

Khan Renewables Energy (Private) Limited

Summary of Waste Characterization Study

1 – Introduction

As part of the overall feasibility study for the proposed Waste to Energy Plant at Jam Chakro landfill site, a waste characterization study was conducted to understand the composition of the different kinds of waste making its way to the same landfill. In this regard, special focus was placed on the Garbage Transfer Stations (GTS) of Karachi, where waste from the city accumulates before being transported in larger vehicles to the Jam Chakro landfill site. In this regard, 4 GTSs were identified in collaboration with the Sindh Solid Waste Management Board (SSWMB) as being the major contributors of waste to the Jam Chakro site:

S. No.	GTS Site	Location
1	Imtiaz	District Korangi
2	Dinga Morr	District Central
3	Sharafi Goth	District Malir
4	Dar ul Suroor	District Central

Note: A detailed account of the areas that these GTS sites serve is attached as Annex I.

2 – Methodology

Subsequent to defining the areas of interest for the waste characterization surveys, the methodology adopted for the different parts of the survey included:

- a. Sampling was conducted as per **EN15442** (methods for sampling of solid recovered fuels), where a day was allocated to each GTS site. On this respective day, 750 kg of waste was sampled from different trucks leaving the site for the landfill, with waste from the trucks being taken from different portions of the trucks at different times of the day (i.e., waste was taken from the bottom of some trucks, from the center of the waste pile in others, and from the top of the pile in others) to ensure stratified random sampling.
- b. Sorting was conducted manually through **EN15440** (solid recovered fuels – methods for determination of biomass content), where a trained team of 11 different personnel was appointed to manually go through the waste in a cool and dry area and sort into the following categories:
 - Paper/Cardboard
 - Wood
 - Other Organic Material
 - Textile
 - Rubber
 - PP > 5 cm (Polypropylene – medicine & etc bottles)
 - HDPE > 5 cm (High Density Polyethylene – oil, shampoo, cleaning products)
 - PET > 5 cm (Polyethylene Terephthalate – water & drink bottles)
 - Other Plastics > 5 cm
 - Diapers, Sanitary Towels
 - Drink Cartons (Tetra Pack)
 - Other Combustible Materials
 - Hazardous Waste
 - Electric & Electronic Waste

- Other Waste
 - Glass
- c. Samples for lab testing were prepared using the sorted fractions as per **EN15443** (Methods for sample preparation of Solid Recovered Fuels), where 5 kg samples were prepared.
- d. Lab testing was conducted to identify the following parameters of the first 12 categories listed above:
- Moisture Content
 - Calorific Value
 - Ash Content
 - Carbon/Nitrogen Ratio
 - Total Organic Matter

The campaign conducted involved sampling of wastes leaving for the landfill site from the GTSs on two separate occasions, where the above-described process was repeated for each site on the following days:

S. No.	GTS Site	Location	Campaign	
			1 st Day	2 nd Day
1	Imtiaz	District Korangi	21/02/2023 Tuesday	28/02/2023 Tuesday
2	Dinga Morr	District Central	22/02/2023 Wednesday	01/03/2023 Wednesday
3	Dar ul Suroor	District Central	23/02/2023 Thursday	02/03/2023 Thursday
4	Sharafi Goth	District Malir	24/02/2023 Friday	03/03/2023 Friday

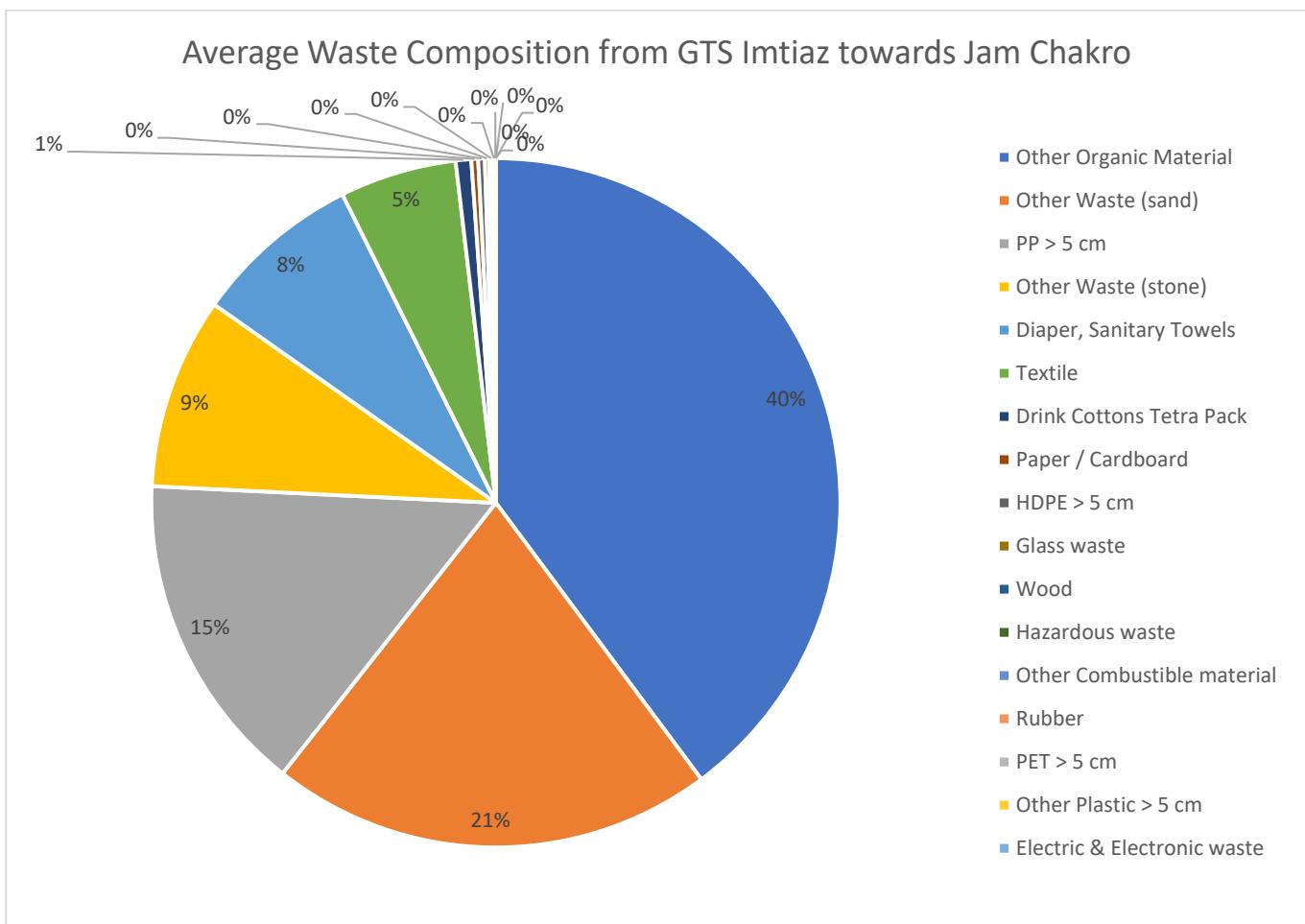
3 - Findings

The findings from the survey for each of the sites are given below:

Imtiaz

As depicted in the figure below, the average waste composition leaving for the Jam Chakro landfill site from GTS Imtiaz, in descending order, comprises of:

- 39.83% other organic material,
- 20.8% other waste (sand),
- 15.15% PP> 5cm,
- 8.99% other waste (stone),
- 7.89% diapers and sanitary towels,
- 5.48% textile,
- 0.73% drink cartons/ tetra pack,
- 0.31% HDPE> 5cm,
- 0.2% Glass,
- 0.17% Wood,
- 0.09% hazardous waste (medical),
- 0.05% other combustible material, and
- 0% for rubber, PET> 5cm, other plastics > 5cm, and electric/ electronic waste.

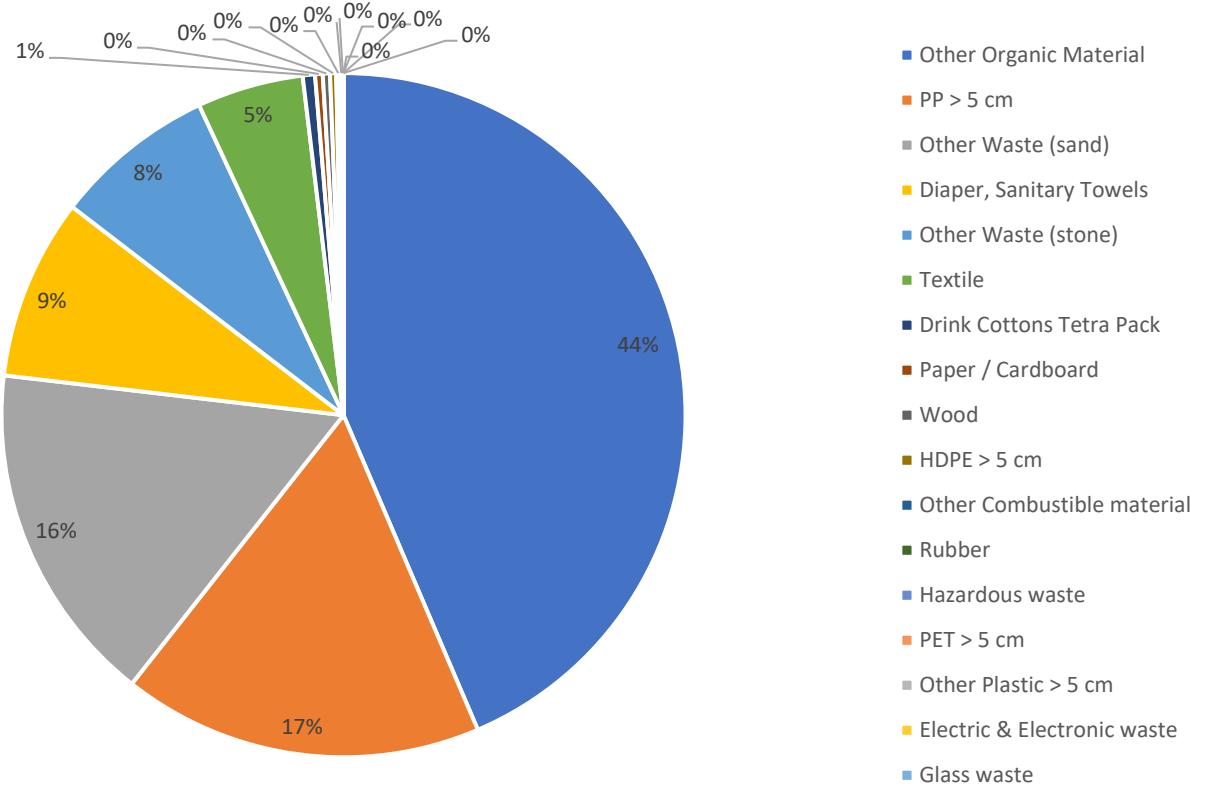


Dinga Morr

As depicted in the figure below, the average waste composition leaving for the Jam Chakro landfill site from GTS Dinga Morr, in descending order, comprises of:

- 43.58% other organic material
- 17.05% PP > 5 cm
- 16.24% Other waste (sand)
- 8.56% Diapers and Sanitary Towels
- 7.64% Other waste (stone)
- 5.03% textile
- 0.58% drink cartons/ tetra pack
- 0.36% cardboard
- 0.34% wood
- 0.28% HDPE > 5 cm
- 0.19% Other combustible material
- 0.09% Rubber
- 0.06% Hazardous waste
- 0% PET > 5cm, Other Plastic > 5cm, Electric/ Electronic Waste, & Glass

Average Waste Composition from GTS Dinga Morr towards Jam Chakro

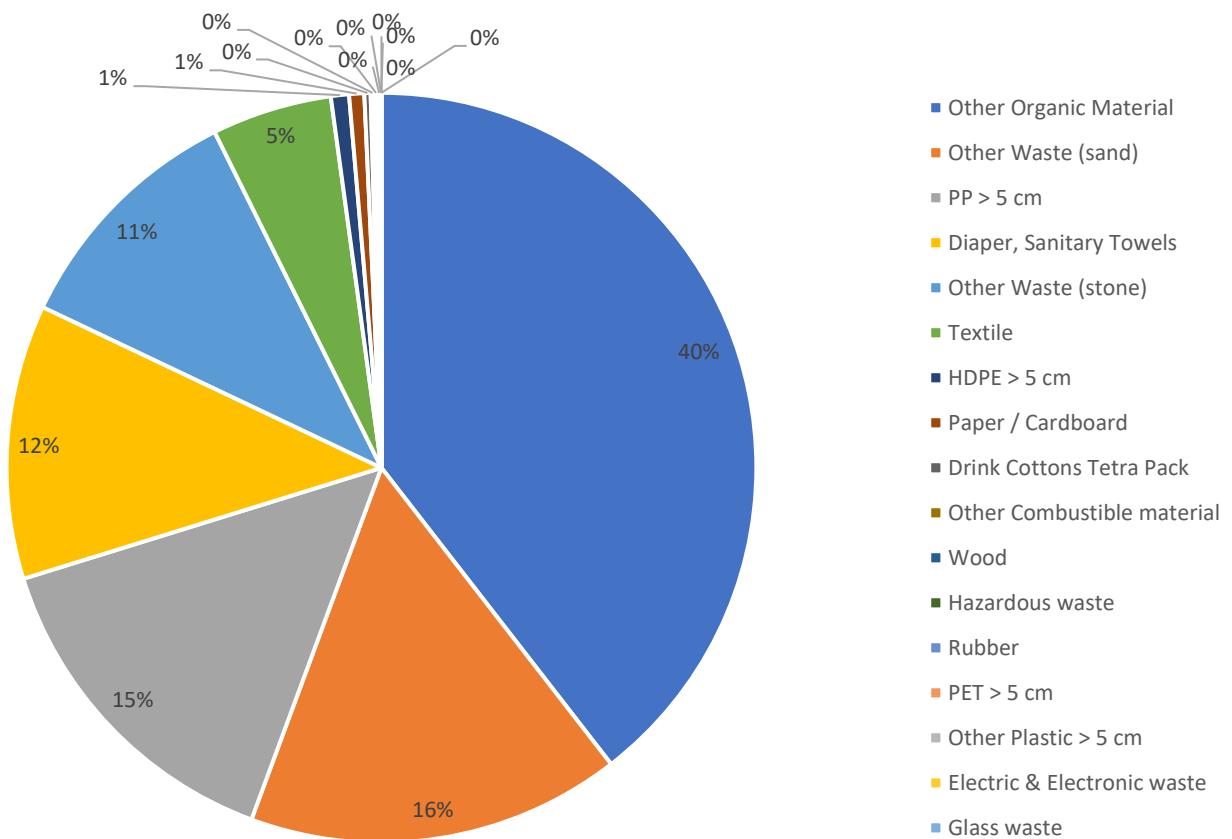


Dar Ul Suroor

As depicted in the figure below, the average waste composition leaving for Jam chakro landfill site from GTS Dar ul Suroor, in descending order, comprises of:

- 39.50% other organic material
- 16.13% other waste (sand)
- 14.58% PP > 5cm
- 11.83% Diapers and Sanitary Towels
- 10.61% other waste (stone)
- 5.18% textile
- 0.78% HDPE > 5cm
- 0.65% paper/cardboard
- 0.27% Drink cartons/ tetra pack
- 0.16% other combustible material
- 0.14% wood
- 0.12% hazardous waste
- 0.04% rubber
- 0% PET > 5cm, Other Plastic > 5cm, Electric/ Electronic Waste, & Glass

Average Waste Composition from GTS Dar ul Suroor towards Jam Chakro

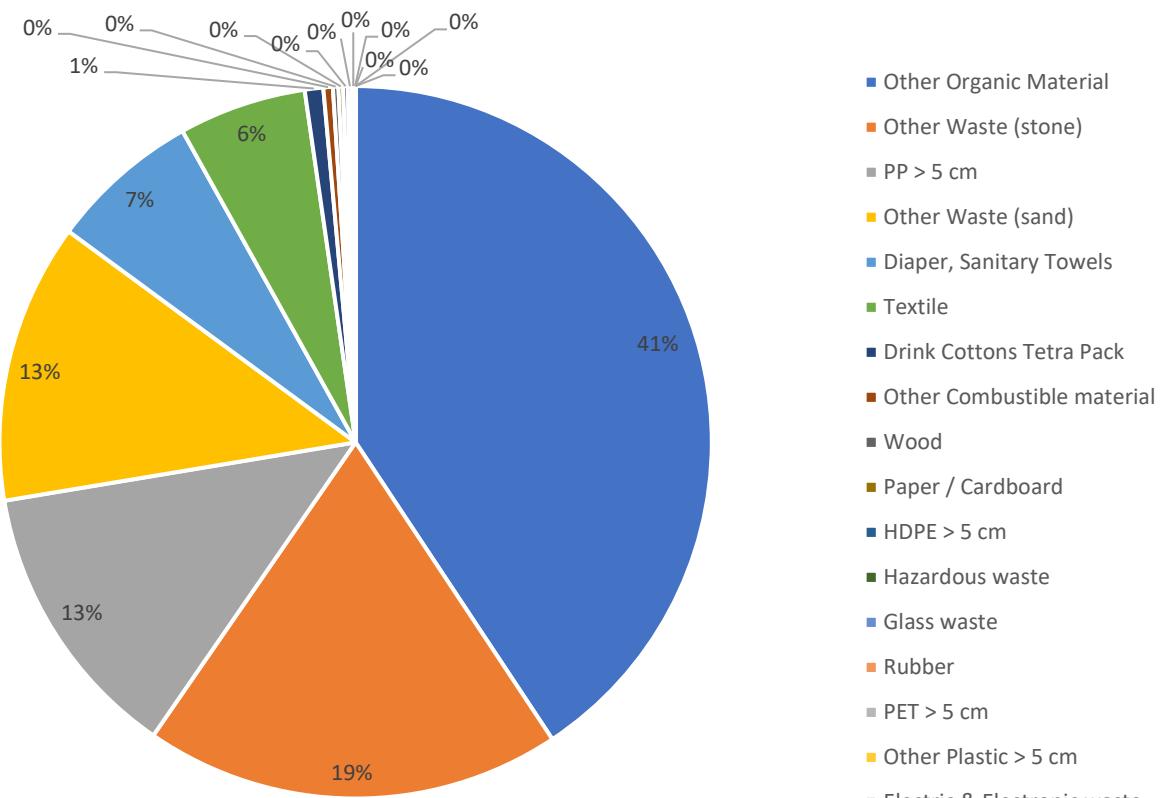


Sharafi Goth

As depicted in the figure below, the average composition leaving for Jam Chakro landfill site from GTS Sharafi Goth, in descending order, comprises of:

- 40.68% Other organic material
- 18.93% Other waste (stone)
- 12.76% PP > 5cm
- 12.71% Other Waste (sand)
- 6.83% diapers and sanitary towels
- 5.79% textile
- 0.84% drink cartons/ tetra pack
- 0.43% other combustible material
- 0.25% wood
- 0.21% paper/cardboard
- 0.21% HDPE > 5cm
- 0.19% hazardous waste
- 0.11% glass waste
- 0.05% Rubber
- 0% PET > 5cm, other plastics > 5cm, Electric & Electronic Waste

Average Waste Composition from GTS Sharafi Goth towards Jam Chakro



Overall Findings & Conclusion

From the overall trends observed across the type of waste surveyed, the waste making its way to the Jam Chakro landfill site comprises majorly of organic material, single use plastics (polypropylene), sand, stone, and textile (clothes). Everything that can be recycled or refurbished to an extent is taken out at the GTS sites by waste pickers including PET bottles, and electric/ electronic waste.

Annex I – Waste Dumping Points for City of Karachi (Before Landfilling)

District East

S No	District	Towns	UC Name	UC_no	GTS
1	East	Gulshan-e-Iqbal Town	Dehli Mercantile	1	GTS Imtiaz
2	East	Gulshan-e-Iqbal Town	Civic Centre	2	GTS Imtiaz
3	East	Gulshan-e-Iqbal Town	Gulshan-E-Iqbal 1	5	GTS Imtiaz
4	East	Gulshan-e-Iqbal Town	Gulshan-E-Iqbal 2	9	GTS Imtiaz
5	East	Gulshan-e-Iqbal Town	Safooran	13	GTS Imtiaz
6	East	Jamshed Town	Jamshed Quarts	10	GTS Imtiaz
7	East	Gulshan-e-Iqbal Town	Essa Nagri	4	GTS Imtiaz
8	East	Gulshan-e-Iqbal Town	Gulzar-E-Hijri	12	GTS Imtiaz
9	East	Gulshan-e-Iqbal Town	P.I.B Colony	3	GTS Imtiaz
10	East	Jamshed Town	Manzoor Colony	2	GTS Imtiaz
11	East	Jamshed Town	Soldier Bazar	12	GTS Imtiaz
12	East	Gulshan-e-Iqbal Town	Pehlwan Goth	10	GTS Imtiaz
13	East	Gulshan-e-Iqbal Town	Metroville Colony	11	GTS Imtiaz
14	East	Gulshan-e-Iqbal Town	Gillani Railway Station	6	GTS Imtiaz
15	East	Gulshan-e-Iqbal Town	Shanti Nagar	7	GTS Imtiaz
16	East	Jamshed Town	Azam Basti	3	GTS Imtiaz
17	East	Jamshed Town	Chanesar Goth	4	GTS Imtiaz
18	East	Jamshed Town	Jat Lane Lines	8	GTS Imtiaz
19	East	Jamshed Town	P.E.C.H.S 1	6	GTS Imtiaz
20	East	Jamshed Town	Akhter Colony	1	GTS Imtiaz
21	East	Jamshed Town	Mehmoodabad	5	GTS Imtiaz
22	East	Jamshed Town	P.E.C.H.S 2	7	GTS Imtiaz
23	East	Jamshed Town	Jacob Lines	9	GTS Imtiaz
24	East	Gulshan-e-Iqbal Town	Jamali Colony	8	GTS Imtiaz

25	East	Jamshed Town	Garden East	11	GTS Imtiaz
26	East	Jamshed Town	Pakistan Qurts	13	GTS Imtiaz

District Malir

S No	District	Town	UC Name	UC_no	GTS
1	Malir	Malir Town	Garibabad	6	Sharafi Goth
2	Malir	Malir Town	Gazi Brohi	7	Sharafi Goth
3	Malir	Bin Qasim Town	Cattle Colony	3	Sharafi Goth
4	Malir	Bin Qasim Town	Quaidabad	4	Sharafi Goth
5	Malir	Malir Town	Jaffer-E-Tayyar	5	Sharafi Goth
6	Malir	Malir Town	Kalaboard	2	Sharafi Goth
7	Malir	Malir Town	Model Colony	1	Sharafi Goth
8	Malir	Malir Town	Khokrapar	4	Sharafi Goth
9	Malir	GADAP Town	Gujiro	4	Sharafi Goth
10	Malir	Bin Qasim Town	Ibrahim Hyderi	1	Sharafi Goth
11	Malir	GADAP Town	Yousuf Goth	6	Sharafi Goth
12	Malir	Bin Qasim Town	Gulshan-E-Hadee	6	Sharafi Goth
13	Malir	Bin Qasim Town	Landhi	5	Sharafi Goth
14	Malir	Bin Qasim Town	Rehri	2	Sharafi Goth
15	Malir	GADAP Town	Darsanno Channo	2	Sharafi Goth
16	Malir	GADAP Town	Murad Memon	1	Sharafi Goth
17	Malir	Malir Town	Saudaabad	3	Sharafi Goth
18	Malir	GADAP Town	Mango Pir	8	Sharafi Goth
19	Malir	GADAP Town	Songal	5	Sharafi Goth
20	Malir	GADAP Town	Maymarabad	7	Sharafi Goth
21	Malir	GADAP Town	Gadap	3	Sharafi Goth
22	Malir	Bin Qasim Town	Ghaghara	7	Sharafi Goth

District South

	District	Town	UC Name	UC_no	GTS
1	South	Lyari Town	Behar Colony	7	Mewa Shah
2	South	Lyari Town	Singo Lane	9	Mewa Shah
3	South	Saddar Town	City Railway Colony	4	Mewa Shah
4	South	Saddar Town	Clifton	10	Mewa Shah
5	South	Saddar Town	Kharadar	3	Mewa Shah
6	South	Saddar Town	Nanak Wara	5	Mewa Shah
7	South	Saddar Town	Saddar	8	Mewa Shah
8	South	Saddar Town	Old Haji Camp	1	Mewa Shah
9	South	Lyari Town	Agrataj Colony	1	Mewa Shah
10	South	Lyari Town	Darya Abad	2	Mewa Shah
11	South	Lyari Town	Shahbaig Lane	6	Mewa Shah
12	South	Lyari Town	New Abad	3	Mewa Shah
13	South	Lyari Town	Bhagdadi	5	Mewa Shah
14	South	Lyari Town	Khada Memon	4	Mewa Shah
15	South	Lyari Town	Rangiwera	8	Mewa Shah
16	South	Saddar Town	Civil Lines	9	Mewa Shah
17	South	Saddar Town	Gazarabad	6	Mewa Shah
18	South	Saddar Town	Millat Nagar	7	Mewa Shah
19	South	Saddar Town	Kehkeshan	11	Mewa Shah
20	South	Saddar Town	Garden	2	Mewa Shah
21	South	Keamari Town	Gaho Pat	8	Mewa Shah
22	South	Keamari Town	Sultanabad	2	Mewa Shah
23	South	Keamari Town	Keamari	3	Mewa Shah
24	South	Keamari Town	Baba Bhitt	4	Mewa Shah
25	South	Keamari Town	Mauri Pur	6	Mewa Shah
26	South	Lyari Town	Allama Iqbal Colony	11	Mewa Shah

	District	Town	UC Name	UC_no	GTS
27	South	Lyari Town	Chakiwara	10	Mewa Shah
28	South	Keamari Town	Bhutta Village	1	Mewa Shah
29	South	Keamari Town	Machar Colony	5	Mewa Shah
30	South	Keamari Town	Sher Shah	7	Mewa Shah

District West

	District	Town	UC Name	UC_no	GTS
1	West	S.I.T.E Town	Banaras Colony	7	Gutter Baghicha
2	West	S.I.T.E Town	Matroville	4	Gutter Baghicha
3	West	S.I.T.E Town	Jahanabad	3	Gutter Baghicha
4	West	S.I.T.E Town	Frontier Colony	6	Gutter Baghicha
5	West	S.I.T.E Town	Qasba Colony	8	Gutter Baghicha
6	West	S.I.T.E Town	Islamia Colony	9	Gutter Baghicha
7	West	S.I.T.E Town	Pak Colony	1	Gutter Baghicha
8	West	S.I.T.E Town	Old Golomar	2	Gutter Baghicha
9	West	S.I.T.E Town	Pathan Colony	5	Gutter Baghicha
10	West	Baldia Town	Mohajir Camp	6	Baldia GTS
11	West	Baldia Town	Islam Nagar	3	Baldia GTS
12	West	Baldia Town	Muslim Mujahid Colony	7	Baldia GTS
13	West	Baldia Town	Nai Abadi	4	Baldia GTS
14	West	Baldia Town	Rasheedabad	8	Baldia GTS
15	West	Orangi Town	Bilal Colony	8	HAWA Goth
16	West	Orangi Town	Haryana Colony	2	Hawa Goath
17	West	Orangi Town	Madina Colony	5	Hawa Goath
18	West	Orangi Town	Ghaziabad	6	HAWA Goath
19	West	Orangi Town	Mujahidabad	12	Hawa Goath
20	West	Orangi Town	Baloch Goth	13	Hawa Goath

	District	Town	UC Name	UC_no	GTS
21	West	Baldia Town	Gulshan-E-Ghazi	1	Baldia GTS
22	West	Baldia Town	Ittehad Town	2	Baldia GTS
23	West	Orangi Town	Gobal Colony	10	Hawa Goath
24	West	Orangi Town	Azad Nagar	1	Hawa Goath
25	West	Orangi Town	Dad Nagar	11	Hawa Goath
26	West	Orangi Town	Hanifabad	3	Hawa Goath
27	West	Orangi Town	Muhammad Nagar	4	HAWA Goath
28	West	Orangi Town	Lalam Chowk	9	Hawa Goath
29	West	Orangi Town	Chushti Nagar	7	Hawa Goath
30	West	Baldia Town	Saeedabad	5	Baldia GTS

District Korangi

S.no	District	Town / Zone	UC Name	UC_no	GTS/Dumping Points
1	Korangi	Model Colony	LASI PARAH / MEHRAN DEPO	1	Azeempura
2			MODEL COLONY	2	Azeempura
3			INDUS MEHRAN	3	Azeempura
4			KHOKHRAPAR	4	Azeempura
5			PANIWALA BABA	5	Azeempura
6			KALABOARD	6	Azeempura
7		Shah Faisal	SHAH FAISAL NO.5	7	Azeempura
8			NATAKHAN GOATH	8	Azeempura
9			DRIGH COLONY	9	Azeempura
10			SHAH FAISAL COLONY	10	Azeempura
11			HAJRABAD	11	Azeempura
12			GREEN TOWN	12	Azeempura

S.no	District	Town / Zone	UC Name	UC_no	GTS/Dumping Points
13			RAFA-E-AAM	13	Azeempura
14			JAMA-E-MILIYA	14	Azeempura
15	Landhi		BHUTTO NAGAR	15	Bilal Chowrangi
16			FAROOQ VILLAS	16	Bilal Chowrangi
17			BILALABAD	17	Bilal Chowrangi
18			KHAWAJA AJMAIR COLONY	18	Bilal Chowrangi
19			ZAMANABAD LANDHI	19	Bilal Chowrangi
20			SHAIRABAD	20	Bilal Chowrangi
21			SHARIF COLONY LANDHI	21	Bilal Chowrangi
22			CIVIC CENTER	22	Bilal Chowrangi
23			AWAMI COLONY	23	Bilal Chowrangi
24			ZAMAN TOWN LANDHI	24	Bilal Chowrangi
25	Korangi		HASRAT MOHANI COLONY	25	100 Quarter
26			NIZAM-E-MUSTAFA COLONY	26	100 Quarter
27			100 QUARTER	27	100 Quarter
28			MADINA COLONY	28	100 Quarter
29			RAHIMABAD	29	100 Quarter
30			KORANGI	30	100 Quarter
31			KORANGI QUARTERS	31	100 Quarter
32			BILAL COLONY	32	3000 Road PCTS Point

S.no	District	Town / Zone	UC Name	UC_no	GTS/Dumping Points
33			ZIA COLONY	33	3000 Road PCTS Point
34			NASIR COLONY	34	3000 Road PCTS Point
35			CHAKRA GOATH	35	3000 Road PCTS Point
36			DAR-UL-SALAM	36	3000 Road PCTS Point
37			QAYYUMABAD	37	3000 Road PCTS Point

District Central

S No	District	Zone	Union Council	UC No	Dumping point/Kachra kundi
1	Central	New Karachi Zone	Shah Nawaz Bhutto Col	1	Dinga Morr(UC9)
2	Central	New Karachi Zone	Gulshan-e-Saeed	2	Dinga Morr(UC9)
3	Central	New Karachi Zone	Khawaja Ajmair Nagri	3	3000 Road
4	Central	New Karachi Zone	Kalyana	4	Dinga Morr(UC9)
5	Central	New Karachi Zone	Hakeem Ahsan	5	Town Kundi(UC5)
6	Central	New Karachi Zone	Abuzar Gaffari Colony	6	Town Kundi(UC5)

S No	District	Zone	Union Council	UC No	Dumping point/Kachra kundi
7	Central	New Karachi Zone	Shah Faisal	7	Town Kundi(UC5)
8	Central	New Karachi Zone	Kala School	8	Town Kundi(UC5)
9	Central	New Karachi Zone	Mustafa Colony	9	Dinga Morr(UC9)
10	Central	New Karachi Zone	Khamisu Goth	10	Gabol(UC13)
11	Central	New Karachi Zone	Madina Colony	11	Saba Chowrangi(UC11)
12	Central	New Karachi Zone	Mujeeb Ul Nisa	12	Saba Chowrangi(UC11)
13	Central	New Karachi Zone	Godhra Hospital	13	Gabol(UC13)
14	Central	North Nazimabad Zone	Fatima Jinah Colony	14	Gabol(UC13)
15	Central	North Nazimabad Zone	Sir Syed	15	Town Kundi(UC5)
16	Central	North Nazimabad Zone	Shadman	16	Darul Saror
17	Central	North Nazimabad Zone	Faroq Azam	17	Darul Saror

S No	District	Zone	Union Council	UC No	Dumping point/Kachra kundi
18	Central	North Nazimabad Zone	Al-Falah	18	Darul Saror
19	Central	North Nazimabad Zone	Mustafa Abad	19	Talib-e- Chaman
20	Central	North Nazimabad Zone	Pahar Gunj	20	Talib-e- Chaman
21	Central	North Nazimabad Zone	Khandu Goth	21	Block B
22	Central	North Nazimabad Zone	Haidri	22	Block B
23	Central	North Nazimabad Zone	Sakhi Hassan	23	Darul Saror
24	Central	North Nazimabad Zone	Buffer Zone-1	24	Darul Saror
25	Central	North Nazimabad Zone	Buffer Zone-2	25	Darul Saror
26	Central	Gulberg Zone	Al Noor Society	26	Norani Ground
27	Central	Gulberg Zone	Samanabad	27	Ultra Sound
28	Central	Gulberg Zone	Ayesha Manzil	28	Yaseenabad
29	Central	Gulberg Zone	Water Pump	29	Ghfran Kundi
30	Central	Gulberg Zone	Yaseenabad	30	Yaseenabad

S No	District	Zone	Union Council	UC No	Dumping point/Kachra kundi
31	Central	Gulberg Zone	Naseerabad	31	Block 14
32	Central	Gulberg Zone	Joharabad	32	Yaseenabad
33	Central	Gulberg Zone	Azizabad	33	Yaseenabad
34	Central	Gulberg Zone	Kareemabad	34	Yaseenabad
35	Central	Gulberg Zone	Musa Colony	35	Phatak Musa Colony
36	Central	Liaquatabad Zone	F.C Area	36	Phatak Musa Colony
37	Central	Liaquatabad Zone	Sharifabad	37	Rukan Uddin
38	Central	Liaquatabad Zone	Bandhani Colony	38	Denga Morr
39	Central	Liaquatabad Zone	Qasimabad	39	Denga Morr
40	Central	Liaquatabad Zone	Comercial Area	40	Denga Morr
41	Central	Liaquatabad Zone	Daak Khana	41	Denga Morr
42	Central	Liaquatabad Zone	Ibne sena	42	Denga Morr
43	Central	Liaquatabad Zone	Liaquatabad	43	Faisal Ground
44	Central	Liaquatabad Zone	Haji Mureed Goth	44	Denga Morr
45	Central	Liaquatabad Zone	Hadi Market	45	Denga Morr
46	Central	Liaquatabad Zone	Abbasi Shaeed	46	Noor-e-Islam

ANNEX I – Waste Dumping Points for City of Karachi (Before Landfill)

S No	District	Zone	Union Council	UC No	Dumping point/Kachra kundi
47	Central	Liaquatabad Zone	Paposh Nagar	47	B Block
48	Central	Liaquatabad Zone	Orangabad	48	Denga Morr
49	Central	Liaquatabad Zone	Nazimabad	49	Denga Morr
50	Central	Liaquatabad Zone	Rizvia Society	50	Denga Morr
51	Central	Liaquatabad Zone	Gulbahar	51	Denga Morr

Karachi Cantonments.

Cantonments	GTS/Dumping point
Cantonments Board Clifton (Included DHA)	GTS Imtiaz
Cantonments Board Faisal	Sharafi GTS
Clifton Board Malir	Jam Chakro Lfs
Korangi Creek	GTS Imtiaz
Cantonments Kiamari	The dumping point (Jungle Shah) then transfers to the gondpass