



## Chapter – 10 : Storm Water Drainage



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**CDP-Delhi**

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## CHAPTER - 10 STORM WATER DRAINAGE

### 10.1 INTRODUCTION

Storm water drainage of Delhi is a complex situation, owing to the combination of a number of natural and man-made drainage systems - five drainage basins, large natural drains, storm water drains along the roads and combined sewer cum storm water drains (sometimes as a bypass arrangement for blocked sewer lines). However, most of the water collected through different drainage systems finally get discharged into the river Yamuna. Historically it is said that the drainage system of Old Delhi was largely developed by the Mughals whereas of New Delhi by the British.

There are a number of basic problems with the drains of city. A majority of the large drains are not lined. Also, there are a large number of mid-size drains that are either unlined or have damaged lining. Often the construction debris in the new drains is not cleared before commissioning and garbage is dumped on the road sides which easily find their way into the adjacent drains. Even road sweepings are pushed into the drains. The drain slabs are not repaired on time leaving convenient openings for pushing garbage and trash matter, construction debris etc. inside the drain. Open drains have become receptacles of garbage till they are completely filled up, leading to overflowing of sullage and storm water. As a result, in the rainy season the drains are unable to take the flow and spill over, flooding the roads.

The drainage system in the slums is either absent or inadequate. In some areas the levels of the road have gone up with repair and renovation or new roads have been built. Even in some DDA colonies like Pitampura and Shalimar Bagh, water logging persists even after repeated attempts to redress the situation. Flooding of the roads and water logging of colonies, even with showers of medium intensity, is quite common, leading to difficult living conditions, inconvenience and traffic congestion.

Spread of diseases like malaria, filaria, dengue and annual recurrence of gastro-enteric diseases is a testimony to the failed drainage system.

It appears that a comprehensive overview of the situation is lacking and only piecemeal solutions have been attempted at different points of development of the city. This is amply illustrated by the example in the following paragraph.



A number of drains discharging into the Najafgarh drain and the Yamuna River are being diverted to the sewerage system with an intention of treating the dirty water in the sewage treatment plants and subsequently reducing the pollution load of the receiving water bodies, particularly Yamuna. However, the diverted drains (already completed ones) are actually not functional either due to blockage

or settlement of the sewer lines or some other problems. These drains carry a huge pollution load into the Yamuna (Table 10.3).

## 10.2 SITUATION ANALYSIS OF THE EXISTING SYSTEM

The responsibility of construction and maintenance of the large drains (natural) is with the Irrigation and Flood Control Department of the Delhi Government. However disposal of the silt removed from these drains is the responsibility of the respective Municipal Bodies, under whose jurisdiction the de-silting is done. Delhi Jal Board looks after drains with more than 1000 cusec discharge. The Public Works Department (Delhi Government) is responsible for the drains in some identified areas. The three Local Bodies - Municipal Corporation of Delhi, New Delhi Municipal Council and Delhi Cantonment Board - have the mandate to look after the construction and maintenance (including de-silting) of the drains in their respective areas, which are aligned with the roads.

The last Master Plan for storm water drainage of Delhi was prepared by the Master Plan Organization set up by the Irrigation and Flood Control Department during the period 1972-1976 (finalized in 1977). An Expert Committee was set up by the Delhi Administration to give guidance to this activity. This Master Plan took into account the urbanization limits up to the year 1981. However, while according approval, the Committee of Experts suggested that a fresh review of the drainage issues be taken while doing the Master Plan - 2021.

Till date the Master Plan for storm water drainage of Delhi has not been revised. Keeping in view the inadequacy of storm water drainage, particularly in the unplanned (un-authorized or regularized) and some other colonies of the city, which is highlighted during the rains every year, a revised master plan needs to be prepared at the earliest. This master plan should consider urbanization limits till 2021.

There is also a need to develop run-off norms for Delhi before making a new plan. A Committee of Experts may be set up under the Chairmanship of Member (RM), Central Water Commission (who has a fully equipped Hydrology Directorate working under him), with Chief Engineers of all the Civic Agencies to finalize the run-off norms and also the terms of reference for the preparation of the revised master plan for storm water drainage in Delhi.

At the same time the extent of urbanization and industrialization have to be ascertained from the various local authorities, such as, MCD, NDMC, DCB, DDA, DSIDC, PWD, Irrigation and Flood department etc.

Proper disposal of storm water is one of the crucial components of urban infrastructure services. In most part of the city, wherever low lying colonies have been developed by the Civic Agencies, the responsibility of disposal of storm water lies with the Municipal Corporation of Delhi. Pumping facilities are required for such situations although non-availability of adequate space (about 1000 sq.m.) is a constraint and stagnation of water persists. Consequently, the residents have to suffer. One way out would be to provide such space so that the pumping facilities can be set up.

One of the fundamental issues normally neglected in our country is the comprehensive design of roads, drains, sewers and other utility network like water pipe, electric and communication cables etc. and their careful and

meticulous execution. Instead, the foundation as well as the surface of the roads, are not proper leading to early damage due to movement and weather conditions. Bad surface of the roads lead to more dust and debris during road sweepings and also further damage to the surface. At least part of this dust and debris get into the adjacent drains. At the same time suitable ducts / pipes should be provided under the foot path to accommodate cables, pipes etc. so that the road is not dug up time and again.

### 10.3 EXISTING DRAINAGE INFRASTRUCTURE

Delhi, topography created a drainage system that carried rain and storm water from the higher elevations of the West to the Yamuna, providing a natural drainage. While the Eastern, low-lying side was originally a part of the flood plain of the river and considered un-inhabitable due to frequent floods. However, settlements in this area also began with the immigration after year 1947. Today, this Eastern wing which is also known as the Trans Yamuna area houses about 20% of the total population of Delhi.

#### 10.3.1 Natural Drainage System

The city has been divided into six drainage zones (i) Northern Zone, (ii) Western Zone, (iii) Central North West and South East Zone, (iv) Central South and South East Zone, (v) East Zone and (vi) South Zone. The length of natural drain in the city is 350 km carrying discharge of 1000 m<sup>3</sup>. Table 10.1 presents the catchment area of the natural drains in the city.

**Table 10.1 Drainage Channels and Catchments for Delhi**

S. No.	Catchments	Location	Length of main drains (km)	Drainage channels	Discharge (cumecs)
1	Alipur	North	140	Supplementary Bhiwana Escape	141
				- No. 6 drain - New Drain	33
2	Kanjhawala	West	120	Mungeshpur	52
3	Najafgarh	Central-North, West and South-West	105	Najafgarh Palam	283
				Bhupania-Chudania (from Haryana)	40
4	Khushak-Barapulla	Central-South and South-East		Khushak and Barapulla drains ('nallah')	120
5	Trans-Yamuna	East	45	Shahdara outfall - Ghazipur	158
				Trunk drain No. 1	86
6	Mehrauli	South	5		

### 10.3.2 Man-made drainage System

The total length of drains is 1700 kms spread over 12 municipal zones. There are around 1300 drains with 339 km in Civil Lines Area and 5 kms in Paharganj Sadar Area (Refer Table 10.2)

**Table 10.2 : Existing Drains in Delhi under MCD**

S. No.	Zone	Number of drains	Total length of drains (km)
1	Central	41	47
2	South	127	102
3	Sadar-Paharganj	10	4.5
4	Karolbagh	47	23
5	City Zone	10	8.6
6	Civil Lines	77	339
7	Shahadara South	174	134
8	Shahadara North	197	135
9	Narela	84	83
10	Rohini	142	180
11	West	185	410
12	Najafgarh	202	228
	<b>Total</b>	<b>1296</b>	<b>1694.1</b>

Source: Nav Bharat Times, New Delhi, 31<sup>st</sup> July, 2006

Table 10.3 shows that the BOD level in four of the ten drains is in the range of 100-200, in two of the drains in the range of 200-300 and in three out of ten drains above 300 mg/litre. Thus in 90 % of these drains the discharge is comparable to a range of weak to strong domestic sewage.



**Table 10.3: BOD load (TPD) contributed to river Yamuna by different drains in Delhi stretch**

S. No.	Drain	BOD load (TPD)			% BOD Load Contribution
		Min	Max	Average	
1.	Najafgarh Drain	64.60	459.53	121.57	32.99
2.	Magazine Road Drain	0.36	3.93	1.61	0.44
3.	Sweepers Colony Drain	0.07	1.76	0.73	0.20
4.	Khyber Pass Drain	0.03	1.05	0.25	0.07
5.	Metcalf House Drain	0.19	1.95	0.54	0.15
6.	ISBT Drain	0.85	9.34	3.42	0.93
7.	Tonga Stand Drain	0.25	8.16	1.50	0.41
8.	Moat Drain	0.03	0.26	0.10	0.03
9.	Civil Mill Drain	3.55	28.00	12.89	3.50
10.	Delhi Gate Drain	4.58	25.41	10.61	2.88
11.	Sen Nursing Home Drain	8.50	66.65	28.17	7.64
12.	Drain No. 12A	0.17	3.19	0.63	0.17
13.	Drain No. 14	3.70	44.39	21.41	5.81

S. No.	Drain	BOD load (TPD)			% BOD Load Contribution
		Min	Max	Average	
14.	Barapulla Drain	0.06	103.20	14.30	3.88
15.	Maharani Bagh Drain	8.75	60.51	23.99	6.51
16.	Kalkaji Drain	0.05	1.71	0.49	0.13
17.	Tehkhand Drain	0.38	2.77	1.43	0.39
18.	Tughlaqabad Drain	0.23	1.71	0.68	0.18
19.	Shahdara Drain	27.75	203.40	64.71	17.56
20.	Sarita Vihar Drain	7.74	86.86	39.93	10.83
21.	Drain at LPG Bottling Plant	0.32	6.29	2.33	0.63
22.	Drain near Sarita Vihar Bridge	7.18	56.60	17.25	4.68
	Total	139.34	1176.67	368.54	100

Source : CPCB Annual Report, 2001-02

#### 10.4 ISSUES

- For a fast growing mega city spread over 1483 square kilometers with built areas, undulated and ridge areas, having multiple drainage basins and finally holding a population of 14 millions, it is a very complex task to have a detailed overview of the overall drainage situation and translate this into a workable comprehensive drainage plan.
- Detailed information regarding the topography of the whole city, invert levels of all the natural and man-made drains, invert levels of the corresponding sewer lines, information about linkage of underground sewer drains and storm water drains would be required through a meticulous survey.
- The task becomes even more complicated due to the actual situation of storm water drainage described above. Storm water drainage is meant to carry storm water (rain water) and any other clean surface water. It is fundamentally not suitable or designed for carrying sewage or industrial waste water or even septic tank effluent. Even the effluent from the sewage treatment plant can not be discharged into it unless it meets the norms set by the BIS code and the Central Pollution Control Board.
- Therefore one of the urgent tasks should be to make plans for diversion of all waste water (both domestic and industrial) from surface drains.
- Roads and drains need to be planned, designed and constructed together so that there is a proper linkage between them and they serve the purpose of not only drainage and collection of surface water on the roads but also facilitate road sweeping and separate collection of solid waste.
- Some of the drains are from the Mughal period and have heritage value. These need to be revived in a suitable manner keeping in view their historical content and their present context. These could, for example be vehicles of ground water recharge through a green sheet of grass and shrubs and a functional lined drain in the middle to carry the lean time discharge.

- There should be strict instructions to the construction agencies to clear all debris and construction material from within the drains before covering the slabs. This is crucial for proper functioning of the drains.
- For cleaning / desilting of major covered drains, 6 nos. of 'Super Sucker's are recommended.
- A report entitled 'Waste Water Management : South Delhi Greenway Project' prepared by the IIT, Delhi has outlined an innovative way to rejuvenate the natural drainage system for Barapulla drain through waste water treatment and modification of the cross section of the drain. Similar projects should be prepared for all the major drains mentioned at Table 10.3 above so that the problem can be solved from the very root in a long term sustainable way.
- An appropriate 'Drainage Authority of NCT' should be created to deal with all sewer, storm water and natural drains within the NCT area in a comprehensive manner.