Chapter 6 Formulation of Urban Transportation Development Strategies

Appendix 6.1 Future Population Distribution by Land-Use

Appendix 6.2 Employment Distribution of Primary Industry by Traffic Zone

Appendix 6.3 Employment Distribution of Secondary Industry by Traffic Zone

Appendix 6.4 Employment Distribution of Tertiary Industry by Traffic Zone

Appendix 6.1 Future Population Distribution by Land-Use

Typology		Area 1992 ha	2000 ha	2010 ha	Population 1992 inhab	Populat./Area 1992 inhab/ha	Max.	Vacant 1992 %	Allocat. 1992-2000 1)	Populat. 2000 1)	Vacant 2002 %	Allocat. 2000-2010 1)	Populat. 2010 1)	Vacant 2010 %
1. Mixed Uses		485	485	485	59,300		155		7,600	66,900		0	66,900	11%
	1A	485	485	485	59,300	122		21%	7,600	66,900	11%	0	66,900	11%
2. Planned Res., high dens.		2,965	3,165	3,565	572,900				74,900	647,800		52,800	700,600	
	2A	690	690	690	81,600	118	170	30%	21,900	103,500	12%	900	104,400	10%
	2B	700	700	700	169,400	242	243	0%	0	169,400	0%	0	169,400	0%
	2C	325	325	325	63,400	195	195	0%	0	63,400	0%	0	63,400	0%
	2D	625	625	625	190,500	305	310	2%	0	190,500	2%	0	190,500	2%
	2E	375	375	375	30,500	81	160	49%	21,400	51,900	14%	1,500	53,400	10%
	2F	250	250	250	37,500	150	200	25%	6,900	44,400	11%	0	44,400	10%
	2G	0	200	600	0	0	140	0%	24,700	24,700	11%	50,400	75,200	10%
3. Planned Res., med. dens.		2,030	4,680	14,130	109,300				191,400	300,700		577,300	878,000	
	3A	305	305	305	23,700	78	85	9%	0	23,700	9%	0	23,700	9%
	3B	1,025	1,025	1,025	21,800	21	95	78%	60,100	81,900	16%	4,700	86,600	10%
	3C	360	360	360	28,800	80	100	20%	3,300	32,100	11%	0	32,100	10%
	3D	340	340	340	35,000	103	105	2%	0	35,000	2%	0	35,000	2%
	3E	0	900	900	0	0	85	0%	49,500	49,500	35%	18,500	68,000	10%
	3F	0	650	650	0	0	85	0%	35,800	35,800	35%	13,200	49,000	10%
	3G	0	1,100	2,000	0	0	85	0%	42,700	42,700	54%	93,300	136,000	20%
SEGEREA	3H	0	0	550	0	0	85	0%	0	0	0%	41,600	41,600	10%
KIZINGA	3I	0	0	3,000	0	0	85	0%	0	0	0%	156,000	156,000	39%
KIGAMBONI	3J	0	0	5,000	0	0	85	0%	0	0	0%	250,000	250,000	41%
4. Planned Res., low dens.		2,295	2,295	2,295	72,300				26,200	98,500		23,500	122,000	
	4A	2,295	2,295	2,295	72,300	32	60	47%	26,200	98,500	28%	23,500	122,000	10%
5. Unplanned Res., fair stand.		1,135	1,135	2,000	42,900				22,300	62,200		70,800	136,000	
	5A	1,135	1,135	2,000	42,900	38	85	56%	22,300	62,200	32%	70,800	136,000	20%
6. Unplanned Res., low stand.		6,005	6,005	6,480	61,2,800				162,600	784,400		95,600	880,000	
	6A	1,425	1,425	1,425	255,100	179	195	8%	0	255,100	8%	0	255,100	8%
	6B	1,525	1,525	2,000	185,600	122	155	21%	24,800	210,400	11%	65,500	275,900	10%
	6C	1,510	1,510	1,510	110,100	73	125	42%	54,600	164,700	13%	3,300	168,000	10%
	6D	310	310	310	26,900	87	135	36%	9,800	36,700	12%	300	37,000	10%
	6E	425	425	425	21,600	51	135	62%	27,400	49,000	15%	2,000	51,000	10%
	6F	810	810	810	22,500	28	130	79%	46,000	68,500	35%	24,500	93,000	10%
7. Institutions		2,670	2,670	2,670	36,500				0	36,500		0	36,500	0
	7A	275	275	275	10,600	39	39	0%	0	10,600	0%	0	10,600	0
	7B	275	275	275	11,000	40	40	0%	0	11,000	0%	0	11,000	0
	7C	520	520	520	6,700	13	13	0%	0	6,700	0%	0	6,700	0
	7D	1,115	1,115	1,115	8,200	7	7	0%	0	8,200	0%	0	8,200	0
	7E	485	485	485	0	0	0	0%	0	0	0%	0	0	0
8. Industrial Areas		2,145	2,745	3,800					0	0		0	0	0
	8A	1,035	1,035	1,035				25%	0	0	0%	0	0	0
	8B	485	485	485				25%	0	0	0%	0	0	0
	8C	125	125	125				50%	0	0	0%	0	0	0
	8D	500	500	500				0%	0	0	0%	0	0	0
	8E	0	600	600				0%	0	0	0%	0	0	0
Total		19,730	23,180	34,370	1,515,000				485,000	2,000,000		820,000	2,820,000	

Appendix 6.2 Employment Distribution of Primary Industry by Traffic Zone

	1993				2000				2010			
Zone	WE1(i) ZWE1(a) (%)	Population Density (person/ha)	Mixed Area (ha)	WE1(i)	Population Density	Mixed Area	WE1(i) ZWE1(i)	WE1(i)	Population Density	Mixed Area	WE1(i) ΣWE1(i)	WE1(i)
10	8.54	166	120	7,400	166	120	8.54	7,30	166	120	8.54	7,100
20	8.54	166	120	7,400	166	120	8.54	7,300	166	120	8.54	7,100
30	8.8	20	100	7,600	36	100	8.64	7,600	36	100	8.64	7,200
40	2.49	51		2,100	51		2.49	2,100	51		2.49	2,100
50	6.45	105	75	5,500	105	100	7.95	6,700	105	100	7.95	6,600
60	1.14	186		1,000	205		0.95	800	205		0.95	800
70	2.18	82		1,900	82	75	6.68	5,700	82	75	6.68	5,600
80	1.46	154		1,200	154		1.46	1,200	154		1.46	1,200
90	2.40	60		2,100	60		2.40	2,000	60		2.40	2,000
100	6.81	69	75	5,900	69	75	6.81	5,800	69	75	6.81	5,700
110	2.44	56		2,100	56		2.44	2,100	56		2.44	2,000
120	5.53	197	75	4,800	197	75	5.53	4,700	197	75	5.53	4,600
130	3.15	135	25	2,700	135	25	3.15	2,700	135	25	3.15	2,600
140	2.67	183	25	2,30	183	25	2.67	2,300	183	25	2.67	2,200
150	3.97	353	75	3,400	353	75	3.97	3,400	353	75	3.97	3,300
160	0.60	240		500	240		0.60	500	240		0.60	500
170	4.98	102	(50)	4,300	139	(50)	4.61	3,900	139	(50)	4.61	3,800
180	2.14	86		1,800	86		2.14	1,800	86		2.14	1,800
190	7.26	24	75	6,200	28	75	7.22	6,100	28	75	7.22	6,000
200	2.86	14		2,400	29	100	8.71	7,400	32	100	8.68	7,200
210	2.81	19		2,400	23		2.77	2,300	23		2.77	2,300
220	2.46	54		2,100	112	60	5.48	4,600	112	100	7.88	6,600
221	3.00	0.5		2,600	0.6		2.99	2,500	8		2.92	2,400
230	2.31	69		2,000	100		2.00	1,700	108		1.92	1,600
240	2.31	69		2,000	69		2.31	2,000	69		2.31	1,900
250	2.90	10		2,500	16		2.84	2,400	30	100	8.70	7,300
260	5.81	169	75	5,000	169	75	5.81	4,900	169	75	5.81	4,800
270	0.95	205		800	205		0.95	800	205		0.95	800
280	2.79	21		2,400	50		2.50	2,100	65	75	6.85	5,700
281	2.99	0.8		2,600	0.9		2.99	2,500	1		2.99	2,500
282	2.87	13		2,500	16		2.84	2,400	33		2.67	2,200
283	2.89	11		2,500	48		2.52	2,100	140		1.60	1,300
290	2.99	1		2,600	2		2.98	2,500	2		2.98	2,500
291	2.98	2		2,600	3		2.97	2,500	52		2.48	2,100
300	2.98	2		2,500	12	50	5.88	5,000	90	50	5.10	4,300
310	2.97	3		2,500	14		2.86	2,400	28	100	8.72	7,300
311	2.99	1		2,600	1		2.99	2,500	4		2.96	2,500
312	2.99	1		2,600	2		2.98	2,500	4		2.96	2,500
320	2.99	1		2,600	6		2.94	2,500	10		2.90	2,400
321	2.98	2		2,600	2		2.98	2,500	3		2.97	2,500
330	2.99	1		2,600	1		2.99	2,500	3		2.97	2,500
331	2.95	5		2,500	6		2.94	2,500	32		2.68	2,200
340	2.91	9		2,500	18		2.82	2,400	41	150	11.59	9,700
341	299	0.6		2,600	0.7		2.99	2,500	2		2.98	2,500
342	3.00	0.4		2,600	0.3		3.00	2,500	0.7		3.00	2,500
343	3.00	0.3		2,600	0.3		3.00	2,500	0.4		3.00	2,500
Total	100.00		890	138,000		1,200	100.00	149,000		1,700	100.00	167,000

Appendix 6.3 Employment Distribution of Secondary Industry by Traffic Zone

	1993				2000				2010			
Zone	WE2(i) ZWE2(a) (%)	Population Density (person/ha)	Mixed Area (ha)	WE2(i)	Population Density	Mixed Area	WE2(i) ZWE2(i)	WE2(i)	Population Density	Mixed Area	WE2(i) ΣWE2(i)	WE2(i)
10	8.7		120	8,300		120		8,300		120		8,300
20	7.2		120	6,800		120		6,800		120		6,800
30	5.8		100	5,600		100		5,600		10		5,600
40	3.2			3,100				3,100				3,100
50	2.3		75	2,200		10		2,200		100		2,20
60	2.8			2,700				2,700				2,700
70	8.1	400		7,800		75		7,800		75		7,800
80	0.7			700				700				700
90	4.5	300		4,300				4,300				4,300
100	5.6	80	75	5,400		75		5,400		75		5,400
110	0.2			200				200				200
120	3.1		75	3,000		75		3,000		75		3,000
130	0.5		25	500		25		500		25		500
140	1.0		25	1,000		25		1,000		25		1,000
150	1.0		75	1,000		75		1,000		75		1,000
160	2.5	(50)		2,400				2,400				2,400
170	3.8		(50)	3,700		(50)		3,700		(50)		3,700
180	0.4	90		400				400				400
190	2.5	120	75	2,400		75		2,400		75		2,400
200	4.4	(100)		4,200	100	100	22.2	12,000	100	100	6.1	17,800
210	9.8	240		9,500				9,500				9,500
220	0.6	80		600		60		600		100		600
221	0			0	100		22.2	7,800	300		18.2	22,600
230	5.5	90		5,300				5,300				5,300
240	4.6	150		4,400				4,400				4,400
250	0.9			900				900	600	100	36.4	35,500
260	7.0	100	75	6,800		75		6,800		75		6,800
270	0.7			700				700				700
280	0.4			400				400		75		400
281	0			0				0		75		0
282	0			0	250		55.6	19,400	250		15.2	33,80
283	0			0				0				0
290	0			0				0				0
291	0			0				0				0
300	0			0		50		0		50		0
310	0.7	500		700				700		100		70
311	0			0				0				0
312	0			0				0				0
320	0			0				0				0
321	0			0				0				0
330	0			0				0				0
331	0			0				0				0
340	0			0				0	400	150	24.1	22,900
341	0			0				0				0
342	0			0				0				0
343	0			0				0				0
Total	100.00	2,150	890	95,000	450	1,200	100.00	130,000	1,650	1,700	100.00	190,000

Appendix 6.4 Employment Distribution of Secondary Industry by Traffic Zone

	1993				2000				2010			
Zone	WE3(i) ZWE3(a) (%)	Population Density (person/ha)	Mixed Area (ha)	WE3(i)	Population Density	Mixed Area	WE3(i) ZWE3(i)	WE3(i)	Population Density	Mixed Area	WE3(i) ΣWE3(i)	WE3(i)
10	9.9	166	120	42,300	166	120		45,200	166	120	10.52	49,800
20	10.2	166	120	43,600	166	120		46,000	166	120	10.52	49,800
30	6.1	20	100	26,100	36	100		28,300	36	100	6.72	31,800
40	5.3	51		22,600	51			23,100	51		5.02	23,800
50	2.1	105	75	9,000	105	100		20,400	105	100	8.10	38,300
60	4.9	186		20,900	205			19,800	205		4.10	19,400
70	3.3	82		14,100	82	75		20,000	82	75	6.14	29,100
80	2.2	154		9,400	154			11,400	154		3.08	14,600
90	4.6	60		19,700	60			19,800	60		4.20	19,900
100	3.5	69	75	15,000	69	75		20,000	69	75	5.88	27,800
110	1.2	56		5,100	56			5,200	56		1.12	5,300
120	4.5	197	75	19,200	197	75		27,300	197	75	8.44	39,900
130	2.7	135	25	11,500	135	25		14,800	135	25	4.20	19,900
140	2.2	183	25	9,400	183	25		15,300	183	25	5.16	24,400
150	2.9	353	75	12,400	353	75		14,100	353	75	3.56	16,800
160	2.7	240		11,500	240			15,900	240		4.80	22,700
170	3.1	102	(50)	13,200	130	(50)		18,700	139	(50)	5.78	27,400
180	1.3	86		5,600	86			6,600	86		1.72	8,100
190	3.0	24	75	12,800	28	75		17,100	28	75	5.06	23,900
200	1.3	14		5,600	29	100		15,600	32	100	6.58	31,100
210	2.6	19		11,100	23			11,300	23		2.46	11,600
220	0.3	54		1,300	112	60		11,600	112	100	5.84	27,600
221	0	0.5		0	0.6			300	8		0.16	800
230	1.6	69		6,800	10			8,100	108		2.16	10,200
240	3.6	69		15,400	69			15,600	69		3.38	16,000
250	0.6	10		2,600	16			13,800	30	100	6.60	31,200
260	7.9	169	75	33,80	169	75		35,200	169	75	7.88	37,300
270	2.2	205		9,400	205			13,300	205		4.10	19,400
280	1.0	21		4,300	50			13,400	65	75	5.80	27,500
281	0	0.8		0	0.9			0	1	75	0.02	100
282	0	13		0	16			1,200	33		0.66	3,100
283	0.1	11		300	48			5,900	140		2.80	13,300
290	0	1		0	2			100	2		0.04	200
291	0	2		0	3			0	52		1.04	4,900
300	0	2		0	12	50		4,900	90	50	4.80	22,700
310	0	3		0	14			12,100	28	100	6.56	31,000
311	0	1		0	1			0	4		0.08	400
312	0	1		0	2			0	4		0.08	400
320	0	1		0	6			400	10		0.20	900
321	0	2		0	2			0	3		0.06	300
330	0	1		0	1			0	3		0.06	300
331	0	5		0	6			0	32		0.64	3,000
340	0	9		0	18			18,200	41	150	9.82	46,500
341	0	0.6		0	0.7			0	2		0.04	200
342	0	0.4		0	0.6			0	0.7		0.01	0
343	0	0.3		0	0.3			0	0.4		0.01	0
Total			890	41,400		1,200		570,000		1,700		833,300

Chapter 7 Traffic Demand Forecast

Appendix 7.1	Vehicle OD Table among Consolidated Traffic Zone (2000)
Appendix 7.2	Vehicle OD Table among Consolidated Traffic Zone (2010)
Appendix 7.3	Future Traffic Volume at Major Points in Dar es Salaam - Result of Traffic Assignment
Appendix 7.4	Future Road Network Information

Appendix 7.1 Vehicle OD Table among Consolidated Traffic Zone (2000)

VT OD Table (2000) (TYPE : PASSENGER-CAR) Unit: Vehicle/day

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTAL
(1)	7676	7305	3535	2396	1081	504	5938	4666	1712	34813
(2)	7353	11745	3628	2809	1007	1703	3041	1662	825	33773
(3)	3654	3674	3761	3090	1758	775	1757	1840	920	21229
(4)	2788	2907	2608	4653	1050	900	1927	3444	922	21199
(5)	1418	1002	1429	1226	1088	395	763	1055	576	8952
(6)	1122	1266	837	907	383	1731	808	1622	522	9198
(7)	6305	3104	1526	2249	419	842	4883	1003	1523	21854
(8)	3597	2302	1879	2768	1178	1562	1745	3314	2269	20614
(9)	1672	1284	270	1043	761	787	629	2611	1217	10274
TOTAL	35585	34589	19473	21141	8725	9199	21491	21217	10486	181906

VT OD Table (2000) (TYPE : LIGHT-GOODS VEHICLE) Unit: Vehicle/day

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTAL
(1)	1482	1229	1332	1124	301	244	1372	883	66	8033
(2)	769	2040	1658	642	374	376	758	320	184	7121
(3)	1030	2077	2931	1971	1040	650	754	797	137	11387
(4)	954	603	1652	2823	387	319	1122	1201	162	9223
(5)	475	528	1175	547	397	246	377	260	984	4989
(6)	61	475	493	416	284	417	339	335	303	3123
(7)	1548	820	771	1121	322	361	1457	397	35	6832
(8)	1053	276	608	844	262	362	398	1291	227	5321
(9)	160	129	114	191	1121	148	109	164	477	2613
TOTAL	7532	8177	10734	9679	4488	3123	6686	5648	2575	58642

VT OD Table (2000) (TYPE : MIDIUM-GOODS VEHICLE) Unit: Vehicle/day

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTAL
(1)	2	50	295	1108	0	5	373	64	29	1926
(2)	103	2685	474	0	484	531	559	172	77	5085
(3)	0	69	697	987	19	55	348	801	71	3047
(4)	0	0	1022	2546	223	44	160	588	24	4607
(5)	0	413	192	468	802	110	69	470	109	2633
(6)	4	128	106	628	158	250	375	429	126	2204
(7)	399	730	235	273	0	751	1531	113	10	4042
(8)	132	238	770	381	193	296	203	1964	62	4239
(9)	41	0	36	58	89	160	32	82	833	1331
TOTAL	681	4313	3827	6449	1968	2202	3650	4683	1341	29114

VT OD Table (2000) (TYPE : HEAVY-GOODS VEHICLE) Unit: Vehicle/day

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTAL
(1)	7	92	0	328	0	0	0	323	0	750
(2)	135	339	0	0	0	21	121	24	19	659
(3)	0	0	8	0	332	31	85	118	34	608
(4)	462	0	0	1038	0	48	53	86	35	1722
(5)	274	0	372	0	350	136	20	113	15	1280
(6)	2	41	8	71	22	125	398	288	59	1014
(7)	41	175	79	89	21	406	917	0	0	1728
(8)	0	27	168	221	380	132	37	954	55	1974
(9)	0	0	37	21	20	110	0	5	419	612
TOTAL	921	674	672	1768	1125	1009	1631	1911	636	10347

VT OD Table (2000) (TYPE : TOTAL) Unit: Vehicle/day

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTAL
(1)	9167	8676	5162	4956	1382	753	7683	5936	1807	45522
(2)	8360	16809	5760	3451	1865	2631	4479	2178	1105	46638
(3)	4684	5820	7397	6048	3149	1511	2944	3556	1162	36271
(4)	4204	3510	5282	11060	1660	1311	3262	5319	1143	36751
(5)	2167	1943	3168	2241	2637	887	1229	1898	1684	17854
(6)	1189	1910	1444	2022	847	2523	1920	2674	1010	15539
(7)	8293	4829	2611	3732	762	2360	8788	1513	1568	34456
(8)	4782	2843	3425	4214	2013	2352	2383	7523	2613	32148
(9)	1873	1413	457	1313	1991	1205	770	2862	2946	14830
TOTAL	44719	47753	34706	39037	16306	15533	33458	33459	15038	280009

Appendix 7.2 Vehicle OD Table among Consolidated Traffic Zone (2010)

VT OD Table (2010) (TYPE : PASSENGER-CAR) Unit: Vehicle/day

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTAL
(1)	11894	8231	3989	2498	1129	1650	10099	11830	2594	53914
(2)	8261	16600	4348	3252	1235	4514	6259	3782	4073	52324
(3)	4268	4821	5395	3830	2289	2595	3110	4868	1734	32910
(4)	2913	3562	3125	6050	1256	3128	2931	8552	1685	33202
(5)	1592	1327	1871	1573	1698	1358	1179	2331	933	13862
(6)	2794	4184	2432	2948	1269	5904	2786	4687	1609	28613
(7)	9417	6594	3095	4003	619	3141	11758	3585	4019	46231
(8)	7997	5557	5239	6683	2579	4912	6532	14681	6449	60629
(9)	5480	2253	422	1941	1333	2042	1087	8307	3428	26293
TOTAL	54616	53129	29916	32778	13407	29244	45741	62623	26524	347978

VT OD Table (2010) (TYPE : LIGHT-GOODS VEHICLE) Unit: Vehicle/day

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTAL
(1)	2261	1637	1720	1345	432	457	2235	2265	174	12526
(2)	943	2799	2273	729	437	999	1441	912	567	11100
(3)	1202	2838	4272	2396	1440	1603	1388	2273	371	17783
(4)	1037	632	2168	3847	456	1151	1635	3085	491	14502
(5)	565	700	1699	678	616	795	613	411	1707	7784
(6)	234	1229	1245	1281	694	1513	1401	1188	802	9587
(7)	2272	1492	1571	1677	444	1469	3899	1524	75	14423
(8)	2810	959	1447	2652	538	1250	1193	5215	756	16820
(9)	391	431	314	587	1924	528	375	465	1558	6573
TOTAL	11715	12717	16709	15192	6981	9765	14180	17338	6501	111098

VT OD Table (2010) (TYPE : MIDIUM-GOODS VEHICLE) Unit: Vehicle/day

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTAL
(1)	30	189	326	1188	0	59	607	332	148	2879
(2)	223	3213	825	130	585	1173	738	580	118	7585
(3)	0	302	534	956	59	370	482	1628	216	4547
(4)	0	0	1016	3055	275	425	351	1806	105	7033
(5)	0	329	225	514	866	620	258	903	217	3932
(6)	18	547	274	1759	453	797	1401	1212	524	6985
(7)	329	813	741	747	89	2034	2338	969	102	8162
(8)	379	1010	1546	1177	428	1133	1150	3609	374	10806
(9)	44	0	194	199	168	509	237	465	1411	3227
TOTAL	1023	6403	5681	9725	2923	7120	7562	11504	3215	55156

VT OD Table (2010) (TYPE : HEAVY-GOODS VEHICLE) Unit: Vehicle/day

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTAL
(1)	15	153	0	493	0	9	6	445	1	1122
(2)	210	414	0	0	0	120	146	68	25	983
(3)	0	0	16	0	423	129	131	166	48	913
(4)	566	0	0	1245	0	391	85	184	93	2564
(5)	0	0	416	0	647	496	0	341	25	1925
(6)	11	109	66	196	132	243	1231	1041	194	3223
(7)	220	199	186	133	21	1166	1465	21	12	3423
(8)	281	81	128	302	341	473	276	1995	351	4228
(9)	7	0	143	138	35	259	0	121	517	1220
TOTAL	1310	956	955	2507	1599	3286	3340	4382	1266	19601

VT OD Table (2010) (TYPE : TOTAL) Unit: Vehicle/day

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTAL
(1)	14200	10210	6035	5524	1561	2175	12947	14872	2917	70441
(2)	9637	23026	7446	4111	2257	6806	8584	5342	4783	71992
(3)	5470	7961	10217	7182	4211	4697	5111	8935	2369	56153
(4)	4516	4194	6309	14197	1987	5095	5002	13627	2374	57301
(5)	2157	2356	4211	2765	3827	3269	2050	3986	2882	27503
(6)	3057	6069	4017	6184	2548	8457	6819	8128	3129	48408
(7)	12238	9098	5593	6560	1173	7810	19460	6099	4208	72239
(8)	11467	7607	8360	10814	3886	7768	9151	25500	7930	92483
(9)	5922	2684	1073	2865	3460	3338	1699	9358	6914	37313
TOTAL	68664	73205	53261	60202	24910	49415	70823	95847	37506	533833

Appendix 7.3 Future Traffic Volume at Major Points in Dar es Salaam - Result of Traffic Assignment

Daily Traffic Volume by Vehicle Type (2000)--Result of Traffic Assignment

Sta.	Road Name	From Node	To Node	M/C	C/T	L/V	M/V	H/V	H/B	M/B	Total ADT	Total PCU
1	Bagamoyo	3003	3004	130	11986	2647	1011	537	218	707	17236	20399
2	Morogoro	4303	4304	154	3376	740	763	837	669	1964	8503	14165
3	Pugu	3400	3501	228	13964	3420	1299	501	593	2002	22007	27367
4	Kilwa	1805	3801	340	20508	5184	887	289	697	2100	30005	34794
5	FERRY	1305	4003	134	10135	3560	3453	1556	0	62	18900	25460
6	Mwongozo	4001	4004	28	5867	1992	1400	634	0	20	12615	67769
7	Mjimwema	4002	4003	0	4268	1568	2053	922	2	46	8859	12806
8	Mpakani	3100	3102	284	16673	4834	678	133	159	630	23391	25141
9	Port Access	2001	3200	1128	21620	5908	1873	676	498	3164	34867	41688
10	Port Access	1704	3602	548	9097	1811	1606	329	291	737	14419	17728
11	Port Access	1901	1990	548	2876	1007	150	279	213	709	5782	7351
12	Old Bagamoy	2905	5000	238	12778	3273	248	2	130	738	17407	18538
13	Haile Selasie	2301	2993	424	5505	1028	495	6	25	521	8004	8870
14	Bagamoyo	2404	3001	602	4052	907	1322	683	419	3428	11413	18066
15	Bagamoyo	2301	2303	822	8917	1670	803	370	159	1719	14460	17622
16	U.N.	1201	1400	396	12153	2312	1493	52	77	297	16780	18630
17	Upanga	1401	2301	2052	18208	3637	1298	376	548	4512	30631	37263
18	Ocean	1304	1402	558	7618	1103	62	13	91	827	10272	11090
19	Shekilango	2702	4301	532	3038	1670	1110	128	287	2020	8785	12479
20	Mwinjuma	2205	2206	106	3661	1673	802	282	58	404	6986	8819
21	Kinondoni	2302	2403	816	3793	939	0	0	875	4333	16431	23741
22	Morocco	2306	2403	684	19547	5951	1055	303	459	5450	33449	41136
23	Morocco	2201	2205	1178	22631	7772	2418	589	601	6468	41657	52334
24	New Kigogo	2101	2203	1060	14562	4573	1054	849	282	1930	24310	29026
25	New Kigogo	1601	2101	1226	14667	4827	809	863	310	3428	26130	32100
26	Changombe	1700	1702	1016	13194	3900	1757	1704	539	3927	26037	35699
27	Changombe	1703	1802	386	5078	1202	802	768	128	219	8583	11203
28	Morogoro	2701	4301	922	14180	5258	3237	863	3020	6038	33518	50098
29	Morogoro	1201	2201	816	22356	8065	3758	1059	980	4333	41367	53128
30	Uhuru	1500	1501	1402	14647	5373	1844	765	1786	6004	31821	44070
31	Pugu	3400	3401	1458	20402	6877	3856	830	1407	5031	39861	52493
32	Pugu	1701	1702	2984	17490	5493	3563	700	778	6994	38002	50023
33	Kilwa	1804	1805	534	25259	3759	876	303	875	2337	33943	39245
34	Kilwa	1802	1803	762	13455	3924	1312	1312	1179	2947	24891	33751
35	Bundari	1705	1801	1568	15335	5610	2222	1092	1586	3461	30874	41129
36	Ocean	1304	1305	112	9625	2349	0	0	33	117	12236	12363
37	Upanga	1303	1402	1098	9832	1941	553	362	370	3388	17544	22400
38	Morogoro	1110	1202	1650	22186	6731	2496	796	2088	2541	38488	48468
39	Pugu	1104	1701	1930	7989	2120	0	0	388	1233	13660	14704
40	Gerezani	1701	1705	1112	18385	7338	4125	1488	1043	2050	35541	46222
41	Sokoine Drv.	1107	1705	1336	19384	5334	2909	2038	735	1243	32979	42009
42	Kivkoni Frnt.	1301	1305	516	18980	5845	3453	1556	521	806	31677	39832
43												
44	Samora	1300	1302	190	6831	1960	883	593	21	173	10651	12840
45	Ohio	1120	1302	650	16999	4673	2385	1016	179	443	26345	31238
46	U.W.T.	1109	1140	1356	14286	4659	1832	654	1187	2446	26420	33702
47	U.W.T	1104	1111	946	7989	220	0	0	1043	976	11174	15663
48	Maktaba	1101	1108	304	2607	634	0	0	0	1885	5430	7163
49	Morogoro	1102	1180	1124	6255	1456	285	85	0	372	9577	9842
50	Uhuru	1103	1111	664	3692	1063	0	0	2495	5095	10077	27730
51	Samora	1103	1104	1138	3209	1056	0	0	107	692	6202	6677
52	Sokoine Drv.	1106	1107	598	18431	5123	2909	2038	1794	2528	33421	46223
53	Samora	1100	1101	556	12920	3070	0	0	0	420	16966	17172
54	Msimbazi	1200	1202	824	6354	2070	374	1	931	1271	11825	14922
55	Uhuru	1103	1111	664	3692	1063	0	0	0	2495	7914	10077

Note :
- M/C : Motorcycle
- C/T : Car & Taxi
- L/V : Light Goods Vehicle
- M/V : Medium Goods Vehicle
- H/V : Heavy Goods Vehicle
- M/B : Mini Bus
- H/B : Heavy Bus

Regarding station No. and link corresponding, refer Fig. 3.2 and Appendix 7.4 respectively.

Daily Traffic Volume by Vehicle type (2010) --Result of Traffic Assignment

Sta.	Road Name	From Node	To Node	M/C	C/T	L/V	M/V	H/V	H/B	M/B	Total ADT	Total PCU
1	Bagamoyo	3003	3004	108	27689	6534	3907	1632	222	722	40814	49097
2	Morogoro	4303	4304	258	6388	1379	1503	1332	1366	4010	16236	27016
3	Pugu	3400	3501	230	39210	11642	8042	2073	813	2452	64462	80613
4	Kilwa	1805	5140	570	37074	10006	2821	1203	1594	4288	57556	69974
5	FERRY	1305	4003	154	34531	10472	11180	5239	36	35	61647	83299
6	Mwongozo	4001	5150	46	29461	9625	8400	3926	0	41	51499	67769
7	Mjimwema	4002	4003	0	5705	1998	4076	1986	5	105	13875	22038
8	Mpakani	3100	3102	818	36240	11306	1720	577	1177	6200	58038	69057
9	Port Access	2001	3200	1326	32037	9991	5741	1562	713	4523	55893	70044
10	Port Access	1704	3602	920	46591	12437	2668	888	595	1505	65604	72283
11	Port Access	1901	1990	918	22489	8058	388	2	388	1448	33691	35848
12	Old Bagamoy	2905	5000	400	12824	2324	347	10	265	1507	17677	19881
13	Haile Selasie	2301	2993	710	7122	1453	673	20	51	1064	11093	12617
14	Bagamoyo	2404	5050	454	28721	7029	5436	1967	398	3235	47240	60414
15	Bagamoyo	2301	2303	1378	29561	7658	2824	1533	325	3510	46789	56150
16	U.N.	1201	1400	664	16743	4325	1985	91	158	606	24572	27329
17	Upanga	1401	2301	3442	33671	8245	3497	1553	1119	9214	60741	77075
18	Ocean	1304	1402	936	25505	6634	308	89	186	1689	35347	37426
19	Shekilango	2702	4301	456	1407	932	1452	174	292	1803	6516	10475
20	Mwinjuma	2205	2206	454	544	277	2020	571	355	3235	7456	14336
21	Kinondoni	2302	2403	500	868	0	0	0	1787	8848	12003	23741
22	Morocco	2306	2403	654	39221	10602	2242	235	1119	5785	59858	70266
23	Morocco	2201	2205	1974	22597	6956	6076	822	1229	13208	52862	75261
24	New Kigogo	2101	2203	1776	28624	7939	2750	1197	577	3941	46804	56155
25	New Kigogo	1601	2101	2054	32568	10155	2423	1217	634	7000	56051	68149
26	Changombe	1700	1702	1704	28046	8121	3105	2290	1100	8019	52385	69437
27	Changombe	1703	1802	646	23388	6616	1345	1018	261	447	33721	37748
28	Morogoro	2701	4301	1546	3502	1789	4004	1804	6166	12330	31141	62642
29	Morogoro	1201	2201	1368	6680	3072	7064	2333	2001	8848	31366	55262
30	Uhuru	1500	1501	2352	17150	6901	3280	1530	3648	12260	47121	71841
31	Pugu	3400	3401	1468	27063	8343	11308	2549	1724	6165	58620	83946
32	Pugu	1701	1702	5002	10094	3379	7265	2239	1589	14282	43850	70548
33	Kilwa	1804	1805	896	49689	801	3278	1351	2001	4772	62788	84304
34	Kilwa	1802	1803	1276	26552	7080	2536	1831	2408	6018	47701	64095
35	Bundari	1705	1901	2630	35978	11508	4219	1736	3238	7067	66376	86295
36	Ocean	1304	1305	188	12276	3799	0	0	67	239	16569	16848
37	Upanga	1303	1402	1842	34199	9288	2329	1451	755	6918	56782	69520
38	Morogoro	1110	1202	2766	33391	13203	5018	2182	4263	5189	66012	87726
39	Pugu	1104	1701	3236	16582	6473	4105	1530	792	2518	35236	44885
40	Gerezani	1701	1705	994	7224	2817	4267	2053	709	3093	21157	33544
41	Sokoine Drv.	1705	5110	2240	34806	11037	3042	2349	1501	2538	57513	69673
42	Kivkoni Frnt.	1301	1305	864	24629	7435	11180	5239	1192	1646	52185	77441
43												
44	Samora	1300	1302	318	12681	3271	1100	793	43	353	18559	21525
45	Ohio	1120	1302	1090	31541	8464	6549	3166	366	905	52081	66054
46	U.W.T.	1109	1140	2272	22552	7704	4220	1715	2425	4995	45883	62242
47	U.W.T	1104	1111	1586	27448	10245	0	0	2129	1993	43401	48859
48	Maktaba	1101	1108	510	4514	1231	0	0	0	3849	10104	13698
49	Morogoro		1180	1886	3860	1029	284	349	0	760	8168	8967
50	Uhuru	1103	1111	1114	13321	3662	0	0	0	5095	23192	27730
51	Samora	1103	1104	1908	6138	2000	0	0	218	1413	11677	12572
52	Sokoine Drv.	1106	1107	1002	9799	3052	7147	3879	3664	5162	33705	60599
53	Samora	1100	1101	932	24716	5815	0	0	0	858	32321	32713
54	Msimbazi	1200	1202	2766	10723	2682	4402	2163	4263	5189	32188	53248
55	Uhuru	1103	1111	1114	13321	3662	0	0	0	5095	23192	27730

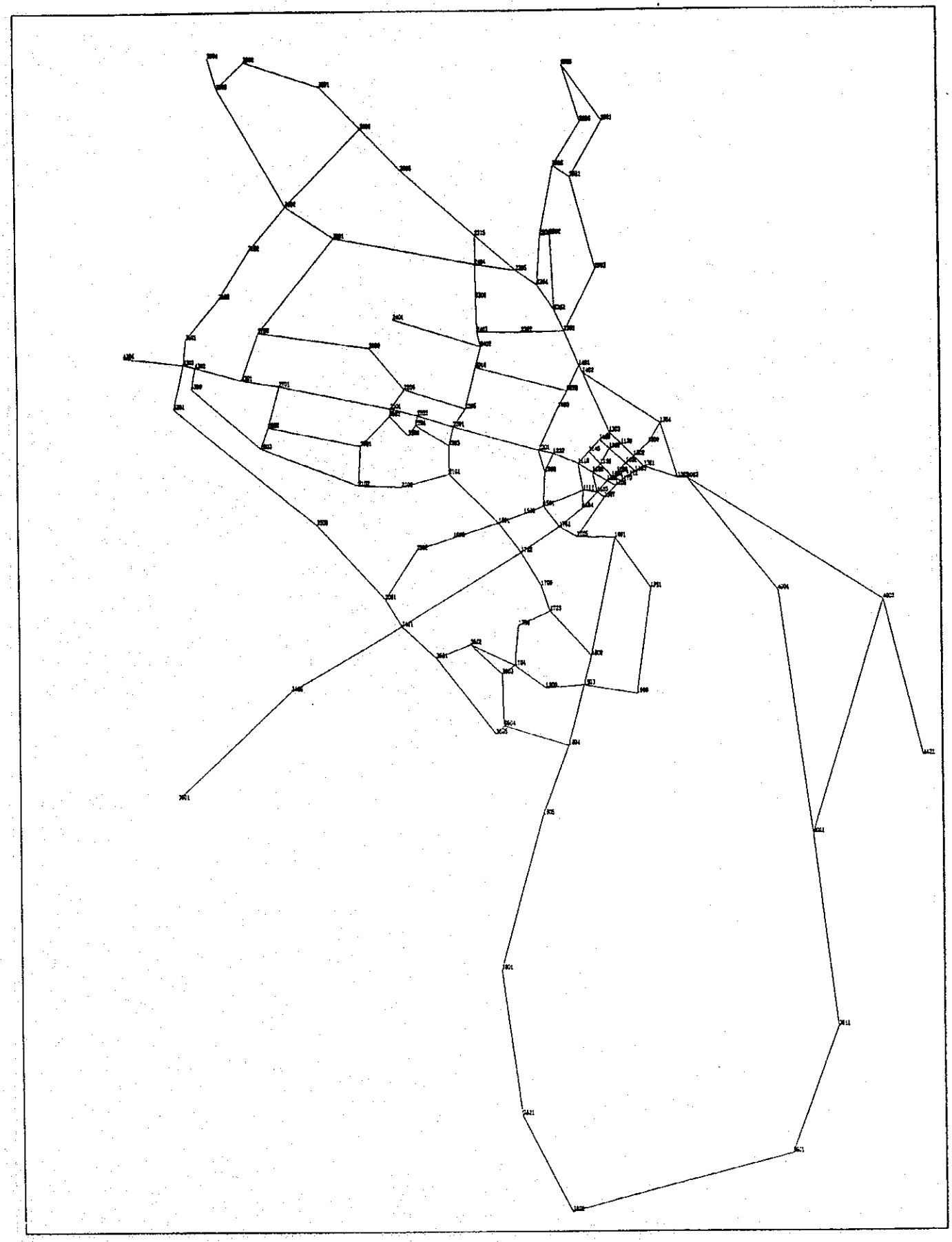
Note :

- M/C : Motorcycle
- C/T : Car & Taxi
- L/V : Light Goods Vehicle
- M/V : Medium Goods Vehicle
- H/V : Heavy Goods Vehicle
- M/B : Mini Bus
- H/B : Heavy Bus

Regarding station No. and link corresponding, refer Fig. 3.2 and Appendix 7.4 respectively.

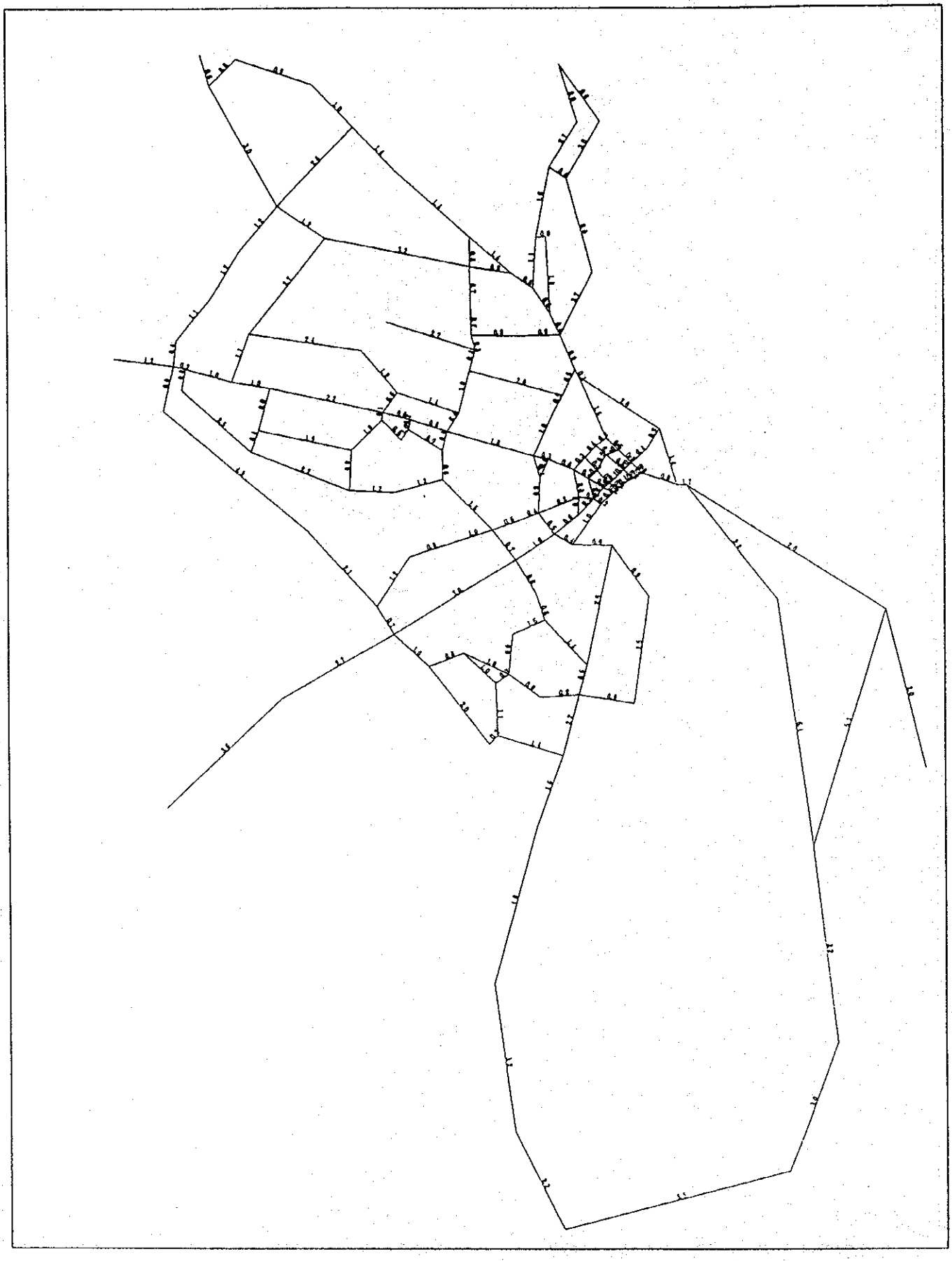
Appendix 7.4 Future Road Network Information

Future Road Network Information (2000) Node No.



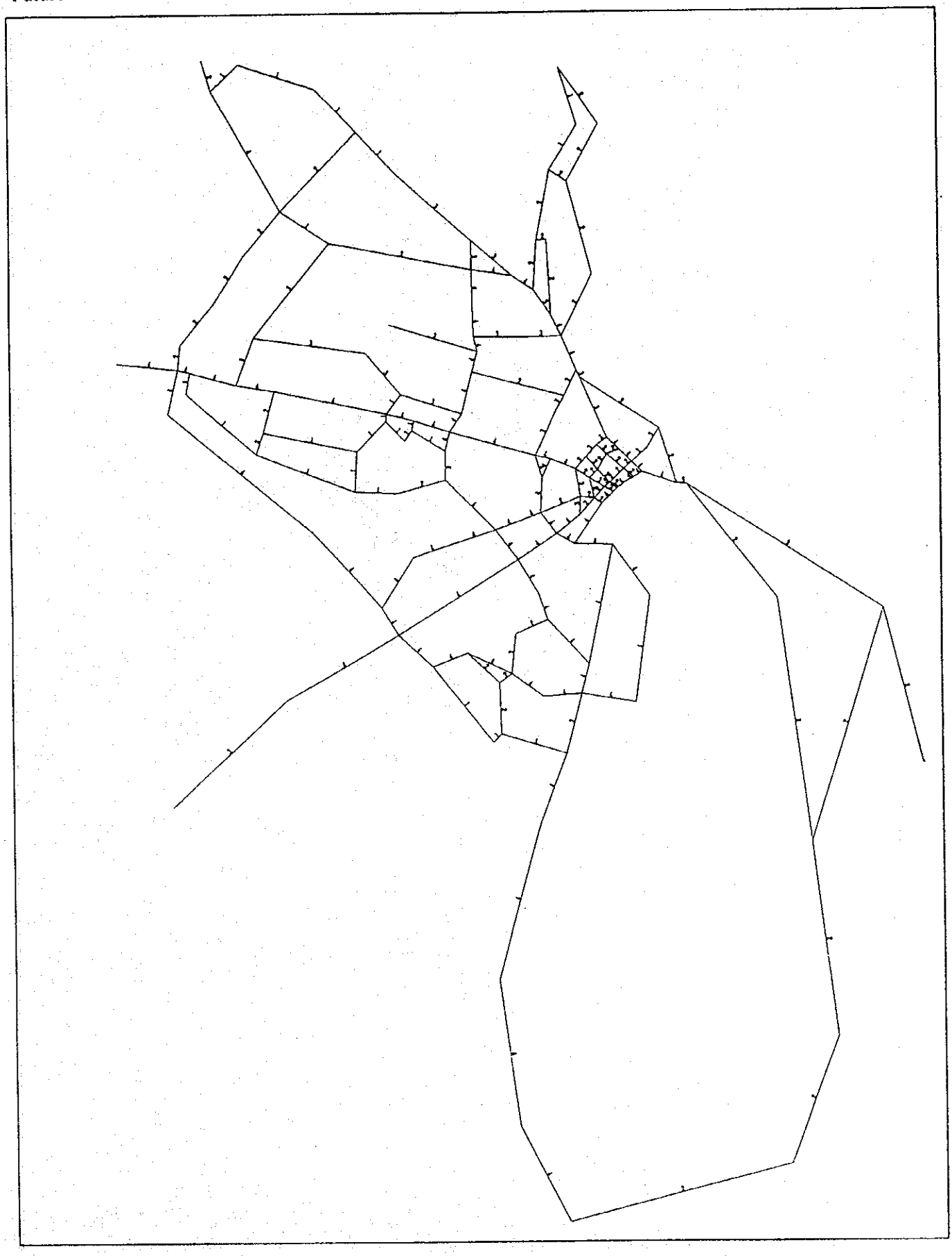
Future Road Network Information (2000)

Link Distance

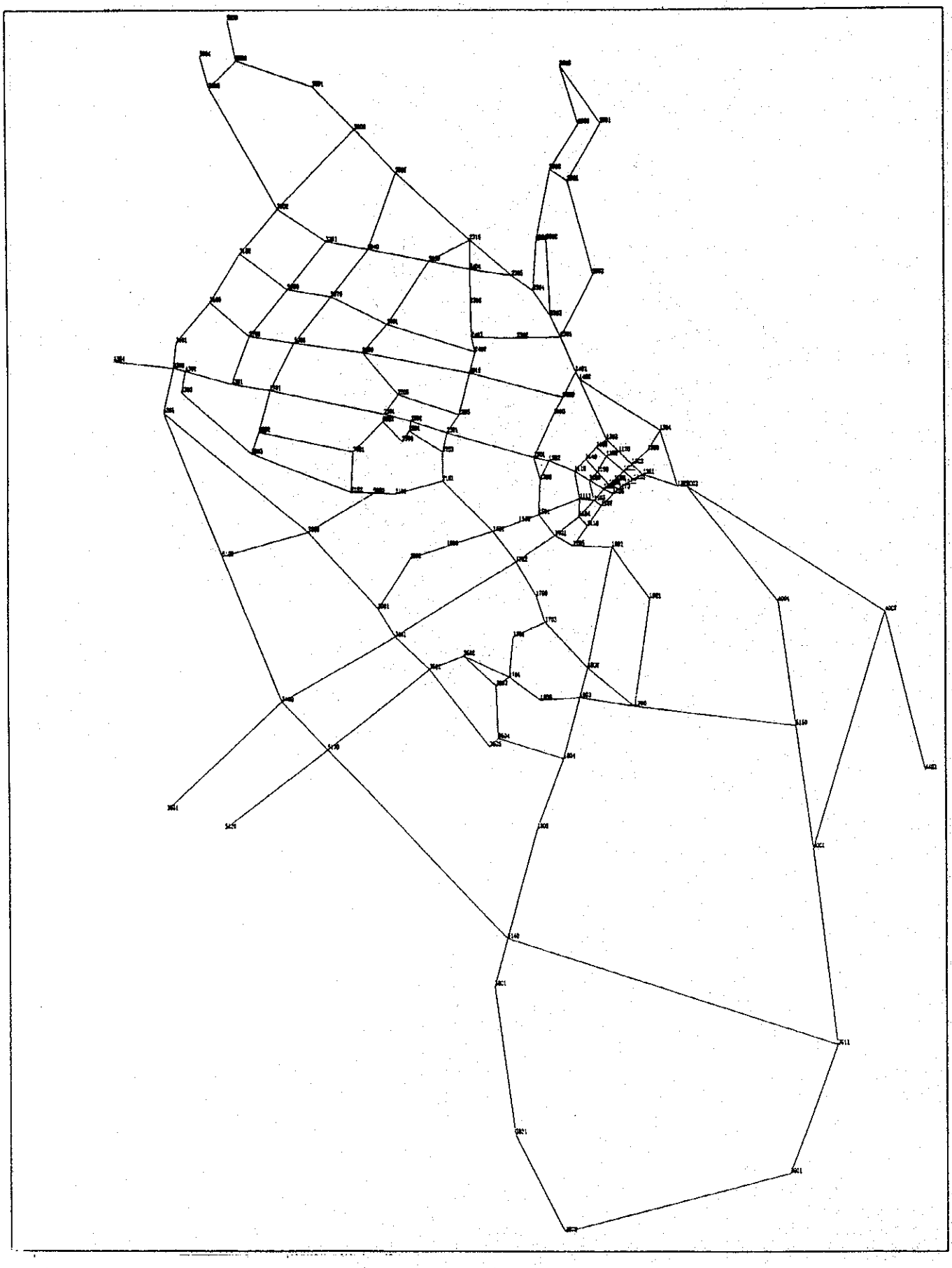


Future Road Network Information (2000)

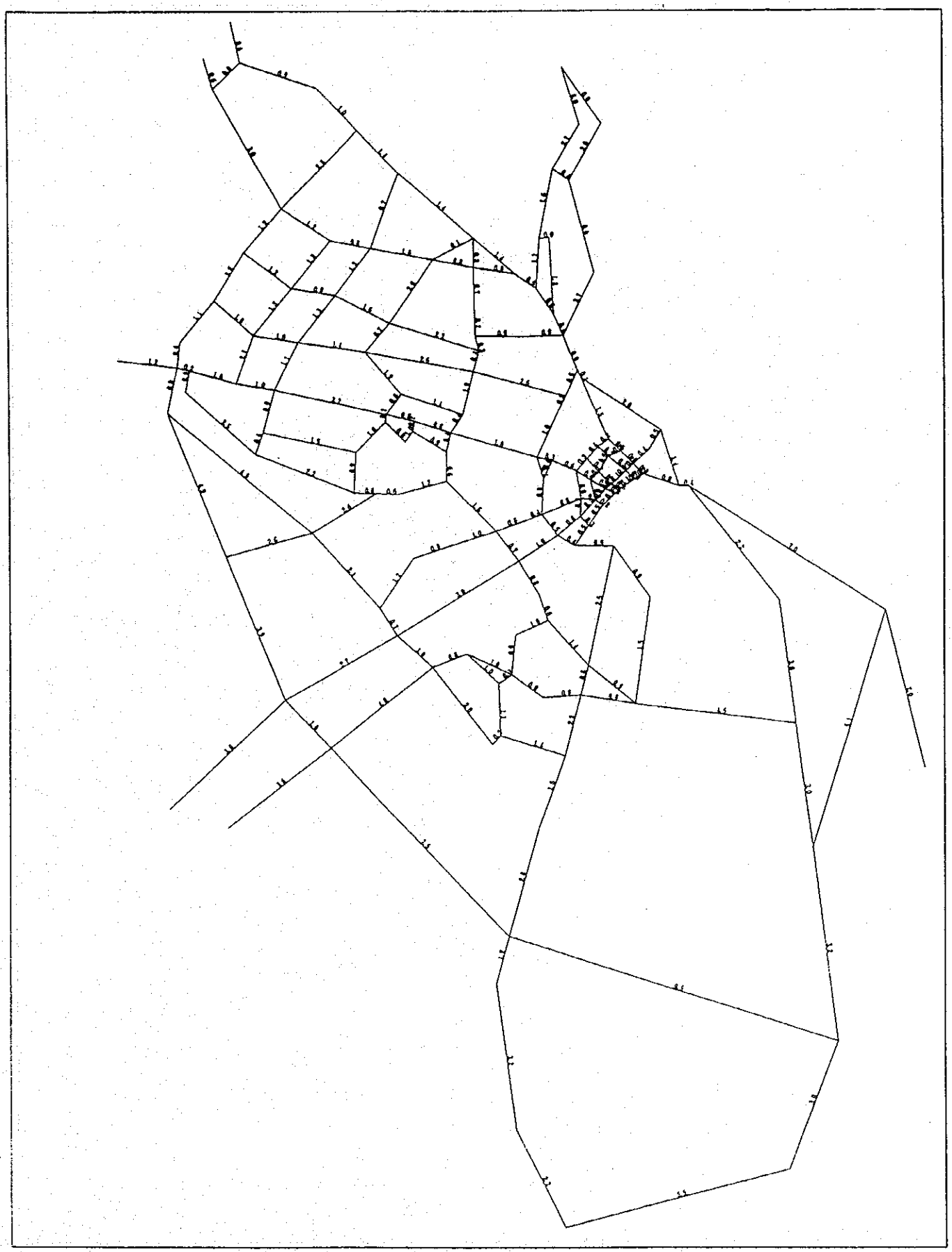
K-V Code



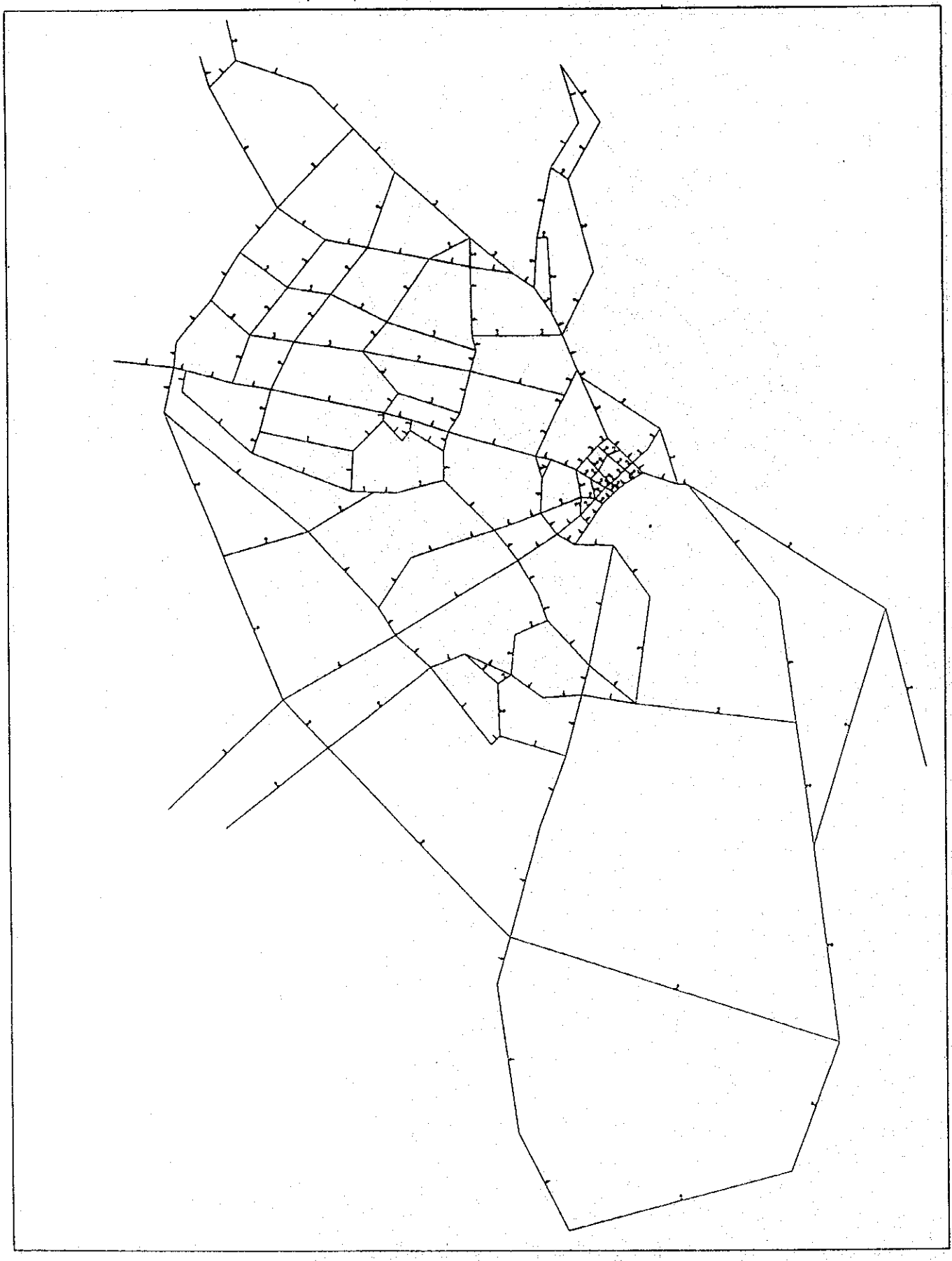
Future Road Network Information (2010)　　Node No.



Future Road Network Information (2010)　　Link Distance



Future Road Network Information (2010) K-V Code



Chapter 8 Road Development Plan

Appendix 8.1	Unit Price List for Major Work Items
Appendix 8.2	Unit Quantity for Each Type of Construction per meter
Appendix 8.3	Unit Cost for Each Type of Construction per meter
Appendix 8.4	Preliminary Cost Estimate
Appendix 8.5	Typical Cross-section of Each Type of Development Measures
Appendix 8.6	Proposed Road Development Measures

Appendix 8.1 Unit Price List for Major Work Items

Item No.	Work	Unit	F/C Portion (Tshs.)	L/C Portion (Tshs.)	Total (Tshs.)
1.	EARTH WORKS				
E-1	Clearing and removal of unsuitable materials	cu.m	3,200	1,600	4,800
E-2	Waste excavation, common	cu.m	2,300	1,400	3,700
E-3	Waste excavation, rock	cu.m	4,700	2,300	7,000
E-4	Embankment, borrowed material	cu.m	3,000	1,800	4,800
E-5	Embankment, excavated material	cu.m	2,200	1,400	3,600
E-6	Removal of existing pavement	cu.m	3,800	1,400	5,200
2.	PAVEMENT WORKS				
P-2	Sub-base course pavement	cu.m	5,400	17,600	23,000
P-3	Base course pavement	cu.m	11,700	23,400	35,100
P-4	Shoulder pavement	cu. m	18,900	24,300	43,200
P-5	Prime coat	sq. m	300	100	400
P-6(F)	Asphalt pavement, t = 50, 100 mm	ton	24,300	27,900	52,200
P-7	Sidewalk	sq. m	1,400	5,000	6,400
P-8	Kerb stone	lin. m	1,100	9,900	11,000
P-9	Boundary block	lin. m	700	5,400	6,100
3.	DRAINAGE WORKS				
D-1	Side riprap drainage	sq. m	700	9,900	10,600
D-2	L-shape side ditch	lin. m	1,400	20,700	22,100
D-3	Pipe culvert, dim. = 600 mm	lin. m	27,000	108,000	135,000
4.	STRUCTURE				
S-1	Excavation	cu.m	5,400	1,400	6,800
S-2	Backfill	cu.m	4,100	900	5,000
S-3	Concrete	cu.m	10,800	49,500	60,300
S-4	Reinforcing bar	ton	270,000	22,500	292,500
S-5	Form	sq. m	6,300	4,500	10,800

Note: The unit price includes construction cost, engineering cost (10%) and physical contingency (10%).

Appendix 8.2 Unit Quantity for Each Type of Construction per meter

Major Work Items	Unit	Calculation	Widening of Existing Road from 2 Lane to 4 Lane		
			Type A-1; Rural Area Quantity	Type A-2; Flat Area Quantity	Type A-3; Urban Area Quantity
Removal work	cu. m		7.5 m + 0.1 = 0.75 m3	7.5 m x 0.1 = 0.75 m3	7.0 m x 0.1 = 0.7 m3
Filling, comon	cu. m		71.8 m2 x 1.0 = 71.8 m3	25.1 m3 x 1.0 = 25.1 m3	2.1 m3 x 1.0 = 2.1 m3
Asphalt concrete	ton	t*w*2.3 t/m3	0.15 x 14.0 x 2.3 = 4.83 k	0.15 x 14.0 x 2.3 = 4.83 t	0.15 x 15 x 2.3 = 5.18 t
Prim coat	sq. m	1.2 Liter/m2	14.0 x 1.0 = 14 m2	14.0 x 1.0 = 14 m2	15.0 x 1.0 = 15 m2
Tuck coat	sq. m	0.4 Liter/m2	14.0 x 1.0 = 14 m2	14.0 x 1.0 = 14 m2	15.0 x 1.0 = 15.0 m2
Subbase, Crusher run	cu. m		14.0 x 0.3 = 4.2 m2	14.0 x 0.3 = 4.2 m3	15.0 0.3 = 4.5 m3
Base, Selected Material	cu. m		14.0 x 0.2 = 2.8 m2	14.0 x 0.2 = 2.8 m3	15.0 x 0.2 = 3.0 m3
Concrete, Drainage	Lin. m		2 m	2 m	2 m
Riprap drainage	Lin. m		2 m	2 m	2 m
Side walk	sq. m		5 x 2 x 1.0 = 10 m2	5 x 2 x 1.0 = 10 m2	5 x 2 x 1.0 = 10 m2

Major Work Items	Unit	Calculation	New Construction		Improvement
			Type B-1; 4 Lane Quantity	Type B-2; 2 Lane Quantity	Type C; 2 Lane Quantity
Removal work	cu. m		15.0 x 0.1 = 1.5 m3	9.0 x 0.1 = 0.9 m3	7.5 x 0.1 = 0.75 m3
Filling, comon	cu. m		2.5 m2 x 1.0 = 2.5 m3	15.5 m2 x 1.0 = 15.5 m3	18.8 m2 x 1.0 = 18.8 m3
Asphalt concrete	ton	t*w*2.3 t/m3	0.15 x 15.0 2.3 = 5.18 t	0.05 x 9.0 x 2.3 = 1.04 t	0.05 x 9.0 x 2.3 = 1.04 t
Prim coat	sq. m	1.2 Liter/m2	15.0 x 1.0 = 15.0 m2	6.0 x 1.0 = 6.0 m2	6.0 x 1.0 = 6.0 m2
Tuck coat	sq. m	0.4 Liter/m2	15.0 x 1.0 = 15.0 m2	0	0
Subbase, Crusher run	cu. m		15.0 x 0.3 = 4.5 m3	9.0 x 0.35 x 1.0 = 3.15 m3	9.0 x 0.35 x 1.0 = 3.15 m3
Base, Selected Material	cu. m		15.0 x 0.2 = 3.0 m3	9.0 x 0.25 x 1.0 = 2.25 m3	9.0 x 0.25 x 1.0 = 2.25 m3
Concrete, Drainage	Lin. m		2 m	2 m	2 m
Riprap drainage	Lin. m		0	2 m	2 m
Side walk	sq. m		5.0 x 2 = 10.0 m2	5.0 x 2 = 10.0 m2	5.0 x 2 = 10.0 m2

w : width t : thickness

Major Work Items	Unit	Calculation	Reconstruction	Overlay	
			Type D; 2 Lane Quantity	Type E-1: 4 Lane Quantity	Type E-2: 2 Lane Quantity
Removal work	cu. m		7.50 x 0.3 x 1.0 = 2.3 m3		
Asphalt concrete	ton	t*w*2.3 t/m3	0.05 x 7.5 x 2.3 = 0.86 t	0.10 x 15.0 x 2.3 = 3.45 t	0.10 x 7.5 x 2.3 = 1.73 t
Prim coat	sq. m	1.2 Liter/m2	7.5 x 1.0 = 7.5 m2		
Tuck coat	sq. m	0.4 Liter/m2		15.0 x 1.0 = 15.0 m2	7.50 x 1.0 = 7.5 m2
Subbase, Crusher run	cu. m		7.50 x 0.30 = 2.25 m3		
Base, Selected Material	cu. m		7.50 x 0.20 = 1.50 m3		

Major Work Items	Unit	Calculation	Rehabilitation		
			Type F-1; 2 Lane Quantity	TypeF-2; 2 Lane Quantity	Type F-3; 1 Lane Quantity
Asphalt concrete	ton	t*w*2.3 t/m3	3.5 m2 x 1.0 -= 3.5 m3	22.5 m2 x 1.0 = 22.5 m3	2.5 m2 x 1.0 = 2.5 m3
Prim coat	sq. m	1.2 Liter/m2	0.03 x 9.0 x 2.3 = 0.62 t	0.03 x 9.0 x 2.3 = 0.62 t	0.03 x 5.5 x 2.3 = 0.38 t
Tuck coat	sq. m	0.4 Liter/m2	9.0 x 1.0 = 9.0 m2	9.0 x 1.0 = 9.0 m2	5.5 x 1.0 = 5.5 m2
Base, Selected Material	cu. m		9.0 x 0.20 = 1.8 m3	9.0 x 0.2 = 1.8 m3	5.5 x 0.2 = 1.1 m3

w : width t : thickness

Appendix 8.3: Unit Cost for Each Type of Construction per meter

Major Work Items	Unit	Rate (Tsh.)	Widening 4 Lane Construction					
			Type A-1; Rural Area Rates		Type A-2; Flat Area Rates		Type A-3; Urban Area Rates	
			(Quantity)	(Tsh.)	(Quantity)	(Tsh.)	(Quantity)	(Tsh.)
Removal work	cu. m	5,700	0.75	3,850	0.75	3,850	0.70	3,590
Exc. & Filling, comon	cu. m	5,300	71.80	342,490	25.10	119,730	2.10	10,020
Asphalt concrete	ton	58,000	4.83	252,130	4.83	252,130	5.18	270,400
Prim coat	sq. m	450	14.00	5,670	14.00	5,670	15.00	6,080
Tuck coat	sq. m	250	14.00	3,150	14.00	3,150	15.00	3,380
Subbase, Crusher run	cu. m	25,500	4.20	96,390	4.20	96,390	4.50	103,280
Base, Selected Material	cu. m	29,000	2.80	73,080	2.80	73,080	3.00	78,300
Concrete, Drainage 45 * 60	Lin. m	24,500	2.00	44,100	2.00	44,100	2.00	44,100
Side riprap drainage	Lin. m	11,800	2.00	21,240	2.00	21,240	2.00	21,240
Side walk	sq. m	7,000	10.00	63,000	10.00	63,000	10.00	63,000
Total				(905,100)		(682,340)		(603,390)
				910,000		680,000		600,000

Major Work Items	Unit	Rate (Tsh.)	New Construction				Improvement	
			Type B-1; 4 Lane Road Urban Area		TypeB-2; 2 Lane Road Rural Area		Type C; 2 Lane Road Rural Area	
			(Quantity)	(Tsh.)	(Quantity)	(Tsh.)	(Quantity)	(Tsh.)
Removal work	cu. m	5,700	1.50 m3	7,700	0.90 m3	4,620	0.75 m3	3,850
Exc. & Filling, comon	cu. m	5,300	2.50 m3	11,930	15.50 m3	73,940	18.80 m3	89,680
Asphalt concrete	ton	58,000	5.18 t	270,400	1.04 t	54,290	1.04 t	54,290
Prim coat	sq. m	450	15.00 m2	6,080	6.00 m2	2,430	6.00 m2	2,430
Tuck coat	sq. m	250	15.00 m2	3,380	0.00 m2	0	0.00 m2	0
Subbase, Crusher run	cu. m	25,500	4.50 m	103,280	3.15 m3	72,290	3.15 m3	72,290
Base, Selected Material	cu. m	29,000	3.00 m3	78,300	2.25 m3	58,730	2.25 m3	58,730
Concrete, Drainage 45 * 60	Lin. m	24,500	2.00 m	44,100	2.00 m	44,100	2.00 m	44,100
Side riprap drainage	Lin. m	11,800	0.00 m	0	2.00 m	21,240	2.00 m	21,240
Side walk	sq. m	7,000	10.00 m2	63,000	10.00 m2	63,000	10.00 m2	63,000
Total				(588,170)		(394,640)		(409,610)
				590,000		390,000		410,000

Major Work Items	Unit	Rate	Reconstruction		Overlay			
			Type D; 2 Lane Road Rates		Type E-1; 4 Lane Rates		Type E-2; 2 Lane Rates	
		(Tsh.)	(Quantity)	(Tsh.)	(Quantity)	(Tsh.)	(Quantity)	(Tsh.)
Filling, comon	cu. m	5,300	2	10,970				
Asphalt concrete	ton	58,000	1	44,890	3	180,090	2	90,310
Prim coat	sq. m	450	8	3,040		0		0
Tuck coat	sq. m	250		0	15	3,380	8	1,690
Subbase, Crusher run	cu. m	25,500	2	51,640				
Base, Selected Material	cu. m	29,000	2	39,150				
Concrete, Drainage 45 * 60	Lin. m	24,500		0				
Side riprap drainage	Lin. m	11,800		0				
Total				149,690		183,470		92,000
				150,000		180,000		90,000

Major Work Items	Unit	Rate	Rehabilitation					
			Type F-1; 2 Lane Rates		Type F-2; 2 Lane Rates		Type F-3; 1 Lane Rates	
		(Tsh.)	(Quantity)	(Tsh.)	(Quantity)	(Tsh.)	(Quantity)	(Tsh.)
Removal work	cu. m							
Exc. & Filling, comon	cu. m	5,300	4	16,700	23	107,330	3	11,930
Asphalt concrete	ton	58,000	1	32,360	62	32,360	0	19,840
Prim coat	sq. m	450	9	3,650	9	3,650	6	2,230
Tuck coat	sq. m	250		0		0		0
Subbase, Crusher run	cu. m	25,500	2	41,310	2	41,310	1	25,250
Base, Selected Material	cu. m	29,000						
Concrete, Drainage 45 * 60	Lin. m	24,500						
Side riprap drainage	Lin. m	11,800						
Total				94,020		184,650		59,250
				90,000		180,000		60,000

Box Culvert

Unit: Tsh

Major Work Items	Unit	Quantity	Unit Cost	Amount
Excavation	m3	40	6,800	272,000
Backfill	m3	10	5,000	50,000
Concrete	m3	10	60,300	603,000
Reinforcing bars	ton	0.2	292,500	59,000
Form	m2	25	10,800	270,000
Miscellaneous	L.S.	1	96,400	96,000
Total				1,350,000

Bridge

Substructure with pile foundation			
Abutment	Hight = 5.0 m Width = 10.0 m Unit rate = 850,000 Tsh/m x 10.0 = 8,500,000		
Pier	Hight = 7.0 m Width = 8.0 m Unit rate = 700,000 Tsh/m x 8.0 = 5,600,000		
Superstructure for simple composite Girder one span per 20.0 m			
Slab	Thickness = 210 m, Girder hight = 1.3 m, Unit weight = 250 kg/m2		
Area	20.0 m x 10.0 m width (Average) = 200 m2		
Weight	0.25 t/m2 x 200 m2 = 50 t x 1,100,000 Tsh/t		= 55,000,000
		Total	= 69,100,000
Unit cost per meter	69,100,000/20.0 m= 3,455,000 Tsh =Ths. 3,500,000/m		

Retaining Wall Hight = 5.0m Footing width = 3.5 m

Work Item	Unit Q'ty	Unit Cost (Tsh)	Amount/m Tshx1000
Earthwork	10.0 m3/m	120	160
Concrete, 240 kg	5.5 m3/m	70,000	380
Reinforcement bar	1.2 ton/m	300,000	360
		Total	900

Compensation cost of housing/building removal

Item	Landuse pattern	House and Buildings Removal/Compensation		
		No. of Houses/ha	Unit Cost	Amount/ha
Type A	Commercial/Industrial Areas	20	1,000,000	20,000,000
Type B	Residential Areas	10	500,000	5,000,000
Type C	Agricultural areas	2	500,000	1,000,000

	Right-of way (m)	Area (ha) per km
4 lanes road	50	5.00
2 lanes road	30	3.00

Appendix 8.4 Preliminary Cost Estimate

Unit: Million Tshs.

No.	Name of Road	Total Length	Road Work Type	Road Work Length	Unit	Amount	Road Work Type	Road Work Length	Unit	Amount	Road Work Type	Road Work Length	Unit	Amount	Bridge Structure Length	Unit	Amount	Box Culvert Length	Unit	Amount	Total Amount	Landuse Pattern	House Compensation Area	Unit	Amount
1	Widening of Arterial Roads in the City Center			(km)				(km)				(km)			(m)			(m)					(ha)		
	Ohio Street	0.96									Type A-3	0.96	600	580							580				
	Sokoine Drive	0.67										0.67	600	400							400				
	Gerazani Road	1.40										1.40	600	840				70	0.9	60	900				
	Bandari Road	2.00										1.95	600	1,170	50	7.0	350	80	0.9	70	1,590				
	Kuvukoni Front	0.40										0.40	600	240							240				
	UWT - Gerezani	0.24									Type B-1	0.24	590	140							140	A	1.20	20	20
	Construction of seaside promenade L=500m											0.50	400	200							200				
	Sub-total	5.67		0.00		0		0.00		0		6.12		3,570	50		350	150		130	4,050		1.20		20
2	Middle Ring Road																								
	Morocco Road	4.00	Type A-1	0.68	910	620	Type A-2	3.30	680	2,240	Type A-3				20	7.0	140				3,000				
	New Kigogo Road	2.80		1.26	910	1,150		1.50	680	1,020					40	7.0	280				2,450				
	Chang'ombe Road	2.80						2.80	680	1,900											1,900				
	Missing link	0.75	Type B-1	0.75	590	440															440	B	3.75	5	20
	Sub-total	10.35		2.69		2,210		7.60		5,160		0.00		0	60		420	0		0	7,790		3.75		20
3	Wideing of Trunk Roads from 2 to 4 lanes																				4,000				
	DTR-5; New Bagamoyo	4.40	Type A-1	4.40	910	4,000															9,040				
	DTR-5; New Bagamoyo	12.60					Type A-2	10.50	680	7,140	Type A-3	2.00	600	1,200	100	7.0	700				3,140				
	DTR-6; San Nujoma Road (Mpakani Road)	3.90		1.80	910	1,640		2.00	680	1,360					20	7.0	140				10,010	B	55.00	5	280
	DTR-3; Morogoro Road	11.00		11.00	910	10,010				0											2,590	A	20.00	20	400
	DTR-9; Uhuru Road	4.00				0		2.48	680	1,690		1.50	600	900							1,360	B	10.00	5	50
	DTR-13; United Nation Road	2.00				0		2.00	680	1,360											2,180	B	16.00	5	80
	DTR-4; Kilwa Road Up to Mandela	3.20				0		3.20	680	2,180											3,950	C	28.00	1	30
	DTR-4; ditto up to Outer Ring Road	5.60				0		5.60	680	3,810					20	7.0	140				2,950	B	9.50	5	50
	New: Morocco-United nation Road	1.90		1.70	910	1,550									200	7.0	1,400				39,220		129.00		890
	Sub-total	48.60		17.20		15,650		25.78		17,540		3.50		2,100	140		2,380	0		0					
4	Strengthening of Road Network in Kigamboni																								
	Improvement Kiganboni Ferry Port			L.S. 700 ton Ferry boat				Berth													1,260				
				1.00	810	810		2.00	225	450											25,470	A	14.00	20	280
	Harbor Bridge Access Road	2.80	Type B-1	1.40	390	550									1,400	17.8	24,920				18,210	B	26.50	5	130
	Kurashini Bridge Access Road	5.30	Type B-2	4.70	390	1,830									600	27.3	16,380				2,050				
	DRR-23 Kongowe - Mjimwema	5.00		5.00	410	2,050															2,670				
	DRR-14 Kivukoni-Vijibweni	6.50		6.50	410	2,670															2,420				
	DRR-29 Tungu-Kibada	5.90		5.90	410	2,420															750				
	DRR-2 Mwongozo-Gomvu	12.50	Type F-3	12.50	60	750															2,590				
	DRR-3 Chekeniwasonga-Buyuni	43.10		43.10	60	2,590															690				
	DRR-8 Kimbiji-Chekeniwasonga	11.50		11.50	60	690															1,080				
	DRR-12 Kimbiji-Tungi-Songani	18.00		18.00	60	1,080															7,740				
	DRR-22 DRR23 intersection-Kimbiji	43.00	Type F-2	43.00	180	7,740															800				
	Kimbiji-Mnazi	13.40	Type F-3	13.40	60	800															870				
	DRR-30 Kibada-Gezaulole	14.50	Type F-3	14.50	60	870															66,600		40.50		410
	Sub-total	181.50		180.50		24,850		2.00		450		0.00		0	2,000		41,300	0		0	9,710	C	66.00	1	70
5	Outer Ring Road Sub-total	22.00		21.84	390	8,520									160	3.5	560	450	1.4	630	127,370		240.45		1,410
	Sub-total (1)	268.12		222.23		51,230		35.38		23,150		9.62		5,670	2,410		45,010	600		760					

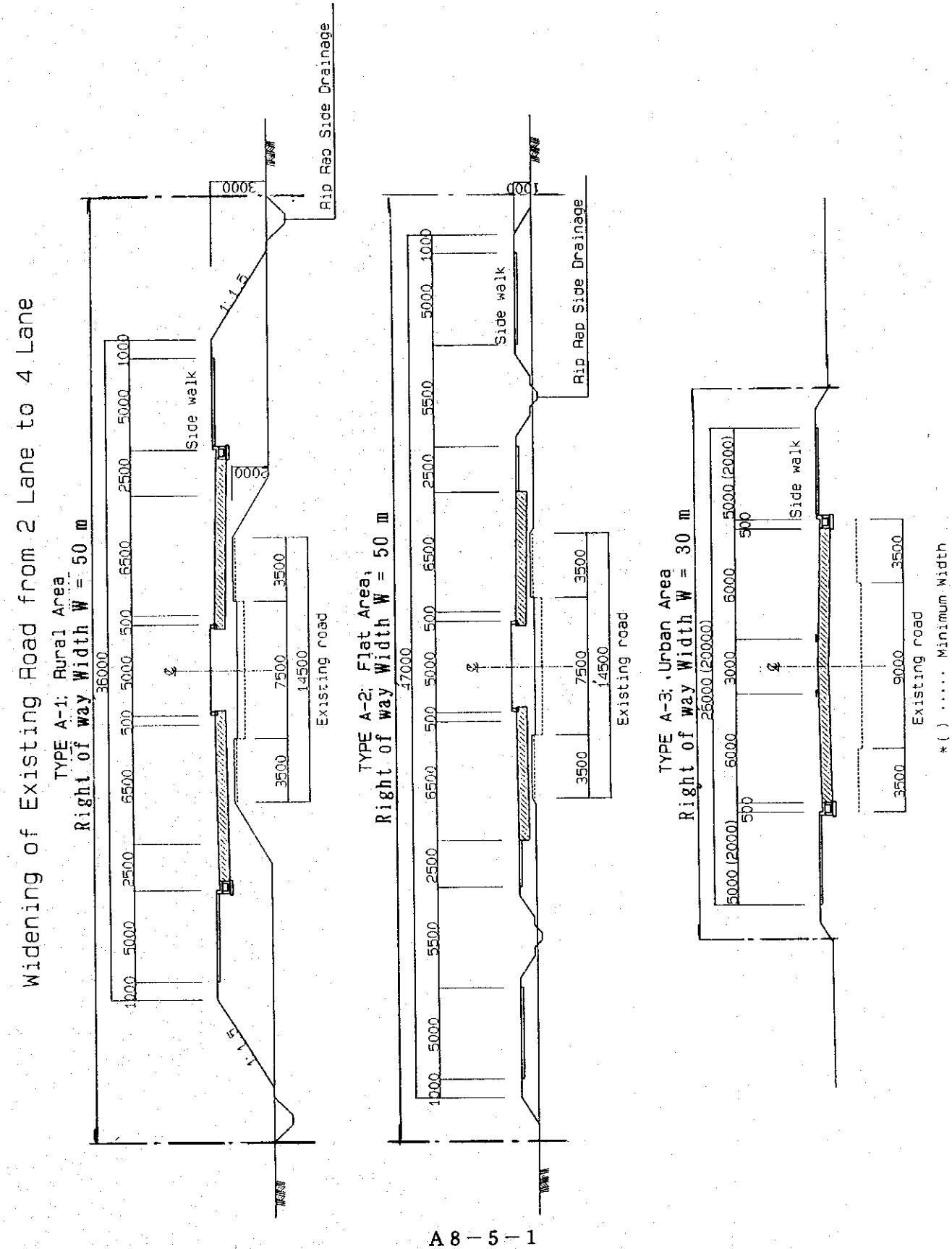
Unit: Million Tshs.

No.	Name of Roa	Total Length	Road Work Type	Length	Unit	Amount	Road Work Type	Length	Unit	Amount	Road Work Type	Length	Unit	Amount	Bridge Structure Length	Unit	Amount	Box Culvert Length	Unit	Amount	Total Amount	Landuse Pattern	House Compensation Area (ha)	Unit	Amount
6	Strengthening of Road Network along Pugu Road																								
	Pugu South-short-term	9.00	Type B-2	9.00	390	3,510												600	1.4	840	4,350	B	27.00	5	140
	Pugu South	9.50	Type B-2	9.50	390	3,710															3,710	B	28.50	5	140
	Pugu North(DRR-17)- short-term	7.50	Type B-2	7.50	390	2,930															2,930	B	22.50	5	110
	Pugu North (DRR-17) Extension	7.50	Type C	7.50	410	3,080															3,080				
	Pugu North-South Access	7.70	Type B-2	7.66	390	2,990									40	3.5	140	200	1.4	280	3,410	B	23.10	5	120
	Sub-total	41.20		41.16		16,220		0.00		0		0.00		0	40		140	800		1,120	17,480		101.10		510
7	Construction and Improvement of Road Network inside Mandela Road																								
	UWT Road	2.00					Type E-1	2.00	180	360											360				
	Uhuru Road	1.20						1.20	180	220											220				
	Old Kigogo Road	6.50	Type C	6.50	410	2,670											0				2,670				
	Old Kigogo - Tabata	1.50		1.50	410	620															620				
	Morogoro -NIT (DTR-20)	1.40		1.40	410	570															570				
	New Sinza Road	3.80		3.80	410	1,560												100	1.4	140	1,700				
	Kagera Road	2.40		2.36	410	970									40	3.5	140				1,110				
	Mwinijuma-H. Bagamoyo and Ext.	3.60		1.40	410	570	Type B-2	1.20	390	470											1,040	B	3.60	5	20
	DTR-25 Old Kigogo	1.00		1.00	410	410				0											410				
	DTR-36 Mikocheni	1.30		1.30	410	530				0											530				
	DTR-38 Mwinjuma-	6.10		5.00	410	2,050	Type B-2	1.10	390	430											2,480	B	3.30	5	20
	DTR-39 Mwinjuma-	4.70		3.20	410	1,310	Type B-2	1.50	390	590											1,900	B	4.50	5	20
	Extention of Old Bagamoyo	6.70		6.70	410	2,750															2,750				
	DTR-28 Temek-Mba	4.70		4.70	410	1,930															1,930				
	DTR-18 Keniyatta-T	7.60					Type-E-2	7.60	90	680											680				
	DTR-35 Chole Road	3.00		2.50	410	1,030		0.50	90	50											1,080				
	DTR-27 Haile Selasi	5.40		2.70	410	1,110		2.70	90	240											1,350				
	Sub-total	62.90		44.06		18,080		17.80		3,040		0.00		0	40		140	100		140	21,400		11.40		60
8	Rehabilitation of Pavement on Local Roads																								
	Local Roads in Temeke Area	13.90	Type D	13.90	150	2,090															2,090				
	Local Roads in Ilala Area	10.30		10.30	150	1,550															1,550				
	Local Roads in Tabata Area	9.20		9.20	150	1,380															1,380				
	Local Roads in Sinza Area	9.20		9.20	150	1,380															1,380				
	Local Roads in Mwinyijuma Area	17.20		17.20	150	2,580															2,580				
	Sub-total	59.80		59.80		8,980		0.00		0		0.00		0	0		0	0		0	8,980		0.00		0
9	Reconstruction of Bridges																								
	Bridge on DTR-4														40	3.5	140				140				
	Bridge on DTR-5														30	3.5	110				110				
	Bridge on DTR-5														35	3.5	120				120				
	Bridge on DTR-3														15	3.5	50				50				
	Bridge on DTR-3														20	3.5	70				70				
	Bridge on DTR-3														25	3.5	90				90				
	Bridge on DTR-33														20	3.5	75				75				
	Sub-total	0.00		0.00		0		0.00		0		0.00		0	185		655	0		0	655		0.00		0
	Sub-total (2)	163.90		145.02	0	43,280		17.80	0	3,040		0.00	0	0	80	0	280	900	0	1,260	48,515		112.50	0	570

Unit: Million Tshs.

No.	Name of Roa	Total Length	Road Work Type	Road Work Length	Road Work Unit	Road Work Amount	Road Work Type	Road Work Length	Road Work Unit	Road Work Amount	Road Work Type	Road Work Length	Road Work Unit	Road Work Amount	Bridge Structure Length	Bridge Structure Unit	Bridge Structure Amount	Box Culvert Length	Box Culvert Unit	Box Culvert Amount	Total Amount	Landuse Pattern	House Compensation Area	House Compensation Unit	House Compensation Amount
															(m)			(m)					(ha)		
10	Grade Separated Intersections																								
	Middle Ring/Pugu Road (4 lanes)														460	7.0	3,220				3,220				
	Middle Ring/Uhulu Road (4 lanes)														460	7.0	3,220				3,220				
	Middle Ring/Morogoro Road (4 lanes)														460	7.0	3,220				3,220				
	Nelson Mandera/Pugu Road (4 lanes)														460	7.0	3,220				3,220				
	Nelson Mandera/Morogoro Road														460	7.0	3,220				3,220				
	Nelson Mandera/Kilwa Road (4 lanes)														460	7.0	3,220				3,220				
	Nelson Msimbazi/Pugu Road (4 lanes)														460	7.0	3,220				3,220				
	Nelson Mandera/Middle Ring Road (4 lanes)														460	7.0	3,220				3,220				
	Sub-total														3,680		25,760				25,760				0
11	Improvement of Important Roads in Rural Areas																				2,540				
	DTR-5 New Bagamoyo beyond Wazo Hill	14.10	Type F-2	14.10	180	2,540															1,220				
	DTR-3 Morogoro beyond	13.60									Type E-2	13.60	90	1,220							960				
	DRR-1 Kawe-Goba- Mbezi	16.00					Type F-3	16.00	60	960											1,200				
	DRR-5 Pugu-Msongola	20.00						20.00	60	1,200											1,730				
	DRR-6 Bunji-Mbeweni	6.40	Type F-2	6.40	180	1,150					Type E-2	6.40	90	580							830				
	DRR-7 Kwembe- Kisosa	13.90						13.90	60	830											540				
	DRR-9 Kibamba-Magowe mpiji	9.00						9.00	60	540											1,200				
	DRR-10 Mikwanbe-Gezaule	20.00						20.00	60	1,200											2,050				
	DRR-11 Kunduchi-Unio- Boko	11.40	Type F-2	11.40	180	2,050															960				
	DRR-13 Msongola- Byuni	16.00						16.00	60	960											500				
	DRR-15 Pugu-Kajungeni	8.30						8.30	60	500											1,450				
	DRR-16 Buniji-Mabwepande-Mpiji	24.10						24.10	60	1,450											1,300				
	DRR-17 DIA-G/Mboto	7.20	Type F-2	7.20	180	1,300															300				
	DRR-18 Pugu-Kinyerezi	5.00						5.00	60	300											480				
	DRR-19 Mbezi-Maramba-Kwembi	8.00						8.00	60	480											540				
	DRR-20 Temboni-Kinyerezeni	9.00						9.00	60	540											340				
	DRR-21 Temboni-Goba	5.70						5.70	60	340											500				
	DRR-22 Goba-Mpiji	8.30						8.30	60	500											2,270				
	DRR-23 Kongowe-Mjimwema	12.60	Type F-2	12.60	180	2,270															8,350				
	DRR-24 Pugu-Chanika-Mbagala	46.40	Type F-2	46.40	180	8,350															270				
	DRR-25 Mbezi-Kwembe	4.50						4.50	60	270											140				
	DRR-26 Morogoro Road-Kiluvia	2.30						2.30	60	140											680				
	DRR-27 Wazo Hill - Goba	11.30						11.30	60	680											90				
	DRR-28 Kibo-Msewe	1.50						1.50	60	90											30,440		0.00		0
	Sub-total	294.60		98.10		17,660		182.90		10,980		20.00		1,800	0	0		0	0		56,200		0.00		0
	Sub-Total (3)	294.60		98.10		17,660		182.90		10,980		20.00		1,800	0	0		0	0		232,085		352.95		1,980
	Total	726.62		465.35		112,170		236.08		37,170		29.62		7,470	2,490		45,290	1,500		2,020					

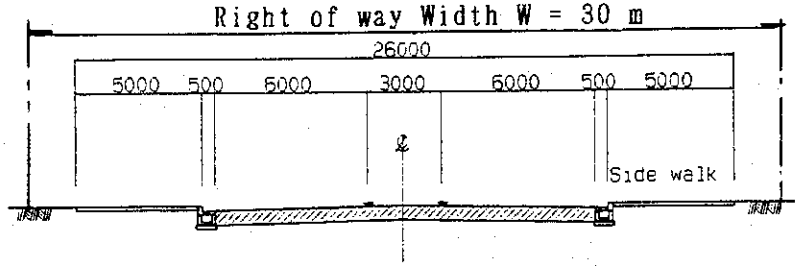
Appendix 8.5 Typical Cross-section for Each Type of Development Measures



New Construction

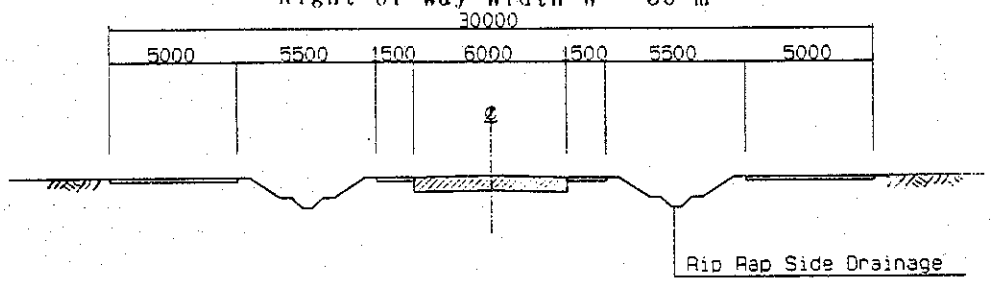
TYPE B-1; 4 Lane

Right of way Width W = 30 m



TYPE B-2; 2 Lane

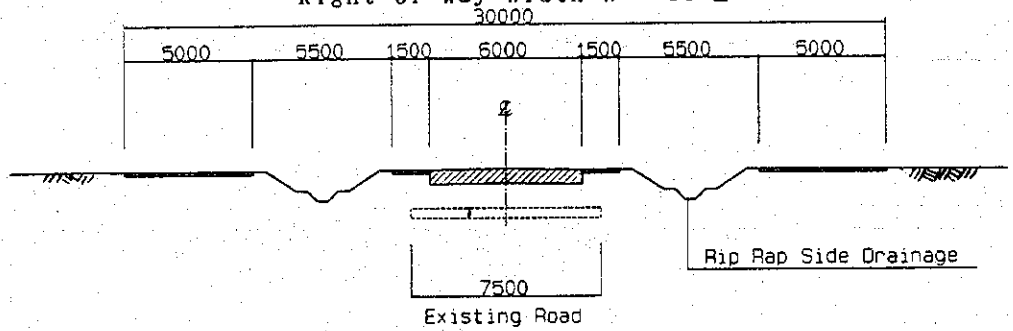
Right of way Width W = 30 m



Improvement

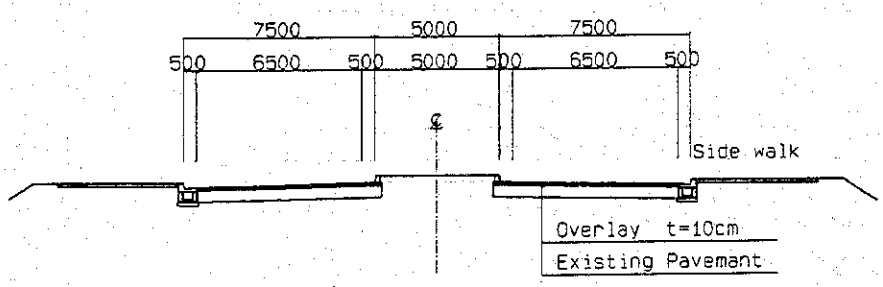
TYPE C; 2 Lane

Right of way Width W = 30 m

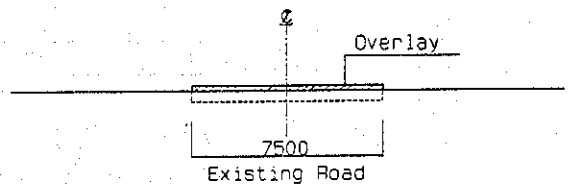


OverLay

TYPE E-1; 4 Lane

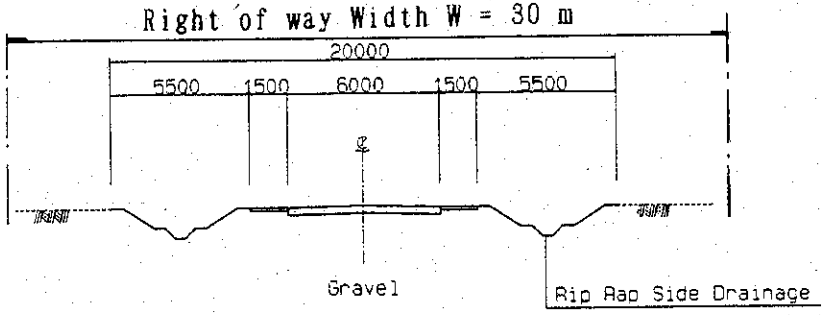


TYPE E-2; 2 Lane

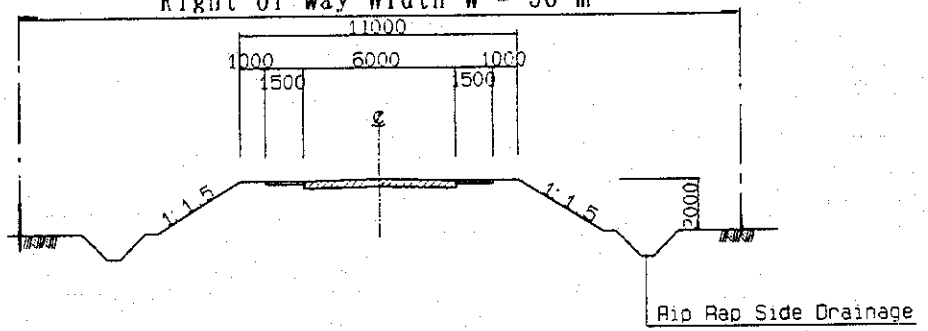


Rehabilitation

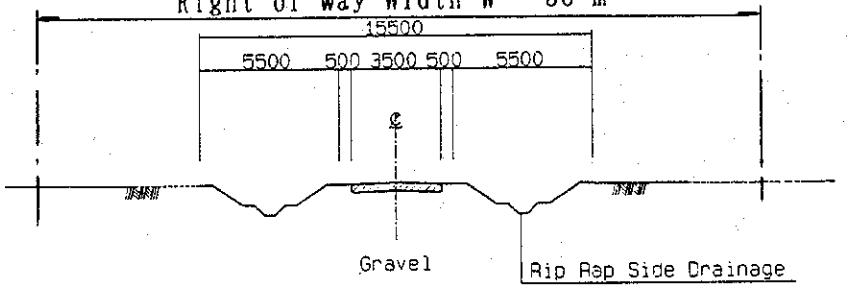
TYPE F-1; 2 Lane
Right of way Width W = 30 m



TYPE F-2; 2 Lane
Right of way Width W = 30 m

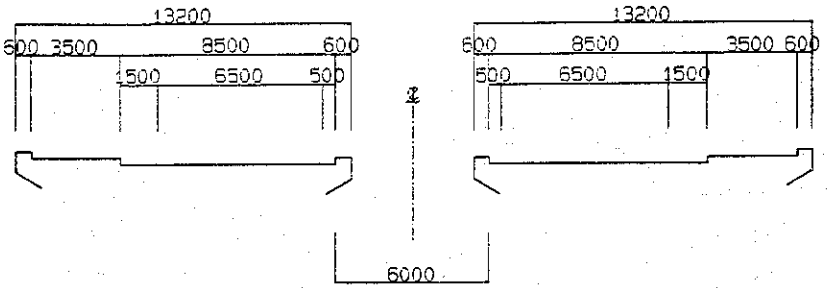


TYPE F-3; 1 Lane
Right of way Width W = 30 m

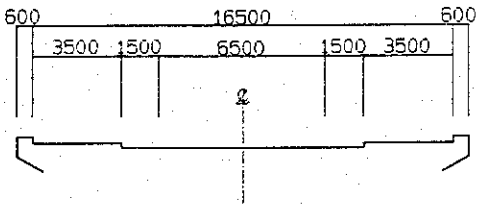


Bridge Section
(Steel Girder Type)

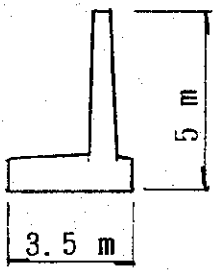
(4 Lanes)



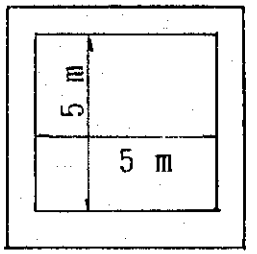
(2 Lanes)



Retaining Wall



Box Culvert



Appendix 8. 6 Proposed Road Development Measures(1/3)

	Link No.	Road Name	Widening	New Construction		Improvement		Overlay		Rehabilitation		Reconst.	Construction of Structure			Grade
			4 Lanes	4 Lanes	2 Lanes	4 Lanes	2 Lanes	4 Lanes	2 Lanes	2 Lanes	1 Lane	of Bridg	Bridge	R.Wall	B. Culv	Separ.
(1) Widening of Arterial Roads in City Center	(1)-1	Ohio Street	0.96											0.40		
	(1)-2	Kivukoni Front	0.40											0.35		
	(1)-3	Sokoine Drive	0.67													
	(1)-4	Gerezani Road	1.40										0.05			
	(1)-5	Bandari Road	2.00													
	(1)-6	UWT-Gerezani Access		0.24									0.02			
(2) Widening of Middle Ring Road with construction of Missing Link	(2)-1	Morocco Road	4.00										0.04			
	(2)-2	New Kigogo Road	2.80													
	(2)-3	Chang`ombe Road	2.80													
	(2)-4	Missing Link		0.75												
(3) Widenig of Trunk Roads from 2 to 4 lanes	(3)-1	New Bagamoyo Road	4.40				14.10					0.000	0.10			
	(3)-2	New Bagamoyo Road	12.60													
	(3)-3	Sam Nujoma Road	3.90										0.02			
	(3)-3	Morogoro Road	11.00					13.60				0.000				
	(3)-4	Uhuru Road		4.00					1.20							
	(3)-5	United Nations Road	2.00													
	(3)-6	United Nations-Morocco Road 2 Lane			1.90								0.02			
	(3)-7	United Nations-Morocco Road 4 Lane		1.90									0.02			
	(3)-8-1	Kilwa Road		3.20								0.000				
	(3)-8-2	Kilwa Road		5.60									0.02			
(4) Strengthening of Road Network in Kigamboni Area including construction of Bridges Access Harbor	(4)-1	Harbor Bridge with Access Road			1.20											
	(4)-2	Kurasini Bridge with Access Road			5.30											
	(4)-3	DRR-22 from Kivukoni upto DRR-23 Junction	7.30							0.00	0.00					
	(4)-4	Kongowe-Mjimwema(DRR-23)					5.00			12.60						
	(4)-5	Kivukoni-Vijibweni(DRR-14)					6.50									
	(4)-6	Tungu-Kibada(DRR-29)					5.90									
	(4)-7	Mwongozo-Gomvu(DRR-2)									12.50					
	(4)-8	Chekeniwasonga-Buyuni(DRR-3)									43.10					
	(4)-9	Kimbiji-Chekeniwasonga(DRR-8)									11.50					
	(4)-10	Kimbiji-Tungi-Songani(DRR-12)									18.00					
	(4)-11	DRR-22 from DRR-23 Junction upto Kimbizi								43.00						
	(4)-12	DRR-22 from Kimbizi upto Mnazi									13.40					
	(4)-13	Kibada-Gezaulole(DRR-30)									14.50					
(5)Construction of Outer Ring Road	(5)-1	Outer Ring Road			13.80		9.20									
(6) Strengthening of Road Network along Pugu Road	(6)-1	South Pugu Road			9.00											
	(6)-2	South Pugu Road			9.50											
	(6)-2	North Pugu Road(DRR-17)					7.50									
	(6)-3	North Pugu Road(DRR-17)			7.50											
	(6)-3	North-South Access			7.70											
		Sub Total(1)	56.23	15.69	55.90	0.00	48.20	13.60	1.20	55.60	113.00	0.000	0.29	0.75	0.00	0.00

Appendix 8. .6 Proposed Road Development Measures(2/3)

	Link No.	Road Name	Widening	New Constructio		Improvement		Overlay		Rehabilitation		Recoost.	Construction of Structure			Grade
			4 Lanes	4 Lanes	2 Lanes	4 Lanes	2 Lanes	4 Lanes	2 Lanes	2 Lanes	1 Lane	of Bridge	Bridge	R.Wall	B. Culv	Separati
(7) Construction and Improvement o	(7)-1	Old Kigogo Road					6.50									
of Collector Roads	(7)-2	New-Kigogo-Tabata Road					1.50									
	(7)-3	Morogoro-NIT(DTR-20) and Extention			0.70		1.40									
	(7)-4	Kagera Street(DTR-26) and Extention					2.40									
	(7)-5	Old Kigogo/Mandera Road(DTR-25)					1.00									
	(7)-6	Mikocheni Access(DTR-36)					1.30									
	(7)-7	Mwinyijuma-Sinza(DTR-38) and Extention			1.10		5.00									
	(7)-8	Mwinyijuma-New Bagamoyo(DTR-39) and Extention			1.50		3.20									
	(7)-9	Extention of Old Bagamoyo Road to north along coast					6.70									
	(7)-10	Temeke/Mbagala					4.70									
	(7)-11	Kenyatta/Toure Drive							7.60							
	(7)-12	Chole Road					2.50		0.50							
	(7)-13	Haile Selassie					2.70		2.70							
	(7)-14	UWT Road						2.00								
(8) Rehabilitation of Pavement	(8)-1	Local Roads in Temeke Area					13.90									
condition on Local Roads	(8)-2	Local Roads in Ilala Area					10.30									
	(8)-3	Local Roads in Tabata Area					9.20									
	(8)-4	Local Roads in Sinza Area					9.20									
	(8)-5	Local Roads in Mwinyijuma Area					17.20									
(9) Reconstruction of (i) Rehabili	(9)-(i)-1	Kilwa Road										0.040				
Bridges on (ii) Recons	(9)-(ii)-1	New Bagamoyo Road										0.030				
Trunk Road	(9)-(ii)-2	New Bagamoyo Road										0.035				
	(9)-(ii)-3	Morogoro Road										0.015				
	(9)-(ii)-4	Morogoro Road										0.020				
	(9)-(ii)-5	Morogoro Road										0.025				
	(9)-(ii)-8	Old Bagamoyo Road										0.020				
(10) Construction of Grade Separate	(10)-1	Intersection between the Middle Ring Road and Pugu Road														1.00
Separated Intersection	(10)-2	Intersection between the Middle Ring Road and Uhuru Road														1.00
at major Trunk Road	(10)-3	Intersection between the Middle Ring Road and Morogoro Road														1.00
	(10)-4	Intersection between Nelson Mandera Road and Pugu Road														1.00
	(10)-5	Intersection between Nelson Mandera Road and Morogoro Road														1.00
	(10)-6	Intersection between Nelson Mandera Road and Kilwa Road														1.00
	(10)-7	Intersection between Msimbazi Road and Pugu Road														1.00
	(10)-8	Intersection between the Middle Ring Road and Nelson Mandera Road														1.00
		Sub Total(2)	0.00	0.00	3.30	0.00	98.70	2.00	10.80	0.00	0.00	0.185	0.00	0.00	0.00	8.00

Appendix 8. 6 Proposed Road Development Measures(3/3)

	Link No.	Road Name	Widening	New Construction		Improvement		Overlay		Rehabilitation		Reconst.	Construction of Structure			Grade
			4 Lanes	4 Lanes	2 Lanes	4 Lanes	2 Lanes	4 Lanes	2 Lanes	2 Lanes	1 Lane	of Bridge	Bridge	R.Wall	B. Culv	Separ.
(11) Improvement of District Roads in Rural Areas	(11)-1	Kawe-Goba-Mbezi(DRR-1)									16.00					
	(11)-2	Pugu-Msongola(DRR-4)									20.00					
	(11)-3	Bunju A-Mbweni(DRR-5)								6.40						
	(11)-4	Kwembe-Kisosa(DRR-6)									13.90					
	(11)-5	Kibamba-Magoe mpiji(DRR-7)									9.00					
	(11)-6	Kimbiji-Chekeniwasonga(DRR-8)									11.50					
	(11)-7	Mikuwambe-Gezauloe(DRR-9)									20.00					
	(11)-8	Kunduchi-Unio-Boko(DRR-10)					11.40									
	(11)-9	Msongola-Byuni(DRR-11)									16.00					
	(11)-10	Kimbiji-Tungwi-Songani(DRR-12)									18.00					
	(11)-11	Pugu-Kajiungeni(DRR-13)									8.30					
	(11)-12	Bunju-Mabwepande-Mpiji(DRR-15)									24.10					
	(11)-13	DIA-G/Mboto(DRR-16)								7.20						
	(11)-14	Mbezi-Maramba Mawili-Kwembe(DRR-18)									8.00					
	(11)-15	Temboni-Kinyerezi(DRR-19)									9.00					
	(11)-16	Temboni-Goba(DRR-20)									5.70					
	(11)-17	Goba-M/Mpiji(DRR-21)									8.30					
	(11)-18	Pugu-Chanika-Mvuti-Mbagala(DRR-24)								46.40						
	(11)-19	Mbezi-Kwembe(DRR-25)									4.50					
	(11)-20	Morogoro Road-Kiluvia(DRR-26)									2.30					
	(11)-21	Wazo Hill - Goba(DRR-27)									11.30					
	(11)-22	Kibo-Msewe(DRR-28)									1.50					
(12) Strengthening of Maintenance Capability																
		Sub Total(3)	0.00	0.00	0.00	0.00	11.40	0.00	0.00	60.00	207.40	0.000	0.00	0.00	0.00	0.00
		(1)+(2)+(3) Total	56.23	15.69	59.20	0.00	158.30	15.60	12.00	115.60	320.40	0.185	0.29	0.75	0.00	8.00

Chapter 10 Traffic Management Pan

Appendix 10.1 Number of Road Crossings at Proposed Location of Pedestrian Crossing Bridge

Appendix 10.1 Number of Road Crossings at Proposed Location of Pedestrian Crossing Bridge

Location PCB 1 (UWT Road, Mnazi Mmoja)

Time Band	Bicycle	Cart	Pedestrian	Total
7-8	15	16	1339	1370
8-9	64	33	2824	2921
9-10	114	77	3553	3744
10-11	74	43	2536	2653
11-12	68	69	2809	2946
12-13	98	35	1679	1812
13-14	24	11	2072	2107
14-15	67	16	2189	2272
15-16	91	45	3304	3440
16-17	59	27	2091	2177
17-18	78	22	2426	2526
18-19	29	15	1620	1664
Total	781	409	28442	29632

Location PCB 2 (Pugu Road, Changombe)

Time Band	Bicycle	Cart	Pedestrian	Total
7-8	117	16	1828	1961
8-9	89	7	1043	1139
9-10	52	6	396	454
10-11	41	8	288	337
11-12	0	0	0	0
12-13	0	0	0	0
13-14	0	0	0	0
14-15	0	0	0	0
15-16	29	1	499	529
16-17	78	6	759	843
17-18	65	7	863	935
18-19	222	4	503	729
Total	693	55	6179	6927

Regarding location of the crossing points, refer Table 10.3

Location PCB 3 (Pugu Road, Nelson Mandela Intersection)

Time Band	Bicycle	Cart	Pedestrian	Total
7-8	190	23	1756	1969
8-9	159	23	1378	1560
9-10	169	20	1082	1271
10-11	154	16	1240	1410
11-12	0	0	0	0
12-13	0	0	0	0
13-14	0	0	0	0
14-15	0	0	0	0
15-16	143	13	887	1043
16-17	145	6	860	1011
17-18	138	15	849	1002
18-19	141	12	984	1137
Total	1239	128	9036	10403

Location PCB 4 (Pugu Road, Kilawani)

Time Band	Bicycle	Cart	Pedestrian	Total
7-8	85	46	1982	2113
8-9	67	46	1654	1767
9-10	88	43	1264	1395
10-11	71	23	1206	1300
11-12	63	37	1576	1676
12-13	96	28	1681	1805
13-14	68	18	1312	1398
14-15	70	13	1303	1386
15-16	113	20	1051	1184
16-17	92	22	1230	1344
17-18	83	26	1561	1670
18-19	103	26	1661	1790
Total	999	348	17481	18828

Chapter 11 Short-term Development Plan and Implementation Schedule

Appendix 11.1 Economic Evaluation of Road Development Master Plan

Appendix 11.1 Economic Evaluation of Road Development Master Plan

Unit : Tsh. million

Year	Construction Cost		Maintenance Cost		Economic Cost	Less Residual Value	Saving of VOC	Saving of TC	Economic Benefit
	Short-term	Long-term	Short-term	Long-term					
1995	9,558	-	-	-	9,558	-	-	-	-
1996	9,117	-	-	-	9,117	-	-	-	-
1997	11,862	-	-	-	11,862	-	-	-	-
1998	14,713	-	-	-	14,713	-	-	-	-
1999	13,317	-	-	-	13,317	-	-	-	-
2000	-	12.614	1,171	-	13,785	-	15,500	536	16,036
2001	-	12.614	1,171	-	13,785	-	16,552	572	17,125
2002	-	12.614	1,171	-	13,785	-	17,514	611	18,125
2003	-	12.614	1,171	-	13,785	-	18,617	653	19,270
2004	-	12.614	1,171	-	13,785	-	19,791	697	20,488
2005	-	12.614	1,171	-	13,785	-	21,037	745	21,782
2006	-	12.614	1,171	-	13,785	-	22,362	796	23,158
2007	-	12.614	1,171	-	13,785	-	23,770	850	24,620
2008	-	12.614	1,171	-	13,785	-	25,269	907	26,176
2009	-	12.614	1,171	-	13,785	-	26,860	968	27,828
2010	-	12.614	1,171	-	13,785	-	28,553	1,034	29,587
2011	-	-	1,171	2,775	3,946	-	47,477	1,447	48,924
2012	-	-	1,171	2,775	3,946	-	50,469	1,614	52,083
2013	-	-	1,171	2,775	3,946	-	53,648	1,725	55,373
2014	-	-	1,171	2,775	3,946	-5,857	57,028	1,840	58,868
2015	-	-	-	2,775	2,775	-	22,814	589	23,403
2016	-	-	-	2,775	2,775	-	24,252	629	24,881
2017	-	-	-	2,775	2,775	-	25,780	672	26,452
2018	-	-	-	2,775	2,775	-	27,404	718	28,122
2019	-	-	-	2,775	2,775	-	29,130	766	29,896
2020	-	-	-	2,775	2,775	-	30,965	818	31,783
2021	-	-	-	2,775	2,775	-	32,916	874	33,790
2022	-	-	-	2,775	2,775	-	34,990	934	35,924
2023	-	-	-	2,775	2,775	-	37,194	997	38,191
2024	-	-	-	2,775	2,775	-	39,537	1,065	40,602
2025	-	-	-	2,775	2,775	-13,875	42,028	1,137	43,165

B/C Ratio: 1.46 IRR: 15.72% Net Present Value: Tsh.52,859 Million at Discount Rate 10%

PART B : FEASIBILITY STUDY ON HIGHT PRIORITY PROJECTS

APPENDICES

Chapter 14 Engineering Survey and Analysis

Appendix 14.1 Location of Boreholes (1) - (7)

Appendix 14.2 Subsoil Investigation Results (1) - (7)

Appendix 14.3 Detailed Test Results of Soil Investigation at Proposed Structures

Appendix 14.4 Location of the Subsoil Investigation

Appendix 14.5 Detailed Test Results of Subsoil Investigation on High Priority Project Roads

Appendix 14.6 Estimation of Effective Thickness of Project Roads

Appendix 14.7 Laboratory Test Results of Aggregate taken at Quarry Sites

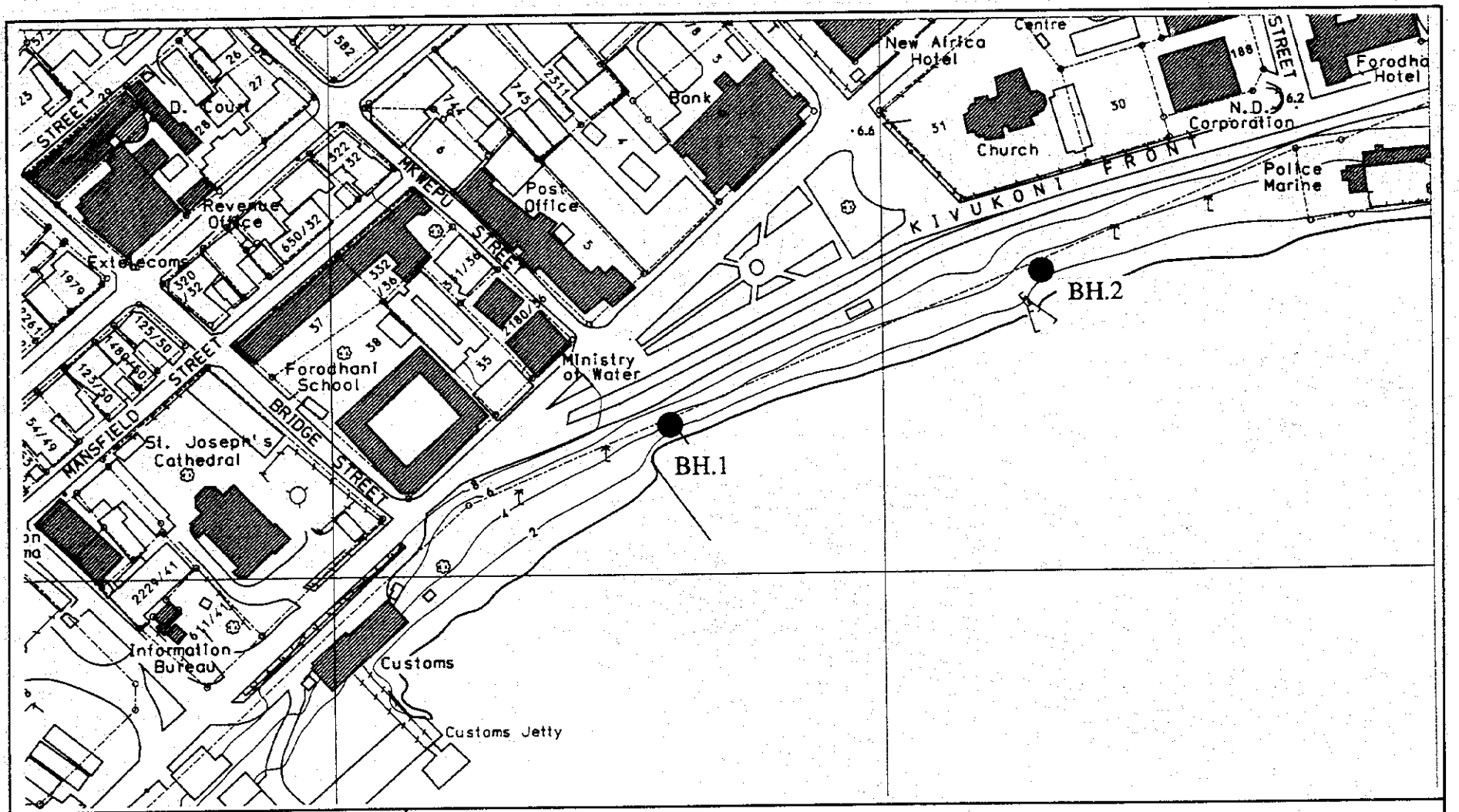
Appendix 14.8 Summary of Sub-Soil Conditions (1) - (4)

Appendix 14.9 Determination of Design CBR Value

Appendix 14.10 Annual Rainfall Data at Raingauge Stations

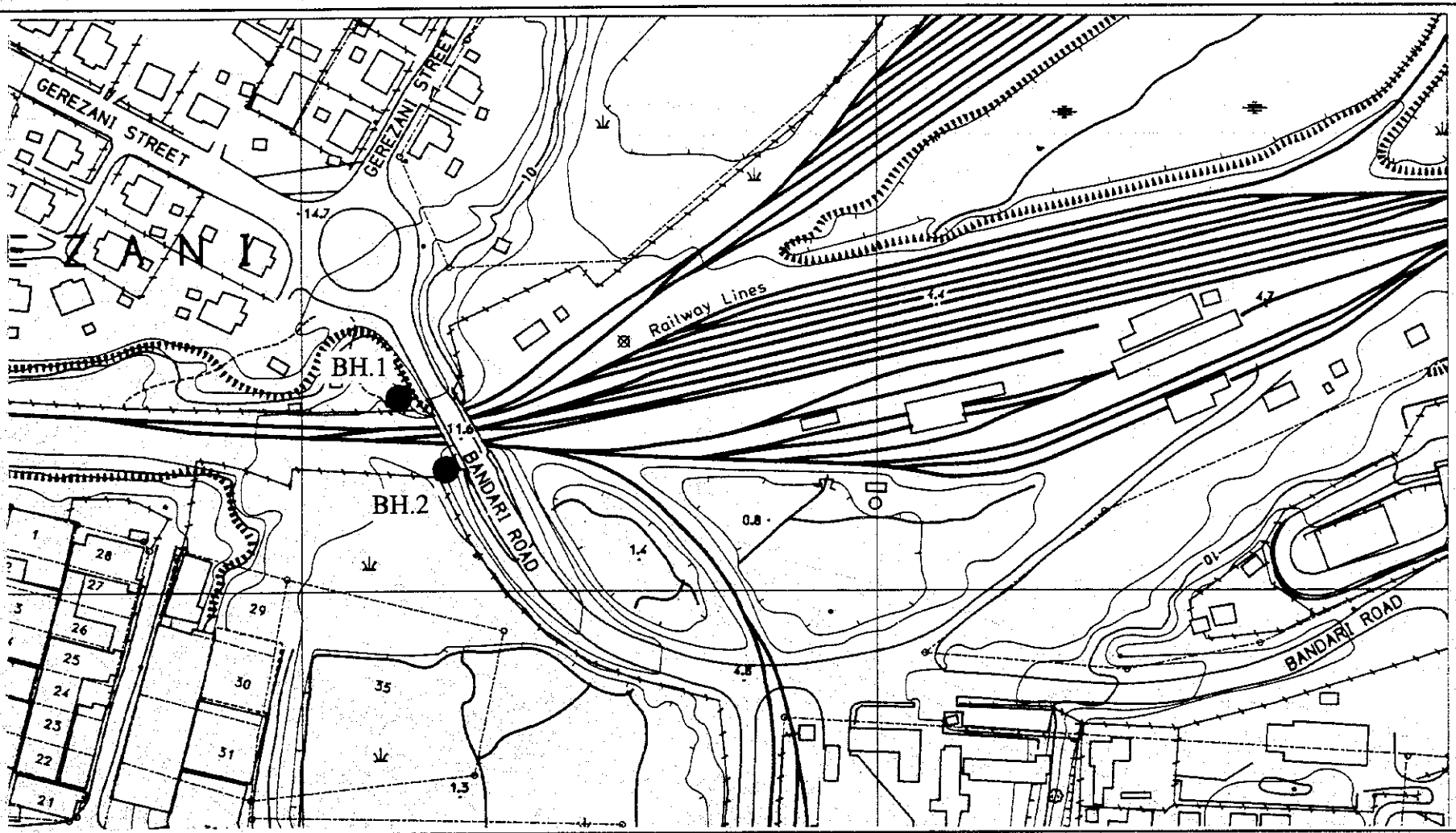
Appendix 14.11 Maximum Daily Rainfall Record at Dar es Salaam

Appendix 14.12 Estimation of Flood Discharge



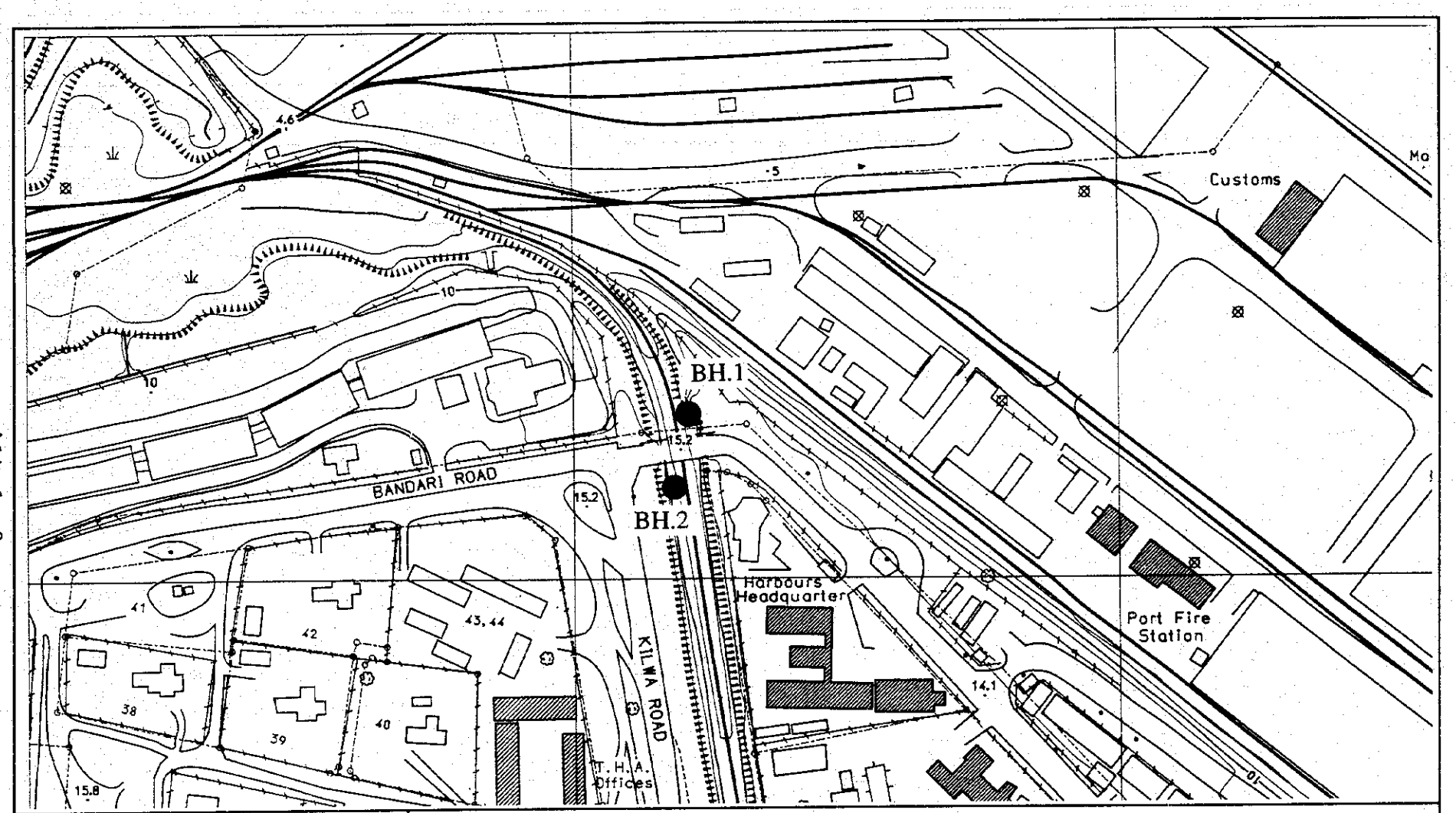
THE STUDY ON DAR ES SALAAM ROAD DEVELOPMENT STUDY	Sokoine Seashore(Location No.1)
Appendix-14.1 Location of Boreholes(1)	

A14－1－1



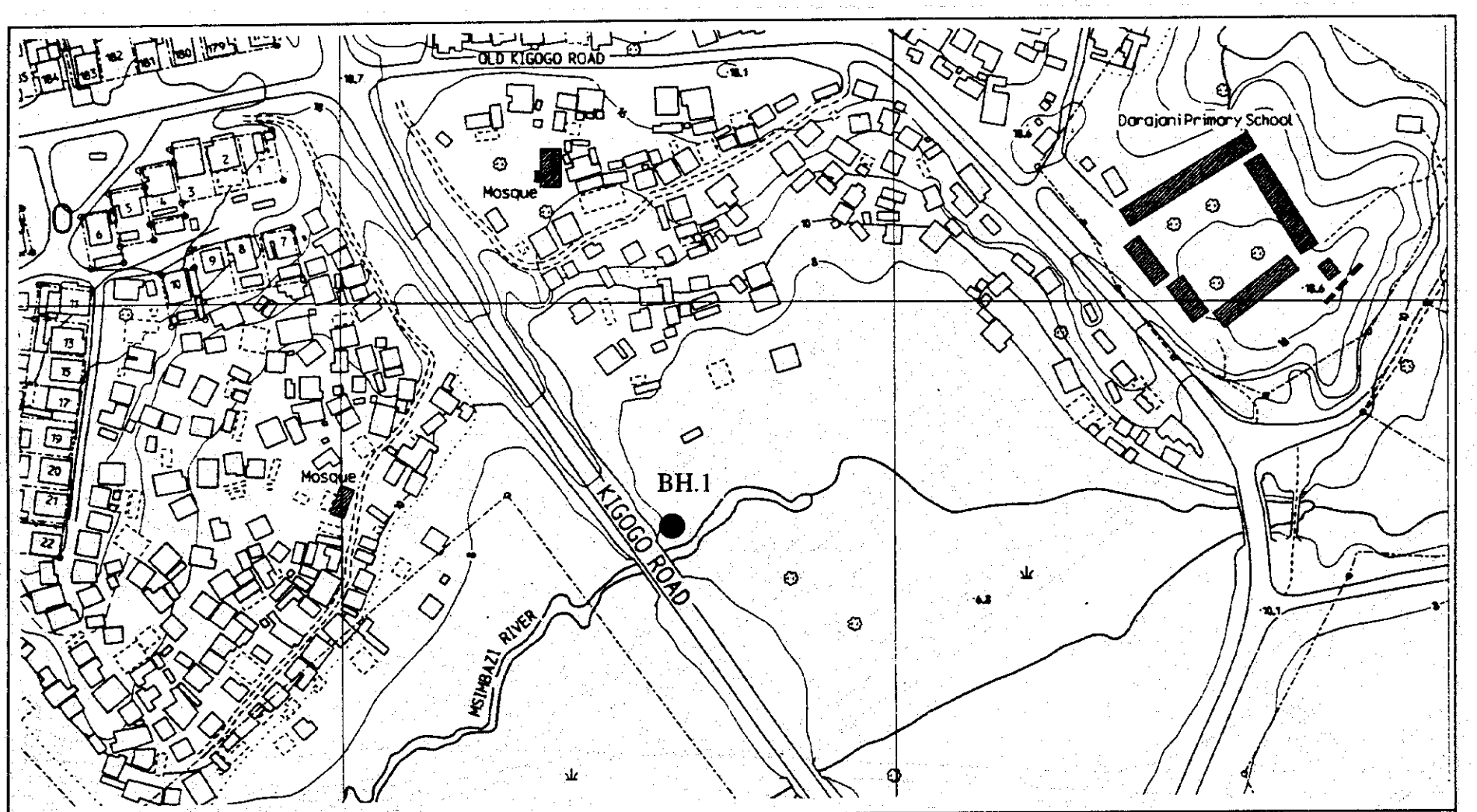
A14－1－2

THE STUDY ON DAR ES SALAAM ROAD DEVELOPMENT STUDY	Gerezani Bridge(Location No.2)
Appendix-14.1 Location of Boreholes(2)	

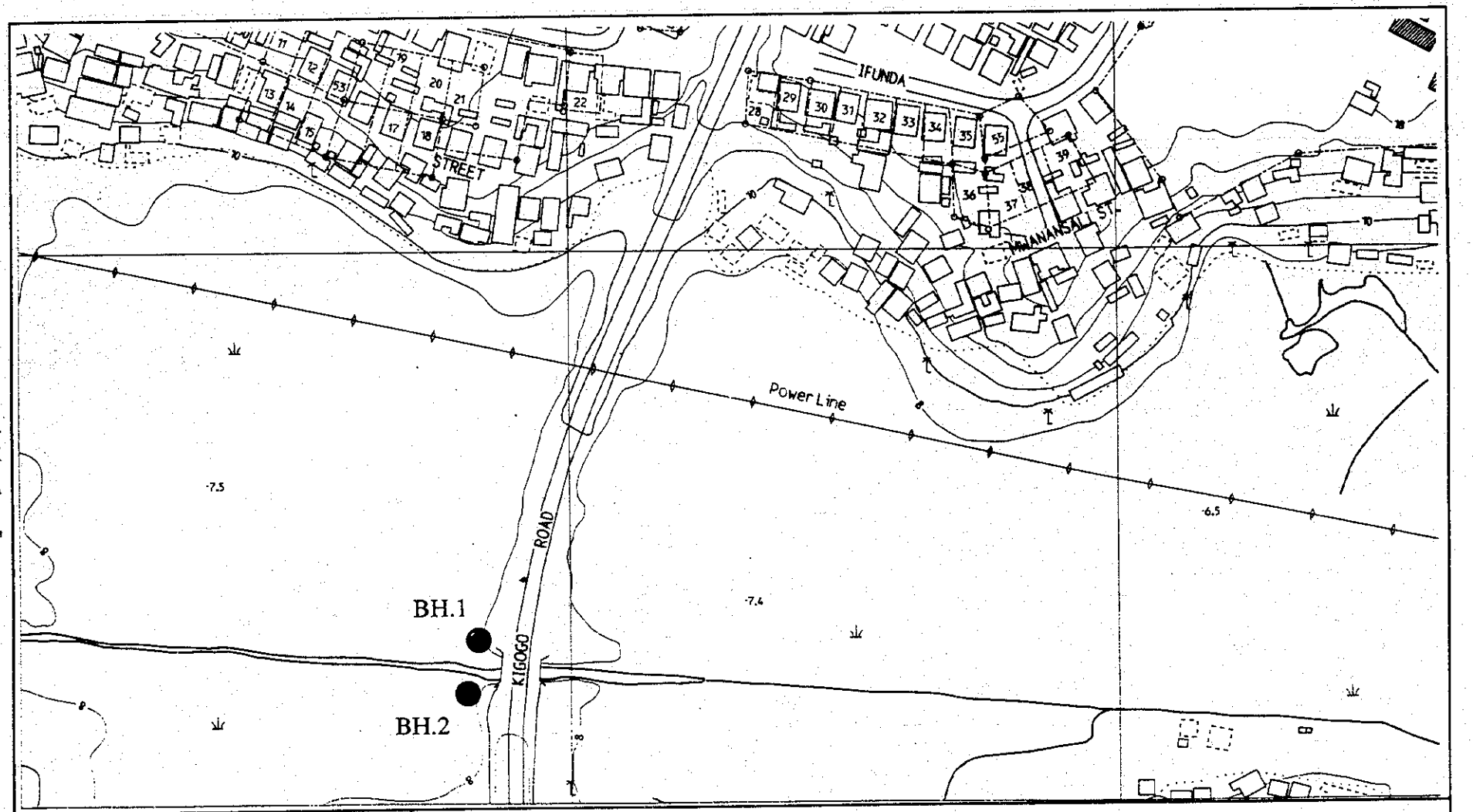


THE STUDY ON DAR ES SALAAM ROAD DEVELOPMENT STUDY	Bandari Bridge(Location No.3)
Appendix-14.1 Location of Boreholes(3)	

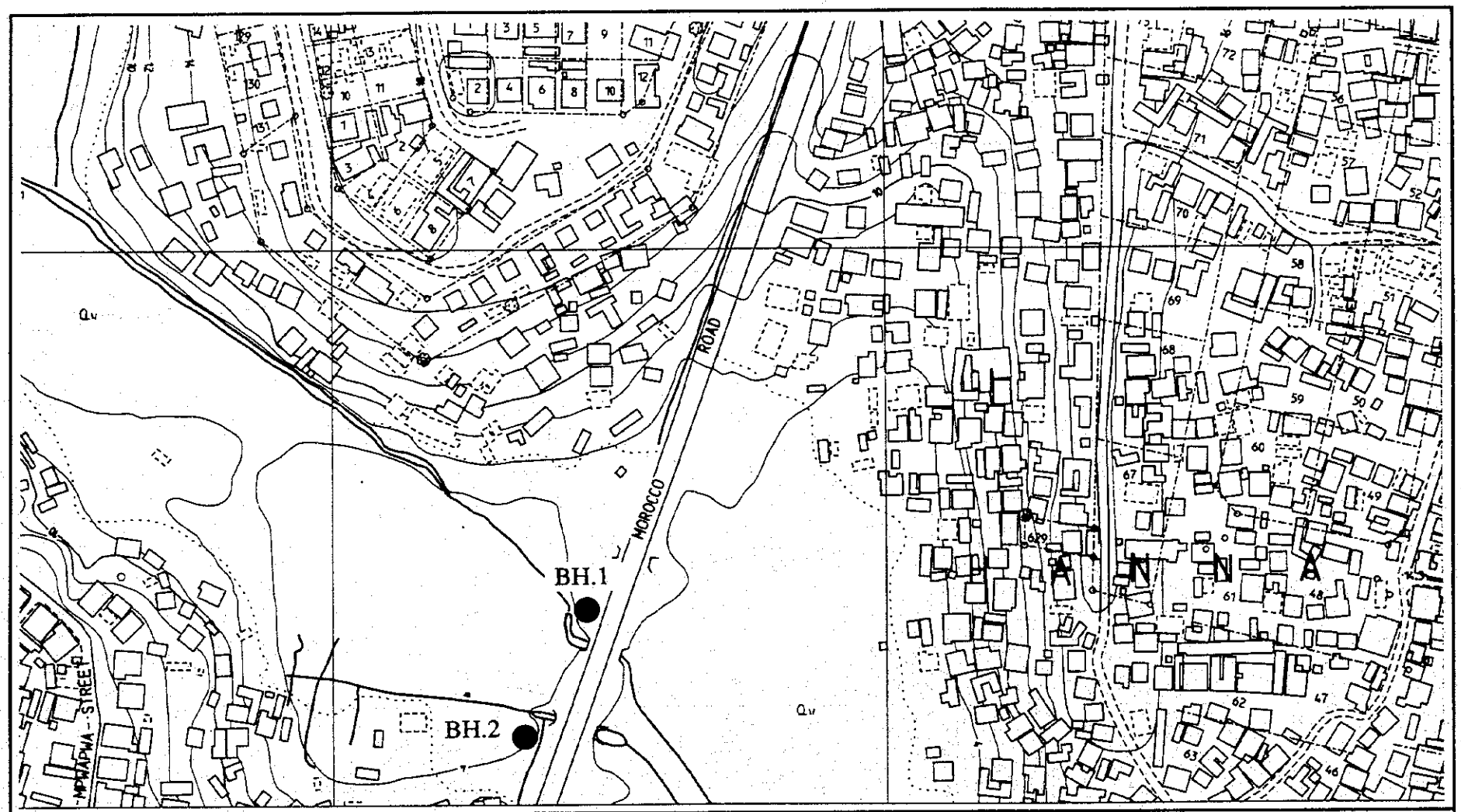
A14－1－3



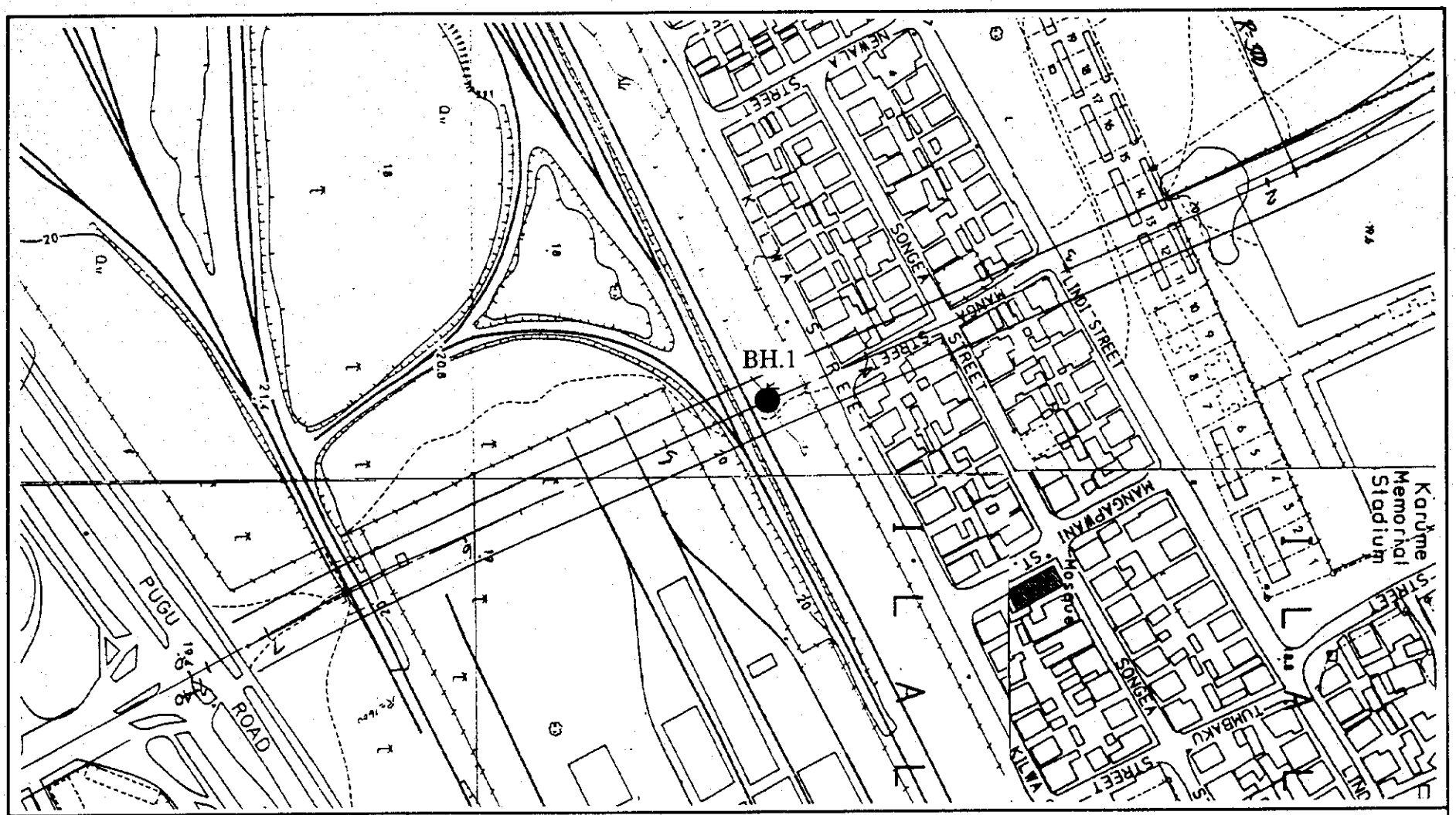
THE STUDY ON DAR ES SALAAM ROAD DEVELOPMENT STUDY	First Msimbazi C-Box(Location No.4)
Appendix-14.1 Location of Boreholes(4)	



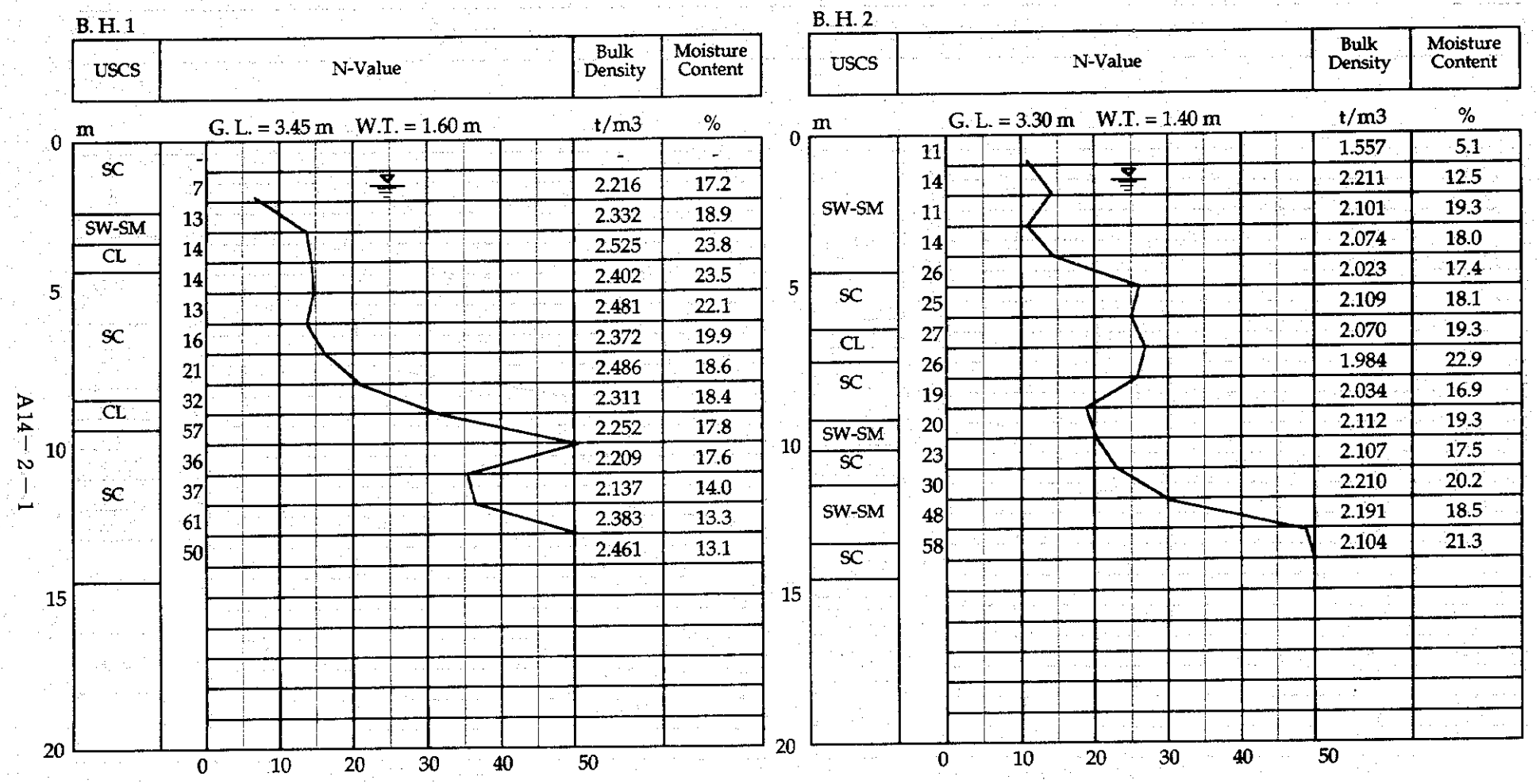
THE STUDY ON DAR ES SALAAM ROAD DEVELOPMENT STUDY	Second Ubungo C-Box(Location No.5)
Appendix-14.1 Location of Boreholes(5)	



THE STUDY ON DAR ES SALAAM ROAD DEVELOPMENT STUDY	Sinza C-Box(Location No.6)
Appendix-14.1 Location of Boreholes(6)	



THE STUDY ON DAR ES SALAAM ROAD DEVELOPMENT STUDY	Ilala Bridge(Location No.7)
Appendix-14.1 Location of Boreholes(7)	



A14－2－1

Appendix-14.2 (1) Subsoil Investigation Results at Sokoine Seashore (Location No. 1)

B. H. 1

USCS	N-Value	Bulk Density	Moisture Content
m	G. L. = 5.86 m W.T. = 2.00 m	t/m3	%
SW	8	1.972	14.1
	9	1.947	16.5
SW-SM	9	2.005	18.2
	7	1.992	17.6
SM	12	1.898	18.7
	14	1.986	18.5
	18	1.895	19.0
SW-SM	21	1.964	17.1
SM	25	2.013	15.2
SW-SM	42	2.011	14.4
SM	64	2.018	11.5
SW-SM	48	2.017	12.1
SM	20	2.014	12.0
	22	2.008	12.5
SW-SM	23	2.018	12.4
	20	2.019	12.5
	28	2.018	13.3
SM	27	2.020	13.0
	26	2.021	12.9
	28	2.019	12.8

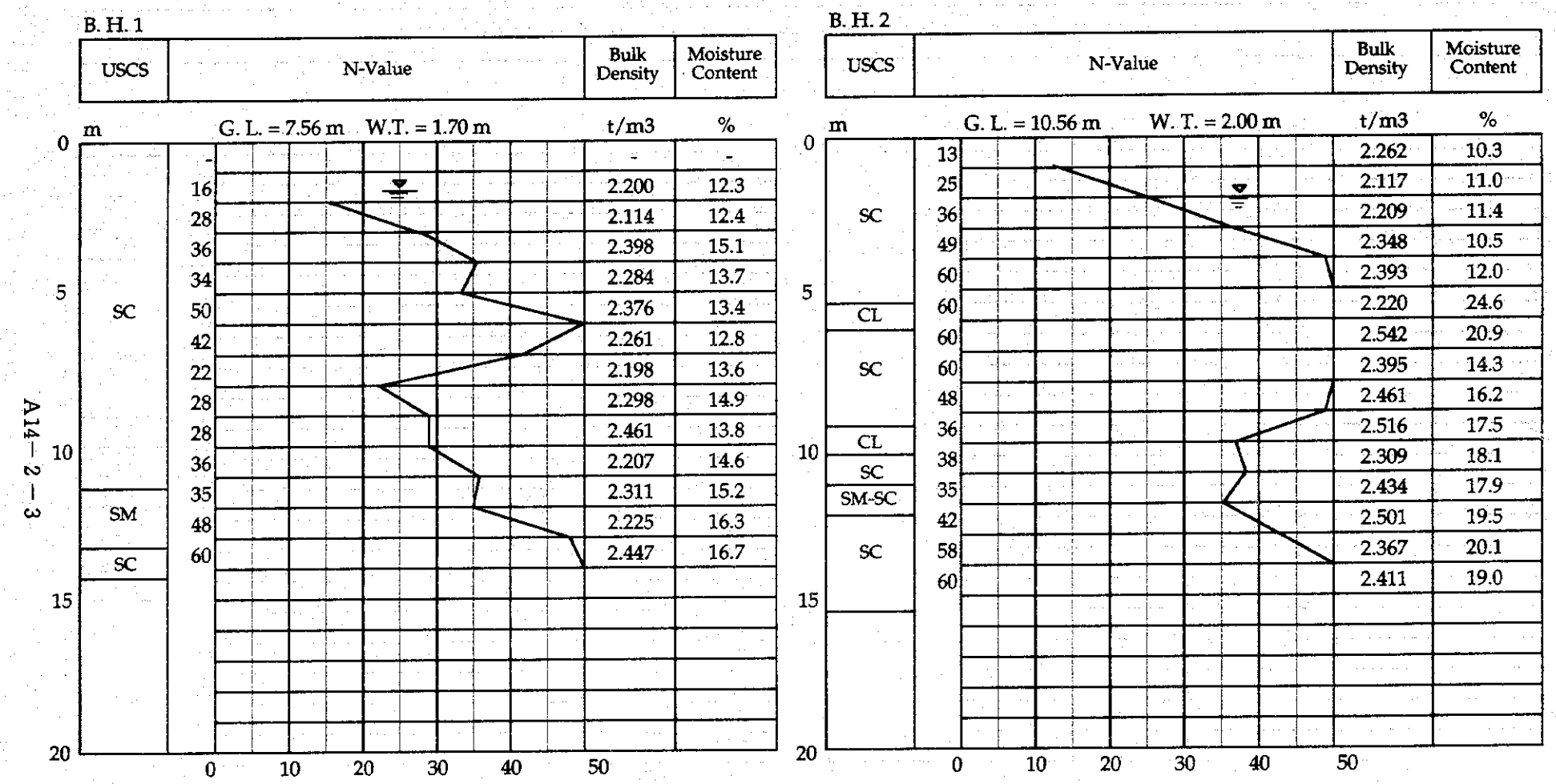
0 10 20 30 40 50

B. H. 2

USCS	N-Value	Bulk Density	Moisture Content
m	G. L. = 5.52 m W.T. = 2.50 m	t/m3	%
SW	0	2.163	11.2
	0	2.306	14.3
SC	4	2.182	15.1
SM	5	2.297	15.7
SW-SM	7	2.301	17.6
SW	6	2.287	19.1
	7	2.452	21.8
SM	12	2.317	19.8
	24	2.501	14.5
SC	13	2.246	15.8
	6	2.204	16.9
SM	9	2.412	16.7
	17	2.573	18.2
SW-SM	18	2.331	15.3
	21	2.210	21.4
	22	2.440	18.7
SM	27	2.351	21.9
	25	2.267	18.0
	27	2.409	22.1
	26	2.380	22.8

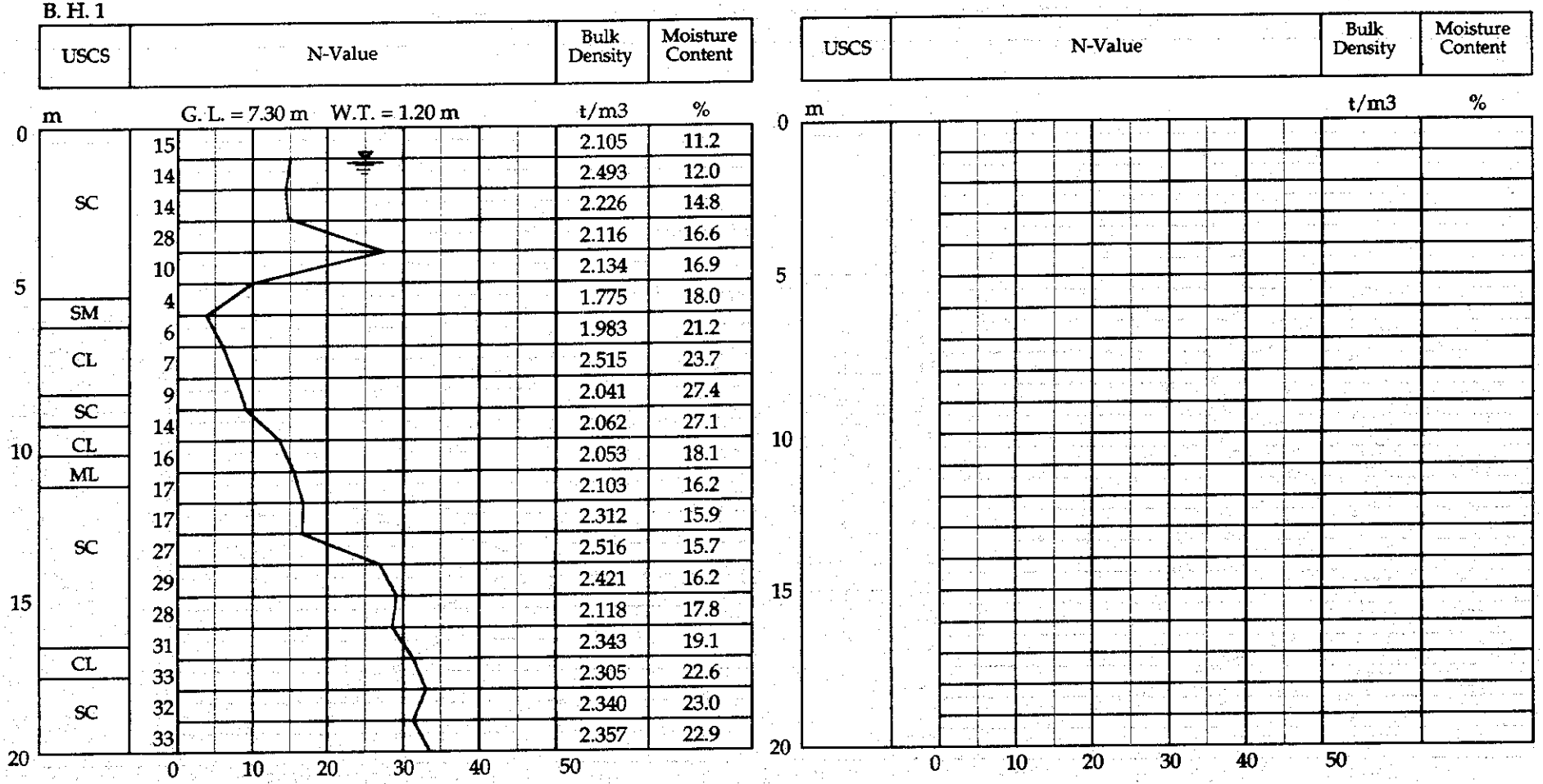
0 10 20 30 40 50

Appendix-14.2 (2) Subsoil Investigation Results at Gerezani Bridge (Location No. 2)

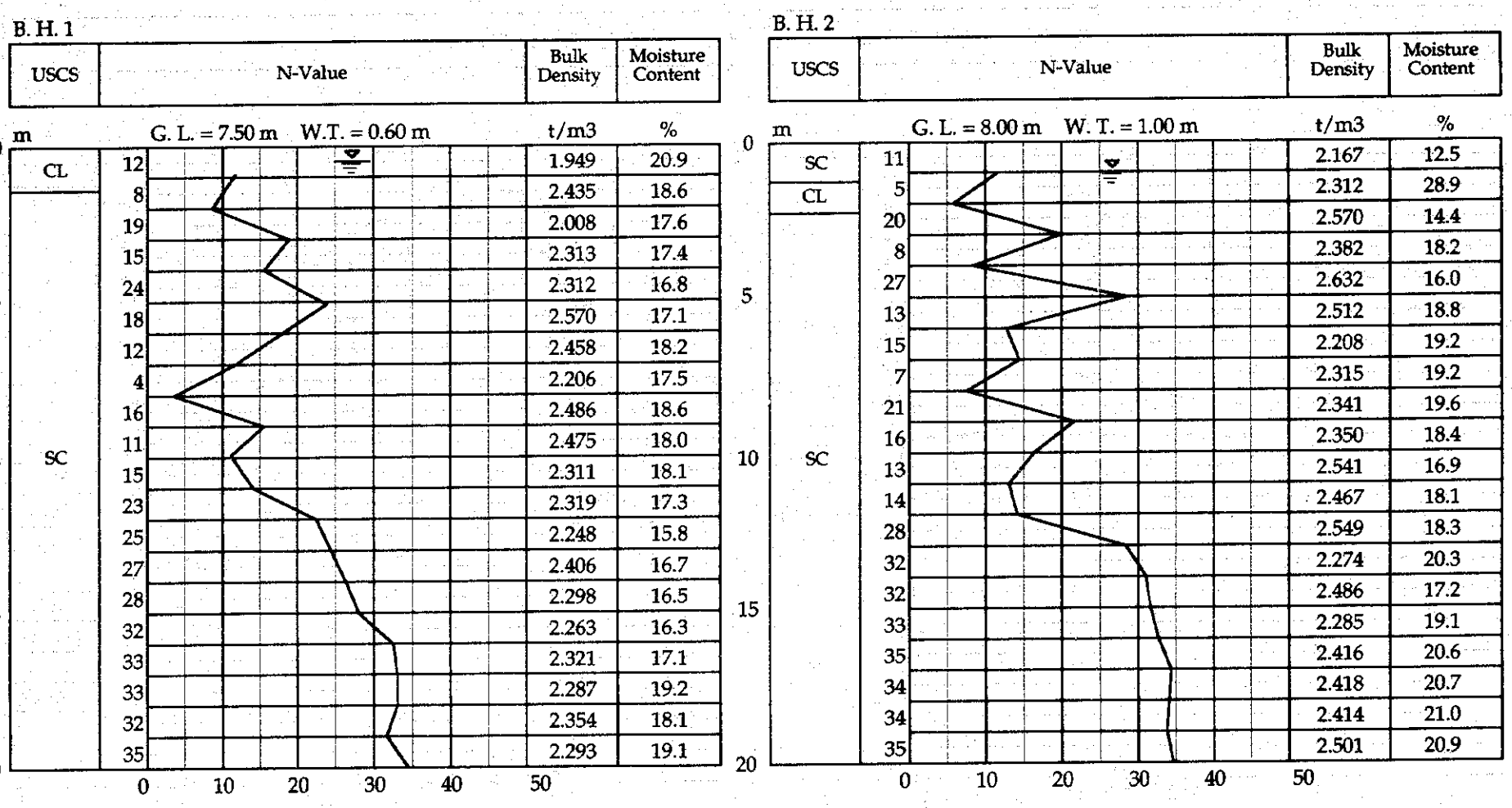


Appendix-14.2 (3) Subsoil Investigation Results at Bandari Bridge (Location No. 3)

B. H. 1



Appendix-14.2 (4) Subsoil Investigation Results at First Msimbazi C-Box (Location No. 4)



Appendix-14.2 (5) Subsoil Investigation Results at Second Ubungo C-Box (Location No. 5)

B. H. 1

G. L. = 3.68 m　W.T. = 0.25 m

m	USCS	N-Value	Bulk Density t/m3	Moisture Content %
0	SC	5	2.006	19.0
		4	1.977	24.0
	SW-SM	4	2.053	12.0
	SW	10	2.070	21.0
5	SW-SM	10	2.117	20.0
	SW	2	1.968	19.0
	SC	2	1.982	24.0
		3	1.967	29.0
	CL	4	2.406	39.0
	CH	3	2.517	39.0
10		5	2.094	22.0
	SC	8	2.129	20.0
		17	2.540	17.0
		28	2.549	16.0
		25	2.569	17.0
15		21	2.607	18.0
		24	2.212	15.0
		30	2.310	18.0
		> 50	2.405	19.0
20				

0　10　20　30　40　50

B. H. 2

G. L. = 3.70 m　W. T. = 0.75 m

m	USCS	N-Value	Bulk Density t/m3	Moisture Content %
0	SC	10	2.066	16.0
		2	2.024	17.0
		4	1.943	19.0
		1	1.960	18.0
5		2	2.075	20.0
		0	1.982	19.0
		2	1.979	20.0
	SW-SM	2	1.812	23.0
	SC	9	1.587	23.0
	CH	6	1.700	22.0
10		5	1.793	29.0
	SC	40	2.235	18.0
		22	2.139	20.0
		15	2.065	17.0
		23	2.111	22.0
15		22	2.118	20.0
		22	2.230	21.0
		27	2.019	23.0
		29	2.140	19.0
		29	2.135	20.0
20				

0　10　20　30　40　50

Appendix-14.2 (6)　Subsoil Investigation Results at Sinza C-Box (Location No. 6)

B. H. 1

USCS	N-Value	Bulk Density	Moisture Content
	G. L. = 17.73 m W.T. = 3.94 m	t/m3	%
SW	9	2.019	4.9
	10	2.236	5.9
SW-SM	14	2.134	6.5
	14	2.341	16.9
SW	14	2.544	17.2
SM	14	2.736	14.0
	13	2.726	20.0
SW-SM	24	2.584	18.3
	29	2.495	15.5
SM	34	2.670	15.2
	44	2.624	19.7
SW-SM	45	2.586	17.8
	53	2.498	18.6
SM	60	2.572	16.4

m: 0, 5, 10, 15, 20

N-Value: 0, 10, 20, 30, 40, 50

USCS	N-Value	Bulk Density	Moisture Content
		t/m3	%

m: 0, 5, 10, 15, 20

N-Value: 0, 10, 20, 30, 40, 50

A14－2－7

Appendix-14.2 (7) Subsoil Investigation Results at Ilala Bridge (Location No. 7)

Appendix 14.3: Detailed Test Results of Soil Investigation at Proposed Structures

Location No.		No. 1																		
Borehole No.		BH1																		
Depth (m)		2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0						
Gradation % passing	76 mm																			
	38 mm																			
	19 mm													100						
	9.5 mm													99						
	4.76 mm			100							100	100	100	92						
	2.36 mm	100	100	99	100	100	100	100	100	100	55	90	91	84						
	1.18 mm	96	97	96	99	100	98	99	99	99	49	82	86	79						
	0.6 mm	81	78	88	98	99	95	90	96	94	44	66	75	73						
	0.425 mm	64	59	79	97	97	91	76	89	88	41	58	69	69						
	0.3 mm	47	41	71	95	94	87	62	80	80	39	52	64	64						
	0.212 mm	34	26	65	89	76	80	53	74	75	35	47	60	56						
	0.15 mm	28	22	62	73	64	68	50	71	60	31	43	54	53						
	0.075 mm	23	19	60	30	28	47	40	63	41	24	36	45	42						
Atterberg Limits	L.L.	28	34	35	31	34	41	37	30	22	21	33	19	25						
	P.L.	12	14	12	13	18	16	15	14	12	10	12	8	13						
	P.I.	17	20	23	18	17	25	22	17	11	11	21	11	12						

Location No.		No. 1																		
Borehole No.		BH2																		
Depth (m)		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0					
Gradation % passing	76 mm																			
	38 mm																			
	19 mm																			
	9.5 mm																			
	4.76 mm			100	100		100				100			100	100					
	2.36 mm	100	100	97	99	100	99	100	100	100	96	100	100	99	55					
	1.18 mm	97	96	81	97	99	97	98	98	94	87	98	97	97	48					
	0.6 mm	75	78	61	82	97	90	98	90	78	67	84	77	77	38					
	0.425 mm	56	60	43	59	93	81	98	85	67	48	67	59	56	33					
	0.3 mm	40	46	28	33	91	73	98	79	53	29	54	41	30	78					
	0.212 mm	26	32	15	13	88	60	96	69	35	19	41	26	15	23					
	0.15 mm	17	23	9	11	80	54	89	54	23	15	29	22	12	22					
	0.075 mm	8	12	4	8	41	29	56	13	14	9	13	10	8	19					
Atterberg Limits	L.L.	NP	22	NP	33	34	37	36	52	49	NP	34	22	28	20					
	P.L.	NP	17	NP	15	14	16	16	18	15	NP	14	13	13	16					
	P.I.	NP	5	NP	18	21	22	20	34	34	NP	20	8	15	4					

Location No.		No. 2																		
Borehole No.		BH1																		
Depth (m)		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
Gradation % passing	76 mm																				
	38 mm																				
	19 mm																				
	9.5 mm																				
	4.76 mm			100	100	100							100	100			100	100			100
	2.36 mm	100	100	99	99	99	100	100	100	100	100	100	99	99	100	100	99	99	100	100	99
	1.18 mm	99	97	93	97	94	99	99	98	98	99	98	96	94	99	97	96	96	94	97	96
	0.6 mm	74	80	73	82	71	86	90	84	83	79	84	69	77	92	85	69	69	77	85	93
	0.425 mm	48	62	54	59	53	75	76	67	68	59	67	50	60	84	71	49	51	62	68	73
	0.3 mm	27	47	37	33	37	67	62	52	56	45	54	33	46	76	47	33	34	48	56	49
	0.212 mm	10	30	21	13	22	60	43	36	45	28	41	19	31	68	21	18	19	31	44	34
	0.15 mm	7	20	12	10	19	58	35	24	32	22	29	16	28	62	13	15	15	29	32	31
	0.075 mm	3	12	8	8	13	56	15	8	13	5	13	10	22	56	10	8	8	23	22	25
Atterberg Limits	L.L.	22	22	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
	P.L.	16	18	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
	P.I.	6	4	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP

Location No.		No. 2																		
Borehole No.		BH2																		
Depth (m)		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
Gradation % passing	76 mm																				
	38 mm																				
	19 mm																				
	9.5 mm																				
	4.76 mm	100				100			100				100				100	100	100		
	2.36 mm	96	100	100	100	98	100	100	96	100	100	100	99	100	100	100	98	99	99	100	100
	1.18 mm	95	99	99	99	96	96	99	87	96	99	99	97	99	97	98	94	94	94	99	99
	0.6 mm	84	87	91	79	67	70	78	67	70	86	89	87	96	66	80	81	81	81	99	89
	0.425 mm	67	70	79	57	45	38	55	48	48	69	70	76	76	41	63	74	72	72	96	76
	0.3 mm	52	59	70	43	26	24	35	29	35	54	55	65	60	26	48	68	61	61	60	60
	0.212 mm	32	43	55	29	12	11	17	17	25	39	40	51	37	14	31	65	56	56	37	36
	0.15 mm	27	30	44	21	9	5	16	15	18	35	36	39	32	11	27	61	48	49	32	32
	0.075 mm	18	18	31	13	4	1	10	9	9	22	22	24	20	6	19	58	46	44	20	20
Atterberg Limits	L.L.	NP	NP	25	NP	NP	NP	NP	NP	24	25	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
	P.L.	NP	NP	11	NP	NP	NP	NP	NP	18	12	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
	P.I.	NP	NP	14	NP	NP	NP	NP	NP	6	13	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP

Location No.		No. 3																			
Borehole No.		BH1																			
Depth (m)		2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0							
Gradation % passing	76 mm																				
	38 mm																				
	19 mm											100									
	9.5 mm									100	100	82									
	4.76 mm				100	100		100	100	99	93	73	100	100							
	2.36 mm	100	100	100	98	98	100	97	98	96	84	68	99	99							
	1.18 mm	98	97	98	89	89	98	91	83	87	79	59	91	89							
	0.6 mm	74	76	75	64	66	87	63	51	61	73	46	69	60							
	0.425 mm	55	57	55	44	44	77	44	36	47	69	39	47	52							
	0.3 mm	40	45	41	33	33	69	30	29	38	64	33	33	50							
	0.212 mm	28	37	32	27	26	62	17	23	29	56	28	26	50							
	0.15 mm	26	32	30	24	23	56	16	18	26	53	21	23	49							
	0.075 mm	18	22	23	20	18	19	15	11	17	42	18	18	49							
Atterberg Limits	L.L.	24	25	31	34	39	34	35	29	28	31	NP	NP	53							
	P.L.	9	11	9	12	13	11	9	12	10	13	NP	NP	17							
	P.I.	15	14	22	22	26	19	26	8	19	18	NP	NP	37							

Location No.		No. 3																			
Borehole No.		BH2																			
Depth (m)		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0					
Gradation % passing	76 mm																				
	38 mm																				
	19 mm																				
	9.5 mm																				
	4.76 mm				100	100				100		100	100			100					
	2.36 mm	100	100	100	99	99	100	100	100	99	100	99	99	100	100	99					
	1.18 mm	99	96	99	91	95	98	98	96	96	99	94	94	98	98	93					
	0.6 mm	80	75	79	67	73	92	91	70	83	97	79	76	89	84	73					
	0.425 mm	61	56	61	44	52	88	82	51	76	93	65	61	79	71	56					
	0.3 mm	45	42	44	33	37	83	76	36	70	89	56	50	70	59	40					
	0.212 mm	31	32	31	26	28	79	70	24	60	81	50	41	60	46	32					
	0.15 mm	28	26	28	22	26	73	65	21	56	78	45	34	53	43	28					
	0.075 mm	19	17	20	17	21	59	49	15	40	60	27	26	44	36	20					
Atterberg Limits	L.L.	25	24	25	29	33	23	25	29	34	34	25	22	29	49	40					
	P.L.	11	12	11	12	16	10	12	12	9	9	16	16	13	14	13					
	P.I.	14	13	13	18	17	14	13	17	26	26	10	6	16	36	17					

Location No.		No. 4																			
Borehole No.		BH1																			
Depth (m)		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
Gradation % passing	76 mm																				
	38 mm																				
	19 mm																				
	9.5 mm																				
	4.76 mm		100				100			100											
	2.36 mm	100	99	100	100	100	98	100	100	97	100	100	100	100	100	100	100	100	100	100	100
	1.18 mm	96	96	99	98	98	90	99	98	95	99	99	99	98	99	97	99	99	99	99	99
	0.6 mm	75	82	96	92	87	68	97	88	84	93	93	90	86	94	86	88	84	97	88	83
	0.425 mm	55	64	86	82	77	49	93	77	70	85	87	77	74	85	69	77	69	93	74	69
	0.3 mm	38	56	78	72	69	36	90	70	57	81	81	66	64	71	59	68	58	86	63	58
	0.212 mm	27	30	65	59	59	25	86	67	42	76	78	56	53	61	49	58	52	73	53	52
	0.15 mm	22	27	61	55	49	18	79	65	39	71	75	53	45	46	41	52	51	67	50	51
	0.075 mm	17	21	48	43	35	11	60	63	30	60	73	43	35	36	31	49	51	48	40	50
Atterberg Limits	L.L.	34	52	36	28	34	NP	36	42	28	28	34	29	28	25	33	33	36	53	35	50
	P.L.	14	15	16	12	17	NP	14	17	15	15	8	13	10	8	14	13	14	13	16	17
	P.I.	20	37	20	16	17	NP	23	25	14	13	26	15	17	17	19	20	23	39	18	33

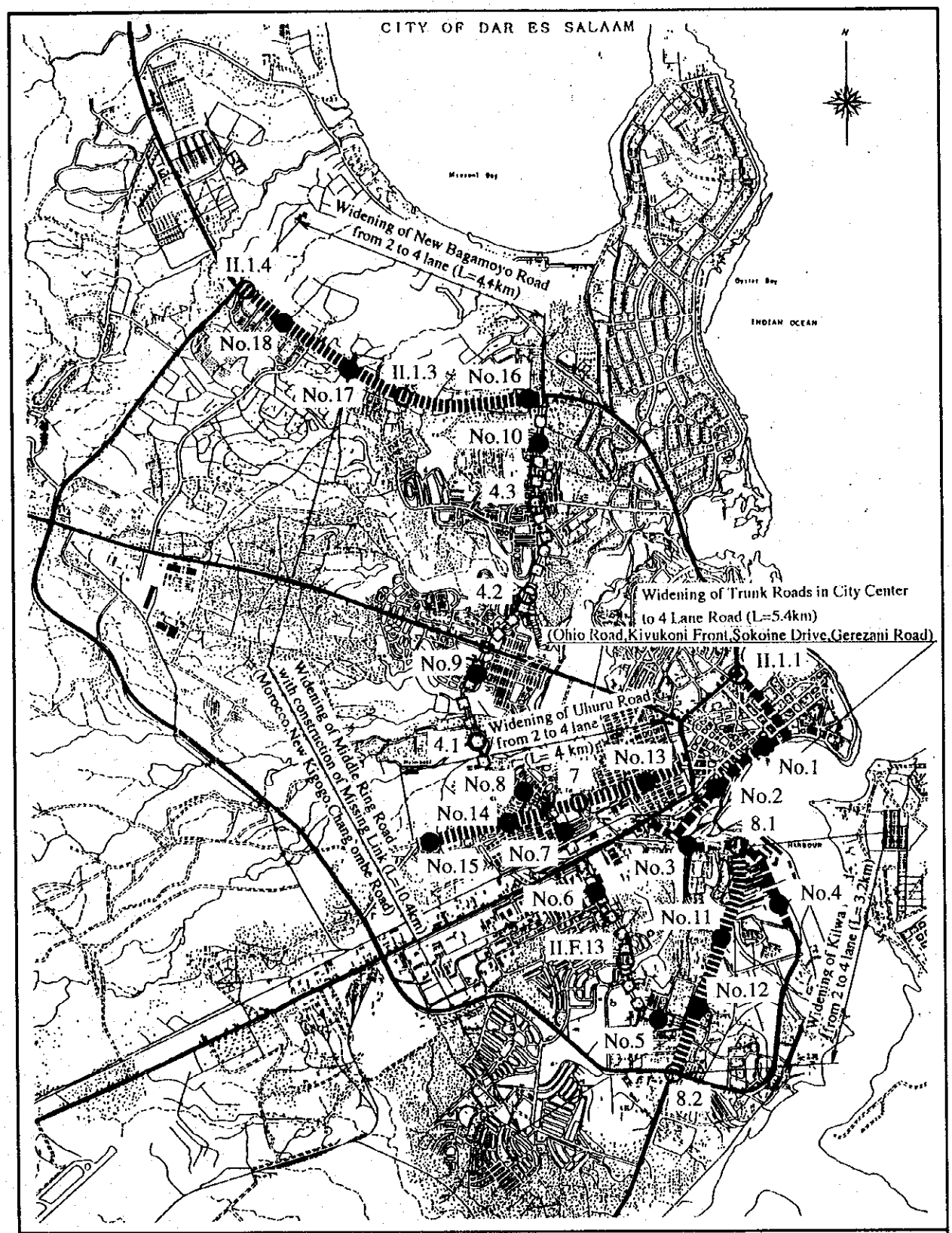
Location No.		No. 5																			
Borehole No.		BH1																			
Depth (m)		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
Gradation % passing	76 mm																				
	38 mm																				
	19 mm																				
	9.5 mm																				
	4.76 mm	100	100	100	100						100										
	2.36 mm	96	99	99	99	100	100	100	100	100	99	100	100	100	100	100	100	100	100	100	100
	1.18 mm	94	98	98	97	95	97	98	95	98	94	97	98	97	96	98	98	98	98	99	100
	0.6 mm	91	88	87	78	78	79	81	72	80	73	78	82	83	81	82	90	84	91	93	99
	0.425 mm	89	76	75	59	60	60	65	58	64	52	64	68	70	67	66	78	72	84	87	98
	0.3 mm	85	66	62	42	47	44	44	49	50	41	51	55	59	57	57	65	60	76	81	96
	0.212 mm	80	57	47	29	34	29	28	42	37	31	37	41	48	46	37	47	45	66	71	89
	0.15 mm	73	55	34	27	27	27	25	38	29	25	35	37	39	41	34	43	41	55	61	77
	0.075 mm	63	49	26	23	22	22	20	32	22	20	26	29	29	32	27	33	32	40	42	49
Atterberg Limits	L.L.	34	55	40	40	37	37	33	37	28	33	37	34	29	35	21	32	24	30	27	29
	P.L.	14	14	12	14	14	13	12	11	12	15	12	13	11	19	10	13	12	14	13	12
	P.I.	20	41	28	26	23	24	22	26	16	17	25	22	18	16	11	19	12	16	15	17

Location No.		No. 5																			
Borehole No.		BH2																			
Depth (m)		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
Gradation % passing	76 mm																				
	38 mm																				
	19 mm																				
	9.5 mm																				
	4.76 mm																				
	2.36 mm	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	1.18 mm	98	98	95	94	96	98	97	95	98	95	97	99	98	96	98	98	98	98	98	98
	0.6 mm	84	89	74	74	82	89	83	75	85	80	85	95	90	79	76	81	92	92	93	92
	0.425 mm	71	78	56	54	67	77	67	57	71	65	71	88	81	63	61	65	85	85	86	86
	0.3 mm	58	71	44	40	55	64	53	42	57	51	59	78	70	49	50	44	75	76	76	76
	0.212 mm	43	66	35	30	44	50	38	30	44	38	49	58	57	37	41	27	62	62	62	64
	0.15 mm	39	63	30	25	38	39	29	24	34	30	42	51	42	29	34	25	49	49	50	49
	0.075 mm	32	59	26	20	31	28	21	19	20	22	35	34	30	23	26	20	32	31	33	34
Atterberg Limits	L.L.	31	53	39	31	30	25	24	25	25	29	34	32	28	26	28	28	31	32	25	31
	P.L.	15	19	15	14	13	19	18	13	11	14	16	13	13	13	14	12	19	21	11	12
	P.I.	15	35	24	17	17	6	6	12	14	15	10	19	15	13	14	15	12	11	14	19

Location No.		No. 6																			
Borehole No.		BH1																			
Depth (m)		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
Gradation % passing	76 mm																				
	38 mm																				
	19 mm																				
	9.5 mm																				
	4.76 mm				100	100	100	100	100		100	100	100	100	100		100	100	100		
	2.36 mm	100	100	100	99	98	98	99	99	100	99	99	99	97	97	100	94	99	99	100	
	1.18 mm	99	99	97	98	97	94	98	98	98	97	97	96	89	95	95	92	93	96	99	
	0.6 mm	81	75	80	75	74	74	86	88	93	89	85	86	71	83	76	83	79	80	96	
	0.425 mm	64	55	59	52	51	49	71	76	89	81	74	74	58	72	58	75	66	69	80	
	0.3 mm	47	49	38	46	45	31	54	62	86	73	62	64	49	59	47	65	53	56	69	
	0.212 mm	40	26	19	20	22	17	44	52	83	65	54	54	42	50	36	36	39	46	56	
	0.15 mm	32	17	10	9	13	10	32	38	80	59	44	47	37	38	29	43	31	36	46	
	0.075 mm	27	14	6	4	11	7	25	28	78	54	35	41	31	29	23	32	24	29	29	
Atterberg Limits	L.L.	37	26	26	24	20	NP	30	31	40	66	53	46	45	45	38	41	43	45	38	
	P.L.	15	12	14	21	18	NP	13	15	21	27	13	17	17	17	16	12	17	11	14	
	P.I.	22	14	13	3	3	NP	17	16	18	39	39	29	28	28	21	29	26	34	24	

Location No.		No. 6																			
Borehole No.		BH2																			
Depth (m)		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
Gradation % passing	76 mm																				
	38 mm																				
	19 mm																				
	9.5 mm																				
	4.76 mm	100	100	100	100	100	100	100	100						100						100
	2.36 mm	99	99	99	99	98	98	99	99	100	100	100	100	100	99	100	100	100	100	100	100
	1.18 mm	93	95	97	95	93	93	97	95	96	95	97	97	96	95	99	98	97	96	95	96
	0.6 mm	70	81	76	75	74	75	90	74	76	79	87	82	82	79	94	88	88	81	81	82
	0.425 mm	51	67	52	55	56	56	78	52	59	62	78	66	68	64	87	76	74	68	67	68
	0.3 mm	37	57	36	40	43	42	68	30	48	51	70	50	55	49	78	62	59	55	57	56
	0.212 mm	25	49	24	28	32	30	57	16	42	43	63	35	43	36	66	47	43	49	46	43
	0.15 mm	19	44	23	21	24	33	46	14	40	40	60	25	34	26	53	35	31	45	37	35
	0.075 mm	15	41	19	16	16	17	32	11	39	38	58	17	27	18	39	25	22	40	28	27
Atterberg Limits	L.L.	26	26	28	27	28	28	37	32	29	37	68	36	31	29	30	26	28	31	29	42
	P.L.	14	14	15	16	18	16	15	16	16	15	21	13	15	12	13	14	14	14	14	13
	P.I.	12	12	13	11	10	12	21	15	13	22	47	23	15	17	17	13	14	17	15	29

Location No.		No. 7																			
Borehole No.		BH1																			
Depth (m)		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0						
Gradation % passing	76 mm																				
	38 mm																				
	19 mm																				
	9.5 mm																				
	4.76 mm						100	100			100	100		100							
	2.36 mm	100	100	100	100	100	99	99	100	100	99	98	100	99	100						
	1.18 mm	98	97	98	98	97	90	90	96	80	86	83	96	86	94						
	0.6 mm	77	75	80	79	77	73	79	65	49	61	31	77	50	82						
	0.425 mm	50	58	61	60	57	58	59	37	29	41	21	59	20	68						
	0.3 mm	31	43	45	42	39	46	47	24	20	33	7	43	18	54						
	0.212 mm	17	15	29	26	23	34	26	18	16	28	6	28	13	40						
	0.15 mm	8	5	17	15	12	26	19	14	13	25	5	18	10	27						
	0.075 mm	3	3	8	6	4	20	12	11	10	22	5	10	7	17						
Atterberg Limits	L.L.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP						
	P.L.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP						
	P.I.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP						



THE STUDY ON DAR ES SALAAM ROAD DEVELOPMENT PLAN	No.--- Test-pits in this Study
Appendix-14.4 Location of the Subsoil Investigation	Other marks Test-pits in previous study

Appendix 14.5: Detailed Test Results of Subsoil Investigation on High Priority Project Roads

Test-pit No.		No. 1		No. 2		No. 3		No. 4		No. 5		No. 6		No. 7		No. 8		No. 9		No. 10	
Sample No.		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Specific Gravity		2.629	2.638	2.657	2.628	2.586	2.581	2.617	2.640	2.656	2.622	2.622	2.637	2.648	2.639	2.645	2.633	2.639	2.645	2.507	2.498
Gradation % passing	76 mm																				
	38 mm																				
	19 mm																				
	9.5 mm																				
	4.76 mm					100	100														
	2.36 mm	100	100	100		99	99			100			100	100	100	100	100	100	100	100	100
	1.18 mm	99	99	99	100	93	96	100	100	99	100	100	99	99	99	98	98	99	98	98	98
	0.6 mm	82	81	78	78	70	71	76	73	76	76	72	78	76	78	80	78	77	75	87	86
	0.425 mm	58	58	55	58	55	56	47	46	46	48	39	51	44	50	52	51	48	45	75	74
	0.3 mm	41	40	40	51	45	52	40	39	30	30	13	29	25	30	36	34	32	29	65	64
	0.212 mm	27	21	28	31	34	33	19	20	19	22	1	14	12	15	24	22	22	19	55	55
	0.15 mm	16	10	18	18	27	23	12	13	10	12	1	8	4	7	15	14	14	12	47	47
	0.075 mm	6	5	6	8	16	15	9	10	2	5	0	3	0	2	8	7	8	6	39	39
Atterberg Limits	L.L.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	55	54
	P.L.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	24	19
	P.I.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	31	36
Natural Moisture Content (%)		4.2	3.3	2.3	2.7	6.8	6.5	6.7	6.8	3.7	3.7	4.1	4.4	3.1	3.2	3.7	3.2	1.9	2.3	21.8	23.0
Compaction	M.D.D. (t/m3)	1.825	1.818	1.889	1.878	1.930	1.925	1.695	1.718	1.858	1.875	1.674	1.836	1.814	1.750	1.724	1.718	1.818	1.841	1.881	1.920
	O.M.C. (%)	10.6	12.0	13.0	10.5	9.0	8.0	10.0	12.0	11.0	11.6	14.0	13.0	13.0	9.0	9.0	7.0	13.0	12.0	10.0	12.0
CBR	M.D.D. (t/m3)	1.734	1.727	1.795	1.784	1.834	1.829	1.610	1.632	1.765	1.658	1.590	1.744	1.723	1.663	1.638	1.632	1.727	1.749	1.787	1.824
	4-days Soaked (%)	7	10	5	6	17	12	5	7	12	16	8	7	11	8	4	5	10	12	2	5

Test-pit No.		No. 11		No. 12		No. 13		No. 14		No. 15		No. 16		No. 17		No. 18					
Sample No.		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2				
Specific Gravity		2.634	2.657	2.633	2.633	2.632	2.637	2.655	2.654	2.556	2.547	2.527	2.569	2.578	2.605	2.569	2.558				
Gradation % passing	76 mm																				
	38 mm																				
	19 mm																				
	9.5 mm																				
	4.76 mm																				
	2.36 mm	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100				
	1.18 mm	99	97	99	99	99	98	97	99	97	99	98	98	99	99	98	98				
	0.6 mm	78	77	81	82	64	68	68	69	75	75	84	84	73	75	82	81				
	0.425 mm	58	57	57	59	35	37	35	36	55	56	70	70	55	57	63	61				
	0.3 mm	51	38	38	51	20	24	17	13	42	40	59	58	42	44	50	47				
	0.212 mm	26	23	20	21	15	15	8	7	32	34	47	47	36	37	40	37				
	0.15 mm	15	14	10	8	9	10	5	4	27	27	38	38	28	29	33	31				
	0.075 mm	11	7	5	5	5	5	3	2	22	23	27	27	21	20	27	25				
Atterberg Limits	L.L.	NP	NP	NP	NP	NP	NP	NP	NP	29	29	30	32	29	27	35	35				
	P.L.	NP	NP	NP	NP	NP	NP	NP	NP	14	15	10	14	14	18	18	15				
	P.I.	NP	NP	NP	NP	NP	NP	NP	NP	15	14	20	17	15	9	17	20				
Natural Moisture Content (%)		6	5.6	4.7	4.8	3.7	4.6	2.8	3	11	10.9	10.6	10.2	11.3	11.1	18.2	17.2				
Compaction	M.D.D. (t/m3)	1.847	1.680	1.739	1.660	1.862	1.714	1.552	1.578	1.910	1.878	1.830	1.830	1.850	1.844	1.850	1.870				
	O.M.C. (%)	12.0	11.0	9.0	10.0	14.0	14.0	9.0	10.0	9.0	10.0	11.0	10.0	10.0	9.6	9.0	12.0				
CBR	M.D.D. (t/m3)	1.755	1.596	1.652	1.577	1.769	1.628	1.474	1.499	1.815	1.784	1.739	1.739	1.758	1.752	1.758	1.777				
	4-days Soaked (%)	10	7	7	3	9	6	4	5	3	3	3	3	9	10	2	3				

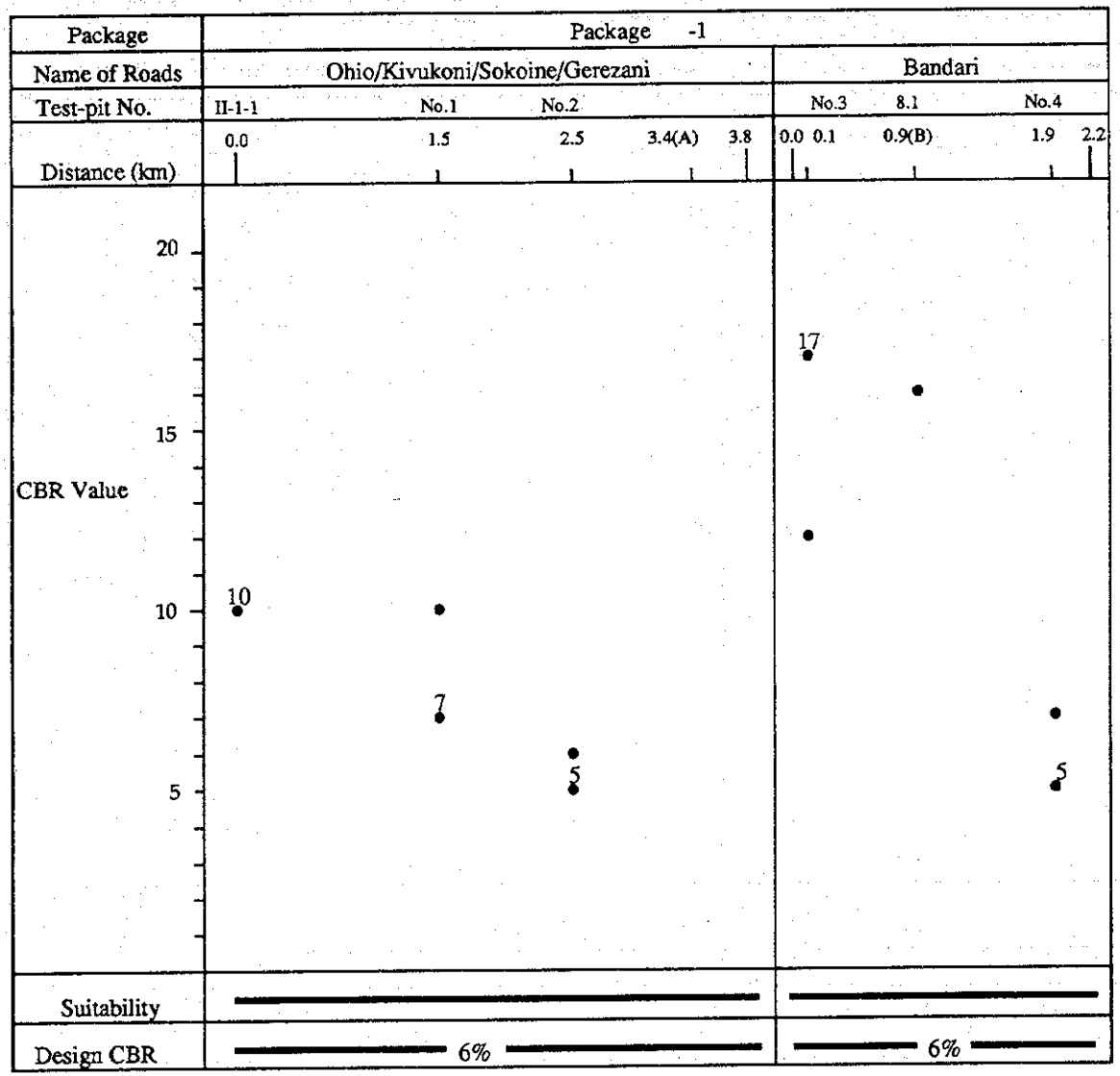
Appendix-14.6 Estimation of Effective Thickness of Project Roads

Project Roads	Caurse		Existing Pavement Thickness							Estimated Existing Thickness	Conver-sion Factor	Effective Thickness	Remarks
Ohio/Kivukoni/ Sokoine	Surface Base	No. 1	9.0 27.5							9.0 cm 27.5 cm	0.8 0.4	7 cm 11 cm	
Gerezani	Surface Base	No. 2	9.0 18.0							9.0 cm 18.0 cm	0.8 0.4	7 cm 7 cm	
Bandari	Surface Base	No. 3	5.0 27.0	No. 4	7.0 18.0					5.0 cm 18.0 cm	0.8 0.4	4 cm 7 cm	
Chang'ombe	Surface Base	No. 5	4.0 34.0	No. 6	6.0 27.0	No. 7	5.0 17.0			5.0 cm 26.0 cm	0.8 0.4	4 cm 10 cm	
New Kigogo	Surface Base	No. 8	7.0 10.0	No. 9	6.0 28.0					6.0 cm 10.0 cm	0.8 0.4	5 cm 4 cm	
Morocco	Surface Base	No.10	9.0 16.5							9.0 cm 16.5 cm	0.8 0.4	7 cm 7 cm	
Kilwa	Surface Base	No.11	6.0 14.0	No.12	8.0 15.0					6.0 cm 14.0 cm	0.8 0.4	5 cm 6 cm	
Uhuru	Surface Base	No.13	6.0 30.0	No.14	6.0 16.0	No.15	8.0 27.0			6.0 cm 24.0 cm	0.8 0.4	5 cm 10 cm	
New Bagamoyo	Surface Base	No. 16	10.0 20.0	No.17	8.0 15.0	No.18	8.0 15.0			9.0 cm 17.0 cm	0.8 0.4	7 cm 7 cm	

Appendix-14.7 Laboratory Test Results of Aggregate taken at Quarry Sites

	Specific Gravity	Water Absorption	Los Angeles Absorption	Aggregate Impact Value	Aggregate Crushing Value	Fine Modulus
Melela	2.9	0.40%	40.00%	-	-	
Kitumbi	2.7	0.40%	29.00%	-	-	
Lugoba (Mindutriani)	2.8	0.30%	26.00%	17.00%	21.00%	
Kigamboni (Mjimwema)	2.5	2.04%	35.40%	23.60%	26.40%	
Mpiji	2.6	0.28%	-	-	-	2.86/3.06/2.96
Kunduchi	2.4/2.6	0.8%/1.0%	46%/37%	-	-	
Quality Requirement per Manual for Pavement by Japan Road Association	Min.=2.45	Max. 3.0	Max. = 30 for surface while Max.=50 for Base	-	-	
Quality Requirement per B.S. for Hot Mix of Asphalt	Min.=2.59	Max.=3.0		Strong 10-20% Satisfactory 30%	Not exceeding 30% (for surface) & 35% (for base)	
Quality Requirement per JIS						2.3 - 3.5 for Cement Concrete

Appendix-14.8 (1) Summary of Subsoil Conditions

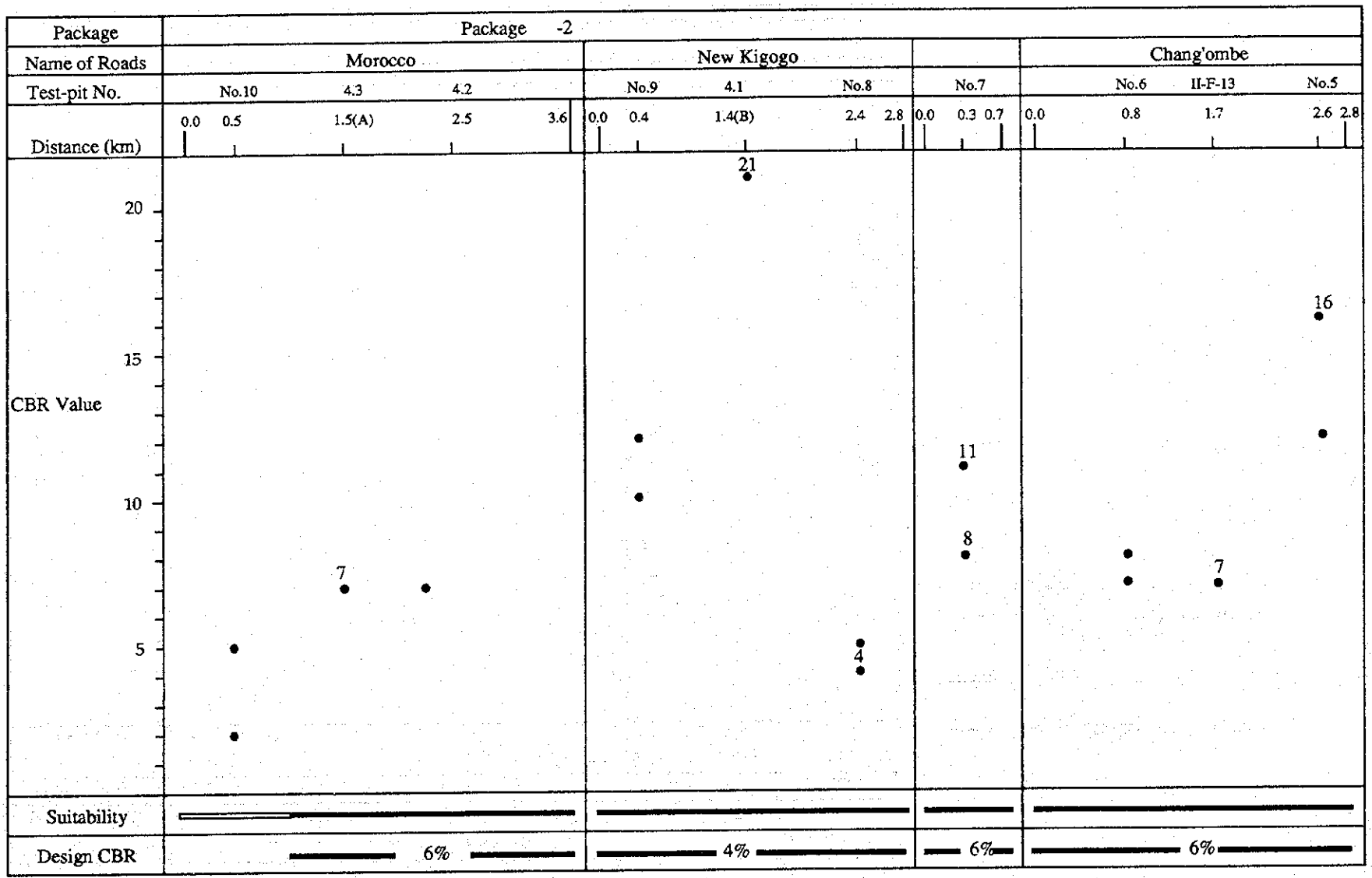


Notes:

- Excellent to Good as Subgrade
- Fair to Poor as Subgrade

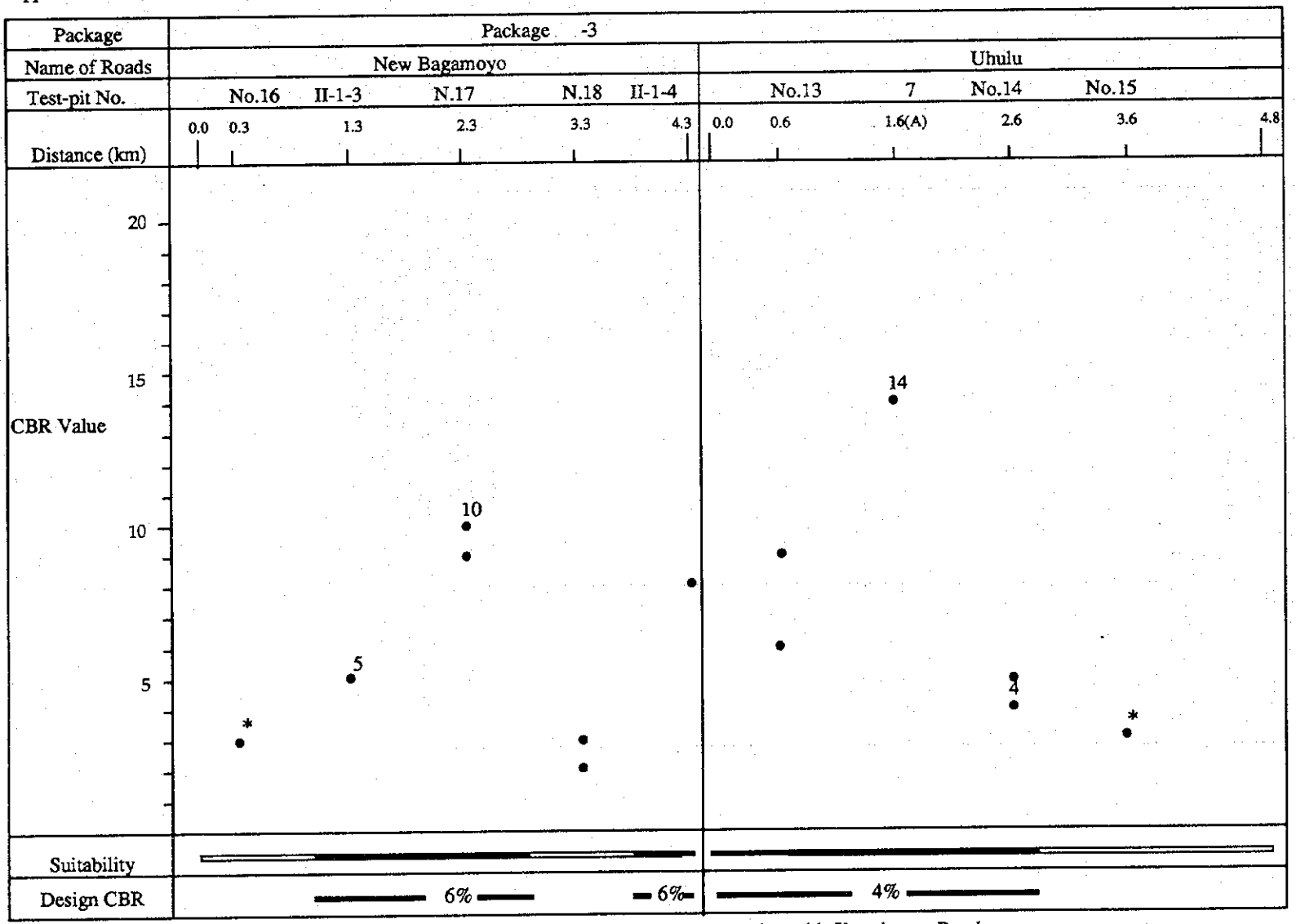
(A) Intersection with Bandari Road
(B) Intersection with Kilwa Road

Appendix-14.8 (2) Summary of Subsoil Conditions



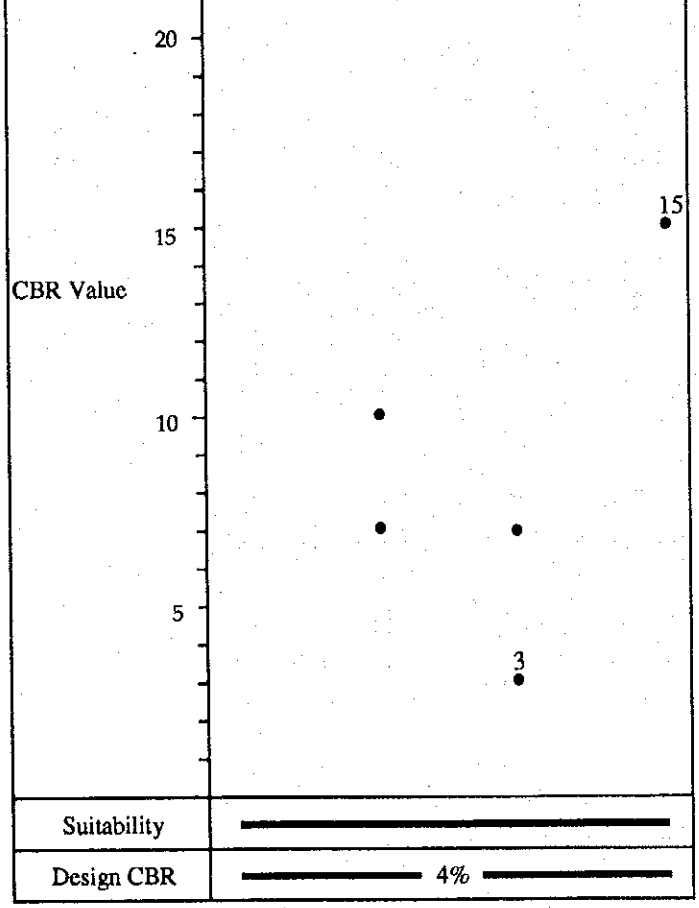
Notes:
- Excellent to Good as Subgrade
- Fair to Poor as Subgrade
- (A) Intersection with Kinondoni Road
- (B) Crossing point with Msimbazi River

Appendix-14.8 (3) Summary of Subsoil Conditions



Appendix-14.8 (4) Summary of Subsoil Conditions

Package	Package -3
Name of Roads	Kilwa
Test-pit No.	No.11 No.12 8.2
Distance (km)	0.0 1.0 2.0 3.1



Notes: Excellent to Good as Subgrade
Fair to Poor as Subgrade

Appendix-14.9 Determination of Design CBR Value

Name of Roads	Average CBR Value	Maximum CBR Value	Minimum CBR Value	Values of C	Section CBR	Design CBR
Ohio/Kiunkoni/Sokoine/Gerezani	7.6	10	5	2.48	6	6
Bandari	11.4	17	5	2.48	7	6
Morocco	7.0	7	7	1.41	7	6
New Kigogo	10.4	21	4	2.48	4	4
Missing Link	9.5	11	8	1.41	7	6
Chang'ombe	10.0	16	7	2.48	6	6
New Bagamoyo	8.0	10	5	2.24	6	6
Uhulu	7.6	14	4	2.48	4	4
Kilwa	8.4	15	3	2.48	4	4

The section CBR is determined based on CBR values of individual locations within the road section by the formula below.

$$\text{Section CBR value} = (\text{Average CBR value of individual locations}) - (\text{CBR max.} - \text{CBR min.})/C$$

Where, C is a coefficient for assuming the standard deviation, and it depends on the number of available values as follows:

Number of available value	2	3	4	5	6	7	8	9	10 or more
C	1.41	1.91	2.24	2.48	2.67	2.83	2.96	3.08	3.18

The design CBR value is obtained from the following table:

Design CBR	Section CBR
2	2 or more, but under 3
3	3 or more, but under 4
4	4 or more, but under 6
6	6 or more, but under 8
8	8 or more, but under 12
12	12 or more, but under 20
20	20 or more

Appendix-14.10 Annual Rainfall Data at Raingauge Stations

	Dar es Salaam Airport	Ubungo Maji	Msimbazi Mission	Chemical Laboratory	Tanganyika Packers
1954				1083.0	
1955				1371.0	
1956			958.0	968.0	
1957	1462.0		1690.0	1498.0	1320.0
1958	823.0		792.0	-	-
1959	902.0	752.0	676.0	-	729.0
1960	1029.0	1021.0	787.0	801.0	713.0
1961	1732.7	1779.0	1369.0	1531.0	1031.0
1962	1013.2	787.5	782.8	911.1	728.0
1963	1606.8	1286.2	1540.2	1343.2	1041.6
1964	907.9	1012.7	1483.6	906.7	838.8
1965	731.3	760.3	801.7	626.3	644.1
1966	1057.5	1058.0	1446.5	1106.1	859.2
1967	1514.2	1393.7	1618.2	1148.5	1032.2
1968	1565.9	1123.8	1315.0	993.9	1085.1
1969	1134.9	944.2	953.5	-	737.9
1970	879.0	849.9	902.5	819.5	883.6
1971	812.6	908.5	933.8	-	1024.0
1972	1429.1	1286.4	1326.8	1367.8	1048.0
1973	774.4	860.4	798.1	869.2	899.0
1974	782.9	645.2	734.3	701.1	611.5
1975	1089.4	980.3	606.6	1001.8	841.7
1976	1010.2	941.6	901.8	1087.1	881.6
1977	1283.4	1057.5	-	971.1	889.0
1978	1490.7	1375.1	-	1496.8	1125.4
1979	1315.2	-	1567.3	1305.2	1146.8
1980	913.4	1094.2	862.1	993.8	875.3
1981	1048.6	1083.1	1266.6	1006.5	950.1
1982	1424.0	1250.3	1234.2	1160.3	1033.6
1983	1065.9	973.1	953.2	1018.7	766.0
1984	1374.1	1019.9	946.1	1111.2	619.0
1985	949.4	939.4	837.0	881.6	688.0
1986	1430.9	1264.2		1251.1	931.1
1987	724.9	797.4		724.8	675.3
1988	955.3	695.1		808.9	663.2
1989	1200.5	995.0		834.3	1190.3
1990	1141.8	911.3		1165.8	980.8
Total	38576.1	31846.3	30083.9	34864.4	29483.2
Years Observed	34	31	28	33	33
Average	1134	1027	1074	1056	893

Appendix-14.11 Maximum Daily Rainfall Record at Dar es Salaam

Year	Date	Maximum Daily Rainfall
1954	22 May	89.7
1955	2 May	95.5
1956	25 Jan	61.2
1957	3 May	94.0
1958	20 Apr	61.7
1959	10 Dec	86.4
1960	12 Apr	77.7
1961	4 Feb	88.1
1962	10 Apr	62.0
1963	10 Nov	126.5
1964	28 Apr	66.8
1965	16 Apr	65.4
1966	11 Apr	57.4
1967	21 Dec	55.8
1968	6 Apr	136.9
1969	25 Apr	69.1
1970	4 May	52.7
1971	8 May	35.8
1972	16 Apr	80.5
1973	28 Apr	70.2
1974	14 Jan	59.1
1975	13 Nov	108.4
1976	15 Mar	55.4
1977	26 Nov	68.2
1978	7 Apr	72.4
1979	4 May	70.1
1980	20 Nov	94.1
1981	5 May	61.1
1982	8 May	81.0
1983	May	68.1
1984	April	67.3
1985	February	64.0
1986	October	72.0
1987	May	55.7
1988	January	57.8
1989	December	87.8
1990	February	87.0

Appendix - 14.12 Estimation of Flood Discharge

The flood discharge was estimated with the following Rational Formula:

$$T = \frac{L}{72\,(H/L)^{0,6}}$$

$$r = \frac{R24}{24}\left(\frac{24}{T}\right)^{2/3}$$

$$Qp = \frac{1}{3.6}\, f \cdot r \cdot A$$

Where, T = Time of Concentration (hrs)

H = Difference of elevation between the highest point in the catchment area and the point where the flood discharge is checked (m)

L = Length of the river between the above two points (m)

r = Rainfall Intensity (mm/hr)

R24 = Probable Daily Rainfall (mm/day)

Qp = Flood Discharge (m3/sec)

f = Discharge Coefficient (0.5, small brooks in flat areas)

A = Area of Basin (km^2)

	Msimbazi	Ubungo/ Ruhanga	Sinza	Kijitonyama
L (km)	30	19	15	3
H (m)	210	132	116	28
T (hrs)	8.2	5.2	3.85	0.69
R24 (mm/day)	134.2	134.2	134.2	134.2
T (hrs)	8.2	5.2	3.85	0.69
r (mm/hr)	11.441	15.501	18.940	59.568
f	0.5	0.5	0.5	0.5
r (mm/hr)	11.441	15.501	18.940	59.568
A (km2)	240	34.2	24.75	3.9
Qp (m3/sec)	381.4	73.6	65.1	32.3

Chapter 15 Preliminary Design

Appendix 15.1 Alternative Cost Study of Uhuru Road in Kariakoo Section

Appendix 15.2 Alternative Cost Study of Structures Overpassing Sinza River

Appendix 15.3 Alternative Cost Study on Bandari Bridge

Appendix 15.4 Construction Cost of Storm Drainage System

Appendix 15.1 Alternative Cost Study of Uhuru Road in Kariakoo Section

1. Option 1; Widening of Existing Road

Description	Unit	Quantities Calculation Length = 750 m	Total	Unit Rate (Tsh.) Foreign Portion	Unit Rate (Tsh.) Local Portion	Amount Foreign Portion	Amount Local Portion	Amount Total (Tsh.)
(1) Construction cost								
Removal of existing pavement (t = 70 cm)	m3		0	5,500	290	0	0	0
Pipe culvert D= 600 (Type A),	m	100 m interval, 7 nos. x 20 m	140	70,120	70,120	9,816,800	9,816,800	19,633,600
U-shape drain ditch, both side	m	750 m	750	31,230	25,550	23,422,500	19,162,500	42,585,000
Catch pit	no.	50 m interval, 2 x 750/50= 30	30	140,620	46,870	4,218,600	1,406,100	5,624,700
Subbase course, CBR more than 30 %	m3	0.4 (thickness)x 6.0(width) x 750 m	1,800	22,400	2,490	40,320,000	4,482,000	44,802,000
Base course, cement stabilized, UCS 30 kg/m2	m3	0.3 (thickness)x 6.0(width) x 750 m	1,350	22,510	2,500	30,388,500	3,375,000	33,763,500
Asphalt concrete Type 2 (BC t=10cm, SC t= 5 cm)	m2	6.0(width) x 750 m	4,500	18,400	2,040	82,800,000	9,180,000	91,980,000
Sidewalk, base cource t=10cm, surface= 3 cm)	m2	3.0 m(width) x 750 m	2,250	16,050	1,780	36,112,500	4,005,000	40,117,500
							Construction Cost Total	278,506,300
(2) House and Building Compensation Cost								
Commercial Buildings, Concrete, 7 storyied	nos.		1		56,000,000		56,000,000	56,000,000
Commercial Buildings, Concrete, 5 storyied	nos.		2		28,000,000		56,000,000	56,000,000
Commercial Buildings, Concrete, 4 storyied	nos.		3		14,000,000		42,000,000	42,000,000
Commercial Buildings, Concrete, 3 storyied	nos.		3		7,000,000		21,000,000	21,000,000
Commercial Buildings, Concrete, 2 storyied	nos.		15		4,250,000		63,750,000	63,750,000
Commercial Buildings, Concrete, flat	nos.		14		2,000,000		28,000,000	28,000,000
			38				House/Building Compensation Cost total	238,750,000
							Grand Total for Option 1	517,256,300

Option 2. One system using Kipata Street (L = 850 m)

Description	Unit	Quantities Calculation Length = 850 m	Total	Unit Rate (Tsh.) Foreign Portion	Unit Rate (Tsh.) Local Portion	Amount Foreign Portion	Amount Local Portion	Amount Total (Tsh.)
(1) Construction cost								
Removal of existing pavement (t = 70 cm)	m3	0.7 (thickness)x 7.0(width) x 850 m	4,165	5,500	290	22,907,500	1,207,850	24,115,350
Pipe culvert D= 600 (Type A),	m	100 m interval, 8 nos. x 10 m	80	70,120	70,120	5,609,600	5,609,600	11,219,200
U-shape drain ditch, both side	m	850 m	850	31,230	25,550	26,545,500	21,717,500	48,263,000
Catch pit	no.	50 m interval, 850/50= 17	17	140,620	46,870	2,390,540	796,790	3,187,330
Subbase course, CBR more than 30 %	m3	0.4 (thickness)x 7.0(width) x 850 m	2,380	22,400	2,490	53,312,000	5,926,200	59,238,200
Base course, cement stabilized, UCS 30 kg/m2	m3	0.3 (thickness)x 7.0(width) x 850 m	1,785	22,510	2,500	40,180,350	4,462,500	44,642,850
Asphalt concrete Type 2 (BC t=10cm, SC t= 5 cm)	m2	7.0(width) x 850 m	5,950	18,400	2,040	109,480,000	12,138,000	121,618,000
Sidewalk, base cource t=10cm, surface= 3 cm)	m2	2 x 2.5 m(width) x 850 m	4,250	16,050	1,780	68,212,500	7,565,000	75,777,500
							Construction Cost Total	388,061,430
(2) House and Building Compensation Cost								
Commercial Buildings, Concrete, 3 or more storyied	nos.		2		7,000,000		14,000,000	14,000,000
Commercial Buildings, Kiosk	nos.		0		200,000		0	0
Residential Buildings, concrete, flat	nos.		19		2,000,000		38,000,000	38,000,000
Residential Buildings, small houses	nos.		8		1,800,000		14,400,000	14,400,000
			29				House/Building Compensation Cost total	66,400,000
							Grand Total for Option 1	454,461,430

Appendix 15.2 Alternative Cost Study of Structures overpassing Sinza River

Description	Unit	Box Culvert L=47.0 m skew 2 x 2.2 x 3.6	Total	Unit Rate (Tsh.) Foreign Portion	Unit Rate (Tsh.) Local Portion	Amount Foreign Portion	Amount Local Portion	Amount Total (Tsh.)
2. Strucutral work								
Concrete block wall, concrete class C, 180kg	m2			3,460	3,460	0	0	0
Box culvert, concrete class B, 240kg	m3	454	454	262,970	87,660	119,388,380	39,797,640	159,186,020
Reinforced retaining walls, concrete class A, 240kg	m3			244,190	81,400	0	0	0
Gravity wall, concrete class C	m3			79,690	79,690	0	0	0
RC Hollow Slab, consrete class -A	m3			469,800	156,600	0	0	0
Pier and Abutment, concrete class-A	m3			160,400	53,470	0	0	0
Steel Plate Girder	ton			5,071,100	266,900	0	0	0
Cast in place pile (D=1,000)	m			43,240	14,410	0	0	0
Concrete Pile D=450	m			32,130	1,690	0	0	0
Improvement of Foundation Excavation	m3	1,460	1,460	16,050	1,780	23,433,000	2,598,800	26,031,800
								185,217,820

Description	Unit	Sinza bridge RC-HS 2x7.5x11.5	Total	Unit Rate (Tsh.) Foreign Portion	Unit Rate (Tsh.) Local Portion	Amount Foreign Portion	Amount Local Portion	Amount Total (Tsh.)
2. Strucutral work								
Concrete block wall, concrete class C, 180kg	m2	0	0	3,460	3,460	0	0	0
Box culvert, concrete class B, 240kg	m3	0	0	262,970	87,660	0	0	0
Reinforced retaining walls, concrete class A, 240kg	m3	0	0	244,190	81,400	0	0	0
Gravity wall, concrete class C	m3	0	0	79,690	79,690	0	0	0
RC Hollow Slab, consrete class -A	m3	192	192	469,800	156,600	90,201,600	30,067,200	120,268,800
Pier and Abutment, concrete class-A	m3	777	777	160,400	53,470	124,630,800	41,546,190	166,176,990
Steel Plate Girder	ton	0	0	5,071,100	266,900	0	0	0
Cast in place pile (D=1,000), L=20 m	m	1,120	1,120	43,240	14,410	48,428,800	16,139,200	64,568,000
Concrete Pile D=450	m	0	0	32,130	1,690	0	0	0
Improvement of Foundation	m3	0	0	5,680	300	0	0	0
								351,013,790

Appendix 15.3 Alternative Cost Study on Bandari Bridge

Description	Unit	Bandari Bridge RC Bridge	Total	Unit Rate (Tsh.) Foreign Portion	Unit Rate (Tsh.) Local Portion	Amount Foreign Portion	Amount Local Portion	Amount Total (Tsh.)
Strucutral work								0
Concrete block wall, concrete class C, 180kg	m2	0	0	3,460	3,460	0	0	0
Box culvert, concrete class B, 240kg	m3	0	0	262,970	87,660	0	0	0
Reinforced retaining walls, concrete class A, 240kg	m3	0	0	244,190	81,400	0	0	0
Gravity wall, concrete class C	m3	0	0	79,690	79,690	0	0	0
RC Hollow Slab, consrete class -A	m3	286	286	469,800	156,600	134,362,800	44,787,600	179,150,400
Pier and Abutment, concrete class-A	m3	1,327	1,327	160,400	53,470	212,850,800	70,954,690	283,805,490
Steel Plate Girder	ton	0	0	5,071,100	266,900	0	0	0
Cast in place pile (D=1,000)	m	0	0	43,240	14,410	0	0	0
Concrete Pile D=450	m	0	0	32,130	1,690			
Strucural Excavation	m3	7,700	7,700	5,680	300	43,736,000	2,310,000	46,046,000
								509,001,890

Description	Unit	Bandari bridge Steel Girder	Total	Unit Rate (Tsh.) Foreign Portion	Unit Rate (Tsh.) Local Portion	Amount Foreign Portion	Amount Local Portion	Amount Total (Tsh.)
Strucutral work								0
Concrete block wall, concrete class C, 180kg	m2	0	0	3,460	3,460	0	0	0
Box culvert, concrete class B, 240kg	m3	0	0	262,970	87,660	0	0	0
Reinforced retaining walls, concrete class A, 240kg	m3	0	0	244,190	81,400	0	0	0
Gravity wall, concrete class C	m3	0	0	79,690	79,690	0	0	0
RC Hollow Slab, consrete class -A	m3	0	0	469,800	156,600	0	0	0
Pier and Abutment, concrete class-A	m3	288	288	160,400	53,470	46,195,200	15,399,360	61,594,560
Steel Plate Girder	ton	107	107	5,071,100	266,900	542,607,700	28,558,300	571,166,000
Cast in place pile (D=1,000)	m	0	0	43,240	14,410	0	0	0
Concrete Pile D=450	m	384	384	32,130	1,690	12,337,920	648,960	12,986,880
Structural Excavation	m3	1,300	1,300	5,680	300	7,384,000	390,000	7,774,000
								653,521,440

Appendix 15.4

Consruction cost of Storm Drainage System

		Unit	Unit Q'ty (m)	Length (m)	Q'ty	Unit Rate (Tsh.)	Amount (Tsh.)
(1) Inuadation Area No.1 (New Bagamoyo Road)							
Concrete Block Wall							
	Type A-1	m2	5.2	1,700	8,840	6,920	61,172,800
	Type A-2	m2	3.6	480	1,728	6,920	11,957,760
	Type A-3	m2	1.7	390	663	6,920	4,587,960
Pipe Culvert	D= 1,000 mm	m	1.0	770	770	112,380	86,532,600
Total							164,251,120
							164,000,000
(2) Inunadation Area No.3 (Gerezani Road)							
Clearing and stripping (1,000m x 150m)		m2	150000.0	1	150,000	160	24,000,000
Embankment (1,000m x 150m x 2.0m)		m3	300000.0	1	300,000	5,980	1,794,000,000
Concrete Block Wall	Type A-2	m2	1.7	2,000	3,400	6,920	23,528,000
Pipe Culvert	D=1,000 mm	m	500.0	1	500	112,380	56,190,000
Total							1,897,718,000
							1,898,000,000