

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 20 th May 1997

Vehicle No. KAB 389Q

Loading Capacity: 7 TON

Researcher's name: Peter Kiama karoki

No. of Crew: 1

Estimated Volume: 10m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9046.4		7 : 55			Ngara office 8:30-9:01
Loading-1	in	9056.5	10,100	9 : 13	78		Westlands near rest Auraty
	out			9 : 25		12	
Loading-2	in			:			Through Forest road-Thika
	out			:		0	road Outer ring road-
Loading-3	in			:	0		Komorock to dumping site
	out			:		0	
Dumping site	in	9071.2	14,700	9 : 45	20		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	9073.7	2,500	9 : 59	14		
Reach to workshop	in			:			
Total			27,300		112	12	Total min.: 124 min.
Collection			0		0	12	
Transportation			24,800		67		
Inside the dumping site			2,500		14	0	Dumping time
Idling time					31		

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 20 th May 1997

Vehicle No. KAB 389Q

Loading Capacity: 7 TON

Researcher's name: Peter Kiama karoki

No. of Crew: 1

Estimated Volume: 10m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9073.7		9 : 59			
Loading-1	in	9087.2	13,500	10 : 30	31		Westlands near Standard
	out			10 : 35		5	Chartered
Dumping site	in	9102.3	15,100	11 : 0	25		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	9104.5	2,200	11 : 10	10		
Reach to workshop	in			:			
Total			30,800		66	5	Total min.: 71 min.
Collection			0		0	5	
Transportation			28,600		56		
Inside the dumping site			2,200		10	0	Dumping time
Idling time							

**Time & Motion Study**

Organization:N.C.C

Trip- 3 Date:20 th May 1997

Vehicle No.KAB 389Q

Loading Capacity:7 TON

Researcher's name: P.K. karoki

No. of Crew:1

Estimated Volume:10m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9104.5		11 : 10			Dandora dumping site
Loading-1	in	9116.4	11,900	11 : 35	25		Forest road -
	out			12 : 0		25	Thika road-Outering
Loading-2	in			:			road-Komarock-
	out			:		0	to Dumping site
Dumping site	in	9128.5	12,100	12 : 17	17		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	9131.8	3,300	12 : 29	12		
Reach to workshop	in			:			
Total			27,300		54	25	Total min.: 79 min.
Collection			0		0	25	
Transportation			24,000		42		
Inside the dumping site			3,300		12	0	Dumping time
Idling time							

**Time & Motion Study**

Organization:N.C.C

Trip- 4 Date:20 th May 1997

Vehicle No.KAB 389Q

Loading Capacity:7 TON

Researcher's name: P. K. kariuki

No. of Crew:1

Estimated Volume:10m<sup>3</sup>

Location		Milage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9131.8		12 : 29			Dandora dumping site
Loading-1	in	9143.9	12,100	12 : 54	25		Parklands police
	out			13 : 30		36	
Loading-2	in			:			Through Forest road-Thika
	out			:			road- Outering Komarock
Dumping site	in	9158.5	14,600	13 : 48	18		to Dumping site
Start dumping				:			
Finish dumping				:			
Dumping site	out	9162.2	3,700	14 : 0	12		
Reach to workshop	in	9179.7	17,500	14 : 35	35		
Total			47,900		90	36	Total min.: 126 min.
Collection			0		0	36	
Transportation			44,200		78		
Inside the dumping site			3,700		12	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 20th May 1997

Vehicle No. KAB390Q

Loading Capacity: 7.83 TON

Researcher's name: B. Chizi

No. of Crew: Tractor

Estimated Volume: 3TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8553		8 : 11			From Workshop -Ngara depart
Loading-1	in	8561	8,000	9 : 15	64		via Jogoo road- Westlands
	out			9 : 18		3	shopping center from Ngara
Loading-2	in			:			depart via Ojijo road Parkland
	out			:		0	road-Ring road
Dumping site	in	8575	14,000	9 : 42	24		
Start dumping				9 : 47	5		
Finish dumping				9 : 48		1	
Dumping site	out			9 : 57	9		
Reach to workshop	in			:			
<b>Total</b>			22,000		102	4	Total min.: 106 min.
Collection			0		0	3	
Transportation			22,000		88		
Inside the dumping site			0		14	1	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 20th May 1997

Vehicle No. KAB390Q

Loading Capacity: 7.83 TON

Researcher's name: B. Chizi

No. of Crew: Tractor

Estimated Volume: 3TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	8575		9 : 57			From Dumping site
Loading-1	in	8592	17,000	10 : 27	30		Westlands shopping center
	out			10 : 33		6	
							Parklands road - Forest road -
							Muranga road - Thika road -
							Outering road - Komarock to
							Dumping site
Dumping site	in	8607	15,000	10 : 58	25		Dumping site through Komarock
Start dumping				:			road - Outering road - Thika road
Finish dumping				:			Muranga road - Forest road
Dumping site	out	8609	2,000	11 : 1	3		to City market
Reach to workshop	in			:			
Total			34,000		58	6	Total min.: 64 min.
Collection			0		0	6	
Transportation			32,000		55		
Inside the dumping site			2,000		3	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 3

Date: 20th May 1997

Vehicle No. KAB390Q

Loading Capacity: 7.83 TON

Researcher's name: B. Chizi

No. of Crew: Tractor

Estimated Volume: 3TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	8609		11 : 1			Dumping site
Loading-1	in	8621	12,000	11 : 23	22		Dumping site through Komarock
	out			11 : 26		3	road-Outering road-Thika road-
Loading-2	in			:			Muranga road-Forest road-
	out			:		0	Limuru road
Loading-3	in			:	0		To Dumping site through same
	out			:		0	route
Dumping site	in	8636	15,000	12 : 21	55		back to city market for fourth
Start dumping				12 : 25	4		loading
Finish dumping				12 : 26		1	
Dumping site	out	8637	1,000	12 : 35	9		
Reach to workshop	in			:			
Total			28,000		90	4	Total min.: 94 min.
Collection			0		0	3	
Transportation			27,000		77		
Inside the dumping site			1,000		13	1	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 4 Date: 20th May 1997

Vehicle No. KAB390Q

Loading Capacity: 7.83 TON

Researcher's name: B. Chizi

No. of Crew: Tractor

Estimated Volume: 3TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	8637		12 : 35			
Loading-1	in	8650	13,000	13 : 3	28		City market from dumping site
	out			13 : 8		5	Route
Loading-2	in			:			Komarock road-outering road-
	out			:		0	Thiak road Muranga road-
Dumping site	in	8663	13,000	13 : 43	35		Forest road-Limuru road Back
Start dumping				13 : 47	4		to workshop after
Finish dumping				13 : 48		1	mechanical problems
Dumping site	out			13 : 54	6		through Komarock-Outering
Reach to workshop	in	8681	18,000	14 : 39	45		Jogoo road
Total			44,000		118	6	Total min.: 124 min.
Collection			0		0	5	
Transportation			44,000		108		
Inside the dumping site			0		10	1	Dumping time
Idling time							



**Time & Motion Study**

Organization: N.C.C

Trip-1 Date: 20/05/97

Vehicle No. KAB 392Q

Loading Capacity: 7 TON

Researcher's name: Debora A. Masaba

No. of Crew: 1

Estimated Volume: 6 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7388.5		8 : 2			Jogoo road Ladhies-
Loading-1	in	7395.6	7,100	9 : 8	66		Bumala road-Ngara depot
	out			9 : 18		10	8:25-8:59
							Ngara road-Ojiju road
							Parklands-Forest road
							Muranga-Thika road
							outing-Komorock-
							Dandora
Dumping site	in	7409.7	14,100	9 : 54	36		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	7413	3,300	10 : 2	8		
Reach to workshop	in			:			
Total			24,500		110	10	Total min.: 120 min.
Collection			0		0	10	
Transportation			21,200		68		
Inside the dumping site			3,300		8	0	Dumping time
Idling time					34		

**Time & Motion Study**

Organization: N.C.C

Trip-2 Date: 20/05/97

Vehicle No. KAB 392Q

Loading Capacity: 7 TON

Researcher's name: Debora A. Masaba

No. of Crew: 1

Estimated Volume: 6 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	7413		10 : 2			
Loading-1	in	7426.5	13,500	10 : 25	23		Westlands shopping
	out			10 : 26		1	centre
Loading-2	in			:			
	out			:		0	Outering-Komorock
Loading-3	in			:			Dandora
	out			:		0	
Loading-4	in			:	0		Idling time: 10:59-11:05
Dumping site	in	7440.6	14,100	10 : 49	23		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	7443.3	2,700	10 : 58	9		
Reach to workshop	in			:			
<b>Total</b>			<b>30,300</b>		<b>55</b>	<b>1</b>	<b>Total min.: 56 min.</b>
Collection			<b>0</b>		<b>0</b>	<b>1</b>	
Transportation			<b>27,600</b>		<b>40</b>		
Inside the dumping site			<b>2,700</b>		<b>9</b>	<b>0</b>	<b>Dumping time</b>
Idling time					<b>6</b>		

**Time & Motion Study**

Organization:N.C.C

Trip-3 Date:20th May 97

Vehicle No.KAB 392Q

Loading Capacity:7 TON

Researcher's name: D. A. Masaba

No. of Crew: 1

Estimated Volume:4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	7443.3		10 : 58			Dandora to city park market
Loading-1	in	7456	12,700	11 : 23	25		through Forest road-Limuru
	out			11 : 57		34	road
Loading-2	in			:			
	out			:		0	City park - Limuru road-
Loading-3	in			:			forest road-Muranga road
	out			:		0	Thika outerring road Dandora
Loading-4	in			:	0		
	out			:		0	Idling time:12:31 to 12:35
Dumping site	in	7468.9	12,900	12 : 15	18		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	7471.3	2,400	12 : 29	14		
Reach to workshop	in			:			
Total			28000		57	34	Total min.: 91 min.
Collection			0		0	30	
Transportation			25,600		43		
Inside the dumping site			2400		14	0	Dumping time
Idling time						4	

**Time & Motion Study**

Organization:N.C.C

Trip-4 Date:20th May 97

Vehicle No.KAB 392Q

Loading Capacity:7 TON

Researcher's name: D. A. Masaba

No. of Crew: 1

Estimated Volume:5.5 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7471.3		12 : 29			
Loading-1	in	7484	12,700	12 : 56	27		Limuru road- forest road
	out			13 : 0		4	Muranga road- Thika road
	in			:			Outering Komorock -Dandora
	out			:		0	Dumping site
Dumping site	in	7496.7	12,700	13 : 18	18		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	7499.5	2,800	13 : 25	7		
Reach to workshop	in			:			
<b>Total</b>			<b>28200</b>		<b>52</b>	<b>4</b>	<b>Total min.: 56 min.</b>
<b>Collection</b>			<b>0</b>		<b>0</b>	<b>4</b>	
<b>Transportation</b>			<b>25,400</b>		<b>45</b>		
<b>Inside the dumping site</b>			<b>2,800</b>		<b>7</b>	<b>0</b>	<b>Dumping time</b>
<b>Idling time</b>							

**Time & Motion Study**

Organization: N.C.C

Trip-5 Date: 20th May 97

Vehicle No. KAB 392Q

Loading Capacity: 7 TON

Researcher's name: D. A. Masaba

No. of Crew: 1

Estimated Volume: 5.5 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	7499.5		13 : 25			Muranga road -forest road
Loading-1	in	7522.5	23,000	14 : 21	56		parklands-Ojijo close
	out			14 : 35		14	Kolobot -limuru
Loading-2	in	7524.3	1,800	14 : 40	5		
	out			14 : 45		5	Forest rd had an accident.
Dumping site	in	7531.7	7,400	17 : 35	170		14:50-17:07
Start dumping				:			
Finish dumping				:		0	
Dumping site	out			:	0		
Reach to workshop	in			:	0		
Total			32,200		231	19	Total min.: 250 min.
Collection			1,800		5	19	
Transportation			30,400		89		
Inside the dumping site			0		0	0	Dumping time
Idling time					137		

**Time & Motion Study**

Organization: N.C.C

Trip-1 Date: 20 th May 1997

Vehicle No. KUL 990

Loading Capacity: 8 TON

Researcher's name: Samuel Kimotho

No. of Crew: 1

Estimated Volume: 4.2m<sup>3</sup>

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop out	202168		8 : 2			Kaloleni- Jogoo-
			:			Outering road-Kangundo
			:			road-Umoja II N.C.C
			:			deport. Idling time
			:			8:25 to 8:45
			:			
			:			Umoja -Kangundo road
			:			Outering -Kariobangi
			:			south-Dandora dumping
			:			site
			:			
			:			Dandora-Kariobangi
			:			south loading point
			:			one
			:			
			:			From workshop-
			:			vehicle was loaded
Dumping site in	202187	19,000	9 : 2	60		
Start dumping	202188	1,000	9 : 10	8		
Finish dumping			10 : 31		81	
Dumping site out	202190	2,000	10 : 50	19		
Reach to workshop in			:			
Total		22,000		87	81	Total min.: 168 min.
Collection		0		0	0	
Transportation		19,000		40		
Inside the dumping site		3,000		27	81	Dumping time
Idling time				20		

**Time & Motion Study**

Organization:N.C.C

Trip-2 Date:20 th May 1997

Vehicle No. KUL 990

Loading Capacity:8 TON

Researcher's name: Samuel Kimotho

No. of Crew:1

Estimated Volume:4.2m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	202190		10 : 50			Kariobangi south-
Loading-1	in	202193	3,000	11 : 5	15		Mutarakwa road was
	out	202193		13 : 25		140	the collection area
							To Dumping site-
							Number of loaders-6
							Dandora-Kariobangi-
							Outering-Kangundo
							Umoja depot
							Idling time; 15:45
							Umojadeport outering
							Jogoo road to
							Kaloleni
Dumping site	in	202198	5,000	13 : 50	25		
Start dumping				14 : 8	18		
Finish dumping				15 : 10		62	
Dumping site	out	202199	1,000	15 : 16	6		
Reach to workshop	in	202217	18,000	16 : 5	49		
Total			27,000		113	202	Total min.: 315 min.
Collection			0		0	140	
Transportation			26,000		89		
Inside the dumping site			1,000		24	62	Dumping time
Idling time							

# Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 20th May 1997

Vehicle No: KUI.991

Loading Capacity:

Researcher's name: Ali Ami Nassir

No. of Crew: 6

Estimated Volume: 3.0m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	155406		8 : 5			Kaloleni depot N.C.C
							Central office 8:29-8:36
							Kaloleni depot 8:50-8:51
Loading-1	in	155417	11,000	8 : 58	53		Pumwani maternity
	out			9 : 17		19	Home
Loading-2	in	155417.5	500	9 : 28	11		Pumwani maternity
	out			9 : 29		1	Home
Loading-3	in	155419	1,500	9 : 30	1		Madina Nursing
	out			9 : 39		9	Home
Loading-4	in	155419.5	500	9 : 43	4		Madina Nursing
	out			9 : 46		3	Home
Loading-5	in	155420	500	9 : 50	4		Mecca medical clinic
	out			10 : 9		19	
Loading-6	in	155421.4	1,400	10 : 19	10		1st Avenue Estleigh
	out			10 : 20		1	to Juja road
Loading-7	in	155421.5	100	10 : 21	1		As above
	out			10 : 28		7	
Loading-8	in	155422.5	1,000	10 : 33	5		Alpha maternity
	out			10 : 39		6	through Juja road
Loading-9	in	155423	500	10 : 44	5		Huruma Nursing
	out			10 : 48		4	
Loading-10	in	155426	3,000	10 : 56	8		Home Nursing
	out			11 : 2		6	via Huruma rd
Loading-11	in	155427	1,000	11 : 8	6		Alice Nursing Home
	out			11 : 26		18	via Huruma-Outering
Loading-12	in	155438	11,000	11 : 40	14		St. Ann Clinic along
	out			11 : 50		10	Thika road
Loading-13	in	155444	6,000	12 : 16	26		Kahawa west maternity
	out			12 : 55		39	
Loading-14	in	155465	21,000	13 : 34	39		Mpaka clinic through
	out			13 : 44		10	Kamiti-Thika-Muranga rd
Loading-15	in	155466	1,000	13 : 47	3		Chiromo Veterinary
	out			13 : 52		5	clinic via mpaka lane
Loading-16	in	155473.4	7,400	14 : 2	10		St. Austin Veterinary
	out			14 : 17		15	via Choromo-Waiyaki
Loading-17	in	155477.8	4,400	14 : 28	11		Nyina Mumbi Maternity
	out			14 : 32		4	James Gichuru-Naivasha rd
Loading-18	in	155482	4,200	14 : 40	8		Ngong Veterinary clinic
	out			14 : 52		12	
Loading-19	in	155490	8,000	15 : 4	12		
	out			15 : 11		7	Nairobi west from Ngong
Loading-20	in	155491	1,000	15 : 30	19		Gandhi road
	out			15 : 34		4	



**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 20th May 1997

Vehicle No: KUI.991

Loading Capacity:

Researcher's name: Ali Ami Nassir

No. of Crew: 6

Estimated Volume: 3.0m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Dumping site	in	155506	15,000	16 : 13	39		Idling time: 15:12 to 15:24
Start dumping		155507	1,000	16 : 19	6		
Finish dumping				:			
Dumping site	out	155507	0	16 : 38	19		
Reach to workshop	in	155523	16,000	17 : 30	52		
Total			117,000		366	199	Total min.: 565 min.
Collection			80,600		185	199	
Transportation			35,400		136		
Inside the dumping site			1,000		25	0	Dumping time
Idling time					20		

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 20th May 1997

Vehicle No. KUL 992

Loading Capacity: 8TON

Researcher's name: Hillary Githua

No. of Crew: 9

Estimated Volume:

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	219951.1		11 : 27			Garage - Kaloleni 11:36-11:43
Loading-1	in	219951.6	500	12 : 4	37		Kaloleni - Central depot
	out			12 : 17		13	Jogoo-road-Haileselasia
Loading-2	in	219957.7	6,100	12 : 21	4		water stores from depot
	out			12 : 41		20	Along lagos road
Loading-3	in	219958.8	1,100	12 : 52	11		Along Tom Mboya st.
	out			13 : 10		18	
Loading-4	in	219959.6	800	13 : 19	9		Lion club Dental
	out			13 : 58		39	unit social service league
Dumping site	in	219972.7	13,100	14 : 28	30		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	219976.9	4,200	15 : 25	57		
Reach to workshop	in	219987.6	10,700	15 : 50	25		
Total			36,500		173	90	Total min.: 263 min.
Collection			8,000		24	90	
Transportation			24,300		85		
Inside the dumping site			4,200		57	0	Dumping time
Idling time					7		

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 20th May 1997

Vehicle KUL 993

Loading Capacity: 6.22

Researcher's name: D Akinyi

No. of Crew: 11

Estimated Volume: 6ton

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	177,899.3		7 : 58			Pumwani depot
Loading-1	in	177,900.0	300	8 : 8	10		Pumwani maternity hospital
	out	177,902.2	2,800	8 : 33		25	KBS parking bay
Loading-2	in	177,902.2	100	9 : 10	37		Estleigh depot
	out	177,903.4	1,200	9 : 19		9	
							Spent more time at loading unit 2 because there was a huge heap of garbage which had to be removed manually.
							The vehicle did not offload because it had a breakdown on the tipping machine gear.
							Then on the way back to the workshop the other gears also breakdown which made it impossible for the crew to go for a second trip.
Dumping site	in	177,913.1	10,900	13 : 10	307		dandora dumping site
Start dumping		177,913.2	100	13 : 17	7		
Finish dumping		177,913.4	200	13 : 19		2	
Dumping site	out	177,914.1	700	13 : 40	21		
Reach to workshop	in	177,924.0	9,900	14 : 30	50		
Total			26,200		425	39	Total min.: 464 min.
Collection			4,100		30	37	
Transportation			21,100		367	0	
Inside the dumping site			1,000		28	2	Dumping time
Idling time							

**Time & Motion Study**

Organization:N.C.C

Trip-1 Date:20th May 1997

Vehicle No.KUL.994

Loading Capacity:7 TON

Researcher's name:Alexander Gaititi

No. of Crew: 2

Estimated Volume:4m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	164258.2		8 : 2			workshop to N.C.C
Loading-1	in	164266	7,800	9 : 9	67		Ngara depart 8:23-8:59
	out			9 : 13		4	Ngara depart via Landhies
							Ring road-Ngara road
							Depart-Ngara road -
							Museum hill road-
							Ojiyo road- Parklands-
							Ring road
							To dumping:Ring road-
							westlands-parklands-
							forest road-Muranga road-
							outering-Komarock-
							dumping site
Dumping site	in	164280.3	14,300	9 : 42	29		
Start dumping		164281.5	1,200	9 : 48	6		
Finish dumping				9 : 50		2	
Dumping site	out	164282.8	1,300	9 : 56	6		
Reach to workshop	in			:			
Total			24,600		108	6	Total min.: 114 min.
Collection			0		0	4	
Transportation			22,100		60		
Inside the dumping site			2,500		12	2	Dumping time
Idling time					36		

**Time & Motion Study**

Organization: N.C.C

Trip-2 Date: 20th May 1997

Vehicle No. KUL 994

Loading Capacity: 7 TON

Researcher's name: Alexander Gaititi

No. of Crew: 2

Estimated Volume: 4m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	164282.8		9 : 56			Dumping site to
Loading-1	in	164298.7	15900	10 : 40	44		Parklands via Komarock-
	out			10 : 58		18	Outering road-Thika road
Loading-2	in	164299.1	400	11 : 2	4		Muranga road
	out			11 : 7		5	Forest road- Ring road
							Same route as for
							trip 1 to dumping site
Dumping site	in	164313	13,900	11 : 36	29		
Start dumping		164314.8	1,800	11 : 43	7		
Finish dumping				11 : 46		3	
Dumping site	out	164318	3,200	11 : 59	13		
Reach to workshop	in			:			
Total			35200		97	26	Total min.: 123 min.
Collection			400		4	23	
Transportation			29,800		73		
Inside the dumping site			5,000		20	3	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip-3 Date: 20th May 1997

Vehicle No. KUL 994

Loading Capacity: 7 TON

Researcher's name: Alexander Gaititi

No. of Crew: 2

Estimated Volume: 4m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	164318		11 : 59			
Loading-1	in	164331.1	13,100	12 : 25	26		From Dumping-
	out			12 : 31		6	Komarock rd- Outering road
							Thika road- Muranga road
							Forest road- Limuru road- Parklands road
							to Ojijo close
							Ojijo road- Parklands
							forest road- Ring road
							Ngara- Kariokor- Ring
							road- Ladhies road-
							Jogoo road to N.C.C
							Kaloleni
							Idling time: 1:55 to 2:07
							Jogoo road - Ring road
							Kariobangi south to
							Dumping site
Dumping site	in	164343	11,900	12 : 55	24		
Start dumping				13 : 0	5		
Finish dumping		164345	2,000	13 : 2		2	
Dumping site	out	164346.9	1,900	13 : 10	8		
Reach to workshop	in			:			
Total			28,900		63	8	Total min.: 71 min.
Collection			0		0	6	
Transportation			25,000		38		
Inside the dumping site			3,900		13	2	Dumping time
Idling time					12		

**Time & Motion Study**

Organization: N.C.C

Trip-4 Date: 20th May 1997

Vehicle No. KUL 994

Loading Capacity: 7 TON

Researcher's name: Alexander Gaititi

No. of Crew: 2

Estimated Volume: 4m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	164346.9		13 : 10			Dumping site:-
Loading-1	in	164359.3	12,400	13 : 34	24		Komarock- Outer ring road
	out			13 : 42		8	Thika road - Miuranga road
							Forest road-Parklands road
							to Ojijo road(collection site)
							Forest road- Muranga road
							Thika road-outer ring road
							Komarock to dumping site
							Ring road-Jogoo road
							Jogoo road to workshop
Dumping site	in	164377	17,700	14 : 26	44		
Start dumping		164378.8	1,800	14 : 32	6		
Finish dumping				14 : 36		4	
Dumping site	out	164380.7	1,900	14 : 44	8		
Reach to workshop	in	164391.7	11,000	15 : 30	46		
Total			44,800		128	12	Total min.: 140 min.
Collection			0		0	8	
Transportation			41,100		114		
Inside the dumping site			3,700		14	4	Dumping time
Idling time							

**Time & Motion Study**

Organization:N.C.C

Trip-I

Date:20th may 1997

Vehicle No.kwc 063

Loading Capacity:7.97 TON

Researcher's name: Jurius Masaba

No. of Crew:6

Estimated Volume:4.6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	160651		8 : 9			Jogoo road- Ngara Depot
Loading-1	in			8 : 53	44		1st-2nd-3rd Avenue of
	out			9 : 0		7	parklands
Loading-2	in			9 : 6	6		3rd avenue parklands
	out			9 : 19		13	Eldama drive-Peponi road
Loading-3	in			9 : 32	13		red hill-Limuru road
	out			9 : 45		13	Ruaka road -Runda
Loading-4	in			9 : 58	13		peponi road
	out			10 : 1		3	spring valley
Loading-5	in			10 : 20	19		lower Kabete
	out			10 : 24		4	Kabaya
Loading-6	in			10 : 29	5		
	out			10 : 31		2	Kabaya way
Loading-7	in			10 : 33	2		
	out			10 : 35		2	
Loading-8	in			10 : 38	3		
	out			10 : 45		7	Mexan Embassy
Loading-9	in			10 : 50	5		
	out			10 : 55		5	Kabarage way
Loading-10	in			10 : 56	1		loresho grovel
	out			10 : 57		1	
Loading-11	in			10 : 59	2		
	out			11 : 2		3	
Loading-12	in			11 : 3	1		Truck developed problem
	out			11 : 5		2	11:06-11:10
Loading-13	in			11 : 14	9		Loresho crescent
	out			11 : 17		3	loresho rise south
Loading-14	in			11 : 20	3		
	out			11 : 23		3	
Loading-15	in			11 : 24	1		
	out			11 : 26		2	
Loading-16	in			11 : 28	2		Loresho rise
	out			11 : 30		2	
Loading-17	in			11 : 32	2		
	out			11 : 35		3	
Loading-18	in			11 : 36	1		
	out			11 : 38		2	Makupa lane
Loading-19	in			11 : 39	1		Loresho crescent
	out			11 : 41		2	
Loading-20	in			11 : 42	1		
	out			11 : 45		3	Loresho close south
Loading-21	in			11 : 48	3		
	out			11 : 50		2	Kendai close



**Time & Motion Study**

Organization: N.C.C

Trip-1

Date: 20th May 1997

Vehicle No. kwe 063

Loading Capacity: 7.97 TON

Researcher's name: Julius Masaba

No. of Crew: 6

Estimated Volume: 4.6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Loading-22	in			11 : 52	2		
	out			11 : 54		2	
Loading-23	in			12 : 0	6		Mwega road
	out			12 : 7		7	Loresho ridge- Kabarage
Loading-24	in			12 : 14	7		Lower Kabete road
	out			12 : 31		17	Parklands-forest road
Loading-25	in			13 : 2	31		Thika road
	out			13 : 20		18	Garden estate road
Loading-26	in			13 : 25	5		Thika- Outering road
	out			13 : 30		5	
Loading-27	in			13 : 40	10		
	out			13 : 45		5	
Loading-28	in			13 : 51	6		
	out						Vehicle developed
				:			mechanical problems
				:			at Komorock and could
				:			not proceed
Dumping site	in			:	0		
Start dumping				:	0		
Finish dumping				:		0	
Dumping site	out			:	0		
Reach to workshop	in			:	0		
Total			0		204	138	Total min.: 342 min.
Collection			0		156	138	
Transportation			0		26		
Inside the dumping site			0		0	0	Dumping time
Idling time					22		Truck developed problem

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 20th May 1997

Vehicle No. KWE 071

Loading Capacity:

Researcher's name: George N. Kamau

No. of Crew: 1

Estimated Volume: N/A

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	3512.5		8 : 0			
Loading-1	in	3525	12,500	9 : 35	95		Luthuli Avenue
	out			:			
Loading-2	in			:	0		
	out			:		0	Kaloleni-City park
Loading-3	in			:	0		depot for allocation
	out			:		0	truck assigned some
Loading-4	in			:	0		other duties:
Dumping site	in						
Start dumping				:			
Finish dumping				:		0	
Dumping site	out			:	0		
Reach to workshop	in	3555	30,000	14 : 45	310		
Total			42,500		405	0	Total min.: 405 min.
Collection			42500		405	0	
Transportation							
Inside the dumping site			0		0	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 20th May 1997

Vehicle No. KWE 081

Loading Capacity: 20m<sup>3</sup>

Researcher's name: J. Olago

No. of Crew: 11

Estimated Volume: 19 m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	186037		8 : 9			Kaloleni
Loading-1	in	186040.3	3,300	8 : 20	11		Truf Food(Jogoo road
	out			10 : 15		115	
				:			To Outering road-Komorock
				:			to Dumping site
Dumping site	in	186050.9	10,600	10 : 40	25		Dandora
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	186052	1,100	11 : 58	78		
Reach to workshop	in			:			
Total			15,000		114	115	Total min.: 229 min.
Collection			0		0	115	
Transportation			13,900		36		
Inside the dumping site			1,100		78	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip-2 Date: 20th May 1997

Vehicle No. KWE 081

Loading Capacity: 20m<sup>3</sup>

Researcher's name: J. Olago

No. of Crew: 11

Estimated Volume: 19 m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	186052		11 : 58			From dumping site
Loading-1	in	186102.2	50,200	14 : 14	136		Tru Food
	out			15 : 25		71	
Loading-2	in	186104.6	2,400	15 : 35	10		Makadara
	out			15 : 48		13	
Loading-3	in	186120.6	16,000	16 : 20	32		Kariobangi
	out			16 : 25		5	
Loading-4	in			:			Jogoo road- Outering road-
	out			:		0	Juja road- Komorock to sumping site
Loading-5	in			:	0		
	out			:		0	
Dumping site	in	186123.7	3,100	16 : 40	15		Dandora
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	186124.9	1,200	16 : 58	18		
Reach to workshop	in	186141.5	16,600	17 : 32	34		Kaloleni
Total			89,500		245	89	Total min.: 334 min.
Collection			18,400		42	89	
Transportation			69,900		185		
Inside the dumping site			1,200		18	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 20th May 1997

Vehicle No. KWE 245

Loading Capacity: 7 TON

Researcher's name: C. Dzuya

No. of Crew: 6

Estimated Volume: 3m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	161585		8 : 40			To Mathare deport -Industrial
Loading-1	in	161609	24,000	11 : 20	160		N.C.C garage Utalii College via
	out			13 : 7		107	Ladhies-Race course Muranga -
Loading-2	in	161610	1,000	13 : 10	3		Thika road Kenya power and
	out			13 : 30		20	Lighting Co.
Loading-3	in	161614	4,000	13 : 39	9		North view road from muranga
	out			13 : 44		5	road Pangani
Loading-4	in	161614	0	13 : 47	3		Pangani muslims mosque
	out			13 : 52		5	
Loading-5	in	161623	9,000	14 : 18	26		Zakhem International off
	out			15 : 0		42	outering road
Dumping site	in	161629	6,000	15 : 20	20		
Start dumping		161630	1,000	15 : 30	10		
Finish dumping				15 : 31		1	
Dumping site	out	161632	2,000	15 : 38	7		To workshop through
Reach to workshop	in	161643	11,000	16 : 15	37		Komarock-Juja road-Muranga-
							Ladhies-Jogoo
Total			58,000		275	180	Total min.: 455 min.
Collection			14,000		41	179	
Transportation			41,000		217		
Inside the dumping site			3,000		17	1	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 20th May 1997

Vehicle No. KWE084

Loading Capacity: 7.88

Researcher's name: Martin Sitati

No. of Crew: 10

Estimated Volume 5m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	99498.2		8 : 0			Workshop -Jogoo
Loading-1	in	99534.5	36,300	10 : 15	135		Lusaka road-Mbagathi
	out			10 : 35		20	Ngong road to take
Loading-2	in	99538	3,500	:			cleaners to Uhuru
	out			:		0	park
							To Dagoreti office
							Vehicle loaded with
							wornout tyres and
							left for Silver springs
							hotel
							To Dandora Via Kenyatta
							Ave.-State H rd.-University
							way-Uhuru highway-
							Museum hill way-Forest
							rd.-Thika road-Outer ring
							rd.-Komarock to Dandora
							To Uhuru park for
							collection
Dumping site	in	99551.2	13,200	11 : 9	34		
Start dumping				:			
Finish dumping						0	
Dumping site	out	99555	3,800	11 : 25	16		
Reach to workshop	in			:			
Total			56,800		185	20	Total min.: 205 min.
Collection			3,500		0	20	
Transportation			49,500		169		
Inside the dumping site			3,800		16	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 20th May 1997

Vehicle No. KWE084

Loading Capacity: 7.88

Researcher's name: Martin Sitati

No. of Crew: 10

Estimated Volume 5m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	99555		11 : 25			
Loading-1	in	99569.3	14,300	12 : 0	35		From Uhuru park
	out			12 : 11		11	Dagoreti Via valley rd
Loading-2	in	99569.8	500	12 : 15	4		Ngong road
	out			12 : 35		20	
Loading-3	in	99581	11,200	13 : 1	26		Kilimani Estate-
	out			13 : 5		4	Hurligham-state house area
Loading-4	in	99581.7	700	13 : 8	3		
	out			13 : 13		5	
Loading-5	in	99582.3	600	13 : 14	1		To Dumping site via
	out			13 : 15		1	Ngong road -Valley rd
Loading-6	in	99582.6	300	13 : 16	1		University way-Uhuru
	out			13 : 18		2	highway-Forest road
Loading-7	in	99582.9	300	13 : 20	2		Thika road-outering
	out			13 : 22		2	road -Komarock-
Loading-8	in	99583.6	700	13 : 23	1		to Dandora
	out			13 : 25		2	
Loading-9	in	99583.7	100	13 : 26	1		Dandora-Kaloleni
	out			13 : 27		1	through Komarock
Loading-10	in	99583.9	200	13 : 29	2		road-outering-Jogoo
	out			13 : 38		9	road
Loading-11	in	99584	100	13 : 39	1		
	out			13 : 42		3	
Loading-12	in	99585.2	1200	13 : 46	4		
	out			13 : 53		7	
Loading-13	in	99585.3	100	13 : 54	1		
	out			14 : 1		7	
Loading-14	in	99586.8	1500	14 : 7	6		
	out			14 : 11		4	
Loading-15	in	99589.5	2700	14 : 18	7		
	out			14 : 37		19	
Loading-16	in	99590.7	1200	14 : 41	4		
	out			14 : 45		4	
Dumping site	in	99623.5	32,800	16 : 1	76		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	99627.2	3,700	16 : 16	15		
Reach to workshop	in	99640	12,800	16 : 40	24		
Total			85,000		214	101	Total min.: 315 min.
Collection			21,400		64	101	
Transportation			59,900		125		
Inside the dumping site			3,700		15	0	Dumping time
Idling time					10		

**Time & Motion Study**

Organization:N.C.C

Trip- 1 Date:21st May 1997

Vehicle No.GK 354X

Loading Capacity:7 TON

Researcher's name: A. Ngaara

No. of Crew:4

Estimated Volume:20m<sup>3</sup>

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	0	8 : 38			Kaloleni to Jogoo, Lusaka
Loading-1	in	3,900	9 : 30	52		Enterprise, Dar-es-Sallaam,
	out	0	9 : 38		8	Mukenia, Dunga, Bonyala,
Loading -2	in	1,000	9 : 49	11		Uhuru H/way, Haille Sellasie,
	out	0	9 : 50		1	to Uhuru park . Out through
Loading -3	in	1,000	10 : 25	35		Kenyatta Ave. Nyerere rd.
	out	0	10 : 25		0	And dumped near Serena
Loading -4	in	1,000	10 : 30	5		(park) Hotel. Then out to
	out		11 : 12		42	Uhuru Park through Nyerere
						rd. Professional way to
						Kenyatta Ave. to Uhuru park.
Dumping site	in	15,000	11 : 50	38		Uhuru park near serena hotel
Start dumping			11 : 55	5		car park.
Finish dumping			11 : 57		2	
Dumping site	out		12 : 2	5		Uhuru park near mainDias
Reach to workshop	in	11,000	12 : 53	51		
Total		32,900		202	53	Total min.: 255 min.
Collection		3,000		49	51	
Transportation		29,900		141		
Inside the dumping site		0		12	2	Dumping time
Idling time						



**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 21st May 1997

Vehicle No. KAB 289 Q

Loading Capacity: 6 TON

Researcher's name: M. Adhiambo

No. of Crew: 8

Estimated Volume: 3 m<sup>3</sup>

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop out			8 : 30			Kaloleni
Loading-1 in			10 : 15	105		Jogoo road- Lusaka road-Enterprise
out			10 : 25		10	Daresalam- Garage road
Dumping site in			10 : 55	30		Lusaka road- Jogoo road-Rabai-
Start dumping			10 : 55	0		Outering-Mutarakwa -Komarock
Finish dumping			10 : 56		1	
Dumping site out			10 : 56	0		
Reach to workshop in						
Total		0		135	11	Total min.: 146 min.
Collection		0		0	10	
Transportation		0		135	0	
Inside the dumping site		0		0	1	Dumping time
Idling time						

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 21st May 1997

Vehicle No. KAB 289 Q

Loading Capacity: 6 TON

Researcher's name: M. Adhiambo

No. of Crew: 8

Estimated Volume: 3m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			10 : 56			
Loading-1	in			11 : 45	49		Dandora-Komarock
	out			12 : 0		15	Outering-Jogoo road-
Loading-2	in			12 : 5	5		Shaurimoyo-B.A.T
	out			13 : 5		60	Ndungu court
Loading-3	in			13 : 6	1		BuruBuru phase 3
	out			13 : 25		19	Truck developed
Loading-4	in			13 : 30	5		Mechanical Problems
	out			13 : 31		1	hence taken to
Loading-5	in			13 : 32	1		Kaloleni for repair
	out			13 : 50		18	collection not dumped
Dumping site	in					0	
Start dumping						0	
Finish dumping						0	
Dumping site	out					0	
Reach to workshop	in			14 : 15	25		
Total				0	86	113	Total min.: 199 min.
Collection				0	12	113	
Transportation				0	74	0	
Inside the dumping site				0	0	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 21st May 1997

Vehicle No. KAB 292Q

Loading Capacity: 14 TON

Researcher's name: C. Dzuya

No. of Crew: 8

Estimated Volume: 7m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	75,219		8 : 30			To N.C.C garage through Lusak
Loading-1	in	75,230	11,000	10 : 0	90		Enterprise Dar-es-salaam to
	out			11 : 57		117	Garage road
Loading-2	in	75,231	1,000	12 : 0	3		Thro Landies, Haile selassie, Moi
	out			12 : 0		0	Ave, tom mboya & Lagos road
							KICC through Moi Ave to
							Harambee Ave, Parliament
Dumping site	in	75,246	15,000	13 : 3	63		Dandora through Simba-Mama
Start dumping		75,248	2,000	13 : 7	4		ngina Moi Avenue-Muranga-
Finish dumping				13 : 8		1	Ngara-Parkland Thika road-
Dumping site	out	75,249	1,000	13 : 10	2		Outering -Komarock
Reach to workshop	in						
Total			30,000		162	118	Total min.: 280 min.
Collection			1,000		3	117	
Transportation			26,000		153		
Inside the dumping site			3,000		6	1	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 21st May 1997

Vehicle No. KAB 292Q

Loading Capacity: 14 TON

Researcher's name: C. Dzuya

No. of Crew: 8

Estimated Volume: 7m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	75,249		13 : 10			
Loading-1	in	75,259	10,000	13 : 40	30		Khalsa Girls sec. from Dandora
	out			14 : 16		36	through Haileselaie road
Loading-2	in	75,261	2,000	14 : 24	8		
	out			14 : 50		26	
							Dandora through parliament road
							City Hall way-Moi Avenue-
							Muranga Ngara-Juja-Komarock-
							jogoo road
Dumping site	in	75,275	14,000	16 : 0	70		
Start dumping		75,276	1,000	16 : 2	2		
Finish dumping				16 : 3		1	
Dumping site	out	75,276	0	16 : 6	3		
Reach to workshop	in	75,287	11,000	16 : 30	24		
Total			38,000		137	63	Total min.: 200 min.
Collection			2,000		8	62	
Transportation			35,000		124	0	
Inside the dumping site			1,000		5	1	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 21st May 1997

Vehicle No. KAB 388Q

Loading Capacity: 5 TON

Researcher's name: A. Gaititi

No. of Crew: 1

Estimated Volume: 5m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11,973.8		8 : 43			workshop - Jogoo rd. - Lusaka rd
Loading-1	in	11,979.2	5,400	9 : 3	20		Uhuru highway- Kenyatta ave.
	out		0	9 : 29		26	Avenue-Uhuru park
				:			Uhuru park- Kenyatta ave. - Ngong
				:			rd. - Cathedral rd. - Haileselesie ave. -
				:			Ring rd. - Kariakor- Ring rd. Ngara -
				:			Muranga rd. - Thika rd. - Outer
				:			ring rd. - Komarock rd. to Dumping
				:			site
Dumping site	in	11,994.9	15,700	10 : 15			
Start dumping		11,996.2	1,300	10 : 22	7		
Finish dumping			0	10 : 23		1	
Dumping site	out	11,998.3	2,100	10 : 28	5		
Reach to workshop	in			:			
Total			24,500		32	27	Total min.: 105min.
Collection			0		0	26	
Transportation			21,100		20	0	
Inside the dumping site			3,400		12	1	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 21st May 1997

Vehicle No. KAB 388Q

Loading Capacity: 5 TON

Researcher's name: A. Gaititi

No. of Crew: 1

Estimated Volume: 5m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	11,998.3		10 : 28			
Loading-1	in	12,026.1	27,800	12 : 13	105		From Dumping site to Komorok rd.-
	out			12 : 18		5	Outer ring rd.-Thika rd.-Forest rd.-
				:			Limuru rd.-Muranga rd.-Slip rd.-
				:			Moi ave.-University way-Uhuru
				:			highway-Kenyatta ave.-Cathedral
				:			rd.-Uhuru highway-Dunga rd.-
				:			Lusaka rd.-Dar es salaam rd.-
				:			Garage rd. to NCC Garage
				:			Time in 11:12
				:			Time out 11:28
							Mileage 12017.3
							From NCC garage to garage Dar es
							salaam rd.-Lusaka rd.-Landries rd.-
							Ring rd.-Kariokur-Juja rd (Loading
							point)-12:13 12:18 to Juja rd.-
							Ring rd. Ngara-Muranga rd.-
							Thika rd.-Outer ring rd.-to Dumping
							site
Dumping site	in	12,036.8	10,700	12 : 44		26	
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	12,040.7	3,900	12 : 55		11	
Reach to workshop	in			:			
Total			42,400			142	5 Total min.: 147min.
Collection			0			0	5
Transportation			38,500			115	0
Inside the dumping site			3,900			11	0 Dumping time
Idling time						16	

**Time & Motion Study**

Organization: N.C.C

Trip- 3 Date: 21st May 1997

Vehicle No. KAB 388Q

Loading Capacity: 5 TON

Researcher's name: A. Gaititi

No. of Crew: 1

Estimated Volume: 4 1/2 m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumpingsite	out	12,040.7		12 : 55			From Dumping site to Outer ring
Loading-1	in	12,050.4	9,700	13 : 12	17		rd.-Thika rd.-Muranga rd.-Ring
	out			13 : 33		21	rd. ngara-Juja rd.(Loading point)
Loading-2	in	12,052.0	1,600	13 : 54	21		From Juja rd.-Kipanga mumanyi
	out			14 : 0		6	st.-Garissa rd.-Looge-Eastleigh
							sec II-Sevent st.-Pstleigh-First
							ave.-Eastleigh to Eastleigh round
							about (Loading Part II)
							From Eastleigh round about to
							First st.-Juja rd.-Ring rd.-
							Komorock rd.-to Dumping site
Dumping site	in	12,057.0	5,000	14 : 14	14		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	12,063.6	6,600	14 : 39	25		
Reach to workshop	in			:			
Total			22,900		77	27	Total min.:104min.
Collection			1,600		21	27	
Transportation			14,700		31	0	
Inside the dumping site			6,600		25	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 4 Date: 21st May 1997

Vehicle No. KAB 388Q

Loading Capacity: 5 TON

Researcher's name: A. Gaititi

No. of Crew: 1

Estimated Volume: 4 1/2m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	12,063.6		14 : 39			From Dumping site to Komorok rd.-Juja rd.-First ave.-
Loading-1	in	12,070.4	6,800	14 : 40	1		
	out			14 : 43		3	Eastleigh to Eastleigh round about (The Loading point)
Loading-2	in			:		0	From Eastleigh round about to First ave. Eastleigh-Juja rd.-
	out			:		0	Komorok rd. to Dumping site
Loading-3	in			:		0	From Dumping site to Komarock rd.-Mutarakwa rd.-Outer ring rd.-
	out			:		0	Jogoo rd. to workshop
Dumping site	in	12,077.7	7,300	15 : 1	18		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	12,080.9	3,200	15 : 15	14		
Reach to workshop	in	12,091.8	10,900	15 : 35	20		
Total			28,200		53	3	Total min.: 56min.
Collection			0		0	3	
Transportation			25,000		39	0	
Inside the dumping site			3,200		14	0	Dumping time
Idling time							



**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 21st May 1997

Vehicle No. KAB 389 Q

Loading Capacity: 6.95 TON

Researcher's name: M. Sitati

No. of Crew: Machine

Estimated Volume: 3m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9,179.1		8 : 25			workshop to Garage- Uhuru
Loading-1	in	9,185.8	6,700	9 : 52	87		highway to Uhuru park
	out			10 : 28		36	Uhuru park-Kenyatta Avenue Nyerere road and dumped at central park central park-Pangani through Uhuru park-
Dumping site	in	9,187.0	1,200	10 : 30	2		Haileselesie Avenue to Juja road
Start dumping							
Finish dumping				10 : 37	7		
Dumping site	out						
Reach to workshop	in					0	
Total			7,900		96	36	Total min.: 132 min.
Collection			0		0	36	
Transportation			7,900		89	0	
Inside the dumping site			0		7	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 21st May 1997

Vehicle No. KAB 389 Q

Loading Capacity: 6.95 TON

Researcher's name: M. Sitati

No. of Crew: Machine

Estimated Volume: 3m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			10 : 37			
Loading-1	in	9,194.7	7,700	11 : 36	59		Pangani
	out			11 : 42		6	To dumping via ring road- Thika road-Komarock to Dumping site
							Dandora-Kariokor
							Kokorock - Outering road- Thika rd -Ring road
Dumping site	in	91,208.0	13,300	12 : 0	18		Ngara-race course
Start dumping							
Finish dumping						0	
Dumping site	out	91,209.9	1,900	12 : 12	12		
Reach to workshop	in						
Total			22,900		89	6	Total min.: 95 min.
Collection			0		0	6	
Transportation			21,000		77	0	
Inside the dumping site			1,900		12	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 3 Date: 21st May 1997

Vehicle No. KAB 389 Q

Loading Capacity: 6.95 TON

Researcher's name: M. Sitati

No. of Crew: Machine

Estimated Volume: 3m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9,209.9		12 : 12			Dumping site
Loading-1	in	9,221.3	11,400	12 : 38	26		Eastleigh: 1st Avenue to
	out			12 : 55		17	Pumwani
Dumping site	in	9,233.7	12,400	13 : 21	26		
Start dumping							
Finish dumping						0	
Dumping site	out	9,237.8	4,100	13 : 45	24		
Reach to workshop	in						
Total			27,900		76	17	Total min.: 93 min.
Collection			0		0	17	
Transportation			23,800		52	0	
Inside the dumping site			4,100		24	0	Dumping time
Idling time							

**Time & Motion Study** Organization: N.C.C Trip- 4 Date: 21st May 1997

Vehicle No. KAB 389 Q Loading Capacity: 6.95 TON Researcher's name: M. Sitati

No. of Crew: Machine Estimated Volume: 3m<sup>3</sup>

Location		Milceage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9,237.8		13 : 45			
Loading-1	in	9,244.2	6,900	14 : 6	21		Pumwani
	out			14 : 13		7	
							Eastleigh-Juja road
							komarock
Dumping site	in	9,251.7	7,000	14 : 29	16		
Start dumping							
Finish dumping						0	
Dumping site	out	9,255.2	3,500	14 : 40	11		
Reach to workshop	in						
Total			17,400		48	7	Total min.: 55 min.
Collection			0		0	7	
Transportation			13,900		37	0	
Inside the dumping site			3,500		11	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 5 Date: 21st May 1997

Vehicle No. KAB 389 Q

Loading Capacity: 6.95 TON

Researcher's name: M. Sitati

No. of Crew: Machine

Estimated Volume: 3m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9255.2		14 : 40			
Loading-1	in	9267.7	7,500	14 : 58	18		
	out			15 : 0		2	
Dumping site	in	9270.2	7,500	15 : 22	22		Dandora road-Komarock-Outering
Start dumping							Thika road-Muranga road
Finish dumping						0	to Kaloleni
Dumping site	out	9273.7	3,500	15 : 34	12		
Reach to workshop	in	9287.5	13,800	15 : 58	24		
Total			32,300		76	2	Total min.: 78 min.
Collection			0		0	2	
Transportation			28,800		64	0	
Inside the dumping site			3,500		12	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 21st May 1997

Vehicle No. KAB 390Q

Loading Capacity: 7.83 TON

Researcher's name: B. Chizi

No. of Crew: Tractor

Estimated Volume: 3m<sup>3</sup>

Location		Mileage (m)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8,687		10 : 35			Workshop to garage
Loading-1	in	8,703	16,000	12 : 18	103		Haileselesie avenue- Kombo
	out			12 : 21		3	munyiri road-Ring road-Ngara road-Juja road Ngara Clinic
							To dumping site through muranga-Thika-Outering-Komarock
							Idling time: 11:30 to 11:43 for oil filling and checking
Dumping site	in	8,757	54,000	12 : 47	26		
Start dumping				12 : 52	5		
Finish dumping				12 : 53		1	
Dumping site	out			12 : 57	4		
Reach to workshop	in						
Total			70,000		138	4	Total min.: 142 min.
Collection			0		0	3	
Transportation			70,000		129	0	
Inside the dumping site			0		9	1	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2

Date: 21st May 1997

Vehicle No. KAB 390Q

Loading Capacity: 7.83 TON

Researcher's name: B. Chizi

No. of Crew: Tractor

Estimated Volume: 3m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8,711		12 : 57			From dumping site
Loading-1	in	8,726	15,000	13 : 59	62		Komarock -Juja road
	out			14 : 3		4	to Esleigh section III
Dumping site	in	8,732	6,000	14 : 21	18		To dumping site through the same
Start dumping				14 : 25	4		above routes
Finish dumping				14 : 26		1	
Dumping site	out			14 : 32	6		
Reach to workshop	in			15 : 30	58		
Total			21,000		148	5	Total min.: 153 min.
Collection			0		0	4	
Transportation			21,000		138	0	
Inside the dumping site			0		10	1	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 3 Date: 21st May 1997

Vehicle No. KAB 390Q

Loading Capacity: 7.83 TON

Researcher's name: B. Chizi

No. of Crew: Tractor

Estimated Volume: 3m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8,736		15 : 30			
Loading-1	in	8,743	7,000	15 : 53	23		From dumping site to Eastliegh
	out			15 : 56		3	through Komarock road Juja
Dumping site	in	8,752	9,000	16 : 6	10		
Start dumping				16 : 14	8		Back to workshop through
Finish dumping				16 : 15		1	mutarakwa road-outering road
Dumping site	out			16 : 20	5		Jogoo
Reach to workshop	in	8,764	12,000	17 : 15	55		
Total			28,000		101	4	Total min.: 105 min.
Collection			0		0	3	
Transportation			28,000		88	0	
Inside the dumping site			0		13	1	Dumping time
Idling time							



**Time & Motion Study**

Organization: N.C.C.

Trip- 1 Date: 21st May 1997

Vehicle No. KAB 392Q

Loading Capacity: 7 TON

Researcher's name: D. A. Masaba

No. of Crew: 1

Estimated Volume:

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7,531		8 : 34			Jogoo rd.-Outer ring rd.-
Loading-1	in			:			Komarock rd. to Dumping
	out			:			site Dandora
							Through the same route to
							Enterprise rd.-Lusaka rd.-
							Dar es salamm rd. and Garage
							road to N.C.C Garage
Dumping site	in	7,543	12,000	8 : 53	19		
Start dumping				:			Stopped for wheel barancing
Finish dumping				:		0	at 9:01 to 9:21
Dumping site	out	7,545	2,000	9 : 0	7		9:22 stopped at Dandora depot
Reach to garage	in	7,559	14,000	9 : 56	56		to register left at 9:26
Total			28,000		82	0	Total min.:82min.
Collection			0		0	0	
Transportation			26,000		51	0	
Inside the dumping site			2,000		7	0	Dumping time
Idling time					24		

**Time & Motion Study**

Organization: N.C.C.

Trip- 2 Date:21st May 1997

Vehicle No.KAB 392Q

Loading Capacity: 7 TON

Researcher's name:D. A. Masaba

No. of Crew:1

Estimated Volume:5M<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from garage	out	7,562		10 : 24			Stopped from 9:56-10:04 to fuel and service
	in	7,566	4,000	10 : 35	11		
	out			11 : 16		41	
Loading-1	in	7,570	4,000	11 : 30	14		Jogoo rd.-Landhies rd.-Haile selassie ave. to Haile selassie to Uhuru park
	out			11 : 37		7	
				:			Did not load because of the Parade left at 11:16
				:			
				:			Haile selassie ave.-Bunyala rd. Race course rd.-Juja rd.-Mugweri
				:			
				:			Ring rd.-Ngara rd.-Muranga rd.-Thika rd.-Outer ring rd.-Komarock to Dandora
Dumping site	in	7,581	11,000	11 : 56	19		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	7,584	3,000	12 : 8	12		
Reach to workshop	in			:			
Total			22,000		56	48	Total min.:104min.
Collection			4,000		11	48	
Transportation			15,000		33	0	
Inside the dumping site			3,000		12	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C.

Trip- 3 Date:21st May 1997

Vehicle KAB 392Q

Loading Capacity: 7 TON

Researcher's name:D. A. Masaba

No. of Crew:1

Estimated Volume:7.8tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min)	Loading time (min.)	Remarks (route)
Start from dumping site	out	7,584		12 : 8			Mugweni-Juja rd.-Ring rd.-
Loading-1	in	7,594	10,000	12 : 25	17		Ngara rd.-Muranga rd.-Thika
	out			12 : 31		6	rd.-Outer ring rd.-Komarock rd. then to dumping site
							Stopped to register at 13:00 to 13:05
Dumping site	in	7,605	11,000	12 : 50	19		
Start dumping				:			
Finish dumping							
Dumping site	out	7,608	3,000	12 : 57		7	
Reach to workshop	in			:			
Total			24,000		43	6	Total min.: 49 min.
Collection			0		0	0	
Transportation			21,000		36	0	
Inside the dumping site			3,000		7		Dumping time
Idling time					5		

**Time & Motion Study**

Organization: N.C.C.

Trip- 4 Date: 21st May 1997

Vehicle KAB 392Q

Loading Capacity: 7 TON

Researcher's name: D. A. Masaba

No. of Crew: 1

Estimated Volume: 8 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	7,608		12 : 57			
Loading-1	in	7,615	7,000	13 : 34	37		It did not load went looking
	out			13 : 40		6	for the tractor loaded later at
Loading-2	in	7,617	2,000	13 : 52	12		Eastleigh 8th Street through Juja
	out			13 : 57		5	rd.-Komarock rd. to Dandora
							dumping site
							Then using the same route
							back to the loading site at
							Eastleigh 8th street round
							about
Dumping site	in	7,624	7,000	14 : 11	14		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	7,627	3,000	14 : 19	8		
Reach to workshop	in			:			
Total			19,000		71	11	Total min.: 82 min.
Collection			2,000		12	11	
Transportation			14,000		51		
Inside the dumping site			3,000		8	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C.

Trip- 5 Date:21st May 1997

Vehicle KAB 392Q

Loading Capacity: 7 TON

Researcher's name:D. A. Masaba

No. of Crew: 1

Estimated Volume: 7.8 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7,627		14 : 19			From Dandora through
Loading-1	in	7,635	8,000	14 : 36	17		Eastleigh 8th street-Juja rd.-
	out			:			Komarock road to Dumping
Loading-2	in			:			site
	out			:			
Loading-3	in			:			From Dandora-Outer ring rd.
	out			:			then Jogoo rd. to the
							Workshop
Dumping site	in	7,642	7,000	14 : 55	19		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	7,645	3,000	15 : 5	10		
Reach to workshop	in	7,656	11,000	15 : 30	25		
<b>Total</b>			29,000		71	0	Total min.:71min.
Collection			0		0	0	
Transportation			26,000		61	0	
Inside the dumping site			3,000		10	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 21st May 1997

Vehicle No. KAB 286Q

Loading Capacity: 7 TON

Researcher's name: S. Kimotho

No. of Crew: 1

Estimated Volume: 2.7m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	37,677		10 : 30			Kaloleni depot-Jogoo rd.-Outer
Loading-1	in		23,000	12 : 15	105		ring rd.-Kangundo rd.to Umoja II
	out			13 : 55		100	depot Idoling time 10:55am to 11:15am
							Umoja Depots-Kangundo rd.-
							Outer ring rod-Airport north rd.
							to Embakasi Police Station :
							The vehicle have only one loading point
							Embakasi Village Police :
							north Airport rd. -Outer ring rd.-
							Mutarakwa rd.-Dandora
							dumping site
							The vehicle have seven loaders.
							Dumping site out, Kariobangi
							south-Outer ring rd.-Kangundo
							rd. to Umoja II Depot : Idoling
							time 5min.
							Depot-Kangundo rd.-Jogoo rd.-
							to Kaloleni workshop :
							N:B The mileage is estimated
							the vehicle was not recording
Dumping site	in	37,709		14 : 30	35		
Start dumping				14 : 35	5		
Finish dumping				14 : 40		5	
Dumping site	out	37,712	3,000	14 : 49	9		
Reach to workshop	in	37,726	14,000	15 : 40	51		
Total			40,000		205	105	Total min.:310min.
Collection			0		0	100	
Transportation			37,000		171	0	
Inside the dumping site			3,000		14	5	Dumping time
Idling time					20		

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 21st May 1997

Vehicle No. KUL 991

Loading Capacity: 8 TON

Researcher's name: P. Kiama Karoki

No. of Crew:

Estimated Volume: 5 m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	155,523.9		8 : 30			Jogoo rd.-Lusaka rd.-Enterprise
Loading-1	in	155,534.9	11,000	10 : 0	90		rd.-Garage rd. at 8:43 Mileage
	out		0	10 : 46		46	155526.9 Time out 9:23 Garage rd.
Loading-2	in	155,539.8	4,900	11 : 2	16		-Dar es Salaam rd.-Enterprise rd.-
	out		0	11 : 22		20	Lusaka rd.-Londhies rd.-Hile
Loading-3	in	155,542.6	2,800	11 : 32	10		selassie ave.-Moi ave.-Mondjase
	out		0	11 : 43		11	st.-Tom mboya st.-Lagos rd.-
Loading-4	in	155,546.8	4,200	11 : 50	7		Nairobi City Comission (9:40-9:
	out		0	11 : 58		8	47) 155532.7-Lagos rd.-River rd.-
Loading-5	in	155,554.6	7,800	12 : 8	10		Race course-Haile selassie-
	out		0	12 : 24		16	Workshop rd.(Loading 1 Ngaira)
Loading-6	in	155,561.2	6,600	12 : 45	21		(155534.9)-Workshop rd.-Haile
	out		0	12 : 56		11	selassie ave.Hospital rd.(Loading
Loading-7	in	155,566.0	4,800	13 : 8	12		Point2)(Kenyatta Hospital) Haile
	out		0	13 : 38		30	selassie ave.-Valley rd Argwings
Loading-8	in	155,580.6	14,600	14 : 0	22		Kodheck rd.-(Loading 3)(Lenana
	out			15 : 20		80	Vetinary Clinick)-Argwings
Loading-9	in			:			Kodheck rd.-Ole odume rd.-
	out			:		0	Gitanga rd.-James gichuru-
Loading-10	in			:		0	(Loading 4)(St.Austins Vertinary
	out			:		0	Clinic) James gichuru rd.-Waiyaki
Loading-11	in			:		0	way-Chiromo rd.(Loading 5)
	out			:		0	Vertinary Clinic-Chiromo rd.-
Loading-12	in			:		0	Museum hill rd.-Forest rd.-Juja rd.-
	out			:		0	First ave(eastleigh)(Loading 6)
Loading-13	in			:		0	(Madina Nursing Home)-2nd ave.
	out			:		0	(eastleigh)-Juja rd.-Huruma rd.
Loading-14	in			:		0	(Loading 7)(Huruma Nursing
	out			:		0	Home)Huruma rd.-Outer ring rd.-
Loading-15	in			:		0	Thika rd.-Kaniti rd.-(Loading 8)
	out			:		0	(Kahawa west) Kamiti rd.-Outer
Loading-16	in			:		0	ring rd.-Thika rd.-Komorock
	out			:		0	rd.(Dumping site)-Komorock-
Dumping site	in	155,596.6	16,000	15 : 55	35		Mutarakwa rd.-Outer ring rd.-
Start dumping				:			Mumias-Rabai rd.-Charles new
Finish dumping				:		0	rd.-Jogoo rd.-Workshop
Dumping site	out	155,601.0	4,400	16 : 30	35		
Reach to workshop	in	155,611.2	10,200	17 : 15	45		
Total			87300		303	222	Total min.:525min.
Collection			45,700		98	222	
Transportation			37,200		123	0	
Inside the dumping site			4,400		35	0	Dumping time
Idling time					47		

**Time & Motion Study**

Organization: N.C.C

Trip-1

Date: 21st May 1997

Vehicle No. KUL 992

Loading Capacity: 7.98 TON

Researcher's name: Ali Ami Nassir

No. of Crew: 10

Estimated Volume: 24m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	219,999.5		8 : 30			Kaloleni workshop to
Loading-1	in						Dumping site via Pumwani
	out					0	office.
							General wloinge road-
							Juja road- Komarock
Dumping site	in	220,012.0	12,500	9 : 21	51		
Start dumping		220,013.0	1,000	9 : 36	15		
Finish dumping		220,013.0	0	10 : 6		30	
Dumping site	out	220,014.0	1,000	10 : 12	6		
Reach to workshop	in						
Total			14,500		72	30	Total min.: 102 min.
Collection			0		0	0	
Transportation			12,500		51	0	
Inside the dumping site			2,000		21	30	Dumping time
Idling time							



**Time & Motion Study**

Organization: N.C.C

Trip-2

Date: 21st May 1997

Vehicle No. KUL 992

Loading Capacity: 7.98 TON Researcher's name: Ali Ami Nassir

No. of Crew: 10

Estimated Volume: 24m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	220,014.0		10 : 12			Dandora-Komorock-Juja road
Loading-1	in	220,023.5	19,500	10 : 47	35		Kipanga Athumani street-Juja rd
	out			10 : 52		5	
Loading-2	in	220,023.8	300	10 : 54	2		Kipanga Athumani street-Juja rd
	out			11 : 4		10	
Loading-3	in	220,023.9	100	11 : 7	3		Kipanga Athumani street -Juja rd
	out			11 : 17		10	
Loading-4	in	220,023.9	30	11 : 18	1		Kipanga Athumani street - Juja rd
	out			11 : 31		13	
Loading-5	in	220,024.9	970	11 : 33	2		Kipanga Athumani street - Juja rd
	out			12 : 3		30	
Loading-6	in	220,025.0	50	12 : 7	4		Kipanga Athumani street-Juja rd
	out			12 : 33		26	
Loading-7	in	#####	20	12 : 37	4		Kipanga Athumani street -Juja rd
	out			12 : 54		17	
Loading-8	in	220,025.2	500	12 : 59	5		Kipanga Athumani street-Juja rd
	out			13 : 4		5	
Loading-9	in	220,026.8	1,600	13 : 13	9		Busagwa Lane off Juja road
	out			13 : 19		6	
Loading-10	in	220,027.5	700	13 : 22	3		4th Avenue - Eastleigh Avenue
	out			13 : 43		21	
Loading-11	in	220,027.7	200	13 : 51	8		3rd street-Eastleigh
	out			14 : 2		11	
Loading-12	in	220,027.8	100	14 : 4	2		
	out			14 : 42		38	
Dumping site	in	220,035.7	7,900	15 : 12	30		Dandora to Kaloleni workshop
Start dumping		220,036.7	1,000	15 : 18	6		
Finish dumping		220,036.7		15 : 47		29	
Dumping site	out	220,037.7	1,000	15 : 52	5		
Reach to workshop	in	220,049.3	11,800	16 : 32	40		
Total			45,770		159	221	Total min.: 380 min.
Collection			4,570		35	192	
Transportation			39,200		105	0	
Inside the dumping site			2,000		11	29	Dumping time
Idling time					8		

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 21st May 1997

Vehicle No. KUL 994

Loading Capacity: 7 TON

Researcher's name: Arafa

No. of Crew: 9

Estimated Volume: 6m<sup>3</sup>

Location		Milage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	164,391.0		8 : 35			
Loading-1	in	164,401.0	10,000	9 : 20	45		Jogoo rd.-Ngara rd.-Muranga rd.-
	out			9 : 47		27	Tom mboya st.
Loading-2	in	164,402.0	1,000	9 : 58	11		Lagos rd.-River rd.-Slip-
	out			10 : 7		9	University way-Uhuru highway-
Loading-3	in	164,403.0	1,000	10 : 14	7		house-Uhuru highway-
	out			10 : 15		1	Kenyatta ave.-Kimathi st.-Banda st.
Loading-4	in	164,403.9	900	10 : 17	2		
	out			11 : 10		53	Muindi Mbingu st.-Market st.
Loading-5	in	164,407.0	3,100	11 : 27	17		
	out			11 : 46		19	Koinange st.-Monbovia st.
Loading-6	in	164,412.0	5,000	12 : 2	16		Moi ave.-slip-Muranga-Ngara
	out			12 : 35		33	rd.-Park rd.-Muranga rd.-
Loading-7	in			:			Thika rd.
	out			:		0	
Dumping site	in	164,418.0	6,000	12 : 47	12		Thika rd.-Outer ring rd.
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	164,422.0	4,000	12 : 55	8		Outer ring rd.-Thika rd.-
Reach to workshop	in			:			Muranga rd.-Slip-Moi ave.-
							Koinange st.-Banda st.-
							City market
Total			31,000		130	154	Total min.:284min.
Collection			11,000		53	154	
Transportation			16,000		42	0	
Inside the dumping site			4,000		20	0	Dumping time
Idling time					15		

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 21st May 1997

Vehicle No. KUL 994

Loading Capacity: 7 TON

Researcher's name: Arafa

No. of Crew: 9

Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	164,420		12 : 55			Outer ring rd.-Thika rd.-Ring rd.-
Loading-1	in	164,436	16,000	13 : 37	42		Muranga rd.-slip-Moi ave.-Koinange
	out			14 : 50		73	st.-Banda st.-City market
Loading-2	in			:			
	out			:		0	
Dumping site	in	164,451	15,000	15 : 45	55		Koinange-
Start dumping				:			Tom mboya st.-Muranga rd.-
Finish dumping				:		0	Thika rd.-Outer ring rd.-
Dumping site	out	164,452	1,000	16 : 20	35		Dandora
Reach to workshop	in	164,469	17,000	16 : 40	20		Outer ring rd.-Mumias rd.-
							Buru buru rd.-Jogoo rd.
Total			49,000		152	73	Total min.:225min.
Collection			0		10	73	
Transportation			48,000		107	0	
Inside the dumping site			1,000		35	0	Dumping time
Idling time					10		

**Time & Motion Study**

Organization: N.C.C

Trip-1 Date: 21st May 1997

Vehicle No: KUL 995

Loading Capacity: 7 TON

Researcher's name: G. N. Kamau

No. of Crew: 6

Estimated Volume: 6.75m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	89,823		8 : 22			
Loading-1	in	89,839	16,000	10 : 20	118		3rd Parklands Avenue
	out			10 : 31		11	
Loading-2	in	89,840	1,000	10 : 38	7		3rd Parklands Avenue
	out			10 : 43		5	
Loading-3	in		200	10 : 45	2		4th Parklands avenue
	out			10 : 48		3	
Loading-4	in	89,842	1,800	10 : 57	9		Wangaapala road
	out			11 : 8		11	
Loading-5	in	89,846	4,000	11 : 22	14		Brookside Garden
	out			11 : 26		4	
Loading-6	in	89,847	1,000	11 : 33	7		Grevillea Groove
	out			11 : 35		2	
Loading-7	in	89,849	2,000	11 : 40	5		Kyuna Crescent
	out			11 : 42		2	
Loading-8	in	89,850	1,000	11 : 50	8		Kyuna crescent
	out			11 : 52		2	
Loading-9	in		100	11 : 55	3		Mugumo crescent
	out			11 : 58		3	
Loading-10	in	89,851	900	12 : 0	2		Mugumo crescent
	out			12 : 9		9	
Loading-11	in		200	12 : 14	5		Kyuna road
	out			12 : 16		2	
Loading-12	in	89,852	800	12 : 20	4		Kyuna road
	out			12 : 22		2	
Loading-13	in	89,857	5,000	12 : 32	10		Thego Lane
	out			12 : 37		5	
Loading-14	in	89,859	2,000	12 : 40	3		Thego Lane
	out			12 : 45		5	
Loading-15	in	89,866	7,000	13 : 1	16		Maua Flats
	out			13 : 18		17	
Loading-16	in	89,868	2,000	13 : 22	4		Tyson's Flats
	out			13 : 30		8	
Loading-17	in	89,869	1,000	13 : 38	8		Brookside Grove
	out			13 : 40		2	
Loading-18	in		30	13 : 42	2		Brookside Grove
	out			13 : 46		4	
Loading-19	in		30	13 : 48	2		Brookside Grove
	out			13 : 55		7	
Loading-20			30	14 : 0	5		Brookside Grove
				14 : 4		4	
Dumping site	in			14 : 57	53		To dumping through Brooksid
Start dumping				15 : 2	5		road -waiyaki way-Parkland r
Finish dumping				16 : 0		58	Ngara road-muranga road-Thi
Dumping site	out	80,891	2,000	16 : 6	6		road-Outering road
Reach to workshop	in	89,901	10,000	16 : 30	24		
Total			58,090		322	166	Total min.: 488 min.
Collection			30,090		116	108	

**Time & Motion Study**

Organization: N.C.C

Trip-1 Date: 21st May 1997

Vehicle No: KUL 995

Loading Capacity: 7 TON

Researcher's name: G. N. Kamau

No. of Crew: 6

Estimated Volume: 6.75m<sup>3</sup>

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Transportation		26,000		143	0	
Inside the dumping site		2,000		11	58	Dumping time
Idling time				52		

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 21st May 1997

Vehicle No. KWE 070

Loading Capacity: 7.97

Researcher's name: J. Masaba

No. of Crew: 2

Estimated Volume: 16m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	203,620.6		8 : 0			Jogoo rd.-Lusaka rd.-Enterprise
Loading-1	in	203,636.5	15,900	9 : 39	99		rd.-Dar es salaam rd. Garage rd.
	out			10 : 32		53	at Garage 8:06 Mileage 203622.7
Loading-2	in			:			Time out 8:44
	out			:		0	Garage rd.-Dar es salaam rd.-
Loading-3	in			:	0		Enterprise rd.-Lusaka rd.-Uhuru
	out			:		0	highway-Museum hill rd.-Forest
							rd.-Limuru rd. City park rd.-
							Mileage 203631.8 from Time in
							9:09-9:15
							Limuru rd. Parklands rd. at post
							office Time 9:20-9:30 Mileage in
							203634.1
							From Parklands rd.-Limuru rd.-
							City park rd. Mileage 203636.5
							time 9:39-
							The trash was disposed within
							City park.
							It took 1 hour 10 minutes because
							had no suitable material for the
							work because the trash had
							yet they had neither forks
							nor gloves. ie to load they
							unloaded in few mins.
							because they had found the
							equipment & assist them.
Dumping site	in	203,637.0	500	10 : 37	5		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	203,637.5	500	10 : 47	10		
Reach to workshop	in			:			
Total			16,900		114	53	Total min.:167min.
Collection			0		0	53	
Transportation			16,400		104	0	Dumping time
Inside the dumping site			500		10	0	
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 21st May 1997

Vehicle No. KWE 070

Loading Capacity: 7.97

Researcher's name: J. Masaba

No. of Crew: 2

Estimated Volume: 16m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	203,637.0		10 : 47			
Loading-1	in	203,637.6	600	10 : 54	7		The second trip was from the
	out		0	11 : 44		50	same place where the first
							began same applies dumping site.
							Out from the dumping site the
							Truck parked at City park rd.
							from 12:00-1:40
Dumping site	in	203,638.1	500	11 : 50	6		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	203,638.3	200	11 : 58	8		
Reach to workshop	in			:			
<b>Total</b>			<b>1,300</b>		<b>21</b>	<b>50</b>	<b>Total min.: 71min.</b>
Collection			0		0	50	
Transportation			1,100		13	0	
Inside the dumping site			200		8	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 3 Date: 21st May 1997

Vehicle No. KWE 070

Loading Capacity: 7.97

Researcher's name: J. Masaba

No. of Crew: 2

Estimated Volume: 4 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	203,638.3		11 : 58			
Loading-1	in	203,640.7	2,400	14 : 0	122		City park -Limuru road
	out			15 : 12		72	forest road -ring road-Ngara
Loading-2	in			:			Landhies rd.-Lusaka rd.-
	out			:		0	Enterprise rd.-Adis abeba rd.-
							Time 2:00
							Lunga Lunga rd.-Likoni rd.-
							Enterprise rd.
							It lasted from 3:52-3:57
							Lusaka rd. then Jogoo to
							Kaloleni (Workshop)
Dumping site	in	203,651.5	10,800	15 : 30	18		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	203,652.0	500	15 : 43	13		
Reach to workshop	in	203,659.5	7,500	16 : 7	24		
<b>Total</b>			<b>21,200</b>		<b>177</b>	<b>72</b>	<b>Total min.:249min.</b>
Collection			<b>0</b>		<b>0</b>	<b>72</b>	
Transportation			<b>20,700</b>		<b>59</b>		
Inside the dumping site			<b>500</b>		<b>13</b>	<b>0</b>	<b>Dumping time</b>
Idling time					<b>105</b>		



**Time & Motion Study** Organization: n.N.C.C Trip- 1 Date: 21st May 1997  
 Vehicle KWE 073 Loading Capacity: 6.23 TON Researcher's name: D. Akinyi  
 No. of Crew: 10 Estimated Volume: 7.7 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	153,759.0		:			
Loading-1	in	153,764.9	5,900	9 : 10			Vehicle went to the garage
	out			11 : 13		123	then came back to Kaloleni
Loading-2	in	153,765.0	100	11 : 15	2		depot to collect loaders before
	out			11 : 16		1	it left for Kaloleni estate area
Loading-3	in	153,765.1	100	11 : 18	2		where it led been allocated
	out			11 : 21		3	
Loading-4	in	153,765.2	100	11 : 41	20		
	out			11 : 42		1	
Loading-5	in	153,765.4	150	11 : 44	2		
	out			11 : 50		6	
Loading-6	in	153,765.4	50	11 : 52	2		
	out			11 : 54		2	
Loading-7	in	153,765.5	100	12 : 0	6		
	out			:			
Dumping site	in	153,777.2	11,700	13 : 30	90		
Start dumping		153,777.8	600	13 : 35	5		
Finish dumping		153,779.0	1200	13 : 37		2	
Dumping site	out	153,780.7	1,700	13 : 42	5		
Reach to workshop	in	153,780.7	0	13 : 42	0		Dandora dumping site
Total			21,700		134	138	Total min.:272min.
Collection			600		34	136	
Transportation			17,600		90		
Inside the dumping site			3,500		10	2	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 21st May 1997

Vehicle KWE 073

Loading Capacity: 6.23 TON

Researcher's name: D. Akinyi

No. of Crew: 10

Estimated Volume: 7.7 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	153,780.7		13 : 42			Dandora dumping site
Loading-1	in	153,790.0	9,300	14 : 0	18		Kaloleni Estate Area
	out			14 : 40		40	
Loading-2	in	153,794.8	4,800	14 : 45	5		Kaloleni Estate Area
	out			15 : 5		20	
							Through Outer ring Road to Umoja Railway crossing
Dumping site	in	153,806.0	11,200	16 : 10	65		
Start dumping		153,807.7	1,700	:			
Finish dumping		153,807.9	200	:		0	
Dumping site	out	153,808.0	100	16 : 25	15		
Reach to workshop	in	153,818.0	10,000	17 : 0	35		Kaloleni parking
Total			37,300		138	60	Total min.: 198min.
Collection			4,800		5	60	
Transportation			30,500		118	0	
Inside the dumping site			2,000		15	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C.

Trip- 1 Date: 21st May 1997

Vehicle No. KWE 081

Loading Capacity: 7 TON

Researcher's name: E.M. Kariuki

No. of Crew: 10

Estimated Volume: 4 tons

Location		Milage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	186,185.0		8 : 22			Kaloleni Deport
Loading-1	in	186,193.0	8,000	9 : 14	52		Route to workshop Lusaka rd.-
	out			9 : 30		16	Enterprise rd.-Dar es salaam rd.-
Loading-2	in	186,194.5	1,500	9 : 34	4		Garage rd.. We were in the
	out			10 : 3		29	workshop at 9:31 and left at
Loading-3	in	186,195.4	900	10 : 7	4		8:44 at Mileage 186187.3 we
	out			10 : 18		11	took off through Dar es salaam
Loading-4	in	186,195.7	300	10 : 21	3		rd. stopped at 8:50 to 8:52 at
	out			10 : 52		31	Dunga rd.-went through Dundori
Loading-5	in	186,195.8	100	10 : 53	1		rd.-Shimo la tewa and stopped
	out			10 : 59		6	there at 8:53 to 9:02
Loading-6	in	186,196.0	200	11 : 1	2		Again we went through Lusaka rd
	out			11 : 24		23	Langata rd.and our loading site
Loading-7	in	186,196.4	400	11 : 30	6		was Wilson airport. truck did not
	out			11 : 40		10	till up and thus we were off
Loading-8	in	186,196.5	100	11 : 45	5		through Langata rd. up to Gandhi
	out			12 : 2		17	ave.where the truck filled up.
							Our way to Dandora dumping
							site was Langata rd. Aerodrome
							rd.-Bunyala rd.-Lower hill rd.-
							Hile selassie ave.-Tom mboya st.-
							Accra rd. stopped at River rd. at
							12:25 up to 12:30.
Dumping site	in	186,215.0	18,500	13 : 0	58		Then Tom mboya st.-Muranga
Start dumping		186,216.0	1,000	13 : 6	6		rd.-Tika rd.-Outer ring rd.-
Finish dumping		186,216.9	900	13 : 32		26	Komarock rd.and finally
Dumping site	out	186,218.0	1,100	13 : 40	8		dumping site Dandorra deport
Reach to workshop	in			:			To trip 2
Total			33,000		149	169	Total min.:318min.
Collection			3,500		54	143	
Transportation			26,500		81	0	
Inside the dumping site			3,000		14	26	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C.

Trip- 2 Date: 21st May 1997

Vehicle No. KWE 081

Loading Capacity: 7 TON

Researcher's name: E.M. Kariuki

No. of Crew: 10

Estimated Volume: 2 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	186,218.0		13 : 40			Dandora dumping site
Loading-1	in	186,237.4	19,400	14 : 15	35		From Dandora, we went
	out	186,252.0	14,600	15 : 7		52	through Komarock rd.-
Loading-2	in	186,254.0	2,000	15 : 10	3		Mutarakwa rd.-Outer ring rd.-
	out	186,254.0	0	15 : 21		11	through to the round about that
							the airport and
							followed the road to Mombasa
							rd. our first loading and the
							second were on Mombasa rd.-
							our truck filled up at the
							indicated two points or rather
							loading points.
							Our route to dumping site was
							the same.
							Note. There seem to be a lot of
							time and distance used by this
							truck. The reason is because the
							truck had tipping problem and
							therefore the driver had to move
							it to and from the dumping site.
							Our way to workshop was,
							Komarock rd.-Outer ring rd.-
							Rabai rd.-Jogoo rd. and arrived at
							Kaloleni depot at time recorded
Dumping site	in	186,267.0	13,000	16 : 20	59		
Start dumping		186,269.0	2,000	16 : 22	2		
Finish dumping		186,269.0	0	16 : 35		13	
Dumping site	out	186,270.0	1,000	16 : 41	6		
Reach to workshop	in	186,281.0	11,000	17 : 10	29		
Total			63,000		134	76	Total min.: 210min.
Collection			16,600		3	63	
Transportation			43,400		123	0	
Inside the dumping site			3,000		8	13	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 21st May 1997

Vehicle No. KWE 084

Loading Capacity: 9.5 TON

Researcher's name: H. Githua N.

No. of Crew: 9

Estimated Volume: 24m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	99,638.5		8 : 4			Kaloleni to Garage B.T.W 8:11-8:22am mileage 099640.7
Loading-1	in	99,666.7	28,200	9 : 35	91		Uhuru park-nairobi baptist
	out		0	9 : 45		10	Church of Ngong road
Loading-2	in	99,667.5	800	9 : 47	2		Baptist church-Silver spring hotel
	out		0	10 : 12		25	off Arch way wing Kadhek rd.
Loading-3	in	99,668.6	1,100	10 : 16	4		Laburnum court apartment
	out		0	10 : 23		7	via valley road
Loading-4	in	99,670.0	1,400	10 : 28	5		St. Andrews apartments
	out		0	10 : 31		3	off Nyerere rd.
Loading-5	in	99,670.6	600	10 : 43	12		United (K) Club
	out		0	10 : 48		5	off nyerere road
Loading-6	in	99,671.8	1,200	10 : 52	4		El- Clot house
	out		0	10 : 59		7	off state house road
Loading-7	in	99,672.2	400	11 : 1	2		Kolobot Gardens
	out		0	11 : 10		9	off state house road
Loading-8	in	99,674.0	1,800	11 : 14	4		Steve Mwangi apartments
	out		0	11 : 20		6	
Loading-9	in	99,676.1	2,100	11 : 27	7		Red rose apartments
	out		0	11 : 32		5	
Loading-10	in	99,676.4	300	11 : 36	4		Maalim juma road
	out		0	11 : 38		2	
Loading-11	in	99,677.1	700	11 : 40	2		Along Likoni road (APTS)
	out		0	11 : 43		3	
Loading-12	in	99,677.4	300	11 : 45	2		river view Apartments
	out		0	12 : 2		17	
Loading-13	in	99,678.2	800	12 : 5	3		Along Nyangumi road
	out		0	12 : 6		1	
Loading-14	in	99,679.0	800	12 : 10	4		Along Lenana road
	out		0	12 : 12		2	
Loading-15	in	99,679.4	400	12 : 16	4		along Turbo road
	out		0	12 : 18		2	
Loading-16	in	99,679.6	200	12 : 21	3		Ithingu court
	out		0	12 : 30		9	
Loading-17	in	99,680.7	1,100	12 : 51	21		Spinal injury hospital
	out		0	13 : 28		37	off lenana road
Loading-18	in	99,680.8	100	13 : 29	1		Few meters away along
	out		0	13 : 35		6	Lenana road
Loading-19	in	99,681.1	300	13 : 37	2		Makuyu lane
	out		0	13 : 46		9	
Loading-20	in	99,682.7	1,600	13 : 52	6		Along Arwings kohdek rd.
	out		0	14 : 1		9	
				:			NB'S
				:			(a)Garage - Dagoreti Depot
				:			Time in 8:45 am
				:			out 9:00 am
				:			Milage 099653

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 21st May 1997

Vehicle No. KWE 084

Loading Capacity: 9.5 TON

Researcher's name: H. Githua N.

No. of Crew: 9

Estimated Volume: 24m<sup>3</sup>

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
			:			(b) Dagoreti - Cemetery
			:			Time in 9:05 am
			:			out 9:12 am
			:			Milage 099655.3
			:			(c) Cemetery - Uhuru park
			:			Time in 9:26 am
			:			out 9:30 am
			:			Milage 099664.7
			:			(d) Stop over at Uhuru park
			:			Time in 2:26 pm
			:			out 2:30 pm
			:			Milage 099687.5
			:			(e) Dagoreti depot through
			:			Ngong rd.
			:			Time in 2:48 pm
			:			out 2:50 pm
			:			Milage 099695.7
Dumping site in	99,717.4	34,700	15 : 31	90		Dandora
Start dumping			:			
Finish dumping			:		0	
Dumping site out	99,720.9	3,500	15 : 51	20		
Reach to workshop in	99,732.4	11,500	16 : 15	24		
<b>Total</b>		<b>93,900</b>		<b>317</b>	<b>174</b>	<b>Total min.: 491 min.</b>
<b>Collection</b>		<b>16,000</b>		<b>92</b>	<b>174</b>	
<b>Transportation</b>		<b>74,400</b>		<b>201</b>	<b>0</b>	
<b>Inside the dumping site</b>		<b>3,500</b>		<b>20</b>	<b>0</b>	<b>Dumping time</b>
<b>Idling time</b>				<b>4</b>		

**Time & Motion Study**

Organization: N.C.C.

Trip- 1 Date: 21th May 1997

Vehicle No. KWE 245

Loading Capacity: 7.83 TON Researcher's name: E. Kairu

No. of Crew: 7

Estimated Volume: 7.5m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	161703		9 : 47			Kaloleni-Garage -Ngara
Loading-1	in	161711	8,000	10 : 34	47		Karura Avenue
	out	161712	1,000	10 : 46		12	
Loading-2	in		50	10 : 51	5		Urafiki Lane
	out			10 : 51		0	
Loading-3	in			10 : 52	1		Mugumo House
	out			10 : 52		0	
Loading-4	in			10 : 53	1		
	out			10 : 54		1	
Loading-5	in			10 : 54	0		
	out			10 : 55		1	
Loading-6	in			10 : 55	0		
	out	161713		10 : 57		2	
Loading-7	in	161713	100	11 : 0	3		Shell Petrol station-limuru rd.
	out			11 : 40		40	Ruaraka rd.- Village market-
Loading-8	in	161723	10,000	11 : 59	19		Kobil petrol station-
	out	161725		12 : 10		11	Gigiri shops
Loading-9	in		30	12 : 13	3		
	out			12 : 14		1	
Loading-10	in		50	12 : 15	1		
	out			12 : 15		0	
Loading-11	in			12 : 16	1		
	out			12 : 17		1	
Loading-12	in		60	12 : 17	0		
	out			12 : 18		1	
Loading-13	in		30	12 : 18	0		
	out			12 : 19		1	
Loading-14	in	161726		12 : 19	0		Muthaiga Lane
	out	161726		12 : 23		4	
Loading-15	in		20	12 : 24	1		
	out			12 : 24		0	
Loading-16	in			12 : 24	0		
	out			12 : 25		1	
Loading-17	in		60	12 : 25	0		
	out			12 : 26		1	
Loading-18	in		15	12 : 26	0		
	out			12 : 27		1	
Loading-19	in			12 : 28	1		Muthaiga Close
	out			12 : 35		7	
Loading-20	in			12 : 36	1		
	out			12 : 36		0	
Loading-21	in			12 : 36	0		
	out		5	12 : 37		1	
Loading-22	in			12 : 37	0		
	out		70	12 : 38		1	
Loading-23	in			12 : 39	1		
	out		5	12 : 39		0	

**Time & Motion Study**

Organization: N.C.C.

Trip- 1 Date: 21th May 1997

Vehicle No. KWE 245

Loading Capacity: 7.83 TON Researcher's name: B. Kainu

No. of Crew: 7

Estimated Volume: 7.5m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Loading-24	in			12 : 39	0		
	out			12 : 40		1	Sergoit Lane
Loading-25	in			12 : 40	0		
	out		15	12 : 43		3	
Loading-26	in			12 : 44	1		Muthiga crescent
	out		50	12 : 45		1	
Loading-27	in			12 : 46	1		
	out		5	12 : 47		1	
Loading-28	in			12 : 47	0		
	out			12 : 48		1	
Loading-29	in			12 : 49	1		
	out			12 : 50		1	
Loading-30	in			12 : 50	0		Naivasha Avenue
	out		1000	12 : 59		9	
Loading-31	in			13 : 0	1		Tchui road
	out		20	13 : 11		11	
Loading-32	in			13 : 11	0		
	out			13 : 12		1	
Loading-33	in		30	13 : 12	0		
	out			13 : 12		0	
Loading-34	in		15	13 : 13	1		
	out			13 : 14		1	
Loading-35	in			13 : 14	0		Mutundu Close
	out			13 : 21		7	
Loading-36	in		20	13 : 22	1		Mua park road
	out			13 : 27		5	
Loading-37	in			13 : 28	1		Tchui road
	out		1,000	13 : 40		12	
Loading-38	in		400	13 : 41	1		
	out			13 : 48		7	
Loading-39	in		50	13 : 49	1		Brazilian Embassy road
	out			13 : 51		2	
Loading-40	in		30	13 : 51	0		
	out			13 : 51		0	
Loading-41	in		30	13 : 52	1		
	out			13 : 52		0	
Loading-42	in		10	13 : 53	1		
	out			14 : 0		7	
Loading-43	in		40	14 : 1	1		
	out			14 : 2		1	
Loading-44	in		25	14 : 2	0		
	out			14 : 3		1	
Loading-45	in		40	14 : 3	0		Orchard Close
	out			14 : 10		7	
Loading-46	in		50	14 : 10	0		
	out			14 : 11		1	



**Time & Motion Study** Organization:N.C.C. Trip- 1 Date:21th May 1997  
 Vehicle No. KWE 245 Loading Capacity:7.83 TON Researcher's name:E. Kairu  
 No. of Crew:7 Estimated Volume:7.5m<sup>3</sup>

Location		Milage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Loading-47	in		20	14 : 11	0		
	out			14 : 12		1	
Loading-48	in		100	14 : 12	0		
	out			14 : 26		14	
Loading-49	in		50	14 : 28	2		
	out			14 : 30		2	
Loading-50	in			14 : 36	6		
	out		10	14 : 37		1	Othelo Lane(Muthiga road)
Loading-51	in			14 : 37	0		
	out			14 : 46		9	Esso Plaza
Loading-52	in		20	14 : 47	1		From Muthaiga rd. Join
	out			14 : 49		2	Kiambu rd. to rounabout &
Loading-53	in			14 : 49	6		connect with Muranga rd.
	out		25	15 : 2		13	continue past two
							roundabouts then join Limuru
Dumping site	in	161755		15 : 50	48		rd. past two more
Start dumping				15 : 56	6		roundabouts via Parklands,
Finish dumping				15 : 57		1	then join Muthaiga rd. A
Dumping site	out			16 : 3	6		roundabout then Thika rd.
Reach to workshop	in	161776		16 : 15	12		Finally connect with Outering
							rd.
Total			22,550		178	210	Total min.: 388 min.
Collection			14,550		59	209	
Transportation			8,000		107		
Inside the dumping site			0		12	1	Dumping time
Idoling time							

**Time & Motion Study**

Organization: N.Y.S

Trip- 1 Date: 22nd May 1997

Vehicle No. GK 354M

Loading Capacity: 8 TON

Researcher's name: P. Kiama

No. of Crew: 3

Estimated Volume: 10m<sup>3</sup>

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out		10 : 0			Jogoo road-Ladhis-Ronald Ngara
Loading-1	in	4,000	10 : 10	10		City Centre near Door
	out		10 : 50		40	Step Hotel
						To Dumping site through
						Tom Mboya street-Muranga road
						Thika road-Outering -Komarock
Dumping site	in	14,000	11 : 25	35		
Start dumping						
Finish dumping					0	
Dumping site	out	4,000	11 : 33	8		
Reach to workshop	in					
Total		22,000		53	40	Total min.: 93 min.
Collection		0		0	40	
Transportation		18,000		45		
Inside the dumping site		4,000		8	0	Dumping time
Idling time						

**Time & Motion Study**

Organization: N.Y.S

Trip- 2 Date: 22nd May 1997

Vehicle No. GK 354M

Loading Capacity: 8 TON

Researcher's name: P. Kiama

No. of Crew: 3

Estimated Volume: 10m<sup>3</sup>

Location	Mileage (m)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out		11 : 33			
Loading-1	in	15,000	12 : 5	32		City Centre near Sgana House
	out		12 : 50		45	
						To Dumping via Rivert road
						Muranga road-Thiika road
						Outering-Komarock
Dumping site	in	15,000	13 : 14	24		Dandora
Start dumping						
Finish dumping					0	
Dumping site	out	500	13 : 30	16		
Reach to workshop	in	3,500	14 : 0	30		
Total		34,000		102	45	Total min.: 147 min.
Collection		0		0	45	
Transportation		33,500		86		
Inside the dumping site		500		16	0	Dumping time
Idling time						

**Time & Motion Study**

Vehicle No. KAI 289Q

No. of Crew:

Organization: NCC

Loading Capacity: 6

Estimated Volume: 3

Trip- 1 Date: 22nd May 1997

Researcher's name: M. Adhiambo

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			13 : 0			Kaloleni
Loading-1	in			13 : 25	25		From Kaloleni we used Jogoo rd.
	out			13 : 43		18	then breaked at Hamza rd. and
Loading-2	in			13 : 44	1		stayed for a short time we rabai
	out			13 : 56		12	at rd.
Loading-3	in			13 : 57	1		Loaded at Maimabiu court in
	out			14 : 6		9	BuruBuru phase IV
Loading-4	in			14 : 8	2		Loaded at Ddirgi court
	out			14 : 15		7	Loaded at Towa court
Loading-5	in			14 : 16	1		Loaded at Tosha court
	out			14 : 19		3	Loaded at Opposite Tosha court
Loading-6	in			14 : 20	1		Loaded at Onetter court
	out			14 : 21		1	Loaded at symeka court
Loading-7	in			14 : 24	3		Loaded at Opposite court
	out			14 : 38		14	Loaded at Site court
Loading-8	in			14 : 39	1		
	out			14 : 41		2	
Loading-9	in			14 : 42	1		
	out			14 : 45		3	
				:			From these court we followed
				:			Mumias rd. via Outer ring rd.
Dumping site	in			15 : 40	55		then Mutarakwa rd.-Komorock
Start dumping							Rd.-to Dandora. Then back to
Finish dumping							Workshop used Komorok rd.-
Dumping site	out			15 : 41	1		Mutarakwa rd.-Outer ring rd.-
Reach to workshop	in			:			Rabai rd.-Jogoo rd. to
							Kaloleni
Total				0	92	69	Total min.: 161 min.
Collection				0	11	69	
Transportation				0	80		
Inside the dumping site				0	1		Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 22nd May 1997

Vehicle No. KAB 388Q

Loading Capacity: 7 TON

Researcher's name: Arafa

No. of Crew: 1

Estimated Volume: 6m<sup>3</sup>

Location		Milceage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	12,091.0		8 : 20			
Loading-1	in	12,102.0	11,000	10 : 14	114		Jogoo rd.-Lusaka rd.-enterprise
	out			10 : 20		6	rd.-Moi ave.-Kenyalta ave.-
				:			Muindi Mbingu st.-market-
				:			Koinange st.-Monrovia st.
				:			Muindi Mbingu st.-University
				:			way-Moi ave.-Muranga rd.-
				:			Tom Mboya st.
				:			corporation
Dumping site	in	12,116.0	14,000	10 : 50	30		Tom Mboya st.-Muranga rd.-
Start dumping				:			Thika rd.-Outer ring rd.-
Finish dumping				:		0	komarock-Dandora
Dumping site	out	12,116.5	500	10 : 51	1		
Reach to workshop	in			:			
Total			25500		145	6	Total min.: 151 min.
Collection			0		0	6	
Transportation			25,000		94	0	
Inside the dumping site			500		1	0	Dumping time
Idling time					50		

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 22nd May 1997

Vehicle No. KAB 388Q

Loading Capacity: 7 TON

Researcher's name: Arafa

No. of Crew: 1

Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	12,116		10 : 51			
Loading-1	in	12,129	13,000	11 : 30	39		Outer ring rd.-Komarock-Tika
	out			11 : 50		20	rd.-Muranga rd.-Tom mboya st.
							To Dumping through Outering
							Komarock-Dandora
Dumping site	in	12,142	13,000	12 : 20	30		
Start dumping				:			20 minute stop due to Puncture
Finish dumping				:		0	Dandora
Dumping site	out	12,146	4,000	12 : 30	10		Outer ring rd.-Komarock-
Reach to workshop	in	12,157	11,000	13 : 11	41		Thika rd.
Total			41,000		120	20	Total min.:140min.
Collection			0		0	20	
Transportation			37,000		90	0	
Inside the dumping site			4,000		10	0	Dumping time
Idling time						20	

**Time & Motion Study**

Organization: N.C.C

Trip- 1

Date: 22 nd May 1997

Vehicle No. KAB 389Q

Loading Capacity: 4.55 TOM

Researcher's name: J. Masaba

No. of Crew: 2

Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9,280.0		8 : 3			From Kaloleni-Jogoo rd.-
Loading-1	in	9,294.4	14,400	9 : 6	63		Landhies rd.-Tom mboya st.-
	out			9 : 30		24	Lagos rd.
Loading-2	in			:			It parked the comition deport
	out			:		0	from 8:27-8:54 Mileage-9293.9
							Koinage st.-Muindi mbingu st.-
							University way-Moi ave.-Slip rd.-
							Muranga rd.-Thika rd.-Outer
							ring rd.-Komarock-Outer ring
							rd.-Thika rd.-Muranga rd. &
							Tom mboya st. where trip 2
							began
Dumping site	in	9,308.9	14,500	9 : 56	26		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	9,309.3	400	10 : 1	5		
Reach to workshop	in			:			
<b>Total</b>			<b>29,300</b>		<b>94</b>	<b>24</b>	<b>Total min.: 118min.</b>
<b>Collection</b>			<b>0</b>		<b>0</b>	<b>24</b>	
<b>Transportation</b>			<b>28,900</b>		<b>62</b>	<b>0</b>	
<b>Inside the dumping site</b>			<b>400</b>		<b>5</b>	<b>0</b>	<b>Dumping time</b>
<b>Idling time</b>					<b>27</b>		

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 22 nd May 1997

Vehicle No. KAB 389Q

Loading Capacity: 4.55 TOM

Researcher's name: J. Masaba

No. of Crew: 2

Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	9309.3		10 : 1			The truck parked waiting for the
Loading-1	in	9321.8	12,500	10 : 27	26		others to be filled from 10:27-
	out			11 : 6		39	11:00 at River rd.to the dumping
							site followed Tom mboya st.-
							Muranga rd.-Thika rd.-Outer
							ring rd.-Komarock rd.
Dumping site	in	9336.1	14,300	11 : 35	29		From Dumping site we fallowed
Start dumping				:			Komarock rd.-Outer ring rd.-Tom
Finish dumping				:		0	mboya st.-River rd.-Ndumkeri rd.-
Dumping site	out	9336.5	400	11 : 51	16		where the truck parked awaiting
Reach to workshop	in			:			loading from 12:07-
Total			27,200		71	39	Total min.:110min.
Collection			0		0	6	
Transportation			26,800		55	0	
Inside the dumping site			400		16	0	Dumping time
Idling time						33	



**Time & Motion Study** Organization: N.C.C Trip- 3 Date: 22 nd May 1997  
 Vehicle KAB 389Q Loading Capacity: 4.55 TOM Researcher's name: J. Masaba  
 No. of Crew: 2 Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	9336.5		11 : 51			It parked from 12:07-12:35
Loading-1	in	9349.9	13,400	12 : 7	16		awaiting loading. As it was going
	out			12 : 43		36	to the dumping site in Dandora.
							It followed Komorock rd.-Outer ring rd.-Thika rd. through
							Muranga rd. to Tom roboya st. where trip 4 started.
Dumping site	in	9364.5	14,600	13 : 12	29		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	9364.9	400	13 : 18	6		
Reach to workshop	in			:			
Total			28,400		51	36	Total min.: 87min.
Collection			0		0	8	
Transportation			28,000		45	0	
Inside the dumping site			400		6	0	Dumping time
Idling time						28	

**Time & Motion Study**

Organization: N.C.C

Trip- 4 Date: 22 nd May 1997

Vehicle KAB 389Q

Loading Capacity: 4.55 TOM Researcher's name: J. Masaba

No. of Crew: 2

Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	9,364.9		13 : 18			It was parked awaiting loading
Loading-1	in	9,378.5	13,600	13 : 45	27		from 13:40-13:45
	out			13 : 49		4	To the dumping site if followed through Tom mboya st.-Muranga rd.-Thika rd.-Outer ring rd.
							As we were returning for the next trip. It followed the same route to the loading point.
Dumping site	in	9,392.9	14,400	14 : 17	28		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	9,393.4	500	14 : 22	5		
Reach to workshop	in			:			
Total			28,500		60	4	Total min.: 64min.
Collection			0		0	4	
Transportation			28,000		50	0	
Inside the dumping site			500		5	0	Dumping time
Idling time					5		

**Time & Motion Study**

Organization: N.C.C

Trip- 5

Date: 22 nd May 1997

Vehicle KAB 389Q

Loading Capacity: 4.55 TOM

Researcher's name: J. Masaba

No. of Crew: 2

Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9,393.4		14 : 22			To the dumping site Nduberi rd.-
Loading-I	in	9,406.7	13,300	14 : 47	25		River rd.-Tom nboya rd.-
	out			14 : 52		5	Muranga rd.-Thika rd.-Outer ring rd.-to Komorock rd.
				:		0	After which we went to the garage to be fixed with the radio at 3:50-4
Dumping site	in	9,421.3	14,600	15 : 22	30		
Start dumping				15 : 24	2		
Finish dumping				:			
Dumping site	out	9,421.8	500	15 : 28	4		
Reach to workshop	in			15 : 50	22		
Total			28,400		83	5	Total min.:88 min.
Collection			0		0	5	
Transportation			27,900		77	0	
Inside the dumping site			500		6	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 22nd May 1997

Vehicle No. KAB 390Q

Loading Capacity: 3 TON

Researcher's name: C. Dzuya

No. of Crew: 1

Estimated Volume: 2m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8,764		9 : 23			To the Garage(NCC) through
Loading-1	in	8,774	10,000	10 : 25	62		Lusaka-Enterprise-Dares-salaam
	out		0	10 : 36		11	to Garage road through Ladhies-
							Seshi-Ronald-Moi Ave.-City hall
							way-Mama Ngina st. to Tom
							Mboya st. ie central area car
							park
Dumping site	in	8,786	12,000	10 : 57	21		
Start dumping		8,788	2,000	11 : 2	5		Back to the same loading
Finish dumping				11 : 3		1	point through Komorock
Dumping site	out	8,789	1,000	11 : 7	4		Outering rd. - Thika rd.-Kiambu rd.-
Reach to workshop	in			:			Muranga rd. to Tom mboya
Total			25,000		92	12	Total min.: 104min.
Collection			0		0	11	
Transportation			22,000		83	0	
Inside the dumping site			3,000		9	1	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 22nd May 1997

Vehicle No. KAB 390Q

Loading Capacity: 3 TON

Researcher's name: C. Dzuya

No. of Crew: 1

Estimated Volume: 2m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8,789		11 : 7			Central area through Komarock-
Loading-1	in	8,802	13,000	11 : 45	38		Outer ring rd.-Thika rd.-Kiambu rd
	out			12 : 24		39	Muranga rd. to Tom Mboya
Loading-2	in	8,803	1,000	12 : 35	11		st. to 2nd loading point through
	out			12 : 39			Tom Mboya st.-Latema rd.-
							Ndumberi rd. and out through River
							rd.-Tom mboya st.-Muranga rd.-
							Kiambu rd.-Thika rd.-Outer ring rd
							to Komarock rd. ie City center
Dumping site	in	8,816	13,000	13 : 5	30		Back for the 3rd trip through
Start dumping		8,817	1,000	13 : 9	4		Komarock-Outer ring rd.-Thika rd.-
Finish dumping				13 : 10		1	Kiambu rd.-Muranga rd.-Tom mboya
Dumping site	out	8,819	2,000	13 : 14	4		st.-River rd. to Ndumberi rd.
Reach to workshop	in			:			
Total			30,000		87	40	Total min.: 127min.
Collection			1,000		11	39	
Transportation			26,000		68	0	
Inside the dumping site			3,000		8	1	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 3 Date: 22nd May 1997

Vehicle No. KAB 390Q

Loading Capacity: 3 TON

Researcher's name: C. Dzuya

No. of Crew: 1

Estimated Volume: 2m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8,819		13 : 14			
Loading-1	in	8,832	13,000	13 : 50	36		To the City Center through
	out			13 : 57		7	Komarock road-Outer ring road
				:			Thika rd.-Kiambu rd.-Muranga-
				:			Tom Mboya-River rd.-Ndumberi rd.
				:			To the dumping site through
				:			Ndumberi rd-River rd.-Tom
				:			Mboya st.-Muranga rd.-Kiambu
				:			rd.-Thika rd.-Outer ring rd. to
				:			Komarock rd.
Dumping site	in	8,845	13,000	14 : 20	23		Back to Kaloleni via Komarock rd.
Start dumping		8,846	1,000	14 : 28	8		Mutarakwa rd.-Mumias-BuruBuru rd.
Finish dumping				14 : 29		1	Rabai rd.-Jogoo rd.
Dumping site	out	8,848	2,000	14 : 34	5		
Reach to workshop	in	8,859	11,000	15 : 10	36		
Total			40,000		108	8	Total min.: 116min.
Collection			0		0	7	
Transportation			37,000		95	0	
Inside the dumping site			3,000		13	1	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 22nd May 1997

Vehicle No. KAB 392Q

Loading Capacity: 7 TON

Researcher's name: D. A. Masaba

No. of Crew: 2

Estimated Volume: 7.8m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7,682		8 : 30			
Loading-1	in	7,690	8,000	9 : 0	30		Lagos road-Moi Lane
	out			9 : 5		5	Muranga road-Thika road
							Outering road-Komarock road to Dumping site Dandora
Dumping site	in	7,704	14,000	9 : 35	30		
Start dumping							
Finish dumping						0	
Dumping site	out	7,707	3,000	9 : 40	5		
Reach to workshop	in						
Total			25,000		65	5	Total min.: 70 min.
Collection			0		0	5	
Transportation			22,000		60		
Inside the dumping site			3,000		5	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 22nd May 1997

Vehicle No. KAB 392Q

Loading Capacity: 7 TON

Researcher's name: D. A. Masaba

No. of Crew: 2

Estimated Volume: 7.8m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7,707		9 : 40			Dumping site
Loading-1	in	7,718	11,000	11 : 0	80		Moi Lane-Tom Mboya
	out			11 : 27		27	Muranga road -Thika road outering road-Komarock to Dandora
Dumping site	in	7,732	14,000	11 : 54	27		
Start dumping							Same route used for back trip
Finish dumping						0	
Dumping site	out	7,735	3,000	12 : 1	7		
Reach to workshop	in						
Total			28,000		114	27	Total min.: 141 min.
Collection			0		0	27	
Transportation			25,000		107		
Inside the dumping site			3,000		7	0	Dumping time
Idling time							



**Time & Motion Study**

Organization: N.C.C

Trip- 3 Date: 22nd May 1997

Vehicle No. KAB 392Q

Loading Capacity: 7 TON

Researcher's name: D. A. Masaba

No. of Crew: 2

Estimated Volume: 7.8m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7,735		12 : 1			Dumping site
Loading-1	in	7,748	13,000	12 : 30	29		Ngenda lane -River road-
	out			13 : 10		40	Tom Mboya street
						0	To Dumping site via
Dumping site	in	7,761	13,000	13 : 38	28		Muranga road- Thika road
Start dumping							Outering road-Komarock road
Finish dumping						0	
Dumping site	out	7,764	3000	13 : 46	8		
Reach to workshop	in						
Total			29,000		65	40	Total min.:105 min
Collection			0		0	40	
Transportation			26,000		57		
Inside the dumping site			3,000		8	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 4 Date: 22nd May 1997

Vehicle No. KAB 392Q

Loading Capacity: 7 TON

Researcher's name: D. A. Masaba

No. of Crew: 2

Estimated Volume: 7.8m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7,764		13 : 46			Dumping site
Loading-1	in	7,777	13,000	14 : 10	24		Ngana Lane to Tom Mboya street
	out			14 : 19		9	
							To dumping site Via muranga road Thika road-Outer ring road
							Komarock road
Dumping site	in	7,790	13,000	14 : 42	23		
Start dumping							
Finish dumping							
Dumping site	out	7,793	3,000	14 : 50		8	
Reach to workshop	in						
Total			29,000		55	9	Total min.: 64 min.
Collection			0		0	9	
Transportation			26,000		47		
Inside the dumping site			3,000		8	0	Dumping time
Idling time						0	

**Time & Motion Study**

Organization: N.C.C

Trip- 5 Date: 22nd May 1997

Vehicle No. KAB 392Q

Loading Capacity: 7 TON

Researcher's name: D. A. Masaba

No. of Crew: 2

Estimated Volume: 4.5m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7,793		14 : 50			Dumping site
Loading-1	in	7,806	13,000	15 : 12	22		Ngenda Lane-River road
	out			15 : 31		19	to Tom Mboya
							To Dumping through
							Muranga road-Thika road
							Outering road-Komarock
Dumping site	in	7,819	13,000	15 : 51	20		
Start dumping							
Finish dumping						0	
Dumping site	out	7,822	3,000	15 : 53	2		
Reach to workshop	in	7,833	11,000	16 : 22	29		
Total			40,000		73	19	Total min.: 92 min.
Collection			0		0	19	
Transportation			37,000		71	0	
Inside the Dump Site			3,000		2	0	
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 22nd May 1997

Vehicle No. KUL 990

Loading Capacity: 7.9 TON

Researcher's name: G. Chege

No. of Crew: 6

Estimated Volume: 7.5m<sup>3</sup>

Location		Milceage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	202,294		8 : 5			Vehicle had leftover refuse
Loading-1	in			:			Checked in for Loaders at Muerot
	out			:			-Ngara-Mathare
							Umoja II depots.
							Jogoo rd.-Landhies rd.-Haile
							selassie ave.-Moi ave.-round
							about Muranga rd.-Ngara rd.-
							Juja rd.-outer ring rd.-Komarock
							rd.-Unioja II depot
							Via Kangundo rd.-Outer ring
							rd.-Komarock rd.
Dumping site	in	202,322	28,000	10 : 3	118		Dandora
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	202,324	2,000	11 : 7	64		
Reach to workshop	in			:			
Total			30,000		182	0	Total min.:182min.
Collection			0		25	0	
Transportation			28,000		93	0	
Inside the dumping site			2,000		64	0	Dumping time
Idling time					25		

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 22nd May 1997

Vehicle No. KUL 990

Loading Capacity: 7.9 TON

Researcher's name: G.Chege

No. of Crew: 6

Estimated Volume: 13.5m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	202,324		11 : 7			Komarock rd.-Mutarakwa rd.-
Loading-1	in	202,338		11 : 37	30		Outer ring rd.-Old airport rd.-
	out			13 : 20		103	Airport police line (collected garbage from robbish dump)
							Old airport-outer ring rd.-
							Komarock (rd.)
Dumping site	in	202,352	28,000	13 : 52	32		Dandora
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	202,355	3,000	14 : 52	60		
Reach to workshop	in	202,373	18,000	15 : 45	53		Dropped tools at unoja II depot
							signed out at Dandora office- Workshop
Total			49,000		175	103	Total min.: 278min.
Collection			0		5	103	
Transportation			46,000		110	0	
Inside the dumping site			3,000		60	0	Dumping time
Idling time					5		

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 22nd May 1997

Vehicle No. KUL 991

Loading Capacity: 7 TON

Researcher's name: J. Orago

No. of Crew: 8

Estimated Volume: 5 m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	155,612		8 : 20			Kaloleni
Loading-1	in	155,616	4,000	8 : 43	23		Lagos road
	out			8 : 58		15	
Loading-2	in	155,622	6,200	9 : 19	21		Pumwani Hospital
	out			9 : 25		6	
Loading-3	in	155,627	5,500	9 : 53	28		Harambee House
	out			10 : 51		58	
Loading-4	in	155,628	900	11 : 22	31		Jogoo House
	out			11 : 30		8	
Loading-5	in	155,632	3,300	11 : 56	26		American Embassy
	out			12 : 32		36	
Loading-6	in	155,640	8,800	13 : 22	50		Gikomba area
	out			14 : 30		68	
							To Dumping site through
							Jogoo road-Hallesefasie road
							Moi avenue-Tom Mboya street
							Lagos road-Muranga
							Ngara road-Ring road-Thika
							road-Outering - Komarock road
Dumping site	in	155,652	12,000	15 : 17	47		
Start dumping							
Finish dumping						0	
Dumping site	out	155,653	700	16 : 5	48		
Reach to workshop	in	155,665	12,400	16 : 30	25		
<b>Total</b>			<b>53,800</b>		<b>299</b>	<b>191</b>	<b>Total min.: 490 min.</b>
Collection			24,700		156	191	
Transportation			28,400		95		
Inside the dumping site			700		48	0	Dumping time
Idling time							

# Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 22nd May 1997

Vehicle No. KUL 992

Loading Capacity: 7 TON

Researcher's name: E. M. Kariuki

No. of Crew: 10

Estimated Volume: 4tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	220,050		8 : 0			Kaloleni Depot
Loading-1	in	220,052	2,000	8 : 27	27		Route to loading site's-Jogoo
	out			9 : 0		33	rd.-Sakwa rd.-Pumwani depot
Loading-2	in	220,053	1,000	9 : 4	4		We were at Pumwani depot
	out			9 : 10		6	at 8:04 220051 till 8:21.
Loading-3	in	220,054	1,000	9 : 15	5		Our first loading point was
	out			10 : 52		97	Pumwani maternity hospital
Loading-4	in	220,055	700	11 : 30	38		form the depot.
	out			11 : 32		2	We followed Muinani st.
Loading-5	in	220,055	300	12 : 3	31		The other loading points were
	out			:			along general waruingi st.
							Our route to dumping site was
							general waruingi st.-Race course
							rd.-ring rd. ngara-Muranga rd.-
							Thika rd.-Outer ring rd.-
							Komorok rd.-Dandora
							Our route from Dandora was
							Komorock-Juja rd.-Second
							ave.-Eastleigh-General
							waruingi st.-Muinani st.-Lamu
							rd.-moyale rd.-Bondo st. and
							finaly to deport Kaloleni.
							Note-The truck had tipping
							problems thus more time
							wasted in the dumping site.
							We had to stop the job earlier
							because the truck developed
							a technical problem.
Dumping site	in	220,068	13,000	12 : 30	27		
Start dumping		220,069	1,000	12 : 37	7		
Finish dumping		220,069	0	13 : 30		53	
Dumping site	out	220,071	2,000	13 : 37	7		
Reach to workshop	in	220,082	11,000	14 : 16	39		
Total			32,000		185	191	Total min.:376min.
Collection			3,000		95	138	
Transportation			26,000		76	0	
Inside the dumping site			3,000		14	53	Dumping time
Idling time					17		

# Time & Motion Study

Vehicle No. KUL 993

No. of Crew: 4

Organization: N.C.C

Loading Capacity: 7.83

Estimated Volume: 7

Trip- 1 Date: 22 nd May 1997

Researcher's name: B. Chizi

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	178,055.0		7 : 36			From workshop to Ngara depot
Loading-1	in	178,060.0	5,000	8 : 24	48		for work allocation at 7:55
	out			8 : 29		5	Routes: Jogoo rd.-Landhies
Loading-2	in	178,061.0	1,000	8 : 30	1		rd.-Kambo munyiri and to Ngara
	out			8 : 32		2	rd.-depot
Loading-3	in	178,062.0	1,000	8 : 36	4		L-1 Through Kolobot rd.-Forest
	out			8 : 50		14	rd. to Forest lodge
Loading-4	in	178,063.0	1,000	8 : 53	3		L-3 Forest rd. to Taarifa rd.-1st
	out			8 : 57		4	ave.-Parklands(Parkwest apart
Loading-5	in	178,064.0	1,000	9 : 2	5		ments)
	out			9 : 5		3	L-4 Parklands-ring rd.-Mwangi
Loading-6	in	178,065.0	1,000	9 : 6	1		rd.-Gen mathenge drive
	out			9 : 13		7	L-5 Masnaka rd. off Ndovu
Loading-7	in	178,065.0		9 : 15	2		ahmed lane to 2nd ave.-Parkland
	out			9 : 24		9	rd.
Loading-8	in	178,066.0	1,000	9 : 26	2		L-7 Masari rd.-2nd. ave.
	out			9 : 43		17	parklands
Loading-9	in	178,066.0		9 : 44	1		L10 Ring rd. parklands-Parklands
	out			9 : 48		4	rd.-Karuna rd.(Bids Apartments)
Loading-10	in	178,069.0	3,000	10 : 0	12		Lower Kabete rd. to Brookside
	out			10 : 25		25	drive
Loading-11	in	178,071.0	2,000	10 : 29	4		Brookside garden off Brookside
	out			10 : 30		1	drive
Loading-12	in	178,071.0		10 : 34	4		Brookside drive(United bible
	out			10 : 43		9	society)-Moorant Estate.
Loading-13	in	178,071.0		10 : 45	2		Brookside drive-muguga green
	out			10 : 50		5	est on Brookside grove.
Loading-14	in	178,072.0	1,000	10 : 53	3		
	out			11 : 13		20	Through Waiyaki way-Chiromo
Loading-15	in	178,073.0	1,000	11 : 15	2		rd.-Museum hill-Forest rd.-
	out			11 : 20		5	Muranga rd.-Thika rd. and Outer
Loading-16	in			:			ring rd. to Trip2
	out			:		0	
Dumping site	in	178,090.0	17,000	12 : 4	44		
Start dumping				12 : 8	4		
Finish dumping				12 : 10		2	
Dumping site	out	178,090.5	500	12 : 15	5		
Reach to workshop	in			:			
Total			35,500		147	132	Total min.:279min.
Collection			13,000		46	130	
Transportation			22,000		92	0	
Inside the dumping site			500		9	2	Dumping time
Idling time							



**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 22 nd May 1997

Vehicle No. KUL 993

Loading Capacity: 7.83

Researcher's name: B. Chizi

No. of Crew: 4

Estimated Volume: 7

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			12 : 15			Form dumping site back to
Loading-1	in	178,107.0	16,500	12 : 55	40		westlands. Through parklands rd.-
	out			13 : 2		7	Karuna rd. to Karna close.
Loading-2	in	178,108.0	1,000	13 : 4	2		L-3 at Matundu Lane staff
	out			13 : 8		4	quarters (K.P & T.C)
Loading-3	in	178,108.0		13 : 13	5		L-4 Brookside grove off Wayaki
	out			13 : 38		25	way
Loading-4	in	178,109.0	1,000	13 : 40	2		L-5 Brookside grove off Wayaki
	out			13 : 45		5	way
Loading-5	in	178,109.0		13 : 49	4		
	out			13 : 50		1	To Casino hotel from Brookside
Loading-6	in	178,110.0	1,000	13 : 50	0		to wayaki way-Chiromo rd.-
	out			13 : 58		8	Museu hill and Westlands rd.
Loading-7	in	178,113.0	3,000	14 : 5	7		
	out			14 : 53		48	To dumping site through Museum
							hill-Ngara rd. Miranga rd.-
							Thika rd.-Outer ring rd.-
							Komorok rd. to Dandora
Dumping site	in	178,127.0	14,000	15 : 54	61		
Start dumping				15 : 58	4		To Workshop through Outer ring
Finish dumping				16 : 0		2	rd. -Jogoo rd.
Dumping site	out	178,127.5	500	16 : 7	7		
Reach to workshop	in	178,131.0	3,500	:			
Total			40,500		132	100	Total min.: 232min.
Collection			6,000		20	98	
Transportation			34,000		101	0	
Inside the dumping site			500		11	2	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 22nd May 1997

Vehicle KUI, 995

Loading Capacity: 7.98

Researcher's name: A. Ami Nassir

No. of Crew: 8

Estimated Volume: 24m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	89,904		8 : 43			From Workshop.
Loading-1	in	89,911	6,700	12 : 15	212		Breakdown Occurred in Enterprise
	out		0	13 : 45		90	rd after leaving Kaloleni Workshop
Loading-2	in	89,913	1,500	13 : 55	10		via Jogoo rd.-Lusaka rd. Near
	out		0	14 : 18		23	Bamburi rd. from 8:50-
Loading-3	in	89,913	300	14 : 22	4		Short repair took Place at 9:23.
	out		0	14 : 28		6	Then taken to garage via Dar es
							salaam rd. and garage rd. Reached
							garage at 9:26, left at 12:08
							From garage to Khalid motors
							along Bunyala rd. via Dar es
							salaam rd.
							From Khalid motors along
							Bunyala rd. to MBC via Uhuru
							highway-Lusaka rd. and Baricho rd.
							From Baricho rd. to Dandora/
							Mukuru via Lusaka rd.-Landhies
							rd.-Jogoo rd.-Rabai rd.-Mumiasu
							rd.-Mutarakwa rd.-Komorock rd.
							From Dandora to Workshop
							through Komarock rd.-Mutarakwa
							rd.-Mumias rd.-Rabai rd.-Jogoo
							rd. to Workshop/Kaloleni Kodhek
							rd.-Valley rd.-Ngong rd.-Ragati rd.-
							Ngong rd.
							Back to Ngong rd. then to Ngong
							rd.-Depart from 13:07-13:15
							Then Ngong rd.-Elgeyo rd.-Kodhek
							rd.-Galana rd.-Nyangumi ave.-
							Denis pritt rd.-State house rd.-
							University way-Moi ave.-Tom
							mboya st.-Limuru rd.-Forest rd.-
Dumping site	in	89,928	15,600	14 : 57	29		Thika rd.-outer ring rd.-
Start dumping		89,929	1,000	15 : 1	4		Komorock rd.-Dandora
Finish dumping		89,929	0	15 : 39		38	
Dumping site	out	89,930	1,000	15 : 43	4		
Reach to workshop	in	89,943	12,300	16 : 29	46		Backto Workshop through
							Komorock rd.-Outer ring rd.
Total			38,400		309	157	Total min.:466min.
Collection			1,800		14	119	
Transportation			34,600		84	0	
Inside the dumping site			2,000		8	38	Dumping time
Idling time					203		

**Time & Motion Study**

Organization: N.C.C

Trip- 1

Date: 22nd May 1997

Vehicle No. KWE 071

Loading Capacity: 7.890 TON

Researcher's name: A.Gaititi

No. of Crew: 1

Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	203,694.6		8 : 8			workshop to NCC City park
Loading-1	in	203,718.4	23,800	9 : 48	100		Depot Uhuru park
	out			10 : 10		22	
							To Dumping site at City park
Dumping site	in			10 : 21	33		
Start dumping		203,722.6	4,200	10 : 36	15		
Finish dumping		203,723.0	400	10 : 49		13	
Dumping site	out	203,723.3	300	10 : 54	5		
Reach to workshop	in	203,765.0	41,700	15 : 45	291		
Total			70,400		444	35	Total min.: 479 min.
Collection			0		0	22	
Transportation			65,500		424		
Inside the dumping site			4,900		20	13	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 22nd May 1997

Vehicle No. KWE 073

Loading Capacity: 7 TON

Researcher's name: G. N. Kamau

No. of Crew: 8

Estimated Volume: 6.75m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	153,862		8 : 22			
Loading-1	in	153,875	12,800	10 : 20	118		Dagoreti Depot (Ngong road)
	out			11 : 4		44	
							From Kaloleni dep. to garage for oiling via Lusaka rd.-Enterprise rd.-Dar es salaam rd.-garage rd.
							We reached at 8:31 left at 9:32 for Dagoretti dep via Murenia rd.-Lusaka rd.-Uhuru highway-Bunyala rd.-Haile Selassie ave.-Ngong rd.-reached at 10:05
							To Dandora and back for Trip2 we took the same route ie Ngong rd.-Uhuru highway-Museum hill rd.-Forest rd.-Muranga rd.-Thika rd.-Outer ring rd.
							NB* The Mileage broke after Loading 1 the rest was just estimation even for Trip-2
Dumping site	in	153,910	35,000	11 : 54	50		Dandora
Start dumping				11 : 57	3		
Finish dumping				12 : 0		3	
Dumping site	out	153,910	500	12 : 3	3		
Reach to workshop	in			:			
<b>Total</b>			<b>48,300</b>		<b>174</b>	<b>47</b>	<b>Total min.: 221 min.</b>
Collection			0		0	44	
Transportation			47,800		107		
Inside the dumping site			500		6	3	Dumping time
Idling time					61		

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 22nd May 1997

Vehicle No. KWE 073

Loading Capacity: 7 TON

Researcher's name: G. N. Kamau

No. of Crew: 8

Estimated Volume: 6.75m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out			12 : 3			Dumping site
Loading-1	in			12 : 38	35		Ngong road
	out			12 : 45		7	
Loading-2	in		200	12 : 55	10		Ngong road
	out			12 : 57		2	
Loading-3	in		50	12 : 59	2		Ngong road
	out			13 : 3		4	
Loading-4	in		20	13 : 4	1		Ngong road
	out			13 : 7		3	
Loading-5	in		2,000	13 : 16	9		Elgeyo marakwet road
	out			13 : 18		2	
Loading-6	in		100	13 : 22	4		Elgeyo marakwet road close
	out			13 : 25		3	
Loading-7	in		1,000	13 : 29	4		Kibera station rd.
	out			13 : 31		2	(Jamuhuri Estate)
Loading-8	in		30	13 : 34	3		Kibera station rd.
	out			13 : 36		2	(Jamuhuri Estate)
Loading-9	in		60	13 : 42	6		Kibera station rd.
	out			13 : 44		2	(Jamuhuri Estate)
Loading-10	in		300	13 : 48	4		Kibera station rd.
	out			13 : 52		4	(Jamuhuri Estate)
Loading-11	in		200	13 : 55	3		Kibera station rd.
	out			13 : 57		2	(Jamuhuri Estate)
Loading-12	in		2,000	14 : 0	3		Ngong road(K.S.T.C.)
	out			14 : 2		2	
Loading-13	in		200	14 : 3	1		Ngong road(K.S.T.C.)
	out			14 : 8		5	
Loading-14	in		30	14 : 11	3		Ngong road(K.S.T.C.)
	out			14 : 13		2	
							went back to Dagoreti dep for clearance
Dumping site	in		41,190	15 : 3	50		Dandora
Start dumping				15 : 7	4		
Finish dumping				15 : 10		3	
Dumping site	out		500	15 : 20	10		
Reach to workshop	in		9,500	16 : 0	40		
Total			57,380		192	45	Total min.:237min.
Collection			6,190		53	42	
Transportation			50,690		125	0	
Inside the dumping site			500		14	3	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 22nd May 1997

Vehicle No. KWE 081

Loading Capacity: 8.0 TON

Researcher's name: S. Kimotho

No. of Crew: 1

Estimated Volume: 4.2 m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	186,373		7 : 48			Kaloleni workshop-Jogoo rd.-
Loading-1	in	186,383	10,000	10 : 6	138		Lusaka rd.-Langata rd breakdown
	out	186,383	0	11 : 15		69	from 8:00 to 9:00 am from
							Langata back Lusaka rd.-Jogoo
							rd.-to Kaloleni workshop
							From workshop-Jogoo rd.-Lusaka
							rd.-Enterprise rd. Garage rd. to
							NCC garage idling from 9:30am
							to 9:45
							Garage-Garage rd.-Chuka rd.-
							Butere rd.-Loading point one.
							Butere rd.-Wajir rd.-Chogoria rd.-
							Dunga rd.-Lusaka rd.-Jogoo rd.-
							Rabai rd.-Buru buru rd.-
							Kariobangi south-Dandora
							dumping site.
							Dandora-Kariobangi south-Buru
							buru rd.-Uhuru highway-Rabai
							rd.-Jogoo rd.-Lusaka rd.-Dunga
							rd. to Wajir rd.-Loading point
							One
							The vehicle have seven loaders
Dumping site	in	186,397	14,000	11 : 50	35		
Start dumping				11 : 55	5		
Finish dumping				12 : 3		8	
Dumping site	out	186,401	4,000	12 : 10	7		
Reach to workshop	in			:			
Total			28,000		185	77	Total min.: 262min.
Collection			0		0	69	
Transportation			24,000		98	0	
Inside the dumping site			4,000		12	8	Dumping time
Idling time					75		

**Time & Motion Study**

Organization:N.C.C

Trip- 2 Date:22nd May 1997

Vehicle No.KWE 081

Loading Capacity:8.0 TON

Researcher's name:S. Kimotho

No. of Crew: 1

Estimated Volume:4.2 m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	186,401		12 : 10			Loading point 2 was the same
Loading-1	in	186,414	13,000	13 : 0	50		place at wair rd. on Butere rd.
	out	186,414	0	13 : 35		35	from there Dunga rd.-Lusaka rd.-
				:			Jogoo rd.-Rabai rd.-Uhuru
				:			highway
				:			BuruBuru rd.-Kariobangi south
				:			Dandora dumping site
				:			
				:			Trip 3 the vehicle went way back
				:			to the same Loading point.
Dumping site	in	186,427	13,000	14 : 5	30		
Start dumping				14 : 10	5		
Finish dumping				:			
Dumping site	out	186,430	3,000	14 : 15	5		
Reach to workshop	in			:			
				:			
Total			29,000		90	35	Total min.:125min.
Collection			0		0	35	
Transportation			26,000		80	0	
Inside the dumping site			3,000		10	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 3 Date: 22nd May 1997

Vehicle No. KWE 081

Loading Capacity: 8.0 TON

Researcher's name: S. Kimotho

No. of Crew: 1

Estimated Volume: 4.2 m<sup>3</sup>

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site out	186,430		14 : 15			Loading point wair rd.-Butere
Loading-1 in	186,444	14,000	15 : 0	45		rd.-Dunga rd.-Lusaka rd.-Jogoo
out	186,444	0	15 : 30		30	rd.-Rabai rd.-Uhuru highway-
						Buruburu rd.-Kariobangi south-
						Dandora dumping site
						Damping site-Kariobangi south-
						Buruburu rd.-Rabai rd.-Jogoo rd.
						to Kaloleni workshop
Dumping site in	186,458	14,000	16 : 28	58		
Start dumping			16 : 30	2		
Finish dumping			:			
Dumping site out	186,460	2,000	16 : 35	5		
Reach to workshop in	186,472	12,000	17 : 3	28		
Total		42,000		138	30	Total min.: 168min.
Collection		0		0	30	
Transportation		40,000		131	0	
Inside the dumping site		2,000		7	0	Dumping time
Idling time						



**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 22nd May 1997

Vehicle No. KWE 084

Loading Capacity: 9.5 TON

Researcher's name: H. Githua

No. of Crew: 10

Estimated Volume: 4m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	99,755.3		9 : 25			Kaloleni-Dagoreti Deport
Loading-1	in	99,776.7	21,400	10 : 26	61		Ingo Flats off Ralph
	out			10 : 31		5	Bunche road
Loading-2	in	99,776.8	100	10 : 34	3		Hotel salama village
	out			10 : 39		5	through kilimani road
Loading-3	in			10 : 40	1		Dolphin Flats(Court)
	out			10 : 48		8	off Kilimani road
Loading-4	in	99,779.8	3,000	10 : 54	6		Frecnh school(Chania)
	out			11 : 10		16	off chania avenue
Loading-5	in	99,781.2	1,400	11 : 12	2		Ngong hills Hotel
	out			11 : 30		18	along Ngong road
Loading-6	in	99,785.4	4,200	11 : 39	9		Y.M.C.A
	out			12 : 23		44	along state house road
Loading-7	in	99,787.9	2,500	12 : 35	12		
	out			12 : 41		6	
Loading-8	in	99,788.3	400	12 : 45	4		state house crescent
	out			12 : 50		5	along state house Avenue
Loading-9	in	99,788.6	300	12 : 51	1		Idling time: 11:50 to 12:15
	out			13 : 40		49	
Dumping site	in	99,826.3	37,700	15 : 47	127		
Start dumping							
Finish dumping							
Dumping site	out	99,829.8	3,500	16 : 4	17		
Reach to workshop	in	99,844.1	14,300	16 : 52	48		
Total			88,800		291	156	Total min.: 447 min.
Collection			11,900		38	156	
Transportation			73,400		236		
Inside the dumping site			3,500		17	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 22nd May 1997

Vehicle No. KWE 245

Loading Capacity: 7.830 TON

Researcher's name: M. Sitati

No. of Crew: 8

Estimated Volume: 5m

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	161,819.8		8 : 0			Katoleni to Ngara office
Loading-1	in	161,826.0	6,200	8 : 47	47		Parklands through muranga road
	out			9 : 12		25	Limuru road-Parklands road
Loading-2	in	161,830.9	4,900	9 : 15	3		GSU headquarters via parklands
	out			9 : 38		23	Limuru road-Forest road
Loading-3	in	161,830.9	0	9 : 40	2		
	out			9 : 50		10	
Loading-4	in	161,833.0	2,100	9 : 58	8		
	out			10 : 2		4	
Loading-5	in	161,834.3	1,300	10 : 9	7		
	out			10 : 24		15	
Loading-6	in	161,843.0	8,700	10 : 41	17		
	out			11 : 15		34	
Loading-7	in	161,843.9	900	12 : 57	102		
	out			13 : 12		15	
							To Dumping site through
							Outering-Komarock road
Dumping site	in	161,849.9	6,000	13 : 27	15		
Start dumping							
Finish dumping						0	
Dumping site	out	161,853.4	3,500	13 : 43	16		
Reach to workshop	in						
Total			33,600		217	126	Total min.: 343 min.
Collection			17,900		139	126	
Transportation			12,200		62		
Inside the dumping site			3,500		16	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 22nd May 1997

Vehicle No. KWE 245

Loading Capacity: 7.83 TON

Researcher's name: M. Sitafi

No. of Crew: 8

Estimated Volume: 5m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	161,853.4		13 : 43			Dumping site
Loading-1	in	161,859.4	6,000	13 : 58	15		GSU headquarters
	out			15 : 26		88	
Loading-2	in	161,859.9	500	15 : 30	4		GSU headquarters
	out			15 : 38		8	
							To dumping site
							through Outering
							Komarock road
							Dandora-Kaloleni via Komarock
							Outering -BuruBuru road
							Jogoo road workshop
Dumping site	in	161,866.0	6,100		0		
Start dumping					0		
Finish dumping						0	
Dumping site	out	161,866.5	500		0		
Reach to workshop	in	161,879.0	12,500	16 : 30	52		
Total			25,600		71	96	Total min.: 167 min.
Collection			500		4	96	
Transportation			24,600		67		
Inside the dumping site			500		0	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: B.C.C

Trip- 1 Date: 23rd May 1997

Vehicle No. KAB 289Q

Loading Capacity: 14TON

Researcher's name: C.Dzuya

No. of Crew: 7

Estimated Volume: 7m<sup>3</sup>

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop out	38,019		8 : 10			To Dumping site through
						Jogoo road - Rabai
						BuruBuru road-Mumias road
						Komarock and back through
						the same route to Kaloleni
Dumping site in			9 : 19	69		
Start dumping			9 : 22	3		
Finish dumping			9 : 24		2	
Dumping site out			9 : 27	3		
Reach to workshop in			9 : 48	21		
Total		0		96	2	Total min.: 98 min.
Collection		0		0	0	
Transportation		0		90		
Inside the dumping site		0		6	2	Dumping time
Idling time						

**Time & Motion Study**

Organization: B.C.C

Trip- 2 Date: 23rd May 1997

Vehicle No. KAB 289Q

Loading Capacity: 14TON

Researcher's name: C.Dzuya

No. of Crew: 7

Estimated Volume: 7m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			9 : 48			
Loading-1	in			11 : 45	117		BuruBuru phase 5
	out			11 : 49		4	Churo road
Loading-2	in			11 : 50	1		Kono Kono road
	out			12 : 1		11	
Loading-3	in			12 : 1	0		Khanga road
	out			12 : 9		8	
Loading-4	in			12 : 10	1		Mchwa road
	out			12 : 18		8	
Loading-5	in			12 : 19	1		Nziu lane
	out			12 : 29		10	
Loading-6	in			12 : 31	2		Rajeta court through
	out			12 : 37		6	mumias road
Loading-7	in			12 : 39	2		Legorenyo court
	out			12 : 53		14	
Loading-8	in			12 : 53	0		Amasya crescent
	out			13 : 6		13	
Loading-9	in			13 : 7	1		Amasya Grove
	out			13 : 19		12	
Loading-10	in			13 : 19	0		Ukunda and Tinganga
	out			13 : 32		13	court
Loading-11	in			13 : 34	2		Gakindu/Ijara court
	out			13 : 47		13	
Loading-12	in			13 : 48	1		Daka-Buko court
	out			13 : 58		10	
Loading-13	in			14 : 0	2		Ukunda Grove
	out			14 : 5		5	
Loading-14	in			14 : 6	1		Ukunda Grove
	out			14 : 17		11	
Loading-15	in			14 : 17	0		Ukunda Grove
	out			14 : 24		7	
Loading-16	in			14 : 24	0		Ukunda Grove
	out			14 : 41		17	
Dumping site	in			15 : 31	50		
Start dumping							
Finish dumping						0	
Dumping site	out			15 : 34	3		
Reach to workshop	in			16 : 10	36		
Total			0		220	162	Total min.: 382 min.
Collection			0		14	162	
Transportation			0		203		
Inside the dumping site			0		3	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 23rd May 1997

Vehicle No. KAB 389Q

Loading Capacity: 12 TON

Researcher's name: C. Njoroge

No. of Crew: 2

Estimated Volume: 4m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9,439		8 : 33			Kaloleni deport to Garage
Loading-1	in	9,444	5,000	9 : 43	70		Jilore road
	out			9 : 47		4	
							To dumping site through
							Jilore road-Lusaka-Jogoo
							BuruBuru-Rabai-Mumias
							Outering-Mutarakwa
							Komarock to Dandora
Dumping site	in	9,457	13,000	10 : 10	23		Dandora dumping site
Start dumping		9,459	2,000	10 : 17	7		
Finish dumping				10 : 19		2	
Dumping site	out	9,460	1,000	10 : 23	4		
Reach to workshop	in						
Total			21,000		104	6	Total min.: 110 min.
Collection			0		0	4	
Transportation			18,000		93		
Inside the dumping site			3,000		11	2	Dumping time
Idling time							Fuel

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 23rd May 1997

Vehicle No. KAB 389Q

Loading Capacity: 12 TON

Researcher's name: C. Njoroge

No. of Crew: 2

Estimated Volume: 4m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9,460		10 : 23			Dumping site
Loading-1	in	9,475	15,000	10 : 52	29		Jilore road
	out			10 : 55		3	
							To dumping site through
							Likoni-Jogoo-BuruBuru
							rabai- Mumias road-Outerig
							roadMutarakwa road-Komarock
							road to Dandora
Dumping site	in	9,487	12,000	11 : 22	27		
Start dumping		9,488	1,000	11 : 27	5		
Finish dumping				11 : 28			
Dumping site	out	9,490	2,000	11 : 30	2		
Reach to workshop	in						
<b>Total</b>			<b>30,000</b>		<b>63</b>	<b>4</b>	<b>Total min.: 67 min.</b>
<b>Collection</b>			<b>0</b>		<b>0</b>	<b>3</b>	
<b>Transportation</b>			<b>27,000</b>		<b>56</b>		
<b>Inside the dumping site</b>			<b>3,000</b>		<b>7</b>	<b>1</b>	<b>Dumping time</b>
<b>Idling time</b>							

**Time & Motion Study**

Organization: N.C.C

Trip- 3 Date: 23rd May 1997

Vehicle No. KAB 3890

Loading Capacity: 12 TON

Researcher's name: C. Njoroge

No. of Crew: 2

Estimated Volume: 4m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9,490		11 : 30			Dumping site
Loading-1	in	9,503	13,000	12 : 35	65		Enterprise road
	out			12 : 52		17	
							To dumping through
							Likoni-BuruBuru road-Rabai
							mumias road-Outering-
							Mutarakwa Komarock road
Dumping site	in	9,515	12,000	13 : 20	28		
Start dumping		9,516	1,000	13 : 26	6		
Finish dumping				13 : 27		1	
Dumping site	out	9,518	2,000	13 : 31	4		
Reach to workshop	in						
Total			28,000		103	18	Total min.: 121 min.
Collection			0		0	10	
Transportation			25,000		93		
Inside the dumping site			3,000		10	1	Dumping time
Idling time						7	Mechanical Problem



**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 23rd May 1997

Vehicle No. KAB 991

Loading Capacity: 7 TON

Researcher's name: Arafa

No. of Crew: 2

Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	12,183		9 : 0			Jogoo-Lusaka-Enterprise
Loading-1	in	12,188	5,000	9 : 25	25		
	out			9 : 27		2	
							Enterprise-Likoni-Jogoo
							Mutarakwa-Komarock to Dumping
Dumping site	in	12,202	14,000	10 : 0	33		
Start dumping							
Finish dumping						0	
Dumping site	out	12,205	3,000	10 : 11	11		
Reach to workshop	in						
Total			22,000		69	2	Total min: 71min.
Collection			0		0	2	
Transportation			19,000		58		
Inside the dumping site			3,000		11	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 23rd May 1997

Vehicle No. KAB 991

Loading Capacity: 7 TON

Researcher's name: Arafa

No. of Crew: 2

Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	12,205		10 : 11			Komarock-Mutarakwa-Outering
Loading-1	in	12,218	13,000	10 : 45	34		Jogoo-Likoni Enterprise
	out			10 : 50		5	
							To dumping through Jogoo road Outering Mutarakwa Komarock
Dumping site	in	12,232	14,000	11 : 20	30		
Start dumping							
Finish dumping						0	
Dumping site	out	12,235	3,000	11 : 30	10		
Reach to workshop	in						
Total			30,000		74	5	Total min.: 79 min.
Collection			0		0	5	
Transportation			27,000		64		
Inside the dumping site			3,000		10	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 3 Date: 23rd May 1997

Vehicle No. KAB 991

Loading Capacity: 7 TON

Researcher's name: Arafa

No. of Crew: 2

Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	12,235		11 : 30			Dumping site
Loading-1	in	12,248	13,000	12 : 5	35		Likoni Enterprise
	out			12 : 58		53	
							To Dumping site through
							Likoni-Jogoo-Outering-
							Mtarakwa Komarock road
Dumping site	in	12,261	13,000	13 : 20	22		
Start dumping							
Finish dumping						0	
Dumping site	out	12,264	3,000	13 : 37	17		
Reach to workshop	in						
Total			29,000		74	53	Total min.: 127 min.
Collection			0		0	53	
Transportation			26,000		57		
Inside the dumping site			3,000		17	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 4 Date: 23rd May 1997

Vehicle No. KAB 991

Loading Capacity: 7 TON

Researcher's name: Arafa

No. of Crew: 2

Estimated Volume: 6m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	12,264		13 : 37			Dumping site
Loading-1	in	12,277	13,000	14 : 3	26		Komarock-Mutarakwa-Outering
	out			14 : 10		7	Jogoo-Likoni Enterprises
							To dumping through
							Jogoo road-Rabai-Mumias
							road Mutarakwa-Komarock
Dumping site	in	12,289	12,000	14 : 40	30		
Start dumping							
Finish dumping						0	
Dumping site	out	12,293	4,000	14 : 50	10		
Reach to workshop	in	12,304	11,000	15 : 12	22		
Total			40,000		88	7	Total min.: 95 min.
Collection			0		0	7	
Transportation			36,000		78		
Inside the dumping site			4,000		10	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 23rd May 1997

Vehicle No. KUL 990

Loading Capacity: 7.83 TON

Researcher's name: M. Sitati

No. of Crew: 2

Estimated Volume: 5m<sup>3</sup>

Location		Milage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	202,394.0		8 : 10			workshop to Ngara office
Loading-1	in	202,403.8	9,800	9 : 15	65		Casino off Muthithi road
	out			9 : 50		35	
Loading-2	in	202,405.3	1,500	10 : 4	14		
	out			12 : 0		116	
							To Dumoping through parklands
							Forest road-Thika road-Outering road Komarock road
Dumping site	in	202,419.7	14,400	12 : 40	40		
Start dumping							
Finish dumping							
Dumping site	out	202,423.1	3,400	13 : 25	45		
Reach to workshop	in						
<b>Total</b>			<b>29,100</b>		<b>164</b>	<b>151</b>	<b>Total min.: 315 min.</b>
Collection			<b>1,500</b>		<b>14</b>	<b>151</b>	
Transportation			<b>24,200</b>		<b>105</b>		
Inside the dumping site			<b>3,400</b>		<b>45</b>	<b>0</b>	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 2 Date: 23rd May 1997

Vehicle No. KUL 990

Loading Capacity: 7.83 TON

Researcher's name: M. Sitati

No. of Crew: 6

Estimated Volume: 5m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	202,423.1		13 : 25			
Loading-1	in	202,433.2	10,100	13 : 50	25		Worked in Gigiri Estate
	out			13 : 52		2	Unep and westlands through
Loading-2	in	202,435.0	1,800	13 : 58	6		Gigiri-Parklands-General
	out			13 : 59		1	Mathenge road to Casino
Loading-3	in	202,436.0	1,000	14 : 10	11		
	out			14 : 13		3	To Dumping through Chiromo
Loading-4	in	202,442.0	6,000	14 : 20	7		Lane-parklands-Ngara road
	out			14 : 22		2	Muranga road-Thika road
Loading-5	in	202,444.0	2,000	14 : 26	4		Outering road -Komarock
	out			14 : 27		1	
Loading-6	in	202,445.6	1,600	14 : 29	2		Dumping site to Kaloleni via
	out			14 : 32		3	Komarock-outering road-
Loading-7	in	202,446.6	1,000	14 : 36	4		Jogoo road
	out			14 : 39		3	
Loading-8	in	202,448.0	1,400	14 : 43	4		
	out			14 : 44		1	
Dumping site	in	202,474.0	26,000	16 : 5	81		
Start dumping							
Finish dumping						0	
Dumping site	out	202,478.0	4,000	16 : 33	28		
Reach to workshop	in	202,491.1	13,100	17 : 18	45		
<b>Total</b>			<b>68,000</b>		<b>217</b>	<b>16</b>	<b>Total min.: 233 min.</b>
Collection			14,800		38	16	
Transportation			49,200		151		
Inside the dumping site			4,000		28	0	Dumping time
Idling time							

**Time & Motion Study** Organization: N.C.C Trip- 1 Date: 23rd May 1997  
 Vehicle No. KUL 991 Loading Capacity: 7.83 TON Researcher's name: E. Kairu  
 No. of Crew: 6 Estimated Volume: 5m<sup>3</sup>

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			9 : 6			Kaloleni to Ngara deport
Loading-1	in	55,718.0		9 : 34	28		Pumwani Maternity hospital
	out			10 : 4		30	
Loading-2	in	55,720.0	2,000	10 : 9	5		Eastleigh first street
	out			10 : 16		7	
Loading-3	in	55,721.0	1,000	10 : 32	16		Madina Nursing Home
	out			10 : 38		6	
Loading-4	in	55,721.0	0	10 : 43	5		Marie slopes Nursing
	out			11 : 3		20	
Loading-5	in	55,723.0	2,000	11 : 11	8		Radiant health clinic
	out			11 : 14		3	
Loading-6	in			11 : 18	4		Fairmont Hotel
	out			11 : 27		9	
Loading-7	in	55,729.0	6,000	11 : 55	28		Huruma Nursing Home
	out			12 : 4		9	
Loading-8	in	55,740.0	11,000	12 : 19	15		Kahawa
	out			12 : 27		8	
Loading-9	in	55,757.0	17,000	12 : 57	30		Vertinary Clinic on
	out			13 : 7		10	Chiromo road
Loading-10	in	55,764.0	7,000	13 : 18	11		
	out			13 : 25		7	Githanga road
Loading-11	in	55,769.0	5000	13 : 36	11		
	out			13 : 42		6	Nyina Mumbi maternity
Loading-12	in	55,773.0	4000	13 : 51	9		
	out			13 : 55		4	Vertinary clinic Ngong
Loading-13	in	55,776.0	3000	14 : 1	6		road
	out			14 : 4		3	
Loading-14	in	55,780.0	4000	14 : 17	13		Ngong road
	out			14 : 50		33	
Dumping site	in	55,796.0	16,000	15 : 43	53		Dandora
Start dumping							
Finish dumping						0	
Dumping site	out	55,796.5	500	16 : 13	30		
Reach to workshop	in						
Total			78,500		272	155	Total min.: 427 min.
Collection			62,000		161	155	
Transportation			16,000		81		
Inside the dumping site			500		30	0	Dumping time
Idling time							

**Time & Motion Study**

Organization: N.C.C

Trip- 1 Date: 23rd May 1997

Vehicle No. KUL 992

Loading Capacity: 7 TON

Researcher's name: G. N. Kamau

No. of Crew: 11

Estimated Volume: 5.6m<sup>3</sup>

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	220,082	8 : 28			
			8 : 35			From Kaloreni Dep
			9 : 12			went to garage for refueling vi
						Lusaka rd., enterprise rd.,
						Sarecalaam rd., garage rd.
Loading-1	in	220,092	10,000	9 : 25	57	Jirore road
	out			9 : 45	20	
						To Dumping site through
						Enterprise-Likoni-Jogoo
						Outering road-Mutarakwa
Dumping site	in	220,108	16,000	10 : 16	31	
Start dumping				10 : 21	5	
Finish dumping				11 : 15	54	
Dumping site	out	220,109	1,000	11 : 20	5	
Reach to workshop	in	220,121	12,000	11 : 50	30	
Total			39,000		128	74 Total min.: 202 min.
Collection			0		0	20
Transportation			38,000		81	
Inside the dumping site			1,000		10	54 Dumping time
Idling time					37	