



ANNEXURES



Annexure 1.1 Composition of the Study Group for Preparation of Functional Plan for Drainage 2021 for NCR

1.	Shri J.S. Ahlawat (upto October, 2008) Shri Harnail Singh Engineer-In-Chief, Dept. of Irrigation, Govt. of Haryana	Chairman
2.	Shri Rajeev Malhotra, Chief Regional Planner, NCRPB	Co-Chairman
3.	Director (UT), Central Water Commission, North Wing, Sewa Bhawan, RK Puram, New Delhi	Member
4.	Chief Engineer, (Ganga), Department of Irrigation, Meerut Division, Govt. of UP.	Member
5.	Chief Engineer, UP Jal Nigam, Lucknow, Govt. of UP.	Member
6.	Chief Engineer, Lift Canal Unit, Irrigation Dept., Govt. of Haryana.	Member
7.	Additional Chief Engineer, Department of Irrigation, Govt. of Rajasthan.	Member
8.	Chief Engineer, Department of Irrigation, Govt. of GNCT-Delhi.	Member
9.	Superintending Engineer, Delhi Jal Board, Govt. of GNCT-Delhi.	Member
10.	Superintending Engineer, PWD, Water Supply & Sanitation Circle, Gurgaon	Member
11.	Chief Coordinator Planner, NCR Cell (UP), Town & Country Dept., Navyug Market, Commercial Building, IInd Floor, Ghaziabad (UP).	Member
12.	Chief Coordinator Planner, (NCR Cell), 3 rd Floor, HUDA Office, Sector- 6, Panchkula, Haryana.	Member
13.	Chief Town Planner (NCR), Nagar Niyojan Bhawan, J.L.N. Marg, Jaipur-302004, Rajasthan.	Member
14.	Associate Town & Country Planner, NCR Cell, Govt. of NCT-Delhi, R. No.507, 5 th Level, B-Wing, Delhi Secretariat, I.P. Estate, N. Delhi	Member
15.	Joint Director, NCR Planning Board	Member Convener
16.	Subject Expert- with permission of the Chairman/Co-Chairman	Special Invitee



Annexure 6. 1: Desired and Existing Water Quality Levels at Various Sampling Station in Water Bodies of Uttar Pradesh (2009 & 2010)

Name of river sampling location	Desired category	Existing category 2009	Existing category 2010	Pollution characteristics
River Ganga				
1- Ganga Rajghat D/s Narora	B	C	C	TC
2- Ganga D/s Garmukteswar	B	D	D	TC
3- Kanpur Bithoor	B	C	C	TC
4- Kanpur U/s	B	C	C	TC
5- Kanpur D/s	B	D	E	TC
6- Kannauj U/s	B	C	C	TC
7- Kannauj D/s	B	D	D	TC
8- RAIBAREILLY – Dalmau	B	D	D	TC
9- Allahabad U/s	B	C	D	TC
10- Allahabad D/s	B	D	D	TC
11- Varanasi U/s	B	D	D	TC
12- Varanasi D/s	B	E	E	TC
13- Ghazipur – Tarighat	B	D	D	TC
River Yamuna				
14- Mathura U/sRanighat	B	D	E	BOD
15- Mathura D/s Ambedkar Drain	B	D	E	BOD
16- Vrindavan U/s	B	D	D	BOD
17- Vrindavan D/s Hasanghat	B	D	E	BOD
18- 18 Agra Kailashghat	B	D	E	TC
19- Agra-water works	B	D	E	TC
20- Agra D/s – Taj Mahal	B	E	E	TC
21- Etawah U/s	B	D	D	BOD



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Name of river sampling location	Desired category	Existing category 2009	Existing category 2010	Pollution characteristics
22- Etawah D/s	B	D	D	BOD
23- Allahabad U/s	B	C	C	TC
Gomti River				
24- Sitapur – U/s	B	C	C	BOD/TC
25- Manghighat	B	C	C	BOD
26- Lucknow U/s Gaughati	B	C	C	TC
27- Lucknow D/s MMB Nala	B	D	D	TC
28- Lucknow Nishantganj Bridge	B	D	E	TC
29- Lucknow U/s Baraj	B	E	E	TC
30- Lucknow Pipraghat D/s	B	E	E	TC
31- Jaunpur D/s	B	D	D	TC
32- Ghazipur- Rajwari	B	D	D	TC/BOD
Sai River				
33- Unnao	B	D	C	TC
Hindon River				
34- Saharanpur D/s	B	D	D	BOD
35- Ghaziabad d/s Kuleshra Bridge	B	E	E	TC
Betwa River				
36- Hameerpur	B	D	D	TC
Kali River				
37- Kannauj	B	C	D	TC
RAMGANGA RIVER				
38- Kannauj before meeting Ganga	B	C	D	TC
SARYU RIVER				



Functional Plan on Drainage for NCR

Name of river sampling location	Desired category	Existing category 2009	Existing category 2010	Pollution characteristics
39- Ayodhya	B	D	D	TC
GHAGHRA RIVER				
40- Deoria	B	B	C	TC
RAPTI RIVER				
41- Gorakhpur	B	B	C	TC
RAMGARH LAKE				
42- Ramgarh lake	B	B	C	TC
43- Govind Sagar	B	B	D	TC
RIHAND DAM				
44- Sonebhadra Renukut U/s	B	C	C	TC
45- Rihand dam Renukut D/s	B	C	C	TC

Source: Compiled from data for yr. 2009 & 2010 from data available on website http://www.uppcb.com/river_quality.htm

Tolerance limits in respect of selected pollution characteristics for inland surface waters required for different uses as prescribed by the Indian Standards Institutions (1982).

**Annexure 6. 2: Water Quality Status of River Yamuna (Date of Sampling 04-03-2015)**

Sl. No.	Locations	pH	COD (mg/l)	BOD (mg/l)	DO (mg/l)	Total Coliform (MPN/100 ml)
Water Quality Criteria ('C' Class)		6.0-9.0	-	3 (max)	4 (min)	5000
1	Palla	7.5	12	1.4	8.3	-
2	Surghat (Downstream of Wazirabad Barrage)	7.6	24	6.6	7	-
3	Khajori Paltoon Pool (Downstream Najafgarh Drain)	7.2	228	62	NIL	-
4	Kudesia Ghat	7.3	144	45	NIL	-
5	ITO Bridge	7.4	96	28	NIL	-
6	Nizamudin Bridge	7.3	96	28	NIL	-
7	Agra Canal (Okhla)	7.3	72	27	NIL	-
8	After meeting Shahdara Drain (Downstream Okhla Barrage)	7.5	128	38	NIL	-
9	Agra Canal (Jaitpur)	7.2	88	33	NIL	-

Source: Delhi Pollution Control Committee, Govt. of NCT-Delhi

Note: Pure water has pH value of 7 and is neutral, i.e. neither acidic nor basic (alkaline)



Annexure 6. 3: Water Quality Status of Drains in NCT Delhi (08-04-2015)

Sl. No.	Name of Sample	pH	TSS (mg/l)	COD (mg/l)	BOD (mg/l)
General Standard		5.5-9.0	100	250	30
1	Najafgarh Drain	7.3	228	260	70
2	Metcalf House Drain	7.4	30	76	22
3	Khyber Pass Drain	7.5	48	112	26.4
4	Sweeper Colony Drain	7.6	100	164	48
5	Magazine Road Drain	7.6	200	252	95
6	ISBT Drain	7.5	212	320	105
7	Tonga Stand Drain	7.6	216	352	130
8	Moat Drain	No Flow	No Flow	No Flow	No Flow
9	Civil Mill Drain	7.7	204	304	92
10	Power House Drain	7.5	320	352	110
11	Sen Nursing Home Drain	7.8	328	412	125
12	Drain No.12A	No Flow	No Flow	No Flow	No Flow
13	Drain No.14	7.4	44	40	11.2
14	Barapulla Drain	7.4	116	148	53
15	Maharani Bagh Drain	7.5	376	640	195
16	Kalkaji Drain	No Flow	No Flow	No Flow	No Flow
17	Sarita Vihar Drain (Mathura Road)	7.7	248	284	85
18	Tekhhand Drain	7.4	240	488	155
19	Tuglakabad Drain	7.3	212	384	126
20	Drain Near LPG Bottling Plant	No Flow	No Flow	No Flow	No Flow
21	Drain Near Saita Vihar Bridge	7.5	162	104	34
22	Shahdara Drain	7.5	248	392	115
23	Sahibabad Drain	7.1	456	824	270
24	Indrapuri Drain	7.6	304	476	145

Source: Delhi Pollution Control Committee, Govt. of NCT-Delhi



Annexure 6. 4: Status and Performance of Sewage Treatment Plants in NCT-Delhi

Sl. No.	Sewage Treatment Plants	Installed Capacity (MGD)	Present Utilisation (MGD)	BOD (mg/l)		COD (mg/l)		TSS (mg/l)	
				Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
1.	Coronation Pillar Phase-I	10	19.95	87	9	301	58	437	26
	Coronation Pillar Phase-II	10+10		418	9	1592	58	722	28
	Coronation Pillar Phase-III*	10 Total -46 including Oxidation Ponds		-	-	-	-	-	-
2.	Oxidation Ponds Timarpur*	6	-	-	-	-	-	-	-
3.	Keshopur Phase-I*	12		-	-	-	-	-	-
	Keshopur Phase-II*	20		-	-	-	-	-	-
	Keshopur Phase-III*	40 Total-72		-	-	-	-	-	-
4.	Okhla Phase-I	30	122.74	147	47	464	172	491	73
	Okhla Phase-II	12		196	70	611	323	554	2
	Okhla Phase-III	37		196	36	611	114	554	69
	Okhla Phase-IV	45		112	33	381	119	272	58
	Okhla Phase-V	16 Total-140		115	24	521	115	332	63
5.	Narela	10	2.6	51	12	154	51	204	23
6.	Najafgarh	5	0.2	115	7	401	51	304	25
7.	Nilothi	40	9.45	178	19	583	89	316	43
8.	Dr. Sen Nursing Home Nalla	2.2	2.53	306	3	925	13	969	6
9.	Delhi Gate Nalla	2.2	2.43	106	4	446	14	248	24
10.	Yamuna Vihar Phase-I	10	11.77	134	8	319	57	221	47
	Yamuna Vihar Phase-II	10 Total-20		92	8	407	71	301	60
11.	Pappan Kalan	20	8.14	179	5	625	32	513	22
12.	Kondli Phase-I	10	45	219	28	466	71	286	91
	Kondli Phase-II	25		97	16	381	68	388	13
	Kondli Phase-III	10 Total-45		86	18	400	62	218	21
13.	Mehrauli	5	1.7	217	21	755	113	585	33
14.	Rohini	15	-	-	-	-	-	-	-
15.	Rithala (Old)	40	47.32	110	11	426	42	250	29
	Rithala (New)	40 Total-80	-	110	21		79		28



Functional Plan on Drainage for NCR

Sl. No.	Sewage Treatment Plants	Installed Capacity (MGD)	Present Utilisation (MGD)	BOD (mg/l)		COD (mg/l)		TSS (mg/l)	
16.	Vasant Kunj Phase-I	2	4.6	156	42	542	166	494	100
	Vasant Kunj Phase-II	3 Total-5		169	18	565	47	337	51
17.	Ghitorni	5	-	-	-	-	-	-	-
Total		512.4 (2305 MLD)	278.43 (1252 MLD)	<i>Note: *STPs are under augmentation</i>					

Source: Annual Report 2011-12, Central Pollution Control Board



Annexure 6. 5: Status and Performance of Sewage Treatment Plant in NCR

S. No.	Sewage Treatment Plant	Installed Capacity (MLD)	Present Utilization (MLD)	BOD (mg/L)		COD (mg/l)		TSS (mg/l)	
				Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Haryana									
1.	Sonepat	30	45	134	50	342	258	352	130
2.	Panipat Jattal Road	10	17	112	152	359	490	165	58
3.	Panipat-UASB-Siwah	35	50	107	44	533	234	58	182
4.	Faridabad Badshapur	65 (45+20)	45	186	(28 & 50)	549	(73 & 118)	435	(30 & 63)
5.	FaridabadMirzapur	45	24	140	70	404	180	275	84
6.	Ballabgarh STP	50	-	-	198	-	564	-	638
Uttar Pradesh									
1.	Noida Sec 54	23	23	165	14	478	56	126	19
2.	Noida Sec 50	33	30	126	14	345	55	82	25
3.	Indirapuram	56	56	152	52	434	122	227	28
4.	Vijay Nagar	73	73	180	47	516	132	165	35

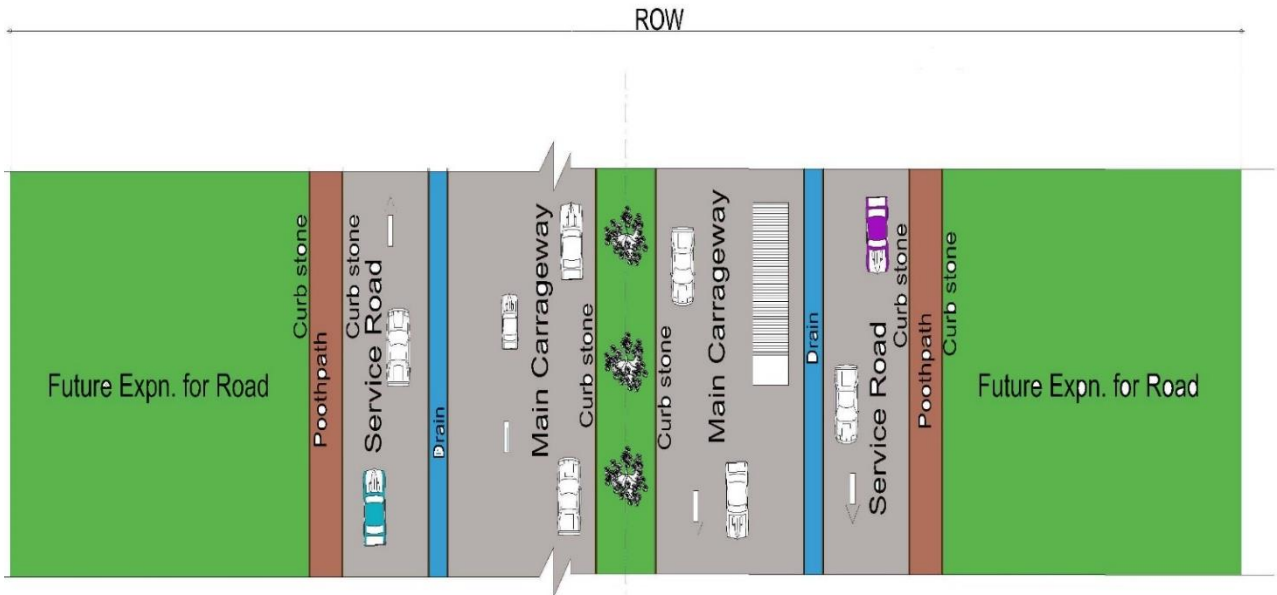
Note : “-” indicates that plants are under renovation / up-gradation.



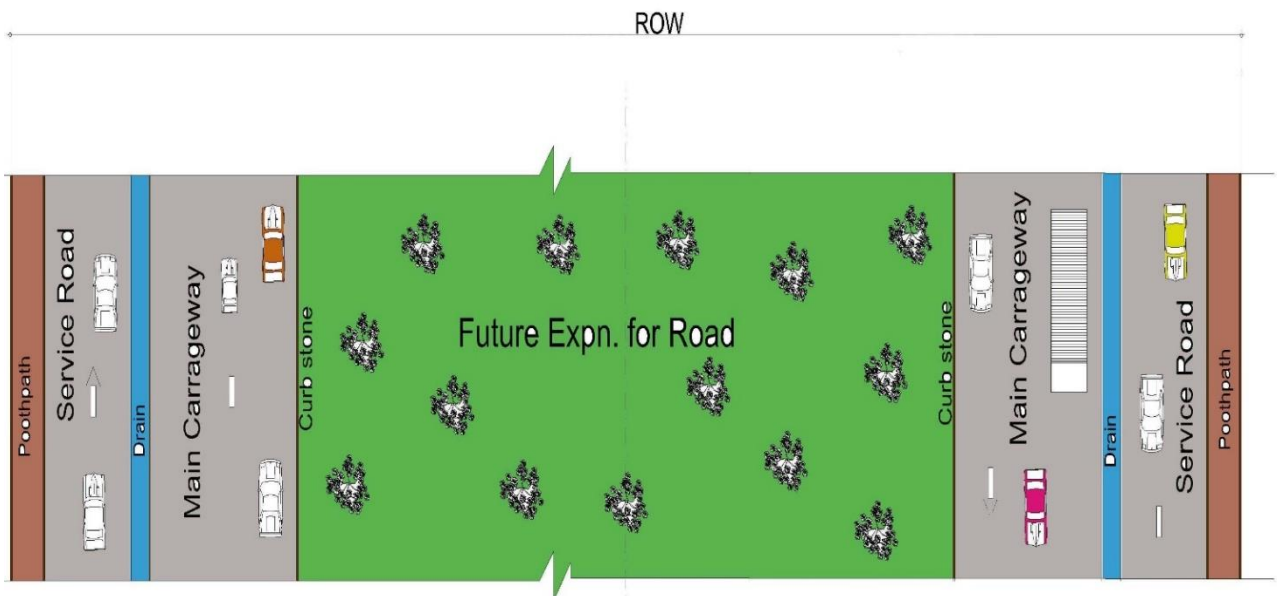
Annexure 8.1 PROPOSED METHOD OF ROAD CONSTRUCTION (Construction of Road from Edge)

PROPOSED METHOD OF CONSTRUCTION

(Construction of Road from Edge)



Existing practice of Road construction



Proposed Method of road construction



Annexure 8.2 RAIN WATER MANAGEMENT FACILITIES (Pond, Roof top gardens)

Pond

- Store and infiltrate rainwater at green space, parks, and valleys



Pond



Series of small retardation dam



Small pond

Roof top gardens

- Store and filter rainwater and lower the flowing speed



Roofs



Walls



Terrace



Annexure 8.3 RAIN WATER MANAGEMENT FACILITIES (Rain Garden, Grassed Waterway)

Rain Garden

- Transform convex garden, roadside green area into concave topography



Conceptual Diagram



Houses



Street-side

Grassed Waterway

- Transform concrete drainage pipes by the road and in parks into grassed waterways



Pavement (Between Roadside Trees)



Between Roads



Parking Lots



Annexure 8.4 Service Level Benchmarks for Storm Water Drainage

(As per the Handbook of Service Level Benchmarking published by the Ministry of Urban Development, Govt. of India)

COVERAGE OF STORM WATER DRAINAGE NETWORK

Indicator	Performance Indicator	
	Unit	Definition
Coverage of storm water drainage network	%	Coverage is defined in terms of the percentage of road length covered by the storm water drainage network
Data required for calculating the indicator	Data Requirements	
	Unit	Remarks
a. Total length of road network in the ULB	km	Only consider roads that are more than 3.5 m wide carriageway
b. Total length of primary, secondary and tertiary drains	km	Only consider drains that are trained, made of pucca construction and are covered.
Coverage of storm water drainage networks	%	Coverage = [(b/a)*100]

Rationale for the Indicator	
This indicator provides an estimation of the extent of coverage of the storm water drainage network in the city. This value should be 100 percent.	
Reliability of Measurement	
Reliability Scale	Description of method
Lowest level of reliability (D)	Not applicable
Intermediate level (C)	Estimated from city road maps, not updated in the past five years
Intermediate level (B)	Estimated from city road maps (that are detailed and to scale), which have been updated in the past five years.
Highest/preferred level of reliability (A)	Actual ground level surveys are carried out to measure drain and road length. Surveys are carried out to verify that drains are of pucca construction and covered.



Minimum frequency of measurement of performance indicator	Smallest geographical jurisdiction for measurement of performance
Measurement	Annually
Measurement	Ward Level

INCIDENCE OF WATER LOGGING/FLOODING

Indicator	Performance Indicator	
	Unit	Definition
Aggregate number of incidents of water logging reported in a year	Number per year	The number of times water logging is reported in a year, at flood prone points within the city.
Data required for calculating the indicator	Data Requirements	
	Unit	Remarks
a. Identification of flood prone points within the ULB limits. The points may be named as A1, A2, A3... An	Number	Flood prone points within the city should be identified as locations that experience water logging at key road intersections, or along a road length of 50 m or more, or in a locality affecting 50 households or more.
b. Number of occasions of flooding/water logging in a year	Number per year	An occasion or incident of flooding/water logging should be considered if it affects transportation and normal life. Typically stagnant water for more than four hours of a depth more than six inches.
The aggregate number of instances or occasions of water logging/flooding reported across the city in a year.	Number per year	Aggregate incidence = (b at A1) + (b at A2) + (b at An).