6	13	27	0	360	0	29	1,134

All Vehicle

O D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	346	208	44	940	9	3	0	10	103	0	0	63	0	368	0	0	2,094
2	331	0	26	7	16	1	1	0	0	19	0	0	55	0	2	0	0	457
3	192	22	0	42	21	1	1	0	0	16	0	0	13	0	57	0	0	365
4	41	8	39	0	12	1	1	0	0	8	3	11	72	0	192	0	0	388
5	892	27	19	9	810	37	24	3	1	13	0	1	9	0	470	0	0	2,316
6	13	1	1	1	33	0	77	8	0	1	0	0	1	0	0	0	0	136
7	4	1	1	1	23	82	0	28	0	1	0	0	1	0	0	0	0	142
8	2	1	1	0	0	4	34	0	0	0	0	0	0	0	0	0	0	42
9	10	4	2	0	3	0	0	0	0	27	0	0	0	0	1	0	0	47
10	100	16	17	9	12	1	1	0	28	0	3	0	3	0	16	0	0	205
11	2	0	2	6	2	0	0	0	0	5	0	16	19	0	1	0	0	53
12	0	0	2	10	3	0	0	0	0	0	16	0	111	0	12	0	0	155
13	34	33	45	57	17	3	1	1	5	12	25	118	0	0	3	0	0	354
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	470	1	1	192	456	0	0	0	0	1	0	0	1	0	0	0	29	1,152
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	29
Total	2,091	460	365	377	2,348	138	143	42	44	206	48	147	348	0	1,150	0	29	7,936

TABLE A.5-4 FUTURE OD TABLE BY VEHICLE TYPE: ROUTE C (5/6) - YEAR 2020 -

M/C

O \ D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	316	218	44	1,270	6	5	1	9	91	0	0	85	0	309	0	0	2,354
2	286	0	23	6	14	1	1	0	0	11	0	0	70	0	2	0	0	414
3	201	20	0	42	25	1	1	0	0	19	0	0	0	0	80	0	0	389
4	34	8	38	0	11	1	1	0	0	7	0	9	89	0	2	0	0	200
5	1,302	18	18	5	560	29	13	5	1	12	0	1	3	0	389	0	0	2,356
6	11	2	2	1	35	0	56	6	0	1	0	0	1	0	0	0	0	116
7	6	2	2	1	15	72	0	25	0	1	0	0	1	0	0	0	0	126
8	3	1	1	1	0	0	37	0	0	1	0	0	1	0	0	0	0	44
9	7	6	5	0	4	0	0	0	0	21	0	0	0	0	1	0	0	45
10	84	9	19	11	13	1	1	0	24	0	0	0	0	0	15	0	0	177
11	3	0	3	2	3	0	0	0	0	2	0	5	17	0	1	0	0	36
12	0	0	5	8	4	0	0	0	0	0	11	0	106	0	11	0	0	147
13	35	33	55	65	11	3	3	1	6	12	21	125	0	0	2	0	0	372
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	398	2	2	1	408	0	0	0	0	1	0	1	1	0	0	0	0	815
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2,371	416	391	187	2,373	115	119	39	41	179	33	142	374	0	813	0	0	7,592

Light

O \ D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	236	137	28	121	7	0	0	7	75	0	0	15	0	262	0	0	888
2	242	0	13	6	9	0	0	0	0	12	0	0	10	0	0	0	0	292
3	121	12	0	22	10	0	0	0	0	8	0	0	11	0	22	0	0	205
4	27	7	22	0	8	0	0	0	0	7	4	7	16	0	0	0	0	98
5	35	17	11	9	525	22	14	0	0	9	0	0	6	0	322	0	0	970
6	11	0	0	0	16	0	50	9	0	0	0	0	0	0	0	0	0	87
7	0	0	0	0	8	52	0	19	0	0	0	0	0	0	0	0	0	80
8	0	0	0	0	0	8	19	0	0	0	0	0	0	0	0	0	0	27
9	9	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	23
10	72	12	8	7	8	0	0	0	12	0	5	0	6	0	5	0	0	136
11	0	0	0	5	0	0	0	0	0	5	0	11	5	0	0	0	0	26
12	0	0	0	6	0	0	0	0	0	0	9	0	38	0	7	0	0	60
13	11	10	13	14	4	0	0	0	4	5	6	40	0	0	3	0	0	111
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	339	0	0	0	285	0	0	0	0	0	0	0	0	0	0	0	0	625
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	868	294	204	97	995	89	84	28	23	136	24	58	108	0	621	0	0	3,630

Bus

O \ D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	17	9	3	0	0	0	0	0	7	0	0	4	0	44	0	0	84
2	15	0	6	0	0	0	0	0	0	5	0	0	6	0	0	0	0	32
3	5	4	0	4	0	0	0	0	0	0	0	0	5	0	6	0	0	25
4	2	0	5	0	0	0	0	0	0	0	0	0	4	0	0	0	0	11
5	0	0	0	0	22	3	3	0	0	0	0	0	0	0	64	0	0	93
6	0	0	0	0	4	0	7	0	0	0	0	0	0	0	0	0	0	11
7	0	0	0	0	3	8	0	5	0	0	0	0	0	0	0	0	0	16
8	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	5
9	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
10	7	5	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	16
11	0	0	0	0	0	0	0	0	0	0	0	4	5	0	0	0	0	9
12	0	0	0	0	0	0	0	0	0	0	4	0	14	0	0	0	0	18
13	3	5	5	4	3	0	0	0	0	0	5	14	0	0	0	0	0	39
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	54	0	0	0	61	0	0	0	0	0	0	0	0	0	0	0	0	115
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	86	31	25	11	94	11	15	5	4	16	9	18	33	0	115	0	0	479

TABLE A.5-4 FUTURE OD TABLE BY VEHICLE TYPE: ROUTE C (6/6) - YEAR 2020 -

Truck

O D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	24	10	3	119	0	0	0	0	7	0	0	5	0	114	0	0	283
2	16	0	4	0	4	0	0	0	0	3	0	0	6	0	0	0	0	33
3	7	0	0	3	0	0	0	0	0	0	0	0	5	0	12	0	0	27
4	3	0	5	0	0	0	0	0	0	0	0	0	5	0	230	0	0	243
5	118	5	0	0	75	6	3	0	0	0	0	0	4	0	136	0	0	347
6	0	0	0	0	4	0	7	0	0	0	0	0	0	0	0	0	0	11
7	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	10
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
10	9	0	0	0	0	0	0	0	4	0	0	0	0	0	6	0	0	20
11	0	0	0	0	0	0	0	0	0	0	0	4	5	0	0	0	0	9
12	0	0	0	0	0	0	0	0	0	0	4	0	15	0	5	0	0	24
13	4	4	5	7	4	0	0	0	0	4	4	18	0	0	0	0	0	50
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	130	0	0	230	140	0	0	0	0	0	0	0	0	0	0	0	45	546
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0	0	45
Total	287	33	24	243	352	11	10	0	4	18	8	22	45	0	549	0	45	1,653

All Vehicle

O D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1	0	593	374	78	1,510	13	5	1	16	180	0	0	109	0	729	0	0	3,609
2	559	0	46	12	26	1	1	0	0	31	0	0	92	0	3	0	0	772
3	334	36	0	71	35	1	1	0	0	27	0	0	21	0	119	0	0	646
4	66	15	70	0	19	1	1	0	0	14	4	16	114	0	232	0	0	553
5	1,454	39	29	15	1,182	60	33	5	1	21	1	2	14	0	911	0	0	3,767
6	23	2	2	1	59	0	120	15	0	1	0	1	1	0	0	0	0	225
7	7	2	2	1	31	137	0	49	0	1	0	1	1	0	0	0	0	232
8	3	1	1	1	0	8	61	0	0	1	0	0	1	0	0	0	0	76
9	16	6	5	0	5	0	0	0	0	43	0	0	0	0	1	0	0	77
10	172	26	27	18	21	1	1	0	44	0	5	0	6	0	27	0	0	349
11	3	0	3	7	3	0	0	0	0	7	0	24	32	0	1	0	0	80
12	0	0	5	14	5	0	0	0	0	0	28	0	173	0	24	0	0	249
13	53	52	78	90	23	3	3	1	10	21	36	197	0	0	5	0	0	573
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	922	2	3	231	894	0	0	0	0	1	0	1	1	0	0	0	45	2,101
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0	0	45
Total	3,612	774	645	539	3,813	227	228	73	72	349	74	241	565	0	2,098	0	45	13,352

TABLE A.6-1 ADT COUNTS AND PROJECTIONS FOR NORMAL AND INDUCED TRAFFIC FOR 2010 AND 2020

	EXISTING	ALTERNATIVE A						ALTERNATIVE B						ALTERNATIVE C					
Total Length (km)	5.4	5.4						3.7						5.2					
Avg. Speed (kph)	45	72.4						67.8						67.9					
Traffic Type.	60% of NR-13	Normal Traffic		Induced Traffic		Total Traffic		Normal Traffic		Induced Traffic		Total Traffic		Normal Traffic		Induced Traffic		Total Traffic	
Vehicle Types/Yr.	1995	2010	2020	2010	2020	2010	2020	2010	2020	2010	2020	2010	2020	2010	2020	2010	2020	2010	2020
2/3 wheelers	1,170	1,866	3,260	261	434	2,127	3,694	1,866	3,260	238	396	2,104	3,656	1,866	3,260	209	350	2,075	3,610
Cars/pickups	1,007	439	785	73	118	512	903	439	785	73	118	512	903	439	785	73	118	512	903
Buses	43	53	98	5	9	58	107	53	98	5	9	58	107	53	98	5	9	58	107
Trucks	357	730	1,007	47	64	777	1,071	730	1,007	47	64	777	1,071	730	1,007	47	64	777	1,071
TOTAL	2,577	3,088	5,150	386	625	3,474	5,775	3,088	5,150	363	587	3,451	5,737	3,088	5,150	334	541	3,422	5,691

Source : Traffic Study, JICA Study Team

TABLE A.6-2 VEHICLE KILOMETERS PER DAY VEHICLE NUMBER PROJECTED

Alternatives	EXISTING	A		B		C		A		B		C	
Traffic type	60% of NR-13	Total Traffic		Total Traffic		Total Traffic		Induced Traffic		Induced Traffic		Induced Traffic	
Vehicle type/Year	1995	2010	2020	2010	2020	2010	2020	2010	2020	2010	2020	2010	2020
2/3 wheelers	6318	11485.8	19947.6	7784.8	13527.2	10790	18772	1409.4	2343.6	880.6	1465.2	1086.8	1820
cars, pick ups	5437.8	2764.8	4876.2	1894.4	3341.1	2662.4	4695.6	394.2	637.2	270.1	436.6	379.6	613.6
buses	232.2	313.2	577.8	214.6	395.9	301.6	556.4	27	48.6	18.5	33.3	26	46.8
trucks	1927.8	4195.8	5783.4	2874.9	3962.7	4040.4	5569.2	253.8	345.6	173.9	236.8	244.4	332.8
Total	13916	18759.6	31185	12768.7	21226.9	17794.4	29593.2	4094.4	5395	3353.1	4191.9	3746.8	4833.2

Note : Induced traffic is included in total figures

TABLE A.6-3 AIR EMISSIONS DATA AND CALCULATIONS OF LOADINGS FOR 5 POLLUT 1995, 2010 AND 2020

1) Estimated total hydrocarbon (THC) emission along new road/bridge section (tonnes/yr).

Distance (km)	5.4	5.4		3.7		5.2	
Scenario	EXISTING	Alternative . A		Alternative B		Alternative C	
Traffic Type	60% of NR-13	Total Traffic		Total Traffic		Total Traffic	
Vehicle Types	1995	2010	2020	2010	2020	2010	2020
2/3 wheelers	26.29	47.79	83.00	32.39	56.29	44.90	78.11
Cars/pickups	2.56	1.30	2.30	0.89	1.57	1.25	2.21
Buses	0.45	0.61	1.12	0.42	0.77	0.58	1.08
Trucks	1.83	3.98	5.49	2.73	3.76	3.83	5.29
Total THC	31.13	53.68	91.91	36.43	62.39	50.56	86.69

2)

Air Pollution parameters	Total hydrocarbons (THC)	Carbon monoxide (CO)	Oxides of Nitrogen (NOx)	Sulphur dioxide (SO2)	Total suspended particles (TSP)
Vehicle types					
2/3 wheelers	11.4	21.4	0.14	0.648	0.08
Cars/pickups	1.29	10.24	1.31	1.74	0.07
Buses	5.3	6.6	16.5	6.6	1.4
Trucks	2.6	6	11.8	4.29	0.9

3) Estimated carbon monoxide (CO) emissions along new road/bridge section (tonnes/yr)

Distance (km)	5.4	5.4		3.7		5.2	
Scenario	EXISTING	Alternative . A		Alternative B		Alternative C	
Traffic	60% of NR-13	Total Traffic		Total Traffic		Total Traffic	
Vehicle Types	1995	2010	2020	2010	2020	2010	2020
2/3 wheelers	49.35	89.72	155.81	60.81	105.66	84.28	146.63
Cars/pickups	20.32	10.33	18.23	7.08	12.49	9.95	17.55
Buses	0.56	0.75	1.39	0.52	0.95	0.73	1.34
Trucks	4.22	9.19	12.67	6.30	8.68	8.85	12.20
Total CO	74.45	109.99	188.10	74.71	127.78	103.81	177.72

4) Estimated NOx emission (tonnes/yr) along new road/bridge section

Distance (km)	5.4	5.4		3.7		5.2	
Scenario	EXISTING	Alternative . A		Alternative B		Alternative C	
Traffic	60% of NR-13	Total Traffic		Total Traffic		Total Traffic	
Vehicle Types	1995	2010	2020	2010	2020	2010	2020
2/3 wheelers	0.32	0.59	1.02	0.40	0.69	0.55	0.96
Cars/pickups	2.60	1.32	2.33	0.91	1.60	1.27	2.25
Buses	1.40	1.89	3.48	1.29	2.38	1.82	3.35
Trucks	8.30	18.07	24.91	12.38	17.07	17.40	23.99
Total NOx	12.62	21.87	31.74	14.98	21.74	21.04	30.55

5) Estimated sulphur dioxide (SO2) emission along new road/bridge section (tonnes/yr)

Distance (km)	5.4	5.4		3.7		5.2	
Scenario	EXISTING	Alternative . A		Alternative B		Alternative C	
Traffic	60% of NR-13	Total Traffic		Total Traffic		Total Traffic	
Vehicle Types	1995	2010	2020	2010	2020	2010	2020
2/3 wheelers	1.49	2.72	4.72	1.84	3.20	2.55	4.44
Cars/pickups	3.45	1.76	3.10	1.20	2.12	1.69	2.98
Buses	0.56	0.75	1.39	0.52	0.95	0.73	1.34
Trucks	3.02	6.57	9.06	4.50	6.20	6.33	8.72
Total SO2	8.52	11.80	18.27	8.06	12.47	11.30	17.48

6) Estimated total suspended particulate mater (TSP) along new road/bridge section (tonnes/yr)

Distance (km)	5.4	5.4		3.7		5.2	
Scenario	EXISTING	Alternative . A		Alternative B		Alternative C	
Traffic	60% of NR-13	Total Traffic		Total Traffic		Total Traffic	
Vehicle Types	1995	2010	2020	2010	2020	2010	2020
2/3 wheelers	0.18	0.34	0.58	0.23	0.39	0.32	0.55
Cars/pickups	0.14	0.07	0.12	0.05	0.09	0.07	0.12
Buses	0.12	0.16	0.30	0.11	0.20	0.15	0.28
Trucks	0.63	1.38	1.19	0.94	1.30	1.33	1.83
Total TSP	1.07	1.95	2.19	1.33	1.98	1.87	2.78

(Base data for 1995, is valid only for Pakse)

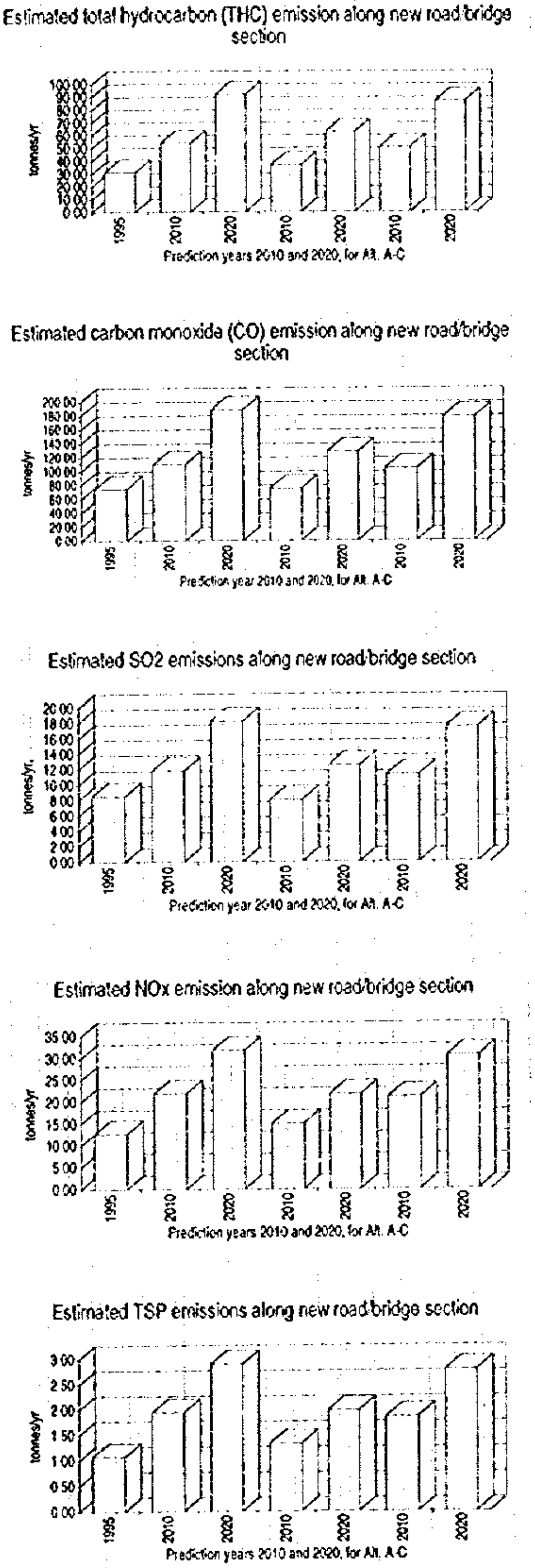


FIGURE A.6-1 ESTIMATED EMISSION LOADINGS ALONG THE PROPOSED ROUTES A, B AND C; 2010 AND 2020 (Base year: 1995, Pal)

TABLE A.6-4 SURFACE WATER QUALITY MEASUREMENTS, JAN. TO DEC. 1992

SEDON RIVER AT DAM SITE, PAKSE

Date	Flow (m3/sec)	Temp (C)	pH	TSS (mg/l)	Cond (mS/m)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	K (meq/l)	Alk (meq/l)	Cl (meq/l)	SO4 (meq/l)	Total-Fe (mg/l)	(NO3+2)-N (mg/l)	NH4-N (mg/l)	Total-N (mg/l)	PO4-P (mg/l)	Total-P (mg/l)	Si (mg/l)	O2 (mg/l)	COD-MN (mg/l)
20-Jan-92		22.1	7.25	16.0	14.7	1.033	0.233	0.185	0.037	1.188	0.135	0.276	0.080	0.060	0.090		0.010	0.041	14.20	6.51	1.4
14-Feb-92		26.6	7.37	18.0	13.2	0.988	0.211	0.127	0.027	1.192	0.112	0.224	0.070	0.181	0.074		0.012	0.016	17.20	6.61	1.3
17-Mar-92		25.6	7.37	12.0	13.0	0.988	0.216	0.079	0.038	1.025	0.121	0.211	[illegible]	0.040	0.077		0.023	0.054	15.30	5.21	[illegible]
17-Apr-92		30.0	[illegible]	14.0	15.1	1.122	0.235	0.122	0.045	1.225	0.133	0.232	0.090	0.053	0.023		0.018	0.032	14.10	6.47	1.5
22-May-92		31.9	7.35	22.0	14.4	1.100	0.226	0.104	0.033	1.322	0.013	0.237	0.080	0.047	0.033		0.014	0.028	14.00	7.83	1.9
15-Jun-92		31.0	7.09	202.0	3.6	0.611	0.093	0.077	0.023	0.710	0.068	0.097	0.070	0.061	0.030		0.118	0.123	14.40	7.76	3.0
16-Jul-92		26.2	7.04	250.0	3.3	0.330	0.111	0.044	0.034	0.405	0.015	0.120	0.240	0.093	0.084		0.066	0.079	13.70	9.67	2.8
17-Aug-92		25.4	7.54	304.0	6.3	0.387	0.129	0.043	0.031	0.467	0.036	0.122	0.200	0.092	0.024		0.054	0.064	14.00	8.22	2.2
15-Sep-92		28.3	8.39	296.0	7.7	0.416	0.137	0.046	0.018	0.486	0.030	0.125	0.220	0.110	0.020		0.037	0.049	13.90	10.82	1.5
15-Oct-92		28.0	7.81	2246.0	9.4	0.589	0.196	0.065	0.026	0.751	0.041	0.151	0.290	0.206	0.036		0.046	0.042	[illegible]	3.22	[illegible]
16-Nov-92		24.6	7.86	13.0	10.6	0.705	0.254	0.160	0.036	0.822	0.075	0.241	0.240	0.049	0.041		0.008	0.015	14.00	9.39	1.5
16-Dec-92		26.6	7.31	25.0	12.1	0.775	0.311	0.195	0.025	1.196	0.019	0.054	0.210	0.125	0.073		0.010	0.020	10.50	9.79	4.8

MEKONG RIVER AT PAKSE

Date	Flow (m3/sec)	Temp (C)	pH	TSS (mg/l)	Cond (mS/m)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	K (meq/l)	Alk (meq/l)	Cl (meq/l)	SO4 (meq/l)	Total-Fe (mg/l)	(NO3+2)-N (mg/l)	NH4-N (mg/l)	Total-N (mg/l)	PO4-P (mg/l)	Total-P (mg/l)	Si (mg/l)	O2 (mg/l)	COD-MN (mg/l)
21-Jan-92		16.6	8.00	42.0	22.6	1.273	0.566	0.372	0.045	1.668	0.228	0.380	0.12	0.173	0.032		0.029	0.043	6.20	8.32	4.5
15-Feb-92		27.9	8.00	16.0	22.3	1.228	0.507	0.361	0.031	1.784	0.220	0.258	0.12	0.082	0.028		0.021	0.026	7.30	8.07	4.5
17-Mar-92		28.5	8.16	26.0	23.7	1.627	0.407	0.086	0.036	1.318	0.213	0.244	0.11	0.094	0.030		0.024	0.050	6.80	8.11	2.3
17-Apr-92		29.2	7.99	12.0	24.9	1.611	0.397	0.404	0.036	1.395	0.226	0.358	0.08	0.062	0.031		0.017	0.034	6.10	8.39	1.4
22-May-92		25.8	7.53	45.0	23.7	1.555	0.338	0.254	0.030	1.673	0.327	0.390	0.16	0.074	0.089		0.018	0.021	5.20	7.83	3.8
16-Jun-92		28.5	7.44	150.0	21.4	1.300	0.322	0.224	0.024	1.168	0.485	0.246	0.11	0.092	0.025		0.071	0.072	6.10	8.03	2.4
17-Jul-92		26.0	7.82	256.0	16.4	0.973	0.324	0.216	0.067	1.188	0.201	0.246	0.69	0.220	0.037		0.041	0.049	6.10	7.85	2.0
17-Aug-92		26.4	7.80	239.0	14.3	0.622	0.231	0.116	0.045	1.090	0.111	0.232	0.51	0.236	0.019		0.052	0.062	6.20	7.32	2.2
16-Sep-92		26.5	7.27	300.0	12.2	0.981	0.245	0.123	0.046	1.000	0.212	0.211	0.67	0.220	0.021		0.049	0.059	6.30	7.80	2.1
17-Oct-92		26.4	8.01	276.0	14.9	1.012	0.253	0.125	0.050	1.071	0.202	0.226	0.54	2.369	1.050		0.053	0.109	5.60	7.55	2.3
16-Nov-92		23.0	7.85	208.0	16.8	1.155	0.348	0.184	0.047	1.228	0.161	0.255	0.54	0.292	0.050		0.036	0.029	5.70	9.36	1.5
17-Dec-92		25.4	7.84	60.0	21.7	1.352	0.451	0.332	0.054	1.619	0.234	0.285	[illegible]	0.162	0.026		0.019	0.035	[illegible]	9.43	[illegible]

Source: Lower Mekong Hydrological Yearbook, 1992. Mekong Commission, Vientiane, Lao PDR.

TABLE A.6-5 RESULTS OF SURVEY ON THE RELATIONSHIP BETWEEN ANNUAL EARNINGS OF LOCAL STORES AND THE CAR FERRY TRAFFIC IN PAKSE (1/2)

Survey No.	Survey Date	Bus. Type	No. Yrs. In Business	Dist. from Ferry Dock (m)	Annual Earnings (Kp)	No. People Employed	Women Owner (1=yes, 2=no)	No. woment working full-time	% of earnings from Ferry Traffic	% of earnings from long-boat Traffic	Impact of Ferry closing (1-4)	Comment-on what sold
1	18/11/95	2	3	300	7,000,000	1	1	1	20	50	2	fertilizer, beer
2	18/11/95	2	5	310	3,000,000	1	1	1	40	20	2	pharmaceuticals
4	18/11/95	2	1	315	2,000,000	1	1	1	30	20	2	cakes, plastic bags
5	18/11/95	2	3	300	16,000,000	1	1	1	10	10	1	gold/silver
6	18/11/95	2	15	280	3,000,000	2	1	2	20	25	1	ceremonial mat., candles
7	18/11/95	2	10	270	4,000,000	1	1	1	25	25	2	ceremonial mat., candles
8	18/11/95	2	0.1	60	200,000	1	1	1	10	10	1	bedding items/material
9	18/11/95	6	0.5	265	250,000	1	1	1	1	2	1	gold/silver, jewelry
10	18/11/95	6	3	260	20,000,000	1	1	1	20	20	1	gold/silver, jewelry
11	18/11/95	2	10	265	2,000,000	1	1	1	50	30	1	bedding, cooking ware
12	18/11/95	3	10	260	3,000,000	2	1	1	6	7	1	ceremonial mat., candles
13	18/11/95	2	0.4	255	400,000	1	1	1	8	10	1	ceremonial mat., candles
14	18/11/95	1	1	250	400,000	1	1	1	60	30	1	tobacco, cigs.,sugar
15	18/11/95	2	7	245	24,000,000	2	1	1	20	18	2	pharmaceuticals
16	18/11/95	2	25	240	2,000,000	2	1	2	10	15	1	general store
17	18/11/95	6	10	235	38,000,000	5	1	1	10	10	1	bicycles and parts
18	18/11/95	2	5	230	3,000,000	3	1	2	10	12	1	small gnrl. store
19	18/11/95	2	10	225	20,000,000	4		2	10	10	1	insecticide, fertil., sugar
20	18/11/95	2	16	220		2	1	2	12	10	1	salt, candle wax
21	18/11/95	2	7	215	22,500,000	2	1	1	10	12	2	pharmaceuticals
22	18/11/95	2	8	210	300,000	1	1	1	30	30	3	potatoes, soft drinks
23	18/11/95	2	12	210	22,500,000	2	1	1	30	30	2	pharmaceuticals
24	18/11/95	2	6	205	10,950,000	2	1	1	20	20	2	pharmaceuticals
25	18/11/95	2	13	200	2,500,000	2	1	2	2	3	1	cookware
26	18/11/95	2	5	195	3,500,000	1	1	1	30	30	2	foodstuffs, produce
27	18/11/95	2	0.4	190	100,000	1	1	1	35	30	2	foodstuffs
28	18/11/95	2	20	185	3,000,000	2	1	2	34	30	2	small gnrl. store
29	18/11/95	4	0.1	170	50,000	2	1	2	2	1	1	tailor, cloth,clothing
30	18/11/95	1	2	160	300,000	1	1	1	20	25	1	bread, sandwitches
31	18/11/95	1	5	140	5,000,000	2	1	1	25	25	1	beer, soft drinks
32	18/11/95	3	0.8	110	2,000,000	2	1	2	5	3	1	food, drinks
33	18/11/95	3	5	115	3,000,000	2	1	2	3	2	1	bananas (boiled)
34	18/11/95	3	1	120	3,600,000	3	1	3	10	15	1	noodles,bread
35	18/11/95	3	2	130	2,500,000	1	1	1	5	3	1	noodles,bread
36	18/11/95	1	1	140	3,000,000	1	1	1	1	2	1	fruit, soft drinks
37	18/11/95	2	6	140		10	1	5	4	5	1	full meals (rest.)
38	18/11/95	2	5	150	15,000,000	2	1	2	0	0	1	Rice
39	18/11/95	2	7	152	16,000,000	2	1	2	0	0	1	Rice
40	18/11/95	2	2	153	13,000,000	2	1	2	0	0	1	Rice, Papaya
41	18/11/95	4	2	153	1,000,000	2	1	2	2	1	1	tailor, clothing
42	18/11/95	4	0.5	155	42,000	3	1	3	1	1	1	taylor, clotning
43	18/11/95	2	2	160	5,822,220	3	1	1	20	25	1	gnrl. store
44	18/11/95	2		165	18,000,000	2	1	1	10	15	1	detergent, soap
45	18/11/95	6	11	170	32,000,000	3	1	1	10	5	1	bike parts, constructn. mat.
46	18/11/95	2	5	175	2,000,000	2	1	1	5	5	1	gnrl. store, detergent, soa
47	18/11/95	2	15	310	16,000,000	2	1	1	10	5	1	pharmaceuticals
48	18/11/95	2	7	300	18,000,000	3	1	3	5	5	1	foodstuffs, soup
49	18/11/95	2	5	275	6,000,000	3	1	2	3	2	1	gnrl. store, rice sacks
50	18/11/95	2	5	270	9,022,222	2	1	1	20	25	1	ceremonial items
51	18/11/95	2	3	265	3,000,000	3	1	3	20	15	1	ceremonial items
52	18/11/95	4	1	260	6,000,000	1	1	1	2	2	1	clothing
53	18/11/95	6	10	255	11,000,000	1	1	1	1	1	1	fishing supplies
54	18/11/95	2	10	250	14,000,000	1	1	1	10	5	1	foodstuffs
55	18/11/95	2	3	240	5,000,000	1	1	1	10	5	1	salt, buckets
56	18/11/95	2	15	235	7,000,000	3	1	2	20	10	1	cooking equip., bedding
57	18/11/95	6	3	230	210,000,000	1	1	1	10	10	1	jewelry (gold/silver)
58	18/11/95	2	8	225	8,000,000	2	1	2	30	12	1	foodstuffs, soap
59	18/11/95	6	25	200	20,000,000	4	1	3	2	1	1	electronic equip
60	18/11/95	2	3	220	1,800,000	1	1	1	10	7	1	ceremonial items, bedding

TABLE A.6-5 RESULTS OF SURVEY ON THE RELATIONSHIP BETWEEN ANNUAL EARNINGS OF LOCAL STORES AND THE CAR FERRY TRAFFIC IN PAKSE (2/2)

Survey No.	Survey Date	Bus. Type	No. Yrs. In Business	Dist. from Ferry Dock (m)	Annual Earnings (Kp)	No. People Employed	Women Owner (1=yes, 2=no)	No. woment working full-time	% of earnings from Ferry Traffic	% of earnings from long-boat Traffic	Impact of Ferry closing (1-4)	Comment-on what sold
61	18/11/95	3	22	228	3,000,000	2	1	2	5	8	1	coffee, ovaltine
62	20/11/95	2	1	345	18,250,000	3	1	2	10	12	1	pharmaceuticals
63	20/11/95	4	17	285	25,500,000	1	1	1	10	10	1	clothing, buttons
64	20/11/95	2	15	350	10,950,000	2	1	1	3	3	1	pharmaceuticals
65	20/11/95	4	2	290	2,190,000	2	1	1	7	5	1	clothing, buttons
66	20/11/95	4	10	295	7,300,000	2	1	1	8	8	1	clothing
67	20/11/95	6	10	300	62,050,000	2	1	1	5	3	1	jewelry
68	20/11/95	6	17	305	127,700,000	2	1	2	7	5	2	jewelry
69	20/11/95	4	6	295	1,825,000	2	1	1	7	7	1	clothing
70	20/11/95	6	4	280	109,500,000	3	1	1	10	10	1	constrctn. materials
71	20/11/95	3	2	270	25,550,000	5	1	3	0	0	1	complete meals
72	20/11/95	6	5	240	2,555,000	2	1	2	10	8	1	shovels, hoes,picks, elect.
73	20/11/95	2		230	10,000,000	1	1	1	12	15	1	gnrl. foodstuffs
74	20/11/95	1	10	225	3,560,000	2	1	2	1	8	1	coconut, chicken
75	20/11/95	1	3	220	2,190,000	1	1	1	5	28	1	noodles, soft drinks
76	20/11/95	1	1	215	91,550,000	1	1	1	5	10	1	chicken, duck
77	20/11/95	1	2	210	7,300,000	2	1	2	2	15	1	alcohol, water
78	20/11/95	1	6	205	9,125,000	1	1	1	5	20	2	soft drinks, chicken
79	20/11/95	1	0.8	200	2,550,000	1	1	1	2	30	1	soup, noodles
80	20/11/95	1	3	180	2,190,000	1	1	1	2	40	1	soft drinks, tea
81	20/11/95	1	3	175	2,190,000	1	1	1	1	50	1	soft drinks, coffee
82	20/11/95		1	170	1,900,000	1	1	1	1	40	1	
83	20/11/95	1	1	165	3,285,000	1	1	1	1	30	1	soft drinks, coffee
84	20/11/95	1	3	160	8,395,000	1	1	1	8	10	1	soft drinks, tea
85	20/11/95	1	4	150	1,825,000	1	1	1	2	50	1	soft drinks, coffee
86	20/11/95	1	1	140	1,277,500	1	1	1	1	40	1	soft drinks, coffee
87	20/11/95	1	0.3	130	2,190,000	2	1	2	2	40	1	soft drinks, alcohol
88	20/11/95	1	2	125	2,555,000	1	1	1	1	40	1	bread, soft drinks
89	20/11/95	1	2	115	1,277,500	1	1	1	2	40	1	soft drinks
90	20/11/95	1	1	110	1,825,000	1	1	1	2	38	2	papaya, alcohol
91	20/11/95	1	0.6	100	1,095,000	1	1	1	3	40	1	soft drinks, alcohol
92	20/11/95	1	2	90	2,555,000	1	1	1	2	35	1	soft drink, tea
93	20/11/95	1	1	60	2,500,000	1	1	1	3	50	1	soft drinks, coffee
94	20/11/95	1	0.1	40	1,460,000	2	1	2	20	20	1	soft drinks, coffee
95	20/11/95	1	3	30	3,650,000	1	1	1	30	20	2	soft drinks, coffee
96	20/11/95	1	3	2.5	4,015,000	1	1	1	50	15	3	soft drinks, coffee
97	20/11/95	6	1		59,568,000	1	1	1	20	20	2	auto fuel
98	20/11/95	1	1	1.5	3,650,000	2	1	2	40	2	3	soft drinks, orange juice
99	20/11/95	3	4	10	7,300,000	3	1	2	60	5	2	potable water, cake
100	20/11/95	1	1	0	2,190,000	1		1	100	0	4	soft drinks, coffee
101	20/11/95	1	10	0	2,920,000	1	1	1	100	0	4	soup, noodles
102	20/11/95	1	2	0	3,650,000	1	1	1	100	0	4	soft drink, coffee
103	20/11/95	1	3	100	2,555,000	1	1	1	2	1	1	soft drinks, cake
104	20/11/95	3	15	100	3,650,000	2	1	2	1	1	1	papaya, cake
105	20/11/95	6	1	30	10,000,000	2	1	1	10	2	2	constrct. mat., steel

TABLE A.6-6 COMPARISON MATRIX FOR ALIGNMENTS OF ALTERNATIVES A, B AND C FROM ASSESMENT OF EXISTING CONDITIONS AT PASE, YEAR: 1995

Environmental Component	Sensitivity Weighting (1-10)	Indicator Number	Indicator description	Units data collected in	Scale conversion relationship (1-10)	Alternative A		Alternative B		Alternative C		Weighted Value			Scalar Averages		
			Definition of scale		1=minimal (least) 10=extreme(worst)	Actual	Weighted Scalar Value	Actual	Weighted Scalar Value	Actual	Weighted Scalar Value	Alt A	Alt B	Alt C	Alt A	Alt B	Alt C
BIOPHYSICAL ENV.				tonnes/yr													
Air	5	1	Emission loadings for 5 pollutants in tonnes/yr	THC	0t=1 - 100t=10	91.9	9	62.4	6.24	86.7	8.5				8.90	5.96	8.31
		2	for Yr. 2020-un-corrected for avg. speed and temp.	CO	0t=1 - 200t=10	188.1	9.4	127.8	6.4	177.7	8.9						
		3		NOx	0t=1 - 50t=10	31.7	7.4	21.7	4.3	30.5	6.1						
		4		SO2	0t=1 - 20t=10	18.25	9.1	12.5	6.25	17.5	8.75						
		5		TSP	0t=1 - 3t=10	2.9	9.6	2	6.6	2.8	9.3	44.50	29.79	41.55			
Noise	6	6	sensitive features (temples, schools and homes) within 200m wide zone exposed to noise environment which is at least 20 dBA above the background level(considering, vert.elev.,etc.)	No. temples, schools, hospitals, houses	<5=1, >200 = 10	36	1.8	162	8.1	51	2.5	10.8	48.6	15	1.8	8.1	2.5
Water Resources	7	7	presence of a sensitive water resources feature	Scale	1=none to 10=extreme	1	1	9	9	4	4				2.5	6.5	4
		8	potential for chronic water pollution:	Scale	1=none to 10=extreme	4	4	4	4	4	4	17.5	45.5	28			
Fisheries Resources	7	9	fisheries migration route disruption	% likelihood	<5%=1 - >30%=10	10	4.3	15	5	15	5				4.3	5	5
		10	fisheries habitat loss (% likelihood)	percentage likelihood	<5%=1 >30%=10	10	4.3	15	5	15	5	30.1	35	35			
Terrestrial Resources	3	11	number of economically important tree/plant species (mature) removed in 40-m wide ROW (6 species to consider)	No. of trees	0 trees=1 - 20 trees =10	0	1	15	7.5	17	8				1	5.25	6
		12	encroachment on wildlife habitat	Scale	0= none to 10=extreme	1	1	3	3	4	4	3	15.75	18			
Mitigation / Compensation	6	13	cost of biophysical environmental impact mitigation	0=none to 10=extremely high	0=none to 10=extremely high	2	2	4	4	4	4	12	24	24	2	4	4
HUMAN/BUILT ENV.																	
Settlement	10	14	no. dwellings to be taken within 40-m wide ROW	No units	0 strct.=1 - 60strct.=10	14	2.3	38	6.3	51	8.5	17.93	60.71	87.67	1.79	6.07	8.77
		15	total cost of dwellings to be taken in 40-m wide ROW	Kip	0 $=1 - 600K$=10	89000	1.5	235000	3.9	529000	8.8						
		16	total no dwellings in 200m wide impact zone	No.Units	0 strct.=1- 200strct.=10	32	1.6	160	8	180	9						
Landuse	8	17	m2 of rice field taken in 40-m wide ROW	m2	0 m2=1 - 150K m2=10	101000	6.7	70000	4.7	146000	9.7	54	37.72	70.2	6.75	4.72	8.78
		18	total m2 rice fields in 200-m wide impact zone	m2	0 m2=1 - 280K m2=10	214000	7.6	215000	7.6	273000	9.7						
		19	total cost of rice fields taken in 40-wide ROW	Kip	0 $=1 - 750K$=10	505000	6.7	350000	4.6	730000	9.7						
		20	extent of access restiction (lost road links)	scale	0=none-10=extreme	6	6	2	2	6	6						
Socioeconomic	9	21	extent of interference with peoplels livelihood	scale	0=none to 10=extreme	5	5	8	8	6	6	49.5	69.75	38.25	5.5	7.75	4.25
		22	change in existing landscape	Scale	0=none to 10=extreme	7	7	8	8	4	4						
		23	Extent of visual intrusion of approach roads	Scale	0=none to 10=extreme	7	7	7	7	3	3						
		24	restriction to planned orderly urban growth and development	Scale	0=none to 10=extreme	3	3	8	8	4	4						
CRITICAL DEVELOPMENT RESTRICTIONS	10	25	Basic local Planning actions (e.g., airport runways) which seriously impede alignment alternative	Scale	0= no impedence, 10= critical impedence	9	9	4	4	2	2	90	40	20	9	4	2
PUBLIC CONSULTATION	9	26	Choice of Goverment of Champasak Province	Scale	most fav.=1 least desirable=10	9	9	6	6	3	3	81	54	27	9	6	3

TABLE A.6-7 SUMMARY OF PROPERTY AFFECTED BY THE APPROACH ROADS OF THE PROPOSED BRIDGES ROUTES

		BRIDGE ALTERNATIVE A				BRIDGE ALTERNATIVE B				BRIDGE ALTERNATIVE C			
Item Description		E-40A	E-200A	W-40A	W-200A	E-40B	E-200B	W-40B	W-200B	E-40C	E-200C	W-40C	W-200C
Bldgs.	1-SW	2	2	10	30	18	58	18	97	26	58	12	77
	1-SWC	0	0	0	0	1	1	0	0	0	3	1	1
	2-SW	0	0	2	3	0	2	2	5	0	1	1	4
	2-SWC	0	1	0	0	1	2	2	7	1	9	1	5
	1-SC	0	0	0	0	0	2	2	5	3	7	1	4
	2-SC	0	0	0	0	0	2	0	0	4	6	0	0
	3-SC	0	0	0	0	0	0	0	0	1	1	0	0
	Other Bldgs.	0	0	0	0	4	8	0	2	0	3	0	1
	Relig. Sites : Wats	none	none	none	none	none	Wat Pan Sawan	none	Wat Kang Yang	none	none	none	Wat Kang Yang
Water	Deep Wells	0	0	0	0	0	0	0	0	4	4	0	0
Roads	Intersections	0	0	6	6	2	2	0	1	6	8	0	1
Agricult.	Rice Fields (m2)	21000	94000	80000	120200	16000	80000	54000	135000	92000	138000	54000	135000
Trees	Tamarind (No.)	0	0	0	0	1	2	0	3	6	6	0	3
	Teak	0	0	0	0	10	25	0	0	0	0	0	0
	Mango	0	0	0	0	0	0	3	20	6	12	3	20
	Palm	0	0	0	0	0	0	1	1	1	1	1	1
Special	Features	high antenna	high antenna	none	none	none	none	none	Kang Yang School	Saman Sai School	none	none	Kang Yang School

C.B. SURVEYING CO.,LTD

STATION RECORD SHEET

STATION	P-03
DATE	OCTOBER 1995

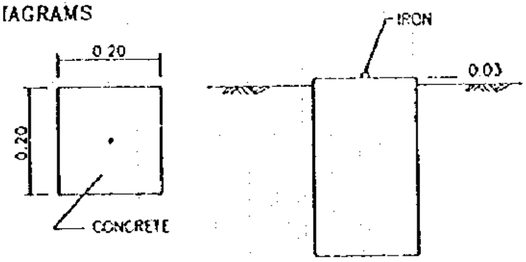
PROJECT : Mekong Bridge at Pakse	LOCATION : Champasak, Pakse
PROJECTION : Gauss - Kruger	VERTICAL DATUM : MSL (South China Sea)
SCALE FACTOR CM 1.00000	Sheriod : Krasobsky

STATION	CO-ORDINATE		GEOGRAPHIC CO-ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
P-03	1674990.098	8582989.358	-	-	102.429

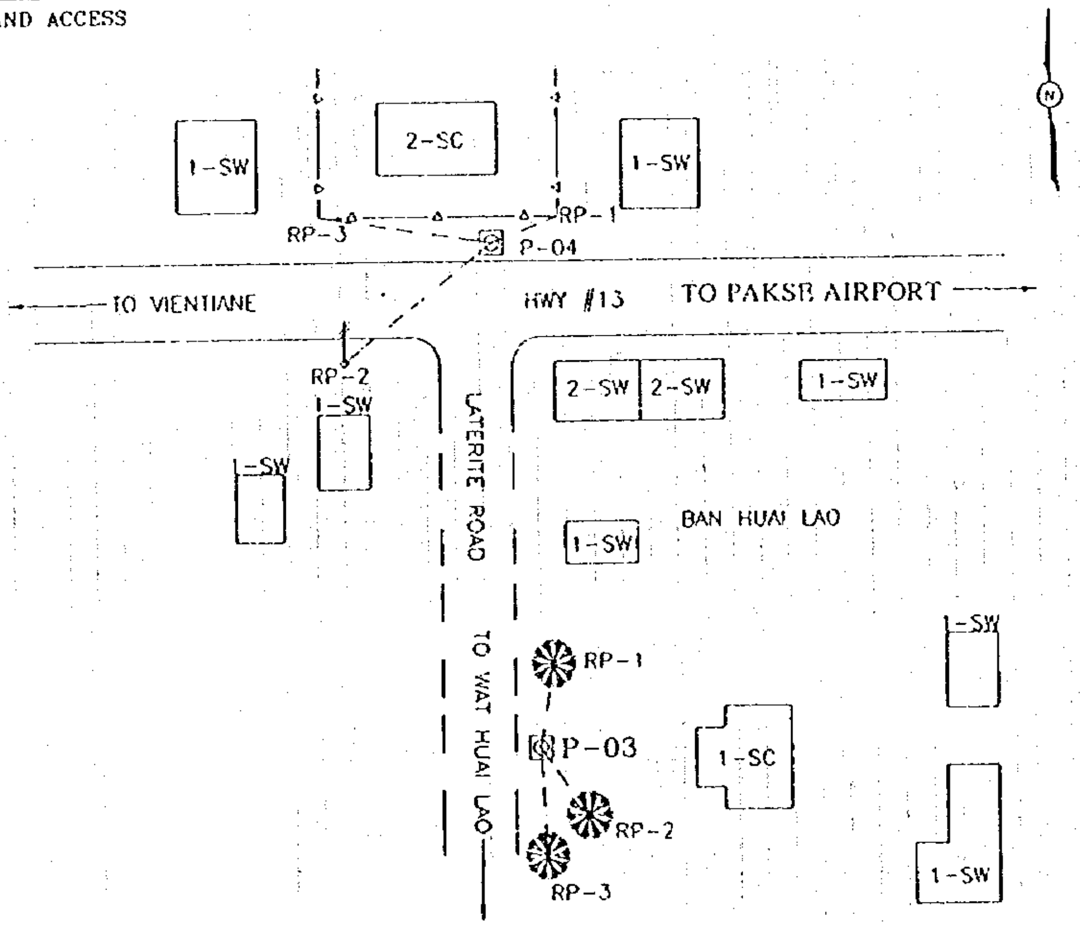
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP-1	TREE ø0.30	AZIMUTH 95° DEG	DISTANCE 9.80 M.
RP-2	MANGO ø0.35	AZIMUTH 211° DEG	DISTANCE 21.41 M.
RP-3	MANGO ø0.30	AZIMUTH 237° DEG	DISTANCE 21.85 M.

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (1/13)

C.B. SURVEYING CO.,LTD	STATION RECORD SHEET	STATION P-04
		DATE OCTOBER 1995

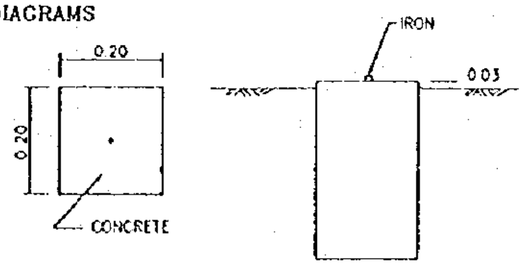
PROJECT : Mekong Bridge at Pakse	LOCATION : Champasak, Pakse
PROJECTION : Gauss - Kruger	VERTICAL DATUM : MSL (South China Sea)
SCALE FACTOR CM 1.00000	Sheriod : Krasobsky

STATION	CO-ORDINATE		GEOGRAPHIC CO-ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
P-04	1675166.667	8583250.106	-	-	102.725

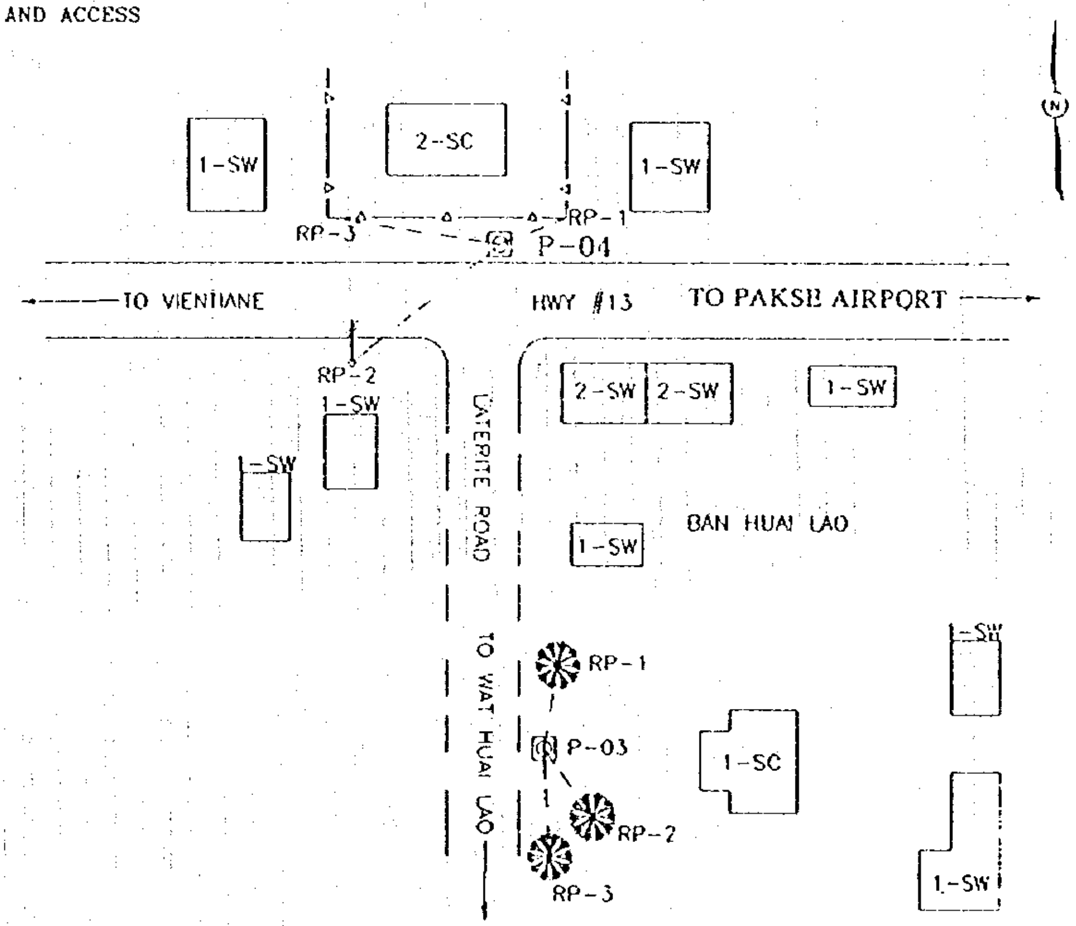
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP-1	CORNER CONCRETE FENCE	AZIMUTH 95° DEG	DISTANCE 2.20 M.
RP-2	ELECTRIC POLE	AZIMUTH 271° DEG	DISTANCE 29.50 M.
RP-3	CORNER CONCRETE FENCE	AZIMUTH 318° DEG	DISTANCE 23.50 M.

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (2/13)

C.S. SURVEYING CO.,LTD.

STATION RECORD SHEET

STATION	P-23
DATE	OCTOBER 1995

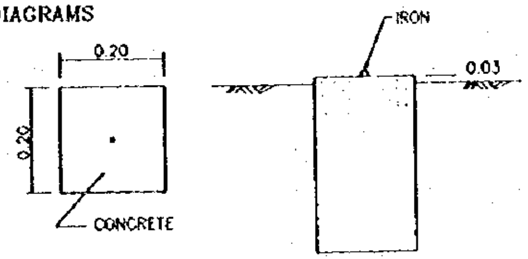
PROJECT : Mekong Bridge at Pakse	LOCATION : Champasak, Pakse
PROJECTION : Gauss - Kruger	VERTICAL DATUM : MSL (South China Sea)
SCALE FACTOR CM 1.00000	Sheriod : Krasobsky

STATION	CO-ORDINATE		GEOGRAPHIC CO-ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
P-23	1672188.169	8587720.442	-	-	101.595

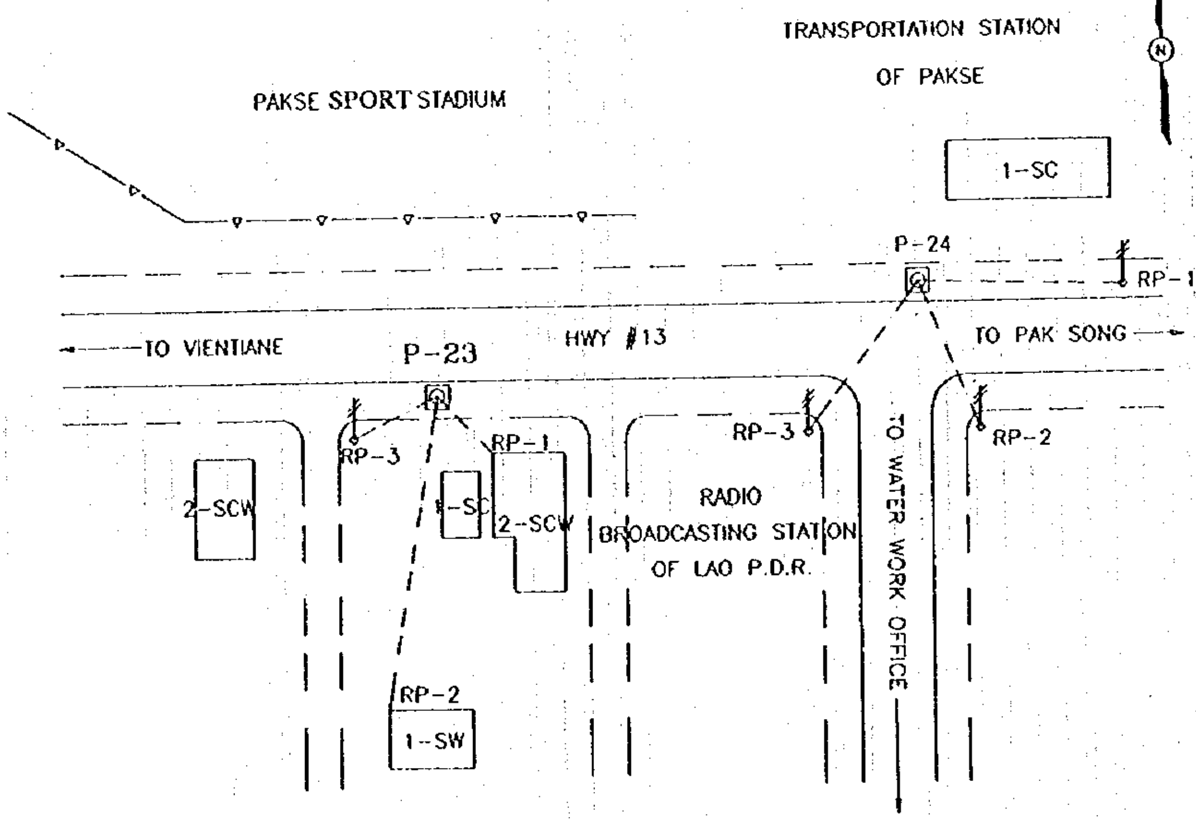
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP-1 CORNER BUILDING AZIMUTH 108° DEG DISTANCE 21.005 M.

RP-2 CORNER BUILDING AZIMUTH 172° DEG DISTANCE 18.20 M.

RP-3 ELECTRICTY POLE #64 AZIMUTH 256° DEG DISTANCE 6.80 M.

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (3/13)

C.S. SURVEYING CO.,LTD

STATION RECORD SHEET

STATION: P-24
DATE: OCTOBER 1995

PROJECT : Mekong Bridge at Pakse — LOCATION : Champasak, Pakse

PROJECTION : Gauss - Kruger — VERTICAL DATUM : MSL (South China Sea)

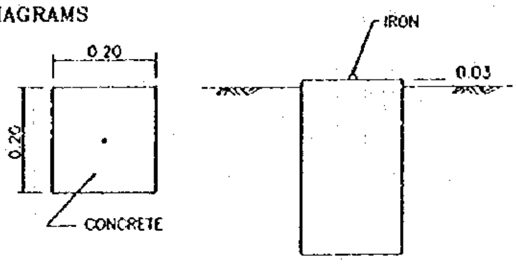
SCALE FACTOR CM 1.00000 — Sheriod : Krasobsky

STATION	CO-ORDINATE		GEOGRAPHIC CO-ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
P-24	1672171.789	8588339.228	-	-	112.057

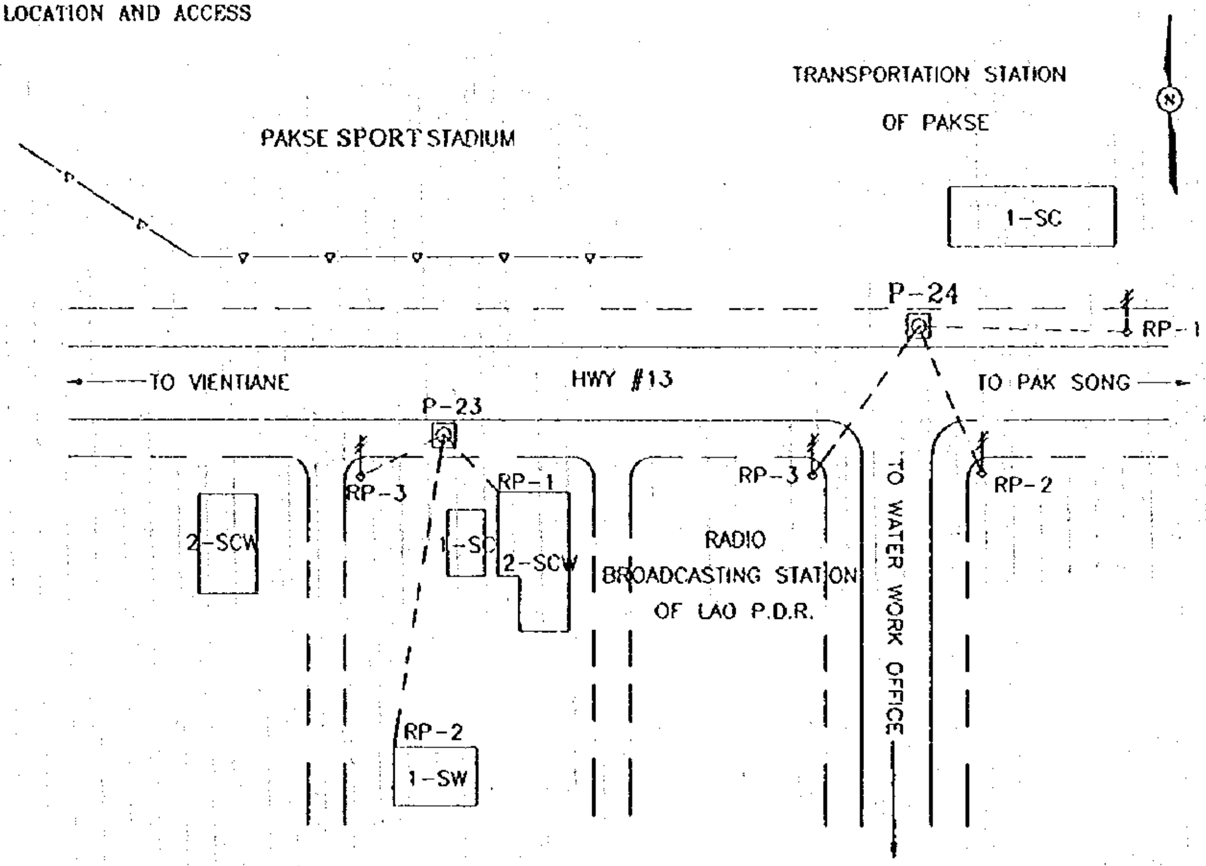
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP-1	ELECTRICTY POLE #025	AZIMUTH 90° DEG	DISTANCE 13.50 M.
RP-2	ELECTRICTY POLE	AZIMUTH 148° DEG	DISTANCE 32.005 M
RP-3	ELECTRICTY POLE	AZIMUTH 190° DEG	DISTANCE 20.30 M

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (4/13)

C.B. SURVEYING CO.,LTD

STATION RECORD SHEET

STATION: *CB-A1*

DATE: OCTOBER 1995

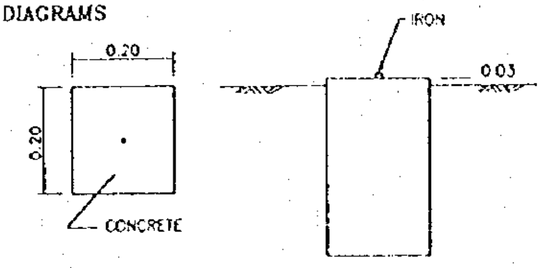
PROJECT : Mekong Bridge at Pakse	LOCATION : Champasak, Pakse
PROJECTION : Gauss - Kruger	VERTICAL DATUM : MSL (South China Sea)
SCALE FACTOR CM 1.00000	Sheriod : Krasobsky

STATION	CO-ORDINATE		GEOGRAPHIC CO-ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
CB-A1	1674746.550	8582358.438	-	-	100.536

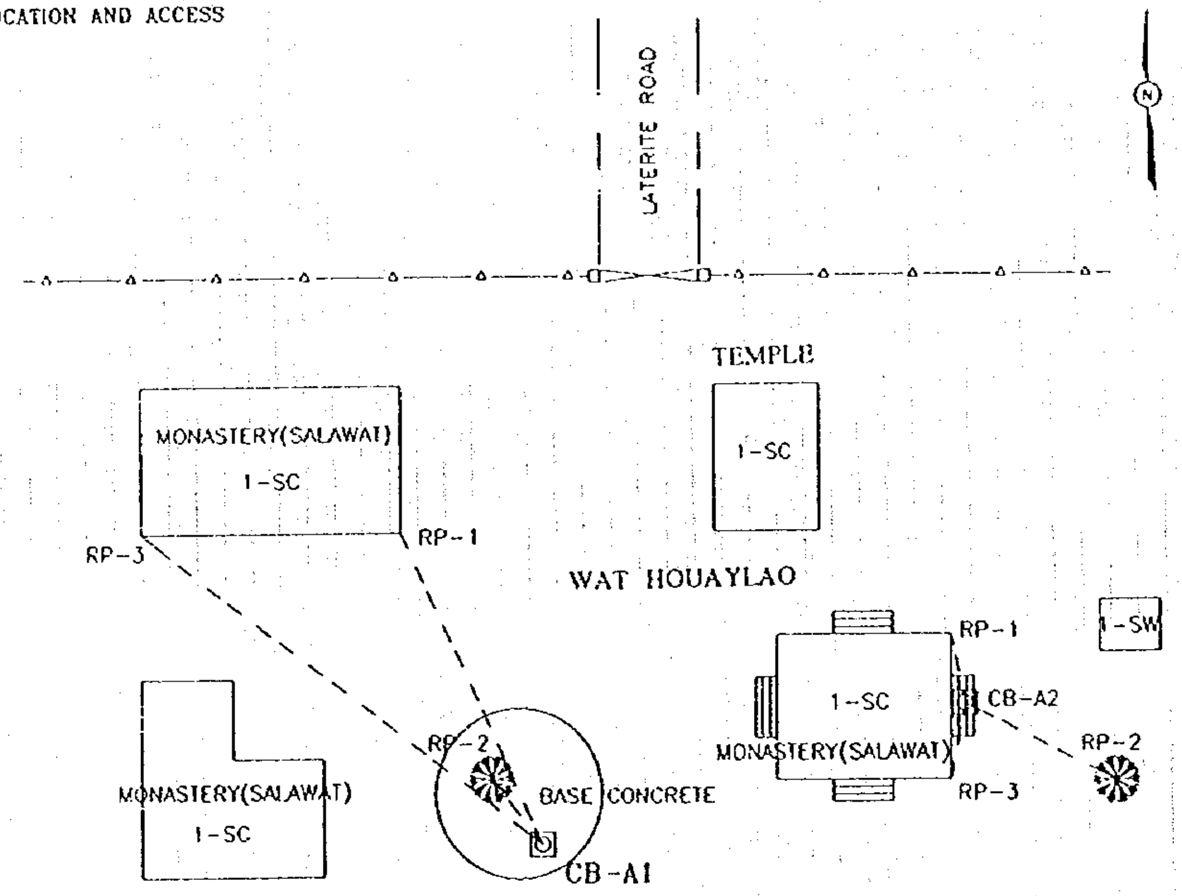
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP-1	CORNER MONASTERY	AZIMUTH 79° DEG	DISTANCE 3.10 M.
RP-2	LONGAN ø0.25	AZIMUTH 172° DEG	DISTANCE 1.80 M.
RP-3	CORNER MONASTERY	AZIMUTH 343° DEG	DISTANCE 9.80 M.

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (5/13)

C.B. SURVEYING CO.,LTD.

STATION RECORD SHEET

STATION: **CB-A2**

DATE: OCTOBER 1995

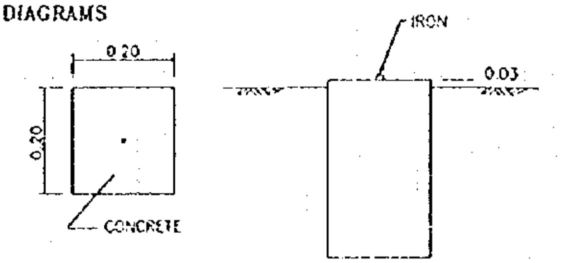
PROJECT : Mekong Bridge at Pakse	LOCATION : Champasak, Pakse
PROJECTION : Gauss - Kruger	VERTICAL DATUM : MSL (South China Sea)
SCALE FACTOR CM 1.00000	Sheriod : Krasobsky

STATION	CO-ORDINATE		GEOGRAPHIC CO-ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
CB-A2	1674719.090	8582397.200	-	-	100.171

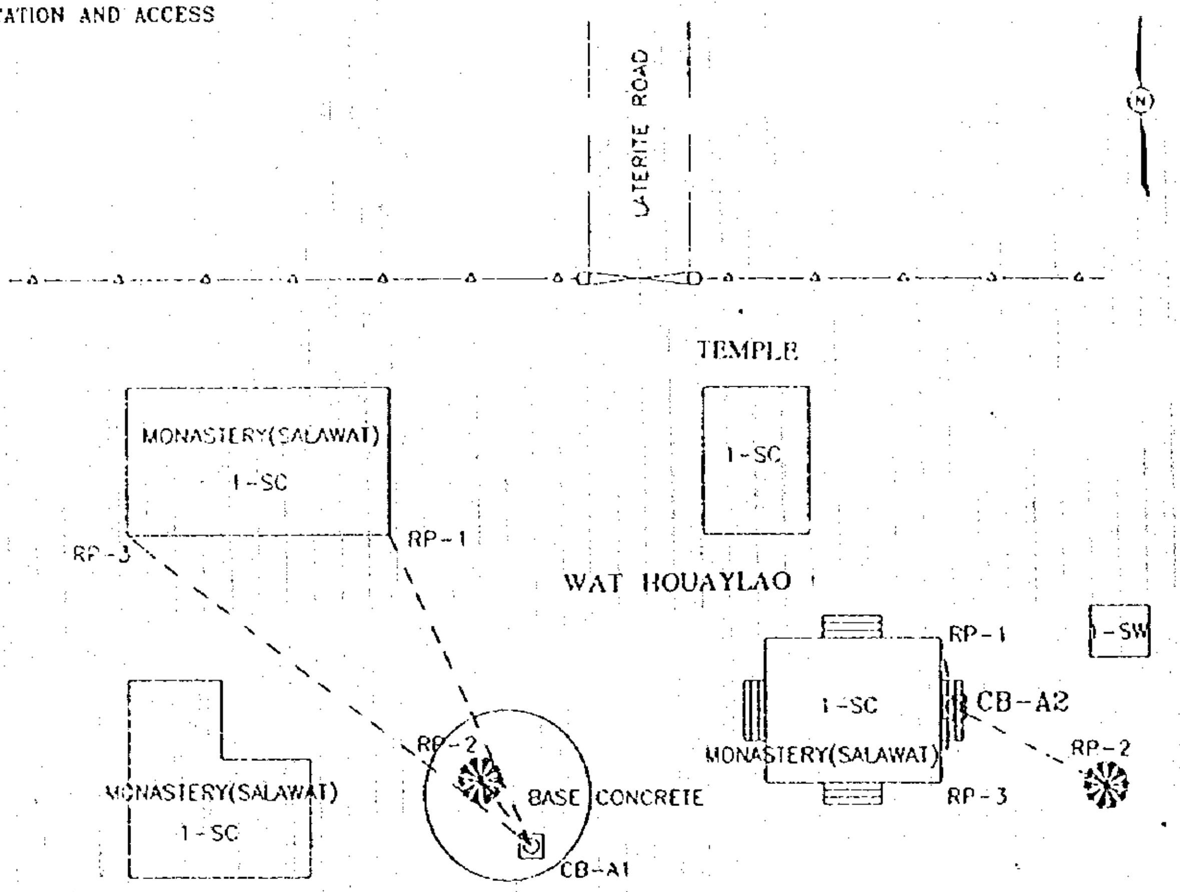
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP-1 CORNER MONASTERY AZIMUTH 38° DEG DISTANCE 5.50 M.

RP-2 FLAME OF THE FOREST ø0.20 AZIMUTH 119° DEG DISTANCE 10.10 M.

RP-3 CORNER MONASTERY AZIMUTH 235° DEG DISTANCE 9.00 M.

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (6/13)

C.B. SURVEYING CO.,LTD

STATION RECORD SHEET

STATION	CB–B1
DATE	OCTOBER 1995

PROJECT : Mekong Bridge at Pakse — LOCATION : Champasak, Pakse

PROJECTION	Gauss – Kruger	VERTICAL DATUM : MSL (South China Sea)

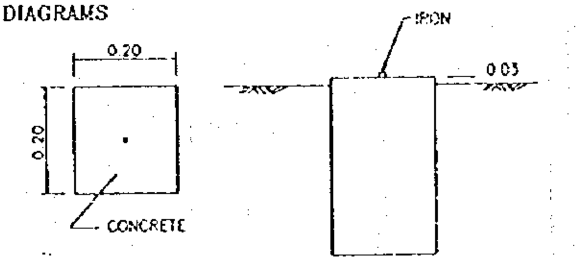
SCALE FACTOR CM 1.00000 — Sheriod : Krasobsky

STATION	CO–ORDINATE		GEOGRAPHIC CO–ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
CB–B1	1671774.214	8587775.972	–	–	108250

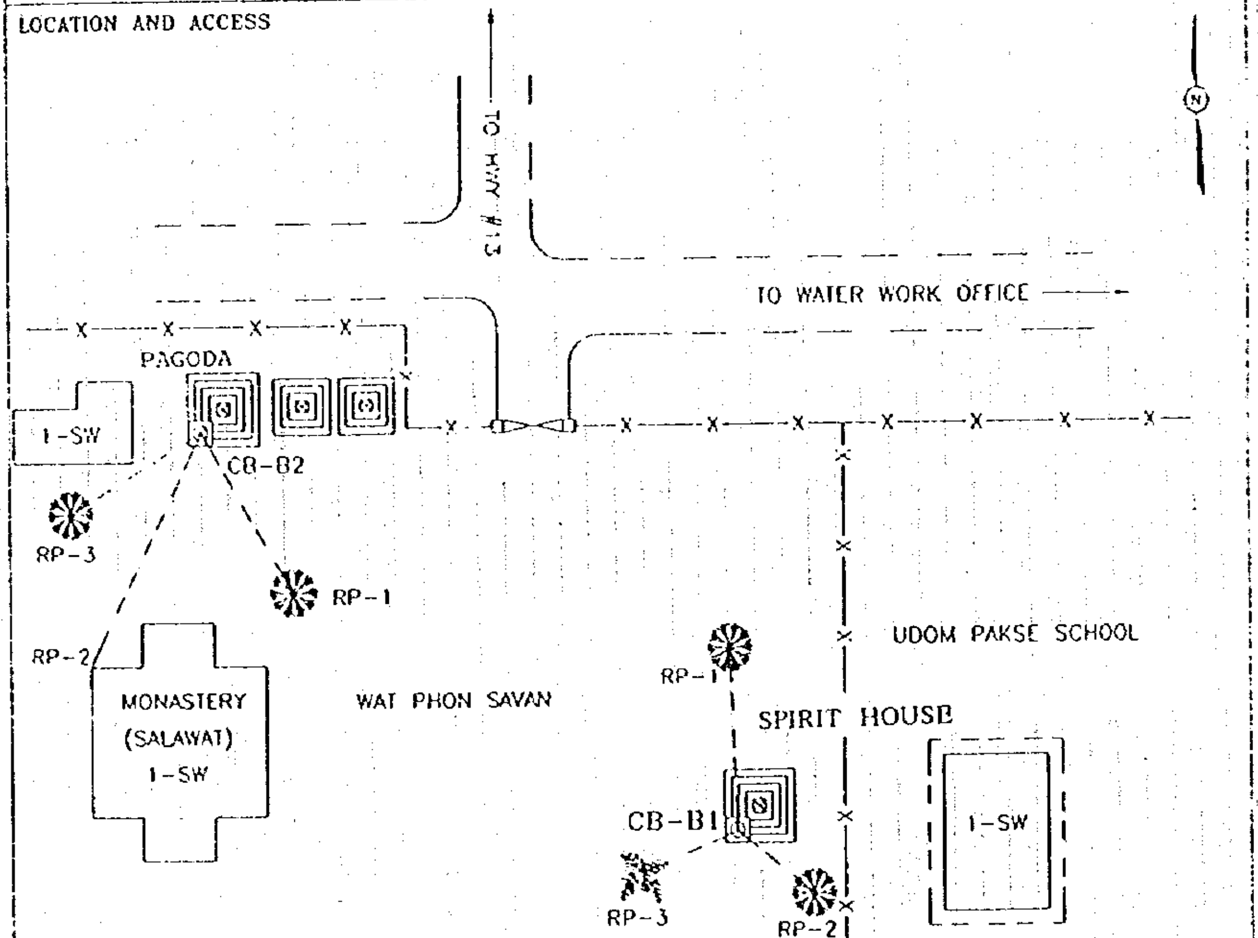
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP–1	MANGO ø0.40	AZIMUTH 10° DEG	DISTANCE 14.95 M.
RP–2	FABACEAE ø0.70	AZIMUTH 183° DEG	DISTANCE 9.35 M.
RP–3	COCONUT ø0.35	AZIMUTH 230° DEG	DISTANCE 4.18 M.

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (7/13)

C.B. SURVEYING GROUP

STATION RECORD SHEET

STATION	CB-B2
DATE	OCTOBER 1995

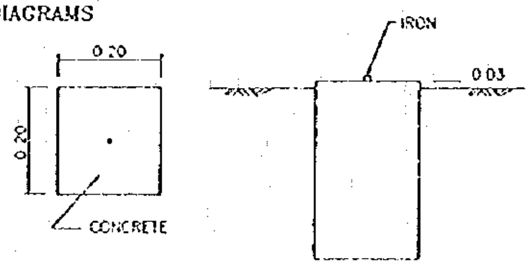
PROJECT : Mekong Bridge at Pakse	LOCATION : Champasak, Pakse
PROJECTION : Gauss - Kruger	VERTICAL DATUM : MSL (South China Sea)
SCALE FACTOR CM 1.00000	Sheriod : Krasobsky

STATION	CO-ORDINATE		GEOGRAPHIC CO-ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
CB-B2	8587751.567	1671843.969	-	-	103.192

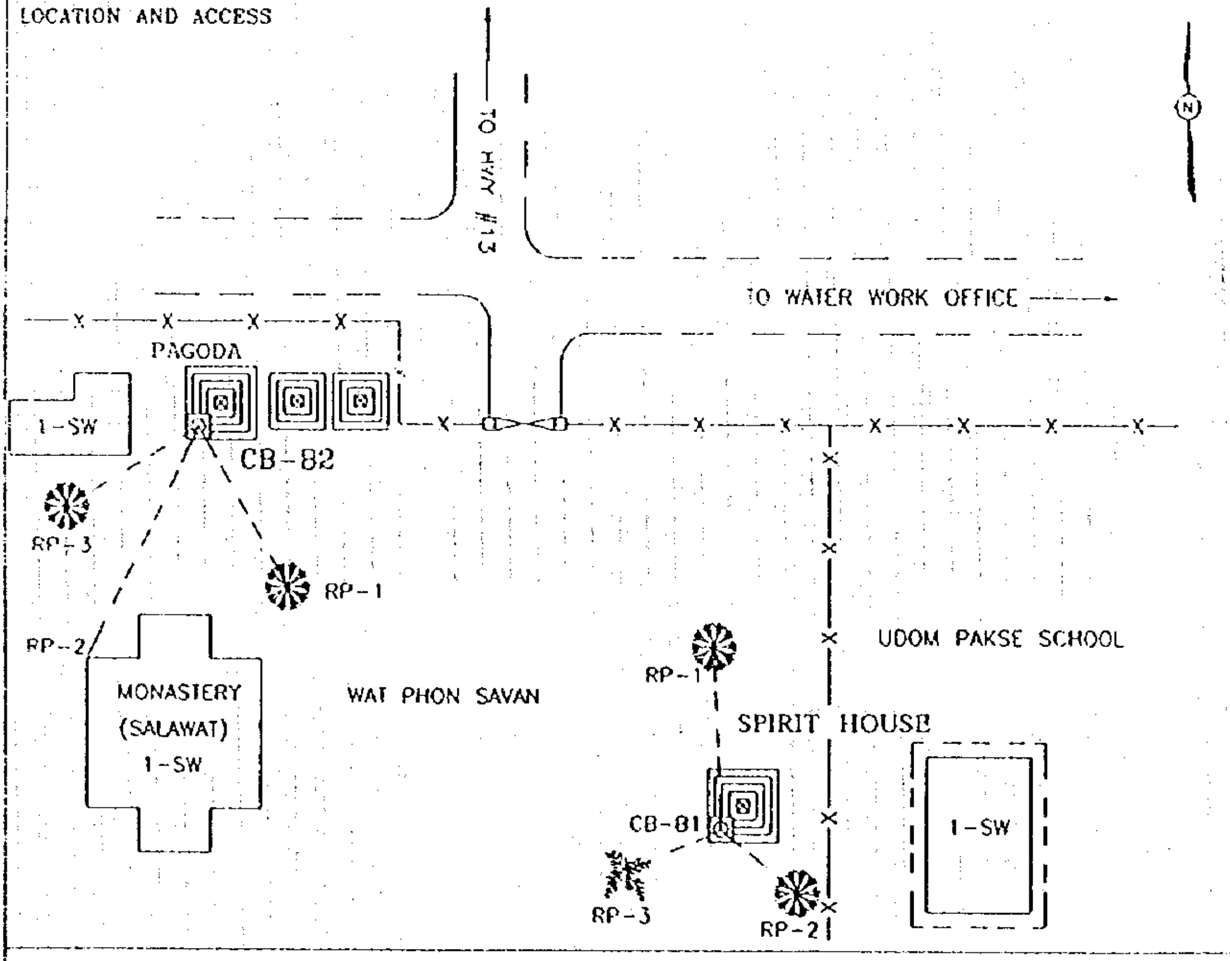
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP-1 MANGO ø0.50 AZIMUTH 164° DEG DISTANCE 35.90 M.

RP-2 CORNER MONASTERY AZIMUTH 205° DEG DISTANCE 42.45 M.

RP-3 TREE ø0.50 AZIMUTH 230° DEG DISTANCE 15.65 M.

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (8/13)

C.S. SURVEYING CO.,LTD

STATION RECORD SHEET

STATION: PQ-06

DATE: OCTOBER 1995

PROJECT : Mekong Bridge at Pakse

LOCATION : Champasak, Pakse

PROJECTION : Gauss - Kruger

VERTICAL DATUM : MSL (South China Sea)

SCALE FACTOR CM 1.00000

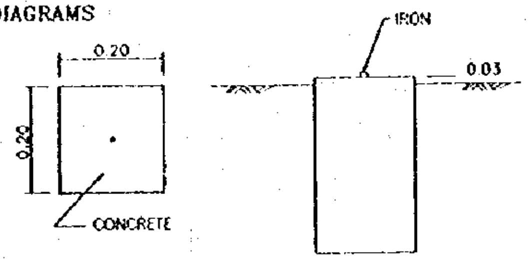
Sheriod : Krasobsky

STATION	CO-ORDINATE		GEOGRAPHIC CO-ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
PQ-06	1669977.965	8586400.662	-	-	98.316

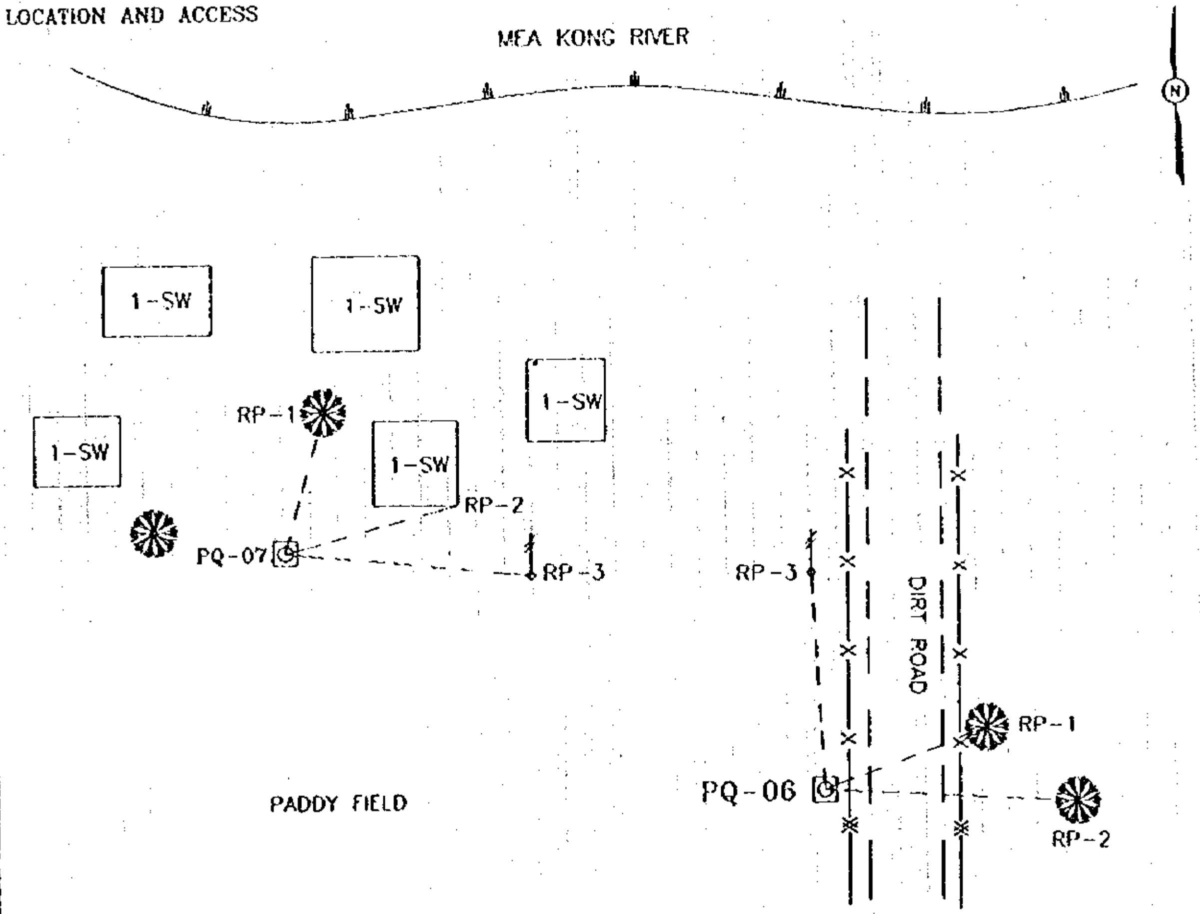
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP-1 TREE ø 0.50 AZIMUTH 78° DEG DISTANCE 7.20 M.

RP-2 TREE ø0.10 AZIMUTH 98° DEG DISTANCE 19.60 M.

RP-3 ELECTRIC PLOE AZIMUTH 357° DEG DISTANCE 18.70 M.

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (9/13)

C.S. SURVEYING CO.,LTD

STATION RECORD SHEET

STATION	PQ-07
DATE	OCTOBER 1995

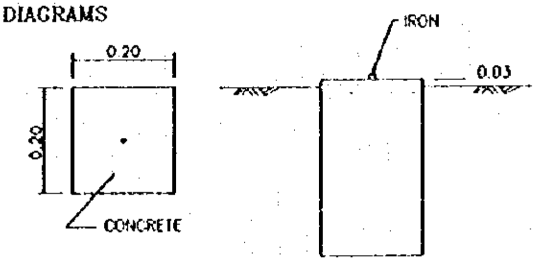
PROJECT : Mekong Bridge at Pakse	LOCATION : Champasak, Pakse
PROJECTION : Gauss - Kruger	VERTICAL DATUM : MSl (South China Sea)
SCALE FACTOR CM 1.00000	Sheriod : Krasobsky

STATION	CO-ORDINATE		GEOGRAPHIC CO-ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
PQ-07	1670012.956	8586216.766	-	-	99.084

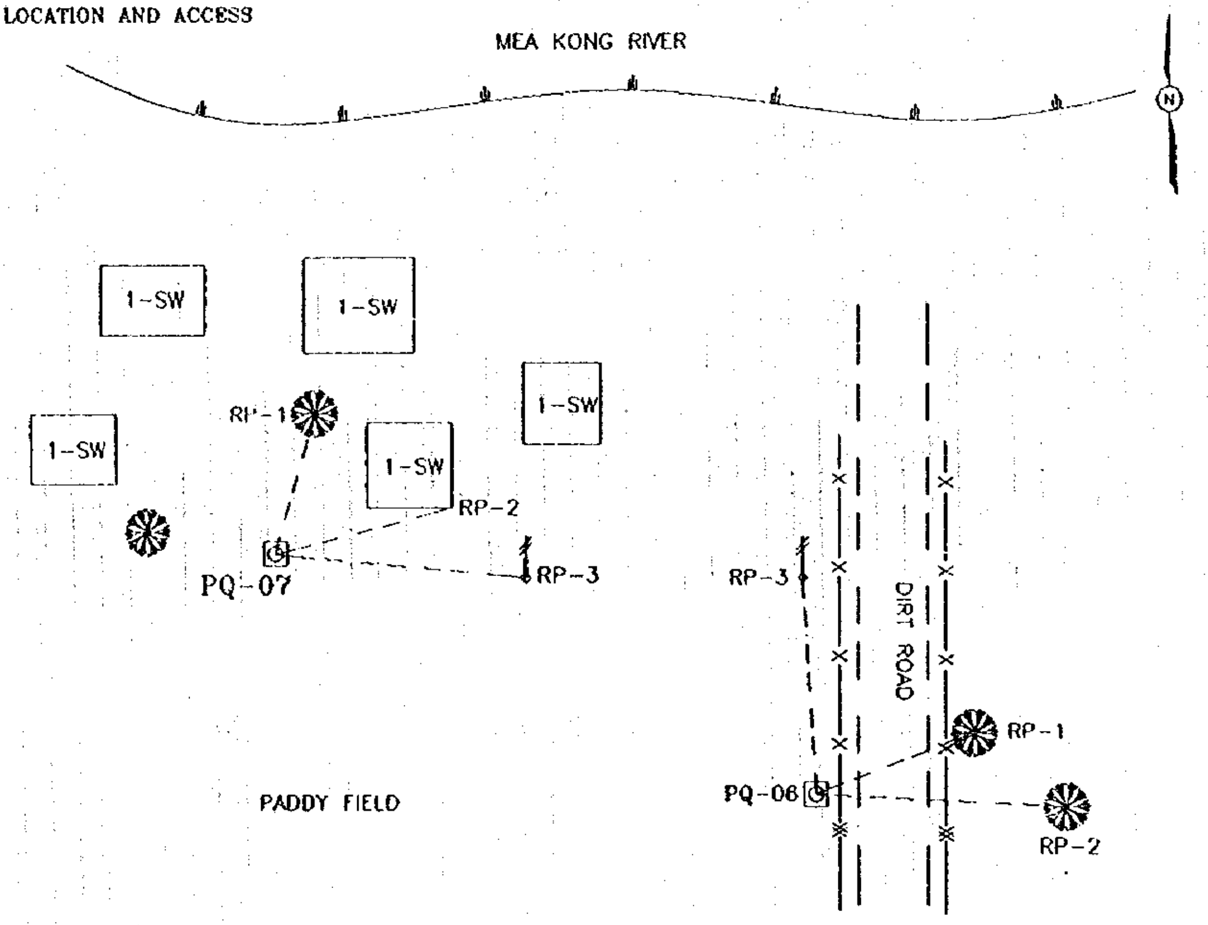
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP-1	TAMARIND ø 0.40	AZIMUTH 29° DEG	DISTANCE 26.20 M.
RP-2	CORNER BRIDGE	AZIMUTH 48° DEG	DISTANCE 25.20 M.
RP-3	ELECTRIC PLOE	AZIMUTH 100° DEG	DISTANCE 24.20 M.

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (10/13)

C.E. SURVEYING CO.,LTD

STATION RECORD SHEET

STATION: PQ14

DATE: OCTOBER 1995

PROJECT : Mekong Bridge at Pakse — LOCATION : Champasak, Pakse

PROJECTION : Gauss – Kruger — VERTICAL DATUM : MSL (South China Sea)

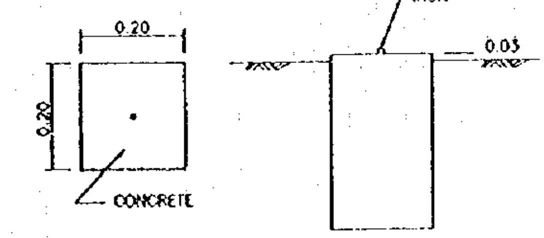
SCALE FACTOR CM 1.00000 — Sherlod : Krasobsky

STATION	CO-ORDINATE NORTHING	CO-ORDINATE EASTING	GEOGRAPHIC CO-ORDINATE LATITUDE	GEOGRAPHIC CO-ORDINATE LONGITUDE	ELEVATION
PQ14	1670057.610	8584697.158	–	–	96.920

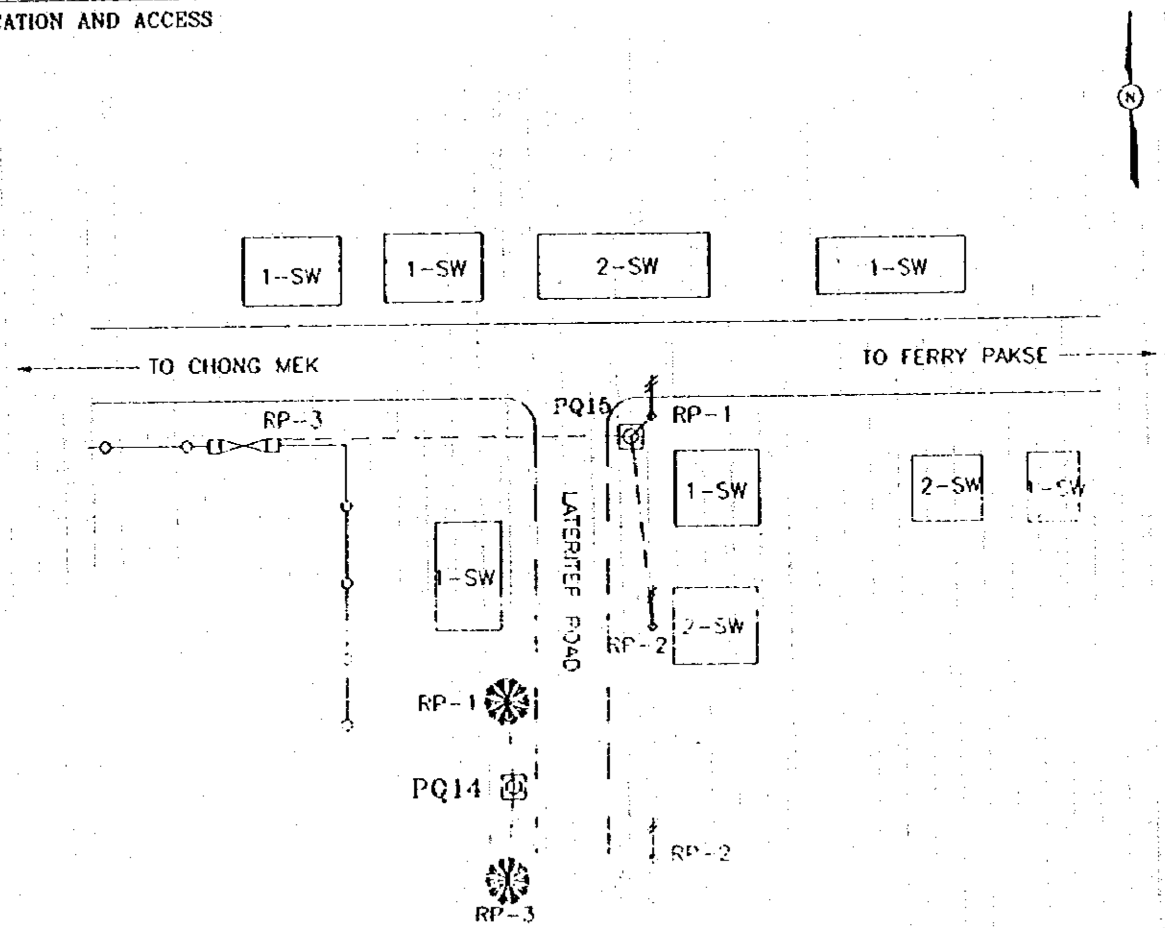
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP–1 MANGO TREE AZIMUTH 6' DEG DISTANCE 51.40 M

RP–2 ELECTRIC POLE AZIMUTH 129' DEG DISTANCE 19.76 M

RP–3 TREE Ø0.30 AZIMUTH 212' DEG DISTANCE 18.00 M

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (11/13)

C.S. SURVEYING CO.,LTD

STATION RECORD SHEET

STATION	PQ15
DATE	OCTOBER 1995

PROJECT : Mekong Bridge at Pakse LOCATION : Champasak, Pakse

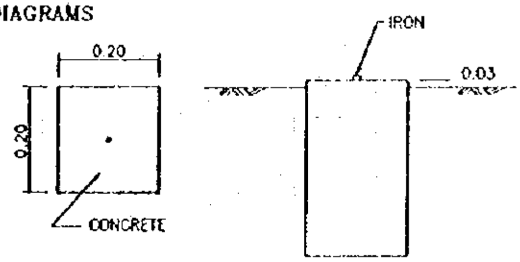
PROJECTION	Gauss - Kruger	VERTICAL DATUM : MSL (South China Sea)
SCALE FACTOR CM	1.00000	Sheriod : Krasobsky

STATION	CO-ORDINATE		GEOGRAPHIC CO-ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
PQ15	1670399.271	8584741.111	-	-	98.170

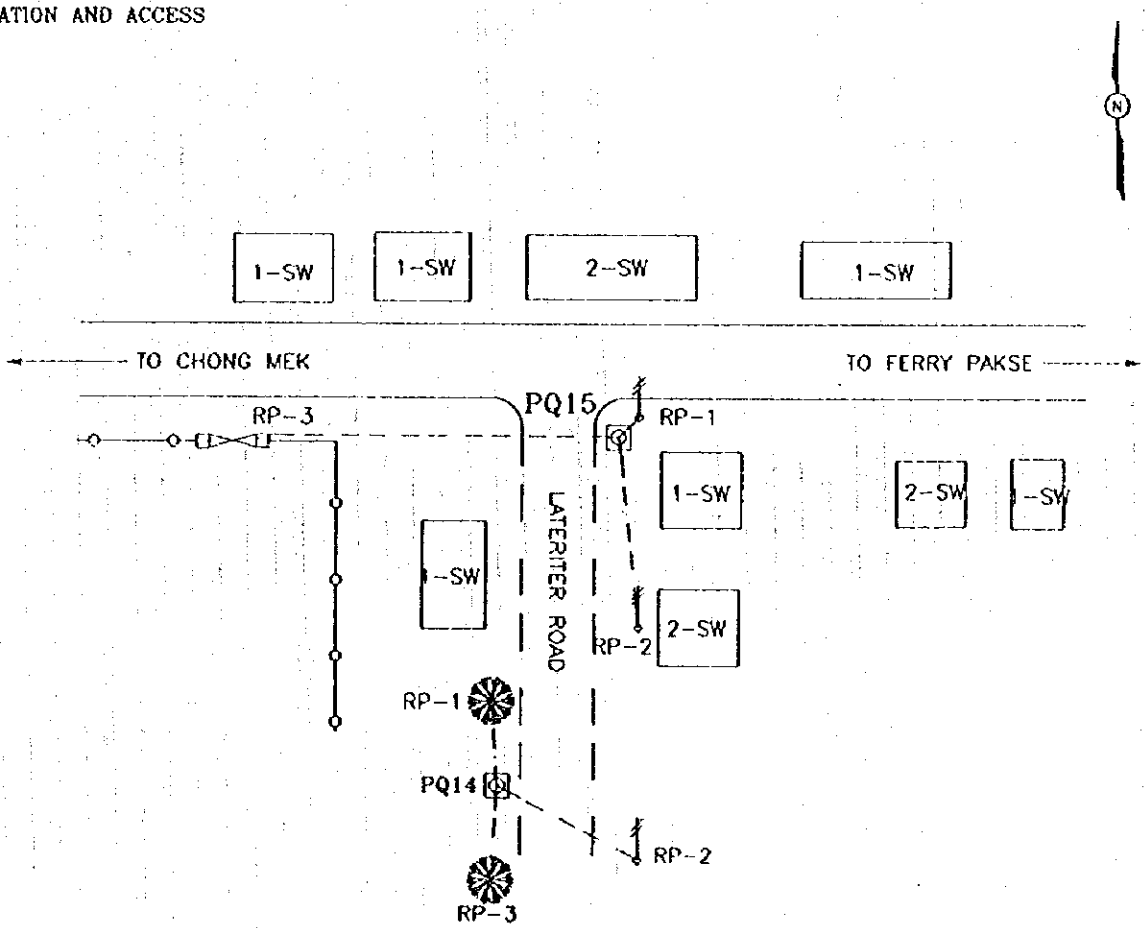
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP-1 ELECTRIC POST AZIMUTH 56' DEG DISTANCE 1.00 M.

RP-2 ELECTRIC POLE AZIMUTH 186' DEG DISTANCE 25.70 M.

RP-3 CORNER MAIN GATE AZIMUTH 285' DEG DISTANCE 34.00 M.

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (12/13)

C.S. SURVEYING CO.,LTD

STATION RECORD SHEET

STATION	BM-0154
DATE	OCTOBER 1995

PROJECT : Mekong Bridge at Pakse — LOCATION : Champasak, Pakse

PROJECTION : Gauss - Kruger — VERTICAL DATUM : MSL (South China Sea)

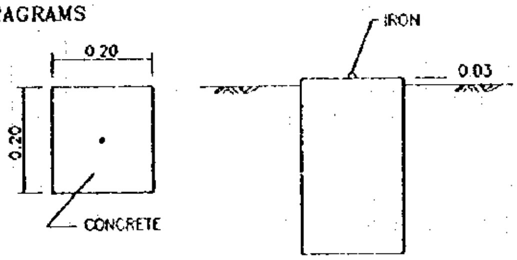
SCALE FACTOR CM 1.00000 — Sheriod : Krasobsky

STATION	CO-ORDINATE		GEOGRAPHIC CO-ORDINATE		ELEVATION
	NORTHING	EASTING	LATITUDE	LONGITUDE	
BM-0154	-	-	-	-	103.216

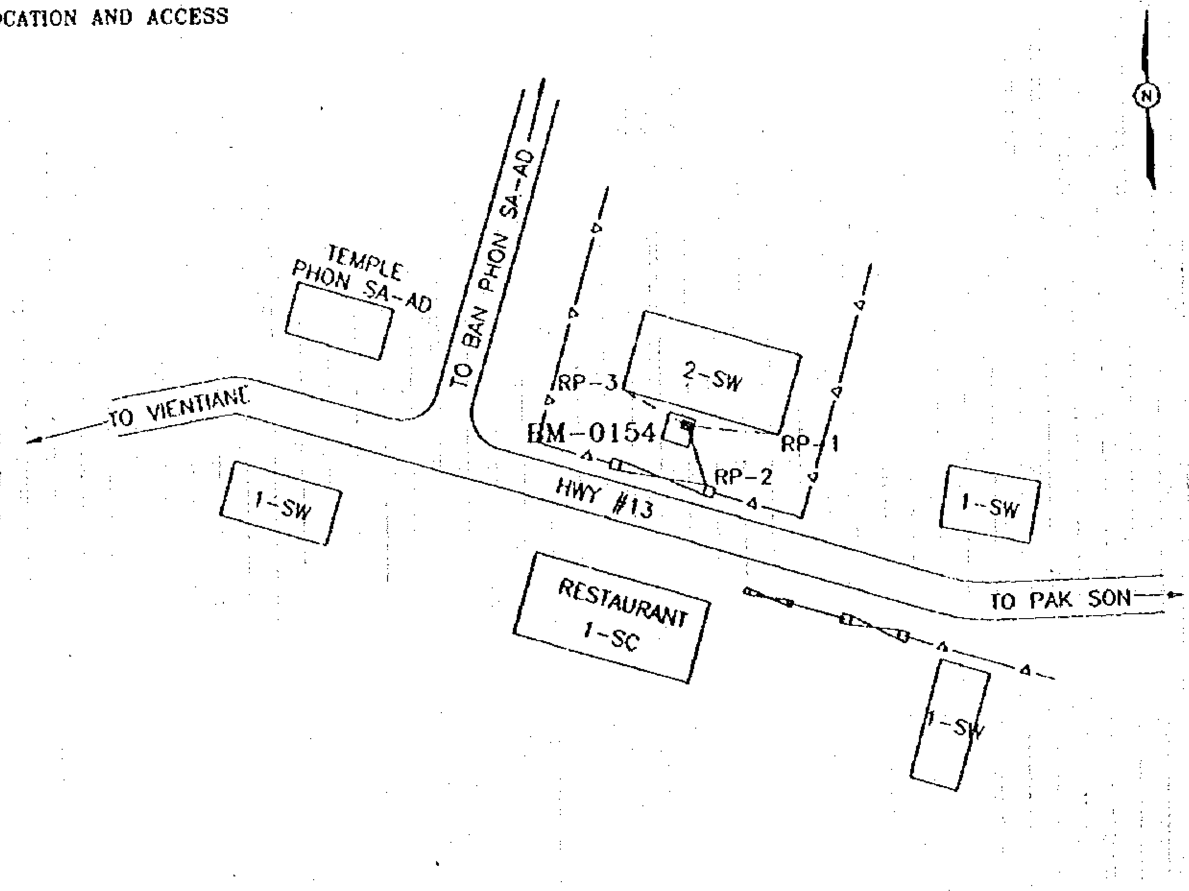
DESCRIPTION OF MARK

PERMANENT MONUMENT

DIAGRAMS



LOCATION AND ACCESS



GENARAL INFORMATION

RP-1	CORNER BUILDING	AZIMUTH 119° DEG	DISTANCE 11.10 M
RP-2	CORNER MAIN GATE	AZIMUTH 205° DEG	DISTANCE 5.74 M.
RP-3	CORNER BUILDING	AZIMUTH 321° DEG	DISTANCE 11.65 M

FIGURE A.7-1 MONUMENTS DESCRIPTOIN SURVEY (13/13)

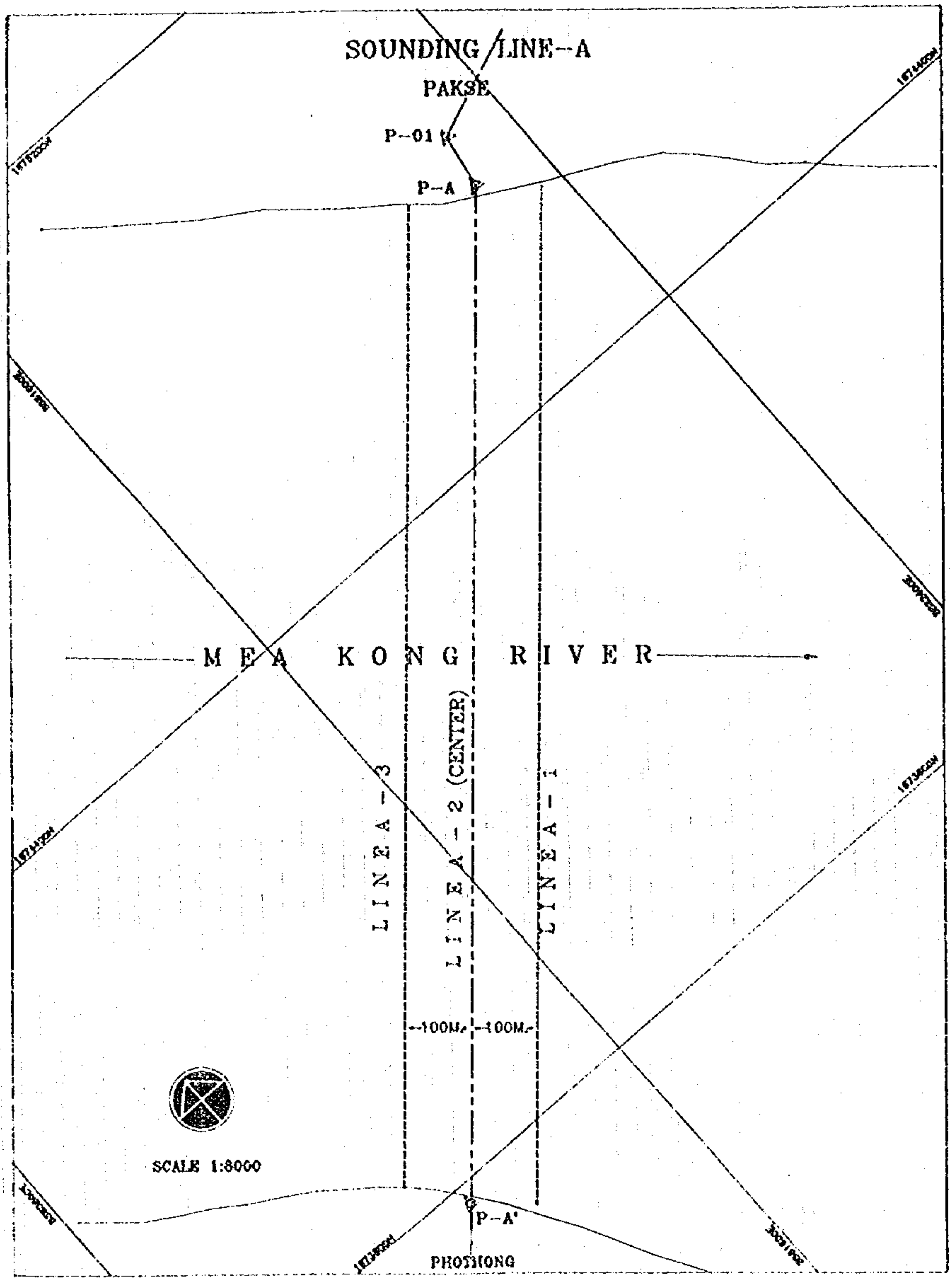


FIGURE A.7-2 SOUNDING RIVER BED (1/3) ROUTE-A

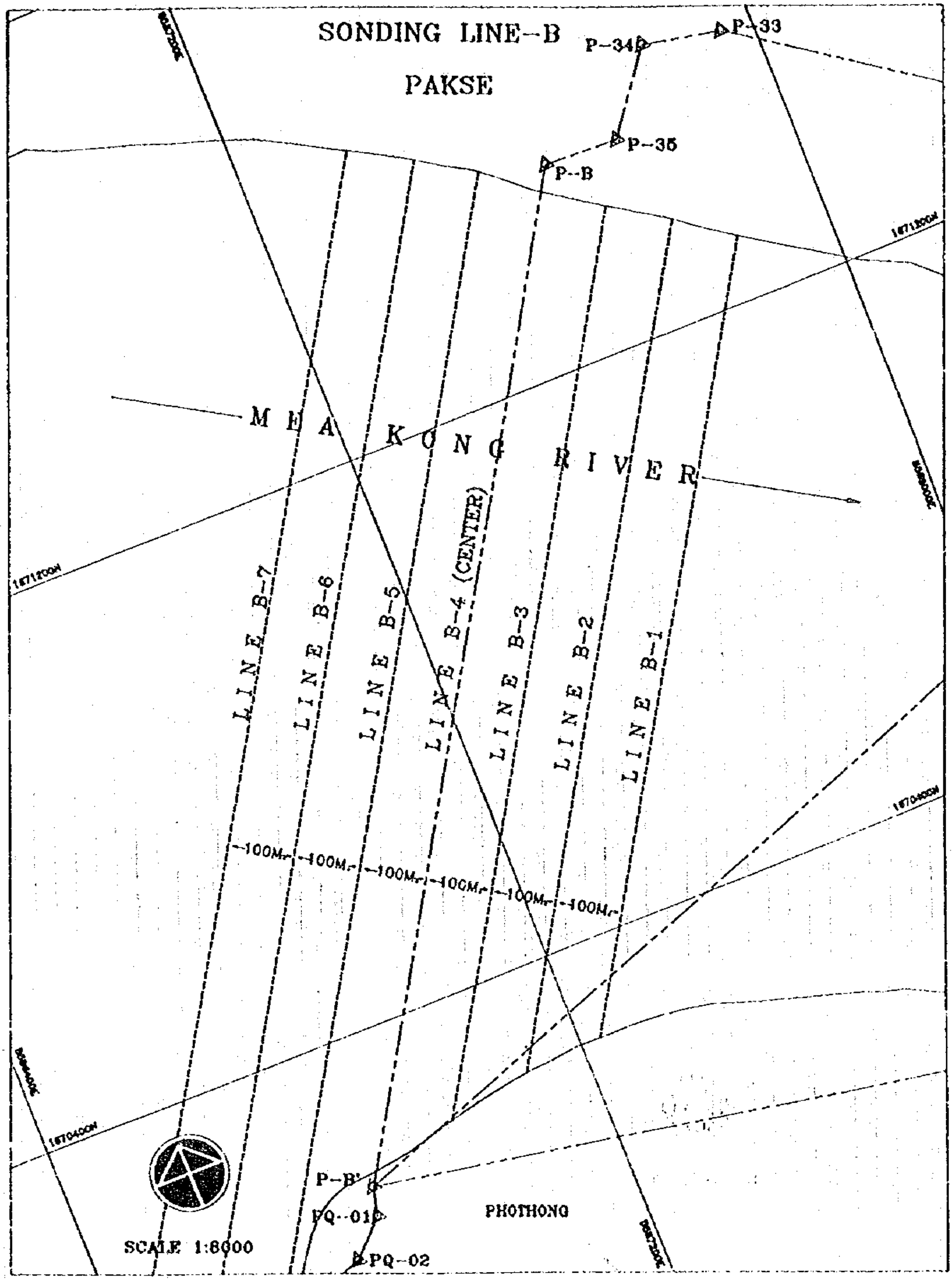


FIGURE A.7-2 SOUNDING RIVER BED (2/3) ROUTE-B

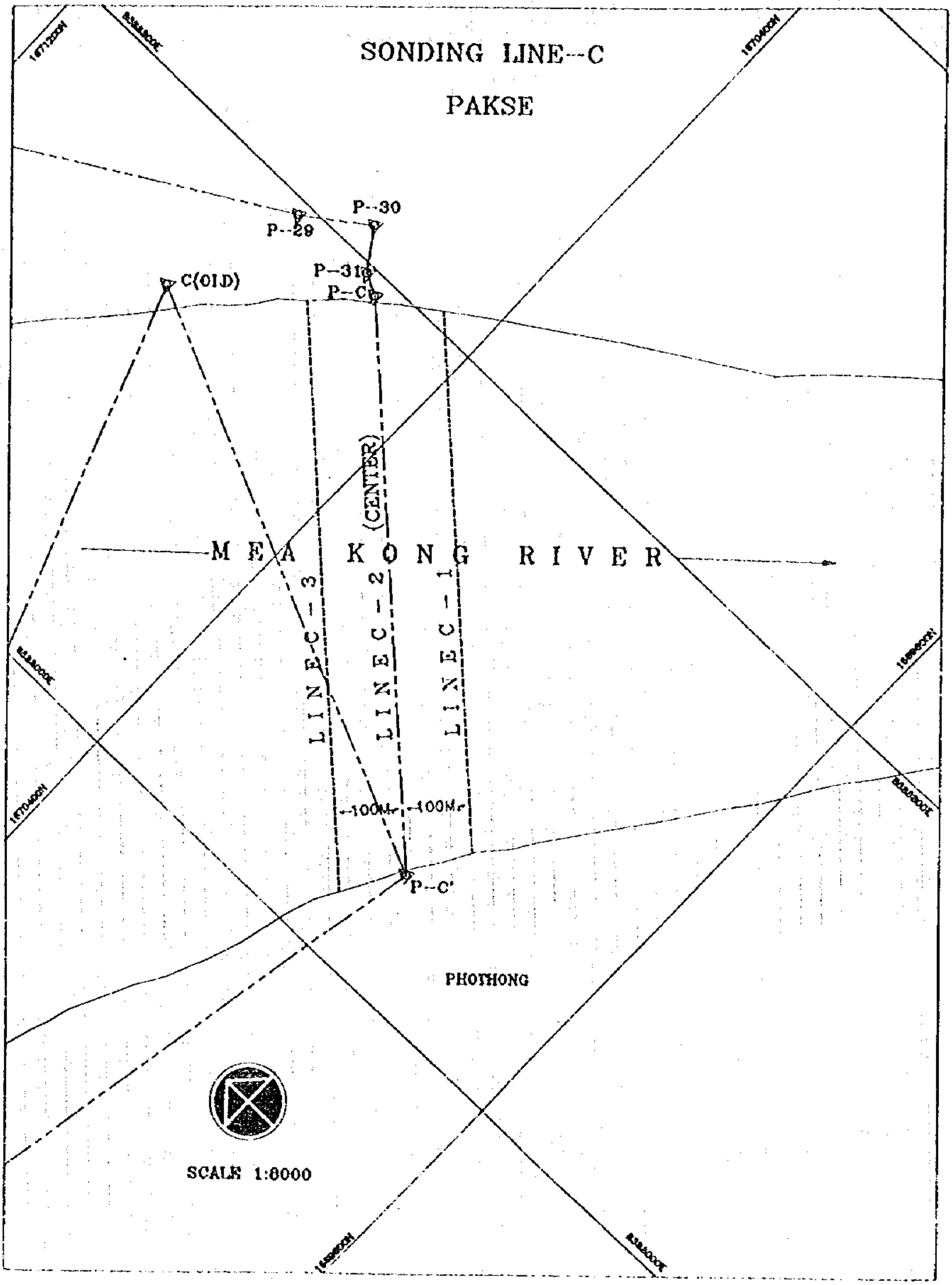
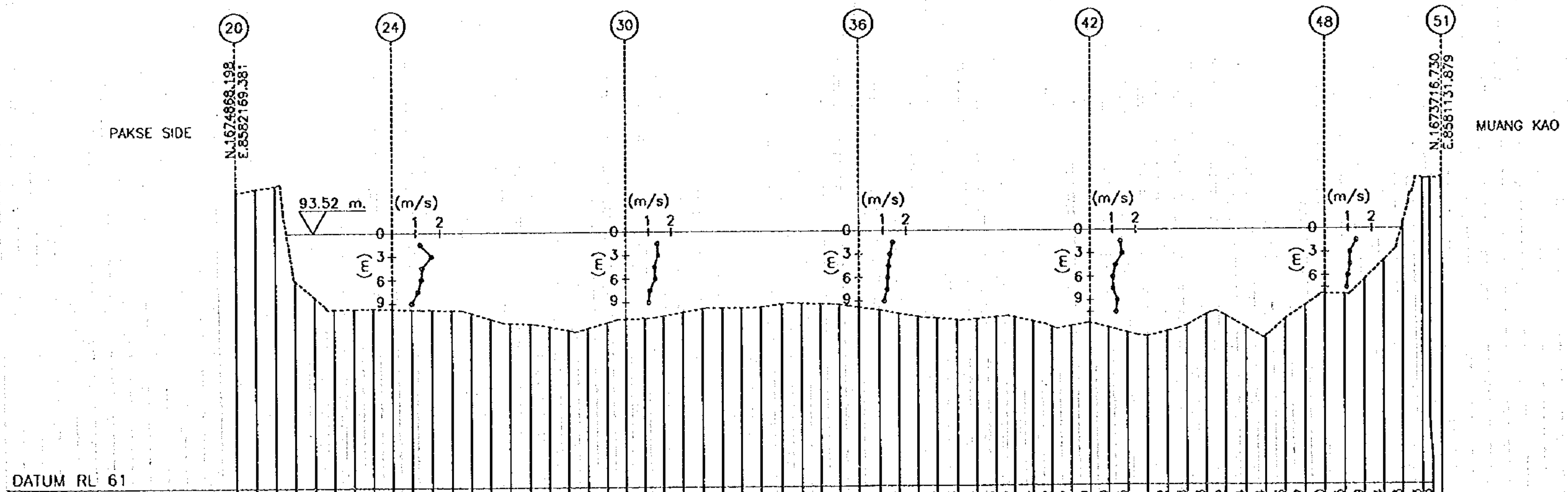


FIGURE A.7-2 SOUNDING RIVER BED (3/3) ROUTE-C

WATER VELOCITY CROSS SECTION LINE -- A

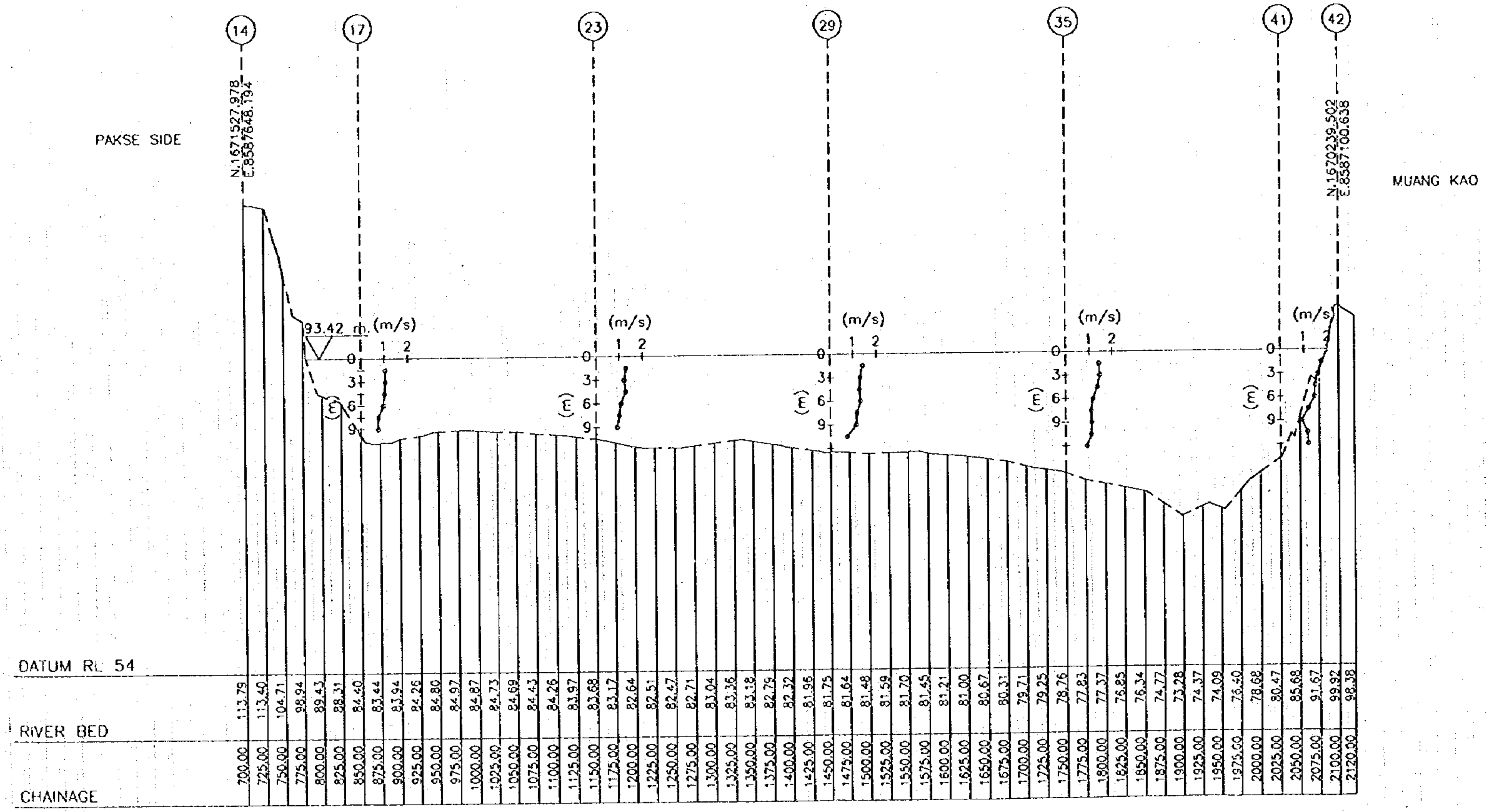


CHAINAGE	RIVER BED
1000.00	99.01
1025.00	99.44
1050.00	99.81
1075.00	87.62
1100.00	85.48
1125.00	83.97
1150.00	84.02
1175.00	84.06
1200.00	83.99
1225.00	83.91
1250.00	83.84
1275.00	83.80
1300.00	83.40
1325.00	82.64
1350.00	82.12
1375.00	82.00
1400.00	81.60
1425.00	81.13
1450.00	81.41
1475.00	82.12
1500.00	82.59
1525.00	82.59
1550.00	82.96
1575.00	83.42
1600.00	83.87
1625.00	83.95
1650.00	83.94
1675.00	84.05
1700.00	84.41
1725.00	84.48
1750.00	84.41
1775.00	84.30
1800.00	83.92
1825.00	83.55
1850.00	83.13
1875.00	82.71
1900.00	82.48
1925.00	82.28
1950.00	82.44
1975.00	82.65
2000.00	82.57
2025.00	82.04
2050.00	81.32
2075.00	81.47
2100.00	81.79
2125.00	81.20
2150.00	80.55
2175.00	80.11
2200.00	80.72
2225.00	81.48
2250.00	82.83
2275.00	82.62
2300.00	81.14
2325.00	80.04
2350.00	82.26
2375.00	83.97
2400.00	85.40
2425.00	85.35
2450.00	87.19
2475.00	89.64
2500.00	94.53
2525.00	100.13
2535.00	100.13

LONGITUDINAL SECTION LINE–A
SCALES HOR 1 : 6000 VER 1 : 600

FIGURE A.7-3 WATER VELOCITY CROSS SECTION (1/3) ROUTE-A

WATER VELOCITY CROSS SECTION LINE – B

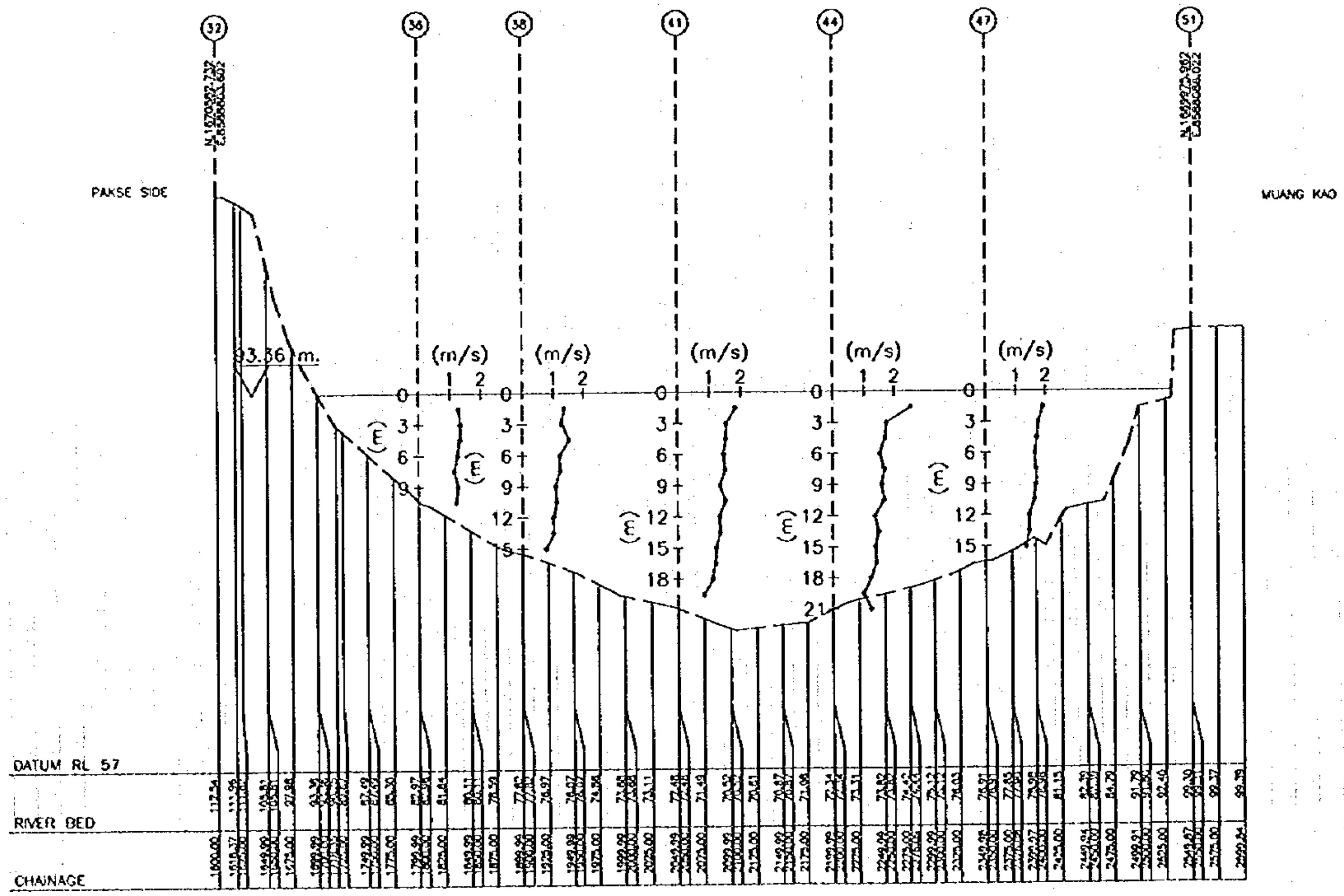


CHAINAGE	RIVER BED
700.00	113.79
725.00	113.40
750.00	104.71
775.00	98.94
800.00	89.43
825.00	88.31
850.00	84.40
875.00	83.44
900.00	83.94
925.00	84.26
950.00	84.80
975.00	84.97
1000.00	84.87
1025.00	84.73
1050.00	84.69
1075.00	84.43
1100.00	84.26
1125.00	83.97
1150.00	83.68
1175.00	83.17
1200.00	82.64
1225.00	82.51
1250.00	82.47
1275.00	82.71
1300.00	83.04
1325.00	83.36
1350.00	83.18
1375.00	82.79
1400.00	82.32
1425.00	81.96
1450.00	81.75
1475.00	81.64
1500.00	81.48
1525.00	81.59
1550.00	81.70
1575.00	81.45
1600.00	81.21
1625.00	81.00
1650.00	80.67
1675.00	80.31
1700.00	79.71
1725.00	79.25
1750.00	78.76
1775.00	77.83
1800.00	77.37
1825.00	76.85
1850.00	76.34
1875.00	74.77
1900.00	73.28
1925.00	74.37
1950.00	74.09
1975.00	76.40
2000.00	78.68
2025.00	80.47
2050.00	85.68
2075.00	91.67
2100.00	99.92
2120.00	98.38

LONGITUDINAL SECTION LINE–B
SCALES HOR 1 : 6000 VER 1 : 600

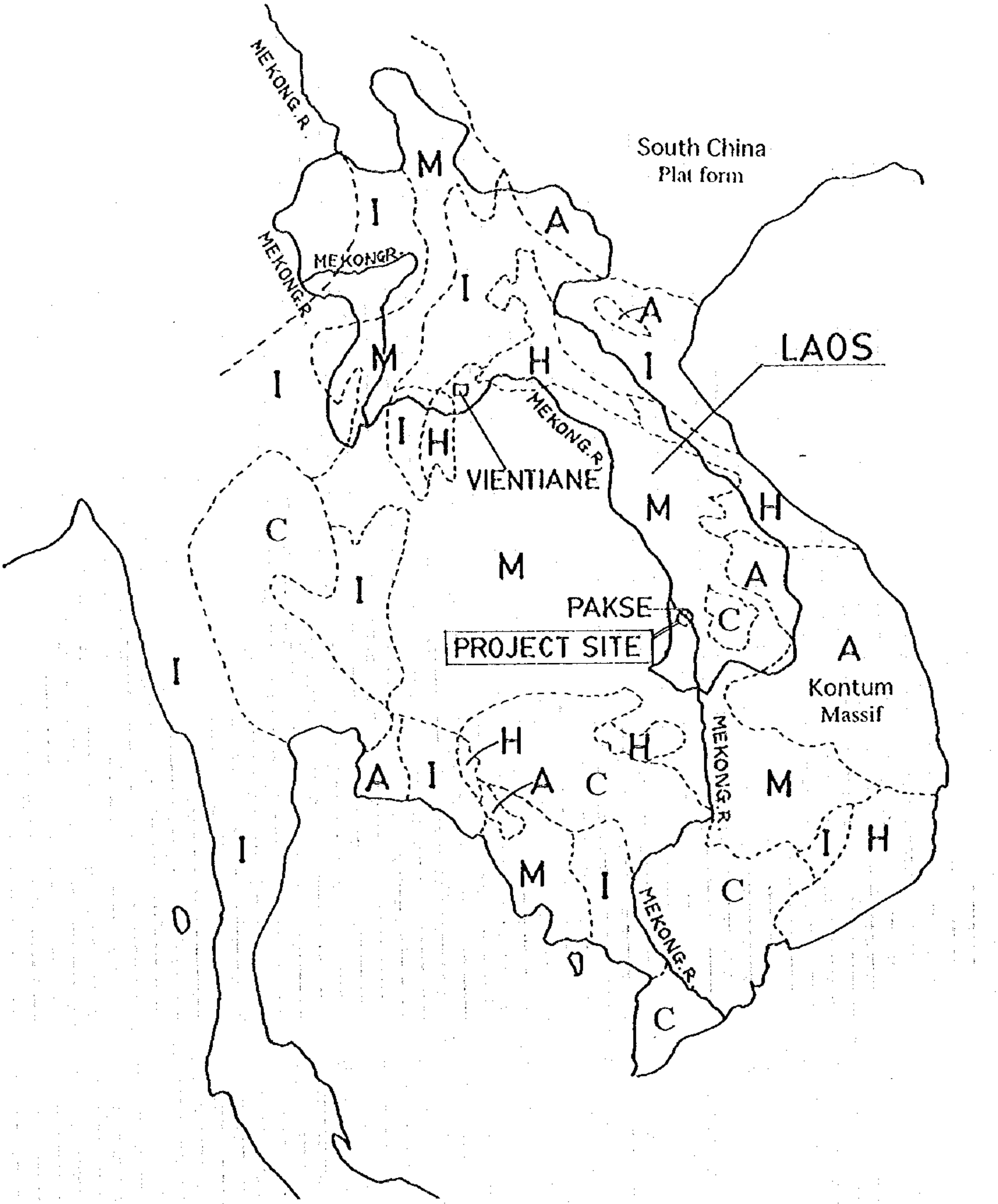
FIGURE A.7-3 WATER VELOCITY CROSS SECTION (2/3) ROUTE-B

WATER VELOCITY CROSS SECTION LINE – C



LONGITUDINAL SECTION LINE–C
SCALES HOR 1 : 6000 VER 1 : 600

FIGURE A.7-3 WATER VELOCITY CROSS SECTION (3/3) ROUTE-C



C : Cenozoic Formation

M : Mesozoic Formation

I : Indosinian Orogene (Mesozoic)

H : Hercinian Orogene (Palaeozoic)

A : Basal Metamorphic Rocks (Pre - Cambrian)

SCALE

0 100 500 Km

FIGURE A.7-4 GENERAL GEO-STRUCTURE IN THE INDOCHINA REGION

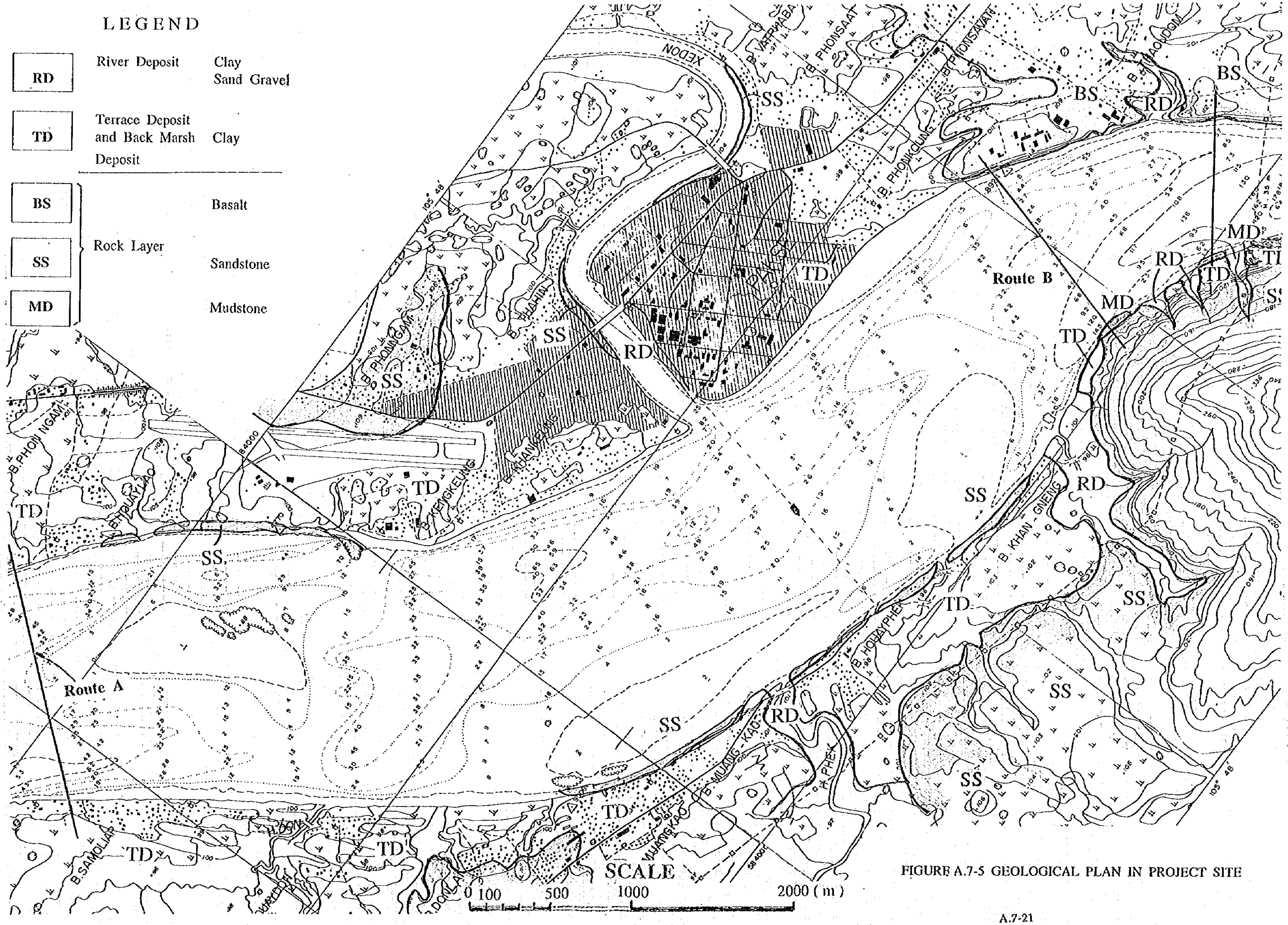
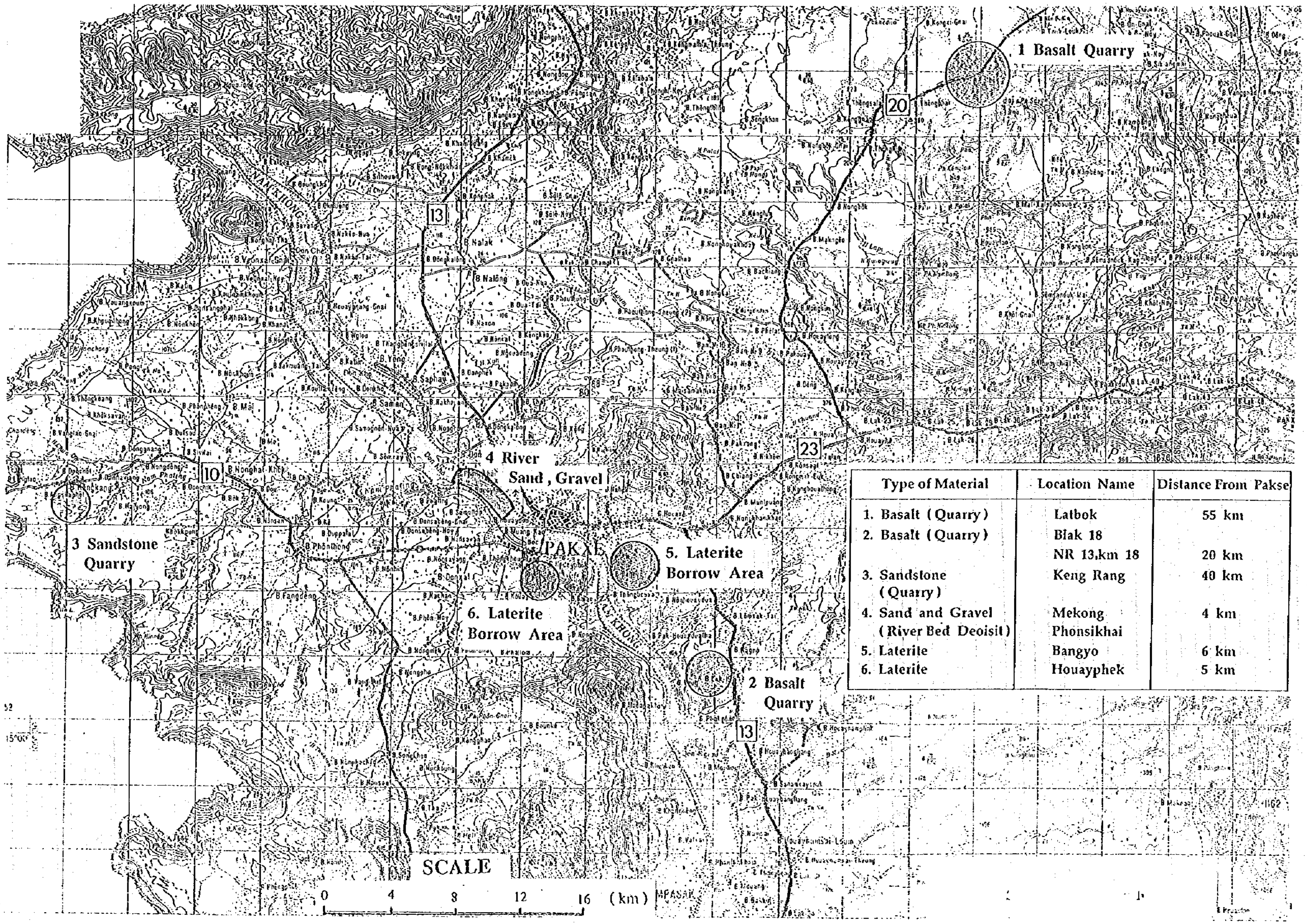


FIGURE A.7-5 GEOLOGICAL PLAN IN PROJECT SITE



Type of Material	Location Name	Distance From Pakse
1. Basalt (Quarry)	Latbok	55 km
2. Basalt (Quarry)	Blak 18 NR 13,km 18	20 km
3. Sandstone (Quarry)	Keng Rang	40 km
4. Sand and Gravel (River Bed Deoisit)	Mekong Phonsikhai	4 km
5. Laterite	Bangyo	6 km
6. Laterite	Houayphek	5 km

FIGURE A.7-6 LOCATION MAP OF SOIL AND ROCK MATERIALS

TABLE A.9-1 COST COMPARISON FOR FOUNDATION STRUCTURES (ROUTE-A)

A Type of Foundation					Cast-in-situ Pile			Direct Foundation					
B Direct Construction Cost		Unit: US$				270,703			365,157				
NO.	DESCRIPTION	SPEC	UNIT	UNIT COST	QUANTITY	AMOUNT	REMARKS	QUANTITY	AMOUNT	REMARKS	QUANTITY	AMOUNT	REMARKS
a)	Works					185,600			141,160				
	1) Steel sheet piling	U-III, L=7m	pc	35		0			0				
	2) Steel sheet piling	U-III, L=8m	pc	37		0			0				
	3) Steel pipe-sheet piling	d=800,L=12m	pc	1150		0		60	69,000				
	4) Support erection	H-beam	t	60		0		40	2,400				
	5) Weight for caisson	H-beam	t	50		0			0				
	6) Sheet pile removal	U-III	pc	25		0			0				
	7) Steel pipe-sheet removal	d=800,L=12m	pc	805		0		60	48,300				
	8) Support removal	H-beam	t	54		0			0				
	9) Weight removal	H-beam	t	45		0		40	1,800				
	10) Embakment of islet	Sand & gravel	m3	5		0			0				
	11) Removal of islet	Sand & gravel	m3	5		0			0				
	12) Drilling, S&G & rock (A)	1500d*5+6m	no.	23200	8	185,600			0				
	13) Drilling, S&G & rock (B)	1500d*10.5+2	no.	13900		0			0				
	14) Drilling, S&G & rock (B)	1000d*10.5+2	no.	11100		0			0				
	15) Drilling, S&G & rock (C)	2000d*4+7m	no.	41500		0			0				
	16) Drilling, S&G & rock (C)	1500d*4+7m	no.	27000		0			0				
	17) Drilling, S&G & rock (C)	1000d*4+5m	no	16500		0			0				
	18) Excavation, manual	Sand & gravel	m3	10		0		1,005	10,050				
	19) Excavation, manual	Rock	m3	60		0		101	6,060				
	20) Backfill	Sand & gravel	m3	5		0		710	3,550				
b)	Materials					81,388			223,997				
	1) Concrete caison		no	0		0			0				
	2) Steel sheet pile	U-III, L=7 m	t d	3		0			0				
	3) Steel sheet pile	U-III, L=8 m	t d	3		0			0				
	4) Steel pipe-sheet pile	d=800,L=12m	t d	7		0			0				
	5) Steel pipe-sheet pile	d=800,L=7.5m	t d	7		0		7,207	50,449				
	6) Steel pipe-sheet pile	d=800,L=4.5m	pc	1625		0		60	97,500				
	7) Steel pipe-sheet pile	d=1000,L=19m	pc	8784		0			0				
	8) Steel pipe-sheet pile	d=1000,L=22m	pc	10240		0			0				
	9) Supporting beams	H-beam	t d	3		0		3,600	10,800				
	10) Casing pipe	2000d*19m	pc	16500		0			0				
	11) Casing pipe	1500d*13m	pc	5100	8	40,800			0				
	12) Casing pipe	1500d*18.5m	pc	7200		0			0				
	13) Casing pipe	1000d*19m	pc	6200		0			0				
	14) Concrete form	Metal	m2	12	217	2,604		95	1,140				
	15) Concrete form	Wooden	m2	13		0			0				
	16) Sliding form	Metal	m2	20		0		235	4,700				
	17) Form support	H-beam, etc.	m3	8	512	4,096			0				
	18) Scaffolding	Unit type	m2	4		0		308	1,232				
	19) Lean concrete	180kg/cm2	m3	50		0		18	900				
	20) Concrete	240kg/cm2	m3	63	286	18,018		482	30,366				
	21) Concrete	400kg/cm2	m3	80		0			0				
	22) Reinforcement bar	Deformed	t	690	23	15,870		39	26,910				
					Materials in piles								
						3,715			0				
	23) Concrete	240kg/cm2	m3	63	28	1,783			0				
	24) Reinforcement bar	Deformed	t	690	3	1,932			0				
	25) Concrete form		m2	12		0			0				
	26) Steel edge	For caison	t	3000		0			0				

TABLE A.9-2 COST COMPARISON FOR FOUNDATION STRUCTURES (ROUTE-B)

A	Type of Foundation				Cast-in-situ Pile			Open Caisson			Interlocking Steel Pipe Pile Well		
B	Direct Construction Cost	Unit: US$				245,102			412,138			432,453	
NO.	DESCRIPTION	SPEC	UNIT	UNIT COST	QUANTITY	AMOUNT	REMARKS	QUANTITY	AMOUNT	REMARKS	QUANTITY	AMOUNT	REMARKS
a)	Works					111,200			196,576			214,542	
	1) Steel sheet piling	U-III, L=7m	pc	35		0			0			0	
	2) Steel sheet piling	U-III, L=8m	pc	37		0			0			0	
	3) Steel pipe-sheet piling	d=800,L=12m	pc	1,150		0		76	87,400			0	
	4) Support erection	H-beam	t	60		0		25	1,500		24	1,440	
	5) Weight for caisson	H-beam	t	50		0		100	5,000			0	
	6) Sheet pile removal	U-III	pc	25		0		83	2,075			0	
	7) Steel pipe-sheet removal	d=800,L=12m	pc	805		0		76	61,180			0	
	8) Support removal	H-beam	t	54		0			0		24	1,296	
	9) Weight removal	H-beam	t	45		0			0			0	
	10) Embakment of islet	Sand & gravel	m3	5		0		1,805	9,025			0	
	11) Removal of islet		m3	5		0		1,805	9,025			0	
	12) Drilling, S&G & rock (A)	1500d*5+6m	no.	23,200		0			0			0	
	13) Drilling, S&G & rock (B)	1500d*10.5+2	no.	13,900	8	111,200			0			0	
	14) Drilling, S&G & rock (B)	1000d*10.5+2	no.	11,100		0			0		19	210,900	
	15) Drilling, S&G & rock (C)	2000d*4+7m	no.	41,500		0			0			0	
	16) Drilling, S&G & rock (C)	1500d*4+7m	no.	27,000		0			0			0	
	17) Drilling, S&G & rock (C)	1000d*4+5m	no.	16,500		0			0			0	
	18) Excavation, manual	Sand & gravel	m3	10		0		1,700	17,000			0	
	19) Excavation, manual	Rock	m3	60		0		40	2,400			0	
	20) Backfill	Sand & gravel	m3	3		0		657	1,971		302	906	
b)	Materials					100,236			137,736			198,192	
	1) Concrete caisson		no.			0			0	See below		0	
	2) Steel sheet pile	U-III, L=7 m	t.d	3		0			0			0	
	3) Steel sheet pile	U-III, L=8 m	t.d	3		0			0			0	
	4) Steel pipe-sheet pile	d=800,L=12m	t.d	7		0		14,610	102,270	3 months		0	
	5) Steel pipe-sheet pile	d=800,L=7.5m	t.d	7		0			0			0	
	6) Steel pipe-sheet pile	d=800,L=4.5m	t	1,625		0			0			0	
	7) Steel pipe-sheet pile	d=1000,L=19m	pc	8,784		0			0		19	166,896	
	8) Steel pipe-sheet pile	d=1000,L=22m	pc	10,240		0			0			0	
	9) Supporting beams	H-beam	t.d	3		0			0		720	2,160	
	10) Casing pipe	2000d*19m	pc	16,500		0			0			0	
	11) Casing pipe	1500d*13m	pc	5,100		0			0			0	
	12) Casing pipe	1500d*18.5m	pc	7,200	8	57,600			0			0	
	13) Casing pipe	1000d*19m	pc	6,200		0			0			0	
	14) Concrete form	Metal	m2	12	217	2,604			0		86	1,032	
	15) Concrete form	Wooden	m2	13		0			0			0	
	16) Sliding form	Metal	m2	20		0		227	4,540			0	
	17) Form support	H-beam, etc.	m3	8	768	6,144		25	200			0	
	18) Scaffolding	Unit type	m2	4		0		294	1,176			0	
	19) Lean concrete	160kg/cm2	m3	50		0			0			0	
	20) Concrete	240kg/cm2	m3	63	286	18,018		250	15,750		238	14,994	
	21) Concrete	400kg/cm2	m3	85		0			0			0	
	22) Reinforcement bar	Deformed	t	690	23	15,870		20	13,800		19	13,110	
					Materials in pile			Materials for Caisson			Materials in Pile		
						33,666			77,826			19,719	
	23) Concrete	240kg/cm2	m3	63	254	16,002		410	25,830		313	19,719	
	24) Reinforcement bar	Deformed	t	690	26	17,664		49	33,948			0	
	25) Concrete form	Metal	m2	12		0		429	5,148			0	
	26) Steel edge	For caison	t	3,000		0		4	12,900			0	

TABLE A.9-3 COST COMPARISON FOR FOUNDATION STRUCTURES (ROUTE-C)

A	Type of Foundation				Cast-in-situ Pile, d=1500 mm			Cast-in-situ Pile, d=2000 mm			Interlocking Steel Pipe Pile Well		
B	Direct Construction Cost	Unit: US$				781,611			816,655			1,240,632	
NO.	DESCRIPTION	SPEC	UNIT	UNIT COST	QUANTITY	AMOUNT	REMARKS	QUANTITY	AMOUNT	REMARKS	QUANTITY	AMOUNT	REMARKS
						486,000			415,000			703,260	
a)	Works												
	1) Steel sheet piling	U-III, L=7m	pc	35		0			0			0	
	2) Steel sheet piling	U-III, L=8m	pc	37		0			0			0	
	3) Steel pipe-sheet piling	d=800,L=12m	pc	1150		0			0			0	
	4) Support erection	H-beam	t	60		0			0			0	
	5) Weight for caisson	H-beam	t	50		0			0			0	
	6) Sheet pile removal	U-III	pc	25		0			0			0	
	7) Steel pipe-sheet removal	d=800,L=12m	pc	805		0			0			0	
	8) Support removal	H-beam	t	54		0			0			0	
	9) Weight removal	H-beam	t	45		0			0			0	
	10) Embakment of islet	Sand & gravel	m3	5		0			0			0	
	11) Removal of islet	Sand & gravel	m3	5		0			0			0	
	12) Drilling, S&G & rock (A)	1500d*5+6m	no.	23200		0			0			0	
	13) Drilling, S&G & rock (B)	1500d*10.5+2	no.	13900		0			0			0	
	14) Drilling, S&G & rock (B)	1000d*10.5+2	no.	11100		0			0			0	
	15) Drilling, S&G & rock (C)	2000d*4+7m	no.	41500		0		10	415,000			0	
	16) Drilling, S&G & rock (C)	1500d*4+7m	no.	27000	18	486,000			0			0	
	17) Drilling, S&G & rock (C)	1000d*4+5m	no.	16500		0			0		42	693,000	
	18) Excavation, manual	Sand & gravel	m3	10		0			0			0	
	19) Excavation, manual	Rock	m3	60		0			0			0	
	20) Backfill	Sand & gravel	m3	3		0			0		3,420	10,260	
						195,378			298,155			491,571	
b)	Materials												
	1) Concrete caison		no.			0			0			0	
	2) Steel sheet pile	U-III, L=7 m	td	3		0			0			0	
	3) Steel sheet pile	U-III, L=8 m	td	3		0			0			0	
	4) Steel pipe-sheet pile	d=800,L=12m	td	7		0			0			0	
	5) Steel pipe-sheet pile	d=800,L=7.5m	td	7		0			0			0	
	6) Steel pipe-sheet pile	d=800,L=4.5m	pc	1625		0			0			0	
	7) Steel pipe-sheet pile	d=1000,L=19m	pc	8784		0			0			0	
	8) Steel pipe-sheet pile	d=1000,L=22m	pc	10240		0			0		42	430,080	
	9) Supporting beams	H-beam	td	3		0			0			0	
	10) Casing pipe	2000d*19m	pc	16500		0		10	165,000			0	
	11) Casing pipe	1500d*13m	pc	5100		0			0			0	
	12) Casing pipe	1500d*18.5m	pc	7200	18	129,600			0			0	
	13) Casing pipe	1000d*19m	pc	6200		0			0			0	
	14) Concrete form	Metal	m2	12	347	4,164		937	11,244		126	1,512	
	15) Concrete form	Wooden	m2	13		0			0			0	
	16) Sliding form	Metal	m2	20		0			0			0	
	17) Form support	H-beam, etc.	m3	8		0			0			0	
	18) Scaffolding	Unit type	m2	4		0			0			0	
	19) Lean concrete	180kg/cm2	m3	50		0			0			0	
	20) Concrete	240kg/cm2	m3	63	518	32,634		1,037	65,331		503	31,689	
	21) Concrete	400kg/cm2	m3	85		0			0			0	
	22) Reinforcement bar	Deformed	t	690	42	28,980		82	56,580		41	28,290	
					Materials in piles			Materials in piles			Materials in piles		
						100,233			103,500			45,801	
	23) Concrete	240kg/cm2	m3	63	763	48,069		754	51,750		727	45,801	
	24) Reinforcement bar	Deformed	t	690	76	52,164		75	51,750			0	
	25) Concrete form	Metal	m2	12		0			0			0	
	26) Steel edge	For caison	t	3000		0			0			0	

TABLE A.9-4 COST DATA FOR BRIDGE TYPES AND SPAN LENGTH RANGE

BRIDGES TYPES AND SPAN LENGTH RANGE
(CONTINUOUS STEEL BOX GIRDER WITH RC SLAB)

(1000U $)

SPAN	SUPERSTRUCTURE COST			SUBSTRUCTURE COST			TOTAL COST	
	AREA	UNIT COST	COST	NUMBERS	UNIT COST	COST		
	M2	US $ /M2	US $	N	US $ /N	US $	US $	US $ /M2
	(ROUTE-A)							
50	17160	2.058	35315.28	33	524	17292	52607.28	3.0656923
70	17160	2.529	43397.64	25	579	14475	57872.64	3.3725315
100	17160	3.326	57074.16	18	661	11898	68972.16	4.0193566
	(ROUTE-B)							
50	15180	2.058	31240.44	29	557	16153	47393.44	3.1220975
70	15180	2.529	38390.22	23	615	14145	52535.22	3.4608182
100	15180	3.326	50488.68	17	701	11917	62405.68	4.1110461
	(ROUTE-C)							
70	10450	2.529	26428.05	15	1074	16110		
SIDE SPAN			2286			506	45330.05	3.7462851
100	10450	3.326	34756.7	13	1165	15145		
SIDE SPAN			2286			506	52693.7	4.3548512

BRIDGES TYPES AND SPAN LENGTH RANGE
(CONTINUOUS STEEL BOX GIRDER WITH STEEL DECK)

(1000U $)

SPAN	SUPERSTRUCTURE COST			SUBSTRUCTURE COST			TOTAL COST	
	AREA	UNIT COST	COST	NUMBERS	UNIT COST	COST		
	M2	US $ /M2	US $	N	US $ /N	US $	US $	(US $ /M2)
	(ROUTE-A)							
70	17160	3.049	52320.84	25	579	14475	66795.84	3.8925315
100	17160	3.521	60420.36	18	661	11898	72318.36	4.2143566
130	17160	4.065	69755.4	13	723	9399	79154.4	4.6127273
160	17160	4.501	77237.16	11	785	8635	85872.16	5.0042051
	(ROUTE-B)							
70	15180	3.049	46283.82	23	615	14145	60428.82	3.9808182
100	15180	3.521	53448.76	17	701	11917	65365.78	4.3060461
130	15180	4.065	61706.7	12	768	9216	70922.7	4.6721146
160	15180	4.501	68325.18	10	832	8320	76645.18	5.0490896
	(ROUTE-C)							
70	10450	2.795	29207.75	15	1074	16110		
SIDE SPAN			2286			506	48109.75	3.9780124
100	10450	3.521	36794.45	13	1165	15145		
SIDE SPAN			2286			506	54731.45	4.5232603
150	10450	4.501	47035.45	9	1316	11844		
SIDE SPAN			2286			506	61671.45	5.096814
200	10450	5.299	55374.55	8	1837	14696		
SIDE SPAN			2286			506	72862.55	6.0216983

BRIDGES TYPES AND SPAN LENGTH RANGE
(THROUGH TYPE STEEL ARCH)

(1000U $)

SPAN	SUPERSTRUCTURE COST			SUBSTRUCTURE COST			TOTAL COST	
	AREA	UNIT COST	COST	NUMBERS	UNIT COST	COST		
	M2	US $/M2	US $	N	US $/N	US $	US $	(US $/M2)
(ROUTE-A)								
70	17160	2.211	37940.76	25	579	14475	52415.76	3.0545315
100	17160	2.874	49317.84	18	661	11898	61215.84	3.5673566
130	17160	3.722	63869.52	13	723	9399	73268.52	4.2697273
160	17160	3.832	65757.12	11	785	8635	74392.12	4.3352051
(ROUTE-B)								
70	15180	2.211	33562.96	23	615	14145	47707.98	3.1428182
100	15180	2.874	43627.32	17	701	11917	55544.32	3.6590461
130	15180	3.722	56499.96	12	766	9192	65691.96	4.3275336
160	15180	3.832	58169.76	10	832	8320	66489.76	4.3800896
(ROUTE-C)								
70	10450	2.026	21171.7	15	1074	16110		
SIDE SPAN			2286			506	40073.7	3.311876
100	10450	2.874	30033.3	13	1165	15145		
SIDE SPAN			2286			506	47970.3	3.9644876
150	10450	3.685	38508.25	9	1316	11844		
SIDE SPAN			2286			506	53144.25	4.3920868
200	10450	4.496	46983.2	8	1837	14696		
SIDE SPAN			2286			506	64471.2	5.3281983

BRIDGES TYPES AND SPAN LENGTH RANGE
(THROUGH TYPE CONTINUOUS STEEL TRUSS)

(1000U $)

SPAN	SUPERSTRUCTURE COST			SUBSTRUCTURE COST			TOTAL COST	
	AREA	UNIT COST	COST	NUMBERS	UNIT COST	COST		
	M2	US $/M2	US $	N	US $/N	US $	US $	(US $/M2)
(ROUTE-A)								
50	17160	1.916	32878.56	33	524	17292	50170.56	2.9236923
70	17160	2.175	37323	25	579	14475	51798	3.0185315
100	17160	2.726	46778.16	18	661	11898	58676.16	3.4193566
130	17160	3.54	60746.4	13	723	9399	70145.4	4.0877273
160	17160	4.275	73359	11	785	8635	81994	4.7782051
(ROUTE-B)								
50	15130	1.916	29084.88	29	557	16153	45237.88	2.9800975
70	15180	2.175	33016.5	23	615	14145	47161.5	3.1068182
100	15180	2.726	41380.68	17	701	11917	53297.66	3.5110461
130	15180	3.54	53737.2	12	768	9216	62953.2	4.1471146
160	15180	4.275	64894.5	10	832	8320	73214.5	4.8230896
(ROUTE-C)								
70	10450	2.175	22728.75	15	1074	16118		
SIDE SPAN			2286			506	41630.75	3.4485579
100	10450	2.727	28497.15	13	1165	15145		
SIDE SPAN			2286			506	46434.15	3.8375331
150	10450	4.091	42750.95	9	1316	11844		
SIDE SPAN			2286			506	57386.95	4.7427231
200	10450	5.012	52375.4	8	1637	14696		
SIDE SPAN			2286			506	69663.4	5.7738347

BRIDGES TYPES AND SPAN LENGTH RANGE
(CONTINUOUS PC BOX GIRDER)

(1000U $)

SPAN	SUPERSTRUCTURE COST			SUBSTRUCTURE COST			TOTAL COST	
	AREA	UNIT COST	COST	NUMBERS	UNIT COST	COST		
	M2	US $ / M2	US $	N	US $ / N	US $	US $	(US $ / M2)
	(ROUTE-A)							
50	17160	1.671	28674.36	33	617	20361	49035.36	2.8575385
70	17160	1.749	30012.84	25	682	17050	47062.84	2.7425897
100	17160	1.866	32020.56	18	778	14004	46024.56	2.6820839
130	17160	2.203	37803.48	13	851	11063	48866.48	2.847697
	(ROUTE-B)							
50	15180	1.671	25365.78	29	655	18995	44360.78	2.9223175
70	15180	1.749	26549.82	23	723	16629	43178.82	2.8444545
100	15180	1.866	28325.88	17	825	14025	42350.88	2.769913
130	15180	2.203	33441.54	12	903	10836	44277.54	2.916834
	(ROUTE-C)							
100	10450	1.844	19269.8	13	1370	17810		
SIDE SPAN	1650		2758			595	40432.8	3.3415537
150	10450	2.208	23073.6	9	1548	13932		
SIDE SPAN	1650		2758			595	40358.6	3.3354215
200	10450	2.513	26260.85	8	2161	17288		
SIDE SPAN	1650		2758			595	46901.85	3.876186

BRIDGES TYPES AND SPAN LENGTH RANGE
(CONTINUOUS RIGID FRAME PC BOX GIRDER)

(1000U $)

SPAN	SUPERSTRUCTURE COST			SUBSTRUCTURE COST			TOTAL COST	
	AREA	UNIT COST	COST	NUMBERS	UNIT COST	COST		
	M2	US $ / M2	US $	N	US $ / N	US $	US $	(US $ / M2)
	(ROUTE-A)							
50	17160	1.61	27627.6	33	617	20361	47988.6	2.7965385
70	17160	1.693	29051.88	25	682	17050	46101.88	2.6865897
100	17160	1.818	31196.88	18	778	14004	45200.88	2.6340839
130	17160	2.178	37374.48	13	851	11063	48437.48	2.822697
160	17160	2.415	41441.4	11	923	10153	51594.4	3.0066667
	(ROUTE-B)							
50	15180	1.61	24439.8	29	655	18995	43434.8	2.8613175
70	15180	1.693	25699.74	23	723	16629	42328.74	2.7884545
100	16180	1.818	27597.24	17	825	14026	41622.24	2.741913
130	16180	2.178	33062.04	12	903	10836	43898.04	2.891834
160	15180	2.415	36659.7	10	979	9790	46449.7	3.0599275
	(ROUTE-C)							
70	10450	1.681	17566.45	15	1263	18945		
SIDE SPAN			2758			595	39864.45	3.2945826
100	10450	1.795	18757.75	13	1370	17810		
SIDE SPAN			2758			595	39920.75	3.2992355
150	10450	2.351	24567.95	9	1548	13932		
SIDE SPAN			2758			595	41852.95	3.4589215
200	10450	2.676	27964.2	8	2161	17288		
SIDE SPAN			2758			595	48605.2	4.0169587

BRIDGES TYPES AND SPAN LENGTH RANGE
(EXTRA-DOSED PC BOX GIRDER)

(1000US$)

SPAN	SUPERSTRUCTURE COST AREA M2	UNIT COST US$/M2	COST US$	SUBSTRUCTURE COST NUMBERS N	UNIT COST US$/N	COST US$	TOTAL COST US$	(US$/M2)
(ROUTE-A)								
100	17160	2.056	35280.96	18	778	14004	49284.96	2.8720839
130	17160	2.428	41664.48	13	851	11063	52727.48	3.072697
160	17160	2.641	45319.56	11	923	10153	55472.56	3.2326667
(ROUTE-B)								
100	15180	2.056	31210.08	17	825	14025	45235.08	2.979913
130	15180	2.428	36857.04	12	903	10836	47693.04	3.141834
160	15180	2.641	40090.38	10	979	9790	49880.38	3.2859275
(ROUTE-C)								
100	10450	2.034	21255.3	13	1370	17810		
SIDE SPAN			2758			595	42418.3	3.5056446
150	10450	2.576	26919.2	8	1548	12384		
SIDE SPAN			2758			595	42656.2	3.5253058
200	10450	3.456	36115.2	6	2161	12966		
SIDE SPAN			2758			595	52434.2	4.333405

BRIDGES TYPES AND SPAN LENGTH RANGE
(CABLE STAYED PC BOX GIRDER)

(1000US$)

SPAN	SUPERSTRUCTURE COST AREA M2	UNIT COST US$/M2	COST US$	SUBSTRUCTURE COST NUMBERS N	UNIT COST US$/N	COST US$	TOTAL COST US$	(US$/M2)
(ROUTE-A)								
100	17160	2.559	43912.44	18	778	14004	57916.44	3.3750839
130	17160	2.982	51171.12	13	851	11063	62234.12	3.626697
160	17160	3.195	54826.2	11	923	10153	64979.2	3.7866667
(ROUTE-B)								
100	15180	2.559	38845.62	17	825	14025	52870.62	3.482913
130	15180	2.982	45266.76	12	903	10836	56102.76	3.695834
160	15180	3.195	48500.1	10	979	9790	58290.1	3.8399275
(ROUTE-C)								
100	10450	2.538	26522.1	13	1370	17810		
SIDE SPAN			2758			595	47685.1	3.9409174
150	10450	3.131	32716.95	9	1548	13932		
SIDE SPAN			2758			595	50003.95	4.1325579
200	10450	3.456	36115.2	8	2160	17280		
SIDE SPAN			2758			595	56748.2	4.6899339

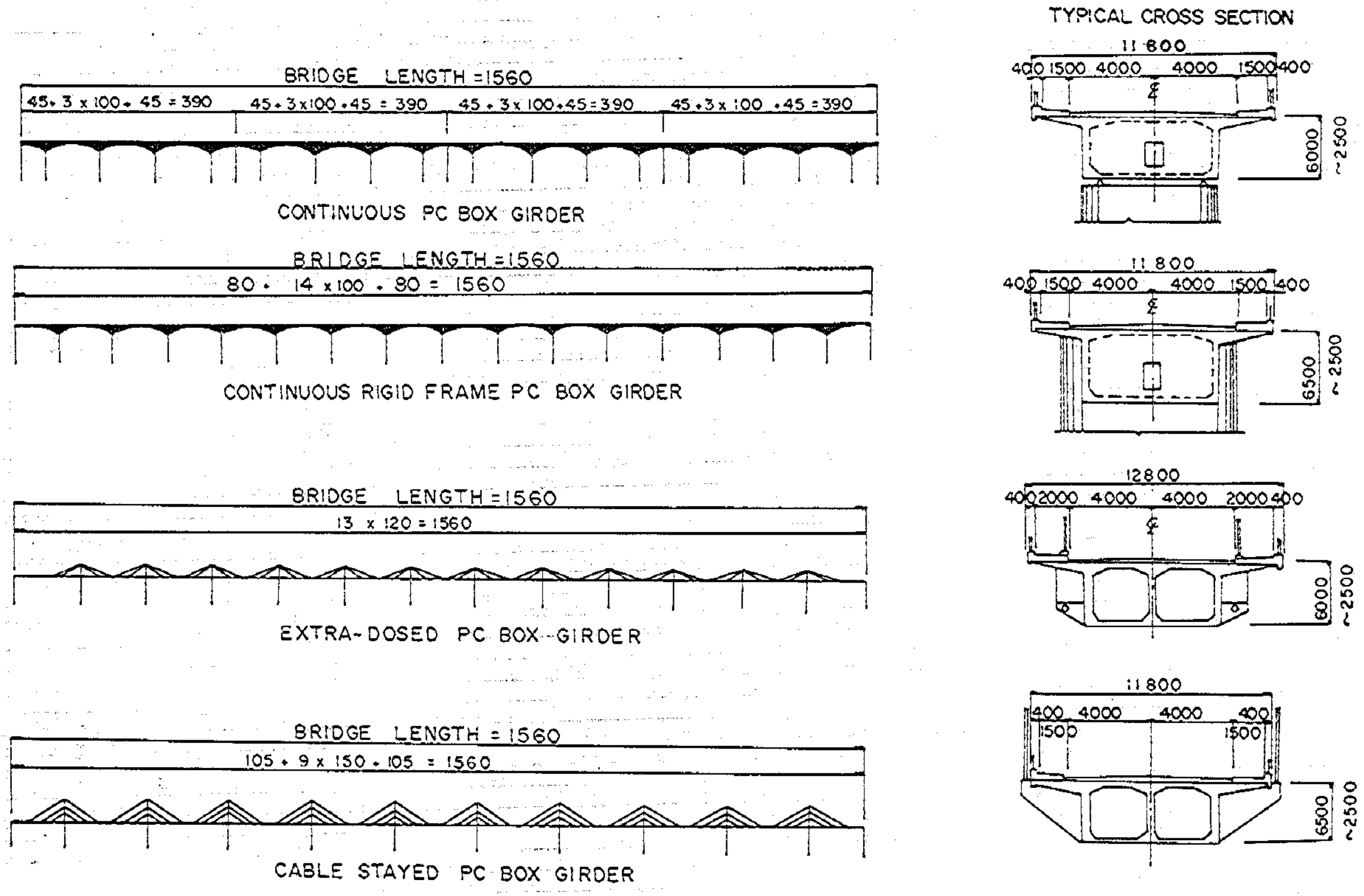


FIGURE A.9-1 SPAN COMPOSITION BY CONCRETE BRIDGE TYPE (ROUTE-A)

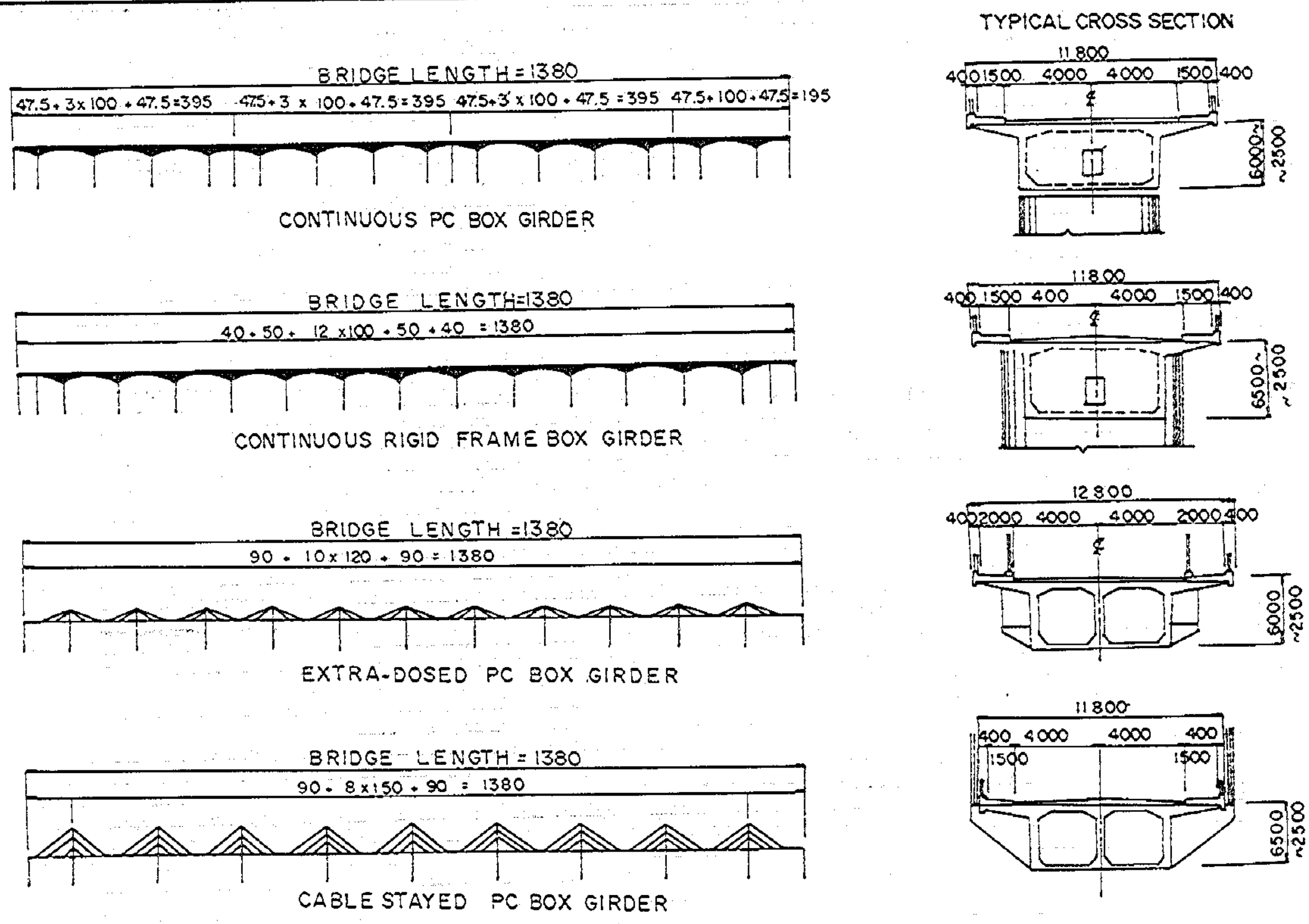


FIGURE A.9-2 SPAN COMPOSITION BY CONCRETE BRIDGE TYPE (ROUTE-B)

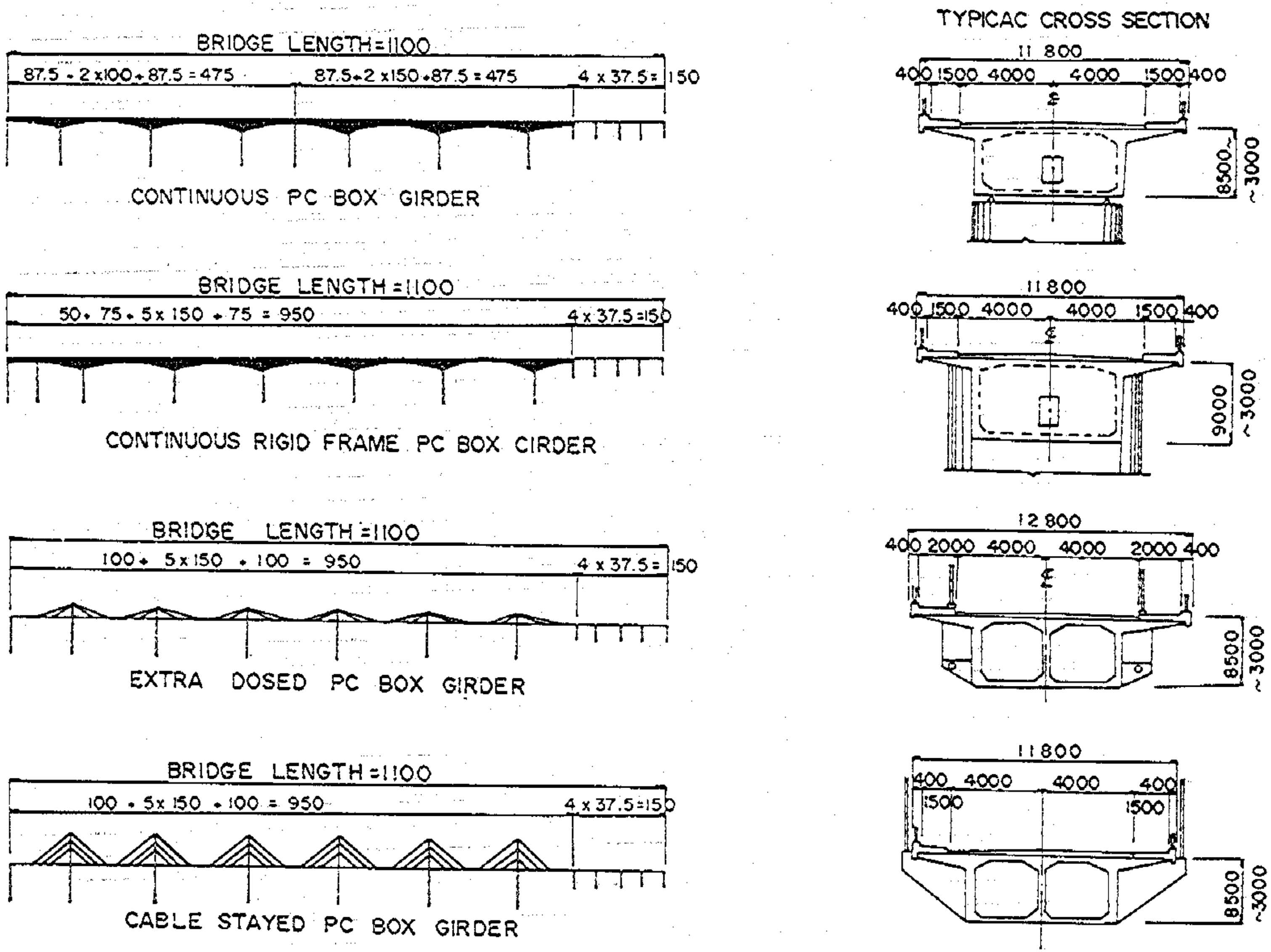


FIGURE A.9-3 SPAN COMPOSITION BY CONCRETE BRIDGE TYPE (ROUTE-C)

TABLE A.9-5 CONSTRUCTION COSTS OF ALTERNATIVE ROUTES

(Unit: US$1,000)

Items of Works		ROUTE-A			ROUTE-B			ROUTE-C		
		Quantity	Unit	Amount	Quantity	Unit	Amount	Quantity	Unit	Amount
1 Superstructure										
1) PC box concrete		16,810		9,750	14,700		8,526	12,240		6,889
Main span	m3	16,810	0.580	9,750	14,700	0.580	8,526	11,200	0.590	6,608
Side span	m3	0		0	0		0	1,040	0.270	281
2) Deformed bar	t	2,520	1.650	4,158	2,210	1.650	3,647	1,840	1.650	3,036
3) PC cable	t	1,220	12.800	15,616	1,070	12.800	13,696	1,120	12.800	14,336
4) Bridge surface	m2	17,160	0.220	3,775	15,180	0.220	3,340	12,100	0.220	2,662
5) Center hinge	each	7	98.000	686	6	98.000	588	3	98.000	294
6) Bearing shoes	each	4	30.000	120	8	12.000	96	16	9.000	144
7) Miscellaneous		LS		2,465	LS		2,388	LS		1,949
Sub-total:				36,570			32,280			29,310
2 Substructure										
1) Cast-in-situ pile	m	1,860	5.340	9,932	1,965	3.880	7,624	1,875	5.700	10,688
2) Pier/Abut concrete	m3	10,440	0.190	1,984	11,030	0.190	2,096	9,230	0.190	1,754
3) Deformed bar	t	1,045	1.650	1,724	1,105	1.650	1,823	925	1.650	1,526
4) Miscellaneous		LS		220	LS		327	LS		403
Sub-total:				13,860			11,870			14,370
3 Approach Roads		(3800m)			(3030m)			(4690m)		
1) Embankment	m3	411,300	0.027	11,105	264,200	0.022	5,812	239,800	0.023	5,515
2) Pavement	m2	41,800	0.009	389	33,330	0.009	310	51,590	0.009	480
3) Road structures		LS		38	LS		1,587	LS		1,455
4) Miscellaneous		LS		978	LS		811	LS		1,030
Sub-total:				12,510			8,520			8,480
Total:				62,940			52,670			52,160

TABLE A.10-1 COST BENEFIT CASH FLOWS (ROUTE-A)

(US$1,000)

No.	Year	COSTS			BENEFITS			B - C
		(1) Investment Cost	(2) Maintenance & Operation	(3) Total Cost	(4) User cost Savings	(5) Savings in Ferry Operation	(6) Total Benefit	(7) Net Cash Flow
	1996	1386		1386	0		0	-1386
	1997	24413		24413	0		0	-24413
	1998	23078		23078	0		0	-23078
	1999	20621		20621	0		0	-20621
	2000	5190	7.6	5198	362	996	1358	-3840
1	2001		15.2	15.2	854	1705	2559	2544
2	2002		15.2	15.2	985	1861	2846	2831
3	2003		15.2	15.2	1116	2246	3362	3347
4	2004		15.2	15.2	1247	2217	3464	3449
5	2005		15.2	15.2	1379	2419	3798	3783
6	2006		15.2	15.2	1510	2856	4366	4350
7	2007		15.2	15.2	1641	2883	4523	4508
8	2008		15.2	15.2	1772	3362	5134	5118
9	2009		15.2	15.2	1903	3650	5553	5538
10	2010		15.2	15.2	2034	3750	5784	5769
11	2011		15.2	15.2	2246	4131	6377	6361
12	2012		15.2	15.2	2457	4090	6547	6532
13	2013		15.2	15.2	2669	4487	7156	7141
14	2014		15.2	15.2	2880	4463	7343	7328
15	2015		15.2	15.2	3092	4664	7755	7740
16	2016		15.2	15.2	3303	5089	8392	8377
17	2017		15.2	15.2	3515	5094	8609	8594
18	2018		15.2	15.2	3726	5541	9267	9251
19	2019		15.2	15.2	3938	5568	9506	9490
20	2020		15.2	15.2	4149	6038	10187	10171
21	2021		15.2	15.2	4361	6305	10665	10650
22	2022		15.2	15.2	4572	6370	10942	10927
23	2023		15.2	15.2	4784	6879	11663	11647
24	2024		15.2	15.2	4995	6973	11968	11953
25	2025		15.2	15.2	5206	7512	12719	12704
26	2026		15.2	15.2	5418	7853	13271	13256
27	2027		15.2	15.2	5629	8211	13840	13825
28	2028		15.2	15.2	5841	8586	14427	14412
29	2029		15.2	15.2	6052	8766	14819	14804
30	2030	-25228	7.6	-25220	3132	4698	7830	33050
	TOTAL	49460	456	49916	96765	149264	246029	196113

EIRR	6.8%

TABLE A.10-2 COST BENEFIT CASH FLOWS (ROUTE-B)

(US$1,000)

No.	Year	COSTS (1) Investment Cost	(2) Maintenance & Operation	(3) Total Cost	BENEFITS (4) User cost Savings	(5) Savings in Ferry Operation	(6) Total Benefit	B - C (7) Net Cash Flow
	1996	1160		1160	0		0	-1160
	1997	20618		20618	0		0	-20618
	1998	20369		20369	0		0	-20369
	1999	17257		17257	0		0	-17257
	2000	3286	6.1	3292	391	996	1387	-1905
1	2001		12.1	12.1	926	1705	2631	2619
2	2002		12.1	12.1	1069	1861	2930	2918
3	2003		12.1	12.1	1213	2246	3459	3447
4	2004		12.1	12.1	1357	2217	3573	3561
5	2005		12.1	12.1	1501	2419	3920	3908
6	2006		12.1	12.1	1644	2856	4500	4488
7	2007		12.1	12.1	1788	2883	4671	4659
8	2008		12.1	12.1	1932	3362	5293	5281
9	2009		12.1	12.1	2075	3650	5725	5713
10	2010		12.1	12.1	2219	3750	5969	5957
11	2011		12.1	12.1	2448	4131	6579	6567
12	2012		12.1	12.1	2677	4090	6767	6755
13	2013		12.1	12.1	2906	4487	7393	7381
14	2014		12.1	12.1	3135	4463	7598	7586
15	2015		12.1	12.1	3364	4664	8028	8016
16	2016		12.1	12.1	3593	5089	8682	8670
17	2017		12.1	12.1	3822	5094	8916	8904
18	2018		12.1	12.1	4051	5541	9592	9579
19	2019		12.1	12.1	4280	5568	9848	9836
20	2020		12.1	12.1	4509	6038	10547	10534
21	2021		12.1	12.1	4738	6305	11043	11031
22	2022		12.1	12.1	4967	6370	11337	11325
23	2023		12.1	12.1	5196	6879	12075	12063
24	2024		12.1	12.1	5425	6973	12398	12386
25	2025		12.1	12.1	5654	7512	13166	13154
26	2026		12.1	12.1	5883	7853	13736	13724
27	2027		12.1	12.1	6112	8211	14323	14311
28	2028		12.1	12.1	6341	8586	14927	14915
29	2029		12.1	12.1	6570	8766	15336	15324
30	2030	-21205	6.1	-21199	3399	4698	8098	29296
	TOTAL	41485	364	41849	105185	149264	254449	212600

EIRR	8.0%

TABLE A.10-3 COST BENEFIT CASH FLOWS (ROUTE-C)

(US$1,000)

No.	Year	COSTS (1) Investment Cost	(2) Maintenance & Operation	(3) Total Cost	BENEFITS (4) User cost Savings	(5) Savings in Ferry Operation	(6) Total Benefit	B - C (7) Net Cash Flow
	1996	1148		1148	0		0	-1148
	1997	20793		20793	0		0	-20793
	1998	20172		20172	0		0	-20172
	1999	17089		17089	0		0	-17089
	2000	3254	9.4	3263	349	996	1345	-1919
1	2001		18.8	18.8	829	1705	2534	2516
2	2002		18.8	18.8	962	1861	2823	2804
3	2003		18.8	18.8	1094	2246	3340	3321
4	2004		18.8	18.8	1227	2217	3443	3425
5	2005		18.8	18.8	1359	2419	3778	3760
6	2006		18.8	18.8	1491	2856	4347	4329
7	2007		18.8	18.8	1624	2883	4507	4488
8	2008		18.8	18.8	1756	3362	5118	5099
9	2009		18.8	18.8	1889	3650	5539	5520
10	2010		18.8	18.8	2021	3750	5771	5752
11	2011		18.8	18.8	2228	4131	6359	6341
12	2012		18.8	18.8	2436	4090	6526	6507
13	2013		18.8	18.8	2643	4487	7130	7112
14	2014		18.8	18.8	2851	4463	7314	7295
15	2015		18.8	18.8	3058	4664	7722	7703
16	2016		18.8	18.8	3265	5089	8354	8336
17	2017		18.8	18.8	3473	5094	8567	8548
18	2018		18.8	18.8	3680	5541	9221	9202
19	2019		18.8	18.8	3888	5568	9456	9437
20	2020		18.8	18.8	4095	6038	10133	10114
21	2021		18.8	18.8	4302	6305	10607	10588
22	2022		18.8	18.8	4510	6370	10880	10861
23	2023		18.8	18.8	4717	6879	11596	11578
24	2024		18.8	18.8	4925	6973	11898	11879
25	2025		18.8	18.8	5132	7512	12644	12626
26	2026		18.8	18.8	5339	7853	13192	13174
27	2027		18.8	18.8	5547	8211	13758	13739
28	2028		18.8	18.8	5754	8586	14341	14322
29	2029		18.8	18.8	5962	8766	14728	14709
30	2030	-21185	9.4	-21176	3085	4698	7783	28958
								0
	TOTAL	41271	563	41834	95490	149264	244753.539	202920

EIRR	7.8%

Note A.11.1 PRELIMINARY DESIGN OF SUPER STRUCTURE

A11.1.1 GENERAL

In this preliminary design, structural analysis was done based on the following layouts;

- Structural frame of one box concrete box girder with sliding bearings on both ends, sliding hinges on each other spans and three span continuous Extradosed portion. (See the Figure of main frame and adopted model for analysis.)
- Piers and Pile caps are considered as parts of main frame.
- Pile foundations are considered as a part of main frame and they are converted to elastic resistance for vertical and horizontal movement, and rotating.
- Stay cables for Extradosed structure are covered by elastic protection materials for anti-corrosion.

A11.1.2 STRUCTURAL ANALYSIS

(1) STRUCTURAL TYPE AND SPAN ARRANGEMENT

Structural layout, structural type and span arrangement, of the Pakse Bridge is as follows;

- Thirteen span continuous prestressed concrete box girder bridge with central sliding hinges and extradosed box girder portion.
- Between A1 and P10, nine(9) span continuous PC box girder with rigidly connected piers and central sliding hinges on each other span.
  Span arrangement : 70 + 9@ 102 = 988 m.
- Between P10 and P13(and A2), three(3) span continuous Extradosed PC box girder with rigidly connected piers and supporting towers for stay cables on P11 and P12.
  Span arrangement : 102 + 150 + 100 + (40) = 392 m.

  Main frame is shown in Figure A11-1.

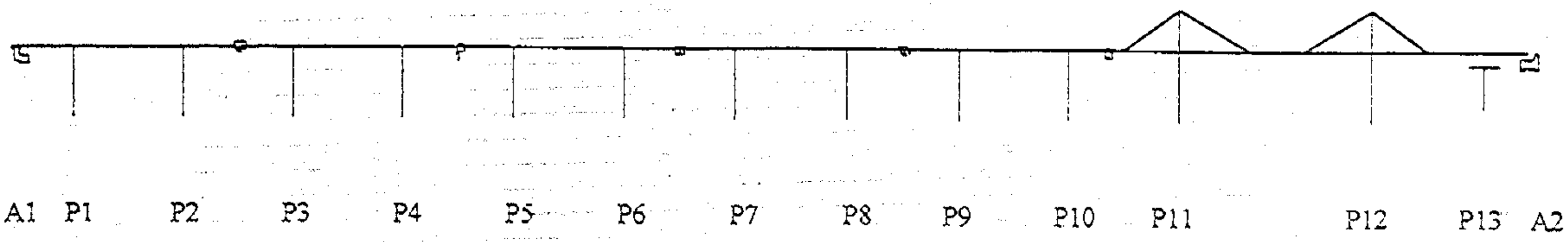
(2) STRUCTURAL MODEL FOR COMPUTER ANALYSIS

The structural model for computer analysis was established based on the following conceptions;

- Full size model is necessary for Extradosed PC box girder portion including end side span of 40 m., P13 to A1.
- Four(4) span model of PC box girder box portion could represent the full size structure of nine(9) span continuous PC box girder.

The frame model for computer analysis is also shown in Figure A.11-1.

STRUCTURAL FRAME OF MAIN BRIDGE



STRUCTURAL MODEL FOR COMPUTER ANALYSIS

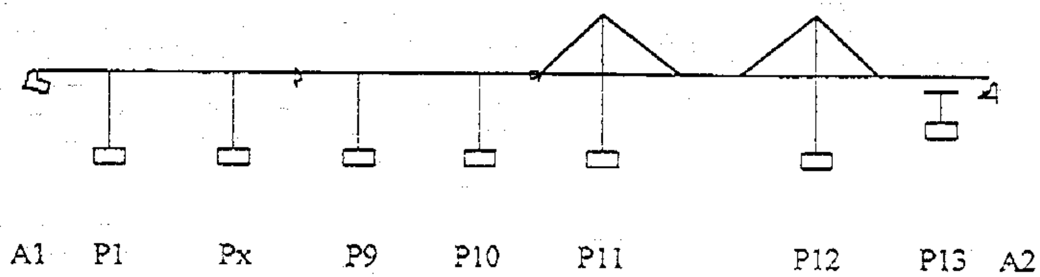


FIGURE A.11-1 STRUCTURAL FRAME AND STRUCTURAL MODEL FOR COMPUTER ANALYSIS

(3) DESIGN CRITERIA

The design criteria were established based on the preliminary survey and study on traffic conditions in the project area and design criteria for relevant projects in Laos and other countries.

(i) Loading Conditions

- Dead Loads

Reinforced Concrete	:	2.50 t/m3
Plain concrete (for pavement)	:	2.30 t/m3

- Live Loads

Lane Load	25 ton / vehicle	
Uniform Load(1)	1.00t/m2	in 5.50 m. width,--for Bending M.
	0.50 t/m2	in 2.50 m. width.
	1.20 t/m2	in 5.50 m. width, -- for Sharing F.
	0.35 t/m2	on Sidewalk. -- for Bending and Sharing.
Uniform Load(2)	0.35 t/m2	in 5.50 m. width,
	0.175 t/m2	in 2.50 m. width.
Impact	i = 10 / (25 + L)	

- Other Loads

  The following loads are considered in the design;
  1) Effect due to temperature changing (Thermal Effect),
  2) Effects due to creep and shrinkage of concrete,
  3) Seismic Load (Effect due to Earthquake),
  4) Wind load.

  In actual design, effects of 1) and 2) are estimated together with Dead Load as a part of it.

(ii) Materials

- Concrete

1) Prestressed Concrete	350	kg/ cm2
2) Reinforced Concrete	240	kg/cm2

- Reinforcing Steel

	Ultimate Strength / Force	Yield Strength / Force
Stay Cable Multi Strands 27-T15.2	kg/mm2 ton/cab. 190 / 718.2	kg/mm2 ton/cab. 160 / 610.2
Main Cable Multi Strands 12-T12.7	190 / 22.4	160 / 190.8
Transversal Cable Multi Cable 12-ϕ8	160 / 96.6	140 / 84.6
Share Bar PC Bar ϕ26	120 / 63.7	95 / 50.4

(iii) MAJOR DIMENSIONS OF BOX GIRDER

SECTION	GIRDER DEPTH	WIDTH of Box	WIDTH of Web	DEPTH of Btm. Slab	DEPTH of Up. Slab
A1	3.00	6.50	0.60	0.50	0.30
Span Center	3.00	6.50	0.40	0.25	0.30
P1 to P10	6.50	6.50	0.60	1.00	0.30
Span Center	3.00	6.50	0.40	0.25	0.30
P11&P12	6.50	6.50	0.60	1.00	0.30
Span Center	3.00	6.50	0.40	0.25	0.30
P13	3.00	6.50	0.60	1.00	0.30
Span Center	3.00	6.50	0.40	0.25	0.30
A2	3.00	6.50	0.60	0.50	0.30

Towers for Extradosed spans:

a b h

Dimension of Tower; 1.00 x 3.00 x 13.00 m. (P11 & P12)

(4) RESULTS OF ANALYSIS

(i) Moment and Deflection Diagram

The results of structural analysis are summarized in the Figure A11-2, A11-3 and A11-4, as Moment Diagrams and Deflection Diagrams for three(3) loading conditions;

- Dead Load only,
- Dead Load and Live Load(only for negative moment portion)
- Dead Load and Live Load (only for positive moment portion)

The summarized figures of estimated Bending Moments on pier top and span center are in Table A11-1.

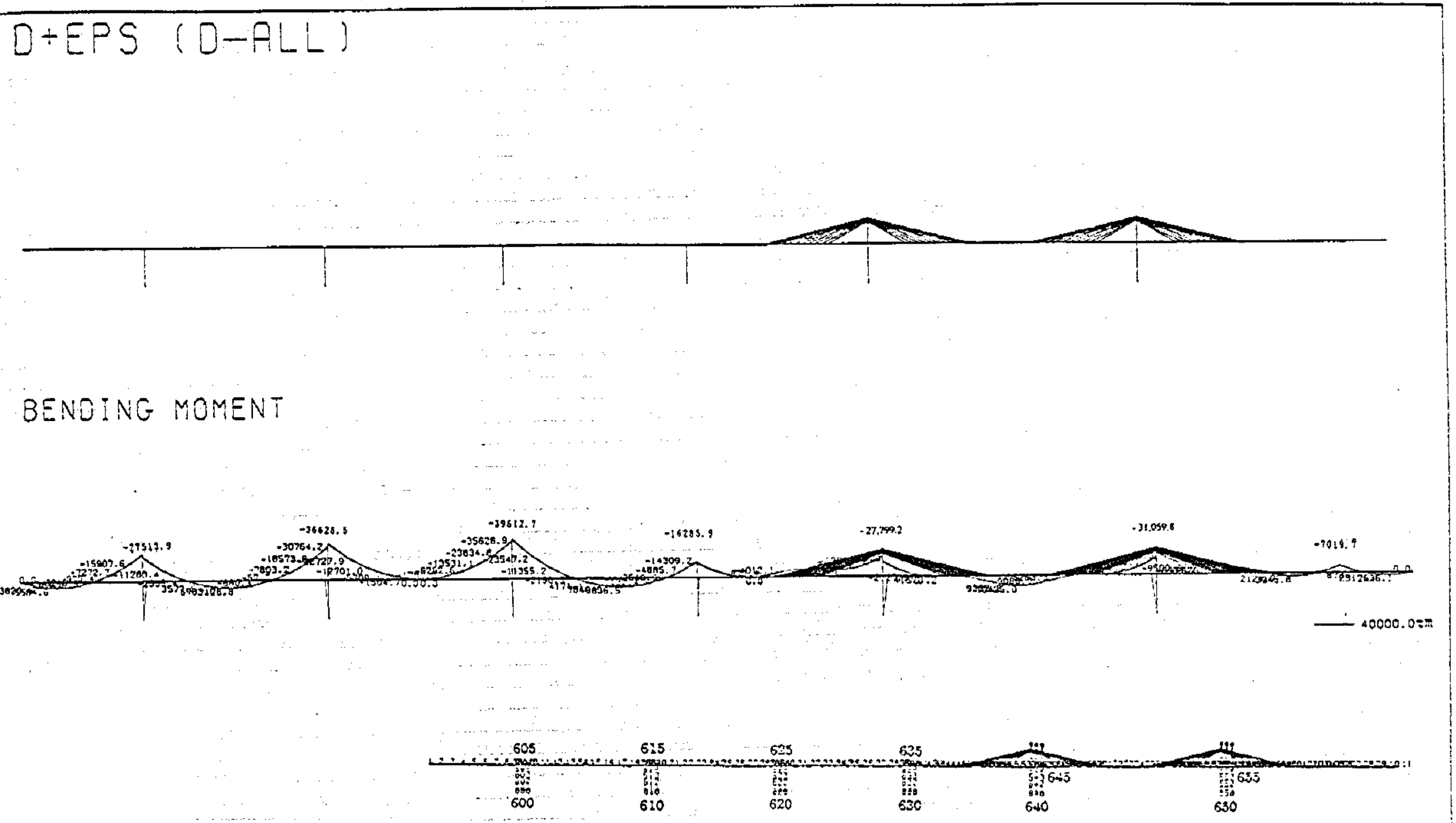


FIGURE A.11-2 MOMENT AND DEFLECTION DIAGRAM (D ONLY)

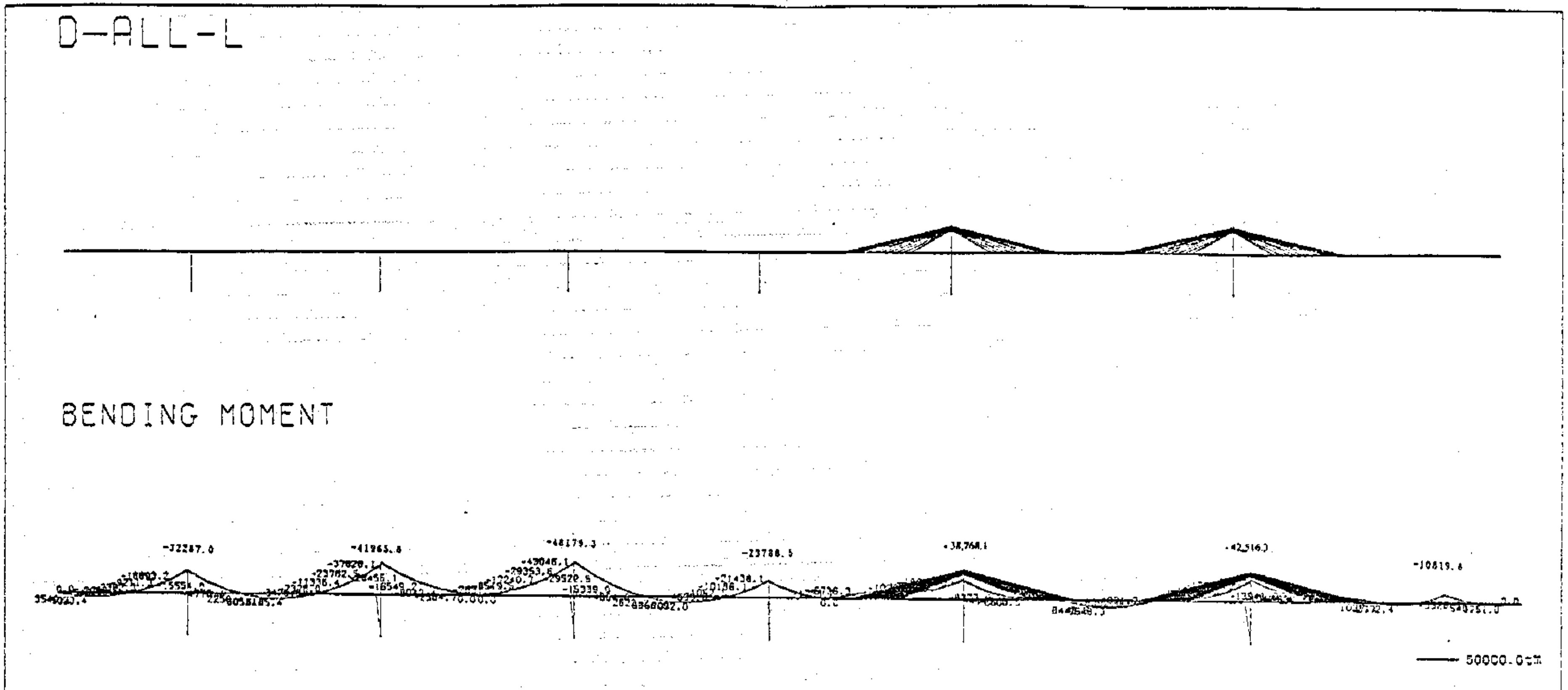


FIGURE A.11-3 MOMENT AND DEFLECTION DIAGRAM (D +L MIN.)

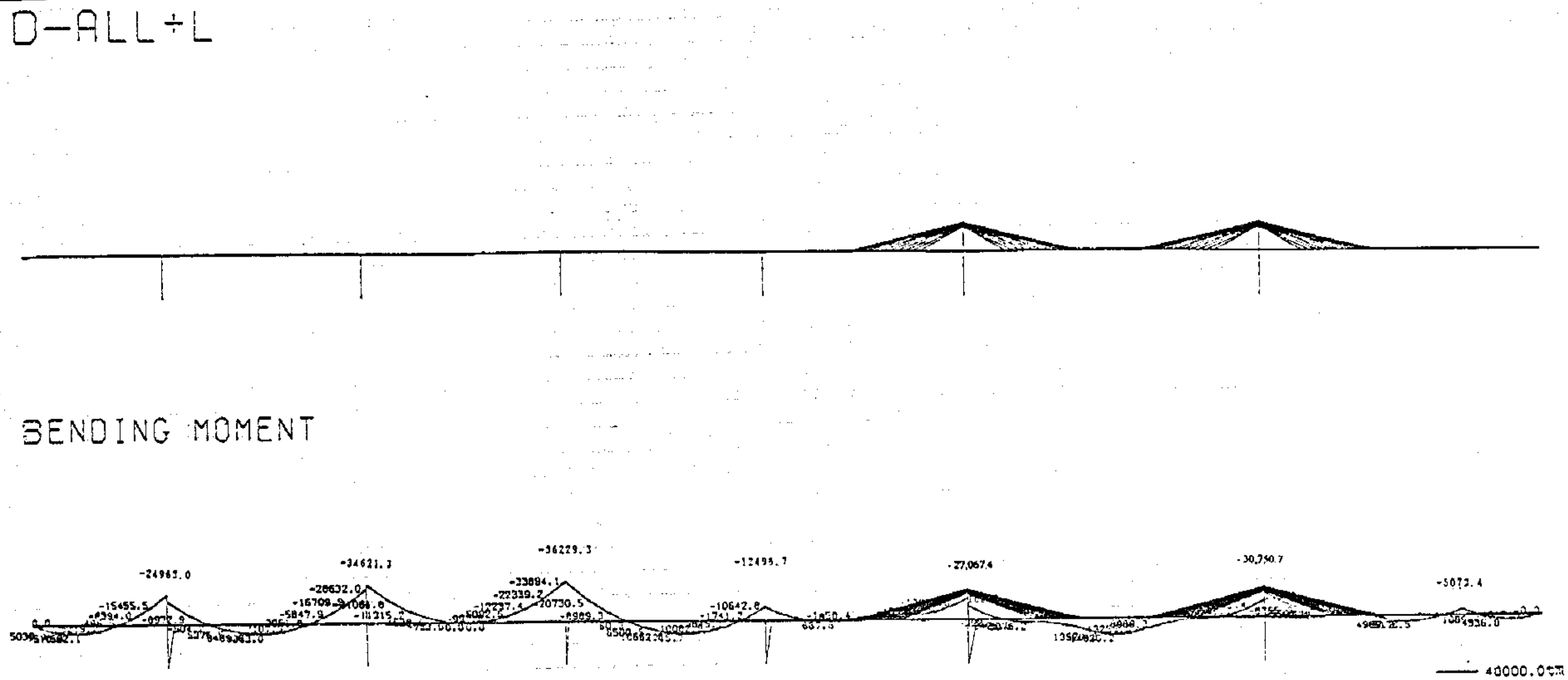
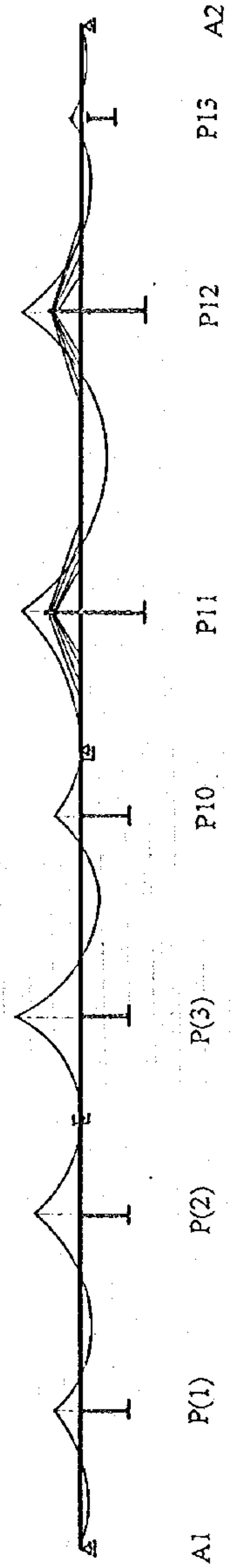


FIGURE A.11-4 MOMENT AND DEFLECTION DIAGRAM (D + L MAX.)

TABLE A.11-1 ESTIMATED BENDING MOMENTS AT MAJOR SECTIONS

	BENDING MOMENTS (ton . m.)			REMARKS
	D (only)	D + L (M-)	D + L (M +)	
A1	-----	-----	-----	
mid.	5,385	5,023	7,562	
P(1)	- 27,513	- 32,287	- 24,963	
mid.	7,129	6,185	9,353	
P(2)	- 36,629	- 41,966	- 34,621	
mid.	------	-----	------	(slid. hinge)
P(3)	- 39,613	- 48,179	- 36,229	
mid.	8,836	7,092	11,716	
P10	- 16,286	- 23,789	- 12,499	
mid.	-----	-----	-----	(sld. bearing)
P11	- 27,799	- 38,768	- 27,067	
mid.	10,425	9,549	14,820	
P12	- 31.060	- 42,516	- 30,751	
mid.	3,246	2,772	5,179	
P13	- 7,020	- 10,820	- 5,073	
mid.	-----	-----	-----	
A2	-----	-----	-----	



(iii) Arrangement of PC Steels

[PC Box Girder]

- Main Cables

Pier Top	98 strands of 12-T12.7
Span Center	24 strands of 12-T12.7

[Extradosed PC Box Girder]

- Stay Cables

Nine(9) strands of 27-T15.2 on each side of Box Girder, 18 strands in total.

Maximum working force	:	354	tons / stay cable
Allowable tensile force	:	430	tons / stay cable

** Maximum working force on stay cables are shown in Table A.11-2.

- Main Cables

Pier Top	86 strands of 12-T12.7
Span Center	32 strands of 12-T12.7

Arrangement of Main Cables at Pier Top and Span Center on PC Box and Extradosed PC Box Girder are shown in Figure A11-5 & A11-6.

TABLE A.11-2 MAXIMUM WORKING FORCE ON STAY CABLES

(tons per two stay cables --- 27 - T15.2)

	D+EPS	L-MAX	L-MIN	D+EPS+LMAX	D+EPS+LMIN
C1	670	38	-13	708	657
C2	670	36	-11	706	659
C3	670	34	-9	704	661
C4	670	32	-7	702	663
C5	670	31	-6	701	664
C6	670	30	-6	700	664
C7	670	28	-5	698	665
C8	670	27	-5	697	665
C9	670	26	-5	696	665
C10	670	35	-5	705	658
C11	670	35	-11	705	659
C12	670	35	-10	705	660
C13	670	35	-9	705	661
C14	670	34	-8	704	662
C15	670	33	-7	703	663
C16	670	32	-6	702	664
C17	670	31	-6	701	664
C18	670	30	-5	700	665
C19	670	36	-9	706	661
C20	670	35	-8	705	662
C21	670	35	-7	705	663
C22	670	35	-7	705	663
C23	670	34	-6	704	664
C24	670	33	-5	703	665
C25	670	32	-4	702	666
C26	670	31	-4	701	666
C27	670	30	-3	700	667
C28	670	34	-9	704	661
C29	670	33	-7	703	663
C30	670	32	-5	702	665
C31	670	31	-4	701	666
C32	670	30	-4	700	666
C33	670	29	-3	699	667
C34	670	29	-3	699	667
C35	670	28	-3	698	667
C36	670	27	-3	697	667

Allowable Tensile Force per two Stay Cables

$0.6\ Pu = 0.6 \times 718.2 \times 2 = 861.84$

$0.75\ Py = 0.75 \times 610.2 \times 2 = 915.3$

$Pa = 0.6\ Pu = 861.84$ tf

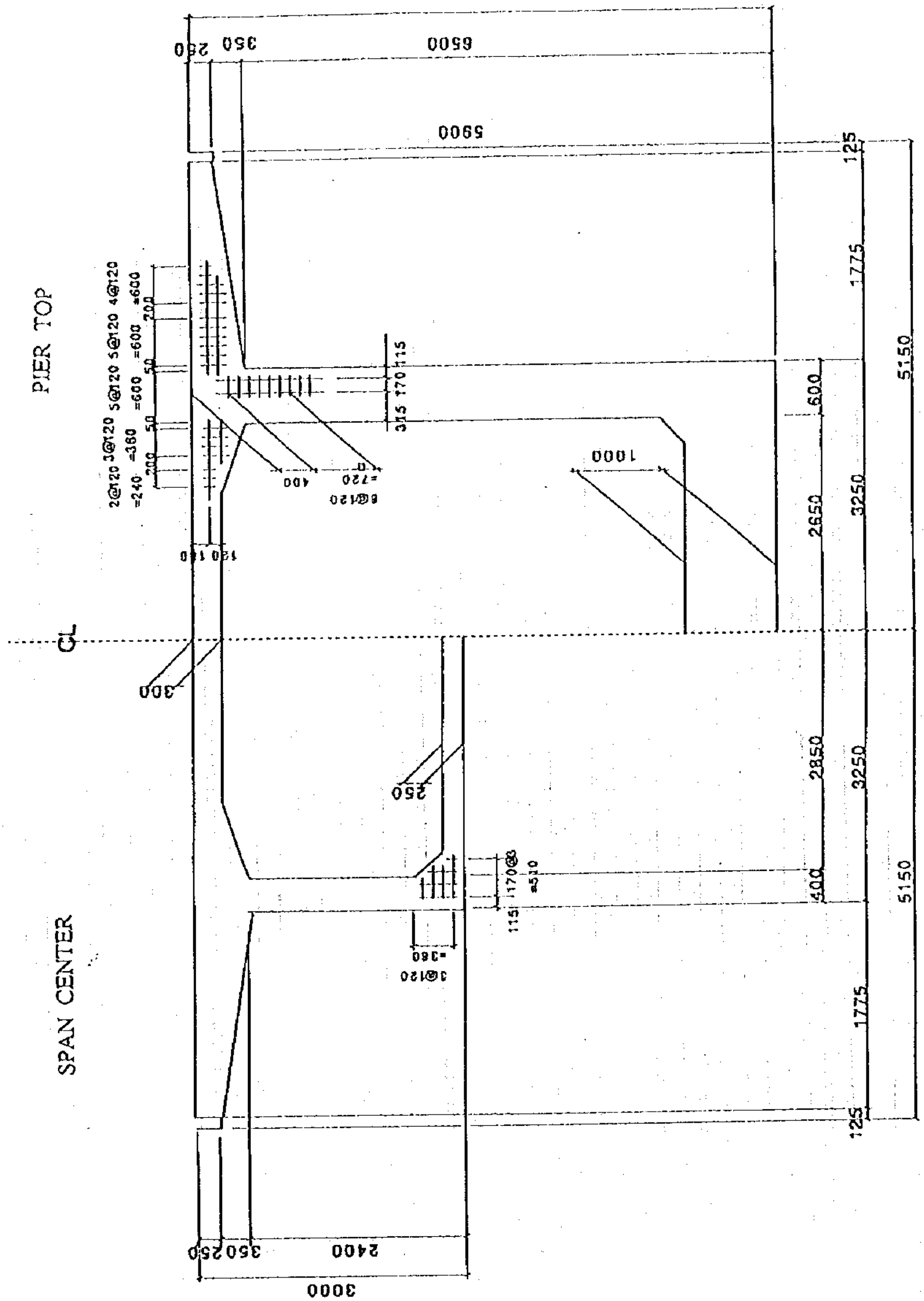


FIGURE A.11-5 ARRANGEMENT OF MAIN CABLES (PC BOX)

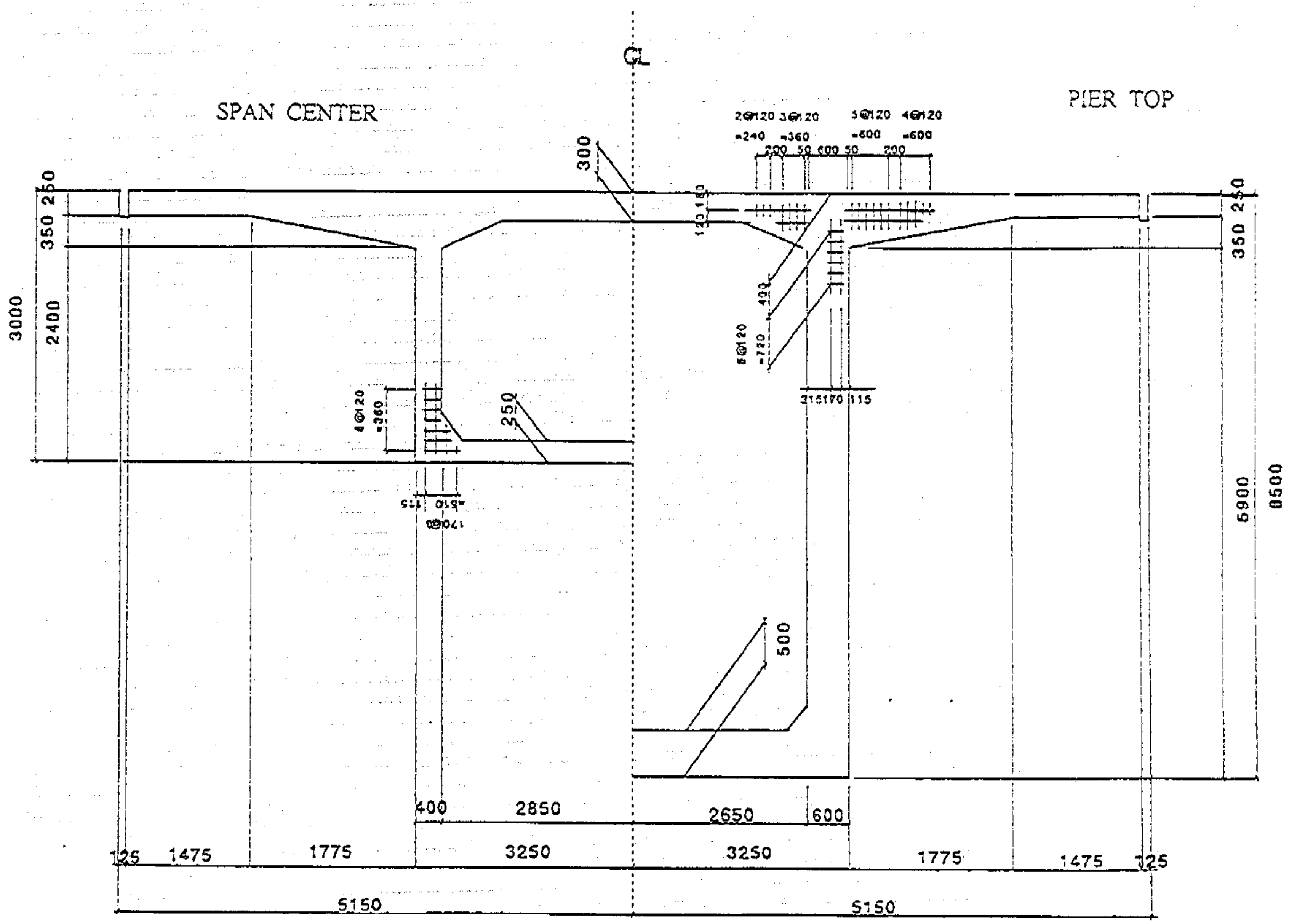


FIGURE A.11-6 ARRANGEMENT OF MAIN CABLES (EXTRADOSED PC BOX)

Note A.11.2 PRELIMINARY DESIGN OF SUB-STRUCTURE

A11.2.1 SELECTED MODELS FOR PRELIMINARY DESIGN

The models for Preliminary Design of Sub-structure were selected based on similarity of pier heights, pile length, soil conditions and loading conditions due to upper structure (main frame).

The selected models and the represented groups are as follows;

Selected Model	A1	P2	P9	P10	P11	P12
Represented Group	A1	P1 - P5	P6 - P9	P10	P11	P12

P13 and A2 are minor structures and are not difficult to decide dimensions and estimate quantities for cost estimation, therefore they are out of the structural analysis in this stage.

A11.2.2 LOADING DUE TO SUPER STRUCTURE(MAIN FRAME)

Sub-structures, piers, pile caps and pile foundations were designed for the specified loading conditions based on the specified Design Standards.

The considered loading conditions are as follows;

- Dead loads
- Live loads
- Effects of Earthquake(Seismic loads)
- Effects of Temperature changing
- Effects of Shrinkage and Creep of concrete members
- Pressure due to river current

Structural analysis of main frame were conducted using computer and summarized in the specified combinations of loading, as follows;

(Case - 1) Due to Dead Loads, Shrinkage and Creep,--------------------(D)
(Case - 2) Due to Dead Loads and Live Loads, -------------------------(D + L)
(Case - 3) Due to (D + L) and Temperature Changing ,---------(D + L + T)
(Case - 4) Due to (D) and Effects of Earthquake, ------------------(D + E)
(Case - 5) Due to (D + L) and Pressure due to River Current,------(D+L+R)

The results are shown in Table A11-3.

TABLE A11-3 LOADING FOR PRELIMINARY DESIGN

Loadings		A1	P2	P9	P10	P11	P12	Remarks
D only,	Vertical Load (N)	1699	4580	4678	4236	9950	10247	
	Horizontal Load (H)	162.3	287.0	153.0	233.0	312.0	214.8	
	Bending Moment(M)	350.8	0.0	3.0	10.0	15.0	12.0	
D + L	Vertical Load (N)	1918	5151	5217	5037	10907	11203	
	Horizontal Load (H)	162.6	20.0	233.0	153.0	25.0	312.0	
	Bending Moment(M)	350.8	3.0	0.0	1.0	6.0	3.0	
D + E	Vertical Load (N)	1652	4644	4676	4448	10051	10327	
	Horizontal Load (H)	257.2	165.0	78.0	92.7	214.8	214.8	
	Bending Moment(M)	798.7	47.2	47.2	69.6	91.0	87.9	

A11.2.3 CALCULATION OF BEARING CAPACITIES PILE FOUNDATION

Bearing capacities of the pile foundations of the proposed bridge were estimated based on the " SPECIFICATIONS FOR HIGHWAY BRIDGES, Part VI : Specifications for Sub-structures " issued by the Japan Road Association.

(1) Soil Conditions

The surveyed soil conditions are as follows;

- Bearing layer is rock layers of sand stone or mud stone.
- They are covered by common soil of sand and/ or silty sand in 3 to 8 meter depth.
- The planned piling method is rock drilling oiling method for cast-in-situ reinforced concrete pile foundation.
- The planned location of pile tip is at fresh rock layer, 3 meter drilled in rock layer from top of rock layer.

The results of Geotechnical Survey, conducted by the JICA Study Team for the Pakse Bridge Project, show the followings;

- Three(3) core borings were conducted with 15 to 30 meter length in total, in river.
- Depth of the surveyed soil and rock layers are as follows;

	(Soil)	(Rock)	(Total)	
(B-3)	10.50	19.75	30.25	m.
(B-4)	10.80	5.00	15.80	m.
(B-5)	15.78	4.35	20.13	m.

- Uniaxial Compressive Strength

(B-3)	Sandstone	55.07 M.Pa.
(B-4)	Mudstone	43.02 M.Pa.
(B-5)	Mudstone	34.57 M.Pa.

(2) Design Criteria and Formula used

(i) Design Criteria

- Ultimate bearing capacity

  qd = 3 qu

  (where) qu: Uniaxial Compressive Strength in Laboratory Test
  Considering the data of the Laboratory Tests, 34.57 to 55.07 M.Pa., and applicable capacity of Rock Drilling Machine ,
  adopted qu for deign : 272 kg/cm2

(ii) Formula used

Ra = r/n · (Ru - Ws) + Ws -W

(where)

r : Revision Factor 1.00

n : Safety Ratio

Ru : Ultimate Bearing Capacity

Ru = qd x A + U l x f

qd : Ultimate Bearing Strength of Bearing Layer, assumed as equivalent to very hard Stiff Clay,

qd = 3 x qu = 3 x 272.0 = 816.0 (t/m2)

A : Sectional Area of Pile Tip Ø 1.50 = 1.767 m2

U : Perimeter of Pile

l : Length of embedment of pile on each soil layer

f : Coefficient of friction due to soil

Sandy soil f = 0.5 N (N < 20)

Silty soil f = C or N (N < 15)

Ws : Effective Weight of soil to be converted by RC Pile

W : Effective Weight of RC Pile

(3) Estimated Pile Bearing Capacities

The whole pile foundations in river portion were categorized into 5 categories, P2 group of P1 to P5, P9 group of P6 to P9, P10, P11 and P12, due to it's length and soil conditions.

And pile bearing capacities were estimated for these 5 model piers and A1, 6 models in total.

The results of estimations are summarized in the Table, shown below.

	A1	P2	P9	P10	P11	P12
Depth of Soil Layer (m)						
Sandy Soil	2.50	5.00	6.00	1.50	0.50	---
Silty Soil	10.50	---	---	8.50	12.00	---
Rock (weathered)	2.00	3.00	3.00	2.00	2.00	13.00
Ru (ton / pile)	2,454	2,088	2,290	2,502	2,785	2,667
Ra (Design Loading)	796	684	750	815	907	870
Ra (Seismic Loading)	1,200	1,030	1,129	1,228	1,367	1,311

Note A.11.3 PRELIMINARY DESIGN OF APPROACH ROAD

TABLE A.11-4 HORIZONTAL ALIGNMENT OF PROPOSED ROUTE

BP			0+ 0.000	0	579.259	1,672,198.000	8,587,630.000
IA.1							
			Station	Cumulative	Intermed.	Northing	Easting
KA	1		0+579.259	579.259	100.000	1,671,618.741	8,587,630.000
BC	1		0+679.259	679.259	35.857	1,671,518.897	8,587,625.838
EC	1		0+715.115	715.115	100.000	1,671,483.569	8,587,619.780
KE	1		0+815.115	815.115	1,138.527	1,671,388.042	8,587,590.441
			A=200.000	tau= 7.0943	IP=	1,671,552.020	8,587,630.000
			R=400.000	IA= 5.0810	IP=	1,671,501.097	8,587,623.601
			A=200.000	tau= 7.0943	IP=	1,671,450.952	8,587,612.670
IA.2							
			Station	Cumulative	Intermed.	Northing	Easting
KA	2		1+953.642	1953.642	100.000	1,670,314.554	8,587,211.142
BC	2		2+ 53.642	2053.642	392.462	1,670,221.800	8,587,173.955
EC	2		2+446.104	2446.104	100.000	1,670,004.162	8,586,866.232
KE	2		2+546.104	2546.104	863.339	1,670,000.000	8,586,766.388
			A=200.000	tau= 7.0943	IP=	1,670,251.644	8,587,188.914
			R=400.000	IA=56.1258	IP=	1,670,030.799	8,587,078.217
			A=200.000	tau= 7.0943	IP=	1,670,000.000	8,586,833.110
IA.3							
			Station	Cumulative	Intermed.	Northing	Easting
KA	3		3+409.443	3409.443	100.000	1,670,000.000	8,585,903.050
BC	3		3+509.443	3509.443	81.821	1,670,004.162	8,585,803.206
EC	3		3+591.264	3591.264	100.000	1,670,022.566	8,585,723.628
KE	3		3+691.264	3691.264	719.717	1,670,062.664	8,585,632.095
			A=200.000	tau= 7.0943	IP=	1,670,000.000	8,585,836.328
			R=400.000	IA=11.4312	IP=	1,670,009.280	8,585,762.472
			A=200.000	tau= 7.0943	IP=	1,670,033.370	8,585,692.041
EP			4+410.981	4410.981		1,670,378.664	8,584,985.460

TABLE A.11-5 VERTICAL ALIGNMENT OF PROPOSED ROUTE (1/3)

Station	IP.Elev.	VCL	Inter.	Grade %
0.000	101.75	0.000	400.000	0.300
400.000	102.95	200.000	300.000	3.000
700.000	111.95	400.000	650.000	0.346
1350.000	114.20	400.000	1350.000	-0.900
2700.000	102.05	200.000	550.000	0.300
3250.000	103.70	200.000	600.000	-0.300
3850.000	101.90	200.000	300.000	0.300
4150.000	102.80	200.000	260.980	-0.307
4410.980	102.00	0.000		

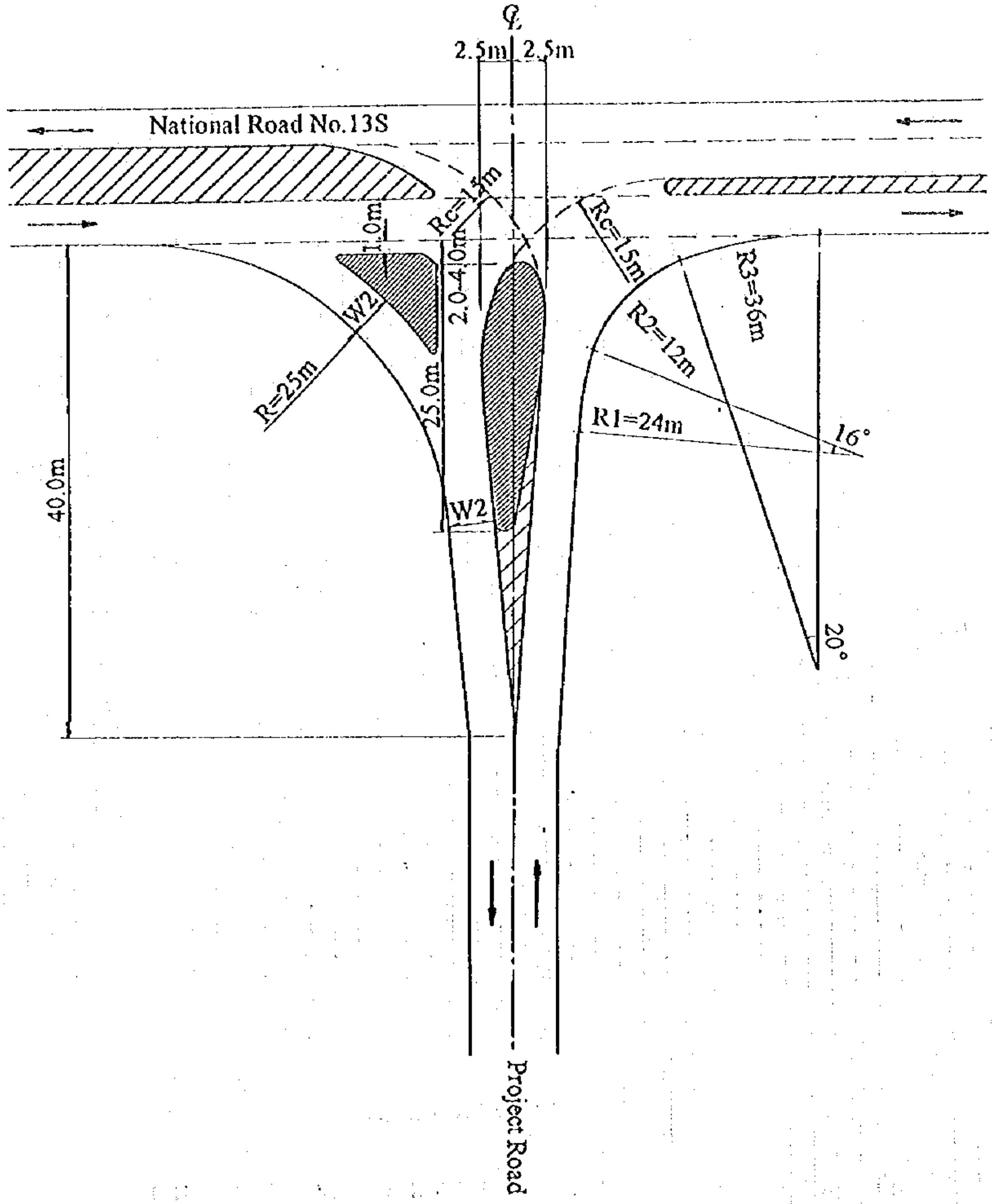
Station	P.H.	Super Elevation Left	Super Elevation Right	G.H.
0.000	101.75	3.000	-3.000	101.01
50.000	101.90	3.000	-3.000	100.27
100.000	102.05	3.000	-3.000	100.04
150.000	102.20	3.000	-3.000	98.56
200.000	102.35	3.000	-3.000	97.95
250.000	102.50	3.000	-3.000	97.61
300.000	102.65	3.000	-3.000	98.62
350.000	102.97	3.000	-3.000	100.00
400.000	103.63	3.000	-3.000	101.29
450.000	104.62	3.000	-3.000	101.66
500.000	105.95	3.000	-3.000	104.38
550.000	107.37	3.000	-3.000	108.89
579.260	108.12	3.000	-3.000	110.82
600.000	108.62	1.405	-3.000	111.64
650.000	109.70	-2.442	-3.000	110.39
679.260	110.26	-7.000	-7.000	112.58
700.000	110.62	-7.000	-7.000	108.71
715.120	110.87	-7.000	-7.000	103.43
750.000	111.38	-1.593	-2.000	91.72
800.000	111.96	1.166	-2.000	86.54
815.120	112.11	2.000	-2.000	84.16
850.000	112.39	2.000	-2.000	83.43
900.000	112.64	2.000	-2.000	84.57
950.000	112.82	2.000	-2.000	85.00
1000.000	112.99	2.000	-2.000	84.72
1050.000	113.16	2.000	-2.000	84.40
1100.000	113.34	2.000	-2.000	83.95
1150.000	113.51	2.000	-2.000	83.13
1200.000	113.64	2.000	-2.000	82.63
1250.000	113.70	2.000	-2.000	82.75
1300.000	113.68	2.000	-2.000	83.41
1350.000	113.58	2.000	-2.000	83.02
1400.000	113.40	2.000	-2.000	81.91
1450.000	113.14	2.000	-2.000	81.87

TABLE A.11-5 VERTICAL ALIGNMENT OF PROPOSED ROUTE (2/3)

Station	P.H.	Super Elevation Left	Super Elevation Right	G.H.
1500.000	112.81	2.000	-2.000	81.88
1550.000	112.40	2.000	-2.000	81.52
1600.000	111.95	2.000	-2.000	80.70
1650.000	111.50	2.000	-2.000	79.97
1700.000	111.05	2.000	-2.000	78.74
1750.000	110.60	2.000	-2.000	76.49
1800.000	110.15	2.000	-2.000	75.45
1850.000	109.70	2.000	-2.000	72.56
1900.000	109.25	2.000	-2.000	73.57
1950.000	108.80	2.000	-2.000	80.25
1953.640	108.77	2.000	-2.000	80.81
2000.000	108.35	-0.558	-2.000	98.03
2050.000	107.90	-6.338	-6.338	101.88
2053.640	107.87	-7.000	-7.000	101.82
2100.000	107.45	-7.000	-7.000	104.50
2150.000	107.00	-7.000	-7.000	105.15
2200.000	106.55	-7.000	-7.000	109.22
2250.000	106.10	-7.000	-7.000	110.11
2300.000	105.65	-7.000	-7.000	111.66
2350.000	105.20	-7.000	-7.000	109.78
2400.000	104.75	-7.000	-7.000	107.25
2446.100	104.34	-7.000	-7.000	105.63
2450.000	104.30	-6.291	-6.291	105.43
2500.000	103.85	-0.546	-3.000	102.24
2546.100	103.44	3.000	-3.000	98.32
2550.000	103.40	3.000	-3.000	97.96
2600.000	102.95	3.000	-3.000	96.53
2650.000	102.58	3.000	-3.000	96.94
2700.000	102.35	3.000	-3.000	95.85
2750.000	102.28	3.000	-3.000	96.13
2800.000	102.35	3.000	-3.000	97.06
2850.000	102.50	3.000	-3.000	97.69
2900.000	102.65	3.000	-3.000	98.14
2950.000	102.80	3.000	-3.000	98.41
3000.000	102.95	3.000	-3.000	98.65
3050.000	103.10	3.000	-3.000	98.64
3100.000	103.25	3.000	-3.000	98.88
3150.000	103.40	3.000	-3.000	98.89
3200.000	103.51	3.000	-3.000	98.98
3250.000	103.55	3.000	-3.000	99.24
3300.000	103.51	3.000	-3.000	99.61
3350.000	103.40	3.000	-3.000	99.75
3400.000	103.25	3.000	-3.000	100.02
3409.440	103.22	3.000	-3.000	100.10
3450.000	103.10	-0.120	-3.000	100.48
3500.000	102.95	-5.284	-5.284	100.65

TABLE A.11-5 VERTICAL ALIGNMENT OF PROPOSED ROUTE (3/3)

Station	P.H.	Super Elevation Left	Right	G.H.
3509.440	102.92	-7.000	-7.000	100.68
3550.000	102.80	-7.000	-7.000	100.92
3591.260	102.68	-7.000	-7.000	100.75
3600.000	102.65	-5.411	-5.411	100.74
3650.000	102.50	-0.174	-3.000	100.49
3691.260	102.38	3.000	-3.000	100.22
3700.000	102.35	3.000	-3.000	100.18
3750.000	102.20	3.000	-3.000	100.17
3800.000	102.09	3.000	-3.000	98.78
3850.000	102.05	3.000	-3.000	92.01
3900.000	102.09	3.000	-3.000	93.40
3950.000	102.20	3.000	-3.000	94.03
4000.000	102.35	3.000	-3.000	97.78
4050.000	102.50	3.000	-3.000	98.64
4100.000	102.61	3.000	-3.000	98.84
4150.000	102.65	3.000	-3.000	99.00
4200.000	102.61	3.000	-3.000	97.50
4250.000	102.49	3.000	-3.000	99.27
4300.000	102.34	3.000	-3.000	99.61
4350.000	102.19	3.000	-3.000	98.12
4400.000	102.03	3.000	-3.000	97.91
4410.980	102.00	3.000	-3.000	98.38



Notes : Rc = Control radius dependent upon vehicle turning characteristics.
Recommended value = 15 m.
The ratio R1 : R2 : R3 to be 2 : 1 :3. R2 = 12 m is recommended.
W1 = The Approach Road lane width, 3.5 m.
W2 = 5.5 m (exclude offset to raised kerbs)

FIGURE A.11-7 INTERSECTION WITH NR 13S

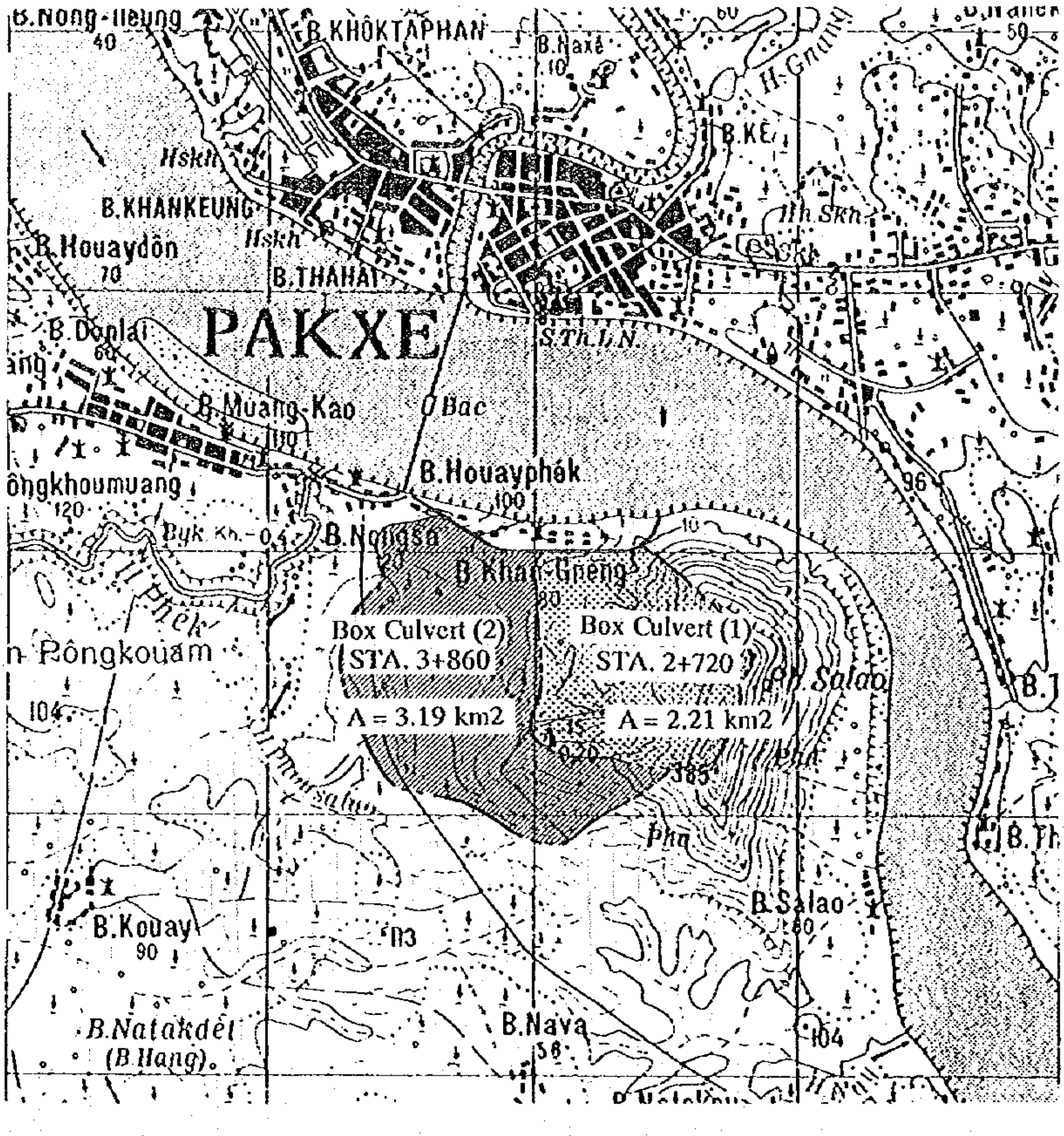


FIGURE A.11-8 CATCHMENT AREA OF BOX CULVERTS

Calculation of Discharge

Box Culvert (1): STA. 2+720

Discharge

$Qd = 0.278 \times C \times I \times A$ — Rational Formula

where

Qd: Discharge (m3 / sec)

C : Runoff Coefficient :	c1 = 0.80 (69%)		
	c2 = 0.70 (31%)	Total	C = 0.769
I : Return Period of Rainfall Intensity : (25 years, 30 min. duration)			I = 12.00 cm/hr
A : Catchment Area :	a1 = 1.53 km2		
	a2 = 0.68 km2	Total	A = 2.21 km2

Qd = 56.7 m3/sec

Runoff Capacity of Box Culvert

$Qc = K \times A \times R^{2/3} \times S^{1/2}$ — Manning's Formula

where

Qc: Capacity (m3/sec)	
K : Roughness Coefficient	K = 60
A : Cross-sectional area of water (m2)	A = 25 m2
R : Hydraulic Radius	R = 0.60
S : Longitudinal slope (%)	S = 0.300 %

then

Qc = 58.4 m3/sec > Qd= 56.7 m3/sec OK

Calculation of Discharge

Box Culvert (2): STA. 3+860

Discharge

$Qd = 0.278 \times C \times I \times A$ Rational Formula

where

Qd: Discharge (m3 / sec)			
C : Runoff Coefficient :	c1 = 0.80 (11%)		
	c2 = 0.70 (89%)	Total	C = 0.711
I : Return Period of Rainfall Intensity : (25 years, 60 min. duration)			I = 7.38 cm/hr
A : Catchment Area :	a1 = 0.36 km2		
	a2 = 2.83 km2	Total	A = 3.19 km2

Qd = 46.5 m3/sec

Runoff Capacity of Box Culvert

$Qc = K \times A \times R^{2/3} \times S^{1/2}$ Manning's Formula

where

Qc: Capacity (m3/sec)	
K : Roughness Coefficient	K = 60
A : Cross-sectional area of water (m2)	A = 25 m2
R : Hydraulic Radius	R = 0.60
S : Longitudinal slope (%)	S = 0.300 %

then

Qc = 58.4 m3/sec   >   Qd= 46.5 m3/sec   OK

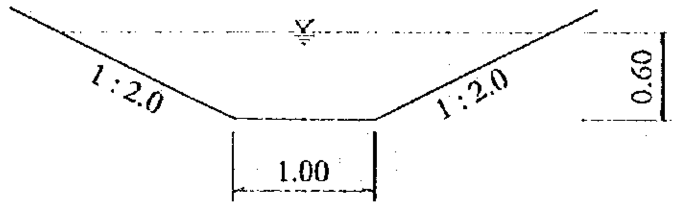
TABLE A.11-6 DISCHARGE OF ROAD SURFACE DRAINAGE (1/2)

Station	Distance	Left	Area	Qf	Right	Area	Qf
0.000	0.00	11.0			11.0		
50.000	50.00	15.2	655	0.020	19.0	750	0.02
100.000	50.00	18.7	848	0.026	20.0	975	0.03
150.000	50.00	17.5	905	0.027	18.5	963	0.03
200.000	50.00	18.4	898	0.027	18.3	920	0.03
250.000	50.00	19.0	935	0.028	18.4	918	0.03
300.000	50.00	17.3	908	0.028	16.3	868	0.03
350.000	50.00	16.8	853	0.026	16.0	808	0.02
400.000	50.00	17.9	868	0.026	16.0	800	0.02
450.000	50.00	15.5	835	0.025	14.3	758	0.02
500.000	50.00	14.3	745	0.023	15.0	733	0.02
550.000	50.00	16.2	763	0.023	16.6	790	0.02
579.260	29.26	16.7	481	0.015	16.3	481	0.01
600.000	20.74	15.8	337	0.010	15.4	329	0.01
650.000	50.00	10.6	660	0.020	20.0	885	0.03
679.260	29.26	13.4	351	0.011	18.6	565	0.02
700.000	20.74	-			-		
715.120	15.12	-			-		
750.000	34.88	-			-		
800.000	50.00	-			-		
815.120	15.12	-			-		
850.000	34.88	-			-		
900.000	50.00	-			-		
950.000	50.00	-			-		
1,000.000	50.00	-			-		
1,050.000	50.00	-			-		
1,100.000	50.00	-			-		
1,150.000	50.00	-			-		
1,200.000	50.00	-			-		
1,250.000	50.00	-			-		
1,300.000	50.00	-			-		
1,350.000	50.00	-			-		
1,400.000	50.00	-			-		
1,450.000	50.00	-			-		
1,500.000	50.00	-			-		
1,550.000	50.00	-			-		
1,600.000	50.00	-			-		
1,650.000	50.00	-			-		
1,700.000	50.00	-			-		
1,750.000	50.00	-			-		
1,800.000	50.00	-			-		
1,850.000	50.00	-			-		
1,900.000	50.00	-			-		
1,950.000	50.00	-			-		
1,953.640	3.64	-			-		
2,000.000	46.36	-			-		
2,050.000	50.00	-			-		
2,053.640	3.64	-			-		
2,100.000	46.36	8.0			17.5		
2,150.000	50.00	6.0	350	0.011	19.1	915	0.028
2,200.000	50.00	4.1	253	0.008	14.3	835	0.025

TABLE A.11-6 DISCHARGE OF ROAD SURFACE DRAINAGE (2/2)

Station	Distance	Left	Area	Qf	Right	Area	Qf
2,250.000	50.00	4.5	215	0.007	14.7	725	0.022
2,300.000	50.00	5.1	240	0.007	15.2	748	0.023
2,350.000	50.00	5.5	265	0.008	14.5	743	0.023
2,400.000	50.00	10.7	405	0.012	16.7	780	0.024
2,446.100	46.10	8.2	436	0.013	16.3	761	0.023
2,450.000	3.90	7.8	31	0.001	16.7	64	0.002
2,500.000	50.00	8.7	413	0.013	18.4	878	0.027
2,546.100	46.10	18.6	629	0.019	18.7	855	0.026
2,550.000	3.90	20.0	75	0.002	20.3	76	0.002
2,600.000	50.00	20.6	1015	0.031	19.8	1003	0.030
2,650.000	50.00	22.0	1065	0.032	18.3	953	0.029
2,700.000	50.00	21.5	1088	0.033	23.8	1053	0.032
2,750.000	50.00	21.0	1063	0.032	20.5	1108	0.034
2,800.000	50.00	22.5	1088	0.033	22.9	1085	0.033
2,850.000	50.00	18.9	1035	0.031	17.7	1015	0.031
2,900.000	50.00	19.0	948	0.029	16.7	860	0.026
2,950.000	50.00	19.0	950	0.029	17.6	858	0.026
3,000.000	50.00	19.3	958	0.029	17.2	870	0.026
3,050.000	50.00	19.0	958	0.029	16.7	848	0.026
3,100.000	50.00	19.0	950	0.029	17.6	858	0.026
3,150.000	50.00	19.3	958	0.029	17.2	870	0.026
3,200.000	50.00	19.0	958	0.029	16.5	843	0.026
3,250.000	50.00	19.6	965	0.029	16.5	825	0.025
3,300.000	50.00	19.6	980	0.030	16.8	833	0.025
3,350.000	50.00	18.6	955	0.029	15.9	818	0.025
3,400.000	50.00	17.6	905	0.027	15.1	775	0.024
3,409.440	9.44	17.8	167	0.005	15.2	143	0.004
3,450.000	40.56	12.1	606	0.018	20.7	728	0.022
3,500.000	50.00	11.3	585	0.018	20.2	1023	0.031
3,509.440	9.44	11.1	106	0.003	19.9	189	0.006
3,550.000	40.56	10.1	430	0.013	19.4	797	0.024
3,591.260	41.26	9.0	394	0.012	18.5	782	0.024
3,600.000	8.74	8.1	75	0.002	18.2	160	0.005
3,650.000	50.00	7.9	400	0.012	18.7	923	0.028
3,691.260	41.26	13.1	433	0.013	13.4	662	0.020
3,700.000	8.74	13.0	114	0.003	13.5	118	0.004
3,750.000	50.00	13.8	670	0.020	14.0	688	0.021
3,800.000	50.00	18.8	815	0.025	17.4	785	0.024
3,850.000	50.00	16.0	870	0.026	20.6	950	0.029
3,900.000	50.00	21.4	935	0.028	19.6	1005	0.030
3,950.000	50.00	21.2	1065	0.032	19.0	965	0.029
4,000.000	50.00	19.3	1013	0.031	15.3	858	0.026
4,050.000	50.00	18.4	943	0.029	16.2	788	0.024
4,100.000	50.00	17.2	890	0.027	17.9	853	0.026
4,150.000	50.00	16.2	835	0.025	18.8	918	0.028
4,200.000	50.00	21.0	930	0.028	18.1	923	0.028
4,250.000	50.00	22.0	1075	0.033	22.0	1003	0.030
4,300.000	50.00	24.0	1150	0.035	14.0	900	0.027
4,350.000	50.00	21.0	1125	0.034	12.4	660	0.020
4,400.000	50.00	17.3	958	0.029	15.2	690	0.021
4,410.980	10.98	17.3	190	0.006	14.3	162	0.005

TYPE - A



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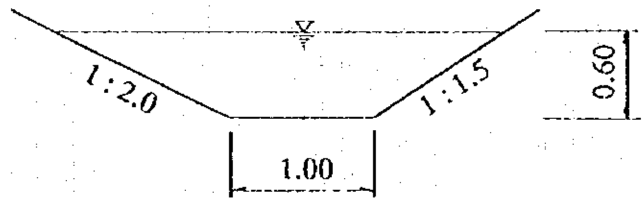
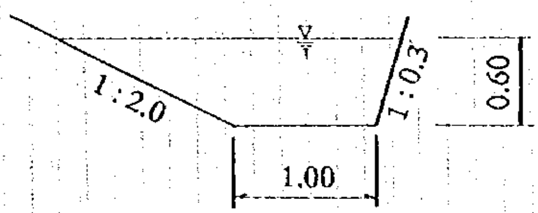


TYPE - C



TYPE - D

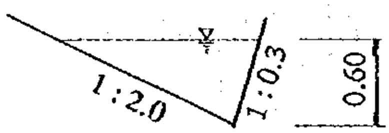


FIGURE A.11-9 TYPE OF SIDE DITCH

TABLE A.11-7 SIDE DITCH RUN-OFF (1/2)

Station	Distance	Left	Type	Grade	Qc	Qf	Right	Type	Grade	Qc	Qf
		98.25	A	-0.005	0.792		98.25	A	-0.005	0.792	
50.000	50.00	98.00	A	-0.005	0.792	0.020	98.00	A	-0.005	0.792	0.023
100.000	50.00	97.75	A	-0.005	0.792	0.026	97.75	A	-0.005	0.792	0.030
150.000	50.00	97.50	A	-0.005	0.792	0.027	97.50	A	-0.005	0.792	0.029
200.000	50.00	97.25	A	-0.005	0.792	0.027	97.25	A	-0.005	0.792	0.028
250.000	50.00	97.00	A		0.792	0.028	97.00	A		0.792	0.028
300.000	50.00	98.00	A	0.020	0.792	0.028	98.00	A	0.020	0.792	0.026
350.000	50.00	99.00	A	0.020	0.792	0.026	99.00	A	0.020	0.792	0.024
400.000	50.00	100.00	A	0.020	0.792	0.026	100.00	A	0.020	0.792	0.024
450.000	50.00	101.00	A		0.792	0.025	101.00	A		0.792	0.023
500.000	50.00	103.00	A	0.040	0.792	0.023	103.00	A	0.040	0.792	0.022
550.000	50.00	105.00	B	0.040	0.738	0.023	105.00	B	0.040	0.738	0.024
579.260	29.26	106.17	B	0.040	0.738	0.015	106.17	B	0.040	0.738	0.015
600.000	20.74	107.00	B	0.040	0.738	0.010	107.00	B	0.040	0.738	0.010
650.000	50.00	109.00	B		0.738	0.020	109.00	B		0.738	0.027
679.260	29.26	108.85	B	-0.005	0.738	0.011	108.85	B	-0.005	0.738	0.017
700.000	20.74	108.75	B		0.738		108.75	B		0.738	
715.120	15.12	-					-				
750.000	34.88	-					-				
800.000	50.00	-					-				
815.120	15.12	-					-				
850.000	34.88	-					-				
900.000	50.00	-					-				
950.000	50.00	-					-				
1,000.000	50.00	-					-				
1,050.000	50.00	-					-				
1,100.000	50.00	-					-				
1,150.000	50.00	-					-				
1,200.000	50.00	-					-				
1,250.000	50.00	-					-				
1,300.000	50.00	-					-				
1,350.000	50.00	-					-				
1,400.000	50.00	-					-				
1,450.000	50.00	-					-				
1,500.000	50.00	-					-				
1,550.000	50.00	-					-				
1,600.000	50.00	-					-				
1,650.000	50.00	-					-				
1,700.000	50.00	-					-				
1,750.000	50.00	-					-				
1,800.000	50.00	-					-				
1,850.000	50.00	-					-				
1,900.000	50.00	-					-				
1,950.000	50.00	-					-				
1,953.640	3.64	-					-				
2,000.000	46.36	-					-				
2,050.000	50.00	-					-				
2,053.640	3.64	-					-				
2,100.000	46.36	104.80	A		2.100		-			-	
2,150.000	50.00	105.40	A	0.012	2.100	0.011	-			-	0.028
2,200.000	50.00	106.00	C		2.028	0.008	105.00	D		0.828	0.025

TABLE A.11-7 SIDE DITCH RUN-OFF (2/2)

Station	Distance	Left	Type	Grade	Qc	Qf	Right	Type	Grade	Qc	Qf
2,250.000	50.00	105.50	C	-0.010	2.028	0.007	104.60	D	-0.008	0.828	0.022
2,300.000	50.00	105.00	C	-0.010	2.028	0.007	104.20	D	-0.008	0.828	0.023
2,350.000	50.00	104.50	C	-0.010	2.028	0.008	103.80	D	-0.008	0.828	0.023
2,400.000	50.00	104.00	B	-0.010	2.459	0.012	103.40	B	-0.008	0.738	0.024
2,446.100	46.10	103.54	B	-0.010	2.459	0.013	103.03	B	-0.008	0.738	0.023
2,450.000	3.90	103.50	B	-0.010	2.459	0.001	103.00	B	-0.008	0.738	0.002
2,500.000	50.00	100.50	A	-0.060	0.792	0.013	101.00	A	-0.040	0.792	0.027
2,546.100	46.10	97.73	A	-0.060	0.792	0.019	98.00	A	-0.065	0.792	0.026
2,550.000	3.90	97.50	A	-0.060	0.792	0.002	97.50	A	-0.128	0.792	0.002
2,600.000	50.00	96.30	A	-0.024	0.792	0.031	97.00	A	-0.010	0.792	0.030
2,650.000	50.00	95.80	A	-0.010	0.792	0.032	-			-	0.029
2,700.000	50.00	95.30	A	-0.010	0.792	0.033	-			-	0.032
2,750.000	50.00	94.30	A	0.020	0.792	0.032	95.00	A		0.792	0.034
2,800.000	50.00	95.30	A	0.020	0.792	0.033	96.00	A	0.020	0.792	0.033
2,850.000	50.00	96.30	A	0.020	0.792	0.031	97.00	A	0.020	0.792	0.031
2,900.000	50.00	97.30	A		0.792	0.029	98.00	A		0.792	0.026
2,950.000	50.00	97.45	A	0.003	0.792	0.029	98.14	A	0.003	0.792	0.026
3,000.000	50.00	97.61	A	0.003	0.792	0.029	98.29	A	0.003	0.792	0.026
3,050.000	50.00	97.76	A	0.003	0.792	0.029	98.43	A	0.003	0.792	0.026
3,100.000	50.00	97.92	A	0.003	0.792	0.029	98.57	A	0.003	0.792	0.026
3,150.000	50.00	98.07	A	0.003	0.792	0.029	98.71	A	0.003	0.792	0.026
3,200.000	50.00	98.23	A	0.003	0.792	0.029	98.86	A	0.003	0.792	0.026
3,250.000	50.00	98.38	A	0.003	0.792	0.029	99.00	A	0.003	0.792	0.025
3,300.000	50.00	98.54	A	0.003	0.792	0.030	99.14	A	0.003	0.792	0.025
3,350.000	50.00	98.69	A	0.003	0.792	0.029	99.29	A	0.003	0.792	0.025
3,400.000	50.00	98.85	A	0.003	0.792	0.027	99.43	A	0.003	0.792	0.024
3,409.440	9.44	98.87	A	0.003	0.792	0.005	99.46	A	0.003	0.792	0.004
3,450.000	40.56	99.00	A		0.792	0.018	99.57	A	0.003	0.792	0.022
3,500.000	50.00	99.33	A	0.007	0.792	0.018	99.71	A	0.003	0.792	0.031
3,509.440	9.44	99.40	A	0.007	0.792	0.003	99.74	A	0.003	0.792	0.006
3,550.000	40.56	99.67	A	0.007	0.792	0.013	99.86	A	0.003	0.792	0.024
3,591.260	41.26	99.94	A	0.007	0.792	0.012	99.98	A	0.003	0.792	0.024
3,600.000	8.74	100.00	A		0.792	0.002	100.00	A		0.792	0.005
3,650.000	50.00	99.75	A	-0.005	0.792	0.012	99.75	A	-0.005	0.792	0.028
3,691.260	41.26	99.54	A	-0.005	0.792	0.013	99.54	A	-0.005	0.792	0.020
3,700.000	8.74	99.50	A	-0.005	0.792	0.003	99.50	A	-0.005	0.792	0.004
3,750.000	50.00	99.25	A		0.792	0.020	99.25	A	-0.005	0.792	0.021
3,800.000	50.00				-	0.025	99.00	A		0.792	0.024
3,850.000	50.00	-			-	0.026	-			-	0.029
3,900.000	50.00	-			-	0.028	-			-	0.030
3,950.000	50.00	-			-	0.032	-			-	0.029
4,000.000	50.00	96.40	A		0.792	0.031	98.50	A		0.792	0.026
4,050.000	50.00	97.07	A	0.013	0.792	0.029	98.25	A	-0.005	0.792	0.024
4,100.000	50.00	97.73	A	0.013	0.792	0.027	98.00	A	-0.005	0.792	0.026
4,150.000	50.00	98.40	A		0.792	0.025	97.75	A	-0.005	0.792	0.028
4,200.000	50.00	96.60	A	-0.006	0.792	0.028	97.50	A	-0.005	0.792	0.028
4,250.000	50.00	96.30	A	-0.006	0.792	0.033	97.25	A	-0.005	0.792	0.030
4,300.000	50.00	96.00	A		0.792	0.035	97.00	A		0.792	0.027
4,350.000	50.00	96.50	A	0.010	0.792	0.034	-			-	0.020
4,400.000	50.00	96.99	A	0.010	0.792	0.029	-			-	0.021
4,410.980	10.98	97.10	A		0.792	0.006	-			-	0.005

Safety Factor Calculation of Circular Slip Analysis

[Condition]

Method :	Circular Slip Analysis
Stress :	Total Stress Analysis
Earthquake :	Common
Block Width :	2.00m

[Calculation]

$$Fs = s / \tau = \Sigma(Cu \times L + W' \times \cos\theta \times \tan\phi \times u) / \Sigma(W' \times \sin\theta)$$

when ;

- s : Shear Resistance on Slip Surface (tf)
- τ : Shear Stress on Slip Surface (tf)
- W : Total Weight of Block (tf / m)
- W' : Efficient Weight of Block (tf / m)
- θ : Gradient of Slip (degree)
- L : Length of Slip (m)
- u : Pore Water Pressure (tf / m2)
- Cu : Coefficient of Total Stress (tf / m2)
- ϕu: Angle of Internal Friction of Total Stress (degree)

[Input Data]

Total Coordination Point : 13

Number of Block : 3

Coordination

No.	X - coordination	Y - coordination
1	-35.000	5.500
2	-20.400	5.800
3	-18.000	6.000
4	-5.500	12.120
5	0.00	12.280
6	5.500	12.120
7	16.600	6.600
8	13.800	6.300
9	21.000	6.800
10	21.000	4.500
11	21.000	0.000
12	-35.000	0.000
13	-35.000	4.500

Block Component

A	3	4	5	6	7	8	
B	1	2	3	8	9	10	13
C	13	10	11	12			

Soil Constant

Block	Unit Weight (t/m3)	Submerged Unit Weight (t/m3)	Coefficient (tf/m2)	Angle of Internal Friction (degree)
A	2.00	---	0.00	25
B	1.60	---	15.00	0
C	1.80	---	0.00	20

Coordination of Circular Center

X	-20.000	to	-11.000 m	3 division
Y	15.000	to	24.000 m	3 division

Range of Circular Radius
Coordination Y of Maximum Radius : 4.500 m
Coordination Y of Minimum Radius : 4.500 m
Increase of Radius : 0.000 m

The result of calculation (Fs = 5.273) is greater than general safety factor (Fs = 1.25).