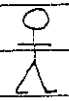
Appendix 4

Axle Load Survey Results

Appendix4.1 Survey Sheet – Traffic Count

Station No.	Name of Enumerator		Direction		Date		Weather		

Time	Pedestrian	Bicycle	Motorcycle Scooter	Passenger car + 4WD	Other Tractor Roadroller	Taxi Mini Bus	Bus	Pick-up Truck	Truck 2-axle	Truck 3 or more axle
					 					
7:00 - 8:00										
8:00 - 9:00										
9:00 - 10:00										
10:00 - 11:00										
11:00 - 12:00										
12:00 - 13:00										
13:00 - 14:00										
14:00 - 15:00										
15:00 - 16:00										
16:00 - 17:00										
17:00 - 18:00										
18:00 - 19:00										
Total										

Appendix4.2 Survey Sheet – Axle Load Survey

Station	Date:	Direction		Time (when interviewed)		Interviewer:		
No.	Day:	1 to Kampala		From	To			
		2 from Kampala						
	Vehicle Type	Origin		Destination		Purpose	No. of passengers	Commodity
		Write the place of departure		Write the place of destination			(including driver)	1. No Luggage
	1. Motorcycle	Inside Uganda		Inside Uganda		1. Go to office/working place		2.Grain
	2. Passenger Car	District	Division/Parish	District	Division/Parish	2. Go to school		3. Timber
	3. Taxi/Mini bus					3. Business		4. Other agricultural
	4. Bus					4. Shopping		5. Oil
	5. Pick-up Truck					5. Come back home		6. Mineral
Sample	6. Truck 2-Axle					6. Others		7. Machinery
no.	7. Truck 3-Axle or more							8. Chemical
	8. Others	Outside Uganda		Outside Uganda				9.Construction Material
		Country		Country				10. Miscellaneous
		Code	Code	Code	Code			
		Code	Code	Code	Code			
		Code	Code	Code	Code			
		Code	Code	Code	Code			

Appendix4.3 Axle Load Survey Results (1)

(Unit : tonnes)

Sample No.	Direction	Registr.	Type	Axle1	Axle2	Axle3	Axle4	Axle5	Axle6	Axle7	Model	Loading
1	Jinja - Kam	279 UZU	A	3	4.8	5					Fiat	Loaded
2	Jinja - Kam	KVQ 875	B1	4	6	4	7	5	6		Benz	Loaded
3	Kam. - Jinja	KWE 491	B2	1.5	1	1	1				Benz	Unloaded
4	Kam. - Jinja	UXU 579	A	4.6	1	1.2					Benz	Unloaded
5	Kam. - Jinja	707 UAQ	A	1	2	1.6					Man	Unloaded
6	Kam. - Jinja	500 UAH	C	2	4						Isuzu	Loaded
7	Kam. - Jinja	KQR 932	B2	3	3	5	3	3			Benz	Loaded
8	Jinja - Kam	265 UAZ	B2	2.4	5.6	3	9.4	6.2	6.2		Fiat	Loaded
9	Kam. - Jinja	UWU 238	A	1.6	1	1					Leyland	Unloaded
10	Jinja - Kam	KAC 965 T	A	6.4	13	9.6					Isuzu	Loaded
11	Kam. - Jinja	060 UCS	A	1.6	7.4						Benz	Loaded
12	Kam. - Jinja	089 UAF	C	2	5.8						Isuzu	Loaded
13	Kam. - Jinja	468 UAR	A	1	1.4						Fiat	Unloaded
14	Jinja - Kam	KAH 265 G	A	5.6	11.4	10					Daf	Loaded
15	Jinja - Kam	KAQ 583 L	A	7	10.4	7.2					Mitsubishi	Loaded
16	Jinja - Kam	UWT 699	B1	2.8	10.2	10.4	10	5.6			Benz	Loaded
17	Jinja - Kam	833 UCE	B2	5	9.2	11.4	20	14	18		Benz	Loaded
18	Kam. - Jinja	UWO 064	A	2	3						Tata	Unloaded
19	Jinja - Kam	KAB 542 Q	B2	3.6	7	5	16.4	11.2	14.4		Fiat	Loaded
20	Jinja - Kam	KAB 346 C	B2	3.6	9	7	16.2	14			Fiat	Loaded
21	Jinja - Kam	KAB 563 T	A	3	9						Fiat	Loaded
22	Kam. - Jinja	804 UBJ	A	2	8							Loaded
23	Not Recorded	UPB	A	2.2	4.4							Loaded
24	Kam. - Jinja	KTR 093	B2	2.2	10.6	14.6	10.8	12.4			Benz	Loaded
25	Kam. - Jinja	KJR 062	B2	2.2	6	8.2	7	8.8			Benz	Loaded
26	Jinja - Kam	KAE 998 K	A	5.8	12.2	10.6					Benz	Loaded
27	Kam. - Jinja	13I 17 B	B1	4.2	4.2	4.2	2.2	4.4	5		Benz	Loaded
28	Kam. - Jinja	TZG 9577	B1	7	12.6	14.6	8.6	14.8	12.8		Benz	Loaded
29	Kam. - Jinja	KIQ 410	B2	3.4	11	11.6	8.4	10.4			Benz	Loaded
30	Jinja - Kam	729 UCD	A	2	6						Isuzu	Loaded
31	Jinja - Kam	UPF 385	A	1.2	7						Tata	Loaded
32	Jinja - Kam	541 UBA	A	3.6	5	3					Benz	Loaded
33	Jinja - Kam	UXT 104	A	1.4	3						Isuzu	Loaded
34	Jinja - Kam	UPG 400	A	2	12.4						Tata	Loaded
35	Jinja - Kam	KAG 847 X	C	2.2	3.6						Scania	Loaded
36	Kam. - Jinja	UPR 730	C	1.2	6.4						Isuzu	Loaded
37	Kam. - Jinja	376 UBA	A	1.6	2.4						Isuzu	Unloaded
38	Jinja - Kam	472 UBA	C	3.4	6.2						Isuzu	Loaded
39	Kam. - Jinja	TZ 90495	B1	1.8	11.6	10.4	3.8	12	16.8		Benz	Loaded
40	Jinja - Kam	KAH 784 C	C	2.8	8.6						Nissan	Loaded
41	Jinja - Kam	UPL 180	A	1.6	3.6						Tata	Loaded
42	Jinja - Kam	579 UCQ	A	1.4	4.8						Bedford	Loaded
43	Kam. - Jinja	UWQ 380	A	1.6	4						Benz	Loaded
44	Jinja - Kam	367 UBR	C	3	6						Isuzu	Loaded
45	Jinja - Kam	UWM 912	A	1.8	6						Tata	Loaded
46	Jinja - Kam	545 UAX	A	1.6	7						Tata	Loaded
47	Jinja - Kam	659 UBM	A	4.6	16.4	8.4					Mitsubishi	Loaded
48	Jinja - Kam	707 UAQ	A	2	6.8	5.2					Tata	Loaded
49	Jinja - Kam	UXU 579	A	3.4	11.2	7.2					Benz	Loaded
50	Kam. - Jinja	UU 0392	C	3	6.4						Leyland	Loaded
51	Kam. - Jinja	UXE 501	B2	3.4	11.8	20	13.4	16.2			Benz	Loaded
52	Jinja - Kam	TZG 6294	B1	7.2	9	8	9	9.2	14.4		Benz	Loaded
53	Jinja - Kam	784 UBN	A	2.6	4						Fuso	Loaded
54	Jinja - Kam	UPA 938	A	2.6	6						Tata	Loaded
55	Jinja - Kam	880 UCK	A	5.2	13	9.2					Fuso	Loaded
56	Jinja - Kam	442 UAH	A	3	7.6						Bedford	Loaded
57	Kam. - Jinja	593 UAV	B2	4.8	18.8	18.8	15				Benz	Loaded
58	Kam - Jinja	23 97R	B1	3.6	2.4	1	4	1.4			Benz	Unloaded
59	Kam. - Jinja	UXJ 753	B1	2	2.2	1.6	2.6	3.2			Benz	Unloaded
60	Kam. - Jinja	UPG 687	C	2	9						Isuzu	Loaded
61	Jinja - Kam	816 UAJ	C	2.4	7.6						Isuzu	Loaded
62	Jinja - Kam	KAG 186 U	A	1.6	3						Isuzu	Unloaded
63	Kam. - Jinja	UXE 902	B2	1	2	5.6	7.6	2			Fiat	Loaded
64	Kam. - Jinja	UPH 603	A	1.4	1.8						Bedford	Unloaded
65	Kam. - Jinja	109 UCG	B1	3.2	10	10.8	4	12.4	14		Benz	Loaded
66	Jinja - Kam	032 UBE	A	3	5.4						Fuso	Loaded
67	Jinja - Kam	573 UAI	A	1.6	7.6						Tata	Loaded
68	Jinja - Kam	UPA 179	A	2	6	4.6					Isuzu	Loaded
69	Jinja - Kam	UWS 518	A	3	12.6						Isuzu	Loaded
70	Kam. - Jinja	472 UBA	C	2	7						Isuzu	Loaded
71	Kam. - Jinja	614 UBH	A	3	2						Tata	Unloaded

Appendix4.3 Axle Load Survey Results (2)

(Unit : tonnes)

Sample No.	Direction	Registr.	Type	Axle1	Axle2	Axle3	Axle4	Axle5	Axle6	Axle7	Model	Loading
72	Kam. - Jinja	UWT 617	A	5	9						Leyland	Loaded
73	Jinja - Kam	106 UAI	A	2	3						Isuzu	Unloaded
74	Kam. - Jinja	UPG 916	B1	3	9	5	13	14.8			Benz	Loaded
75	Kam. - Jinja	UPP 914	B2	4	5.2	7	15.2	12	13		Benz	Loaded
76	Kam. - Jinja	UXT 104	A	1.6	7.2						Isuzu	Loaded
77	Jinja - Kam	826 UCG	A	2.4	5.4						Bedford	Loaded
78	Jinja - Kam	995 UBC	A	2.4	5.6						Bedford	Loaded
79	Kam. - Jinja	KV 4691 C	B2	5.6	11.2	10	17	19.6	20		Benz	Loaded
80	Kam. - Jinja	UWS 602	A	4	6						Isuzu	Loaded
81	Kam. - Jinja	UWW 816	A	2.4	10.2						Isuzu	Loaded
82	Kam. - Jinja	601 UCS	B1	2	2.4	1.8	2				Fiat	Unloaded
83	Kam. - Jinja	UPL 099	A	3	8						Tata	Loaded
84	Kam. - Jinja	UPD 434	A	1.2	5.4						Tata	Loaded
85	Jinja - Kam	UXR 631	A	4.6	10.6						Benz	Loaded
86	Jinja - Kam	KAG 186 U	A	3	4						Mitsubishi	Loaded
87	Jinja - Kam	KZK 561	B2	3	12	10	20	16	18		Mitsubishi	Loaded
88	Jinja - Kam	804 UBN	A	5	16						Isuzu	Loaded
89	Kam. - Jinja	UPF 844	A	2.4	10						Tata	Loaded
90	Kam. - Jinja	367 UBR	C	5	9						Isuzu	Loaded
91	Kam. - Jinja	KAG 97	C	5	6						Isuzu	Loaded
92	Kam. - Jinja	UXL 435	A	4	7.2						Benz	Loaded
93	Kam. - Jinja	UWT 740	A	2.6	5.2						Leyland	Unloaded
94	Jinja - Kam	814 UCA	A	4.6	11	11					Isuzu	Loaded
95	Jinja - Kam	262 UBN	A	8	16						Isuzu	Loaded
96	Jinja - Kam	714 UCJ	A	3.6	7.2						Fuso	Loaded
97	Jinja - Kam	TZK 4648	B2	7	9.8	8.4	14.4	10.6	8.6		Scania	Loaded
98	Kam. - Jinja	TZH 1785	B2	5	7	7.6	16.4	18.2	18.8		Scania	Loaded
99	Jinja - Kam	UXE 156	B2	5.6	7.6	8.4	6	8			Benz	Loaded
100	Jinja - Kam	TZK 1070	B2	5	8	8	13.6	10	9.8		Benz	Loaded
101	Jinja - Kam	TZK 4640	B2	4.4	10	6	12.4	10	8.8		Benz	Loaded
102	Jinja - Kam	272 UBK	B2	7	11.6	13.6	15	12			Benz	Loaded
103	Jinja - Kam	687 UCM	A	2.4	9.2						Fuso	Loaded
104	Kam. - Jinja	TZH 3566	B2	4	8.8	9.2	20	18.2	20		Scania	Loaded
105	Jinja - Kam	TZJ 9798	B2	5.6	9.6	9.2	14	8.4	12		Scania	Loaded
106	Jinja - Kam	TZK 1072	B2	4	9	8	10.4	8.4	9		Scania	Loaded
107	Kam. - Jinja	TZH 3365	B2	5.6	9.2	13	20	16	20		Scania	Loaded
108	Jinja - Kam	UPS 567	B2	7	11.2	10	16	9	18.8		Benz	Loaded
109	Not Recorded	KAG 085 W	B2	5	9.2	9.2	20	18	18.2		Mack	Loaded
110	Kam. - Jinja	UVY 023	C	4.4	6						Leyland	Loaded
111	Kam. - Jinja	994 UBC	C	4.4	8						Isuzu	Loaded
112	Jinja - Kam	127 UCQ	B2	4.8	4	12	12	14	12.4		Benz	Loaded
113	Jinja - Kam	UPX 594	A	5	10						Bedford	Loaded
114	Jinja - Kam	952 UBS	A	8	14						Benz	Loaded
115	Kam. - Jinja	493 UAZ	B2	4	4.8	6.2	6	6	7.8		Benz	Loaded
116	Kam. - Jinja	UXB 134	A	4	10						Bedford	Loaded
117	Jinja - Kam	UPL 196	B2	4	8	14	18	20			Isuzu	Loaded
118	Kam. - Jinja	UPF 707	B2	4.2	4.6	8.2	12	12.4			Benz	Loaded
119	Jinja - Kam	676 UBJ	A	5	9.2						Benz	Loaded
120	Kam. - Jinja	UPA 938	A	3	4						Tata	Unloaded
121	Jinja - Kam	871 UBK	A	3	4.8						Toyota	Loaded
122	Jinja - Kam	UWU 687	A	4.4	10						Tata	Loaded
123	Kam. - Jinja	863 UBB	A	5	12	10					Nissan	Loaded
124	Kam. - Jinja	UWW 764	A	2.4	6.4						Tata	Loaded
125	Jinja - Kam	UWJ 834	A	3	8.4						Benz	Loaded
126	Jinja - Kam	UPF 505	A	4	9						Tata	Loaded
127	Jinja - Kam	TZ 89846	B2	7	10.4	9	12	9.2	10.6		Benz	Loaded
128	Jinja - Kam	064 UAM	B1	6.2	12	6	6				Fiat	Loaded
129	Jinja - Kam	635 UAM	A	4	8						Tata	Loaded
130	Jinja - Kam	UPB 901	A	4.4	10						Tata	Loaded
131	Jinja - Kam	UXN 902	A	3	4						Isuzu	Loaded
132	Jinja - Kam	UPG 715	A	2.8	7						Isuzu	Loaded
133	Jinja - Kam	UPG 703	A	3	8.4						Isuzu	Loaded
134	Kam. - Jinja	367 UAK	A	6	4.8	4					Mack	Unloaded
135	Jinja - Kam	UWM 289	A	3.6	7						Tata	Loaded
136	Jinja - Kam	UXR 485	A	4	12.4						Benz	Loaded
137	Jinja - Kam	UXJ 054	B2	4.4	8	14	8	9			Benz	Loaded
138	Jinja - Kam	192 UCD	A	3	6						Tata	Unloaded
139	Jinja - Kam	995 UBC	A	2	6						Bedford	Loaded
140	Jinja - Kam	KAE 897 P	B2	6	12.4	14.4	10	10.4			Benz	Loaded
141	Jinja - Kam	083 UCK	A	5	9						Benz	Loaded
142	Kam. - Jinja	UPO 539	A	1	3						Nissan	Unloaded
143	Jinja - Kam	560 UCD	A	3.6	8						Isuzu	Loaded
144	Jinja - Kam	UPP 117	C	5	6						Benz	Loaded

Appendix4.3 Axle Load Survey Results (3)

(Unit : tonnes)

Sample No.	Direction	Registr.	Type	Axle1	Axle2	Axle3	Axle4	Axle5	Axle6	Axle7	Model	Loading
145	Kam. - Jinja	225 UAZ	B2	6	4	4	2	5	6		Benz	Unloaded
146	Kam. - Jinja	HZO 928 C	B1	4.4	4	4	2	2			Benz	Unloaded
147	Jinja - Kam	KAE 964 Z	B2	7	11.8	10	16	14	12	16	Fiat	Loaded
148	Kam. - Jinja	KAG 092 W	B2	6	12	14	18	16	20		Internation	Loaded
149	Jinja - Kam	UPF 337	A	6	3						Isuzu	Unloaded
150	Kam. - Jinja	664 UCQ	A	4	6	10					Fiat	Loaded
151	Kam. - Jinja	KAG 942 S	C	3.6	7						Nissan	Loaded
152	Jinja - Kam	UXB 951	A	4	6						Tata	Loaded
153	Kam. - Jinja	UXW 441	A	4	8						Tata	Loaded
154	Jinja - Kam	KAG 826 R	B2	6	12	10	10	12			Benz	Loaded
155	Jinja - Kam	KYU 510	A	6	8						Isuzu	Loaded
156	Jinja - Kam	KAE 766 W	B2	7	12.6	12.4	18	12.6	12		Benz	Loaded
157	Jinja - Kam	KAG 824 R	B2	6.6	9	14	13.8	13			Benz	Loaded
158	Jinja - Kam	UWS 192	A	5	7						Leyland	Loaded
159	Kam. - Jinja	UPG 826	A	3	4						Fiat	Unloaded
160	Kam. - Jinja	776 UBN	A	2	3						Leyland	Unloaded
161	Jinja - Kam	858 UAH	C	5	7.8						Isuzu	Loaded
162	Jinja - Kam	KAE 475 G	A	7	12	8					Benz	Loaded
163	Jinja - Kam	162 UAZ	B2	7	10.2	10.2	18	14	16		Benz	Loaded
164	Jinja - Kam	KAE 698 C	B2	7	10	10	20	16	16	16	Volvo	Loaded
165	Jinja - Kam	UXR 631	A	5	10						Benz	Loaded
166	Jinja - Kam	302 UBC	A	3.6	9						Tata	Loaded
167	Jinja - Kam	ARP 114	B2	4.6	4	4	6	4	4		Benz	Loaded
168	Jinja - Kam	KAE 667 S	B2	6	11.8	11.8	15.6	14	14	16	Benz	Loaded
169	Jinja - Kam	KAE 665 S	B2	6	9	10.8	16.8	13.4	11.2	15	Benz	Loaded
170	Jinja - Kam	UWV 746	B2	5	10	12	8	8			Benz	Loaded
171	Jinja - Kam	UXT 032	B1	7	12.4	10.2	12	9			Benz	Loaded
172	Jinja - Kam	KAG 813 B	B2	7.6	16.2	11	10.2	16			Benz	Loaded
173	Jinja - Kam	KNH 337	B2	5	16	16	8	10			Fiat	Loaded
174	Jinja - Kam	TZF 4267	B1	4	7.8	8	7				Fiat	Loaded
175	Jinja - Kam	UPF 949	B2	6	9	11.8	10	10			Benz	Loaded
176	Kam. - Jinja	KTD 083	B1	6	14	6	3	6.4	7.6		Fiat	Loaded
177	Kam. - Jinja	952 UBS	A	2	3						Benz	Unloaded
178	Jinja - Kam	121 UCA	A	4.4	10						Fuso	Loaded
179	Jinja - Kam	UPF 798	A	3.6	8						Tata	Loaded
180	Jinja - Kam	239 UCN	A	8	10						Benz	Loaded
181	Jinja - Kam	427 UCK	B1	6	9	8	8	10	8.6		Benz	Loaded
182	Jinja - Kam	UPJ 526	A	3	8						Bedford	Loaded
183	Jinja - Kam	UWR 750	A	4.4	11						Tata	Loaded
184	Jinja - Kam	KAE 776 M	C	4.4	5						Scania	Loaded
185	Jinja - Kam	KAG 967 U	A	8	10	9					Mitsubishi	Loaded
186	Jinja - Kam	552 UBE	C	6	7						Isuzu	Loaded
187	Jinja - Kam	KAG 968 U	A	5.4	9.8	9					Mitsubishi	Loaded
188	Jinja - Kam	714 UCJ	A	3	7						Fuso	Loaded
189	Jinja - Kam	KRY 790	B1	5.4	10.6	7	7	7			Benz	Loaded
190	Jinja - Kam	582 UCD	A	6.4	12.6						Isuzu	Loaded
191	Jinja - Kam	KAE 362 M	A	5.6	9	9					Mitsubishi	Loaded
192	Jinja - Kam	KAD 756 L	A	6	9	9					Mitsubishi	Loaded
193	Jinja - Kam	907 UAJ	C	5	7						Isuzu	Loaded
194	Jinja - Kam	509 UCK	B2	4	9.8	6	6				Benz	Loaded
195	Jinja - Kam	KZK 700	B2	4	6	6	8	10	12		Fiat	Loaded
196	Jinja - Kam	787 UAZ	B2	7	12	8	16	12	14		Benz	Loaded
197	Jinja - Kam	830 UAJ	C	5	6						Isuzu	Loaded
198	Not Recorded	867 UAI	A	4	6						Tata	Loaded
199	Kam. - Jinja	TZH 2654	B1	3.6	3	3	2	3.4	3.2		Benz	Unloaded

Appendix 7

Traffic Assignment for Year 2005

Assignment for year 2005

The proposals for this year comprise :

- junction improvements
  Port Bell junction
  Jinja Road roundabout
  Kibuya roundabout
  Natete roundabout
  Makerere roundabout

- road improvements
  Hoima Road
  Natete Road
  Gaba Road
  Port Bell Road

As with the 2015 network, junction improvements were represented by a 25% increase in the capacity of links connected to the junction. Link improvements were represented by a 25% increase in capacity.

The results of the assignment are shown in the table. In the case of junctions, the flow shown is the total inflow and the nominal capacity in the sum of the inbound capacities on the approach links. In the case of roads, two-way flows and capacities are indicated. As can be seen from the table, where there is route choice, the provision of extra capacity can lead to a flow increase at the location.

The analysis of volume to capacity ratios from the assignments indicates that these improvements go a long way to improving network performance. However, a greater increase in capacity would be preferred, if practical, along Natete Road and the Nsambya Road end of Gaba Road, and at Port Bell junction, Jinja Road roundabout and Kibuya roundabout. The improvement at Hoima Road is motivated by the need to prevent flood damage rather than by a need to reinforce the linehaul.

The current assignment methodology, which does not involve simulation of junctions, is suited to modelling link capacity improvements, but the method of modelling junction improvements is inexact. More detailed analysis will be performed when turning movements and stop line capacities are known.

The 2005 assignment summary statistics indicate that these improvements will yield time savings of 5000 pcu-hours per hour, a substantial amount.

Summary of Assignment for Year 2005

Improvement Location	Matrix for year 2005 assigned to					
	Base year network			Network for 2005		
	Flow (Pcus/hr)	Nominal Capacity (Pcus/hr)	Ratio	Flow (Pcus/hr)	Nominal Capacity (Pcus/hr)	Ratio
Junctions						
Port Bell junction	4405	3680	1.20	4867	4600	1.06
Jinja Road roundabout	7781	6160	1.26	8335	7700	1.08
Kibuya roundabout	7846	6200	1.27	8124	7750	1.05
Natete roundabout	2691	3040	0.89	2717	3800	0.72
Makerere roundabout	3878	4200	0.92	4037	5250	0.77
Roads						
Hoima Road	511	1600	0.32	511	2000	0.26
Natete Road	1925	1280	1.50	2098	1600	1.31
Gaba Road	1438	1600	0.90	1438	2000	0.72
Gaba Road	1950	1600	1.22	1950	2000	0.98
Gaba Road (Nsambya)	3494	2000	1.75	3494	2500	1.40
Port Bell Road	1187	1600	0.74	1187	2000	0.59
Port Bell Road	1937	2000	0.97	2070	2500	0.83

Appendix 9

Design Standard

UGANDA ROAD DESIGN STANDARDS

-GEOMETRIC DESIGN-

	GEOMETRIC DESIGN STANDARDS					
Design parameter	BITUMEN			GRAVEL		
Class of Roads	CLASSI	CLASS II	CLASS III	CLASS A	CLASS B	CLASS C
DESIGN SPEED kph F R M	110 100 80	100 (90) 90 (80) To Suit (60)	80 70 To Suit (50)	90 80 70	80 60 50	60 50 40
S LEVEL 'C' p.c.u/day DESIGN CAPACITY X 1000	10 -6 ≈9.0	8 - 4 ≈6.5	6 - 2 ≈5.5	8 - 4 ≈6.5	6 - 2 ≈5.5.	<2 -
ROADWAY WIDTH RESERVE WIDTH	11.0 40.0	11.0(9.0) 30.0	8.6(7.6) 25.0	10.0(9.0) 30.0	8.6(7.6) 25.0	6.4 15.0
CARRIAGEWAY WIDTH CAMBER	7.0 2.5	6.0 2.5	5.6 2.5	6.0 4.0	5.6 4.0	4.0 4.0
SHOULDERS WIDTH CAMBER	2.0 5.0	2.0(1.5) 5.0	1.5(1.0) 5.0	2.0(1.5) 4.0	1.5(1.0) 4.0	1.2 4.0

UGANDA ROAD DESIGN STANDARDS

-SIGHT DISTANCES-

Design Speed (Kph)	Stopping distance on Level Ground (m)		Corrections for Grade (m)				Anticipatory Sight	Passing sight distance (m)	
			Upgrade		Down grade				
	Des	Min	+3%	+6%	-3%	+6%	Distance (m)	Normal	Reduced
40	50	50	0	0	0	13	170	290	170
50	65	65	0	-3	+3	+6	185	350	170
60	80	80	-3	-5	+4	+8	210	420	240
70	110	95	-3	-7	+5	+9	265	490	310
80	140	115	-5	-9	+6	+14	330	560	375
90	175	135	-7	-12	+8	+19	410	620	445
100	210	155	-9	-15	+9	+21	495	680	515
110	250	180	-12	-20	+13	+31	590	740	580
120	290	210	-15	-25	-17	+38	700	800	650

UGANDA ROAD DESIGN STANDARDS

-MINIMUM RADII-

Design Speed (Kph)	Minimum Radius (e-7%)		Min.Radius No 'e' (m)	K value (Stopping Sight Distance)				K Value (Passing)		K Value (Anticipatory
	Absolute	Desirable		Crest		Sag		Crest		
	(m)	(m)		Min	Des	Min	Des	Normal	Reduced	Crest
40	50	65	650	6	6	8	12	90	30	140
50	80	115	1000	10	10	12	18	130	30	165
60	125	165	1200	16	17	16	24	190	60	210
70	180	225	1500	20	30	20	30	260	100	330
80	240	310	2000	35	45	25	40	335	150	520
90	315	400	3000	45	75	30	50	410	210	800
100	400	520	4000	60	115	35	60	500	280	1170
110	500	660	5000	80	160	40	75	580	360	1660
120	600	840	7000	110	210	50	90	680	450	2300

UGANDA ROAD DESIGN STANDARDS

-CURVATURE-

Design Speed (Kph)	Minimum length of Curve (m)		Maximum Gradient add 2% for light traffic roads		
	Min	Des	Flat	Rolling	Mountaineous
40	30	80	4	6	10
50	40	100	4	7	9
60	45	120	4	6	8
70	50	140	4	6	7
80	60	160	3	5	7
90	70	180	3	5	-
100	75	200	3	5	-
110	85	220	3	-	-
120	90	240	3	-	-

Appendix 10

Result of Natural Condition Survey

Appendix10.1 Results of Standard Penetration Test (1)

BOREHOLE NO. 1, HOIMA ROAD

DATE: 7TH FEBRUARY, 1997

DEPTH OF GWT 1.5m

DEPTH (M)	SOIL DESCRIPTION	BH LOG	SAMPLE	SPT N-VALUE	REMARKS
	TOP SOIL	********			GWT WAS ENCOUNTERED AT 1.5 DEPTH.
1	DARK GREY CLAY	/ / / / / / / /	U-100	2	SOFT SOIL.
2	YELLOWISH GREY SILTY SANDY CLAY	/ // / / / / / /		8	FIRM/STIFF SOIL.
3		/ / // / / / / /	U-100	16	VERY STIFF SOIL.
4		/ / / / / / / /		38	HARD SOIL
5		/ / / / / / / /		50++	VERY HARD SOIL (HAMMER REBOUNDING)
6		/ / / / / / / /		50++	VERY HARD SOIL (HAMMER REBOUNDING)
7		/ / / / / / / /			COULD NOT ACHIEVE ANY PENETRATION
8		/ / / / / / / /			

Appendix10.1 Results of Standard Penetration Test (2)

BOREHOLE NO. 2, NATETE ROAD

DATE: 8TH FEBRUARY, 1997

DEPTH OF GWT: NOT REACHED

DEPTH (M)	SOIL DESCRIPTION	BH LOG	SAMPLE	SPT N-VALUE	REMARKS
	TOP SOIL	******			GWT WAS NOT REACHED.
1	REDDISH BROWN CLAYEY SILTS	/ / / /	U-100	9	STIFF SOIL.
2		/ / / /		11	
3		/ / / /	U-100	5	FIRM SOIL
4		/ / / /		5	
5		/ / / /		7	
6		/ / / /		7	
7		/ / / /		7	
8		/ / / /		5	
9		/ / / /		7	
10		/ / / /		10	STIFF SOIL END OF BOREHOLE

Appendix10.1 Results of Standard Penetration Test (3)

BOREHOLE NO. 3, ENTEBBE ROAD

DATE: 12TH FEBRUARY, 1997

DEPTH OF GWT: 7.7M

DEPTH (M)	SOIL DESCRIPTION	BH LOG	SAMPLE	SPT VALUE	REMARKS
	TOP SOIL	******			GWT IS AT 7.7M DEPTH
1	LIGHT BROWN SILTY CLAY	/ / / / / / / /	U-100	15	VERY STIFF SOIL.
2		/ / / / / / / /	U-100	9	
3		/ / / / / / / /		21	
4		/ / / / / / / /		18	
5	YELLOWISH BROWN SANDY CLAY WITH FINE GRAVELS	/ . / .		40	VERY STIFF/ DENSE SOIL.
6		. // / . / ./ / .		50++	
7		. / . / / . / .		57 -	
8		/ / / / . / . /		50++	
9		/ . / /. . / . /		53	
10		. / . /		37	END OF BORE-HOLE

Appendix10.1 Results of Standard Penetration Test (4)

BOREHOLE NO. 4, GABA ROAD

DATE: 10TH FEBRUARY, 1997

DEPTH OF GWT: 7.5M

DEPTH (M)	SOIL DESCRIPTION	BH LOG	SAMPLE	SPT VALUE	REMARKS
	TOP SOIL	******			GWT IS AT 7.5M DEPTH.
1		/ / / /		8	FIRM SOIL
	BROWN YELLOWISH	/ / / /	U-100		
2		/ / / /		8	STIFF SOIL
	GREY SILTY CLAY	/ / / /	U-100		
3		/ / / /		9	
		/ / / /			
4		/ / / /		14	
		/ / / /			
5		/ / / /		16	VERY STIFF SOIL
		/ / / /			
6		/ / / /		22	
		/ / / /			
7		/ / / /		29	
		/ / / /			
8		/ / / /		35	
		/ / / /			
9		/ / / /		43	
		/ / / /			
10		/ / / /		50	END OF BORE-HOLE

Appendix10.2 Results of Laboratory Test for Borehole Sample

Borehole Boring NO.		BH1		BH2		BH3		BH4	
Name of Road		HOIMA ROAD		RUBAGA ROAD		ENTEBBE ROAD		GABA ROAD	
Depth (m)		2.0	3.0	2.0	3.0	1.0	2.0	2.0	3.0
Grain-Size Analysis	BS Sieve								
	37.5mm								
	20.0mm								
	10.0mm					100	100		
	6.3mm					96	98		
	5.0mm		100			-	-		
	2.0mm	100	99	100	100	80	94	100	
	0.6mm	59	87	90	94	79	87	97	
	0.425mm	47	81	85	91	78	85	95	100
	0.3mm	38	74	80	87	76	82	93	9
	0.212mm	35	68	75	83	75	79	91	98
	0.15mm	33	62	69	79	73	76	89	97
	0.063mm	31	56	64	75	70	72	87	96
Specific Gravity		2.71	2.68	2.63	2.63	2.71	2.86	2.43	2.45
Natural Moisture Content (%)		21.0	17.0	26.0	25.0	21.0	15.0	36	32.0
Atterberg Limits	L.L (%)	53.0	52.0	38.0	60.0	56.0	42.0	50	68.0
	P.L (%)	15.7	16.4	18.0	21.2	23.0	21.6	20.3	18.5
	P.I (%)	37.3	35.6	20.0	38.8	33.0	20.4	29.7	49.5
BS Soil Classification		SC	CH	CI	CH	CH	CI	CH	CH

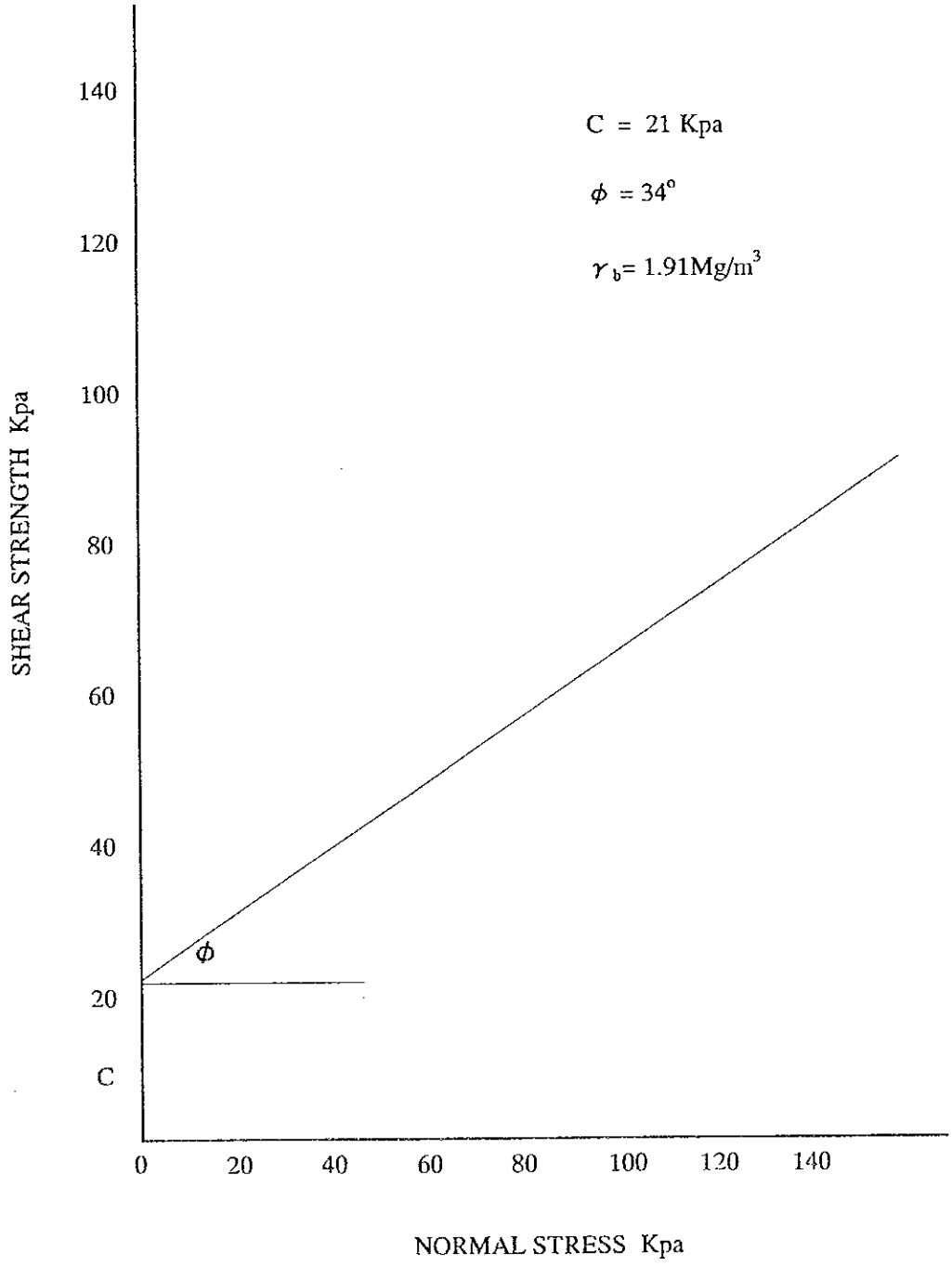
Appendix10.3 Shear Strength Tests

Borehole	Depth (m)	Bulk Density Mg/m^3	Cohesion C, KPa	Angle of Friction degree
Hoima Road BH No. 1	1.50 - 1.95	1.91	21	34
Hoima Road BH No. 1	3.00 - 3.45	2.03	44	32
Rubaga Road BH No. 2	1.50 - 1.95	1.67	0	14
Rubaga Road BH No. 2	3.00 - 3.45	1.77	21	29
Entebbe Road BH No. 3	1.00 - 1.45	1.86	17	31
Entebbe Road BH No. 3	2.00 - 2.45	1.90	32	14
Gaba Road BH No. 4	1.50 - 1.95	1.69	40	9
Gaba Road BH No. 4	2.50 - 2.95	1.76	34	12

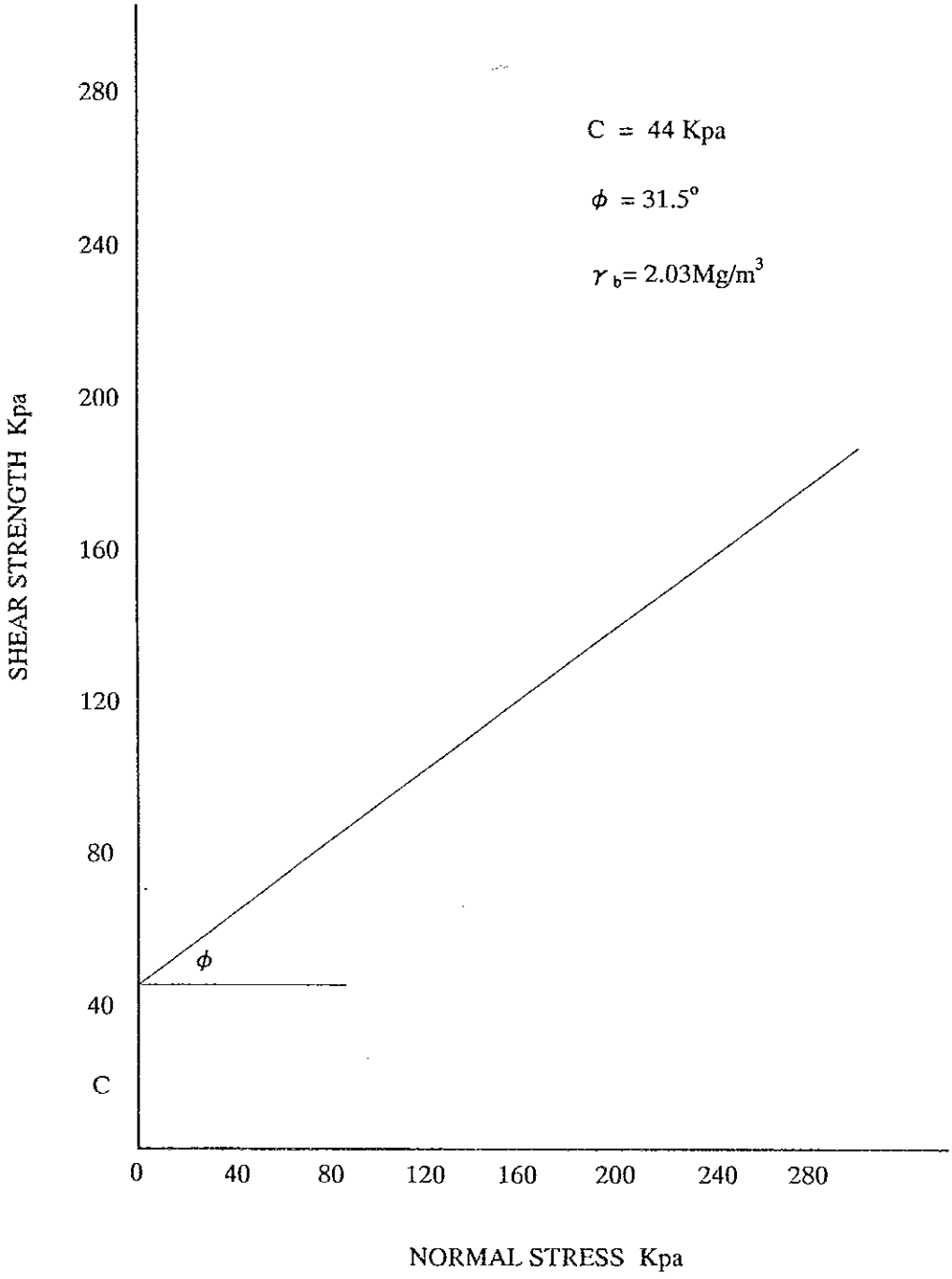
Result of Shear Strength Test (1)

HOIMA ROAD (1)

BH NO.1 DEPTH 1.50 - 1.95



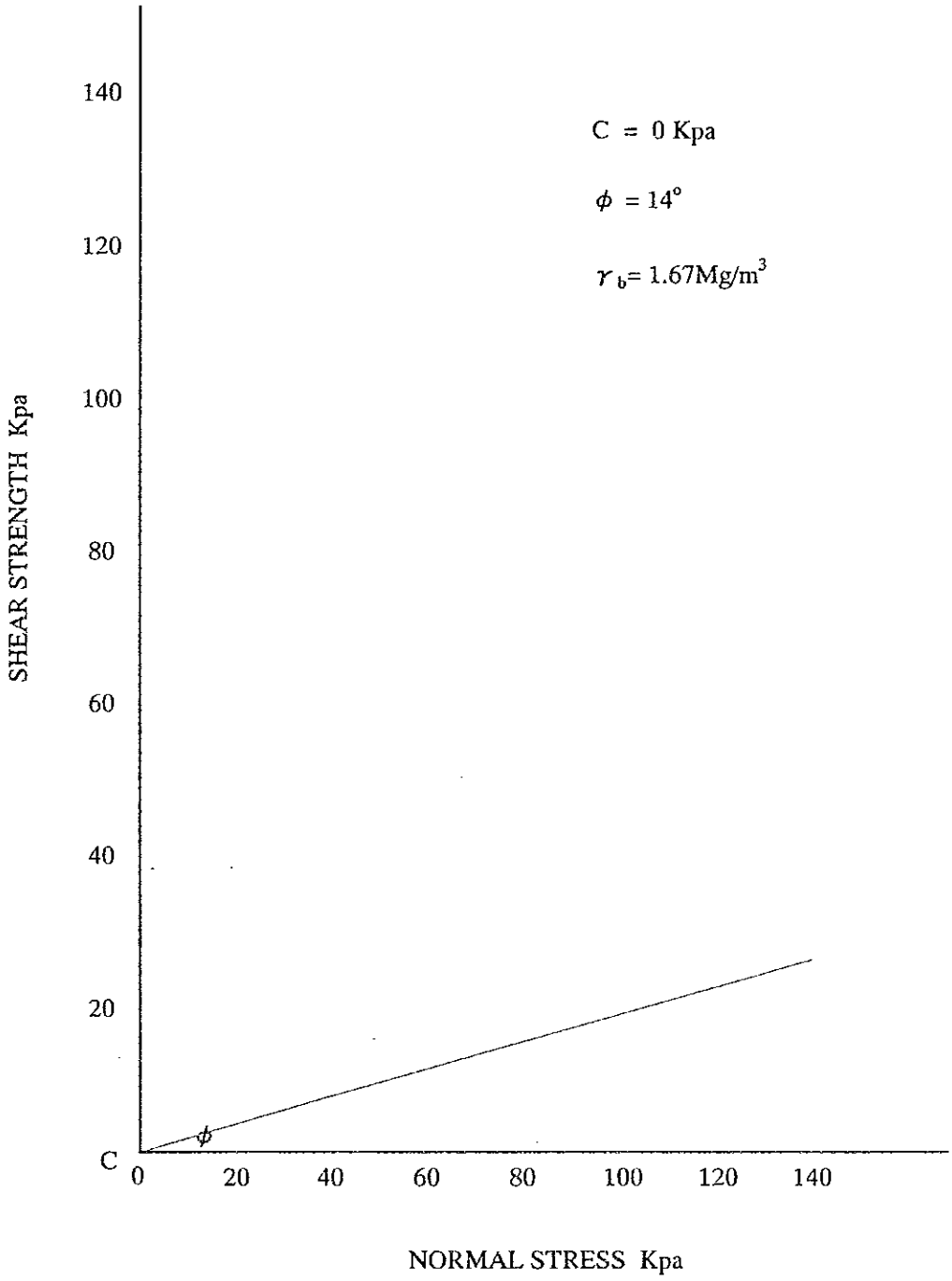
Result of Shear Strength Test (2)
HOIMA ROAD (2)
BH NO. 1 DEPTH:3.00 - 3.45m



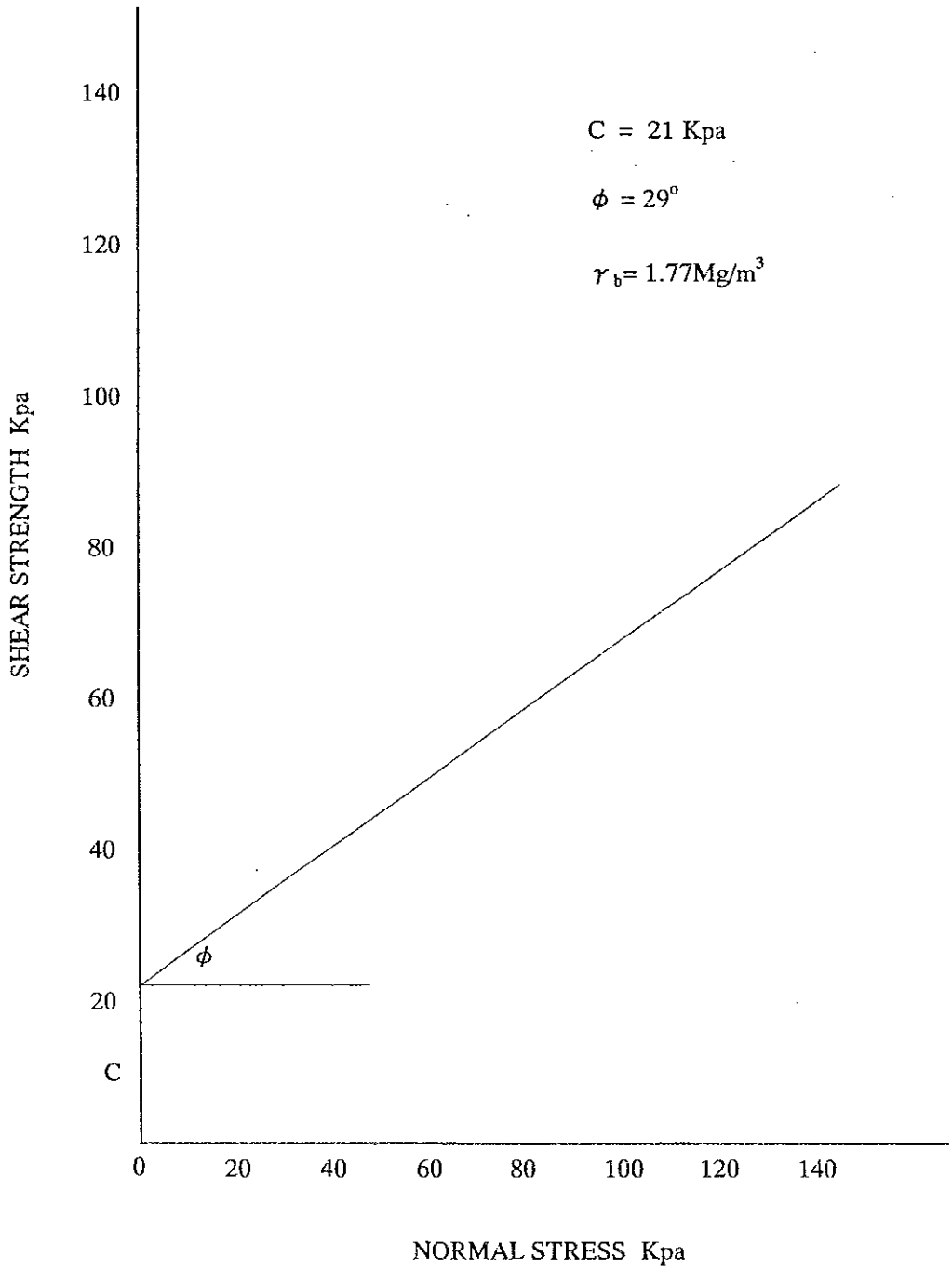
Result of Shear Strength Test (3)

NATETE ROAD (1)

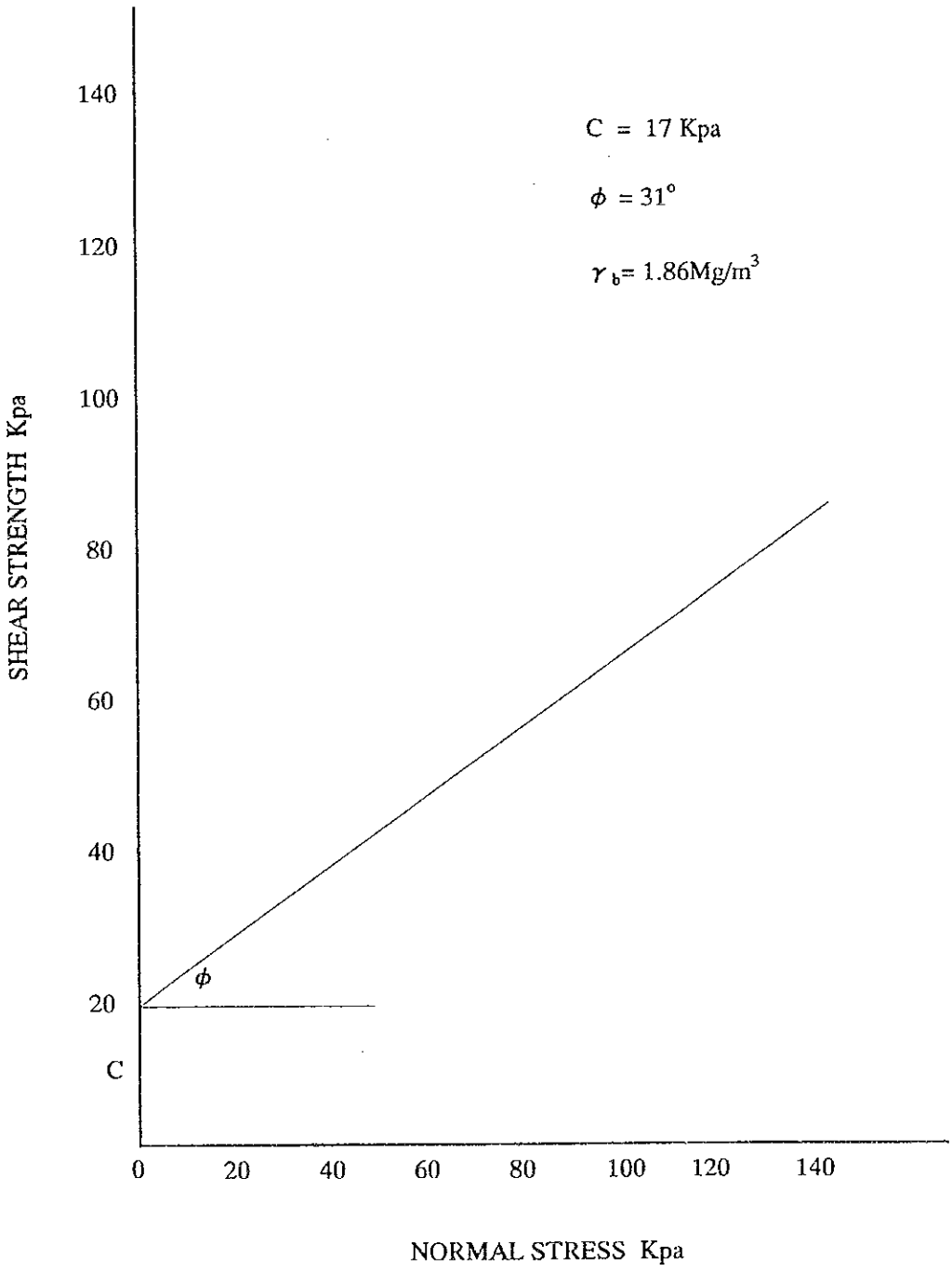
BH NO.2 DEPTH:1.50 - 1.95m



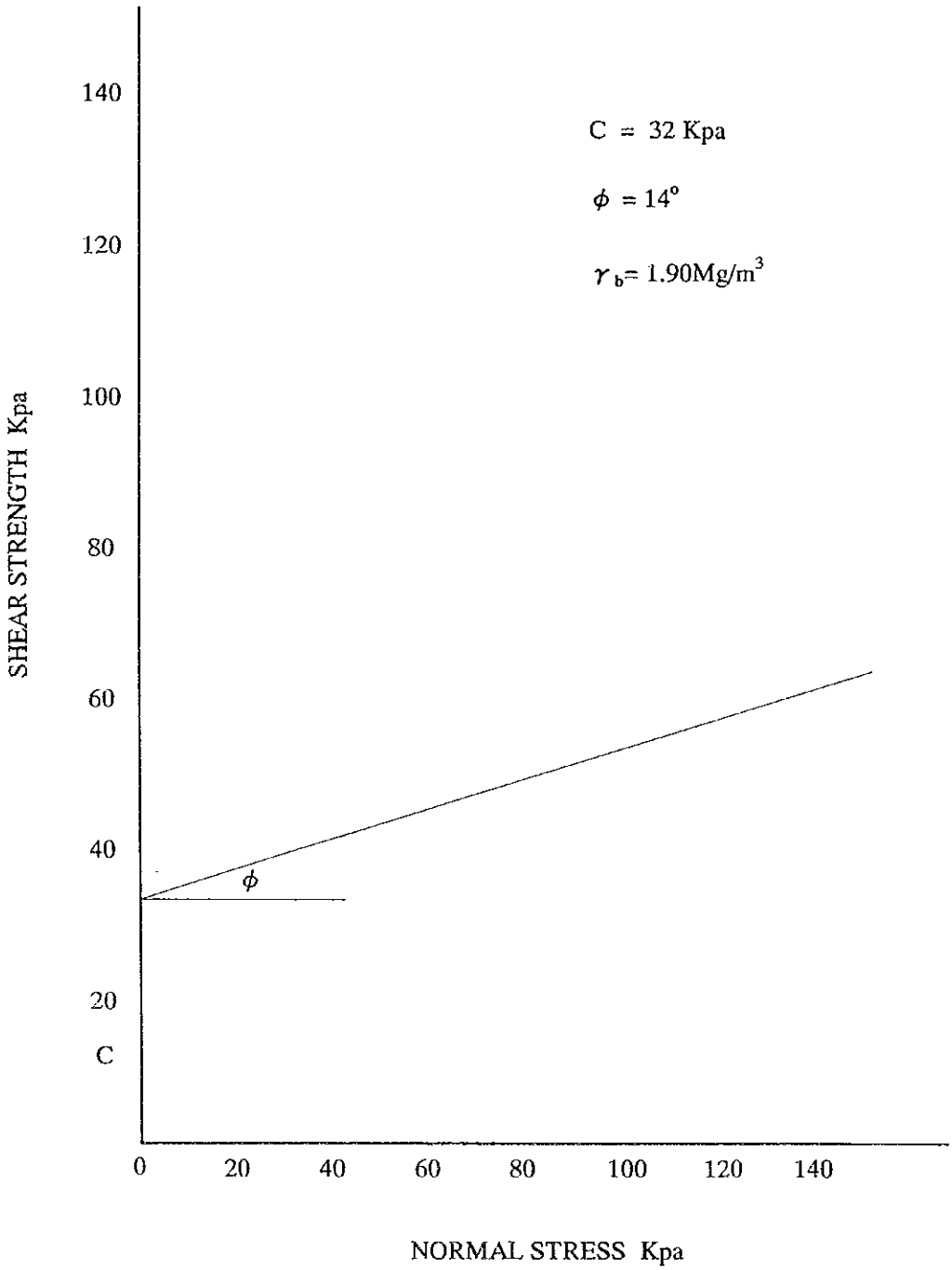
Result of Shear Strength Test (4)
NATETE ROAD (2)
BH NO. 1 DEPTH:3.00 - 3.45m



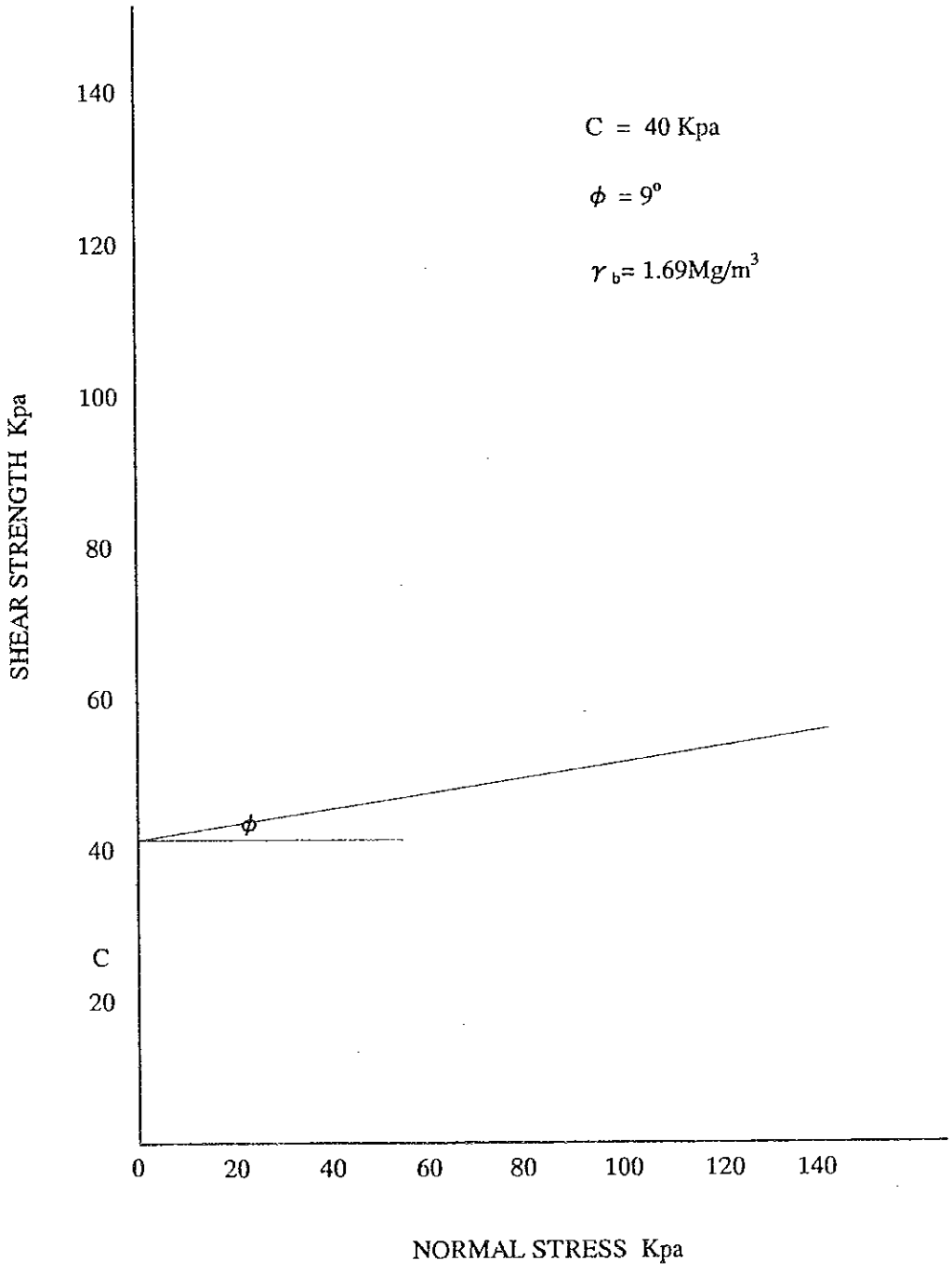
Result of Shear Strength Test (5)
ENTEBBE ROAD (1)
BH NO. 1 DEPTH:1.00 - 1.45m



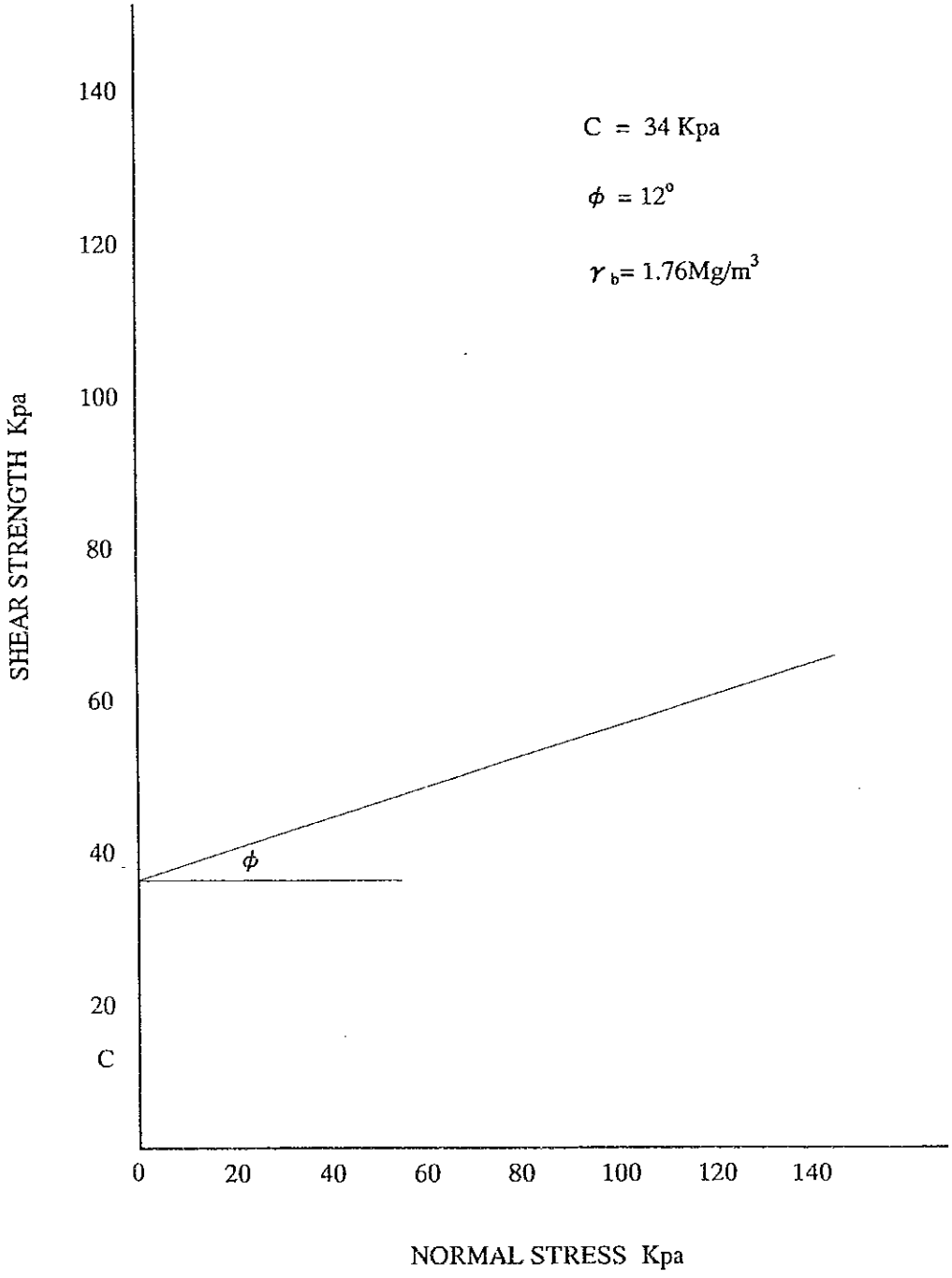
Result of Shear Strength Test (6)
ENTEBBE ROAD (2)
BH NO. 1 DEPTH:2.00 - 2.45m



Result of Shear Strength Test (7)
GABA ROAD (1)
BH NO. 1 DEPTH:1.50 - 1.95m



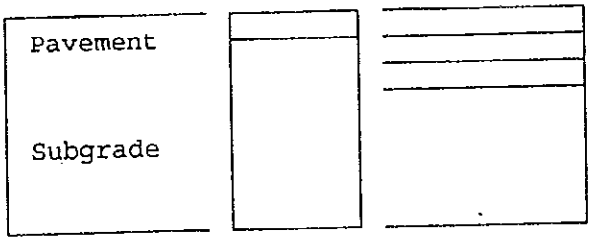
Result of Shear Strength Test (8)
GABA ROAD (2)
BH NO. 1 DEPTH:2.50 - 2.95m



Appendix10.4 Result of Pavement Structure (1)

Name of Road	GAYAZA ROAD	Station	GA NO. 1

Cross Section

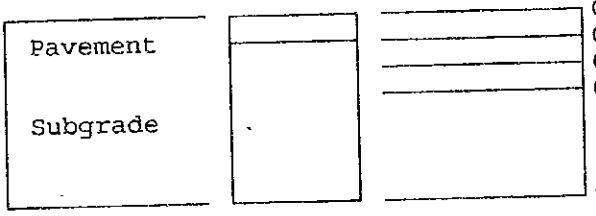


Soil Profile

(m)	
0.000	Surface AS Pavement
0.035	
0.185	Base(L.S.G)
0.385	Subbase (Neat gravel)
	Brown silt sandy CLAY
1.385	

Name of Road	GAYAZA ROAD	Station	GA NO. 2

Cross Section

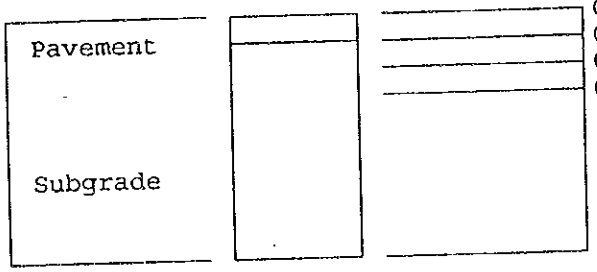


Soil Profile

(m)	
0.000	Surface AS Pavement
0.020	
0.130	Base(L.S.G)
0.250	Subbase (Neat gravel)
	Black silt-sandy CLAY
1.250	

Name of Road	GAYAZA ROAD	Station	GA NO. 3

Cross Section

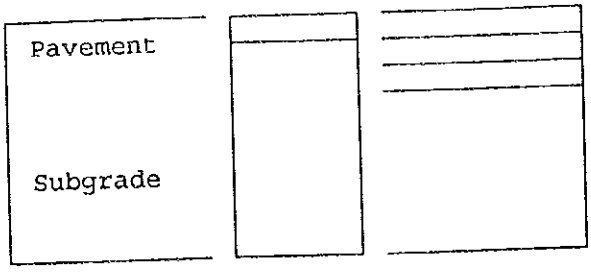


Soil Profile

(m)	
0.000	Surface AS Pavement
0.020	
0.080	Base(L.S.G)
0.230	Subbase (Neat gravel)
	Brown silt-sandy CLAY
1.230	

Name of Road	GAYAZA ROAD	Station	GA NO. 4

Cross Section



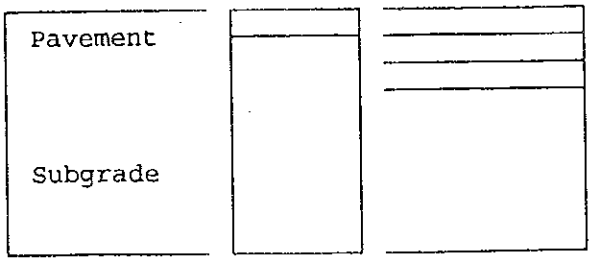
Soil Profile

(m)	
0.000	Surface AS Pavement
0.030	
0.105	Base(L.S.G)
0.205	Subbase (Neat gravel)
	Brown sandy silt CLAY
1.205	

Appendix10.4 Result of Pavement Structure (2)

Name of Road	BOMBO ROAD	Station	BO NO. 1

Cross Section

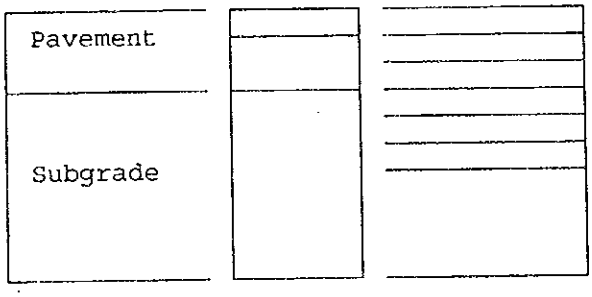


Soil Profile

(m)	
0.000	Surface AS Pavement
0.060	
0.210	Base(L.S.G)
0.360	Subbase (Neat gravel)
	Red silt sandy CLAY
1.360	

Name of Road	BOMBO ROAD	Station	BO NO. 2

Cross Section

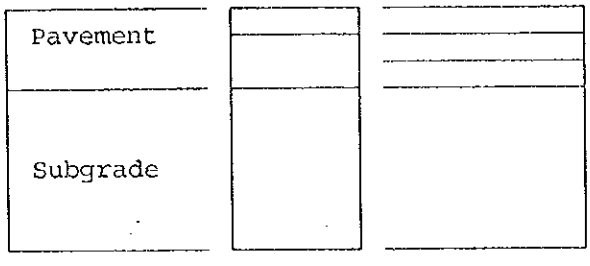


Soil Profile

(m)	
0.000	Surface AS Pavement
0.030	
0.150	Base(L.S.G)
0.250	Subbase (Neat gravel)
0.270	Old asphalt surfaces
0.420	L.S.G
0.570	Neat gravel
	Grey silty SANDS
1.570	

Name of Road	HOIMA ROAD	Station	HO NO. 1

Cross Section

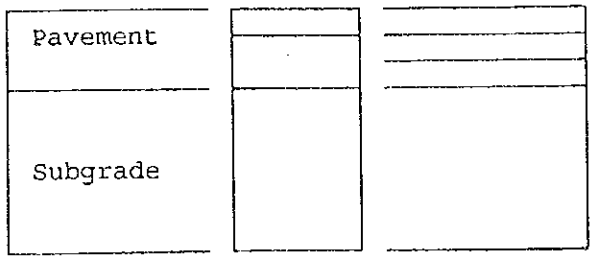


Soil Profile

(m)	
0.000	Surface AS Pavement
0.100	
0.190	Base(C.S.B)
0.290	Subbase (Neat gravel)
	Red silty CLAY
1.290	

Name of Road	HOIMA ROAD	Station	HO NO. 2

Cross Section



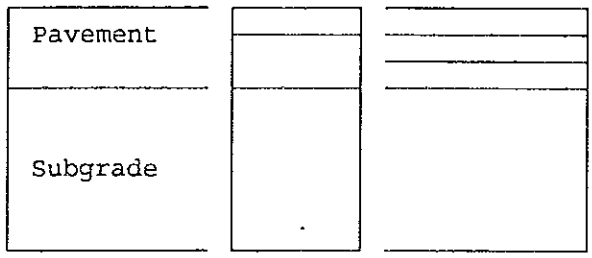
Soil Profile

(m)	
0.000	Surface AS Pavement
0.070	
0.170	Base(C.S.B)
0.270	Subbase (Neat gravel)
	Dark brown sandy CLAY
1.270	

Appendix10.4 Result of Pavement Structure (3)

Name of Road	HOIMA ROAD	Station	HO NO. 3

Cross Section

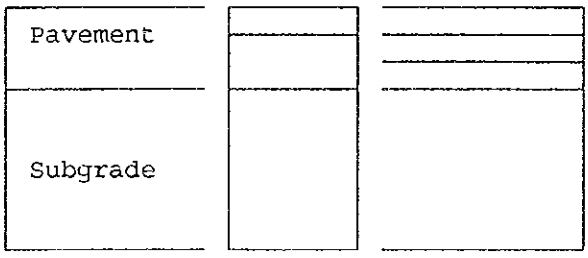


Soil Profile

(m)	
0.000	Surface AS Pavement
0.040	
0.120	Base(L.S.G)
0.220	Subbase(Neat gravel)
	Brown CLAY
1.220	

Name of Road	HOIMA ROAD	Station	HO NO. 4

Cross Section

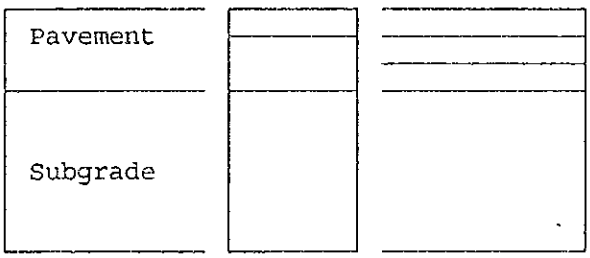


Soil Profile

(m)	
0.000	Surface AS Pavement
0.040	
0.190	Base(Neat gravel)
0.240	Subbase(Neat gravel)
	Gravelly silt SANDS
1.240	

Name of Road	NAMIREMBE ROAD	Station	NA NO. 1

Cross Section

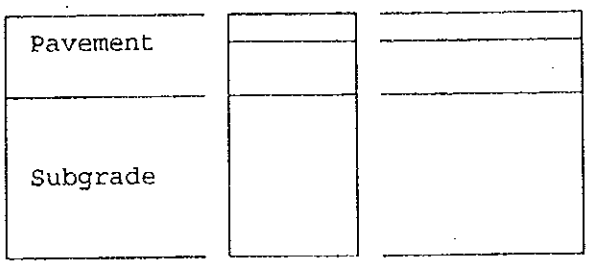


Soil Profile

(m)	
0.000	Surface AS Pavement
0.040	
0.190	Base(L.S.G)
0.290	Subbase (Neat gravel)
	Brown sandy silty CLAY
1.290	

Name of Road	MASAKA ROAD	Station	MSK NO. 1

Cross Section



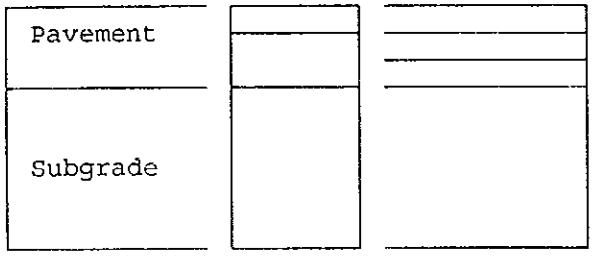
Soil Profile

(m)	
0.000	Surface AS Pavement
0.030	
	Base(L.S.G)
0.230	Subbase (Absent)
	Grey silty SANDS
1.230	

Appendix10.4 Result of Pavement Structure (4)

Name of Road	MASAKA ROAD	Station	MSK NO. 2

Cross Section

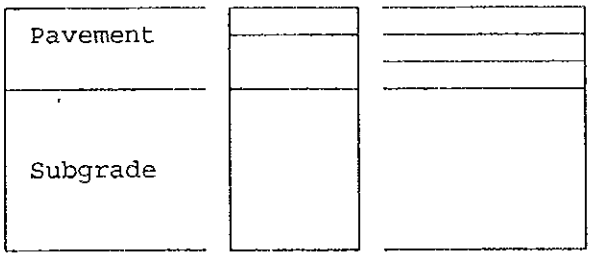


Soil Profile

(m)	
0.000	Surface AS Pavement
0.040	
0.190	Base(L.S.G)
0.340	Subbase(Neat gravel)
	Brown sandy silty CLAY
1.340	

Name of Road	MASAKA ROAD	Station	MSK NO. 3

Cross Section

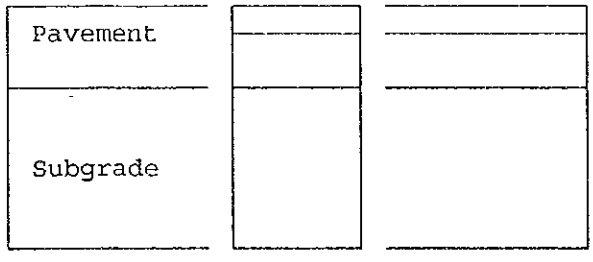


Soil Profile

(m)	
0.000	Surface AS Pavement
0.020	
0.120	Base(L.S.G)
0.220	Subbase(Neat gravel)
	Dark very sandy silt CLAY
1.220	

Name of Road	MENGO ROAD	Station	ME NO. 1

Cross Section

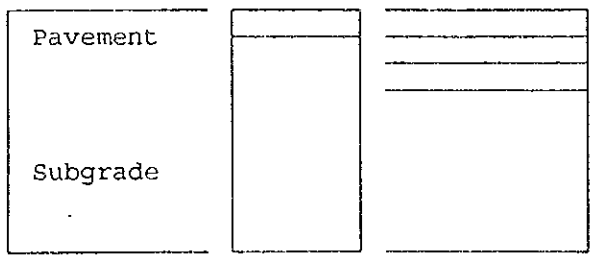


Soil Profile

(m)	
0.000	Surface AS Pavement
0.010	
	Base(Neat gravel)
0.045	Subbase (Absent)
	Silty CLAY
1.045	

Name of Road	MENGO ROAD	Station	ME NO. 2

Cross Section



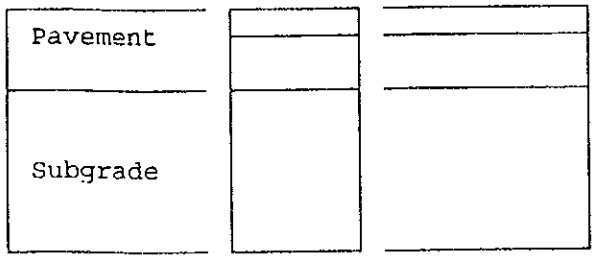
Soil Profile

(m)	
0.000	Surface AS Pavement
0.040	
0.140	Base(Neat gravel)
0.290	Subbase (Neat gravel)
	Brown silty CLAY
1.290	

Appendix10.4 Result of Pavement Structure (5)

Name of Road	KATWE ROAD	Station	KT NO. 1

Cross Section

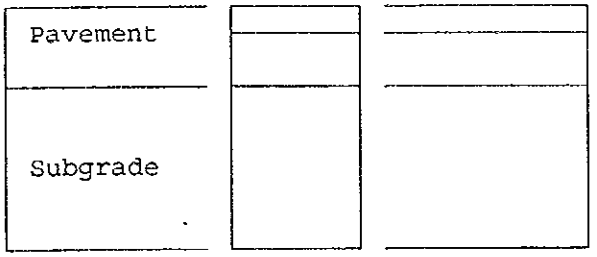


Soil Profile

(m)	
0.000	Surface AS Pavement
0.030	Base(L.S.G)
0.090	Subbase (Absent)
	Brown silty CLAY
1.090	

Name of Road	GABA ROAD	Station	GB NO. 1

Cross Section

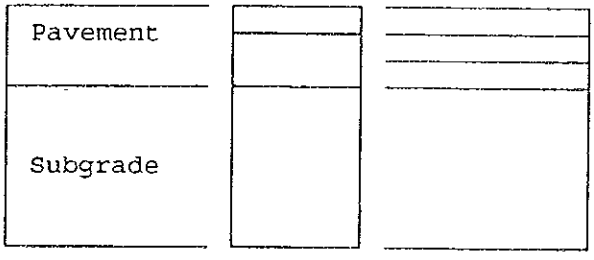


Soil Profile

(m)	
0.000	Surface AS Pavement
0.065	Base(Neat gravel)
0.265	Subbase (Absent)
	Brown sandy silt CLAY
1.265	

Name of Road	GABA ROAD	Station	GB NO. 2

Cross Section

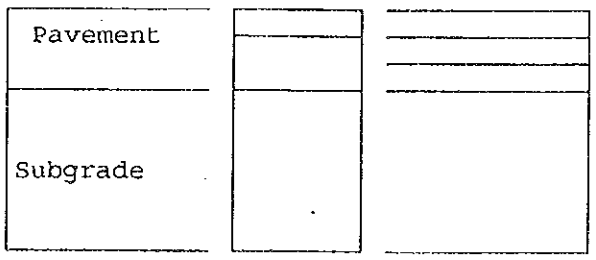


Soil Profile

(m)	
0.000	Surface AS Pavement
0.030	
0.180	Base(Neat gravel)
0.330	Subbase(Neat gravel)
	Yellowish silt SANDS (FILL)
1.330	

Name of Road	GABA ROAD	Station	GB NO. 3

Cross Section



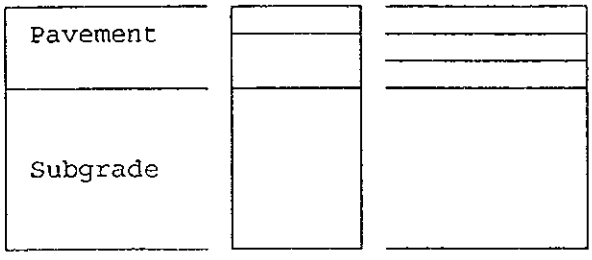
Soil Profile

(m)	
0.000	Surface AS Pavement
0.040	
0.190	Base(L.S.G)
0.340	Subbase(Neat gravel)
	Dark brown sandy silt CLAY
1.340	

Appendix10.4 Result of Pavement Structure (6)

Name of Road	GABA ROAD	Station	GB NO. 4

Cross Section

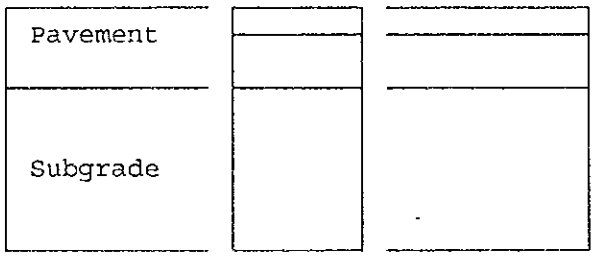


Soil Profile

(m)	
0.000	Surface AS Pavement
0.040	
0.140	Base(L.S.G)
0.260	Subbase(Neat gravel)
	Brown sandy silty CLAY
1.260	

Name of Road	PORTBELL ROAD	Station	PB NO. 1

Cross Section

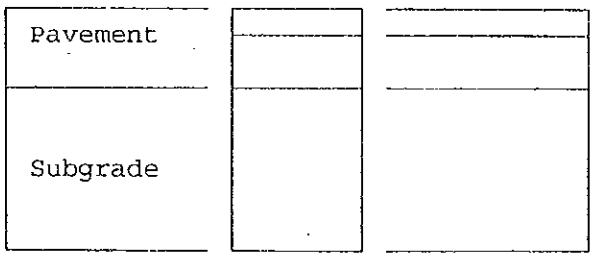


Soil Profile

(m)	
0.000	Surface AS Pavement
0.020	
	Base(L.S.B GRAVEL)
0.220	Subbase (Absent)
	Dark brown sandy CLAY
1.220	

Name of Road	PORTBELL ROAD	Station	PB NO. 2

Cross Section

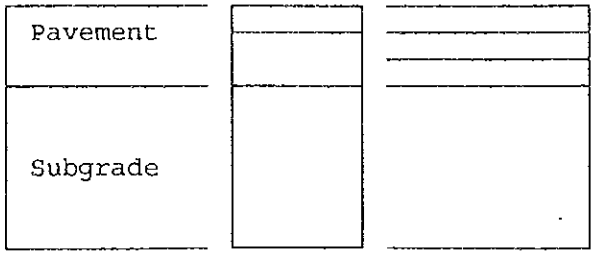


Soil Profile

(m)	
0.000	Surface AS Pavement
0.030	
	Base(L.S.G)
0.230	Subbase (Absent)
	Brown silty CLAY
1.230	

Name of Road	PORTBELL ROAD	Station	PB NO. 3

Cross Section



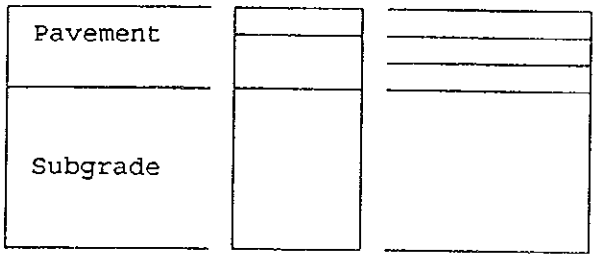
Soil Profile

(m)	
0.000	Surface AS Pavement
0.030	
0.230	Base(L.S.G)
0.380	Subbase (Neat gravel)
	Grey clayey SANDS
1.380	

Appendix10.4 Result of Pavement Structure (7)

Name of Road	JINJA ROAD	Station	JJA NO. 1

Cross Section

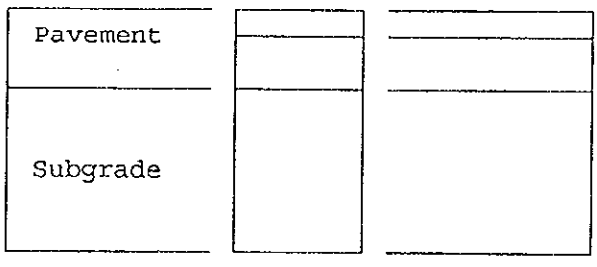


Soil Profile

(m)	
0.000	Surface AS Pavement
0.090	
0.240	Base(L.S.G)
0.390	Subbase(Neat Gravel)
	Grey sand silt CLAY
1.390	

Name of Road	JINJA ROAD	Station	JJA NO. 2

Cross Section

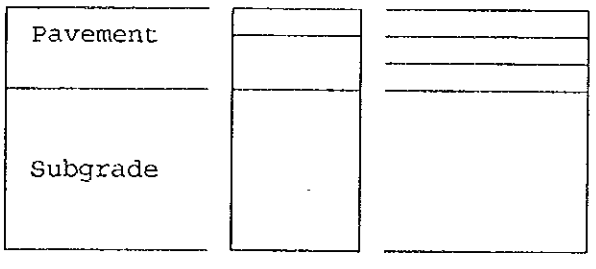


Soil Profile

(m)	
0.000	Surface AS Pavement
0.095	
	Base(L.S.G)
0.185	Subbase (Absent)
	Brown sand-silt CLAY
1.185	

Name of Road	JINJA ROAD	Station	JJA NO. 3

Cross Section



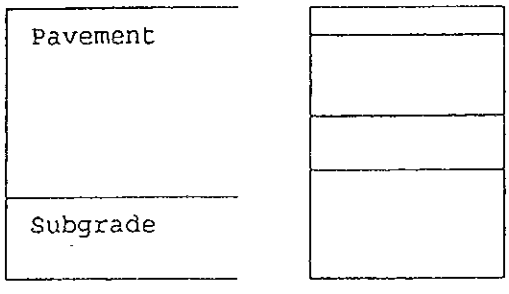
Soil Profile

(m)	
0.000	Surface AS Pavement
0.050	
0.350	Base(L.S.G)
0.650	Subbase (Neat gravel)
	Clayey gravel (Fill)
1.650	

Appendix10.4 Result of Pavement Structure (8)

KIBUYE ROUND-ABOUT

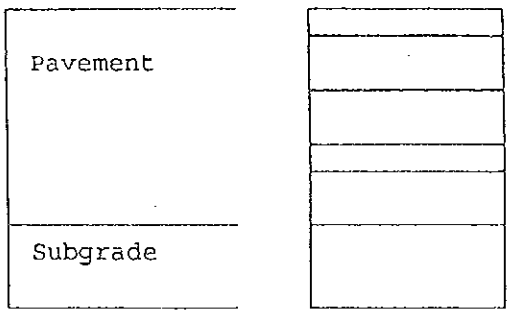
PIT CROSS SECTION (m)



0.000	Surface dressing
0.020	Lime stabilized brown clayey gravel
0.320	Yellowish clayey gravel
0.420	Red silty clay
1.000	

JINJA ROAD ROUND-ABOUT

PIT CROSS SECTION (m)



0.000	Asphalt
0.050	Red clay gravel stabilized
0.300	Yellowish clay gravel (non-stabilized)
0.450	Old surface dressing 10mm
0.460	Yellow clay gravel
0.660	Red silty clay (fill)
1.500	

Appendix10.5 Results of Surface Thickness Investigation

REFERENCE POINT	SURFACING TYPE	THICKNESS (mm)
HO No. 5	Surface dressing	20
HO No. 6	Surface dressing	10
HO No. 7	Surface dressing	10
HO No. 8	Surface dressing	20
GA No. 5	Surface dressing	10

REFERENCE POINT	SURFACING TYPE	THICKNESS (mm)
NA No. 2	Surface dressing	20
NA No. 3	Asphalt concrete	30
NA No. 4	Asphalt concrete	40
PB No. 4	Surface dressing	10
PB No. 5	Surface dressing	20

REFERENCE POINT	SURFACING TYPE	THICKNESS (mm)
PB No. 6	Asphalt	30
GB No. 5	None	-
GB No. 6	Surface dressing	20
GB No. 7	Surface dressing	10
GB No. 8	Surface dressing	10

Appendix10.6 Results of Test for Subgrade Material (1)

Test-pit No.		GA No.1	GA No.2	GA No.3	GA No.4	BO No.1	BO No.2	BO No.3	HO No.1	HO No.2	HO No.3	HO No.4	NA No.1	MSK No.1	MSK No.2	MSK No.3	ME No.1
Grain-Size	BS Sieve	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing
Analysis	37.5mm	100	-	-	-	-	-	-	100	-	-	100	-	-	-	-	-
	20.0mm	97	100	100	100	-	100	-	99	100	100	94	100	-	100	100	-
	10.0mm	94	99	96	98	100	94	100	99	98	99	83	98	100	99	98	-
	5.0mm	85	96	89	95	98	89	99	98	97	98	76	95	98	99	95	-
	2.0mm	70	94	84	93	97	84	98	98	95	97	61	93	95	98	89	100
	0.6mm	64	86	77	86	90	74	90	91	86	90	49	86	74	89	78	91
	0.425mm	62	83	74	82	88	68	85	88	82	87	47	84	63	85	75	88
	0.3mm	60	77	70	78	85	61	79	83	75	84	45	80	55	80	72	83
	0.212mm	57	71	65	72	82	52	71	78	68	80	42	77	45	73	68	78
	0.15mm	54	64	60	67	79	45	62	74	62	77	40	73	34	66	63	73
	0.063mm	50	60	56	62	76	37	55	71	56	73	37	69	26	62	54	71
Specific Gravity		2.67	2.65	2.85	2.60	2.65	2.65	2.78	2.61	2.71	2.75	2.78	2.70	2.80	2.64	2.75	2.72
Natural Moisture Content (%)		16.0	14.0	15.0	12.0	24.0	16.0	13.0	20.0	12.0	19.0	9.0	21.0	8.0	1.0	10.0	14.0
Atterberg	L.L (%)	48.0	40.0	38.0	42.0	51.0	27.0	38.0	49.2	38.0	57.0	43.0	47.0	22.0	38.0	39.0	39.0
Limits	P.L (%)	20.2	16.2	16.1	18.1	22.4	NP	17.4	21.0	17.5	22.8	20.6	22.6	NP	16.4	16.3	15.8
	P.I (%)	27.8	23.8	21.9	23.9	28.6	-	20.6	28.2	20.5	34.2	22.4	24.4	-	21.6	22.7	23.2
Site CBR (%)		1.9, 2.4, 1.0	9.3, 6.0, 7.1	31.4, 33.5, 26.8	7.2, 10.6, 10.2	0.7, 1.9, 2.2	8.3, 6.9, 7.4	16.2, 18.0, 15.6	3.2, 4.1, 10.2	16.7, 3.7, 18.1	6.3, 30.5, 28.3	55.4, 60.4, 50.9	15.5, 17.7, 24.4	13.4, 10.4, 9.3	13.2, 12.4, 10.9	25.5, 26.5, 30.7	16.4, 16.8, 18.6
BS Soil Classification		CI	CI	CI	CI	CH	SM	CI	CI	CI	CH	SM	CI	SM	CI	CI	CI

Appendix10.6 Results of Test for Subgrade Material (2)

Test-pit No.		ME No.2	KT No.1	GE No.1	GE No.2	GE No.3	GE No.4	PB No.1	PB No.2	PB No.3	JJA No.1	JJA No.2	JJA No.3	JJA No.4	JJA No.5	JRA	KRA
Grain-Size Analysis	BS Sieve	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing
	37.5mm	-	100	-	100	100	-	-	-	100	-	-	95	100	100	100	100
	20.0mm	100	99	-	98	98	100	-	-	95	-	-	90	99	99	99	100
	10.0mm	99	97	100	94	96	98	100	100	93	-	100	80	96	98	98	100
	5.0mm	96	93	99	88	90	93	99	98	87	100	99	64	91	91	96	99
	2.0mm	93	91	98	76	85	85	98	97	80	99	97	55	86	94	94	97
	0.6mm	83	85	93	58	79	79	89	89	65	94	93	45	77	89	88	93
	0.425mm	79	83	90	5	77	77	86	86	60	90	91	43	75	87	84	89
	0.3mm	74	79	86	50	73	75	80	82	55	85	89	41	72	84	81	85
	0.212mm	69	76	80	46	70	73	73	77	50	80	86	39	68	80	77	80
	0.15mm	64	71	73	42	66	71	63	73	46	72	80	37	64	75	72	74
	0.063mm	57	69	70	36	63	69	53	70	41	67	74	33	59	71	63	69
Specific Gravity		2.82	2.72	2.71	2.81	2.83	2.72	2.68	2.69	2.77	2.59	2.82	2.83	2.75	2.74	2.76	2.74
Natural Moisture Content (%)		14.0	17.0	17.0	17.0	16.0	17.0	17.0	18.0	18.0	30.0	20.0	14.0	14.0	15.0	21.0	16.0
Atterberg Limits	L.L (%)	46.0	45.0	47.0	41.0	46.8	50.5	30.2	41.0	39.0	46.0	44.5	42.0	40.0	38.0	46.0	48.0
	P.L (%)	18.0	17.7	14.2	14.9	20.8	24.6	13.9	18.8	16.2	15.7	19.3	19.6	18.4	17.1	23.0	22.0
	P.I (%)	28.0	27.3	29.8	26.1	26.0	25.9	16.3	25.2	22.8	30.3	25.2	22.6	21.6	20.9	23.0	26.0
Site CBR (%)		27.1, 25.1, 31.5	19.2, 34.1, 26.3	23.7, 27.3, 10.8	6.9, 6.9, 7.3	22.1, 20.2, 18.4	27.1, 30.9, 25.5	7.5, 7.4, 8.0	7.4, 5.7, 6.5	4.5, 6.7, 4.0	3.5, 5.0, 6.3	16.8, 17.6, 14.5	10.6, 12.9, 10.2	11.8, 9.0, 9.3	25.6, 26.2, 28.8	-	-
BS Soil Classification		CI	CI	CI	SM	CI	CI	CL	CI	SC	CI	CI	GC	CI	CI	CI	CI

JRA Jinja Road Roundabout
KRA Kibuye Roundabout

Appendix10.7 Results of Pavement Structure Investigation (1)

REFERENCE POINT	TEST NO.	BASE		SUBBASE		SUBGRADE	
		THICKNESS (mm)	CBR (%)	THICKNESS (mm)	CBR (%)	THICKNESS (mm)	CBR (%)
NA NO.2	1	141	69	190	28	300	6
	2	178	49	140	37	300	4
	3	130	40	130	40	300	8
Average		150	53	153	35	300	6
NA NO.3	1	245	20	200	20	300	10
	2	250	23	199	23	300	13
	3	222	22	200	22	300	15
Average		239	22	200	22	300	13
NA NO.4	1	166	60	250	26	300	25
	2	164	54	360	25	300	23
	3	148	82	240	30	300	25
Average		159	65	283	27	300	24
GB NO.5	1	150	118	190	51	300	35
	2	150	95	140	61	300	38
	3	164	118	120	78	300	31
Average		155	110	150	63	300	35
GB NO.6	1	140	45	200	36	300	20
	2	155	36	200	36	290	21
	3	160	88	170	53	300	19
Average		152	56	190	42	297	20
GB NO.7	1	130	302	120	145	300	45
	2	133	341	120	160	300	40
	3	130	302	120	160	300	50
Average		131	315	120	155	300	45
GB NO.8	1	250	64	240	24	300	20
	2	249	80	220	37	300	27
	3	265	64	230	29	270	14
Average		255	69	230	30	290	20
PB NO.4	1	214	75	150	163	300	41
	2	197	84	140	169	300	57
	3	200	83	160	160	300	52
Average		204	81	150	164	300	50

Appendix10.7 Results of Pavement Structure Investigation (2)

REFERENCE POINT	TEST NO.	BASE		SUBBASE		SUBGRADE	
		THICKNESS (mm)	CBR (%)	THICKNESS (mm)	CBR (%)	THICKNESS (mm)	CBR (%)
PB NO.5	1	87	121	150	63	300	29
	2	87	121	150	63	300	31
	3	87	121	170	88	300	31
Average		87	121	157	71	300	30
PB NO.6	1	145	215	160	73	300	26
	2	156	200	110	96	300	37
	3	156	200	120	92	300	40
Average		152	205	130	87	300	34
HO NO.5	1	115	73	130	33	300	17
	2	144	64	150	30	300	13
	3	103	82	170	35	300	23
Average		121	73	150	33	300	18
HO NO.6	1	139	102	200	39	300	19
	2	130	101	200	38	300	35
	3	130	101	200	38	300	35
Average		133	101	200	38	300	30
HO NO.7	1	133	98	180	34	300	35
	2	137	95	200	35	300	21
	3	125	79	280	34	300	25
Average		132	91	220	34	300	27
HO NO.8	1	131	79	160	46	300	17
	2	124	89	170	55	300	35
	3	139	98	190	37	300	21
Average		131	89	173	46	300	24
GA NO.5	1	253	93	200	26	300	11
	2	303	72	180	17	300	12
	3	331	72	180	45	300	10
Average		296	79	187	29	300	11

Appendix10.8 Results of Borrow Material (1)

Name of Borrow Pit		NANSANA	SEGUKU	KANYANYA	MUTUNDWE	MBUYA
Grain-Size Analysis	BS Sieve					
	50.0 mm	100	100		100	100
	37.5 mm	95	95	100	94	90
	20.0 mm	80	85	92	80	81
	10.0 mm	62	59	69	50	62
	6.3 mm	49	41	52	32	47
	5.0 mm	42	37	46	27	41
	2.0 mm	29	29	33	17	28
	0.6 mm	24	24	28	17	24
	0.425 mm	22	23	27	16	23
	0.3 mm	21	23	26	16	22
	0.212 mm	19	22	25	15	22
	0.15 mm	18	21	25	15	21
	0.063 mm	16	20	24	14	20
Specific Gravity		2.69	2.84	2.75	2.81	2.76
Natural Moisture Content (%)		23	20	23	21	20
Atterberg Limits	L.L. (%)	41.0	47.5	54.0	47.0	51.0
	P.L. (%)	19.0	23.0	26.0	24.0	25.0
	P.I (%)	22.0	24.5	28.0	23.0	26.0
CBR Modified	OMC (%) MDD (t/m^3)	9.0 2.09	11.8 2.11	11.5 2.13	10.2 2.14	11.2 2.02
	4-days soaked (%)	31	26	30	28	20
BS Soil Classification		GC	GC	GC	GC	GC

Appendix10.8 Results of Borrow Material (2)

Name of Borrow Pit		NANSANA	SEGUKU	KANYANYA	MUTUNDWE	MBUYA
Grain-Size Analysis	BS Sieve					
	50.0 mm	100	100		100	100
	37.5 mm	90	95		96	93
	20.0 mm	75	80	100	82	80
	10.0 mm	65	60	90	64	63
	6.3 mm	52	42	50	35	46
	5.0 mm	40	38	44	29	40
	2.0 mm	34	32	34	18	29
	0.6 mm	30	28	31	17	25
	0.425 mm	27	26	29	17	24
	0.3 mm	26	24	28	17	23
	0.212 mm	24	21	27	16	22
	0.15 mm	19	19	26	15	21
	0.063 mm	18	17	24	15	19
Specific Gravity		2.72	2.80	2.72	2.80	2.75
Natural Moisture Content (%)		23	21	23	21	20
Atterberg Limits	L.L. (%)	42.0	46.0	55.0	47.2	50.0
	P.L. (%)	20.0	23.0	27.0	24.1	25.0
	P.I (%)	22.0	23.0	28.0	23.1	25.0
CBR Proctor	OMC (%)	13.7	14.4	11.8	13.0	14.6
	MDD (t/m^3)	1.82	1.86	2.00	1.93	1.86
	4-days soaked (%)	8	5	13	12	8
BS Soil Classification		GC	GC	GC	GC	GC

Appendix10.9 Results of Quarry Material

Name of Quarry Site		MUYENGA	MUYENGA
Grain-Size Analysis	BS Sieve	20 mm	14 mm
	28 mm	100	100
	20.0 mm	100	100
	14 mm	33	90
	10 mm	3	6
	6.3 mm	-	0
	2.36 mm	1	0
	0.075 mm	0	0
Specific Gravity			
Flakiness Index		17	9
Average Linear Dimension (ALD %)		10.1	9.6
Aggregate Impact Value (AIV %)		16	14
Los Angeles abrasion Value (LAAV %)		22	19
10% FACT (kN)		215	240

Appendix10.10 Annual Rainfall Data

Year	Annual Total
1974	948.6
1975	1019.8
1976	1263.3
1977	1134.4
1978	1451.3
1979	1220.9
1980	1423.2
1981	1141.2
1982	-
1983	1092.3
1984	739.9
1985	1009.4
1986	926.9
1987	1029.9
1988	1427.4
1989	1289.2
1990	1028.0
1991	1411.6
1992	850.5
1993	969.7
1994	1114.0
1995	1052.5
1996	1176.8

Appendix 10.11 Rainfall at Kampala

		1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Jan	Total	75.5	36.9	47.7	102.5	8.3	78.2	36.1	73.3	-	52.5	19.4	123.8	18.1	78.9	105.5	19.2	76.4	39.2	55.8	46.6	33.2	6.7	131.1
	Average	2.4	1.2	1.5	3.3	0.3	2.5	1.2	2.4	-	1.7	0.6	4.0	0.6	2.5	3.4	0.6	2.5	1.3	1.8	1.5	1.1	0.2	4.2
	Max	18.1	11.2	16.0	50.6	4.0	25.3	27.5	34.2	-	40.5	8.0	39.5	10.3	30.5	44.0	11.0	20.1	25.2	34.0	22.2	17.0	6.7	54.4
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb	Total	45.1	79.2	140.8	0.0	124.1	127.5	27.2	37.9	-	10.0	7.6	15.5	24.5	7.3	42.7	83.6	18.5	64.7	33.4	23.3	43.6	46.0	14.4
	Average	1.5	2.6	4.5	#DIV/0!	4.0	4.1	0.9	1.2	-	0.3	0.2	0.5	0.8	0.2	1.4	2.7	0.6	2.1	1.1	0.8	1.4	1.5	0.5
	Max	20.5	17.5	31.8	0.0	51.3	45.9	8.2	17.2	-	3.2	2.0	15.5	10.6	4.2	15.5	59.3	9.4	21.8	13.6	17.7	25.7	30.0	5.5
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar	Total	71.2	125.1	167.5	188.5	119.7	169.6	162.8	103.2	-	64.5	73.2	106.3	99.2	19.6	161.5	106.3	221.9	86.6	54.1	154.3	26.6	166.4	168.5
	Average	2.3	4.0	5.4	6.1	3.9	5.7	5.3	3.3	-	2.1	2.4	3.4	3.2	0.6	5.2	3.5	7.2	2.8	1.7	5.0	0.9	5.4	5.4
	Max	20.2	47.5	54.4	54.5	51.6	52.5	51.3	23.4	-	22.0	34.0	45.0	23.4	3.6	31.0	22.0	38.9	26.7	28.3	50.0	17.7	61.6	55.0
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr	Total	125.2	100.2	186.7	169.9	186.4	153.6	214.5	76.8	-	108.2	0.0	137.2	111.4	191.6	307.4	97.7	0.0	328.3	161.0	129.7	161.5	198.9	83.8
	Average	4.0	3.3	6.2	5.7	6.2	5.1	7.2	2.6	-	3.6	#DIV/0!	4.6	3.7	6.4	10.2	3.3	#DIV/0!	10.9	5.4	4.3	5.4	6.6	2.8
	Max	30.5	24.4	34.2	31.9	46.5	50.9	45.5	25.3	-	39.6	0.0	37.8	27.2	36.4	64.4	25.4	0.0	54.4	36.6	40.3	50.5	60.0	30.4
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May	Total	82.9	109.3	90.3	153.8	206.9	154.4	105.1	200.8	-	108.7	55.7	188.9	219.8	72.6	37.7	174.1	94.3	142.8	120.3	167.9	74.6	188.6	286.1
	Average	2.7	3.5	2.9	5.0	6.7	5.0	3.4	6.5	-	3.5	1.8	6.1	7.1	2.3	1.2	5.6	3.0	4.6	3.9	5.4	2.4	6.1	9.2
	Max	18.0	19.6	15.0	51.0	52.2	31.3	43.0	42.9	-	41.8	12.6	47.0	39.0	22.8	20.8	50.0	26.5	22.2	50.8	43.2	36.4	47.6	110.0
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun	Total	86.1	108.5	88.7	105.7	62.3	84.3	98.7	29.8	-	72.1	31.6	20.4	33.0	96.3	53.9	51.1	19.9	56.2	82.4	77.4	34.4	32.4	51.8
	Average	2.8	3.6	3.0	3.5	2.1	2.8	3.3	1.0	-	2.4	1.1	0.7	1.1	3.2	1.8	1.7	0.7	1.9	2.7	2.6	1.1	1.1	1.7
	Max	47.6	39.0	52.1	49.0	17.0	43.5	48.3	16.5	-	42.2	15.8	6.2	15.8	43.7	23.8	15.1	5.8	26.7	21.0	15.1	18.7	14.1	30.5
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul	Total	165.4	35.7	27.0	0.0	54.2	58.5	41.7	50.9	-	80.9	33.7	61.1	44.8	47.0	101.6	36.0	35.0	19.3	83.9	22.7	70.1	89.7	65.9
	Average	5.3	1.2	0.9	#DIV/0!	1.7	1.9	1.3	1.6	-	2.6	1.1	2.0	1.4	1.5	3.3	1.2	1.1	0.6	2.7	0.7	2.3	2.9	2.1
	Max	58.3	8.2	9.3	0.0	13.4	16.7	13.0	20.8	-	37.0	13.5	29.0	19.7	25.0	49.5	19.0	21.0	7.7	22.7	20.7	26.0	36.2	44.9
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug	Total	60.4	81.0	80.0	163.6	123.6	46.4	149.4	77.7	-	81.1	92.3	50.8	1.6	98.6	150.4	58.6	103.0	77.4	90.8	17.0	92.3	42.4	31.6
	Average	1.9	2.6	2.6	5.3	4.0	1.5	4.8	2.5	-	2.6	3.0	1.6	0.1	3.2	4.9	1.9	3.3	2.5	2.9	0.5	3.0	1.4	1.0
	Max	39.8	24.5	27.4	50.5	51.4	17.1	51.0	30.0	-	37.5	37.5	21.6	1.6	46.7	50.5	19.6	48.5	25.0	33.2	6.7	31.0	42.4	10.0
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sep	Total	72.0	141.1	146.6	46.6	88.8	50.8	163.5	181.5	-	181.4	33.6	68.1	49.3	85.6	135.1	93.4	109.8	103.3	0.0	134.0	86.0	152.9	124.3
	Average	2.3	4.6	4.7	1.5	2.9	1.6	5.3	5.9	-	5.9	1.1	2.2	1.6	2.8	4.4	3.0	3.5	3.3	#DIV/0!	4.3	2.8	4.9	4.0
	Max	18.7	20.4	38.6	16.6	32.5	19.0	47.5	32.0	-	51.6	18.6	24.8	18.4	18.5	43.2	35.2	37.8	62.7	0.0	78.3	22.1	32.5	30.1
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oct	Total	57.8	83.1	88.3	119.1	160.3	58.2	97.0	132.8	-	135.3	61.1	77.2	59.6	111.9	93.4	178.7	92.1	194.6	0.0	128.2	221.2	128.5	62.4
	Average	1.9	2.7	2.8	3.8	5.2	1.9	3.1	4.3	-	4.4	2.0	2.5	1.9	3.6	3.0	5.8	3.0	6.3	#DIV/0!	4.1	7.1	4.1	2.0
	Max	28.0	19.4	21.7	20.5	37.6	21.5	28.2	30.0	-	31.9	17.3	30.0	12.4	21.4	15.6	29.4	21.0	68.0	0.0	40.5	69.3	35.5	21.0
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nov	Total	76.8	57.7	125.8	0.0	187.4	148.7	255.7	32.9	-	127.0	256.8	152.5	153.4	131.6	124.4	228.0	135.5	202.6	85.4	40.6	169.5	0.0	114.5
	Average	2.5	1.9	4.1	#DIV/0!	6.0	4.8	8.2	1.1	-	4.1	8.3	4.9	4.9	4.2	4.0	7.4	4.4	6.5	2.8	1.3	5.5	#DIV/0!	3.7
	Max	17.0	21.0	27.0	0.0	28.2	36.1	51.9	16.8	-	35.0	34.6	41.5	33.0	55.5	19.4	56.5	45.6	56.2	26.0	19.8	36.0	0.0	25.4
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dec	Total	30.2	62.0	73.9	84.7	129.3	90.7	71.5	143.6	-	70.6	74.9	7.6	112.2	88.9	113.8	162.5	121.6	96.6	83.4	28.0	101.0	0.0	42.4
	Average	1.0	2.0	2.4	2.7	4.2	2.9	2.3	4.6	-	2.3	2.4	0.2	3.6	2.9	3.7	5.2	3.9	3.1	2.7	0.9	3.3	#DIV/0!	1.4
	Max	12.3	28.8	39.1	28.3	38.8	19.4	29.0	38.1	-	28.5	15.6	2.0	47.0	48.2	37.6	39.0	40.0	34.1	24.3	12.7	33.6	0.0	12.0
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual Total		948.6	1019.8	1263.3	1134.4	1451.3	1220.9	1423.2	1141.2	-	1092.3	739.9	1009.4	926.9	1029.9	1427.4	1289.2	1028.0	1411.6	850.5	969.7	1114.0	1052.5	1176.8
Annual Average		2.6	2.8	3.4	#DIV/0!	3.9	3.3	3.9	3.1	-	3.0	#DIV/0!	2.7	2.5	2.8	3.9	3.5	#DIV/0!	3.8	#DIV/0!	2.6	3.0	#DIV/0!	3.2
Annual Max		58.3	47.5	54.4	54.5	52.2	52.5	51.9	42.9	-	51.6	37.5	47.0	47.0	55.5	64.4	59.3	48.5	68.0	50.8	78.3	69.3	61.6	110.0
Annual Min		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix10.12 Maximum Daily Rainfall and Water Level of Lake Victoria

Station / Year	Kampala		Entebbe		
	Date	Rainfall	Date	Gage W.L	Sea Level
1973					
1974	Jul.8	58.3	Jan.8	11.79	1135.22
1975	Mar.19	47.5	Jan.5	11.63	1135.06
1976	Mar.27	54.4	May.31	11.72	1135.15
1977	Mar.18	54.5	-	-	-
1978	Mar.11	52.2	May.11	12.19	1135.62
1979	Mar.16	52.5	May.23	12.60	1136.03
1980	Mar.1	51.3	May.26	12.05	1135.48
1981	Mar.6	42.9	May.30	11.70	1135.13
1982	-	-	-	-	-
1983	Sep.11	51.6	May.30	11.67	1135.10
1984	Aug.7	37.5	May.14	11.65	1134.93
1985	May.7	47.0	May.31	11.49	1134.92
1986	Dec.8	47.0	May.19	11.39	1134.82
1987	Nov.26	55.5	Jun.22	11.42	1134.85
1988	Apr.16	54.4	Jun.1	11.55	1134.98
1989	Feb.6	59.3	May.28	11.69	1134.12
1990	Feb.22	48.5	Jun.13	12.08	1135.51
1991	Oct.18	68.0	Jun.18	11.90	1135.33
1992	May.1	50.8	May.27	11.50	1135.39
1993	Sep.18	78.3	Jun.28	11.45	1134.88
1994	Oct.2	69.3	Dec.29	11.12	1134.55
1995	Mar.6	61.6	Jun.3	11.37	1134.80
1996	May.24	86.5	May.28	11.51	1134.94

Note: Om of Gage W.L is 1,123,432 at Sea level

Appendix10.13 Frequency Analysis of Rainfall (1)

****
*** PLOTTING POSITION ***
****

- STATION : KAMPALA

- DATA : RAINFALL

		WEIBULL PLOT		HAZEN PLOT	
I	X(I)	P(I)	F(I)	P(I)	F(I)
1	86.50	4.35	95.65	2.27	97.73
2	78.30	8.70	91.30	6.82	93.18
3	69.30	13.04	86.96	11.36	88.64
4	68.00	17.39	82.61	15.91	84.09
5	61.60	21.74	78.26	20.45	79.55
6	59.30	26.09	73.91	25.00	75.00
7	58.30	30.43	69.57	29.55	70.45
8	55.50	34.78	65.22	34.09	65.91
9	54.50	39.13	60.87	38.64	61.36
10	54.40	43.48	56.52	43.18	56.82
11	54.40	47.83	52.17	47.73	52.27
12	52.50	52.17	47.83	52.27	47.73
13	52.20	56.52	43.48	56.82	43.18
14	51.60	60.87	39.13	61.36	38.64
15	51.30	65.22	34.78	65.91	34.09
16	50.80	69.57	30.43	70.45	29.55
17	48.50	73.91	26.09	75.00	25.00
18	47.50	78.26	21.74	79.55	20.45
19	47.00	82.61	17.39	84.09	15.91
20	47.00	86.96	13.04	88.64	11.36
21	42.90	91.30	8.70	93.18	6.82
22	37.50	95.65	4.35	97.73	2.27

NOTE: I : ORDER NUMBER
X(I) : DATA
P(I) : EXCEEDANCE PROBABILITY IN %
F(I) : NON-EXCEEDANCE PROBABILITY IN %

****
*** HAZEN METHOD ***
****

- STATION : KAMPALA

- DATA : RAINFALL

- ESTIMATION EQUATION

$$X = XO + (KK * CV + 1)$$

XO = 55.859
CV = 0.203
CS = 1.510
KK : SKEW CURVE FACTOR

RETURN PERIOD	EXCEEDANCE PROBABILITY	PROBABLE VALUES	SKEW CURVE FACTORS
10000.00	0.01	160.96	9.264
1000.00	0.10	126.42	6.220
500.00	0.20	117.50	5.434
300.00	0.33	110.70	4.834
200.00	0.50	105.29	4.357
100.00	1.00	96.77	3.606
80.00	1.25	94.26	3.385
50.00	2.00	88.91	2.914
40.00	2.50	86.37	2.690
30.00	3.33	83.10	2.401
25.00	4.00	81.02	2.218
20.00	5.00	78.48	1.994
10.00	10.00	71.06	1.340
5.00	20.00	63.64	0.686
3.00	33.33	57.92	0.181
2.00	50.00	53.38	-0.219
1.50	66.67	49.24	-0.583
1.01	99.01	39.91	-1.406

Appendix10.13 Frequency Analysis of Rainfall (2)

****
*** PEARSON III METHOD ***
****

- STATION : KAMPALA

- DATA : RAINFALL

- ESTIMATION EQUATION

LOG X = XO + SQR (V) * KK

XO = 1.739
V = 0.048
CS = 0.608
KK : SKEW CURVE FACTOR

RETURN PERIOD	EXCEEDANCE PROBABILITY	PROBABLE VALUES	SKEW CURVE FACTORS
10000.00	0.01	146.79	5.154
1000.00	0.10	119.00	4.055
500.00	0.20	110.34	3.659
300.00	0.33	104.38	3.369
200.00	0.50	99.88	3.138
100.00	1.00	92.90	2.758
80.00	1.25	90.66	2.630
50.00	2.00	86.11	2.361
40.00	2.50	83.90	2.225
30.00	3.33	81.14	2.050
25.00	4.00	79.44	1.939
20.00	5.00	77.21	1.790
10.00	10.00	70.68	1.327
5.00	20.00	63.88	0.797
3.00	33.33	58.06	0.297
2.00	50.00	53.82	-0.100
1.50	66.67	49.27	-0.562
1.01	99.00	38.33	-1.878

****
*** GUMBEL METHOD ***
****

- STATION : KAMPALA

- DATA : RAINFALL

- ESTIMATION EQUATION

X = XO + Y / A

XO = 50.430
A = 10.306
Y : REDUCED VALIATE

RETURN PERIOD	EXCEEDANCE PROBABILITY	PROBABLE VALUES	REDUCED VALIATES
10000.00	0.01	145.34	9.209
1000.00	0.10	121.62	6.907
500.00	0.20	114.47	6.214
300.00	0.33	109.19	5.702
200.00	0.50	105.01	5.296
100.00	1.00	97.84	4.600
80.00	1.25	95.53	4.376
50.00	2.00	90.64	3.902
40.00	2.50	88.32	3.676
30.00	3.33	85.31	3.384
25.00	4.00	83.39	3.199
20.00	5.00	81.04	2.970
10.00	10.00	73.62	2.250
5.00	20.00	65.89	1.500
3.00	33.33	59.73	0.903
2.00	50.00	54.21	0.367
1.50	66.67	49.46	-0.094
1.01	99.01	34.67	-1.529

Appendix10.14 Frequency Analysis of Water Level of Victoria Lake (1)

****
*** PLOTTING POSITION ***
****

- STATION : ENTEBBE

- DATA : WATERLEV

		WEIBULL PLOT		HAZEN PLOT	
I	X(I)	P(I)	F(I)	P(I)	F(I)
1	1136.03	4.55	95.45	2.38	97.62
2	1135.62	9.09	90.91	7.14	92.86
3	1135.51	13.64	86.36	11.90	88.10
4	1135.48	18.18	81.82	16.67	83.33
5	1135.39	22.73	77.27	21.43	78.57
6	1135.33	27.27	72.73	26.19	73.81
7	1135.22	31.82	68.18	30.95	69.05
8	1135.15	36.36	63.64	35.71	64.29
9	1135.13	40.91	59.09	40.48	59.52
10	1135.10	45.45	54.55	45.24	54.76
11	1135.06	50.00	50.00	50.00	50.00
12	1134.98	54.55	45.45	54.76	45.24
13	1134.94	59.09	40.91	59.52	40.48
14	1134.93	63.64	36.36	64.29	35.71
15	1134.92	68.18	31.82	69.05	30.95
16	1134.88	72.73	27.27	73.81	26.19
17	1134.85	77.27	22.73	78.57	21.43
18	1134.82	81.82	18.18	83.33	16.67
19	1134.80	86.36	13.64	88.10	11.90
20	1134.55	90.91	9.09	92.86	7.14
21	1134.12	95.45	4.55	97.62	2.38

NOTE: I : ORDER NUMBER
X(I) : DATA
P(I) : EXCEEDANCE PROBABILITY IN %
F(I) : NON-EXCEEDANCE PROBABILITY IN %

****
*** HAZEN METHOD ***
****

- STATION : ENTEBBE

- DATA : WATERLEV

- ESTIMATION EQUATION

$$X = XO * (KK * CV + 1)$$

XO = 1135.086
CV = 0.000
CS = 0.046
KK : SKEW CURVE FACTOR

RETURN PERIOD	EXCEEDANCE PROBABILITY	PROBABLE VALUES	SKEW CURVE FACTORS
10000.00	0.01	1136.63	3.822
1000.00	0.10	1136.36	3.156
500.00	0.20	1136.26	2.903
300.00	0.33	1136.17	2.702
200.00	0.50	1136.11	2.543
100.00	1.00	1136.03	2.354
80.00	1.25	1136.00	2.259
50.00	2.00	1135.91	2.054
40.00	2.50	1135.87	1.956
30.00	3.33	1135.82	1.831
25.00	4.00	1135.79	1.751
20.00	5.00	1135.75	1.654
10.00	10.00	1135.59	1.246
5.00	20.00	1135.42	0.838
3.00	33.33	1135.23	0.367
2.00	50.00	1135.08	-0.007
1.50	66.67	1134.88	-0.518
1.01	99.01	1134.16	-2.291

Appendix10.14 Frequency Analysis of Water Level of Victoria Lake (2)

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**********************
*** GUMBEL METHOD ***
**********************

- STATION : ENTEBBE

- DATA    : WATERLEV

- ESTIMATION EQUATION

    X = XO + Y / A

       XO = 1134.841
        A =    0.468
        Y : REDUCED VALIATE
```

RETURN PERIOD	EXCEEDANCE PROBABILITY	PROBABLE VALUES	REDUCED VALIATES
10000.00	0.01	1139.15	9.209
1000.00	0.10	1138.07	6.907
500.00	0.20	1137.75	6.214
300.00	0.33	1137.51	5.702
200.00	0.50	1137.32	5.296
100.00	1.00	1136.99	4.600
80.00	1.25	1136.89	4.376
50.00	2.00	1136.67	3.902
40.00	2.50	1136.56	3.676
30.00	3.33	1136.42	3.384
25.00	4.00	1136.34	3.199
20.00	5.00	1136.23	2.970
10.00	10.00	1135.89	2.250
5.00	20.00	1135.54	1.500
3.00	33.33	1135.26	0.903
2.00	50.00	1135.01	0.367
1.50	66.67	1134.80	-0.094
1.01	99.01	1134.13	-1.529

Appendix10.15 Catchment Area of Road Crossing Culvert

Name of Channel	Name of Road	Catchment Area (km^2)	Remarks
Lubigi Swamp	Mubende	61.5	Corrugated steel Pipe ϕ800×3
	Semtema	45.0	Corrugated steel Pipe ϕ800×3
	Hoima	30.8	Box culvert 1.20×1.20×2
	Kawaala	24.0	
	Bombo	18.0	Corrugated steel Pipe ϕ800×2
	Gayaza (1)	7.2	Corrugated steel Pipe ϕ600×3
Distributary of Lubigi Swamp	Gayaza (2)	3.8	Corrugated steel Pipe ϕ600×1
	Natete (1)	0.14	
Distributary of Nalukolon (1)	Natete (1)	1.4	Corrugated steel Pipe ϕ600×1
Distributary of Nalukolon (1)	Masaka (2)	1.4	Corrugated steel Pipe ϕ600×1
Distributary of Nalukolon (2)	Masaka (2)	4.1	Corrugated steel Pipe ϕ600×1
Distributary of Nalukolon (3)	Masaka (3)	2.3	Corrugated steel Pipe ϕ600×1
Kansanga	Gaba	9.1	Corrugated steel Pipe ϕ800×2×3nos
Vubyabnege	Jinja (1)	5.3	Corrugated steel Pipe ϕ600×1
	Jinja (2)	1.0	-
Kawaya	Jinja (3)	1.8	Corrugated steel Pipe ϕ800×3
Wankolokolo	Jinja (4)	0.9	-
Kironbe Swamp	(Neck portion)	12.0	-
Nakivubo Swamp	Roads of central city	30.0	Rehabilitation Project Nakivubo Channel

Appendix10.16 Design Flood Discharge

Calculating Point	Distance		Difference in E.L		Run-off Velocity		Concentration time			Rainf. In.	Catch. Ar	Discharge
	L1 (m)	L2 (m)	H1 (m)	H2 (m)	W1(m/s)	W2(m/s)	T1(sec)	T2(sec)	t (hr)	r(mm/hr)	A (km^2)	Q (m^3/s)
Mubende	7,500	6,300	30	13	0.728226	0.489544	10299.01	12869.12	6.43559	8.357	61.5	71.386
Sentema	7,500	3,800	30	8	0.728226	0.495466	10299.01	7670	4.991265	9.900	45.0	61.878
Hoima	7,500	1,300	30	3	0.728226	0.523524	10299.01	2483	3.550604	12.42303	30.8	53.147
Kawaala	7,500	0	30	0	0.728226	0	10299.01	0	2.860835	14.347	24.0	47.828
Bombo	6,400	0	25	0	0.717936	0	8914	0	2.476233	15.797	18.0	39.495
Gayaza (1)	5,400	0	22	0	0.736287	0	7334	0	2.037248	17.991	7.2	17.993
Gayaza (2)	3,000	0	15	0	0.832553	0	3603	0	1.000937	28.895	3.8	15.251
Natete (1)	800	0	5	0	0.951827	0	840	0	0.233469	76.256	0.14	1.483
Natete (2)	800	500	8	2	1.261915	0.728226	634	687	0.366822	56.423	1.4	10.972
Masaka (1)	1,500	0	10	0	0.989408	0	1516	0	0.421127	51.462	2.4	17.155
Masaka (2)	800	900	8	4	1.261915	0.775748	634	1160	0.498369	45.997	4.1	26.195
Masaka (3)	800	1,100	7	5	1.164756	0.786278	687	1398.995	0.579399	41.602	2.3	13.290
Gaba	2,000	2,500	12	10	0.928797	0.728226	2153	3433.002	1.551757	21.571	9.1	27.266
Jinja (1)	1,500	1,500	12	8	1.103784	0.865425	1358.962	1733	0.858949	31.998	5.3	23.556
Jinja (2)	1,500	1,500	15	8	1.261915	0.865425	1189	1733	0.811645	33.229	1.0	4.616
Jinja (3)	700	1,000	7	5	1.261915	0.832553	555	1201	0.487733	46.663	1.8	11.667
Jinja (4)	1,000	600	10	3	1.261915	0.832553	792	721	0.420	51.529	0.9	6.442
Kironbe (N.P)	1,500	2,500	12	10	1.103784	0.728226	1358.962	3433.002	1.331101	23.89397	12.0	39.826

Note R24 : Probable daily rainfall = 83.4 mm

Rainf. In. : Rainfall Intensity

Catch. Ar : Catchment Area

N.P. : Neck Portion