APPENDIX

APPENDIX 1 Collection Plan for DSMAS

(1) Collection Plan for DSMAS (A3)

1. Nlhamanculo
2. KaMaxaquene
3. KaMubukuwane
4. KaMavota

(2) ME Collection Plan for DSMAS (A3)

1. Nlhamanculo
2. KaMaxaquene
3. KaMubukuwane
4. KaMavota

APPENDIX 2 Collection Plan for TOR

APPENDIX 2-1 Collection Plan for TOR

(1) List of Containers (A3)

1 Nlhamanculo
2. KaMaxaquene
3. KaMubukuwane
4. KaMavota

(2) Collection route Map (A3)

1. Nlhamanculo
2. KaTembe
3. KaMaxaquene
4. KaMubukuwane
5. KaMavota

(3) Collection Plan (A3)

1. Nlhamanculo
2. KaMaxaquene
3. KaMubukuwane
4. KaMavota

(4) Collection Route Sheet (A4)

1. Nlhamanculo 6m3
1. Nlhamanculo 12m3
2. KaMaxaquene 6m3

3. Kamubukuwane 12m3
3. KaMubuwane 6m3
4. KaMavota 6m3
4. KaMavota 12m3

APPENDIX 2-2 Formats for TOR

1. Container list (A4)
2. Collection Plan (A4)
3. Collection route sheet (A4)
4. Map with the Collection route (A3)

APPENDIX 2-3 Format for the TDR Personnel and Organizational Chart (A4)

APPENDIX 2-4 Format for the TDR Equipment sheet (A3)

APPENDIX 2-5 Format for the TOR Equipment maintenance sheet (A4)

APPENDIX 2-6 Format for TOR Health and Safety schedule sheet (A4)

APPENDIX 2-7 TDR Monthly Report Format (A4)

APPENDIX 3 Transfer Station Calculations

(1) Distance and time to the urban area (A4)
(2) Distance and time to Suburban area (A4)
(3) Distance and time (A4)
(4) Transfer station (A4)
(5) Secondary pickup (A3)
(6) Transfer station (A3)
(7) Result (A3)

APPENDIX 4 List of PSRRs for commercial waste (A4)

APPENDIX 5 List of institution which have contract with CMM (A4)

APPENDIX 6 Waste volume data for each district (A4)

(1) Container collection plan for DSMAS (Nlhamanculo)

Appendix1: Container collection plan for DSMAS

No	Now	New	CONT NAME (Nlhamnkulo)	Longitude	Latitude	2nd Collection Plan S	T	Q	Q	F	S	Total S	T	Q	Q	F	S
1	12	12	Entrada da Base Aerea - Av. 19 de Outubro	32.562085	-25.922761	1	0	0	1	0	0	1	0	0	1	0	0
2	12	12	Campo Base Aerea - Av. 19 de Outubro	32.562580	-25.930900	1	1	0	1	1	0	1	1	0	1	1	0
3	12	12	007-Rua Gago Coutinho	32.573491	-25.930688	1	0	1	0	0	1	0	0	1	0	0	1
4	12	12	Rua Gago Coutinho - Igreja Catolica	32.571065	-25.931221	1	0	1	0	0	1	0	0	1	0	0	1
5	12	12	Igreja Assembleia-Rua Gago Coutinho	32.568471	-25.931993	1	1	0	0	1	0	0	1	0	0	1	0
6	12	12	Escola Unidade 18 -Rua Gago Coutinho	32.566439	-25.932545	1	1	1	0	1	1	0	1	1	0	1	1
7	12	12	Cape-Cape-Campo - Rua 2.282	32.555710	-25.943592	1	0	1	1	0	1	1	0	1	1	0	1
8	12	12	10- Esquadra - Rua de Xipamanine	32.562421	-25.935345	1	0	1	0	0	1	0	0	1	0	0	1
9	12	12	Rua do Zimabwe	32.566486	-25.941054	1	1	0	1	1	0	1	1	0	1	1	0
10	12	12	Sao Joaquim Rua Zambeze	32.568872	-25.943809	1	0	1	1	0	1	1	0	1	1	0	1
10	**120m3**	**120m3**				0	0	0	0	0	0	0	0	0	0	0	0
1	12	6	Mercado Vulcano 1- Rua Gago Coutinho	32.562462	-25.933316	1	1	1	1	1	1	1	2	2	1	2	2
2		6	Mercado Vulcano 2- Rua Gago Coutinho	32.562462	-25.933316	1	1	1	1	1	1	2	2	2	2	2	2
3	12	6	Zixaxa 1- Rua do Zixaxa Nr. 2.302	32.560600	-25.935774	1	1	1	1	1	1	1	1	1	1	1	1
4		6	Zixaxa 2- Rua do Zixaxa Nr. 2.302	32.560600	-25.935774	1	1	1	1	1	1	1	1	1	1	1	1
5	12	6	Naggi 1-Rua Gago Coutinho	32.556682	-25.935110	1	1	1	1	1	1	1	1	0	1	1	0
6		6	Naggi 2-Rua Gago Coutinho	32.556682	-25.935110	1	1	1	1	1	1	1	1	0	1	1	0
7	12	6	Terminal da Junta-1	32.550818	-25.935218	1	1	1	1	1	1	0	1	0	0	1	0
8		6	Terminal da Junta-2	32.550818	-25.935218	1	1	1	1	1	1	0	1	0	0	1	0
9	12	6	Lhanguene-Av. Mozambique-1	32.545892	-25.940547	1	1	1	1	1	1	0	1	1	0	1	1
10		6	Lhanguene-Av. Mozambique-2	32.545892	-25.940547	1	1	1	1	1	1	0	1	1	0	1	1
11	6	6	Mega CASH and CARRY	32.541927	-25.946280	1	1	1	1	1	1	0	0	1	0	0	1
12	12	6	Up-Av. Trabalho-1	32.543945	-25.944700	1	1	1	1	1	1	0	0	1	0	0	1
13		6	Up-Av. Trabalho-2	32.543945	-25.944700	1	1	1	1	1	1	0	0	1	0	0	1
14	12	6	Ufa-1 Rua 2.276	32.552701	-25.948462	1	1	1	1	1	1	0	1	1	0	1	1
15		6	Ufa-2 Rua 2.276	32.552701	-25.948462	1	1	1	1	1	1	0	1	1	0	1	1
16	12	6	Coca-cola-Rua lago Maramba-1	32.550864	-25.950301	1	1	1	1	1	1	0	1	0	0	1	0
17		6	Coca-cola-Rua lago Maramba-2	32.550864	-25.950301	1	1	1	1	1	1	0	1	0	0	1	0
18	12	6	Rotunda 16 de Junho-1 Av. OUA	32.553406	-25.953362	1	1	1	1	1	1	0	1	0	0	1	0
19		6	Rotunda 16 de Junho-2 Av. OUA	32.553406	-25.953362	1	1	1	1	1	1	0	1	0	0	1	0
20	6	6	Saida da ponte Maputo Katembe - Av. 24 de Julho	32.556133	-25.955219	1	1	1	1	1	1	2	1	1	2	1	1
21	6	6	LOUMAR1	32.556625	-25.958017	1	1	1	1	1	1	0	0	1	0	0	1
22	6	6	LOUMAR2	32.558002	-25.959057	1	1	1	1	1	1	0	0	1	0	0	1
23	6	6	STAE - Av. 24 de Julho	32.559685	-25.957378	1	1	1	1	1	1	1	0	0	1	0	0
24	6	6	Igreja Anglicana	32.560860	-25.955959	1	1	1	1	1	1	1	0	0	1	0	0
25	6	6	Mercado Malanga 1	32.558517	-25.953579	1	1	1	1	1	1	1	1	1	1	1	1
26	6	6	Mercado Malanga 2	32.558636	-25.953621	1	1	1	1	1	1	1	1	1	1	1	1
27		6	**Chamanculo A-1 NEW**	32.558160	-25.952179	1	1	1	1	1	1	2	1	1	2	1	1
28		6	**Chamanculo A-2 NEW**	32.558160	-25.952179	1	1	1	1	1	1	1	1	1	1	1	1
29	6	6	Mercado Fajardo 1	32.560551	-25.954491	1	1	1	1	1	1	1	1	1	1	1	1
30	6	6	Mercado Fajardo 2	32.560303	-25.954346	1	1	1	1	1	1	1	1	1	1	1	1
31	12	6	Colombia - Rua Major Teixeira Pinto-1	32.564843	-25.955253	1	1	1	1	1	1	1	1	1	1	1	1
32		6	Colombia - Rua Major Teixeira Pinto-2	32.564843	-25.955253	1	1	1	1	1	1	1	1	1	1	1	1
33	6	6	Campo de Mahafil-Rua Mateteu	32.565144	-25.951962	1	1	1	1	1	1	1	0	0	1	0	0
34	6	6	Retiro-Rua da Fatima	32.564850	-25.949942	1	1	1	1	1	1	0	1	0	0	1	0
35	6	6	Escola Unidade 16-Rua da Fatima	32.561401	-25.949450	1	1	1	1	1	1	0	1	0	0	1	0
36	12	6	Zanza-1 Rua Marcelino dos Santos	32.559326	-25.946500	1	1	1	1	1	1	1	1	0	1	1	0
37		6	Zanza-2 Rua Marcelino dos Santos-2	32.559326	-25.946500	1	1	1	1	1	1	1	1	0	1	1	0
38	6	6	Bazuca - Rua Irmaos Ruby	32.562431	-25.940529	1	1	1	1	1	1	1	1	2	1	1	2
39	12	6	Rua dos Irmaos Ruby/Parque Xipamanine-1	32.563955	-25.944543	1	1	1	1	1	1	1	0	1	1	0	1
40		6	Rua dos Irmaos Ruby/Parque Xipamanine-2	32.563955	-25.944543	1	1	1	1	1	1	1	0	0	1	0	0
41	12	6	Mercado Xipamanine-1 Rua Zixaxa	32.562923	-25.946209	1	1	1	1	1	1	1	1	1	1	1	1
42		6	Mercado Xipamanine-2 Rua Zixaxa	32.563271	-25.946194	1	1	1	1	1	1	1	1	1	1	1	1
43	12	6	Mercado Xipamanine-3 Rua Zixaxa	32.563271	-25.946194	1	1	1	1	1	1	1	1	1	1	1	1
44		6	Mercado Xipamanine-4 Rua Zixaxa	32.563271	-25.946194	1	1	1	1	1	1	1	1	1	1	1	1
45	12	6	Xibamate 1- Av. De Angola	32.570200	-25.948600	1	1	1	1	1	1	0	1	1	0	1	1
46	12	6	Xibamate 2- Av. De Angola	32.570500	-25.948400	1	1	1	1	1	1	1	0	0	1	0	0
47		6	Xibamate 3- Av. De Angola	32.570500	-25.948400	1	1	1	1	1	1	0	1	1	0	1	1
48	12	6	CETA 1-Centro de Saude de Xipamanine - Av. Joaquim Chissano	32.566179	-25.937561	1	1	1	1	1	1	1	1	0	1	1	0
49		6	CETA 2-Centro de Saude de Xipamanine - Av. Joaquim Chissano	32.566179	-25.937561	1	1	1	1	1	1	1	1	0	1	1	0
50		6	**CETA 3-Centro de Saude de Xipamanine - Av. Joaquim Chissano NE**	32.566179	-25.937561	1	1	1	1	1	1	0	1	1	0	1	1
51	12	6	Av. Mocambique- jardim Zoologico 1	32.556915	-25.927295	1	1	1	1	1	1	0	1	0	0	1	0
52	-	6	Av. Mocambique- jardim Zoologico 2	32.556915	-25.927295	1	1	1	1	1	1	0	1	0	0	1	0
52	**300m3**	**312m3**				52	52	52	52	52	52	33	43	34	33	43	34
1	6	6	Ponto-Final (perto do Quartel)	32.524292	-25.988365	1	0	1		1	0	1	0	0	1	0	0
2	6	6	Assucena	32.531355	-25.993878	1		1	0	1	0	0	1	0	0	1	0
3	6	6	Cemiterio-Incassane	32.530023	-26.006760	1	0	1		1		1	0	1	1	0	1
4	6	6	Mercado Chali	32.559395	-26.008022	1	0	1	0	1		0	0	1	0	0	1
5	6	6	Chibantchane	32.568661	-26.013409	1		1		1	0	1	1	0	1	1	0
6	6	6	Firmino	32.564775	-26.032139	1		1		1	0	1	1	0	1	1	0
7	6	6	Espiga D'ouro	32.570944	-26.020809	1	0	1	0	1		0	0	1	0	0	1
8	6	6	Complexo Guimaraes	32.557790	-25.980115	1	0	1		1	0	1	0	0	1	0	0
9	6	6	EPC	32.557865	-25.983403	1	0	1		1	0	1	0	0	1	0	0
10	6	6	Raul	32.557116	-25.993233	1		1	0	1		0	1	1	0	1	1
10	**60m3**	**60m3**				6	0	6	0	6	0	4	3	2	4	3	2
62	**480m3**	**492m3**				58	52	58	52	58	52	37	46	36	37	46	36

No	Primary collection S	T	Q	Q	F	S	1 MEs	S	T	Q	Q	F	S	2 MEs	Mercado	Problem	Business
1	A			A			AEROPORTO B										
2	A	B		A	B		AEROPORTO B										
3			C			C	AEROPORTO A										V(small)
4			C			C	AEROPORTO A										
5		B			B		AEROPORTO A										
6			C			C	AEROPORTO A		B			B		AEROPORTO B			
7	A			A			CHAMANCULO C			C			C	CHAMANCULO B			
8			C			C	AEROPORTO B										
9	A			A			XIPAMANINE		B			B		MUNHUANA			
10	A		C	A		C	MUNHUANA									V(overload)	
10																	
1		B	C		B	C	UNIDADE 7	A	B	C	A	B	C	Mercado Vulcano	V		
2	A	B	C	A	B	C	AEROPORTO B	A	B	C	A	B	C	Mercado Vulcano	V		
3	A	B	C	A	B	C	CHAMANCULO D										
4	A	B	C	A	B	C	CHAMANCULO D										
5	A	B		A	B		UNIDADE 7									V(overload)	V(carpintalia)
6	A	B		A	B		UNIDADE 7										
7		B			B		CHAMANCULO C									V(overload)	V(big)
8		B			B		CHAMANCULO C										
9		B	C		B	C	CHAMANCULO C										V
10		B	C		B	C	CHAMANCULO C										
11			C			C	MALANGA										
12			C			C	MALANGA										V
13			C			C	MALANGA										
14		B	C		B	C	CHAMANCULO B										
15		B	C		B	C	CHAMANCULO B										
16		B			B		MALANGA										V
17		B			B		MALANGA										
18		B			B		MALANGA										V
19		B			B		MALANGA										
20	A			A			MALANGA	A	B	C	A	B	C	Add collection for informal	V(informal)	V(overload)	
21			C			C	MALANGA										
22			C			C	MALANGA										
23	A			A			MALANGA										
24	A			A			MALANGA									V(scater)	
25	A	B	C	A	B	C	Mercado Malanga								V		
26	A	B	C	A	B	C	Mercado Malanga								V		
27	A	B	C	A	B	C	CHAMANCULO A	A			A			MALANGA			
28	A	B	C	A	B	C	CHAMANCULO A										
29	A	B	C	A	B	C	Mercado Fajardo								V		V(Baraca)
30	A	B	C	A	B	C	Mercado Fajardo								V		V(Baraca)
31	A	B	C	A	B	C	CHAMANCULO A										
32	A	B	C	A	B	C	CHAMANCULO A										
33	A			A			MINKADJUINE										
34		B			B		XIPAMANINE										
35		B			B		XIPAMANINE										
36	A	B		A	B		CHAMANCULO B										V
37	A	B		A	B		CHAMANCULO B										
38			C			C	XIPAMANINE	A	B	C	A	B	C	Add collection for informal	V(informal)	V(overload)	
39	A			A			XIPAMANINE			C			C	MINKADJUINE	V(informal)		V
40	A			A			XIPAMANINE										
41	A	B	C	A	B	C	Mercado Xipamanine								V		
42	A	B	C	A	B	C	Mercado Xipamanine								V		
43	A	B	C	A	B	C	Mercado Xipamanine								V		
44	A	B	C	A	B	C	Mercado Xipamanine								V		
45		B	C		B	C	MINKADJUINE										
46	A			A			MUNHUANA										
47		B	C		B	C	MAFALALA										
48	A	B		A	B		AEROPORTO A									V(overload)	
49	A	B		A	B		AEROPORTO B										
50		B	C		B	C	AEROPORTO B										
51		B			B		AEROPORTO B										
52		B			B		AEROPORTO B										
52																	
1	A			A													
2		B			B		INCASSANE										
3	A		C	A		C											
4			C			C											
5	A	B		A	B		CHALI										
6	A	B		A	B												
7			C			C											
8	A			A													
9	A			A			GUACHENI										
10		B	C		B	C											
10																	
62																	

No		Container *1 llegada	0:10	Salida	Hulene *1 llegada	0:10	Salida	Container *2 0:00	km	0:00		Hulene *2 19:00	km	22:00	
1		**19:00**	0:10	19:10	19:31	0:10	19:41					0:21	6.9	0:16	0:16
2		20:02	0:10	20:12	20:33	0:10	20:43					0:21	6.1	0:16	0:16
3		21:01	0:10	21:11	21:29	0:10	21:39					0:18	4.9	0:12	0:12
4		21:53	0:10	22:03	22:17	0:10	22:27					0:19	5.1	0:14	0:19
5		22:41	0:10	22:51	23:05	0:10	23:15					0:19	5.4	0:14	0:19
6		23:29	0:10	23:39	23:53	0:10	0:03					0:19	5.6	0:14	0:19
7		0:23	0:10	0:33	0:53	0:10	1:03					0:26	7.6	0:20	0:20
8		1:19	0:10	1:29	1:45	0:10	1:55					0:22	6.4	0:16	0:16
9		2:14	0:10	2:24	2:43	0:10	2:53					0:26	7.7	0:19	0:19
10		3:12	0:10	3:22	3:41	0:10	**3:51**					0:29	7.2	0:19	0:19
10													**62.9**		**175min**
1	T01-1	**19:00**	0:10	19:10				0:00	0	0:00					
2	T01-2	19:10	0:10	19:20				0:00	0	0:00	0:00				
3	T01-3	19:22	0:10	19:32				0:02	0.45	0:02	0:02				
4	T01-4	19:32	0:10	19:42	20:04	0:10	20:14	0:00	0	0:00	0:00	0:22	6.4	0:16	0:22
5	T02-1	**20:36**	0:10	20:46								0:22	6.6	0:17	0:22
6	T02-2	20:46	0:10	20:56				0:00	0	0:00	0:00				
7	T02-3	20:58	0:10	21:08				0:02	0.6	0:02	0:02				
8	T02-4	21:08	0:10	21:18	21:42	0:10	21:52	0:00	0	0:00	0:00	0:24	7.5	0:20	0:24
9	T03-1	**22:12**	0:10	22:22								0:22	8.1	0:20	0:20
10	T03-2	22:22	0:10	22:32				0:00	0	0:00	0:00				
11	T03-3	22:37	0:10	22:47				0:05	1.5	0:05	0:05				
12	T03-4	22:52	0:10	23:02	23:24	0:10	23:34	0:05	1.1	0:05	0:05	0:29	8.8	0:22	0:22
13	T04-1	**23:54**	0:10	0:04								0:22	8.6	0:20	0:20
14	T04-2	0:08	0:10	0:18				0:04	1.1	0:04	0:04				
15	T04-3	0:18	0:10	0:28				0:00	0	0:00	0:00				
16	T04-4	0:31	0:10	0:41	1:05	0:10	1:15	0:03	0.45	0:03	0:03	0:31	9.8	0:24	0:24
17	T05-1	**1:38**	0:10	1:48								0:26	9.7	0:23	0:23
18	T05-2	1:50	0:10	2:00				0:02	0.45	0:02	0:02				
19	T05-3	2:00	0:10	2:10				0:00	0	0:00	0:00				
20	T05-4	2:11	0:10	2:21	2:44	0:10	2:54	0:01	0.35	0:01	0:01	0:35	9.2	0:23	0:23
21	T06-1	**3:17**	0:10	3:27								0:27	9.8	0:23	0:23
22	T06-2	3:28	0:10	3:38				0:01	0.17	0:01	0:01				
23	T06-3	3:41	0:10	3:51				0:03	0.9	0:03	0:03				
24	T06-4	3:53	0:10	4:03	4:25	0:10	**4:35**	0:02	0.3	0:02	0:02	0:34	8.7	0:22	0:22
25	T07-1	**19:00**	0:10	19:10								0:27	9.6	0:22	
26	T07-2	19:10	0:10	19:20				0:00	0	0:00	0:00				
27	T07-3	19:22	0:10	19:32				0:02	0.23	0:02	0:02				
28	T07-4	19:32	0:10	19:42	20:15	0:10	20:25	0:00	0	0:00	0:00	0:33	9	0:23	0:33
29	T08-1	**20:55**	0:10	21:05								0:30	9.7	0:24	0:30
30	T08-2	21:05	0:10	21:15				0:00	0	0:00	0:00				
31	T08-3	21:20	0:10	21:30				0:05	1	0:04	0:05				
32	T08-4	21:30	0:10	21:40	21:59	0:10	22:09	0:00	0	0:00	0:00	0:30	8	0:19	0:19
33	T09-1	**22:30**	0:10	22:40								0:23	7.8	0:21	0:21
34	T09-2	22:41	0:10	22:51				0:02	0.24	0:01	0:01				
35	T09-3	22:53	0:10	23:03				0:02	0.35	0:02	0:02				
36	T09-4	23:06	0:10	23:16	23:36	0:10	23:46	0:03	0.6	0:03	0:03	0:26	7.7	0:20	0:20
37	T10-1	**0:06**	0:10	0:16								0:24	7.8	0:20	0:20
38	T10-2	0:22	0:10	0:32				0:06	1.6	0:06	0:06				
39	T10-3	0:35	0:10	0:45				0:03	0.45	0:03	0:03				
40	T10-4	0:45	0:10	0:55	1:15	0:10	1:25	0:00	0	0:00	0:00	0:26	7.6	0:20	0:20
41	T11-1	**1:46**	0:10	1:56								0:26	7.9	0:21	0:21
42	T11-2	1:56	0:10	2:06				0:00	0	0:00	0:00				
43	T11-3	2:06	0:10	2:16				0:00	0	0:00	0:00				
44	T11-4	2:16	0:10	2:26	2:48	0:10	2:58	0:00	0	0:00	0:00	0:30	7.8	0:22	0:22
45	T12-1	**3:14**	0:10	3:24								0:20	7.1	0:16	0:16
46	T12-2	3:24	0:10	3:34				0:00	0	0:00	0:00				
47	T12-3	3:34	0:10	3:44				0:00	0	0:00	0:00				
48	T12-4	3:48	0:10	3:58	4:16	0:10	**4:26**	0:04	1.6	0:04	0:04	0:23	6.8	0:18	0:18
49	T13-1	**19:00**	0:10	19:10								0:20	7.3	0:16	
50	T13-2	19:10	0:10	19:20				0:00	0	0:00	0:00				
51	T13-3	19:25	0:10	19:35				0:05	1.8	0:04	0:05				
52	T13-4	19:35	0:10	19:45	20:14	0:10	20:24	0:00	0	0:00	0:00	0:29	7.8	0:20	0:29
52															
1	T14-1	**21:12**	0:10	21:22				0:00	0	0:00		0:48	21.5	0:40	0:48
2	T14-2	21:27	0:10	21:37				0:05	1.5	0:05	0:05				
3	T14-3	21:43	0:10	21:53				0:06	1.5	0:06	0:06				
4	T14-4	22:02	0:10	22:12				0:09	3.3	0:09	0:09				
5	T14-5	22:16	0:10	22:26	23:04	0:10	23:14	0:04	1.2	0:04	0:04	0:45	19.1	0:38	0:38
6	T15-1	**23:54**	0:10	0:04				0:00	0	0:00		0:45	21.7	0:40	0:40
7	T15-2	0:11	0:10	0:21				0:07	1.9	0:07	0:07				
8	T15-3	0:30	0:10	0:40				0:09	4.1	0:09	0:09				
9	T15-4	0:42	0:10	0:52				0:02	0.45	0:02	0:02				
10	T15-5	0:56	0:10	1:06	1:41	0:10	**1:51**	0:04	1.3	0:04	0:04	0:43	18.9	0:35	0:35
10								**0:46**		**0:46**					
62									**30.49**		**107min**		**286.3**		**675min**

*1: This collection time is for reference only. These collection times do not consider break times. In the proposal document, the collection time should be prepared considering the break time.

*2: This time and distance were measured with the Google Maps application. The proposer should present the expected values in the proposal document.

(1) Container collection plan for DSMAS (KaMaxaquene)

Appendix1: Container collection plan for DSMAS

KaMaxaquene						2nd Collection Plan						Total						Primary collection																		Mercado	Problematic container	Bussiness mixed	Container *1			Hulene *1			Container *2			Hulene *2			
Nr.	Now	New	Namo of container point	Longitude	Latitude	S	T	Q	Q	F	S	S	T	Q	Q	F	S	S	T	Q	Q	F	S	1ME	S	T	Q	Q	F	S	2ME	S	T	Q	Q	F	S	3ME				llegada	on	Salida	llegada	off	Salida	19:00	Km	22:00		19:00	Km	22:00	
1	12	6	51.Av. Angola Kia-1	32.57532	-25.93622	1	1	1	1	1	1	0	1	1	0	1	1			C			C	Urbanização		B			B		AEROPORTO B										T1-1	**19:00**	0:10	19:10				0:00	0	0:00							
2		6	51.Av. Angola Kia-2	32.57532	-25.93622	1	1	1	1	1	1	0	1	1	0	1	1			C			C	Urbanização		B			B		AEROPORTO B										T1-2	19:10	0:10	19:20				0:00	0	0:00	0:00						
3	12	6	Av. Angola atras das Bombas Sasol-1	32.57555	-25.94170	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Urbanização																		T1-3	19:22	0:10	19:32				0:02	0.65	0:02	0:02						
4		6	Av. Angola atras das Bombas Sasol-2	32.57555	-25.94170	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Urbanização																		T1-4	19:32	0:10	19:42	20:04	0:10	20:14	0:00	0	0:00	0:00	0:22	6.2	0:16	0:22
5	12	6	Av. Angola/Joaquim Chissano Semaforo-1	32.57270	-25.94474	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Mafalala																		T2-1	**20:32**	0:10	20:42				0:00	0.4	0:02		0:18	6.4	0:14	0:18
6		6	Av. Angola/Joaquim Chissano Semaforo-2	32.57270	-25.94474	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Urbanização																		T2-2	20:42	0:10	20:52				0:00	0	0:00	0:00				
7	12	6	Praca dos Herois - Mercado Mazambanine-1	32.57921	-25.93461	1	1	1	1	1	1	1	1	2	1	1	2			C			C	Urbanização	A	B	C	A	B	C	Mercado Mazambanine							X			T2-3	20:57	0:10	21:07				0:05	2.3	0:05	0:05				
8		6	Praca dos Herois - Mercado Mazambanine-2	32.57921	-25.93461	1	1	1	1	1	1	1	1	2	1	1	2			C			C	Urbanização	A	B	C	A	B	C	Mercado Mazambanine							X			T2-4	21:07	0:10	21:17	21:31	0:10	21:41	0:00	0	0:00	0:00	0:20	5.7	0:14	0:14
9	6	6	Av.Acordos Lusaka - MICOA 1	32.57962	-25.93696	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Maxaquene A																		T3-1	**21:53**	0:10	22:03				0:00	0	0:00		0:16	5.3	0:12	0:12
10	6	6	Av.Acordos Lusaka - Balthazar	32.57917	-25.93924	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Maxaquene A																		T3-2	22:04	0:10	22:14				0:01	0.27	0:01	0:01				
11	6	6	Av.Acordos Lusaka - MICOA 3	32.57921	-25.94045	1	1	1	1	1	1	1	1	0	1	1	0	A	B			A	B	Maxaquene A																		T3-3	22:15	0:10	22:25	22:43	0:10	22:53	0:01	0.11	0:01	0:01	0:23	7	0:18	0:18
12	6	6	Av.Acordos Lusaka - ETRAGO	32.57909	-25.94165	1	1	1	1	1	1	1	1	0	1	1	0	A	B			A	B	Maxaquene A																X (Peneus)		T4-1	**23:06**	0:10	23:16				0:01	0.12	0:01		0:16	5.8	0:13	0:13
13	6	6	Av. Acordos de Lusaka-Estaleiro 1	32.57877	-25.94384	1	1	1	1	1	1	1	1	0	1	1	0	A	B			A	B	Maxaquene A															X			T4-2	23:17	0:10	23:27				0:01	0.18	0:01	0:01				
14	6	6	Av. Acordos de Lusaka-Estaleiro 2	32.57877	-25.94384	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Maxaquene B															X			T4-3	23:27	0:10	23:37	23:51	0:10	0:01	0:01	0.11	0:00	0:00	0:20	6.3	0:14	0:14
15	6	6	Campo 1o de Maio 1	32.58639	-25.93472	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene B															X			T5-1	**0:13**	0:10	0:23				0:08	2.3	0:08		0:14	5.4	0:12	0:12
16	6	6	Campo 1o de Maio 2	32.58517	-25.93653	1	1	1	1	1	1	0	0	2	0	0	2			C			C	Maxaquene A			C			C	Maxaquene D										X			T5-2	0:23	0:10	0:33				0:00	0	0:00	0:00				
17	12	6	Rua atras Do Bamco de Mocambique-1	32.58929	-25.93335	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene D															X	X		T5-3	0:36	0:10	0:46	0:59	0:10	1:09	0:03	0.65	0:03	0:03	0:19	5.4	0:13	0:13
18		6	Rua atras Do Bamco de Mocambique-2	32.58929	-25.93335	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene D															X	X		T6-1	**1:21**	0:10	1:31				0:00	0	0:00		0:14	5.1	0:12	0:12
19	12	6	Atras da Soveste-1	32.59597	-25.93008	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene D														X (Informal)	X (Cheio)	X	T6-2	1:35	0:10	1:45				0:04	1	0:04	0:04				
20		6	Atras da Soveste-2	32.59597	-25.93008	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene D														X (Informal)	X (Cheio)	X	T6-3	1:45	0:10	1:55	2:07	0:10	2:17	0:00	0	0:00	0:00	0:17	4.9	0:12	0:12
21	12	6	Escola primaria de Maguiguana 1	32.59595	-25.93615	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Maxaquene C																		T7-1	**2:30**	0:10	2:40				0:00	0	0:00		0:16	4.7	0:13	0:13
22		6	Escola primaria de Maguiguana 2	32.59595	-25.93615	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene D																		T7-2	2:40	0:10	2:50				0:00	0	0:00	0:00				
23	12	6	50.Mercado Carrimbo-1	32.58835	-25.94591	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Maxaquene B	A	B	C	A	B	C	Mercado Carrimbo							X	X		T7-3	2:55	0:10	3:05	3:20	0:10	**3:30**	0:05	1.5	0:05	0:05	0:20	5.8	0:15	0:15
24		6	50.Mercado Carrimbo-2	32.58835	-25.94591	1	1	1	1	1	1	1	2	2	1	2	2		B	C		B	C	Maxaquene C	A	B	C	A	B	C	Mercado Carrimbo							X	X		T8-1	**19:00**	0:10	19:10				0:00	0	0:00		0:19	5.9	0:16	
25	12	6	Rua da Resistencia/Joaquim Chissano	32.58816	-25.95111	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Maxaquene C																		T8-2	19:14	0:10	19:24				0:04	0.95	0:04	0:04				
26	6	6	Micaela - Resistencia 1	32.58934	-25.94929	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Maxaquene C																		T8-3	19:25	0:10	19:35	19:49	0:10	19:59	0:01	0.35	0:01	0:01	0:23	6.1	0:14	0:14
27	6	6	Micaela - Resistencia 2	32.58934	-25.94929	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Maxaquene C																		T9-1	**19:59**	0:10	20:09				0:00	0	0:00		0:21	6.1	0:16	
28	6	6	Av.Vlademir Lenine - Mae Africa	32.59423	-25.94537	1	1	1	1	1	1	2	2	0	2	2	0	A	B			A	B	Maxaquene C	A	B			A	B	Polana Caniço A										T9-2	20:12	0:10	20:22				0:03	0.8	0:02	0:03				
29	6	6	Av.Vlademir Lenine - Saul 1	32.59546	-25.94366	1	1	1	1	1	1	1	1	0	1	1	0	A	B			A	B	Polana Caniço A															X	X		T9-3	20:25	0:10	20:35	20:56	0:10	21:06	0:03	0.25	0:01	0:03	0:21	5.3	0:12	0:21
30	6	6	Av.Vlademir Lenine - Saul 2	32.59418	-25.94518	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Maxaquene C															X	X		T10-1	**21:23**	0:10	21:33				0:00	0	0:00		0:17	5.1	0:14	0:17
31		6	**Av.Vlademir Lenine - Compone-2 NEW**	32.60091	-25.93629	1	1	1	1	1	1	2	1	2	2	1	2	A			A			Polana Caniço B			C			C	Maxaquene C	A	B	C	A	B	C	Mercado Compone	X	X		T10-2	21:37	0:10	21:47				0:04	1	0:03	0:04				
32	6	6	Av.Vlademir Lenine - Compone-1	32.60091	-25.93629	1	1	1	1	1	1	2	1	2	2	1	2	A			A			Maxaquene D			C			C	Polana Caniço A	A	B	C	A	B	C	Mercado Compone	X	X		T10-3	21:47	0:10	21:57	22:07	0:10	22:17	0:00	0	0:00	0:00	0:16	4.1	0:10	0:10
33	6	6	Av.Vlademir Lenine - Canhoeiro	32.60320	-25.93265	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Polana Caniço B															X	X		T11-1	**22:26**	0:10	22:36				0:00	-	0:00		0:12	3.6	0:09	0:09
34	6	6	Escola Nova de Polana Canico 1	32.60451	-25.93797	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Polana Caniço A															X	X		T11-2	22:40	0:10	22:50				0:04	1.1	0:04	0:04				
35	6	6	Escola Nova de Polana Canico 2	32.60451	-25.93797	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Polana Caniço A															X	X		T11-3	22:50	0:10	23:00	23:13	0:10	23:23	0:00	0	0:00	0:00	0:18	4.7	0:13	0:13
36	12	6	Rua Carlos Cardoso-Ravina-1	32.60670	-25.94201	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Polana Caniço A															X (Cheio)			T12-1	**23:38**	0:10	23:48				0:00	0	0:00		0:17	6.2	0:15	0:15
37		6	Rua Carlos Cardoso-Ravina-2	32.60670	-25.94201	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Polana Caniço A															X (Cheio)			T12-2	23:48	0:10	23:58				0:00	0	0:00	0:00				
38	12	6	Rua carlos cardoso-Costa do Sol 1	32.60743	-25.93455	1	1	1	1	1	1	1	0	1	1	0	1			C			C	Polana Caniço A	A			A			Polana Caniço B											T12-3	0:04	0:10	0:14	0:24	0:10	0:34	0:06	1.1	0:06	0:06	0:18	4	0:10	0:10
39		6	Rua carlos cardoso-Costa do Sol 2	32.60743	-25.93455	1	1	1	1	1	1	1	0	1	1	0	1			C			C	Polana Caniço A	A			A			Polana Caniço B											T13-1	**0:45**	0:10	0:55				0:00	0	0:00		0:14	4	0:11	0:11
40	12	6	Mercado Peixa- Xiquelene-1	32.60743	-25.93028	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana							X	X (Cheio)	X	T13-2	0:59	0:10	1:09				0:04	0.75	0:04	0:04				
41		6	Mercado Peixa- Xiquelene-2	32.60743	-25.93028	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana							X			T13-3	1:09	0:10	1:19	1:27	0:10	1:37	0:00	0	0:00	0:00	0:10	3.1	0:08	0:08
42	12	6	Mercado Peixa- Xiquelene-3	32.60743	-25.93028	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana							X	X (Cheio)	X	T14-1	**1:45**	0:10	1:55				0:00	0	0:00		0:11	3.5	0:08	0:08
43		6	Mercado Peixa- Xiquelene-4	32.60743	-25.93028	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana							X			T14-2	1:55	0:10	2:05				0:00	0	0:00	0:00				
44	12	6	Escola P. Matchique Tchique-1	32.61325	-25.92903	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Polana Caniço B															X (Informal)			T14-3	2:10	0:10	2:20	2:32	0:10	2:42	0:05	1	0:05	0:05	0:18	5.6	0:12	0:12
45		6	Escola P. Matchique Tchique-2	32.61325	-25.92903	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Polana Caniço B															X (Informal)			T15-1	**2:54**	0:10	3:04				0:00	0	0:00		0:14	4.2	0:12	0:12
46	12	6	Igreja Mucorriano-1	32.61186	-25.93096	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Polana Caniço B																		T15-2	3:07	0:10	3:17				0:03	0.5	0:03	0:03				
47		6	Igreja Mucorriano-2	32.61186	-25.93096	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Polana Caniço B																		T15-3	3:17	0:10	3:27				0:00	0	0:00	0:00				
48	6	6	Av Julius Nhyerere Ravina1	32.60937	-25.93799	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Polana Caniço A																		T15-4	3:31	0:10	3:41	3:50	0:10	**4:00**	0:04	1.4	0:04	0:04	0:17	4.4	0:09	0:09
49	6	6	Av Julius Nhyerere Ravina2	32.60854	-25.94148	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Polana Caniço A																X		T16-1	**19:00**	0:10	19:10				0:00	-	0:00		0:12	4.5	0:09	
50	6	6	Golf	32.61358	-25.93953	1	1	1	1	1	1	0	0	1	0	0	1		C			C		Polana Caniço B																		T16-2	19:14	0:10	19:24				0:04	1.3	0:03	0:04				
51	6	6	Circuito Campo costa de sol	32.61702	-25.94154	1	1	1	1	1	1	0	0	1	0	0	1		C			C		Polana Caniço B																		T16-3	19:30	0:10	19:40	20:01	0:10	**20:11**	0:06	1.4	0:05	0:06	0:21	6	0:14	0:21
306m3	**306m3**	**TOTAL**				**51**	**51**	**51**	**51**	**51**	**51**	**39**	**44**	**38**	**39**	**44**	**38**																														**21.49**		**73min**		**160.4**		**378min**	

*1: This collection time is for reference only. These collection times do not consider break times. In the proposal document, the collection time should be prepared considering the break time.

*2: This time and distance were measured with the Google Maps application. The proposer should present the expected values in the proposal document.

(1) Container collection plan for DSMAS (KaMubukuwana)

Appendix1: Container collection plan for DSMAS

			Kamubukwane			2nd Collection plan						Total					
Tr.	Now	New	Name of the container point	Lat	Long	S	T	Q	Q	F	S	S	T	Q	Q	F	S
1	12	12	Inhagoia Junto a igreja 1	32.5553932	-25.9179630	1	1	1	0	1	1	0	1	1	0	1	1
2	12	12	Inhagoia Junto a igreja 2	32.5554848	-25.9179230	1	1	0	1	1	0	1	1	0	1	1	0
3	12	12	Mercado Inhagoia 1	32.5601387	-25.9194698	1	1	1	1	1	1	2	2	1	2	2	1
4	-	12	**Mercado Inhagoia 2 NEW**	32.5601387	-25.9194698	1	1	1	1	1	1	2	2	1	2	2	1
5	12	12	Av. Mocambique- Chapa Xai-xai	32.5652122	-25.9161358	1	1	1	1	1	1	1	1	1	1	1	1
6	12	12	Av. Mocambique- Construa	32.5653572	-25.9102230	1	0	0	1	0	0	1	0	0	1	0	0
7	12	12	Ponte - Mercado 25 de Junho B	32.5655654	-25.9077357	1	1	1	1	1	1	1	2	2	1	2	2
8	12	12	Av. Mocambique-Bandaute 1	32.5659370	-25.9057732	1	1	1	1	1	1	1	1	1	1	1	1
9	12	12	Av. Mocambique-Bandaute 2	32.5659370	-25.9057732	1	1	1	1	1	1	1	1	1	1	1	1
10	12	12	Mercado Bagamoio	32.5727158	-25.8973064	1		1		1		1	0	1	0	1	0
11	12	12	Esquina Rua Da Paz	32.5812607	-25.8956051	1	1	1	0	1	1	0	1	1	0	1	1
12	12	12	Campo Aeronatica Vedacaoantiga 6m3	32.5751877	-25.8916054	1	1	1	0	1	1	0	1	1	0	1	1
13	12	12	Mabalawene Rua Da Esquadra	32.5718155	-25.8912449	1	0	1	0	0	1	0	0	1	0	0	1
14	12	12	Campo Aeoronautica Civil Vedacao 2	32.5727272	-25.8870506	1	1	0	0	1	0	0	1	0	0	1	0
15	12	12	Campo Aeoronautica Civil Vedacao 1	32.5758209	-25.8874435	1	1	0	0	1	0	0	1	0	0	1	0
16	12	12	Av. Mocambique - Missao Roque	32.5675850	-25.8788719	1	0	0	1	0	0	1	0	0	1	0	0
17	12	12	Escola Nova De Magoanine	32.5988197	-25.8746281	1	1	1	1	1	1	1	1	1	1	1	1
18	12	12	Av. Sebastiao Mabote - Borboleta	32.6196671	-25.8577251	1	1	1	1	1	1	1	1	1	1	1	1
19	12	12	Av. Nelson Mandela- Mercado Mbuzine	32.6011772	-25.8338947	1	1	1	1	1	1	1	2	2	1	2	2
20	12	12	Vila Olimpia Extremo Sul	32.5815506	-25.8321915	1	1	1	1	1	1	1	1	1	1	1	1
21	12	12	Cemiterio de Zimpeto 1	32.5866241	-25.8333035	1	0	1	1	0	1	1	0	1	1	0	1
22	-	12	**Cemiterio de Zimpeto 2 NEW**	32.5866241	-25.8333035	1	0	1	0	0	1	0	0	1	0	0	1
23	12	12	Extremo Norte vila olimpica	32.5850830	-25.8216686	1	1	1	1	1	1	1	1	1	1	1	1
24	12	12	Extremo Norte Grande Maputo	32.5849648	-25.8215008	1	1	1	1	1	1	1	1	1	1	1	1
25	12	12	Mercado Grossista Zimpeto	32.5717583	-25.8324661	1	1	1	1	1	1	1	1	1	1	1	1
26	12	12	Mercado Grossista Zimpeto	32.5718880	-25.8324814	1	1	1	1	1	1	1	1	1	1	1	1
27	12	12	Anexo Grossista	32.5721779	-25.8335075	1	1	1	1	1	1	1	1	1	1	1	1
28	12	12	Anexo Grossista (Terminal de Transporte -1)	32.5701027	-25.8305912	1	1	1	1	1	1	1	1	1	1	1	1
29	12	12	Anexo Grossista (Terminal de Transporte -2)	32.5698471	-25.8306065	1	1	1	1	1	1	1	1	1	1	1	1
29	**324m3**	**348m3**	**Total**			**29**	**23**	**24**	**21**	**24**	**23**	**24**	**27**	**26**	**23**	**28**	**25**
1	6	6	Atras Da Volvo	32.5382300	-25.9442000	1	1	1	1	1	1	0	0	1	0	0	1
2	12	6	N4 Volvo 1	32.5379448	-25.9420395	1	1	1	1	1	1	0	0	1	0	0	1
3	-	6	N4 Volvo 2	32.5379448	-25.9420395	1	1	1	1	1	1	0	0	1	0	0	1
4	12	6	Mercado Luis. Cabral 1	32.5350761	-25.9402466	1	1	1	1	1	1	2	2	2	2	2	2
5	-	6	Mercado Luis. Cabral 2	32.5350761	-25.9402466	1	1	1	1	1	1	2	2	2	2	2	2
6	12	6	Atras da Veternaria 1	32.5462112	-25.9305973	1	1	1	1	1	1	1	0	0	1	0	0
7	-	6	Atras da Veternaria 2	32.5462112	-25.9305973	1	1	1	1	1	1	1	0	0	1	0	0
8	6	6	Atras Da Veternaria 3	32.5473600	-25.9333000	1	1	1	1	1	1	1	1	0	1	1	0
9	6	6	Ponte Jardim	32.5530300	-25.9315700	1	1	1	1	1	1	1	1	1	1	1	1
10	6	6	Rua da Agricultura - Electricidade	32.5537500	-25.9302300	1	1	1	1	1	1	1	1	1	1	1	1
11	6	6	Rua da Agricultura - Rua das Dalias	32.5518100	-25.9289700	1	1	1	1	1	1	1	1	1	1	1	1
12	6	6	Linha ferrea	32.5500000	-25.9289000	1	1	1	1	1	1	1	1	1	1	1	1
13	6	6	Escola do Jardim	32.5492700	-25.9273400	1	1	1	1	1	1	1	1	1	1	1	1
14	6	6	Escola dom Bosco	32.5454900	-25.9270700	1	1	1	1	1	1	1	1	1	1	1	1
15	6	6	2M	32.5441100	-25.9248100	1	1	1	1	1	1	1	1	1	1	1	1
16	6	6	2M Bombas (Januario)	32.5460900	-25.9220100	1	1	1	1	1	1	0	0	1	0	0	1
17	6	6	Rua do Algodao	32.5469000	-25.9236500	1	1	1	1	1	1	1	1	1	1	1	1
18	6	6	Mercado Jardim (1)	32.5475200	-25.9241000	1	1	1	1	1	1	1	1	1	1	1	1
19	6	6	Mercado Jardim (2)	32.5481100	-25.9249100	1	1	1	1	1	1	1	1	1	1	1	1
20	6	6	PRM esquadra do Jardim- carwach	32.5514400	-25.9267300	1	1	1	1	1	1	1	1	1	1	1	1
21	6	6	Rua das Dalias	32.5529200	-25.9276600	1	1	1	1	1	1	1	1	1	1	1	1
22	6	6	Rua do Salao	32.5532700	-25.9284400	1	1	1	1	1	1	1	1	1	1	1	1
23	12	6	Av. Mocambique - Sede 25 de Junho 1	32.5589333	-25.9062691	1	1	1	1	1	1	0	1	1	0	1	1
24	-	6	Av. Mocambique - Sede 25 de Junho 2	32.5589333	-25.9062691	1	1	1	1	1	1	0	1	1	0	1	1
25	12	6	Av. Mocambique-UGC 1	32.5631180	-25.8983631	1	1	1	1	1	1	1	0	0	1	0	0
26	-	6	Av. Mocambique-UGC 2	32.5631180	-25.8983631	1	1	1	1	1	1	1	0	0	1	0	0
27	12	6	Av. Mocambique-MozBrake 1	32.5656242	-25.8638363	1	1	1	1	1	1	1	0	0	1	0	0
28	-	6	Av. Mocambique-MozBrake 2	32.5656242	-25.8638363	1	1	1	1	1	1	1	0	0	1	0	0
29	12	6	Av. Mocambique- Mercado 25 de Setembro 1	32.5687294	-25.8452396	1	1	1	1	1	1	0	0	1	0	0	1
30	-	6	Av. Mocambique- Mercado 25 de Setembro 2	32.5687294	-25.8452396	1	1	1	1	1	1	0	0	1	0	0	1
31	12	6	Rua dos Leos 1	32.5762596	-25.8474216	1	1	1	1	1	1	0	1	1	0	1	1
32	-	6	Rua dos Leos 2	32.5762596	-25.8474216	1	1	1	1	1	1	0	1	1	0	1	1
33	12	6	Av. Nelson Mandela- Campo Sheel1	32.5836182	-25.8454971	1	1	1	1	1	1	1	1	0	1	1	0
34	-	6	Av. Nelson Mandela- Campo Sheel2	32.5836182	-25.8454971	1	1	1	1	1	1	1	1	0	1	1	0
35	12	6	Mercado Comunitaria Matendene 1	32.5939102	-25.8464165	1	1	1	1	1	1	2	2	1	2	2	1
36		6	Mercado Comunitaria Matendene 2	32.5939102	-25.8464165	1	1	1	1	1	1	2	2	1	2	2	1
37	12	6	Minas 1	32.6216023	-25.8332294	1	1	1	1	1	1	0	1	1	0	1	1
38	-	6	Minas 2	32.6216023	-25.8332294	1	1	1	1	1	1	0	1	1	0	1	1
39	12	6	Minas 3	32.6216023	-25.8332294	1	1	1	1	1	1	0	1	1	0	1	1
40	-	6	Minas 4	32.6216023	-25.8332294	1	1	1	1	1	1	0	1	1	0	1	1
41	12	6	Grande Maputo Igreja Assemblea de Deus Circular 1	32.6076241	-25.8284359	1	1	1	1	1	1	0	1	1	0	1	1
42	-	6	Grande Maputo Igreja Assemblea de Deus Circular 2	32.6076241	-25.8284359	1	1	1	1	1	1	0	1	1	0	1	1
43	6	6	Av. Nelson Mandela & Grande Maputo Estaleiro	32.6024500	-25.8269500	1	1	1	1	1	1	0	0	1	0	0	1
44	6	6	Condominio Grande Maputo CM 1	32.5766700	-25.8194800	1	1	1	1	1	1	1	1	1	1	1	1
45	6	6	Condominio Grande Maputo CM 2	32.5766200	-25.8195600	1	1	1	1	1	1	1	1	1	1	1	1
46	12	6	Av. Mocambique-Depois do control Zimpeto1	32.5710030	-25.8231659	1	1	1	1	1	1	1	0	0	1	0	0
47	-	6	Av. Mocambique-Depois do control Zimpeto2	32.5710030	-25.8231659	1	1	1	1	1	1	1	0	0	1	0	0
48	6	6	Avenida de Mocambique-Drive in	32.5704000	-25.8268300	1	1	1	1	1	1	1	1	1	1	1	1
49	12	6	Av. Mocambique-Terreno Mabor 1	32.5689735	-25.8374062	1	1	1	1	1	1	1	1	1	1	1	1
50	-	6	Av. Mocambique-Terreno Mabor 2	32.5689735	-25.8374062	1	1	1	1	1	1	1	1	1	1	1	1
51	12	6	Av. Lurdes Mutola -Estaleiro 1	32.5718422	-25.8759441	1	1	1	1	1	1	1	1	0	1	1	0
52	-	6	Av. Lurdes Mutola -Estaleiro 2	32.5718422	-25.8759441	1	1	1	1	1	1	1	1	0	1	1	0
53	12	6	Av. Lurdes Mutola- Posto 19 novas Bombas 1	32.5802879	-25.8781052	1	1	1	1	1	1	0	1	0	0	1	0
54	-	6	Av. Lurdes Mutola- Posto 19 novas Bombas 2	32.5802879	-25.8781052	1	1	1	1	1	1	0	1	0	0	1	0
55	6	6	Av. Lurdes Mutola - Fim do Muro da Paiol	32.5907500	-25.8795400	1	1	1	1	1	1	0	1	1	0	1	1
56	12	6	Av. Lurdes Mutola - Praca da Juventude 1	32.6040077	-25.8825283	1	1	1	1	1	1	1	0	1	1	0	1
57	-	6	Av. Lurdes Mutola - Praca da Juventude 2	32.6040077	-25.8825283	1	1	1	1	1	1	1	0	1	1	0	1
58	6	6	Avenida Lurdes Mutola - Mesquita	32.6018500	-25.8823700	1	1	1	1	1	1	0	0	1	0	0	1
59	12	6	Fim do Murro do Aeroporto 1	32.5966339	-25.8810368	1	1	1	1	1	1	0	1	1	0	1	1
60	-	6	Fim do Murro do Aeroporto 2	32.5966339	-25.8810368	1	1	1	1	1	1	0	1	1	0	1	1
61	12	6	Campo de Malhazine 1	32.5861320	-25.8803329	1	1	1	1	1	1	2	2	2	2	2	2
62	-	6	Campo de Malhazine 2	32.5861320	-25.8803329	1	1	1	1	1	1	2	2	2	2	2	2
63	12	6	Escola Secundaria Mubukwana 1	32.5828094	-25.8874893	1	1	1	1	1	1	0	0	1	0	0	1
64	-	6	Escola Secundaria Mubukwana 2	32.5828094	-25.8874893	1	1	1	1	1	1	0	0	1	0	0	1
65	6	6	Av. Mocambique - Mercado Benfica 1	32.5653000	-25.8888836	1	1	1	1	1	1	1	1	1	1	1	1
66	6	6	Av. Mocambique - Mercado Benfica 2	32.5653000	-25.8888836	1	1	1	1	1	1	1	1	1	1	1	1
67	12	6	Av. Mocambique - Carcaca 1	32.5657387	-25.9047699	1	1	1	1	1	1	1	0	0	1	0	0
68	-	6	Av. Mocambique - Carcaca 2	32.5657387	-25.9047699	1	1	1	1	1	1	1	0	0	1	0	0
69	12	6	Av. Mocambique -Timbila 1	32.5655060	-25.9145050	1	1	1	1	1	1	0	1	0	0	1	0
70	-	6	Av. Mocambique -Timbila 2	32.5655060	-25.9145050	1	1	1	1	1	1	0	1	0	0	1	0
70	**420m3**	**420m3**	**Total**			**70**	**70**	**70**	**70**	**70**	**70**	**49**	**54**	**55**	**49**	**54**	**55**

	Primary collection														Market	Problem	Bussiness
Tr.	S	T	Q	Q	F	S	1ME	S	T	Q	Q	F	S	2ME			
1		B	C		B	C	Inhagoia A								X (Informal)	X(Demoram na remoção)	
2	A	B		A	B		Inhagoia B								X (Informal)	X(Demoram na remoção)	
3	A	B		A	B		Inhagoia B	A	B	C	A	B	C	Mercado Inhagoia	X	X(Partilha com mercado,	X (Barracas que circunda
4	A	B		A	B		Inhagoia A	A	B	C	A	B	C	Mercado Inhagoia	X	X(Partilha com mercado,	X (Barracas que circunda
5	A	B	C	A	B	C	Nsalene									X (Enche muito)	
6	A			A			25 de Junho A									X(Demora para a remoçã	X(Barracas, lojas, papela
7		B	C		B	C	25 de Junho B	A	B	C	A	B	C	Mercado 25 de JunhoB	X	X(Falhas na remoção, fo	X(barracas, lojas)
8	A	B	C	A	B	C	25 de Junho B									X(Baldeamentos)	X(Pneus, peças)
9	A	B	C	A	B	C	25 de Junho B									X(Falta de remoção, enche muito)	
10	A		C		B		Mercado Bagamoyo								X		
11			C			C	George Dimitrov		B			B		Bagamoyo		X(Baldeamento, Deposição de Dejectos de porco,	
12		B	C		B	C	Bagamoyo										
13			C			C	Bagamoyo									X(Demora na remoção, baldeamentos, Deposição	
14		B			B		George Dimitrov										
15		B			B		George Dimitrov								X(Informal)	X (Baldeamentos, Barrac	X (Barracas que circunda
16	A			A			George Dimitrov									X (Ramas, Baldeamentos noturnos)	
17	A	B	C	A	B	C	Magoanine A									X(muitos quarteirões naquele contentor, falta de	
18		B	C		B	C	Magoanine A	A			A			Magoanine B		X(Constantemente cheios, A Enviroserv demora a	
19		B	C		B	C	Magoanine B	A	B	C	A	B	C	Mercado Mbuzine	X(ANEX)		
20	A	B	C	A	B	C	Zimpeto										X(Barracas, Botle stores
21	A		C	A		C	Zimpeto									X(Sempre cheio, demoram na remoção, ramas, pa	
22			C			C	Magoanine C									X(Sempre cheio, demoram na remoção, ramas, pa	
23	A	B	C	A	B	C	Zimpeto									X(Baldeamentos de cumbeza, condom]inios)	
24	A	B	C	A	B	C	Zimpeto									X(Baldeamentos de cumbeza, condom]inios)	
25	A	B	C	A	B	C	Mercado Grossista								X		
26	A	B	C	A	B	C	Mercado Grossista								X		
27	A	B	C	A	B	C	Anexo Grossista								X(ANEX)		
28	A	B	C	A	B	C	Anexo Grossista								X(ANEX)		
29	A	B	C	A	B	C	Anexo Grossista								X(ANEX)		
1			C			C	Luís Cabral										
2			C			C	Luís Cabral										
3			C			C	Luís Cabral										
4	A	B	C	A	B	C	Luís Cabral	A	B	C	A	B	C	Mercado Luis. Cabral	X		
5	A	B	C	A	B	C	Luís Cabral	A	B	C	A	B	C	Mercado Luis. Cabral	X		
6	A			A			Luís Cabral										
7	A			A			Luís Cabral										
8	A	B		A	B		Luís Cabral										
9	A	B	C	A	B	C	Jardim										
10	A	B	C	A	B	C	Jardim										
11	A	B	C	A	B	C	Jardim										
12	A	B	C	A	B	C	Jardim										
13	A	B	C	A	B	C	Jardim										
14	A	B	C	A	B	C	Jardim										
15	A	B	C	A	B	C	Jardim										
16			C			C	Inhagoia B								X(informal)		X (Lojas, barracas, etc)
17	A	B	C	A	B	C	Jardim										
18	A	B	C	A	B	C	Mercado Jardim								X		
19	A	B	C	A	B	C	Mercado Jardim								X		
20	A	B	C	A	B	C	Jardim										
21	A	B	C	A	B	C	Jardim										
22	A	B	C	A	B	C	Jardim										
23		B	C		B	C	25 de Junho A									X(Demora na remoção)	
24		B	C		B	C	25 de Junho A									X(Demora na remoção)	
25	A			A			Bagamoyo									X(Demora na remoção)	X(Barracas nas proximid
26	A			A			Bagamoyo									X(Demora na remoção)	X(Barracas nas proximid
27	A			A			Zimpeto									X(Baldeamentos, sempre	X(Vidros, restos de trigo
28	A			A			Zimpeto									X(Baldeamentos, sempre	X(Vidros, restos de trigo
29			C			C	Zimpeto								X(ANEX)	X(Baldeamentos, sempre	X(Barracas, oficinas, loja
30			C			C	Zimpeto								X(ANEX)	X(Baldeamentos, sempre	X(Barracas, oficinas, loja
31		B	C		B	C	Zimpeto									X(Falhas na remoção e p	X(Barracas)
32		B	C		B	C	Zimpeto									X(Falhas na remoção e p	X(Barracas)
33	A	B		A	B		Magoanine C									X(Baldeamento, catadores)	
34	A	B		A	B		Magoanine C									X(Baldeamento, catadores)	
35	A	B		A	B		Magoanine C	A	B	C	A	B	C	Mercado Matendene	X	X(partilha com mercado(	X(lojas, barracas)
36	A	B		A	B		Magoanine C	A	B	C	A	B	C	Mercado Matendene	X	X(partilha com mercado(	X(lojas, barracas)
37		B	C		B	C	Magoanine B										
38		B	C		B	C	Magoanine B										
39		B	C		B	C	Magoanine B										
40		B	C		B	C	Magoanine B										
41		B	C		B	C	Magoanine B										
42		B	C		B	C	Magoanine B										
43			C			C	Magoanine C										
44	A	B	C	A	B	C										X(Baldeamentos)	
45	A	B	C	A	B	C										X(Baldeamentos)	
46	A			A			Zimpeto										X(Alumínio e vidro)
47	A			A			Zimpeto										X(Alumínio e vidro)
48	A	B	C	A	B	C	Mercado Drive in								X		
49	A	B	C	A	B	C	Zimpeto										X(Padaria, barracas, ofic
50	A	B	C	A	B	C	Zimpeto										X(Padaria, barracas, ofic
51	A	B		A	B		George Dimitrov								X(Informal)	X(Ramas, Baldeamento, catadores disconhecidos	
52	A	B		A	B		George Dimitrov								X(Informal)	X(Ramas, Baldeamento, catadores disconhecidos	
53		B			B		George Dimitrov									X (Ramas, Baldeamentos, catadores desconhecid	
54		B			B		George Dimitrov									X (Ramas, Baldeamentos, catadores desconhecid	
55			C			C	Malhazine		B			B		Magoanine A			
56	A			A			Magoanine A			C			C	Hulene B	X(ANEX)		
57	A			A			Magoanine A			C			C	Hulene B	X(ANEX)		
58			C			C	Magoanine A										
59		B	C		B	C	Magoanine A										
60		B	C		B	C	Magoanine A										
61	A	B	C	A	B	C	Malhazine	A	B	C	A	B	C	Mercado Malhazine	X	X(quando enche, compro	X(Barracas, lojas)
62	A	B	C	A	B	C	Malhazine	A	B	C	A	B	C	Mercado Malhazine	X	X(quando enche, compro	X(Barracas, lojas)
63			C			C	George Dimitrov								X(Informal)	X (Baldeamentos)	
64			C			C	George Dimitrov								X(Informal)	X (Baldeamentos)	
65	A			A			George Dimitrov	A	B	C	A	B	C	Mercado Benfica	X(Formal e Informal)	X(Cheio, Contentor Bloq	X (Barracas que circunda
66	A			A			George Dimitrov	A	B	C	A	B	C	Mercado Benfica	X(Formal e Informal)	X(Cheio, Contentor Bloq	X (Barracas que circunda
67	A			A			Bagamoyo										
68	A			A			Bagamoyo										
69		B			B		25 de Junho B									X(Falhas de remoção)	X(Baldeamentos de ofici
70		B			B		25 de Junho B									X(Falhas de remoção)	X(Baldeamentos de ofici

	Container *1			Hulene *1			Container *2				Hulene *2			
	llegada	0:10	Salida	llegada	0:10	Salida	19:00	Km	22:00		19:00	Km	22:00	
1	19:00	0:10	19:10	19:40	0:10	19:50	0	0	0		0:30	8	0:23	0:30
2	20:20	0:10	20:30	21:00	0:10	21:10	0	0	0		0:30	8	0:23	0:30
3	21:29	0:10	21:39	21:58	0:10	22:08	0	0	0		0:24	7.5	0:19	0:19
4	22:27	0:10	22:37	22:56	0:10	23:06	0	0	0		0:24	7.5	0:19	0:19
5	23:27	0:10	23:37	23:58	0:10	0:08	0	0	0		0:29	8.8	0:21	0:21
6	0:31	0:10	0:41	1:04	0:10	1:14	0	0	0		0:00	8.8	0:23	0:23
7	1:35	0:10	1:45	2:06	0:10	2:16	0	0	0		0:26	8.6	0:21	0:21
8	2:38	0:10	2:48	3:10	0:10	3:20	0	0	0		0:30	9	0:22	0:22
9	3:42	0:10	3:52	4:14	0:10	**4:24**	0	0	0		0:29	9	0:22	0:22
10	19:00	0:10	19:10	19:34	0:10	19:44	0	0	0		0:24	7.5	0:20	0:24
11	20:04	0:10	20:14	20:34	0:10	20:44	0	0	0		0:20	6.3	0:16	0:20
12	21:06	0:10	21:16	21:38	0:10	21:48	0	0	0		0:22	6.7	0:18	0:22
13	22:07	0:10	22:17	22:36	0:10	22:46	0	0	0		0:24	6.7	0:19	0:19
14	23:02	0:10	23:12	23:28	0:10	23:38	0	0	0		0:20	6.1	0:16	0:16
15	23:54	0:10	0:04	0:20	0:10	0:30	0	0	0		0:22	6.3	0:16	0:16
16	0:50	0:10	1:00	1:20	0:10	1:30	0	0	0		0:24	6.6	0:20	0:20
17	1:42	0:10	1:52	2:04	0:10	2:14	0	0	0		0:16	3.9	0:12	0:12
18	2:29	0:10	2:39	2:54	0:10	3:04	0	0	0		0:18	5.5	0:15	0:15
19	3:32	0:10	3:42	4:10	0:10	**4:20**	0	0	0		0:35	9.1	0:28	0:28
20	19:00	0:10	19:10	19:48	0:10	19:58	0	0	0		0:38	13.8	0:28	0:38
21	20:38	0:10	20:48	21:28	0:10	21:38	0	0	0		0:40	14.6	0:30	0:40
22	22:08	0:10	22:18	22:48	0:10	22:58	0	0	0		0:30	14.6	0:30	0:30
23	23:24	0:10	23:34	0:00	0:10	0:10	0	0	0		0:30	16.1	0:26	0:26
24	0:36	0:10	0:46	1:12	0:10	1:22	0	0	0		0:30	16.1	0:26	0:26
25	1:47	0:10	1:57	2:22	0:10	2:32	0	0	0		0:35	11.5	0:25	0:25
26	2:57	0:10	3:07	3:32	0:10	**3:42**	0	0	0		0:35	11.5	0:25	0:25
27	19:00	0:10	19:10	19:45	0:10	19:55	0	0	0		0:35	11.8	0:25	0:35
28	20:27	0:10	20:37	21:09	0:10	21:19	0	0	0		0:32	11.5	0:24	0:32
29	21:51	0:10	22:01	22:33	0:10	**22:43**	0	0	0		0:32	11.5	0:24	0:32
							0	-	0			**272.9**		**708min**
T01-1	19:00	0:10	19:10					-						
T01-2	19:13	0:10	19:23				0:03	0.80	0:03	0:03				
T01-3	19:23	0:10	19:33				0:00	-	0:00	0:00				
T01-4	19:36	0:10	19:46	20:16	0:10	20:26	0:03	2.50	0:03	0:03	0:30	9.5	0:23	0:30
T2-1	20:52	0:10	21:02								0:26	9.6	0:23	0:26
T2-2	21:10	0:10	21:20				0:08	2.80	0:07	0:08				
T2-3	21:20	0:10	21:30				0:00	-	0:00	0:00				
T2-4	21:33	0:10	21:43	22:05	0:10	22:15	0:03	0.35	0:03	0:03	0:29	8	0:22	0:22
T3-1	22:33	0:10	22:43								0:22	7.7	0:18	0:18
T3-2	22:44	0:10	22:54				0:01	0.21	0:01	0:01				
T3-3	22:55	0:10	23:05				0:01	0.24	0:01	0:01				
T3-4	23:07	0:10	23:17				0:03	0.60	0:02	0:02				
T3-5	23:18	0:10	23:28	23:51	0:10	0:01	0:01	0.28	0:01	0:01	0:32	8.9	0:23	0:23
T4-1	0:23	0:10	0:33								0:26	8.9	0:22	0:22
T4-2	0:36	0:10	0:46				0:03	0.55	0:03	0:03				
T4-3	0:47	0:10	0:57				0:01	0.45	0:01	0:01				
T4-4	0:58	0:10	1:08	1:32	0:10	1:42	0:01	0.26	0:01	0:01	0:33	9.1	0:24	0:24
T5-1	2:04	0:10	2:14								0:26	9.1	0:22	0:22
T5-2	2:14	0:10	2:24				0:00	-	0:00	0:00				
T5-3	2:26	0:10	2:36				0:03	0.45	0:02	0:02				
T5-4	2:38	0:10	2:48	3:09	0:10	**3:19**	0:02	0.25	0:02	0:02	0:30	8.3	0:21	0:21
T6-1	19:00	0:10	19:10								0:24	8.2	0:20	
T6-2	19:26	0:10	19:36				0:16	3.50	0:10	0:16				
T6-3	19:36	0:10	19:46				0:00	-	0:00	0:00				
T6-4	19:52	0:10	20:02	20:30	0:10	20:40	0:06	2.10	0:05	0:06	0:28	8.7	0:22	0:28
T7-1	20:28	0:10	20:38								0:26	9.2	0:22	0:26
T7-2	20:50	0:10	21:00				0:12	4.10	0:07	0:12				
T7-3	21:00	0:10	21:10				0:00	-	0:00	0:00				
T7-4	21:15	0:10	21:25				0:05	2.10	0:04	0:05				
T7-5	21:25	0:10	21:35	21:57	0:10	22:07	0:00	-	0:00	0:00	0:28	9.9	0:22	0:22
T8-1	22:29	0:10	22:39								0:28	10.6	0:22	0:22
T8-2	22:39	0:10	22:49				0:00	-	0:00	0:00				
T8-3	22:53	0:10	23:03				0:04	1.00	0:04	0:04				
T8-4	23:03	0:10	23:13	23:38	0:10	23:48	0:00	-	0:00	0:00	0:34	11	0:25	0:25
T9-1	0:10	0:10	0:20								0:26	7.3	0:22	0:22
T9-2	0:20	0:10	0:30				0:00	-	0:00	0:00				
T9-3	0:42	0:10	0:52				0:12	5.80	0:12	0:12				
T9-4	0:52	0:10	1:02	1:26	0:10	1:36	0:00	-	0:00	0:00	0:26	12.5	0:24	0:24
T10-1	2:00	0:10	2:10								0:26	12.4	0:24	0:24
T10-2	2:10	0:10	2:20				0:00	-	0:00	0:00				
T10-3	2:23	0:10	2:33				0:03	1.60	0:03	0:03				
T10-4	2:33	0:10	2:43	3:09	0:10	**3:19**	0:00	-	0:00	0:00	0:28	14	0:26	0:26
T11-1	19:00	0:10	19:10								0:28	14.3	0:26	
T11-2	19:16	0:10	19:26				0:06	2.90	0:06	0:06				
T11-3	19:26	0:10	19:36				0:00	-	0:00	0:00				
T11-4	19:38	0:10	19:48	20:23	0:10	20:33	0:02	0.95	0:02	0:02	0:35	12.4	0:26	0:35
T12-1	20:28	0:10	20:38								0:40	14.3	0:32	0:40
T12-2	20:40	0:10	20:50				0:02	0.35	0:02	0:02				
T12-3	20:54	0:10	21:04				0:04	1.20	0:03	0:04				
T12-4	21:04	0:10	21:14	21:45	0:10	21:55	0:00	-	0:00	0:00	0:31	10.7	0:23	0:31
T13-1	22:09	0:10	22:19								0:16	5.6	0:14	0:14
T13-2	22:19	0:10	22:29				0:00	-	0:00	0:00				
T13-3	22:31	0:10	22:41				0:03	0.85	0:02	0:02				
T13-4	22:41	0:10	22:51	23:03	0:10	23:13	0:00	-	0:00	0:00	0:17	4.9	0:12	0:12
T14-1	23:22	0:10	23:32								0:12	3.6	0:09	0:09
T14-2	23:35	0:10	23:45				0:04	1.40	0:03	0:03				
T14-3	23:45	0:10	23:55				0:00	-	0:00	0:00				
T14-4	23:56	0:10	0:06	0:15	0:10	0:25	0:01	0.22	0:01	0:01	0:10	2.6	0:09	0:09
T15-1	0:33	0:10	0:43								0:12	3	0:08	0:08
T15-2	0:43	0:10	0:53				0:00	-	0:00	0:00				
T15-3	0:56	0:10	1:06				0:03	1.20	0:03	0:03				
T15-4	1:06	0:10	1:16	1:28	0:10	1:38	0:00	-	0:00	0:00	0:16	4.5	0:12	0:12
T16-1	1:50	0:10	2:00								0:16	5.2	0:12	0:12
T16-2	2:00	0:10	2:10				0:00	-	0:00	0:00				
T16-3	2:14	0:10	2:24				0:04	1.40	0:04	0:04				
T16-4	2:24	0:10	2:34	2:56	0:10	3:06	0:00	-	0:00	0:00	0:28	8.4	0:22	0:22
T17-1	3:26	0:10	3:36								0:24	9.3	0:20	0:20
T17-2	3:36	0:10	3:46				0:00	0	0:00	0:00				
T17-3	3:49	0:10	3:59				0:03	1.1	0:03	0:03				
T17-4	3:59	0:10	4:09	4:29	0:10	**4:39**	0:00	-	0:00	0:00	0:24	7.9	0:20	0:20
								42km		**119min**		**290km**		**671min**

*1: This collection time is for reference only. These collection times do not consider break times. In the proposal document, the collection time should be prepared considering the break time.

*2: This time and distance were measured with the Google Maps application. The proposer should present the expected values in the proposal document.

(1) Container collection plan for DSMAS (KaMavota)

Nr.	Now m3	New m3	KaMavota CONT NAME	Longitude	Latitude	2nd Collection plan S	T	Q	Q	F	S	Total S	T	Q	Q	F	S
1	12	12	Fertiliza	32.609268	-25.920803	1	0	1	1	0	1	1	0	1	1	0	1
2	12	12	Quarterao 13	32.616222	-25.919107	1	0	1	0	0	1	0	0	1	0	0	1
3	12	12	Rua Da Beira Estaleiro Dragao	32.602760	-25.906931	1	0	0	1	0	0	1	0	0	1	0	0
4	12	12	Rua Da Beira Taka Nha	32.592133	-25.915010	1	1	1	1	1	1	1	2	1	1	2	1
5	12	12	Rua Da Beira Mercado Mavalane 1	32.586000	-25.922000	1	1	1	0	1	1	0	1	1	0	1	1
6		12	**Rua Da Beira Mercado Mavalane 2 NEW**	32.586000	-25.922000	1	1	1	1	1	1	1	2	2	1	2	2
7	12	12	Rua Da Beira TTA	32.581173	-25.922514	1	1	1	0	1	1	0	1	1	0	1	1
8	12	12	Antena da Vodacom	32.617702	-25.900510	1	0	1	0	0	1	0	0	1	0	0	1
9	12	12	Av. Dom Alexandre- Muro Pindada Vodacom	32.619900	-25.892248	1	0	1	0	0	1	0	0	1	0	0	1
10	12	12	Av. Dom Alexandre Farmacia Africa	32.628998	-25.856705	1	1	1	0	1	1	0	1	1	0	1	1
11	12	12	Av. Dom Alexandre Escola Secundaria Albazine	32.632679	-25.848309	1	1	0	0	1	0	0	1	0	0	1	0
12	12	12	Av. Dom Alexandre Estaleiro Monica	32.634056	-25.844820	1	0	0	1	0	0	1	0	0	1	0	0
13	12	12	Av. Dom Alexandre Escola Primaria Albazine	32.636719	-25.842516	1	0	0	1	0	0	1	0	0	1	0	0
14	12	12	Ao Longo da Linha Feira Chicabele	32.637371	-25.859655	1	1	1	0	1	1	0	1	1	0	1	1
15	12	12	Mercado Romao	32.632771	-25.870972	1	1	0	0	1	0	0	1	0	0	1	0
15	**168m3**	**180m3**				**15**	**8**	**10**	**6**	**8**	**10**	**6**	**10**	**11**	**6**	**10**	**11**
1	6	6	Dona Alice-Chapa Munguambe Sucata Metal atras do muro MEA PAZ	32.634010	-25.900633	1	1	1	1	1	1	0	1	0	0	1	0
2	6	6	Quarteirao 46 Costa do Sol	32.644066	-25.908276	1	1	1	1	1	1	0	1	0	0	1	0
3	6	6	Mapulene 1	32.660554	-25.885710	1	1	1	1	1	1	0	0	1	0	0	1
4	6	6	Bairro dos pescadores 1	32.658382	-25.904261	1	1	1	1	1	1	1	1	2	1	1	2
5	6	6	Bairro dos pescadores 2	32.659679	-25.901217	1	1	1	1	1	1	0	0	1	0	0	1
6	6	6	Escola primaria do Triunfo	32.636379	-25.925289	1	1	1	1	1	1	1	0	0	1	0	0
7	6	6	Pontinha - Costa do sol	32.631508	-25.923475	1	1	1	1	1	1	1	0	0	1	0	0
8	6	6	Rua de Mangal	32.633274	-25.919661	1	1	1	1	1	1	1	0	0	1	0	0
9	6	6	Vila Sol 1	32.628520	-25.916799	1	1	1	1	1	1	0	0	1	0	0	1
10	6	6	Vila Sol 2	32.628680	-25.916844	1	1	1	1	1	1	0	0	1	0	0	1
11	6	6	Rua dos Continuadores	32.631099	-25.927476	1	1	1	1	1	1	1	0	0	1	0	0
12	6	6	Igreja Testemunha de Jeova	32.629040	-25.931074	1	1	1	1	1	1	1	0	0	1	0	0
13	12	6	Praca dos Herois - Eucalipto 1	32.580040	-25.932121	1	1	1	1	1	1	0	0	1	0	0	1
14	-	6	Praca dos Herois - Eucalipto 2	32.580040	-25.932121	1	1	1	1	1	1	1	0	1	1	0	1
15	6	6	Av. FPLM Centro de Saude Mavalane 1	32.587662	-25.931366	1	1	1	1	1	1	1	0	0	1	0	0
16	6	6	Av. FPLM Centro de Saude Mavalane 2	32.587662	-25.931366	1	1	1	1	1	1	1	0	1	1	0	1
17	12	6	Av.FPLM Hospital Mavalane 1	32.584152	-25.930176	1	1	1	1	1	1	1	0	0	1	0	0
18	-	6	Av.FPLM Hospital Mavalane 2	32.584152	-25.930176	1	1	1	1	1	1	1	1	0	1	1	0
19	12	6	AV. FPLM Cruz Vermelho 1	32.597965	-25.928268	1	1	1	1	1	1	1	1	1	1	1	1
20	-	6	AV. FPLM Cruz Vermelho 2	32.597965	-25.928268	1	1	1	1	1	1	1	1	1	1	1	1
21	6	6	Mercado Informal de Mbusine	32.603096	-25.926405	1	1	1	1	1	1	0	0	1	0	0	1
22	12	6	Av. Juluis Nhyrere- Ponte Ferroviario 1	32.604618	-25.921352	1	1	1	1	1	1	1	0	1	1	0	1
23	-	6	Av. Juluis Nhyrere- Ponte Ferroviario 2	32.604618	-25.921352	1	1	1	1	1	1	1	0	0	1	0	0
24	6	6	Av.Julius Nyerere- Rua de Complexo 1	32.603752	-25.918739	1	1	1	1	1	1	1	1	0	1	1	0
25	-	6	**Av.Julius Nyerere- Rua de Complexo 2 NEW**	32.603752	-25.918739	1	1	1	1	1	1	1	1	0	1	1	0
26	-	6	**Av.Julius Nyerere- Rua de Complexo 3 NEW**	32.603752	-25.918739	1	1	1	1	1	1	1	0	0	1	0	0
27	-	6	**Av.Julius Nyerere- Rua de Complexo 4 NEW**	32.603752	-25.918739	1	1	1	1	1	1	1	0	0	1	0	0
28	12	6	Av. Juluis Nhyerere-Chapa Amarelo 1	32.602886	-25.916683	1	1	1	1	1	1	1	0	0	1	0	0
29		6	Av. Juluis Nhyerere-Chapa Amarelo 2	32.602886	-25.916683	1	1	1	1	1	1	1	1	0	1	1	0
30	6	6	Rua da Beira - Feira de Hulene 1	32.594124	-25.913319	1	1	1	1	1	1	1	1	0	1	1	0
31	6	6	Rua da Beira - Feira de Hulene 2	32.594124	-25.913342	1	1	1	1	1	1	1	1	0	1	1	0
32	12	6	Rua da Beira 1 (Sitoe)	32.589600	-25.916100	1	1	1	1	1	1	1	1	0	1	1	0
33	-	6	Rua da Beira 2 (Sitoe)	32.589600	-25.916100	1	1	1	1	1	1	0	0	1	0	0	1
34	12	6	Centro de Saude 1 de Junho 1	32.610035	-25.914469	1	1	1	1	1	1	1	1	0	1	1	0
35	-	6	Centro de Saude 1 de Junho 2	32.610035	-25.914469	1	1	1	1	1	1	1	1	0	1	1	0
36	12	6	Campo Ferroviario 1	32.612988	-25.917322	1	1	1	1	1	1	1	0	0	1	0	0
37	-	6	Campo Ferroviario 2	32.612988	-25.917322	1	1	1	1	1	1	1	0	0	1	0	0
38	12	6	Junto Ao 1 Andar 1	32.610085	-25.907919	1	1	1	1	1	1	0	1	0	0	1	0
39	-	6	Junto Ao 1 Andar 2	32.610085	-25.907919	1	1	1	1	1	1	0	1	0	0	1	0
40	12	6	Mercado Maguiguana 1	32.613789	-25.906811	1	1	1	1	1	1	0	1	0	0	1	0
41	-	6	Mercado Maguiguana 2	32.613789	-25.906811	1	1	1	1	1	1	1	2	1	1	2	1
42	12	6	Procuradoria 1	32.616913	-25.904024	1	1	1	1	1	1	0	1	1	0	1	1
43	-	6	Procuradoria 2	32.616913	-25.904024	1	1	1	1	1	1	0	1	1	0	1	1
44	6	6	Pontinha - Romao	32.628651	-25.881825	1	1	1	1	1	1	0	1	0	0	1	0
45	6	6	20 casas	32.641635	-25.847561	1	1	1	1	1	1	0	0	1	0	0	1
46	12	6	Cemitério Guebo 1	32.625290	-25.864416	1	1	1	1	1	1	0	1	1	0	1	1
47	-	6	Cemitério Guebo 2	32.625290	-25.864416	1	1	1	1	1	1	0	1	1	0	1	1
48	12	6	Ceração 1	32.623859	-25.871548	1	1	1	1	1	1	1	1	1	1	1	1
49	-	6	Ceração 2	32.623859	-25.871548	1	1	1	1	1	1	1	1	1	1	1	1
50	12	6	Av. Dom Alxandre Bombas Pumas 1	32.620396	-25.886040	1	1	1	1	1	1	0	1	0	0	1	0
51	-	6	Av. Dom Alxandre Bombas Pumas 2	32.620396	-25.886040	1	1	1	1	1	1	0	1	0	0	1	0
52	12	6	Av. Dom Alxandre 14 de Novembro 1	32.618530	-25.897333	1	1	1	1	1	1	0	0	1	0	0	1
53	-	6	Av. Dom Alxandre 14 de Novembro 2	32.618530	-25.897333	1	1	1	1	1	1	0	0	1	0	0	1
54	12	6	Governo da cidade Maputo a frente 1	32.612442	-25.897533	1	1	1	1	1	1	1	1	0	1	1	0
55	-	6	Governo da cidade Maputo a frente 2	32.612442	-25.897533	1	1	1	1	1	1	1	1	0	1	1	0
56	12	6	Governo da Cidade Maputo atras 1	32.612335	-25.896095	1	1	1	1	1	1	1	1	0	1	1	0
57	-	6	Governo da Cidade Maputo atras 2	32.612335	-25.896095	1	1	1	1	1	1	1	1	0	1	1	0
58	12	6	Rua Da Impazol -Maogeira 1	32.611763	-25.889572	1	1	1	1	1	1	1	2	1	1	2	1
59	-	6	Rua Da Impazol -Maogeira 2	32.611763	-25.889572	1	1	1	1	1	1	0	1	0	0	1	0
60	12	6	Atras da Shoprite Magoanine 1	32.600544	-25.886827	1	1	1	1	1	1	0	0	1	0	0	1
61	-	6	Atras da Shoprite Magoanine 2	32.600544	-25.886827	1	1	1	1	1	1	0	0	1	0	0	1
62	12	6	Av. Juluis Nherere-PT Magoanine 1	32.604359	-25.885328	1	1	1	1	1	1	1	0	0	1	0	0
63	-	6	Av. Juluis Nherere-PT Magoanine 2	32.604359	-25.885328	1	1	1	1	1	1	0	0	1	0	0	1
64	12	6	Av. Sebastiao Mabote -Lavandaria Khurula 1	32.614258	-25.865383	1	1	1	1	1	1	1	1	1	1	1	1
65	-	6	Av. Sebastiao Mabote -Lavandaria Khurula 2	32.614258	-25.865383	1	1	1	1	1	1	1	1	1	1	1	1
65	**372m3**	**390m3**				**65**	**65**	**65**	**65**	**65**	**65**	**39**	**37**	**30**	**39**	**37**	**30**

Nr.	Primary collection S	T	Q	Q	F	S	1 ME	S	T	Q	Q	F	S	2 ME	Mar	Prob	Bus
1	A		C	A		C	Ferroviário										
2			C			C	Ferroviário									X (Falta de remoção)	
3	A			A			Laulane								X (Informal)	X (Muito cheio, baldeamentos)	X (Barracas)
4	A	B		A	B		Hulene B		B	C		B	C	Hulene A	X	X (Partilha)	X (Barracas)
5		B			B		Mavalane A			C			C	Hulene A		X (Cheio)	
6		B	C		B	C	Mavalane B	A	B	C	A	B	C	Mercado	X	X (Cheio)	
7		B	C		B	C	Mavalane A									X (Falta de remoção)	
8			C			C	Laulane										
9			C			C	3 de Fevereiro									X (Baldeamentos, SOS - Munícipes	X (Lojas)
10		B			B		Albazine			C			C	Mahotas			
11		B			B		Albazine									X (Falta de remoção, Citizens of M	X (Lojas e barracas)
12	A			A			Albazine									X (baldeamentos, Residentes de Marracuene depositam neste conten	
13	A			A			Albazine									X (baldeamentos)	X
14			C			C	Albazine		B			B		Mahotas			
15		B			B		Mahotas								X	X (Ramas, baldeamento)	X
15																	
1		B			B		Costa do Sol										
2		B			B		Costa do Sol									X (baldeamentos)	
3			C			C	Costa do sol									X (Baldeamentos, fogos)	
4			C			C	Costa do Sol	A	B	C	A	B	C	Mercado	X	X (Falta de remoção)	
5			C			C	Costa do Sol										
6	A			A			Costa do sol									X (ramas)	X (escolas)
7	A			A			Costa do sol									X (Ramas)	X (apartamentos)
8	A			A			Costa do sol									X (Catadores Marginais agressivos	X (apartamentos)
9			C			C	Ferroviário										
10			C			C	Ferroviário										
11	A			A			Costa do sol									X (Partilha e entulhos)	
12	A			A			Costa do sol										
13			C			C	Urbanização										
14	A		C	A		C	Mavalane A										
15	A			A			Maxaquene D									X (Cheio, partilhas)	X (Hospital)
16	A			A			Mavalane A			C			C	Mavalane B		X (Cheio, partilhas)	X (Hospital)
17	A			A			Mavalane A										X (Hospital)
18	A	B		A	B		FPLM										X (Hospital)
19	A	B	C	A	B	C	FPLM									X (Cheio)	X
20	A	B	C	A	B	C	FPLM									X (Cheio)	X
21			C			C	FPLM								X (ANEX)	X (Cheio, lixo espalhado)	X (barracas a volta do mercado)
22	A			A			Ferroviário			C			C	FPLM		X (Partilha)	
23	A			A			Mavalane B									X (Partilha)	
24	A	B		A	B		Mavalane B									X (Partilha)	X (ramas)
25	A	B		A	B		Mavalane B									X (Partilha)	X (ramas)
26	A			A			Ferroviário									X (Partilha)	X (ramas)
27	A			A			Hulene A									X (Partilha)	X (ramas)
28	A			A			Hulene A									X (Sempre cheio devido à Partilha)	X (Barracas)
29	A	B		A	B		Ferroviário									X (Sempre cheio devido à Partilha)	X (Barracas)
30	A	B		A	B		Hulene B								X (Informal)		X (Barracas)
31	A	B		A	B		Hulene A								X (Informal)		X (Barracas)
32	A			A			Hulene B		B			B		Mavalane B		X (Falta de re	
33			C			C	Hulene A									X (Falta de re	
34	A	B		A	B		Ferroviário										X (Centro de saúde)
35	A	B		A	B		Ferroviário										X (Centro de saúde)
36	A			A			Ferroviário								X (Informal)	X (Falta de remoção)	X (Barracas)
37	A			A			Ferroviário								X (Informal)	X (Falta de remoção)	X (Barracas)
38		B			B		Ferroviário									X (Falta de remoção)	
39		B			B		Ferroviário									X (Falta de remoção)	
40		B			B		Laulane								X	X (Ramas, falta de remoção)	X (Barracas)
41		B			B		Laulane	A	B	C	A	B	C	Mercado	X	X (Ramas, falta de remoção)	X (Barracas)
42		B	C		B	C	Laulane									X (Falta de remoção)	X (Lojas)
43		B	C		B	C	Laulane									X (Falta de remoção)	X (Lojas)
44		B			B		Mahotas									X (Ramas)	
45			C			C	Albazine										
46		B	C		B	C	Mahotas										
47		B	C		B	C	Mahotas										
48	A	B	C	A	B	C	Mahotas										
49	A	B	C	A	B	C	Mahotas										
50		B			B		Mahotas								X (Informal)	X (baldeamentos)	
51		B			B		Mahotas								X (Informal)	X (baldeamentos)	
52			C			C	Laulane									X (baldeamentos)	
53			C			C	Laulane									X (baldeamentos)	
54	A	B		A	B		Laulane									X (baldeamentos)	X (Chineses mercado)
55	A	B		A	B		Laulane									X (baldeamentos)	X (Chineses mercado)
56	A	B		A	B		Laulane									X (baldeamentos)	X (Chineses mercado)
57	A	B		A	B		Laulane									X (baldeamentos)	X (Chineses mercado)
58		B			B		3 de Fevereiro	A	B	C	A	B	C	Mercado	X(ANEX)	X (Cheio, baldeamentosd)	X (lojas)
59		B			B		3 de Fevereiro									X (Cheio, baldeamentosd)	X (lojas)
60			C			C	Hulene B									X (Falta de remoção, dejectos animais, chamas)	
61			C			C	Hulene B									X (Falta de remoção, dejectos animais, chamas)	
62	A			A			3 de Fevereiro										X (Lojas, barracas)
63			C			C	Hulene B										X (Lojas, barracas)
64			C			C	Mahotas	A	B		A	B		Magoanine A			
65			C			C	Mahotas	A	B		A	B		Magoanine A			
65																	

Nr.		Container *1 llegada	on	Salida	Hulene *1 llegada	off	Salida	Container *2 19:00	Km	22:00		Hulene *2 19:00	Km	22:00	
1	1	19:00	0:10	19:10	19:25	0:10	19:35					0:15	4	0:11	0:15
2	2	19:47	0:10	19:57	20:09	0:10	20:19					0:12	4.5	0:11	0:12
3	3	20:25	0:10	20:35	20:41	0:10	20:51					0:06	1.4	0:04	0:06
4	4	21:01	0:10	21:11	21:21	0:10	21:31					0:10	1.9	0:06	0:10
5	5	21:40	0:10	21:50	21:59	0:10	22:09					0:14	3	0:09	0:09
6	6	22:18	0:10	22:28	22:37	0:10	22:47					0:14	3	0:09	0:09
7	7	22:57	0:10	23:07	23:17	0:10	23:27					0:15	3.5	0:10	0:10
8	8	23:35	0:10	23:45	23:53	0:10	0:03					0:08	3.2	0:08	0:08
9	9	0:11	0:10	0:21	0:29	0:10	0:39					0:08	3.2	0:08	0:08
10	10	0:58	0:10	1:08	1:27	0:10	1:37					0:20	7.3	0:19	0:19
11	11	1:58	0:10	2:08	2:29	0:10	2:39					0:22	8.3	0:21	0:21
12	12	3:01	0:10	3:11	3:33	0:10	**3:43**					0:24	8.7	0:22	0:22
13	13	**19:00**	0:10	19:10	19:32	0:10	19:42					0:22	10.3	0:20	0:22
14	14	19:57	0:10	20:07	20:22	0:10	20:32					0:15	8.3	0:15	0:15
15	15	20:46	0:10	20:56	21:10	0:10	**21:20**					0:14	6.1	0:12	0:14
15													**76.7**		**200min**
1	T01-1	**19:00**	0:10	19:10											
2	T01-2	19:17	0:10	19:27				0:07	2.1	0:07	0:07				
3	T01-3	19:36	0:10	19:46	20:08	0:10	20:18	0:09	4.8	0:09	0:09	0:22	9.6	0:20	0:22
4	T2-1	**20:40**	0:10	20:50								0:22	7.6	0:18	0:22
5	T2-2	20:52	0:10	21:02				0:02	0.45	0:02	0:02				
6	T2-3	21:09	0:10	21:19	21:40	0:10	21:50	0:07	3.7	0:07	0:07	0:21	7.5	0:18	0:21
7	T3-1	**22:08**	0:10	22:18								0:20	6.9	0:18	0:18
8	T3-2	22:20	0:10	22:30				0:02	0.7	0:02	0:02				
9	T3-3	22:33	0:10	22:43	22:59	0:10	23:09	0:03	0.6	0:03	0:03	0:18	5	0:16	0:16
10	T4-1	**23:23**	0:10	23:33								0:16	5	0:14	0:14
11	T4-2	23:39	0:10	23:49				0:06	1.8	0:06	0:06				
12	T4-3	23:52	0:10	0:02	0:20	0:10	0:30	0:03	0.5	0:03	0:03	0:25	8.6	0:18	0:18
13	T5-1	**0:42**	0:10	0:52								0:14	4.8	0:12	0:12
14	T5-2	0:52	0:10	1:02				0:00	0	0:00	0:00				
15	T5-3	1:05	0:10	1:15				0:03	0.8	0:03	0:03				
16	T5-4	1:15	0:10	1:25	1:37	0:10	1:47	0:00	0	0:00	0:00	0:17	5.2	0:12	0:12
17	T6-1	**1:59**	0:10	2:09								0:14	5.2	0:12	0:12
18	T6-2	2:09	0:10	2:19				0:00	0	0:00	0:00				
19	T6-3	2:22	0:10	2:32				0:03	1.1	0:03	0:03				
20	T6-4	2:32	0:10	2:42	2:50	0:10	3:00	0:00	0	0:00	0:00	0:14	3.7	0:08	0:08
21	T7-1	**3:09**	0:10	3:19								0:11	3.3	0:09	0:09
22	T7-2	3:22	0:10	3:32				0:04	0.8	0:03	0:03				
23	T7-3	3:32	0:10	3:42	3:48	0:10	**3:58**	0:00	0	0:00	0:00	0:09	2.2	0:06	0:06
24	T8-1	**19:00**	0:10	19:10								0:07	2	0:05	
25	T8-2	19:10	0:10	19:20				0:00	0	0:00	0:00				
26	T8-3	19:20	0:10	19:30	19:44	0:10	19:54	0:00	0	0:00	0:00	0:14	3.8	0:09	0:14
27	T9-1	**20:00**	0:10	20:10								0:06	1.9	0:05	0:06
28	T9-2	20:11	0:10	20:21				0:01	0.27	0:01	0:01				
29	T9-3	20:21	0:10	20:31	20:39	0:10	20:49	0:00	0	0:00	0:00	0:08	1.6	0:05	0:08
30	T10-1	**20:55**	0:10	21:05								0:06	1.5	0:05	0:06
31	T10-2	21:05	0:10	21:15				0:00	0	0:00	0:00				
32	T10-3	21:19	0:10	21:29				0:04	0.75	0:03	0:04				
33	T10-4	21:29	0:10	21:39	21:46	0:10	21:56	0:00	0	0:00	0:00	0:12	2.2	0:07	0:07
34	T11-1	**22:06**	0:10	22:16								0:12	3.4	0:10	0:10
35	T11-2	22:16	0:10	22:26				0:00	0	0:00	0:00				
36	T11-3	22:29	0:10	22:39				0:03	0.55	0:03	0:03				
37	T11-4	22:39	0:10	22:49	22:57	0:10	23:07	0:00	0	0:00	0:00	0:10	2.1	0:08	0:08
38	T12-1	**23:13**	0:10	23:23								0:07	2.3	0:06	0:06
39	T12-2	23:23	0:10	23:33				0:00	0	0:00	0:00				
40	T12-3	23:36	0:10	23:46				0:03	0.55	0:03	0:03				
41	T12-4	23:46	0:10	23:56	0:02	0:10	0:12	0:00	0	0:00	0:00	0:07	2.4	0:06	0:06
42	T13-1	**0:18**	0:10	0:28								0:06	2.3	0:06	0:06
43	T13-2	0:28	0:10	0:38				0:00	0	0:00	0:00				
44	T13-3	0:52	0:10	1:02				0:14	7.1	0:14	0:14				
45	T13-4	1:02	0:10	1:12	1:30	0:10	1:40	0:00	5	0:00	0:00	0:18	9	0:18	0:18
46	T14-1	**1:56**	0:10	2:06								0:18	6.4	0:16	0:16
47	T14-2	2:06	0:10	2:16				0:00	0	0:00	0:00				
48	T14-3	2:18	0:10	2:28				0:02	0.8	0:02	0:02				
49	T14-4	2:28	0:10	2:38	2:54	0:10	3:04	0:00	0	0:00	0:00	0:16	5.6	0:16	0:16
50	T15-1	**3:13**	0:10	3:23								0:12	4	0:09	0:09
51	T15-2	3:23	0:10	3:33				0:00	0	0:00	0:00				
52	T15-3	3:37	0:10	3:47				0:05	1.3	0:04	0:04				
53	T15-4	3:47	0:10	3:57	4:04	0:10	**4:14**	0:00	0	0:00	0:00	0:07	2.7	0:07	0:07
54	T16-1	**19:00**	0:10	19:10								0:07	2.3	0:07	
55	T16-2	19:10	0:10	19:20				0:00	0	0:00	0:00				
56	T16-3	19:21	0:10	19:31				0:01	0.17	0:01	0:01				
57	T16-4	19:31	0:10	19:41	19:47	0:10	19:57	0:00	0	0:00	0:00	0:07	2.1	0:06	0:06
58	T17-1	**20:06**	0:10	20:16								0:10	2.7	0:09	0:09
59	T17-2	20:16	0:10	20:26				0:00	0	0:00	0:00				
60	T17-3	20:32	0:10	20:42				0:06	1.4	0:06	0:06				
61	T17-4	20:42	0:10	20:52	21:01	0:10	21:11	0:00	0	0:00	0:00	0:09	2.1	0:06	0:09
62	T18-1	**21:19**	0:10	21:29								0:08	2	0:05	0:08
63	T18-2	21:29	0:10	21:39				0:00	0	0:00	0:00				
64	T18-3	21:46	0:10	21:56				0:07	2.6	0:05	0:07				
65	T18-4	21:56	0:10	22:06	22:21	0:10	**22:31**	0:00	0	0:00	0:00	0:15	4.5	0:12	0:15
65									**37.84**		**93min**		**143.5**		**380min**

*1: This collection time is for reference only. These collection times do not consider break times. In the proposal document, the collection time should be prepared considering the break time.

*2: This time and distance were measured with the Google Maps application. The proposer should present the expected values in the proposal document.

(2) ME collection plan for DSMAS (Nlhamanculo)

Appendix1: Container collection plan for DSMAS

Nlhamankulo					2nd Collection Plan						Total						Primary collection												
Obs	Nr.	m3	Microempresa	CONT NAME	S	T	Q	Q	F	S	S	T	Q	Q	F	S	S	T	Q	Q	F	S	1 MEs	S	T	Q	Q	F	S	2 MEs
1	1	6	AEROPORTO A	CETA 1-Centro de Saude de Xipamanine - Av. Joaquim Chissano	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		AEROPORTO A							
2	2	6		51.Av. Angola Kia-1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		AEROPORTO A							
3	3	6		51.Av. Angola Kia-2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		AEROPORTO A							
4	4	12		Igreja Assembleia-Rua Gago Coutinho	1	1	0	0	1	0	0	1	0	0	1	0		B			B		AEROPORTO A							
5	5	12		Escola Unidade 18 -Rua Gago Coutinho	1	0	1	0	0	1	0	0	1	0	0	1			C			C	AEROPORTO A							
6	6	12		Rua Gago Coutinho - Igreja Catolica	1	0	1	0	0	1	0	0	1	0	0	1			C			C	AEROPORTO A							
7	7	12		007-Rua Gago Coutinho	1	0	1	0	0	1	0	0	1	0	0	1			C			C	AEROPORTO A							
8	1	6	AEROPORTO B	Mercado Vulcano 2- Rua Gago Coutinho	1	1	1	1	1	1	2	2	2	2	2	2	A	B	C	A	B	C	AEROPORTO B	A	B	C	A	B	C	Mercado Vulcano
9	2	12		Entrada da Base Aerea - Av. 19 de Outubro	1	0	0	1	0	0	1	0	0	1	0	0	A			A			AEROPORTO B							
10	3	12		Campo Base Aerea - Av. 19 de Outubro	1	1	0	1	1	0	1	1	0	1	1	0	A	B		A	B		AEROPORTO B							
11	4	6		CETA 2-Centro de Saude de Xipamanine - Av. Joaquim Chissano	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		AEROPORTO B							
12	5	12		Escola Unidade 18 -Rua Gago Coutinho	1	1	0	0	1	0	0	1	0	0	1	0		B			B		AEROPORTO B							
13	6	6		Av. Mocambique- jardim Zoologico 1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		AEROPORTO B							
14	7	6		Av. Mocambique- jardim Zoologico 2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		AEROPORTO B							
15	8	6		CETA 3-Centro de Saude de Xipamanine - Av. Joaquim Chissano NEW	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	AEROPORTO B							
16	9	12		10– Esquadra - Rua de Xipamanine	1	0	1	0	0	1	0	0	1	0	0	1			C			C	AEROPORTO B							
17	1	6	CHAMANCULO A	Chamanculo A-1 NEW	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	CHAMANCULO A							
18	2	6		Chamanculo A-2 NEW	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	CHAMANCULO A							
19	3	6		Colombia - Rua Major Teixeira Pinto-1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	CHAMANCULO A							
20	4	6		Colombia - Rua Major Teixeira Pinto-2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	CHAMANCULO A							
21	1	6	CHAMANCULO B	Zanza-1 Rua Marcelino dos Santos	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		CHAMANCULO B							
22	2	6		Zanza-2 Rua Marcelino dos Santos-2	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		CHAMANCULO B							
23	3	6		Ufa-1 Rua 2.276	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	CHAMANCULO B							
24	4	6		Ufa-2 Rua 2.276	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	CHAMANCULO B							
25	5	12		Cape-Cape-Campo - Rua 2.282	1	0	1	0	0	1	0	0	1	0	0	1			C			C	CHAMANCULO B							
26	1	12	CHAMANCULO C	Cape-Cape-Campo - Rua 2.282	1	0	0	1	0	0	1	0	0	1	0	0	A			A			CHAMANCULO C							
27	2	6		Terminal da Junta-1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		CHAMANCULO C							
28	3	6		Terminal da Junta-2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		CHAMANCULO C							
29	4	6		Lhanguene-Av. Mozambique-1	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	CHAMANCULO C							
30	5	6		Lhanguene-Av. Mozambique-2	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	CHAMANCULO C							
31	1	6	CHAMANCULO D	Zixaxa 1- Rua do Zixaxa Nr. 2.302	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	CHAMANCULO D							
32	2	6		Zixaxa 2- Rua do Zixaxa Nr. 2.302	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	CHAMANCULO D							
33	1	6	MAFALALA	Xibamate 3- Av. De Angola	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	MAFALALA							
34	1	6	MALANGA	Saida da ponte Maputo Katembe - Av. 24 de Julho	1	1	1	1	1	1	2	1	1	2	1	1	A			A			MALANGA	A	B	C	A	B	C	Add collection for informal
35	2	6		STAE - Av. 24 de Julho	1	1	1	1	1	1	1	0	0	1	0	0	A			A			MALANGA							
36	3	6		Igreja Anglicana	1	1	1	1	1	1	1	0	0	1	0	0	A			A			MALANGA							
37	4	6		Chamanculo A-1 NEW	1	1	1	1	1	1	1	0	0	1	0	0	A			A			MALANGA							
38	5	6		Coca-cola-Rua lago Maramba-1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		MALANGA							
39	6	6		Coca-cola-Rua lago Maramba-2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		MALANGA							
40	7	6		Rotunda 16 de Junho-1 Av. OUA	1	1	1	1	1	1	0	1	0	0	1	0		B			B		MALANGA							
41	8	6		Rotunda 16 de Junho-2 Av. OUA	1	1	1	1	1	1	0	1	0	0	1	0		B			B		MALANGA							
42	9	6		Mega CASH and CARRY	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA							
43	10	6		Up-Av. Trabalho-1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA							
44	11	6		Up-Av. Trabalho-2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA							
45	12	6		LOUMAR1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA							
46	13	6		LOUMAR2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA							
47	1	6	MINKADJUINE	Campo de Mahafil-Rua Mateteu	1	1	1	1	1	1	1	0	0	1	0	0	A			A			MINKADJUINE							
48	2	6		Xibamate 1- Av. De Angola	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	MINKADJUINE							
49	3	6		Rua dos Irmaos Ruby/Parque Xipamanine-1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MINKADJUINE							
50	1	6	MUNHUANA	Xibamate 2- Av. De Angola	1	1	1	1	1	1	1	0	0	1	0	0	A			A			MUNHUANA							
51	2	12		Rua do Zimabwe	1	1	0	0	1	0	0	1	0	0	1	0		B			B		MUNHUANA							
52	3	12		S綰 Joaquim Rua Zambeze	1	0	1	1	0	1	1	0	1	1	0	1	A		C	A		C	MUNHUANA							
53	1	6	UNIDADE 7	Naggi 1-Rua Gago Coutinho	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		UNIDADE 7							
54	2	6		Naggi 2-Rua Gago Coutinho	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		UNIDADE 7							
55	3	6		Mercado Vulcano 1- Rua Gago Coutinho	1	1	1	1	1	1	1	2	2	1	2	2		B	C		B	C	UNIDADE 7	A	B	C	A	B	C	Mercado Vulcano
56	1	12	XIPAMANINE	Rua do Zimabwe	1	0	0	1	0	0	1	0	0	1	0	0	A			A			XIPAMANINE							
57	2	6		Rua dos Irmaos Ruby/Parque Xipamanine-1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			XIPAMANINE							
58	3	6		Rua dos Irmaos Ruby/Parque Xipamanine-2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			XIPAMANINE							
59	4	6		Retiro-Rua da Fatima	1	1	1	1	1	1	0	1	0	0	1	0		B			B		XIPAMANINE							
60	5	6		Escola Unidade 16-Rua da Fatima	1	1	1	1	1	1	0	1	0	0	1	0		B			B		XIPAMANINE							
61	6	6		Bazuca - Rua Irmaos Ruby	1	1	1	1	1	1	1	1	2	1	1	2			C			C	XIPAMANINE	A	B	C	A	B	C	Add collection for informal
62	1	6	Mercado Fajardo	Mercado Fajardo 1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Fajardo							
63	2	6		Mercado Fajardo 2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Fajardo							
64	1	6	Mercado Malanga	Mercado Malanga 1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Malanga							
65	2	6		Mercado Malanga 2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Malanga							
66	1	6	Mercado Xipamanine	Mercado Xipamanine-1 Rua Zixaxa	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Xipamanine							
67	2	6		Mercado Xipamanine-2 Rua Zixaxa	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Xipamanine							
68	3	6		Mercado Xipamanine-3 Rua Zixaxa	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Xipamanine							
69	4	6		Mercado Xipamanine-4 Rua Zixaxa	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Xipamanine							
				KATEMBE																									
1	1	6	CHALI	Chibantchane	1		1		1		1	1	0	1	1	0	A	B			A	B	CHALI							
2	2	6		Firmino	1		1		1		1	1	0	1	1	0	A	B			A	B	CHALI							
3	3	6		Espiga D'ouro	1		1		1		0	0	1	0	0	1			C			C	CHALI							
4	4	6		Mercado Chali	1		1		1		0	0	1	0	0	1			C			C	CHALI							
5	1	6	GUACHENI	Complexo Guimaraes	1		1		1		1	0	0	1	0	0	A			A			GUACHENI							
6	2	6		EPC	1		1		1		1	0	0	1	0	0	A			A			GUACHENI							
7	3	6		Raul	1		1		1		0	1	1	0	1	1		B	C		B	C	GUACHENI							
8	1	6	INCASSANE	Ponto-Final (perto do Quartel)	1		1		1		1	0	0	1	0	0	A			A			INCASSANE							
9	2	6		Assucena	1		1		1		0	1	0	0	1	0		B			B		INCASSANE							
10	3	6		Cemiterio-Incassane	1		1		1		1	0	1	1	0	1	A		C	A		C	INCASSANE							

(2)ME collection plan for DSMAS (KaMaxaquene)

Appendix1: Container collection plan for DSMAS

KaMaxaquene					2nd Collection plan						Total						Primary collection																							
Obs	Nr.	m3	Microempresa	Nome do ponto de contentor	S	T	Q	Q	F	S	S	T	Q	Q	F	S	S	T	Q	Q	F	S	1ME	S	T	Q	Q	F	S	2ME	S	T	Q	Q	F	S	3ME
1	1	6	Mafalala	Av. Angola/Joaquim Chissano Semaforo-1	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Mafalala																	
2	1	6	Maxaquene A	Av.Acordos Lusaka - MICOA 3	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Maxaquene A																	
3	2	6		Av.Acordos Lusaka - ETRAGO	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Maxaquene A																	
4	3	6		Av. Acordos de Lusaka-Estaleiro 1	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Maxaquene A																	
5	4	6		Av.Acordos Lusaka - Balthazar	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Maxaquene A																	
6	5	6		Av.Acordos Lusaka - MICOA 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Maxaquene A																	
7	6	6		Campo 1o de Maio 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Maxaquene A																	
8	1	6	Maxaquene B	Campo 1o de Maio 1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene B																	
9	2	6		50.Mercado Carrimbo-1	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Maxaquene B	A	B	C	A	B	C	Mercado Carrimbo											
10	3	6		Av. Acordos de Lusaka-Estaleiro 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Maxaquene B																	
11	1	6	Maxaquene C	Rua da Resistencia/Joaquim Chissano	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Maxaquene C																	
12	2	6		Micaela - Resistencia 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Maxaquene C																	
13	3	6		Micaela - Resistencia 2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Maxaquene C																	
14	4	6		Av.Vlademir Lenine - Mae Africa	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Maxaquene C																	
15	5	6		Escola primaria de Maguiguana 1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Maxaquene C																	
16	6	6		50.Mercado Carrimbo-2	1	1	1	1	1	1	1	2	2	1	2	2		B	C		B	C	Maxaquene C	A	B	C	A	B	C	Mercado Carrimbo											
17	7	6		Av.Vlademir Lenine - Saul 2	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Maxaquene C																	
18	8	6		Av.Vlademir Lenine - Compone-2 NEW	1	1	1	1	1	1	1	1	2	1	1	2			C			C	Maxaquene C	A	B	C	A	B	C	Mercado Compone											
19	1	6	Maxaquene D	Av.Vlademir Lenine - Compone-1	1	1	1	1	1	1	2	1	1	2	1	1	A			A			Maxaquene D	A	B	C	A	B	C	Mercado Compone											
20	2	6		Rua atras Do Bamco de Mocambique-1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene D																	
21	3	6		Rua atras Do Bamco de Mocambique-2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene D																	
22	4	6		Atras da Soveste-1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene D																	
23	5	6		Atras da Soveste-2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene D																	
24	6	6		Escola primaria de Maguiguana 2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Maxaquene D																	
25	7	6		Campo 1o de Maio 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Maxaquene D																	
26	1	6	Polana Caniço A	Av Julius Nhyerere Ravina2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Polana Caniço A																	
27	2	6		Av.Vlademir Lenine - Saul 1	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Polana Caniço A																	
28	3	6		Av.Vlademir Lenine - Mae Africa	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Polana Caniço A																	
29	4	6		Rua Carlos Cardoso-Ravina-1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Polana Caniço A																	
30	5	6		Rua Carlos Cardoso-Ravina-2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Polana Caniço A																	
31	6	6		Escola Nova de Polana Canico 1	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Polana Caniço A													A	B	C	A	B	C	Mercado Compone
32	7	6		Escola Nova de Polana Canico 2	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Polana Caniço A													A	B	C	A	B	C	Mercado Compone
33	8	6		Rua carlos cardoso-Costa do Sol 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Polana Caniço A																	
34	9	6		Rua carlos cardoso-Costa do Sol 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Polana Caniço A																	
35	10	6		Av.Vlademir Lenine - Compone-1	1	1	1	1	1	1	1	1	2	1	1	2			C			C	Polana Caniço A	A	B	C	A	B	C	Mercado Compone											
36	11	6		Av Julius Nhyerere Ravina1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Polana Caniço A																	
37	1	6	Polana Caniço B	Av.Vlademir Lenine - Compone-2 NEW	1	1	1	1	1	1	2	1	1	2	1	1	A			A			Polana Caniço B	A	B	C	A	B	C	Mercado Compone											
38	2	6		Av.Vlademir Lenine - Canhoeiro	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Polana Caniço B																	
39	3	6		Rua carlos cardoso-Costa do Sol 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Polana Caniço B																	
40	4	6		Rua carlos cardoso-Costa do Sol 2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Polana Caniço B																	
41	5	6		Mercado Peixa- Xiquelene-1	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana											
42	6	6		Mercado Peixa- Xiquelene-2	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana											
43	7	6		Mercado Peixa- Xiquelene-3	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana											
44	8	6		Mercado Peixa- Xiquelene-4	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana											
45	9	6		Escola P. Matchique Tchique-1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Polana Caniço B																	
46	10	6		Escola P. Matchique Tchique-2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Polana Caniço B																	
47	11	6		Igreja Mucorriano-1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Polana Caniço B																	
48	12	6		Igreja Mucorriano-2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Polana Caniço B																	
49	13	6		Golf	1	1	1	1	1	1	0	0	1	0	0	1		C			C		Polana Caniço B																	
50	14	6		Circuito Campo costa de sol	1	1	1	1	1	1	0	0	1	0	0	1		C			C		Polana Caniço B																	
51	1	6	Urbanização	Av. Angola/Joaquim Chissano Semaforo-2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Urbanização																	
52	2	6		Av. Angola atras das Bombas Sasol-1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Urbanização																	
53	3	6		Av. Angola atras das Bombas Sasol-2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Urbanização																	
54	4	6		51.Av. Angola Kia-1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Urbanização																	
55	5	6		51.Av. Angola Kia-2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Urbanização																	
56	6	6		Praca dos Herois - Mercado Mazambanine-1	1	1	1	1	1	1	1	1	2	1	1	2			C			C	Urbanização	A	B	C	A	B	C	Mercado Mazambanine											
57	7	6		Praca dos Herois - Mercado Mazambanine-2	1	1	1	1	1	1	1	1	2	1	1	2			C			C	Urbanização	A	B	C	A	B	C	Mercado Mazambanine											

(2) ME collection plan for DSMAS (KaMukuwane)

Appendix1: Container collection plan for DSMAS

			Kamubukwane		2nd Collection plan						Total						Primary collection													
Obs	Nr.	m3	Microempresa	Nome do ponto de contentor	S	T	Q	Q	F	S	S	T	Q	Q	F	S	S	T	Q	Q	F	S	1ME	S	T	Q	Q	F	S	2ME
1	1	12	25 de Junho A	Av. Mocambique- Construa	1	0	0	1	0	0	1	0	0	1	0	0	A			A			25 de Junho A							
2	2	6		Av. Mocambique - Sede 25 de Junho 1	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	25 de Junho A							
3	3	6		Av. Mocambique - Sede 25 de Junho 2	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	25 de Junho A							
4	1	12	25 de Junho B	Av. Mocambique-Bandaute 1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	25 de Junho B							
5	2	12		Av. Mocambique-Bandaute 2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	25 de Junho B							
6	3	6		Av. Mocambique -Timbila 1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		25 de Junho B							
7	4	6		Av. Mocambique -Timbila 2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		25 de Junho B							
8	5	12		Ponte - Mercado 25 de Junho B	1	1	1	1	1	1	1	2	2	1	2	2		B	C		B	C	25 de Junho B	A	B	C	A	B	C	Mercado 25 de JunhoB
9	1	6	Bagamoyo	Av. Mocambique-UGC 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Bagamoyo							
10	2	6		Av. Mocambique-UGC 2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Bagamoyo							
11	3	6		Av. Mocambique - Carcaca 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Bagamoyo							
12	4	6		Av. Mocambique - Carcaca 2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Bagamoyo							
13	5	12		Esquina Rua Da Paz	1	1	0	0	1	0	0	1	0	0	1	0		B			B		Bagamoyo							
14	6	12		Campo Aeronatica Vedacaoantiga 6m3	1	1	1	0	1	1	0	1	1	0	1	1		B	C		B	C	Bagamoyo							
15	7	12		Mabalawene Rua Da Esquadra	1	0	1	0	0	1	0	0	1	0	0	1			C			C	Bagamoyo							
16	1	12	George Dimitrov	Av. Mocambique - Missao Roque	1	0	0	1	0	0	1	0	0	1	0	0	A			A			George Dimitrov							
17	2	6		Av. Mocambique - Mercado Benfica 1	1	1	1	1	1	1	1	1	1	1	1	1	A			A			George Dimitrov	A	B	C	A	B	C	Mercado Benfica
18	3	6		Av. Mocambique - Mercado Benfica 2	1	1	1	1	1	1	1	1	1	1	1	1	A			A			George Dimitrov	A	B	C	A	B	C	Mercado Benfica
19	4	6		Av. Lurdes Mutola -Estaleiro 1	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		George Dimitrov							
20	5	6		Av. Lurdes Mutola -Estaleiro 2	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		George Dimitrov							
21	6	12		Campo Aeoronautica Civil Vedacao 2	1	1	0	0	1	0	0	1	0	0	1	0		B			B		George Dimitrov							
22	7	12		Campo Aeoronautica Civil Vedacao 1	1	1	0	0	1	0	0	1	0	0	1	0		B			B		George Dimitrov							
23	8	6		Av. Lurdes Mutola- Posto 19 novas Bombas 1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		George Dimitrov							
24	9	6		Av. Lurdes Mutola- Posto 19 novas Bombas 2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		George Dimitrov							
25	10	12		Esquina Rua Da Paz	1	0	1	0	0	1	0	0	1	0	0	1			C			C	George Dimitrov							
26	11	6		Escola Secundaria Mubukwana 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	George Dimitrov							
27	12	6		Escola Secundaria Mubukwana 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	George Dimitrov							
28	1	12	Inhagoia A	Mercado Inhagoia 2 NEW	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Inhagoia A	A	B	C	A	B	C	Mercado Inhagoia
29	2	12		Inhagoia Junto a igreja 1	1	1	1	0	1	1	0	1	1	0	1	1		B	C		B	C	Inhagoia A							
30	1	12	Inhagoia B	Inhagoia Junto a igreja 2	1	1	0	1	1	0	1	1	0	1	1	0	A	B		A	B		Inhagoia B							
31	2	12		Mercado Inhagoia 1	2	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Inhagoia B	A	B	C	A	B	C	Mercado Inhagoia
32	3	6		2M Bombas (Januario)	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Inhagoia B							
33	1	6	Jardim	Ponte Jardim	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
34	2	6		Rua da Agricultura - Electricidade	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
35	3	6		Rua da Agricultura - Rua das Dalias	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
36	4	6		Linha ferrea	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
37	5	6		Escola do Jardim	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
38	6	6		Escola dom Bosco	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
39	7	6		2M	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
40	8	6		Rua do Algodao	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
41	9	6		PRM esquadra do Jardim- carwach	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
42	10	6		Rua das Dalias	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
43	11	6		Rua do Salao	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
44	1	6	Luís Cabral	Atras da Veternaria 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Luís Cabral							
45	2	6		Atras da Veternaria 2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Luís Cabral							
46	3	6		Mercado Luis. Cabral 1	1	1	1	1	1	1	2	2	2	2	2	2	A	B	C	A	B	C	Luís Cabral	A	B	C	A	B	C	Mercado Luis. Cabral
47	4	6		Mercado Luis. Cabral 2	1	1	1	1	1	1	2	2	2	2	2	2	A	B	C	A	B	C	Luís Cabral	A	B	C	A	B	C	Mercado Luis. Cabral
48	5	6		Atras Da Veternaria 3	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Luís Cabral							
49	6	6		Atras Da Volvo	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Luís Cabral							
50	7	6		N4 Volvo 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Luís Cabral							
51	8	6		N4 Volvo 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Luís Cabral							
52	1	6	Magoanine A	Av. Lurdes Mutola - Praca da Juventude 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Magoanine A							
53	2	6		Av. Lurdes Mutola - Praca da Juventude 2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Magoanine A							
54	3	12		Escola Nova De Magoanine	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Magoanine A							
55	4	6		Av. Sebastiao Mabote -Lavandaria Khurula 1	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Magoanine A							
56	5	6		Av. Sebastiao Mabote -Lavandaria Khurula 2	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Magoanine A							
57	6	6		Av. Lurdes Mutola - Fim do Muro da Paiol	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Magoanine A							
58	7	12		Av. Sebastiao Mabote - Borboleta	1	1	1	0	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine A							
59	8	6		Fim do Murro do Aeroporto 1	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine A							
60	9	6		Fim do Murro do Aeroporto 2	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine A							
61	10	6		Avenida Lurdes Mutola - Mesquita	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Magoanine A							
62	1	12	Magoanine B	Av. Sebastiao Mabote - Borboleta	1	0	0	1	0	0	1	0	0	1	0	0	A			A			Magoanine B							
63	2	12		Av. Nelson Mandela- Mercado Mbuzine	1	1	1	1	1	1	1	2	2	1	2	2		B	C		B	C	Magoanine B	A	B	C	A	B	C	Mercado Mbuzine
64	3	6		Minas 1	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
65	4	6		Minas 2	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
66	5	6		Minas 3	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
67	6	6		Minas 4	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
68	7	6		Grande Maputo Igreja Assemblea de Deus Circular1	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
69	8	6		Grande Maputo Igreja Assemblea de Deus Circular2	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
70	1	6	Magoanine C	Av. Nelson Mandela- Campo Sheel1	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Magoanine C							
71	2	6		Av. Nelson Mandela- Campo Sheel2	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Magoanine C							
72	3	6		Mercado Comunitaria Matendene 1	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Magoanine C	A	B	C	A	B	C	Mercado Matendene
73	4	6		Mercado Comunitaria Matendene 2	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Magoanine C	A	B	C	A	B	C	Mercado Matendene
74	5	12		Cemiterio de Zimpeto 2 NEW	1	0	1	0	0	1	0	0	1	0	0	1			C			C	Magoanine C							
75	6	6		Av. Nelson Mandela & Grande Maputo Estaleiro	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Magoanine C							
76	1	6	Malhazine	Campo de Malhazine 1	1	1	1	1	1	1	2	2	2	2	2	2	A	B	C	A	B	C	Malhazine	A	B	C	A	B	C	Mercado Malhazine
77	2	6		Campo de Malhazine 2	1	1	1	1	1	1	2	2	2	2	2	2	A	B	C	A	B	C	Malhazine	A	B	C	A	B	C	Mercado Malhazine
78	3	6		Av. Lurdes Mutola - Fim do Muro da Paiol	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Malhazine							
79	1	12	Nsalene	Av. Mocambique- Chapa Xai-xai	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Nsalene							
80	1	6	Zimpeto	Av. Mocambique-MozBrake 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Zimpeto							
81	2	6		Av. Mocambique-MozBrake 2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Zimpeto							
82	3	6		Av. Mocambique-Depois do control Zimpeto1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Zimpeto							
83	4	6		Av. Mocambique-Depois do control Zimpeto2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Zimpeto							
84	5	12		Vila Olimpia Extremo Sul	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
85	6	12		Extremo Norte vila olimpica	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
86	7	12		Extremo Norte Grande Maputo	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
87	8	6		Av. Mocambique-Terreno Mabor 1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
88	9	6		Av. Mocambique-Terreno Mabor 2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
89	10	6		Condominio Grande Maputo CM 1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
90	11	6		Condominio Grande Maputo CM 2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
91	12	12		Cemiterio de Zimpeto 1	1	0	1	1	0	1	1	0	1	1	0	1	A		C	A		C	Zimpeto							
92	13	6		Rua dos Leos 1	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Zimpeto							
93	14	6		Rua dos Leos 2	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Zimpeto							
94	15	6		Av. Mocambique- Mercado 25 de Setembro 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Zimpeto							
95	16	6		Av. Mocambique- Mercado 25 de Setembro 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Zimpeto							
96	1	12	Mercado Bagamoyo	Mercado Bagamoyo	1		1		1		1	0	1	0	1	0	A		C		B		Mercado Bagamoyo							
97	1	6	Mercado Jardim	Mercado Jardim (1)	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Jardim							
98	2	6		Mercado Jardim (2)	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Jardim							
99	1	6	Mercado Drive in	Avenida de Mocambique-Drive in	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Drive in							
100	1	12	Mercado Grossista	Mercado Grossista Zimpeto	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Grossista							
101	2	12		Mercado Grossista Zimpeto	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Grossista							
102	1	12	Anexo Grossista	Anexo Grossista	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Anexo Grossista							
103	2	12		Anexo Grossista (Terminal de Transporte -1)	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Anexo Grossista							
104	3	12		Anexo Grossista (Terminal de Transporte -2)	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Anexo Grossista							

(2) ME collection plan for DSMAS (KaMavota)

Appendix1: Container collection plan for DSMAS

Obs	Nr.	m3	ME	KaMavota Name of Container point	2nd Collection plan S	T	Q	Q	F	S	Total S	T	Q	Q	F	S	Primary collection S	T	Q	Q	F	S	1ME	2ME S	T	Q	Q	F	S	2ME
1	1	6	3 de Fevereiro	Av. Juluis Nherere-PT Magoanine 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			3 de Fevereiro							
2	2	6		Rua Da Impazol -Maogeira 1	1	1	1	1	1	1	1	2	1	1	2	1		B			B		3 de Fevereiro	A	B	C	A	B	C	Mercado
3	3	6		Rua Da Impazol -Maogeira 2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		3 de Fevereiro							
4	4	12		Av. Dom Alexandre- Muro Pindada Vodacom	1	0	1	0	0	1	0	0	1	0	0	1			C			C	3 de Fevereiro							
5	1	12	Albazine	Av. Dom Alexandre Estaleiro Monica	1	0	0	1	0	0	1	0	0	1	0	0	A			A			Albazine							
6	2	12		Av. Dom Alexandre Escola Primaria Albazine	1	0	0	1	0	0	1	0	0	1	0	0	A			A			Albazine							
7	3	12		Av. Dom Alexandre Farmacia Africa	1	1	0	0	1	0	0	1	0	0	1	0		B			B		Albazine							
8	4	12		Av. Dom Alexandre Escola Secundaria Albazine	1	1	0	0	1	0	0	1	0	0	1	0		B			B		Albazine							
9	5	12		Ao Longo da Linha Feira Chicabele	1	0	1	0	0	1	0	0	1	0	0	1			C			C	Albazine							
10	6	6		20 casas	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Albazine							
11	1	6	Costa do Sol	Escola primaria do Triunfo	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Costa do sol							
12	2	6		Pontinha - Costa do sol	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Costa do sol							
13	3	6		Rua de Mangal	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Costa do sol							
14	4	6		Rua dos Continuadores	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Costa do sol							
15	5	6		Igreja Testemunha de Jeova	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Costa do sol							
16	6	6		Dona Alice -Chapa Munguambe Sucata Metal atras do muro MEA PAZ	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Costa do Sol							
17	7	6		Quarteirao 46 Costa do Sol	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Costa do Sol							
18	8	6		Mapulene 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Costa do sol							
19	9	6		Bairro dos pescadores 1	1	1	1	1	1	1	1	1	2	1	1	2			C			C	Costa do Sol	A	B	C	A	B	C	Mercado
20	10	6		Bairro dos pescadores 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Costa do Sol							
21	1	6	Ferroviário	Av. Juluis Nhyrere- Ponte Ferroviario 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Ferroviário							
22	2	6		**Av.Julius Nyerere- Rua de Complexo 3 NEW**	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Ferroviário							
23	3	6		Campo Ferroviario 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Ferroviário							
24	4	6		Campo Ferroviario 2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Ferroviário							
25	5	6		Av. Juluis Nhyerere-Chapa Amarelo 2	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Ferroviário							
26	6	6		Centro de Saude 1 de Junho 1	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Ferroviário							
27	7	6		Centro de Saude 1 de Junho 2	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Ferroviário							
28	8	12		Fertiliza	1	0	1	1	0	1	1	0	1	1	0	1	A		C	A		C	Ferroviário							
29	9	6		Junto Ao 1 Andar 1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Ferroviário							
30	10	6		Junto Ao 1 Andar 2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Ferroviário							
31	11	12		Quarterao 13	1	0	1	0	0	1	0	0	1	0	0	1			C			C	Ferroviário							
32	12	6		Vila Sol 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Ferroviário							
33	13	6		Vila Sol 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Ferroviário							
34	1	6	FPLM	AV. FPLM Cruz Vermelho 1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	FPLM							
35	2	6		AV. FPLM Cruz Vermelho 2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	FPLM							
36	3	6		Av.FPLM Hospital Mavalane 2	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		FPLM							
37	4	6		Av. Juluis Nhyrere- Ponte Ferroviario 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	FPLM							
38	5	6		Mercado Informal de Mbusine	1	1	1	1	1	1	0	0	1	0	0	1			C			C	FPLM							
39	1	6	Hulene A	Av. Juluis Nhyerere-Chapa Amarelo 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Hulene A							
40	2	6		**Av.Julius Nyerere- Rua de Complexo 4 NEW**	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Hulene A							
41	3	6		Rua da Beira - Feira de Hulene 2	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Hulene A							
42	4	12		Rua Da Beira Taka Nha	1	0	1	0	0	1	0	1	1	0	1	1		B	C		B	C	Hulene A							
43	5	12		Rua Da Beira Mercado Mavalane	1	0	1	0	0	1	0	0	1	0	0	1			C			C	Hulene A							
44	6	6		Rua da Beira 2 (Sitoe)	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Hulene A							
45	1	6	Hulene B	Rua da Beira 1 (Sitoe)	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Hulene B							
46	2	12		Rua Da Beira Taka Nha	1	0	0	1	0	0	1	1	0	1	1	0	A	B		A	B		Hulene B							
47	3	6		Rua da Beira - Feira de Hulene 1	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Hulene B							
48	4	6		Atras da Shoprite Magoanine 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Hulene B							
49	5	6		Atras da Shoprite Magoanine 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Hulene B							
50	6	6		Av. Lurdes Mutola - Praca da Juventude 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Hulene B							
51	7	6		Av. Lurdes Mutola - Praca da Juventude 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Hulene B							
52	8	6		Av. Juluis Nherere-PT Magoanine 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Hulene B							
53	1	12	Laulane	Rua Da Beira Estaleiro Dragao	1	0	0	1	0	0	1	0	0	1	0	0	A			A			Laulane							
54	2	6		Governo da cidade Maputo a frente 1	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Laulane							
55	3	6		Governo da cidade Maputo a frente 2	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Laulane							
56	4	6		Governo da Cidade Maputo atras 1	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Laulane							
57	5	6		Governo da Cidade Maputo atras 2	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Laulane							
58	6	6		Mercado Maguiguana 1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Laulane							
59	7	6		Mercado Maguiguana 2	1	1	1	1	1	1	1	2	1	1	2	1		B			B		Laulane	A	B	C	A	B	C	Mercado
60	8	6		Procuradoria 1	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Laulane							
61	9	6		Procuradoria 2	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Laulane							
62	10	12		Antena da Vodacom	1	0	1	0	0	1	0	0	1	0	0	1			C			C	Laulane							
63	11	6		Av. Dom Alxandre 14 de Novembro 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Laulane							
64	12	6		Av. Dom Alxandre 14 de Novembro 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Laulane							
65	1	6	Mahotas	Ceração 1	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mahotas							
66	2	6		Ceração 2	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mahotas							
67	3	12		Mercado Romao	1	1	0	0	1	0	0	1	0	0	1	0		B			B		Mahotas							
68	4	6		Pontinha - Romao	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Mahotas							
69	5	6		Av. Dom Alxandre Bombas Pumas 1	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Mahotas							
70	6	6		Av. Dom Alxandre Bombas Pumas 2	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Mahotas							
71	7	12		Ao Longo da Linha Feira Chicabele	1	1	0	0	1	0	0	1	0	0	1	0		B			B		Mahotas							
72	8	6		Cemitério Guebo 1	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Mahotas							
73	9	6		Cemitério Guebo 2	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Mahotas							
74	10	12		Av. Dom Alexandre Farmacia Africa	1	0	1	0	0	1	0	0	1	0	0	1			C			C	Mahotas							
75	11	6		Av. Sebastiao Mabote -Lavandaria Khurula 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Mahotas							
76	12	6		Av. Sebastiao Mabote -Lavandaria Khurula 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Mahotas							
77	1	6	Mavalane A	Av. FPLM Centro de Saude Mavalane 2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Mavalane A							
78	2	6		Av.FPLM Hospital Mavalane 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Mavalane A							
79	3	6		Praca dos Herois - Eucalipto 2	1	1	1	1	1	1	1	0	1	1	0	1	A		C	A		C	Mavalane A							
80	4	12		Rua Da Beira Mercado Mavalane 1	1	1	0	0	1	0	0	1	0	0	1	0		B			B		Mavalane A							
81	5	12		Rua Da Beira TTA	1	1	1	0	1	1	0	1	1	0	1	1		B	C		B	C	Mavalane A							
82	1	6	Mavalane B	Av. Juluis Nhyrere- Ponte Ferroviario 2	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Mavalane B							
83	2	6		Av. FPLM Centro de Saude Mavalane 1	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Maxaquene D							
84	3	6		Av.Julius Nyerere- Rua de Complexo 1	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Mavalane B							
85	4	6		**Av.Julius Nyerere- Rua de Complexo 2 NEW**	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Mavalane B							
86	5	6		Rua da Beira 1 (Sitoe)	1	1	1	1	1	1	0	1	0	0	1	0		B			B		Mavalane B							
87	6	12		**Rua Da Beira Mercado Mavalane 2 NEW**	1	1	1	1	1	1	1	2	2	1	2	2		B	C		B	C	Mavalane B	A	B	C	A	B	C	Mercado
88	7	6		Av. FPLM Centro de Saude Mavalane 2	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Mavalane B							
89	8	6		Praca dos Herois - Eucalipto 1	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Urbanização							

(1) Container list for TOR (Nlhamanculo)

		CONT NAME	Longitude	Latitude
1	12	Entrada da Base Aerea - Av. 19 de Outubro	32.562085	-25.922761
2	12	Campo Base Aerea - Av. 19 de Outubro	32.562580	-25.930900
3	12	007-Rua Gago Coutinho	32.573491	-25.930688
4	12	Rua Gago Coutinho - Igreja Catolica	32.571065	-25.931221
5	12	Igreja Assembleia-Rua Gago Coutinho	32.568471	-25.931993
6	12	Escola Unidade 18 -Rua Gago Coutinho	32.566439	-25.932545
7	12	Cape-Cape-Campo - Rua 2.282	32.555710	-25.943592
8	12	10– Esquadra - Rua de Xipamanine	32.562421	-25.935345
9	12	Rua do Zimabwe	32.566486	-25.941054
10	12	Sao Joaquim Rua Zambeze	32.568872	-25.943809
10	**120m3**			
1	6	Mercado Vulcano 1- Rua Gago Coutinho	32.562462	-25.933316
2	6	Mercado Vulcano 2- Rua Gago Coutinho	32.562462	-25.933316
3	6	Zixaxa 1- Rua do Zixaxa Nr. 2.302	32.560600	-25.935774
4	6	Zixaxa 2- Rua do Zixaxa Nr. 2.302	32.560600	-25.935774
5	6	Naggi 1-Rua Gago Coutinho	32.556682	-25.935110
6	6	Naggi 2-Rua Gago Coutinho	32.556682	-25.935110
7	6	Terminal da Junta-1	32.550818	-25.935218
8	6	Terminal da Junta-2	32.550818	-25.935218
9	6	Lhanguene-Av. Mozambique-1	32.545892	-25.940547
10	6	Lhanguene-Av. Mozambique-2	32.545892	-25.940547
11	6	Mega CASH and CARRY	32.541927	-25.946280
12	6	Up-Av. Trabalho-1	32.543945	-25.944700
13	6	Up-Av. Trabalho-2	32.543945	-25.944700
14	6	Ufa-1 Rua 2.276	32.552701	-25.948462
15	6	Ufa-2 Rua 2.276	32.552701	-25.948462
16	6	Coca-cola-Rua lago Maramba-1	32.550864	-25.950301
17	6	Coca-cola-Rua lago Maramba-2	32.550864	-25.950301
18	6	Rotunda 16 de Junho-1 Av. OUA	32.553406	-25.953362
19	6	Rotunda 16 de Junho-2 Av. OUA	32.553406	-25.953362
20	6	Saida da ponte Maputo Katembe - Av. 24 de Julho	32.556133	-25.955219
21	6	LOUMAR1	32.556625	-25.958017
22	6	LOUMAR2	32.558002	-25.959057
23	6	STAE - Av. 24 de Julho	32.559685	-25.957378
24	6	Igreja Anglicana	32.560860	-25.955959
25	6	Mercado Malanga 1	32.558517	-25.953579
26	6	Mercado Malanga 2	32.558636	-25.953621
27	6	Chamanculo A-1	32.558160	-25.952179
28	6	Chamanculo A-2	32.558160	-25.952179
29	6	Mercado Fajardo 1	32.560551	-25.954491
30	6	Mercado Fajardo 2	32.560303	-25.954346
31	6	Colombia - Rua Major Teixeira Pinto-1	32.564843	-25.955253
32	6	Colombia - Rua Major Teixeira Pinto-2	32.564843	-25.955253
33	6	Campo de Mahafil-Rua Mateteu	32.565144	-25.951962
34	6	Retiro-Rua da Fatima	32.564850	-25.949942
35	6	Escola Unidade 16-Rua da Fatima	32.561401	-25.949450
36	6	Zanza-1 Rua Marcelino dos Santos	32.559326	-25.946500
37	6	Zanza-2 Rua Marcelino dos Santos-2	32.559326	-25.946500
38	6	Bazuca - Rua Irmaos Ruby	32.562431	-25.940529
39	6	Rua dos Irmaos Ruby/Parque Xipamanine-1	32.563955	-25.944543
40	6	Rua dos Irmaos Ruby/Parque Xipamanine-2	32.563955	-25.944543
41	6	Mercado Xipamanine-1 Rua Zixaxa	32.562923	-25.946209
42	6	Mercado Xipamanine-2 Rua Zixaxa	32.563271	-25.946194
43	6	Mercado Xipamanine-3 Rua Zixaxa	32.563271	-25.946194
44	6	Mercado Xipamanine-4 Rua Zixaxa	32.563271	-25.946194
45	6	Xibamate 1- Av. De Angola	32.570200	-25.948600
46	6	Xibamate 2- Av. De Angola	32.570500	-25.948400
47	6	Xibamate 3- Av. De Angola	32.570500	-25.948400
48	6	CETA 1-Centro de Saude de Xipamanine - Av. Joaquim Chissano	32.566179	-25.937561
49	6	CETA 2-Centro de Saude de Xipamanine - Av. Joaquim Chissano	32.566179	-25.937561
50	6	CETA 3-Centro de Saude de Xipamanine - Av. Joaquim Chissano	32.566179	-25.937561
51	6	Av. Mocambique- jardim Zoologico 1	32.556915	-25.927295
52	6	Av. Mocambique- jardim Zoologico 2	32.556915	-25.927295
52	**312m3**			
1	6	Ponto-Final (perto do Quartel)	32.524292	-25.988365
2	6	Assucena	32.531355	-25.993878
3	6	Cemiterio-Incassane	32.530023	-26.006760
4	6	Mercado Chali	32.559395	-26.008022
5	6	Chibantchane	32.568661	-26.013409
6	6	Firmino	32.564775	-26.032139
7	6	Espiga D'ouro	32.570944	-26.020809
8	6	Complexo Guimaraes	32.557790	-25.980115
9	6	EPC	32.557865	-25.983403
10	6	Raul	32.557116	-25.993233
10	**60m3**			
62	**492m3**			

(1) Container list for TOR (KaMaxaquene)

Nr.	m3	Namo of container point	longitude F	latitude F
1	6	51.Av. Angola Kia-1	32.57532	-25.93622
2	6	51.Av. Angola Kia-2	32.57532	-25.93622
3	6	Av. Angola atras das Bombas Sasol-1	32.57555	-25.94170
4	6	Av. Angola atras das Bombas Sasol-2	32.57555	-25.94170
5	6	Av. Angola/Joaquim Chissano Semaforo-1	32.57270	-25.94474
6	6	Av. Angola/Joaquim Chissano Semaforo-2	32.57270	-25.94474
7	6	Praca dos Herois - Mercado Mazambanine-1	32.57921	-25.93461
8	6	Praca dos Herois - Mercado Mazambanine-2	32.57921	-25.93461
9	6	Av.Acordos Lusaka - MICOA 1	32.57962	-25.93696
10	6	Av.Acordos Lusaka - Balthazar	32.57917	-25.93924
11	6	Av.Acordos Lusaka - MICOA 3	32.57921	-25.94045
12	6	Av.Acordos Lusaka - ETRAGO	32.57909	-25.94165
13	6	Av. Acordos de Lusaka-Estaleiro 1	32.57877	-25.94384
14	6	Av. Acordos de Lusaka-Estaleiro 2	32.57877	-25.94384
15	6	Campo 1o de Maio 1	32.58639	-25.93472
16	6	Campo 1o de Maio 2	32.58517	-25.93653
17	6	Rua atras Do Bamco de Mocambique-1	32.58929	-25.93335
18	6	Rua atras Do Bamco de Mocambique-2	32.58929	-25.93335
19	6	Atras da Soveste-1	32.59597	-25.93008
20	6	Atras da Soveste-2	32.59597	-25.93008
21	6	Escola primaria de Maguiguana 1	32.59595	-25.93615
22	6	Escola primaria de Maguiguana 2	32.59595	-25.93615
23	6	50.Mercado Carrimbo-1	32.58835	-25.94591
24	6	50.Mercado Carrimbo-2	32.58835	-25.94591
25	6	Rua da Resistencia/Joaquim Chissano	32.58816	-25.95111
26	6	Micaela - Resistencia 1	32.58934	-25.94929
27	6	Micaela - Resistencia 2	32.58934	-25.94929
28	6	Av.Vlademir Lenine - Mae Africa	32.59423	-25.94537
29	6	Av.Vlademir Lenine - Saul 1	32.59546	-25.94366
30	6	Av.Vlademir Lenine - Saul 2	32.59418	-25.94518
31	**6**	Av.Vlademir Lenine - Compone-2	32.60091	-25.93629
32	6	Av.Vlademir Lenine - Compone-1	32.60091	-25.93629
33	6	Av.Vlademir Lenine - Canhoeiro	32.60320	-25.93265
34	6	Escola Nova de Polana Canico 1	32.60451	-25.93797
35	6	Escola Nova de Polana Canico 2	32.60451	-25.93797
36	6	Rua Carlos Cardoso-Ravina-1	32.60670	-25.94201
37	6	Rua Carlos Cardoso-Ravina-2	32.60670	-25.94201
38	6	Rua carlos cardoso-Costa do Sol 1	32.60743	-25.93455
39	6	Rua carlos cardoso-Costa do Sol 2	32.60743	-25.93455
40	6	Mercado Peixa- Xiquelene-1	32.60743	-25.93028
41	6	Mercado Peixa- Xiquelene-2	32.60743	-25.93028
42	6	Mercado Peixa- Xiquelene-3	32.60743	-25.93028
43	6	Mercado Peixa- Xiquelene-4	32.60743	-25.93028
44	6	Escola P. Matchique Tchique-1	32.61325	-25.92903
45	6	Escola P. Matchique Tchique-2	32.61325	-25.92903
46	6	Igreja Mucorriano-1	32.61186	-25.93096
47	6	Igreja Mucorriano-2	32.61186	-25.93096
48	6	Av Julius Nhyerere Ravina1	32.60937	-25.93799
49	6	Av Julius Nhyerere Ravina2	32.60854	-25.94148
50	6	Golf	32.61358	-25.93953
51	6	Circuito Campo costa de sol	32.61702	-25.94154
	306m3	**TOTAL**		

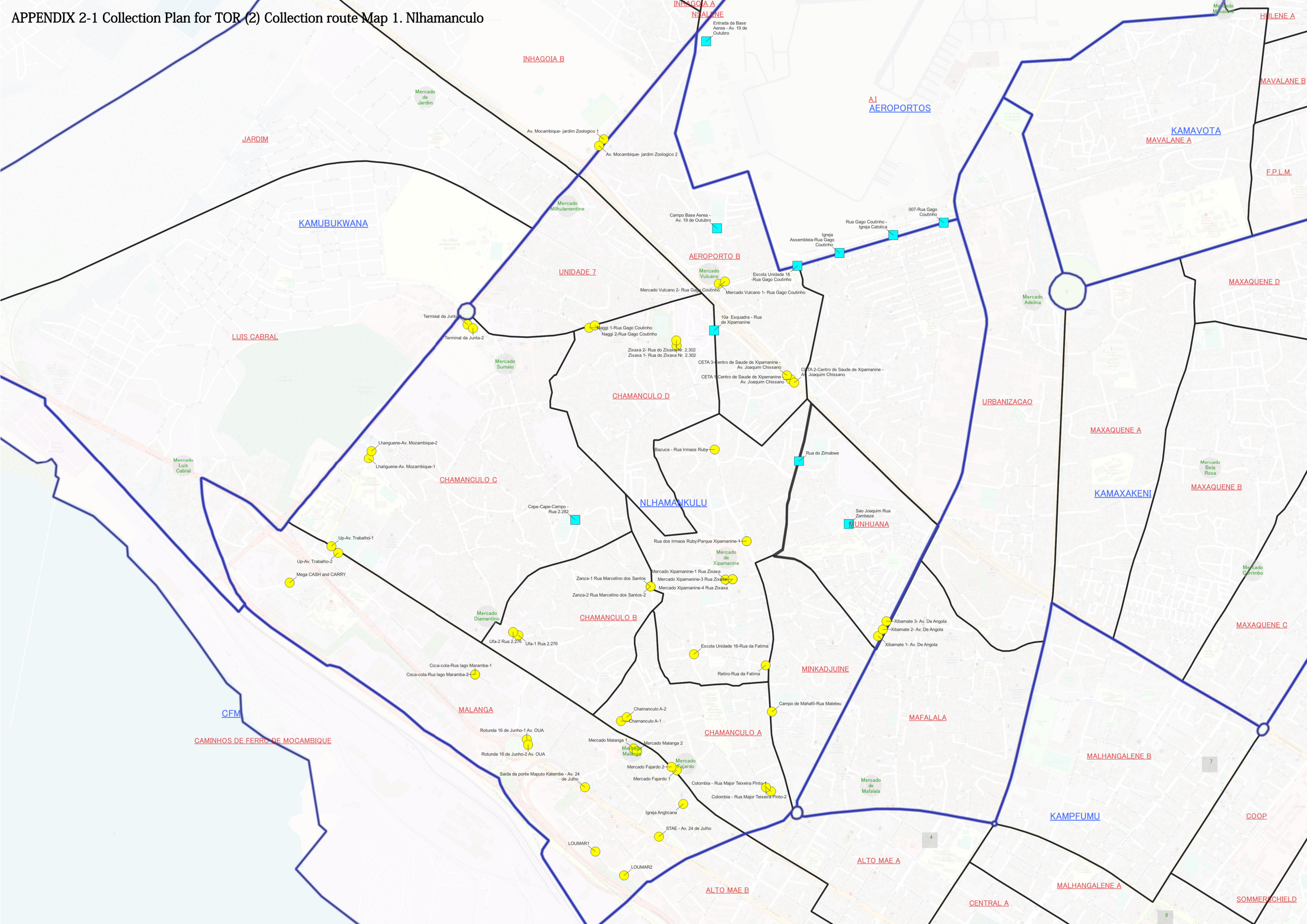
(1) Container list for TOR (KaMubukuwane)

Tr.	m3	Name of the container point	Longitude	Latitude
1	12	Inhagoia Junto a igreja 1	32.5553932	-25.9179630
2	12	Inhagoia Junto a igreja 2	32.5554848	-25.9179230
3	12	Mercado Inhagoia	32.5601387	-25.9194698
4	12	Mercado Inhagoia2	32.5601387	-25.9194698
5	12	Av. Mocambique- Chapa Xai-xai	32.5652122	-25.9161358
6	12	Av. Mocambique- Construa	32.5653572	-25.9102230
7	12	Ponte - Mercado 25 de Junho B	32.5655654	-25.9077357
8	12	Av. Mocambique-Bandaute 1	32.5659370	-25.9057732
9	12	Av. Mocambique-Bandaute 2	32.5659370	-25.9057732
10	12	Mercado Bagamoio	32.5727158	-25.8973064
11	12	Esquina Rua Da Paz	32.5812607	-25.8956051
12	12	Campo Aeronatica Vedacaoantiga 6m3	32.5751877	-25.8916054
13	12	Mabalawene Rua Da Esquadra	32.5718155	-25.8912449
14	12	Campo Aeoronautica Civil Vedacao 2	32.5727272	-25.8870506
15	12	Campo Aeoronautica Civil Vedacao 1	32.5758209	-25.8874435
16	12	Av. Mocambique - Missao Roque	32.5675850	-25.8788719
17	12	Escola Nova De Magoanine	32.5988197	-25.8746281
18	12	Av. Sebastiao Mabote - Borboleta	32.6196671	-25.8577251
19	12	Av. Nelson Mandela- Mercado Mbuzine	32.6011772	-25.8338947
20	12	Vila Olimpia Extremo Sul	32.5815506	-25.8321915
21	12	Cemiterio de Zimpeto 1	32.5866241	-25.8333035
22	12	Cemiterio de Zimpeto 2	32.5866241	-25.8333035
23	12	Extremo Norte vila olimpica	32.5850830	-25.8216686
24	12	Extremo Norte Grande Maputo	32.5849648	-25.8215008
25	12	Mercado Grossista Zimpeto	32.5717583	-25.8324661
26	12	Mercado Grossista Zimpeto	32.5718880	-25.8324814
27	12	Anexo Grossista	32.5721779	-25.8335075
28	12	Anexo Grossista (Terminal de Transporte -1)	32.5701027	-25.8305912
29	12	Anexo Grossista (Terminal de Transporte -2)	32.5698471	-25.8306065
29	**348m3**	Total		
1	6	Atras Da Volvo	32.5382300	-25.9442000
2	6	N4 Volvo 1	32.5379448	-25.9420395
3	6	N4 Volvo 2	32.5379448	-25.9420395
4	6	Mercado Luis. Cabral 1	32.5350761	-25.9402466
5	6	Mercado Luis. Cabral 2	32.5350761	-25.9402466
6	6	Atras da Veternaria 1	32.5462112	-25.9305973
7	6	Atras da Veternaria 2	32.5462112	-25.9305973
8	6	Atras Da Veternaria 3	32.5473600	-25.9333000
9	6	Ponte Jardim	32.5530300	-25.9315700
10	6	Rua da Agricultura - Electricidade	32.5537500	-25.9302300
11	6	Rua da Agricultura - Rua das Dalias	32.5518100	-25.9289700
12	6	Linha ferrea	32.5500000	-25.9289000
13	6	Escola do Jardim	32.5492700	-25.9273400
14	6	Escola dom Bosco	32.5454900	-25.9270700
15	6	2M	32.5441100	-25.9248100
16	6	2M Bombas (Januario)	32.5460900	-25.9220100
17	6	Rua do Algodao	32.5469000	-25.9236500
18	6	Mercado Jardim (1)	32.5475200	-25.9241000
19	6	Mercado Jardim (2)	32.5481100	-25.9249100
20	6	PRM esquadra do Jardim- carwach	32.5514400	-25.9267300
21	6	Rua das Dalias	32.5529200	-25.9276600
22	6	Rua do Salao	32.5532700	-25.9284400
23	6	Av. Mocambique - Sede 25 de Junho 1	32.5589333	-25.9062691
24	6	Av. Mocambique - Sede 25 de Junho 2	32.5589333	-25.9062691
25	6	Av. Mocambique-UGC 1	32.5631180	-25.8983631
26	6	Av. Mocambique-UGC 2	32.5631180	-25.8983631
27	6	Av. Mocambique-MozBrake 1	32.5656242	-25.8638363
28	6	Av. Mocambique-MozBrake 2	32.5656242	-25.8638363
29	6	Av. Mocambique- Mercado 25 de Setembro 1	32.5687294	-25.8452396
30	6	Av. Mocambique- Mercado 25 de Setembro 2	32.5687294	-25.8452396
31	6	Rua dos Leos 1	32.5762596	-25.8474216
32	6	Rua dos Leos 2	32.5762596	-25.8474216
33	6	Av. Nelson Mandela- Campo Sheel1	32.5836182	-25.8454971
34	6	Av. Nelson Mandela- Campo Sheel2	32.5836182	-25.8454971
35	6	Mercado Comunitaria Matendene 1	32.5939102	-25.8464165
36	6	Mercado Comunitaria Matendene 2	32.5939102	-25.8464165
37	6	Minas 1	32.6216023	-25.8332294
38	6	Minas 2	32.6216023	-25.8332294
39	6	Minas 3	32.6216023	-25.8332294
40	6	Minas 4	32.6216023	-25.8332294
41	6	Grande Maputo Igreja Assemblea de Deus Circular 1	32.6076241	-25.8284359
42	6	Grande Maputo Igreja Assemblea de Deus Circular 2	32.6076241	-25.8284359
43	6	Av. Nelson Mandela & Grande Maputo Estaleiro	32.6024500	-25.8269500
44	6	Condominio Grande Maputo CM 1	32.5766700	-25.8194800
45	6	Condominio Grande Maputo CM 2	32.5766200	-25.8195600
46	6	Av. Mocambique-Depois do control Zimpeto1	32.5710030	-25.8231659
47	6	Av. Mocambique-Depois do control Zimpeto2	32.5710030	-25.8231659
48	6	Avenida de Mocambique-Drive in	32.5704000	-25.8268300
49	6	Av. Mocambique-Terreno Mabor 1	32.5689735	-25.8374062
50	6	Av. Mocambique-Terreno Mabor 2	32.5689735	-25.8374062
51	6	Av. Lurdes Mutola -Estaleiro 1	32.5718422	-25.8759441
52	6	Av. Lurdes Mutola -Estaleiro 2	32.5718422	-25.8759441
53	6	Av. Lurdes Mutola- Posto 19 novas Bombas 1	32.5802879	-25.8781052
54	6	Av. Lurdes Mutola- Posto 19 novas Bombas 2	32.5802879	-25.8781052
55	6	Av. Lurdes Mutola - Fim do Muro da Paiol	32.5907500	-25.8795400
56	6	Av. Lurdes Mutola - Praca da Juventude 1	32.6040077	-25.8825283
57	6	Av. Lurdes Mutola - Praca da Juventude 2	32.6040077	-25.8825283
58	6	Avenida Lurdes Mutola - Mesquita	32.6018500	-25.8823700
59	6	Fim do Murro do Aeroporto 1	32.5966339	-25.8810368
60	6	Fim do Murro do Aeroporto 2	32.5966339	-25.8810368
61	6	Campo de Malhazine 1	32.5861320	-25.8803329
62	6	Campo de Malhazine 2	32.5861320	-25.8803329
63	6	Escola Secundaria Mubukwana 1	32.5828094	-25.8874893
64	6	Escola Secundaria Mubukwana 2	32.5828094	-25.8874893
65	6	Av. Mocambique - Mercado Benfica 1	32.5653000	-25.8888836
66	6	Av. Mocambique - Mercado Benfica 2	32.5653000	-25.8888836
67	6	Av. Mocambique - Carcaca 1	32.5657387	-25.9047699
68	6	Av. Mocambique - Carcaca 2	32.5657387	-25.9047699
69	6	Av. Mocambique -Timbila 1	32.5655060	-25.9145050
70	6	Av. Mocambique -Timbila 2	32.5655060	-25.9145050
70	**420m3**	Total		

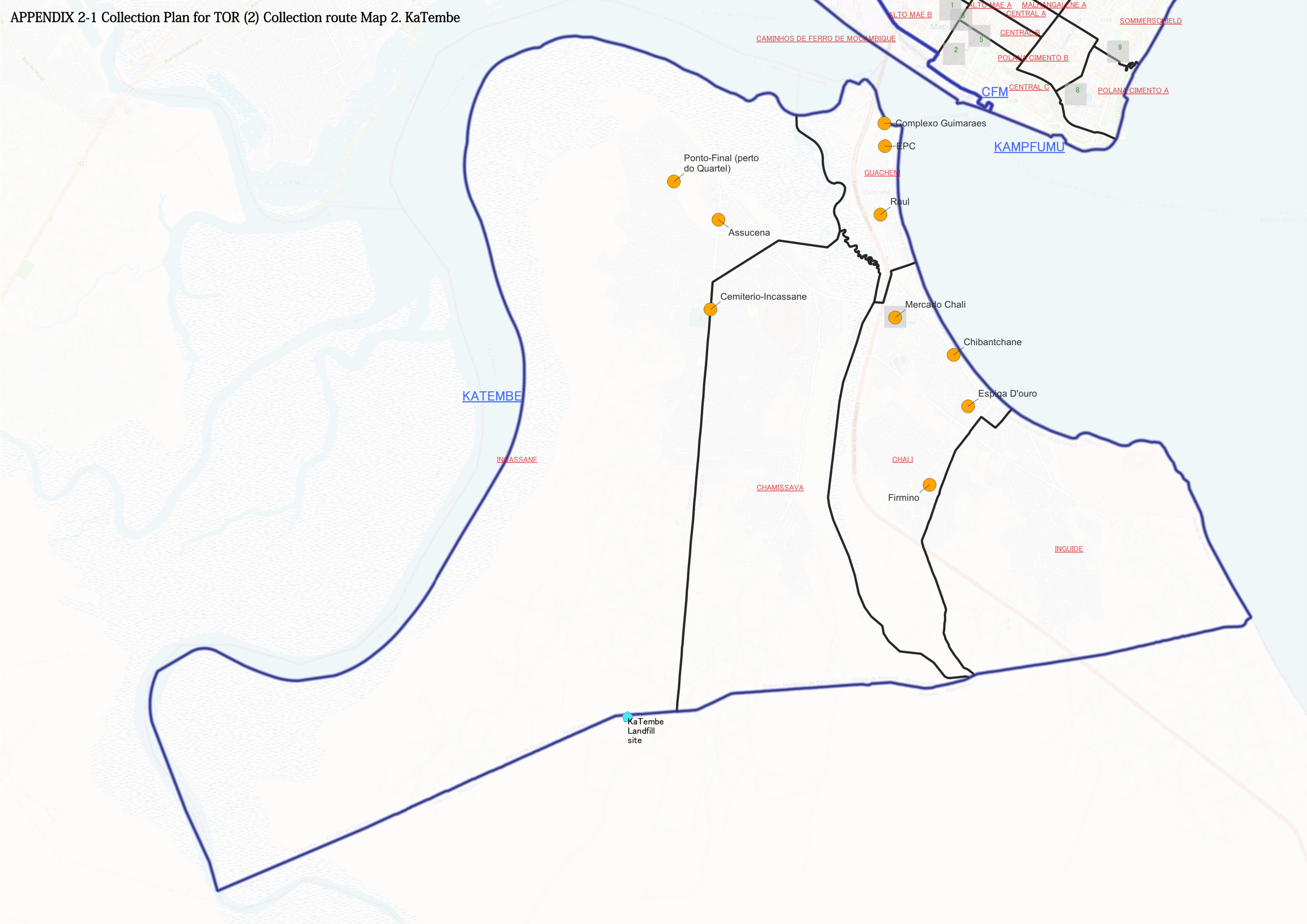
(1) Container list for TOR (KaMavota)

Nr.	m3	Name of Container point	longitude	latitude
1	12	Fertiliza	32.609268	-25.920803
2	12	Quarterao 13	32.616222	-25.919107
3	12	Rua Da Beira Estaleiro Dragao	32.602760	-25.906931
4	12	Rua Da Beira Taka Nha	32.592133	-25.915010
5	12	Rua Da Beira Mercado Mavalane 1	32.586000	-25.922000
6	12	Rua Da Beira Mercado Mavalane 2	32.586000	-25.922000
7	12	Rua Da Beira TTA	32.581173	-25.922514
8	12	Antena da Vodacom	32.617702	-25.900510
9	12	Av. Dom Alexandre- Muro Pindada Vodacom	32.619900	-25.892248
10	12	Av. Dom Alexandre Farmacia Africa	32.628998	-25.856705
11	12	Av. Dom Alexandre Escola Secundaria Albazine	32.632679	-25.848309
12	12	Av. Dom Alexandre Estaleiro Monica	32.634056	-25.844820
13	12	Av. Dom Alexandre Escola Primaria Albazine	32.636719	-25.842516
14	12	Ao Longo da Linha Feira Chicabele	32.637371	-25.859655
15	12	Mercado Romao	32.632771	-25.870972
15	**180m3**			
1	6	Dona Alice-Chapa Munguambe Sucata Metal atras do muro MEA PAZ	32.634010	-25.900633
2	6	Quarteirao 46 Costa do Sol	32.644066	-25.908276
3	6	Mapulene 1	32.660554	-25.885710
4	6	Bairro dos pescadores 1	32.658382	-25.904261
5	6	Bairro dos pescadores 2	32.659679	-25.901217
6	6	Escola primaria do Triunfo	32.636379	-25.925289
7	6	Pontinha - Costa do sol	32.631508	-25.923475
8	6	Rua de Mangal	32.633274	-25.919661
9	6	Vila Sol 1	32.628520	-25.916799
10	6	Vila Sol 2	32.628680	-25.916844
11	6	Rua dos Continuadores	32.631099	-25.927476
12	6	Igreja Testemunha de Jeova	32.629040	-25.931074
13	6	Praca dos Herois - Eucalipto 1	32.580040	-25.932121
14	6	Praca dos Herois - Eucalipto 2	32.580040	-25.932121
15	6	Av. FPLM Centro de Saude Mavalane 1	32.587662	-25.931366
16	6	Av. FPLM Centro de Saude Mavalane 2	32.587662	-25.931366
17	6	Av.FPLM Hospital Mavalane 1	32.584152	-25.930176
18	6	Av.FPLM Hospital Mavalane 2	32.584152	-25.930176
19	6	AV. FPLM Cruz Vermelho 1	32.597965	-25.928268
20	6	AV. FPLM Cruz Vermelho 2	32.597965	-25.928268
21	6	Mercado Informal de Mbusine	32.603096	-25.926405
22	6	Av. Juluis Nhyrere- Ponte Ferroviario 1	32.604618	-25.921352
23	6	Av. Juluis Nhyrere- Ponte Ferroviario 2	32.604618	-25.921352
24	6	Av.Julius Nyerere- Rua de Complexo 1	32.603752	-25.918739
25	6	Av.Julius Nyerere- Rua de Complexo 2	32.603752	-25.918739
26	6	Av.Julius Nyerere- Rua de Complexo 3	32.603752	-25.918739
27	6	Av.Julius Nyerere- Rua de Complexo 4	32.603752	-25.918739
28	6	Av. Juluis Nhyerere-Chapa Amarelo 1	32.602886	-25.916683
29	6	Av. Juluis Nhyerere-Chapa Amarelo 2	32.602886	-25.916683
30	6	Rua da Beira - Feira de Hulene 1	32.594124	-25.913319
31	6	Rua da Beira - Feira de Hulene 2	32.594124	-25.913342
32	6	Rua da Beira 1 (Sitoe)	32.589600	-25.916100
33	6	Rua da Beira 2 (Sitoe)	32.589600	-25.916100
34	6	Centro de Saude 1 de Junho 1	32.610035	-25.914469
35	6	Centro de Saude 1 de Junho 2	32.610035	-25.914469
36	6	Campo Ferroviario 1	32.612988	-25.917322
37	6	Campo Ferroviario 2	32.612988	-25.917322
38	6	Junto Ao 1 Andar 1	32.610085	-25.907919
39	6	Junto Ao 1 Andar 2	32.610085	-25.907919
40	6	Mercado Maguiguana 1	32.613789	-25.906811
41	6	Mercado Maguiguana 2	32.613789	-25.906811
42	6	Procuradoria 1	32.616913	-25.904024
43	6	Procuradoria 2	32.616913	-25.904024
44	6	Pontinha - Romao	32.628651	-25.881825
45	6	20 casas	32.641635	-25.847561
46	6	Cemitério Guebo 1	32.625290	-25.864416
47	6	Cemitério Guebo 2	32.625290	-25.864416
48	6	Ceração 1	32.623859	-25.871548
49	6	Ceração 2	32.623859	-25.871548
50	6	Av. Dom Alxandre Bombas Pumas 1	32.620396	-25.886040
51	6	Av. Dom Alxandre Bombas Pumas 2	32.620396	-25.886040
52	6	Av. Dom Alxandre 14 de Novembro 1	32.618530	-25.897333
53	6	Av. Dom Alxandre 14 de Novembro 2	32.618530	-25.897333
54	6	Governo da cidade Maputo a frente 1	32.612442	-25.897533
55	6	Governo da cidade Maputo a frente 2	32.612442	-25.897533
56	6	Governo da Cidade Maputo atras 1	32.612335	-25.896095
57	6	Governo da Cidade Maputo atras 2	32.612335	-25.896095
58	6	Rua Da Impazol -Maogeira 1	32.611763	-25.889572
59	6	Rua Da Impazol -Maogeira 2	32.611763	-25.889572
60	6	Atras da Shoprite Magoanine 1	32.600544	-25.886827
61	6	Atras da Shoprite Magoanine 2	32.600544	-25.886827
62	6	Av. Juluis Nherere-PT Magoanine 1	32.604359	-25.885328
63	6	Av. Juluis Nherere-PT Magoanine 2	32.604359	-25.885328
64	6	Av. Sebastiao Mabote -Lavandaria Khurula 1	32.614258	-25.865383
65	6	Av. Sebastiao Mabote -Lavandaria Khurula 2	32.614258	-25.865383
65	**390m3**	**Total**		

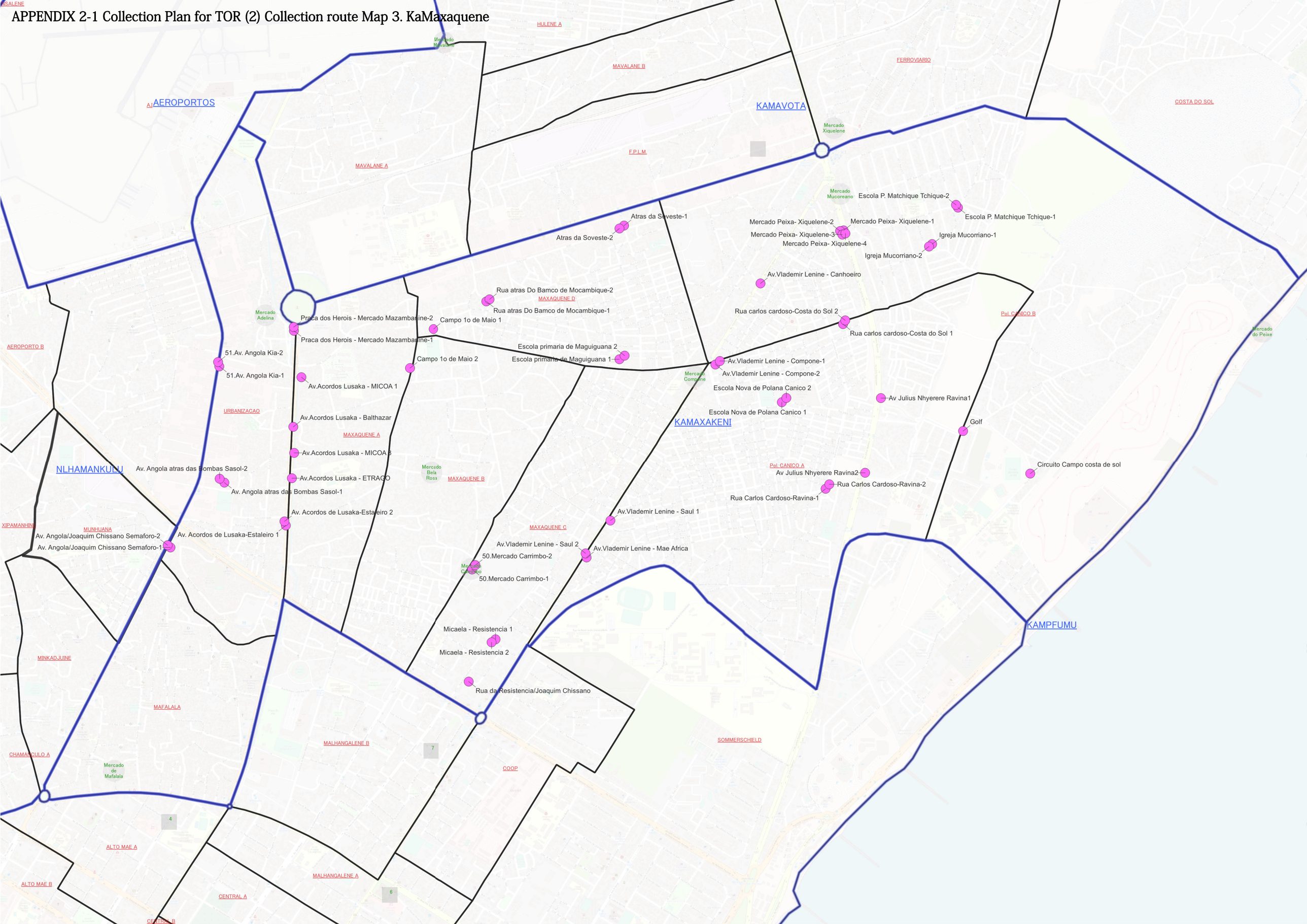
APPENDIX 2-1 Collection Plan for TOR (2) Collection route Map 1. Nlhamanculo



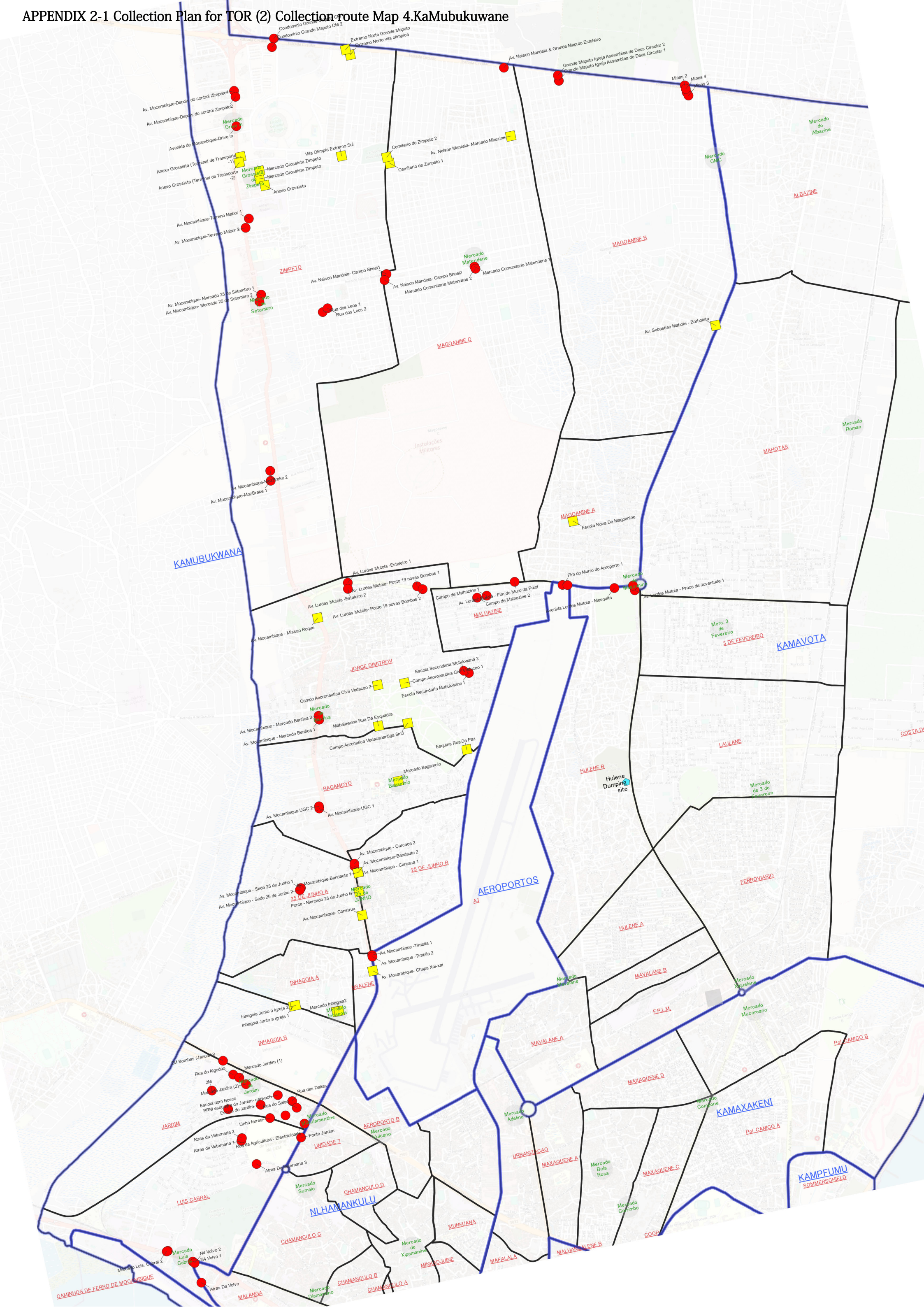
APPENDIX 2-1 Collection Plan for TOR (2) Collection route Map 2. KaTembe



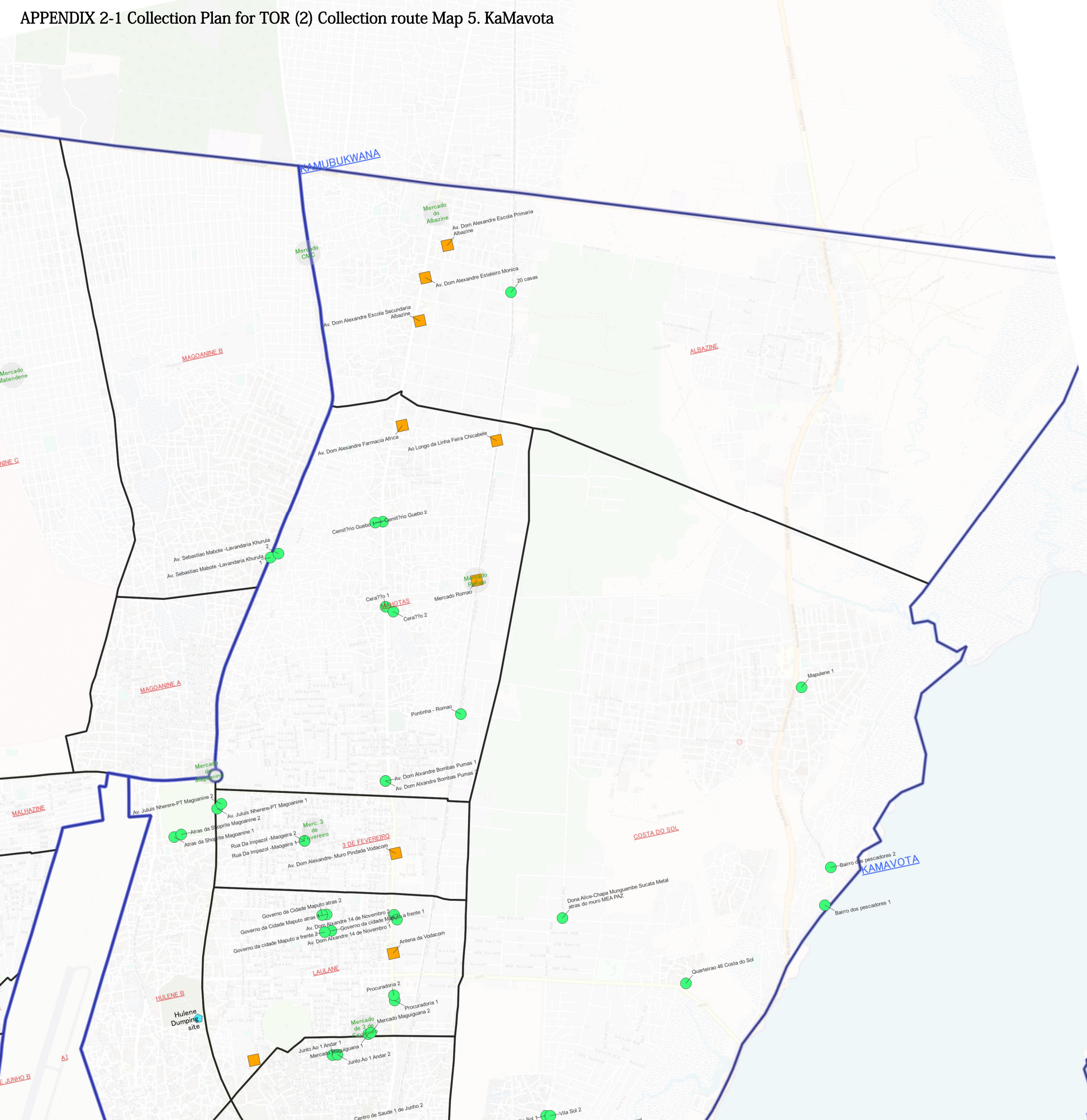
APPENDIX 2-1 Collection Plan for TOR (2) Collection route Map 3. KaMaxaquene



APPENDIX 2-1 Collection Plan for TOR (2) Collection route Map 4.KaMubukuwane



APPENDIX 2-1 Collection Plan for TOR (2) Collection route Map 5. KaMavota



Appendix2-1 Container collection plan for TOR

Appendix2: Work plan for TOR

(3) Container collection plan (NIhamanculo)					2nd Collection Plan						Total						Primary collection													Container *1			Hulene *1			Container *2				Hulene *2			
	m3	CONT NAME	Longitude	Latitude	S	T	Q	Q	F	S	S	T	Q	Q	F	S	S	T	Q	Q	F	S	1 MEs	S	T	Q	Q	F	S	2 MEs		llegada	0:10	Salida	llegada	0:10	Salida	0:00	km	0:00		19:00	km	22:00	
1	12	Entrada da Base Aerea - Av. 19 de Outubro	32.562085	-25.922761	1	0	0	1	0	0	1	0	0	1	0	0	A			A			AEROPORTO B									**19:00**	0:10	19:10	19:31	0:10	19:41					0:21	6.9	0:16	0:16
2	12	Campo Base Aerea - Av. 19 de Outubro	32.562580	-25.930900	1	1	0	1	1	0	1	1	0	1	1	0	A	B		A	B		AEROPORTO B									20:02	0:10	20:12	20:33	0:10	20:43					0:21	6.1	0:16	0:16
3	12	007-Rua Gago Coutinho	32.573491	-25.930688	1	0	1	0	0	1	0	0	1	0	0	1			C			C	AEROPORTO A									21:01	0:10	21:11	21:29	0:10	21:39					0:18	4.9	0:12	0:12
4	12	Rua Gago Coutinho - Igreja Catolica	32.571065	-25.931221	1	0	1	0	0	1	0	0	1	0	0	1			C			C	AEROPORTO A									21:53	0:10	22:03	22:17	0:10	22:27					0:19	5.1	0:14	0:19
5	12	Igreja Assembleia-Rua Gago Coutinho	32.568471	-25.931993	1	1	0	0	1	0	0	1	0	0	1	0		B			B		AEROPORTO A									22:41	0:10	22:51	23:05	0:10	23:15					0:19	5.4	0:14	0:19
6	12	Escola Unidade 18 -Rua Gago Coutinho	32.566439	-25.932545	1	1	1	0	1	1	0	1	1	0	1	1			C			C	AEROPORTO A		B			B		AEROPORTO B	23:29	0:10	23:39	23:53	0:10	0:03					0:19	5.6	0:14	0:19
7	12	Cape-Cape-Campo - Rua 2.282	32.555710	-25.943592	1	0	1	1	0	1	1	0	1	1	0	1	A			A			CHAMANCULO C			C			C	CHAMANCULO B	0:23	0:10	0:33	0:53	0:10	1:03					0:26	7.6	0:20	0:20
8	12	10– Esquadra - Rua de Xipamanine	32.562421	-25.935345	1	0	1	0	0	1	0	0	1	0	0	1			C			C	AEROPORTO B									1:19	0:10	1:29	1:45	0:10	1:55					0:22	6.4	0:16	0:16
9	12	Rua do Zimabwe	32.566486	-25.941054	1	1	0	1	1	0	1	1	0	1	1	0	A			A			XIPAMANINE		B			B		MUNHUANA	2:14	0:10	2:24	2:43	0:10	2:53					0:26	7.7	0:19	0:19
10	12	Sao Joaquim Rua Zambeze	32.568872	-25.943809	1	0	1	1	0	1	1	0	1	1	0	1	A		C	A		C	MUNHUANA									3:12	0:10	3:22	3:41	0:10	**3:51**					0:29	7.2	0:19	0:19
10	**120m3**				**10**	**4**	**6**	**5**	**4**	**6**	**5**	**4**	**6**	**5**	**4**	**6**																										**62.9**			**175min**
1	6	Mercado Vulcano 1- Rua Gago Coutinho	32.562462	-25.933316	1	1	1	1	1	1	1	2	2	1	2	2		B	C		B	C	UNIDADE 7	A	B	C	A	B	C	Mercado Vulcano	T01-1	**19:00**	0:10	19:10				0:00	0	0:00								
2	6	Mercado Vulcano 2- Rua Gago Coutinho	32.562462	-25.933316	1	1	1	1	1	1	2	2	2	2	2	2	A	B	C	A	B	C	AEROPORTO B	A	B	C	A	B	C	Mercado Vulcano	T01-2	19:10	0:10	19:20				0:00	0	0:00	0:00							
3	6	Zixaxa 1- Rua do Zixaxa Nr. 2.302	32.560600	-25.935774	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	CHAMANCULO D								T01-3	19:22	0:10	19:32				0:02	0.45	0:02	0:02							
4	6	Zixaxa 2- Rua do Zixaxa Nr. 2.302	32.560600	-25.935774	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	CHAMANCULO D								T01-4	19:32	0:10	19:42	20:04	0:10	20:14	0:00	0	0:00	0:00	0:22	6.4	0:16	0:22
5	6	Naggi 1-Rua Gago Coutinho	32.556682	-25.935110	1	1	1	1	1	1	1	1	0	1	1	0	A	B			A	B	UNIDADE 7								T02-1	**20:36**	0:10	20:46								0:22	6.6	0:17	0:22
6	6	Naggi 2-Rua Gago Coutinho	32.556682	-25.935110	1	1	1	1	1	1	1	1	0	1	1	0	A	B			A	B	UNIDADE 7								T02-2	20:46	0:10	20:56				0:00	0	0:00	0:00							
7	6	Terminal da Junta-1	32.550818	-25.935218	1	1	1	1	1	1	0	1	0	0	1	0		B				B	CHAMANCULO C								T02-3	20:58	0:10	21:08				0:02	0.6	0:02	0:02							
8	6	Terminal da Junta-2	32.550818	-25.935218	1	1	1	1	1	1	0	1	0	0	1	0		B				B	CHAMANCULO C								T02-4	21:08	0:10	21:18	21:42	0:10	21:52	0:00	0	0:00	0:00	0:24	7.5	0:20	0:24
9	6	Lhanguene-Av. Mozambique-1	32.545892	-25.940547	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	CHAMANCULO C								T03-1	**22:12**	0:10	22:22								0:22	8.1	0:20	0:20
10	6	Lhanguene-Av. Mozambique-2	32.545892	-25.940547	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	CHAMANCULO C								T03-2	22:22	0:10	22:32				0:00	0	0:00	0:00							
11	6	Mega CASH and CARRY	32.541927	-25.946280	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA								T03-3	22:37	0:10	22:47				0:05	1.5	0:05	0:05							
12	6	Up-Av. Trabalho-1	32.543945	-25.944700	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA								T03-4	22:52	0:10	23:02	23:24	0:10	23:34	0:05	1.1	0:05	0:05	0:29	8.8	0:22	0:22
13	6	Up-Av. Trabalho-2	32.543945	-25.944700	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA								T04-1	**23:54**	0:10	0:04								0:22	8.6	0:20	0:20
14	6	Ufa-1 Rua 2.276	32.552701	-25.948462	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	CHAMANCULO B								T04-2	0:08	0:10	0:18				0:04	1.1	0:04	0:04							
15	6	Ufa-2 Rua 2.276	32.552701	-25.948462	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	CHAMANCULO B								T04-3	0:18	0:10	0:28				0:00	0	0:00	0:00							
16	6	Coca-cola-Rua lago Maramba-1	32.550864	-25.950301	1	1	1	1	1	1	0	1	0	0	1	0		B				B	MALANGA								T04-4	0:31	0:10	0:41	1:05	0:10	1:15	0:03	0.45	0:03	0:03	0:31	9.8	0:24	0:24
17	6	Coca-cola-Rua lago Maramba-2	32.550864	-25.950301	1	1	1	1	1	1	0	1	0	0	1	0		B				B	MALANGA								T05-1	**1:38**	0:10	1:48								0:26	9.7	0:23	0:23
18	6	Rotunda 16 de Junho-1 Av. OUA	32.553406	-25.953362	1	1	1	1	1	1	0	1	0	0	1	0		B				B	MALANGA								T05-2	1:50	0:10	2:00				0:02	0.45	0:02	0:02							
19	6	Rotunda 16 de Junho-2 Av. OUA	32.553406	-25.953362	1	1	1	1	1	1	0	1	0	0	1	0		B				B	MALANGA								T05-3	2:00	0:10	2:10				0:00	0	0:00	0:00							
20	6	Saida da ponte Maputo Katembe - Av. 24 de Julho	32.556133	-25.955219	1	1	1	1	1	1	2	1	1	2	1	1	A			A			MALANGA	A	B	C	A	B	C	Add collection for informal	T05-4	2:11	0:10	2:21	2:44	0:10	2:54	0:01	0.35	0:01	0:01	0:35	9.2	0:23	0:23
21	6	LOUMAR1	32.556625	-25.958017	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA								T06-1	**3:17**	0:10	3:27								0:27	9.8	0:23	0:23
22	6	LOUMAR2	32.558002	-25.959057	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA								T06-2	3:28	0:10	3:38				0:01	0.17	0:01	0:01							
23	6	STAE - Av. 24 de Julho	32.559685	-25.957378	1	1	1	1	1	1	1	0	0	1	0	0	A			A			MALANGA								T06-3	3:41	0:10	3:51				0:03	0.9	0:03	0:03							
24	6	Igreja Anglicana	32.560860	-25.955959	1	1	1	1	1	1	1	0	0	1	0	0	A			A			MALANGA								T06-4	3:53	0:10	4:03	4:25	0:10	**4:35**	0:02	0.3	0:02	0:02	0:34	8.7	0:22	0:22
25	6	Mercado Malanga 1	32.558517	-25.953579	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Malanga								T07-1	**19:00**	0:10	19:10								0:27	9.6	0:22	
26	6	Mercado Malanga 2	32.558636	-25.953621	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Malanga								T07-2	19:10	0:10	19:20				0:00	0	0:00	0:00							
27	6	Chamanculo A-1	32.558160	-25.952179	1	1	1	1	1	1	2	1	1	2	1	1	A	B	C	A	B	C	CHAMANCULO A	A				A		MALANGA	T07-3	19:22	0:10	19:32				0:02	0.23	0:02	0:02							
28	6	Chamanculo A-2	32.558160	-25.952179	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	CHAMANCULO A								T07-4	19:32	0:10	19:42	20:15	0:10	20:25	0:00	0	0:00	0:00	0:33	9	0:23	0:33
29	6	Mercado Fajardo 1	32.560551	-25.954491	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Fajardo								T08-1	**20:55**	0:10	21:05								0:30	9.7	0:24	0:30
30	6	Mercado Fajardo 2	32.560303	-25.954346	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Fajardo								T08-2	21:05	0:10	21:15				0:00	0	0:00	0:00							
31	6	Colombia - Rua Major Teixeira Pinto-1	32.564843	-25.955253	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	CHAMANCULO A								T08-3	21:20	0:10	21:30				0:05	1	0:04	0:05							
32	6	Colombia - Rua Major Teixeira Pinto-2	32.564843	-25.955253	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	CHAMANCULO A								T08-4	21:30	0:10	21:40	21:59	0:10	22:09	0:00	0	0:00	0:00	0:30	8	0:19	0:19
33	6	Campo de Mahafil-Rua Mateteu	32.565144	-25.951962	1	1	1	1	1	1	1	0	0	1	0	0	A			A			MINKADJUINE								T09-1	**22:30**	0:10	22:40								0:23	7.8	0:21	0:21
34	6	Retiro-Rua da Fatima	32.564850	-25.949942	1	1	1	1	1	1	0	1	0	0	1	0		B				B	XIPAMANINE								T09-2	22:41	0:10	22:51				0:02	0.24	0:01	0:01							
35	6	Escola Unidade 16-Rua da Fatima	32.561401	-25.949450	1	1	1	1	1	1	0	1	0	0	1	0		B				B	XIPAMANINE								T09-3	22:53	0:10	23:03				0:02	0.35	0:02	0:02							
36	6	Zanza-1 Rua Marcelino dos Santos	32.559326	-25.946500	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		CHAMANCULO B								T09-4	23:06	0:10	23:16	23:36	0:10	23:46	0:03	0.6	0:03	0:03	0:26	7.7	0:20	0:20
37	6	Zanza-2 Rua Marcelino dos Santos-2	32.559326	-25.946500	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		CHAMANCULO B								T10-1	**0:06**	0:10	0:16								0:24	7.8	0:20	0:20
38	6	Bazuca - Rua Irmaos Ruby	32.562431	-25.940529	1	1	1	1	1	1	1	1	2	1	1	2		C				C	XIPAMANINE	A	B	C	A	B	C	Add collection for informal	T10-2	0:22	0:10	0:32				0:06	1.6	0:06	0:06							
39	6	Rua dos Irmaos Ruby/Parque Xipamanine-1	32.563955	-25.944543	1	1	1	1	1	1	1	0	1	1	0	1	A			A			XIPAMANINE		C			C		MINKADJUINE	T10-3	0:35	0:10	0:45				0:03	0.45	0:03	0:03							
40	6	Rua dos Irmaos Ruby/Parque Xipamanine-2	32.563955	-25.944543	1	1	1	1	1	1	1	0	0	1	0	0	A			A			XIPAMANINE								T10-4	0:45	0:10	0:55	1:15	0:10	1:25	0:00	0	0:00	0:00	0:26	7.6	0:20	0:20
41	6	Mercado Xipamanine-1 Rua Zixaxa	32.562923	-25.946209	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Xipamanine								T11-1	**1:46**	0:10	1:56								0:26	7.9	0:21	0:21
42	6	Mercado Xipamanine-2 Rua Zixaxa	32.563271	-25.946194	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Xipamanine								T11-2	1:56	0:10	2:06				0:00	0	0:00	0:00							
43	6	Mercado Xipamanine-3 Rua Zixaxa	32.563271	-25.946194	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Xipamanine								T11-3	2:06	0:10	2:16				0:00	0	0:00	0:00							
44	6	Mercado Xipamanine-4 Rua Zixaxa	32.563271	-25.946194	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Xipamanine								T11-4	2:16	0:10	2:26	2:48	0:10	2:58	0:00	0	0:00	0:00	0:30	7.8	0:22	0:22
45	6	Xibamate 1- Av. De Angola	32.570200	-25.948600	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	MINKADJUINE								T12-1	**3:14**	0:10	3:24								0:20	7.1	0:16	0:16
46	6	Xibamate 2- Av. De Angola	32.570500	-25.948400	1	1	1	1	1	1	1	0	0	1	0	0	A			A			MUNHUANA								T12-2	3:24	0:10	3:34				0:00	0	0:00	0:00							
47	6	Xibamate 3- Av. De Angola	32.570500	-25.948400	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	MAFALALA								T12-3	3:34	0:10	3:44				0:00	0	0:00	0:00							
48	6	CETA 1-Centro de Saude de Xipamanine - Av. Joaquim Chissano	32.566179	-25.937561	1	1	1	1	1	1	1	1	0	1	1	0	A	B			A	B	AEROPORTO A								T12-4	3:48	0:10	3:58	4:16	0:10	**4:26**	0:04	1.6	0:04	0:04	0:23	6.8	0:18	0:18
49	6	CETA 2-Centro de Saude de Xipamanine - Av. Joaquim Chissano	32.566179	-25.937561	1	1	1	1	1	1	1	1	0	1	1	0	A	B			A	B	AEROPORTO B								T13-1	**19:00**	0:10	19:10								0:20	7.3	0:16	
50	6	CETA 3-Centro de Saude de Xipamanine - Av. Joaquim Chissano	32.566179	-25.937561	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	AEROPORTO B								T13-2	19:10	0:10	19:20				0:00	0	0:00	0:00							
51	6	Av. Mocambique- jardim Zoologico 1	32.556915	-25.927295	1	1	1	1	1	1	0	1	0	0	1	0		B				B	AEROPORTO B								T13-3	19:25	0:10	19:35				0:05	1.8	0:04	0:05							
52	6	Av. Mocambique- jardim Zoologico 2	32.556915	-25.927295	1	1	1	1	1	1	0	1	0	0	1	0		B				B	AEROPORTO B								T13-4	19:35	0:10	19:45	20:14	0:10	20:24	0:00	0	0:00	0:00	0:29	7.8	0:20	0:29
52	**312m3**				**52**	**52**	**52**	**52**	**52**	**52**	**33**	**43**	**34**	**33**	**43**	**34**																														
1	6	Ponto-Final (perto do Quartel)	32.524292	-25.988365	1	0	1		1	0	1	0	0	1	0	0	A			A											T14-1	**21:12**	0:10	21:22				0:00	0	0:00		0:48	21.5	0:40	0:48
2	6	Assucena	32.531355	-25.993878	1		1	0	1	0	0	1	0	0	1	0		B			B		INCASSANE								T14-2	21:27	0:10	21:37				0:05	1.5	0:05	0:05							
3	6	Cemiterio-Incassane	32.530023	-26.006760	1	0	1		1		1	0	1	1	0	1	A		C	A		C									T14-3	21:43	0:10	21:53				0:06	1.5	0:06	0:06							
4	6	Mercado Chali	32.559395	-26.008022	1	0	1	0	1		0	0	1	0	0	1			C			C									T14-4	22:02	0:10	22:12				0:09	3.3	0:09	0:09							
5	6	Chibantchane	32.568661	-26.013409	1		1		1	0	1	1	0	1	1	0	A	B		A	B		CHALI								T14-5	22:16	0:10	22:26	23:04	0:10	23:14	0:04	1.2	0:04	0:04	0:45	19.1	0:38	0:38
6	6	Firmino	32.564775	-26.032139	1		1		1	0	1	1	0	1	1	0	A	B		A	B										T15-1	**23:54**	0:10	0:04				0:00	0	0:00		0:45	21.7	0:40	0:40
7	6	Espiga D'ouro	32.570944	-26.020809	1	0	1	0	1		0	0	1	0	0	1			C			C									T15-2	0:11	0:10	0:21				0:07	1.9	0:07	0:07							
8	6	Complexo Guimaraes	32.557790	-25.980115	1	0	1		1	0	1	0	0	1	0	0	A			A											T15-3	0:30	0:10	0:40				0:09	4.1	0:09	0:09							
9	6	EPC	32.557865	-25.983403	1	0	1		1	0	1	0	0	1	0	0	A			A			GUACHENI								T15-4	0:42	0:10	0:52				0:02	0.45	0:02	0:02							
10	6	Raul	32.557116	-25.993233	1		1	0	1		0	1	1	0	1	1		B	C		B	C									T15-5	0:56	0:10	1:06	1:41	0:10	**1:51**	0:04	1.3	0:04	0:04	0:43	18.9	0:35	0:35
10	**60m3**				**10**	**0**	**10**	**0**	**10**	**0**	**6**	**4**	**4**	**6**	**4**	**4**																														
62	**492m3**				**62**	**52**	**62**	**52**	**62**	**52**	**39**	**47**	**38**	**39**	**47**	**38**																														

*1: This collection time is for reference only. These collection times do not consider break times. In the proposal document, the collection time should be prepared considering the break time.

*2: This time and distance were measured with the Google Maps application. The proposer should present the expected values in the proposal document.

Appendix2-1 Container collection plan for TOR

Appendix2: Work plan for TOR

(3) Container collection plan (KaMaxaquene)

Nr.	m3	Namo of container point	longitude F	latitude F	2nd Collection Plan S	T	Q	Q	F	S	Total S	T	Q	Q	F	S
1	6	51.Av. Angola Kia-1	32.57532	-25.93622	1	1	1	1	1	1	0	1	1	0	1	1
2	6	51.Av. Angola Kia-2	32.57532	-25.93622	1	1	1	1	1	1	0	1	1	0	1	1
3	6	Av. Angola atras das Bombas Sasol-1	32.57555	-25.94170	1	1	1	1	1	1	0	1	0	0	1	0
4	6	Av. Angola atras das Bombas Sasol-2	32.57555	-25.94170	1	1	1	1	1	1	0	1	0	0	1	0
5	6	Av. Angola/Joaquim Chissano Semaforo-1	32.57270	-25.94474	1	1	1	1	1	1	0	1	1	0	1	1
6	6	Av. Angola/Joaquim Chissano Semaforo-2	32.57270	-25.94474	1	1	1	1	1	1	1	0	0	1	0	0
7	6	Praca dos Herois - Mercado Mazambanine-1	32.57921	-25.93461	1	1	1	1	1	1	1	1	2	1	1	2
8	6	Praca dos Herois - Mercado Mazambanine-2	32.57921	-25.93461	1	1	1	1	1	1	1	1	2	1	1	2
9	6	Av.Acordos Lusaka - MICOA 1	32.57962	-25.93696	1	1	1	1	1	1	0	0	1	0	0	1
10	6	Av.Acordos Lusaka - Balthazar	32.57917	-25.93924	1	1	1	1	1	1	0	1	0	0	1	0
11	6	Av.Acordos Lusaka - MICOA 3	32.57921	-25.94045	1	1	1	1	1	1	1	1	0	1	1	0
12	6	Av.Acordos Lusaka - ETRAGO	32.57909	-25.94165	1	1	1	1	1	1	1	1	0	1	1	0
13	6	Av. Acordos de Lusaka-Estaleiro 1	32.57877	-25.94384	1	1	1	1	1	1	1	1	0	1	1	0
14	6	Av. Acordos de Lusaka-Estaleiro 2	32.57877	-25.94384	1	1	1	1	1	1	0	0	1	0	0	1
15	6	Campo 1o de Maio 1	32.58639	-25.93472	1	1	1	1	1	1	1	1	1	1	1	1
16	6	Campo 1o de Maio 2	32.58517	-25.93653	1	1	1	1	1	1	0	0	2	0	0	2
17	6	Rua atras Do Bamco de Mocambique-1	32.58929	-25.93335	1	1	1	1	1	1	1	1	1	1	1	1
18	6	Rua atras Do Bamco de Mocambique-2	32.58929	-25.93335	1	1	1	1	1	1	1	1	1	1	1	1
19	6	Atras da Soveste-1	32.59597	-25.93008	1	1	1	1	1	1	1	1	1	1	1	1
20	6	Atras da Soveste-2	32.59597	-25.93008	1	1	1	1	1	1	1	1	1	1	1	1
21	6	Escola primaria de Maguiguana 1	32.59595	-25.93615	1	1	1	1	1	1	0	1	0	0	1	0
22	6	Escola primaria de Maguiguana 2	32.59595	-25.93615	1	1	1	1	1	1	1	1	1	1	1	1
23	6	50.Mercado Carrimbo-1	32.58835	-25.94591	1	1	1	1	1	1	2	2	1	2	2	1
24	6	50.Mercado Carrimbo-2	32.58835	-25.94591	1	1	1	1	1	1	1	2	2	1	2	2
25	6	Rua da Resistencia/Joaquim Chissano	32.58816	-25.95111	1	1	1	1	1	1	1	0	0	1	0	0
26	6	Micaela - Resistencia 1	32.58934	-25.94929	1	1	1	1	1	1	1	0	0	1	0	0
27	6	Micaela - Resistencia 2	32.58934	-25.94929	1	1	1	1	1	1	1	0	0	1	0	0
28	6	Av.Vlademir Lenine - Mae Africa	32.59423	-25.94537	1	1	1	1	1	1	2	2	0	2	2	0
29	6	Av.Vlademir Lenine - Saul 1	32.59546	-25.94366	1	1	1	1	1	1	1	1	0	1	1	0
30	6	Av.Vlademir Lenine - Saul 2	32.59418	-25.94518	1	1	1	1	1	1	0	1	1	0	1	1
31	**6**	Av.Vlademir Lenine - Compone-2	32.60091	-25.93629	1	1	1	1	1	1	2	1	2	2	1	2
32	6	Av.Vlademir Lenine - Compone-1	32.60091	-25.93629	1	1	1	1	1	1	2	1	2	2	1	2
33	6	Av.Vlademir Lenine - Canhoeiro	32.60320	-25.93265	1	1	1	1	1	1	1	0	0	1	0	0
34	6	Escola Nova de Polana Canico 1	32.60451	-25.93797	1	1	1	1	1	1	0	1	1	0	1	1
35	6	Escola Nova de Polana Canico 2	32.60451	-25.93797	1	1	1	1	1	1	0	1	1	0	1	1
36	6	Rua Carlos Cardoso-Ravina-1	32.60670	-25.94201	1	1	1	1	1	1	1	1	1	1	1	1
37	6	Rua Carlos Cardoso-Ravina-2	32.60670	-25.94201	1	1	1	1	1	1	1	1	1	1	1	1
38	6	Rua carlos cardoso-Costa do Sol 1	32.60743	-25.93455	1	1	1	1	1	1	1	0	1	1	0	1
39	6	Rua carlos cardoso-Costa do Sol 2	32.60743	-25.93455	1	1	1	1	1	1	1	0	1	1	0	1
40	6	Mercado Peixa- Xiquelene-1	32.60743	-25.93028	1	1	1	1	1	1	2	2	1	2	2	1
41	6	Mercado Peixa- Xiquelene-2	32.60743	-25.93028	1	1	1	1	1	1	2	2	1	2	2	1
42	6	Mercado Peixa- Xiquelene-3	32.60743	-25.93028	1	1	1	1	1	1	2	2	1	2	2	1
43	6	Mercado Peixa- Xiquelene-4	32.60743	-25.93028	1	1	1	1	1	1	2	2	1	2	2	1
44	6	Escola P. Matchique Tchique-1	32.61325	-25.92903	1	1	1	1	1	1	0	1	0	0	1	0
45	6	Escola P. Matchique Tchique-2	32.61325	-25.92903	1	1	1	1	1	1	0	1	0	0	1	0
46	6	Igreja Mucorriano-1	32.61186	-25.93096	1	1	1	1	1	1	0	1	0	0	1	0
47	6	Igreja Mucorriano-2	32.61186	-25.93096	1	1	1	1	1	1	0	1	0	0	1	0
48	6	Av Julius Nhyerere Ravina1	32.60937	-25.93799	1	1	1	1	1	1	0	0	1	0	0	1
49	6	Av Julius Nhyerere Ravina2	32.60854	-25.94148	1	1	1	1	1	1	1	0	0	1	0	0
50	6	Golf	32.61358	-25.93953	1	1	1	1	1	1	0	0	1	0	0	1
51	6	Circuito Campo costa de sol	32.61702	-25.94154	1	1	1	1	1	1	0	0	1	0	0	1
	306m3	**TOTAL**			**51**	**51**	**51**	**51**	**51**	**51**	**39**	**44**	**38**	**39**	**44**	**38**

Primary collection

Nr.	S	T	Q	Q	F	S	1ME	S	T	Q	Q	F	S	2ME	S	T	Q	Q	F	S	3ME
1			C			C	Urbanização		B			B		AEROPORTO B							
2			C			C	Urbanização		B			B		AEROPORTO B							
3		B			B		Urbanização														
4		B			B		Urbanização														
5		B	C		B	C	Mafalala														
6	A			A			Urbanização														
7			C			C	Urbanização	A	B	C	A	B	C	Mercado Mazambanine							
8			C			C	Urbanização	A	B	C	A	B	C	Mercado Mazambanine							
9			C			C	Maxaquene A														
10		B			B		Maxaquene A														
11	A	B		A	B		Maxaquene A														
12	A	B		A	B		Maxaquene A														
13	A	B		A	B		Maxaquene A														
14			C			C	Maxaquene B														
15	A	B	C	A	B	C	Maxaquene B														
16			C			C	Maxaquene A			C			C	Maxaquene D							
17	A	B	C	A	B	C	Maxaquene D														
18	A	B	C	A	B	C	Maxaquene D														
19	A	B	C	A	B	C	Maxaquene D														
20	A	B	C	A	B	C	Maxaquene D														
21		B			B		Maxaquene C														
22	A	B	C	A	B	C	Maxaquene D														
23	A	B		A	B		Maxaquene B	A	B	C	A	B	C	Mercado Carrimbo							
24		B	C		B	C	Maxaquene C	A	B	C	A	B	C	Mercado Carrimbo							
25	A			A			Maxaquene C														
26	A			A			Maxaquene C														
27	A			A			Maxaquene C														
28	A	B		A	B		Maxaquene C	A	B		A	B		Polana Caniço A							
29	A	B		A	B		Polana Caniço A														
30		B	C		B	C	Maxaquene C														
31	A			A			Polana Caniço B			C			C	Maxaquene C	A	B	C	A	B	C	Mercado Compone
32	A			A			Maxaquene D			C			C	Polana Caniço A	A	B	C	A	B	C	Mercado Compone
33	A			A			Polana Caniço B														
34		B	C		B	C	Polana Caniço A														
35		B	C		B	C	Polana Caniço A														
36	A	B	C	A	B	C	Polana Caniço A														
37	A	B	C	A	B	C	Polana Caniço A														
38			C			C	Polana Caniço A	A			A			Polana Caniço B							
39			C			C	Polana Caniço A	A			A			Polana Caniço B							
40	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana							
41	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana							
42	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana							
43	A	B		A	B		Polana Caniço B	A	B	C	A	B	C	Mercado Xiqueleney Mucoriana							
44		B			B		Polana Caniço B														
45		B			B		Polana Caniço B														
46		B			B		Polana Caniço B														
47		B			B		Polana Caniço B														
48			C			C	Polana Caniço A														
49	A			A			Polana Caniço A														
50		C			C		Polana Caniço B														
51		C			C		Polana Caniço B														

Work plan

Nr.		Container *1 llegada	on	Salida	Hulene *1 llegada	off	Salida	Container *2 19:00	Km	22:00		Hulene *2 19:00	Km	22:00	
1	T1-1	**19:00**	0:10	19:10				0:00	0	0:00					
2	T1-2	19:10	0:10	19:20				0:00	0	0:00	0:00				
3	T1-3	19:22	0:10	19:32				0:02	0.65	0:02	0:02				
4	T1-4	19:32	0:10	19:42	20:04	0:10	20:14	0:00	0	0:00	0:00	0:22	6.2	0:16	0:22
5	T2-1	**20:32**	0:10	20:42				0:00	0.4	0:02		0:18	6.4	0:14	0:18
6	T2-2	20:42	0:10	20:52				0:00	0	0:00	0:00				
7	T2-3	20:57	0:10	21:07				0:05	2.3	0:05	0:05				
8	T2-4	21:07	0:10	21:17	21:31	0:10	21:41	0:00	0	0:00	0:00	0:20	5.7	0:14	0:14
9	T3-1	**21:53**	0:10	22:03				0:00	0	0:00		0:16	5.3	0:12	0:12
10	T3-2	22:04	0:10	22:14				0:01	0.27	0:01	0:01				
11	T3-3	22:15	0:10	22:25	22:43	0:10	22:53	0:01	0.11	0:01	0:01	0:23	7	0:18	0:18
12	T4-1	**23:06**	0:10	23:16				0:01	0.12	0:01		0:16	5.8	0:13	0:13
13	T4-2	23:17	0:10	23:27				0:01	0.18	0:01	0:01				
14	T4-3	23:27	0:10	23:37	23:51	0:10	0:01	0:01	0.11	0:00	0:00	0:20	6.3	0:14	0:14
15	T5-1	**0:13**	0:10	0:23				0:08	2.3	0:08		0:14	5.4	0:12	0:12
16	T5-2	0:23	0:10	0:33				0:00	0	0:00	0:00				
17	T5-3	0:36	0:10	0:46	0:59	0:10	1:09	0:03	0.65	0:03	0:03	0:19	5.4	0:13	0:13
18	T6-1	**1:21**	0:10	1:31				0:00	0	0:00		0:14	5.1	0:12	0:12
19	T6-2	1:35	0:10	1:45				0:04	1	0:04	0:04				
20	T6-3	1:45	0:10	1:55	2:07	0:10	2:17	0:00	0	0:00	0:00	0:17	4.9	0:12	0:12
21	T7-1	**2:30**	0:10	2:40				0:00	0	0:00		0:16	4.7	0:13	0:13
22	T7-2	2:40	0:10	2:50				0:00	0	0:00	0:00				
23	T7-3	2:55	0:10	3:05	3:20	0:10	**3:30**	0:05	1.5	0:05	0:05	0:20	5.8	0:15	0:15
24	T8-1	**19:00**	0:10	19:10				0:00	0	0:00		0:19	5.9	0:16	
25	T8-2	19:14	0:10	19:24				0:04	0.95	0:04	0:04				
26	T8-3	19:25	0:10	19:35	19:49	0:10	19:59	0:01	0.35	0:01	0:01	0:23	6.1	0:14	0:14
27	T9-1	**19:59**	0:10	20:09				0:00	0	0:00		0:21	6.1	0:16	
28	T9-2	20:12	0:10	20:22				0:03	0.8	0:02	0:03				
29	T9-3	20:25	0:10	20:35	20:56	0:10	21:06	0:03	0.25	0:01	0:03	0:21	5.3	0:12	0:21
30	T10-1	**21:23**	0:10	21:33				0:00	0	0:00		0:17	5.1	0:14	0:17
31	T10-2	21:37	0:10	21:47				0:04	1	0:03	0:04				
32	T10-3	21:47	0:10	21:57	22:07	0:10	22:17	0:00	0	0:00	0:00	0:16	4.1	0:10	0:10
33	T11-1	**22:26**	0:10	22:36				0:00	-	0:00		0:12	3.6	0:09	0:09
34	T11-2	22:40	0:10	22:50				0:04	1.1	0:04	0:04				
35	T11-3	22:50	0:10	23:00	23:13	0:10	23:23	0:00	0	0:00	0:00	0:18	4.7	0:13	0:13
36	T12-1	**23:38**	0:10	23:48				0:00	0	0:00		0:17	6.2	0:15	0:15
37	T12-2	23:48	0:10	23:58				0:00	0	0:00	0:00				
38	T12-3	0:04	0:10	0:14	0:24	0:10	0:34	0:06	1.1	0:06	0:06	0:18	4	0:10	0:10
39	T13-1	**0:45**	0:10	0:55				0:00	0	0:00		0:14	4	0:11	0:11
40	T13-2	0:59	0:10	1:09				0:04	0.75	0:04	0:04				
41	T13-3	1:09	0:10	1:19	1:27	0:10	1:37	0:00	0	0:00	0:00	0:10	3.1	0:08	0:08
42	T14-1	**1:45**	0:10	1:55				0:00	0	0:00		0:11	3.5	0:08	0:08
43	T14-2	1:55	0:10	2:05				0:00	0	0:00	0:00				
44	T14-3	2:10	0:10	2:20	2:32	0:10	2:42	0:05	1	0:05	0:05	0:18	5.6	0:12	0:12
45	T15-1	**2:54**	0:10	3:04				0:00	0	0:00		0:14	4.2	0:12	0:12
46	T15-2	3:07	0:10	3:17				0:03	0.5	0:03	0:03				
47	T15-3	3:17	0:10	3:27				0:00	0	0:00	0:00				
48	T15-4	3:31	0:10	3:41	3:50	0:10	**4:00**	0:04	1.4	0:04	0:04	0:17	4.4	0:09	0:09
49	T16-1	**19:00**	0:10	19:10				0:00	-	0:00		0:12	4.5	0:09	
50	T16-2	19:14	0:10	19:24				0:04	1.3	0:03	0:04				
51	T16-3	19:30	0:10	19:40	20:01	0:10	**20:11**	0:06	1.4	0:05	0:06	0:21	6	0:14	0:21
TOTAL									**21.49**		**73min**		**160.4**		**378min**

*1: This collection time is for reference only. These collection times do not consider break times. In the proposal document, the collection time should be prepared considering the break time.

*2: This time and distance were measured with the Google Maps application. The proposer should present the expected values in the proposal document.

Anexo2-1 Plano de recolha de contentores para os TDR

Anexo2: Plano de trabalho for TDR

(3) Plano de recolha de contentores (KaMubukuwane)

	m3	Nome do ponto de contentor	Longitude	Latitude	Plano da recolha 2nd						Total						Recolha primária													
					S	T	Q	Q	F	S	S	T	Q	Q	F	S	S	T	Q	Q	F	S	1ME	S	T	Q	Q	F	S	2ME
1	12	Inhagoia Junto a igreja 1	32.5553932	-25.9179630	1	1	1	0	1	1	0	1	1	0	1	1		B	C		B	C	Inhagoia A							
2	12	Inhagoia Junto a igreja 2	32.5554848	-25.9179230	1	1	0	1	1	0	1	1	0	1	1	0	A	B		A	B		Inhagoia B							
3	12	Mercado Inhagoia	32.5601387	-25.9194698	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Inhagoia B	A	B	C	A	B	C	Mercado Inhagoia
4	12	Mercado Inhagoia2	32.5601387	-25.9194698	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Inhagoia A	A	B	C	A	B	C	Mercado Inhagoia
5	12	Av. Mocambique- Chapa Xai-xai	32.5652122	-25.9161358	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Nsalene							
6	12	Av. Mocambique- Construa	32.5653572	-25.9102230	1	0	0	1	0	0	1	0	0	1	0	0	A			A			25 de Junho A							
7	12	Ponte - Mercado 25 de Junho B	32.5655654	-25.9077357	1	1	1	1	1	1	1	2	2	1	2	2		B	C		B	C	25 de Junho B	A	B	C	A	B	C	Mercado 25 de JunhoB
8	12	Av. Mocambique-Bandaute 1	32.5659370	-25.9057732	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	25 de Junho B							
9	12	Av. Mocambique-Bandaute 2	32.5659370	-25.9057732	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	25 de Junho B							
10	12	Mercado Bagamoio	32.5727158	-25.8973064	1		1		1		1	0	1	0	1	0	A		C		B		Mercado Bagamoyo							
11	12	Esquina Rua Da Paz	32.5812607	-25.8956051	1	1	1	0	1	1	0	1	1	0	1	1			C			C	George Dimitrov		B			B		Bagamoyo
12	12	Campo Aeronatica Vedacaoantiga 6m3	32.5751877	-25.8916054	1	1	1	0	1	1	0	1	1	0	1	1		B	C		B	C	Bagamoyo							
13	12	Mabalawene Rua Da Esquadra	32.5718155	-25.8912449	1	0	1	0	0	1	0	0	1	0	0	1			C			C	Bagamoyo							
14	12	Campo Aeoronautica Civil Vedacao 2	32.5727272	-25.8870506	1	1	0	0	1	0	0	1	0	0	1	0		B			B		George Dimitrov							
15	12	Campo Aeoronautica Civil Vedacao 1	32.5758209	-25.8874435	1	1	0	0	1	0	0	1	0	0	1	0		B			B		George Dimitrov							
16	12	Av. Mocambique - Missao Roque	32.5675850	-25.8788719	1	0	0	1	0	0	1	0	0	1	0	0	A			A			George Dimitrov							
17	12	Escola Nova De Magoanine	32.5988197	-25.8746281	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Magoanine A							
18	12	Av. Sebastiao Mabote - Borboleta	32.6196671	-25.8577251	1	1	1	1	1	1	1	1	1	1	1	1		B	C		B	C	Magoanine A	A			A			Magoanine B
19	12	Av. Nelson Mandela- Mercado Mbuzine	32.6011772	-25.8338947	1	1	1	1	1	1	1	2	2	1	2	2		B	C		B	C	Magoanine B	A	B	C	A	B	C	Mercado Mbuzine
20	12	Vila Olimpia Extremo Sul	32.5815506	-25.8321915	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
21	12	Cemiterio de Zimpeto 1	32.5866241	-25.8333035	1	0	1	1	0	1	1	0	1	1	0	1	A		C	A		C	Zimpeto							
22	12	Cemiterio de Zimpeto 2	32.5866241	-25.8333035	1	0	1	0	0	1	0	0	1	0	0	1			C			C	Magoanine C							
23	12	Extremo Norte vila olimpica	32.5850830	-25.8216686	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
24	12	Extremo Norte Grande Maputo	32.5849648	-25.8215008	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
25	12	Mercado Grossista Zimpeto	32.5717583	-25.8324661	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Grossista							
26	12	Mercado Grossista Zimpeto	32.5718880	-25.8324814	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Grossista							
27	12	Anexo Grossista	32.5721779	-25.8335075	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Anexo Grossista							
28	12	Anexo Grossista (Terminal de Transporte -1)	32.5701027	-25.8305912	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Anexo Grossista							
29	12	Anexo Grossista (Terminal de Transporte -2)	32.5698471	-25.8306065	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Anexo Grossista							
29	**348m3**	Total			29	23	24	21	24	23	24	27	26	23	28	25														
1	6	Atras Da Volvo	32.5382300	-25.9442000	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Luís Cabral							
2	6	N4 Volvo 1	32.5379448	-25.9420395	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Luís Cabral							
3	6	N4 Volvo 2	32.5379448	-25.9420395	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Luís Cabral							
4	6	Mercado Luis. Cabral 1	32.5350761	-25.9402466	1	1	1	1	1	1	2	2	2	2	2	2	A	B	C	A	B	C	Luís Cabral	A	B	C	A	B	C	Mercado Luis. Cabral
5	6	Mercado Luis. Cabral 2	32.5350761	-25.9402466	1	1	1	1	1	1	2	2	2	2	2	2	A	B	C	A	B	C	Luís Cabral	A	B	C	A	B	C	Mercado Luis. Cabral
6	6	Atras da Veternaria 1	32.5462112	-25.9305973	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Luís Cabral							
7	6	Atras da Veternaria 2	32.5462112	-25.9305973	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Luís Cabral							
8	6	Atras Da Veternaria 3	32.5473600	-25.9333000	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Luís Cabral							
9	6	Ponte Jardim	32.5530300	-25.9315700	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
10	6	Rua da Agricultura - Electricidade	32.5537500	-25.9302300	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
11	6	Rua da Agricultura - Rua das Dalias	32.5518100	-25.9289700	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
12	6	Linha ferrea	32.5500000	-25.9289000	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
13	6	Escola do Jardim	32.5492700	-25.9273400	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
14	6	Escola dom Bosco	32.5454900	-25.9270700	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
15	6	2M	32.5441100	-25.9248100	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
16	6	2M Bombas (Januario)	32.5460900	-25.9220100	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Inhagoia B							
17	6	Rua do Algodao	32.5469000	-25.9236500	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
18	6	Mercado Jardim (1)	32.5475200	-25.9241000	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Jardim							
19	6	Mercado Jardim (2)	32.5481100	-25.9249100	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Jardim							
20	6	PRM esquadra do Jardim- carwach	32.5514400	-25.9267300	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
21	6	Rua das Dalias	32.5529200	-25.9276600	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
22	6	Rua do Salao	32.5532700	-25.9284400	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Jardim							
23	6	Av. Mocambique - Sede 25 de Junho 1	32.5589333	-25.9062691	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	25 de Junho A							
24	6	Av. Mocambique - Sede 25 de Junho 2	32.5589333	-25.9062691	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	25 de Junho A							
25	6	Av. Mocambique-UGC 1	32.5631180	-25.8983631	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Bagamoyo							
26	6	Av. Mocambique-UGC 2	32.5631180	-25.8983631	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Bagamoyo							
27	6	Av. Mocambique-MozBrake 1	32.5656242	-25.8638363	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Zimpeto							
28	6	Av. Mocambique-MozBrake 2	32.5656242	-25.8638363	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Zimpeto							
29	6	Av. Mocambique- Mercado 25 de Setembro 1	32.5687294	-25.8452396	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Zimpeto							
30	6	Av. Mocambique- Mercado 25 de Setembro 2	32.5687294	-25.8452396	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Zimpeto							
31	6	Rua dos Leos 1	32.5762596	-25.8474216	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Zimpeto							
32	6	Rua dos Leos 2	32.5762596	-25.8474216	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Zimpeto							
33	6	Av. Nelson Mandela- Campo Sheel1	32.5836182	-25.8454971	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Magoanine C							
34	6	Av. Nelson Mandela- Campo Sheel2	32.5836182	-25.8454971	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		Magoanine C							
35	6	Mercado Comunitaria Matendene 1	32.5939102	-25.8464165	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Magoanine C	A	B	C	A	B	C	Mercado Matendene
36	6	Mercado Comunitaria Matendene 2	32.5939102	-25.8464165	1	1	1	1	1	1	2	2	1	2	2	1	A	B		A	B		Magoanine C	A	B	C	A	B	C	Mercado Matendene
37	6	Minas 1	32.6216023	-25.8332294	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
38	6	Minas 2	32.6216023	-25.8332294	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
39	6	Minas 3	32.6216023	-25.8332294	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
40	6	Minas 4	32.6216023	-25.8332294	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
41	6	Grande Maputo Igreja Assemblea de Deus Circular 1	32.6076241	-25.8284359	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
42	6	Grande Maputo Igreja Assemblea de Deus Circular 2	32.6076241	-25.8284359	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine B							
43	6	Av. Nelson Mandela & Grande Maputo Estaleiro	32.6024500	-25.8269500	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Magoanine C							
44	6	Condominio Grande Maputo CM 1	32.5766700	-25.8194800	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C								
45	6	Condominio Grande Maputo CM 2	32.5766200	-25.8195600	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C								
46	6	Av. Mocambique-Depois do control Zimpeto1	32.5710030	-25.8231659	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Zimpeto							
47	6	Av. Mocambique-Depois do control Zimpeto2	32.5710030	-25.8231659	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Zimpeto							
48	6	Avenida de Mocambique-Drive in	32.5704000	-25.8268300	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Mercado Drive in							
49	6	Av. Mocambique-Terreno Mabor 1	32.5689735	-25.8374062	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
50	6	Av. Mocambique-Terreno Mabor 2	32.5689735	-25.8374062	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	Zimpeto							
51	6	Av. Lurdes Mutola -Estaleiro 1	32.5718422	-25.8759441	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		George Dimitrov							
52	6	Av. Lurdes Mutola -Estaleiro 2	32.5718422	-25.8759441	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		George Dimitrov							
53	6	Av. Lurdes Mutola- Posto 19 novas Bombas 1	32.5802879	-25.8781052	1	1	1	1	1	1	0	1	0	0	1	0		B			B		George Dimitrov							
54	6	Av. Lurdes Mutola- Posto 19 novas Bombas 2	32.5802879	-25.8781052	1	1	1	1	1	1	0	1	0	0	1	0		B			B		George Dimitrov							
55	6	Av. Lurdes Mutola - Fim do Muro da Paiol	32.5907500	-25.8795400	1	1	1	1	1	1	0	1	1	0	1	1			C			C	Malhazine		B			B		Magoanine A
56	6	Av. Lurdes Mutola - Praca da Juventude 1	32.6040077	-25.8825283	1	1	1	1	1	1	1	0	1	1	0	1	A			A			Magoanine A			C			C	Hulene B
57	6	Av. Lurdes Mutola - Praca da Juventude 2	32.6040077	-25.8825283	1	1	1	1	1	1	1	0	1	1	0	1	A			A			Magoanine A			C			C	Hulene B
58	6	Avenida Lurdes Mutola - Mesquita	32.6018500	-25.8823700	1	1	1	1	1	1	0	0	1	0	0	1			C			C	Magoanine A							
59	6	Fim do Murro do Aeroporto 1	32.5966339	-25.8810368	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine A							
60	6	Fim do Murro do Aeroporto 2	32.5966339	-25.8810368	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	Magoanine A							
61	6	Campo de Malhazine 1	32.5861320	-25.8803329	1	1	1	1	1	1	2	2	2	2	2	2	A	B	C	A	B	C	Malhazine	A	B	C	A	B	C	Mercado Malhazine
62	6	Campo de Malhazine 2	32.5861320	-25.8803329	1	1	1	1	1	1	2	2	2	2	2	2	A	B	C	A	B	C	Malhazine	A	B	C	A	B	C	Mercado Malhazine
63	6	Escola Secundaria Mubukwana 1	32.5828094	-25.8874893	1	1	1	1	1	1	0	0	1	0	0	1			C			C	George Dimitrov							
64	6	Escola Secundaria Mubukwana 2	32.5828094	-25.8874893	1	1	1	1	1	1	0	0	1	0	0	1			C			C	George Dimitrov							
65	6	Av. Mocambique - Mercado Benfica 1	32.5653000	-25.8888836	1	1	1	1	1	1	1	1	1	1	1	1	A			A			George Dimitrov	A	B	C	A	B	C	Mercado Benfica
66	6	Av. Mocambique - Mercado Benfica 2	32.5653000	-25.8888836	1	1	1	1	1	1	1	1	1	1	1	1	A			A			George Dimitrov	A	B	C	A	B	C	Mercado Benfica
67	6	Av. Mocambique - Carcaca 1	32.5657387	-25.9047699	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Bagamoyo							
68	6	Av. Mocambique - Carcaca 2	32.5657387	-25.9047699	1	1	1	1	1	1	1	0	0	1	0	0	A			A			Bagamoyo							
69	6	Av. Mocambique -Timbila 1	32.5655060	-25.9145050	1	1	1	1	1	1	0	1	0	0	1	0		B			B		25 de Junho B							
70	6	Av. Mocambique -Timbila 2	32.5655060	-25.9145050	1	1	1	1	1	1	0	1	0	0	1	0		B			B		25 de Junho B							
70	**420m3**	**Total**			70	70	70	70	70	70	49	54	55	49	54	55														

		Contentor *1			Hulene *1			Contentor *2				Hulene *2			
		llegada	0:10	Salida	llegada	0:10	Salida	0:00	km	0:00		19:00	km	22:00	
1	1	19:00	0:10	19:10	19:40	0:10	19:50	0	0	0		0:30	8	0:23	0:30
2	2	20:20	0:10	20:30	21:00	0:10	21:10	0	0	0		0:30	8	0:23	0:30
3	3	21:29	0:10	21:39	21:58	0:10	22:08	0	0	0		0:24	7.5	0:19	0:19
4	4	22:27	0:10	22:37	22:56	0:10	23:06	0	0	0		0:24	7.5	0:19	0:19
5	5	23:27	0:10	23:37	23:58	0:10	0:08	0	0	0		0:29	8.8	0:21	0:21
6	6	0:31	0:10	0:41	1:04	0:10	1:14	0	0	0		0:00	8.8	0:23	0:23
7	7	1:35	0:10	1:45	2:06	0:10	2:16	0	0	0		0:26	8.6	0:21	0:21
8	8	2:38	0:10	2:48	3:10	0:10	3:20	0	0	0		0:30	9	0:22	0:22
9	9	3:42	0:10	3:52	4:14	0:10	**4:24**	0	0	0		0:29	9	0:22	0:22
10	10	**19:00**	0:10	19:10	19:34	0:10	19:44	0	0	0		0:24	7.5	0:20	0:24
11	11	20:04	0:10	20:14	20:34	0:10	20:44	0	0	0		0:20	6.3	0:16	0:20
12	12	21:06	0:10	21:16	21:38	0:10	21:48	0	0	0		0:22	6.7	0:18	0:22
13	13	22:07	0:10	22:17	22:36	0:10	22:46	0	0	0		0:24	6.7	0:19	0:19
14	14	23:02	0:10	23:12	23:28	0:10	23:38	0	0	0		0:20	6.1	0:16	0:16
15	15	23:54	0:10	0:04	0:20	0:10	0:30	0	0	0		0:22	6.3	0:16	0:16
16	16	0:50	0:10	1:00	1:20	0:10	1:30	0	0	0		0:24	6.6	0:20	0:20
17	17	1:42	0:10	1:52	2:04	0:10	2:14	0	0	0		0:16	3.9	0:12	0:12
18	18	2:29	0:10	2:39	2:54	0:10	3:04	0	0	0		0:18	5.5	0:15	0:15
19	19	3:32	0:10	3:42	4:10	0:10	**4:20**	0	0	0		0:35	9.1	0:28	0:28
20	20	**19:00**	0:10	19:10	19:48	0:10	19:58	0	0	0		0:38	13.8	0:28	0:38
21	21	20:38	0:10	20:48	21:28	0:10	21:38	0	0	0		0:40	14.6	0:30	0:40
22	22	22:08	0:10	22:18	22:48	0:10	22:58	0	0	0		0:30	14.6	0:30	0:30
23	23	23:24	0:10	23:34	0:00	0:10	0:10	0	0	0		0:30	16.1	0:26	0:26
24	24	0:36	0:10	0:46	1:12	0:10	1:22	0	0	0		0:30	16.1	0:26	0:26
25	25	1:47	0:10	1:57	2:22	0:10	2:32	0	0	0		0:35	11.5	0:25	0:25
26	26	2:57	0:10	3:07	3:32	0:10	**3:42**	0	0	0		0:35	11.5	0:25	0:25
27	27	**19:00**	0:10	19:10	19:45	0:10	19:55	0	0	0		0:35	11.8	0:25	0:35
28	28	20:27	0:10	20:37	21:09	0:10	21:19	0	0	0		0:32	11.5	0:24	0:32
29	29	21:51	0:10	22:01	22:33	0:10	**22:43**	0	0	0		0:32	11.5	0:24	0:32
29								0	-	0			**272.9**		**708min**
1	T01-1	**19:00**	0:10	19:10					-						
2	T01-2	19:13	0:10	19:23				0:03	0.80	0:03	0:03				
3	T01-3	19:23	0:10	19:33				0:00	-	0:00	0:00				
4	T01-4	19:36	0:10	19:46	20:16	0:10	20:26	0:03	2.50	0:03	0:03	0:30	9.5	0:23	0:30
5	T2-1	**20:52**	0:10	21:02								0:26	9.6	0:23	0:26
6	T2-2	21:10	0:10	21:20				0:08	2.80	0:07	0:08				
7	T2-3	21:20	0:10	21:30				0:00	-	0:00	0:00				
8	T2-4	21:33	0:10	21:43	22:05	0:10	22:15	0:03	0.35	0:03	0:03	0:29	8	0:22	0:22
9	T3-1	**22:33**	0:10	22:43								0:22	7.7	0:18	0:18
10	T3-2	22:44	0:10	22:54				0:01	0.21	0:01	0:01				
11	T3-3	22:55	0:10	23:05				0:01	0.24	0:01	0:01				
12	T3-4	23:07	0:10	23:17				0:03	0.60	0:02	0:02				
13	T3-5	23:18	0:10	23:28	23:51	0:10	0:01	0:01	0.28	0:01	0:01	0:32	8.9	0:23	0:23
14	T4-1	**0:23**	0:10	0:33								0:26	8.9	0:22	0:22
15	T4-2	0:36	0:10	0:46				0:03	0.55	0:03	0:03				
16	T4-3	0:47	0:10	0:57				0:01	0.45	0:01	0:01				
17	T4-4	0:58	0:10	1:08	1:32	0:10	1:42	0:01	0.26	0:01	0:01	0:33	9.1	0:24	0:24
18	T5-1	**2:04**	0:10	2:14								0:26	9.1	0:22	0:22
19	T5-2	2:14	0:10	2:24				0:00	-	0:00	0:00				
20	T5-3	2:26	0:10	2:36				0:03	0.45	0:02	0:02				
21	T5-4	2:38	0:10	2:48	3:09	0:10	**3:19**	0:02	0.25	0:02	0:02	0:30	8.3	0:21	0:21
22	T6-1	**19:00**	0:10	19:10								0:24	8.2	0:20	
23	T6-2	19:26	0:10	19:36				0:16	3.50	0:10	0:16				
24	T6-3	19:36	0:10	19:46				0:00	-	0:00	0:00				
25	T6-4	19:52	0:10	20:02	20:30	0:10	20:40	0:06	2.10	0:05	0:06	0:28	8.7	0:22	0:28
26	T7-1	**20:28**	0:10	20:38								0:26	9.2	0:22	0:26
27	T7-2	20:50	0:10	21:00				0:12	4.10	0:07	0:12				
28	T7-3	21:00	0:10	21:10				0:00	-	0:00	0:00				
29	T7-4	21:15	0:10	21:25				0:05	2.10	0:04	0:05				
30	T7-5	21:25	0:10	21:35	21:57	0:10	22:07	0:00	-	0:00	0:00	0:28	9.9	0:22	0:22
31	T8-1	**22:29**	0:10	22:39								0:28	10.6	0:22	0:22
32	T8-2	22:39	0:10	22:49				0:00	-	0:00	0:00				
33	T8-3	22:53	0:10	23:03				0:04	1.00	0:04	0:04				
34	T8-4	23:03	0:10	23:13	23:38	0:10	23:48	0:00	-	0:00	0:00	0:34	11	0:25	0:25
35	T9-1	**0:10**	0:10	0:20								0:26	7.3	0:22	0:22
36	T9-2	0:20	0:10	0:30				0:00	-	0:00	0:00				
37	T9-3	0:42	0:10	0:52				0:12	5.80	0:12	0:12				
38	T9-4	0:52	0:10	1:02	1:26	0:10	1:36	0:00	-	0:00	0:00	0:26	12.5	0:24	0:24
39	T10-1	**2:00**	0:10	2:10								0:26	12.4	0:24	0:24
40	T10-2	2:10	0:10	2:20				0:00	-	0:00	0:00				
41	T10-3	2:23	0:10	2:33				0:03	1.60	0:03	0:03				
42	T10-4	2:33	0:10	2:43	3:09	0:10	**3:19**	0:00	-	0:00	0:00	0:28	14	0:26	0:26
43	T11-1	**19:00**	0:10	19:10								0:28	14.3	0:26	
44	T11-2	19:16	0:10	19:26				0:06	2.90	0:06	0:06				
45	T11-3	19:26	0:10	19:36				0:00	-	0:00	0:00				
46	T11-4	19:38	0:10	19:48	20:23	0:10	20:33	0:02	0.95	0:02	0:02	0:35	12.4	0:26	0:35
47	T12-1	**20:28**	0:10	20:38								0:40	14.3	0:32	0:40
48	T12-2	20:40	0:10	20:50				0:02	0.35	0:02	0:02				
49	T12-3	20:54	0:10	21:04				0:04	1.20	0:03	0:04				
50	T12-4	21:04	0:10	21:14	21:45	0:10	21:55	0:00	-	0:00	0:00	0:31	10.7	0:23	0:31
51	T13-1	**22:09**	0:10	22:19								0:16	5.6	0:14	0:14
52	T13-2	22:19	0:10	22:29				0:00	-	0:00	0:00				
53	T13-3	22:31	0:10	22:41				0:03	0.85	0:02	0:02				
54	T13-4	22:41	0:10	22:51	23:03	0:10	23:13	0:00	-	0:00	0:00	0:17	4.9	0:12	0:12
55	T14-1	**23:22**	0:10	23:32								0:12	3.6	0:09	0:09
56	T14-2	23:35	0:10	23:45				0:04	1.40	0:03	0:03				
57	T14-3	23:45	0:10	23:55				0:00	-	0:00	0:00				
58	T14-4	23:56	0:10	0:06	0:15	0:10	0:25	0:01	0.22	0:01	0:01	0:10	2.6	0:09	0:09
59	T15-1	**0:33**	0:10	0:43								0:12	3	0:08	0:08
60	T15-2	0:43	0:10	0:53				0:00	-	0:00	0:00				
61	T15-3	0:56	0:10	1:06				0:03	1.20	0:03	0:03				
62	T15-4	1:06	0:10	1:16	1:28	0:10	1:38	0:00	-	0:00	0:00	0:16	4.5	0:12	0:12
63	T16-1	**1:50**	0:10	2:00								0:16	5.2	0:12	0:12
64	T16-2	2:00	0:10	2:10				0:00	-	0:00	0:00				
65	T16-3	2:14	0:10	2:24				0:04	1.40	0:04	0:04				
66	T16-4	2:24	0:10	2:34	2:56	0:10	3:06	0:00	-	0:00	0:00	0:28	8.4	0:22	0:22
67	T17-1	**3:26**	0:10	3:36								0:24	9.3	0:20	0:20
68	T17-2	3:36	0:10	3:46				0:00	0	0:00	0:00				
69	T17-3	3:49	0:10	3:59				0:03	1.1	0:03	0:03				
70	T17-4	3:59	0:10	4:09	4:29	0:10	**4:39**	0:00	-	0:00	0:00	0:24	7.9	0:20	0:20
70									**42km**		**119min**		**290km**		**671min**

*1: This collection time is for reference only. These collection times do not consider break times. In the proposal document, the collection time should be prepared considering the break time.

*2: This time and distance were measured with the Google Maps application. The proposer should present the expected values in the proposal document.

Appendix2-1 Container collection plan for TOR — **Appendix2: Work plan for TOR**

(3) Container collection plan (KaMavota)					2nd Collection plan							Total							Primary collection								Container *1				Hulene *1				Container *2				Hulene *2			
Nr.	m3	Name of Container point	longitude F	latitude F	S	T	Q	Q	F	S		S	T	Q	Q	F	S		S	T	Q	Q	F	S	1 ME	2 ME		llegada	on	Salida		llegada	off	Salida		19:00	Km	22:00		19:00	Km	22:00	
1	12	Fertiliza	32.609268	-25.920803	1	0	1	1	0	1		1	0	1	1	0	1		A		C	A		C	Ferroviário		1	19:00	0:10	19:10		19:25	0:10	19:35						0:15	4	0:11	0:15
2	12	Quarterao 13	32.616222	-25.919107	1	0	1	0	0	1		0	0	1	0	0	1				C			C	Ferroviário		2	19:47	0:10	19:57		20:09	0:10	20:19						0:12	4.5	0:11	0:12
3	12	Rua Da Beira Estaleiro Dragao	32.602760	-25.906931	1	0	0	1	0	0		1	0	0	1	0	0		A			A			Laulane		3	20:25	0:10	20:35		20:41	0:10	20:51						0:06	1.4	0:04	0:06
4	12	Rua Da Beira Taka Nha	32.592133	-25.915010	1	1	1	1	1	1		1	2	1	1	2	1		A	B		A	B		Hulene B	Hulene A	4	21:01	0:10	21:11		21:21	0:10	21:31						0:10	1.9	0:06	0:10
5	12	Rua Da Beira Mercado Mavalane 1	32.586000	-25.922000	1	1	1	0	1	1		0	1	1	0	1	1			B			B		Mavalane A	Hulene A	5	21:40	0:10	21:50		21:59	0:10	22:09						0:14	3	0:09	0:09
6	12	Rua Da Beira Mercado Mavalane 2	32.586000	-25.922000	1	1	1	1	1	1		1	2	2	1	2	2			B	C		B	C	Mavalane B	Mercado	6	22:18	0:10	22:28		22:37	0:10	22:47						0:14	3	0:09	0:09
7	12	Rua Da Beira TTA	32.581173	-25.922514	1	1	1	0	1	1		0	1	1	0	1	1			B	C		B	C	Mavalane A		7	22:57	0:10	23:07		23:17	0:10	23:27						0:15	3.5	0:10	0:10
8	12	Antena da Vodacom	32.617702	-25.900510	1	0	1	0	0	1		0	0	1	0	0	1				C			C	Laulane		8	23:35	0:10	23:45		23:53	0:10	0:03						0:08	3.2	0:08	0:08
9	12	Av. Dom Alexandre- Muro Pindada Vodacom	32.619900	-25.892248	1	0	1	0	0	1		0	0	1	0	0	1				C			C	3 de Fevereiro		9	0:11	0:10	0:21		0:29	0:10	0:39						0:08	3.2	0:08	0:08
10	12	Av. Dom Alexandre Farmacia Africa	32.628998	-25.856705	1	1	1	0	1	1		0	1	1	0	1	1			B			B		Albazine	Mahotas	10	0:58	0:10	1:08		1:27	0:10	1:37						0:20	7.3	0:19	0:19
11	12	Av. Dom Alexandre Escola Secundaria Albazine	32.632679	-25.848309	1	1	0	0	1	0		0	1	0	0	1	0			B			B		Albazine		11	1:58	0:10	2:08		2:29	0:10	2:39						0:22	8.3	0:21	0:21
12	12	Av. Dom Alexandre Estaleiro Monica	32.634056	-25.844820	1	0	0	1	0	0		1	0	0	1	0	0		A			A			Albazine		12	3:01	0:10	3:11		3:33	0:10	**3:43**						0:24	8.7	0:22	0:22
13	12	Av. Dom Alexandre Escola Primaria Albazine	32.636719	-25.842516	1	0	0	1	0	0		1	0	0	1	0	0		A			A			Albazine		13	**19:00**	0:10	19:10		19:32	0:10	19:42						0:22	10.3	0:20	0:22
14	12	Ao Longo da Linha Feira Chicabele	32.637371	-25.859655	1	1	1	0	1	1		0	1	1	0	1	1				C			C	Albazine	Mahotas	14	19:57	0:10	20:07		20:22	0:10	20:32						0:15	8.3	0:15	0:15
15	12	Mercado Romao	32.632771	-25.870972	1	1	0	0	1	0		0	1	0	0	1	0			B			B		Mahotas		15	20:46	0:10	20:56		21:10	0:10	**21:20**						0:14	6.1	0:12	0:14
15	**180m3**				**15**	**8**	**10**	**6**	**8**	**10**		**6**	**10**	**11**	**6**	**10**	**11**																								**76.7**		**200min**
1	6	Dona Alice-Chapa Munguambe Sucata Metal atras do muro MEA PAZ	32.634010	-25.900633	1	1	1	1	1	1		0	1	0	0	1	0			B			B		Costa do Sol		T01-1	**19:00**	0:10	19:10													
2	6	Quarteirao 46 Costa do Sol	32.644066	-25.908276	1	1	1	1	1	1		0	1	0	0	1	0			B			B		Costa do Sol		T01-2	19:17	0:10	19:27						0:07	2.1	0:07	0:07				
3	6	Mapulene 1	32.660554	-25.885710	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Costa do sol		T01-3	19:36	0:10	19:46		20:08	0:10	20:18		0:09	4.8	0:09	0:09	0:22	9.6	0:20	0:22
4	6	Bairro dos pescadores 1	32.658382	-25.904261	1	1	1	1	1	1		1	1	2	1	1	2				C			C	Costa do Sol	Mercado	T2-1	**20:40**	0:10	20:50										0:22	7.6	0:18	0:22
5	6	Bairro dos pescadores 2	32.659679	-25.901217	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Costa do Sol		T2-2	20:52	0:10	21:02						0:02	0.45	0:02	0:02				
6	6	Escola primaria do Triunfo	32.636379	-25.925289	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Costa do sol		T2-3	21:09	0:10	21:19		21:40	0:10	21:50		0:07	3.7	0:07	0:07	0:21	7.5	0:18	0:21
7	6	Pontinha - Costa do sol	32.631508	-25.923475	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Costa do sol		T3-1	**22:08**	0:10	22:18										0:20	6.9	0:18	0:18
8	6	Rua de Mangal	32.633274	-25.919661	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Costa do sol		T3-2	22:20	0:10	22:30						0:02	0.7	0:02	0:02				
9	6	Vila Sol 1	32.628520	-25.916799	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Ferroviário		T3-3	22:33	0:10	22:43		22:59	0:10	23:09		0:03	0.6	0:03	0:03	0:18	5	0:16	0:16
10	6	Vila Sol 2	32.628680	-25.916844	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Ferroviário		T4-1	**23:23**	0:10	23:33										0:16	5	0:14	0:14
11	6	Rua dos Continuadores	32.631099	-25.927476	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Costa do sol		T4-2	23:39	0:10	23:49						0:06	1.8	0:06	0:06				
12	6	Igreja Testemunha de Jeova	32.629040	-25.931074	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Costa do sol		T4-3	23:52	0:10	0:02		0:20	0:10	0:30		0:03	0.5	0:03	0:03	0:25	8.6	0:18	0:18
13	6	Praca dos Herois - Eucalipto 1	32.580040	-25.932121	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Urbanização		T5-1	**0:42**	0:10	0:52										0:14	4.8	0:12	0:12
14	6	Praca dos Herois - Eucalipto 2	32.580040	-25.932121	1	1	1	1	1	1		1	0	1	1	0	1		A		C	A		C	Mavalane A		T5-2	0:52	0:10	1:02						0:00	0	0:00	0:00				
15	6	Av. FPLM Centro de Saude Mavalane 1	32.587662	-25.931366	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Maxaquene D		T5-3	1:05	0:10	1:15						0:03	0.8	0:03	0:03				
16	6	Av. FPLM Centro de Saude Mavalane 2	32.587662	-25.931366	1	1	1	1	1	1		1	0	1	1	0	1		A			A			Mavalane A	Mavalane B	T5-4	1:15	0:10	1:25		1:37	0:10	1:47		0:00	0	0:00	0:00	0:17	5.2	0:12	0:12
17	6	Av.FPLM Hospital Mavalane 1	32.584152	-25.930176	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Mavalane A		T6-1	**1:59**	0:10	2:09										0:14	5.2	0:12	0:12
18	6	Av.FPLM Hospital Mavalane 2	32.584152	-25.930176	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		FPLM		T6-2	2:09	0:10	2:19						0:00	0	0:00	0:00				
19	6	AV. FPLM Cruz Vermelho 1	32.597965	-25.928268	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C	FPLM		T6-3	2:22	0:10	2:32						0:03	1.1	0:03	0:03				
20	6	AV. FPLM Cruz Vermelho 2	32.597965	-25.928268	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C	FPLM		T6-4	2:32	0:10	2:42		2:50	0:10	3:00		0:00	0	0:00	0:00	0:14	3.7	0:08	0:08
21	6	Mercado Informal de Mbusine	32.603096	-25.926405	1	1	1	1	1	1		0	0	1	0	0	1				C			C	FPLM		T7-1	**3:09**	0:10	3:19										0:11	3.3	0:09	0:09
22	6	Av. Juluis Nhyrere- Ponte Ferroviario 1	32.604618	-25.921352	1	1	1	1	1	1		1	0	1	1	0	1		A			A			Ferroviário	FPLM	T7-2	3:22	0:10	3:32						0:04	0.8	0:03	0:03				
23	6	Av. Juluis Nhyrere- Ponte Ferroviario 2	32.604618	-25.921352	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Mavalane B		T7-3	3:32	0:10	3:42		3:48	0:10	**3:58**		0:00	0	0:00	0:00	0:09	2.2	0:06	0:06
24	6	Av.Julius Nyerere- Rua de Complexo 1	32.603752	-25.918739	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		Mavalane B		T8-1	**19:00**	0:10	19:10										0:07	2	0:05	
25	6	Av.Julius Nyerere- Rua de Complexo 2	32.603752	-25.918739	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		Mavalane B		T8-2	19:10	0:10	19:20						0:00	0	0:00	0:00				
26	6	Av.Julius Nyerere- Rua de Complexo 3	32.603752	-25.918739	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Ferroviário		T8-3	19:20	0:10	19:30		19:44	0:10	19:54		0:00	0	0:00	0:00	0:14	3.8	0:09	0:14
27	6	Av.Julius Nyerere- Rua de Complexo 4	32.603752	-25.918739	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Hulene A		T9-1	**20:00**	0:10	20:10										0:06	1.9	0:05	0:06
28	6	Av. Juluis Nhyerere-Chapa Amarelo 1	32.602886	-25.916683	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Hulene A		T9-2	20:11	0:10	20:21						0:01	0.27	0:01	0:01				
29	6	Av. Juluis Nhyerere-Chapa Amarelo 2	32.602886	-25.916683	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		Ferroviário		T9-3	20:21	0:10	20:31		20:39	0:10	20:49		0:00	0	0:00	0:00	0:08	1.6	0:05	0:08
30	6	Rua da Beira - Feira de Hulene 1	32.594124	-25.913319	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		Hulene B		T10-1	**20:55**	0:10	21:05										0:06	1.5	0:05	0:06
31	6	Rua da Beira - Feira de Hulene 2	32.594124	-25.913342	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		Hulene A		T10-2	21:05	0:10	21:15						0:00	0	0:00	0:00				
32	6	Rua da Beira 1 (Sitoe)	32.589600	-25.916100	1	1	1	1	1	1		1	1	0	1	1	0		A			A			Hulene B	Mavalane B	T10-3	21:19	0:10	21:29						0:04	0.75	0:03	0:04				
33	6	Rua da Beira 2 (Sitoe)	32.589600	-25.916100	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Hulene A		T10-4	21:29	0:10	21:39		21:46	0:10	21:56		0:00	0	0:00	0:00	0:12	2.2	0:07	0:07
34	6	Centro de Saude 1 de Junho 1	32.610035	-25.914469	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		Ferroviário		T11-1	**22:06**	0:10	22:16										0:12	3.4	0:10	0:10
35	6	Centro de Saude 1 de Junho 2	32.610035	-25.914469	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		Ferroviário		T11-2	22:16	0:10	22:26						0:00	0	0:00	0:00				
36	6	Campo Ferroviario 1	32.612988	-25.917322	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Ferroviário		T11-3	22:29	0:10	22:39						0:03	0.55	0:03	0:03				
37	6	Campo Ferroviario 2	32.612988	-25.917322	1	1	1	1	1	1		1	0	0	1	0	0		A			A			Ferroviário		T11-4	22:39	0:10	22:49		22:57	0:10	23:07		0:00	0	0:00	0:00	0:10	2.1	0:08	0:08
38	6	Junto Ao 1 Andar 1	32.610085	-25.907919	1	1	1	1	1	1		0	1	0	0	1	0			B			B		Ferroviário		T12-1	**23:13**	0:10	23:23										0:07	2.3	0:06	0:06
39	6	Junto Ao 1 Andar 2	32.610085	-25.907919	1	1	1	1	1	1		0	1	0	0	1	0			B			B		Ferroviário		T12-2	23:23	0:10	23:33						0:00	0	0:00	0:00				
40	6	Mercado Maguiguana 1	32.613789	-25.906811	1	1	1	1	1	1		0	1	0	0	1	0			B			B		Laulane		T12-3	23:36	0:10	23:46						0:03	0.55	0:03	0:03				
41	6	Mercado Maguiguana 2	32.613789	-25.906811	1	1	1	1	1	1		1	2	1	1	2	1			B			B		Laulane	Mercado	T12-4	23:46	0:10	23:56		0:02	0:10	0:12		0:00	0	0:00	0:00	0:07	2.4	0:06	0:06
42	6	Procuradoria 1	32.616913	-25.904024	1	1	1	1	1	1		0	1	1	0	1	1			B	C		B	C	Laulane		T13-1	**0:18**	0:10	0:28										0:06	2.3	0:06	0:06
43	6	Procuradoria 2	32.616913	-25.904024	1	1	1	1	1	1		0	1	1	0	1	1			B	C		B	C	Laulane		T13-2	0:28	0:10	0:38						0:00	0	0:00	0:00				
44	6	Pontinha - Romao	32.628651	-25.881825	1	1	1	1	1	1		0	1	0	0	1	0			B			B		Mahotas		T13-3	0:52	0:10	1:02						0:14	7.1	0:14	0:14				
45	6	20 casas	32.641635	-25.847561	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Albazine		T13-4	1:02	0:10	1:12		1:30	0:10	1:40		0:00	5	0:00	0:00	0:18	9	0:18	0:18
46	6	Cemitério Guebo 1	32.625290	-25.864416	1	1	1	1	1	1		0	1	1	0	1	1			B	C		B	C	Mahotas		T14-1	**1:56**	0:10	2:06										0:18	6.4	0:16	0:16
47	6	Cemitério Guebo 2	32.625290	-25.864416	1	1	1	1	1	1		0	1	1	0	1	1			B	C		B	C	Mahotas		T14-2	2:06	0:10	2:16						0:00	0	0:00	0:00				
48	6	Ceração 1	32.623859	-25.871548	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C	Mahotas		T14-3	2:18	0:10	2:28						0:02	0.8	0:02	0:02				
49	6	Ceração 2	32.623859	-25.871548	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C	Mahotas		T14-4	2:28	0:10	2:38		2:54	0:10	3:04		0:00	0	0:00	0:00	0:16	5.6	0:16	0:16
50	6	Av. Dom Alxandre Bombas Pumas 1	32.620396	-25.886040	1	1	1	1	1	1		0	1	0	0	1	0			B			B		Mahotas		T15-1	**3:13**	0:10	3:23										0:12	4	0:09	0:09
51	6	Av. Dom Alxandre Bombas Pumas 2	32.620396	-25.886040	1	1	1	1	1	1		0	1	0	0	1	0			B			B		Mahotas		T15-2	3:23	0:10	3:33						0:00	0	0:00	0:00				
52	6	Av. Dom Alxandre 14 de Novembro 1	32.618530	-25.897333	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Laulane		T15-3	3:37	0:10	3:47						0:05	1.3	0:04	0:04				
53	6	Av. Dom Alxandre 14 de Novembro 2	32.618530	-25.897333	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Laulane		T15-4	3:47	0:10	3:57		4:04	0:10	**4:14**		0:00	0	0:00	0:00	0:07	2.7	0:07	0:07
54	6	Governo da cidade Maputo a frente 1	32.612442	-25.897533	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		Laulane		T16-1	**19:00**	0:10	19:10										0:07	2.3	0:07	
55	6	Governo da cidade Maputo a frente 2	32.612442	-25.897533	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		Laulane		T16-2	19:10	0:10	19:20						0:00	0	0:00	0:00				
56	6	Governo da Cidade Maputo atras 1	32.612335	-25.896095	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		Laulane		T16-3	19:21	0:10	19:31						0:01	0.17	0:01	0:01				
57	6	Governo da Cidade Maputo atras 2	32.612335	-25.896095	1	1	1	1	1	1		1	1	0	1	1	0		A	B		A	B		Laulane		T16-4	19:31	0:10	19:41		19:47	0:10	19:57		0:00	0	0:00	0:00	0:07	2.1	0:06	0:06
58	6	Rua Da Impazol -Maogeira 1	32.611763	-25.889572	1	1	1	1	1	1		1	2	1	1	2	1			B			B		3 de Fevereiro	Mercado	T17-1	**20:06**	0:10	20:16										0:10	2.7	0:09	0:09
59	6	Rua Da Impazol -Maogeira 2	32.611763	-25.889572	1	1	1	1	1	1		0	1	0	0	1	0			B			B		3 de Fevereiro		T17-2	20:16	0:10	20:26						0:00	0	0:00	0:00				
60	6	Atras da Shoprite Magoanine 1	32.600544	-25.886827	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Hulene B		T17-3	20:32	0:10	20:42						0:06	1.4	0:06	0:06				
61	6	Atras da Shoprite Magoanine 2	32.600544	-25.886827	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Hulene B		T17-4	20:42	0:10	20:52		21:01	0:10	21:11		0:00	0	0:00	0:00	0:09	2.1	0:06	0:09
62	6	Av. Juluis Nherere-PT Magoanine 1	32.604359	-25.885328	1	1	1	1	1	1		1	0	0	1	0	0		A			A			3 de Fevereiro		T18-1	**21:19**	0:10	21:29										0:08	2	0:05	0:08
63	6	Av. Juluis Nherere-PT Magoanine 2	32.604359	-25.885328	1	1	1	1	1	1		0	0	1	0	0	1				C			C	Hulene B		T18-2	21:29	0:10	21:39						0:00	0	0:00	0:00				
64	6	Av. Sebastiao Mabote -Lavandaria Khurula 1	32.614258	-25.865383	1	1	1	1	1	1		1	1	1	1	1	1				C			C	Mahotas	Magoanine A	T18-3	21:46	0:10	21:56						0:07	2.6	0:05	0:07				
65	6	Av. Sebastiao Mabote -Lavandaria Khurula 2	32.614258	-25.865383	1	1	1	1	1	1		1	1	1	1	1	1				C			C	Mahotas	Magoanine A	T18-4	21:56	0:10	22:06		22:21	0:10	**22:31**		0:00	0	0:00	0:00	0:15	4.5	0:12	0:15
65	**390m3**	**Total**			**65**	**65**	**65**	**65**	**65**	**65**		**39**	**37**	**30**	**39**	**37**	**30**																				**37.84**		**93min**		**143.5**		**380min**

*1: This collection time is for reference only. These collection times do not consider break times. In the proposal document, the collection time should be prepared considering the break time.

*2: This time and distance were measured with the Google Maps application. The proposer should present the expected values in the proposal document.

(4) Container collection route sheet (Nlhamanculo)

Appendix2-1 Container collection plan

Nlhamanculo 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Monday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Entrada da Base Aerea - Av. 19 de Outubro											**19:00**	19:10	
2	12	Campo Base Aerea - Av. 19 de Outubro											20:02	20:12	
3	12	007-Rua Gago Coutinho											21:01	21:11	
4	12	Rua Gago Coutinho - Igreja Catolica											21:53	22:03	
5	12	Igreja Assembleia-Rua Gago Coutinho											22:41	22:51	
6	12	Escola Unidade 18 -Rua Gago Coutinho											23:29	23:39	
7	12	Cape-Cape-Campo - Rua 2.282											0:23	0:33	
8	12	10- Esquadra - Rua de Xipamanine											1:19	1:29	
9	12	Rua do Zimabwe											2:14	2:24	
10	12	Sao Joaquim Rua Zambeze											3:12	3:22	

Nlhamanculo 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Thursday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Entrada da Base Aerea - Av. 19 de Outubro											**19:00**	19:10	
2	12	Campo Base Aerea - Av. 19 de Outubro											20:02	20:12	
3	12	007-Rua Gago Coutinho											21:01	21:11	
4	12	Rua Gago Coutinho - Igreja Catolica											21:53	22:03	
5	12	Igreja Assembleia-Rua Gago Coutinho											22:41	22:51	
6	12	Escola Unidade 18 -Rua Gago Coutinho											23:29	23:39	
7	12	Cape-Cape-Campo - Rua 2.282											0:23	0:33	
8	12	10- Esquadra - Rua de Xipamanine											1:19	1:29	
9	12	Rua do Zimabwe											2:14	2:24	
10	12	Sao Joaquim Rua Zambeze											3:12	3:22	

Nlhamanculo 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Tuesday, Friday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Entrada da Base Aerea - Av. 19 de Outubro											**19:00**	19:10	
2	12	Campo Base Aerea - Av. 19 de Outubro											20:02	20:12	
3	12	007-Rua Gago Coutinho											21:01	21:11	
4	12	Rua Gago Coutinho - Igreja Catolica											21:53	22:03	
5	12	Igreja Assembleia-Rua Gago Coutinho											22:41	22:51	
6	12	Escola Unidade 18 -Rua Gago Coutinho											23:29	23:39	
7	12	Cape-Cape-Campo - Rua 2.282											0:23	0:33	
8	12	10− Esquadra - Rua de Xipamanine											1:19	1:29	
9	12	Rua do Zimabwe											2:14	2:24	
10	12	Sao Joaquim Rua Zambeze											3:12	3:22	

Nlhamanculo 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Wednesday, Saturday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Entrada da Base Aerea - Av. 19 de Outubro											**19:00**	19:10	
2	12	Campo Base Aerea - Av. 19 de Outubro											20:02	20:12	
3	12	007-Rua Gago Coutinho											21:01	21:11	
4	12	Rua Gago Coutinho - Igreja Catolica											21:53	22:03	
5	12	Igreja Assembleia-Rua Gago Coutinho											22:41	22:51	
6	12	Escola Unidade 18 -Rua Gago Coutinho											23:29	23:39	
7	12	Cape-Cape-Campo - Rua 2.282											0:23	0:33	
8	12	10− Esquadra - Rua de Xipamanine											1:19	1:29	
9	12	Rua do Zimabwe											2:14	2:24	
10	12	Sao Joaquim Rua Zambeze											3:12	3:22	

(4) Container collection route sheet (Nlhamanculo)

Appendix2-1 Container collection plan

Nlhamanculo 6m3: Normal Collection(7pm-7am)

Nome do WSPC:

Everday

Numelo do ROTA:

Data:

Matrícula do veículo:

Tipo de veiculo:

Motorista

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	6	Mercado Vulcano 1- Rua Gago Coutinho											19:00		
2	6	Mercado Vulcano 2- Rua Gago Coutinho											19:10		
3	6	Zixaxa 1- Rua do Zixaxa Nr. 2.302											19:22		
4	6	Zixaxa 2- Rua do Zixaxa Nr. 2.302											19:32	20:04	
5	6	Naggi 1-Rua Gago Coutinho											20:36		
6	6	Naggi 2-Rua Gago Coutinho											20:46		
7	6	Terminal da Junta-1											20:58		
8	6	Terminal da Junta-2											21:08	21:42	
9	6	Lhanguene-Av. Mozambique-1											22:12		
10	6	Lhanguene-Av. Mozambique-2											22:22		
11	6	Mega CASH and CARRY											22:37		
12	6	Up-Av. Trabalho-1											22:52	23:24	
13	6	Up-Av. Trabalho-2											23:54		
14	6	Ufa-1 Rua 2.276											0:08		
15	6	Ufa-2 Rua 2.276											0:18		
16	6	Coca-cola-Rua lago Maramba-1											0:31	1:05	
17	6	Coca-cola-Rua lago Maramba-2											1:38		
18	6	Rotunda 16 de Junho-1 Av. OUA											1:50		
19	6	Rotunda 16 de Junho-2 Av. OUA											2:00		
20	6	Saida da ponte Maputo Katembe - Av. 24 de Julho											2:11	2:44	
21	6	LOUMAR1											3:17		
22	6	LOUMAR2											3:28		
23	6	STAE - Av. 24 de Julho											3:41		
24	6	Igreja Anglicana											3:53	4:25	

Nlhamanculo 6m3: Normal Collection(7pm-7am)

Nome do WSPC:

Everday

Numelo do ROTA:

Data:

Matrícula do veículo:

Tipo de veiculo:

Motorista

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
25	6	Mercado Malanga 1											19:00		
26	6	Mercado Malanga 2											19:10		
27	6	Chamanculo A-1											19:22		
28	6	Chamanculo A-2											19:32	20:15	
29	6	Mercado Fajardo 1											20:55		
30	6	Mercado Fajardo 2											21:05		
31	6	Colombia - Rua Major Teixeira Pinto-1											21:20		
32	6	Colombia - Rua Major Teixeira Pinto-2											21:30	21:59	
33	6	Campo de Mahafil-Rua Mateteu											22:30		
34	6	Retiro-Rua da Fatima											22:41		
35	6	Escola Unidade 16-Rua da Fatima											22:53		
36	6	Zanza-1 Rua Marcelino dos Santos											23:06	23:36	
37	6	Zanza-2 Rua Marcelino dos Santos-2											0:06		
38	6	Bazuca - Rua Irmaos Ruby											0:22		
39	6	Rua dos Irmaos Ruby/Parque Xipamanine-1											0:35		
40	6	Rua dos Irmaos Ruby/Parque Xipamanine-2											0:45	1:15	
41	6	Mercado Xipamanine-1 Rua Zixaxa											1:46		
42	6	Mercado Xipamanine-2 Rua Zixaxa											1:56		
43	6	Mercado Xipamanine-3 Rua Zixaxa											2:06		
44	6	Mercado Xipamanine-4 Rua Zixaxa											2:16	2:48	
45	6	Xibamate 1- Av. De Angola											3:14		
46	6	Xibamate 2- Av. De Angola											3:24		
47	6	Xibamate 3- Av. De Angola											3:34		
48	6	CETA 1-Centro de Saude de Xipamanine - Av. Joaquim Chissano											3:48	4:16	

NIhamanculo 6m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Eeveryday, 3day/week**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
49	6	CETA 2-Centro de Saude de Xipamanine - Av. Joaquim Chissano											19:00		
50	6	CETA 3-Centro de Saude de Xipamanine - Av. Joaquim Chissano											19:10		
51	6	Av. Mocambique- jardim Zoologico 1											19:25		
52	6	Av. Mocambique- jardim Zoologico 2											19:35	20:14	
1	6	Ponto-Final (perto do Quartel)											21:12		
2	6	Assucena											21:27		
3	6	Cemiterio-Incassane											21:43		
4	6	Mercado Chali											22:02		
5	6	Chibantchane											22:16	23:04	
6	6	Firmino											23:54		
7	6	Espiga D'ouro											0:11		
8	6	Complexo Guimaraes											0:30		
9	6	EPC											0:42		
10	6	Raul											0:56	1:41	

(4) Container collection route sheet (KaMaxaquene) **Appendix2-1 Container collection plan**

KaMaxaquene 6m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Everday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	6	51.Av. Angola Kia-1											19:00		
2	6	51.Av. Angola Kia-2											19:10		
3	6	Av. Angola atras das Bombas Sasol-1											19:22		
4	6	Av. Angola atras das Bombas Sasol-2											19:32	20:04	
5	6	Av. Angola/Joaquim Chissano Semaforo-1											20:32		
6	6	Av. Angola/Joaquim Chissano Semaforo-2											20:42		
7	6	Praca dos Herois - Mercado Mazambanine-1											20:57		
8	6	Praca dos Herois - Mercado Mazambanine-2											21:07	21:31	
9	6	Av.Acordos Lusaka - MICOA 1											21:53		
10	6	Av.Acordos Lusaka - Balthazar											22:04		
11	6	Av.Acordos Lusaka - MICOA 3											22:15	22:43	
12	6	Av.Acordos Lusaka - ETRAGO											23:06		
13	6	Av. Acordos de Lusaka-Estaleiro 1											23:17		
14	6	Av. Acordos de Lusaka-Estaleiro 2											23:27	23:51	
15	6	Campo 1o de Maio 1											0:13		
16	6	Campo 1o de Maio 2											0:23		
17	6	Rua atras Do Bamco de Mocambique-1											0:36	0:59	
18	6	Rua atras Do Bamco de Mocambique-2											1:21		
19	6	Atras da Soveste-1											1:35		
20	6	Atras da Soveste-2											1:45	2:07	
21	6	Escola primaria de Maguiguana 1											2:30		
22	6	Escola primaria de Maguiguana 2											2:40		
23	6	50.Mercado Carrimbo-1											2:55	3:20	

KaMaxaquene 6m3: Normal Collection(7pm-7am)

Nome do WSPC:

Everday

Numelo do ROTA:

Data:

Matrícula do veículo:

Tipo de veiculo:

Motorista

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
24	6	50.Mercado Carrimbo-2											19:00		
25	6	Rua da Resistencia/Joaquim Chissano											19:14		
26	6	Micaela - Resistencia 1											19:25	19:49	
27	6	Micaela - Resistencia 2											19:59		
28	6	Av.Vlademir Lenine - Mae Africa											20:12		
29	6	Av.Vlademir Lenine - Saul 1											20:25	20:56	
30	6	Av.Vlademir Lenine - Saul 2											21:23		
31	6	New Av.Vlademir Lenine - Compone-2											21:37		
32	6	Av.Vlademir Lenine - Compone-1											21:47	22:07	
33	6	Av.Vlademir Lenine - Canhoeiro											22:26		
34	6	Escola Nova de Polana Canico 1											22:40		
35	6	Escola Nova de Polana Canico 2											22:50	23:13	
36	6	Rua Carlos Cardoso-Ravina-1											23:38		
37	6	Rua Carlos Cardoso-Ravina-2											23:48		
38	6	Rua carlos cardoso-Costa do Sol 1											0:04	0:24	
39	6	Rua carlos cardoso-Costa do Sol 2											0:45		
40	6	Mercado Peixa- Xiquelene-1											0:59		
41	6	Mercado Peixa- Xiquelene-2											1:09	1:27	
42	6	Mercado Peixa- Xiquelene-3											1:45		
43	6	Mercado Peixa- Xiquelene-4											1:55		
44	6	Escola P. Matchique Tchique-1											2:10	2:32	
45	6	Escola P. Matchique Tchique-2											2:54		
46	6	Igreja Mucorriano-1											3:07		
47	6	Igreja Mucorriano-2											3:17		
48	6	Av Julius Nhyerere Ravina1											3:31	3:50	

KaMaxaquene 6m3: Normal Collection(7pm-7am)

Nome do WSPC:

Everday

Numelo do ROTA:

Data:

Matrícula do veículo:

Tipo de veiculo:

Motorista

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
49	6	Av Julius Nhyerere Ravina2											19:00		
50	6	Golf											19:14		
51	6	Circuito Campo costa de sol											19:30	20:01	

(4) Container collection route sheet (KaMubukuwane)

Appendix2-1 Container collection plan

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Monday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Inhagoia Junto a igreja 1											**19:00**	19:40	
2	12	Inhagoia Junto a igreja 2											20:20	21:00	
3	12	Mercado Inhagoia 1											21:29	21:58	
4	12	Mercado Inhagoia 2											22:27	22:56	
5	12	Av. Mocambique- Chapa Xai-xai											23:27	23:58	
6	12	Av. Mocambique- Construa											0:31	1:04	
7	12	Ponte - Mercado 25 de Junho B											1:35	2:06	
8	12	Av. Mocambique-Bandaute 1											2:38	3:10	
9	12	Av. Mocambique-Bandaute 2											3:42	4:14	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Thursday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Inhagoia Junto a igreja 1											**19:00**	19:40	
2	12	Inhagoia Junto a igreja 2											20:20	21:00	
3	12	Mercado Inhagoia 1											21:29	21:58	
4	12	Mercado Inhagoia 2											22:27	22:56	
5	12	Av. Mocambique- Chapa Xai-xai											23:27	23:58	
6	12	Av. Mocambique- Construa											0:31	1:04	
7	12	Ponte - Mercado 25 de Junho B											1:35	2:06	
8	12	Av. Mocambique-Bandaute 1											2:38	3:10	
9	12	Av. Mocambique-Bandaute 2											3:42	4:14	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Monday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
10	12	Mercado Bagamoio											**19:00**	19:34	
11	12	Esquina Rua Da Paz											20:04	20:34	
12	12	Campo Aeronatica Vedacaoantiga 6m3											21:06	21:38	
13	12	Mabalawene Rua Da Esquadra											22:07	22:36	
14	12	Campo Aeoronautica Civil Vedacao 2											23:02	23:28	
15	12	Campo Aeoronautica Civil Vedacao 1											23:54	0:20	
16	12	Av. Mocambique - Missao Roque											0:50	1:20	
17	12	Escola Nova De Magoanine											1:42	2:04	
18	12	Av. Sebastiao Mabote - Borboleta											2:29	2:54	
19	12	Av. Nelson Mandela- Mercado Mbuzine											3:32	4:10	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Thursday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
10	12	Mercado Bagamoio											**19:00**	19:34	
11	12	Esquina Rua Da Paz											20:04	20:34	
12	12	Campo Aeronatica Vedacaoantiga 6m3											21:06	21:38	
13	12	Mabalawene Rua Da Esquadra											22:07	22:36	
14	12	Campo Aeoronautica Civil Vedacao 2											23:02	23:28	
15	12	Campo Aeoronautica Civil Vedacao 1											23:54	0:20	
16	12	Av. Mocambique - Missao Roque											0:50	1:20	
17	12	Escola Nova De Magoanine											1:42	2:04	
18	12	Av. Sebastiao Mabote - Borboleta											2:29	2:54	
19	12	Av. Nelson Mandela- Mercado Mbuzine											3:32	4:10	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Monday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
20	12	Vila Olimpia Extremo Sul											**19:00**	19:48	
21	12	Cemiterio de Zimpeto 1											20:38	21:28	
22	12	Cemiterio de Zimpeto 2											22:08	22:48	
23	12	Extremo Norte vila olimpica											23:24	0:00	
24	12	Extremo Norte Grande Maputo											0:36	1:12	
25	12	Mercado Grossista Zimpeto 1											1:47	2:22	
26	12	Mercado Grossista Zimpeto 2											2:57	3:32	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Thursday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
20	12	Vila Olimpia Extremo Sul											**19:00**	19:48	
21	12	Cemiterio de Zimpeto 1											20:38	21:28	
22	12	Cemiterio de Zimpeto 2											22:08	22:48	
23	12	Extremo Norte vila olimpica											23:24	0:00	
24	12	Extremo Norte Grande Maputo											0:36	1:12	
25	12	Mercado Grossista Zimpeto 1											1:47	2:22	
26	12	Mercado Grossista Zimpeto 2											2:57	3:32	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Monday, Thursday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
27	12	Anexo Grossista											**19:00**	19:45	
28	12	Anexo Grossista (Terminal de Transporte -1)											20:27	21:09	
29	12	Anexo Grossista (Terminal de Transporte -2)											21:51	22:33	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Tuesday, Friday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Inhagoia Junto a igreja 1											**19:00**	19:40	
2	12	Inhagoia Junto a igreja 2											20:20	21:00	
3	12	Mercado Inhagoia 1											21:29	21:58	
4	12	Mercado Inhagoia 2											22:27	22:56	
5	12	Av. Mocambique- Chapa Xai-xai											23:27	23:58	
6	12	Av. Mocambique- Construa											0:31	1:04	
7	12	Ponte - Mercado 25 de Junho B											1:35	2:06	
8	12	Av. Mocambique-Bandaute 1											2:38	3:10	
9	12	Av. Mocambique-Bandaute 2											3:42	4:14	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Tuesday, Friday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
10	12	Mercado Bagamoio											**19:00**	19:34	
11	12	Esquina Rua Da Paz											20:04	20:34	
12	12	Campo Aeronatica Vedacaoantiga 6m3											21:06	21:38	
13	12	Mabalawene Rua Da Esquadra											22:07	22:36	
14	12	Campo Aeoronautica Civil Vedacao 2											23:02	23:28	
15	12	Campo Aeoronautica Civil Vedacao 1											23:54	0:20	
16	12	Av. Mocambique - Missao Roque											0:50	1:20	
17	12	Escola Nova De Magoanine											1:42	2:04	
18	12	Av. Sebastiao Mabote - Borboleta											2:29	2:54	
19	12	Av. Nelson Mandela- Mercado Mbuzine											3:32	4:10	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Tuesday, Friday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
20	12	Vila Olimpia Extremo Sul											**19:00**	19:48	
21	12	Cemiterio de Zimpeto 1											20:38	21:28	
22	12	Cemiterio de Zimpeto 2											22:08	22:48	
23	12	Extremo Norte vila olimpica											23:24	0:00	
24	12	Extremo Norte Grande Maputo											0:36	1:12	
25	12	Mercado Grossista Zimpeto 1											1:47	2:22	
26	12	Mercado Grossista Zimpeto 2											2:57	3:32	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Tuesday, Friday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
27	12	Anexo Grossista											**19:00**	19:45	
28	12	Anexo Grossista (Terminal de Transporte -1)											20:27	21:09	
29	12	Anexo Grossista (Terminal de Transporte -2)											21:51	22:33	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Wednesday, Saturday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Inhagoia Junto a igreja 1											**19:00**	19:40	
2	12	Inhagoia Junto a igreja 2											20:20	21:00	
3	12	Mercado Inhagoia 1											21:29	21:58	
4	12	Mercado Inhagoia 2											22:27	22:56	
5	12	Av. Mocambique- Chapa Xai-xai											23:27	23:58	
6	12	Av. Mocambique- Construa											0:31	1:04	
7	12	Ponte - Mercado 25 de Junho B											1:35	2:06	
8	12	Av. Mocambique-Bandaute 1											2:38	3:10	
9	12	Av. Mocambique-Bandaute 2											3:42	4:14	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Wednesday, Saturday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
10	12	Mercado Bagamoio											**19:00**	19:34	
11	12	Esquina Rua Da Paz											20:04	20:34	
12	12	Campo Aeronatica Vedacaoantiga 6m3											21:06	21:38	
13	12	Mabalawene Rua Da Esquadra											22:07	22:36	
14	12	Campo Aeoronautica Civil Vedacao 2											23:02	23:28	
15	12	Campo Aeoronautica Civil Vedacao 1											23:54	0:20	
16	12	Av. Mocambique - Missao Roque											0:50	1:20	
17	12	Escola Nova De Magoanine											1:42	2:04	
18	12	Av. Sebastiao Mabote - Borboleta											2:29	2:54	
19	12	Av. Nelson Mandela- Mercado Mbuzine											3:32	4:10	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Wednesday, Saturday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
20	12	Vila Olimpia Extremo Sul											**19:00**	19:48	
21	12	Cemiterio de Zimpeto 1											20:38	21:28	
22	12	Cemiterio de Zimpeto 2											22:08	22:48	
23	12	Extremo Norte vila olimpica											23:24	0:00	
24	12	Extremo Norte Grande Maputo											0:36	1:12	
25	12	Mercado Grossista Zimpeto 1											1:47	2:22	
26	12	Mercado Grossista Zimpeto 2											2:57	3:32	

KaMubukuwane 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Wednesday, Saturday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
27	12	Anexo Grossista											**19:00**	19:45	
28	12	Anexo Grossista (Terminal de Transporte -1)											20:27	21:09	
29	12	Anexo Grossista (Terminal de Transporte -2)											21:51	22:33	

(4) **Container collection route sheet (KaMubukuwane)** **Appendix2-1 Container collection plan**

KaMubukuwane 6m3: Normal Collection (7pm-7am) **Nome do WSPC:** **Everday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	6	Atras Da Volvo											19:00		
2	6	N4 Volvo 1											19:13		
3	6	N4 Volvo 2											19:23		
4	6	Mercado Luis. Cabral 1											19:36	20:16	
5	6	Mercado Luis. Cabral 2											20:52		
6	6	Atras da Veternaria 1											21:10		
7	6	Atras da Veternaria 2											21:20		
8	6	Atras Da Veternaria 3											21:33	22:05	
9	6	Ponte Jardim											22:33		
10	6	Rua da Agricultura - Electricidade											22:44		
11	6	Rua da Agricultura - Rua das Dalias											22:55		
12	6	Linha ferrea											23:07		
13	6	Escola do Jardim											23:18	23:51	
14	6	Escola dom Bosco											0:23		
15	6	2M											0:36		
16	6	2M Bombas (Januario)											0:47		
17	6	Rua do Algodao											0:58	1:32	
18	6	Mercado Jardim (1)											2:04		
19	6	Mercado Jardim (2)											2:14		
20	6	PRM esquadra do Jardim- carwach											2:26		
21	6	Rua das Dalias											2:38	3:09	

KaMubukuwane 6m3: Normal Collection (7pm-7am) **Nome do WSPC:** **Everday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
22	6	Rua do Salao											19:00		
23	6	Av. Mocambique - Sede 25 de Junho 1											19:26		
24	6	Av. Mocambique - Sede 25 de Junho 2											19:36		
25	6	Av. Mocambique-UGC 1											19:52	20:30	
26	6	Av. Mocambique-UGC 2											20:28		
27	6	Av. Mocambique-MozBrake 1											20:50		
28	6	Av. Mocambique-MozBrake 2											21:00		
29	6	Av. Mocambique- Mercado 25 de Setembro 1											21:15		
30	6	Av. Mocambique- Mercado 25 de Setembro 2											21:25	21:57	
31	6	Rua dos Leos 1											22:29		
32	6	Rua dos Leos 2											22:39		
33	6	Av. Nelson Mandela- Campo Sheel1											22:53		
34	6	Av. Nelson Mandela- Campo Sheel2											23:03	23:38	
35	6	Mercado Comunitaria Matendene 1											0:10		
36	6	Mercado Comunitaria Matendene 2											0:20		
37	6	Minas 1											0:42		
38	6	Minas 2											0:52	1:26	
39	6	Minas 3											2:00		
40	6	Minas 4											2:10		
41	6	Grande Maputo Igreja Assemblea de Deus Circular 1											2:23		
42	6	Grande Maputo Igreja Assemblea de Deus Circular 2											2:33	3:09	

KaMubukuwane 6m3: Normal Collection (7pm-7am) **Nome do WSPC:** **Everday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
43	6	Av. Nelson Mandela & Grande Maputo Estaleiro											19:00		
44	6	Condominio Grande Maputo CM 1											19:16		
45	6	Condominio Grande Maputo CM 2											19:26		
46	6	Av. Mocambique-Depois do control Zimpeto1											19:38	20:23	
47	6	Av. Mocambique-Depois do control Zimpeto2											20:28		
48	6	Avenida de Mocambique-Drive in											20:40		
49	6	Av. Mocambique-Terreno Mabor 1											20:54		
50	6	Av. Mocambique-Terreno Mabor 2											21:04	21:45	
51	6	Av. Lurdes Mutola -Estaleiro 1											22:09		
52	6	Av. Lurdes Mutola -Estaleiro 2											22:19		
53	6	Av. Lurdes Mutola- Posto 19 novas Bombas 1											22:31		
54	6	Av. Lurdes Mutola- Posto 19 novas Bombas 2											22:41	23:03	
55	6	Av. Lurdes Mutola - Fim do Muro da Paiol											23:22		
56	6	Av. Lurdes Mutola - Praca da Juventude 1											23:35		
57	6	Av. Lurdes Mutola - Praca da Juventude 2											23:45		
58	6	Avenida Lurdes Mutola - Mesquita											23:56	0:15	
59	6	Fim do Murro do Aeroporto 1											0:33		
60	6	Fim do Murro do Aeroporto 2											0:43		
61	6	Campo de Malhazine 1											0:56		
62	6	Campo de Malhazine 2											1:06	1:28	
63	6	Escola Secundaria Mubukwana 1											1:50		
64	6	Escola Secundaria Mubukwana 2											2:00		
65	6	Av. Mocambique - Mercado Benfica 1											2:14		
66	6	Av. Mocambique - Mercado Benfica 2											2:24	2:56	
67	6	Av. Mocambique - Carcaca 1											3:26		
68	6	Av. Mocambique - Carcaca 2											3:36		
69	6	Av. Mocambique -Timbila 1											3:49		
70	6	Av. Mocambique -Timbila 2											3:59	4:29	

(4) Container collection route sheet (KaMavota)

Appendix2-1 Container collection plan

KaMavota 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Monday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Fertiliza											**19:00**	19:25	
2	12	Quarterao 13											19:47	20:09	
3	12	Rua Da Beira Estaleiro Dragao											20:25	20:41	
4	12	Rua Da Beira Taka Nha											21:01	21:21	
5	12	Rua Da Beira Mercado Mavalane 1											21:40	21:59	
6	12	Rua Da Beira Mercado Mavalane 2											22:18	22:37	
7	12	Rua Da Beira TTA											22:57	23:17	
8	12	Antena da Vodacom											23:35	23:53	
9	12	Av. Dom Alexandre- Muro Pindada Vodacom											0:11	0:29	
10	12	Av. Dom Alexandre Farmacia Africa											0:58	1:27	
11	12	Av. Dom Alexandre Escola Secundaria Albazine											1:58	2:29	
12	12	Av. Dom Alexandre Estaleiro Monica											3:01	3:33	
13	12	Av. Dom Alexandre Escola Primaria Albazine											**19:00**	19:32	
14	12	Ao Longo da Linha Feira Chicabele											19:57	20:22	
15	12	Mercado Romao											20:46	21:10	

KaMavota 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Thursday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Fertiliza											**19:00**	19:25	
2	12	Quarterao 13											19:47	20:09	
3	12	Rua Da Beira Estaleiro Dragao											20:25	20:41	
4	12	Rua Da Beira Taka Nha											21:01	21:21	
5	12	Rua Da Beira Mercado Mavalane 1											21:40	21:59	
6	12	Rua Da Beira Mercado Mavalane 2											22:18	22:37	
7	12	Rua Da Beira TTA											22:57	23:17	
8	12	Antena da Vodacom											23:35	23:53	
9	12	Av. Dom Alexandre- Muro Pindada Vodacom											0:11	0:29	
10	12	Av. Dom Alexandre Farmacia Africa											0:58	1:27	
11	12	Av. Dom Alexandre Escola Secundaria Albazine											1:58	2:29	
12	12	Av. Dom Alexandre Estaleiro Monica											3:01	3:33	
13	12	Av. Dom Alexandre Escola Primaria Albazine											**19:00**	19:32	
14	12	Ao Longo da Linha Feira Chicabele											19:57	20:22	
15	12	Mercado Romao											20:46	21:10	

KaMavota 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Tuesday, Friday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Fertiliza											**19:00**	19:25	
2	12	Quarterao 13											19:47	20:09	
3	12	Rua Da Beira Estaleiro Dragao											20:25	20:41	
4	12	Rua Da Beira Taka Nha											21:01	21:21	
5	12	Rua Da Beira Mercado Mavalane 1											21:40	21:59	
6	12	Rua Da Beira Mercado Mavalane 2											22:18	22:37	
7	12	Rua Da Beira TTA											22:57	23:17	
8	12	Antena da Vodacom											23:35	23:53	
9	12	Av. Dom Alexandre- Muro Pindada Vodacom											0:11	0:29	
10	12	Av. Dom Alexandre Farmacia Africa											0:58	1:27	
11	12	Av. Dom Alexandre Escola Secundaria Albazine											1:58	2:29	
12	12	Av. Dom Alexandre Estaleiro Monica											3:01	3:33	
13	12	Av. Dom Alexandre Escola Primaria Albazine											**19:00**	19:32	
14	12	Ao Longo da Linha Feira Chicabele											19:57	20:22	
15	12	Mercado Romao											20:46	21:10	

KaMavota 12m3: Normal Collection(7pm-7am) **Nome do WSPC:** **Wednesday, Saturday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12	Fertiliza											**19:00**	19:25	
2	12	Quarterao 13											19:47	20:09	
3	12	Rua Da Beira Estaleiro Dragao											20:25	20:41	
4	12	Rua Da Beira Taka Nha											21:01	21:21	
5	12	Rua Da Beira Mercado Mavalane 1											21:40	21:59	
6	12	Rua Da Beira Mercado Mavalane 2											22:18	22:37	
7	12	Rua Da Beira TTA											22:57	23:17	
8	12	Antena da Vodacom											23:35	23:53	
9	12	Av. Dom Alexandre- Muro Pindada Vodacom											0:11	0:29	
10	12	Av. Dom Alexandre Farmacia Africa											0:58	1:27	
11	12	Av. Dom Alexandre Escola Secundaria Albazine											1:58	2:29	
12	12	Av. Dom Alexandre Estaleiro Monica											3:01	3:33	
13	12	Av. Dom Alexandre Escola Primaria Albazine											**19:00**	19:32	
14	12	Ao Longo da Linha Feira Chicabele											19:57	20:22	
15	12	Mercado Romao											20:46	21:10	

(4) Container collection route sheet (KaMavota)

Appendix2-1 Container collection plan

KaMavota 6m3: Normal Collection (7pm-7am)

Nome do WSPC:

Everday

Numelo do ROTA:

Data:

Matrícula do veículo:

Tipo de veiculo:

Motorista

No.	m3	Nome	Supervisor	cont ID	Hora Cheg.ao Cont	Hora Saida ao Cont	Hora Cheg.ao Lixeira	Hora Saida ao Lixeira	Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan Cheg Cont	Plan Cheg Lixeira	@
1	6	Dona Alice-Chapa Munguambe Sucata Metal atras do muro MEA PAZ											19:00		
2	6	Quarteirao 46 Costa do Sol											19:17		
3	6	Mapulene 1											19:36	20:08	
4	6	Bairro dos pescadores 1											20:40		
5	6	Bairro dos pescadores 2											20:52		
6	6	Escola primaria do Triunfo											21:09	21:40	
7	6	Pontinha - Costa do sol											22:08		
8	6	Rua de Mangal											22:20		
9	6	Vila Sol 1											22:33	22:59	
10	6	Vila Sol 2											23:23		
11	6	Rua dos Continuadores											23:39		
12	6	Igreja Testemunha de Jeova											23:52	0:20	
13	6	Praca dos Herois - Eucalipto 1											0:42		
14	6	Praca dos Herois - Eucalipto 2											0:52		
15	6	Av. FPLM Centro de Saude Mavalane 1											1:05		
16	6	Av. FPLM Centro de Saude Mavalane 2											1:15	1:37	
17	6	Av.FPLM Hospital Mavalane 1											1:59		
18	6	Av.FPLM Hospital Mavalane 2											2:09		
19	6	AV. FPLM Cruz Vermelho 1											2:22		
20	6	AV. FPLM Cruz Vermelho 2											2:32	2:50	
21	6	Mercado Informal de Mbusine											3:09		
22	6	Av. Juluis Nhyrere- Ponte Ferroviario 1											3:22		
23	6	Av. Juluis Nhyrere- Ponte Ferroviario 2											3:32	3:48	

KaMavota 6m3: Normal Collection (7pm-7am)

Nome do WSPC:

Everday

Numelo do ROTA:

Data:

Matrícula do veículo:

Tipo de veiculo:

Motorista

No.	m3	Nome	Supervisor	cont ID	Hora Cheg.ao Cont	Hora Saida ao Cont	Hora Cheg.ao Lixeira	Hora Saida ao Lixeira	Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan Cheg Cont	Plan Cheg Lixeira	@
24	6	Av.Julius Nyerere- Rua de Complexo 1											19:00		
25	6	Av.Julius Nyerere- Rua de Complexo 2											19:10		
26	6	Av.Julius Nyerere- Rua de Complexo 3											19:20	19:44	
27	6	Av.Julius Nyerere- Rua de Complexo 4											20:00		
28	6	Av. Juluis Nhyerere-Chapa Amarelo 1											20:11		
29	6	Av. Juluis Nhyerere-Chapa Amarelo 2											20:21	20:39	
30	6	Rua da Beira - Feira de Hulene 1											20:55		
31	6	Rua da Beira - Feira de Hulene 2											21:05		
32	6	Rua da Beira 1 (Sitoe)											21:19		
33	6	Rua da Beira 2 (Sitoe)											21:29	21:46	
34	6	Centro de Saude 1 de Junho 1											22:06		
35	6	Centro de Saude 1 de Junho 2											22:16		
36	6	Campo Ferroviario 1											22:29		
37	6	Campo Ferroviario 2											22:39	22:57	
38	6	Junto Ao 1 Andar 1											23:13		
39	6	Junto Ao 1 Andar 2											23:23		
40	6	Mercado Maguiguana 1											23:36		
41	6	Mercado Maguiguana 2											23:46	0:02	
42	6	Procuradoria 1											0:18		
43	6	Procuradoria 2											0:28		
44	6	Pontinha - Romao											0:52		
45	6	20 casas											1:02	1:30	
46	6	Cemitério Guebo 1											1:56		
47	6	Cemitério Guebo 2											2:06		
48	6	Ceração 1											2:18		
49	6	Ceração 2											2:28	2:54	
50	6	Av. Dom Alxandre Bombas Pumas 1											3:13		
51	6	Av. Dom Alxandre Bombas Pumas 2											3:23		
52	6	Av. Dom Alxandre 14 de Novembro 1											3:37		
53	6	Av. Dom Alxandre 14 de Novembro 2											3:47	4:04	

KaMavota 6m3: Normal Collection (7pm-7am)

Nome do WSPC:

Everday

Numelo do ROTA:

Data:

Matrícula do veículo:

Tipo de veiculo:

Motorista

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
54	6	Governo da cidade Maputo a frente 1											19:00		
55	6	Governo da cidade Maputo a frente 2											19:10		
56	6	Governo da Cidade Maputo atras 1											19:21		
57	6	Governo da Cidade Maputo atras 2											19:31	19:47	
58	6	Rua Da Impazol -Maogeira 1											20:06		
59	6	Rua Da Impazol -Maogeira 2											20:16		
60	6	Atras da Shoprite Magoanine 1											20:32		
61	6	Atras da Shoprite Magoanine 2											20:42	21:01	
62	6	Av. Juluis Nherere-PT Magoanine 1											21:19		
63	6	Av. Juluis Nherere-PT Magoanine 2											21:29		
64	6	Av. Sebastiao Mabote -Lavandaria Khurula 1											21:46		
65	6	Av. Sebastiao Mabote -Lavandaria Khurula 2											21:56	22:21	

(1) Container list (District:)

Nr.	m3	Name of Container point	longitude	latitude
1	12			
2	12			
3	12			
4	12			
5	12			
6	12			
7	12			
8	12			
9	12			
10	12			
	__m3			
1	6			
2	6			
3	6			
4	6			
5	6			
6	6			
7	6			
8	6			
9	6			
10	6			
11	6			
12	6			
13	6			
14	6			
15	6			
16	6			
17	6			
18	6			
19	6			
20	6			
21	6			
22	6			
23	6			
24	6			
25	6			
26	6			
27	6			
28	6			
29	6			
30	6			
31	6			
32	6			
33	6			
34	6			
35	6			
36	6			
37	6			
38	6			
39	6			
40	6			
41	6			
42	6			
43	6			
44	6			
45	6			
46	6			
47	6			
48	6			
49	6			
50	6			
	__m3			

(2) Container collection plan (District:)						Container *1			Hulene *1		
Nr.	m3	Name of Container point	longitude F	latitude F	trip	llegada	on	Salida	llegada	off	Salida
1	12										
2	12										
3	12										
4	12										
5	12										
6	12										
7	12										
8	12										
9	12										
10	12										
	___m3										
1	6										
2	6										
3	6										
4	6										
5	6										
6	6										
7	6										
8	6										
9	6										
10	6										
11	6										
12	6										
13	6										
14	6										
15	6										
16	6										
17	6										
18	6										
19	6										
20	6										
21	6										
22	6										
23	6										
24	6										
25	6										
26	6										
27	6										
28	6										
29	6										
30	6										
31	6										
32	6										
33	6										
34	6										
35	6										
36	6										
37	6										
38	6										
39	6										
40	6										
41	6										
42	6										
43	6										
44	6										
45	6										
46	6										
47	6										
48	6										
49	6										
50	6										
	___m3										

Appendix2-2 Container collection plan (3) collection Route sheet

Appendix2: Work plan for TOR

Distorict: **6m3: Normal Collection(7pm-7am)** **Nome do WSPC:** **Everday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	6														
2	6														
3	6														
4	6														
5	6														
6	6														
7	6														
8	6														
9	6														
10	6														
11	6														
12	6														
13	6														
14	6														
15	6														
16	6														
17	6														
18	6														

Distorict: **6m3: Additional & Extra(7am-7pm)** **Nome do WSPC:**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	6														
2	6														
3	6														
4	6														
5	6														
6	6														
7	6														
8	6														
9	6														
10	6														
11	6														
12	6														
13	6														
14	6														
15	6														
16	6														
17	6														
18	6														

Distorict: **12m3: Normal Collection(7pm-7am)** **Nome do WSPC:** **Monday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12														
2	12														
3	12														
4	12														
5	12														
6	12														
7	12														
8	12														
9	12														
10	12														
11	12														
12	12														
13	12														
14	12														
15	12														
16	12														
17	12														
18	12														

Distorict: **12m3: Normal Collection(7pm-7am)** **Nome do WSPC:** **Thursday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12														
2	12														
3	12														
4	12														
5	12														
6	12														
7	12														
8	12														
9	12														
10	12														
11	12														
12	12														
13	12														
14	12														
15	12														
16	12														
17	12														
18	12														

Distorict: **12m3: Normal Collection(7pm-7am)** **Nome do WSPC:** **Tuesday, Friday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12														
2	12														
3	12														
4	12														
5	12														
6	12														
7	12														
8	12														
9	12														
10	12														
11	12														
12	12														
13	12														
14	12														
15	12														
16	12														
17	12														
18	12														

Distorict: **12m3: Normal Collection(7pm-7am)** **Nome do WSPC:** **Wednesday, Saturday**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12														
2	12														
3	12														
4	12														
5	12														
6	12														
7	12														
8	12														
9	12														
10	12														
11	12														
12	12														
13	12														
14	12														
15	12														
16	12														
17	12														
18	12														

Distorict: **12m3: Additional & Extra(7am-7pm)** **Nome do WSPC:**

Numelo do ROTA: **Data:**

Matrícula do veículo: **Tipo de veiculo:** **Motorista**

No.	m3	Nome	Supervisor	cont ID	Hora		Hora		Peso de lixo	Assinatura do Op. da Basucla	Assinatura do Motorista	Observação	Plan		@
					Cheg.ao Cont	Saida ao Cont	Cheg.ao Lixeira	Saida ao Lixeira					Cheg Cont	Cheg Lixeira	
1	12														
2	12														
3	12														
4	12														
5	12														
6	12														
7	12														
8	12														
9	12														
10	12														
11	12														
12	12														
13	12														
14	12														
15	12														
16	12														
17	12														
18	12														

Appendix 2-2 container collection plan for TDR format (4) Collection Route Map

Appendix 2-3 personnel sheet and Organizational chart

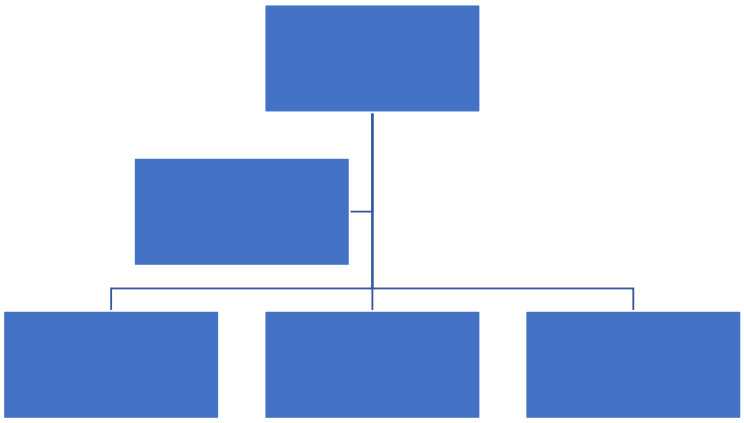
1) Personnel list

Position	Section /Department	Name	Nationality	Years of Experience for the Role	General Qualifications Suitable for the Role
Director of operations					
Senior Supervisor					
Safety, Health, Environment and quality Coordinator					

***attach CVs**

Section/Department	Number to be employed under the contract				
	ADMINISTRATIVE	TECHNICIAN	SUPERVISOR	DRIVERS	OPERATORS

2) Organization chart



Name of the sertion/department
Name of the person responsible
Number of employees per section/department

ADMINISTRATIVE
TECHNICIAN
SUPERVISORS
DRIVERS
OPERATORS

Director of operations
Senior Supervisor
Safety, Health, Environment and quality Coordinator

Appendix 2-4 Equipment sheet (collection equipment, supervisor, others)

1) Container list

No.	Capacity m3	Total Number	Other specifications Provenance, manufacturer, year, etc...	Observation
1				
2				
3				
4				
5				
6				

2) List of collection Vehicles

No.	Vehicle plate number	Type	Other specifications						Observation	2.7.1 Registration and compliance with local legislation (Attachments)					
			Brand	Year	Capacity		gas consumption	Others	Include spare and active vehicles	Drawings	Registration	Ensurance	Road fees	Inspection	Compliance with emmission regulations
					m3	t	km/L								
1											Mozambique	up to date	up to date	up to date	Yes or No
2											Mozambique	up to date	up to date	up to date	Yes or No
3											Mozambique	up to date	up to date	up to date	Yes or No
4											Mozambique	up to date	up to date	up to date	Yes or No
5											Mozambique	up to date	up to date	up to date	Yes or No
											Mozambique	up to date	up to date	up to date	Yes or No
											Mozambique	up to date	up to date	up to date	Yes or No
											Mozambique	up to date	up to date	up to date	Yes or No

*Send attachments in relation to the design of vehicles, registration, insurance, road fees, inspection, etc.

3) List of Supervision equipment

No.	Vehicle plate number	Type	Total Number	Specifications					Observations	2.7.1 Registration and compliance with local legislation (Attachments)					
				Brand	Year	Model	Others			Drawings	Registration	Ensurance	Road fees	Inspections	Compliance with emmission regulations
1															
2															
3															
4															
5															

4) lista de outros equipamentos

No.	Citem	Type	Number	Specifications					Observations
				Brand	Year	Models	Others		
1									
2									
3									
4									
5									

Appendix 2-5 Equipment maintenance schedule sheet (collection equipment, container, other)

1) Vehicle Maintenance List and Schedule

No	Content	Detail	Schedule																																																	
			2025		2026												2027												2028												2029											
			11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1																																																				
2																																																				
3																																																				
4																																																				
5																																																				
6																																																				
7																																																				
8																																																				
9																																																				
10																																																				

2) Contaienr maintenance List and Schedule

No.	Content	Detail	Schedule																																																	
			2025		2026												2027												2028												2029											
			11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1																																																				
2																																																				
3																																																				
4																																																				
5																																																				
6																																																				
7																																																				
8																																																				

* Exemplo: de 3 em 3 meses

Appendix 2-6. Safety & hygiene schedule sheet

1) Protective Equipment

(1) List of Protective Equipment

No	Type	Specification	Schedule																																																	
			2025		2026												2027												2028												2029											
			11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1																																																				
2																																																				
3																																																				
4																																																				
5																																																				
6																																																				
7																																																				
8																																																				

*Exemplo: de 3 em 3 meses

(2) Protection Training List and Schedule

No	Content	Detail	Schedule																																																	
			2025		2026												2027												2028												2029											
			11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1																																																				
2																																																				
3																																																				
4																																																				
5																																																				
6																																																				
7																																																				
8																																																				

*Exemplo: de 3 em 3 meses

2) Fire Control

(1) List of Fire control equipment and replacement schedule

No	Type	Specification	Schedule																																																	
			2025		2026												2027												2028												2029											
			11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1																																																				
2																																																				
3																																																				
4																																																				
5																																																				
6																																																				
7																																																				
8																																																				

(2) Training list and schedule for Fire Control

No	Content	Detail	Schedule																																																	
			2020		2021												2022												2023												2024											
			11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1																																																				
2																																																				
3																																																				
4																																																				
5																																																				
6																																																				
7																																																				
8																																																				

3) Accidents

1) Training list and schedule for Accident Control

No.	Content	Detail	Schedule																																																	
			2020		2021												2022												2023												2024											
			11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1																																																				
2																																																				
3																																																				
4																																																				
5																																																				
6																																																				
7																																																				
8																																																				

Appendix 2-7 Monthly report format for TOR

Monthly Report Format

(1) Collection route sheet

- Each collection route sheet report for each month, organized from the first day of the month to the last, organized by each route number and equipment with the signature from the weighbridge operators should be attached at the monthly report, including the monthly summary.

(2) Maintenance Management

- Schedule, type of Maintenance (periodical or emergency, vehicle, container etc), detailed information (Ex: tyre, engine, how long it took, etc) and others.

(3) Safety and hygiene Management

1) Trainings (Protection, Fire Control, Accident Control etc.)

- Contents, schedule, nr. of personnel involved, photos, attendance list, others.

(4) Complain and accident Information

1) Complain

- Date, detailed information on the reported problems (number of complains, complain contents, number of responses and measures).

2) Accidents

- Date, type of accidents, causes, detailed information (people/vehicle involved, level of damage, others), photos, solution measure.

Note:

The collection route report is mandatory to be submitted every month for monitoring and payment matters. The other contents will only be reported in cases of implementation.

Collection result summary

Day	Time to container collection					
	Normal collection		Additional & Extra collection		Total	
	12m3	6m3	12m3	6m3	12m3	6m3
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
total						

Note:
The collection route report is mandatory to be submitted every month for monitoring and payment matters. The other contents will only be reported in cases of implementation at the table below.

☐ Maintenance Management ☐Safety and hygiene Management ☐Complain & Accident information	Date: Company name

No	Content	Details

Appendix 3 Transfer station calculation

1) Distance & time for Urban

Kampfumo

Rota	No.	Agrupamentos	Rua	Hora do Inicio	Hora do Fim	Coordenadas	km			
1	1	ACJ 888 MC	Ponte Maputo-Katembe	28.03.2022 16:00:44	29.03.2022 01:00:16	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	62	30	32	8:59:32
	1.1	Segunda-feira	Ponte Maputo-Katembe	28.03.2022 16:00:44	29.03.2022 00:17:20	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	52			
	1.2	Terça-feira	Rua Da Beira	29.03.2022 00:17:20	29.03.2022 01:00:16	Rua Da Beira, Kamavota, Cidade de Maputo, Mozambique	9.95			
4	2	ACJ 889 MC	Ponte Maputo-Katembe	28.03.2022 16:00:50	29.03.2022 01:00:44	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	56	30	26	8:59:54
	2.1	Segunda-feira	Ponte Maputo-Katembe	28.03.2022 16:00:50	29.03.2022 01:00:44	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	56			
7	3	ACJ 934 MC	Ponte Maputo-Katembe	28.03.2022 16:00:18	29.03.2022 01:00:02	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	55	30	25	8:59:44
	3.1	Segunda-feira	Ponte Maputo-Katembe	28.03.2022 16:00:18	29.03.2022 00:05:48	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	54			
	3.2	Terça-feira	Rua Alberto Massavanhane	29.03.2022 00:05:48	29.03.2022 01:00:02	Rua Alberto Massavanhane, Kampfumo, Cidade de Maputo, Mozambique	0.55			
	4	ACL 252 MC	Ponte Maputo-Katembe	28.03.2022 16:00:36	29.03.2022 01:00:48	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	0			
	4.1	Segunda-feira	Ponte Maputo-Katembe	28.03.2022 16:00:36	29.03.2022 01:00:48	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	0,0			
2	5	ACL 256 MC	Ponte Maputo-Katembe	28.03.2022 16:00:50	29.03.2022 01:00:22	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	58	30	28	8:59:32
	5.1	Segunda-feira	Ponte Maputo-Katembe	28.03.2022 16:00:50	29.03.2022 00:02:20	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	57			
	5.2	Terça-feira	Avenida 24 De Julho	29.03.2022 00:02:20	29.03.2022 01:00:22	Avenida 24 De Julho, Kampfumo, Cidade de Maputo, Mozambique	1.77			
3	6	ACL 269 MC	Ponte Maputo-Katembe	28.03.2022 16:00:22	29.03.2022 01:00:08	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	64	30	34	8:59:46
	6.1	Segunda-feira	Ponte Maputo-Katembe	28.03.2022 16:00:22	29.03.2022 00:00:12	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	57			
	6.2	Terça-feira	Rua Do Eng. Vasconcelos E Sá	29.03.2022 00:00:12	29.03.2022 01:00:08	Rua Do Eng. Vasconcelos E Sá, Kampfumo, Cidade de Maputo, Mozambique	7.17			
5	7	ACL 334 MC	Ponte Maputo-Katembe	28.03.2022 16:00:50	29.03.2022 01:00:06	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	55	30	25	8:59:16
	7.1	Segunda-feira	Ponte Maputo-Katembe	28.03.2022 16:00:50	29.03.2022 00:00:10	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	53			
	7.2	Terça-feira	Karl Marx Avenue	29.03.2022 00:00:10	29.03.2022 01:00:06	Karl Marx Avenue, Kampfumo, Cidade de Maputo, Mozambique	2.2			
	8	ACL 655 MC	Ponte Maputo-Katembe	28.03.2022 16:00:26	29.03.2022 01:00:30	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	0			
	8.1	Segunda-feira	Ponte Maputo-Katembe	28.03.2022 16:00:26	29.03.2022 01:00:30	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	0,0			
6	9	ACL 699 MC	Ponte Maputo-Katembe	28.03.2022 16:00:06	29.03.2022 01:00:10	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	70	30	40	9:00:04
	9.1	Segunda-feira	Ponte Maputo-Katembe	28.03.2022 16:00:06	29.03.2022 00:00:24	Ponte Maputo-Katembe, Kampfumo, Cidade de Maputo, Mozambique	69			
	9.2	Terça-feira	25 De Setembro Avenue	29.03.2022 00:00:24	29.03.2022 01:00:10	25 De Setembro Avenue, Cidade De Maputo, Mozambique	1.25			
							420	210	210	

Appendix 3 Transfer station calculation

2) Distance & time for sub-urban

Nlhamanculo

	12m3 CA							Hulene			New			KaTembe		
Co	Name		Log	Lat				19:00	km	22:00	19:00	km	22:00	19:00	km	22:00
1	Entrada da Base Aerea - Av. 19 de Outubro	12	32.56	-25.92				22 min	6.9	16 min	48 min	17.9	35 min	45 min	20.6	35 min
2	Naggi-Rua Gago Coutinho	12	32.56	-25.94				26 min	6.8	18 min	53 min	20.4	45 min	45 min	19.3	45 min
3	10– Esquadra - Rua de Xipamanine	12	32.56	-25.94				25 min	6.2	16 min	50 min	20.9	45 min	47 min	19.9	47 min
4	Terminal da Junta	12	32.55	-25.94				35 min	9.5	24 min	55 min	21.7	45 min	43 min	18.5	43 min
5	Lhanguene-Av. Mo軋mbique	12	32.55	-25.94				35 min	9	22 min	55 min	21.2	45 min	42 min	18	42 min
6	Up-Av. Trabalho	12	32.54	-25.94				30 min	8.9	22 min	55 min	21.1	45 min	42 min	17	42 min
7	Rotunda 16 de Junho- Av. OUA	12	32.55	-25.95				32 min	10.6	23 min	45 min	23.2	40 min	28 min	15.6	28 min
8	Coca-cola-Rua lago Maramba	12	32.55	-25.95				35 min	9.9	24 min	58 min	22.1	45 min	40 min	15.9	40 min
9	Colombia - Rua Major Teixeira Pinto	12	32.56	-25.96				27 min	8	19 min	45 min	23.6	40 min	35 min	17.1	35 min
10	Xibamate - Av. De Angola	12	32.57	-25.95				24 min	6.9	18 min	53 min	21.9	45 min	47 min	17.7	45 min
11	Zanza - Rua Marcelino dos Santos	12	32.56	-25.95				35 min	7.8	22 min	58 min	21.3	48 min	45 min	17.2	45 min
12	Cape-Cape-Campo - Rua 2.282	12	32.56	-25.94				30 min	7.7	22 min	55 min	20.9	45 min	44 min	17.1	44 min
13	Ufa- Rua 2.276	12	32.55	-25.95				35 min	8.2	24 min	58 min	22.1	48 min	42 min	16.3	42 min
14	Escola Unidade 18 -Rua Gago Coutinho	12	32.57	-25.93				22 min	5.6	14 min	45 min	19.3	40 min	49 min	20.4	47 min
15	Campo Base Aerea - Av. 19 de Outubro	12	32.56	-25.93				23 min	6	16 min	45 min	19	40 min	49 min	20.3	47 min
16	Rua Gago Coutinho - Igreja Catolica	12	32.57	-25.93				19 min	5.1	12 min	40 min	21.3	35 min	40 min	20.8	40 min
17	007-Rua Gago Coutinho	12	32.57	-25.93				22 min	4.9	14 min	48 min	20	40 min	50 min	21.5	49 min
18	Igreja Assembleia-Rua Gago Coutinho	12	32.57	-25.93				20 min	5.4	12 min	40 min	21.5	35 min	43 min	20.5	40 min
19	Mercado Xipamanine - Rua Zixaxa 1	12	32.56	-25.95				28 min	7.6	22 min	53 min	21.4	48 min	49 min	18	49 min
20	Mercado Xipamanine - Rua Zixaxa 2	12	32.56	-25.95				28 min	7.6	22 min	53 min	21.4	48 min	49 min	18	49 min
21	San Joaquim Rua Zambeze	12	32.57	-25.94				28 min	7	20 min	53 min	21.2	45 min	49 min	18.4	47 min
22	CETA-Centro de Saude de Xipamanine - Av. Joaquim Chissano	12	32.57	-25.94				24 min	7.3	18 min	50 min	20.4	43 min	49 min	19.3	48 min
23	Zixaxa - Rua do Zixaxa Nr. 2.302	12	32.56	-25.94				26 min	6.5	18 min	53 min	21	45 min	47 min	19.9	47 min
24	Mercado Vulcano - Rua Gago Coutinho	12	32.56	-25.93				24 min	6	16 min	53 min	21	45 min	47 min	19.9	47 min
25	Rua do Zimabwe	12	32.57	-25.94				25 min	7.6	18 min	45 min	22.9	40 min	40 min	21.3	40 min
26	Rua dos Irmaos Ruby/Parque Xipamanine	12	32.56	-25.94				26 min	7.5	20 min	45 min	23.3	40 min	40 min	18.1	35 min
								706	**191**		**1,311**	**552**		**1,146**	**487**	

	6m3 CA				Ruta				Hulene			New			KaTembe		
Co	Name	m3	Log	Lat			19:00	km	22:00	19:00	km	22:00	19:00	km	22:00	19:00	km	22:00
1	Bazuca - Rua Irmaos Ruby	6	32.56	-25.94	**1.1**	->1.2	5 min	1.1	3 min	22 min	7.7	18 min	65 min	21.5	40 min	40 min	20.5	35 min
2	Retiro-Rua da Fatima	6	32.56	-25.95	1.2	->1.3	2 min	0.35	2 min									
3	Escola Unidade 16-Rua da Fatima	6	32.56	-25.95	1.3	->1.4	3 min	0.6	3 min									
4	Campo de Mahafil-Rua Mateteu	6	32.57	-25.95	1.4	->1.5	5 min	1.3	4 min									
5	Igreja Anglicana	6	32.56	-25.96	1.5	->1.6	2 min	0.75	3 min									
6	Mercado Fajardo 1	6	32.56	-25.95	**1.6**					30 min	10.0	22 min	65 min	23.5	40 min	35 min	16.8	30 min
7	Mercado Fajardo 2	6	32.56	-25.95	**2.1**	->2.2	2 min	0.4	3 min	30 min	10.1	22 min	65 min	23.5	40 min	35 min	16.8	30 min
8	Mercado Malanga 1	6	32.56	-25.95	2.2	->2.3	1 min	0.01	1 min									
9	Mercado Malanga 2	6	32.56	-25.95	2.3	->2.4	5 min	2.6	5 min									
10	Mega CASH and CARRY	6	32.54	-25.95	**2.4**		14 min	10	14 min	30 min	9.4	22 min	65 min	21.6	40 min	30 min	17.4	35 min
11	LOUMAR1	6	32.56	-25.96	4.7	->4.8	1 min	0.18	1 min									
12	Saida da ponte Maputo Katembe - Av. 24 de Julho	6	32.56	-25.96	4.6	->4.7	2 min	0.45	2 min									
13	STAE - Av. 24 de Julho	6	32.56	-25.96	4.5	->4.6	1 min	0.4	1 min									
14	LOUMAR2	6	32.56	-25.96	**4.8**					33 min	9.2	23 min	70 min	23.7	40 min	30 min	16.1	30 min
15	Raul	6	32.56	-25.99	3.3	->3.4	6 min	2.6	6 min									
16	EPC	6	32.56	-25.98	3.2	->3.3	3 min	1.1	3 min									
17	Complexo Guimaraes	6	32.56	-25.98	**3.1**	->3.2	2 min	0.4	2 min	50 min	21.0	45 min	80 min	33.3	55 min	35 min	12.2	35 min
18	Firmino	6	32.52	-25.99	**4.1**	->4.2	4 min	1.3	4 min	50 min	21.4	45 min	85 min	33.7	60 min	24 min	9.4	24 min
19	Chibantchane	6	32.57	-26.01	3.4	->3.5	3 min	0.95	3 min									
20	Espiga D'ouro	6	32.57	-26.02	3.5	->3.6	5 min	2.4	5 min									
21	Mercado Chali	6	32.56	-26.01	**3.6**					40 min	17.5	35 min	55 min	30.2	45 min	26 min	9.2	26 min
22	Cemiterio-Incassane	6	32.53	-26.01	4.3	->4.4	16 min	8.3	16 min									
23	Ponto-Final (perto do Quartel)	6	32.56	-26.03	4.4	->4.5	16 min	12.4	16 min									
24	Assucena	6	32.53	-25.99	4.2	->4.3	5 min	1.3	5 min									
							103	**48.9**	**102**	**285**	**106.3**	**232**	**550**	**211.0**	**360**	**255**	**118.4**	**245**

KaMaxaquene

	12m3 KaMaxaquene							Hulene			New			KaTembe		
Co	Nome WP	m3	Log	Lat				19:00	km	22:00	19:00	km	22:00	19:00	km	22:00
1	Mercado Mucorriana	12	32.61	-25.93				12 min	3.2	9 min	45 min	24.5	40 min	58 min	24.2	57 min
2	Mercado Peixa- Xiquelene	12	32.61	-25.93				14 min	3.7	12 min	45 min	24.6	40 min	59 min	24.7	59 min
3	Escola P. Matchique Tchique	12	32.61	-25.93				20 min	4.5	14 min	60 min	29.3	45 min	60 min	24.7	45 min
4	Escola primaria de Maguiguana	12	32.60	-25.94				16 min	5.1	14 min	45 min	24.2	40 min	57 min	22.1	55 min
5	Atras da Soveste	12	32.60	-25.93				14 min	4.1	12 min	45 min	24.6	40 min	57 min	23.3	55 min
6	Rua Carlos Cardoso-Ravina	12	32.61	-25.94				17 min	4.8	16 min	50 min	26.1	45 min	61 min	22.9	59 min
7	Av. Angola/Joaquim Chissano Semaforo	12	32.57	-25.94				22 min	6.4	16 min	70 min	26.3	45 min	40 min	18.6	35 min
8	Rua da Resistencia/Joaquim Chissano-1	12	32.59	-25.95				20 min	6.3	18 min	40 min	23.5	40 min	51 min	20.5	51 min
9	50.Mercado Carrimbo	12	32.59	-25.95				22 min	5.9	14 min	80 min	28.2	45 min	45 min	20.4	40 min
10	51.Av. Angola Kia	12	32.58	-25.94				19 min	5.5	14 min	60 min	25.8	40 min	40 min	19.4	35 min
11	Mercado Informal- Senta Baixo	12	32.61	-25.93				14 min	3.9	12 min	45 min	24.7	40 min	62 min	24.9	59 min
12	Rua carlos cardoso-Costa do Sol	12	32.61	-25.93				15 min	4.1	14 min	45 min	25.8	40 min	60 min	23.4	58 min
13	Rua atras Do Bamco de Mocambique	12	32.59	-25.93				16 min	5.3	14 min	45 min	23.4	40 min	56 min	22.2	55 min
14	Praca dos Herois - Mercado Mazambanine	12	32.58	-25.93				19 min	5.9	12 min	65 min	26.6	45 min	45 min	21.3	40 min
15	Av. Angola atras das Bombas Sasol	12	32.58	-25.94				22 min	6.2	14 min	65 min	26.5	45 min	40 min	19.4	35 min
								262	**75**		**805**	**384**		**791**	**332**	

	6m3 KaMaxaquene				Ruta				Hulene			New			KaTembe		
Co	Nome WP	m3	Log	Lat			19:00	km	22:00	19:00	km	22:00	19:00	km	22:00	19:00	km	22:00
1	Av.Acordos Lusaka - MICOA 1	6	32.58	-25.94	1.1	->1.2	2 min	0.4	2 min	22 min	6.2	16 min	45 min	22.8	40 min	45.0	21.2	45 min
2	Av.Acordos Lusaka - MICOA 3	6	32.58	-25.94	1.3	->1.4	1 min	0.13	1 min									

3	Av.Acordos Lusaka - ETRAGO	6	32.58	-25.94	1.4	->1.5	3 min	1	2 min										
4	Av.Acordos Lusaka - Balthazar	6	32.58	-25.94	1.2	->1.3	1 min	0.14	1 min										
5	Campo 1o de Maio 1	6	32.59	-25.93	1.7					19 min	5.5	12 min	60 min	22.8	43 min	45.0	21.3	45 min	
6	Campo 1o de Maio 2	6	32.59	-25.94	2.1	->2.2	7 min	2.6	7 min	14 min	5.6	16 min	60 min	22.9	43 min	45.0	20.7	45 min	
7	Av.Vlademir Lenine - Farmacia	6	32.59	-25.95	2.2	->2.3	1 min	0.19	1 min										
8	Av.Vlademir Lenine - Mae Africa	6	32.59	-25.95	2.4	->2.5	1 min	0.05	1 min										
9	Av.Vlademir Lenine - Compone	6	32.60	-25.94	3.2	->3.3	3 min	0.6	3 min										
10	Av.Vlademir Lenine - Saul 1	6	32.60	-25.94	2.6					21 min	5.0	12 min	67 min	28.6	50 min	47.0	21.2	45 min	
11	Av.Vlademir Lenine - Saul 2	6	32.59	-25.95	2.5	->2.6	2 min	0.21	1 min										
12	Av.Vlademir Lenine - Canhoeiro	6	32.60	-25.93	3.1	->3.2	2 min	0.5	2 min	12 min	3.7	11 min	45 min	25.3	45 min	50.0	22.8	45 min	
13	Micaela - Resistencia	6	32.59	-25.95	2.3	->2.4	2 min	0.8	2 min										
14	Escola Nova de Polana Canico 1	6	32.60	-25.94	3.3	->3.4	1 min	0.01	1 min										
15	Escola Nova de Polana Canico 2	6	32.60	-25.94	3.4	->3.5	4 min	0.8	4 min										
16	Av Julius Nhyerere Ravina1	6	32.61	-25.94	3.6					17 min	4.4	10 min	57 min	31.3	40 min	57.0	24.1	50 min	
17	Av Julius Nhyerere Ravina2	6	32.61	-25.94	3.5	->3.6	1 min	0.45	1 min										
18	Av. Acordos de Lusaka-Estaleiro 1 @	6	32.58	-25.94	1.5	->1.6	1 min	0.01	1 min										
19	Av. Acordos de Lusaka-Estaleiro 2 @	6	32.58	-25.94	1.6	->1.7	6 min	2.3	5 min										
							38	**10.2**	**35**	**105**	**30.4**	**77**	**334**	**153.7**	**261**	**289**	**131.3**	**275**	

KaMavota

	12m3 KaMavota									**Hulene**			**New**			**KaTembe**		
Co	**Nome WP**	**m3**	**Log**	**Lat**						**19:00**	**km**	**22:00**	**19:00**	**km**	**22:00**	**19:00**	**km**	**22:00**
1	AV. FPLM Cruz Vermelho	12	32.60	-25.93			12			14 min	4	12 min	45 min	24.3	40 min	85 min	35.2	80 min
2	Av. Dom Alexandre Farmancia Vaneza	12	32.62	-25.87			12			16 min	5.5	14 min	26 min	17.1	26 min	80 min	30.8	70 min
3	Rua Da Beira Mercado Mavalane	12	32.59	-25.92			12			12 min	3	9 min	70 min	26.8	50 min	45 min	23.2	45 min
4	Av. Dom Alexandre Procuradoria	12	32.63	-25.86			12			6 min	2.3	5 min	45 min	26.5	40 min	65 min	27.6	55 min
5	Campo Ferroviario	12	32.61	-25.92			12			14 min	3.2	12 min	40 min	23.1	40 min	61 min	24.5	60 min
6	Av. Sebastiao Mabote -Minas 1	12	32.62	-25.84			12			24 min	7.7	20 min	16 min	12.1	16 min	80 min	38.3	80 min
7	Av. Dom Alxandre Escola Secundaria Albazine	12	32.63	-25.85			12			22 min	8.4	18 min	21 min	14.3	20 min	80 min	33.9	75 min
8	Mercado Maguiguana	12	32.61	-25.91			12			8 min	2.4	7 min	35 min	22.3	35 min	65 min	26.5	61 min
9	Rua Da Beira Taka Nha	12	32.59	-25.92			12			9 min	1.9	5 min	65 min	25.4	45 min	50 min	24.5	45 min
10	Rua Da Impazol -Maogeira	12	32.61	-25.89			12			8 min	2.5	8 min	40 min	17.9	38 min	75 min	28.4	70 min
11	Mercado Romao	12	32.63	-25.87			12			14 min	6.1	14 min	24 min	17.3	24 min	75 min	30	75 min
12	Quarterao 13	12	32.62	-25.92			12			14 min	4.3	14 min	40 min	23.3	40 min	62 min	24.6	60 min
13	Av.FPLM Hospital Mavalane	12	32.58	-25.93			12			16 min	4.7	10 min	70 min	27.7	45 min	45 min	21.8	40 min
14	Av. Dom Alxandre Escola Primaria Albazine	12	32.64	-25.84			12			22 min	10.4	22 min	19 min	13.7	18 min	83 min	35.9	80 min
15	Av. Dom Alxandre Bombas Pumas	12	32.62	-25.89			12			12 min	3.8	10 min	30 min	18.7	28 min	73 min	29.2	65 min
16	Rua Da Beira TTA	12	32.58	-25.92			12			12 min	4.2	10 min	55 min	25.5	50 min	85 min	34.2	85 min
17	Junto Ao 1 Andar	12	32.61	-25.91			12			8 min	2.3	7 min	40 min	22.7	35 min	65 min	26.4	61 min
18	Av. Juluis Nhyerere-Chapa Amarelo	12	32.60	-25.92			12			9 min	1.7	6 min	45 min	20.6	40 min	57 min	24.6	57 min
19	Av. Dom Alxandre- Estaleiro Monica	12	32.63	-25.84			12			23 min	8.8	20 min	20 min	13.9	18 min	85 min	34.1	75 min
20	Av. Sebastiao Mabote -Lavandaria Khurula	12	32.61	-25.87			12			14 min	4.4	12 min	40 min	20.3	35 min	65 min	32.2	60 min
21	Centro de Saude 1 de Junho	12	32.61	-25.91			12			10 min	2.8	9 min	40 min	23.2	40 min	70 min	26.9	62 min
22	Rua Da Beira Estaleiro Dragao	12	32.60	-25.91			6			6 min	1.3	4 min	40 min	23.5	35 min	61 min	25.4	59 min
23	Av. Dom Alxandre- Muro Pindada Vodacom	12	32.62	-25.89			6			10 min	3.3	9 min	35 min	19.4	30 min	70 min	28.6	65 min
24	Av. Dom Alxandre- Cemiterio	12	32.62	-25.90			6			7 min	2.4	7 min	35 min	21.5	35 min	67 min	27.3	63 min
25	Av. FPLM Centro de Saude Mavalane	12	32.59	-25.93			12			16 min	5.7	12 min	50 min	22.9	45 min	85 min	33.6	85 min
26	Av. Sebastiao Mabote -Minas 2	12	32.62	-25.84			12			24 min	7.7	18 min	16 min	12.1	16 min	80 min	38.3	80 min
27	Av. Dom Alexandre Farmacia Africa	12	32.63	-25.86			12			22 min	6.9	18 min	35 min	20.2	30 min	80 min	32.9	75 min
28	Av. Juluis Nhyrere- Ponte Ferroviario	12	32.60	-25.92			12			10 min	2.2	7 min	45 min	24.1	40 min	57 min	23.8	56 min
29	Governo da cidade Maputo a frente	12	32.61	-25.90			12			5 min	1.9	5 min	50 min	25.5	40 min	65 min	27.6	60 min
30	Ao Longo da Linha Feira Chicabele	12	32.64	-25.86			12			18 min	8.3	16 min	35 min	20.9	30 min	75 min	32.6	70 min
31	Governo da Cidade Maputo atras	12	32.61	-25.90			12			5 min	1.9	5 min	50 min	25.5	40 min	65 min	27.6	60 min
32	Praca dos Herois - Eucalipto	12	32.58	-25.93			12			14 min	5.5	12 min	55 min	22.1	45 min	85 min	32.8	80 min
33	Av. Juluis Nherere-PT Magoanine	12	32.60	-25.89			12			7 min	1.9	5 min	45 min	21.7	40 min	65 min	30.5	60 min
34	Atras da Shoprite Magoanine	12	32.60	-25.89			12			9 min	2.1	6 min	45 min	21.7	40 min	65 min	30.6	60 min
35	Av. Dom Alxandre 14 de Novembro	12	32.62	-25.90			12			7 min	2.7	6 min	45 min	26.9	40 min	65 min	28.4	60 min
36	Fertiliza	12	32.61	-25.92			12			15 min	3.7	14 min	40 min	23.6	40 min	59 min	24	57 min
37	Rua da Beira 1 (Sitoe)	12	32.59	-25.92			12			12 min	2.2	6 min	70 min	27.6	45 min	50 min	23.7	45 min
										474	**154**		**1,517**	**796**		**2,545**	**1,081**	

	6m3 KaMavota					**Ruta**			**Hulene**			**New**			**KaTembe**		
Co	**Nome WP**	**m3**	**Log**	**Lat**		19:00	km	22:00	19:00	km	22:00	19:00	km	22:00	19:00	km	22:00
1	Mercado Informal de Mbusine	6	32.60	-25.93	**4.1**	->4.2	19 min	7.2	14 min	12 min	3.4	10 min	45 min	25.0	45 min	50 min	23.3	50 min
2	Quarteirao 46 Costa do Sol	6	32.64	-25.91	**2.1**	->2.2	7 min	2.3	7 min	14 min	4.9	12 min	40 min	25.4	35 min	57 min	30.6	55 min
3	Bairro dos pescadores 1	6	32.66	-25.90	**1.1**	->1.2	2 min	0.45	2 min	20 min	7.2	16 min	35 min	24.3	35 min	65 min	31.3	55 min
4	Bairro dos pescadores 2	6	32.66	-25.90	1.2	->1.3	14 min	4.7	14 min									
5	Vila Sol 1	6	32.63	-25.92	2.2	->2.3	1 min	0.01	1 min									
6	Vila Sol 2	6	32.63	-25.92	2.3	->2.4	2 min	0.6	2 min									
7	Dona Alice-Chapa Munguambe Sucata Metal atras do muro MEAPAZ-20cas	6	32.63	-25.90	1.3	->1.5	9 min	3.4	9 min									
8	Pontinha - Romao	6	32.63	-25.88	**1.5**					12 min	4.9	10 min	30 min	18.7	28 min	63 min	28.9	63 min
9	Av.Julius Nyerere- Rua de Complexo 1	6	32.60	-25.92	**3.1**	->3.5	10 min	1.8	6 min	7 min	2.0	6 min	53 min	24.9	40 min	55 min	24.4	50 min
10	Rua da Beira - Feira de Hulene 1	6	32.59	-25.91	3.5	->3.6	1 min	0.01	1 min	8 min	1.6	5 min	55 min	20.3	43 min	55 min	23.8	50 min
11	Rua da Beira - Feira de Hulene 2	6	32.59	-25.91	**3.6**													
12	Escola primaria do Triunfo	6	32.64	-25.93	4.4	->4.5	2 min	0.6	2 min									
13	Rua dos Continuadores	6	32.63	-25.93	4.3	->4.4	3 min	1	3 min									
14	Pontinha - Costa do sol	6	32.63	-25.92	**4.5**					19 min	6.7	18 min	47 min	26.9	37 min	63 min	29.9	55 min
15	Rua de Mangal	6	32.63	-25.92	**2.4**					18 min	6.0	16 min	43 min	27.6	40 min	65 min	30.6	57 min
16	Igreja Testemunha de Jeova	6	32.63	-25.93	4.2	->4.3	3 min	0.55	3 min									
							73	**22.6**	**64**	**110**	**36.7**	**93**	**348**	**193.1**	**303**	**473**	**222.8**	**435**

KaMubukuwana

12m3 KaMubukuwa

Co	Nome WP	m3	Log	Lat	Hulene 19:00	Hulene km	Hulene 22:00	New 19:00	New km	New 22:00	KaTembe 19:00	KaTembe km	KaTembe 22:00
1	N4 Volvo	12	32.54	-25.94	35 min	10	24 min	68 min	27	47 min	37 min	18.6	38 min
2	Mercado Luis. Cabral	12	32.54	-25.94	31 min	9.5	21 min	65 min	26.6	45 min	35 min	18.1	35 min
3	Atras da Veternaria	12	32.55	-25.93	26 min	8.1	22 min	70 min	25.2	45 min	40 min	20.1	40 min
4	Av. Mocambique- jardim Zoologico	12	32.56	-25.93	26 min	7.9	18 min	60 min	23.5	40 min	52 min	24.2	50 min
5	Mercado Inhagoia	12	32.56	-25.92	25 min	7.5	18 min	60 min	23	40 min	40 min	21.2	40 min
6	Inhagoia Junto a igreja 1	12	32.56	-25.92	28 min	7.9	22 min	60 min	23.5	40 min	45 min	21.8	45 min
7	Inhagoia Junto a igreja 2	12	32.56	-25.92	25 min	7.9	22 min	60 min	23.5	40 min	45 min	21.8	45 min
8	Av. Mocambique -Timbila	12	32.57	-25.91	28 min	8.8	19 min	50 min	21.9	35 min	45 min	22.7	45 min
9	Av. Mocambique- Chapa Xai-xai	12	32.57	-25.92	25 min	8	18 min	60 min	23.8	40 min	45 min	21.8	40 min
10	Av. Mocambique - Carcaca	12	32.57	-25.90	27 min	9.1	20 min	50 min	22	37 min	45 min	22.7	45 min
11	Av. Mocambique-Depois do control Zimpeto	12	32.57	-25.82	35 min	12.3	26 min	20 min	13.3	21 min	65 min	32	60 min
12	Av. Mocambique- Construa	12	32.57	-25.91	26 min	9	22 min	50 min	21.3	35 min	45 min	22.8	45 min
13	Av. Mocambique-Bandaute	12	32.57	-25.91	27 min	9	20 min	50 min	21.9	37 min	50 min	22.9	45 min
14	Av. Mocambique - Sede 25 de Junho	12	32.56	-25.91	28 min	9.3	22 min	50 min	21.5	40 min	50 min	23.1	45 min
15	Policiamento Comunitaria	12	32.57	-25.91	28 min	9.3	22 min	50 min	22	37 min	47 min	23	45 min
16	Mercado Bagamoio	12	32.57	-25.90	24 min	7.3	20 min	45 min	20.7	35 min	50 min	24.4	45 min
17	Av. Lurdes Mutola - Praca da Juventude	12	32.60	-25.88	10 min	2.4	7 min	45 min	21.7	37 min	65 min	28.6	60 min
18	Escola Nova De Magoanine	12	32.60	-25.87	16 min	3.9	12 min	45 min	21.4	40 min	65 min	29.8	60 min
19	Av. Mocambique-MozBrake	12	32.57	-25.86	24 min	7.8	18 min	30 min	16	27 min	55 min	27.8	55 min
20	Mercado Comunitaria Matendene	12	32.59	-25.85	26 min	7.5	24 min	28 min	17	28 min	65 min	32.2	60 min
21	Av. Nelson Mandela- Campo Sheel	12	32.58	-25.85	30 min	8.6	24 min	28 min	15.5	27 min	65 min	31.2	60 min
22	Rua dos Leos	12	32.58	-25.85	30 min	10.7	24 min	28 min	14.9	27 min	65 min	30.6	60 min
23	Av. Sebastiao Mabote - Borboleta	12	32.62	-25.86	18 min	5.5	14 min	37 min	19.3	30 min	80 min	31.6	70 min
24	Campo Aeoronautica Civil Vedacao 2	12	32.57	-25.89	20 min	6.3	18 min	45 min	19.8	35 min	52 min	25.9	50 min
25	Campo Aeoronautica Civil Vedacao 1	12	32.58	-25.89	21 min	6	16 min	45 min	19.9	37 min	52 min	25.9	55 min
26	Campo aeronautiva Vedacao 3	12	32.58	-25.89	21 min	6	16 min	45 min	19.9	37 min	52 min	25.9	55 min
27	Mabalawene Rua Da Esquadra	12	32.57	-25.89	24 min	6.6	18 min	45 min	19.7	35 min	52 min	25.3	45 min
28	Campo Aeronatica Vedacaoantiga 6m3	12	32.58	-25.89	23 min	6.5	18 min	45 min	19.9	37 min	52 min	25.5	50 min
29	Extremo Norte Grande Maputo	12	32.58	-25.82	35 min	13.8	28 min	18 min	12.3	18 min	70 min	33.6	60 min
30	Extremo Norte vila olimpica	12	32.59	-25.82	35 min	13.8	28 min	18 min	12.3	18 min	70 min	33.6	60 min
31	Vila Olimpia Extremo Sul	12	32.58	-25.83	30 min	17.3	28 min	20 min	13.6	22 min	70 min	33.7	60 min
32	Grande Maputo Igreja Assemblea de Deus Circular	12	32.61	-25.83	28 min	10.2	24 min	22 min	14.7	22 min	72 min	35.9	65 min
33	Av. Nelson Mandela- Mercado Mbuzine	12	32.60	-25.83	35 min	11.6	26 min	22 min	14.9	24 min	75 min	34.2	65 min
34	Cemiterio de Zimpeto	12	32.59	-25.83	35 min	13	28 min	22 min	14.3	24 min	70 min	32.8	65 min
35	Mercado Grossista Zimpeto	12	32.57	-25.83	30 min	11.5	25 min	20 min	13.3	22 min	65 min	31.2	57 min
36	Mercado Zimpeto Grossista	12	32.57	-25.83	30 min	11.5	25 min	20 min	13.3	22 min	65 min	31.2	57 min
37	Anexo Grossista Zimpeto	12	32.57	-25.83	30 min	11.4	24 min	22 min	13.4	22 min	65 min	31.2	57 min
38	Terminal de Transporte -1	12	32.57	-25.83	30 min	11.5	24 min	20 min	13.2	22 min	65 min	31.3	57 min
39	Terminal de Transporte -2	12	32.57	-25.83	30 min	11.5	24 min	20 min	13.2	22 min	65 min	31.3	57 min
40	Esquina Rua Da Paz	12	32.58	-25.90	20 min	6.1	16 min	45 min	21.2	37 min	50 min	24.8	50 min
41	Av. Lurdes Mutola -Estaleiro	12	32.57	-25.88	18 min	5.8	14 min	35 min	18	31 min	50 min	26.5	50 min
42	Av. Mocambique-UGC	12	32.56	-25.90	28 min	8.9	20 min	45 min	20	35 min	50 min	24.5	45 min
43	Av. Lurdes Mutola- Posto 19 novas Bombas	12	32.58	-25.88	17 min	4.9	12 min	40 min	18.9	31 min	55 min	27.4	52 min
44	Av. Mocambique - Missao Roque	12	32.57	-25.88	24 min	6.6	18 min	42 min	20.1	35 min	50 min	25.9	50 min
45	Campo de Malhazine	12	32.59	-25.88	15 min	4.4	12 min	40 min	19.7	35 min	55 min	28.1	55 min
46	Escola Secundaria Mubukwana	12	32.58	-25.89	18 min	5.3	14 min	42 min	20.3	35 min	55 min	25.8	55 min
47	Av. Mocambique - Mercado Benfica	12	32.57	-25.89	28 min	8.4	20 min	42 min	19.5	35 min	47 min	24.5	45 min
48	Av. Mocambique- Mercado 25 de Setembro	12	32.57	-25.85	26 min	9.8	21 min	24 min	13.8	24 min	57 min	29.7	55 min
49	Av. Mocambique-Terreno Mabor	12	32.57	-25.84	28 min	10.7	22 min	22 min	13	23 min	65 min	30.6	55 min
50	Unnamed Av. Lurdes Mutola	12	32.60	-25.88	13 min	3.2	10 min	42 min	20.6	35 min	57 min	29.1	55 min
					1,290	**430**		**1,977**	**939**		**2,799**	**1,358**	

6m3-KaMubukuwana

Co	Nome WP	m3	Log	Lat	Ruta		Ruta 19:00	Ruta km	Ruta 22:00	Hulene 19:00	Hulene km	Hulene 22:00	New 19:00	New km	New 22:00	KaTembe 19:00	KaTembe km	KaTembe 22:00
1	Rua da Agricultura - Electricidade	6	32.55	-25.93	**1.1**	->1.2	1 min	0.23	1 min	23 min	7.9	19 min	40 min	19.8	35 min	40 min	19.2	35 min
2	Rua da Agricultura - Rua das Dalias	6	32.55	-25.93	1.2	->1.3	1 min	0.3	1 min									
3	Escola do Jardim	6	32.55	-25.93	1.3	->1.4	2 min	0.45	2 min									
4	Linha ferrea	6	32.55	-25.93	**1.5**					31 min	8.8	20 min	57 min	19.5	35 min	45 min	20.5	40 min
5	Ponte Jardim	6	32.55	-25.93	3.3	->3.4	6 min	2.3	6 min									
6	2M	6	32.54	-25.92	2.2	->2.3	2 min	0.45	2 min									
7	2M Bombas (Januario)	6	32.55	-25.92	**2.1**	->2.2	2 min	0.45	2 min	23 min	9.9	20 min	40 min	23.5	35 min	45 min	22.0	40 min
8	Rua do Algodao	6	32.55	-25.92	2.3	->2.4	1 min	0.09	1 min									
9	PRM esquadra do Jardim- carwach	6	32.55	-25.93	**2.6**					30 min	8.5	20 min	57 min	19.3	35 min	43 min	20.0	40 min
10	Mercado Jardim (1)	6	32.55	-25.92	2.4	->2.5	1 min	0.18	1 min									
11	Mercado Jardim (2)	6	32.55	-25.92	2.5	->2.6	2 min	0.45	2 min									
12	Rua do Salao	6	32.55	-25.93	**3.1**	->3.2	1 min	0.19	1 min	24 min	8.4	20 min	47 min	24.9	45 min	40 min	19.5	35 min
13	Escola dom Bosco	6	32.55	-25.93	1.4	->1.5	3 min	0.55	3 min									
14	Rua das Dalias	6	32.55	-25.93	3.2	->3.3	3 min	0.65	3 min									
15	Atras Da Volvo	6	32.54	-25.94	3.4	->3.5	5 min	2.2	5 min									
16	Atras Da Veternaria	6	32.55	-25.93	**3.5**					30 min	9.2	22 min	60 min	21.5	40 min	35 min	17.1	35 min
17	Av. Nelson Mandela & Grande Maputo Estaleiro	6	32.60	-25.83	**4.1**	->4.2	4 min	2.7	4 min	28 min	14.3	26 min	14 min	9.4	14 min	87 min	36.1	65 min
18	Av. Lurdes Mutola - Fim do Muro da Paiol	6	32.59	-25.88	4.5	->4.6	3 min	1.1	2 min									
19	Avenida de Mocambique-Drive in	6	32.57	-25.83	4.4	->4.5	18 min	8.1	16 min									
20	Condominio Grande Maputo CM 2	6	32.58	-25.82	4.2	->4.3	1 min	0.01	1 min									
21	Condominio Grande Maputo CM 1	6	32.58	-25.82	4.3	->4.4	3 min	1.3	3 min									
22	Avenida Lurdes Mutola @ Unnamed	6	32.60	-25.88	**4.6**					12 min	2.7	8 min	35 min	16.3	30 min	60 min	29.3	55 min
							59	**21.7**	**56**	**201**	**69.7**	**155**	**350**	**154.2**	**269**	**395**	**183.7**	**345**

Appendix 3 Transfer station calculation

3) Distance & Time

	12m3			Hulene		Matlhemele		KaTembe		6m3		Helene		Matlhemele		KaTembe	
Nlhama	Distance	collection & go FDS	container	26	191km	26	552km	26	487km	Distance	container	24	49km	24	49km	24	49km
		collection & go FDS	container	49	359km	49	1040km	49	917km		Trip(go&back)	4	106km	4	211km	4	118km
											->	6	159km	6	317km	6	178km
		Total			**718km**		**2081km**		**1834km**				**208km**		**365km**		**226km**
	Time	collection & go FDS	container	26	706min	26	1311min	26	1146min	Time	container	24	103min	24	103min	24	103min
		collection & go FDS	container	49	1331min	49	2471min	49	2160min		Trip(go&back)	4	285min	4	550min	4	255min
											->	6	428min	6	825min	6	383min
		2way			2661min		4941min		4320min				531min		928min		486min
		Container louding	min/container	10	490min	10	490min	10	490min			10	240min	10	240min	10	240min
		Container unlouding	min/container	10	490min	10	490min	10	490min			10	60min	10	60min	10	60min
		Total			**3641min**		**5921min**		**5300min**				**831min**		**1228min**		**786min**
KaMaxa	Distance	collection & go FDS	container	15	75km	15	384km	15	332km	Distance	container	19	10km	19	10km	19	10km
		collection & go FDS	container	18	90km	18	461km	18	398km		Trip(go&back)	3	30km	3	154km	3	131km
											->	7	71km	7	359km	7	306km
		Total(go x 2)			**180km**		**922km**		**797km**				**81km**		**369km**		**317km**
	Time	collection & go FDS	container	15	262min	15	805min	15	791min	Time	container	19	38min	19	38min	19	38min
		collection & go FDS	container	18	314min	18	966min	18	949min		Trip(go&back)	3	105min	3	334min	3	289min
											->	7	245min	7	779min	7	674min
		2way			629min		1932min		1898min				283min		817min		712min
		Container louding	min/container	10	180min	10	180min	10	180min			10	190min	10	190min	10	190min
		Container unlouding	min/container	10	180min	10	180min	10	180min			10	70min	10	70min	10	70min
		Total			**989min**		**2292min**		**2258min**				**543min**		**1077min**		**972min**
KaMavota	Distance	collection & go FDS	container	37	154km	37	796km	37	1081km	Distance	container	16	23km	16	23km	16	23km
		collection & go FDS	container	43	179km	43	925km	43	1256km		Trip(go&back)	4	37km	4	193km	4	473km
											->	5	46km	5	241km	5	591km
		Total			**358km**		**1850km**		**2511km**				**68km**		**264km**		**614km**
	Time	collection & go FDS	container	37	474min	37	1517min	37	2545min	Time	container	16	73min	16	73min	16	73min
		collection & go FDS	container	43	551min	43	1763min	43	2958min		Trip(go&back)	4	110min	4	348min	4	473min
											->	5	138min	5	435min	5	591min
		2way			1102min		3526min		5915min				211min		508min		664min
		Container louding	min/container	10	430min	10	430min	10	430min			10	160min	10	160min	10	160min
		Container unlouding	min/container	10	430min	10	430min	10	430min			10	50min	10	50min	10	50min
		Total			**1962min**		**4386min**		**6775min**				**421min**		**718min**		**874min**
KaMabuku	Distance	collection & go FDS	container	50	430km	50	939km	50	1358km	Distance	container	22	22km	22	22km	22	22km
		collection & go FDS	container	54	464km	54	1014km	54	1467km		Trip(go&back)	4	70km	4	154km	4	184km
											->	3	61km	3	134km	3	160km
		Total	**container**	**54**	**929km**	**54**	**2029km**	**54**	**2934km**				**82km**		**156km**		**181km**
	Time	collection & go FDS	container	50	1290min	50	1977min	50	2799min	Time	container	22	59min	22	59min	22	59min
		collection & go FDS	container	54	1393min	54	2135min	54	3023min		Trip(go&back)	4	201min	4	350min	4	395min
											->	3	175min	3	304min	3	343min
		2way	container	54	2786min	54	4270min	54	6046min				234min		363min		402min
		Container louding	min/container	10	540min	10	540min	10	540min			10	220min	10	220min	10	220min
		Container unlouding	min/container	10	540min	10	540min	10	540min			10	35min	10	35min	10	35min
		Total			**3866min**		**5350min**		**7126min**				**488min**		**618min**		**657min**
ECOLIFE	Distance	Collection	7	30km	210km	30km	210km	30km	210km								
1.1m3		To FDS	14	15km	210km	25km	350km	20km	280km								
		from FDS	14	15km	210km	25km	350km	20km	280km								
		Total			**630km**		**910km**		**770km**								
	Time	Collection	7	500min	3500min	500min	3500min	500min	3500min								
		To FDS	14	20min	280min	50min	700min	45min	630min								
		from FDS	14	20min	280min	50min	700min	45min	630min								
		Total			**4060min**		**4900min**		**4760min**								

Appendix 3 Transfer station calculation

4) Transfer station

				3,192 t/24h		**2,400** t/24h		**1,608** t/24h		**792** t/24h	
CAPEX	JPY/MZN	1.92		4line		3 line		2line		1line	
Compactor-container type				Revised based on ShinMaywa		Original of ShinMaywa		Revised based on ShinMaywa		Revised based on ShinMaywa	
				133 t /h		**100 t/h (1200 t/12h)**		**67 t/h**		**33 t/h**	
Items	Spec	Unit Cost millon JPY	Unit Cost K MZN	Qty	Cost mi MZN	Qty	Cost mi MZN	Qty	Cost mi MZN	Qty	Cost mi MZN
Total					**1,718**		**1,377**		**1,047**		**753**
					1,593		**1,277**		**972**		**678**
Facilities					**1,104**		**843**		**593**		**343**
Truck scale	20 t	9	4.7	3	14	2	9	2	9	2	9
Truck scale	40 t	11	5.7	2	11	1	6	1	6	1	6
Hopper feeder	90m3			4		3		2		1	
Compactor	XBP60	480	250.0	4	1,000	3	750	2	500	1	250
Hydraulic Units	22kWx5			4		3		2		1	
Electrical instrumentation equipment	1 lot			1		1		1		1	
Dust collection and deodorization	1 lot	150	78.1	1	78	1	78	1	78	1	78
Civil					**490**		**434**		**379**		**334**
Waste Re-loading Building		0.140	0.073	4,560	333	3,800	277	3,040	222	2,432	177
Administration Building		0.050	0.026	400	10	400	10	400	10	400	10
Weighing Building		0.070	0.036	200	7	200	7	200	7	200	7
Lamp way (120m x 7m2)		0.070	0.036	1,680	61	1,680	61	1,680	61	1,680	61
Fence		0.005	0.003	30,000	78	30,000	78	30,000	78	30,000	78
Vehicles					**125**		**100**		**75**		**75**
Container (extra)	40m3	28	15	5	73	4	58	3	44	3	44
Trucker head (on-site+extra)		20	10	5	52	4	42	3	31	3	31
maintenace cost					**19**		**14**		**9**		**5**
facility(1 line)	K JPY/y	9	5	4	19	3	14	2	9	1	5
container	K JPY/y	2.5	1.3								
Large-scale Maintenance	K JPY/y	36.7	19.1	4	76	3	57	2	38	1	19

Operation				Line 3	**2,400** tpd/			24 hr	Line 2	**1,608** tpd/			24 hr	Line 1	**792** tpd/			24 hr
			Unit cost	Total	Number of Staff				Total	Number of Staff				Total	Number of Staff			
			K MZN/y	K MZN/y	Total	1st	2nd	3rd SB	K MZN/y	Total	1st	2nd	3rd SB	K MZN/y	Total	1st	2nd	3rd SB
1 Transfer Station Building	Central Control	Engineer	541	4,326	8	2	2	2 2	4,326	8	2	2	2 2	4,326	8	2	2	2 2
	Unloading area	Worker	142	1,420	10	3	3	3 1	994	7	2	2	2 1	568	4	1	1	1 1
	workshop	Worker	142	994	7	2	2	2 1	710	5	2	1	1 1	710	5	2	1	1 1
	Cleaner	Cleaner	95	662	7	2	2	2 1	473	5	2	1	1 1	379	4	1	1	1 1
	Sub-total			7,402	32	9	9	9 5	6,503	25	8	6	6 5	5,983	21	6	5	5 5
2 Admin. Building	Manager	Manager	811	1,622	2	1		1	1,622	2	1		1	1,622	2	1		1
	Technical Staff	Engineer	541	4,326	8	2	2	2 2	3,786	7	2	2	2 1	2,163	4	1	1	1 1
	Mechanic	Engineer	541	2,704	5	2	1	1 1	2,704	5	2	1	1 1	2,163	4	1	1	1 1
	Electrician	Engineer	541	2,163	4	1	1	1 1	2,163	4	1	1	1 1	2,163	4	1	1	1 1
	Clerk	Worker	142	994	7	2	2	1 2	852	6	2	1	1 2	710	5	1	1	1 2
	Cafeteria	Cleaner	95	568	6	2	2	1 1	568	6	2	2	1 1	379	4	1	1	1 1
	Cleaner	Cleaner	95	284	3	2		1	284	3	2		1	189	2	1		1
	Sub-total			12,661	35	12	8	6 9	11,979	33	12	7	6 8	9,390	25	7	5	5 8
3 Other Area	weighbridge	Engineer	541	5,949	11	2	3	3 3	5,949	11	2	3	3 3	4,326	8	2	2	2 2
	Tractor head driver	Driver	270	1,622	6	2	2	1 1	1,082	4	1	1	1 1	1,082	4	1	1	1 1
	Leachate treatment plant	Engineer	541	1,082	2	1		1	1,082	2	1		1	1,082	2	1		1
	Tyre washing	Worker	142	568	4	1	1	1 1	568	4	1	1	1 1	568	4	1	1	1 1
	Public Drop off	Worker	142	426	3		1	1 1	426	3		1	1 1	426	3		1	1 1
	Guard house	Worker	142	568	4	1	1	1 1	568	4	1	1	1 1	568	4	1	1	1 1
	Sub-total			10,214	30	6	7	6 7	9,106	24	5	6	6 7	7,483	21	5	5	5 6
	Total			30,278	97	27	24	21 21	27,588	82	25	19	18 20	22,856	67	18	15	15 19

Appendix 3 Transfer station calculation

5) Calculation of 2nd collection				KaMpfumo			Nlhama									KaMaxa								
				Hurene	Matlhemele	KaTembe	Hurene			Matlhemele			KaTembe			Hulene			Matlhemele			KaTembe		
				20m3	20m3	20m3	12m3	6m3		12m3	6m3		12m3	6m3		12m3	6m3		12m3	6m3		12m3	6m3	
Container number 12m2							26			26			26			15			15			15		
Container number 5.5m3=6m3				45	45	45		24			24			24			19			19			19	
Container number 1.1m3	**unit**			535	535	535																		
Calculation of number of 2nd collection & transportation																								
Waste volume to be generated	t/day	1,093		**165**	165	165	**293**	**239**	**54**	**293**	239	54	**293**	239	54	**138**	**80**	**58**	**138**	80	58	**138**	80	58
Number of operation day per week	day	6		6	6	6		6	6		6	6		6	6		6	6		6	6		6	6
Waste volume /day to be collected	t/day			193	193	193		279	63		279	63		279	63		93	68		93	68		93	68
Waste density	t/m3			0.67	0.67	0.67		0.47	0.49		0.47	0.49		0.47	0.49		0.44	0.51		0.44	0.51		0.44	0.51
Waste volume to be transported	m3/day			287	287	287		593	129		593	129		593	129		212	133		212	133		212	133
Average capacity of existing vehicle	m3			20	20	20		12	20		12	20		12	20		12	20		12	20		12	20
Loading ratio	—	1.00		1.00	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Total required trips	trip/day			14	14	14		49	6		49	6		49	6		18	7		18	7		18	7
Total required trips for 6m3 container	container /day								21			21			21			22			22			22
Total required trips/container for year	trip/year			4,482	4,482	4,482		15,288	6,686		15,288	6,686		15,288	6,686		5,616	6,899		5,616	6,899		5,616	6,899
Total distance for day	km/d			**630**	**910**	**770**		**718**	**208**		**2,081**	**365**		**1,834**	**226**		**180**	**81**		**922**	**369**		**797**	**317**
Total distance for year	km/year			196,560	283,920	240,240		224,028	65,002		649,152	114,002		572,242	70,665		56,085	25,310		287,614	115,073		248,602	98,766
Required time for all collection /day	min/d			**4,060**	**4,900**	**4,760**		**3,641**	**831**		**5,921**	**1,228**		**5,300**	**786**		**989**	**543**		**2,292**	**1,077**		**2,258**	**972**
Operation hours	hour	12.0		12.0	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0
Operation hours	%	79%		9.5	9.5	9.5		9.5	9.5		9.5	9.5		9.5	9.5		9.5	9.5		9.5	9.5		9.5	9.5
Required number of vehicle	vehicle	9.500		7.1	8.6	8.4		6.4	1.5		10.4	2.2		9.3	1.4		1.7	1.0		4.0	1.9		4.0	1.7
Operation ratio considering maintenance		90%		0.90	0.90	0.90		0.90	0.90		0.90	0.90		0.90	0.90		0.90	0.90		0.90	0.90		0.90	0.90
Required number of vehicle	vehicle			**8**	**10**	**10**		**8**	**2**		**12**	**3**		**11**	**2**		**2**	**2**		**5**	**3**		**5**	**2**
Cost for 2nd collection	K MZN/5 year	5year		**304,844**	**381,496**	**364,176**	**310,752**	**238,772**	**71,980**	**580,909**	**469,862**	**111,047**	**497,960**	**423,735**	**74,225**	**128,369**	**69,486**	**58,882**	**322,296**	**208,183**	**114,113**	**280,722**	**192,714**	**88,008**
	K MZN/ year			**60,969**	**76,299**	**72,835**	**62,150**	**47,754**	**14,396**	**116,182**	**93,972**	**22,209**	**99,592**	**84,747**	**14,845**	**25,674**	**13,897**	**11,776**	**64,459**	**41,637**	**22,823**	**56,144**	**38,543**	**17,602**
CAPEX	K MZN/5year	5year		**98,355**	**117,022**	**117,022**	**87,540**	**65,033**	**22,507**	**123,540**	**91,700**	**31,840**	**107,540**	**85,033**	**22,507**	**41,790**	**20,083**	**21,707**	**71,123**	**40,083**	**31,040**	**61,790**	**40,083**	**21,707**
	K MZN/year			32% **19,671**	31% **23,404**	32% **23,404**	28% **17,508**	**13,007**	**4,501**	21% **24,708**	**18,340**	**6,368**	22% **21,508**	**17,007**	**4,501**	33% **8,358**	**4,017**	**4,341**	22% **14,225**	**8,017**	**6,208**	22% **12,358**	**8,017**	**4,341**
Vehicle purchase cost	K MZN/year	**7.5year**		5% **14,933**	5% **18,667**	5% **18,667**	5% **14,400**	**10,667**	**3,733**	4% **21,600**	**16,000**	**5,600**	4% **18,400**	**14,667**	**3,733**	5% **6,400**	**2,667**	**3,733**	4% **12,267**	**6,667**	**5,600**	4% **10,400**	**6,667**	**3,733**
New vehicles	vehicle			8	10	10		8	2		12	3		11	2		2	2		5	3		5	2
Roll-on-off from WB	K MZN/vehicle	10,000						80,000			120,000			110,000			20,000			50,000			50,000	
Compactor(MAN) from Ecolife	K MZN/vehicle	14,000		112,000	140,000	140,000			28,000			42,000			28,000			28,000			42,000			28,000
Compactor(Caina) by DSMAS	K MZN/vehicle	8,000																						
Container purchase cost	K MZN/year	**5year**		2% **4,738**	1% **4,738**	1% **4,738**	1% **3,108**	**2,340**	**768**	1% **3,108**	**2,340**	**768**	1% **3,108**	**2,340**	**768**	2% **1,958**	**1,350**	**608**	1% **1,958**	**1,350**	**608**	1% **1,958**	**1,350**	**608**
12m3 from Enviroserv (400-500)	K MZN/container	450						11,700			11,700			11,700			6,750			6,750			6,750	
5,5m3 from Ecolife	K MZN/container	160		7,200	7,200	7,200			3,840			3,840			3,840			3,040			3,040			3,040
1.1m3 from Ecolife	K MZN/container	31		16,489	16,489	16,489																		
OPEX	K MZN/year			68% **41,298**	69% **52,895**	68% **49,431**	72% **44,642**	**34,748**	**9,895**	79% **91,474**	**75,632**	**15,841**	78% **78,084**	**67,740**	**10,344**	67% **17,316**	**9,881**	**7,435**	78% **50,234**	**33,620**	**16,615**	78% **43,786**	**30,526**	**13,260**
Staff	K MZN/year			20% **12,452**	20% **14,889**	20% **14,889**	20% **12,405**	**9,966**	**2,438**	15% **17,255**	**13,846**	**3,409**	15% **15,315**	**12,876**	**2,438**	26% **6,584**	**3,508**	**3,077**	16% **10,464**	**6,418**	**4,047**	17% **9,494**	**6,418**	**3,077**
Driver & worker	K MZN/year			16% **9,748**	16% **12,185**	17% **12,185**	16% **9,701**	**7,760**	**1,940**	13% **14,551**	**11,641**	**2,910**	13% **12,611**	**10,671**	**1,940**	15% **3,880**	**1,940**	**1,940**	12% **7,760**	**4,850**	**2,910**	12% **6,790**	**4,850**	**1,940**
No of drivers	person	1		8	10	10		8	2		12	3		11	2		2	2		5	3		5	2
No of workers	person	2		16	20	20		16	4		24	6		22	4		4	4		10	6		10	4
No of workers(KaMpfumo)	person	1		8	10	10																		
# drivers shift/day(12h/8h)	person	1.50		12	15	15		12	3		18	5		17	3		3	3		8	5		8	3
# workers shift/day(12h/8h))	person	1.50		36	45	45		24	6		36	9		33	6		6	6		15	9		15	6
# drivers reserve 7day/6day		1.17		14	17.5	18		14	4		21	5		19	4		4	4		9	5		9	4
# workers reserve 7day/6day		1.17		42	53	53		28	7		42	11		39	7		7	7		18	11		18	7
Driver unit cost from WB	K MZN/person/y	270		3,786	4,732	4,732		3,786	946		5,678	1,420		5,205	946		946	946		2,366	1,420		2,366	946
Worker unit cost from WB	K MZN/person/y	142		5,962	7,453	7,453		3,975	994		5,962	1,491		5,465	994		994	994		2,484	1,491		2,484	994
Administration staff				4% **2,704**	4% **2,704**	4% **2,704**	4% **2,704**	**2,206**	**498**	2% **2,704**	**2,206**	**498**	3% **2,704**	**2,206**	**498**	11% **2,704**	**1,568**	**1,136**	4% **2,704**	**1,568**	**1,136**	5% **2,704**	**1,568**	**1,136**
Manager	K MZN/person/y	811 person	1	811	811	811	811	662	150	811	662	150	811	662	150	811	470	341	811	470	341	811	470	341
Engineer	K MZN/person/y	541 person	2	1,082	1,082	1,082	1,082	882	199	1,082	882	199	1,082	882	199	1,082	627	455	1,082	627	455	1,082	627	455
Inspection	K MZN/person/y	270 person	3	811	811	811	811	662	150	811	662	150	811	662	150	811	470	341	811	470	341	811	470	341
Replacement cost Vehicles	**K MZN/year**			5% **3,298**	4% **3,298**	5% **3,298**	0% **0**	**0**	**0**	0% **0**	**0**	**0**	0% **0**	**0**	**0**	0% **0**	**0**	**0**	0% **0**	**0**	**0**	0% **0**	**0**	**0**
Vehicle	K MZN/year			0.0	0.0	0.0		0	0		0	0		0	0		0	0		0	0		0	0
km/veicle/5year	km	700,000		122,850	141,960	120,120		140,018	162,505		270,480	190,003		260,110	176,662		140,213	63,276		287,614	191,788		248,602	246,914
replace for 5 years	unit			0.0	0.0	0		0	0		0	0		0	0		0	0		0	0		0	0
container	K MNZ/year			3,298	3,298	3,298		0	0		0	0		0	0		0	0		0	0		0	0
12m3 container/year	unit	0%		0	0	0		0	0		0	0		0	0		0	0		0	0		0	0
5.5m3 container/year	unit	0%		0	0	0		0	0		0	0		0	0		0	0		0	0		0	0
1.1m3 containr/year	unit	20%		107	107	107		0	0		0	0		0	0		0	0		0	0		0	0
Others(Fuel,Tyre,oil)	K MZN/year			20% **12,488**	24% **18,038**	21% **15,263**	30% **18,362**	**14,233**	**4,130**	42% **48,484**	**41,241**	**7,243**	41% **40,844**	**36,355**	**4,489**	20% **5,171**	**3,563**	**1,608**	40% **25,583**	**18,272**	**7,311**	39% **22,068**	**15,794**	**6,275**
Fuel	K MZN/year			12% 7,174	14% 10,363	12% 8,769	17% 10,550	8,177	2,373	24% 27,855	23,694	4,161	24% 23,466	20,887	2,579	12% 2,971	2,047	924	23% 14,698	10,498	4,200	23% 12,679	9,074	3,605
unit price	K MZN/L	0.0730																						
Consumption rate	km/L	2.0		98,280	141,960	120,120		112,014	32,501		324,576	57,001		286,121	35,332		28,043	12,655		143,807	57,536		124,301	49,383
Tire	K MZN/year			9% 5,242	10% 7,571	9% 6,406	12% 7,707	5,974	1,733	18% 20,351	17,311	3,040	17% 17,144	15,260	1,884	8% 2,171	1,496	675	17% 10,738	7,670	3,069	16% 9,263	6,629	2,634
Mileage/unit/year	km/unit/year			24,570	28,392	24,024		28,004	32,501		54,096	38,001		52,022	35,332		28,043	12,655		57,523	38,358		49,720	49,383
Number of units replaced	tyre/y			131	189	160		149	43		433	76		381	47		37	17		192	77		166	66
Mileage for replacement	km	15,000																						
Number of tyre per vehicle	tyre	10																						
Purchase cost of tyre	K MZN/tyre	40																						
Engine oil	K MZN/year			0% 72	0% 103	0% 87	0% 105	82	24	0% 278	236	41	0% 234	208	26	0% 30	20	9	0% 147	105	42	0% 126	90	36
Engine oil	K MZN/L	0.0910																						
Consumption rate	km/L	250		786	1,136	961		896	260		2,597	456		2,289	283		224	101		1,150	460		994	395
Maintenance etc				12% **7,395**	13% **9,593**	13% **9,194**	13% **8,039**	**6,046**	**1,994**	13% **15,069**	**11,928**	**3,141**	13% **12,771**	**10,726**	**2,045**	12% **3,143**	**1,512**	**1,631**	13% **8,277**	**5,126**	**3,151**	13% **7,072**	**4,770**	**2,302**
Spareparts	K MZN/year			3% 1,795	3% 2,593	3% 2,194	4% 2,639	2,046	594	6% 6,969	5,928	1,041	6% 5,871	5,226	645	3% 743	512	231	6% 3,677	2,626	1,051	6% 3,172	2,270	902
	K MZN/km	0.0091																						
maintenance by supplier	K MZN/year	5%		9% 5,600	9% 7,000	10% 7,000	9% 5,400	4,000	1,400	7% 8,100	6,000	2,100	7% 6,900	5,500	1,400	9% 2,400	1,000	1,400	7% 4,600	2,500	2,100	7% 3,900	2,500	1,400
Safety Material/Equipment		1%		0% **231**	0% **278**	0% **274**	0% **204**	**160**	**44**	0% **323**	**258**	**65**	0% **281**	**236**	**45**	0% **97**	**50**	**47**	0% **187**	**115**	**72**	0% **166**	**112**	**54**
(Personal+Replacement+maintenance) x %				231	278	274		160	44		258	65		236	45		50	47		115	72		112	54
Fixed Expenses/Administrative Costs/profit		9.0%		9% **5,434**	9% **6,800**	9% **6,514**	9% **5,632**	**4,343**	**1,289**	9% **10,343**	**8,359**	**1,984**	9% **8,873**	**7,547**	**1,326**	9% **2,320**	**1,247**	**1,072**	9% **5,722**	**3,688**	**2,034**	9% **4,986**	**3,432**	**1,553**
License fee etc..	K MZN/year			1% 400	1% 500	1% 500	1% 500	400	100	1% 750	600	150	1% 650	550	100	1% 200	100	100	1% 400	250	150	1% 350	250	100
License fee etc..	K MZN/year	50		400	500	500	500	400	100	750	600	150	650	550	100	200	100	100	400	250	150	350	250	100
Administration/profit	K MZN/year			8% 5,034	8% 6,300	8% 6,014	8% 5,132	3,943	1,189	8% 9,593	7,759	1,834	8% 8,223	6,997	1,226	8% 2,120	1,147	972	8% 5,322	3,438	1,884	8% 4,636	3,182	1,453
				5,034	6,300	6,014	5,132	3,943	1,189	9,593	7,759	1,834	8,223	6,997	1,226	2,120	1,147	972	5,322	3,438	1,884	4,636	3,182	1,453
without brigde	K MZN/year			**60,969**	**76,299**	**72,835**	**62,525**	47,754	14,770	**116,556**	93,972	22,584	**99,592**	84,747	14,845	**25,674**	13,897	11,776	**64,459**	41,637	22,823	**56,144**	38,543	17,602
KaTembe Brigde	K MZN/year					**10,757**			374			374	**41,184**	36,691	4,493								13,478	5,242
fee	K MZN/time	1.200																						
time/year(go&back)	time/year					8,964			312			312	**34,320**	30,576	3,744								11,232	4,368
with brigde	K MZN/year					**83,592**							**140,776**	121,438	19,338							**74,864**	52,021	22,843

Appendix 3 Transfer station calculation

5) Calculation of 2nd collection			KaMavota									KaMubu								
			Hulene			Matlhemele			KaTembe			Hulene			Matlhemele			KaTembe		
			12m3	6m3		12m3	6m3		12m3	6m3		12m3	6m3		12m3	6m3		12m3	6m3	
Container number 12m2			37			37			37			50			50			50		
Container number 5.5m3=6m3				16			16			16			22			22			22	
Container number 1.1m3	**unit**																			
Calculation of number of 2nd collection & transportation																				
Waste volume to be generated	t/day	1,093	**213**	**174**	**39**	**213**	174	39	**213**	174	39	**284**	**256**	**28**	**284**	256	28	**284**	256	28
Number of operation day per week	day	6		6	6		6	6		6	6		6	6		6	6		6	6
Waste volume /day to be collected	t/day			203	46		203	46		203	46		299	33		299	33		299	33
Waste density	t/m3			0.39	0.47		0.39	0.47		0.39	0.47		0.46	0.47		0.46	0.47		0.46	0.47
Waste volume to be transported	m3/day			521	97		521	97		521	97		649	70		649	70		649	70
Average capacity of existing vehicle	m3			12	20		12	20		12	20		12	20		12	20		12	20
Loading ratio	—	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Total required trips	trip/day			43	5		43	5		43	5		54	3		54	3		54	3
Total required trips for 6m3 container	container /day				16			16			16			12			12			12
Total required trips/container for year	trip/year			13,416	5,034		13,416	5,034		13,416	5,034		16,848	3,614		16,848	3,614		16,848	3,614
Total distance for day	km/d			**358**	**68**		**1,850**	**264**		**2,511**	**614**		**929**	**82**		**2,029**	**156**		**2,934**	**181**
Total distance for year	km/year			111,752	21,370		577,178	82,366		783,567	191,527		289,718	25,664		633,013	48,568		915,453	56,565
Required time for all collection /day	min/d			**1,962**	**421**		**4,386**	**718**		**6,775**	**874**		**3,866**	**488**		**5,350**	**618**		**7,126**	**657**
Operation hours	hour	12.0		12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0
Operation hours	%	79%		9.5	9.5		9.5	9.5		9.5	9.5		9.5	9.5		9.5	9.5		9.5	9.5
Required number of vehicle	vehicle	9.500		3.4	0.7		7.7	1.3		11.9	1.5		6.8	0.9		9.4	1.1		12.5	1.2
Operation ratio considering maintenance		90%		0.90	0.90		0.90	0.90		0.90	0.90		0.90	0.90		0.90	0.90		0.90	0.90
Required number of vehicle	vehicle			**4**	**1**		**9**	**2**		**14**	**2**		**8**	**1**		**11**	**2**		**14**	**2**
Cost for 2nd collection	K MZN/5 year	5year	**170,770**	**137,142**	**33,628**	**477,295**	**399,843**	**77,452**	**680,569**	**559,834**	**120,735**	**312,985**	**277,866**	**35,119**	**524,718**	**460,879**	**63,839**	**686,772**	**619,762**	**67,010**
	K MZN/ year		**34,154**	**27,428**	**6,726**	**95,459**	**79,969**	**15,490**	**136,114**	**111,967**	**24,147**	**62,597**	**55,573**	**7,024**	**104,944**	**92,176**	**12,768**	**137,354**	**123,952**	**13,402**
CAPEX	K MZN/5year	5year	**55,210**	**43,317**	**11,893**	**97,877**	**76,650**	**21,227**	**131,210**	**109,983**	**21,227**	**88,687**	**75,833**	**12,853**	**118,020**	**95,833**	**22,187**	**138,020**	**115,833**	**22,187**
	K MZN/year		32% **11,042**	**8,663**	**2,379**	21% **19,575**	**15,330**	**4,245**	19% **26,242**	**21,997**	**4,245**	28% **17,737**	**15,167**	**2,571**	22% **23,604**	**19,167**	**4,437**	20% **27,604**	**23,167**	**4,437**
Vehicle purchase cost	K MZN/year	**7.5year**	4% **7,200**	**5,333**	**1,867**	3% **15,733**	**12,000**	**3,733**	3% **22,400**	**18,667**	**3,733**	4% **12,533**	**10,667**	**1,867**	4% **18,400**	**14,667**	**3,733**	3% **22,400**	**18,667**	**3,733**
New vehicles	vehicle			4	1		9	2		14	2		8	1		11	2		14	2
Roll-on-off from WB	K MZN/vehicle	10,000		40,000			90,000			140,000			80,000			110,000			140,000	
Compactor(MAN) from Ecolife	K MZN/vehicle	14,000			14,000			28,000			28,000			14,000			28,000			28,000
Compactor(Caina) by DSMAS	K MZN/vehicle	8,000																		
Container purchase cost	K MZN/year	**5year**	2% **3,842**	**3,330**	**512**	1% **3,842**	**3,330**	**512**	1% **3,842**	**3,330**	**512**	2% **5,204**	**4,500**	**704**	1% **5,204**	**4,500**	**704**	1% **5,204**	**4,500**	**704**
12m3 from Enviroserv (400-500)	K MZN/container	450		16,650			16,650			16,650			22,500			22,500			22,500	
5,5m3 from Ecolife	K MZN/container	160			2,560			2,560			2,560			3,520			3,520			3,520
1.1m3 from Ecolife	K MZN/container	31																		
OPEX	K MZN/year		68% **23,112**	**18,765**	**4,347**	79% **75,884**	**64,639**	**11,245**	81% **109,872**	**89,970**	**19,902**	72% **44,860**	**40,407**	**4,453**	78% **81,340**	**73,009**	**8,331**	80% **109,750**	**100,786**	**8,965**
Staff	K MZN/year		22% **7,554**	**6,089**	**1,465**	14% **13,375**	**10,939**	**2,435**	13% **18,225**	**15,790**	**2,435**	18% **11,435**	**10,198**	**1,237**	15% **15,315**	**13,108**	**2,207**	13% **18,225**	**16,018**	**2,207**
Driver & worker	K MZN/year		14% **4,850**	**3,880**	**970**	11% **10,671**	**8,731**	**1,940**	11% **15,521**	**13,581**	**1,940**	14% **8,731**	**7,760**	**970**	12% **12,611**	**10,671**	**1,940**	11% **15,521**	**13,581**	**1,940**
No of drivers	person	1		4	1		9	2		14	2		8	1		11	2		14	2
No of workers	person	2		8	2		18	4		28	4		16	2		22	4		28	4
No of workers(KaMpfumo)	person	1																		
# drivers shift/day(12h/8h)	person	1.50		6	2		14	3		21	3		12	2		17	3		21	3
# workers shift/day(12h/8h))	person	1.50		12	3		27	6		42	6		24	3		33	6		42	6
# drivers reserve 7day/6day		1.17		7	2		16	4		25	4		14	2		19	4		25	4
# workers reserve 7day/6day		1.17		14	4		32	7		49	7		28	4		39	7		49	7
Driver unit cost from WB	K MZN/person/y	270		1,893	473		4,259	946		6,625	946		3,786	473		5,205	946		6,625	946
Worker unit cost from WB	K MZN/person/y	142		1,987	497		4,472	994		6,956	994		3,975	497		5,465	994		6,956	994
Administration staff			8% **2,704**	**2,209**	**495**	3% **2,704**	**2,209**	**495**	2% **2,704**	**2,209**	**495**	4% **2,704**	**2,437**	**267**	3% **2,704**	**2,437**	**267**	2% **2,704**	**2,437**	**267**
Manager	K MZN/person/y	811 person 1		811	663	149	811	663	149	811	663	149	811	731	80	811	731	80	811	731	80
Engineer	K MZN/person/y	541 person 2		1,082	884	198	1,082	884	198	1,082	884	198	1,082	975	107	1,082	975	107	1,082	975	107
Inspection	K MZN/person/y	270 person 3		811	663	149	811	663	149	811	663	149	811	731	80	811	731	80	811	731	80
Replacement cost Vehicles	**K MZN/year**		0% **0**	**0**	**0**	0% **0**	**0**	**0**	0% **0**	**0**	**0**	0% **0**	**0**	**0**	0% **0**	**0**	**0**	0% **0**	**0**	**0**
Vehicle	K MZN/year			0	0		0	0		0	0		0	0		0	0		0	0
km/veicle/5year	km	700,000		139,690	106,852		320,654	205,916		279,845	478,819		181,074	128,318		287,733	121,421		326,947	141,412
replace for 5 years	unit			0	0		0	0		0	0		0	0		0	0		0	0
container	K MNZ/year			0	0		0	0		0	0		0	0		0	0		0	0
12m3 container/year	unit	0%		0	0		0	0		0	0		0	0		0	0		0	0
5.5m3 container/year	unit	0%		0	0		0	0		0	0		0	0		0	0		0	0
1.1m3 containr/year	unit	20%		0	0		0	0		0	0		0	0		0	0		0	0
Others(Fuel,Tyre,oil)	K MZN/year		25% **8,457**	**7,100**	**1,358**	44% **41,901**	**36,669**	**5,233**	46% **61,948**	**49,781**	**12,168**	32% **20,036**	**18,406**	**1,630**	41% **43,301**	**40,216**	**3,086**	45% **61,753**	**58,159**	**3,594**
Fuel	K MZN/year		14% 4,859	4,079	780	25% 24,073	21,067	3,006	26% 35,591	28,600	6,991	18% 11,511	10,575	937	24% 24,878	23,105	1,773	26% 35,479	33,414	2,065
unit price	K MZN/L	0.0730																		
Consumption rate	km/L	2.0		55,876	10,685		288,589	41,183		391,783	95,764		144,859	12,832		316,507	24,284		457,726	28,282
Tire	K MZN/year		10% 3,550	2,980	570	18% 17,588	15,391	2,196	19% 26,003	20,895	5,107	13% 8,410	7,726	684	17% 18,176	16,880	1,295	19% 25,920	24,412	1,508
Mileage/unit/year	km/unit/year			27,938	21,370		64,131	41,183		55,969	95,764		36,215	25,664		57,547	24,284		65,389	28,282
Number of units replaced	tyre/y			75	14		385	55		522	128		193	17		422	32		610	38
Mileage for replacement	km	15,000																		
Number of tyre per vehicle	tyre	10																		
Purchase cost of tyre	K MZN/tyre	40																		
Engine oil	K MZN/year		0% 48	41	8	0% 240	210	30	0% 355	285	70	0% 115	105	9	0% 248	230	18	0% 354	333	21
Engine oil	K MZN/L	0.0910																		
Consumption rate	km/L	250		447	85		2,309	329		3,134	766		1,159	103		2,532	194		3,662	226
Maintenance etc			11% **3,916**	**3,021**	**895**	12% **11,923**	**9,771**	**2,152**	13% **17,304**	**14,155**	**3,149**	12% **7,580**	**6,646**	**934**	13% **13,124**	**11,281**	**1,844**	13% **17,276**	**15,360**	**1,917**
Spareparts	K MZN/year		4% 1,216	1,021	195	6% 6,023	5,271	752	7% 8,904	7,155	1,749	5% 2,880	2,646	234	6% 6,224	5,781	444	6% 8,876	8,360	517
	K MZN/km	0.0091																		
maintenance by supplier	K MZN/year	5%	8% 2,700	2,000	700	6% 5,900	4,500	1,400	6% 8,400	7,000	1,400	8% 4,700	4,000	700	7% 6,900	5,500	1,400	6% 8,400	7,000	1,400
Safety Material/Equipment		1%	**0% 115**	**91**	**24**	**0% 253**	**207**	**46**	**0% 355**	**299**	**56**	**0% 190**	**168**	**22**	**0% 284**	**244**	**41**	**0% 355**	**314**	**41**
(Personal+Replacement+maintenance) x %				91	24		207	46		299	56		168	22		244	41		314	41
Fixed Expenses/Administrative Costs/profit		9.0%	9% **3,070**	**2,465**	**605**	9% **8,432**	**7,053**	**1,379**	9% **12,039**	**9,945**	**2,094**	9% **5,619**	**4,989**	**630**	9% **9,315**	**8,161**	**1,154**	9% **12,141**	**10,935**	**1,207**
License fee etc..	K MZN/year		1% 250	200	50	1% 550	450	100	1% 800	700	100	1% 450	400	50	1% 650	550	100	1% 800	700	100
License fee etc..	K MZN/year	50	250	200	50	550	450	100	800	700	100	450	400	50	650	550	100	800	700	100
Administration/profit	K MZN/year		8% 2,820	2,265	555	8% 7,882	6,603	1,279	8% 11,239	9,245	1,994	8% 5,169	4,589	580	8% 8,665	7,611	1,054	8% 11,341	10,235	1,107
			2,820	2,265	555	7,882	6,603	1,279	11,239	9,245	1,994	5,169	4,589	580	8,665	7,611	1,054	11,341	10,235	1,107

without brigde	K MZN/year		**34,154**	27,428	6,726	**95,459**	79,969	15,490	**136,114**	111,967	24,147	**62,597**	55,573	7,024	**104,944**	92,176	12,768	**137,354**	123,952	13,402
KaTembe Brigde	K MZN/year									32,198	3,744								40,435	2,602
fee	K MZN/time	1.200																		
time/year(go&back)	time/year									26,832	3,120								33,696	2,169
with brigde	K MZN/year								**172,056**	144,165	27,891							**180,392**	164,388	16,004

Appendix 3 Transfer station calculation

6) Calculation of Transfer station

Mathlemele

	Kampfumo	165	165	165		165	165	165		165			165	165		165				165					165	
	Nlhama	292	292	292	292	292	292		292	292	292		292		292		292	292			292					
	KaMaxa	138	138		138	138	138	138			138	138	138	138		138		138	138	138						138
	KaMavo	213	213	213	213		213	213	213	213	213	213				213	213		213					213		
	KaMubu	284	284	284	284	284		284	284			284		284	284							284				
Calculation on transfer vehicle																										
Waste volume to be transported	t	1,092	1,092	954	927	879	808	800	789	670	643	635	595	587	576	516	505	430	351	303	292	284	213	165	138
Number of operation day per week	day		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Waste volume per day to be transported	t/day		1,092	954	927	879	808	800	789	670	643	635	595	587	576	516	505	430	351	303	292	284	213	165	138
Waste density	t/m3	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Waste volume to be transported	m3		1,638	1,431	1,391	1,319	1,212	1,200	1,184	1,005	965	953	893	881	864	774	758	645	527	455	438	426	320	248	207
Capacity of transfer vehicle	m3		40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Compensating ratio	15%		0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Total required trips	trip/day		47	41	40	38	35	34	34	29	28	27	26	25	25	22	22	19	15	13	13	12	9	7	6
Distance	km		**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**
Annual mileage(go &Back)	km/year		790,367	690,485	670,943	636,202	584,814	579,023	571,062	484,932	465,390	459,600	430,649	424,858	416,897	373,470	365,509	311,225	254,047	219,305	211,344	205,553	154,165	119,424	99,882
Toral traveling time	min		**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**
Loading time(min)	min	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Unloading time (min)	min	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Return trip	min		44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
Required time per trip	min		163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163
Operation hours	hour	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Possible trip per day	trip/day		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Required number of vehicle	unit		5.9	5.1	5.0	4.7	4.4	4.3	4.3	3.6	3.5	3.4	3.2	3.2	3.1	2.8	2.7	2.3	1.9	1.6	1.6	1.5	1.1	0.9	0.7
Operation Wrking ratio considering maintenance	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Required number of vehicle	unit		**8**	**7**	**7**	**6**	**6**	**6**	**6**	**5**	**5**	**5**	**5**	**4**	**4**	**4**	**4**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**1**
Cost for Secondary transportation																									
CAPEX	K MZN		**1,230,313**	**1,205,313**	**1,205,313**	**1,165,729**	**1,165,729**	**1,165,729**	**1,165,729**	**846,396**	**846,396**	**846,396**	**846,396**	**806,813**	**806,813**	**806,813**	**806,813**	**781,813**	**781,813**	**781,813**	**742,229**	**742,229**	**742,229**	**742,229**	**717,229**
Transfer Station	K MZN/15 year		**971,979**	**971,979**	**971,979**	**971,979**	**971,979**	**971,979**	**971,979**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**	**677,646**
Design Capasity (Daily)	ton/day		1,100	1,000	1,000	900	900	800	800	700	700	700	600	600	600	600	600	500	400	400	300	300	300	200	200
Operation hour	hr/day		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Design Capasity (hourly)	ton/hour		46	42	42	38	38	33	33	29	29	29	25	25	25	25	25	21	17	17	13	13	13	8	8
			971,979	971,979	971,979	971,979	971,979	971,979	971,979	677,646	677,646	677,646	677,646	677,646	677,646	677,646	677,646	677,646	677,646	677,646	677,646	677,646	677,646	677,646	677,646
Transfer vehcle	K MZN		**258,333**	**233,333**	**233,333**	**193,750**	**193,750**	**193,750**	**193,750**	**168,750**	**168,750**	**168,750**	**168,750**	**129,167**	**129,167**	**129,167**	**129,167**	**104,167**	**104,167**	**104,167**	**64,583**	**64,583**	**64,583**	**64,583**	**39,583**
Unit Price of Container	K MZN	14,583																							
Unit Price of Trucker head	K MZN	10,417																							
No of container	unit		12	11	11	9	9	9	9	8	8	8	8	6	6	6	6	5	5	5	3	3	3	3	2
No of tucker head	unit		8	7	7	6	6	6	6	5	5	5	5	4	4	4	4	3	3	3	2	2	2	2	1
Initial purchase of container	K MZN		175,000	160,417	160,417	131,250	131,250	131,250	131,250	116,667	116,667	116,667	116,667	87,500	87,500	87,500	87,500	72,917	72,917	72,917	43,750	43,750	43,750	43,750	29,167
Initial purchase of trucker head	K MZN		83,333	72,917	72,917	62,500	62,500	62,500	62,500	52,083	52,083	52,083	52,083	41,667	41,667	41,667	41,667	31,250	31,250	31,250	20,833	20,833	20,833	20,833	10,417
OPEX			**285,616**	**254,800**	**252,094**	**240,141**	**233,026**	**232,224**	**231,122**	**176,304**	**173,598**	**172,796**	**168,788**	**160,843**	**159,741**	**153,728**	**152,626**	**142,523**	**134,606**	**129,796**	**118,401**	**117,599**	**110,484**	**105,673**	**100,381**
Transfer Station	K MZN/year	9.7%	**94,597**	**94,597**	**94,597**	**94,597**	**94,597**	**94,597**	**94,597**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**	**60,193**
Manpower	K MZN/year		27,588	27,588	27,588	27,588	27,588	27,588	27,588	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856
			27,588	27,588	27,588	27,588	27,588	27,588	27,588	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856	22,856
Utility	**% of Capex		13,298	12,089	12,089	10,880	10,880	9,671	9,671	11,979	11,979	11,979	10,267	10,267	10,267	10,267	10,267	8,556	6,845	6,845	5,134	5,134	5,134	3,422	3,422
Water, Other general Consumables(Lamps, administration goods)		2.0%	19,440	19,440	19,440	19,440	19,440	19,440	19,440	13,553	13,553	13,553	13,553	13,553	13,553	13,553	13,553	13,553	13,553	13,553	13,553	13,553	13,553	13,553	13,553
Maintenance work, Spare parts	**% of Capex	2.0%	9,375	9,375	9,375	9,375	9,375	9,375	9,375	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688
		0.96%	9,375	9,375	9,375	9,375	9,375	9,375	9,375	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688	4,688
Repair work (initial cost x **%)		10.0%	38,194	38,194	38,194	38,194	38,194	38,194	38,194	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097
		3.9%	38,194	38,194	38,194	38,194	38,194	38,194	38,194	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097
trasfer vehicle(with KaTembe brigde)	K MZN/year	73.9%	**191,019**	**160,203**	**157,498**	**145,544**	**138,429**	**137,627**	**136,525**	**116,111**	**113,405**	**112,603**	**108,595**	**100,650**	**99,548**	**93,535**	**92,433**	**82,330**	**74,413**	**69,603**	**58,207**	**57,406**	**50,290**	**45,480**	**40,188**
Driver			**9**	**8**	**8**	**7**	**7**	**7**	**7**	**6**	**6**	**6**	**6**	**5**	**5**	**5**	**5**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**1**
No of drivers 3shift	person	3	24	21	21	18	18	18	18	15	15	15	15	12	12	12	12	9	9	9	6	6	6	6	3
7days/week		1.40	34	29	29	25	25	25	25	21	21	21	21	17	17	17	17	13	13	13	8	8	8	8	4
Driver unit cost from WB	K MZN/person	0	9	8	8	7	7	7	7	6	6	6	6	5	5	5	5	3	3	3	2	2	2	2	1
Fuel	K MZN/year		**38,465**	**33,604**	**32,653**	**30,962**	**28,461**	**28,179**	**27,792**	**23,600**	**22,649**	**22,367**	**20,958**	**20,676**	**20,289**	**18,176**	**17,788**	**15,146**	**12,364**	**10,673**	**10,285**	**10,004**	**7,503**	**5,812**	**4,861**
unit cost	K MZN/L	0.0730																							
Annual mileage(go &Back)	km/year		790,367	690,485	670,943	636,202	584,814	579,023	571,062	484,932	465,390	459,600	430,649	424,858	416,897	373,470	365,509	311,225	254,047	219,305	211,344	205,553	154,165	119,424	99,882
Consumption rate	km/L	1.5	526,911	460,324	447,296	424,135	389,876	386,016	380,708	323,288	310,260	306,400	287,099	283,239	277,931	248,980	243,672	207,483	169,364	146,203	140,896	137,036	102,777	79,616	66,588
Replacement tuck cost	K MZN/year		**20,833**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**	**10,417**
Replacement	km/truck	700,000	98,796	98,641	95,849	106,034	97,469	96,504	95,177	96,986	93,078	91,920	86,130	106,215	104,224	93,368	91,377	103,742	84,682	73,102	105,672	102,777	77,082	59,712	99,882
	units/year		2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Replacement container cost	K MZN/year		**23,333**	**20,417**	**20,417**	**17,500**	**17,500**	**17,500**	**17,500**	**14,583**	**14,583**	**14,583**	**14,583**	**11,667**	**11,667**	**11,667**	**11,667**	**11,667**	**11,667**	**11,667**	**5,833**	**5,833**	**5,833**	**5,833**	**5,833**
Replacement 8 year/time	units/5year		8	7	7	6	6	6	6	5	5	5	5	4	4	4	4	4	4	4	2	2	2	2	2
KaTembe brigde fee	K MZN/year		**41,237**	**36,025**	**35,006**	**33,193**	**30,512**	**30,210**	**29,795**	**25,301**	**24,281**	**23,979**	**22,469**	**22,167**	**21,751**	**19,485**	**19,070**	**16,238**	**13,255**	**11,442**	**11,027**	**10,725**	**8,043**	**6,231**	**5,211**
price/ time	K MZN/time	1.2																							
Consumption rate	time/year		34,364	30,021	29,171	27,661	25,427	25,175	24,829	21,084	20,234	19,983	18,724	18,472	18,126	16,238	15,892	13,532	11,046	9,535	9,189	8,937	6,703	5,192	4,343
Others			**45,586**	**40,509**	**39,974**	**35,378**	**33,972**	**33,813**	**33,595**	**28,895**	**28,360**	**28,201**	**27,409**	**23,605**	**23,387**	**22,199**	**21,981**	**18,152**	**16,587**	**15,636**	**11,773**	**11,614**	**10,208**	**9,257**	**6,379**
Tyre	K MZN/year		14,227	12,429	12,077	11,452	10,527	10,422	10,279	8,729	8,377	8,273	7,752	7,647	7,504	6,722	6,579	5,602	4,573	3,947	3,804	3,700	2,775	2,150	1,798
Annual mileage(go &Back)	km/year		790,367	690,485	670,943	636,202	584,814	579,023	571,062	484,932	465,390	459,600	430,649	424,858	416,897	373,470	365,509	311,225	254,047	219,305	211,344	205,553	154,165	119,424	99,882
Mileage for replacement	km	40,000																							
Number of tyre per vehicle	tyre	18																							
Purchase cost of tyre	K MZN/tyre	40.0																							
Engine oil	K MZN/year		288	251	244	232	213	211	208	177	169	167	157	155	152	136	133	113	92	80	77	75	56	43	36
unit cost	K MZN/L	0.0910																							
Consumption rate	km/L	250																							
Spareparts	K MZN/year		7,113	6,214	6,038	5,726	5,263	5,211	5,140	4,364	4,189	4,136	3,876	3,824	3,752	3,361	3,290	2,801	2,286	1,974	1,902	1,850	1,387	1,075	899
unit cost	K MZN/km	0.0090																							
maintenance for containers by supplier	K MZN/year		15,625	14,323	14,323	11,719	11,719	11,719	11,719	10,417	10,417	10,417	10,417	7,813	7,813	7,813	7,813	6,510	6,510	6,510	3,906	3,906	3,906	3,906	2,604
	K MZN/year-container	1,302																							
maintenance for Trucker head by supplier	K MZN/year		8,333	7,292	7,292	6,250	6,250	6,250	6,250	5,208	5,208	5,208	5,208	4,167	4,167	4,167	4,167	3,125	3,125	3,125	2,083	2,083	2,083	2,083	1,042
	K MZN/year-container	10%																							
License			**21,557**	**19,224**	**19,024**	**18,088**	**17,561**	**17,502**	**17,420**	**13,310**	**13,109**	**13,050**	**12,753**	**12,114**	**12,033**	**11,587**	**11,506**	**10,707**	**10,121**	**9,765**	**8,870**	**8,811**	**8,284**	**7,928**	**7,486**
License fee etc..	K MZN/year		400	350	350	300	300	300	300	250	250	250	250	200	200	200	200	150	150	150	100	100	100	100	50
License fee	K MZN/year	50	400	350	350	300	300	300	300	250	250	250	250	200	200	200	200	150	150	150	100	100	100	100	50
Insurance etc,.																									
Administration	K MZN/year		21,157	18,874	18,674	17,788	17,261	17,202	17,120	13,060	12,859	12,800	12,503	11,914	11,833	11,387	11,306	10,557	9,971	9,615	8,770	8,711	8,184	7,828	7,436
		8%	21,157	18,874	18,674	17,788	17,261	17,202	17,120	13,060	12,859	12,800	12,503	11,914	11,833	11,387	11,306	10,557	9,971	9,615	8,770	8,711	8,184	7,828	7,436
Transfer vehicle(Without Brigde fee)	K MZN/year		**149,783**	**124,178**	**122,492**	**112,351**	**107,917**	**107,418**	**106,731**	**90,810**	**89,124**	**88,624**	**86,126**	**78,484**	**77,797**	**74,049**	**73,363**	**66,092**	**61,158**	**58,161**	**47,181**	**46,681**	**42,247**	**39,249**	**34,977**

Appendix 3 Transfer station calculation

6) Calculation of Transfer station

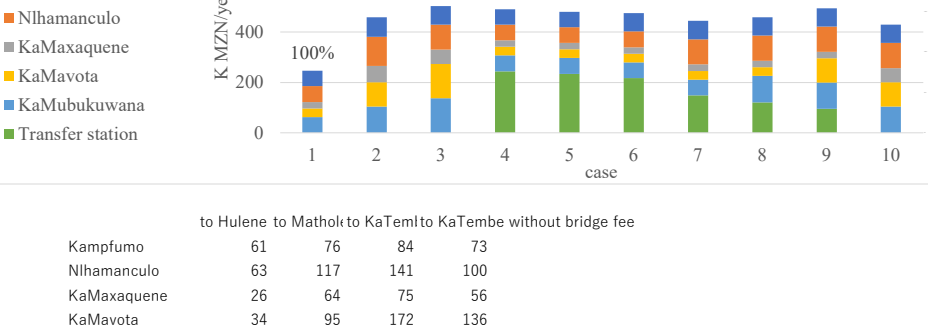
										KaTembe								
	Kampfumo	165	165	165		165	165	165							165			
	Nlhama	292	292	292	292	292	292		292	292								
	KaMaxa	138	138		138	138	138	138		138	138	138	138	138	138			138
	KaMavo	213	213	213	213		213	213	213	213	213	213		213			213	
	KaMubu	284	284	284	284	284		284	284		284	284	284			284		
Calculation on transfer vehicle																		
Waste volume to be transported	t	1,092	1,092	954	927	879	808	800	789	643	635	497	422	351	303	284	213	138
Number of operation day per week	day		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Waste volume per day to be transported	t/day		1,092	954	927	879	808	800	789	643	635	497	422	351	303	284	213	138
Waste density	t/m3	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Waste volume to be transported	m3		1,638	1,431	1,391	1,319	1,212	1,200	1,184	965	953	746	633	527	455	426	320	207
Capacity of transfer vehicle	m3		40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Compensating ratio	15%		0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Total required trips	trip/day		47	41	40	38	35	34	34	28	27	21	18	15	13	12	9	6
Distance	km		25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Annual mileage(go &Back)	km/year		859,095	750,528	729,286	691,524	635,667	629,373	620,719	505,859	499,565	390,998	331,994	276,138	238,375	223,428	167,571	108,567
Toral traveling time	min		49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49
Loading time(min)	min	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Unloading time (min)	min	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Return trip	min		49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49
Required time per trip	min		173	173	173	173	173	173	173	173	173	173	173	173	173	173	173	173
Operation hours	hour	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Possible trip per day	trip/day		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Required number of vehicle	unit		5.9	5.1	5.0	4.7	4.4	4.3	4.3	3.5	3.4	2.7	2.3	1.9	1.6	1.5	1.1	0.7
Operation Wrking ratio considering maintenance	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Required number of vehicle	unit		**8**	**7**	**7**	**6**	**6**	**6**	**6**	**5**	**5**	**4**	**3**	**3**	**3**	**2**	**2**	**1**
Cost for Secondary transportation																		
CAPEX	K MZN		**MZN 1,230,313**	**MZN 1,205,313**	**MZN 1,205,313**	**MZN 1,165,729**	**MZN 1,165,729**	**MZN 1,165,729**	**MZN 1,165,729**	**MZN 846,396**	**MZN 846,396**	**MZN 806,813**	**MZN 781,813**	**MZN 781,813**	**MZN 781,813**	**MZN 742,229**	**MZN 742,229**	**MZN 717,229**
Transfer Station	K MZN/15 year		**MZN 971,979**	**MZN 971,979**	**MZN 971,979**	**MZN 971,979**	**MZN 971,979**	**MZN 971,979**	**MZN 971,979**	**MZN 677,646**	**MZN 677,646**	**MZN 677,646**	**MZN 677,646**	**MZN 677,646**	**MZN 677,646**	**MZN 677,646**	**MZN 677,646**	**MZN 677,646**
Design Capasity (Daily)	ton/day		1,100	1,000	1,000	900	900	800	800	700	700	500	500	400	400	300	300	200
Operation hour	hr/day		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Design Capasity (hourly)	ton/hour		46	42	42	38	38	33	33	29	29	21	21	17	17	13	13	8
			MZN 971,979	MZN 971,979	MZN 971,979	MZN 971,979	MZN 971,979	MZN 971,979	MZN 971,979	MZN 677,646	MZN 677,646	MZN 677,646	MZN 677,646	MZN 677,646	MZN 677,646	MZN 677,646	MZN 677,646	MZN 677,646
Transfer vehcle	K MZN		**MZN 258,333**	**MZN 233,333**	**MZN 233,333**	**MZN 193,750**	**MZN 193,750**	**MZN 193,750**	**MZN 193,750**	**MZN 168,750**	**MZN 168,750**	**MZN 129,167**	**MZN 104,167**	**MZN 104,167**	**MZN 104,167**	**MZN 64,583**	**MZN 64,583**	**MZN 39,583**
Unit Price of Container	K MZN	14,583																
Unit Price of Trucker head	K MZN	10,417																
No of container	unit		12	11	11	9	9	9	9	8	8	6	5	5	5	3	3	2
No of tucker head	unit		8	7	7	6	6	6	6	5	5	4	3	3	3	2	2	1
Initial purchase of container	K MZN		MZN 175,000	MZN 160,417	MZN 160,417	MZN 131,250	MZN 131,250	MZN 131,250	MZN 131,250	MZN 116,667	MZN 116,667	MZN 87,500	MZN 72,917	MZN 72,917	MZN 72,917	MZN 43,750	MZN 43,750	MZN 29,167
Initial purchase of trucker head	K MZN		MZN 83,333	MZN 72,917	MZN 72,917	MZN 62,500	MZN 62,500	MZN 62,500	MZN 62,500	MZN 52,083	MZN 52,083	MZN 41,667	MZN 31,250	MZN 31,250	MZN 31,250	MZN 20,833	MZN 20,833	MZN 10,417
OPEX			**MZN 269,455**	**MZN 244,785**	**MZN 242,150**	**MZN 213,763**	**MZN 206,835**	**MZN 204,845**	**MZN 203,772**	**MZN 151,618**	**MZN 150,837**	**MZN 126,984**	**MZN 117,271**	**MZN 108,631**	**MZN 103,947**	**MZN 88,846**	**MZN 81,918**	**MZN 70,494**
Transfer Station	K MZN/year	9.7%	**MZN 88,455**	**MZN 87,246**	**MZN 87,246**	**MZN 86,037**	**MZN 86,037**	**MZN 84,828**	**MZN 84,828**	**MZN 58,619**	**MZN 58,619**	**MZN 55,196**	**MZN 55,196**	**MZN 53,485**	**MZN 53,485**	**MZN 51,774**	**MZN 51,774**	**MZN 50,063**
Manpower	K MZN/year		MZN 27,588	MZN 27,588	MZN 27,588	MZN 27,588	MZN 27,588	MZN 27,588	MZN 27,588	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856
			MZN 27,588	MZN 27,588	MZN 27,588	MZN 27,588	MZN 27,588	MZN 27,588	MZN 27,588	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856	MZN 22,856
Utility	**% of Capex		MZN 13,298	MZN 12,089	MZN 12,089	MZN 10,880	MZN 10,880	MZN 9,671	MZN 9,671	MZN 11,979	MZN 11,979	MZN 8,556	MZN 8,556	MZN 6,845	MZN 6,845	MZN 5,134	MZN 5,134	MZN 3,422
Water, Other general Consumables(Lamps, administration goods)		2.0%	MZN 19,440	MZN 19,440	MZN 19,440	MZN 19,440	MZN 19,440	MZN 19,440	MZN 19,440	MZN 13,553	MZN 13,553	MZN 13,553	MZN 13,553	MZN 13,553	MZN 13,553	MZN 13,553	MZN 13,553	MZN 13,553
Maintenance work, Spare parts	**% of Capex	2.0%	MZN 9,375	MZN 9,375	MZN 9,375	MZN 9,375	MZN 9,375	MZN 9,375	MZN 9,375	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688
		0.96%	MZN 9,375	MZN 9,375	MZN 9,375	MZN 9,375	MZN 9,375	MZN 9,375	MZN 9,375	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688	MZN 4,688
Repair work (initial cost x **%)		10.0%	MZN 38,194	MZN 38,194	MZN 38,194	MZN 38,194	MZN 38,194	MZN 38,194	MZN 38,194	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097
		3.9%	MZN 38,194	MZN 38,194	MZN 38,194	MZN 38,194	MZN 38,194	MZN 38,194	MZN 38,194	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097	MZN 19,097
trasfer vehicle(with KaTembe brigde)	K MZN/year	73.9%	**MZN 181,000**	**MZN 157,539**	**MZN 154,904**	**MZN 127,726**	**MZN 120,797**	**MZN 120,017**	**MZN 118,943**	**MZN 92,999**	**MZN 92,218**	**MZN 71,787**	**MZN 62,075**	**MZN 55,146**	**MZN 50,462**	**MZN 37,072**	**MZN 30,144**	**MZN 20,431**
Driver			MZN 7	MZN 6	MZN 6	MZN 5	MZN 5	MZN 5	MZN 5	MZN 4	MZN 4	MZN 3	MZN 3	MZN 2	MZN 2	MZN 2	MZN 1	MZN 1
No of drivers 3shift	person	3	18	15	15	14	13	13	13	10	10	8	7	6	5	5	3	2
7days/week		1.40	25	22	21	20	18	18	18	15	14	11	10	8	7	6	5	3
Driver unit cost from WB	K MZN/person	0	MZN 7	MZN 6	MZN 6	MZN 5	MZN 5	MZN 5	MZN 5	MZN 4	MZN 4	MZN 3	MZN 3	MZN 2	MZN 2	MZN 2	MZN 1	MZN 1
Fuel	K MZN/year		MZN 41,809	MZN 36,526	MZN 35,492	MZN 33,654	MZN 30,936	MZN 30,629	MZN 30,208	MZN 24,618	MZN 24,312	MZN 19,029	MZN 16,157	MZN 13,439	MZN 11,601	MZN 10,873	MZN 8,155	MZN 5,284
unit cost	K MZN/L	0.0730																
Annual mileage(go &Back)	km/year		859,095	750,528	729,286	691,524	635,667	629,373	620,719	505,859	499,565	390,998	331,994	276,138	238,375	223,428	167,571	108,567
Consumption rate	km/L	1.5	572,730	500,352	486,191	461,016	423,778	419,582	413,813	337,239	333,043	260,665	221,330	184,092	158,917	148,952	111,714	72,378
Replacement tuck cost	K MZN/year		MZN 16,667	MZN 14,583	MZN 14,583	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0
Replacement	km/truck	700,000	107,387	107,218	104,184	115,254	105,945	104,896	103,453	101,172	99,913	97,750	110,665	92,046	79,458	111,714	83,785	108,567
	units/year		2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Replacement container cost	K MZN/year		MZN 38,623	MZN 33,105	MZN 33,105	MZN 27,588	MZN 27,588	MZN 27,588	MZN 27,588	MZN 18,284	MZN 18,284	MZN 13,713	MZN 13,713	MZN 13,713	MZN 13,713	MZN 4,571	MZN 4,571	MZN 4,571
Replacement 8 year/time	units/5year		8.0	7.0	7.0	6.0	6.0	6.0	6.0	5.0	5.0	4.0	4.0	4.0	4.0	2.0	2.0	2.0
KaTembe brigde fee	K MZN/year		MZN 41,237	MZN 36,025	MZN 35,006	MZN 33,193	MZN 30,512	MZN 30,210	MZN 29,795	MZN 24,281	MZN 23,979	MZN 18,768	MZN 15,936	MZN 13,255	MZN 11,442	MZN 10,725	MZN 8,043	MZN 5,211
price/ time	K MZN/time	1.2																
Consumption rate	time/year		34,364	30,021	29,171	27,661	25,427	25,175	24,829	20,234	19,983	15,640	13,280	11,046	9,535	8,937	6,703	4,343
Others			MZN 42,658	MZN 37,294	MZN 36,712	MZN 33,285	MZN 31,757	MZN 31,585	MZN 31,348	MZN 25,811	MZN 25,639	MZN 20,274	MZN 16,266	MZN 14,737	MZN 13,704	MZN 10,901	MZN 9,373	MZN 5,365
Tyre	K MZN/year		MZN 15,464	MZN 13,509	MZN 13,127	MZN 12,447	MZN 11,442	MZN 11,329	MZN 11,173	MZN 9,105	MZN 8,992	MZN 7,038	MZN 5,976	MZN 4,970	MZN 4,291	MZN 4,022	MZN 3,016	MZN 1,954
Annual mileage(go &Back)	km/year		859,095	750,528	729,286	691,524	635,667	629,373	620,719	505,859	499,565	390,998	331,994	276,138	238,375	223,428	167,571	108,567
Mileage for replacement	km	40,000																
Number of tyre per vehicle	tyre	18																
Purchase cost of tyre	K MZN/tyre	40.0																
Engine oil	K MZN/year		MZN 313	MZN 273	MZN 265	MZN 252	MZN 231	MZN 229	MZN 226	MZN 184	MZN 182	MZN 142	MZN 121	MZN 101	MZN 87	MZN 81	MZN 61	MZN 40
unit cost	K MZN/L	0.0910																
Consumption rate	km/L	250																
Spareparts	K MZN/year		MZN 7,732	MZN 6,755	MZN 6,564	MZN 6,224	MZN 5,721	MZN 5,664	MZN 5,586	MZN 4,553	MZN 4,496	MZN 3,519	MZN 2,988	MZN 2,485	MZN 2,145	MZN 2,011	MZN 1,508	MZN 977
unit cost	K MZN/km	0.0090																
maintenance for containers by supplier	K MZN/year		MZN 10,417	MZN 9,115	MZN 9,115	MZN 7,813	MZN 7,813	MZN 7,813	MZN 7,813	MZN 6,510	MZN 6,510	MZN 5,208	MZN 3,906	MZN 3,906	MZN 3,906	MZN 2,604	MZN 2,604	MZN 1,302
	K MZN/year-container	1,302																
maintenance for Trucker head by supplier	K MZN/year		MZN 8,333	MZN 7,292	MZN 7,292	MZN 6,250	MZN 6,250	MZN 6,250	MZN 6,250	MZN 5,208	MZN 5,208	MZN 4,167	MZN 3,125	MZN 3,125	MZN 3,125	MZN 2,083	MZN 2,083	MZN 1,042
	K MZN/year-container	10%																
License																		
License fee etc..	K MZN/year		MZN 400	MZN 350	MZN 350	MZN 300	MZN 300	MZN 300	MZN 300	MZN 250	MZN 250	MZN 200	MZN 150	MZN 150	MZN 150	MZN 100	MZN 100	MZN 50
License fee	K MZN/year	50	MZN 400	MZN 350	MZN 350	MZN 300	MZN 300	MZN 300	MZN 300	MZN 250	MZN 250	MZN 200	MZN 150	MZN 150	MZN 150	MZN 100	MZN 100	MZN 50
Insurance etc,.																		
Administration	K MZN/year		MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0	MZN 0
		8%																
Transfer vehicle(Without Brigde fee)	K MZN/year		**MZN 139,763**	**MZN 121,514**	**MZN 119,898**	**MZN 94,532**	**MZN 90,285**	**MZN 89,807**	**MZN 89,149**	**MZN 68,718**	**MZN 68,239**	**MZN 53,019**	**MZN 46,139**	**MZN 41,892**	**MZN 39,020**	**MZN 26,348**	**MZN 22,100**	**MZN 15,220**

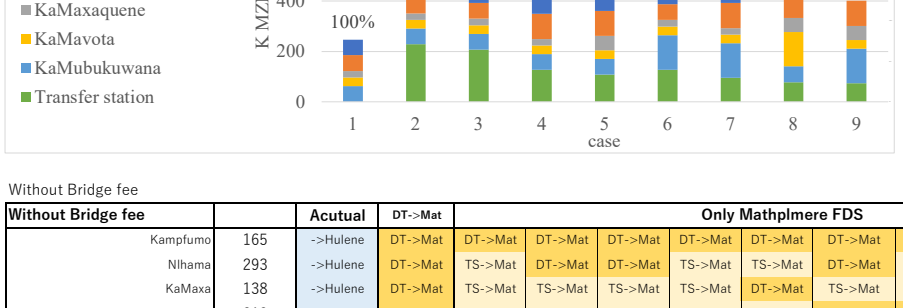
Appendix 3 Transfer station calculation

7) Result

With Bridge fee		Acutual	DT->Matmele	DT->KaTbe	Mathlemele & KaTembe landfill function						
Kampfumo	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	
Nlhama	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	DT->KaT	DT->KaT	DT->KaT	DT->KaT	
KaMaxa	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	TS->Mat	TS->Mat	DT->KaT	
KaMavo	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	TS->Mat	DT->Mat	DT->Mat	
KaMubu	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	DT->Mat	DT->Mat	DT->Mat	
Transfer station t/d		1,093	0	0	1,093	1093	928	635	351	138	0
	Kampfumo	61	76	84	61	61	84	84	84	84	84
	Nlhamanculo	63	117	141	63	63	63	141	141	141	141
	KaMaxaquene	26	64	75	26	26	26	26	26	26	75
	KaMavota	34	95	172	34	34	34	34	34	95	95
	KaMubukuwana	63	105	180	63	63	63	63	105	105	105
	sub-total	246	458	652	246	246	269	347	389	450	500
Transfer station	TS O&M				95	95	95	60	60	60	
Transfer track	TT O&M				191	181	157	113	74	40	
	Transfer station	0	0	0	286	276	252	173	135	100	0
	Total(K MZN)	246	458	652	532	522	521	520	524	551	500
		100%	186%	265%	216%	212%	212%	211%	213%	224%	203%

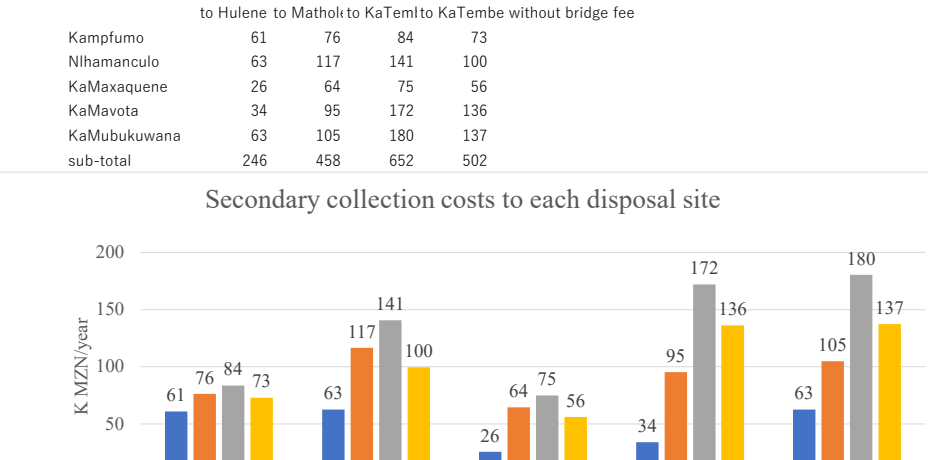
With Bridge fee		Acutual	KaTembe landfill only							
Kampfumo	->Hulene	TS->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	
Nlhamanculo	->Hulene	TS->KaT	TS->KaT	DT->KaT	DT->KaT	TS->KaT	DT->KaT	DT->KaT	DT->KaT	
KaMaxaquene	->Hulene	TS->KaT	TS->KaT	TS->KaT	DT->KaT	TS->KaT	TS->KaT	DT->KaT	DT->KaT	
KaMavota	->Hulene	TS->KaT	TS->KaT	TS->KaT	TS->KaT	TS->KaT	TS->KaT	DT->KaT	TS->KaT	
KaMubukuwana	->Hulene	TS->KaT	TS->KaT	TS->KaT	TS->KaT	DT->KaT	DT->KaT	TS->KaT	DT->KaT	
Transfer station t/d		0	1,093	928	635	497	644	351	284	213
	Kampfumo	61	61	84	84	84	84	84	84	84
	Nlhamanculo	63	63	63	141	141	63	141	141	141
	KaMaxaquene	26	26	26	26	75	26	26	75	75
	KaMavota	34	34	34	34	34	34	34	172	34
	KaMubukuwana	63	63	63	63	63	180	180	63	180
	sub-total	246	246	269	347	396	386	465	534	514
Transfer station	TS O&M		88	87	59	55	59	53	52	52
Transfer track	TT O&M		181	155	92	72	93	55	37	30
	Transfer station	0	269	242	151	127	152	109	89	82
	Total(K MZN)	246	515	511	498	523	538	573	623	596
		100%	210%	208%	202%	213%	219%	233%	253%	242%

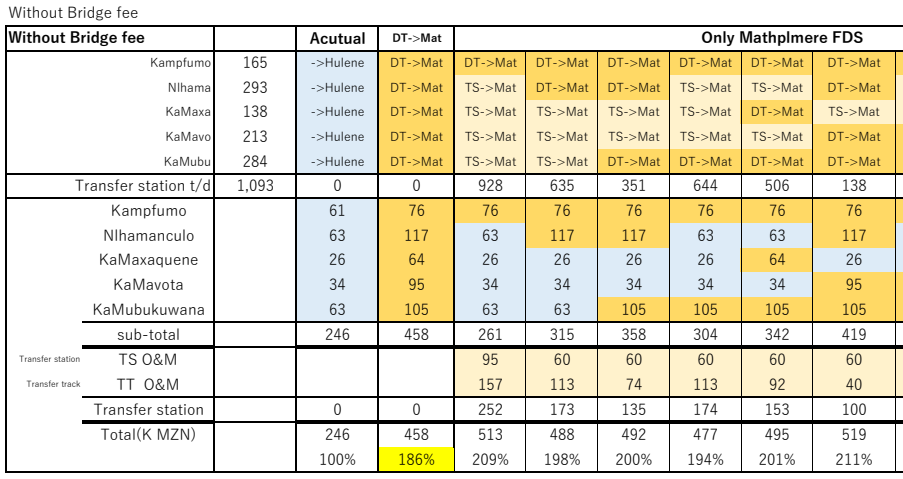




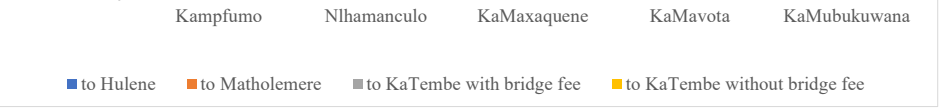
Without Bridge fee		Acutual	DT->Matmele	DT->KaTbe	Matmele & KaTembe landfill function						
Kampfumo	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	
Nlhama	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	DT->KaT	DT->KaT	DT->KaT	DT->KaT	
KaMaxa	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	TS->Mat	TS->Mat	DT->KaT	
KaMavo	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	TS->Mat	DT->Mat	DT->Mat	
KaMubu	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	DT->Mat	DT->Mat	DT->Mat	
Transfer station t/d		1,093	0	0	1,093	1093	928	635	351	138	0
	Kampfumo	61	76	73	61	61	73	73	73	73	73
	Nlhamanculo	63	117	100	63	63	63	100	100	100	100
	KaMaxaquene	26	64	56	26	26	26	26	26	26	56
	KaMavota	34	95	136	34	34	34	34	34	95	95
	KaMubukuwana	63	105	137	63	63	63	63	105	105	105
	sub-total	246	458	502	246	246	258	295	337	399	429
Transfer station	TS O&M				95	95	95	60	60	60	
Transfer track	TT O&M				150	140	122	89	61	35	
	Transfer station	0	0	0	244	234	217	149	121	95	0
	Total(K MZN)	246	458	502	490	480	475	444	459	494	429
		100%	186%	204%	199%	195%	193%	180%	186%	201%	174%

Without Bridge fee		Acutual	KaTembe landfill only							
Kampfumo	->Hulene	TS->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	
Nlhamanculo	->Hulene	TS->KaT	TS->KaT	DT->KaT	DT->KaT	TS->KaT	DT->KaT	DT->KaT	DT->KaT	
KaMaxaquene	->Hulene	TS->KaT	TS->KaT	TS->KaT	DT->KaT	TS->KaT	TS->KaT	DT->KaT	DT->KaT	
KaMavota	->Hulene	TS->KaT	TS->KaT	TS->KaT	TS->KaT	TS->KaT	TS->KaT	DT->KaT	TS->KaT	
KaMubukuwana	->Hulene	TS->KaT	TS->KaT	TS->KaT	TS->KaT	DT->KaT	DT->KaT	TS->KaT	DT->KaT	
Transfer station t/d		0	1,093	928	635	497	644	351	284	213
	Kampfumo	61	61	73	73	73	73	73	73	73
	Nlhamanculo	63	63	63	100	100	63	100	100	100
	KaMaxaquene	26	26	26	26	56	26	26	56	56
	KaMavota	34	34	34	34	34	34	34	136	34
	KaMubukuwana	63	63	63	63	63	137	137	63	137
	sub-total	246	246	258	295	325	333	370	427	400
Transfer station	TS O&M		88	87	59	55	59	53	52	52
Transfer track	TT O&M		140	120	68	53	69	42	26	22
	Transfer station	0	228	207	127	108	127	95	78	74
	Total(K MZN)	246	474	465	422	434	460	465	505	474
		100%	193%	189%	171%	176%	187%	189%	206%	193%



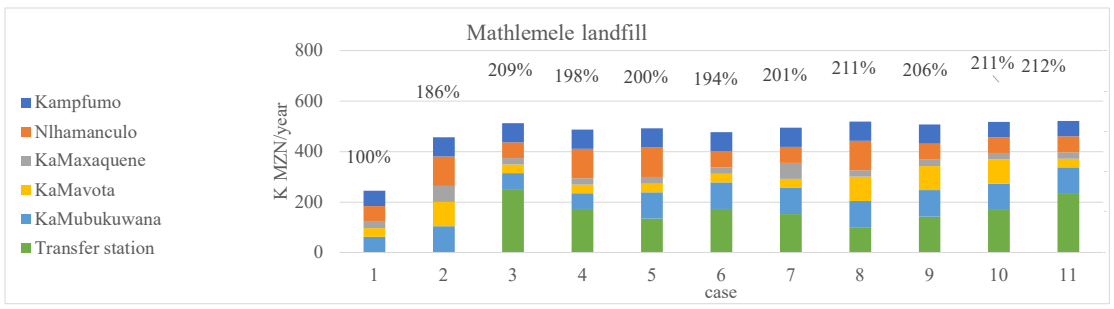


	to Hulene	to Matholemere	to KaTemb	to KaTembe without bridge fee
Kampfumo	61	76	84	73
Nlhamanculo	63	117	141	100
KaMaxaquene	26	64	75	56
KaMavota	34	95	172	136
KaMubukuwana	63	105	180	137
sub-total	246	458	652	502



Without Bridge fee

Without Bridge fee		Acutual	DT->Mat	Only Mathplmere FDS								
Kampfumo	165	->Hulene	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	TS->Mat	TS->Mat
Nlhama	293	->Hulene	DT->Mat	TS->Mat	DT->Mat	DT->Mat	TS->Mat	TS->Mat	DT->Mat	TS->Mat	TS->Mat	TS->Mat
KaMaxa	138	->Hulene	DT->Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat	DT->Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat
KaMavo	213	->Hulene	DT->Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat	DT->Mat	DT->Mat	DT->Mat	TS->Mat
KaMubu	284	->Hulene	DT->Mat	TS->Mat	TS->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat
Transfer station t/d	1,093		0	0	928	635	351	644	506	138	431	596	809
	Kampfumo		61	76	76	76	76	76	76	76	76	61	61
	Nlhamanculo		63	117	63	117	117	63	63	117	63	63	63
	KaMaxaquene		26	64	26	26	26	26	64	26	26	26	26
	KaMavota		34	95	34	34	34	34	34	95	95	95	34
	KaMubukuwana		63	105	63	63	105	105	105	105	105	105	105
	sub-total		246	458	261	315	358	304	342	419	365	350	288
Transfer station	TS O&M				95	60	60	60	60	60	60	60	95
Transfer track	TT O&M				157	113	74	113	92	40	82	109	138
	Transfer station		0	0	252	173	135	174	153	100	143	169	233
	Total(K MZN)		246	458	513	488	492	477	495	519	507	518	521
			100%	186%	209%	198%	200%	194%	201%	211%	206%	211%	212%



Appendix 4 List of WCSPs for Business waste

Service provider for business waste	t/d Ave
Total	87
3 Rs	5
ABBEYCON MOCAMBIQUE	1
AFUA	6
AMOR	2
ANSERV, LDA	3
ARMAZENS AFRICA	1
AUTO ABDUL	0
AUTO RALLY LD	2
BOMBAR CLEAN	2
CASA DE PAPEL	2
CASSIMO J_ PANACHANDE	5
CHEN IMPORT E EXPORT	1
CIDADE LIMPA	1
CLEAN FOSSAS	2
CONTINENTAL CLEAN,LDA	1
DA TERRA	0
ECOCLEAN MULTISERVICE,LDA	1
ECOLIFE SERVICO COMERCIAL	3
ELIMPER LIXO,E_I	1
ENVIROSERV SERVICOS COMERCIAIS	13
EXPRESS AUTO E INDUSTRIAL	3
FAUMIL	1
FLAMA,SERVICOS DE LAVANDARIA E LIMPEZA	2
FUERTE FOMIGACOES	2
FUNET	1
GAMA-GRUPO	2
GARAGEM ESTRELA	1
GIFTS OF AFRICA	2
GOOLDEN CLEN	1
GREEN	3
HCM	9
HELP MULT SERVICE	5
HOTEL 2010	1
IMOVISA	1
INAGRICO	1
Indiferenciado	1
KALITE, LDA	0
KELING INTERNACIONAL	1
KHUPA TUDO	2
KIPAMUZAIA Lda	2
KUKULA	5
L EDUARTE DOS SANTOS	3
LEEF	1
LEVA TUDO	3
LIMPESA OLIVEIRA	3
LIMPEZA COSTA E FILHOS	3
LINE LIMPEZAS	3
M_R_R_S_M_	1
MANGUS VILA	2
MARTA VIANA	2
MAZI CLEAN	1
MHM	1
MJ SERRVICES E_I	2

Service provider for business waste	t/d Ave
MORGEST LDA	2
MOZAGO, LDA	1
MPFEMULANE SERVICE LDA	1
MUNDIWESTE	10
NEOQUIMICA	3
NHASENGO COMERCIAL	2
ORGANIZACOES MUFUNDISSE	0
PAVIMATE, LDA	0
PERFECT CLEAN	3
POMODORO	4
PROTECNA	4
RECSOL-SOCIEDADE UNIPESSOAL,LDA	2
SANTA VERDE	2
SELECT CAR E WASH LDA	1
SELET CAR E WASH,LDA	1
SERLIMPES	3
SERVICOS TANA	1
SISEMA LDA	3
SOLUA	3
SOMBRA MATSINHE	2
SOUNGA HOUSE,LDA	1
SW_ FUMIGACOES E LIMPESA	1
TEXEIRA DUARTE MOC, LDA	10
TLAKULA	1
TOPOGRAFIA PAPELARIA CENTRAL	1
TRANSPORTES ANA	1
U_G_S_M	2
VISAQUA	14
VISTA 1	1
XIVONINGO	1
ZIMAL - ZINCOS DE MAPUTO, LDA	2

Source: DSMAS 2019

Appendix 5: List of institution which have contract with CMM

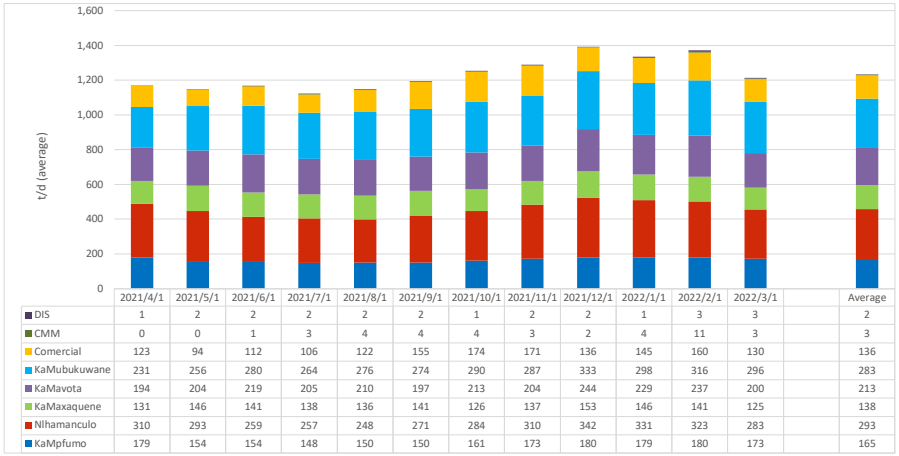
No.	Name	Container	Collection days/week	Address
1	Televisão de Moçambique	[Contentor de 1.1 m^3]	[Mon, Wed, Fri]	Av 25 Setembro
2	Hotel Tamariz	[Saco Plástico de 100 lt]	[Mon, Wed, Fri]	Rua Consigler Pedrosa
3	CEDSIF-Centro Desevolvimento de Sistemas de Informação de Finanças	[Contentor de 1.1 m^3]	[Tues, Fri]	Av Guerra Popular nr 20
4	UEM, Faculdade de Engenharia	[Contentor de 1.1 m^3]	[Tues, Thu]	Av de Moçambique Km 15
5	Ministerio Das Finanças, Avª. 10 de Novembro	[Contentor de 1.1 m^3]	[Mon, Wed, Fri]	Av 10 Novembro
6	PNUD Programme Nations United Development	[Saco Plástico de 100 lt]	[Wed, Fri]	Av Kenneth Kaunda Nr 924/931
7	Ministerio da Defesa	[Contentor de 1.1 m^3]	[Tues, Thu]	Av. Martires Da Moeda
8	Ministério do Ma,Águs I. e PESCAS	[Contentor de 1.1 m^3]	[Tues, Fri]	Rua Marques de Pombal nr 285
9	Industria Plastica J.H., Lda	[Saco Plástico de 100 lt]	[Tues]	Av do Trabalho,Rua da UEFA
10	Ministério de Interior	[Contentor de 1.1 m^3]	[Tues, Thu]	Av Olof Palme
11	Horto Fruticula Empresa Nacional	[Saco Plástico de 100 lt]	[Thu]	Av MArien Nguabi Nr 480
12	Cruz Vermelha de Moçambique	[Contentor de 1.1 m^3]	[Tues, Fri]	Av Agostinho Neto
13	Ministério Das Finanças (Contab Publica)	[Contentor de 1.1 m3]	[Mon, Wed, Fri]	Av.Vlademir Lenine,Nr598
14	Timsay Estação de Serviços Sagres	[Saco Plástico de 100 lt]	[Mon]	Rua Mateus Sansao Mutemba Nr 156
15	Magnifico Moçambique, Lda.	[Saco Plástico de 100 lt]	[Mon]	Av.de Trabalho Rua da UEFA
16	Conselho Constituicional	[Contentor de 1.1 m^3]	[Tues, Fri]	2Rua Mateus Sansao Mutemba Nr 493
17	Embaixada da Rússia	[Contentor de 1.1 m^3]	[Mon, Tues, Wed, Thu, Fri, Sat]	Av Vlademir Lenine
18	Comando da Forca de Intervencao Rapida	[Contentor de 6 m^3]	[Fri]	Av de Moçambique n290
19	CARNES POLANA,EI	[Saco Plástico de 100 lt]	[Tues, Fri]	Av Mateus Sansão Mutemba nº201
20	Casa Militar-Cidade	[Contentor de 6 m^3]	[Fri]	Av Samuel DaBula Nkumpula Nº223
21	Departamento Logistico -DALOG	[Contentor de 6 m^3]	[Fri]	Av 24 de Julho
22	Estado Maior General (Quartel General)	[Contentor de 6 m^3]	[Fri]	Av 24 de Julho
23	Comando do Exercito	[Contentor de 6 m^3]	[Tues]	Av 24 de Julho
24	Comando das Unidades Cerimonias	[Contentor de 6 m^3]	[Wed]	Av de Moçambique
25	Marinha de Guerra de Mocambique	[Contentor de 6 m3]	[Fri]	10 de Novembro nº1000

Source: DSMAS 2020. February

Appendix 6 Waste volume data each districto

	Total	municipal waste							Comercial	
			KaMpfumo	Nlhamanculo	KaMaxaquene	KaMavota	KaMubukuwane	CMM	DIS		
	t/d	t/d	t/d	t/d	t/d	t/d	t/d	t/d	t/d	t/d	day
2021/4/1	1,167	1,045	179	310	131	194	231	0	1	123	30
2021/5/1	1,146	1,052	154	293	146	204	256	0	2	94	27
2021/6/1	1,165	1,053	154	259	141	219	280	1	2	112	30
2021/7/1	1,118	1,012	148	257	138	205	264	3	2	106	31
2021/8/1	1,143	1,020	150	248	136	210	276	4	2	122	31
2021/9/1	1,189	1,034	150	271	141	197	274	4	2	155	30
2021/10/1	1,248	1,074	161	284	126	213	290	4	1	174	30
2021/11/1	1,283	1,112	173	310	137	204	287	3	2	171	29
2021/12/1	1,388	1,252	180	342	153	244	333	2	2	136	31
2022/1/1	1,328	1,183	179	331	146	229	298	4	1	145	31
2022/2/1	1,358	1,198	180	323	141	237	316	11	3	160	28
2022/3/1	1,206	1,076	173	283	125	200	296	3	3	130	31
											359
Average	1,233	1,098	165	293	138	213	283	3	2	136	

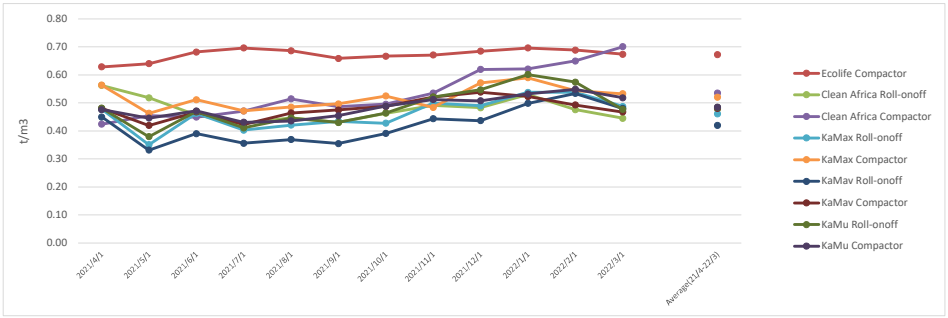
2022/4/1



	2021/4/1	2021/5/1	2021/6/1	2021/7/1	2021/8/1	2021/9/1	2021/10/1	2021/11/1	2021/12/1	2022/1/1	2022/2/1	2022/3/1		Average
DIS	1	2	2	2	2	2	1	2	2	1	3	3		2
CMM	0	0	1	3	4	4	4	3	2	4	11	3		3
Comercial	123	94	112	106	122	155	174	171	136	145	160	130		136
KaMubukuwane	231	256	280	264	276	274	290	287	333	298	316	296		283
KaMavota	194	204	219	205	210	197	213	204	244	229	237	200		213
KaMaxaquene	131	146	141	138	136	141	126	137	153	146	141	125		138
Nlhamanculo	310	293	259	257	248	271	284	310	342	331	323	283		293
KaMpfumo	179	154	154	148	150	150	161	173	180	179	180	173		165

t/m3		Ecolife Compactor	Clean Africa Roll-onoff	Clean Africa Compactor	KaMax Roll-onoff	KaMax Compactor	KaMav Roll-onoff	KaMav Compactor	KaMu Roll-onoff	KaMu Compactor
		t/m3	t/m3	t/m3	t/m3	t/m3	t/m3	t/m3	t/m3	t/m3
		20	12	20	12	20	12	20	12	20
2021/4/1		0.63	0.56	0.42	0.48	0.56	0.45	0.48	0.48	0.48
2021/5/1		0.64	0.52	0.45	0.35	0.46	0.33	0.42	0.38	0.45
2021/6/1		0.68	0.46	0.45	0.46	0.51	0.39	0.47	0.47	0.47
2021/7/1		0.70	0.43	0.47	0.40	0.47	0.36	0.42	0.41	0.43
2021/8/1		0.69	0.45	0.51	0.42	0.48	0.37	0.46	0.45	0.44
2021/9/1		0.66	0.43	0.49	0.43	0.50	0.35	0.47	0.43	0.45
2021/10/1		0.67	0.46	0.50	0.43	0.52	0.39	0.49	0.46	0.49
2021/11/1		0.67	0.49	0.53	0.50	0.48	0.44	0.52	0.52	0.51
2021/12/1		0.68	0.48	0.62	0.49	0.57	0.44	0.54	0.55	0.51
2022/1/1		0.70	0.53	0.62	0.54	0.59	0.50	0.52	0.60	0.53
2022/2/1		0.69	0.48	0.65	0.54	0.54	0.53	0.49	0.57	0.55
2022/3/1		0.67	0.45	0.70	0.49	0.53	0.48	0.47	0.48	0.52
Average(21/4-22/3)		0.67	0.48	0.54	0.46	0.52	0.42	0.48	0.48	0.48

2022/4/1



t/month		Ecolife Compactor	Clean Africa Roll-onoff	Clean Africa Compactor	KaMax Roll-onoff	KaMax Compactor	KaMav Roll-onoff	KaMav Compactor	KaMu Roll-onoff	KaMu Compactor
		t/month	t/month	t/month	t/month	t/month	t/month	t/month	t/month	t/month
2021/4/1	31,336	5,358	7,679	1,620	2,313	1,611	4,769	1,047	6,235	704
2021/5/1	28,392	4,148	6,300	1,601	2,340	1,592	4,546	956	6,329	580
2021/6/1	31,592	4,606	6,437	1,347	2,479	1,750	5,328	1,253	7,618	773
2021/7/1	31,357	4,580	6,746	1,215	2,605	1,678	5,078	1,269	7,540	647
2021/8/1	31,634	4,665	6,381	1,306	2,724	1,503	5,254	1,243	7,740	818
2021/9/1	31,005	4,507	6,643	1,498	2,669	1,559	4,766	1,149	7,423	790
2021/10/1	32,234	4,842	7,017	1,516	2,312	1,458	5,044	1,336	7,927	781
2021/11/1	32,248	5,016	7,516	1,487	2,399	1,577	4,806	1,114	7,638	696
2021/12/1	38,801	5,572	8,483	2,119	2,591	2,160	6,306	1,261	9,336	974
2022/1/1	36,683	5,539	8,318	1,949	2,329	2,207	6,025	1,077	8,218	1,021
2022/2/1	33,538	5,038	7,267	1,766	2,086	1,870	5,517	1,132	7,643	1,217
2022/3/1	33,359	5,361	6,808	1,962	1,954	1,907	5,054	1,150	8,271	891
2022/4/1										
Average(21/4-22/3)	32,681	4,936	7,133	1,616	2,400	1,739	5,208	1,166	7,660	824
Average t/d(21/4-22/3)	1,093	165	238	54	80	58	174	39	256	28

trip/month		Ecolife Compactor	Clean Africa Roll-onoff	Clean Africa Compactor	KaMax Roll-onoff	KaMax Compactor	KaMav Roll-onoff	KaMav Compactor	KaMu Roll-onoff	KaMu Compactor
		trip/month	trip/month	trip/month	trip/month	trip/month	trip/month	trip/month	trip/month	trip/month
2021/4/1		426	1,137	191	404	143	884	109	1,080	74
2021/5/1		324	1,013	176	555	172	1,141	114	1,388	65
2021/6/1		338	1,175	150	447	171	1,138	134	1,351	82
2021/7/1		329	1,316	129	539	178	1,189	150	1,529	75
2021/8/1		340	1,191	127	540	155	1,187	134	1,447	94
2021/9/1		342	1,286	154	512	157	1,119	121	1,438	87
2021/10/1		363	1,264	153	451	139	1,076	137	1,423	80
2021/11/1		374	1,275	139	401	163	903	107	1,222	68
2021/12/1		407	1,465	171	441	189	1,204	117	1,423	96
2022/1/1		398	1,308	157	361	187	1,008	103	1,139	96
2022/2/1		366	1,272	136	323	172	861	115	1,109	111
2022/3/1		398	1,274	140	334	179	878	123	1,447	86
2022/4/1										
Average(21/4-22/3)		367	1,248	152	442	167	1,049	122	1,333	85

Appendices of Chapter 2.4
Activities Related to Output 3

Appendix 4-1
Draft Resolution on Promotion of
Source Separation and Recycling

(Draft) Resolution on the promotion of source separation and recycling

Chapter 1 General provisions

Article 1. Purpose

This resolution aims at establishing the norms to promote source separation and recycling of the municipal solid waste in Maputo City.

Chapter 2. Recyclable waste items, color coding, container

Article 2. Recyclable waste items

1. The recyclable items of municipal solid waste that need to be segregated at source shall include at least the followings:
   1) Plastic;
   2) Paper;
   3) Metal;
   4) Glass; and
   5) Hazardous waste.
2. It is permissible and encouraged to add to or subdivide the above recyclable waste items to the extent that segregation, collection, and recycling are practical and feasible.

Article 3. Color coding of recyclable waste

In order to promote understanding and facilitate the identification of municipal solid waste generators to the source separation rules, the following color codes shall be assigned to the above-mentioned recyclable waste.

1) Plastic: Red
2) Paper: Blue
3) Metal: Yellow
4) Glass: Green
5) Hazardous Purple
6) Other Black

Article 4. Container of recyclable waste

The above-mentioned recyclable waste shall be appropriately segregated and deposited into recycling containers, boxes, or baskets designated for each recyclable waste item which shall be equipped with a signboard for each item following the color coding.

Chapter 3. Obligations and responsibilities of waste generators

Article 5. Obligations of the Maputo Municipal Council

1. All the offices and facilities of the Maputo Municipal Council shall perform source separation of the recyclable waste.
2. The competent departments/officers of each office and facility of the Maputo Municipal Council shall:
   - Provide instruction and training on the source separation rule and procedures for the staff,
   - Manage the recycling containers,
   - Store the recovered recyclable waste,
   - Monitor the amount of recovered recyclable waste by each item,
   - Deliver the recovered recyclable waste to recyclers that can appropriately recycle it.
3. The competent directorate of the Maputo Municipal Council shall provide instruction and training, and conduct awareness-raising activities on the promotion of source separation and recycling for business waste generators and households.
4. The competent directorate of the Maputo Municipal Council shall supervise and monitor the licensed waste collection service providers and the registered recycling companies and NGOs on their segregated collection and transportation of recyclable waste.

Article 6. Obligations of business waste generators

1. All business waste generators shall perform source separation of their business waste. It is prohibited to discharge business waste without segregation.
2. All business waste generators shall install recyclable waste containers at each facility of their business operation.
3. All business waste generators shall make contracts with licensed waste collection service providers that can perform segregated collection and transportation of recyclable waste or make agreements with registered NGOs and private companies that can perform the collection and transportation of recyclable waste.
4. All business waste generators shall keep records of the amounts of segregated recyclable waste by each item and provide them to the Maputo Municipal Council when requested.

Article 7. Responsibility of citizens

1. All citizens in Maputo City are encouraged to perform source separation of their

household waste and have a responsibility to deliver it to the registered NGOs or private companies that can perform segregated collection and transportation of recyclable waste or operate recyclable waste containers (eco-points) at their accessible locations.

Chapter 4. Obligation and responsibilities of recycling-related actors

Article 8. Obligations of the licensed waste collection service providers

1. The waste collection service providers that perform segregated collection and transportation of recyclable waste must obtain a license from the Maputo Municipal Council that need to be renewed annually.
2. The licensed recyclable waste collection service provider shall perform segregated collection and transportation of recyclable waste by following the requirements stipulated in this resolution and other instructions by the Maputo Municipal Council.
3. The licensed recyclable waste collection service provider shall submit quarterly reports on their recyclable waste collection and recovery activities which include a list of contracted waste generators with names, contacts and locations, and the amount of collected and recovered recyclable waste by each item.

Article 9. Obligations of the registered recycling companies and NGOs

1. The recycling companies and NGOs that perform segregated collection and transportation of recyclable waste and/or operate recyclable waste containers (eco-points) must be registered at the competent directorate of the Maputo Municipal Council.
2. The registered recycling companies and NGOs shall perform and/or operate recyclable waste containers (eco-points) by following the requirements stipulated in this resolution and other guidance by the Maputo Municipal Council.
3. The registered recycling companies and NGOs shall submit yearly reports on their recyclable waste collection and recovery activities which include the amount of collected and recovered recyclable waste by each item.

Chapter 5. Composting

Article 10. Promotion of organic waste composting

1. All households in Maputo City are encouraged and recommended to practice source separation of the organic waste they produce at households and composting at home.
2. Business waste generators that generate organic waste such as food manufacturing and processing factories, hotels, and restaurants, are encouraged and recommended

to practice source separation of the organic waste they produce and composting in feasible manners and arrangements.

3. The municipal markets that the Maputo Municipal Council manages shall perform source separation of the organic waste and its composting in feasible manners and arrangements.

Chapter 6. Recycling platform and association

Article 11. Promotion of recycling platform and association

1. The competent directorate of the Maputo Municipal Council shall establish information sharing platform with recycling-related actors to promote recycling activity in Maputo City.
2. The competent directorate of the Maputo Municipal Council shall support creation of waste pickers' association to manage their activity and to provide livelihood assistance to them.

Chapter 7. Final provisions

Article 12. Penalties

1. Notwithstanding the provisions in the Maputo Municipality Cleaning Ordinance, penalties corresponding to violations of the provisions hereto are established in Annex of this Regulation.
2. Recurrence of the violations, established in this Regulation, is punishable with a fine equivalent to the originally issued fine, with an addition of 100% of its value.

Article 13. Doubts or omissions

Any doubts or omissions that might arise from the interpretation and enforcement of this Regulation, as well as the issuance of instructions aiming at its harmonized implementation, must be addressed by the Mayor of Maputo Municipality.

ANNEX Violations and sanctions

Article	Violation	Sanction

Appendices of Chapter 2.5
Activities Related to Output 4

Appendix 5-1

Guideline on Operation and Management of Sanitary Landfill

Appendix 5-2

Training Material of Guideline on Operation and Management of Sanitary Landfill

Appendix 5-1
Guideline on Operation and Management of Sanitary Landfill

The Republic of Mozambique

Directorate of Municipal Service of Environment and Waste (DSMAS), Municipal Council of Maputo

The Project for the Capacity Development to Realize Integrated Solid Waste Management in Great Maputo

Guideline on Operation and Management of Sanitary Landfill

August 2022

Japan International Cooperation Agency (JICA)

Nippon Koei Co., Ltd.

The Project for the Capacity Development to Realize Integrated Solid Waste Management in Great Maputo
Guideline on Operation and Management of Sanitary Landfill

Table of Contents

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List of Tables

1. MANAGEMENT OF LANDFILL FOR MUNICIPAL SOLID WASTE

There are two types of landfill. One is for municipal (non-hazardous) solid waste and the other is for hazardous waste. This guideline describes landfills for municipal solid waste.

In the current waste treatment and disposal process, it is difficult to completely reduce or recycle waste. Landfills play a major role as the final receiving facility for treatment residues and other waste. Therefore, landfills are the final point of waste treatment and secondary pollution must not be caused, such as leachate runoff or waste scattering from landfill sites.

The purpose of land disposal of municipal solid waste is achieved by maintaining and managing each facility in the landfill site so that it can perform its intended function and each function can be utilized organically. Facility management is important for the proper management of landfills.

This guideline addresses the following contents regarding the management of landfills for municipal solid waste:

- Functions and facilities of landfills
- Management of landfills (transport control management, landfill operation management, facility management, environmental management, and safety management)
- After reclamation and site management

2. FUNCTIONS AND FACILITIES OF LANDFILLS

To protect the living environment, a landfill must be capable of safely landfilling the required amount of waste while preventing external discharge of leachate, contamination of groundwater, waste scattering, landfill gas emission, and outbreak of sanitary insect pests. To this end, a landfill site should consist of a variety of facilities. A conceptual diagram of an onshore and open-type landfill for municipal solid waste is shown in Figure 1.

Littering prevention equipment
The equipment for preventing environmental pollution of the peripheral area caused by scattering of solid waste from the disposed site.

Firefighting equipment
The equipment for fire extinction when fire occurs and for preventing fire spreading to surrounding area.

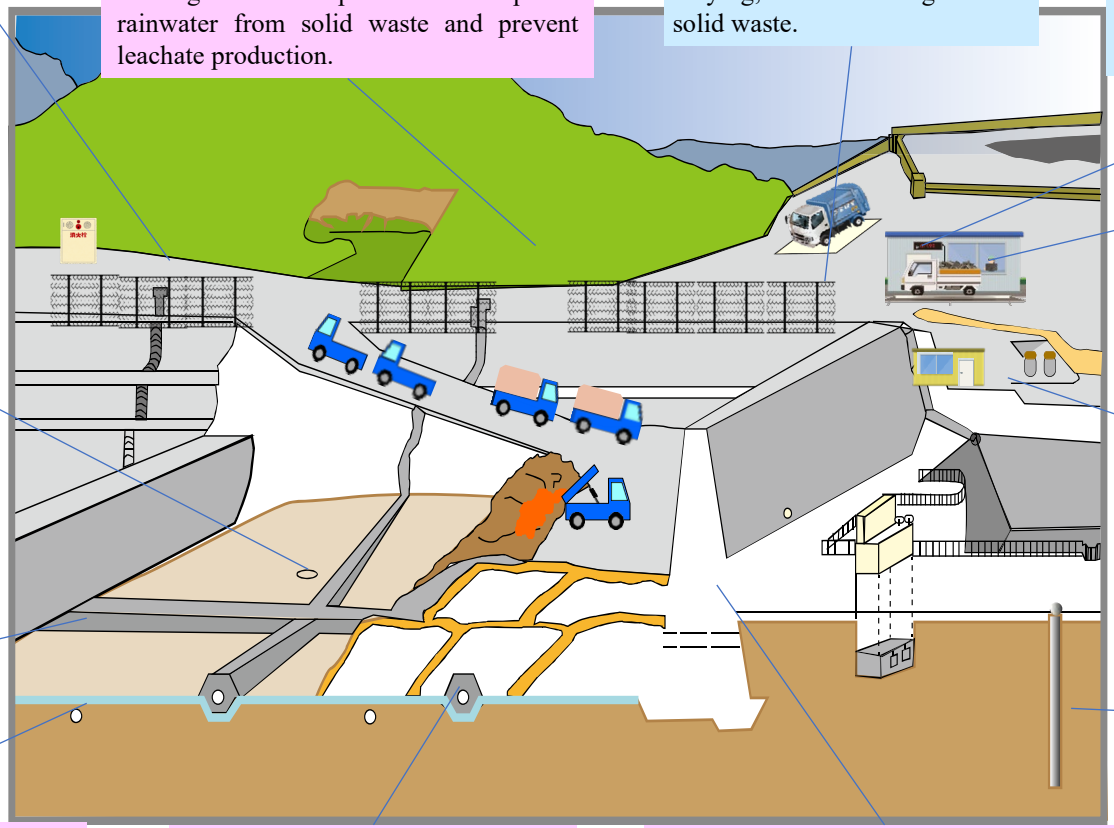
Landfill gas treatment facility
The vent for the emission of the landfill gas and the admission of fresh air.

Leachate collection facility
The facility for the quick discharge of leachate and the admission of fresh air.

Underground water drainage facility
The facility for collecting and discharging underground water efficiently to prevent underground water from affecting the effects of seepage control work.

Rainwater collection facility
The facility for preventing rainwater from flowing into the disposed site to separate rainwater from solid waste and prevent leachate production.

Liner facilities
The facility for cutting off the effluence of leachate outside the landfill to prevent environmental pollution of the peripheral area.



Transport control facility
The facility for weighing, tallying, and recording hauled solid waste.

Storage structure
The facility for retaining solid wastes safely to prevent the effluence of solid waste and leachate outside.

Vehicle washer
The equipment for washing vehicles entering the disposed site to prevent environmental pollution of the peripheral road.

Maintenance road
The road on the landfill site used for daily operation and maintenance.

Leachate treatment facility
The facility for treating leachate to meet the designed effluent quality standard to prevent contamination of a public water body and underground water by leachate at the discharge point.

Environmental monitoring facility
The facility for monitoring surrounding underground water to prevent environmental pollution of the peripheral area caused by leachate leakage.

Main Facilities
Administrative
Related Facilities

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 1 Conceptual Diagram of a Sanitary Landfill

The facilities in a landfill site are interrelated and must be organically combined as a whole to ensure that the landfill site functions effectively. The relationship between each facility and its function is shown in Table 1.

Table 1 Relationship between Facilities and Functions of a Sanitary Landfill

Functions of Sanitary Landfill / Sanitary Landfill Facilities		Storage and Treatment Functions	Environmental Conservation Functions			Local Return Function
			Groundwater Pollution Prevention	Prevention of Pollution of Public Waters	Others (Air Pollution Control, Living Environment Preservation, etc.)	
Main Facilities	1. Storage structure	◎		○		
	2. Groundwater collection facility		○			
	3. Liner Facilities	○	◎			
	4. Runoff Collection Facility			○		
	5. Leachate Collection Facility	○	◎	◎		
	6. Leachate Treatment Facility	○	◎	◎		
	7. Landfill Gas Treatment Facility	○			○	
Administrative Facilities	1. Transport Control Facility	◎			◎	
	2. Environmental Monitoring Facility		◎	◎	◎	
	3. Control Building	○				
	4. Maintenance Road	○		○	○	
	5. Others (Car Wash Facility)				○	
Related Facilities	1. Littering Prevention Equipment	○				
	2. Firefighting Equipment				○	
Community Return Facilities (Use of Former Sites, Assembly Halls, Surrounding Green Areas, etc.)						○

◎: Relationship is extremely large.

○: Related.

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

2.1 Landfill Structure

The purpose of landfills is not only to store the transported waste but also to decompose and stabilize organic matter and hazardous substances through the microbial environment within the site.

In decomposing and stabilizing organic matter and hazardous materials, landfills are classified as "anaerobic landfill structure" or "semi-aerobic landfill structure" based on the microbial environment within the landfill layer. The respective structures are shown in Figure 2. The former is an anaerobic structure in which the landfill layer is sealed off from the air by water sealing, etc., while the latter is an aerobic structure in which

the end of the water collection pipe is opened to the atmosphere to allow air circulation within the landfill layer.

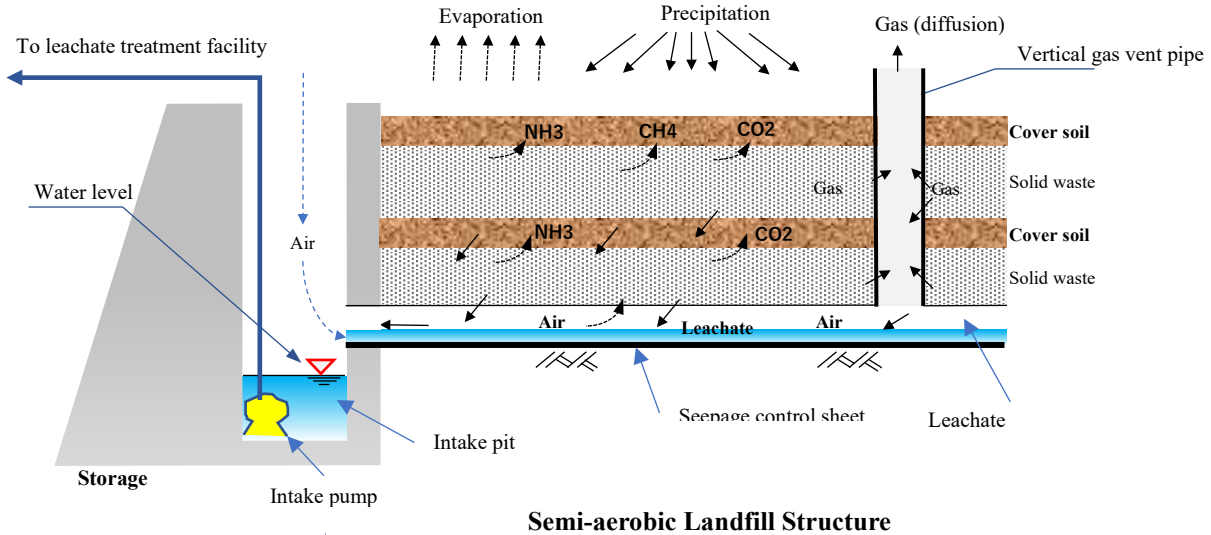
Anaerobic landfill structure is used for anaerobic decomposition of organic matter and methane recovery and utilization. This is widely used in Europe and the United States. In the case of semi-aerobic landfill structure, organic matter is decomposed aerobically in the aerobic zone and heavy metals such as mercury are insolubilized by sulfides in the anaerobic zone to prevent leakage. The latter is used in most landfills in Japan.

In the semi-aerobic landfill structure, the end of the water collection pipe is opened to allow air distribution through natural ventilation into the landfill layer, but the center of the landfill layer, where no air distribution occurs, is a mixture of aerobic and anaerobic areas due to air supplied through the vertical leachate collection pipes and gas vent pipes.

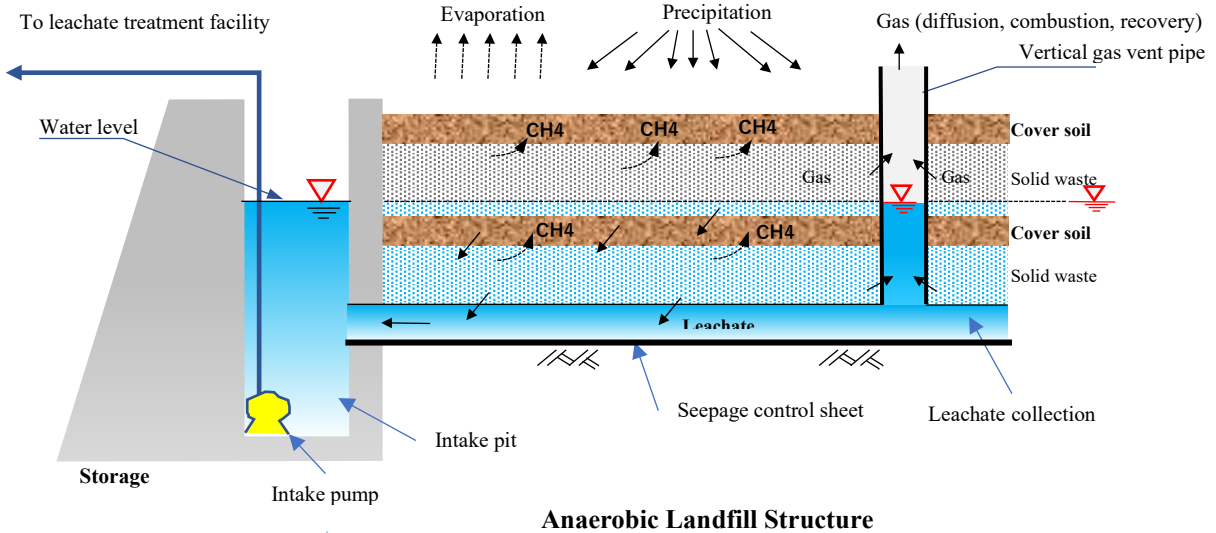
The semi-aerobic landfill structure has the following characteristics:

- Organic matter decomposition in aerobic areas
- Heavy metal fixation in anaerobic areas

In other words, it is possible to expect early stabilization of landfill sites and early purification of leachate quality through organic matter decomposition and fixation of heavy metals in landfill sites through insolubilization.



Semi-aerobic Landfill Structure



Anaerobic Landfill Structure

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 2 Anaerobic Landfill Structure and Semi-aerobic Landfill Structure

2.2 Main Facilities

Main facilities are facilities that play important roles in the proper operation of a landfill site and include storage structure, groundwater collection facility, liner facilities, rainwater collection facility, leachate collection facility, and leachate treatment facility.

2.2.1 Storage Structure

Storage structures are important structures for the safe storage of landfill waste by preventing landfill waste layers from spilling or collapsing and leachate from flowing outward. There are several kinds of storage structures: concrete dam forms, embankment dam forms, retaining wall structure, etc.

The purpose of a storage structure is to store waste, not to store water. However, storage structures are required to have a safe water storage function as well. The reasons for this are as follows:

- Landfills may have temporarily stagnant water in the event of abnormal precipitation that exceeds expectations.

- Even within the design precipitation range, leachate is expected to be stored in the landfill due to maintenance and repair of leachate treatment facilities and leachate adjustment facilities.

2.2.2 Groundwater Collection Facility

Underground water drainage facilities are installed in the lower part of the liner facilities to effectively collect groundwater, spring water, and gas generated in the soil and discharge them quickly.

In landfill sites with surface liner facilities shown below, groundwater collection and drainage works are installed to prevent damage to the liner facilities due to the increase in uplift pressure caused by the rise of groundwater levels, groundwater collapse, and landslides around the landfill site due to loosening of the natural ground caused by the rise of groundwater levels.

In the groundwater collection facility, leakage of leachate from liner facilities can also be monitored by measuring changes in the chloride ion concentration and electrical conductivity of the collected groundwater.

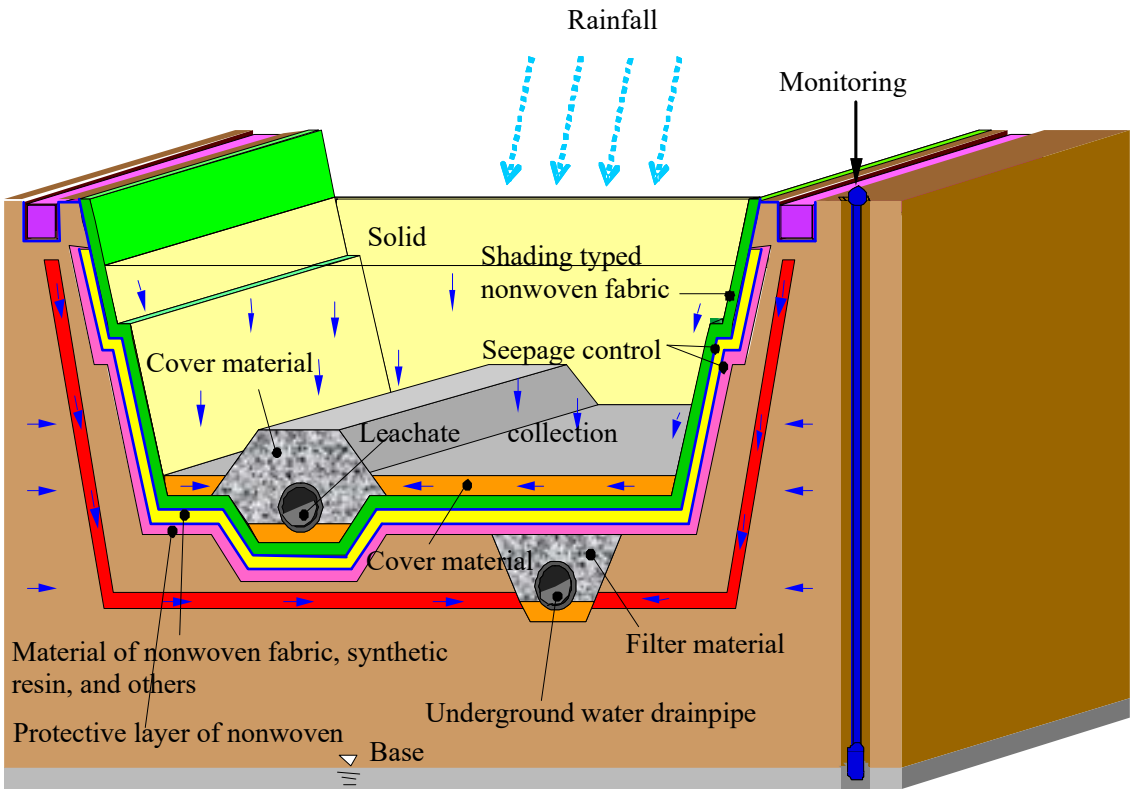
2.2.3 Liner Facilities

Liner facilities are one of the most important facilities to prevent leachate from flowing out of the landfill site, i.e., to prevent water pollution of public water bodies and the surrounding environment such as groundwater. The two types of liner facilities are as follows:

- Surface liner facilities: They are installed on the bottom or slope of landfill and include impervious sheets, soil interceptors, and watertight asphalt concrete interceptors.
- Vertical liner facilities: They are installed up to the impermeable layer in the ground and include injection solidification works, continuous underground walls, and steel sheet piles.

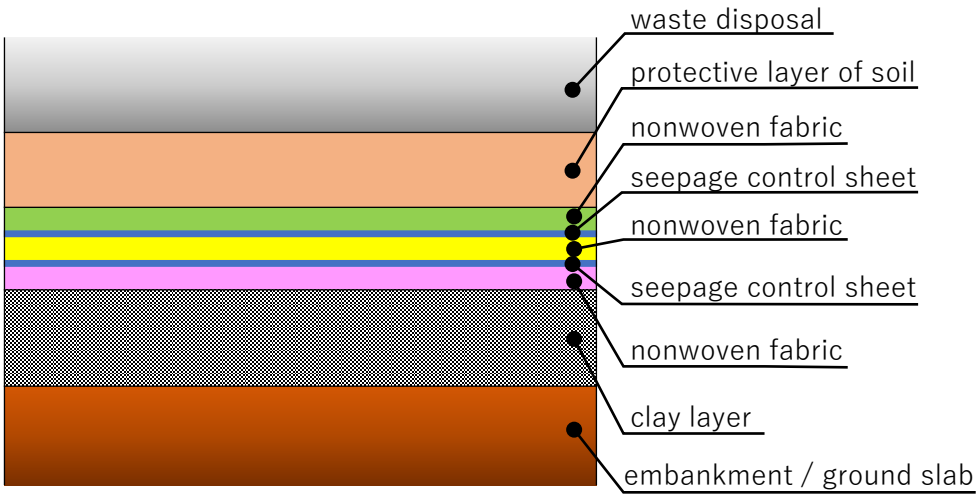
This guideline describes the surface liner facilities used in most landfills.

One of the types of surface liner facilities is soil-based impervious construction. Soil-based impervious construction consists of impervious sheets and cohesive soil. In Japan, the standards for soil-based impervious construction include a permeability coefficient of 10 cm/s or less and a thickness of 50 cm or more. The structure of liner facilities is shown in Figure 3 and Figure 4.



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 3 Schematic Diagram of Liner Facilities System



Source: Nippon Koei Co., Ltd.

Figure 4 Detail of Liner Facilities Structure

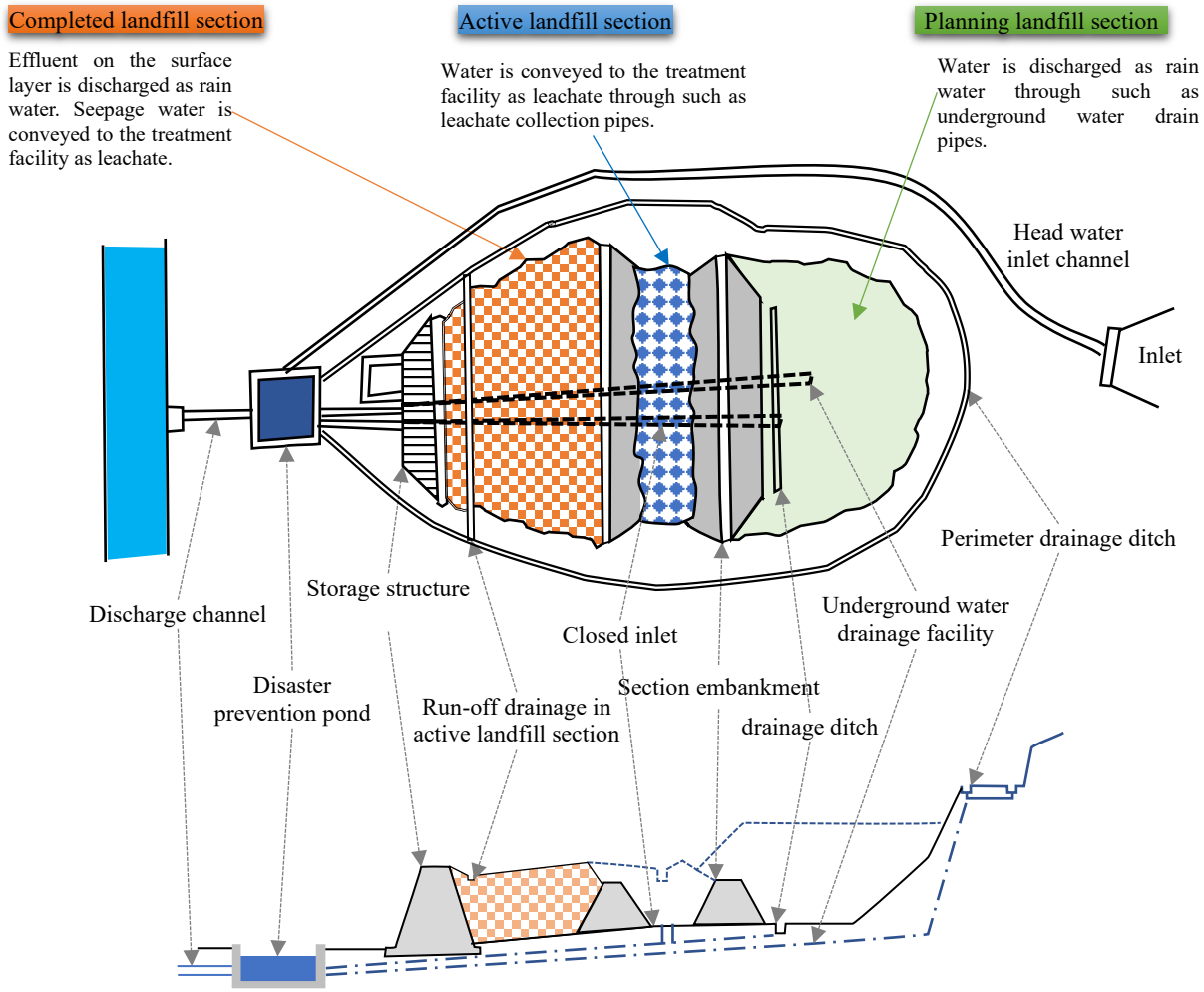
Precipitation on the landfill site soaks into the waste layer and leachate is produced, which eventually is collected at the leachate treatment facility through the leachate collection facilities installed. The purpose of installing liner facilities is to prevent groundwater contamination by this leachate.

Liner facilities have the following various functions to achieve the purpose of the installation:

- Impervious function: To prevent groundwater contamination by leachate.
- Damage prevention function: To prevent damage caused by uneven foundation ground or foreign objects in waste.
- Functions to ensure leakage time and to mitigate contamination: To mitigate the degree of groundwater contamination if it should occur.
- Damage monitoring function: To monitor damage to the impervious function.
- Repair function: To repair damaged areas by itself and ensure the specified impermeability.

2.2.4 Rainwater Collection Facility

Runoff collection facilities are designed to collect and drain rainwater to prevent rainwater outside the landfill from entering the landfill and to prevent rainwater on the planned section from entering the waste layers. By preventing rainwater from entering the landfill, this facility serves to reduce leachate production and reduce the burden on leachate treatment facilities and liner facilities. The concept and the examples of installation of a rainwater collection facility for a landfill with surface liner facilities are illustrated in Figure 5 and Figure 6, respectively.



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

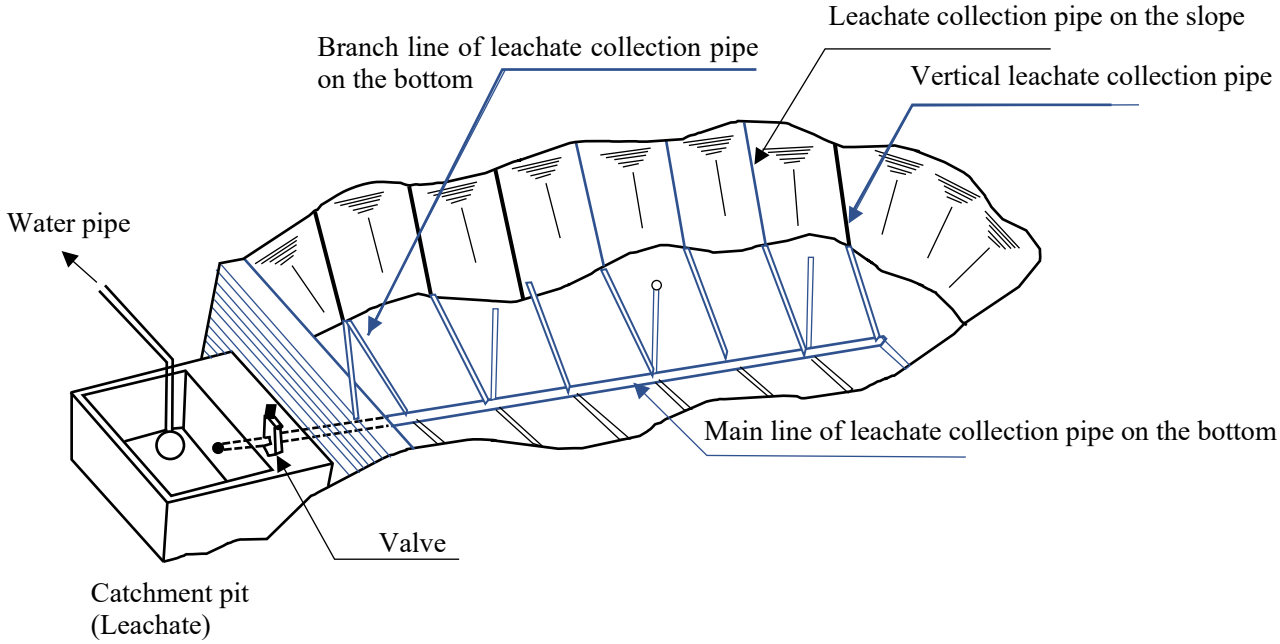
Figure 5 Conceptual Diagram of a Rainwater collection facility at a Sanitary Landfill with Surface Liner Facilities

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 6 Examples of Rainwater Collection Facility Installation

2.2.5 Leachate Collection Facility

Leachate collection facilities are designed to efficiently and quickly collect and drain moisture contained in the waste and leachate that has passed through the waste layers to convey it to leachate treatment facilities outside the landfill. In semi-aerobic landfill structure, they also serve as air distribution and gas collection systems. The conceptual diagram of a leachate collection facility is shown in Figure 7 and an example installation is shown in Figure 8.



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 7 Conceptual Layout of Leachate Collection Facility

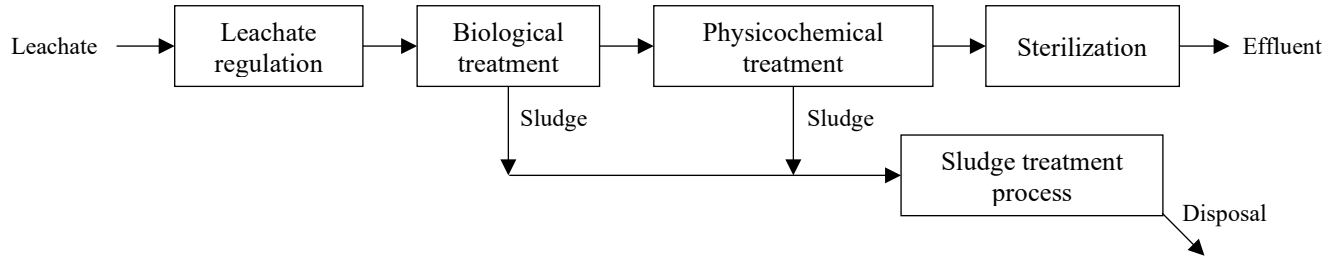
Source: "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 8 Example of Leachate Collection Facility Installation

2.2.6 Leachate Treatment Facility

Leachate treatment facilities are facilities that treat leachate collected through the leachate collection facilities described in the previous section to not affect the quality of public waters and groundwater at the discharge point.

Most leachate treatment facilities in developing countries consist of leachate regulating tanks (reservoirs), biological treatment tanks, physicochemical treatment tanks, sterilizing apparatus, and sludge treatment equipment. However, each treatment method varies and the treatment flow is set according to the types of waste and the effluent standards of the discharge point. An example of a basic leachate treatment flow is shown in Figure 9.



Source: Nippon Koei Co., Ltd.

Figure 9 Example of Basic Leachate Treatment Flow

1) Leachate regulating tank (reservoir)

The leachate regulating tank has the function of pumping a fixed amount of influent water to the subsequent treatment tank and has the role of adjusting both the quantity and quality of water.

2) Biological treatment tank

Biological treatment is a treatment method in which organic pollutants in wastewater are decomposed and removed by microorganisms. Microorganisms are broadly divided into two types: aerobic microorganisms, which require oxygen, and anaerobic microorganisms, which do not require oxygen. There are various methods such as the activated sludge method and the biological membrane method.

3) Physicochemical treatment tank

Physicochemical treatment tank is responsible for the physicochemical removal of heavy metals, suspended solids, residual organic matter, and dissolved solids. Various methods are available, including coagulating sedimentation separation, pressure flotation separation, sand filtration, adsorption, ion exchange, and membrane separation.

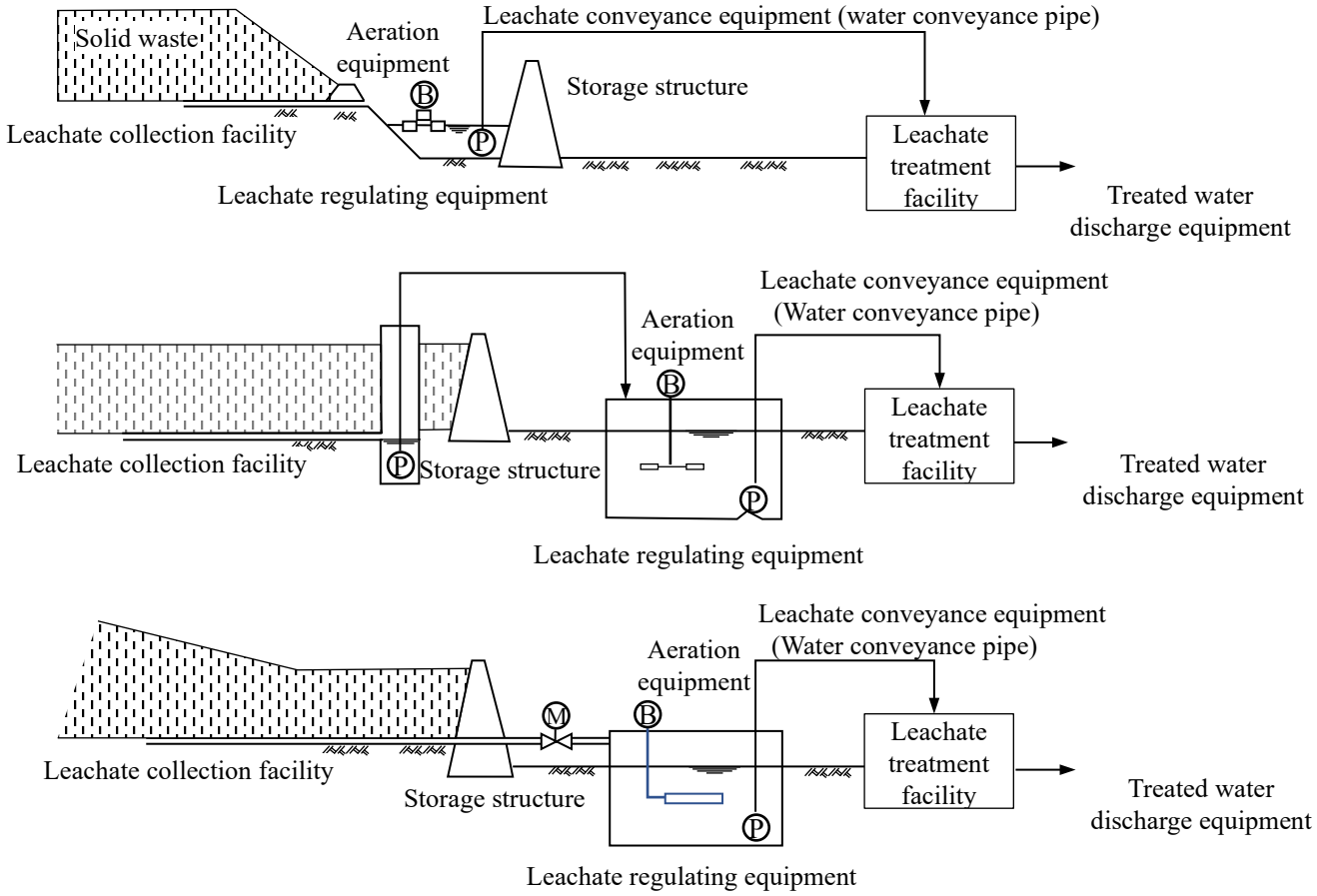
4) Sterilizing apparatus

Sterilizing apparatus is responsible for final sterilization before discharge. Various methods are available.

5) Sludge treatment equipment

Sludge treatment is responsible for treating sludge generated by biological or physicochemical treatment.

Three examples of leachate treatment facility configurations are shown in Figure 10 and photographic examples of the treatment process are shown in Figure 11.



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 10 Example Configuration of a Leachate Treatment Facility

Biological treatment process

Coagulating sedimentation treatment (physicochemical treatment process)

Sand filtration treatment (physicochemical treatment process)

Sludge treatment process

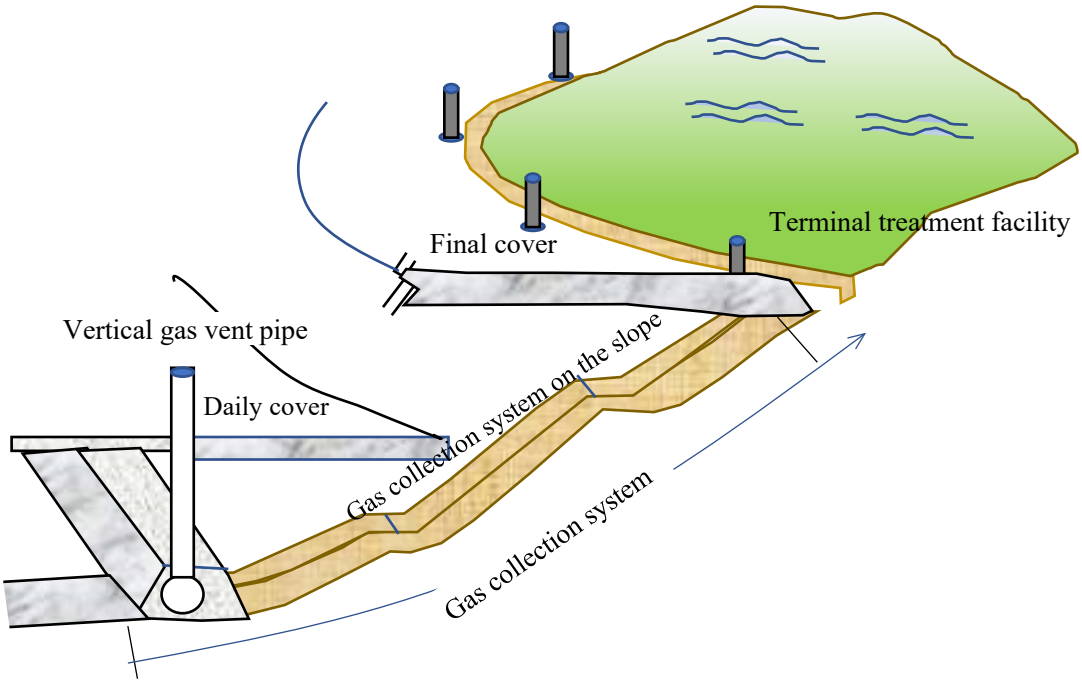
Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 11 Leachate Treatment Process

2.2.7 Landfill Gas Treatment Facility

Landfill gas treatment facilities consist of a vertical gas vent pipe installed at the bottom and a gas vent pipe installed on the slope that also serves as a leachate collection and drainage pipe. The facilities are responsible for releasing landfill gas generated from inside the landfill and supplying air into it.

The function of a landfill gas treatment facility is to promote waste decomposition by quickly venting landfill gas from the landfill, which provides air to the landfill and creates a semi-aerobic condition. The gas vent pipes for landfill gas treatment also serve the function of collecting and draining leachate from the landfill (vertical drainage pipes) because they are connected to the leachate collection and drainage pipes installed at the bottom for air permeability. A conceptual diagram of a landfill gas treatment facility is shown in Figure 12 and an example of installation is shown in Figure 13.



Source: Nippon Koei Co., Ltd. based on "*How to prepare A Sanitary landfill Guideline*" [Translated from Japanese.]

Figure 12 Schematic of a Landfill Gas Treatment Facility

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

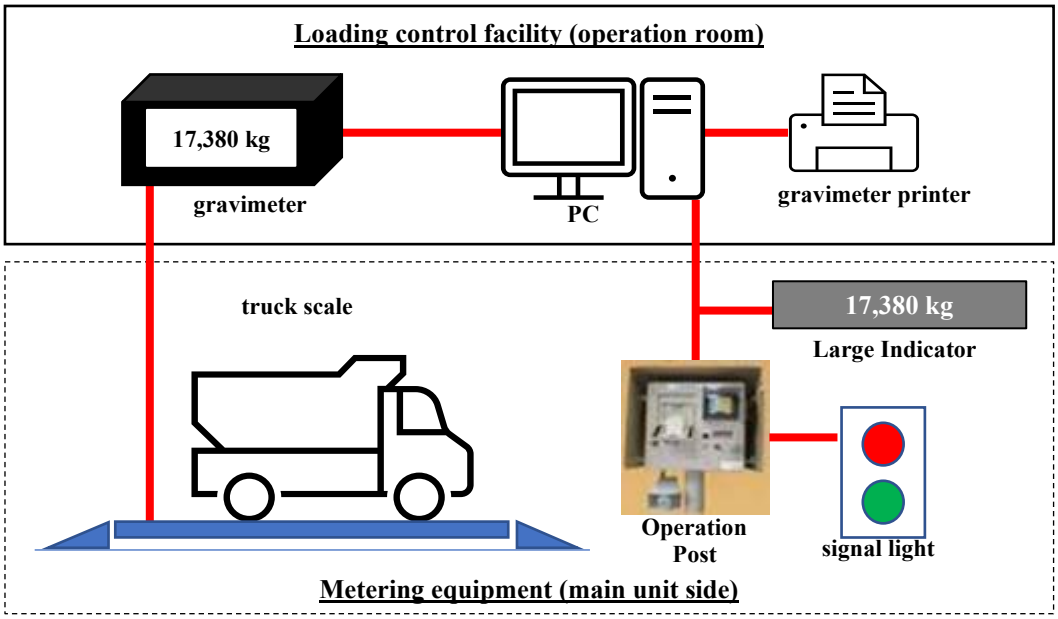
Figure 13 Landfill Gas Treatment Facility Installation (Photo)

2.3 Administrative Facilities

For proper operation of a landfill site, it is important to properly manage the quantity and quality of the transported waste, the landfill operation, and the waste after landfill (environmental management). The administrative facilities are facilities for these controls and consist of a transport control facility, environmental monitoring facility, control building, road equipment, and car wash facility.

2.3.1 Transport Control Facility

The transport control facility has the function of properly controlling the quantity and quality of waste received in the landfill and managing the risk posed to the landfill site at its entrance. The facility consists of weighing equipment such as truck scales and analytical equipment for waste materials and other materials. An overview of the transport control facility is shown in Figure 14.



Source: Nippon Koei Co., Ltd.

Figure 14 Transport Control Facility

2.3.2 Environmental Monitoring Facility

Environmental monitoring facilities monitor landfill materials, leachate, effluent, groundwater, landfill gas, and odors to properly manage the landfill site.

Table 2 and Figure 15 show specific examples of monitoring facilities. Monitoring facilities can be broadly classified into two categories: landfill layer monitoring and environmental monitoring.

Table 2 Specific Examples of Monitoring Facilities

Monitoring Item	Main Facilities
Underground water	Groundwater observation wells, conductivity meters, and pH meters
Final effluent	Flowmeter, pH meter, and UV meter
Leachate	Flow meter, pH meter, and water temperature meter
Landfill gas	Gas sampling pipe (gas venting facility connected to leachate collection and drainage pipe, or installed exclusively for gas sampling)
Noise and vibration	Noise and vibration meters
Waste scattering	Anemometer
Reclaimed bed	Settlement plate
Weather	Rain gauge, evaporation gauge, anemometer, and thermometer

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Example of measurements in the groundwater monitoring well
(Automatic measurement of pH and EC)

Example of measurements in the groundwater monitoring well
(Simplified water level measurement)

Example of equipment for measuring landfill gas generation
Hot-wire current meter

Example of equipment for measuring landfill gas generation
Soap membrane flow meter

Example of anemometer installation

Source: "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 15 Monitoring Equipment

2.3.3 Control Building

The control building is a facility for the integrated management of a series of operations, including inspection and weighing of transported waste, operation and maintenance of the leachate treatment facility, and monitoring. It is the central facility for facility operation and management from the start of the landfill operations.

In addition to administrative offices, the control building consists of meeting rooms, test and analysis rooms, worker waiting rooms, hot water rooms, lavatories, and management control rooms, as needed. In addition, there are many places in Japan and other countries that require meeting rooms for residents' tours and other events. Example of control building is shown in Figure 16.

Source: "*How to Prepare a Manual of Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 16 Facilities in the Control Building

2.3.4 Road Equipment

The road equipment in a landfill site is important for the traffic of vehicles transporting landfill waste and for the management of various facilities. It is important that the vehicles can run on them without any obstacles. Road equipment can be divided into two categories according to their function: approach roads for the delivery of landfill waste and maintenance roads for the maintenance of the landfill site. Examples of road equipment are shown in Figure 17.

An approach road is a road for transporting landfill materials to the landfill area and can be divided into two sections: one section is the public road and the other section is from the site entrance to the landfill site. The approach road is distinguished from the onsite road, which is located within the landfill site, but it is described here including the onsite road.

Maintenance roads are established for the daily management, maintenance, and inspection of facilities in a landfill site, as well as for fire prevention and safety management. Among these, the management of roads for the following purposes is particularly important:

- Roads that allow a complete circuit around the perimeter of the landfill to patrol and inspect the entire area of the landfill site.
- Roads for loading and unloading machinery and materials to and from the leachate treatment facility.
- Roads for firefighting in areas where fires are expected to occur.
- Roads for spraying chemicals when necessary for the extermination of sanitary insect pests or odor control measures.

Source: "*How to Prepare a Manual of Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 17 Road Equipment

2.3.5 Car Wash Facility

Car wash facilities are necessary to wash waste collection vehicles to ensure sanitary loading operations and to prevent pollution of the surrounding environment when vehicles leave the site. There are two types of car

wash facilities: manual (pool type) and automatic (rotating brush type or high-pressure injection type). They should be selected based on the number of vehicles washed per installation and waste collection vehicle management methods. Examples of two types of car wash facilities are shown in Figure 18.

Drainage water after washing should be treated as leachate. When drainage from the car wash is connected to a leachate collection and drainage pipe at the landfill, consideration should be given to ensure that the drainage function is adequate even when the landfill top elevation is increased.

(Pool type)

(High-pressure injection type)

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 18 Example of Car Wash Facility Installation

2.4 Related Facilities

Related facilities include littering prevention equipment and firefighting equipment. Although not directly involved in the disposal of waste, these facilities are important for the proper and safe operation of the landfill.

2.4.1 Littering Prevention Equipment

The purpose of littering prevention equipment is to prevent landfill waste from being scattered or spilled by strong winds or birds, thereby contaminating the environment around the landfill site. It also serves the purpose of preventing animals and people from entering the facility by being placed around the perimeter of the landfill. Examples of the equipment are shown in Figure 19.

Littering prevention equipment includes mesh fences and net fences as anti-scattering equipment, blindfold fences and windbreaks as windbreak equipment, and simple fences (mobile type) as temporary equipment.

However, it is difficult to completely prevent scattering through fences and windbreaks alone; daily cover must also be implemented to be effective.

Example of water sprinkler system installation

Littering prevention equipment

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 19 Littering Prevention Equipment

2.4.2 Firefighting Equipment

Firefighting equipment is necessary to extinguish fires in the event of a fire and to prevent the spread to the area surrounding the landfill.

Fires that can occur in landfills are mainly caused by combustible gas such as methane gas generated after landfilling organic waste such as raw garbage and putrefactive matter and by drying and smoking of wood chips, plastics, and other materials. Therefore, it is important to cover the landfill with appropriate soil and to quickly remove the landfill gas generated as fire prevention measures.

While these fire prevention measures are basic, firewater tanks and fire hydrants should be installed to provide water for fire prevention in the event of a fire in the landfill site. Examples are shown in Figure 20.

In addition, in buildings such as control buildings, fire extinguishers and other firefighting equipment appropriate to the use and size of the building must be installed in accordance with the Building Standard Law and the Fire Service Law.

Firewater tank

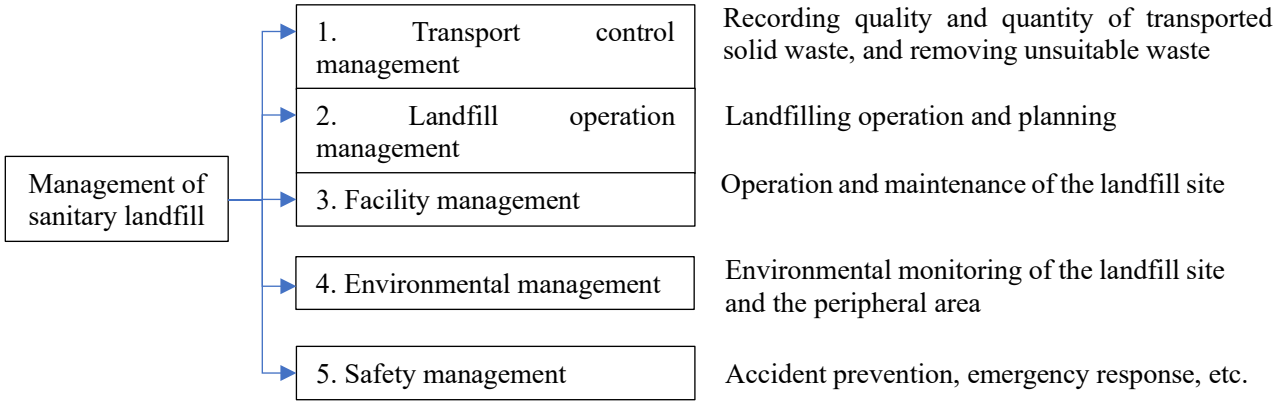
Fire hydrant

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 20 Firefighting Equipment

3. MANAGEMENT OF LANDFILLS

Management items required for the operation of a landfill site are transport control management, landfill operation management, facility management, environmental management, and safety management (Figure 21). This chapter describes each of these management items.



Source: Nippon Koei Co., Ltd.

Figure 21 Control Items and Contents of a Landfill Site

3.1 Transport Control Management

In order to systematically and properly manage the landfill site, the amount of each type of waste delivered to the landfill site is ascertained through transport control management. In addition, to ascertain the properties of the waste, deployment inspections and property analysis inspections are also conducted. Moreover, wastes that are not acceptable or that do not meet the acceptance criteria are eliminated for proper landfill operation. Although cover materials are not wastes, it is necessary to grasp their amount and properties for proper landfill management and landfill planning. The main objectives of transport control management are listed below.

- Implementation of planned waste management projects: implement waste management projects in a planned manner by monitoring and managing waste volumes.
- Prevention of environmental pollution: prevent environmental pollution such as pollution of public waters and groundwater by leachate, scattering and spilling of waste, bad odor, and inhabitation of sanitary insect pests.
- Maintenance of facilities: maintain each facility such as storage structures, liner facilities, etc.
- Facilitation of landfill operations: facilitate landfill operations such as placement and compaction of waste materials and construction of soil cover.

3.1.1 Transported Waste

1) Types of transported waste

Since a landfill for municipal solid waste is a facility for non-hazardous waste, the following wastes are assumed to be accepted:

- Domestic waste
- Industrial waste
- Waste that has been detoxified and can be accepted in a municipal solid waste landfill

2) Waste acceptance criteria

Considering the function, operation, and maintenance of the landfill, the acceptance criteria should be set as the basis for acceptance inspections. If the acceptance criteria are set too strictly, there is a risk that waste that does not meet the criteria will be illegally dumped. Therefore, the acceptance criteria for waste should

be determined in consideration of the waste disposal system of the target municipality as a whole (some municipalities may stipulate in their ordinances or administrative rules on what waste can and cannot be accepted in the landfill). Examples of waste that cannot be accepted are shown in Table 3. It is advisable to review the acceptance criteria periodically or as necessary.

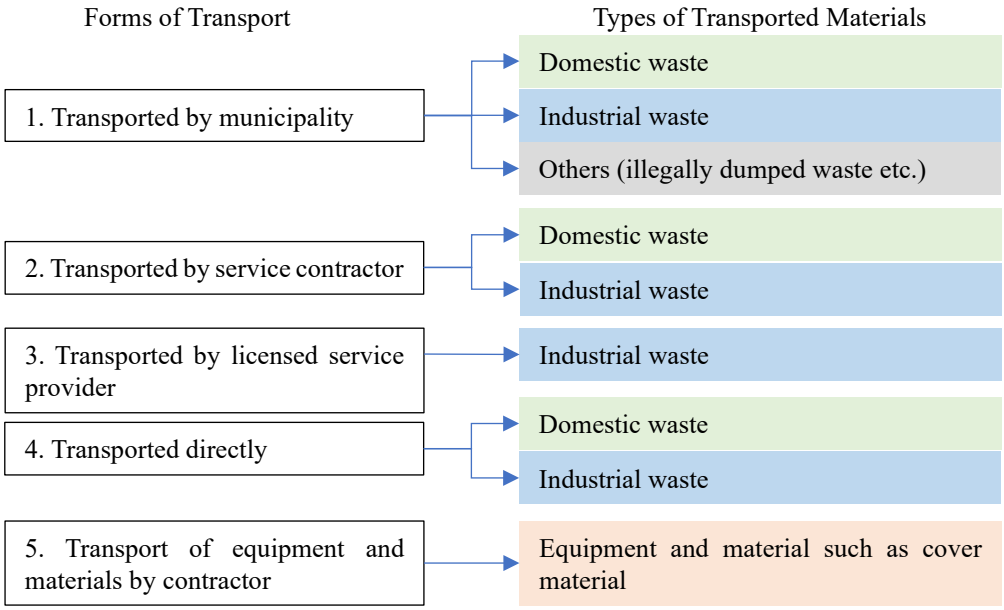
Table 3 Examples of Waste that Cannot be Accepted in Landfills

Classification	Exemplification
(1) Industrial waste	Cinders, sludge, wood waste, construction waste, waste plastic, rubber waste, mineral scraps, soot and dust, waste oil, waste acid, etc.
(2) Toxic and noxious substances	Parts using PCBs included in the following: Scrapped air conditioners, TVs, microwave ovens Items that are contaminated with pesticides, deleterious chemicals, or other toxic substances Items for which landfill disposal is prohibited by law
(3) Fire and flammable materials	Cinders, leftover burnt materials that catch fire. High-temperature items, such as explosives, paints, gas cylinders, solvents, etc.
(4) Items that emit a significant odor or sewage	Urine, decomposed animal and vegetable residues, etc.
(5) Difficult-to-dispose-of materials	Fire extinguishers, batteries, tires, automobiles, motorcycles, large agricultural machinery, pianos, septic tanks, pruned trees over 50 cm in length
(6) Infectious waste	Waste containing or potentially containing infectious pathogens, such as gauze and needles with blood on them from medical institutions, etc.

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

3.1.2 Form of Transport

Although it depends on the waste collection system of the municipality, the generally assumed waste transported by each form of transport is shown in Figure 22. Each form of transport has its own acceptance management flow.

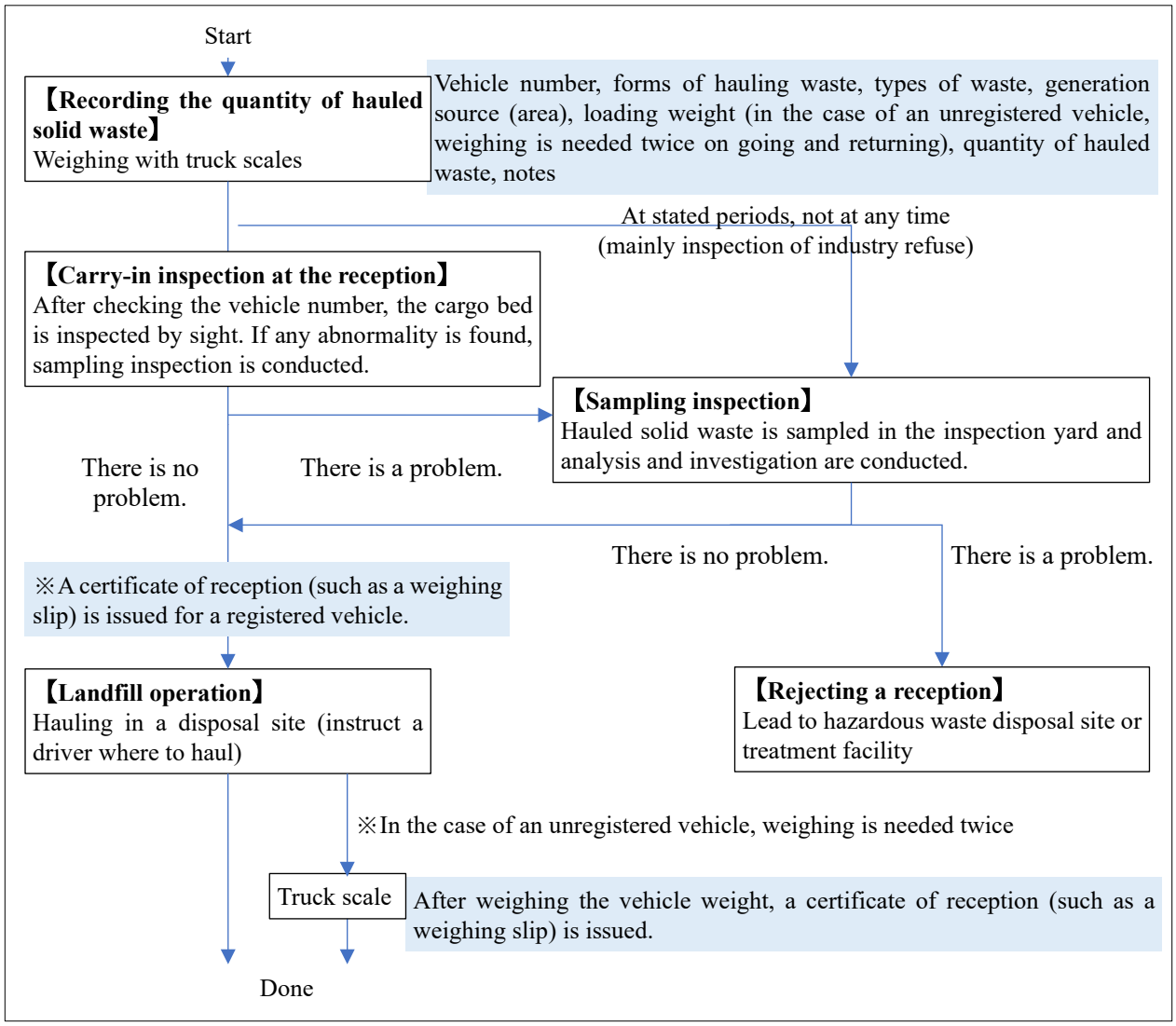


Source: Nippon Koei Co., Ltd.

Figure 22 Types of Materials Transported by Each Form of Transport

3.1.3 Acceptance Management Flow

The procedures for acceptance management are as shown in Figure 23.



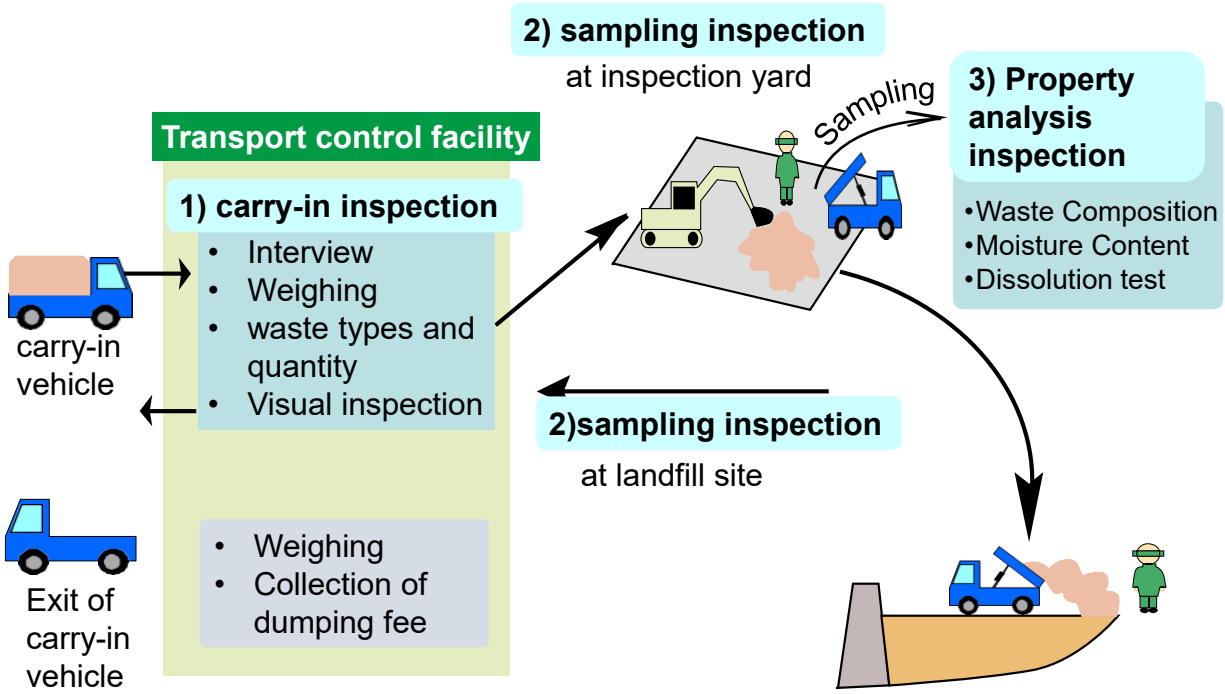
Source: Nippon Koei Co., Ltd.

Figure 23 Example of Waste Acceptance Management Flow

3.1.4 Acceptance Test

Acceptance tests shall include an interview investigation and a visual inspection as a carry-in inspection at the reception, as well as a sampling inspection and property analysis inspection as necessary.

The need for acceptance inspections varies depending on the type of waste to be landfilled, so it is necessary to determine the inspection items required for each waste destination. An example of the flow of transport control management and acceptance inspection is shown in Figure 24.



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 24 Example of a Flow Chart of Transport Control Management and Inspection

1) Carry-in inspection

Waste inspection during the carry-in includes an interview conducted at the weighing building, an investigation of the type and quantity of waste, and a visual inspection (Table 4). It is checked whether any waste that cannot be accepted in the landfill is mixed. In addition, the type of waste is confirmed and the amount of transported waste, which is weighed on a truck scale, is recorded.

Table 4 shows an overview of the inspections to be conducted during the carry-in. It is desirable to conduct inspections when carrying in on a regular basis rather than as needed. In addition, it is necessary to pay attention to the possibility that industrial waste may contain unsuitable materials.

Table 4 Overview of Inspection When Carrying In

Examination	Contents
Interview investigation	Interview the driver when the delivery vehicle is being weighed on the truck scale to confirm the type of waste delivered.
Survey of waste types and quantities	Confirm the type of waste for each delivery vehicle at the interview survey and determine the amount of waste volume using a truck scale.
Visual inspection	Visually check the delivered waste for conformity with the interviewed waste.

Source: Nippon Koei Co., Ltd.

2) Sampling inspection

Since visual inspection when carrying in can only confirm a portion of the waste, it is desirable to conduct a sampling inspection for each transport vehicle by random sampling when it cannot be determined through inspection when carrying in and as needed. The inspection should be conducted in a pre-determined inspection yard or landfill site.

3) Property analysis inspection

It is desirable to conduct composition analysis, water content measurement, elution tests, and other measurements of waste to confirm the composition and properties of the waste and whether or not hazardous substances are mixed in the waste, which are difficult to ascertain through visual inspections. In some cases,

the waste generator is obliged to conduct the property analysis inspection, while in other cases, sampling is conducted when carrying in to the landfill by the administrator of the facility.

The results of property analysis inspection are useful data for understanding the types and properties of landfill waste. In relation to the generation of landfill gas from the landfill, the quality of leachate, and the settlement of the waste layer, this information is important for proper landfill management and is also useful for preparing site utilization plans and other information.

Waste composition

Unlike sludge, waste is not uniform in appearance and is composed of a wide variety of materials, so the physical composition is used as an indicator of properties. The physical composition of waste shows the weight ratio of each compositional component, such as metal accounts for ○% and glass for ○%, and is relatively easy to analyze. It is important to set proper items of the composition according to how to utilize the results. Examples of physical composition items are shown in Table 5.

Table 5 Examples of Physical Composition Items

Broad Category	Classification	Subclass	kg	%
Combustible	Papers			
	Kitchen waste			
	Fiber			
	Trees and grass			
	Cloth			
	Rubber leathers			
	Others			
	Subtotal			
Plastics	PET bottle (clear plastic beverage bottle)			
	Trays and cups			
	Styrofoam			
	Wraps			
	Molded product			
	Containers			
	Others			
	Subtotal			
Incombustible	Metals	aluminum can		
		steel can		
		irons		
		nonferrous metals		
		petty sum		
	Glass and ceramics	bottle		
		container		
		Other		
		petty sum		
	Fluorescent tube			
	Dry cell			
	Small household appliances			
	Others			
	Subtotal			
Total				100.0

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Water content

Water content should be measured especially for items that contain a large amount of water, such as sludge. It is desirable to measure the water content of sludge with high water content on a regular basis because it

not only affects landfill operations but may also impair the stability of the landfill surface. Since the water content of waste is also related to the amount of leachate, it is also useful to measure it from the perspective of leachate management.

Elution test

Elution tests should be conducted periodically to ensure leachate treatment functions and to prevent environmental contamination. In conducting elution tests, it is necessary to adjust the analysis sample for wastes with large or irregular shapes, such as adjusting the particle size to the extent that there is no difference in the test results.

Landfill wastes that require elution test measurements include dewatered sludge generated from leachate treatment facilities at landfills and others. In addition, the content of inorganic salts such as calcium and chloride and heavy metals of concern for leaching should also be periodically tested from the perspective of stabilizing landfill waste and ensuring leachate treatment functions.

3.1.5 Items of Transport Control Management

In operating and maintaining a landfill, it is important to keep track of landfill materials and manage information about them. Therefore, when carrying in landfill materials, the following items should be managed:

- Types and properties of waste
- Amount of waste, form of transport, etc.
- Amount and material of soil cover

1) Types and properties of waste

The types and properties of waste transported to a municipal solid waste landfill should be organized as basic information for proper maintenance of the landfill site, as well as for abolition and site utilization, since they affect leachate quality, gas generation, settlement, and other factors.

In addition, recently, landfill disposal of disaster waste must also be considered in the event of a disaster. Disaster waste to be landfilled includes crushed non-combustible residues, glass and ceramic waste, roof tiles and debris, gypsum board, and slate siding. Since these items are transported in large quantities and within a short period of time and may affect leachate treatment, it is very important to understand their types and properties.

2) Amount of waste, form of transport, etc.

Weighing of the amount of waste is done using truck scales (weighing machines) for each vehicle or each type of transported waste. There are two main types of weighing methods: (1) weighing is conducted twice, at the time of loading and unloading, and the difference between the two is used to determine the amount of waste; and (2) the weight of the vehicle and the weight of the crew as indicated on the vehicle inspection certificate or other documentation is subtracted from the weight of the vehicle with the waste loaded.

Along with the type and amount of waste, it is also necessary to record the date and time of transport, vehicle type, name of the person transporting the waste, and the source of the waste transport in order to determine the need for fee collection, the location where the waste was generated, and the transport record.

The items to be recorded, such as the form of transport, are determined by the purpose for which the records are to be used. Examples of items to be recorded are given below and an example of the record table is also shown in Table 6. These weighing data should be tabulated as daily, monthly, and annual reports.

- Transport date and time
- Vehicle no.
- Form of transport: municipality, service contractor (name of consignor), licensed service provider (name of permittee), directly, materials and equipment (covering soil, etc.)
- Waste types: domestic, industrial, and materials and equipment

- Emission sources: domestic (local), industrial (e.g., emitting companies)
- Loading weight: weight including garbage (1st weighing)
- Vehicle weight: weight of vehicle only (2nd weighing)
- Amount of transported waste: vehicle weight is subtracted from loading weight
- Others

Table 6 Record Table of Transport Records (Example)

Date and Time	Vehicle No.	Transporter type	Waste type	Source of waste generated	Region	Loading Weight	Vehicle Weight	Amount of Waste	Remarks

*It is also recommended that this table be prepared and maintained by type of delivery.

*If there is a truck scale weight system, the system should also allow the above items and others to be entered.

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

3) Amount and material of cover soil

In a landfill site, a large amount of cover soil is required over a long period of time. Therefore, it is necessary to know the amount of cover soil brought in during a certain period of time in order to continue landfill operation smoothly and to predict the amount of cover soil that will be required in the future.

3.2 Landfill Operation Management

Landfill operations must be managed with due consideration for the living and natural environment, as well as for the purpose of proper reclamation and improvement of the working environment.

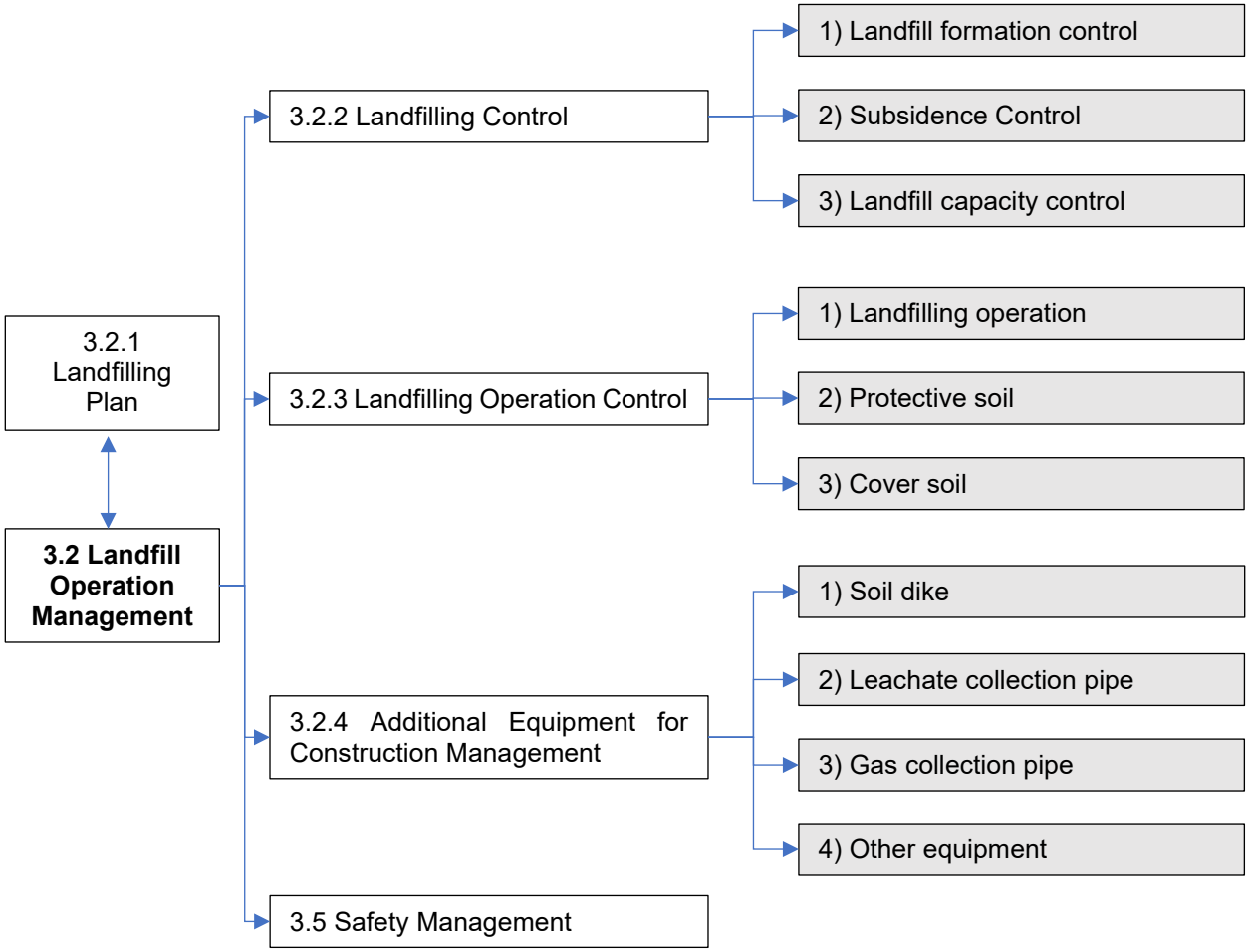
- Purpose of landfill operation management

While the type and volume of waste delivered and landfilled on a daily basis can be ascertained through delivery management, the location of the landfill, the workmanship such as landfill thickness, and the degree of bedding and compaction must all be ascertained through landfill operation management. In addition, reclamation of landfills must be conducted in such a way that there is no external leakage of leachate, dispersal or spillage of waste, generation of foul odors, or generation of pests.

Along with securing landfill capacity, it is also necessary to properly landfill waste from the viewpoint of stabilizing landfill ground and controlling the quality of leachate and landfill gas. In this regard, landfill operation management is important for this purpose. Furthermore, if the landfill site is to be used after closure, it is necessary to manage the contents related to the landfill operation as the basic data for the after-closure use of the landfill site.

- Landfill operation management

Landfill operation management is classified into landfill reclamation management, landfill operation management, additional equipment installation management, and safety management (Figure 25). These management items should be set appropriately according to the characteristics of the landfill site.



Source: Nippon Koei Co., Ltd.

Figure 25 Control Items during Landfill Operations

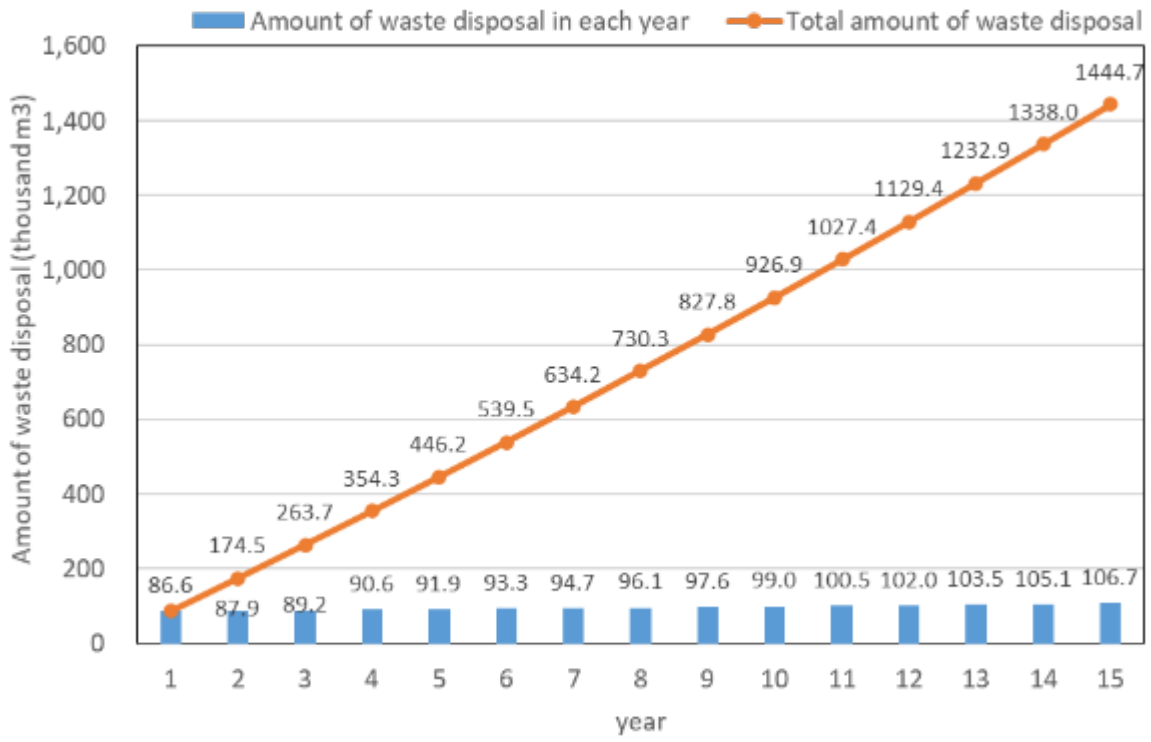
3.2.1 Landfilling Plan

At landfill sites, landfill operations should be based on a long-term landfill policy, in addition to understanding annual and periodic landfill plans, and comparing actual results with the initial landfill plan (quantity and quality of landfill waste, landfill shape, etc.). In addition, landfill operations must be conducted with an understanding of the planned landfill methods.

The landfill plan is important to determine the remaining capacity of the landfill site and to predict the timing of construction of the slope raising embankment. Therefore, it is necessary to record the actual amount of waste delivered to the landfill site and compare it with the initially predicted amount by grasping the amount of waste delivered through the weighing facility and measuring the amount of soil and sand to be delivered as soil cover. Therefore, the landfilling plan shall take into consideration the following items:

1) Yearly landfilling plan

The landfill area, landfill capacity, and annual landfill plan of the landfill site should be periodically verified and revised with respect to the implementation of the plan. A table comparing the predicted and actual landfill delivery by waste material should be prepared. The plan should be reviewed when the actual data deviates from the predictions. In addition, the remaining capacity must be verified at least once a year by surveying, etc., and the planned landfill operation must be promoted. An example of an annual landfill plan is shown in Figure 26.



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

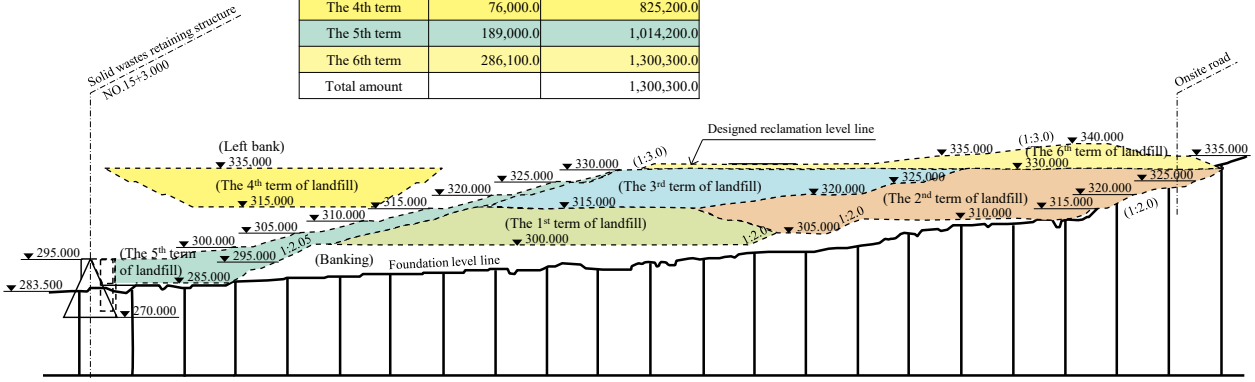
Figure 26 Example of a Yearly Landfill Plan

2) Periodic landfilling plan

The landfill period of a landfill site is usually 15 years, which is a long period of time, so the landfill plan should be prepared by periods as shown in Figure 27.

Landfill capacity of each section

Term of landfill	Volume (m^3)	Cumulative total (m^3)
The 1st term	207,000.0	207,000.0
The 2nd term	321,100.0	528,100.0
The 3rd term	221,100.0	749,200.0
The 4th term	76,000.0	825,200.0
The 5th term	189,000.0	1,014,200.0
The 6th term	286,100.0	1,300,300.0
Total amount		1,300,300.0



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

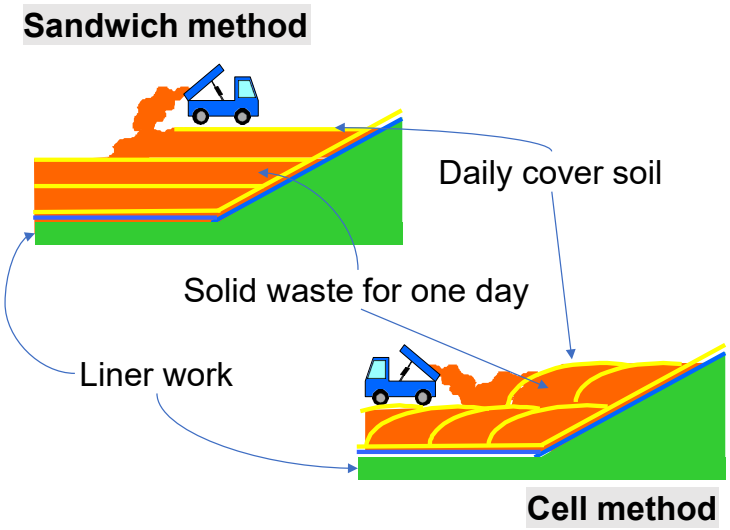
Figure 27 Example of Landfill Plans by Period

3) Consistency with leachate treatment plan

The shape of the landfill, compartmentalized landfill, and method of surface water exclusion at the landfill termination surface are usually closely related to the leachate treatment plan (size of the leachate treatment facility), so the initial plan must be reviewed and fully harmonized.

4) Landfilling method

Landfill methods for landfill sites include the sandwich method, cell method, etc., as shown in Figure 28. Landfill operation must be performed according to the planned method.



Source: Nippon Koei Co., Ltd. based on "*How to prepare A Sanitary landfill Guideline*" [Translated from Japanese.]

Figure 28 Landfilling Method

5) Landfilling equipment

In selecting landfill equipment, the equipment should be appropriate for the amount and type of waste and for compaction according to the plan. Table 7 shows an example of landfill equipment functionality comparison. Depending on the characteristics of the landfill waste, landfill equipment should be selected

for landfill operations (including protective soil and soil covering), for soil cover collection, and protective soil placement.

Table 7 Comparison of Landfilling Equipment Capabilities

Type	Ability	Waste		Protective Soil and Cover			Transport	Movement	Feature
		Equal Four	Surface Compaction	Excavation	Equal four	Surface Compaction			
Bulldozer	Weight: 35 T – 40 T Travel speed: 0 to 14 km/h Blade capacity: 0.5 to 10 m^3	◎	○	△	◎	○	×	○	Excellent leveling function. Suitable for compaction work and can be used on soft ground. Lacks mobility.
Tractor shovel	Bucket capacity: 0.2 m^3 Travel speed: 0 to 14 km/h	○	○	◎	○	○	○	○	Can excavate and transport with a bucket. Compared to bulldozers, the leveling and compaction functions are slightly lower.
Compactor (Blade)	Weight: 20 T – 37 T Blade width: 3.7 m	◎	◎	×	○	◎	×	×	Most effective in crushing and compaction. However, it is less effective when the ground is not firm.
Compactor (Bucket)	Weight: 18 T – 34 T Bucket capacity: 2.7 m^3	○	◎	△	△	◎	○	×	Can be transported by bucket. However, its functionality is slightly lower than that of the compact (blade) type.
Hydraulic power shovel	Bucket capacity: 0.29 m^3	×	×	◎	△	×	×	×	Excellent for excavation work. Excavation of the covering soil, the Suitable for excavation of drainage ditches, filling of protective materials on water collection pipes, etc.
Wheel loader	Bucket capacity: 0.2 m^3	○	×	△	○	×	○	◎	Suitable for transportation and loading. Unsuitable for compaction work. Suitable for soft ground, but not for soft ground

Legend
◎:The most suitable function.
○: Good functionality.
△: Applicable but not fully functional.
×: Not suitable.
Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

3.2.2 Landfilling Control

1) Landfill formation control

The shape of the landfill construction shall be controlled by periodic observation of defined measuring points. The consistency of the landfill configuration with the initial landfill plan shall be confirmed. The amount of settlement is to be controlled by periodically measuring the specified measuring points. The actual capacity of the landfill is periodically calculated based on the results of landfill development management.

The residual capacity shall be calculated and recorded at least once a month from the actual landfill capacity and other data.

Measuring point

The area of the landfill and examples of stratification are shown in Figure 30. The following should be noted about the measurement points:

- A measuring point shall be established for each waste type area.
- Establish a measuring point at each depth, aiming for a reclamation depth of about 5 m.
- The depth of reclamation should be about 10 m and a measuring point should be established for each layer of reclamation.
- Even within the same area, survey points should be established every 1 to 2 ha or so.
- Even within the same area, a measurement point should be established every 1 to 2 years or so during the reclamation period.

Measurement method

The following are some notes on the measurement method:

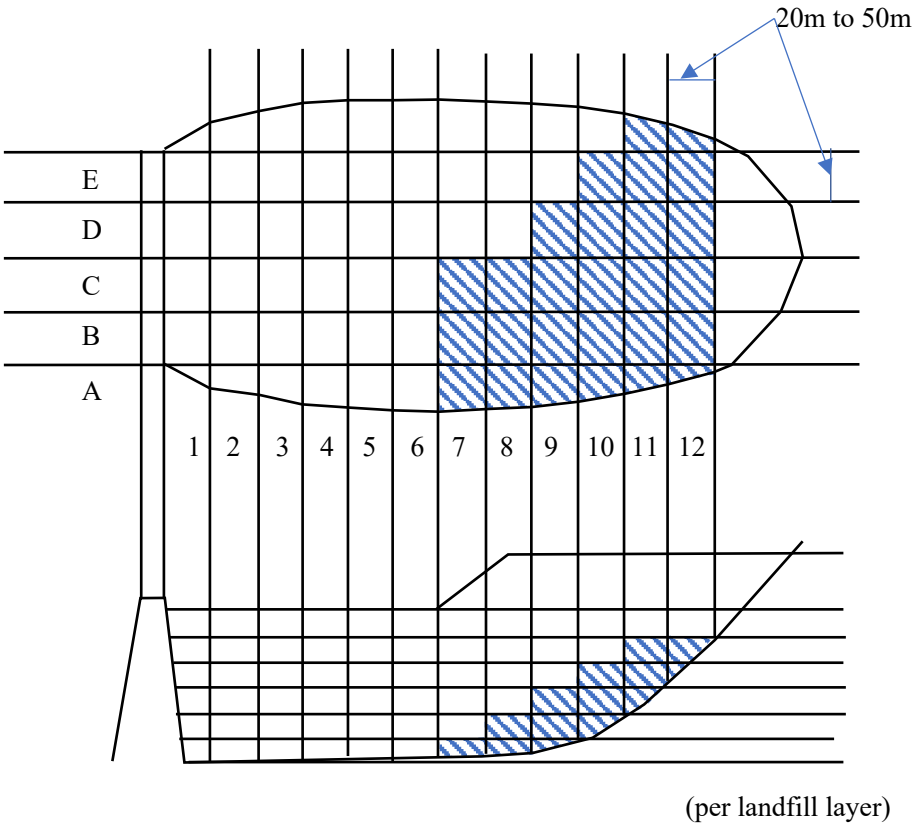
- In the measurement of mainly the amount of sinkage of the surface soil, level measurement is performed by setting up a measurement pile at the sinkage measurement point based on several reference piles previously set up at points unaffected by sinkage.
- The positioning of the measurement stakes will be done by surveying the direction and distance using a transit and tape measure, but within an error of about 1 to 2 m.

Frequency

The frequency of measurement should be approximately once or twice a month.

Landfill development data organization

For reclamation data management, it is desirable to establish a system for data organization and data entry on a personal computer to manage the data for each measurement.



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 29 Example of Stratification by Area Map within a Parcel

2) Subsidence control

Measuring point

The measurement points for settlement control are the same as those used for landfill development control (Figure 31).

Source: "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 30 Example of Subsidence Measurement Points

Measurement method

The following are some notes about the measurement method:

- In the measurement of mainly the amount of subsidence of the surface soil, level measurement is performed by setting up a measuring stake at the subsidence measurement location based on several reference piles previously set up at locations unaffected by subsidence.
- The positioning of the measurement stakes will be done by surveying the direction and distance using a transit and tape measure, but within an error of about 1 to 2 m.

Frequency

The frequency of measurement should be approximately once or twice a month.

Settlement data organization

It is desirable to maintain documentation of each measurement on a computer for the amount of settlement (a table of measurement results is attached as an example in the appendix).

3) Landfill capacity management

Actual landfill capacity

The actual landfill capacity (cumulative capacity and period capacity) is calculated from the landfill formation management results. The landfill capacity shall be calculated by the cross-sectional method based on the landfill cross-sectional map for each period. The management frequency should be about once a month. The results are compared with the annual landfill plan and used as basic data for reviewing the landfill plan in the future.

Calculation of residual capacity

The remaining capacity is calculated from the actual landfill capacity (accumulated capacity).

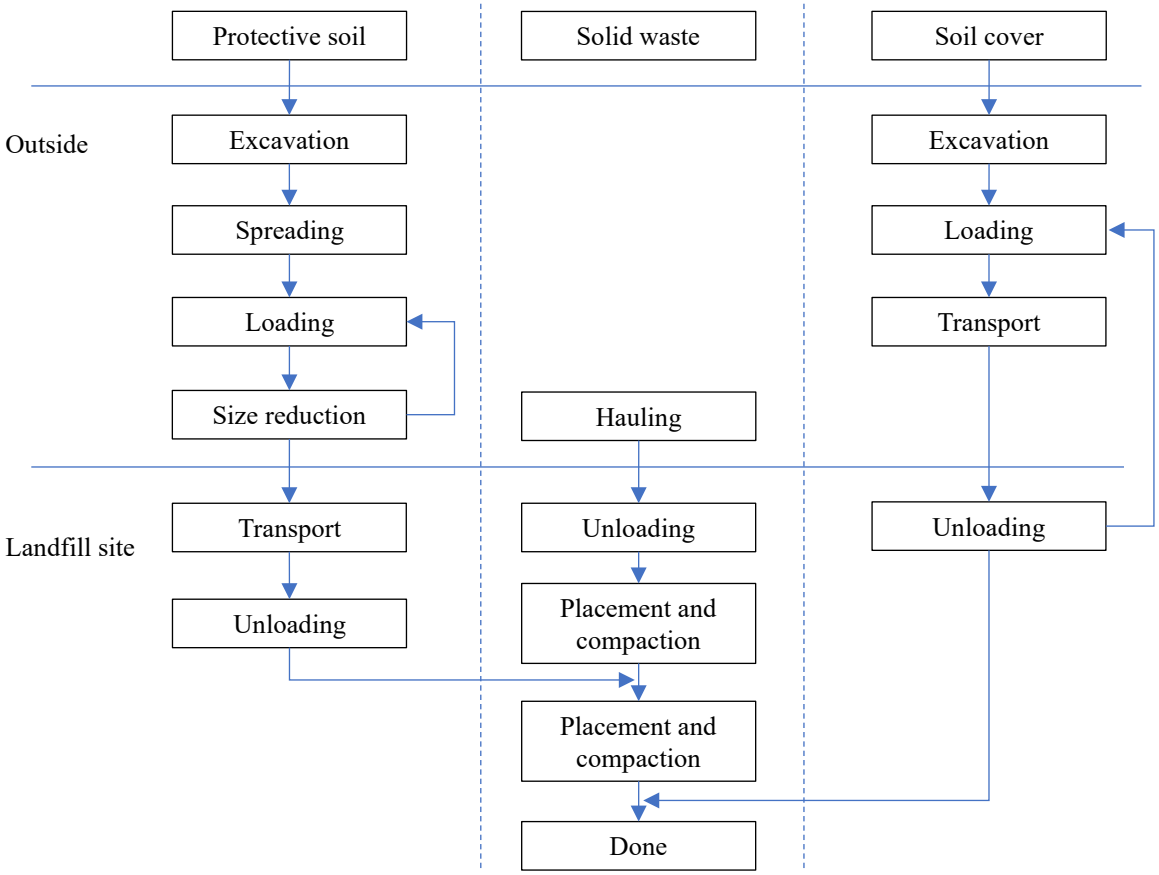
Remaining capacity (m^3) = (Total landfill capacity) - Actual landfill capacity (accumulated capacity)

*The actual capacity of landfill (accumulated capacity) includes the amount of soil cover.

The frequency of management is estimated to be about once a month. The frequency should be compared with the annual reclamation plan and used as a basis for reviewing the reclamation plan in subsequent years.

3.2.3 Landfilling Operation Management

Landfill operations can be divided into three major construction processes: solid waste, protective soil, and cover soil. The basic work process is shown in Figure 32.



Source: Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

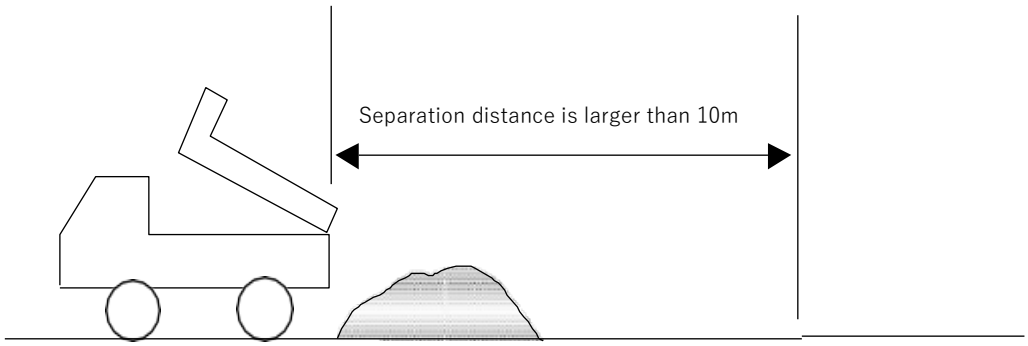
Figure 31 Flowchart of Landfilling Operation

1) Landfilling operation

Loading and unloading from transport vehicles

The following points should be considered for loading and unloading operations from the transport vehicle:

- The site must be covered and compacted to prevent flat tires on the hauling vehicle and the inability to escape due to buried tires.
- Keep haul trucks out of the landfill area to avoid contact with heavy landfill equipment.
- If the waste is unloaded close to the slope of the landfill, the load of the falling waste and the protrusions in the waste may adversely affect the impervious surfaces. Therefore, it is necessary to keep a certain distance from the bottom of the slope at which the waste is unloaded (Figure 33).



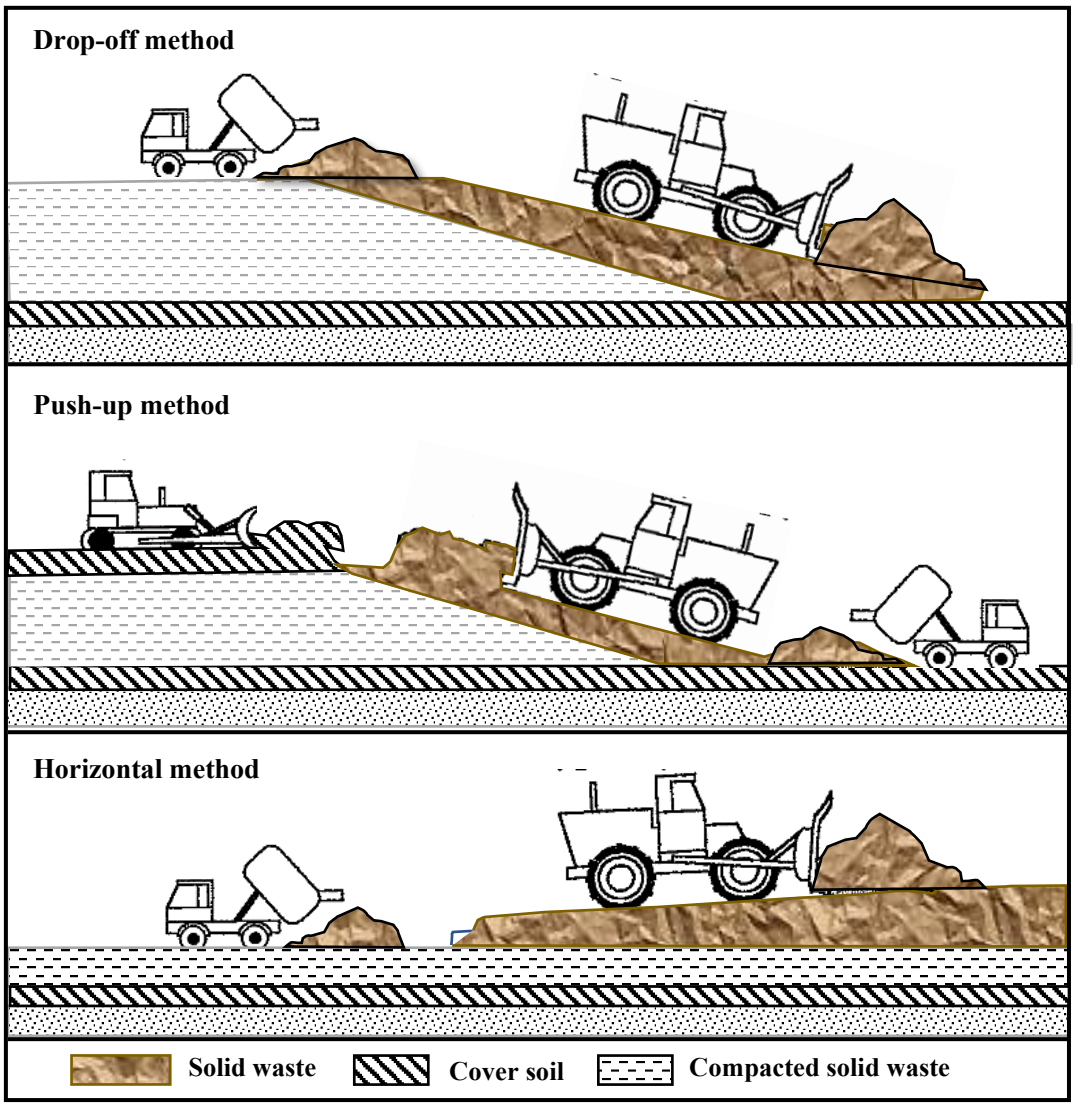
Source: Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 32 Example of Waste Loading/Unloading Positions

Placement and surface compaction operations

For placement and surface compaction operations (Figure 34), the following should be noted:

- If the fill is concentrated in one place (heaped up) by pushing one side or the like, localized tension is likely to occur in the impervious sheet due to consolidation settlement, etc. Therefore, the fill should be uniformly spread over as wide an area as possible.
- Establish the daily landfill thickness and determine the daily landfill area.
- The waste material should be compacted by removing the material with a thickness of 30 to 50 cm and reciprocating 5 to 6 times.
- The working speed of the rolling machine should be low (one speed).
- The thickness of one layer, including the immediate covering soil, is established, and reclamation of the upper layer is started after all of the same layers have been reclaimed.
- Surrounding workers and vehicles are not allowed in the landfill area.
- Operate with caution near slopes and near equipment such as gas vent pipes.
- In the initial stage of reclamation, the rolling should be done carefully and loosely, taking into account the possibility of damage to the impervious sheet. Also, do not turn abruptly.
- If the bottom of the landfill site is sloped, the direction of spreading and rolling should be toward the mountain side if the bottom ground is sloped because spreading and rolling in the downward direction is likely to cause displacement of the waste layer, which will lead to the damage of the impervious sheet.



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 33 Methods of Placement and Surface Compaction

Prevention of impact on surrounding facilities

There is a risk that impervious sheets and leachate collection and drainage pipes may be damaged not only by their contact with the delivery vehicles and heavy machinery, but also by being approached. Therefore, the following points should be kept in mind and monitors should be posted at all times to monitor and guide delivery vehicles and heavy machinery.

Prohibiting in principle heavy machinery work on protected soil

- In principle, it is prohibited for heavy reclamation equipment to travel directly on the protected soil or to change direction, especially abruptly, as this places a load on the impervious sheet.
- In the initial stages of reclamation, since it is anticipated that work will be performed on the protective soil, a supervisor should be assigned to carefully drive over the area. It is advisable to thicken the protective soil in the initial reclamation work area in advance.

Maintaining distance for heavy equipment work near the slope surface

- Since heavy reclamation equipment traveling near the slope increases the possibility of contact with the sheet and increases the load for fixed construction due to the pulling force, a separation distance should be set to prevent damage to the impervious sheet, and heavy equipment traveling within the specified

range is prohibited in principle. It is recommended that a separation distance of at least 1 m be maintained.

2) Construction of protective soil

Protective soil should be carefully constructed with good quality materials to prevent damage to the impervious sheet. An example of construction of protective soil is shown in Figure 35.

Securing protective soil

Establish a minimum thickness and use good quality residual soil or purchased soil, such as temporary soil cover. (In addition to soil and sand, tatami mats may be used for sheet protection.)

Putting in slope protective soil

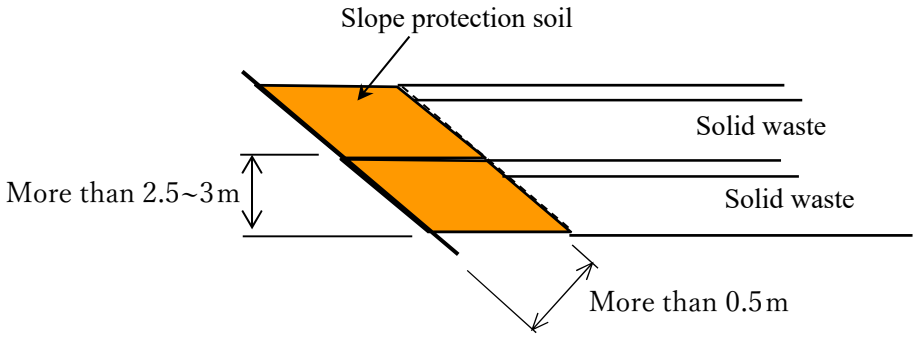
The protective soil is placed by dumping it from a dump truck. However, the dumping position should be a distance away from the slope and the dump truck should be carefully moved to the edge of the slope by a backhoe. The protective soil should be placed by a small backhoe. Depending on the shape of the slope, the soil may be placed and compacted manually.

Putting in bottom protective soil

The protective soil should be dumped from a position where the dump truck does not ride directly on top of the cushioning material (or shading sheet) and carefully spread by backhoe or other means.

Measures against sheet shrinkage

As much as possible, protective soil should be applied in winter or early morning of summer when the impervious sheet shrinks the most (i.e., when the sheet is least sagging) due to the drop in temperature.



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 34 Example of Slope Protection Soil

3) Construction of soil cover

Soil cover plays a wide variety of roles, including ensuring the stability of reclaimed slopes, preventing leachate seepage, improving reclamation work efficiency, preventing waste dispersal, stormwater drainage, and site utilization. Therefore, appropriate materials should be selected according to the purpose of construction of various types of soil cover and applied at the appropriate time (Table 8).

Table 8 Purpose of Covering Soil

Purpose of Covering Soil	Application Details
Leachate volume control	Design and construct a proper soil cover to prevent rainwater infiltration and ensure gas exchange within the landfill layer.
Prevention of spattering and runoff	To prevent landfill waste from scattering outside, do not leave it unattended but cover it promptly
Prevention of odor	Promptly cover the landfill waste to prevent odors from emanating outside

Purpose of Covering Soil	Application Details
Fire prevention	Cover the site promptly to prevent the outbreak of fire. It is also desirable to have soil covering materials in the field as fire extinguishing equipment in case of fire.
Prevention of rodent and insect outbreaks	Cover the soil promptly to prevent rats, mosquitoes, flies, and other pests
Closure of landfill termination parcels	The opening shall be covered and closed with earth and sand of approximately 50 cm or more in thickness to the finished reclaimed parcel.

Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

The following are points to be considered in the construction of the soil cover:

- The materials to be used shall be secured from residual soil at temporary soil cover sites, etc. The required soil material (grain size) should be set for the purpose of controlling rainwater infiltration and ensuring air permeability.
- The purpose of the daily cover is to prevent scattering of landfill waste and drainage of rainwater. The thickness of the daily landfill layer is set and the daily cover is placed on top of the daily landfill layer.
- The intermediate soil cover should be about 50 cm thick per 2.0 to 3.0 m for the purpose of using it as a pathway for waste transport vehicles and for drainage of rainwater in reclaimed areas that will be left for a relatively long period of time.
- The final cover is applied above the final reclaimed surface to allow rainwater drainage and site utilization. The thickness should be 1.0 m or more according to the purpose. The finished final soil cover should have a drainage slope of 1-2% downstream to allow rainwater to drain away. Therefore, the finished height of the final soil cover should be strictly controlled.

3.2.4 Additional Equipment for Construction Management

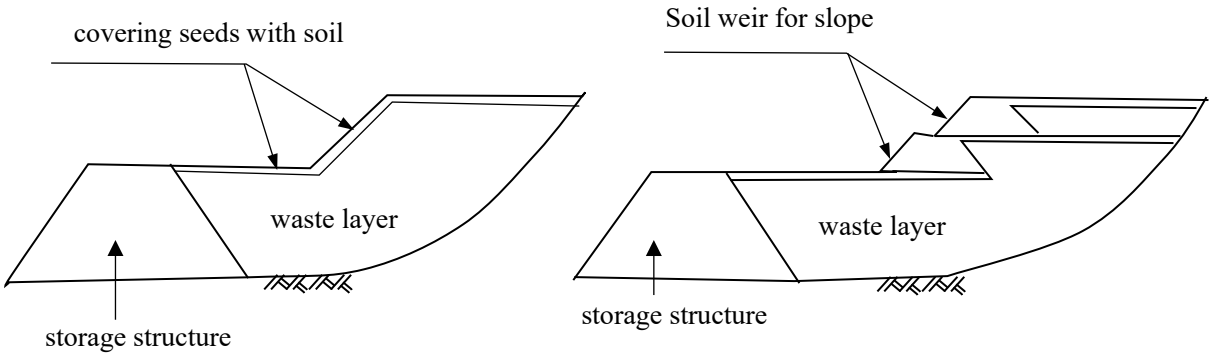
As the reclamation progresses, additional construction will be implemented, such as earth weirs on the reclamation slope to prevent waste runoff, construction of unexcavated sections of leachate collection and drainage pipes, and extension of the vertical gas venting system.

It is important to prepare a list of additional equipment to be installed during reclamation to ensure that it is installed and that the reclamation crews are made aware of it.

1) Weir

When wastes are to be reclaimed higher than the storage structure, an earthen weir is required within the landfill site. In other words, in principle, the landfill slope should not be created by waste or cover soil but rather an earthen weir of 3 to 5 m per level should be constructed at the slope before reclamation with waste, from which the landfill should be directed upstream (Figure 36). This is because it is difficult to compact the waste and cover soil on the slope, and the slope cannot be completed with the final cover until the designed reclamation height is reached.

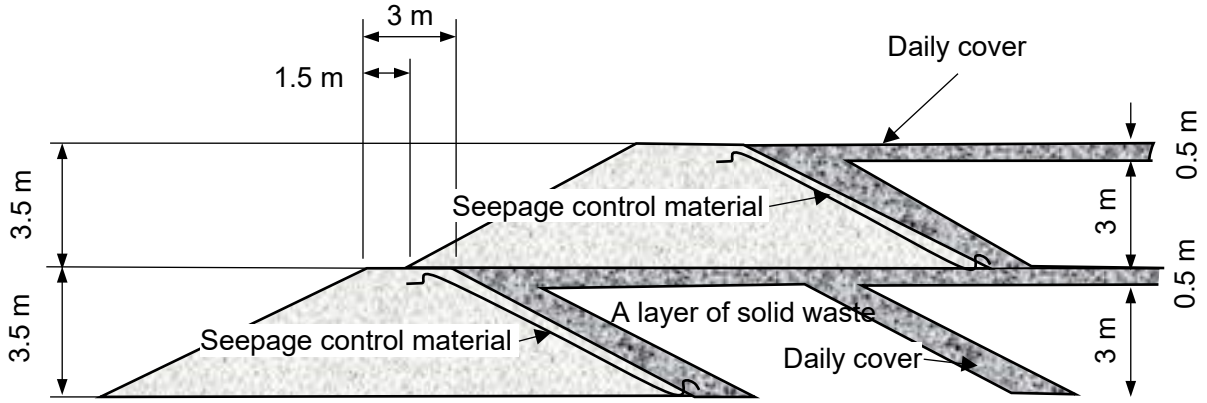
However, since this earthen weir is to partially replace the slope of the waste layer with compacted soil and not to be constructed as a storage structure, the earthen weir for the slope should not be provided as a means of downsizing the storage structure.



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 35 Example of Earthen Weir Construction

Each tier of earthen weirs should have a berm of at least 1 m. If the number of tiers to be stacked is large, there should be a sufficient horizontal distance in the middle to ensure that there is no safety hazard. An example of the construction of an earthen weir is shown in Figure 37. When landfill operation is carried out, it should be ensured that the originally designed reclamation shape and the position of the earthen weir should not be changed to the hazardous side.



Source: Nippon Koei Co., Ltd. based on "*How to Prepare a Sanitary Landfill Guideline*" [Translated from Japanese.]

Figure 36 Example of Earthen Weir Construction

2) Leachate collection facilities (leachate collection and drainage pipes)

As reclamation progresses, leachate collection and drainage pipes should be installed if there are unexcavated areas on the slope.

Leachate collection and drainage pipes are as important as liner facilities. Blockage of the leachate collection and drainage pipes causes leachate to stagnate in the landfill site, leading to the deterioration of leachate quality and increased leakage in the event that the liner facility is damaged.

In some cases, during the initial construction, pipes in the slope area may not be partially constructed to avoid collapse due to wind or other factors. In such cases, additional construction must be done in advance before reclamation.

3) Landfill gas treatment facility (vertical gas venting facility)

Vertical gas venting facilities are constructed as reclamation progresses. The same applies to slope gas venting facilities that also serve as leachate collection and drainage pipes in the slope area.

The gas venting facility is an important facility for maintaining the semi-aerobic landfill structure of the landfill. The gas venting facility is connected to the leachate collection and drainage pipes and must maintain air circulation and venting functions within the pipes. Therefore, the initial construction cross section must be secured and extended as the reclaimed surface rises. In addition, waste materials with relatively large particle size, such as crushed noncombustible materials, must be landfilled around the gas venting facility.

4) Other equipment

In addition to earthen weirs, leachate collection and drainage pipes, and vertical gas venting facilities, any facilities that require construction during reclamation should be identified during design and construction, and a list of additional facilities should be prepared to clarify the timing of construction.

3.3 Facility Management

Management of each facility is required to maintain the landfill. The objectives of facility management include the following and appropriate management is required for each final disposal facility:

- Prevention of impact on the surrounding environment
- Preventing accidents due to abnormalities or damage to facilities
- Proper implementation of waste delivery, landfill operations, and leachate treatment
- Ensuring proper and economical operation of facilities
- Preventing damage to facilities due to landfill operations, etc.
- Health care of staff and workers

3.3.1 Facility Management Details

Management of final disposal facilities is usually divided into the following categories:

- Inspections: Inspections of facilities for damage, defects, or for the progress of damage, with a plan for the next period, frequency, and items to be inspected. Various methods are available, including visual and photographic inspections, physical inspections using measuring instruments, and scientific analysis.
- Repair: Repair or update a facility to restore damage to the facility.
- Damage Prevention: Prevention of damage to facilities caused by landfill equipment during landfill operations.
- Cleaning: Cleaning and dredging of stormwater collection and drainage facilities.

1) Facility inspection

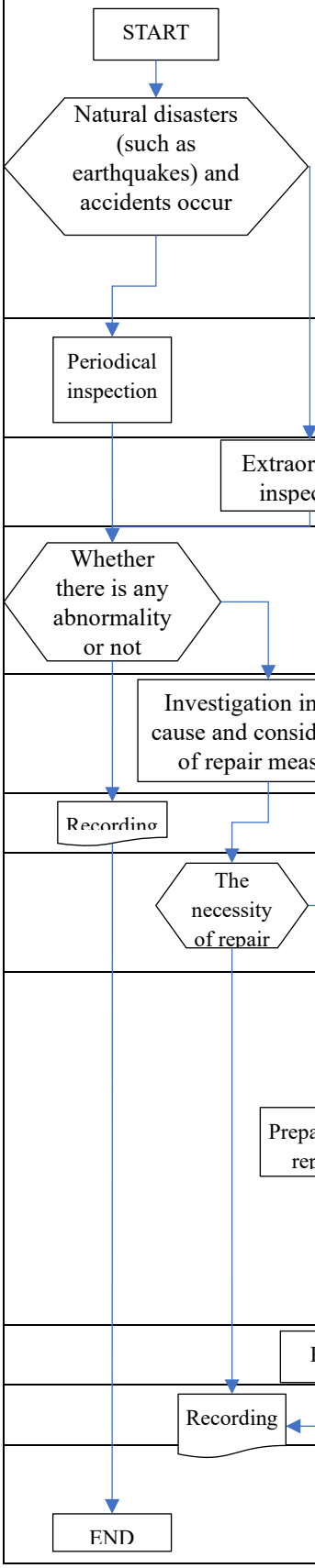
Facility inspections can be classified into three categories: constant daily inspections, detailed inspections in the event of facility damage, and abnormality inspections in the event of natural disasters or other unusual events (Table 9).

Table 9 Type of Inspection

Type of Inspection	Contents
Daily Inspection	The main objective is to prevent damage to the facility and detect damage as early as possible so that the reclamation can be carried out without affecting the surrounding environment. In the unlikely event that damage is found, the cause of the damage and the need for repairs shall be examined.
Detailed Inspection	This inspection is conducted when the need for repair cannot be determined from the results of daily inspections alone and further detailed inspections are necessary, or when damage to the facility is found but the cause is unknown or the need for repair is unclear, or when it is necessary to study repair methods, etc. Detailed investigations using test equipment, etc. are conducted.
Abnormality Inspection	This inspection is performed to check for damage to the facility in the event of an earthquake, heavy rain, freezing, or other abnormal conditions.

Source: Nippon Koei Co., Ltd.

The inspection procedures for the detailed inspections and abnormality inspections should be established in advance according to the actual conditions at each landfill site. An example of the procedures is shown in Figure 38.

Inspection Management Flow	Remarks
	*To prevent the facility from being damaged or exceeded, the following measures should be taken: (1) Manuals for reclamation operations and site maintenance methods (2) Make sure that the workers of the heavy equipment operator's office are aware of the situation. *To be prepared for natural disasters and accidents, the following advance measures should be taken on a normal basis: (1) Review and development of response items and procedures in the event of a disaster (2) Ensure that all workers are well informed by conducting drills and other activities based on the assumption that a disaster has occurred.
	Conduct inspection management at a certain frequency such as once/day, once/week, once/month. *Control items, frequency, and methods specified for each facility shall be implemented.
	Inspection and management in the event of disasters, matters, etc. *Control items. Control methods are equivalent to the contents of periodic inspections (prepare temporary inspection items, etc., from normal times).
	If there is concern that partial damage may spread to the entire building, a detailed inspection should be conducted to determine the cause. *The presence or absence of abnormalities (standard values) should be determined according to the actual conditions at each disposal site. *Request cooperation from specialists, contractors, etc. as necessary.
	Conduct various investigations of abnormalities and damage found during inspections to determine the causes of damage and consider repair measures. *Request the cooperation of specialists, contractors, etc. as necessary.
	Record the details of inspections, inspections, and other measures taken. *Refer to "Management Format (Forms 5-1~5-3)
	Consider and decide on the necessity of collection from the viewpoint of whether there is a problem in maintaining the functionality of the facility or whether it will have a negative impact on the future functionality of the facility.
	Prepare a repair plan including repair methods, repair schedule, etc. *Repair methods are broadly classified into the following two categories, and a decision on which to choose should be made after considering the degree of damage, cause of damage, impact on the surrounding environment, impact on reclamation work, impact on maintenance and management, necessary costs, etc. (1) Repair method to restore partial and minor damage to normal condition, depending on the extent of damage (2) Repair method to restore normal condition of damage that progresses over time by a drastic method. *Prepare design drawings, etc. (If subcontracting, they must be organized as purchase order drawings.)
	Implement repair measures based on the prepared repair plan *Conduct appropriate construction management.
	Record details of inspections, repair measures, and other actions taken. *Refer to "Management Format (Forms 5-1~5-3)
	*Remedy and eliminate promptly any causes that have been identified *From the viewpoint of preventing recurrence, the details of past accidents and countermeasures should be documented, accumulated, and disseminated at internal training sessions, etc.

Source: Nippon Koei Co., Ltd. based on "*Manual for Maintenance and Management of Industrial Waste Landfill Sites*"[Translated from Japanese.]

Figure 37 Inspection Procedure

3.3.2 Management of Solid Waste Storage Structure

Proposed inspection details for concrete structures and earthen weirs are shown in Table 10. In addition, after earthquakes, typhoons, heavy rains, accidents, etc., the same items as in Table 10 are to be inspected for abnormalities immediately.

Table 10 Table of Inspection Details

Checklist	Inspection Method	Inspection Frequency
Concrete Structure		
Leakage from levee	Seeing	once/week
Delamination, cracking, and deterioration of concrete surfaces	〃	〃
Joint breakage, misalignment, exposure of rebar, and flaring out	〃	〃
Settlement (e.g., height of gravity concrete top edge)	Measurement of top edge height, etc. using a settlement meter or level meter, etc.	once/month
Inclination, tilt (weir position)	Measuring the distance of a concrete weir from a reference point	4 times/year
Weir		
Waste materials, sediment deposition, weed growth, and vegetation on embankments	Seeing	once/week
Leakage from levee	〃	〃
Cracks and swelling of levees	〃	〃
Erosion and collapse of small steps	〃	〃
Slope collapse, erosion, scouring, and runoff	〃	〃
Collapse or collapse of ground	〃	〃
Settlement of embankment and foundation ground	Measurement of top edge height, etc. using a settlement meter or level meter, etc.	once/month
Horizontal displacement of embankment	Measurement of the distance from the reference point to the top of the dike	4 times/year

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.3.3 Management of Groundwater Collection Facility

This facility cannot be directly controlled because it is installed below the liner facilities. Maintenance of the facility is conducted by monitoring groundwater quantity and quality, as well as preventing damage during landfill operations. Examples of inspection items for underground water drainage facilities in Japan are shown in Table 11.

Table 11 Example of Inspection Details for Groundwater Collection Facility

Checklist		Inspection Method	Inspection Frequency
Groundwater collection and drainage outlets, etc.	Quantity or volume of water	measure	once/month
	Appearance (turbidity, color, and odor)	seeing	once/month
	Water quality (conductivity and pH)	For automatic continuous measurement	24-hour (e.g., observation, operation (of a machine), care (of patient)
	Water quality (conductivity or chloride ion)	water-quality test	once/month

Checklist		Inspection Method	Inspection Frequency
	Water quality (25 test items for groundwater, etc.) Cd, CN		once/year
	Water quality (dioxins)	water-quality test	

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.3.4 Management of Liner Facilities

Apart from problems that can be resolved during design and construction, many cases of damage to impervious works are caused by reclamation operations and weather conditions. Most damage is due to human error and most can be prevented by careful daily work.

1) Inspection items for surface liner facilities

Inspections of impervious sheets are divided into daily inspections, periodic inspections, inspections in case of abnormalities, and detailed inspections for the purpose of preventing damage and detecting it early (Table 12). In addition, detailed inspections are conducted as necessary. Inspection items and methods of each type of inspection are shown in Table 13.

Table 12 Type, Purpose, Timing, and Proposed Content of Inspections

Type	Purpose	Timing	Contents
Daily Inspection	Daily inspections prior to landfill are conducted in areas where waste will be landfilled, such as on slopes where landfill is in progress. A final check of the impervious construction and impervious sheets is conducted to confirm that there are no abnormalities, then reclamation work is commenced. After the reclamation work of the day is completed, inspect the site and confirm that there are no abnormalities. If any abnormality is found, investigate the cause of the abnormality, consider repair methods, and ensure that the abnormality is repaired.	Performed routinely before, during, and after daily waste landfill operations	Using auxiliary tools such as tape measures, inspection sticks, water-based sprays, hammers, etc., and preparing cameras, drawings of the landfill site, and inspection record sheets, inspect the liner facility for deformities.
Periodic Inspection	The entire area within the landfill site and its surrounding are covered. Pay attention not only to the liner facility but also to the joints between various structures and impervious sheets, each facility in the landfill site, and the surrounding topography. Inspection areas are to be defined and conducted on a regular basis.	Performed at 5, 10, and 15 years after completion of construction and termination of warranty	
Abnormality Inspection	Inspections are to determine if there are any abnormalities in the impervious works after earthquakes, heavy rains, typhoons, and freezing (after abnormal conditions). The inspection is performed in a manner similar to periodic inspections.	Earthquake, heavy rain, typhoon, and icy conditions	Follow the contents of periodic inspections.
Detailed Inspection	This is done when the cause of a liner facility deformation is unknown, when determining the method of repair measures or when considering a repair plan.	Perform daily inspections, periodic inspections, and ad hoc inspections when abnormalities are found.	Conduct inspections in a manner similar to periodic inspections and promptly consult with experts and specialized contractors to determine the details of the inspection.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

Table 13 Inspection Items and Methods for Surface Liner Facilities

Checklist	Inspection Details	Inspection Method*
1. Whether or not waste, gravel, or other materials are being ingested.	If a situation is identified where waste or other materials have penetrated the impervious sheet, a repair plan will be developed after the waste or gravel is removed.	Visual inspection container method negative pressure test
2. Composting of waste, sediment, presence/absence of load, etc.	Remove any sediment on the impervious sheet. Grass may grow in the future.	Visual inspection
3. No holes or tears	If holes or other phenomena are identified in the impervious sheets, a repair plan should be developed.	Visual inspection container method negative pressure test
4. Presence of abnormal elongation	If an abnormal stretching phenomenon is observed in the impervious sheet, the situation should be continuously observed.	Visual inspection
5. Softening or hardening	If softening or hardening of the impervious sheet is observed, the situation should be continuously observed.	Visual inspection
6. Swelling of impervious sheet due to substrate deformation, water inflow, and dents	If a phenomenon such as swelling or denting of the impervious sheet due to substrate deformation or water inflow are observed, the situation should be continuously observed.	Visual inspection
7. Presence of flaking at joints	If peeling phenomenon is observed at the joints of impervious sheets, a repair plan should be established.	Visual inspection container method negative pressure test
8. Presence of abnormal tension	If an abnormal tension phenomenon is observed in the impervious sheet, the situation should be continuously observed.	Visual inspection
9. Plant stem, bud penetration, and scars due to grass growth	If damage to the impervious sheet is observed due to plant stems, bud penetration, or grass growth, a repair plan should be developed.	Visual inspection container method negative pressure inspection
10. Missing terminal seals, and gaps	If a phenomenon such as missing terminal seals or gaps are identified, a repair plan should be developed.	Visual inspection
11. Presence of cracks in the fixation work and scratches due to lifting	If damage to the impervious sheet is observed due to cracking or lifting of the fixed construction, a repair plan should be developed.	Visual inspection
12. Presence of delamination of joints with structures	If peeling is observed at the joints between the impervious sheet and the structure, a repair plan should be developed.	Visual inspection
13. Whether the protective mat is always wet or not	If it is observed that the protective mat is always wet, remove the protective mat and inspect the impervious sheet as well.	Visual inspection
14. Waterlogging after rainfall (Leachate reduction)	If the water volume of leachate drops quickly after rainfall, continuously observe the situation. If the water volume continues to drop, check the impervious sheet.	Visual inspection
Inspection of water shield sheet damage (leakage) location detection monitoring	Two or more groundwater monitoring wells should be installed to monitor whether the impervious function of the landfill site is properly functioning (maintained). The soundness of the	

	impermeable function is evaluated by monitoring continuous changes in water quality in the monitoring wells.	

*If protective mats are installed, inspect in the order of protective mats → impervious sheets.
Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

2) Repair methods for liner facilities

Regarding the repair of surface impervious works, if the inspection of the impervious sheet reveals that there are deformities, the following items should be considered based on the results of the inspection and other factors:

- Need for repair
- Necessity of emergency measures and emergency response plans
- Recurrence prevention measures
- Need for detailed inspection and inspection plan
- Repair methods, etc.

Below are examples of how to repair impervious sheets when they need to be repaired.

- Direct repair method, such as excavating the waste to expose the sheet by open excavation method or casing method and then adding more sheets of the same material to the damaged area.
- A method in which a material identical to that of the impervious sheet is made in a molten state and poured into the damaged portion of the impervious sheet to fill and adhere to the damaged portion.
- Method of grouting material without excavating waste
- A method in which boring bits are used in combination with water jetting technology to reach the damaged location of the impervious sheet and a special liquid is injected to fill the area near the damaged location of the impervious sheet with a hardening liquid.

3) Inspection items of soil-based liner facilities

Soil liner facilities are covered with impervious sheets and protective mats, so it is impossible to visually inspect and detect any damage or abnormalities. Therefore, abnormalities in the soil liner facilities are estimated based on the results of inspections of other facilities, such as the impervious sheets, protective mats and protective soil covering the soil liner facilities, groundwater monitoring wells, and underground water drainage facilities. Table 14 shows the relationship between the soil-based liner facilities and the abnormalities observed during inspections of other facilities.

Table 14 Relationship between the Abnormalities Observed in the Inspection of Other Facilities and Estimated Condition of Soil Liner Facilities

Checklist		Inspection Items by Surface Condition			Estimated Damage to Soil Liner Facilities	
		Protective Mat	Protective Earth	Landfill Waste	Degree of Involvement	Estimated Main Damage Conditions
1	Abnormal stretching of protective mats	●			×	
2	Bulges or dents in protective mat	●			◎	Sinks and ridges.
3	Protective mat peeling	●			×	
4	Holes in protective mat	●			○	Have a hole.
5	Scratches and tears on protective mats	●			○	Cracks and fissures.
6	Cracks and sinking of protected soil surface		●		◎	There is a sinkhole.

Checklist		Inspection Items by Surface Condition			Estimated Damage to Soil Liner Facilities	
		Protective Mat	Protective Earth	Landfill Waste	Degree of Involvement	Estimated Main Damage Conditions
7	Sliding or collapsing of protective soil		●		○	There are sinkholes, ridges, and collapses.
8	Protective soil extrusion (floating)		●		○	Ridges.
9	Spring	●	●		◎	There are holes and permeable areas.
10	Soil gas blowout	●	●		◎	There are holes and gas permeable areas.
11	Plant stem and root penetration	●	●		◎	Plant stems and roots penetrated.
12	Drainage conditions after rainfall	●	●		×	
13	Water quantity and quality at the entrance and exit of leachate collection and drainage facilities	●	●	●	×	
14	Water quantity and quality at the entrance and exit at groundwater collection and drainage facilities	●	●	●	◎	There are holes and permeable areas.
15	Water quality by observation wells	●	●	●	◎	There are holes and permeable areas.
16	Water barrier breakage (leakage) detection technology （Confirmation of leakage e.g., by electrical detection)	●	●	●	-	Varies by system.
17	Cracks and sinking of the ground surface			●	○	There is a sinkhole.

Legend: ◎ High possibility of damage.
○ Possible damage.
× Low relationship with damage.
Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

4) Repair methods for soil-based liner facilities

When the soil liner facility is damaged, even if there is no leakage, it will not function properly and it needs to be repaired. Examples of the repair methods are shown in Table 15.

Table 15 Repair Methods for Soil-Based Liner Facilities (Example)

Terms	Repair Method
Damaged areas are in a condition where they can be dug out (small landfill layer thickness)	Partial material replacement Grout Improvement of impervious surfaces Material improvement and recompaction of liner facility Change of impervious construction (switch to impervious sheets) Ground rehabilitation and improvement
When the liner facility is buried under the waste layer where the damaged part cannot be found and it is difficult to move the landfill waste to another location.	Capping the landfill surface with impervious sheets or other means to prevent rainwater from flowing into the landfill. Construct vertical liner facility. Install multiple pump wells within the landfill to lower the leachate level and prevent it from flowing outward. The water level of groundwater is raised above the leachate level by installing continuous underground walls to prevent leachate from flowing out. As a temporary measure, groundwater is treated to prevent contaminated water from leaking outside.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.3.5 Management of Rainwater Collection Facility

The purpose of inspecting stormwater collection and drainage facilities is as follows:

- Perform periodic maintenance and renovation work to keep the facility functioning and prevent damage.
- To prevent damage to the facility from affecting other facilities and interfering with landfill operations, inspect the facility and detect any abnormalities at an early stage.
- If a facility is found to have an abnormality, a repair plan will be developed and the facility will be repaired.

1) Inspection items

Table 16 and Table 17 show the proposed items and frequency of daily inspections of runoff collection and drainage channels and disaster prevention ponds, respectively. The same items should also be inspected in case of abnormalities after heavy rains or earthquakes.

Daily inspections should consist primarily of visual inspections. The use of photography to document the progress of damage can be useful.

Table 16 Proposed Inspection Items for Rainwater Drainage Canal

Checklist	Inspection Method	Inspection Frequency
Damage and subsidence of catch basins, catch basins, and drinking fountains	Visual (it is useful to use photography to document the progress of damage)	Once/month (Once/week for uncovered channels)
Deposition of sediment and other materials in drainage ditches, catch basins, and drinking fountains		
Existence and condition of overflows and stagnant water		
Existence or non-existence of abnormalities at the connection with the liner facility		
Water and sediment inflow from the surrounding areas		
Growth of weeds and other vegetation in the surrounding area		
Stormwater runoff conditions		

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

Table 17 Proposed Inspection Items for Disaster Prevention Pond

Checklist	Inspection Method	Inspection Frequency
Damage to protective fences	Visual (it is useful to use photography to document the progress of damage)	once/month
Water level in storage		
Deposition of sediment and other materials at the bottom of the pond		
Deposition of sediment and other materials on slopes		
Weed growth on slopes		
Condition of weirs and slopes (details follow inspection of storage structures)		
Slope collapse		
Water discharge and accumulation of sediment and other debris in the discharge channel		
Damage to water outlet and spillway		

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

2) Repair methods for rainwater collection facility

When repair is required, the cause of damage, extent of damage, and other factors should be thoroughly examined. A repair plan should be developed after considering the repair method and other factors. In formulating a repair plan, the following items should be considered. Examples of repair methods for rainwater collection facility are shown in Table 18.

- Impact on the surrounding environment

- Impact on other structures
- Impact on landfill operations
- Necessary expenses

Table 18 Examples of Repair Methods for Rainwater Collection Facility

Damaged Part		Repair Method
Rainwater catchment and drainage channel	Cracks and spalling of concrete	Epoxy resin injection, putty, or fast-strengthening cement Repair by repair or other means by
	Displacement or damage to joints due to unequal settlement of gutters	Foundation ground is investigated, and the ground is repaired and improved as well.
	Replacement of ducts, etc.	The foundation ground is surveyed to determine if unequal settlement will occur after the replacement of the foundation.
	Damage to ducts, etc.	Consider relocating the location of the fabric to another location, if necessary.
Disaster Prevention Pond	Damage to protective fences	Repair immediately.
	Repair weirs and slopes	Select the best repair method (details on repairing storage structures)
	Repair discharge works and discharge pipes	Follows the repair of stormwater catch basins.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.3.6 Management of Leachate Collection Facility

If leachate collection facilities are damaged, the leachate collection capacity will be reduced and leachate will be stored in the landfill. In addition, if the water collection pipes are damaged, the impervious sheet may be damaged because of it.

1) Inspection items

Table 19 shows the proposed items for the daily inspection of the leachate collection facility. The same items should also be inspected during abnormal events such as heavy rains and earthquakes.

Table 19 Proposed Items for Daily Inspection of Leachate Collection Facility

Checklist	Inspection Method	Inspection Frequency
Residual water level in the landfill	Collecting pit or pit water level in landfill	once/month
	Collecting pit or landfill pit water level gauge*1	24-hour (e.g., observation, operation (of a machine), care (of patient)
Valve operating conditions Lubricate valves	Confirmation of manual valve opening/closing Confirmation of valve opening and closing by automatic operation in case of automatic operation	once/month
Water volume at leachate collection pipe or leachate delivery pipe outlet	Seeing	once/month
Cracks and sinking of landfill surface		
Cracks, delamination, and deterioration of interior concrete surfaces such as water collection pits		
Peeling of corrosion protection work inside water collection pits, etc.		
Conditions in leachate collection pipes and leachate delivery pipes	Pipe inspection from outlet and manhole and investigation by TV camera insertion*2	once/year

1: In case of installing a water level gauge (It is desirable to install a water level gauge as much as possible in order to monitor the stagnant water level in the reclaimed land).

2: A TV camera survey is a survey method that has been put to practical use in sewer pipeline facilities, where a self-propelled TV camera is inserted into the pipe and continuously records the internal conditions of the pipe (scaling, corrosion, deterioration, damage, etc.) on a VTR while conducting a detailed survey along the pipe line. In general, the images of the survey results are digitized and the system is capable of locating and photographing defective areas, making it possible to perform high-pressure cleaning and repairs along with the survey.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

2) Measures to maintain function

The measures shown in Table 20 should be taken to maintain the functionality of leachate collection facility.

Table 20 Measures to Maintain Leachate Collection Facility Functionality (Example)

Counter-measure	Contents
Establishment of landfill work regulations	Until the thickness of the landfill waste layer is sufficiently thick, operating precautions and work practices should be established because of the possibility of pipe breakage by the landfill equipment.
Training of operators of landfill equipment, etc.	Since many cases of damage to facilities are caused by landfill equipment, training should be provided for operators of landfill equipment.

Counter-measure	Contents
Clarify reclamation methods and inform workers	It is best to avoid burying sludge and other materials with poor permeability around the collection and drainage pipes. In the case of compartmentalized reclamation, if reclamation is carried out without a good understanding of the sequence or concept of partial jointing or switching of leachate and groundwater collection and drainage facilities, leachate may flow into the groundwater collection and drainage facilities, leading to an unexpected accident. To avoid such mistakes, reclamation methods should be well defined and workers should be made aware of them through posters or other means when necessary.
Study of the impact on the facility in the event of a change in reclamation method	It is important to note that any significant change in reclamation methods may change the loads applied to the collection pipes and collection pits.
Study of the impact on facilities in the event of a change in the physical properties of the waste delivered to the facility.	Some leachate properties may affect the materials used in leachate collection and drainage facilities, so when the properties of landfill waste change, leaching tests should be conducted and reviewed.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.3.7 Management of Leachate Treatment Facility

The quality and quantity of leachate from landfill sites fluctuate depending on the properties of the landfill waste, the history of landfill cover, landfill methods, weather conditions, and other factors. It is necessary to inspect, repair, and replace each facility to ensure long-term stable treatment of fluctuating water quality and quantity.

1) Inspection items

Leachate treatment facilities consist of civil structures, mechanical and electrical equipment, and buildings, with the mainstay of management being the mechanical and electrical equipment. Since this facility operates daily, it is important to confirm normality through daily and periodic step-by-step inspections and to take preliminary measures against abnormalities, such as repairing or replacing the equipment in advance.

In principle, daily inspection items should be performed once/day and periodic inspection items once/week to once/month. For details, refer to the "instruction manual" or other manuals prepared by each facility.

2) Annual inspection and major repair plan

Annual inspections should be conducted not only to take preliminary measures against abnormalities, such as repairing or replacing equipment, but also to develop repair plans for each facility. Since the implementation includes items that require shutdown of the facility, it is preferable to conduct it during the drought season.

Annual inspections of plant facilities include overhauling and replacing consumable parts for pumps, blowers, agitators, and dehydrators, cleaning and inspecting water tanks, inspecting instruments by the manufacturer, and checking electrical panels and electrical equipment. Annual inspections in building facilities include inspections of storm drainage systems and septic tanks. As reclamation progresses, the quality of leachate changes and treatment facilities and methods need to be reconstructed. A plan for major repairs is recommended approximately every 10 years to update and improve the equipment to match leachate quality and anticipated future conditions, with the goal of efficient and stable operation. In particular, the required capacity of chemical injection equipment and aeration airflow for biological treatment should be considered and planned so that there are no excesses or deficiencies. In addition, when updating or remodeling, running costs can be reduced by using inverters for aeration blowers and treatment facilities that match the water quality.

3) Management of water treatment facility structures

Since water treatment facility structures preserve and protect leachate treatment facilities, it is important to confirm normality and take preliminary measures against abnormalities, such as making repairs in advance, through step-by-step inspections on a daily and periodic basis. The proposed inspection items for water treatment facility structures are shown in Table 21.

Table 21 Proposed Inspection Items for Water Treatment Facility Structures

Item	Inspection Method	Inspection Frequency
Confirmation of exterior wall damage	Visual inspection, etc.	once/month
Check for damage to fittings	〃	once/month
Check for roof damage		once/month
Confirmation of floor damage		once/month
Confirmation of interior wall damage		once/month
Confirmation of ceiling surface damage		once/month
RC Crack occurrence		once/month
Manhole cover opening/closing inspection		once/week
Confirmation of damage to the dike		once/week
Check for damage to the oil-proof housing		once/month
Check for damage to exterior structures		once/month
Septic Tank Inspection		once/year
Check the gutters in the facility		once/month
Check fences, gates, and plantings		once/month
Check storm water drainage system		once/ 3 months
Inspection of firefighting equipment	As required by the Fire Service Act	once/year
Inspection of water supply and drainage facilities	According to statutory inspection regulations	

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

4) Response to fluctuating water quantity and quality in order to maintain functionality

For stable leachate treatment, it is necessary to organize leachate raw water inflow and water quality data, predict changes due to precipitation and reclamation timing in advance, and systematically take the actions stated in Table 22.

Table 22 Response to Fluctuating Water Quantity and Quality

Responding to Fluctuations in Water Volume
Although leachate volume fluctuates with precipitation, the treatment capacity of leachate treatment facilities is limited. For stable operation of leachate treatment facilities throughout the year, it is necessary to maximize the function of leachate conditioning facilities. • Reduction of water storage in leachate control facilities and periodic removal of sediments prior to rainy and typhoon seasons. • During periods of drought, the volume of treated water is reduced to satisfy the minimum storage volume. • Since the capacity of the leachate treatment facility is usually set at the maximum reclamation time during the reclamation period, it is advisable to assume the leachate volume by period during the reclamation period so that the actual leachate volume can always be compared with the actual leachate volume.
Responding to Fluctuations in Water Quality
[Fluctuation over time] As shown in Figure 39, the concentration is generally high in the initial stage of reclamation, but decreases over time. **Early stage of reclamation** • Because silt content and sediment in the landfill may flow in abnormally, leachate intake facilities and leachate adjustment facilities should be properly drained. • Since the concentration of organic matter may be high, water quality analysis (BOD, etc.) of the leachate should be performed and the appropriate amount of oxygen should be supplied to the biological treatment process.

- Due to the high concentration of organic matter, facilities to prevent decomposition and air agitation should be considered in leachate conditioning facilities.
- Since there are more biodegradable materials in during the landfill life than at the end, and the biological treatment process is the main part of the treatment, this should be kept in mind for maintenance and management purposes.

Middle to end of reclamation

- For water quality that is difficult to treat with biological treatment in the later stages of reclamation, it is important to address the maintenance aspect, such as using low-load biological treatment or bypassing the switch to physic-chemical treatment-driven operation.
- The concentration of suspended solids in leachate is relatively stable but the amount of biologically persistent substances increases, so the coagulation conditions of the coagulation sedimentation process should be optimized.
- Properly managed excess sludge withdrawal from sedimentation tanks and sludge withdrawal from sludge thickening tanks, and perform appropriate air agitation, etc. to prevent decomposition in sludge storage tanks.

[Fluctuation due to wet and dry seasons]

When water is temporarily stored in a landfill due to heavy rainfall, etc., organic acids are generated in the leachate due to anaerobic conversion and the concentrations of BOD, COD, T-N, etc., increase, resulting in deterioration of the water quality. In the event of water retention, the amount of water treated in water treatment should be increased to the extent possible to quickly eliminate the retention. In particular, since COD removal may become difficult due to decay, the amount of oxygen supplied to biological treatment should be increased and the amount of chemicals used in coagulation sedimentation should be adjusted, depending on the situation.

Dry season

- Implement measures in conjunction with various biological treatment methods to prevent excessive oxygen supply.
- When the system is operated with the number of series corresponding to the amount of water to be treated, the sewage is cleaned in the stopped series.
- Depending on the duration and extent of the drought, efforts should be made to maintain microorganisms in the tank by circulating biologically treated water and adding nutrients as necessary.

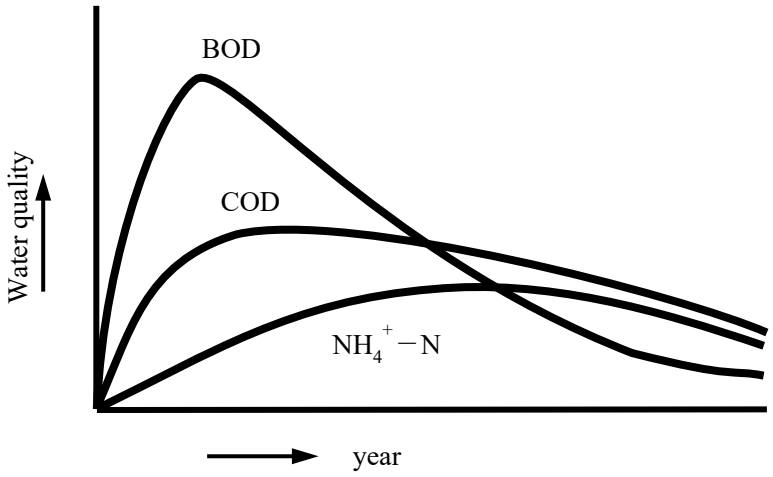
Rainy season

- Adjustment of in-landfill storage and leachate adjustment facilities should be implemented in advance to maximize the flow control function.
- Implement measures in accordance with various biological treatment methods to prevent oxygen supply from becoming insufficient.
- Since the amount of chemicals to be injected increases, the amount of chemicals, etc., is inspected and the necessary storage volume is secured.

Times of heavy rain

- Consider in advance methods of countermeasures against heavy rainfall, such as controlling inflow water volume by adjusting or blocking inflow section flow gates, returning leachate to the landfill, and taking measures to prevent rainwater from entering the landfill.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]



Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

Figure 38 BOD, COD, and NH4+－N in Leachate

3.3.8 Management of Landfill Gas Treatment Facility

If a malfunction occurs in a landfill gas treatment facility and its function is disrupted, the air supply to the landfill site will be lost, which will affect the stabilization of the landfill materials. In order to maintain the functionality and prevent damage, proper attention should be given to the landfill operation management so as not to cause damage or clogging.

1) Inspection items

Visually inspect any exposed areas of the landfill gas treatment facility. If the landfill has been closed and the deformation of the gas venting facility cannot be visually observed directly, a comprehensive judgment should be made based on the amount and properties of the landfill gas generated. The proposed daily inspection items for the landfill gas treatment facility are shown in Table 23. The same items should also be inspected during abnormal events such as heavy rain and earthquakes.

Since it is not possible to visually check the gas venting facilities in the landfill layer, the presence or absence of damage to the landfill gas treatment facility is determined from the data of the measurement results performed in Section 3.4.5. Note that landfill gas is affected by weather and atmospheric pressure, and thus fluctuates widely.

Table 23 Proposed Inspection Items for Landfill Gas Treatment Facility

Checklist		Inspection Method	Inspection Frequency
Exposed areas	Gas venting facilities around landfill operations	Visual	once/day
	Facilities away from the landfill work site	Portable Instrument Measurement	once/week
Gas venting facilities in reclaimed layers	Landfill gas temperature*.	Assaying	twice/year or more
	Amount of landfill gas (defined as the sum of methane and carbon dioxide gas volumes)*		
	Landfill gas composition*. (The following gas measurements can be used to determine the stabilization trend in the landfill and to examine the need for safety assurance in upper landfill use.) Gases produced mainly in aerobic conditions: carbon dioxide (CO2) Gases mainly generated under anaerobic conditions: methane (CH4), carbon dioxide (CO2), hydrogen sulfide (H2S), nitrogen		

Checklist		Inspection Method	Inspection Frequency
	(N2); gases generated under alkaline conditions: ammonia (NH3), hydrogen (H2) Other gases measured to ensure safety: Oxygen (O2)		

* Uses monitoring data.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

2) Repair of landfill gas treatment facility

If damage is found to an exposed landfill gas treatment facility, the area should be repaired as soon as possible. When the gas volume has decreased and the landfill gas treatment facility is no longer functioning, a new gas venting facility should be installed near the facility using a borehole or other means. In this case, care should be taken not to damage the other facilities such as liner facilities.

3.3.9 Management of Transport Control Facility

Since all incoming waste is weighed on truck scales, one truck scale must be kept in operation at all times. The proposed inspection items for the truck scale are shown in Table 24.

Table 24 Proposed Truck Scale Inspection Items

Checklist	Inspection Method	Inspection Frequency
Foreign objects entering the gap between the weighing platform and the pit perimeter	Seeing	Everyday
Weighing section operation	Operation test	
Computer operation		
Situation in the pit	Seeing	once/month

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.3.10 Management of Environmental Monitoring Facility

Monitoring facilities are used to ensure that each facility in a landfill site is maintained in proper condition. Therefore, it must be maintained to ensure that accurate values are measured at all times, since any malfunction of this facility could lead to misleading information about the safety of the landfill site. The proposed inspection items for the monitoring facility are shown in Table 25.

Table 25 Proposed Inspection Items for Monitoring Facility

Checklist	Inspection Method	Inspection Frequency
Water levels in groundwater monitoring wells	Confirmation by groundwater sampling	twice/year
Leachate flowmeter, conductivity meter, pH meter, etc.	Operation test	once/year
Rain gauges, evaporation gauges, anemometers, thermometers, etc.	Operation test	once/year

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.3.11 Management of Control Building

Maintenance inspections can be broadly classified into daily inspections, periodic inspections, and repair plans for roofs, exterior walls, etc. Table 26 shows typical inspection items, inspection methods, and inspection frequency for daily and periodic inspections.

Table 26 Example of Inspection Items for Control Building

Checklist	Inspection Category	Inspection Method	Inspection Frequency
Building (floors, walls, ceilings, fittings, etc.)	Daily Inspection	Seeing	once/week
Building (roof, exterior walls, etc.)	Daily Inspection	Seeing	once/year
Plumbing	Daily Inspection	Visual and operational status	once/month
Air conditioning equipment (filters, air conditioning drains, etc.)	Daily Inspection	Visual and operational status	once/month
Ventilation equipment	Daily Inspection	Visual and operational status	once/month
Lighting equipment	Daily Inspection	Visual and operational status	once/month
Firefighting equipment	Periodic inspection	-	twice/year
Machine security inspection (security company)	-	-	24-hour (e.g., observation, operation (of a machine), care (of patient)
Periodic building inspections	Periodic inspection	-	once/3 years
Periodic Inspection of Building Equipment	Periodic inspection	-	once/year

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.3.12 Management of Road Equipment

It is important that road equipment be inspected to ensure that vehicular traffic can pass unimpeded. The proposed inspection items for road equipment are shown in Table 27. If an abnormality is found in any of the inspection items listed in Table 27, the cause of the abnormality should be investigated.

Table 27 Proposed Inspection Items for Road Equipment

Checklist	Inspection Method	Inspection Frequency
Damaged or not damaged pavement surface	Visual	once/week
Traffic obstruction due to fallen trees and sediment inflow		
Fallen objects from waste delivery vehicles		
Pollution of road surfaces due to lack of washing of delivery vehicles		

Source: Nippon Koei Co., Ltd. Based on “How to Prepare a Manual of Sanitary Landfill Guideline” [Translated from Japanese.]

3.3.13 Management of Car Wash Facility

Since car wash facilities are always necessary when accepting wastes, daily maintenance and inspections are important. Table 28 shows the proposed maintenance and inspection items for car wash facilities (pool type and high-pressure jet type).

Table 28 Proposed Maintenance and Inspection Items for Car Wash Facility

Maintenance and Inspection Items		Inspection Method	Inspection Frequency
Pool-style	Cleaning of bottom plate irregularities	Cleaning with brushes, etc.	once/month
	Valve open/close status	Seeing	once/month
	Damage to concrete structures	Seeing	once/month
	Damage to grating, etc.	Seeing	once/month
	Cleaning gutters, etc.	Removal of sediments	once/month

Maintenance and Inspection Items		Inspection Method	Inspection Frequency
	Clogged pipes, etc.	After cleaning of stored water	once/year
High-pressure injection type	Damage to concrete structures	Seeing	once/month
	Cleaning gutters, etc.	Removal of sediments	once/month
	High-pressure jet cleaners	Depends on the instruction manual	

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.3.14 Management of Littering Prevention Equipment

Table 29 shows examples of inspection items for litter control screen.

Table 29 Example of Inspection Items for Litter Control Screen

Checklist	Inspection Method	Inspection Frequency
Damaged or loose fencing	Seeing	once/week
Damage to columns		
Foundation Stability		
Adhesion of waste materials		

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.3.15 Management of Firefighting Equipment

Firefighting equipment must be maintained and inspected so that it can respond to a fire at any time. Table 30 shows the proposed maintenance and inspection items for firefighting equipment.

Table 30 Proposed Maintenance and Inspection Items for Firefighting Equipment

Maintenance and Inspection Items		Inspection Method	Inspection Frequency
Firewater Tank	Water level in water tank (leakage)	Seeing	once/month
	Clogged pipes, etc.	Seeing	once/month
	Operation of total water pumps, etc.	Operation test	once/month
	Maintenance of water pumps, etc.	Depends on the instruction manual	
	Cleaning of fire water tanks	After cleaning of stored water	once/year
	Cracks, lifting, and delamination of concrete surfaces in firewater tanks	Seeing	Check when cleaning the tank
Fire Hydrant	Water discharge status	Seeing	once/week
	Fire hydrant maintenance	Depends on the instruction manual	

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.4 Environmental Management

Regular measures and preventive measures should be taken to ensure that landfill waste, leachate, and landfill gases do not affect the surrounding environment. A conceptual diagram of environmental management is shown in Figure 40.

Source: Nippon Koei Co., Ltd.

Figure 39 Environmental Management

3.4.1 Leachate Management

Water quantity and quality of leachate fluctuate widely, and it is important to measure them in order to properly manage leachate treatment facilities. In addition, they must be fully understood because not only can they be used as useful data for future landfill site planning, but they are also important information for evaluating landfill site stabilization (deciding whether to abolish a landfill site) and preventing public waters.

1) Measuring point

As a rule, the leachate volume should be measured at the point of discharge from the landfill. Generally, only the treated water volume of leachate treatment facilities is measured in many cases but it is important to ascertain the leachate volume.

Since leachate is once stored in the leachate regulating equipment, it is necessary to measure leachate quality at both the point of discharge from the landfill and the point of inflow to the leachate treatment facility in order to manage the operation of the leachate treatment facility and to understand the status of stabilization within the landfill layer. In addition, by measuring the leachate level in the landfill, it is possible to estimate the amount of internal storage (amount of interstitial water in the landfill layer) to be temporarily performed in an emergency, which is effective in terms of understanding the amount of internal storage available and maintaining the leachate treatment facility.

2) Measurement items and frequency

Table 31 shows the proposed leachate measurement items. Meteorological data such as precipitation, wind direction, and wind velocity at the landfill site are also listed assuming that they are also measured. Other meteorological data include amount of evaporation and atmospheric temperature.

If there is a water collection pit in the landfill, the water level in the landfill can be easily and automatically measured by installing a flow gauge in the collection pit. If there is no water collection pit, a vertical gas venting system or other equipment installed in the landfill site can be used. If there is a pit for maintaining semi-aerobic conditions within the landfill layer or for inspecting leachate collection facilities, automatic measurement will be possible as in the case of a water collection pit, and will be effective from a maintenance and management perspective.

Although there are no measurement standards for water quality when the landfill is in service, it is necessary to comply with the same standards as for effluent when the landfill is decommissioned. Therefore, it is desirable that each water quality item be measured in a timely manner from the time of service considering the time of decommissioning. Examples of water quality items and measurement frequencies in Japan are shown in Table 32.

Table 31 Examples of Leachate Measurement Items

Measurement Item	Measurement Method	Frequency
Precipitation, wind direction, and speed	Automatic measurement	24-hour (e.g., observation, operation (of a machine), care (of patient))
Leachate	Automatic measurement	24-hour (e.g., observation, operation (of a machine), care (of patient))
Leachate level in landfill (Upper row for automatic measurement, lower row for manual water level measurement)	Automatic measurement	24-hour (e.g., observation, operation (of a machine), care (of patient)
	Water Level Measurement	Approx. once/week
Water quality	-	See Table 32.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

Table 32 Examples of Leachate Quality Items in Japan

Item	Frequency
Alkyl mercury compounds	More than once/year
Mercury and alkylmercury, other mercury compounds	More than once/year
Cadmium and its compounds	More than once/year
Lead and its compounds	More than once/year
Organophosphorous compound	More than once/year
Hexavalent chromium compounds	More than once/year
Arsenic and its compounds	More than once/year
Cyanide	More than once/year
PCB	More than once/year
Trichloroethylene	More than once/year
Tetrachloroethylene	More than once/year
Dichloromethane	More than once/year
Carbon tetrachloride (CCl4)	More than once/year
1,2-Dichloroethane	More than once/year
1,1-Dichloroethylene	More than once/year
Cis-1,2-dichloroethylene	More than once/year
1,1,1-Trichloroethane	More than once/year
1,1,2-Trichloroethane	More than once/year
1,3-Dichloropropene	More than once/year
Thiuram	More than once/year
Shimadin	More than once/year
Thiobencarb	More than once/year
Benzene	More than once/year
Selenium and its compounds	More than once/year
Boron and its compounds	More than once/year
Fluorine and its compounds	More than once/year
Ammonia, ammonium compounds, nitrous acid compounds and nitric acid compounds	More than once/year
pH (measure of acidity)	More than once/day

Item	Frequency
Bandwidth-on-demand	once/week or more
COD	once/week or more
SS	More than once/month
Normal hexane extract (mineral oils)	More than once/year
Normal hexane extract (animal and vegetable oils and fats)	More than once/year
Phenol content	More than once/year
Copper content	More than once/year
Zinc content	More than once/year
Soluble iron content	More than once/year
Soluble manganese content	More than once/year
Chromium content	More than once/year
Coliform population	More than once/year
Nitrogen content	More than once/month
Phosphorus content	More than once/year
Dioxins	More than once/year
Nitrate-nitrogen	More than once/month
Nitrous nitrite	More than once/month
Ammonia nitrogen	More than once/month

Source: Nippon Koei Co., Ltd. based on “Manual for Maintenance and Management of Industrial Waste Landfill Sites” [Translated from Japanese.]

3.4.2 Effluent Management

In order to properly manage leachate treatment facilities so as not to pollute public waters, it is important to know the quantity and quality of water discharged from leachate treatment facilities.

1) Measuring point

The measurement point shall be the point of discharge from the leachate treatment facility.

2) Measurement items and frequency

Table 33 shows the proposed measurement items for the effluent. The measurement items of the effluent are the same as that of leachate but the effluent standards must be observed. An example of effluent standards in Japan is shown in Table 34.

Table 33 Proposed Measurement Items for Effluent

Measurement Term	Measurement Method	Frequency
Effluent	Automatic measurement	24-hour (e.g., observation, operation (of a machine), care (of patient)
Effluent water quality (see Table 34 for items)	-	See Table 34.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

Table 34 Examples of Japanese Standards for Water Quality Items in Effluent

Item	Effluent Standard (mg/L)	Frequency
Alkyl mercury compounds	Not detected	More than once/year
Mercury and alkylmercury, other mercury compounds	0.005	More than once/year

Item	Effluent Standard (mg/L)	Frequency
Cadmium and its compounds	0.1	More than once/year
Lead and its compounds	0.1	More than once/year
Organophosphorous compound	1	More than once/year
Hexavalent chromium compounds	0.5	More than once/year
Arsenic and its compounds	0.1	More than once/year
Cyanide	1	More than once/year
PCB	0.003	More than once/year
Trichloroethylene	0.3	More than once/year
Tetrachloroethylene	0.1	More than once/year
Dichloromethane	0.2	More than once/year
Carbon tetrachloride (CCl4)	0.02	More than once/year
1,2-Dichloroethane	0.04	More than once/year
1,1-Dichloroethylene	0.2	More than once/year
Cis-1,2-dichloroethylene	0.4	More than once/year
1,1,1-Trichloroethane	3	More than once/year
1,1,2-Trichloroethane	0.06	More than once/year
1,3-Dichloropropene	0.02	More than once/year
Thiuram	0.06	More than once/year
Shimadin	0.03	More than once/year
Thiobencarb	0.2	More than once/year
Benzene	0.1	More than once/year
Selenium and its compounds	0.1	More than once/year
Boron and its compounds	50	More than once/year
Fluorine and its compounds	15	More than once/year
Ammonia, ammonium compounds, nitrous acid compounds and nitric acid compounds	200	More than once/year
pH (measure of acidity)	5.8~8.6	More than once/day
Bandwidth-on-demand	60	once/week or more

Item	Effluent Standard (mg/L)	Frequency
COD	90	once/week or more
SS	60	More than once/month
Normal hexane extract (mineral oils)	5	More than once/year
Normal hexane extract (animal and vegetable oils and fats)	30	More than once/year
Phenol content	5	More than once/year
Copper content	3	More than once/year
Zinc content	2	More than once/year
Soluble iron content	10	More than once/year
Soluble manganese content	10	More than once/year
Chromium content	2	More than once/year
Coliform population	3,000 per day	More than once/year
Nitrogen content	120 (60 days)	More than once/month
Phosphorus content	16 (8 days)	More than once/year
Dioxins	10 pg-TEQ/1	More than once/year
Nitrate-nitrogen	-	More than once/month
Nitrous nitrite	-	More than once/month
Ammonia nitrogen	-	More than once/month

Source: Nippon Koei Co., Ltd. based on "Manual for Maintenance and Management of Industrial Waste Landfill Sites" [Translated from Japanese.]

3.4.3 Management of Dewatered Sludge

Dewatered sludge generated from leachate treatment facilities should be monitored to determine its impact on leachate quality and landfill operations.

1) Measuring point

The measurement point shall be within the leachate treatment facility.

2) Measurement items and frequency

Table 35 shows the proposed measurement items for dewatered sludge. Table 36 shows an example of leaching test items and standards in Japan. If calcium and chloride ions in the leachate are at high concentrations, they should also be measured.

Table 35 Proposed Measurement Items for Dewatered Sludge

Measurement Item	Frequency	Remarks
Moisture content	4 times/year or more	Less than 85%
Dissolution test	More than once/year	See Table 36 for examples of inspection items and criteria.

Source: Nippon Koei Co., Ltd. based on "Manual for Maintenance and Management of Industrial Waste Landfill Sites" [Translated from Japanese.]

Table 36 Examples of Leaching Test Items and Standards for Dewatered Sludge in Japan

Item	Standard (mg/L)
Alkyl mercury compounds	Not detected
Mercury and mercury compounds	0.005
Cadmium and its compounds	0.1
Lead and its compounds	0.1
Organophosphorous compound	1
Hexavalent chromium compounds	0.5
Arsenic and its compounds	0.1
Cyanide	1
PCB	0.003
Trichloroethylene	0.3
Tetrachloroethylene	0.1
Dichloromethane	0.2
Carbon tetrachloride (CCl4)	0.02
1,2-Dichloroethane	0.04
1,1-Dichloroethylene	0.2
Cis-1,2-dichloroethylene	0.4
1,1,1-Trichloroethane	3
1,1,2-Trichloroethane	0.06
1,3-Dichloropropene	0.02
Thiuram	0.06
Shimadin	0.03
Thiobencarb	0.2
Benzene	0.1
Selenium and its compounds	0.3
1,4-Dioxane	0.5
Dioxins	3 ng/g

Source: "Ministerial Ordinance to Prescribe the Judgment Criteria for Industrial Waste Containing Metals", February 17, 1973, General Ordinance No. 5, last revised December 15, 2006, KANREI Ordinance No. 36, 25 items in Appendix 1.

3.4.4 Groundwater Management

In order to monitor the integrity of the liner facility, it is important to know the water level and quality of the surrounding groundwater.

1) Measuring point

- Groundwater monitoring wells At least 2 locations
- Groundwater collection and drainage pipes, pits, etc. At least 1 location
- Other nearby wells, etc. As appropriate

2) Measurement items and frequency

Table 37 shows the proposed groundwater parameters to be measured. Generally, the water quality should be tested at two or more observation wells or underground water drainage facilities. However, if groundwater flow direction is judged to be difficult to determine or if seasonal variations in groundwater flow direction are significant, it is recommended that three or more groundwater observation wells be installed. In groundwater monitoring wells, it is desirable to measure not only groundwater quality but also

groundwater levels on a regular basis. Table 38 is a Japanese example of an environmental standard for groundwater quality.

For chloride ions or electrical conductivity, automatic measurement should be performed at one or more locations, such as groundwater collection and drainage pits, since continuous measurement is required once a month.

In addition, in order to investigate the cause of a substance exceeding the standard value, it is necessary to evaluate the quality of the groundwater in comparison with the leachate raw water quality. Therefore, when analyzing the water quality of the marginal groundwater observation wells, the leachate raw water should be analyzed for the same items as in the marginal groundwater observation wells at the same time. When abnormalities are found in the items that are measured monthly, it is necessary to measure the groundwater and other inspection items immediately.

Table 37 Proposed Groundwater Measurements

Measurement Item		Measurement Method	Frequency
Groundwater level		Water Level Measurement	4 times/year or more
Groundwater quality of groundwater monitoring wells, groundwater collection and drainage pits, etc.	pH, EC (upper row for automatic measurement, for water sampling) (Lower row for measurement by)	Automatic measurement	24-hour (e.g., observation, operation (of a machine), care (of patient)
		Water sampling measurement	More than once/month
	Cl^-,BOD, COD, SS, coliform count	Water sampling measurement	More than once/month Once/month or more
	Other water quality parameters (see Table 38)	Water sampling measurement	More than once/year
Other groundwater quality such as surrounding wells	Cl^-	Water sampling measurement	As necessary
	Other water quality parameters (see Table 38)		

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

Table 38 Examples of Groundwater Quality Items Measured and Environmental Standards in Japan

Item	Standard
Alkyl mercury	Not detected
Total mercury	0.0005 mg/L or less
Cadmium (Cd)	0.003 mg/L or less
Lead (the metal)	0.01 mg/L or less
Hexavalent chromium	0.05 mg/L or less
Arsenic (As)	0.01 mg/L or less
Total cyanide	Not detected
Polychlorinated biphenyl	Not detected
Trichloroethylene	0.01 mg/L or less
Tetrachloroethylene	0.01 mg/L or less
Dichloromethane	0.02 mg/L or less
Carbon tetrachloride (CCl4)	0.002 mg/L or less
1,2-Dichloroethane	0.004 mg/L or less
1,1-Dichloroethylene	0.1 mg/L or less
1,2-Dichloroethylene	0.04 mg/L or less
1,1,1-Trichloroethane	1 mg/L or less

1,1,2-Trichloroethane	0.006 mg/L or less
Thiuram	0.006 mg/L or less
Shimadin	0.003 mg/L or less
Thiobencarb	0.02 mg/L or less
Benzene	0.01 mg/L or less
Selenium (Se)	0.01 mg/L or less
1,4-Dioxane	0.05 mg/L or less
Vinyl chloride	0.002 mg/L or less
Nitrate nitrogen and nitrite nitrogen	10mg/L or less
Fluorine (F)	0.8 mg/L or less
Abundance of elements	1 mg/L or less

Source: Ministry of Environment in Japan, "Environmental Quality Standards for Groundwater Pollution"

3.4.5 Landfill Gas Management

Landfill gas is an indicator of landfill waste stabilization. It is important to measure landfill gas volume and landfill gas composition to determine the stabilization status within the landfill.

1) Measuring point

The points to be measured are vertical venting facilities, slope venting facilities, and gas vent pipes not connected to leachate collection facilities in the landfill site. The gas vent pipes that are not connected to leachate collection facilities include an additional gas vent pipe covering the bottom to the surface and a gas vent pipe covering the area under the cover soil. The former is installed additionally when vertical gas venting facilities are not installed at least once per 2,000 to 3,000 m^2 or when there is a possibility that gas is being generated from the landfill due to plant mortality or visual observation of gas generation above the landfill. The latter should be installed primarily to determine methane gas composition.

2) Measurement items and frequency

The proposed landfill gas measurement items are shown in Table 39. The volume of landfill gas is defined as the total volume of methane gas and carbon dioxide gas.

Table 39 Proposed Landfill Gas Measurement Items

Measurement item	Frequency	
	Obsolescent Criterion at the Time of Judgment (Judgement)	Others
Gas temperature (temperature in waste layer, varies with depth of landfill)	Once/ more than 3 months	Twice/year or more
Amount of landfill gas generated (total amount of methane gas (CH4) and carbon dioxide (CO2))	Once / more than 3 months	Twice/year or more
Landfill gas composition (methane (CH4), carbon dioxide (CO2), oxygen (O2), nitrogen (N2)) and other toxic gases (ammonia (NH3), hydrogen sulfide (H2S), hydrogen (H2))	Once / more than 3 months	Twice/year or more

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.4.6 Surrounding Environment Monitoring

To ensure that the landfill site does not impact public waters, the impact of the landfill site on the water quality of the rivers and other public waters to which it discharges should be measured and monitored on a regular basis.

1) Measuring point

The measurement points shall be the discharge points of public water bodies in close proximity to the landfill site and in the case of agricultural or other water diversions, the points of water diversion in close proximity to the landfill site.

2) Measurement items and frequency

Table 40 shows the proposed measurement items for public waters. The items to be measured at least once a month are the same as those for effluent and may be omitted if they can be substituted for effluent.

Table 40 Proposed Measurements for Public Waters

Measurement Item		Frequency
River water	pH, BOD, COD, SS, T-N, Ca2+, Cl-, etc.	More than once/month
	Environmental standard items related to water pollution, etc.	More than once/year

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.4.7 Odor

If there is a risk that odors emitted from the landfill site may affect residents and others in the vicinity, the site should be regularly measured and monitored. Preventive measures should be taken as necessary.

1) Measuring point

At least one site boundary of the landfill site.

2) Measurement items and frequency

Table 41 shows the proposed items to be measured for odor. Odor measurements should be conducted once or twice a year for odor index and odorant concentration and possibly at three locations: the landfill operation site, the downwind site boundary, and the upwind site boundary, so that the diffusion of the odor can be monitored.

Table 41 Suggested Items to Measure for Odors

Measurement Item	Frequency
Odor 22 Substances (written parameters), odor index	1-2 times/year

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.4.8 Sediment

Depending on the location of the landfill site, it may be necessary to periodically measure and monitor the bottom sediment and soil to ensure that effluent, scattering of waste and cover soil due to landfill operations, etc., do not contaminate the bottom sediment of rivers and other downstream areas or the soil around the landfill site.

1) Measuring point

At least one leachate effluent point and one location around the landfill site.

2) Measurement items and frequency

Proposed measurement items for deposit and soil are shown in Table 42. Although it is often not necessary to measure these items as general monitoring items, it is desirable to measure and monitor bottom sediment and soil on a regular basis, depending on the location conditions of the landfill site, such as water use in the downstream area, land use, shape of the landfill site, and surrounding topography.

Table 42 Proposed Items to Be Measured for Deposit and Soil

Measurement Item		Frequency
Sediment	Soil Environmental Standards (27 items) (written parameters), dioxins, pH, Cl-.	Once/year

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.4.9 Noise and Vibration

Noise and vibration are caused by the operation of heavy machinery during landfill operations, the operation of leachate treatment facilities, and the driving of waste transport vehicles. If there is a possibility that noise and vibration from such a landfill site could affect residents in the vicinity, the noise and vibration should be measured and monitored regularly, and preventive measures should be taken if necessary.

1) Measuring point

- Noise and vibration from machine operation: one location near private residences
- Road traffic noise/vibration: one location near a private residence along the approach road

Noise and vibration from machine operation shall be subject to measurement when private residences are located near the landfill site where noise and vibration are expected to change to a significant degree. Waste transport vehicles shall be subject to measurement when there are private residences along an approach road where the traffic volume is expected to change to a considerable degree.

2) Measurement items and frequency

Table 43 shows the proposed measurement items for noise and vibration. While the landfill site is in service, operational noise and vibration from heavy machinery during landfill operations and road noise and vibration from vehicles carrying waste and soil cover may be considered to have an impact on the surrounding area. In addition, noise and vibration from leachate treatment facilities may be considered to have an impact even after closure.

Therefore, if necessary, the noise and vibration generated from the landfill site should be regularly measured and monitored to determine whether they are affecting residents in the surrounding area, and countermeasures should be implemented if necessary.

Table 43 Proposed Noise and Vibration Measurement Items

Measurement Item		Frequency
Noise, Vibration	Machine operating noise and vibration	Once/year
	Road traffic noise and vibration	Once/year

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.4.10 Air Pollution

With regard to air quality, the impact of dust scattering such as cover soil and waste materials from landfill operations is a concern. If there is a risk that the air from landfill sites may affect residents in the vicinity, etc., measurement and monitoring should be conducted periodically, and preventive measures should be taken if necessary.

1) Measuring point

- Downstream of landfill: one location

2) Measurement items and frequency

Proposed air quality measurement items are shown in Table 44. While the landfill site is in service, there may be a possibility that the dispersal of dust originating from the soil cover and waste during landfill operations may affect the surrounding area. Although it is often not necessary as a general monitoring item, it is desirable to measure and monitor air quality on a regular basis, depending on the location conditions of the landfill site, such as the shape of the landfill site and the surrounding topography. In addition, depending on the surrounding environment, it may be necessary to consider periodic measurement and monitoring of air quality environmental standard items as well.

Table 44 Proposed Air Quality Measurements

Measurement Item	Frequency
Dust	Once/year

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.4.11 Natural Environment

The preservation of the natural environment, including flora and fauna, in the vicinity of the landfill site is as important as the preservation of the living environment. Therefore, it is desirable to monitor the natural environment periodically as necessary, depending on the status of the surrounding environment. It is also desirable to plan for the future use of the site, taking the surrounding natural environment into consideration. Examples of monitoring are shown below.

1) Animal

Surveys should be conducted annually from the start of the service, and the results should be compiled every 5 years to study the impacts. The survey should be categorized into birds (raptors), birds (other than raptors), amphibians/reptiles, insects, fish, mammals, etc. The species to be conserved should be determined by their growth, reproduction status, and status at alternative sites.

Frequency: Fixed-point surveys should be conducted when the breeding status can be confirmed and habitat conditions can be checked.

2) Plant

Surveys should be conducted annually from the start of use, and the results should be compiled every 5 years to study the impacts. For plants, the population and growth of transplanted species and species to be conserved, such as rare species, should be confirmed.

Frequency: Conducted at a time when the growth of each surveyed species can be confirmed.

3) Scenery

Changes in the landscape around the landfill site should be identified. View landscaping and other activities should be conducted in a timely manner.

3.4.12 Summary of Monitoring Plan

If a list and floor plan of the monitoring plan are prepared, including the results of the monitoring including the transported waste, all the monitoring plans can be understood at a glance. If the measurement results are also organized in the list, they will be useful for maintenance and management. It is also desirable to describe the various standards in an organized manner. An example of a monitoring plan is shown in Table 45.

Table 45 Example Environmental Monitoring Plan

Classification.	Contents	Item	Frequency
Incoming litter	Incoming litter	Physical composition (directly delivered household and commercial noncombustible waste)	More than once/year
In a reclaimed area	Weather	Rainfall, wind direction and speed	Automatic measurement
	Water level in landfill	Installation of water level gauge	Automatic measurement
	Leachate	Flow meter installation	Automatic measurement
	Landfill gas volume	Total amount of methane gas and carbon dioxide gas part	Twice/year or more
	Landfill gas composition	CH4, CO, CO2, N2, O2, NH3, H2S ○○ place	Twice/year or more
	Landfill gas temperature	Temperature in waste layer part	Twice/year or more

Classification.	Contents	Item	Frequency
	Settlement of waste landfill layer	Settlement meter installed part	More than once/year
Leachate treatment facility	Effluent	Flow meter installation	Automatic measurement
	Dehydrated sludge	Moisture content	4 times/year or more
		Dissolution test (dissolution standard test items, Ca2+, CL-, etc.)	More than once/year
Water quality	Leachate (raw water), effluent	pH, BOD, COD, SS, T-N, Ca2+, CL-, etc. Items other than the above such as effluent standards, dioxins, etc.	More than once/month More than once/year
	Groundwater (groundwater monitoring wells, groundwater collection and drainage pits, etc.)	pH, EC Cl-, BOD, COD, SS, coliform count Groundwater environmental standard items (28 items), dioxins, etc.	Automatic measurement More than once/month More than once/year
	Groundwater (other surrounding areas) (e.g., wells)	CL-, Environmental standard items related to water pollution of groundwater (26 items), dioxins and other necessary items	As necessary
	River water River water	pH, BOD, COD, SS, T-N, Ca2+, CL-, etc. Environmental standard items related to water pollution, etc.	More than once/month More than once/year
	River water (agricultural water)	pH, BOD, COD, SS, T-N, Ca2+, CL-, etc. Agricultural water standard items, including	More than once/month More than once/year
Underground water	Groundwater level	At least 2 groundwater monitoring wells One or more groundwater collection/drainage pits, etc. Other nearby wells, etc. Required locations	4 times/year or more
Odor	Landfill site boundary boundary More than 1 location	Odor 22 Substances, Odor Index	1-2 times/year
Sediment	Treated leachate inflow Location At least 1 location	Soil environmental standards (27 items), dioxins, pH, CL-.	Once/year
Soil	Landfill site area At least 1 location	Soil environmental standards (27 items), dioxins, pH, CL-.	Once/year
Noise and Vibration	Machine operation noise and vibration Road traffic noise and vibration	Nearby People's House 1 location Near private residences along the delivery road 1 location	Once/year
Disposition (in airs) to be magnanimous	Downstream of reclaimed land 1 location	Dust	Once/year

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.4.13 Vector Control

Sanitary insect pests that may be a problem at the landfill sites include crows, flies, and rats. However, crows fly in for the small amount of food attached to containers and other objects. Daily cover is an easy and

effective method of preventing crows from flying over. Cover soil is an effective measure to prevent not only crows but also flies, rats, etc.

Therefore, after spreading the wastes, soil covering should be done immediately to shorten the exposure time of the wastes as much as possible to prevent the outbreak of sanitary insect pests. If they do occur, they should be promptly exterminated by spraying insecticides or rodenticides.

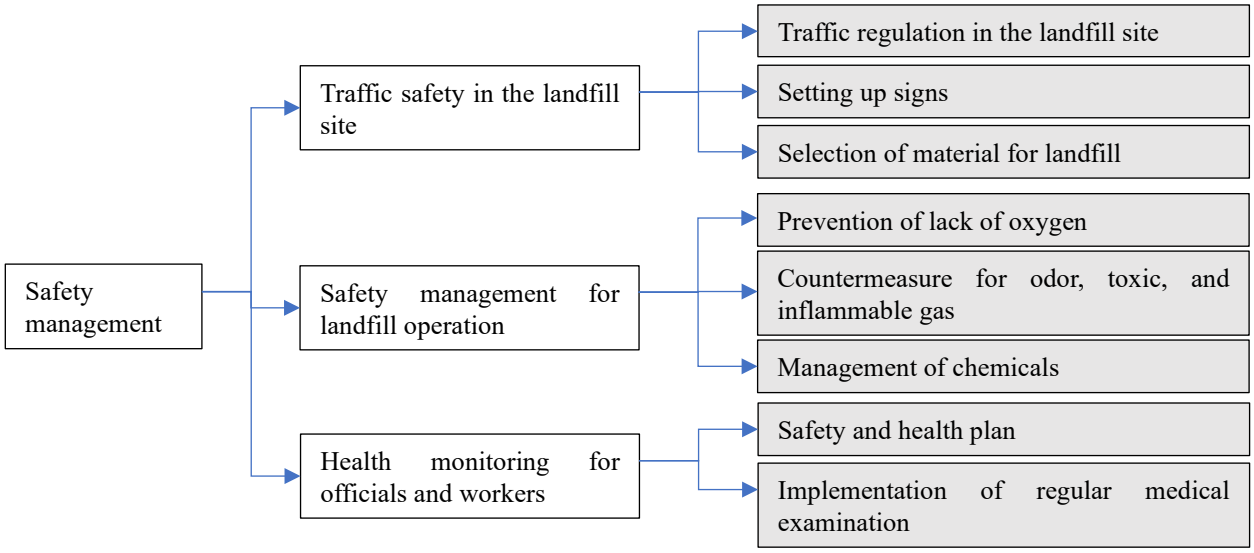
3.4.14 Prevention of Waste Scattering

The causes of scattering of wastes can be broadly classified into two categories: wind and sanitary insect pests such as crows. Therefore, it is desirable to cover the soil promptly to prevent scattering by wind. Since prompt implementation of the daily cover is also effective as a measure against sanitary insect pests, it is desirable to implement it not only at the end of a day's work, but also before breaks and other times during the work hours.

In addition, to monitor the occurrence of scattering, the wind velocity is monitored using an anemometer, and patrols are conducted once a day, in principle, and if scattering of waste is detected, measures such as water spraying are promptly taken.

3.5 Safety Management

Safety management associated with landfill operations includes prevention of traffic accidents on site, prevention of accidents during landfill operations, and safety and health management of workers. Safety management related to landfill operations can be categorized as shown in Figure 41. In addition, measures should be taken in the event of an accident.



Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

Figure 40 Safety Management Classification

3.5.1 Traffic Safety Management in the Landfill Site

In passing through the landfill site, traffic regulations and speed limits must be set to prevent vehicle accidents, and landfill workers and outside haulers must be made aware of these regulations.

1) Traffic rules in the landfill site

The following items shall be taken into consideration when regulating traffic within the site:

- Restrictions on roads other than entry/exit routes, designation of one-way streets, and other regulations as necessary to ensure the smooth passage of waste delivery vehicles, etc.
- To ensure the safety of workers, crosswalks, etc., are provided and road crossings are restricted.

In addition, the following speeds should be used as a guide for in-place speeds, depending on the type of road:

- Loading road: 20 to 40 km/h approx.
- Controlled roads: 20 to 30 km/h approx.
- On-site roads: 20-30 km/h approx.

2) Installation of signs

Signs, which include guide signs, warning signs, and regulatory signs (Table 46), should be installed as needed.

Table 46 Sign Types

Item	Contents
Guide sign	• Type: entrance and exit instructions, direction, direction and distance, landfill site guidance, etc. • Installation position: At a height high enough to be recognized from the driver's seat. • Installation location: The location must be easy to see, with reference to signs on public roads, etc., and allow enough time and distance to move into action.

Item	Contents
Warning sign	• Type: Intersection sign. • Location: Follow the signage. • Location: Same as above.
Regulation sign	• Type: Entry restrictions, one-way streets, speed limits, temporary stops, etc. • Location: Follow the signage. • Location: Same as above.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3.5.2 Safety Management of Landfill Operation

Proper prevention and safety measures should be taken for items that may affect the health of workers in the landfill work process and for items related to ensuring worker safety.

1) Prevention of oxygen deprivation

The following measures should be taken to prevent acid deficiency accidents. In particular, since hydrogen sulfide may be generated in high concentrations in raw water pits, the measures shown in Table 47 should be taken when working in pits, and oxygen levels should be measured prior to starting work to confirm safety.

Table 47 Acid Prevention Measures

Counter-measure	Contents
Ventilation	Installation of ventilation and deodorization equipment, including ventilation and airflow in the pit
Measurement	Compliance with working environment measurement standards, carrying concentration detectors during maintenance and management
Protective gear	Wear protective equipment (e.g., oxygen mask)
Education	In order to ensure the use of protective equipment, etc., and to identify areas prone to oxygen deficiency, efforts should be made to understand past cases and areas structurally prone to oxygen deficiency.
Sign	Post safety signs and other reminders at hazardous locations

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

2) Countermeasures against odors, noxious and flammable gases

In landfill operations, check the waste materials before they are delivered to the landfill, and establish in advance the measures to be taken in case of fire and prevention of fire as shown in Table 48.

Table 48 Countermeasures for Odors, Noxious and Flammable Gases

Counter-measure	Contents
Detection of gas leak locations	For areas where gas leakage is likely to occur, gas measurements should be taken before work begins and records of past gas leakage locations should be collected to enable identification of gas leakage locations.
Disaster Preparedness	Install fire extinguishing equipment and establish a system for reporting and extinguishing fires.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

3) Handling of chemicals

Chemicals should be used with a thorough understanding of the characteristics of the chemicals used, and internal regulations regarding the handling of chemicals, including storage methods and locations, should be established and used. In addition, leachate treatment facilities should regularly keep a reserve of chemicals and parts used on a daily basis, so that they can respond appropriately at any time.

For chemicals, Safety Data Sheets (SDS) should be posted in easily visible locations around the chemical tanks. The hazards, toxicity, first aid measures in case of exposure or leakage, handling, storage, and disposal methods should be understood and confirmed. Also, be sure to wear protective equipment (protective glasses, protective gloves, etc.) when handling chemicals.

Standards for handling chemicals

- Storage location — Warehouse, chemical storage, etc.
- Person in charge of storage — (e.g., head of the office, section manager, etc.)
- Qualifications of responsible persons — Hazardous Materials Handling Manager, etc.
- Control of storage location — Locked at all times, etc.

Chemicals

Classify and control the types of chemicals according to their intended use.

- Water treatment chemicals — Coagulants, pH adjusters, etc.
- Sanitary pest control — Insecticides, fungicides, herbicides, etc.
- Landfill equipment maintenance supplies — Oil, gasoline, etc.
- Other — Other uses

3.5.3 Health Care of Staff and Workers

1) Health and safety plan

A health and safety plan shall be developed and implemented to cover the following:

- Safety Measures — Preventive measures should be taken in advance against possible disasters for each operation.
- Hygiene measures — Preventive measures against occupational diseases caused by work with hazardous gases, dust, and lack of oxygen
- Health and Safety Education — Training in the workplace and outside of the workplace
- Health Management — Health management: Periodic health checkups

3.5.4 Accident Response

In preparation for the unlikely event of an accident or natural disaster, the company will take preliminary measures such as the establishment of a communication system and periodic drills, etc., during normal times. In the event of an accident or natural disaster, the company will respond promptly and strive to prevent recurrence.

1) Countermeasures in advance

A communication system should be prepared to promptly and accurately communicate the details of accidents and disasters that have occurred. The prepared communication system should be posted at the Administration Building and the landfill worker's station. The three items that should be prepared and posted are: 1) an internal contact network, 2) emergency contact information (outside the company), and 3) reporting procedures. After an accident, it is important to minimize damage by implementing necessary first aid measures until firefighters and emergency services arrive. To ensure smooth implementation of first aid measures, it is important to conduct accident simulation drills during normal times. The following is a list of these drills as seen in Table 49:

Table 49 Contents of Preliminary Measures

Item	Contents
Internal communication network	Clarification of the chain of instructions (creation of a flow format) Clarification of roles and responsibilities (e.g., supervisor in charge of management, first-aid, investigation, liaison, firefighting, etc.) Clarification of responsibilities (multiple people in charge, order of responsibilities (regular, deputy))

Item	Contents
	(Determination of the) Multiple means of communication (TEL (in-house, home, mobile), fax, e-mail, etc.)
Emergency contacts outside the company (contact list created)	Licensing authority for the facility (prefecture, etc.) Police stations (in jurisdiction) Fire station (in jurisdiction) Labor Standards Inspection Offices (in jurisdiction) Emergency hospital (preferably a hospital accredited for occupational accidents) Electric power company Cooperating companies (water treatment plant manufacturers, etc.)
Reporting guidelines	The report should include the reporter, date and time of the incident, location of the incident, subject of the incident, cause of the incident, results of the incident, first aid measures, and request for instructions.
Conducting training	Information communication drills (drills using established communication protocols, reporting procedures, etc.) Lifesaving training (checking and training on lifesaving equipment, medical equipment, rescue methods, and cardiopulmonary resuscitation) Safety survey training (confirming the installation location and operation of holding equipment, gas detectors, etc.) Firefighting training (confirm location, quantity, expiration date, and operation of fire extinguishers and equipment)

Source: Nippon Koei Co., Ltd. based on "Manual for Maintenance and Management of Industrial Waste Final Disposal Sites" [Translated from Japanese.]

2) Response to outbreak

In the event of an accident, the incident shall be reported to internal and external agencies, and prompt and appropriate action shall be taken. In the event of a natural disaster (earthquake, windstorm, flood, etc.), the following points should be noted:

- Conduct emergency inspections of each facility.
- Make a decision as soon as possible on whether to continue delivery and notify the customer.
- Report abnormalities not only internally, but also externally as necessary (consider reporting to local residents as well as government agencies).

In the event of an accident, the cause of the accident shall be investigated and necessary measures are to be taken to prevent recurrence (Table 50).

Table 50 Measures to Prevent Recurrence

Item	Contents
Investigation of the cause of the problem	There are "direct causes" and "indirect causes" of accidents and both should be investigated. **immediate cause** The "behavior of the parties involved in the accident" and the "conditions at the site of the accident" are assumed to be involved. These patterns of occurrence are analyzed to identify indirect causes and prevent recurrence. **indirect cause** The investigation of the indirect cause of an accident is a time-consuming and labor-intensive process. In order to investigate indirect causes, it is necessary to interview the accident victims and workers about the details of the situation, and in addition, it is necessary to collect a wide range of opinions about the work environment, the working environment, the condition of the facility, and so on. In addition, it is also effective to seek opinions from experts, if necessary.
Improvements to prevent recurrence	The causes identified should be promptly eliminated or remedied. However, it may not be possible to improve the facility or work environment in a short period of time because it may be difficult to improve the facility quickly due to its functionality, or because it may take time to secure personnel. In such cases, the workers and management should consult with each other thoroughly and work as a team to improve the situation.

Item	Contents
	In addition, from the viewpoint of preventing recurrence, the details of past accidents and responses should be documented and disseminated at internal training sessions, etc.

Source: Nippon Koei Co., Ltd. based on "Manual for Maintenance and Management of Industrial Waste Final Disposal Sites" [Translated from Japanese]

4. SITE MANAGEMENT AFTER LANDFILL COMPLETION

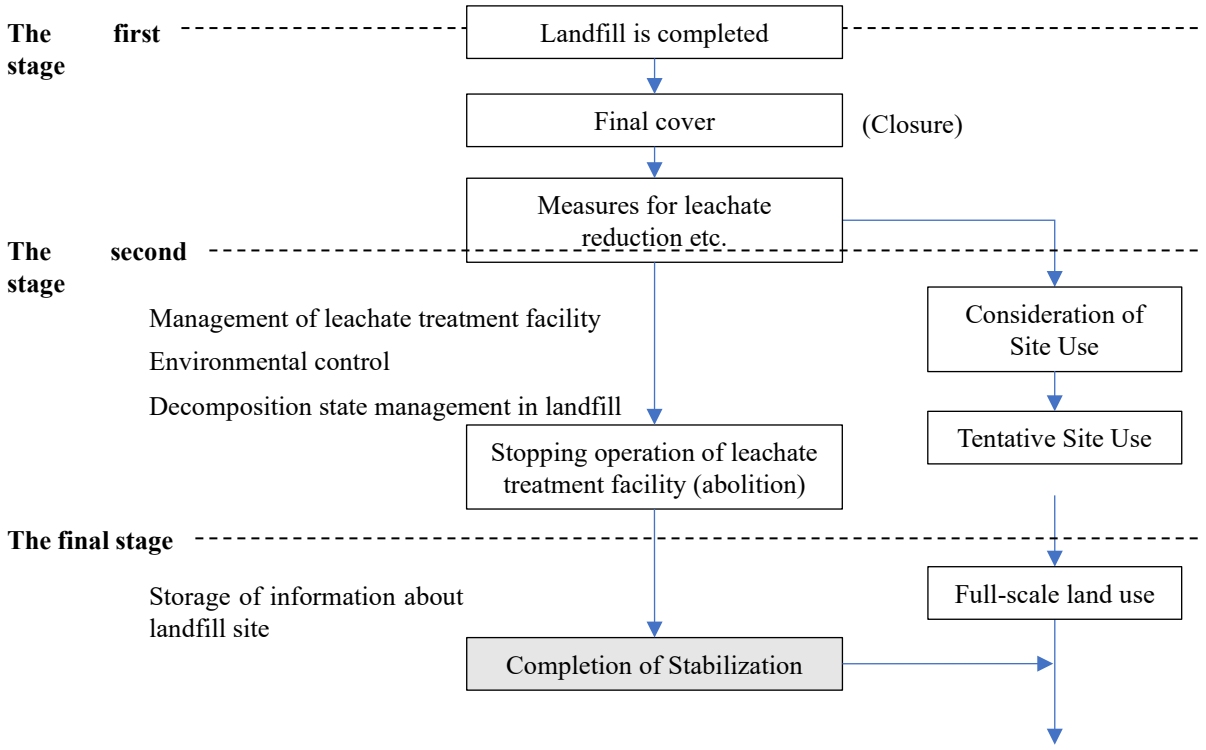
4.1 Need to Manage the Landfill Site after Landfilling

Decomposition of landfill waste continues in the landfill site even after the landfill is finished. Even after the landfill is finished, it is necessary to continue the management of leachate as well as the decomposition and stabilization status of the waste so that the landfill site does not affect the living environment in the surrounding area. It is desirable to prepare a "maintenance and management plan" after the landfill is closed and to carry out management in a systematic manner. An example of the flow of post-closure management and ultimate land use is shown in Figure 42.

The first stage is when landfill is completed and final cover is applied. Measures are taken to reduce leachate by developing drainage channels to eliminate stormwater and to treat landfill gas.

The second stage is the stage in which the decomposition and stabilization of the landfill waste have progressed, the treatment of leachate and landfill gas is stopped, and the management of the facilities such as leachate treatment facilities is no longer required. However, the management of facilities such as storage structures and runoff collection facilities is still required when the site is used.

Furthermore, over time, the decomposition of organic matter in the landfill waste is almost complete, and the organic matter content is not much different from that of ordinary soil. At this stage, the landfill waste can be considered to have completed decomposition and stabilization, and no special landfill management is required.



Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

Figure 41 Flowchart of Post-Closure Management and Ultimate Land Use

4.2 Facility Management after Landfilling

Each facility of the landfill site, such as storage structures, liner facilities, underground water drainage facilities, and leachate collection facilities, should be managed to comply with the structural standards after

reclamation and when the site is used. Storage structures must be managed so that they do not fail to conform to the loading conditions of the stability calculations, even when filled or structures are installed at the time of ultimate land use. In addition, appropriate maintenance and management should be conducted to prevent the generation of odors, fires, and sanitary insect pests.

4.3 Environmental Management after Landfilling

4.3.1 Leachate Management

After the landfill is completed, it is necessary to measure the quality and quantity of leachate and to determine the duration of leachate treatment, the need for leachate reduction measures, and the timing of compliance with the decommissioning criteria based on their changes over time.

1) Leachate measurement

After the landfill is completed, leachate shall be monitored regularly for quantity and quality. Refer to Section 3.4 Environmental Management for more information on monitoring items and methods.

2) Leachate reduction measures

To reduce the amount of leachate, the cover soil should be made of impermeable materials to quickly remove rainwater from the landfill site, and the landfill site should be kept under aerobic conditions as much as possible. In addition, drainage ditches should be constructed to promote the elimination of surface water. In this case, surface water drainage facilities should be designed to easily cope with differential settlement and should be regularly inspected and repaired to maintain the required capacity. Examples of leachate reduction methods are shown in Table 51.

Table 51 Examples of Leachate Reduction Methods

Method	Contents
Elimination of surface water by graded soil cover	When the final cover is applied, the slope shall be in such a way that rainwater falling on the final cover can be quickly removed and collected as rainwater. As a rule, the drainage slope of the final cover should be about 2 to 5/100.
Elimination of surface water by ditches, etc.	As in the case of general land development, ditches installed at regular intervals to ensure surface water exclusion effects.
Accelerate evaporation by circulating leachate, etc.	By circulating leachate through the landfill to keep the surface of the soil cover constantly wet, evaporation from the surface of the soil cover will also occur constantly, resulting in a reduction in the amount of leachate. Circulating leachate can reduce the volume and improve the quality of leachate and should be considered in conjunction with measures such as drainage with soil cover.
Increase water retention capacity and promote evaporation through tree planting, etc.	Methods to increase the water holding capacity of the soil and promote evaporation, such as by planting trees.
Prevention of rainwater infiltration through capping (asphalt, sheet, etc.)	Methods to prevent rainwater infiltration by constructing impermeable pavement such as asphalt or impervious sheets. In such cases, it is necessary to provide venting facilities at the bottom of the pavement or sheeting, as well as adequate measures to prevent landslides. It should also be noted that the decomposition and stabilization of waste may be delayed because the supply of oxygen to the interior of the landfill and the infiltration of rainwater will be hindered.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

4.3.2 Landfill Gas Management

The quantity and properties of landfill gas generated from the landfill site should be measured and monitored until it can be determined that there is no impact on the surrounding environment, even after the landfill has been completed. In addition, measures and management of the landfill gas treatment facility should be taken as necessary to ensure that there are no obstacles to the ultimate land use.

1) Measurement of landfill gas

Even after the landfill is completed, the properties and quantity of landfill gas should be measured. Refer to Section 3.4 Environmental Management for the items and frequency of landfill gas measurements.

2) Landfill gas treatment measures after reclamation

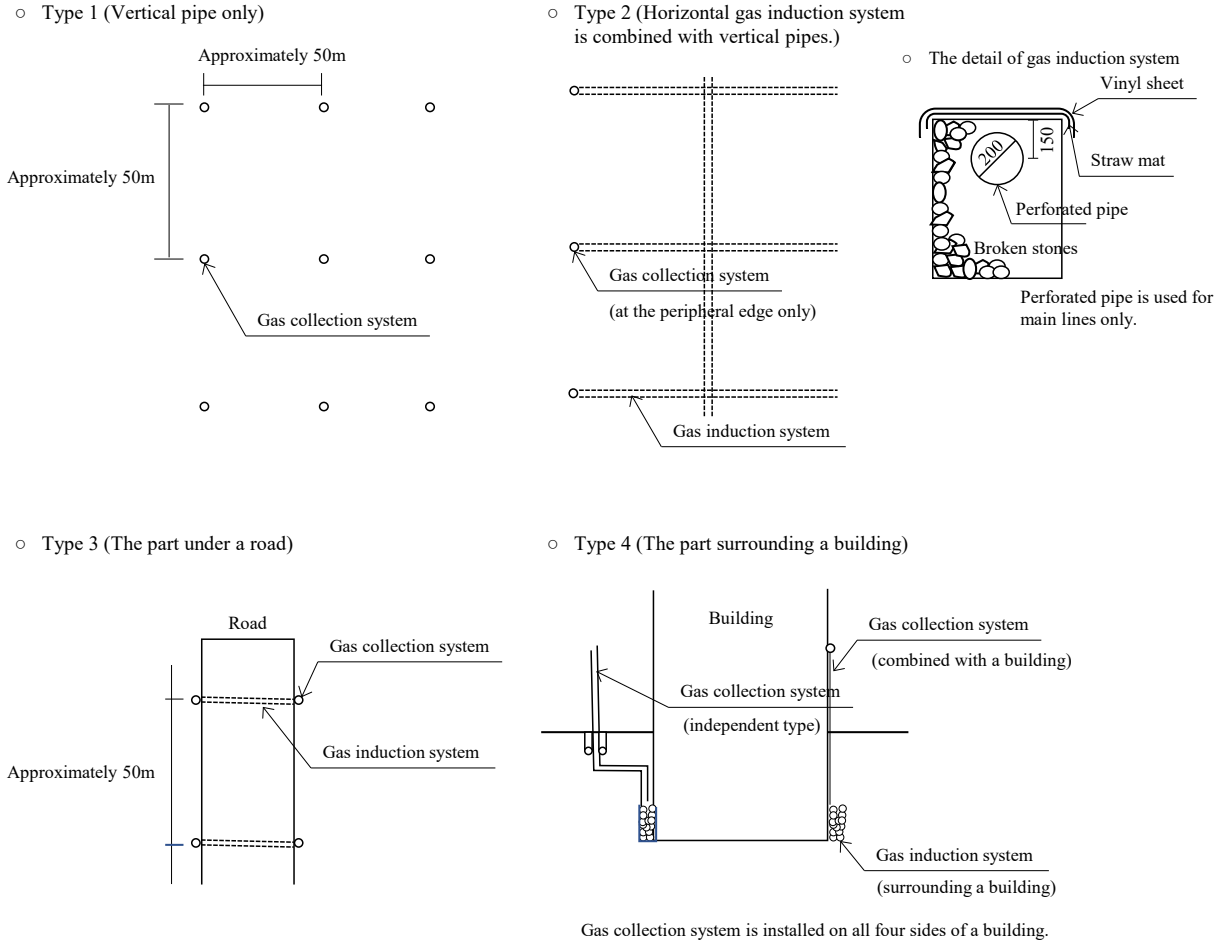
Since the amount of landfill gas generated decreases over time and the content of combustible components such as methane decreases, it is not difficult to use the landfill site after the landfill is completed as long as appropriate measures are taken such as installing landfill gas treatment facilities.

If landfill gas is still generated after the landfill is completed, gas treatment measures, such as the installation of landfill gas treatment facilities, should be taken depending on the type of use of the site including temporary use. Examples of landfill gas measures according to the type of use of the site are shown in Table 52 and Figure 43.

Table 52 Examples of Landfill Gas Measures According to the Type of Use of the Site

Type of Use of the Site	Examples of Landfill Gas Measures
(1) Use as grassland and bare land (green spaces, playgrounds, etc.)	Gas venting facilities can be started up above ground at any time (Figure 43 Pattern 1), or release the gas from the surface of the ground except for the surface-utilizing area (Figure 43 Pattern 2). In this case, to avoid obstruction to the use of the site, install horizontal induction pipes as necessary or take other measures to reduce the number of points at which gas is brought up to the surface (Figure 43 Pattern 2). Gas venting facilities (Figure 43 Pattern 2), users should be kept away from the area around the facility because of the possibility of oxygen deficiency, etc.
(2) Use with pavement, etc. (green spaces, playgrounds, etc.)	Because of the potential for gas to accumulate under pavement, etc., horizontal gas induction pipes, etc., are laid in the paved area to release the landfill gas (Figure 43 Pattern 3).
(3) Use of building installed	Gas induction pipes are laid around the perimeter of the building to induct and vent the gas from the lower part of the building (Figure 43 Pattern 4). In some cases, forced ventilation may be provided by fans, etc.

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]



Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

Figure 42 Examples of Layout Patterns for Barrier Vent for Landfill

4.3.3 Management of Surrounding Groundwater

Even after the landfill is completed, the quality of the surrounding groundwater should be periodically monitored to check for leachate leakage from the landfill site into the surrounding groundwater.

If a leak is detected, monitoring should be continued, and if there is concern about the impact on the living environment and human health, necessary measures should be taken, such as investigating the cause of the leak and repairing the liner facilities.

For information on sampling methods, measurement items, frequencies, and methods of determining compliance required to manage the surrounding groundwater, refer to Section 3.4 Environmental Management.

4.3.4 Management of Reclaimed Ground Level Settlement

Since decomposition and compaction of wastes cause ground level settlement of landfill sites, the amount of settlement should be measured and monitored. Necessary measures should be taken to ensure that the settlement of the landfill site does not interfere with the ultimate land use.

1) Settlement measurement point

Table 53 shows an example of setting up measurement points for ground level settlement of a waste landfill site.

Table 53 Example of Setting Up Measurement Points for Ground Level Settlement of a Waste Landfill Site

Estimation Method	Contents
Selection of measurement points	Center of reclaimed parcel Since the decomposition reaction is more active around gas venting facilities and leachate collection and drainage facilities than in other areas and the settling speed is faster, stabilization can be properly evaluated by comparison with other points. If there are many measurement points, it is desirable to arrange them in a grid pattern.
Number of measurement points	Inland landfill sites: 1 site per 1,000-3,000 m^2

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

2) Settlement characteristics of waste landfill ground

Waste landfill sites undergo compressive settlement when a load is applied and recover to some extent when the load is removed. However, waste is not a perfectly elastic body; wood and other materials lose strength due to progressive decay, and settlement occurs after a certain period, while kitchen waste and other materials gradually decompose, resulting in gradual settlement.

As described above, the settlement characteristics of reclaimed ground are related to various factors, and it is difficult to predict the amount of settlement, but it is also important as a design indicator when using the site. Therefore, it is necessary to establish a prediction method based on the results of measurement and analysis of actual settlement, type of landfill material, and decomposition status.

4.3.5 Management of Temperature Inside the Landfill

Understanding the status of decomposition and stabilization of landfill waste is useful for determining when to decommission a landfill site and for considering how to use the site. The temperature inside the landfill waste layer is used as an indicator of the decomposition and stabilization status of landfill waste because the temperature inside the landfill waste layer tends to be higher than the underground temperature in ordinary soil due to heat generated by the decomposition of organic matter and chemical reactions.

The temperature inside the landfill should be measured periodically to determine the status of decomposition and stabilization of the landfill waste.

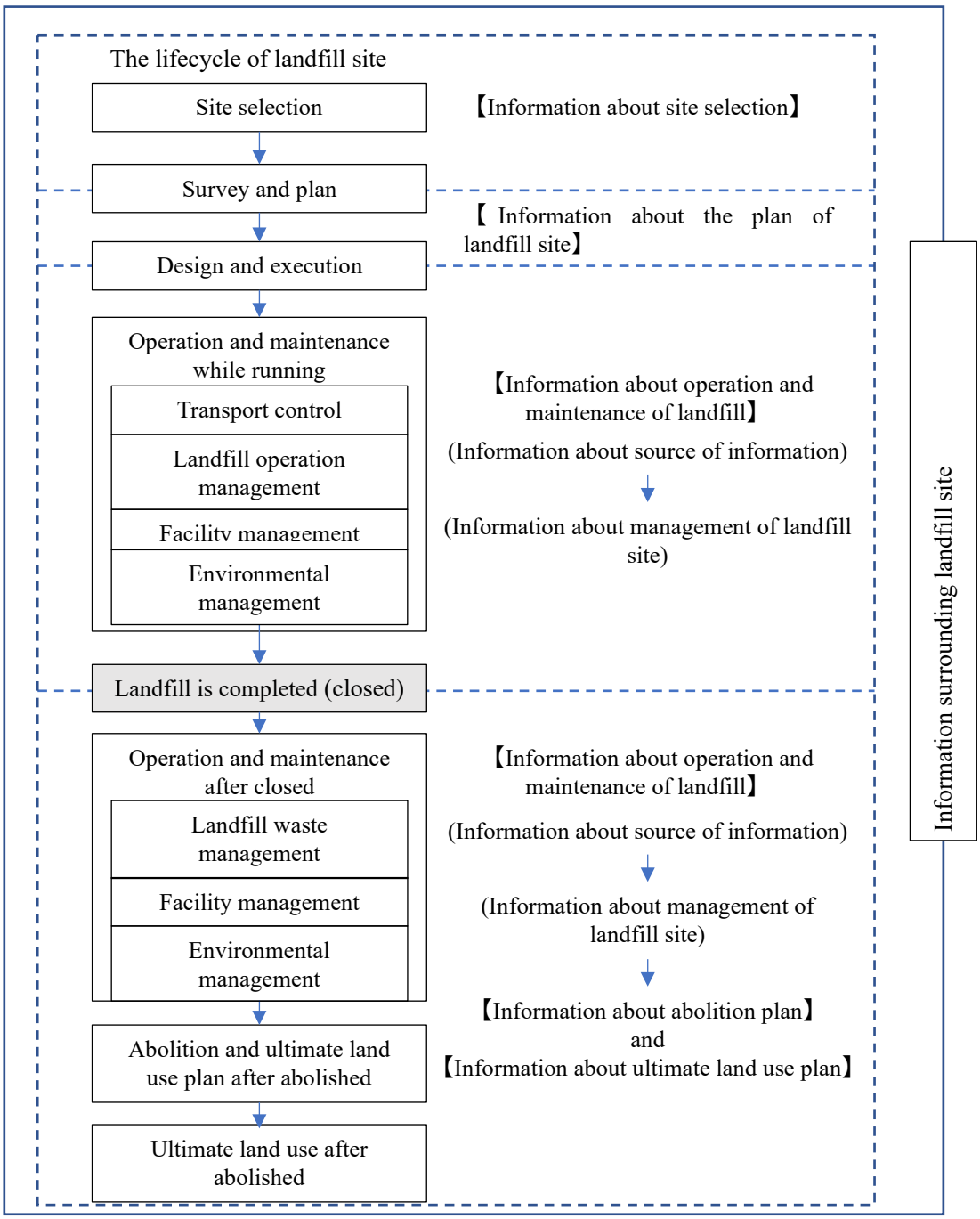
4.4 Ultimate Land Use and Site Management

In the interim use of a site after the landfill has been completed, appropriate use details must be formulated in consideration of the characteristics of the landfill ground and other factors. The site must be managed so as not to cause damage to the users. Even in a landfill site where time has passed since the end of landfill, excavation of land or other changes in the land profile may cause fermentation or decomposition of the stable underground wastes by agitation or supply of oxygen. This may cause gas and wastewater to be generated, which may be harmful to the preservation of the living environment. Therefore, proper construction and monitoring should be conducted when using the site of a landfill site.

4.5 Management and Inheritance of Information

Information on the planning and maintenance of landfill sites is important even after the landfill is completed or closed. For example, data on the quantity and properties of waste materials obtained in the transport control management and data on the quality of leachate in the environmental management are indispensable for determining when to use the site after the landfill is completed and when to abolish the landfill.

In particular, when using a site, the entity operating the landfill site and the entity operating the ultimate land use may differ. In such cases, it is necessary to share and pass on various information on the landfill site among the different entities in order to facilitate the ultimate land use of the site. The information flow of a landfill site is illustrated in Figure 44.



Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

Figure 43 Information Flow during the Life Cycle of a Landfill Site (Japan)

5. MAINTENANCE PRACTICES

5.1 Management Record Forms

For proper management and smooth operation of the landfill site, it is necessary to prepare management record forms and checklists. The forms and checklist are shown in the appendix.

6. APPENDIX

Table 1 Example of Control Table for Covering Soil, etc.

Type	Delivery Date and Time	Soil Classification	Amount Carried in (t)	Covering Soil Supply Destination	Volume Conversion Factor (m^3/t)	Amount Carried in (m^3)
Same-day cover						
Intermediate cover						
	subtotal					
final cover						
	subtotal					
Antecedent protected soil						
	subtotal					
Total amount						

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

						Reference Number:	
Spot		1	2	3	4		Remarks
Area		I	I	II	III.		
Classification		1	2	1			
Waste classification		Municipal waste	Market waste	Resource sorting residue	Construction waste		
Waste layer thickness		3.0 m	3.0 m	3.0 m			
Overlay (type of soil)		Earth dug out of a construction site	Earth dug out of a construction site	Earth dug out of a construction site			
Overcast thickness		0.5 m	0.5 m	0.5 m			
Roll thickness		0.3 m	0.3 m	0.3 m			
Layer Finish Thickness		3.5 m	3.5 m	3.5 m			
Number of times of rolling pressure		Three times	Three times	Three times			
Amount of sinking (sinking)	Year Month Day						
	Year Month Day						Start of 2nd layer
	Year Month Day						
	Year Month Day						
	Year Month Day						

Source: Nippon Koei Co., Ltd. based on "How to Prepare a Manual of Sanitary Landfill Guideline" [Translated from Japanese.]

Form 2-4: Car carry-in vehicle registration form (example)

Registration form for delivery vehicle

Company name			Date of submission (dd/mm/yy): / /
Name of person in charge (contact person)		phone	Email:

Vehicle No.	Driver name	Vehicle Information						Vehicle classification	Transported by	Name of the service contractor
		Length m	Width m	Height m	Capacity M3	Maximum loading capacity kg	Vehicle weight kg			
								4t (A/D/P) Large size (A/D/flat/P) Other	Own / Service contractor	
								4t (A/D/P) Large size (A/D/flat/P) Other	Own / Service contractor	
								4t (A/D/P) Large size (A/D/flat/P) Other	Own / Service contractor	
								4t (A/D/P) Large size (A/D/flat/P) Other	Own / Service contractor	

*Vehicle classification: Circle the applicable vehicle (4t = 4-ton company, large = heavy-duty vehicle), (= arm roll, D = dump truck, flat = flat-body, P = packer truck). If not applicable, put "Other" in "0" and enter the vehicle type in parentheses.

*Circle "Own" in the case of transportation by a contracted company, or "Service contractor" in the case of re-consignment of transportation.

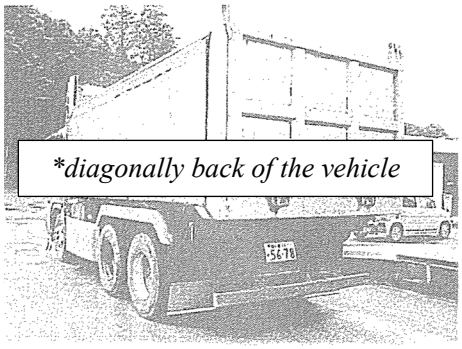
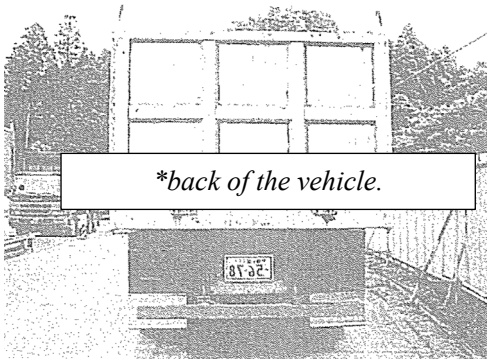
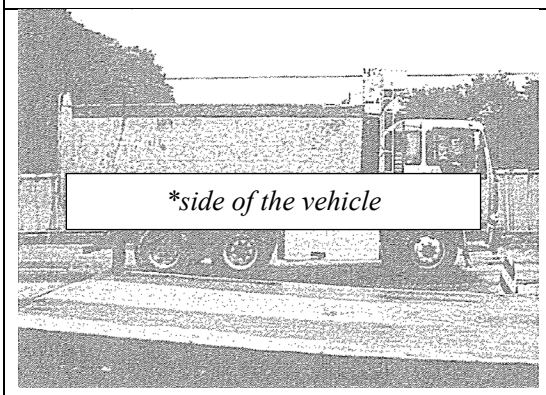
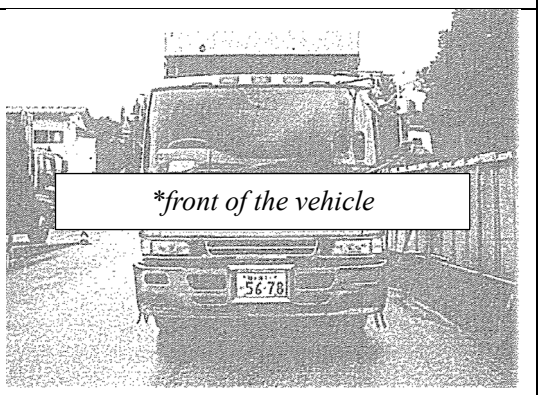
*In the case of re-consignment of transportation, enter the company to which the transportation is consigned.

Keep together with Form 2-5.

Source: Nippon Koei Co., Ltd. based on "Manual for Maintenance and Management of Industrial Waste Final Disposal Sites" [Translated from Japanese.]

Form 2-5: Photograph of registration of delivery vehicle

Photo of registration of delivery vehicle

Shooting Date	Year Month Day (new/renewal)		
Carrier Name		Driver Name	
Vehicle No.		Car model	
Maximum carrying capacity		Vehicle weight	
Cargo size	Length: m, Width: m, Height: m Capacity: m^3		
Photographs of delivery vehicles	 *diagonally back of the vehicle	 *back of the vehicle.	
	 *side of the vehicle	 *front of the vehicle	

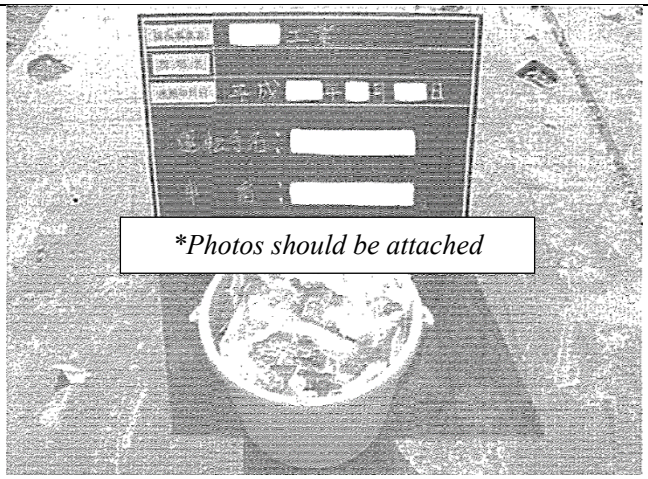
Keep together with Form 2-4.
Source: Nippon Koei Co., Ltd. based on "Manual for Maintenance and Management of Industrial Waste Final Disposal Sites" [Translated from Japanese.]

Form 2-8: Sample collection work report (example)

Date: Year Month Day
Weather:

Approval number		
Chief	Person in charge	Person in charge

Sampling operation report

Date and time of sample collection		Year Month Day (A.M./P.M.) Hour, Minute
Name of the discharging company		
Collecting and transporting company name		
Vehicle number and driver's name		Vehicle No. / Driver's name
Waste type		☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Cinders ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Sludge Waste plastics Paper waste Wood waste Fiber scraps Plant and animal residues Rubber scraps Metal scraps Glass and concrete and ceramic scraps Mining waste Rubble and debris Soot and dust Waste No. 13 ☐☐Others Other
Amount of sample taken		Kg
Collection site		☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Reception building ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Deployment inspection area ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Other
Properties of waste	Variety	With ☐ ( ) Color No ( )
	Shape	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Muddy ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Granular ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Powdery Clumpy Plate-like Rods ☐☐Others
	Bad smell	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Intense ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Yes ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ No ☐ ☐ ☐ No
Photographs of collected samples		 *Photos should be attached*
Duration of dissolution tests and other investigations		☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ In-house ☐ ☐ Outsourcing (Institution name:
Judgment result		☐No problem No problem (continued acceptance)

(Dissolution test results attached)	☐ ☐ ☐ Some problems (continue to accept, but notify the discharger of the problems) [Request for resubmission of inspection data (yes/no)] Problematic (notify the discharger of the problem and refuse to accept in the future) [Request for investigation of cause and submission of proposed countermeasures (Yes/No)]

Source: Nippon Koei Co., Ltd. based on "Manual for Maintenance and Management of Industrial Waste Final Disposal Sites" [Translated from Japanese]

Form 2-9: Daily report of incoming inspection (example)

Date: Year Month Day
Weather:

Approval number		
Chief	Person in charge	Person in charge

Daily report of incoming inspection [for the reception building]"

	Loading time	Name of the discharging company	Collecting and transporting company name	Vehicle No.	Driver name	Inspection results	Inspector
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	

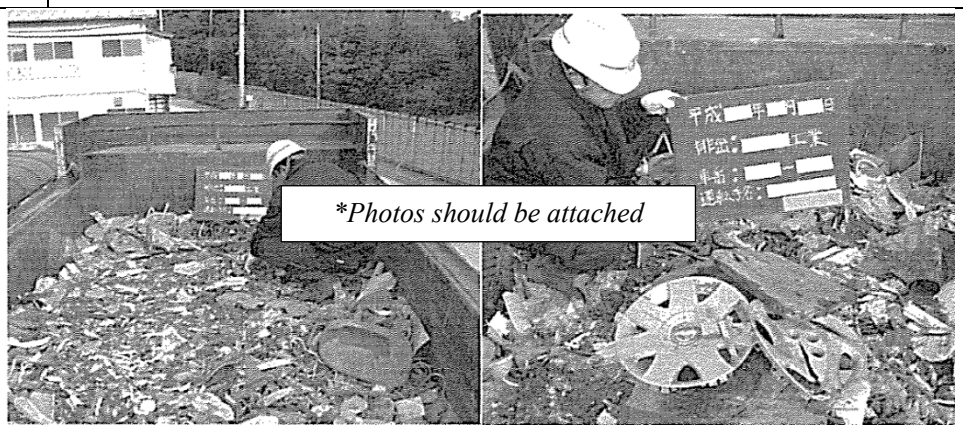
Source: Nippon Koei Co., Ltd. based on “Manual for Maintenance and Management of Industrial Waste Final Disposal Sites” [Translated from Japanese.]

Form 2-10: Incoming inspection report (example)

Date: Year Month Day
Weather:

Approval number		
Chief	Person in charge	Person in charge

Carry-in inspection report [for reception building].

Date and Time	Year Month Day (A.M./P.M.) Hour, Minute	
Name of the discharging company		
Collecting and transporting company name		
Vehicle number and driver's name	Vehicle No.	Driver's name
Visual inspection results	☐Attention (Your brought-in waste will be noted for the following reasons. If you continue to bring in waste in this condition in the future, we may refuse to accept it.) Return (The waste you hauled in today is unacceptable for the following reasons)	
Reason	1	Waste other than municipal solid waste is mixed in. (Contaminants)
	2	The properties differ from the information in the Waste Data Sheet (WDS) (☐Shape ☐Odor ☐Fluidity ☐Color ☐Others)
	3	Other ( )
Photo		

Source: Nippon Koei Co., Ltd. based on “Manual for Maintenance and Management of Industrial Waste Final Disposal Sites” [Translated from Japanese.]

Form 2-11: Daily report of deployment inspection [for deployment inspection stations] (example)

Date: Year Month Day
Weather:

Approval number		
Chief	Person in charge	Person in charge

Daily report of deployment inspections [for deployment inspection stations].

	Loading time	Name of the discharging company	Collecting and transporting company name	Vehicle No.	Driver name	Inspection results	Inspector
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	
	:					No problem ☐Attention Return	

Source: Nippon Koei Co., Ltd. based on “Manual for Maintenance and Management of Industrial Waste Final Disposal Sites” [Translated from Japanese.]

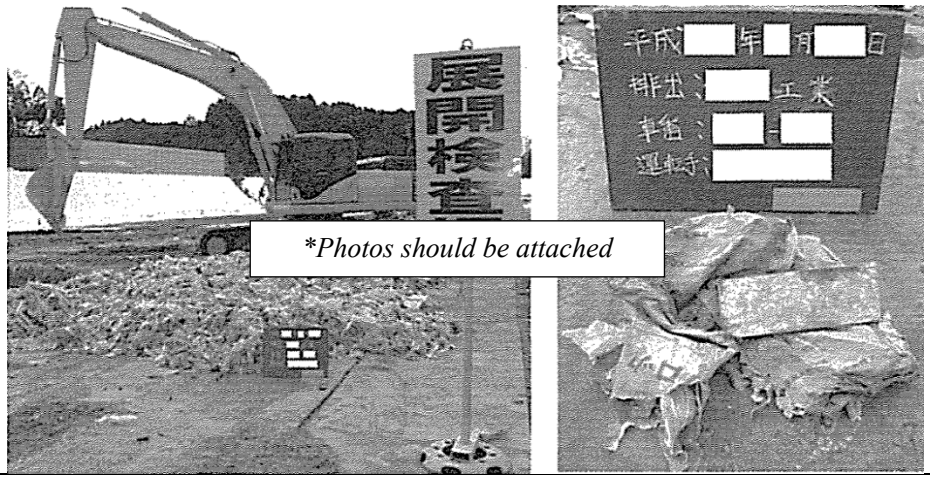
Form 2-12: Deployment inspection report [for regular deployment inspection] (example)

Date: Year Month Day
Weather:

Approval number		
Chief	Person in charge	Person in charge

Deployment inspection report [Deployment inspection regular use].

Date and Time	Year Month Day (A.M./P.M.) Hour, Minute	
Name of the discharging company		
Collecting and transporting company name		
Vehicle number and driver's name	Vehicle No.	Driver's name
Visual inspection results	☐Attention (Your brought-in waste will be noted for the following reasons. If you continue to bring in waste in this condition in the future, we may refuse to accept it.) Return (The waste you hauled in today is unacceptable for the following reasons)	
Reason	1	Non-municipal waste is mixed in. (Contaminants)
	2	The properties differ from the information in the Waste Data Sheet (WDS) (☐Shape ☐Odor ☐Fluidity ☐Color ☐Others)
	3	Other ( )

Photo	

Source: Nippon Koei Co., Ltd. based on "Manual for Maintenance and Management of Industrial Waste Final Disposal Sites" [Translated from Japanese.]

Form 3-1: Daily report of landfill operation management (example)

Date: Year Month Day
Weather:

Approval number		
Chief	Person in charge	Person in charge

Daily report of landfill operation management

Equipment Operation Status			
Type	Number of Units in Operation	Main Work	Whether or Not There Is a Breakdown or Other Questionable Face
Prudhouser	stand	Reclamation □Covering □Field maintenance □Others:	Yes (Support: done/not done) □No
Backhoe	stand	Reclamation □Covering ☐Protective soil □Others:	Yes (Support: done/not done) □No
Dump truck	stand	☐Transportation of overburden □Others:	Yes (Support: done/not done) □No
Sprinkler truck	stand	In the yard (times) □On the road (times) Amount of water used (total m^3)	Yes (Support: done/not done) □No
	stand		Yes (Support: done/not done) □No
	stand		Yes (Support: done/not done) □No

Maintenance Status of the Site			
Work Item	Execution Point	Construction Details	Construction Quantity
Gas vent pipe installation (vertical)		Additional construction ☐Repair ☐Others:	
On-street parking lot		Extension ☐ Replacement ☐ Repair ☐ Security measures	

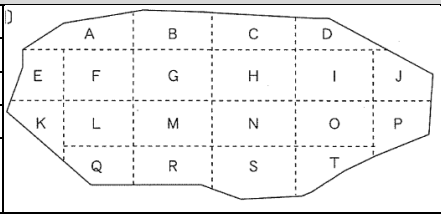
Situation of the Site, etc.		
Work Item	Target Area	Details of Implementation
Landfill site surveying		
In-situ density testing		
Settlement measurement		

Other Environmental and Other Conditions		
Item	Abnormality	Details of Measures Taken
Generation of bad odor	Yes (Support: done/not done) □No	☐Covering ☐Spraying with a pesticide (type: , amount used:) □Others:
Outbreak of sanitary pests and vermin	Yes (Support: done/not done) □No	☐Covering soil ☐Spraying with a pesticide (type;, amount used:) □Others:
Dispersal and spillage of waste	Yes (Support: done/not done) □No	Covering ☐Watering ☐Others:
Safety management and security equipment	Yes (Support: done/not done) □No	Replacement of a part of the housing (☐Replacement) □Repair of a part of the housing (□Others.)

Fire	Yes (Support: done/not done) □No	Fire Fighting (Equipment) □Others:

Landfill Location and Volume

Landfill Location
A
B
C
D



Height of the landfilled area;

- A:
- B:
- C:

*Color the landfilled area

Purpose of this table and notes
Used to record the contents of a day's work at the landfill site.
Critics of waste delivery are controlled by Form 2-6.
Each facility will be managed by Form 5-1~5-3
Source: Nippon Koei Co., Ltd. based on “Manual for Maintenance and Management of Industrial Waste Final Disposal Sites” [Translated from Japanese.]

Form 4-1: Water quality inspection record book (example)

Date: Year Month Day
Weather:

Approval number		
Chief	Person in charge	Person in charge

Water quality inspection records (e.g., disposal sites, groundwater)

Sampling Location					…
Sampling Date			/ /	/ /	…
Date of analysis result					…
Analyzing Items	Unit	Standards			…
Alkyl mercury compounds	mg/L	*N.D.*			…
Mercury and alkylmercury, other mercury compounds	mg/L	0.005			…
Cadmium and its compounds	mg/L	0.1			…
Lead and its compounds	mg/L	0.1			…
Organophosphorous compound	mg/L	1			…
Hexavalent chromium compounds	mg/L	0.5			…
Arsenic and its compounds	mg/L	0.1			…
Cyanide	mg/L	1			…
PCB	mg/L	0.003			…
Trichloroethylene	mg/L	0.3			…
Tetrachloroethylene	mg/L	0.1			…
Dichloromethane	mg/L	0.2			…
Carbon tetrachloride (CCl4)	mg/L	0.02			…
1,2-Dichloroethane	mg/L	0.04			…
1,1-Dichloroethylene	mg/L	0.2			…
…	…	…	…	…	…
…	…	…	…	…	…
…	…	…	…	…	…
…	…	…	…	…	…

Source: Nippon Koei Co., Ltd. based on “Manual for Maintenance and Management of Industrial Waste Final Disposal Sites” [Translated from Japanese.]

Form 4-2: Landfill gas inspection record book (example)

Date: Year Month Day
Weather:

Approval number		
Chief	Person in charge	Person in charge

Landfill gas inspection record book (e.g., controlled landfill)

Sampling location					
Date of sample collection		Date	Date	Date	Date
Date of analysis result		Date	Date	Date	Date
Weather					
Atmospheric temperature					
Atmospheric pressure					
Gas quantity					
Measurement item	Unit				
CH4	Vol%.				
CO2	Vol%.				
H2S	PPM				
NH3	PPM				
O2	Vol%.				
N2	Vol%.				

Graph and manage data based on data (to evaluate changes over time)

Source: Nippon Koei Co., Ltd. based on “Manual for Maintenance and Management of Industrial Waste Final Disposal Sites” [Translated from Japanese.]

Form 5-1 Facility management sheet (daily) (example)

Date: Year Month Day
Weather:

Approval number		
Chief	Person in charge	Person in charge

Facility management sheet (daily)

Location	Control item	Rating (0/x)	Remarks
Liner facilities Note: Assuming a double impervious sheet structure with the sheet covered by protective soil	Cracks and sinking of protected soil surface		
	Slide and collapse of slope protection soil		
	Protected soil surface runoff		
	Waterlogging after rainfall		
Landfill gas treatment facility	Damage / Inclination		
	Functional deterioration due to clogging, etc.		
Metering equipment	Measurement section operation		
	Computer operation		
Car wash facility	Equipment operation		
	Water supply and drainage		
Disaster prevention pond	Water level		
Door(s) of a gate	Operation check		
	Deterioration and damage		

Purpose of this table and notes:

Used to record the presence or absence of any abnormality during daily inspections (it is important to keep a documented record regardless of the presence or absence of an abnormality).

If the evaluation is X, provide details on Form 5-4 5-5

Tables and graphs of the measurement results that served as the basis for the decision, as well as photographs of the site, should also be attached (even if the evaluation is 0, it is desirable to attach these items).

Even minor damage that does not require repair should be followed up and documented if it is progressive.

Leachate treatment system shall be prepared separately for each disposal site, since the management details of leachate treatment system vary greatly due to differences in facility conditions, etc. at each company.

Source: Nippon Koei Co., Ltd. based on “Manual for Maintenance and Management of Industrial Waste Final Disposal Sites” [Translated from Japanese.]

Form 5-2 Facility management sheet (weekly) (example)

Date: Year Month Day
Weather:

Approval number		
Chief	Person in charge	Person in charge

Facility management sheet (weekly)

Location	Control item	Rating (0/x)	Remarks
Storage structure Note: Assuming an earthen weir	Deposition of waste, sediment, etc.		
	Weed growth and vegetation		
	Leakage from levee		
	Cracks in the levee		
	Swelling of the levee		
	Erosion and collapse of small steps		
	Erosion and scouring of slopes		
	The law's bellybutton		
	Slope collapse/collapse		
	Collapse or collapse of ground		
Leachate collection facility Note: Assumes exposed condition	Pipe cracks, perforations		
	Goodness with scale on tube		
	Wet water from joints		
	Coating material runoff		
	Pipe clogging		
	Stuck or clogged bulps		
Landfill gas treatment facility	Damaged, tilted		
	Functional deterioration due to clogging, etc.		
Car wash facility	Sand (mud) situation		
Road equipment	Road surface condition (dirt, falling rocks, etc.)		
	Roadside and shoulder conditions (collapse, etc.)		
	Structural condition (damage, etc.)		
	Slope conditions (collapses, springs, etc.)		
	Condition of accessories (damage, dirt, etc.)		
	Dust dispersion		
Littering prevention equipment	Fence and foundation damage		
	Garbage and dirt		

Purpose of this table and notes

Used to record the presence or absence of abnormalities from weekly inspections (it is important to document regardless of the presence or absence of abnormalities).

If the evaluation is X, provide details in Form 5-4~ 5-5.

(It is desirable to attach tables and graphs of the measurement results and photographs of the site that were used to make the judgment (even if the evaluation is "0").

Even minor damage that does not require repair should be followed up and documented if it is progressive.

Leachate treatment facilities should be prepared separately for each disposal site, as the management details may vary greatly due to differences in facility conditions, etc. at each company.

Source: Nippon Koei Co., Ltd. based on “Manual for Maintenance and Management of Industrial Waste Final Disposal Sites” [Translated from Japanese.]

Form 5-3 Facility management sheet (monthly, yearly, as appropriate) (example)

Date: Year Month Day
Weather:

Approval number		
Chief	Person in charge	Person in charge

Facility management sheets (monthly, yearly, as needed)

Location		Control item	Rating (0/x)	Remarks
Storage structure Note: Assuming an earthen weir		Embankment settlement		
		Settlement of foundation ground		
Groundwater collection facility		Water volume at collection and drainage outlets		
		Water quality at collection and drainage outlets		
Rainwater collection facility		Damage and subsidence of the facility		
		Deposition of sediment and other materials at the facility		
		Overflow and stagnant water situation		
		Rainwater and sediment inflow from surrounding areas		
		Growth of weeds and other vegetation around the facility		
Metering equipment		Abnormality of machine parts		
		Electrical resistance of electric circuits		
		Humidity in the pit		
		Environmental conditions around the facility		
Groundwater monitoring facility		Damage to facilities		
Disaster prevention equipment	Disaster prevention pond	Deposit of sediments, etc.		
		Deterioration and damage to enclosure facilities		
		Deterioration and damage to the building frame		
		Deterioration and damage to outlet and discharge channel		
		Sediment accumulation at outlet and discharge channel		
	Firewater tank	Deterioration and damage to the building frame		
		Quantity or volume of water		
	Other equipment	Volume		
		Confirmation of operation		
Littering prevention equipment (e.g., anti-encroachment, site boundary fencing, etc.)		Deterioration and damage to facilities		

Purpose of this table and notes

Used to record the presence or absence of abnormalities from monthly or yearly inspections (it is important to keep a documented record regardless of the presence or absence of abnormalities)

If the evaluation is X, provide details in Muku Formulas 5-4- 5-5
(It is desirable to attach tables and graphs of the measurement results and photographs of the site, etc., which were used as the basis for the judgment (even if the evaluation is "0").
Even minor damage that does not require repair should be followed up and documented if it is progressive.
Leachate treatment facilities should be prepared separately for each disposal site, as the management details may vary greatly due to differences in design conditions, etc. at each disposal site.
Source: Nippon Koei Co., Ltd. based on “Manual for Maintenance and Management of Industrial Waste Final Disposal Sites” [Translated from Japanese.]

Form 5-4 Restoration record sheet (before and after restoration) (example)

Before restoration			
Date: Year Month Day Weather:	Chief	Person in charge	Person in charge
Photo			
Name of damaged facility: Damage status: Failure factors: Name of the facility, the condition of the damage or more, and the cause of the damage.			
Post-restoration status			
Date: Year Month Day Weather:	Chief	Person in charge	Person in charge
Photo			
Restoration methods: *Specifically describe the repair method.			

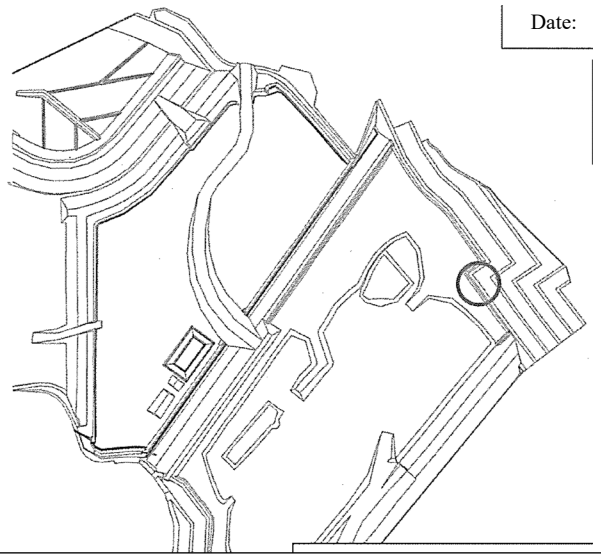
Purpose of this table and notes
Used to detect anomalies and record repairs performed.

Attach any materials that support the judgment that restoration is necessary, as well as specific materials (specifications, drawings, etc.) on the restoration method.

Source: Nippon Koei Co., Ltd. based on "Manual for Maintenance and Management of Industrial Waste Final Disposal Sites"[Translated from Japanese.]

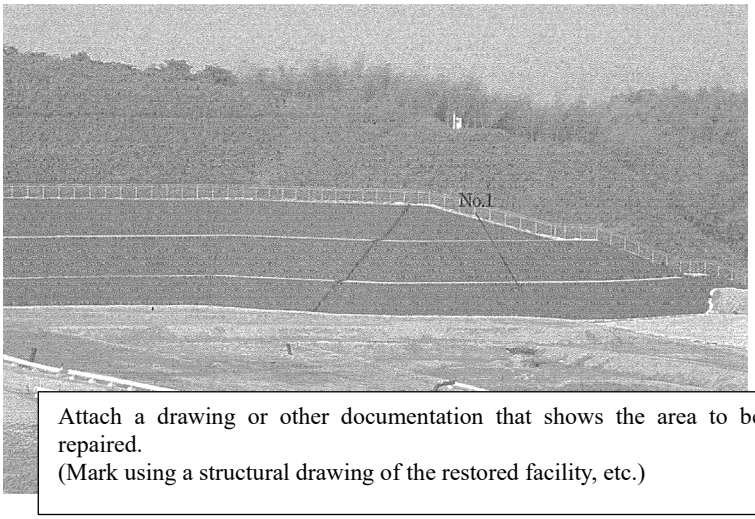
Form 5-5 Restoration record sheet (restoration location) (example)

Restoration location in the overall landfill site			
Date: Year Month Day Weather:	Chief	Person in charge	Person in charge



Attach a drawing or other documentation that shows the area to be repaired.
(Mark using the overall plan of the disposal site, etc.)

Post-restoration status			
Date: Year Month Day Weather:	Chief	Person in charge	Person in charge



Attach a drawing or other documentation that shows the area to be repaired.
(Mark using a structural drawing of the restored facility, etc.)

Purpose of this table and notes

Used to detect anomalies and record repairs performed.
Source: Nippon Koei Co., Ltd. based on “Manual for Maintenance and Management of Industrial Waste Final Disposal Sites” [Translated from Japanese.]

Appendix 5-2

Training Material of Guideline on Operation and Management of Sanitary Landfill

Training on
Sanitary Landfill Operation and Management

JICA Expert Team
November 2022

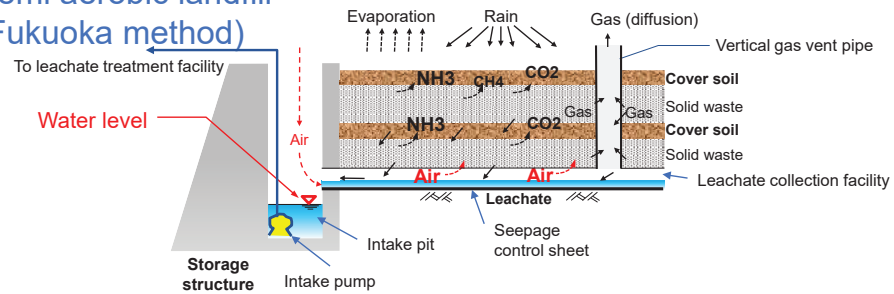
1. Outline of Sanitary Landfill Management

1.1 What is Landfill

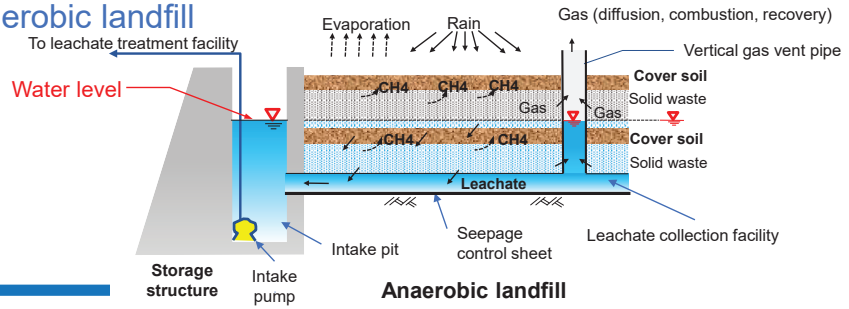
- Types of Landfill
  - Municipal (non-hazardous) solid waste
  - Hazardous waste
- Roles of a sanitary landfill for municipal solid waste
  - Final receiving facility for all waste
  - Preventing waste from runoff to the surrounding areas.
  - Stabilizing and detoxicating waste.

1.2 Landfilling Structure

Semi aerobic landfill
(Fukuoka method)

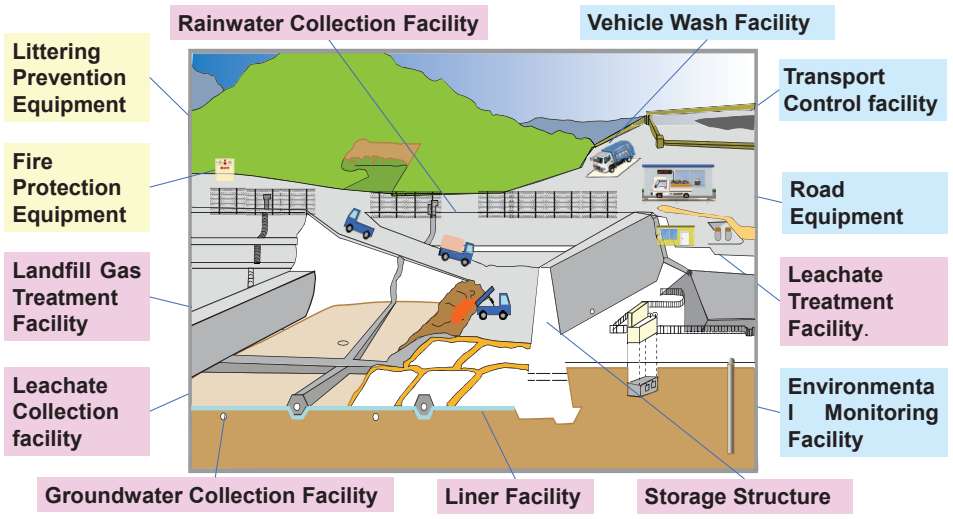


Anaerobic landfill



2.1 Functions and Facilities of Landfills

2.1 Facilities in Sanitary Landfill



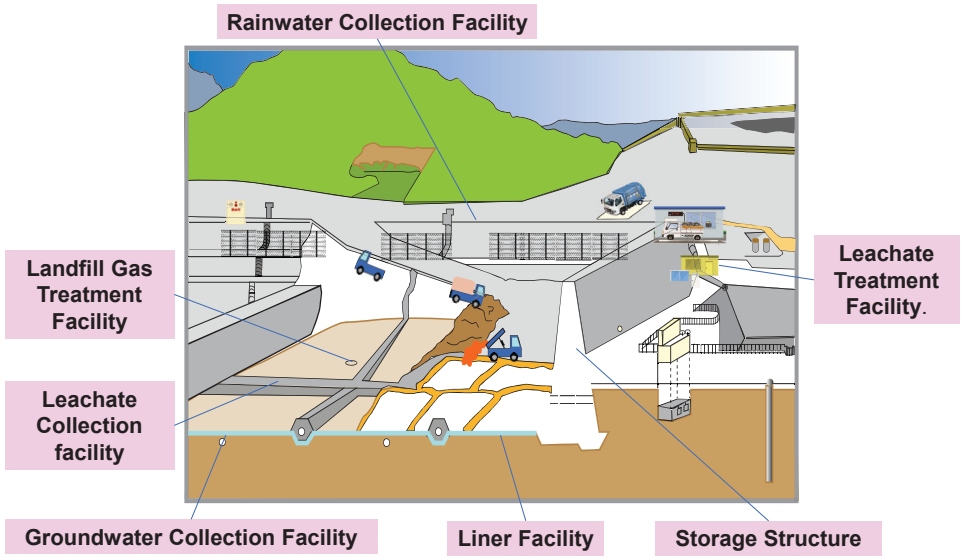
2.1 Relationship between Facilities and Functions

Facilities \ Functions		Storage and treatment functions	Environmental Conservation Functions: Ground water Pollution Prevention	Environmental Conservation Functions: Prevention of Pollution of Public Waters	Environmental Conservation Functions: Others (air pollution, environment preservation, etc.)
Main Facilities	1.Storage structures	◎		○	
	2.Groundwater collection and drainage facilities		○		
	3.Water interceptor	○	◎		
	4.Rainwater catchment and drainage facilities			○	
	5.Leachate collection and drainage facilities	○	◎	◎	
	6.Leachate treatment facilities	○	◎	◎	
	7.Landfill gas treatment facilities	○			○
Control Facilities	1.Carry-in management facilities	◎			◎
	2.Environmental monitoring facilities		◎	◎	◎
	3.Administration Building	○			
	4.Controlled road	○		○	○
	5.Others (car wash facilities)				○
Related Facilities	1.Anti-scattering equipment	○			
	2.Fire protection equipment				○

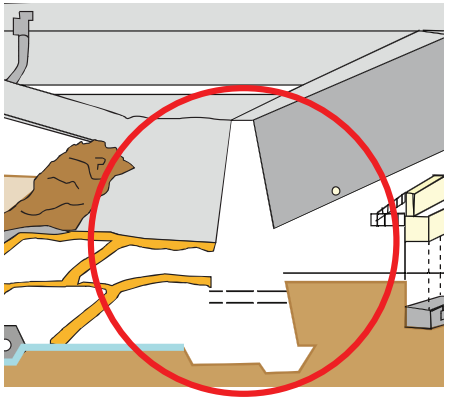
2. Functions and Facilities of Landfills

2.2 Functions and Facilities of Landfills -Main Facilities

2.2 What is the Main Facility?

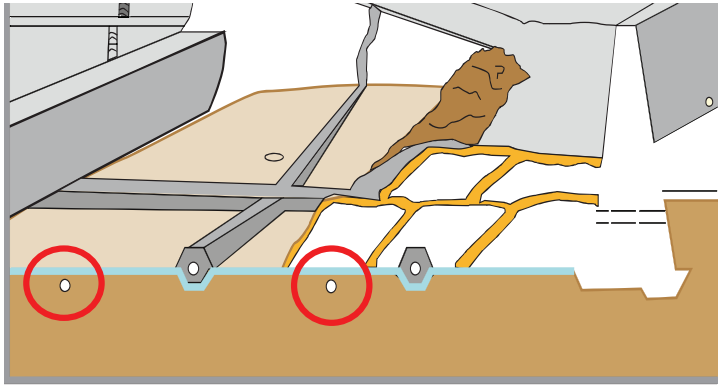


2.2.1 Storage Structure



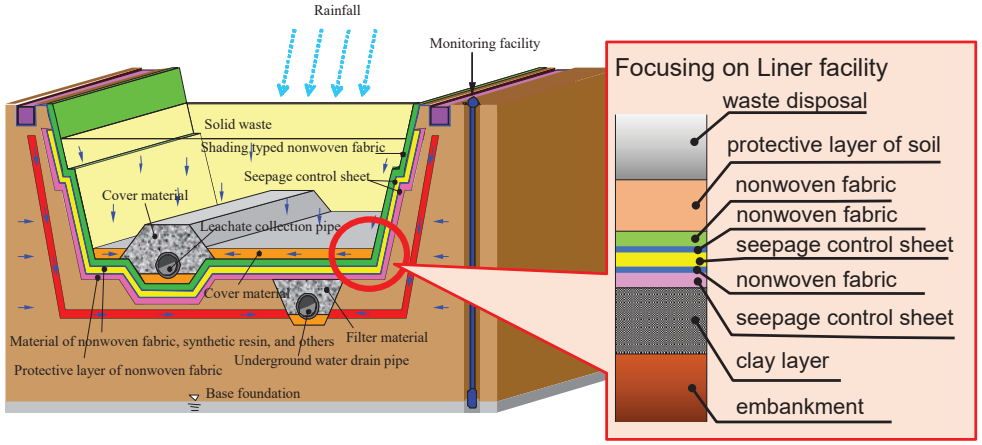
The facility for retaining solid wastes safely to prevent the effluence of solid waste and leachate outside.

2.2.2 Groundwater Collection and Drainage Facilities



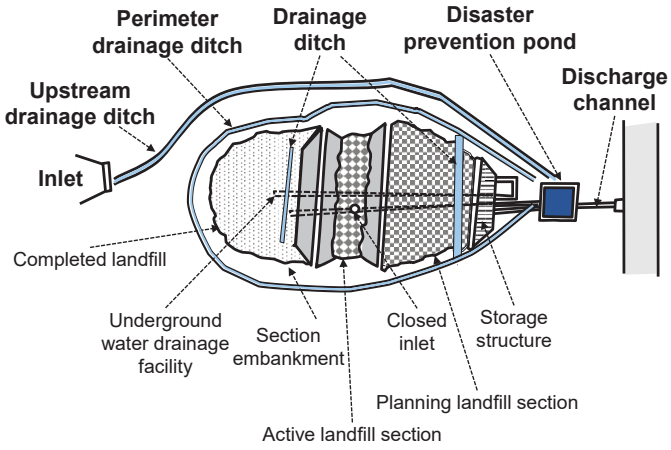
The facility for collecting and discharging underground water efficiently to prevent underground water from affecting the effects of seepage control work.

2.2.3 Liner Facility



The facility for cutting off the effluence of leachate outside the landfill to prevent environmental pollution of the peripheral area.

2.2.4 Rainwater Collection Facility

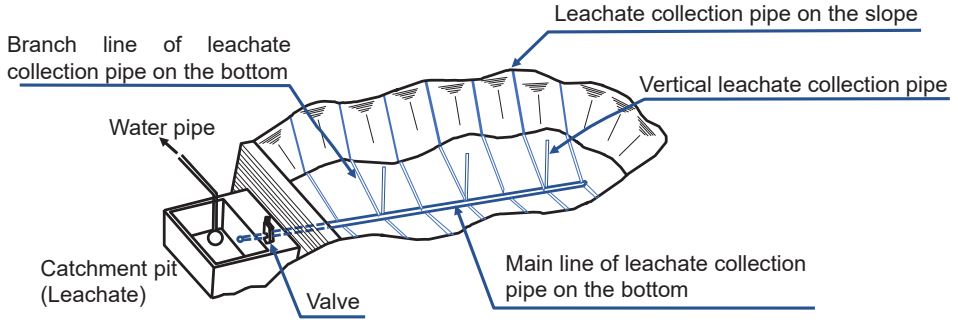


Drainage ditch

Disaster prevention pond

The facility for preventing rainwater from flowing into the landfill site, and to reduce the amount of leachate.

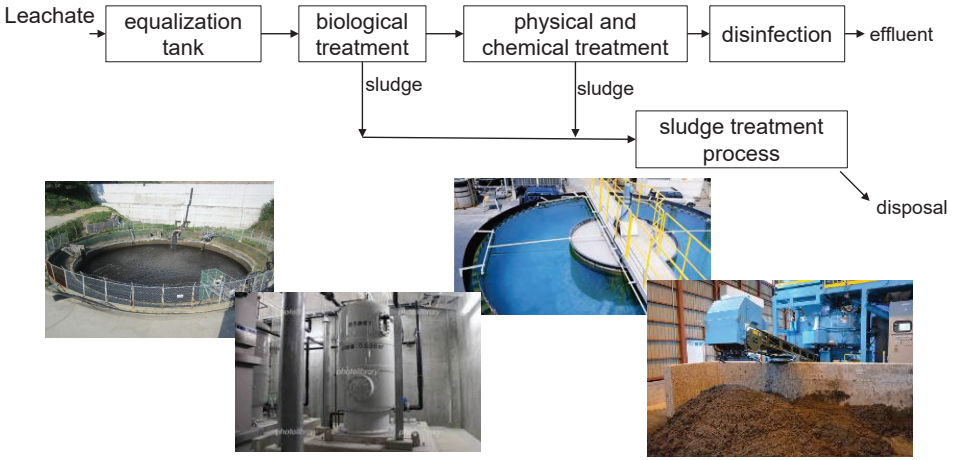
2.2.5 Leachate Collection Facilities





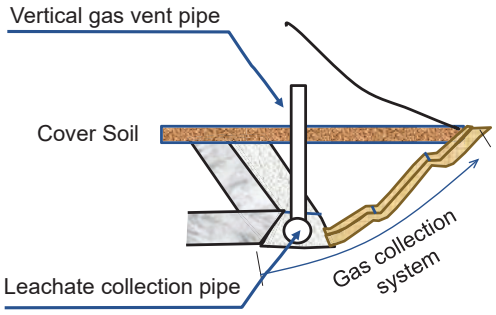

The facility for the collection and discharge of leachate, and intaking the fresh air into the landfill in Fukuoka method.

2.2.6 Leachate Treatment Facility



The facility for treating leachate to meet the designed effluent quality standard, and preventing leachate from contamination of a public water body and underground water.

2.2.7 Landfill Gas Treatment Facilities

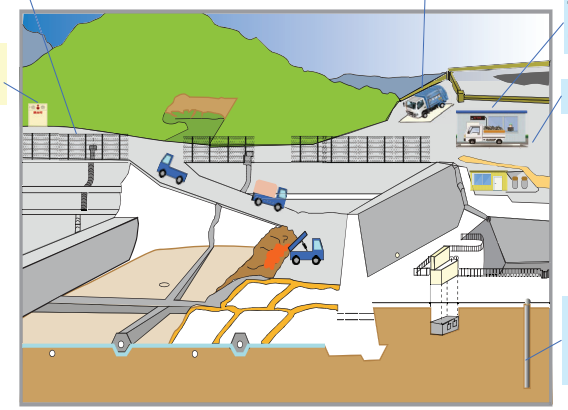


The vent for the emission of the landfill gas and the admission of the fresh air.

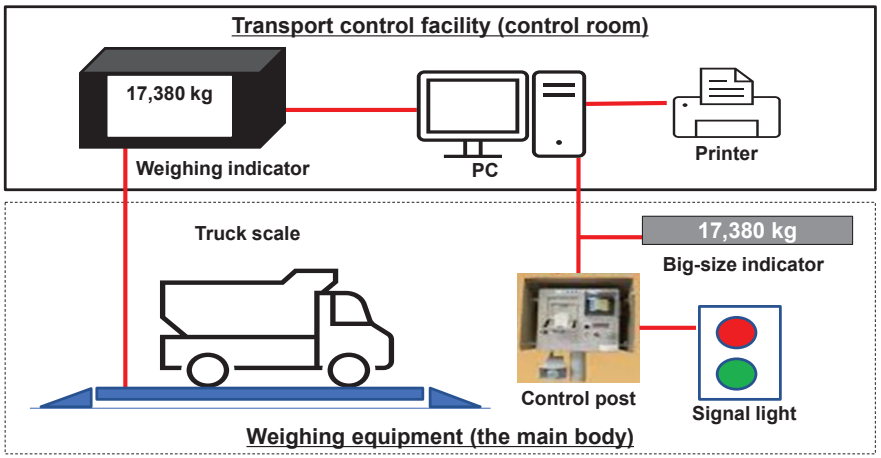
2. Functions and Facilities of Landfills

2.3 Control Facilities
2.4 Related Facilities

2.3 What are Control Facilities and Related Facilities?



2.3.1 Transport Control Facilities



The facility for weighing, tallying, and recording transported solid waste.

2.3.2 Environmental Monitoring Facilities




The facility is for the equipment management to monitor the environmental factors, ex. a thermometer, pH meter, conductivity meter, and a water level meter of groundwater well.

2.3.3 Control Building

This facility is for the comprehensive management of a series of operations at the landfill site.

2.3.4 Road Equipment

The road on the landfill site used for daily operation and maintenance.

2.3.5 Vehicle Wash Facility

The facility is for washing the vehicles exiting the landfill site and preventing environmental pollution of the surrounding areas.

2.4 What is the Related Facility?

- 2.4.1 Littering Prevention Equipment

The equipment is for preventing solid waste scattering of solid waste from the disposed site.

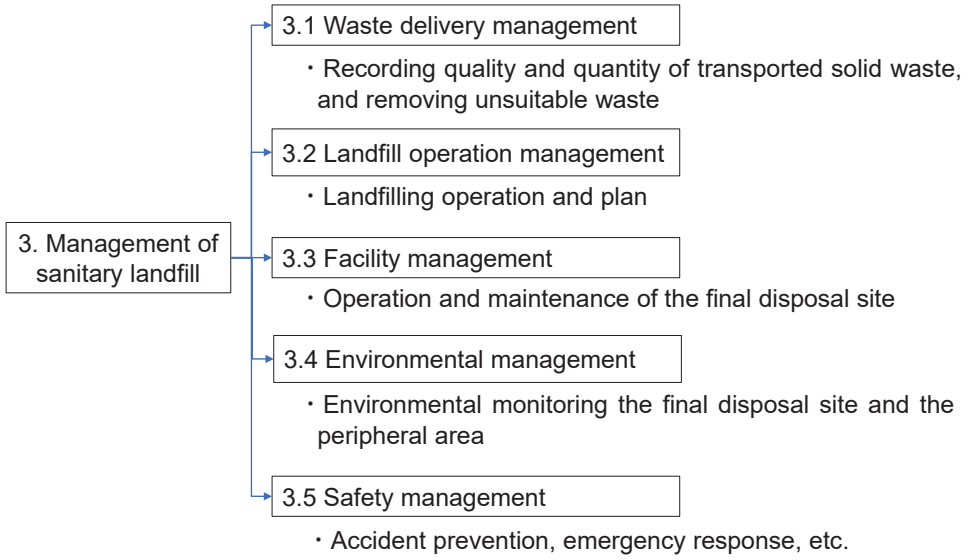
- 2.4.2 Fire Protection Equipment

The equipment for fire extinction when the fire occurs and for preventing the fire from spreading to the surrounding area.

3. Management of Sanitary Landfill

3. What is Sanitary Landfill Management?

The followings are necessary for sanitary landfill management



3. Management of Sanitary Landfill

3.1 Waste Delivery Management

3.1.1 What is Waste Delivery Management?

Objective

- **Implementation of planned waste management operations:**
  Implement waste management operations in a planned manner by monitoring and managing waste volumes.
- **Prevention of environmental pollution:**
  such as pollution of public waters and groundwater by leachate, scattering, and spilling of waste, bad odor, and inhabitation of sanitary vermin and animals.
- **Maintenance of facilities:**
  such as storage structures, impervious structures, etc.
- **Facilitation of landfill operations:**
  such as spreading and compaction waste materials and soil cover construction.

1) Types of Transported Waste

The following wastes are assumed to be accepted:

- Household waste
- Business waste
- Hazardous waste that has been rendered harmless and can be disposed of in a non-hazardous waste landfill

2) Waste Acceptance Criteria

The following waste should be unaccepted in the landfill.

classification	exemplification
(1) Industrial waste	Cinders, sludge, wood waste, construction waste, waste plastic, rubber waste, mineral scraps, soot and dust, waste oil, waste acid, etc.
(2) Toxic and noxious substances	Parts using PCBs included in the following Scrapped air conditioners, TVs, microwave ovens Items that are contaminated with pesticides, deleterious chemicals, or other toxic substances Items for which landfill disposal is prohibited by the law
(3) Fire and flammable materials	Cinders, leftover burnt materials that catch fire. High-temperature items Explosives, paints, gas cylinders, solvents, etc.
(4) Items that emit a significant odor or sewage	Urine, decomposed animal and vegetable residues, etc.
(5) Difficult-to-dispose-of materials	Fire extinguishers, batteries, tires, automobiles, motorcycles, large agricultural machinery, pianos, septic tanks, pruned trees over 50 cm in length
(6) Infectious waste	Waste containing or potentially containing infectious pathogens, such as gauze and needles with blood on them from medical institutions, etc.

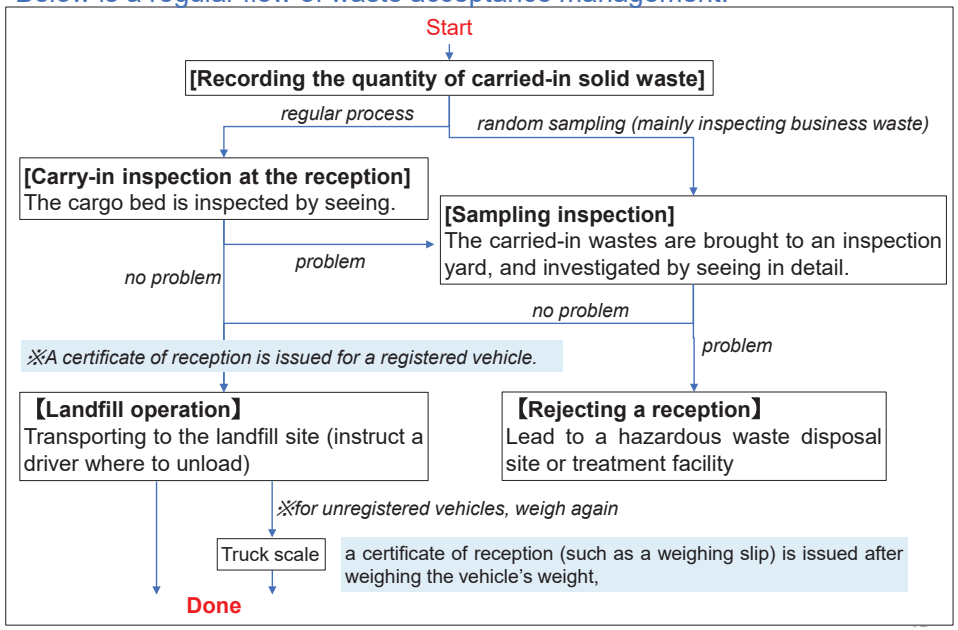
3.1.2 Transporter types to Landfill Site

Carrying-in types are shown below.
The acceptance method should be decided for each type.

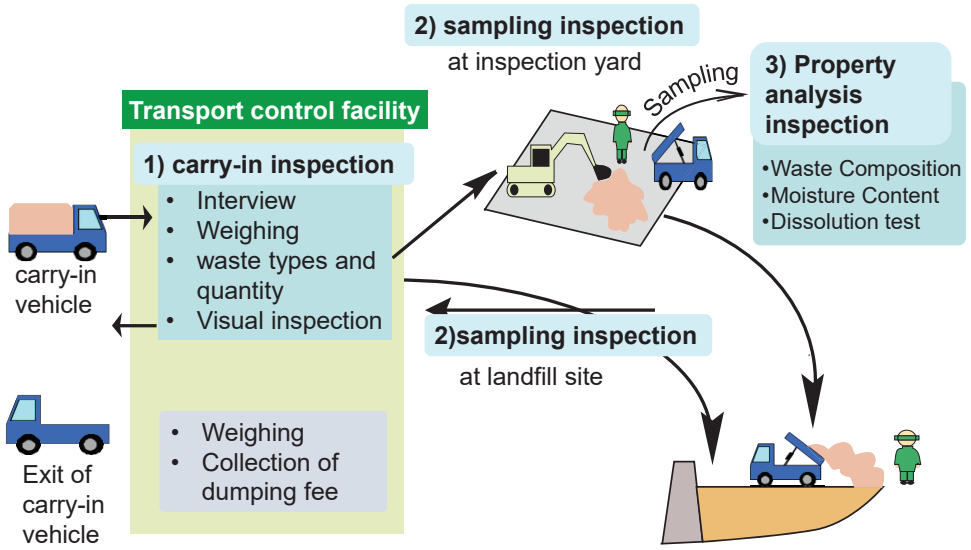
Transporter types	Types of Transported Materials
1. Carried-in by municipal	Domestic waste Business waste Others (illegal waste dumpling etc.)
2. Carried-in by service contractor	Domestic waste Business waste
3. Carried-in by WCSP	Business waste
4. Carried-in directly	Domestic waste Business waste
5. Transport of equipment and materials by contractor	Equipment and material such as cover material

3.1.3 Acceptance Management Flow

Below is a regular flow of waste acceptance management.



3.1.4 Acceptance Test



3.1.5 Transport Control Items

The waste accepted to the landfill should be managed in the following items.

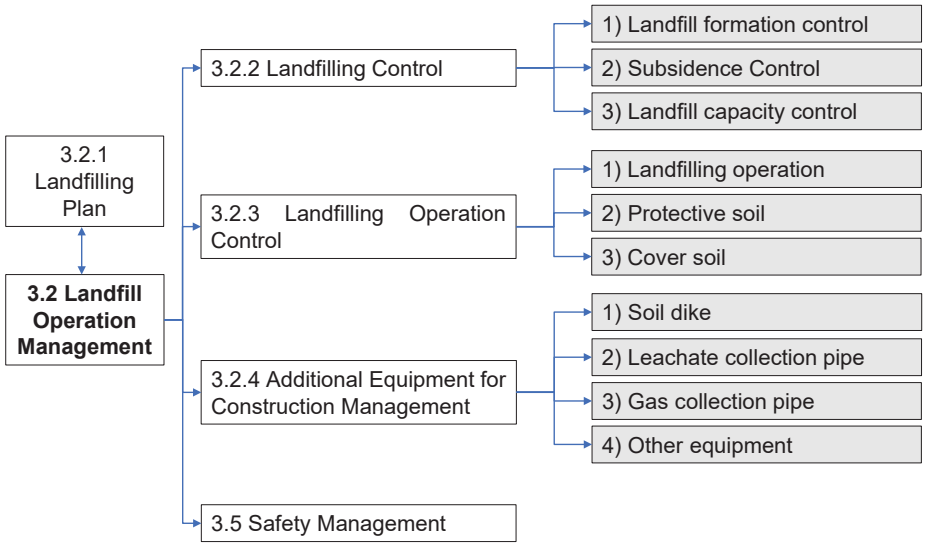
1. Types and properties of waste
2. Amount of waste, Transporter type, etc.
3. Amount and material of cover soil

Date & Time	Vehicle No.	Transporter type	Waste type	Source of waste generated	Region	Loading weight	Vehicle weight	Amount of waste	Remarks

3. Management of Sanitary Landfill

3.2 Landfill Operation Management

3.2 What is Landfill Operation Management?



3.2.1 Landfilling Plan

Objective

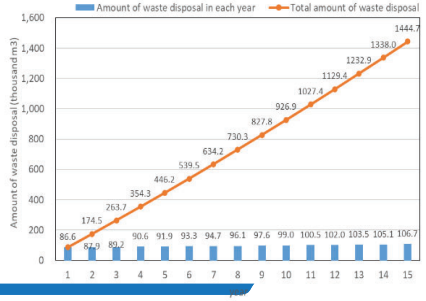
A reclamation plan is important to determine the remaining capacity of the landfill site and to predict the timing of the construction of the slope-raising embankment.

The followings should be considered for the landfilling plan

1) Yearly Landfilling Plan
2) Periodic Landfilling Plan
3) Consistency with Leachate Treatment Plan
4) Landfilling Method
5) Landfilling Equipment

1) Yearly Landfilling Plan

- A reclamation capacity and an annual reclamation plan of the landfill site should be periodically verified and revised concerning the implementation of the plan.
- A table comparing the predicted and actual landfill delivery by waste material should be prepared.
- The plan should be reviewed when the actual data deviates from the predictions

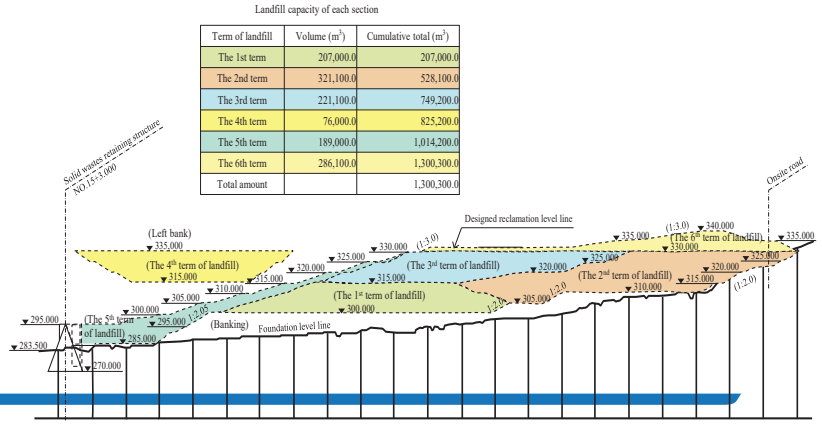


2) Periodic Landfilling Plan

The landfilling period of a landfill site is usually 15 years, which is a long period, so the landfill plan should be prepared in periods

Landfill capacity of each section

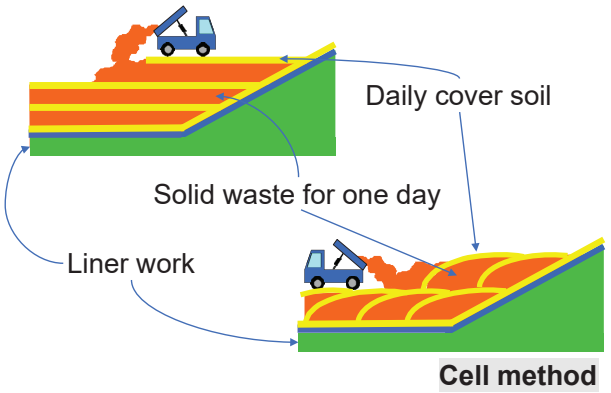
Term of landfill	Volume (m^3)	Cumulative total (m^3)
The 1st term	207,000.0	207,000.0
The 2nd term	321,100.0	528,100.0
The 3rd term	221,100.0	749,200.0
The 4th term	76,000.0	825,200.0
The 5th term	189,000.0	1,014,200.0
The 6th term	286,100.0	1,300,300.0
Total amount		1,300,300.0



4) Landfilling Method

There are two kinds of landfilling methods.

Sandwich method



Cell method

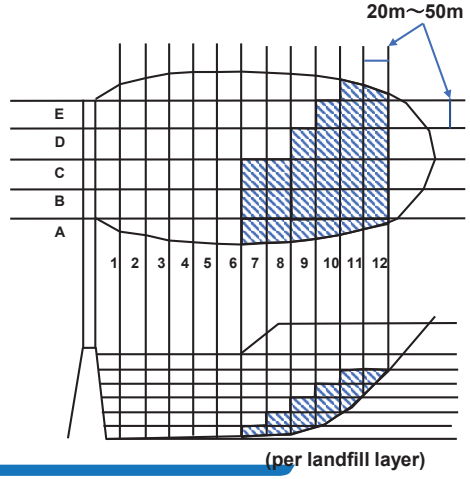
The cell method is better in terms of environmental and safety management.

5) Landfilling Equipment

Type	Waste		Protective soil and cover			Transport	Movement
	Leveling	Surface compaction	Excavation	Leveling	Surface compaction		
Bulldozer	◎	○	△	◎	○	×	○
Tractor shovel	○	○	◎	○	○	○	○
Compactor (Blade)	◎	◎	×	○	◎	×	×
Compactor (Bucket)	○	◎	△	△	◎	○	×
Hydraulic power shovel	×	×	◎	△	×	×	×
Wheel Loader	○	×	△	○	×	○	◎

3.2.2 Landfilling Control
1,2) Landfill formation and Subsidence Control

- Purpose
  - Ensure consistency between plans and actual results of landfill reclamation shape.
- Measuring method
  - Set up measurement stakes based on the several reference piles installed beforehand at the location unaffected by subsidence.
  - Measure a distance and angle using a transit and tape measure.
- Frequency
  - Once or twice a month

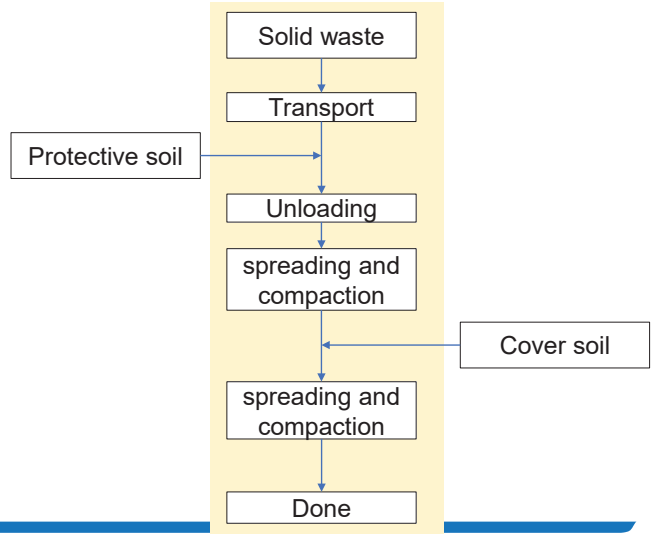


3) Landfill Capacity Management

- Actual Landfilled Volume
  - Calculated from the landfilling control results.
    *Calculated by the amount of carried-in waste if it is difficult to do the landfill reclamation control.
  - The results are compared with the annual landfilling plan and used as basic data for reviewing the landfill plan in the future.
- Calculation of Landfill Capacity
  - "Landfill Capacity (m^3) "
    = "Total landfill capacity" – "Actual landfilled volume"
- Frequency
  - Once a month

3.2.3 Landfilling Operation Management

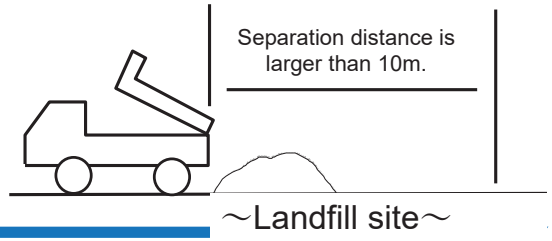
Below is the flow of landfilling operation



1) Landfilling Operation

In unloading from transport vehicles, below are cautions

- Covered and compacted to prevent flat tires on the hauling vehicle
- Keep carrying-in vehicles out of the landfill area to avoid contact with heavy landfill equipment.
- Keep a certain distance from the bottom of the slope at which the waste is unloaded.



1) Landfilling Operation

In spreading and compaction work, below are the cautions.

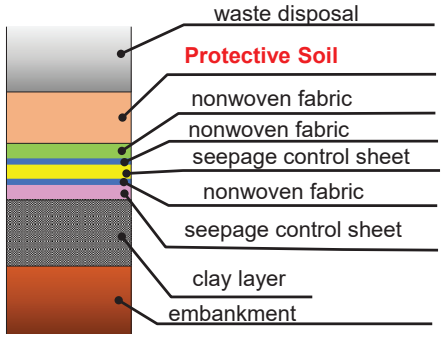
- Spread over a whole area as wide as possible.
- Decide the daily landfill area and thickness
- The thickness of compacted waste is 30 to 50 cm
- Compact in 5 to 6 round trips
- The speed of a compactor is low, the first gear.
- After the completion of compacting all the layers in a day, start the second layer.
- No humans and vehicles during spreading and compaction.
- Take care near a sloped area and a gas treatment pipe.
- Take care of the sheets of the liner facility on the first layer.
- In the slope area, spread, and compact in an upward direction.

2) Construction of Protective Soil

Protective soil is important to protect the sheet of the liner facility

Protective soil shall be constructed according to the following

- Securing Protective Soil
- Putting in slope protection soil
- Putting in bottom protective soil
- Measures against sheet shrinkage



3) Construction of Soil Cover

- Purpose
  - Leachate volume control
  - Prevention of spattering and runoff
  - Prevention of stench dispersion
  - Fire prevention
  - Vector control
  - Closure of landfill termination parcels

3) Construction of Soil Cover

There are three types of soil cover.

Type	Purpose	Frequency
Daily Soil Cover	• Prevent scattering of landfill waste and drainage of rainwater.	Every day
Intermediate Soil Cover	• Pathway for the vehicles • Drainage of rainwater in the landfill areas	each height in 2.0 to 3.0 m
Final Soil Cover	• Use the landfill site, which is completed landfilling works, as another site.	After completing all landfilling works.

3. Management of Sanitary Landfill

Facility Management

Additional equipment should be constructed according to the progress of landfilling

- Main Additional Equipment
  - Soil dike
  - Leachate collection pipes
  - Extension of the vertical gas venting system

Prepare a list of additional equipment to be installed during reclamation to ensure that it is installed, and that the reclamation staff is made aware of it.

3.3 What is Facilities Management?

- Prevention of impacts on the surrounding environment
- Prevention of accidents due to abnormalities
- Proper implementation of waste delivery, landfill operations, and leachate treatment
- Ensure proper and economical operation of facilities
- Prevention of damages to facilities due to landfill operations, etc.
- Health care of staff and workers

Contents of Facility Management

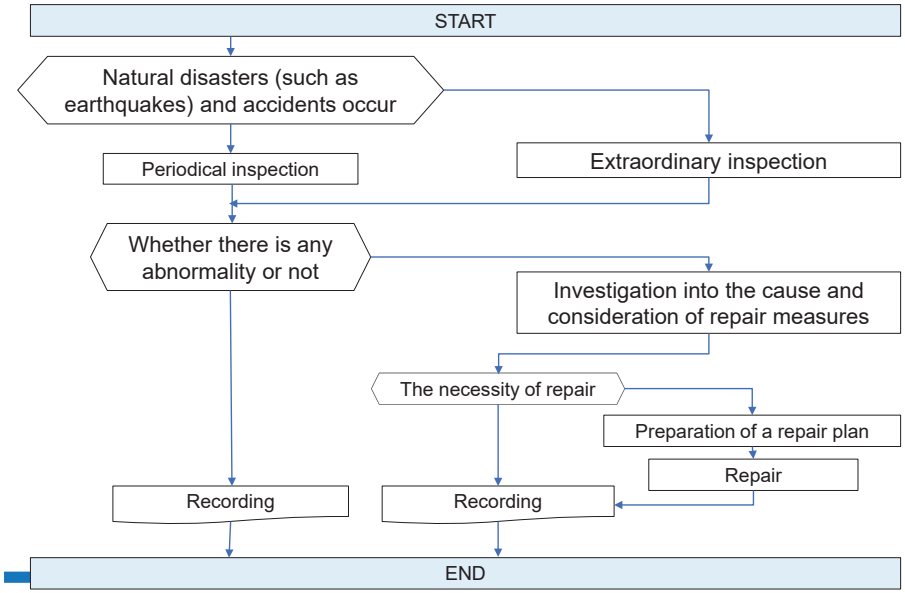
- Inspection : Inspections of facilities for damage or defects, or for the progress of damage, with a plan for the next period, frequency, and items to be inspected. Various methods are available, including visual and photographic inspections, physical inspections using measuring instruments, and scientific analysis.
- Repair : Repair or update a facility to restore damage to the facility.
- Damage Prevention: Prevention of damage to facilities caused by landfill equipment during landfill operations
- Cleaning: Cleaning and dredging of stormwater collection and drainage facilities

Inspection Types

There are three types of inspections for the facility management.

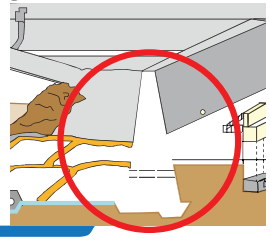
Inspection	Frequency	Contents
Daily Inspection	Periodically (daily, weekly, yearly) - The frequency is decided in each facility	The main objective is to detect damage as early as possible.
Detailed inspection	In case that facility damages are found by the daily inspection, and it is difficult to judge doing repairment.	Using suitable test equipment for each facility
Abnormality Inspection	It shall be conducted after disasters such as earthquake, heave rain, and cyclone.	Do check same items with the daily and detailed inspections.

Procedure of the Abnormality Inspection



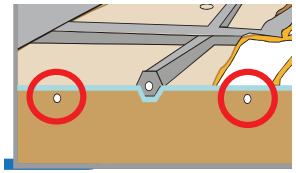
3.3.2 Storage Structure

- Main method of maintenance
  - Visual check about cracks, leakage and so on, every day.
- Adverse effect without the maintenance
  - landfill collapse
  - water pollution into the surrounding river.



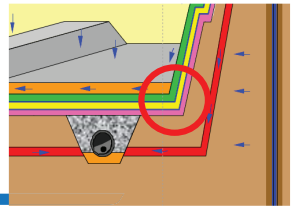
3.3.3 Groundwater Collection Facilities

- Main method of maintenance
  - Visual check, measure of water quantity and water quality test
- Adverse effect without the maintenance
  - Groundwater damages the liner facility by pumping pressure, and the landfill do a collapse or slide.
- Remarks
  - The facility cannot be directly controlled because it is installed below the liner work. The maintenance is conducted by monitoring groundwater quantity and quality.



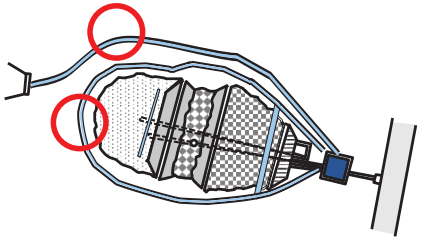
3.3.4 Liner Facility

- Main method of maintenance
  - Visual check about a hole, crack, and tear and so on.
  - Quantity and quality test of the groundwater
- Adverse effect without the maintenance
  - Leachate water is discharged into the groundwater and causes water pollution.



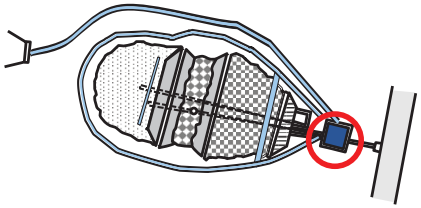
3.3.5 Rainwater Collection Facilities
1) Rainwater Drainage Canal

- Main method of maintenance
  - Do visual check about a crack, damage, leakage, growth of surrounding plants and so on
- Adverse effect without the maintenance
  - Flood
  - Water pollution into the surrounding river and sediment.



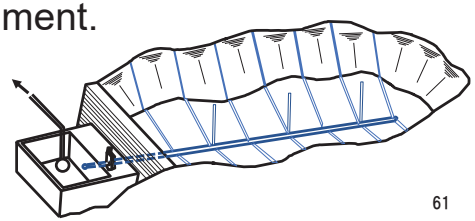
3.3.5 Rainwater Catchment Facilities
2) Disaster Prevention Pond

- Main method of maintenance
  - Do visual check about a water level, crack, damage, leakage, growth of surrounding plants and so on.
- Adverse effect without the maintenance
  - Flood
  - Water pollution into the surrounding river and sediment.



3.3.6 Leachate Collection Facilities

- Main method of maintenance
  - Measure water level in the landfill
  - Do visual check of leachate quantity, a crack of the landfill and so on.
- Adverse effect without the maintenance
  - Leachate is stored in the landfill.
  - Water pollution into the surrounding river, groundwater and sediment.



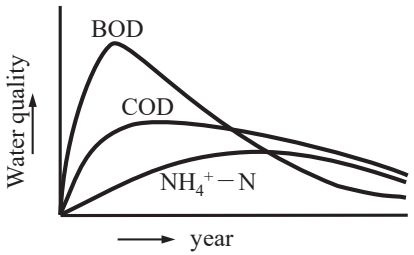
3.3.7 Leachate Treatment Facility (1)

- Main method of maintenance
  - Visual check of cracks and damages of each equipment.
  - Check a treatment plant according to the manual
- Adverse effect without the maintenance
  - Water pollution into the surrounding river, groundwater and sediment.
  - Flood

3.3.7 Leachate Treatment Facility (2)

- Countermeasure against fluctuating water quality and quantity.
  - The amount of leachate is fluctuating depending on the dry/wet season or the early/middle/end stage of the landfill.

- Prepare the treatment plan according to the season and the stage

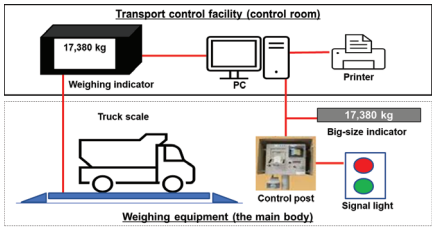


3.3.8 Landfill Gas Treatment Facilities

- Main method of maintenance
  - Clean surrounding the facility and visual check of cracks and damages.
  - Check temperature, amount and property of landfill gas.
- Adverse effect without the maintenance
  - Landfill gas is stored in the landfill, and causes fire accident and health hazard.
  - Delay a landfill stabilization.

3.3.9 Transport Control Facilities

- Main method of maintenance
  - Visual check of cracks and damages of each equipment.
  - Check of facility according to the manual
- Adverse effect without the maintenance
  - Unable to measure the amount of carried-in waste.
  - Unable to make a landfill plan.



3.3.10 Environmental Monitoring Facilities

- Main method of maintenance
  - Operation test of each equipment
- Adverse effect without the maintenance
  - Unable to measure any environmental factors.
  - Water pollution into the surrounding environments, rivers, groundwater, and sediments.
  - Air pollution
  - Noise & Vibration

3.3.11 Control Building

- Main method of maintenance
  - Visual and operation check of the buildings and the equipment of air-conditioning, lighting, firefighting, and so on.
- Adverse effect without the maintenance
  - Unable to manage the whole landfill operation.
  - Health problems of the staff

3.3.12 Road Equipment

- Main method of maintenance
  - Visual check of a road crack, and obstructions.
- Adverse effect without the maintenance
  - Flat tire
  - Vehicle breakdowns
  - Traffic jam
  - Vehicle accidents

3.3.13 Vehicle Wash Facilities

- Main method of maintenance
  - Visual check of cracks and damages.
  - Clean up the facilities
  - Operation check of the washing equipment.
- Adverse effect without the maintenance
  - Carrying-out the landfill waste with the vehicle.
  - Flat tire.


3.3.14 Littering Prevention Equipment

- Main method of maintenance
  - Visual check of damages of the fences and pillars.
  - Clean up waste on the fences.
- Adverse effect without the maintenance
  - Waste runoff into the surrounding areas and rivers.

3.3.15 Fire Protection Equipment

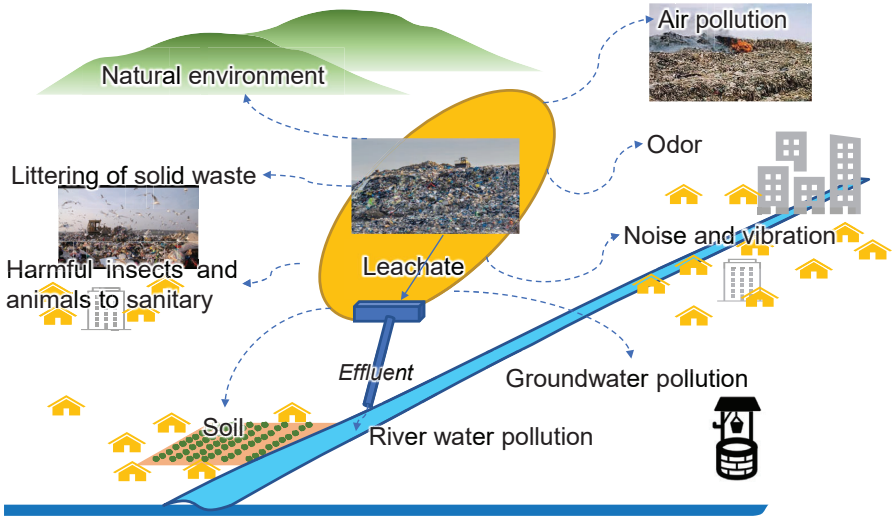
- Main method of maintenance
  - Visual check of water level in the firewater tank, and of a crack of the pipes.
  - Operation check of the supply waster pump and fire hydrant.
- Adverse effect without the maintenance
  - Unable to start immediately extinguishing fire
  - Fire spread


3. Management of Sanitary Landfill

3.4 Environments Management

3.4 What is Environments Management?

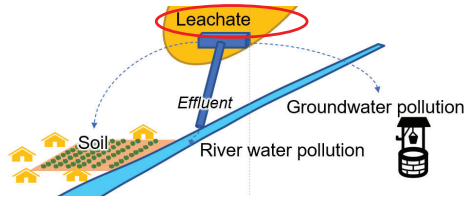
Landfill activities influence the surrounding environment.



3.4.1 Leachate Management

Negative influences on;

- River
- Groundwater
- Soil



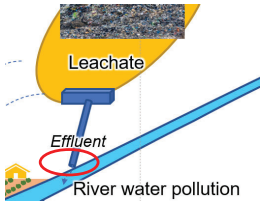
The measuring point is at the point of discharge from the landfill.

measurement item	Frequency
Precipitation, wind direction and speed	24-hour
Leachate volume	24-hour
Leachate level in landfill	24-hour *automatic measurement 1 time/week *manual measurement
Leachate water quality	described in the guideline

3.4.2,3 Effluent and Dewatered Sludge Management

3.4.2 Effluent

- Negative influences on rivers and soils
- The measuring point is the discharge point from the landfill site.



measurement term	Frequency
effluent volume	24-hour
effluent water quality (standard parameters are described in the guideline)	described in the guideline

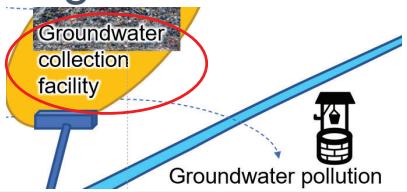
3.4.3 Dewatered Sludge

- Negative influences on the disposal site.
- The measuring point is inside the leachate treatment facility.

measurement item	Frequency	remarks
moisture content	4 times/year	Less than 85
dissolution test	1 time/year	described in the guideline

3.4.4 Groundwater Management

- Negative influences on the surrounding groundwater



measuring point	measuring item		Frequency
Groundwater monitoring wells	Groundwater level		4 times/year
	Groundwater quality	pH, EC	24-hour *automatic
Groundwater collection			1 time/month *manual
Drainage pits		Cl^- , BOD, COD, SS, Coliform count	1 time/month 1 time / month
etc.		Other parameters (see the guideline)	1 time/year
Surrounding wells	Groundwater quality	Cl^-	as necessary
		Other parameters (see the guideline)	

3.4.5 Landfill Gas Management

Negative influences on
- Air pollution

The measuring point
- Discharge points of gas collection pipes

measurement item	Frequency	
	at the time of closing	other times
Gas temperature	4 times/year	2 times/year
Amount of landfill gas generated	4 times/year	2 times/year
Landfill gas composition	4 times/year	2 times/year

3.4.6~11 Surrounding Environmental Management

Measuring each environmental item outside the landfill site.

Measurement item		Frequency
3.4.6 River water	pH, BOD, COD, SS, T-N, Ca2+, CL-, etc.	1 time/month
	Environmental standard items related to water pollution, etc.	1 time/year
3.4.7 Odor	Odor 22 substances (see the guideline)	1 time/year
3.4.8 Sediment	Regulations (see the guideline)	1 time/year
3.4.9 Noise and Vibration	Machine operating noise and vibration	1 time/year
	Road traffic noise and vibration	1 time/year
3.4.10 Air pollution	Dust	1 time/year
3.4.11 Natural Environment	Animal : categorize the species and count the number	1 time/year
	Plant: categorize the species and count the number	1 time/year
	Scenery: record the landscape around the landfill site by photo	1 time/year

3.4.12 Summary of Monitoring Plan

Make a summary of the monitoring plan to manage daily.

Classification	Contents	Parameter	Location	Frequency
Landfilling area	Leachate	volume	discharge point from a landfill site	24-hour
		water quality	discharge point from a landfill site	
Surrounding area	River water	pH, BOD, COD, SS, T-N, Ca2+, CL-, etc.	surrounding river	1 time/month
		Environmental standard items related to water pollution, etc.	surrounding river	1 time/year
	Odor	*following to the regulation*	boarder of the landfill site	1 time/year
	Sediment	*following to the regulation*	surrounding the landfill site	1 time/year
	Noise	Machine operating noise and vibration	housing area surrounding the landfill site	1 time/year

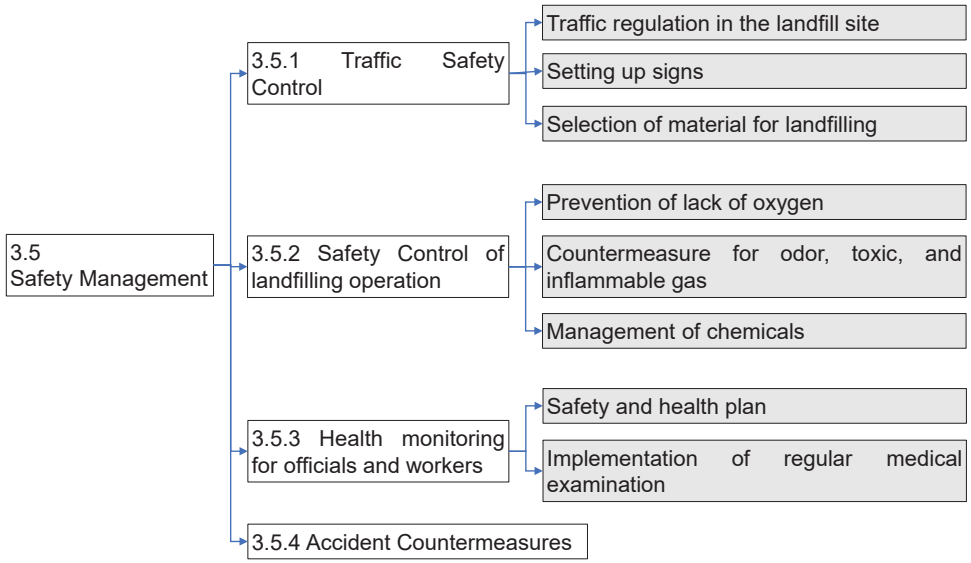
3.4.13 Vector Control
3.4.14 Prevention of Waste Littering

- Vectors in a landfill
  - Crows and other sanitary pests and animals.
- Waste littering
  - Wind
  - Crows and other sanitary pests and animals.
- Countermeasures
  - Covering the soil promptly every day as much as possible.
  - Pesticide

3. Management of Landfill

3.5 Safety Management

3.5 Outline of Safety Management



3.5.1 Traffic Safety Control

- Traffic rules in the site
  - Restrictions on roads other than entry/exit routes, designation of one-way streets, and other regulations as necessary to ensure the smooth passage of waste delivery vehicles, etc.
  - To ensure the safety of workers, crosswalks, etc., are provided and road crossings are restricted.
  - Speed Limit: 20 to 30 km/h
- Installation of signboards

Item	Examples
guide sign	entrance and exit instructions, direction, direction and distance, landfill site guidance, etc.
warning sign	Intersection sign
regulation sign	Entry restrictions, one-way streets, speed limits, temporary stops, etc.

3.5.2 Safety Management of Landfilling Operation

- Oxygen deficiency
  - Ventilation
  - Measurement
  - Protective gear
  - Education
  - Signboard
- Odors, and Noxious and flammable gas
  - Detection of gas leak location
  - Disaster

3.5.3 Health care management for staffs and workers

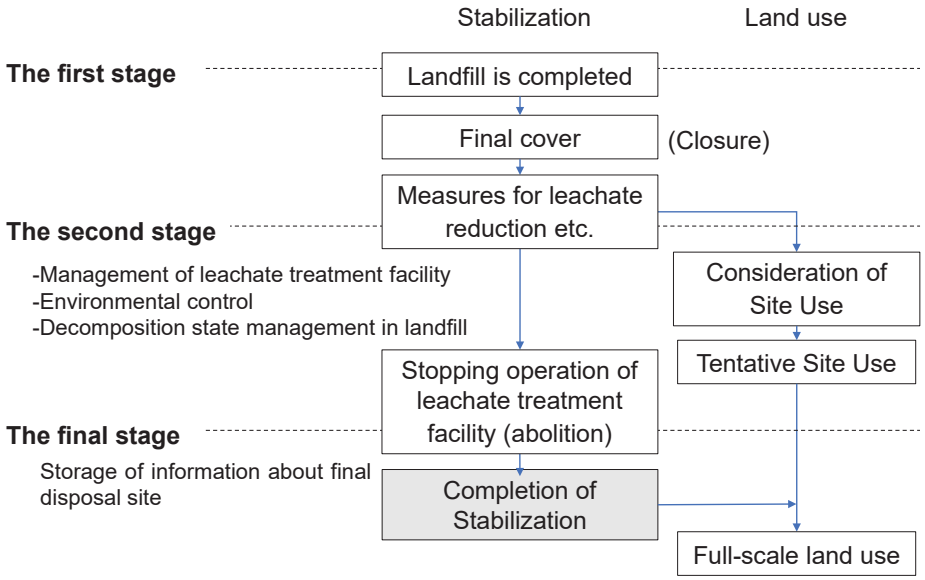
- **Safety Measures**
  - Preventive measures should be taken in advance against possible disasters for each operation.
- **Hygiene measures**
  - Preventive measures against occupational diseases caused by work with hazardous gases, dust, and lack of oxygen
- **Health and Safety Education**
  - Training in the workplace and outside of the workplace
- **Health Management**
  - Health management: Periodic health checkups

3.5.4 Accident Countermeasures

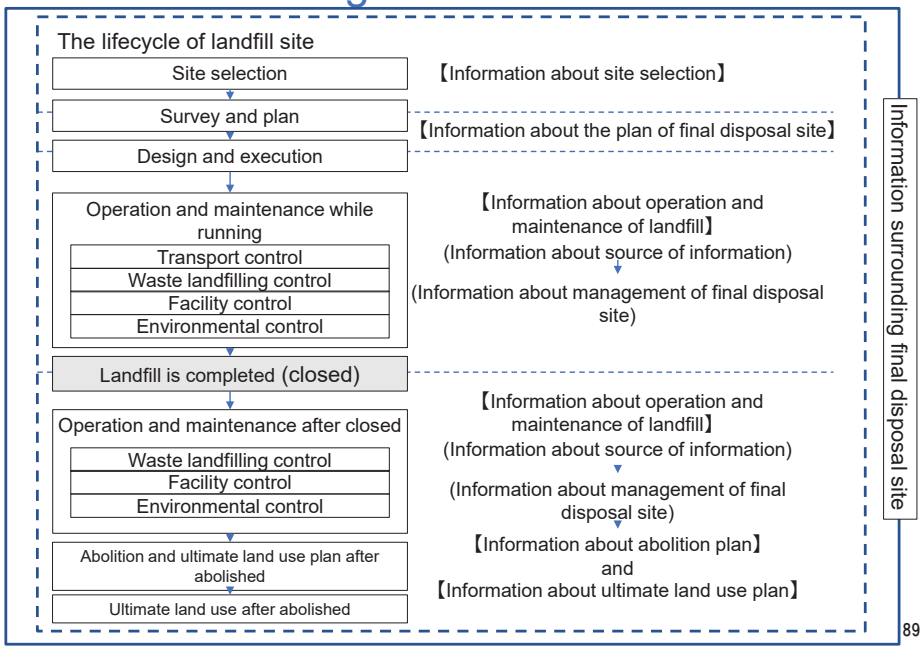
- **Countermeasures in advance**
  - 1) an internal contact network
  - 2) emergency contact information (outside the company)
  - 3) reporting procedures
  - 4) training on the assumption of an accident
- **Countermeasures after an accident**
  - 1) Conduct emergency inspections of each facility
  - 2) Make a decision as soon as possible on whether to continue delivery and notify the customer.
  - 3) Report abnormalities not only internally, but also externally as necessary (consider reporting to local residents as well as government agencies)

4. Site Management after Landfill Completion

4.1~4.4 Outline of closing a landfill and land use after



Information management



Appendices of Chapter 2.6
Activities Related to Output 5

Appendix 6-1
DSMAS Operating Expense Accounts from 2016 to 2022

Appendix 6-2
DSMAS Operating Revenue Accounts from 2016 to 2022

Appendix 6-3
Financial Sustainability Strategy of Solid Waste Management in Maputo City

Appendix 6-4
Plan for Updating the regulations related to SWM in Maputo City

Appendix 6-5
Organizational and Human Resources Development Plan of DSMAS

Appendix 6-1
DSMAS Operating Expense Accounts from 2016 to 2022

BUDGET EXECUTIONS								
Classificação Economica	Descrição	2016	2017	2018	2019	2020	2021	2022
1.1.1	**Salários e Remunerações**	**24,111,758.00**	**25,524,149.49**	**27,337,420.57**	**29,243,430.39**	**32,620,851.97**	**35,471,125.28**	**37,554,488.16**
1.1.1.1.01	Vencimento Base do Pessoal do Quadro	11,812,099.00	12,043,453.61	11,891,350.10	12,566,206.52	14,447,823.44	14,900,255.38	15,196,173.32
1.1.1.1.02	Vencimento Base do Pessoal Fora do Quadro	2,537,170.00	2,728,962.24	3,132,703.61	3,305,449.31	3,258,486.15	3,282,805.63	3,632,027.51
1.1.1.1.04	Pessoal Aguardando Aposentação	810,392.00	1,022,930.21	1,250,904.42	1,316,899.48	1,670,678.05	1,904,701.58	3,046,233.59
1.1.1.1.05	Diuturnidade para pessoal civil	-	4,500.00	4,500.00	-			
1.1.1.1.06	Gratificação de Chefia	231,988.00	323,832.12	454,502.96	583,997.43	641,641.29	830,215.10	935,413.88
1.1.1.1.07	Outras Remunerações Certas	1,025,000.00	1,039,201.54	1,099,028.97	3,123,502.33	3,033,509.36	3,232,146.90	2,613,647.71
1.1.1.1.08	Remunerações extraordinarias	-	12,126.22	26,982.96	17,750.66	92,502.68	190,130.49	58,540.32
1.1.1.1.09	Subsidio de localizacao							
1.1.1.1.10	Subsidio de exclusividade	8,720.00	8,769.35	9,044.40	9,044.40	9,043.80	47,265.90	9,044.40
1.1.1.1.11	Bonos Especial	3,370,108.00	3,710,544.26	4,422,157.84	4,971,048.42	5,854,602.80	5,654,491.26	5,841,335.94
1.1.1.1.12	Rectroativos salariais do exercicio corrente para o pessoal civil		583,673.25	-				
1.1.1.1.13	Bonus de rendibilidade para pessoal civil							
1.1.1.1.14	abaonos 13: mês	1,269,978.00	588,683.26	1,425,436.50	1,523,107.15	1,568,028.93	1,640,470.86	1,814,071.87
1.1.1.1.99	Outras Remunerações	3,046,303.00	3,457,473.43	3,620,808.81	1,826,424.69	2,044,535.47	3,788,642.18	4,407,999.62
1.1.2	**Outras Despesas com o Pessoal**	**232,675.60**	**1,183,425.05**	**451,129.18**	**1,074,746.99**	**313,350.00**	**762,340.00**	**740,733.28**
1.1.2.1.01	Ajudas de Custo dentro do País	31,110.00	72,625.00	58,415.00	41,400.00	77,400.00	312,600.00	28,200.00
1.1.2.1.02	Ajudas de Custo fora do País	193,065.60	943,917.10	183,220.70	852,884.00			
1.1.2.1.05	Representação	-	45,000.00	45,000.00	45,000.00	47,250.00	4,500.00	210,593.28
1.1.2.1.06	Subsídio Combustível e Manutenção de Viaturas	8,500.00	121,882.95	164,493.48	135,462.99	188,700.00	445,240.00	501,940.00
1.1.2.1.07	Suplemento de Vencimentos	-	-	-				
1.1.2.1.09	subcidio de telefone	-	-	-				
1.1.2.1.99	Outras Depesas com pessoal civil	-	-	-				
1.2.1.0.00	**Bens**	**12,613,681.96**	**12,219,731.12**	**12,175,022.32**	**7,984,473.90**	**12,764,186.00**	**5,690,052.51**	**3,294,401.31**
1.2.1.0.01	Combustíveis e lubrificantes	7,652,198.75	8,950,587.81	9,377,488.38	4,736,358.20	7,667,804.43	2,137,800.00	1,978,811.20
1.2.1.0.02	Material para manutenção e reparação de bens imóveis	72,871.52	37,633.93	80,541.54	70,224.65	202,469.10	501,935.00	91,316.38
1.2.1.0.03	Material para manutenção e reparação de bens móveis + (RC)	1,100,876.00	1,636,011.73	1,278,532.25	1,955,454.20	1,819,043.48	1,076,578.50	239,716.88
1.2.1.0.05	Material de consumo para escritório	405,761.14	903,006.54	942,627.60	400,593.86	413,700.00	524,825.00	233,185.00
'1.2.1.0.07	Fardamento e calcado	-	-	-	-	977,581.80	-	
1.2.1.0.10	Géneros alimentícios	2,030,988.57	135,964.45	126,602.54	30,057.47	181,013.05	88,178.78	72,356.85
1.2.1.0.11	Material de limpeza e higiene	461,150.11	222,441.14	207,918.49	131,949.12	677,114.14	642,361.60	182,520.00
1.2.1.0.21	Material para festividades homenagens e premiação	338,782.50	-	-	297,443.40	-	-	5,265.00
1.2.1.0.22	Material de consumo para informática	304,033.98	321,596.20	90,105.00	313,710.00	440,500.00	376,778.29	489,850.00
1.2.1.0.26	Material de consumo para copa e cozinha	-	-	100.00	-	-	121,110.00	
1.2.1.0.31	Material para conservacao de rede de electrificacao	-	669.32	1,330.95	-	384,500.00	1,195.60	1,170.00
1.2.1.0.32	Material para aplicacao em projectos sociais e assistencia social	-	-	-	-	-	-	
1.2.1.0.34	Material para conservação de rede de água e esgoto	-	-	69,005.57	5,639.00	460.00	219,289.74	
1.2.1.0.98	Outros Bens	247,019.39	11,820.00	770.00	43,044.00			210.00
1.2.2.0. 00	**Serviços**	**269,183,421.31**	**323,111,625.14**	**277,593,181.56**	**529,378,426.63**	**501,334,463.10**	**368,509,449.91**	**450,395,571.52**
1.2.2.0.01	Comunicação em geral	461,443.65	561,037.71	652,535.71	430,283.33	200,000.18	247,353.54	134,993.69
1.2.2.0.02	Passagens dentro do país	41,769.00	23,580.00	-	2,640.00	3,800.00	720.00	97,050.00
1.2.2.0.03	Passagens fora do país	7,974.00	-	-	279,488.00			471,449.00

1.2.2.0.05	Manutenção reparação de bens imóveis	44,109.00	-	-				
1.2.2.0.06	Manutenção e reparação de bens móveis	74,593.35	127,972.56	274,829.96		8,892.00	150.00	237,812.45
1.2.2.0.07	Manutenção e reparação de veículos	829,570.58	671,058.93	163,758.23	9,745.63	85,576.94	241,620.40	1,158,891.41
1.2.2.0.08	Transporte e Carga							421,200.00
1.2.2.0.09	Seguros							9,614.00
1.2.2.0.10	Servicos de representacao	-	-	-		20,277.50	648,922.95	
1.2.2.0.11	Festividades homenagens e premiação	-	-	-	218,850.00			
1.2.2.0.12	Água	537,993.79	361,334.99	413,882.10	610,635.42	579,343.55	1,202,808.49	650,614.06
1.2.2.0.13	Energia eléctrica	322,756.58	542,607.24	716,724.38	900,487.25	964,071.79	1,215,340.99	769,417.28
1.2.2.0.14	Consultoria e assistência técnica residente - pessoa singular (RC)	1,342,775.00	2,405,302.50	1,447,994.00	31,941.00			171,990.00
1.2.2.0.15	Consultoria e assistência técnica residente - pessoa colectiva	-	-	-	156,065.00			1,053,049.12
1.2.2.0.16	Consultoria e assistência técnica não residente - pessoa singular	-	-	-	-			
1.2.2.0.17	Consultaria e assistancia technica nao residente - pessoa collectiva							
1.2.2.0.18	Contratos de manutencao para maquinas e equipamentos	678,663.20	-	357,275.29		3,084,568.34	3,168,938.16	1,783,848.00
1.2.2.0.19	Locacao de bens moveis					3,486,600.00	198,494.01	3,486,600.00
1.2.2.0.21	Limpeza e conservacao			972.00				
1.2.2.0.24	Serviços gráficos	254,767.05	-	-	1,500.00	1,500.00	535,177.89	
	Servicos a projectos de assistancia social							
	Manutencao e reparacao de estradas e vias							
	Manutencao e reparacao de rede de electrificacao					308,655.95		
1.2.2.0.28	Manutencao e reparacao de rede de agua e esgoto	103,390.00	36,765.24	-				299,550.10
1.2.2.0.99	Outros Serviços + (RC)	264,483,616.11	318,381,965.97	273,565,209.89	526,736,791.00	492,591,176.85	361,049,923.48	439,649,492.41
1.4.1.0.0	**Tranferências correntes a Administrações Públicas**	**75,000.00**	**127,862.89**	**80,000.00**	**125,000.00**	**-**	**-**	**-**
	Transferencas correntes a institucoes autonomas	75,000.00	85,000.00	80,000.00	125,000.00			
	Outras transferencial correntes a administracoes publicas		42,862.89					
1.4.2.0.0	**Tranferências correntes a Administrações Privadas**							
1.4.3.0.0	**Transferencias correntes a familias**	**-**	**-**	**-**	**-**	**146,456.00**	**383,839.13**	**287,776.00**
	Subsidio por morte para civis							
	Subsídio funeral					130,000.00	160,000.00	230,000.00
	Transferencias a comunidade local					16,456.00	223,839.13	57,776.00
1.6.0.0.0	**Execicios Findos**	**1,989,498.87**	**-**	**1,390,122.71**	**1,892.70**	**5,309,854.57**	**-**	**-**
1.6.1.0.0	Retroactivos salariais	1,989,498.87		**1,264,040.45**				
1.6.2.0.0	Retroactivos de bens e servicos			126,082.26	1,892.70			
1.6.3.0.0	Retroactivos de Pensoes					5,309,854.57		
1.7.0.0.0	**Demais despesas correntes**	**49,608.00**	**-**	**-**	**25,764.24**	**-**	**-**	**270,000.00**
1.4.3.4.07	Transferências a comunidade local	49,608.00			25,764.24			270,000.00
	TOTAL OPERATIONS	**308,255,643.74**	**362,166,793.69**	**319,026,876.34**	**567,833,734.85**	**552,489,161.64**	**410,816,806.83**	**492,542,970.27**
2.0.0.0.0	**Despesas de capital**					**83,287,675.69**	**29,942,459.16**	**169,350,883.99**
2.1.0.0.0	**Bens de capital**					**83,287,675.69**	**29,942,459.16**	**169,350,883.99**
2.1.1.0.0	**Construcoes**					**83,287,675.69**	**25,909,200.50**	**168,124,743.99**
2.1.1.1.0	Construcoes em curso					83,287,675.69	25,909,200.50	168,124,743.99
2.1.1.2.0	Construcoes acabadas							
2.1.2.0.0	**Maquinaria equipamento e mobiliarios**						**4,033,258.66**	**1,226,140.00**
2.1.2.0.07	Maquinas e equipamento refrigeracao							

2.1.2.0.10	Equipamento de Seguranca e Sinalização						1,475,398.66	
2.1.2.0.16	Aparelho de som e imagem							79,560.00
2.1.2.0.19	Equipamento Informático							1,146,580.00
2.1.2.0.20	Ferramentas de uso geral							
2.1.2.0.0.99	Outras maquinarias equipamentos e mobiliarios						2,557,860.00	
2.1.3.0.0	**Meios de transporte**							
2.1.4.0.0	**Demais bens de capital**							
2.1.4.1.0	**Demais bens de capital-bens imoveis**						**-**	**-**
2.1.4.1.01	Animais							
2.1.4.1.02	Software de aplicacao							
Total		**308,255,643.74**	**362,038,930.80**	**319,026,876.34**	**567,706,842.15**	**635,776,837.33**	**440,759,265.99**	**661,893,854.26**

Appendix 6-2
DSMAS Operating Revenue Accounts from 2016 to 2022

ACTUALIZACAO DE RECEITAS

Balancete de Receita Arecadada de 2016-2019

		2016			2017			2018		
Rubrica	Proviniencia	DOTACAO (MT)	ACTUAL (MT	REALIZACAO (%)	DOTACAO (MT)	ACTUAL (MT	REALIZACAO (%)	DOTACAO (MT)	ACTUAL (MT	REALIZACAO (%)
1 2 3	**Receitas nao Fiscais**									
1 2 3 2	**Coimas e Multas**	**641,923**	**329,227**	**51%**	**641,923**	**214,294**	**33%**	**641,923**	**223,815**	**35%**
1 2 3 2 5	Cobranca de Multas DMSC (30%)	641,923	329,227	51%	641,923	214,294	33%	641,923	223,815	35%
	Multa de Residuos Sólidos									
1 3	**Receitas Consignadas**	**175,842,026**	**149,139,406**	**85%**	**192,663,330**	**153,949,429**	**80%**	**220,487,625**	**172,332,607**	**78%**
1 3 0 5	**A Recolha e Tratamento de Lixo**	**175,842,026**	**149,139,406**	**85%**	**192,663,330**	**153,949,429**	**80%**	**220,487,625**	**172,332,607**	**78%**
1 3 0 5 1	EDM - CMM (95%)	165,765,962	139,237,225	84%	176,071,474	141,663,806	80%	201,130,841	160,568,848	80%
1 3 0 5 2	Prova de Servico, Taxa de Limpeza	3,800,000	6,372,371	168%	9,854,181	6,555,489	67%	9,854,182	7,328,958	74%
1 3 0 5 3	Taxa de Lixeira Municipal de Hulene	2,700,000	1,454,278	54%	2,998,306	1,323,594	44%	2,998,306	1,364,649	46%
1 3 0 5 4	Contratos de recolha de residuos solidos	3,000,000	1,823,123	61%	3,112,024	3,983,209	128%	5,280,997	2,631,594	50%
1 3 0 5 5	Licencas de provisao de servicos de recolha	376,064	197,139	52%	427,345	402,561	94%	823,299	419,463	51%
1 3 0 5 6	Remocao especial	200,000	55,270	28%	200,000	20,770	10%	200,000	19,094	10%
1 3 0 5 7	Inceneracao	-	-		-	-		200,000	-	
	Licenciamento ambiental									
1 3 0 14	*EDM - Prestacao de Servicos (5%)*	*8,513,998*	*7,174,468*	84%	*9,266,920*	*2,701,712*	29%	*10,585,834*	*8,450,992*	80%
2 2	**Outras Receitas de Capital**	**864,000**	**788,473**	**91%**	**1,419,251**	**1,101,688**	**78%**	**1,560,000**	**1,472,719**	**94%**
2 2 2 2	**Bens imoveis, incluindo rendas e aforos sobre terra**	**864,000**	**788,473**	**91%**	**1,419,251**	**1,101,688**	**78%**	**1,560,000**	**1,472,719**	**94%**
2 2 2 2 4	DMGRSU	864,000	788,473	91%	1,419,251	1,101,688	78%	1,560,000	1,472,719	94%
TOTAL DE RECEITAS		**177,347,949**	**150,257,106**	**85%**	**194,724,504**	**155,265,411**	**80%**	**222,689,548**	**174,029,141**	**78%**

2019			2020			2021			2022		
DOTACAO (MT)	ACTUAL (MT	EALIZCAA (%)	DOTACAO (MT)	ACTUAL (MT	ALIZAC (%)	DOTACAO (MT)	ACTUAL (MT	ALIZAC (%)	DOTACAO (MT)	ACTUAL (MT	REALIZACAO (%)
641,923	**156,829**	**24%**	**2,139,743.00**	**397,635.99**	**19%**	**572,005.00**	**1,463,424.76**	**256%**	**2,031,799.00**	**1,272,631.00**	**63%**
641,923	156,829	24%	2,139,743.00	397,635.99	**19%**	257,660.00	1,140,783.51	443%	2,031,799.00	1,272,631.00	63%
						314,345.00	322,641.25	103%			
270,640,197	**176,417,594**	**65%**	**336,525,143.00**	**168,856,550.66**	**50%**	**312,027,680.00**	**181,210,223.97**	**58%**	**205,775,302.00**	**187,205,282.50**	**91%**
270,640,197	**176,417,594**	**65%**	**336,525,143.00**	**168,856,550.66**	**50%**	**312,027,680.00**	**181,210,223.97**	**58%**	**205,775,302.00**	**187,205,282.50**	**91%**
250,000,000	164,051,500	66%	294,117,647.00	157,141,481.79	**53%**	276,824,616.00	168,916,517.80	**61%**	164,821,523.00	172,006,372.66	**104%**
11,137,595	7,221,338	65%	14,695,446.00	7,982,179.37	**54%**	12,000,000.00	8,261,088.81	**69%**	18,375,017.00	10,569,285.76	**58%**
2,998,306	2,149,029	72%	2,998,306.00	1,231,711.30	**41%**	1,500,000.00	1,274,767.23	**85%**	794,054.00	1,573,757.26	**198%**
5,280,997	2,343,871	44%	5,280,997.00	1,783,484.20	**34%**	2,500,000.00	2,115,540.88	**85%**	2,204,717.00	1,899,179.82	**86%**
823,299	548,630	67%	1,032,747.00	653,400.00	**63%**	1,100,000.00	621,186.25	**56%**	1,579,991.00	1,149,587.00	**73%**
200,000	103,226	52%	200,000.00	64,294.00	**32%**	103,064.00	21,123.00	**20%**	-	7,100.00	
200,000	-	0%	200,000.00		**0%**	-	-		-	-	
			18,000,000.00		**0%**	18,000,000.00	-	**0%**	18,000,000.00	-	**0%**
13,157,895	-	0%									
1,560,000	**1,303,168**	**84%**	**1,560,000.00**	**1,105,903.10**	**71%**	**1,173,642.00**	**635,937.39**	**54%**	**1,173,642.00**	**329,362.80**	**28%**
1,560,000	**1,303,168**	**84%**	**1,560,000.00**	**1,105,903.10**	**71%**	**1,173,642.00**	**635,937.39**	**54%**	**1,173,642.00**	**329,362.80**	**28%**
1,560,000	1,303,168	84%	1,560,000.00	1,105,903.10	**71%**	1,173,642.00	635,937.39	54%	1,173,642.00	329,362.80	28%
272,842,120	**177,877,591**	**65%**	**340,224,886.00**	**170,360,089.75**	**50%**	**313,773,327.00**	**183,309,586.12**	**58%**	**208,980,743.00**	**188,807,276.30**	**90%**

Appendix 6-3
Financial Sustainability Strategy of Solid Waste Management in Maputo City

FINANCIAL SUSTAINABILITY STRATEGY OF **SOLID WASTE MANAGEMENT** IN MAPUTO CITY

The principle on which the strategy to achieve financial sustainability in the City's solid waste management is anchored on is EQUITABILITY.

The PRINCIPLE of EQUITABILITY
Revenue enhancement without raising fees;
Cost optimization without sacrificing operations.

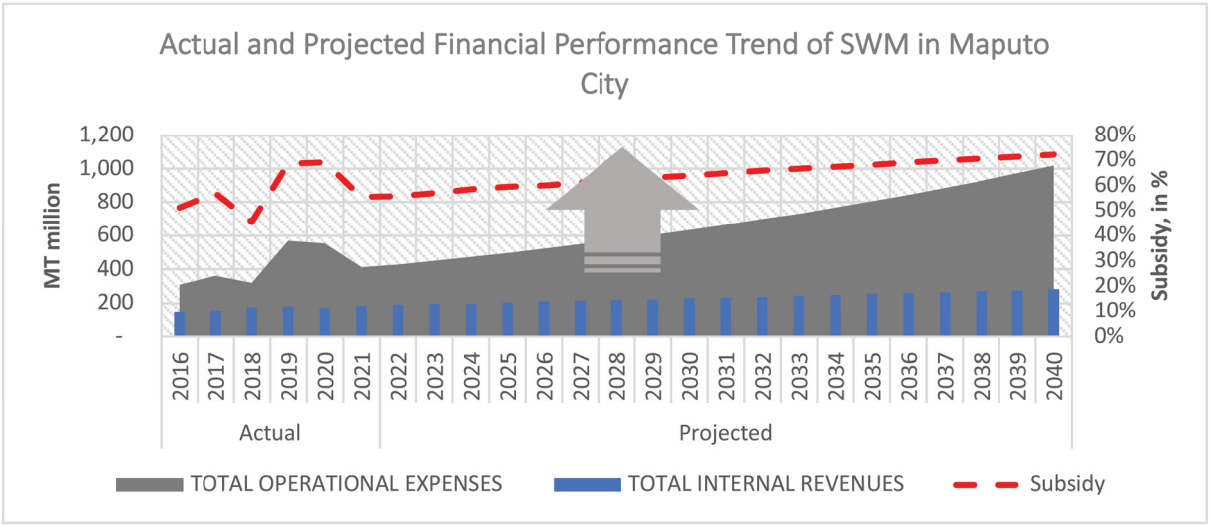
The strategy will neither raise or create new fees, nor will it suggest a difficult compromise in operations to save on costs. Instead, it will bank on natural human tendency to support an endeavor that is perceived to be JUST, CREDIBLE, and EQUITABLE where everyone pitches in according to their utility and capacity.

This means attaining sound financial operations will be realized through measures that will: (1) correct current systems, (2) provide mechanisms that would ensure transparency in transactions, and (3) ensure fairness in the distribution of costs of SWM.

The financial sustainability strategy is geared towards encouraging more public participation towards a better solid waste management in Maputo City.

From 2016 to 2021, the sector of SWM had been subsidized by an average of 58%. The years 2019 and 2020 were heavily affected by the unanticipated additional cost requirements after the Hulene dumpsite tragedy in February 2018. Internal revenue, which comprised an average of 42% of operational requirements, had only grown 4% in the last 6 years, whereas costs have annually increased by about 13%.

Given the business-as-usual trend, for internal revenue to catchup with budgetary requirements will be impossible. By 2040, total subsidy can reach over 70%.



With the City's planned investment on more advanced, environmentally-sound technology such as a sanitary landfill, operational funding requirements may double in time, as indicated by the grey-

colored upward pointing arrow on the graph. The already heavily subsidized sector will then require further external financial support, or its operations will direly suffer.

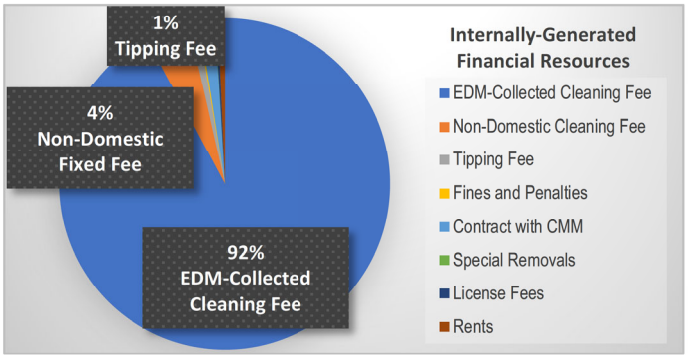
The primary implication of a heavily subsidized sector is that limited government resources will then have to be thinly spread to meet competing demands. The SWM sector is expected to be self-supporting at a reasonable level because of the fees that are charged for its services. However, its mediocre revenue-generation means it will have to compete with other sectors that are equally important but not income-earning, such as education, health, culture, and social welfare.

On the other hand, the Government is deeply obliged to subsidize solid waste management. If not, services may stop and this will result to uncollected garbage, filthy streets, and flooding which are problems that are very visual. These would quickly impact on tourism and on the investment attractiveness of the city. Eventually, this creates discontent among the general population and breed more social issues, causing an overall decrease in the quality of life of citizens and visitors.

The need for financial sustainability of the sector is critical. Financial sustainability is a state where self-generated financial resources would be sufficient to cover operational funding requirements. While a fully independent SWM sector is not envisioned in the short- to medium-term, weaning away from subsidy over time means scarce public resources can be freed for other uses. It will also be able to address service gaps in less time. The outcome will be beneficial for all.

Keeping the principle of equitability in mind, the financial sustainability strategy for Maputo City's SWM sector is two-fold because it touches on both revenue and cost sides.

On the revenue side, the strategy will focus on: (1) the cleaning fee collected through the monthly electricity bill, (2) the fixed non-domestic waste generation fee, and (3) the tipping fee.

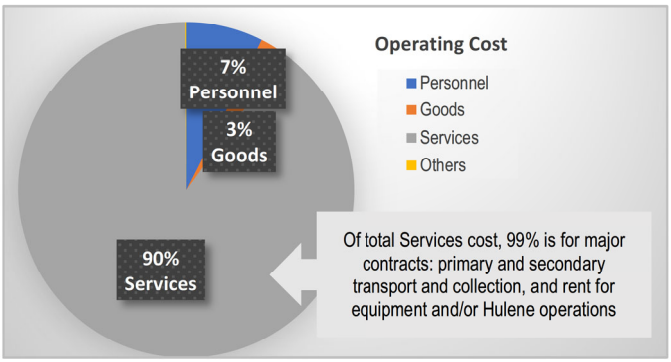


The ***taxa de limpeza*** is still the primary internal revenue source of the sector, with 92% contribution, overall. Its manner of collection, which is through the electricity bill, is still considered the most efficient method for Maputo City with over 95% electrification rate. Despite this, there are inherent weaknesses in the current fee structure. The strategy will address these.

Meanwhile, the **fixed non-domestic waste fee** imposed on businesses and other institutions is seen to have high potential for increase but the manner in which it is presently collected needs to be anchored on a more efficient --- and existing --- system.

The **tipping fee** for the use of Hulene dumpsite is another internal revenue source with considerable potential for improvement. It is not so much on the fee itself, but, as again, on the way it is collected.

Scrutinizing costs is imperative to financial sustainability. Analysis of the sector from 2016 to 2021 shows that 90% of the total cost of SWM is on provision of Services. And of this, 99% is spent on major contracts for the primary and secondary transport and collection of waste, and the rent for equipment that were used in Hulene operations.



This underscores the criticality of **contract management**. DSMAS, as it is now, must be restructured to give more emphasis on monitoring the performance of all its contractors. DSMAS must give focus on its responsibilities as administrator of contracts. DSMAS must make sure that the City receives appropriate services for the contracted work that it is pays for.

In the interest of optimizing costs[1], the following must be done:

1. A restructure of DSMAS to reflect emphasis on Contracts Management as a key department, among other things;
2. Participation of SWM technical and financial experts in the drafting of *Terms of Reference* when contracting services, which should include key performance indicators, among others, that set conditions for incentives or disincentives;
3. Development of reliable cost benchmarks against which proposals may be assessed or compared;
4. A transparent bids evaluation that involves financial evaluation of proposals;
5. A systematic monitoring of performance against commitments or targets within defined timeframes.

In a recent survey that the JICA Project conducted among over 400 companies in Maputo City, the correlation between waste generation and electricity consumption is statistically significant. Results prove that energy consumption is a good indicator of wealth, which translates to more economic activities, thereby creating waste as a natural by-product. Thus, using the electricity bill as a collection vehicle for the cleaning fee is logical and practical.

However, there are fundamental issues in the current structure of the cleaning fee. First, it distinguishes waste generators according to 3 echelons of electricity consumption: low, medium, high. For both domestic and non-domestic waste generators, the definition of echelons by levels of kWh consumption for the month are the same. This assumes that electricity demand for both types of consumers is identical --- this is not correct.

Energy Consumption	Domestic		Non-Domestic	
	kwh	MT	kwh	MT
Low	Up to 200	45	Up to 200	80
Medium	201-500	75	201-500	160
High	500 <	110	500 <	250

[1] *These strategies touching on cost optimization is in collaboration with Output 2 of the JICA Project which aims to improve the operational and institutional efficiency of the SWM sector.*

Current Situation for Domestic Waste Generators			
Budget (MT)	Energy Purchase (kWh)	Taxa de Limpeza (MT)	Impact on Budget (%)
100.00	7	45	45%
2,000.00	241	75	4%
5,000.00	611	110	2%

It is also difficult to justify the intervals in consumption levels, and the corresponding fee per level. The set fees are also neither related to the volume of waste generation, nor to the cost of SWM. Furthermore, there is unfair subsidization by the lower income for higher income waste generators within category, as well as across categories. For example, households with only MT100 budget for electricity has to pay the MT45 *taxa de limpeza*. This impacts on their monthly utility budget by 45%. The impact decreases as the consumer becomes richer. It is a classic case of the poor supporting the rich.

Based also on several testimonies, the current charging system of the pre-paid CREDELEC of EDM has limitations. Because the system charges only once a month, the fee is applied only on the first purchase of the month, and usually, it is the lowest fee. If the consumer makes several purchases within the period, which is a typical practice, the household can consume as much energy even going beyond the fee category but without paying a corresponding increase in the *taxa*. Moreover, if a consumer does not purchase electricity for several months, say due to a long travel, they will be charged with the fee multiplied by the number of months they were gone even if they did not generate waste in the City for that period.

In 2021, the cost of SWM[2] was MT0.84/kg.[3] During this year, the total waste generation was 448.2 million kilograms, of which 61% came from the households (domestic waste), and 39% from businesses, institutions and other such entities (non-domestic waste).

The electricity company, EDM, also reported a total energy consumption of 506.2 MW, in the 2021 Statistical Yearbook of the INE.

Using published data on electricity consumers and their corresponding consumption, and relating them to waste generation, it was calculated that an average domestic consumer (a household connection in EDM) produces 0.71kg of waste for every 1kWh of energy consumed. On the other hand, an average non-domestic consumer (a commercial connection in EDM) produces 1.45kg of waste for every 1kWh consumed.

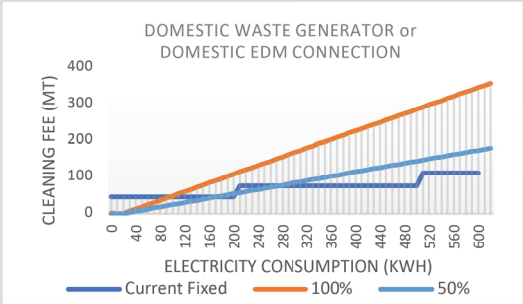
By putting together the unit cost of SWM (MT/kg) and the waste generation per energy consumed (kg/kWh), the appropriate unit pricing of SWM anchored on electricity consumption is derived for the year 2021 with MT/kWh as unit of measure.

Domestic: MT0.59/kWh
Non-Domestic: MT1.21/kWh

This unit cost can be revised and updated every 3 or 5 years depending on policy to reflect the appropriate levels of cost, waste generation, and electricity consumption.

[2] *Referring only to Goods and Services [Personnel Cost is not considered as cost to recover.*
[3] *MT374.6million total DSMAS budget less personnel cost / 448.2million kilograms of waste generated*

With Strategy Situation for Domestic Waste Generators			
Budget (MT)	Energy Purchase (kWh)	Taxa de Limpeza (MT)	Impact on Budget (%)
100.00	12	7	7%
2,000.00	231	148	7%
5,000.00	579	372	7%



Applying 100% of the unit costs on the electricity bill of domestic and non-domestic EDM connections will allow the City to efficiently collect the total cost of SWM, less Personnel costs. And there would be no need for any other fees to generate other revenues.

The strategy also presents enough flexibility for policy-makers to ensure full public understanding and acceptability of this innovative change.

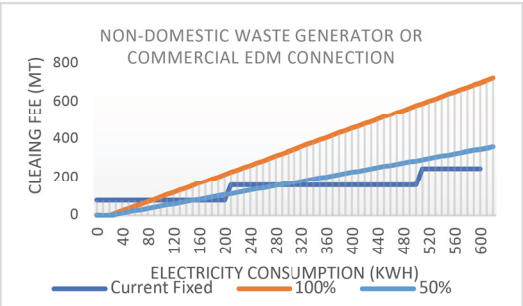
At MT0.59/kWh or 100% of domestic unit cost, the impact on all household budgets for the monthly electricity bill is 7%. If the 100% unit cost is implemented, households consuming an average of 75kWh of energy will feel a reduction in the taxa de limpeza. At 50% unit cost implementation, even households consuming 150kWh[4] per month will feel the benefit. Analysis shows that for CMM to generate increase in total revenue with this strategy on households, the Government can choose from a minimum of 50% unit cost implementation; but we recommend an option between 75% to 100%.

Nonetheless, at any scenario, a consumer with only MT10 will be able to afford electricity and as well as contribute fairly to the cost of SWM in the City, correspondent to his economic status.

Similarly, for the commercial connections of EDM, or the non-domestic waste generators, decision-makers may choose a reasonable level of implementation of the MT1.21/kWh unit charge.

The impact of the unit cleaning fee on commercial consumers is bigger than on the households because they require more energy for their operations and also produce more wastes as a by-product of their economic activities.

Policy Scenarios for Non-Domestic Waste Generators	
Policy on Unit Cost for SWM	Impact on Budget for Electricity
100%	30%
75%	23%
50%	15%
45%	14%
40%	12%
35%	11%
30%	9%



At 100%, the impact of the fee on the monthly electricity bill will be high at 30%. This could potentially spark protest among members of the private sector, given that they are also required by law to contract private service providers for the transport and collection of their waste.

With a lower policy on the unit price application, this unfavorable scenario can be avoided by choosing a policy of up to 30% implementation of the unit cost. Thus, instead of imposing the full MT1.21/kWh, only MT0.36/kWh will be applied which takes away just 9% from the electricity bill.

The study proposes a reasonable policy between 30% to 40% for non-domestic waste generators, which includes businesses, social and public institutions, as well as all other private local and international organizations.

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[4] *Even higher than the average domestic monthly consumption of 120.45kWh in Maputo City*

Current fixed cleaning fee collected from non-domestic waste generators

Category	Waste Generation per day	Corresponding Monthly Cleaning Tax
A	More than 350 kg or 1000 liters	MT 5200
B	Up to 350 kg or 1000 liters	MT 2600
C	Up to 200 kg or 500 liters	MT 1300
D	Up to 100 kg or 250 liters	MT 650
E	Up to 25 kg or 50 liters	MT 325

Actual survey and data simulation results

Proposed fixed cleaning fee collected from non-domestic waste generators

Category	Waste Generation per day	Corresponding Monthly Cleaning Tax
A	**More than 300 kg or 850 liters**	**MT 2,600**
B	**Up to 300 kg or 850 liters**	**MT 1,300**
C	Up to 200 kg or 500 liters	**MT 650**
D	Up to 100 kg or 250 liters	**MT 325**
E	Up to 25 kg or 50 liters	**MT 162**

One of the existing revenue sources that will be enhanced is the monthly fixed cleaning fee that is collected from the non-domestic waste generators and recorded under the Proof of Service (PdS). The collection efficiency of this is 18% in 2021 and has been consistently low.

The strategy on this is to significantly lower the fee to encourage better participation, correct the classification of non-domestic entities, AND expand the revenue base by tapping an existing --- but relatively more efficient --- system.

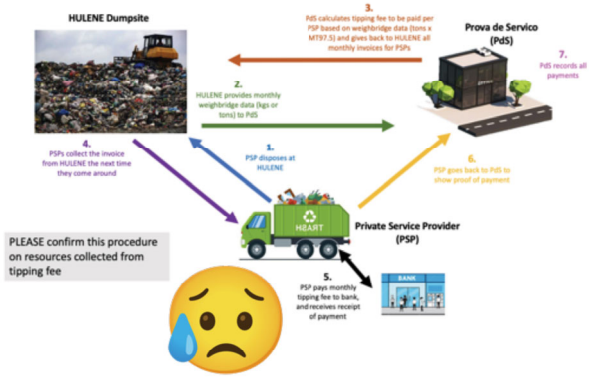
Based on the JICA Project study backed by a survey on 400+ companies in the City, the fixed fees can optimally be lowered by 50%. Waste generation per classification must also be corrected by reflecting a more realistic interval of waste generation. With this, more entities will move from a low category to a higher category.

Moreover, the PdS will be made to stop sending monthly invoices to the registered entities which consumes too much resources (manpower, time, paper, etc.) but with consistently dismal results. The collection is proposed to be done through the annual business registration or the economic activity tax (TAE), which is obligatory for businesses and institutions that operate in the City.

It is also important to note that the CMM business licensing section has 16,000 entities in its database compared to only 10,000 registered entities in the PdS. If databases can be integrated, the potential income can increase from a mere MT8.2 million in 2021, to MT99million. The scenario will even be more favorable if the EDM database with over 30,0000 non-domestic or commercial connections can be utilized. The maximum gain for the City could be as much as over MT230 million in a year.

Finally, the tipping fee collection will be simplified. As again, no increase in the fee is proposed.

Currently, tipping fee collection method is complicated and confusing. Invoices can potentially get lost or disregarded, and in many cases are unpaid. The payment and reporting methods are likewise troublesome for the users of Hulene, as they are required to present the proof of bank payment, manually, to the PdS for it to be acknowledged.

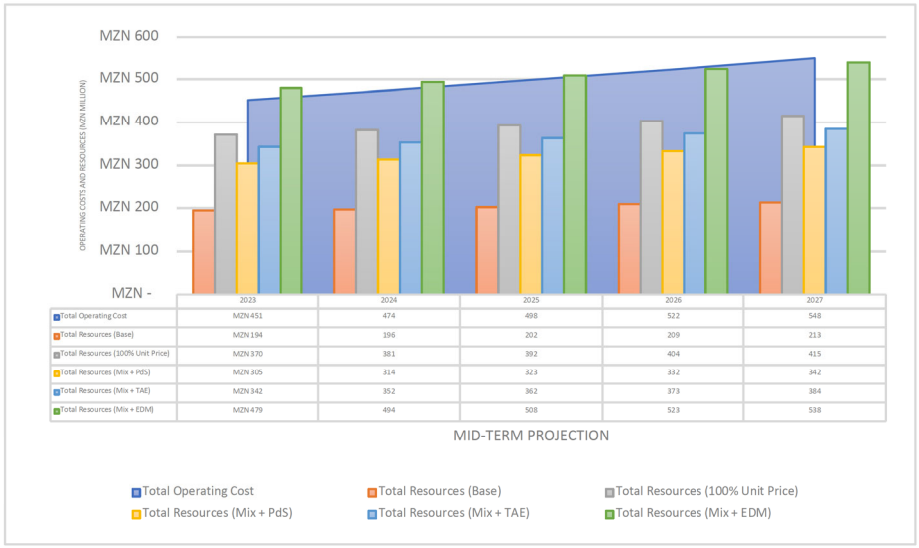


The proposal is to collect the tipping fee at *point-of-sales*, or at Hulene weighbridge/entry through a mobile payment platform such as M-PESA, e-MOLA, and MKESH. Hulene tipping fee will have its own QR code for easy payment and direct transfer to CMM account from the mobile companies. This dispenses the need for monthly invoicing. And because the weighbridge automatically captures data of entry of trucks in Hulene, including those that are contracted by the City for the primary and secondary collection, it is easy to verify payments. In the MasterPlan, it was likewise

proposed that these CMM-contracted major companies must pay the tipping fee, in the interest of financial transparency.

Potential increase in revenue from tipping fee could be from the 2021 collection level of less than MT2 million, to about MT16 million, or an increase by 700%.

The decision on the *taxa de limpeza* will be influenced by various social and political factors. The strategy provides sufficient flexibility and allows a mix of reasonable policies to attain a level of financial sustainability that is beneficial to all constituents of Maputo City.

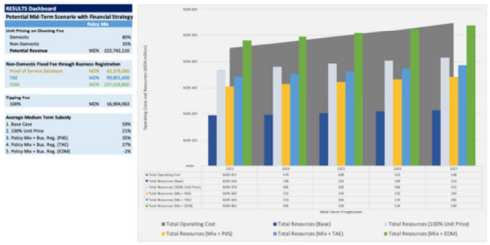


Thus, the need to enhance the fixed non-domestic cleaning fee, the classifications of non-domestic waste generators, and the manner of collecting the tipping fee must be simultaneously done.

From an alarming scenario of 70% subsidy in the future, mid-term subsidy can go down significantly. Depending on the policy mix, and political will to enjoin stakeholders, financial surplus will be attainable even in the medium-term.

Critical activities and institutional linkages to support the proposed financial sustainability strategy are:

- Stronger efforts in public information dissemination: MESSAGING WILL be very important
- Strong collaboration among CMM Business Registration/Revenue Sections, DSMAS and EDM especially on information-sharing/data integration



The JICA Project also provides a simple MS Excel-based tool that will visually provide possible scenarios for all policy mixes.

This will be very helpful for the technical people and decision-makers of CMM.

MUITO OBRIGADA!

Appendix 6-4
Plan for Updating the regulations related to SWM in Maputo City

The Republic of Mozambique

Directorate of Municipal Service of Environment and Waste (DSMAS), Municipal Council of Maputo

The Project for the Capacity Development to Realize Integrated Solid Waste Management in Great Maputo

Plan for Updating Regulations related to Solid Waste Management in Maputo City

June 2023

Japan International Cooperation Agency (JICA)

Nippon Koei Co., Ltd.

The Project for the Capacity Development to Realize Integrated Solid Waste Management in Great Maputo

Plan for Updating Regulations related to Solid Waste Management in Maputo City

Table of Contents

1. WASTE COLLECTION AND TRANSPORTATION

In order to implement the MP and the Plan for Improvement of Waste Collection and Transportation Service in Maputo City, the current CMM resolutions and their provisions that need to be revised, and the recommended revisions, are summarized as follows.

Resolution	Article	Recommendation for update
Resolution nr. 86/AM/2008, from May 22nd **SWM**	**Article 20 (Collection contracts)** 1. Public and private producers are required to engage a USW collection service if they produce, on a daily basis, quantities **equal or above 25kg or 50 litres**. 2. For this purpose, producers mentioned in the above item can engage collection services from Maputo Municipal Services or provide evidence of a contract with a duly licensed private entity, **called "proof of service"**.	• Should be changed the classification of waste producer: ✧ Public producers to domestic waste producer ✧ Private waste producer to non-domestic waste producer. • The condition for domestic waste producers will remain (special collection or PSP when producing equal or above 25 kg or 50 litres. • For non-domestic waste producers, independently of the quantities or volumes produced, they should engage a USW collection service (contract with PSP). • Article 20, nr. 2 Seems to be unclear, "**called Proof of service**" should be changed to PSP or if it is to mention the evidence as proof of service, the number 2 should be re-formulated.
	Article 26 (cleaning fee for the utilization of Municipal Services) **2** **a) Domiciliary producers** **b) Non-domiciliary producers** **c) Large non domiciliary producers**	Should be used the same classification as in article 20: • a) Domestic waste producers • b) Non-domestic waste producers
Resolution nr. 88/AM/2008, from May 22 **license**	**CHAPTER III COLLECTION CONTRACTS BETWEEN LARGE PRODUCERS AND PRIVATE ENTITIES** **Article 12(Collection contracts)** 1. Public and private producers are obliged to engage USW collection services if they produce quantities equal of **above 25 kg or 50 liters** daily, and in such case they will be referred to as large producers.	First should be revised the chapter name to match with the **Article 20 of the** Resolution nr. 86/AM/2008, from May 22nd as same as the contents. For Example: Collection contracts. Nr.3 should be deleted following the condition: • For non-domestic waste producers, independently of the quantities or volumes produced, they should engage a USW collection service (contract with PSP).

Resolution	Article	Recommendation for update
	2. For this purpose, alternatively to enter a waste collection contract with Maputo Municipal Council, the producers mentioned in the above paragraph may display evidence of a service provision contract entered with a duly licensed private entity. **This option is referred to as "proof of services" (prova de serviço).** **3.** Public and private producers who produce quantities of USW **less than 25kg or 50 liters** are exempted from the provisions in the above paragraphs, and they may use the locations, equipment and facilities previously defined for placement, and covered by the Municipal Collection Services.	
	Article 13 (clauses of the collection contract)	Should be removed the word **large producer** and substitute by waste producers.
Resolution nr. 89/AM/2008, from May 22nd	**Article 12 (Schedule for discharge)** 1. The USW to be collected by the Municipal Services or by duly licensed private entities must be discharged in appropriate containers during the period **between 3:30pm to 7pm**. 2. In areas where there are no public containers, serviced by the door-to-door system, the placement of USW must be **between 6pm and 8pm**. 3. The Municipal Services may determine for the USW to be discharged, within a period to be determined, directly into the municipal vehicles or in vehicles of licensed entities, as well as in different days or schedules for certain neighbourhoods or areas.	Should be deleted number 2 because it is included in number 3.
	Article 18 (Conservation of USW placement equipment) 1. It is up to each owner to maintain the USW placement equipment in good condition.	Five days after issuing the notification? The starting day should be defined.

Resolution	Article	Recommendation for update
	2. Whenever any equipment is in poor conservation condition, the respective owner will be notified to repair it, within a period of five days.	
	Appendix 2, article 37/nr. 2 According to RFM, DSMAS is using Appendix 2, article 37/nr. 2 as a reference for penalties to non-domestic waste producers when discharging waste into CMM containers. But this article refers to special waste (information from RFM); Information from the resolution nr. 89/AM/2008, from May 22nd at our SharePoint – The use of Municipal dumping sites without permission.	No penalty for non-domestic waste discharged into CMM container was identified at the resolution. So, it should be decided considering the different categories of the non-domestic waste producers.

Source: JICA Project Team

2. FINANCIAL MANAGEMENT OF SWM

In order to implement the MP and the Financial Sustainability Strategy of Solid Waste Management in Maputo City, the current CMM resolutions and their provisions that need to be revised, and the recommended revisions, are summarized as follows.

Resolution	Article	Recommendation for update
Resolution nr. 86/AM/2008, from May 22nd **SWM**	Art. 20, nr. 1 1. Public and private producers are required to engage a waste collection service if they produce, on a	Non-domestic waste generators are obliged to contract a CMM-accredited waste collection service, regardless of the daily amount of waste produced. The contract shall be one of the obligatory documents to obtain an annual business registration certificate. For those that are renting space for business operations and whose waste collection are taken cared of by the owner/management of the establishment, a proof of contract between the lessor and a CMM-accredited private service provider is a required document for the annual business license to operate in Maputo City. ALL businesses/institutions must undergo a one-time orientation and obtain certification of attendance by the Public Information Office (PIO) (a newly proposed section of the DSMAS) on the SWM, environment and other related City regulations prior to obtaining a license to operate. A re-orientation will also be required

<table>
<tr><td></td><td>daily basis, quantities equal or above 25kg or 50 litres.</td><td>each time a business entity is found to have violated the relevant regulations, in addition to applicable fines and penalties.

Private service providers in the business of collecting waste in the City, whether for domestic, non-domestic and other municipal wastes, must be duly accredited by the CMM.</td></tr>
<tr><td></td><td>Art. 26, nr. 1 (Annex I)
Municipal Cleaning Fee</td><td>THE matrix below is to be removed and, instead, the Financial Sustainability Strategy on unit pricing of SWM with respect to electricity for domestic and non-domestic EDM consumers must be included, including principles and calculation factors.
<table>
<tr><th rowspan="2">Consumption</th><th colspan="2">Domestic</th><th colspan="2">Non-Domestic</th></tr>
<tr><th>kwh</th><th>MT</th><th>kwh</th><th>MT</th></tr>
<tr><td>Low</td><td>Up to 200</td><td>45</td><td>Up to 200</td><td>80</td></tr>
<tr><td>Medium</td><td>201-500</td><td>75</td><td>201-500</td><td>160</td></tr>
<tr><td>High</td><td>500 <</td><td>110</td><td>500 <</td><td>250</td></tr>
</table>
The following steps of calculating the unit pricing for SWM must be included. Assessment or revision of unit pricing may be done every 5 years to reflect prevailing situation.
Step 1: Calculating the unit operating cost of SWM (Mt/kg) for FY_1
Total Operating Cost of SWM (MT) (Less: 1.1 Personnel) in FY_0 /
Total Waste Generation (kg) in FY_0 =
Unit operating cost of SWM (Mt/kg)
Step 2: Calculating waste generation per energy consumed (kg/kwh) for FY_1
a. Total Domestic Waste Generation (kg) in FY_0 /
Total Energy Consumed by Domestic Consumers (kWh) in FY_0 =
Waste generation per energy consumed of Domestic Consumers (kg/kWh)</td></tr>
</table>

b. Total **Non-Domestic** Waste Generation (kg) in FY_0 /
Total Energy Consumed by **Non-Domestic** Consumers (kWh) in FY_0 =

Waste generation per energy consumed of **Non-Domestic Consumers** (kg/kWh)

Step 3: Deriving unit cost of SWM for each unit of energy consumed (Mt/kWh) for FY_1

a. Unit operating cost (Mt/kg) of SWM x
Waste generation per energy consumed of **Domestic Consumers** (kg/kWh) =

Domestic unit price of SWM (Mt/kWh)

b. Unit operating cost (Mt/kg) of SWM x
Waste generation per energy consumed of **Non-Domestic Consumers** (kg/kWh) =

Non- Domestic unit price of SWM (Mt/kWh)

Where:

- FY_1 pertains to fiscal year on which the pricing will be applied
- FY_0 preceding fiscal year
- Total operating cost of SWM, less personnel, is available from RAF
- Waste generation according to source is data from Hulene dumpsite
- Energy consumption per consumer type is data from EDM

The matrix below is to be corrected and, instead, the Financial Sustainability Strategy on monthly fee for non-domestic producers according to category must be included.

Producer Category		Monthly Fee to be paid
A	Daily production of MSW greater than 350 kg or 2000 L	5,200.00 Mts
B	Daily MSW production up to 350 kg or 1000 L	2,600, Mts
C	Daily production of MSW up to 200 kg or 500 L	1,300, Mts
D	Daily MSW production up to 100 kg or 250 L	650, Mts
E	Daily MSW production up to 25 kg or 50 L	325, Mts

Replace with the following matrix, which is a 50% reduction of the current rates:

<table>
<tr>
<td></td>
<td></td>
<td>
<table>
<tr><th>Category</th><th>Waste Generation per day</th><th>Corresponding Monthly Cleaning Tax</th></tr>
<tr><td>A</td><td>More than 300 kg or 850 liters</td><td>MT 2,600</td></tr>
<tr><td>B</td><td>Up to 300 kg or 850 liters</td><td>MT 1,300</td></tr>
<tr><td>C</td><td>Up to 200 kg or 500 liters</td><td>MT 650</td></tr>
<tr><td>D</td><td>Up to 100 kg or 250 liters</td><td>MT 325</td></tr>
<tr><td>E</td><td>Up to 25 kg or 50 liters</td><td>MT 162</td></tr>
</table>
The fee will be collected on a monthly (x12) or biannual (x6) basis as part of the annual business registration of CMM. In the same business registration process, the contract with PSP must be submitted, as well as the latest certificate of attendance to the DSMAS PIO orientation.
</td>
</tr>
<tr>
<td></td>
<td>Art. 26, nr. 2

For the purposes set out in number 1, producers are classified as:

a) Home producers;

b) non-domestic producers;

c) Large non-domestic producers</td>
<td>For the purposes set out in paragraph 1, producers are classified as:

a) Domestic producers;
b) Non-Domestic Producers</td>
</tr>
<tr>
<td>Resolution nr. 15/AM/2004</td>
<td>Art. 50, nr. 1

For the use of municipal services in cleaning operations, when requested or imposed, the fees set out in Annex I are charged, taking into account the provisions of number 1 of Article 29</td>
<td>Article 29 has been repealed, but the current fees for the use of municipal services, which must be included as an annex, are as follows:
<table>
<tr><td>Service</td><td>Fee</td></tr>
<tr><td>Using the Hulene Dumpsite</td><td>97.50 Mts per ton</td></tr>
<tr><td colspan="2">RS collection and transport services by:</td></tr>
<tr><td>• 12 m3 container</td><td>2,621.00 Mts</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr>
<td></td>
<td></td>
<td>
<table>
<tr><td>• 6 m3 container</td><td>1,872.00 Mts</td></tr>
<tr><td>• 1.1 m3 container</td><td>702.00 Mts</td></tr>
<tr><td>• 100 liter plastic bag</td><td>234.00 Mts</td></tr>
<tr><td>• 240 liter container</td><td>325.00 Mts</td></tr>
<tr><td>• Loader (Machine)</td><td>1,775.00 Mts per hour</td></tr>
<tr><td>• tractor cart</td><td>1,040.00 Mts</td></tr>
</table>
</td>
</tr>
<tr>
<td>Resolution nr. 89/AM/2008, from May 22nd
SWM</td>
<td>Art. 32, nr. 2
Individuals or Companies that, as a result of their activities, deposit their waste directly in the Municipal Dumpster, must pay a fee for each ton deposited, under the terms of Annex I of these Regulations.</td>
<td>Update Annex I
Ensure that ALL private service providers using the Hulene dumpsite MUST pay, following the point-of-sales payment method through mobile cash transfer. There are no exemptions. Corresponding receipt will be provided upon payment.
<table>
<tr><td>Service</td><td>Fee</td></tr>
<tr><td>Using the Hulene Dumpsite</td><td>97.50 Mts per ton</td></tr>
</table>
Payment and receipting will be at point-of-sales (POS) --- no more monthly invoicing by Proof of Service --- by all PSPs using the disposal site. This will be done via mobile payments available (M-PESA, M-KESH, and e-MOLA, etc.). Hulene dumpsite account must have it’s own unique QR code from the mobile payment servisse companies.</td>
</tr>
</table>

Source: JICA Project Team

3. PROMOTION OF RECYCLING

In order to implement the MP and to promote recycling in Maputo City, the draft resolution on the promotion of source separation and recycling was proposed by including provisions on recyclable waste items, color-coding, container, obligations and responsibilities of waste generators and recycling-related actors, composting and recycling platform and association.

Appendix 6-5
Organizational and Human Resources Development Plan of DSMAS

The Republic of Mozambique

Directorate of Municipal Service of Environment and Waste (DSMAS), Municipal Council of Maputo

The Project for the Capacity Development to Realize Integrated Solid Waste Management in Great Maputo

Organizational and Human Resources Development Plan of DSMAS

July 2023

Japan International Cooperation Agency (JICA)

Nippon Koei Co., Ltd.

The Project for the Capacity Development to Realize Integrated Solid Waste Management in Great Maputo
Organizational and Human Resources Development Plan of DSMA

Table of Contents

1. DSMAS ORGANIZATIONAL DEVELOPMENT PLAN

1.1 Organizational Structure of DSMAS

1.1.1 The Municipal Directorate of Environment and Health Service (DMAS)

The Municipal Directorate of Environment and Health Service, abbreviated as DMAS is headed by the Director and Deputy Director and the management has 4 staff including a secretary, messenger, and servant. The scope of work of the entire DSMAS is stipulated in the CMM's internal regulation 2022 as below.

Article 4

- Propose and implement policies and strategies for cleaning the Municipality.
- Ensure the collection, handling, and transportation of municipal solid waste produced in the Municipality.
- Ensure the final disposal of urban solid waste in environmentally acceptable conditions.
- Promote reduction, reuse, and recycling activities for urban solid waste.
- Elaborate and collaborate in studies, guidelines, and regulatory norms that support the Municipality's action in environmental matters.
- Prevent and control noise pollution within the scope of the competencies attributed to the Municipalities, defining and supervising operating conditions regarding acoustics resulting from the licensing of noisy activities of permanent or temporary nature.
- Propose and implement environmental management policies.
- To elaborate and review Environmental Impact Studies
- Elaborate resettlement action plans for investment projects in the Municipality of Maputo
- Proceed with Environmental Licensing
- Ensure implementation of environmental and social safeguards for municipal investment projects
- Supervise/inspect the operation of public and private economic agents.
- To fine violators of the provisions of environmental licenses during the exercise of economic activities
- Elaborate and update the city's strategic noise map.
- Coordinate the preparation of municipal noise reduction plans or action plans to manage noise.
- Promote air pollution control actions in partnership with other internal or external entities.
- Participate in the definition and development of environmental indicators to characterize the quality of the urban environment.
- To issue an opinion in the scope of industrial licensing or other economic activities with relevant pollutant emissions, in what concerns the different environmental aspects, namely residual waters, residues, noise, and atmospheric emissions, based on the applicable legal norms.
- Develop and promote the municipal strategy of mitigation and adaptation to climate change.
- Ensure the participation of citizens, community organizations, and the private sector in the management of urban solid waste.
- Supervise the quality standards of the provision of internal or external services (providers) as well as the compliance of the posture by the Municipalities.
- Coordinate and control the sweeping of roads and berms considering the protection of drainage systems and general cleaning of the city.
- Ensure strategic and operational planning, as well as its monitoring.
- Ensure the acquisition, maintenance, and repair of the collection means.
- Manage the service provision contracts.
- Ensure the implementation of a strategy for environmental, economic, and financial sustainability of urban solid waste management.
- Ensure the application of the proof of service to all non-household producers.
- Promote the integration of the informal sector in the integrated management of urban solid waste.
- Ensure the maintenance and repair of garbage collection vehicles.
- Prepare the Organic Unit's Plan of Activities and Budget proposal and ensure its implementation, monitoring, and evaluation in articulation with the Organic Units responsible for its coordination and control.

- Ensure the implementation, monitoring, and assessment of the City Council's Human Resources Management Policies
- Ensure compliance with the technical-administrative policies, standards, and procedures in force at the City Council.

1.1.2 Department of Administration, Human Resources and Finance (DARHF)

The Department of Administration, Human Resources and Finance (DARHF) headed by the Department Head has 4 sections with the scope of work as below.

Article 16

- Organizing the processes and files related to promotion, promotion, transfer, exoneration, retirement, leave of absence, and related tasks.
- Organizing the register of employees and certifying their effectiveness for legal purposes
- To elaborate, execute and control, in coordination with the Municipal Planning and Finance Department, the plan and budget, guaranteeing the correct distribution, rational and efficient use, and maintenance of the means assigned to the Department.
- To elaborate the reports, balance sheets, and other control maps of the Directorate's use of budget funds
- To elaborate on the Department's quarterly, semi-annual, and annual reports
- To evaluate the performance and effectiveness of resource utilization and propose corrective measures if necessary.
- To support other departments in the preparation of strategies and plans for budget execution and forecasting
- To make an inventory of the existing movable assets, keeping the respective books duly registered
- To promote professional training actions for the continuous improvement of the employees' performance
- To conduct studies on the composition, sizing, and control of the staff
- To collect revenues and forward them to the Municipal Planning and Finance Department
- Ensure the registry of licensed companies in the occupation of public spaces, users of the WWTP, and other emerging areas.

(1) Administration and Finance Section (RAF)

The Administration and Finance Section (RAF) headed by the Section Chief has 10 staff with the scope of work as below.

Article 29

- To elaborate on the requisition of funds for payment execution.
- To assist in the coordination of the material acquisition process.
- To elaborate on reports and balances of control and use of funds from the Directorate's budget.
- To guarantee the execution and control, in coordination with the Municipal Finance Department, of the plan and the budget, guaranteeing the correct distribution, rational and efficient use, and maintenance of the means assigned to the Department.
- To support the evaluation of the performance and effectiveness of resource use and propose corrective measures if necessary.
- To elaborate on quarterly, semi-annual, and annual reports of the Department.
- To ensure the expansion of the Service's sources of revenue.
- To ensure the collection of the Fees from the large MSW producers.
- To register large and small USW producers.
- To manage licensing, proof of service, and contracts.
- To issue invoices for proof of service receipts.
- To ensure the collection, organization, and forwarding of revenues.
- To manage the collection of fees and other taxes, as well as coercive collections.
- To control the collection of fees, licenses, and fines foreseen in the directorate and the compliance with established procedures (through awareness, inspection, and corrective inspection actions).

- Ensure the strict control of the receipt books and several services intervening in the revenue collection operations.
- Register the licensed companies in the occupation of public spaces, users of the WWTP, and other emerging areas
- To carry out the collection, organization, and forwarding of revenues and other taxes, as well as the coercive collections
- Control the collection of fees, licenses, and fines foreseen in the management and compliance with established procedures (through awareness, inspection, and corrective inspection actions).

(2) Human Resources Section (RRH)

The Human Resources Section (RRH) headed by the Section Chief has 5 staff with the scope of work as below.

Article 30

- To carry out the processing of salaries.
- Ensure the social assistance of the employees.
- To ensure the production of information necessary to the Department.
- To ensure the evaluation of individual performance.
- To ensure the professional development of the employees.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To elaborate proposals for training and capacity-building plans.
- To analyze and issue opinions about different human resource management processes, observing the legislation in effect.
- Ensure the organization and updating of Individual Processes.

(3) Property Section (RP)

The Property Section (RP) headed by the Section Chief has 2 staff with the scope of work as below.

Article 31

- Managing, and inventorying the Directorate's assets.
- To execute tasks pertinent to the receipt, distribution, conservation, registration, and control of the Directorate's patrimonial assets.
- Proposing, periodically, the list of patrimonial goods to be disposed of.
- To keep the bookkeeping of the patrimonial accounts.
- To watch over the movable and immovable assets.
- To control the stock of consumable and non-consumable goods.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To analyze the processes of disposal and transfer of assets between the Organic Unit and the Planning and Finance Department.
- To elaborate on specifications for the acquisition of new assets.

(4) Municipal Secretariat (SM)

The Municipal Secretariat (SM) headed by the Section Chief has 15 staff with the scope of work as below.

Article 14

- Reception, classification, and expedition of the expedient.
- Keep records up-to-date and the accessibility of documents.
- Carry out periodic document evaluation, to guarantee the transition of documents between the current, intermediate, and permanent archives.
- To control and supervise the time books and to elaborate on the management's effectiveness.
- To control and supervise the work of the Directorate's servants.
- To elaborate quarterly, semester, and annual reports of the activities developed in the sector.
- To analyze and receive requests from the citizens and verify if they fulfill the requirements to enter these services.

- To clarify to the citizen any doubt regarding the processing of their files/requests or related to the matters handled by the Department.
- To proceed with the physical and digital registration of the documentation.
- To clarify any doubts the citizens may have to deliver Dispatch Communications Notes to the respective addressees.
- To issue communication notes on applications for the extension of Building Permits.
- To sign 6th Category permits.
- Send the processes to file in the City Foral Tramitar.

1.1.3 Department of Municipal Solid Waste Management (DGRSU)

The Department of Municipal Solid Waste Management (DGRSU) headed by the Department Head has 4 sections with the scope of work as below.

Article 18

- To guarantee the services of collection and transport of solid urban waste in the Municipality of Maputo.
- To fix the limits of the operation areas and the routes for garbage collection, as well as for weeding and sweeping operations.
- Develop studies and carry out research regarding volume, weight, origin (domestic, industrial, among others), and approximate composition (estimated quantity of organic material, paper, cans, glass, inert material) of the garbage collected, aiming at its utilization.
- To guarantee the operationalization and maintenance services of the Municipal Dump of Hulene.
- coordinate with other collective or singular entities in the cleaning activities of public and private spaces in the context of camping and the development of cleaning campaigns.
- To promote coordination meetings of sweeping activities with the Municipal Districts.
- To collaborate in the cleaning and removal of vegetation soils in untreated public spaces.
- To accompany the management of services entrusted to concessionary companies, namely informal dumps and selective collection.
- To propose the acquisition of goods and services, and promote the installation, and conservation for the disposal of solid urban residues.
- To participate in awareness actions related to public cleaning.
- To participate in the elaboration of norms and regulations concerning the management of urban solid residues, in harmony with national legislation and regional and international norms, when applicable.
- To give opinions about Projects, regarding the fulfillment of the regulations about solid residues and the feasibility of collection and transport.
- To keep up to date with all relevant statistical data relating to the collection of solid urban waste in the municipality of Maputo.
- To coordinate the process of elaboration, implementation, and monitoring of the Directorate's Annual Plan of Activities.
- To record and provide periodic information about the provision of services under the contracts.
- To control the performance of the operators of the Bascule and dump services.
- To guarantee the implementation of the maintenance and repair plan of the equipment and circulating means in coordination with the Department of Workshops and Auto Park.
- r.To elaborate on quarterly, half-yearly, and annual reports of the Department.

(1) Contract Management Section (RGC)

The Contract Management Section (RGC) headed by the Section Chief has 4 staff with the scope of work as below.

Article 36

- To manage and supervise the contracts signed with public or private entities for the provision of services and supply of materials in general.
- To keep up to date with all relevant statistical data relating to the collection of solid urban waste in the municipality of Maputo.

- To register and provide periodic information about the rendering of services under the scope of major contracts.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- Create and monitor performance and/or execution standards to compare them with planned and executed actions.
- Propose the renewal or opening of new contracts when the expiration of the same is observed.

(2) Inspection Section (RFM)

The Inspection Section (RFM) headed by the Section Chief has 35 staff with the scope of work as below.

Article 37
- Ensure compliance with the rules regarding the inspection of cleaning activities.
- Enforce municipal norms and laws.
- Ensure that the RSU ordinance is fully complied with.
- To note infractions and to issue a notice of infraction.
- Raise awareness and sensitize citizens and commercial institutions.
- To guarantee that the final deposition and disposal of USW is done according to the norms.
- To control the suppliers' registry.
- To guarantee the supervision and management of critical areas.
- To do the daily supervision of the containers in Urban and Suburban areas.
- To identify informal dumpsites.
- To elaborate quarterly, semi-annual, and annual reports of the Division.
- To transform decisions into practical actions of prompt intervention in the course of implementation.

(3) Hulene Dumping Site Section (RLH)

Hulene Dumping Site Section (RLH) headed by the Section Chief has 17 staff with the scope of work as below.

Article 39
- Ensure compliance with the Dumpsite Regulation.
- Register the database of the entries.
- Control and register the performance of the machines.
- Ensure the operationalization of the track scale, and the reliability, and integrity of the daily registration data.
- Guarantee the operationalization of the machines.
- Creating deposition fields and opening access ways for the circulation of RSU discharge vehicles.
- To elaborate quarterly, half-yearly, and annual reports of the Division.
- To guarantee an adequate final deposition, organized in environmentally acceptable conditions.
- To create a database for the registration of information.

(4) Public Removal Section (RRP)

The Public Removal Section (RRP) headed by the Section Chief has 22 staff with the scope of work as below.

Article 38
- Respond to the collection and transportation of urban solid residues.
- To systematize the data of the entries in the dumpsite.
- Supervising the defined Routes.
- To monitor the public sweeping to the Municipal Districts.
- To promote the cleaning campaigns, and elimination of vegetation, soils, and emerging informal dumps.
- To determine the needs for equipment and material for Public cleaning.
- To do the technical and administrative management of the activities of special removal, contracts, and at the level of the City of Maputo.
- To make a technical survey of the work requested by the Municipality.

- To plan and monitor contract activities in coordination with the Proof of Service.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- Coordinate the licensing activities of the cleaning services.

1.1.4 Department of Fleet Management and Workshops (DGFO)

The Department of Fleet Management and Workshops (DGFO) headed by the Department Head has 4 sections with the scope of work as below.

Article 19

- Ensure the acquisition, maintenance, and repair of the collection means.
- Ensure the maintenance and repair of the garbage collection vehicles.
- Managing the stock of fleet material (accessories, batteries, and tires).
- To ensure the registration of all circulating means and machinery in the Municipal Patrimony Register attached to the Municipal Directorate of Planning and Finance.
- To elaborate quarterly, semi-annual, and annual reports of the Department.

(1) Mechanical Section (RM)

The Mechanical Section (RM) headed by the Section Chief has 9 staff with the scope of work as below.

Article 40

- Perform preventive and equipment maintenance according to the plan.
- Ensure the acquisition of workshop equipment and tools and their maintenance.
- Plan daily, weekly and monthly activities and ensure their fulfillment.
- To ensure the operability of the fleet through routine maintenance to minimize breakdowns.
- Manage and evaluate the performance of the workshop staff.
- To elaborate weekly and monthly reports of work done or completed.
- To elaborate training plans, internships, and refresher courses by specialty.
- To elaborate quarterly, semi-annual, and annual reports of the Department.

(2) Procurement Section (RA)

The Procurement Section (RA) headed by the Section Chief has 4 staff with the scope of work as below.

Article 41

- Controlling the maintenance of the equipment in the warehouse.
- To elaborate proposals for ordering parts for stock replacement.
- To register the incoming and outgoing materials.
- To make the warehouse inventory.
- To proceed with the requisitions of materials observing the legal procedures instituted.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To analyze the proposals/quotations presented by suppliers and service providers.
- Suggest organizational changes and other measures for the better functioning of the department.

(3) Fleet Management Section (RGF)

Fleet Management Section (RGF) headed by the Section Chief has 9 staff with the scope of work as below.

Article 42

- To elaborate reports on the entry and exit of vehicles.
- To manage drivers' schedules and control vehicles.
- Preparing and scheduling the systematic maintenance plans of vehicles and machines and checking the technical condition of the vehicles in the park.
- To control, suggest improvements, and register the functioning of the vehicles.
- To control the validity of insurance and vehicle documentation and their timely updating.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To keep the automobile patrimony data up to date.
- To report all breakdowns and accidents involving fleet vehicles.

- To elaborate monthly reports on the activities developed in the sector as well as on the functioning and maintenance of the fleet.

(4) Workshop Section (RO)

The Workshop Section (RO) headed by the Section Chief has 5 staff with the scope of work as below.

Article 43

- Carry out periodic examinations of the facilities by performing corrective and preventive maintenance of the metallic structures.
- To provide repairs and replacements of whatever is necessary, adopting care to each type of work, aiming at the perfect functioning of the installations.
- To carry out technical examinations in the installation and maintenance of metallic structures.
- To execute services of welding or confection of small iron pieces.
- Performing general bodywork painting, disassembling, and assembling components.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To detect and eliminate paint defects and prepare the vehicle for delivery.
- To assemble and repair body parts or other component parts of motor vehicles.

1.1.5 Department of Environmental Management and Inspection (DGIA)

The Department of Environmental Management and Inspection (DGIA) headed by the Department Head has 3 sections with the scope of work as below.

Article 17

- Propose environmental management policies with the evolution of the main factors of impact on the urban environment.
- Participate in the process of urban planning and licensing, particularly in the verification of urban environmental constraints and compliance with the requirements and characteristics stipulated in sectoral management plans.
- Direct the Municipality's programs and projects on environmental protection and the rational use of natural resources.
- Promote the survey of the necessary information to keep the Master Plan and the action plans of the Municipality's government up to date regarding the protection of the environment.
- To enforce the technical norms and Standards of environmental protection, control, and conservation defined in the legislation in force.
- To promote the updating of the municipal legislation about the environment and to propose mechanisms for its effective application.
- To elaborate on the Municipality's studies and opinions on licensing processes for the installation, construction, expansion, operation, and functioning of polluting or potentially polluting activities.
- To propose norms aiming at the control of environmental pollution in all its forms.
- To ensure the requirement, monitoring, and approval of environmental impact studies for projects, services, and activities carried out by public and private entities.
- To ensure the monitoring of the most relevant environmental factors to urban activity (water quality, sanitation, solid waste, soil occupation, air quality, beaches)
- To carry out the environmental licensing of activities and the periodic monitoring of the operation of public and private economic activities with the potential to influence the environment.
- To elaborate and prepare the approval of strategies and plans for the resettlement of populations and activities affected by projects, in coordination with the department responsible for their implementation.
- To elaborate, review, and implement climate change adaptation plans to make Maputo City more resilient.
- To elaborate quarterly, semi-annual, and annual reports of the Department.

(1) Urban Resilience Section (RRU)

The Urban Resilience Section (RRU) headed by the Section Chief has 4 staff with the scope of work as below.

Article 35

- Propose the development and revision of policies on environmental and social safeguards and the municipal resettlement policy framework.
- Ensure compliance with national and World Bank policies on environmental and social safeguards for municipal investment projects.
- Develop, review, and monitor the implementation of Resettlement Action Plans (RAP) for Municipal investment projects.
- Produce a database on the resettlement process carried out in Maputo Municipality.
- Monitor those affected post-resettlement and produce reports on the implementation of resettlement action plans.
- Elaborate, review, and monitor the implementation of the Climate Change Adaptation plan to make the city of Maputo more resilient.
- Mapping of risk areas, to the impacts of extreme events (cyclones, droughts, floods, and areas more vulnerable to seismic events).
- To carry out surveys of households living in areas at risk from natural disasters, and to promote awareness campaigns to voluntarily leave these areas, in coordination with other related units.
- Propose and follow up the implementation of local urban resilience plans against natural disasters, always seeking to ensure the participation of the affected communities in the search for solutions.
- Carry out the post-voluntary resettlement monitoring of families in coordination with the related Organic Units.
- Participate and promote events to exchange experiences with other municipalities, both national and international, regarding climate change adaptation, making the city more resilient.
- Seek different types of national and international partnerships to develop and implement projects, strategies, and local plans for urban resilience.
- Insert Maputo and the companies based in the city that collaborates in the development and implementation of resilience projects as references in this field, as well as international institutions.
- Ensure the integration of resilience in the planning and governance cycle of the Municipality.
- Prepare quarterly, semi-annual, and annual reports of the Office.
- Create and lead urban resilience networks in all spheres national and international that deal with this matter, creating a database, and disseminating strategies and projects developed at the level of the Municipality of Maputo.

(2) Environmental Inspection Section (RIA)

The Environmental Inspection Section (RIA) headed by the Section Chief has 4 staff with the scope of work as below.

Article 33

- Propose environmental management policies with the evolution of the main factors of impact on the urban environment.
- Supervising, demanding, monitoring, and approving environmental impact studies for projects, services, and activities carried out by public and private entities.
- Ensure the monitoring of the most relevant environmental factors to urban activity (water and air quality, sanitation, solid waste, soil occupation, beaches).
- To elaborate studies and opinions for the Municipality in licensing processes for the installation, construction, expansion, operation, and functioning of polluting or potentially polluting activities
- To carry out the environmental licensing of activities and the periodic monitoring of the operation of public and private activities with the potential to influence the environment.
- To manage the environment's Geographic Information System, through the rationalization of the use of natural resources.

- Promote the environmental zoning, in the Municipality, identifying, characterizing, and registering the environmental resources with a view to the execution of a management policy, based on ecological criteria compatible with the general definitions of the Municipality's Master Plan.
- To implement the Ecological Zoning Plan, to control the use and destruction of the hillsides, dunes, springs, and mangroves.
- Identify and prevent the use of risk areas.
- To periodically monitor the operation of public and private economic activities.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To fine violators of the provisions of the environmental licenses for the exercise of the activity.
- To produce a database for all inspection actions carried out by the sector.

(3) Environmental Education Section (REA)

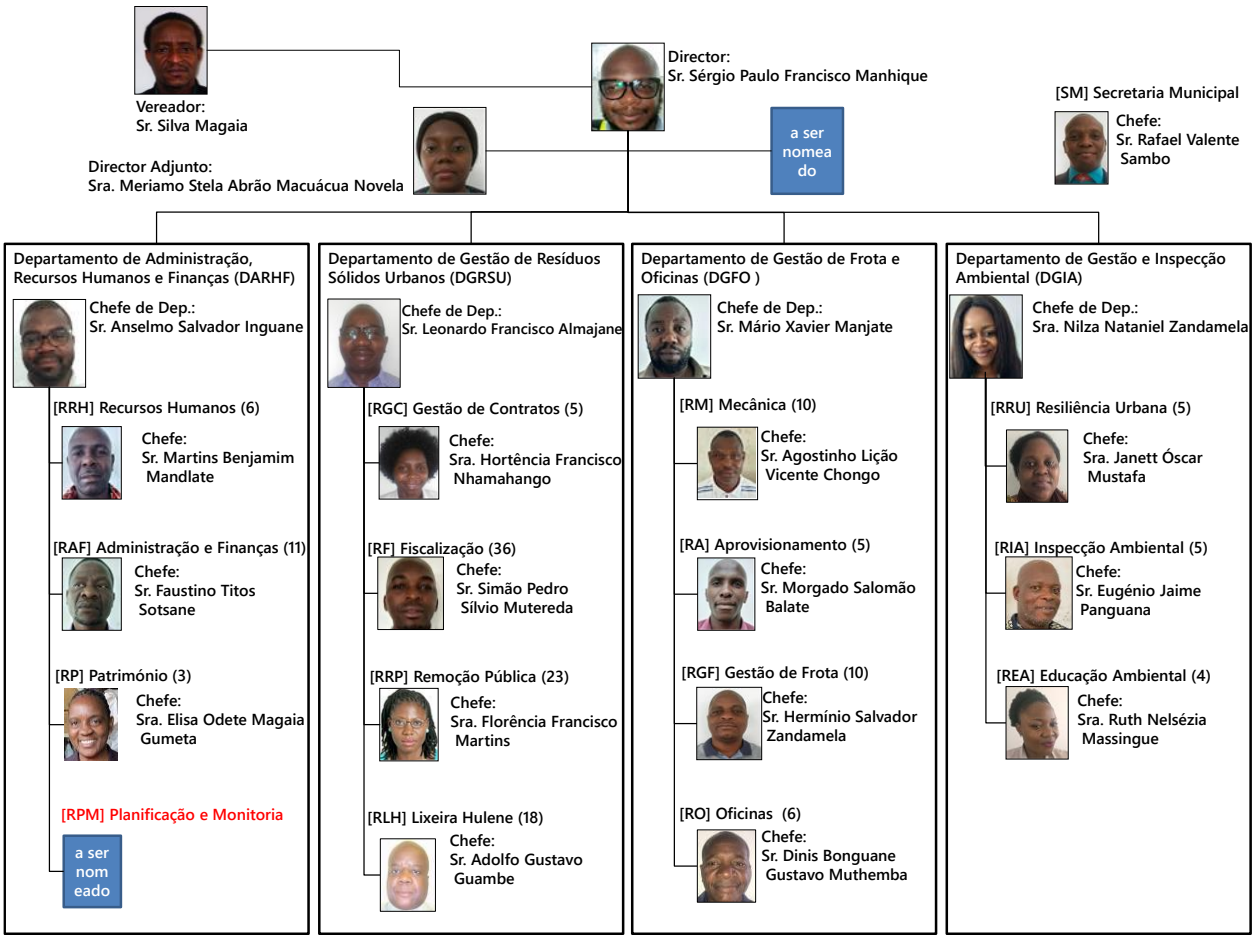
The Environmental Education Section (REA) headed by the Section Chief has 3 staff with the scope of work as below.

Article 34

- Promote education and awareness projects for sustainable development (ESD) with and among the educational community.
- Guide community education campaigns, aimed at making the public and institutions acting in the Municipality aware of environmental preservation issues.
- Promote staff training for the application of the norms regarding environmental preservation.
- To advise the Municipal Administration in all aspects related to ecology and environmental preservation.
- To program the divulgation of events, actions, and municipal programs related to protection, control, and environmental development.
- To elaborate and review environmental education programs.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To promote environmental education actions at formal and non-formal levels, aiming at the active participation of the school community and population in general in the defense of the environment, including urban solid residues.
- To sensitize the citizens of the City of Maputo on good practices of Urban Solid Waste Management.
- To create environmental clubs in primary and secondary schools, in neighborhoods, and municipal districts in general.
- Introduce and sensitize teachers and students on the importance of environmental preservation, regarding the good practices GRSU, 5Rs (Reduce, Reuse, Recycle, Rethink, and Refuse).
- Carry out cleaning and awareness campaigns on the public road, semi-collective transporters, and motorists at public transport terminals, on beaches, and in neighborhoods.
- Produce a database for activities developed in this sector.

1.1.6 Organizational Chart of DSMAS

The organizational chart of DSMAS with the names and portraits of each head/chief as of May 2023 is summarized as shown in the figure below.



Source: JICA Project Team

Figure 1 DSMAS Organizational Chart

1.2 Measures on DSMAS organizational development

1.2.1 Concept and direction

The concept and direction of DSMAS organizational development is as below.

Strengthening contract management, financial management and planning & monitoring function

1.2.2 Measure 1: Enhancing RGC (Contract Management Section)

Contract management of private service providers has already become the major task of DSMAS, i.e., primary collection service contracts (46 MEs), secondary collection service contracts (6 Districts), and Hulene dumping site operation contracts, which account for 90% of DSMAS operating expenses.

Hence, Capacity building of the staff, standardizing monitoring and reporting forms, and increasing number of technicians are necessary. It is also important to have specific sections or units for: (1) primary collection services, (2) secondary collections services, (3) Hulene operations-related service, and (4) consultancy services.

All other contracts on goods and services pertinent to office operations of DSMAS must be under the responsibility of RAF.

1.2.3 Measure 2: Re-creation of Proof of Service (PdS) section

The PdS serves important functions for the sector. Currently, this is only a staff designation instead of a section under the DARHF. It is necessary to clearly define the real mandate of the DSMAS Proof of Service

and why it is important: licensing, correct classification of non-domestic waste generators, registration of non-domestic waste generations, management of database related to its functions.

At the Proof of Service space, there are four (4) distinct activities being undertaken: (1) the operations of the General Secretary of DSMAS, (2) fee collection function of CMM, (3) properties management and, (4) the regular Proof of Service operations. This results to having many people in one room with different purposes, creating confusion and disorder. It is important to organize or redesign the physical layout of the office to delineate specific operations and improve overall condition.

1.2.4 Measure 3: Enhancing REA (Environmental Education Section)

REA should also be responsible for coordination and liaison with related actors for the promotion of recycling, in addition to various environmental education and awareness activities. Hence enhancing human resources of REA is necessary.

1.2.5 Measure 4: Realizing DPM (Planning and Monitoring Department)

It is recommended to create a department responsible for monitoring the implementation of M/P and A/P, formulating and updating various plans, and centrally managing various information and data within DSMAS.

The supervisors (RFM) should be under this Department as a specific section and will no longer be involved in the distribution of invoices with the full implementation of the financial sustainability strategy. Also, the RGC should be under this Department.

1.2.6 Measure 5: Create a Management Information System (MIS)

The MIS must be directly under the Director, and it will be the repository of technical information from all the sections of DSMAS.

1.2.7 Measure 6: Create the Public Information Office (PIO)

The PIO must be directly under the Director, which will be in-charge of the following: (1) one-time orientation and certification of businesses on environmental and SWM-related regulations as a requirement for business licensing (for new businesses) or registration (for existing businesses), (2) conduct of regular civic education activities, (3) management of DSMAS library where materials developed for the sector, M/P, related laws and regulation, and other publications are kept, catalogued and made available for public use, (4) hotline number for the sector to receive calls from the general public.

1.2.8 Measure 7: Optimizing DGFO (Department of Fleet Management and Workshops)

Waste collection & transportation, and final disposal site operations are increasingly outsourced to the private service providers, and maintenance of heavy equipment and vehicles currently owned by DSMAS is often outsourced. Hence it is reasonable to examine optimization of the DGFO.

1.2.9 Measure 8: Optimizing RRP (Public Removal Section)

The RRP is responsible for waste collection services for several government facilities and special collection services for illegal dumping. Currently, RRP provides waste collection services to some business waste generators, but it should be left to licensed private service providers.

The RRP should continue so CMM can provide the minimal service of collection and transport for special public institutions and public events, but it must operate at efficient levels. For a more focused/efficient operation, RRP should not engage in any transport and collection of waste from business waste generators.

1.2.10 Measure 9: Creation of Katembe landfills management section

Assuming Katembe sanitary landfill will be operated by a private service provider, a contract management section for landfill operation will be necessary.

2. DSMAS HUMAN RESOURCES DEVELOPMENT PLAN

2.1 Current human resource management in DSMAS

Although a list of personnel exists, it is inefficiently created by adding necessary information when it is needed for a particular purpose in an ad hoc manner. The database isn't organized as a database that can be used for planning human resource development and personnel transfers.

With regards to the database in Excel format, personnel data hasn't been compiled as a single output sheet but was divided into sheets of category, including sectors, careers, gender, and education course, etc., thus the database is composed of over twenty input-output sheets. Furthermore, it is found that some large parts of the data input at the personnel sheet is misspelled and/or blank.

2.2 DSMAS human resources database

2.2.1 Development of DSMAS human resources database

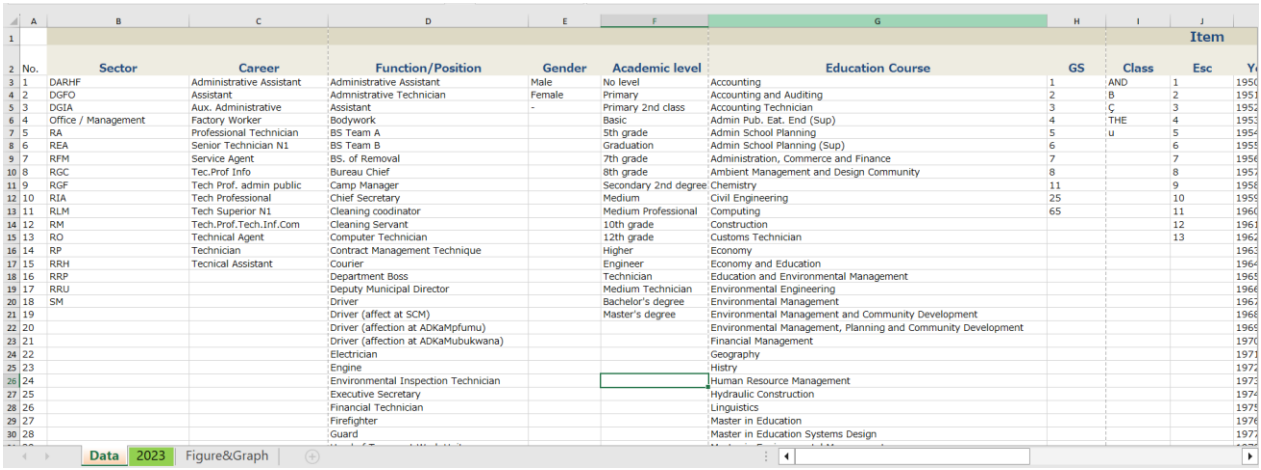
Based on the above, the DSMAS staff database that will contribute to the human resource development of DSMAS staff has been organized as a result of discussion and work among JET and the team of Human Resources Section (RRH).

Over twenty input-output sheets as in the Excel file of previous personnel database were reexamined well and were compiled into three sheets comprehensively. Each sheet in this revised database is explained as follows.

- Master Input Data Sheet: A master input data sheet contains all detailed information list of 17 category items, such as sector, career, function/position, gender, academic level, educational and training background, three internal promotion codes, date of birth, year of service at CMM/DSMAS, retirees' information and penalty information, etc. as a compiled information to be input currently. This input data is to be pulled down at cells of a personnel input-output sheet.
- Personnel Input-Output Sheet: In the personnel input-output sheet, each staff name is allocated at the vertical column, whereas each categorized information is allocated at the horizontal row. Hence, each staff name and categorized information are integrated into rows as a matrix. In addition, each category item is to be pulled down from the list, where data is aligned at master input data sheet, for input-output of personnel information at the matrix. Furthermore, as the AutoFilter function is built-in to this matrix, it is easy to either hide and rest categorized data in column optionally, or reapply a filter to get up-to-date results, or clear a filter to redisplay all of the data.
- Figure Output Sheet: Some categories of input-output data, which is appropriate to be utilized statistically, are output to a pie chart, treemap charts, column charts in the figure output sheet. These figures are to be utilized for mass-analyzing the personnel data to find out the tendency of human resource management from a bird's-eye view.

Figure 2 shows a screenshot of Master Input Data Sheet, and Figure 3 shows a screenshot of Personnel Input-Output Sheet.

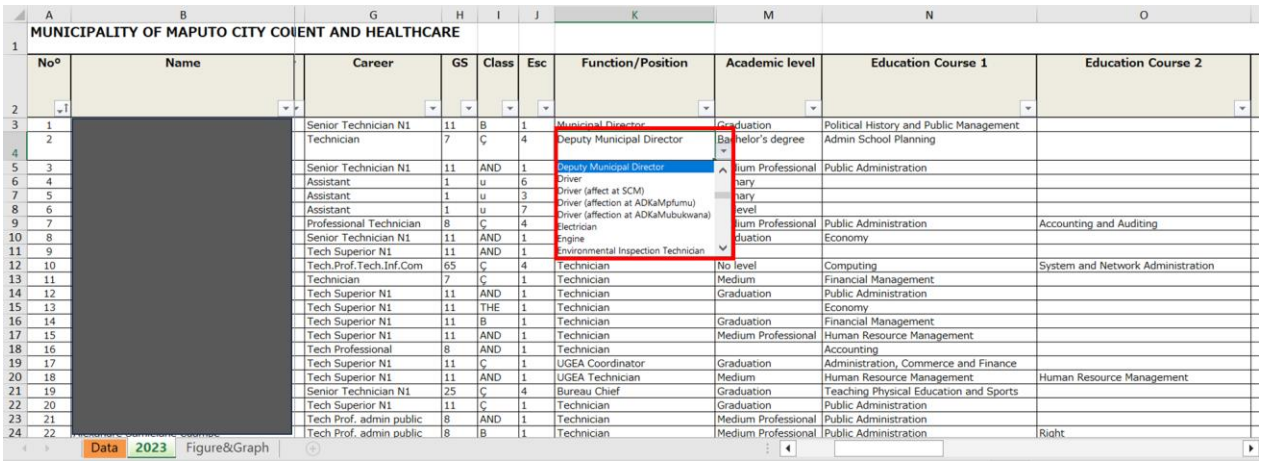
In Figure 3, names of personnel are grayed out in this report to protect personal information. In addition, the category information selected in the pull-tab is framed in red for reference.



No.	Sector	Career	Function/Position	Gender	Academic level	Education Course	GS	Class	Esc
1	DARHF	Administrative Assistant	Administrative Assistant	Male	No level	Accounting	1	AND	1
2	DGFO	Assistant	Admnistrative Technician	Female	Primary	Accounting and Auditing	2	B	2
3	DGIA	Aux. Administrative	Assistant	-	Primary 2nd class	Accounting Technician	3	Ç	3
4	Office / Management	Factory Worker	Bodywork		Basic	Admin Pub. Eat. End (Sup)	4	THE	4
5	RA	Professional Technician	BS Team A		5th grade	Admin School Planning	5	u	5
6	REA	Senior Technician N1	BS Team B		Graduation	Admin School Planning (Sup)	6		6
7	RFM	Service Agent	BS. of Removal		7th grade	Administration, Commerce and Finance	7		7
8	RGC	Tec.Prof Info	Bureau Chief		8th grade	Ambient Management and Design Community	8		8
9	RGF	Tech Prof. admin public	Camp Manager		Secondary 2nd degree	Chemistry	11		9
10	RIA	Tech Professional	Chief Secretary		Medium	Civil Engineering	25		10
11	RLM	Tech Superior N1	Cleaning coodinator		Medium Professional	Computing	65		11
12	RM	Tech.Prof.Tech.Inf.Com	Cleaning Servant		10th grade	Construction			12
13	RO	Technical Agent	Computer Technician		12th grade	Customs Technician			13
14	RP	Technician	Contract Management Technique		Higher	Economy			
15	RRH	Tecnical Assistant	Courier		Engineer	Economy and Education			
16	RRP		Department Boss		Technician	Education and Environmental Management			
17	RRU		Deputy Municipal Director		Medium Technician	Environmental Engineering			
18	SM		Driver		Bachelor's degree	Environmental Management			
19			Driver (affect at SCM)		Master's degree	Environmental Management and Community Development			
20			Driver (affection at ADKaMpfumu)			Environmental Management, Planning and Community Development			
21			Driver (affection at ADKaMubukwana)			Financial Management			
22			Electrician			Geography			
23			Engine			Histry			
24			Environmental Inspection Technician			Human Resource Management			
25			Executive Secretary			Hydraulic Construction			
26			Financial Technician			Linguistics			
27			Firefighter			Master in Education			
28			Guard			Master in Education Systems Design			

Source: JICA Project Team

Figure 2 A Screenshot of Master Input Data Sheet as an example



MUNICIPALITY OF MAPUTO CITY COUNCIL AND HEALTHCARE

No°	Name	Career	GS	Class	Esc	Function/Position	Academic level	Education Course 1	Education Course 2
1	[redacted]	Senior Technician N1	11	B	1	Municipal Director	Graduation	Political History and Public Management	
2		Technician	7	Ç	4	Deputy Municipal Director	Bachelor's degree	Admin School Planning	
3		Senior Technician N1	11	AND	1	Deputy Municipal Director	ium Professional	Public Administration	
4		Assistant	1	u	6	Driver	nary		
5		Assistant	1	u	3	Driver (affect at SCM)	nary		
6		Assistant	1	u	7	Driver (affection at ADKaMpfumu)	level		
7		Professional Technician	8	Ç	4	Driver (affection at ADKaMubukwana)	ium Professional	Public Administration	Accounting and Auditing
8		Senior Technician N1	11	AND	1	Electrician	duation	Economy	
9		Tech Superior N1	11	AND	1	Engine			
10		Tech.Prof.Tech.Inf.Com	65	Ç	4	Environmental Inspection Technician	No level	Computing	System and Network Administration
11		Technician	7	Ç	1	Technician	Medium	Financial Management	
12		Tech Superior N1	11	AND	1	Technician	Graduation	Public Administration	
13		Tech Superior N1	11	THE	1	Technician		Economy	
14		Tech Superior N1	11	B	1	Technician	Graduation	Financial Management	
15		Tech Superior N1	11	AND	1	Technician	Medium Professional	Human Resource Management	
16		Tech Professional	8	AND	1	Technician		Accounting	
17		Tech Superior N1	11	Ç	1	UGEA Coordinator	Graduation	Administration, Commerce and Finance	
18		Tech Superior N1	11	AND	1	UGEA Technician	Medium	Human Resource Management	Human Resource Management
19		Senior Technician N1	25	Ç	4	Bureau Chief	Graduation	Teaching Physical Education and Sports	
20		Tech Superior N1	11	Ç	1	Technician	Graduation	Public Administration	
21		Tech Prof. admin public	8	AND	1	Technician	Medium Professional	Public Administration	
22		Tech Prof. admin public	8	B	1	Technician	Medium Professional	Public Administration	Right

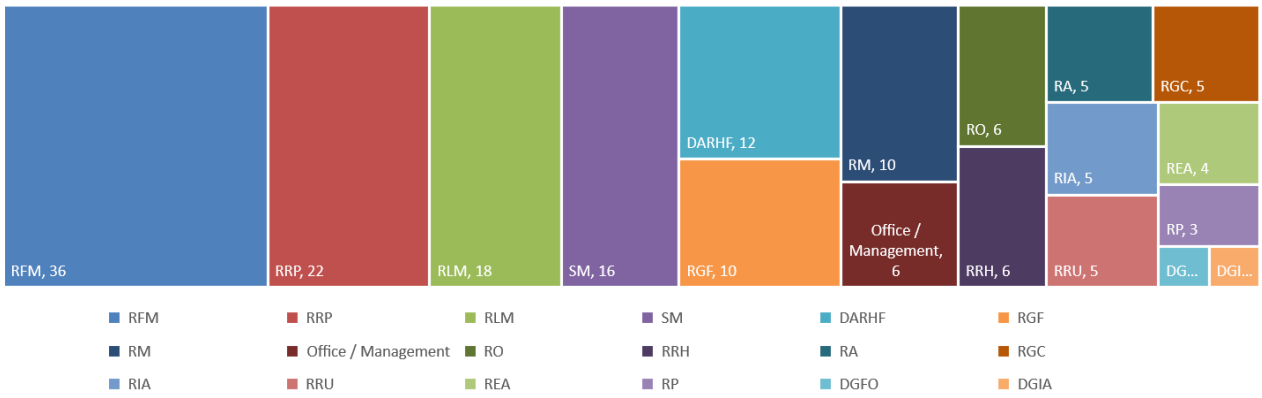
Source: JICA Project Team

Figure 3 A Screenshot of Personnel Input-Output Sheet as an example

Figure 4 in treemap chart shows a composition of sectors in DSMAS in 2022, and Figure 5 in treemap chart shows a composition of function/position in DSMAS in 2022. The value of data in figures are of persons.

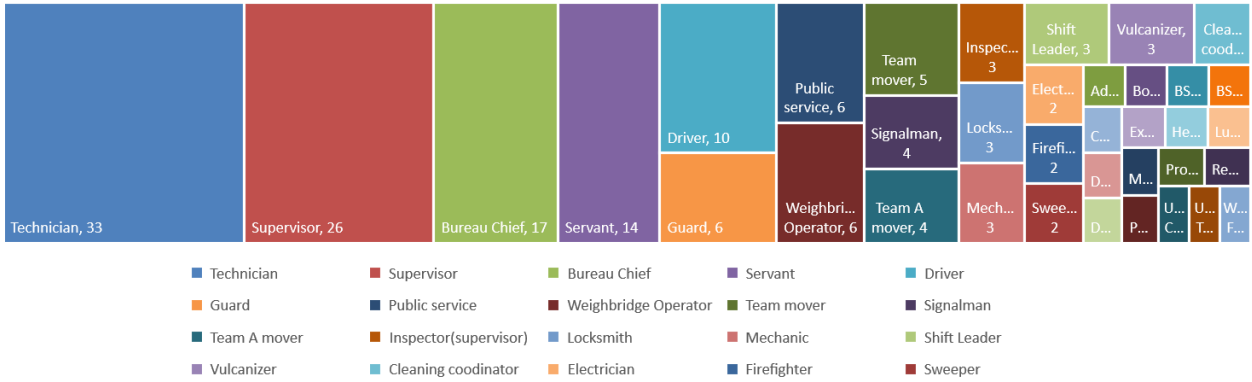
As a reference, abbreviations of sectors in Figure 4 have the following meanings respectively.

RFM: Supervision Section, RRP: Public Removal Section, RLM: Municipal Dumping Site Section, SM: Municipal Secretary, DARHF: Department of Administration, Human Resources and Finance, RGF: Fleet Management Section, RM: Mechanical Section, RO: Workshop Section, RRH: Human Resources Section, RA: Procurement Section, RGC: Contract Management Section, RIA: Environmental Inspection Section, RRU: Urban Resilience Section, REA: Environmental and Sanitation Education Section, RP: Property Section, DGFO: Department of Fleet Management and Workshops, DGIA: Department of Environmental Management and Inspection.



Source: JICA Project Team

Figure 4 Composition of Sectors in DSMAS in 2022 (Data Value: Persons)

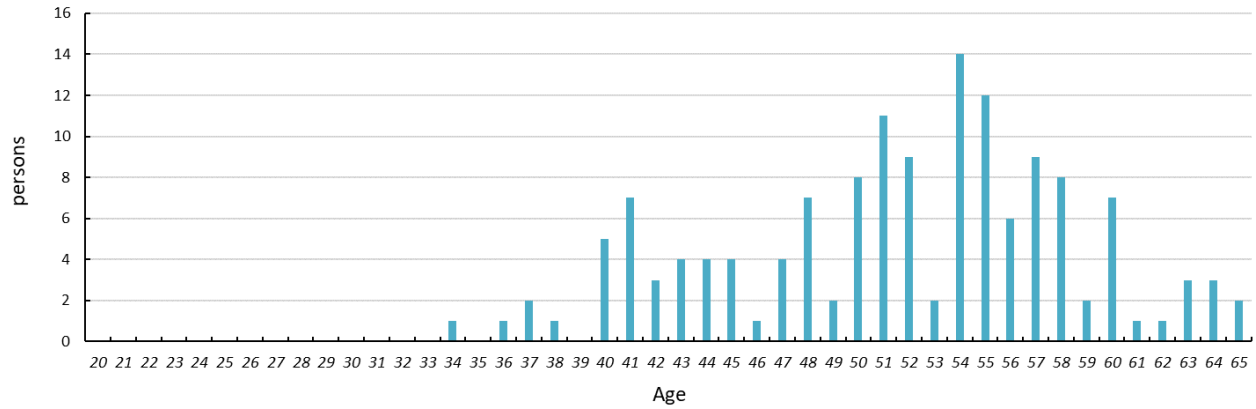


Source: JICA Project Team

Figure 5 Composition of Function/Position in DSMAS in 2022 (Data Value: Persons)

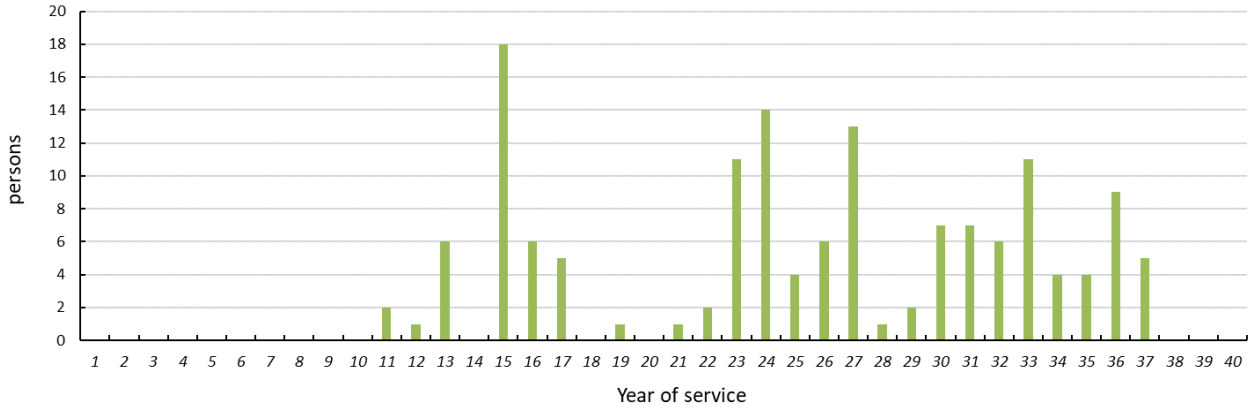
Figure 6 in column chart shows age hierarchy of DSMAS staff in 2022, and Figure 7 in column chart shows year of service of staff at CMM/DSMAS in 2022.

In Figure 6, age of each staff was calculated from the information; date of birth, today's date, whereas year of service of staff in Figure 7 was calculated from the information; date of entrance into CMM/DSMAS, today's date respectively.



Source: JICA Project Team

Figure 6 Age Hierarchy of DSMAS Staff in 2022



Source: JICA Project Team

Figure 7 Year of Service of Staff at CMM/DSMAS in 2022

These figures developed based on statistical data is helpful for organizational management without doubt.

Notwithstanding, it is necessary to note that there are quite a few fundamental pieces of information including date of birth, gender, year of entrance into CMM/DSMAS, academic level, etc., that are blank in the file. Besides that, as having already been mentioned in this report, there is redundant or almost same input data still exist at master input data sheet. To resolve the above issues, JET and HHR staff in DSMAS are continuously working on adding, fine-tuning the data together, in addition to that, HHR staff shall be eagerly devoted to improving the structure of the file to be utilized more effectively for managing their whole directorate in organized manner in near future.

Furthermore, as requested from HHR, JET has set the password to the file for security management. This security management was shared with HHR and they learned that the file which includes personal information shall be secured well and be accessed by limited persons.

2.3 Measures on DSMAS human resources development

Utilizing the above database, the following human resource development policies shall be established.

(1) Well harmonized staffing

A well harmonized assignment of senior and junior staff will be organized in each department, and the work environment will be tuned in which skills can be transferred from senior to junior staff through on-the-job training.

(2) Personnel transfer based on the expertise and background of personnel

To implement personnel transfers based on the expertise and work history of each staff member, taking into consideration the future career path of the staff member.

(3) Recruitment of staff according to needs

To hire staff with the necessary expertise and skills, based on the duties and responsibilities of each department as outlined in the organizational development plan and the direction of future organizational restructuring.

(4) Selection of suitable trainees for various training programs

Systematically and strategically select participants for training programs provided by international donors such as JICA.

Appendices of Chapter 2.7
Activities Related to Output 6

Appendix 7-1
Waste Separation Game Manual

Appendix 7-2
Eco-point Operation Manual

Appendix 7-3
Spo-Gomi Manual

Appendix 7-4
Environmental Picture Diary Manual

Appendix 7-1
Waste Separation Game Manual

Waste is just waste when mixed
It has value when separated

Manual of Waste Segregation Game

1. Preparation

1-1 General Preparation

1. Coordination of date and time
   * Required time is approximately 45 minutes

2. Arrangement of venue
   * Ex. Meeting room

3. Invitation of the participants
   * 15-20 participants
   * Moderator, assistant, note-taker, photographer

Example of Timetable

Activity	Time	Contents	Person in Charge
Preparation	-	● Sample waste ● Boxes, baskets, or bags to segregate into “Plastic,” “Metal,” “Glass,” “Paper,” “Hazardous Waste” and “Others”	Organizer of the activity
Presentation	15 min	● Why do we need waste segregation?	Presenter
Game	15 min	● All the participants segregate the sample waste into the boxes of “Paper,” “Plastic,” “Metal,” “Glass” and “Hazardous Waste”	All the participants
Closing	15 min	● All the participants check together if the segregation is correct ● Free discussion, free comments, Q&A session	All the participants

1-2 Preparation of the Items

1. Red, yellow, green, blue, purple and black boxes
2. Laminated signboards * See Appendix
3. Sample waste



Sample Waste

Plastic


PET bottle


Plastic cup


Plastic cutlery


Plastic container

Metal


Aluminum can


Steel can


Bottle cap


Clip

Sample Waste

Glass

Wine bottle

Food bottle

Paper

Newspaper

Magazine

Copy paper

Paper package

Cardboard

Toilet paper tube

Sample Waste

Hazardous waste

Battery

Fluorescent lamp

Others

Tissue

Toilet paper

Organic waste

Cloth

Cigarette

2. Procedure

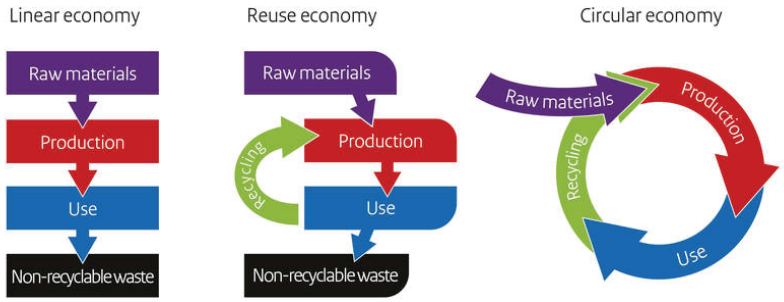
2-1 Opening

- All the participants introduce themselves.
- The moderator explain the purpose of the game “To understand how to and why segregate recyclable waste”
- Explain the rule of the game “Segregate the sample waste into the boxes of correct categories of the resource”

2-2 Why do we have to segregate?

The presentor explains the reasons why waste segregation is necessary.

- Natural resources are limited.
- To reduce the quantity of the waste to be dumped so that the dumping site can be used for a long time.
- To keep the quality of recycled material.



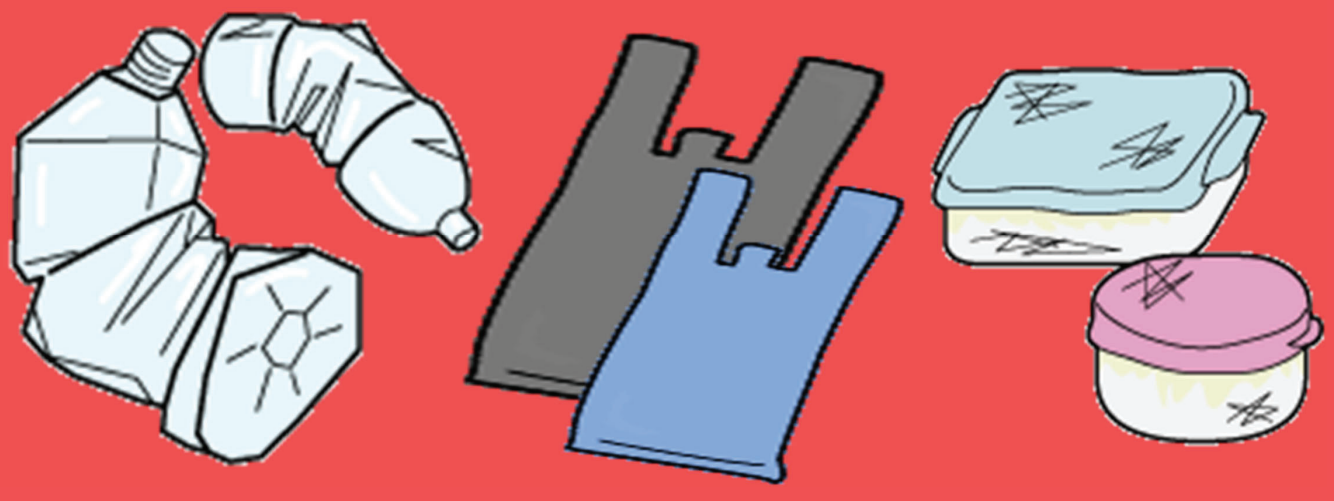
2-3 Separate the waste

- All the participants segregate the sample waste into the boxes of correct categories of the resources

2-4 Closing

- All the participants check the segregation of each sample waste
- Q&A

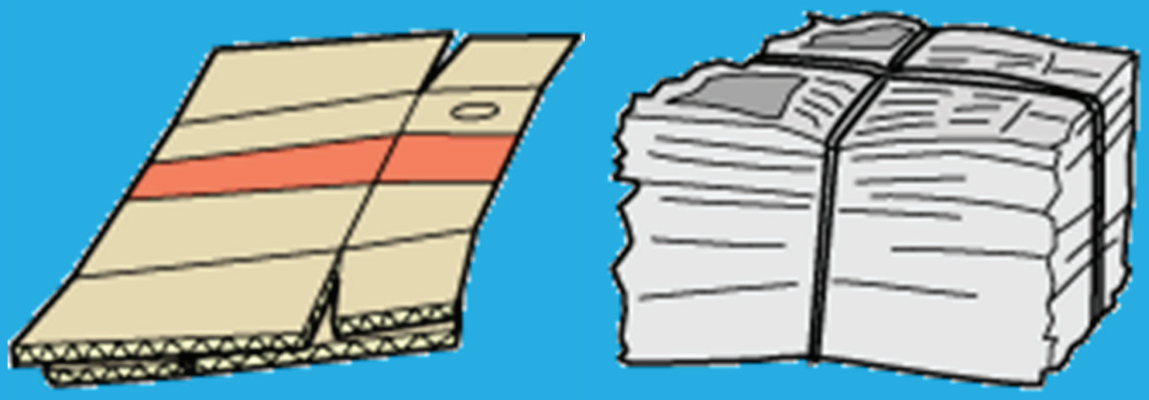
Appendix



GARRAFAS PET
PLASTICO DURO/LIMPO

SWITHUMBANA SWA KUBASA, MIMKWAMA NI MATIGELA YA KU BASA

Ilustração de resíduos por METI, Japão



PAPEL LIMPO
CARTOLINAS

MAPAPELA YA KU BASA NI
MAPAPELA YA KAKI

Ilustração de resíduos por METI, Japão

LATAS/METAL

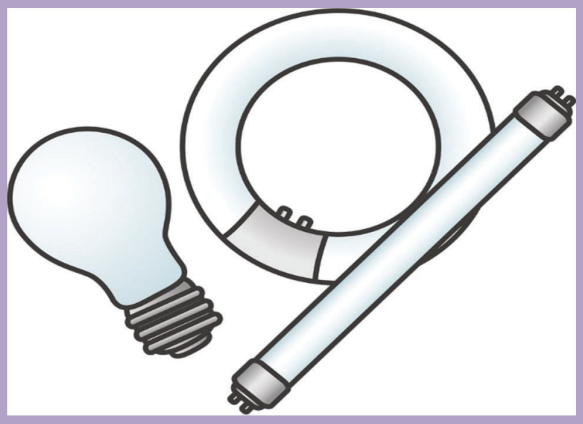
SWIKOTELA / TISIMBI

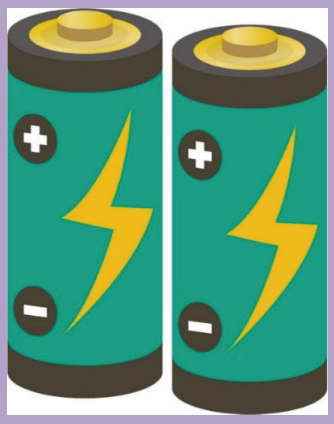
Ilustração de resíduos por METI, Japão

VIDROS

ŜWIGADZANA

Ilustração de resíduos por METI, Japão





LÁMPADA FLORESCENTE E PILHAS

MAGEZI YA KU VANINGA NI MAPILHA

OUTROS

TI NSILA TI NWANA

Ilustração de resíduos por METI, Japão

Appendix 7-2
Eco-point Operation Manual

Operation Manual for Eco-Points

Category of Eco Point

What do we do for operation of Eco Points?

1. Check the Eco Point
2. Improve the Eco Point if necessary
3. Weigh and record the weight of the waste

1. Check the Eco Point

No.	Check Point	If	Countermeasure
1	Is the waste segregated correctly?	NO ➡	Segregate again (→ Improve the Eco Point ①)
2	Are signboards pasted on the wall?	NO ➡	Paste (→ Improve the Eco Point ②)
3	Are the boxes placed correctly and beautifully?	NO ➡	Rearrange (→Improve the Eco Point ③)

2. Improve the Eco Point ①

No good!!

Plastics in “Metal” box!!

- ☐ Segregate correctly again
- ☐ Raise awareness of the colleagues
- ☐ Share information with the cleaning staff

2. Improve of Eco Point ②

No good!!

Signboard is fell in the ground!!

- ☐ Paste the signboard beautifully again

2. Improve of Eco Point ③

No good!!

There is a gap between the boxes!!

- ☐ Place the boxes without any gaps
- ☐ Place the boxes just below the signboards
- ☐ Wash the boxes to look beautiful

3. Weigh and record the weight of the waste ①

- ☐ Collect the waste in the <u>bag of each category</u>
- ☐ Move to the warehouse

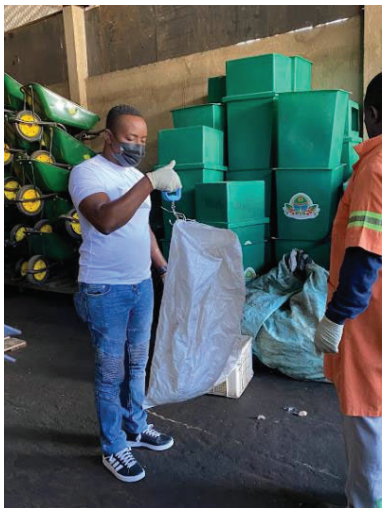
Attention!!

Never take the boxes to the warehouse!

It would cause the box to be missing.

<u>The boxes never leave the Eco Point.</u>

3. Weigh and record the weight of the waste ②



- ☐ Weigh the waste of each category
- ☐ Keep the record
- ☐ Weigh the waste for twice a month

Date	Plastic (kg)	Metal (kg)	Vidro (kg)	Paper (kg)	Hazardous waste (kg)	Remarks
2022/9/3						
2022/9/17					2.59	HW:fluore scent tube
2022/10/8						
2022/10/29	2.45			12.15		

Example of Assgining Persons in Charge of Eco Points

No.	Location	Person in Charge	Cleaning Staff
1	Secretart	Mr. Raul	Ms. Arminda Mr. Cumbula
2	REA	Mr. Edson Mr. Bila	Ms. Marta Mr. Ricardo
3	DOPA	Mr. Silvino	Mr. Dionildes
4	Proof of Service	Mr. Morgado	Mr. Calcavato
5	Meeting Room	Ms. Mafalda	Mr. Bernardo Ms. Marta
6	Finance	Ms. Rita	Mr. Malevane
7	Project Office	Ms. Stella	Mr. Malevane