

STUDY GROUP REPORT ON INCREASE OF POLLUTION IN RIVER YAMUNA



Central Pollution Control Board
(Ministry of Environment, Forest & Climate Change, Govt. of India)
Parivesh Bhawan, East Arjun Nagar,
Delhi – 110032.

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1. Background

Increase of Ammonical Nitrogen in River Yamuna at border of Haryana and Delhi is reported by media and Delhi Jal Board (DJB) mostly during winter season in the past few years. During December, 2020, DJB has raised concern on issue of increase in Ammonical Nitrogen levels in river Yamuna at the entry point of Delhi resulting into shutdown of Water Treatment Plants (WTP) at Wazirabad. DJB stops intake of water from Wazirabad barrage and shuts down WTPs at Wazirabad and Chandrawal whenever Ammonical Nitrogen Level in river Yamuna waters exceeds 0.9 mg/L.

2. Constitution of the Study Group

A meeting was convened on 14.12.2020 at 02:30 PM through Video Conferencing under the Chairmanship of Dr. Prashant Gargava, Member Secretary, Central Pollution Control Board (CPCB) with the officials of Delhi Pollution Control Committee (DPCC), Haryana State Pollution Control Board (HSPCB), Delhi Jal Board (DJB), Irrigation & Water Resources Department (I&WR), Haryana, Irrigation and Flood Control Department, Delhi (I & FC) to discuss the issue of increase in Ammonical –Nitrogen levels in river Yamuna at entry point of Delhi. In the meeting, a study group has been constituted comprising representatives from concerned organisations (if required outside experts also be included) for finalising Long Term and Short Term measures required for control of Ammonical Nitrogen in river Yamuna. Following tasks to be performed by the study group as detailed below:

- i.* **To analyse five-year water quality data including the profile or trend of Ammonical Nitrogen in River Yamuna.**
- ii.* **To assess the present practices of sewage generated from scattered habitations situated between Palla and Wazirabad in Delhi and to suggest treatment and disposal options to avoid pollution in river Yamuna.**
- iii.* **To identify possible sources of sudden spike in Ammonical Nitrogen in river Yamuna especially at entry point of Delhi & at intake point of Wazirabad reservoir.**
- iv.* **Need for strengthening of monitoring of river Yamuna through Real Time Water Quality Monitoring System (RTWQMS) and for increasing frequency of manual monitoring of drains and river Yamuna.**
- v.* **To suggest uniform and standard protocols to be followed for sampling and analysis of river samples both by HSPCB and DJB.**

- vi. ***Requirement of effective surveillance to stop illegal discharges in river Yamuna.***
- vii. ***Long term measures to be implemented including upgradation of existing Water Treatment Plants in Delhi to handle Ammonical Nitrogen in river Yamuna beyond 0.8 mg/L.***
- viii. ***Short term measures to be implemented in the event of sudden spike in Ammonical Nitrogen content in river Yamuna.***

The Minutes of the meeting held on 14.12.2020 are attached as **Annexure I**

2.1 Initiatives of the Study Group

First meeting of the study group was held on 04.01.2021 through Video Conference with the officials of Delhi and Haryana to discuss the course of action by the study group. Study group has constituted a Joint Surveillance Squad (JSS) comprising of officials of Delhi Pollution Control Committee, Haryana Pollution Control Board, Irrigation and Flood Control Department Delhi, Irrigation and Water Resources Department, Haryana and Delhi Jal Board. The main tasks assigned to the JSS are:

- i. Identification of sources of pollution & hot spots.
- ii. Identification of illegal discharges between Palla and Wazirabad.
- iii. Present practices followed for discharges of sewage generated from un-sewered colonies.
- iv. Drains which require frequent monitoring.

Minutes of the meeting were circulated vide CPCB letter dated 07.01.2021 to the concerned departments of Delhi and Haryana is annexed at **Annexure II**. Meanwhile, CPCB vide letter dated 05.01.2021 (**Annexure III**) requested Haryana SPCB and Delhi PCC to take action as per decisions taken in the first meeting of the study group on the following aspects:

- (i) Meeting with operators of RTWQMS at Palla & Wazirabad for regular calibration without data gap (**Action by DPCC**).
- (ii) Performance assessment of few STPs, CETPs & ETPs of industrial units located at Panipat, Sonapat, Yamuna Nagar & Karnal along river Yamuna and submission of report to CPCB (**Action: By HSPCB**).

It was also communicated to Haryana and Delhi vide letter dated 05.01.2021 that necessary action be ensured in a time bound manner and action taken report be submitted to CPCB within 15 days to enable study group for finalisation of report in the matter. CPCB also convened a review meeting of the Study Group on 13.01.2021 for assessment of activities undertaken by the JSS. Minutes of the meeting of JSS held on

13.01.2021 is annexed as **Annexure IV**. Upon discussion, following actions were suggested for SPCB/PCCs and JSS:

- (i) Mapping of industries in the catchment areas including CETPs, STPs by the joint team of Delhi and Haryana SPCB/PCC. Also surprise visits/inspection of industries to CETPs, STPs shall be done by HSPCB and DPCC to identify all probable sources of pollution such as industries situated along the drains /river.
- (ii) Mapping of DD-2 and DD-8 from point of origin to point of confluence with river Yamuna,
- (iii) Mapping of first order drains as well as second order drains markings of villages, towns and cities of importance and their details,
- (iv) Confluence of second order drains with major drains to be marked and samples be collected,
- (v) Sampling points shall include confluence points of drains as well as upstream and downstream points of confluence,
- (vi) Mapping exercise to be completed within 7 days by the joint teams,
- (vii) Coordinates to be marked of the sampling point showing its location and importance, and
- (viii) Analysis of additional parameters such as Nitrate in place of Nitrite, Flow of the drain, colour. During mapping illegal discharge through tankers should also be tracked to identify the nearby possible sources of pollution. The report of JSS to be submitted within 10 days to CPCB.

A review meeting was held on 16.01.2021 under the Chairmanship of Chairman, CPCB and agencies were directed to provide the information such as sewage generation, capacity of existing Sewage Treatment Plants (STPs), industrial pollution, sources of pollution including cities and villages etc. which shall be collated by CPCB. Subsequent meeting was also organised on 17.01.2021 wherein discussions were held regarding State of Haryana to tap the drains of Panipat and Yamunanagar and to utilise full capacity of STPs. Delhi Jal Board (DJB) was also enquired for action taken on *in-situ* generation of Ammonical Nitrogen from Wazirabad pond, wherein DJB informed that proper investigation is required in this matter. For laying of conduit line communication has been sent by DJB to Haryana and response is awaited. The project could be revived, if HSPCB agree to it. Both Delhi and Haryana States were directed to complete the tasks identified in the special meeting held with concerned Chief Secretaries of Delhi and Haryana in February, 2018. Minutes of the meeting held on 16.01.2021 and 17.01.2021 are enclosed as **Annexure V (a)** and **Annexure V (b)**

3. River Yamuna and Water Quality Assessment

The Yamuna River originates from Yamunotri glacier in the Bandarpunch in the Himalayas, Uttarakhand State. From its source, the river Yamuna flows south through the Himalayan foothills of Uttarakhand into the Indo-Gangetic Plains. The Yamuna river traverses a distance of 1,376 Km through the States of Himachal Pradesh, Haryana, Delhi and Uttar Pradesh and finally confluences with River Ganga at Prayagraj. The main urban centres on the banks of River Yamuna are Yamunanagar, Karnal, Panipat, Sonapat Baghpat, Delhi, Noida, Mathura, Agra, Firozabad, Etawah, Kalpi, Hamirpur,

and Prayagraj. Major tributaries of river Yamuna are River Tons, Hindon, Ken, Chambal, Sasur Khedri, Betwa or Betravati. River Yamuna is polluted mainly due to discharge of treated/partially treated industrial effluents, municipal sewage generated from Haryana, Delhi and U.P States apart from lack of adequate infrastructure for management of wastes from the afore-said States.

3.1 Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP) on river Yamuna

The Water Quality of river Yamuna is monitored at 30 locations by Central Pollution Control Board (CPCB) in association with the State Pollution Control Boards of Uttarakhand, Himachal Pradesh, Haryana and Uttar Pradesh under NWMP. Four locations on River Yamuna are monitored in Delhi viz., Palla, Nizamuddin, Okhla Bridge (Inlet of Agra Canal) and Okhla after meeting Shahdara Drain and one location is monitored at Agra canal at Madanpur Khadar. Diagrammatic representation of state-wise distribution of water quality monitoring stations under NWMP on river Yamuna is given in **Figure 1**.

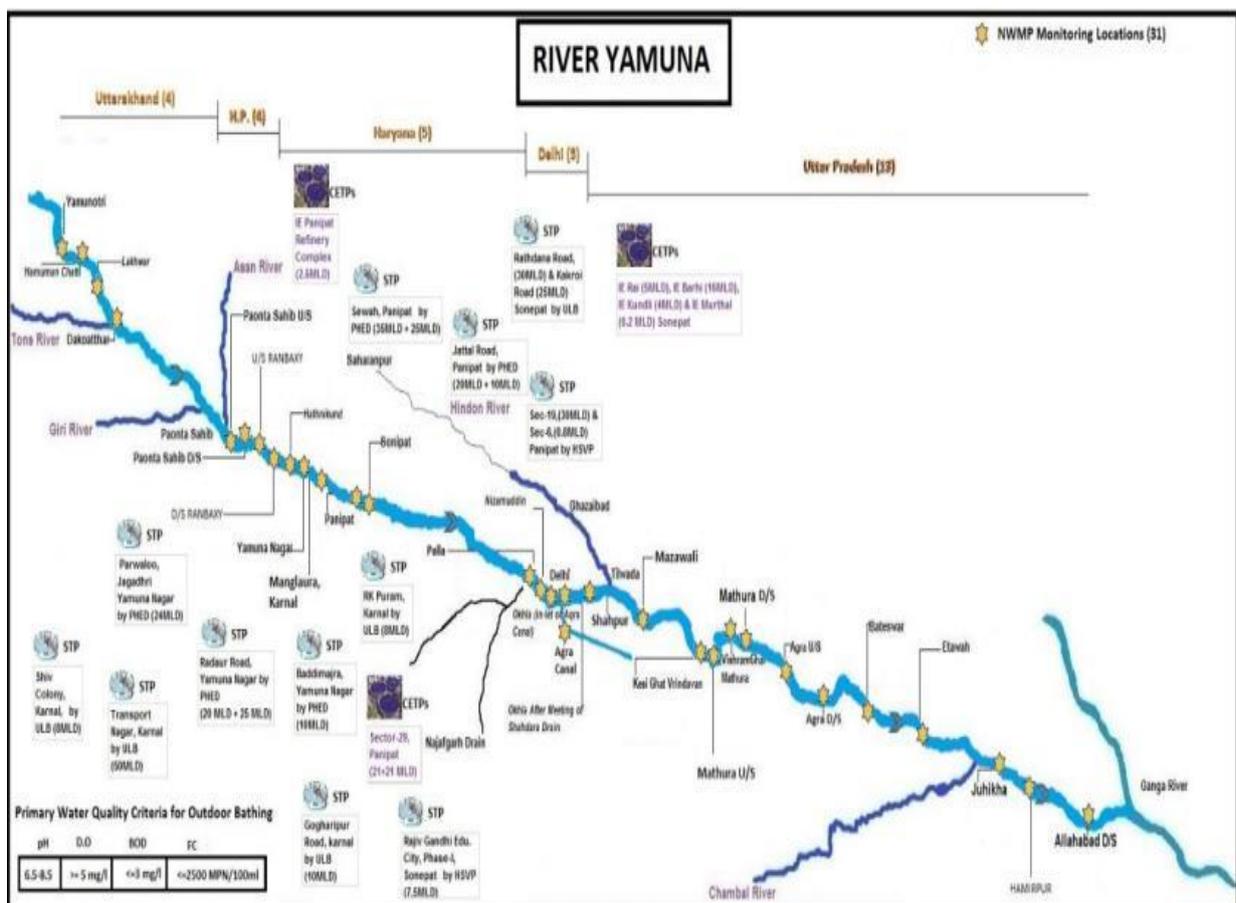


Figure 1: Diagrammatic representation of state-wise distribution of water quality monitoring stations under NWMP on river Yamuna.

3.3. Water Quality Assessment of river Yamuna during the year 2020 under NWMP

Based on the assessment of water quality data of river Yamuna, it was observed that 23 locations out of 31 locations based on 04 parameters viz. Dissolved Oxygen (DO), pH, Bio-Chemical Oxygen Demand (BOD) and Faecal Coliform (FC) monitored in year 2020, were found non-complying with respect to Primary Water Quality Criteria for bathing water, notified by MoEF&CC under Environment (Protection) Rules, 1986. Details on compliance of Parameters with respect to criteria are given below: -

- 14 locations were non-complying with respect to DO (<5 mg/L) with respect to DO. Some of the locations had high DO due to algal bloom observed as 17.1 mg/L at Palla;
- 22 locations were found non-complying with respect to BOD (< 3 mg/L); maximum BOD observed as 114 mg/L at Okhla after meeting Shahdara drain in Delhi;
- 19 locations were found non-complying with respect to Faecal Coliform (<2500 MPN/100 mL); maximum observed as 11×10^6 MPN/100mL at Nizamuddin, Delhi.

Water quality of river Yamuna for the year 2020 and Primary Water Quality Criteria for Outdoor Bathing notified by Ministry of Environment, Forest and Climate Change (MoEF&CC) under The Environment (Protection) Rules, 1986, are given at **Annexure VI (a) & VI b**.

3.4 Water Quality Assessment of river Yamuna at Palla monitored during 31.05.2021 to 12.07.2021

Central Pollution Control Board (CPCB) carried out monitoring of River Yamuna at Palla during 31.05.2021 to 12.07.2021 on twice in a week basis. During this period, 13 sets of samples were collected to assess the water quality specially for Ammonical Nitrogen concentration at Palla. Analytical results of collected river Yamuna samples at Palla during 31.05.2021 to 12.07.2021 is annexed as **Annexure –VII**. Samples were analysed for parameters viz., pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Fecal Coliform (FC) and Fecal Streptococci (FS) and compared with Primary Water Quality Criteria for Outdoor Bathing notified under The Environment (Protection) Rules, 1986 for assessment of compliance status. Samples were also analysed for the parameter Ammonical Nitrogen. Analytical results of collected samples reveals that

- The value of Dissolved Oxygen (DO) was observed in the range of 3.8 mg/L (minimum) and 10.5 mg/L (maximum). At 5 instances during the month of June and July, the DO concentration is observed as below the Bathing Water Quality Criteria (> 5mg/L).

- The pH value at Palla recorded in the range of 7.1 to 8.4 and well within the criteria at all monitored times (6.5 to 8.5).
- BOD at Palla was observed in the range of 5.5 mg/L (minimum) and 20 mg/L (maximum). BOD value exceeding to the criteria at all 13 times while increase in trend is observed in the month of July.
- Faecal Coliform was observed in the range of 23 MPN/ 100 ml (minimum) and 45000 MPN/100 ml (maximum). At 7 instances, the value of Faecal Coliform exceeded the Bathing criteria. The Faecal Streptococci was observed in the range of 33 MPN/100 ml (minimum) and 2400 MPN/100 ml (maximum). Out of 13 observations; 04 times the Faecal Streptococci exceeded the criteria limit in the month of June and July.
- The Ammonical Nitrogen was observed in the range of 0.4 mg/L - 7.2 mg/L. 08 times Ammonical Nitrogen exceeding the value of 0.9 mg/L (Maximum limit for which WTPs in Delhi is designed).

3.5 Water Quality Assessment of river Yamuna and drains in Delhi during November, 2021 (08.11.2021 to 11.11.2021)

Central Pollution Control Board (CPCB) received complaints regarding increase in Ammonical Nitrogen in Yamuna river at Wazirabad and increase in foam formation at D/s of Okhla Barrage. To ascertain the facts, CPCB also carried out sampling of river Yamuna at Palla, Wazirabad, ITO, Okhla, CLC, inlet of WTP at Wazirabad, Drain No. 6 and Drain No. 8 during 08.11.2021, 09.11.2021 and 11.11.2021. The analysis results of the collected samples are given in the **Table 1** below:

Table 1: Water quality of River Yamuna (08.11.2021 to 11.11.2021)

S. No	Sampling Locations	Sampling Date	Dissolved Oxygen (mg/L)	pH	BOD (mg/l)	Faecal Coliform (MPN-100ML)	Faecal Streptococci (MPN/100ml)	Detergent (mg/L)	COD (mg/L)	Ammonical Nitrogen (mg/L)	Phosphate (mg/L)
Primary Water Quality criteria for Outdoor Bathing notified by MoEF&CC			> 5 mg/L	6.5-8.5	<3 mg/L	<2500 MPN/ 100 ml	< 500 MPN/ 100 ml	-	-	-	-
1	Palla	09-11-2021	7.4	7.1	5	35000	1700	BDL	14	4	0.2
2	Wazirabad Barrage	09-11-2021	9.0	7.1	2	490	240	BDL	7	1.1	0.16
		11-11-2021	8.5	8.1	3	1300	4.5	BDL	13	1.6	0.16
3	Inlet to WTP, Wazirabad	09-11-2021	9.1	6.7	BDL	790	170	BDL	13	0.3	0.05
4	CLC	09-11-2021	8.9	6.6	2	13000	790	BDL	10	0.3	BDL
5	ITO	08-11-2021	BDL	6.7	10	4600000	790000	2.2	-	12.5	1.32
		11-11-2021	BDL	7.5	22	7900000	170000	2.6	68	22.3	1.36
6	Okhla	08-11-2021	4.5	6.8	10	13000000	1300000	1.8	-	15.8	1.05
		11-11-2021	3.9	7.6	9	3500000	24000	2	46	13.3	0.66

Water quality of Drains

S.No	Locations	Sampling Date	Dissolved Oxygen (mg/L)	Faecal Coliform MPN-100ML	Faecal Streptococci (MPN/100ml)
1	Drain No 8	09-11-2021	1.8	1400000	130000
2	Drain No 6	09-11-2021	BDL	3300000	790000

Observations on water quality monitoring at Palla

Based on the monitoring carried out on 09.11.2021 at Palla, following are observations:

- The concentration of Ammonical Nitrogen (4 mg/L), BOD (5 mg/L), Faecal Coliform (35000 MPN / 100 mL) and Faecal Streptococci (1700 MPN / 100 mL) count are high. Detergent is observed as 'BDL' and Phosphate as 0.2 mg/L.

Observations on water quality monitoring at Okhla

Based on the monitoring carried out on 8.11.2021 at Okhla., following are observations:

- The concentration of Ammonical Nitrogen (15.8 mg/L), BOD (10 mg/L), Faecal Coliform (13000000 MPN / 100 mL) and Faecal Streptococci (1300000 MPN/100 mL) are high. Detergents are also observed as 1.8 mg/L and Phosphate as 1.05 mg/L.

Based on the monitoring carried out on 11.11.2021 at Okhla. Following are observations:

- The concentration of Ammonical Nitrogen (13.3 mg/L), BOD (9 mg/L), Faecal Coliform (3500000 MPN/100 mL) and Faecal Streptococci (24000 MPN / 100 mL) are high. Detergents are also observed as 2 mg/L and Phosphate as 0.66 mg/L.

3.6 Identified Polluted River Stretches on River Yamuna and the Action Plans for Rejuvenation of River Yamuna

CPCB identified 351 polluted river stretches in the country based on water quality data of 2016 and 2017, including 3 polluted river stretches on River Yamuna based on Biochemical Oxygen Demand (BOD) as criteria pollutant. The identified polluted stretches on river Yamuna as polluted are under Priority Class I in Haryana (Panipat to Sonapat), Delhi (Wazirabad to Asgarpur) and Uttar Pradesh (Asgarpur to Etawah & Shahpur to Allahabad, Balua Ghat).

In compliance to Hon'ble NGT orders passed in OA No 673/2018, River Rejuvenation Committee (RRC) constituted by Delhi, Haryana, Uttar Pradesh Governments prepared and submitted action plans to CPCB for bringing polluted river stretch of River Yamuna in the respective jurisdiction to be fit at least for bathing purposes (i.e. BOD < 3 mg/L and FC < 500 MPN/100 ml). Action plans for rejuvenation of River Yamuna, prepared on the basis of gap analysis (w.r.t. sewage, industrial effluent, waste management and other aspects) have been submitted by Haryana, Uttar Pradesh and Delhi which were approved by CPCB Task Team with conditions.

3.7 Role Ministry of Jal Shakti

Vide S. O. No. 1986 (E) Notification dated 31.07.2014, the subject matter of river Ganga and its tributaries including river Yamuna has been transferred from MoEF&CC to Ministry of Water Resources and Ganga Rejuvenation (MoWR & GR) now renamed as Ministry of Jal Shakti (MoJS). Vide Notification No. S.O. 1972(E) dated 14.06.2019, the Government of India allocated the business relating to "Conservation, development, management and abatement of pollution of rivers" to Department of Water Resources, River Development and Ganga Rejuvenation under Ministry of Jal Shakti (MoJS). The National Mission for Clean Ganga (NMCG) under the Ministry of Jal Shakti is undertaking and supervising the projects/activities for conservation, protection and abatement of pollution in river Ganga and its Tributaries

4. Gap Analysis of Municipal Sewage, Industrial Wastewater and Solid Waste Management in the catchment of river Yamuna (As per MPR submitted to CPCB in OA No. 673/ 2018 by Haryana, Delhi and Uttar Pradesh States)

4.1 Gap Analysis of Municipal Sewage, Industrial Wastewater and Solid Waste Management in the catchment of river Yamuna in Haryana, Delhi and Uttar Pradesh States

Information as per monthly progress reports (MPRs) provided by the Haryana (July-September 2021), Delhi (September 2021) and UP State (June -September 2021) detailed in **Table 2** below: -

Table 2: Overall Status of Sewage, Industrial Effluent and Solid Waste Management Status of Haryana, Delhi and Uttar Pradesh

S.No	Description	Haryana (Yamuna Catchment) (August –September 2021)	Delhi (Entire State) (September 2021)	UP (Entire State) (June -September 2021)
Sewage Management				
1	Estimated Sewage Generation	1086 MLD	3273 MLD	5500 MLD
2	Existing STPs in the State	59 (1074.2 MLD)	34 (Capacity 2624.22 MLD)	110 (3483MLD)
3	Capacity Utilization of STPs	1027.5 MLD	2339.6 MLD (89.1%)	2905 MLD
4	Non-complying STPs	46	26	14
5	Construction of STPs	19 (365.5 MLD)	2(882 MLD)	41 (932 MLD)
6	Proposed STPs	3 (65 MLD)	56 (Decentralised) (426.5 MLD)	18 (664.45 MLD) + 35 STPs (737.7 MLD under approval)

S.No	Description	Haryana (Yamuna Catchment) (August –September 2021)	Delhi (Entire State) (September 2021)	UP (Entire State) (June -September 2021)
Industrial Effluent Management				
7	No. of industries existing along rivers	3474	1516 water Polluting Industries	Total: 11,332 1648 Grossly Polluting Industries
8	Industrial effluent generation	121.11 MLD	36 MLD	850.5 MLD
9	No. of Industries connected to CETPs	814	33690 in 17 Approved Industrial areas	514
10	Existing CETPs	14 (161.5 MLD)	13 (212.3 MLD)	7 (58.55 MLD)
11	Non-complying CETPs	2	4	2
12	CETPs under construction	3 (19 MLD)	Nil	3 (26.65 MLD)
13	CETPs Proposed	5 (145.5 MLD)	Nil	-
Waste Management				
14	No. of Municipalities	88 (Entire State)	5 ULBs	651 ULBs
15	MSW Generation	5387 TPD (Entire State)	11038 TPD	14468 TPD
	Existing processing facility	2375 TPD	5262 TPD	9,860 TPD
16	Plastic Waste Generation	520 TPD (Entire State)	1000 TPD (Recyclers-315; Producers-251 and manufacturers-364)	254401.8 TPA
17	BMW Generation	14.81 TPD (Entire State) (11 CBWTFs)	23.20 TPD (2 CBWTF Facilities of Cap. 63 TPD)	52.5 MT/D (18 Functional CBWTFs)
18	Hazardous Waste Generation	220987.09 MTA (Entire State) (1 TSDF)	2944.68 MTA from 2318 industries (1 TSDF under construction)	524343.50 MTA from 2597 industries (Capacity of TSDFs- 8.1 lakh MT)

4.2 Directions issued by CPCB to HSPCB and DPCC on STPs and CETPs

Haryana

CPCB issued directions to HSPCB on 26.11.2020 under Section 18 (1) (b) of the Water (Prevention & Control of Pollution) Act, 1974 for non-complying STPs at Sonapat, Faridabad and Gurugram and for ensuring compliance to:

- i. *Issue directions to concerned authorities to ensure that sewage treatment plants are optimally operated so as to comply with the prescribed norms.*
- ii. *Direct the local municipal bodies/ state level authorities to ensure that entire sewage generated at Yamunanagar, Panipat, Karnal, Sonapat, Gurugram and Faridabad and any other town located in the catchment area of river Yamuna, is conveyed to Sewage Treatment Plants (STPs) and these STPs are operated at the designed capacity and conform to the prescribed norms.*

CPCB issued directions to Haryana SPCB on 26.11.2020 under Section 18 (1) b of the Water (Prevention & Control of Pollution) Act, 1974 regarding non-compliance of CETPs in Haryana and for ensuring compliance for following:

- i. Direct the non-complying CETP to take immediate corrective actions to comply with the prescribed effluent discharge standards.*
- ii. Ensure that no industrial unit discharges effluent without meeting prescribed norms.*
- iii. In case of non-complying CETP and industrial units, actions as deemed fit, including levying of Environmental Compensation, shall be taken.*

CPCB issued directions to HSPCB on 15.02.2021 under Section 18 (1) (b) of the Water (Prevention & Control of Pollution) Act, 1974 for wider use of mobile based application on STP Monitoring and for ensuring compliance of following:

- i. STP operators of all Municipal Corporations concerned local body/ agency/ Authority who are operating STP shall be directed under section 33 (A) of the Water (Prevention & Control of Pollution) Act, 1974 to start using the Mobile based Application on STP Monitoring and upload data on weekly basis with immediate effect; and*
- ii. The directions issued for installation of OCEMS vide CPCB letter No. A-19014/43/06-UPC-I/4625-4672 dated 07/08/2020 are implemented without any delay.*

CPCB issued directions to HSPCB on 11.03.2021 under Section 18 (1) (b) of the Water (Prevention & Control of Pollution) Act, 1974 for Installation and Connectivity of Online Continuous Effluent Monitoring Systems (OCEMS) by Grossly Polluting Industries (GPIs) and for ensuring compliance of following:

- i. To install online continuous effluent monitoring system (OCEMS) at the outlet of the effluent treatment plants for the measurement of the parameters (industry/ sector specific) namely flow, pH, BOD, COD, TSS and for other consented parameters as per the above referred guidelines; within 03 months.*
- ii. To connect and upload the online continuous effluent monitoring data at SPCB and CPCB servers in a time bound manner within 03 months.*
- iii. Regular maintenance, calibration and operation of online continuous effluent monitoring system (OCEMS) with temper proof mechanism having facilities for online calibration.*
- iv. Submission of 24x7 online monitoring data to SPCB and CPCB servers.*

CPCB issued directions to HSPCB on 06.12.2021 under Section 18 (1) (B) of The Water (Prevention and Control of Pollution) Act, 1974 in the matter of control of Pollution in River Yamuna.

Delhi

CPCB issued directions to Delhi Jal Board on 26.11.2020 under Section 5 of the Environment (Protection) Act, 1986 for ensuring 100% collection and treatment of domestic wastewater generated in the region of NCT of Delhi and ensuring compliance to following:

- i. Ensure 100% collection of domestic wastewater generated in NCT, Delhi region and also provide treatment as per consented norms of Delhi Pollution Control Committee.*
- ii. Ensure that no untreated domestic waste water is discharged into any of the 22 storm water drains or any other water drain.*
- iii. Adhere to the timelines stipulated in the Order dated 11.09.2019 issued by Hon'ble NGT in the matter of OA No. 06 of 2012 titled as Manoj Mishra VS Union of India.*
- iv. Submit time bound action plan for corrective actions in the matter including augmentation and upgradation of these STPs so as to ensure compliance with the notified/ prescribed standards.*

CPCB issued directions to Delhi Pollution Control Committee under Section 18 1 (b) of the Water (Prevention & Control of Pollution) Act, 1974 regarding non- compliance of CETPs in Delhi 26.11.2020 and to ensure compliance to following:

- i. Direct the non-complying CETPs to take immediate corrective actions to comply with the prescribed effluent discharge standards.*
- ii. Ensure that no industrial unit discharges effluent without meeting prescribed norms.*
- iii. In case of non-complying CETPs and industrial units, actions as deemed fit, including levying of Environmental Compensation, shall be taken.*

CPCB issued directions on 24.09.2021 under section 18 (1) (b) of the Water (Prevention & Control of Pollution) Act, 1986 to Delhi Pollution Control Committee, for ensuring 100 % collection and treatment of domestic and industrial wastewaters generated in the catchment of Shahdara drain.

CPCB issued directions to DPCC on 06.12.2021 under Section 18 (1) (B) Of The Water (Prevention and Control of Pollution) Act, 1974 in the matter of control of Pollution in River Yamuna.

5. Five-year water quality data analysis of River Yamuna including the profile or trend of Ammonical Nitrogen in River Yamuna

Water quality data generated under National Water Quality Monitoring Programme (NWMP) for five-year period (2016-20) has been analysed to see the trend of Ammonical Nitrogen concentration at the monitored locations of river Yamuna from its origin at Yamunotri to confluence to river Ganga at Allahabad (Prayagraj). The trend is also depicted through graphical representation and heat maps.

Based on the data analysis for the period 2016-2020, the observations reveal that

- From Yamunotri (Uttarakhand) to downstream of Ranbaxy locations (Himachal Pradesh), concentration of Ammonical Nitrogen remains constant and observed in the range of 0.02- 0.15 mg/L.
- In Haryana, slight increase in concentration of Ammonical Nitrogen is observed at Hathnikund on few occasions in recent years which gradually goes up from Manglaura to Khojkipur (Panipat) and Sonapat. Maximum Concentration was observed as 6.72 mg/L at Khojkipur in 2019. At Sonapat, the concentration shows increase in trend, except at few occasions. Maximum concentration at Sonapat was observed as 4.90 mg/L in 2018. Increase of Ammonical Nitrogen concentration at Panipat and Sonapat clearly indicate impact of drains meeting river Yamuna from these cities carrying municipal and industrial wastewater.
- River Yamuna at monitored locations in Delhi, depicts that at Palla there is an increase in concentration of Ammonical Nitrogen during all the years, up to 4.80 mg/l. There is a steep increase in concentration from Nizamuddin to Okhla after meeting Shahdara drain, which was at 40.7 mg/L.
- In Uttar Pradesh, concentration of Ammonical Nitrogen level varies between 39.90 mg/L (2018) at Agra Upstream to 0.20 mg/L (2020) at Allahabad downstream, gradually lowering down from Mazawali to Allahabad D/s.

There is no significant improvement w.r.t Ammonical Nitrogen concentration over the five-year period at the monitored locations in Delhi. In UP, monitored locations (D/s of Delhi) show higher value of Ammonical Nitrogen while gradually decreasing towards the end and this may be due to the augmentation of dilution from river Chambal (at Etawah), Betwa (at Hamirpur) and other tributaries joining river Yamuna.

The heat map is prepared to identify the critical months at selected locations and also the hotspots responsible for increase of Ammonical Nitrogen in river Yamuna. Analysis of Ammonical Nitrogen data has been carried out for a 5-year period (2016-2020) and it is observed that higher concentrations of Ammonical Nitrogen were observed during January to March from Magalaura, Haryana to Palla in Delhi (2016 to 2020). Maximum value (35.4 mg/L) was observed at Palla in January, 2016. Thus, it may be concluded that gradual increase in concentration of Ammonical Nitrogen takes place during the winters (November to March) months, mainly during January in each year. Khojkipur, Panipat and Sonapat in Haryana have been identified as hotspot locations with respect to occurrences of high for Ammonical Nitrogen levels.

During rest of the months in these years, the concentration of Ammonical Nitrogen ranges between 0.2 to 3.4 mg/L. Trend analysis shows that the two identified hotspot locations are showing increasing trend over the five-year period w.r.t Ammonical Nitrogen concentration. *Details of Ammonical nitrogen in river Yamuna during the years 2016-2020 detailed in **Figure 2 (Graphical representation of Ammonical Nitrogen in river Yamuna from Yamunotri, Uttarakhand to Sonapat, Haryana.), Figure 3 (Graphical representation of Ammonical Nitrogen in river Yamuna from Palla, Delhi Border to Allahabad Downstream, UP) and Figure 4 (Heat Map Analysis at five monitored locations before entry of river Yamuna in Delhi)***

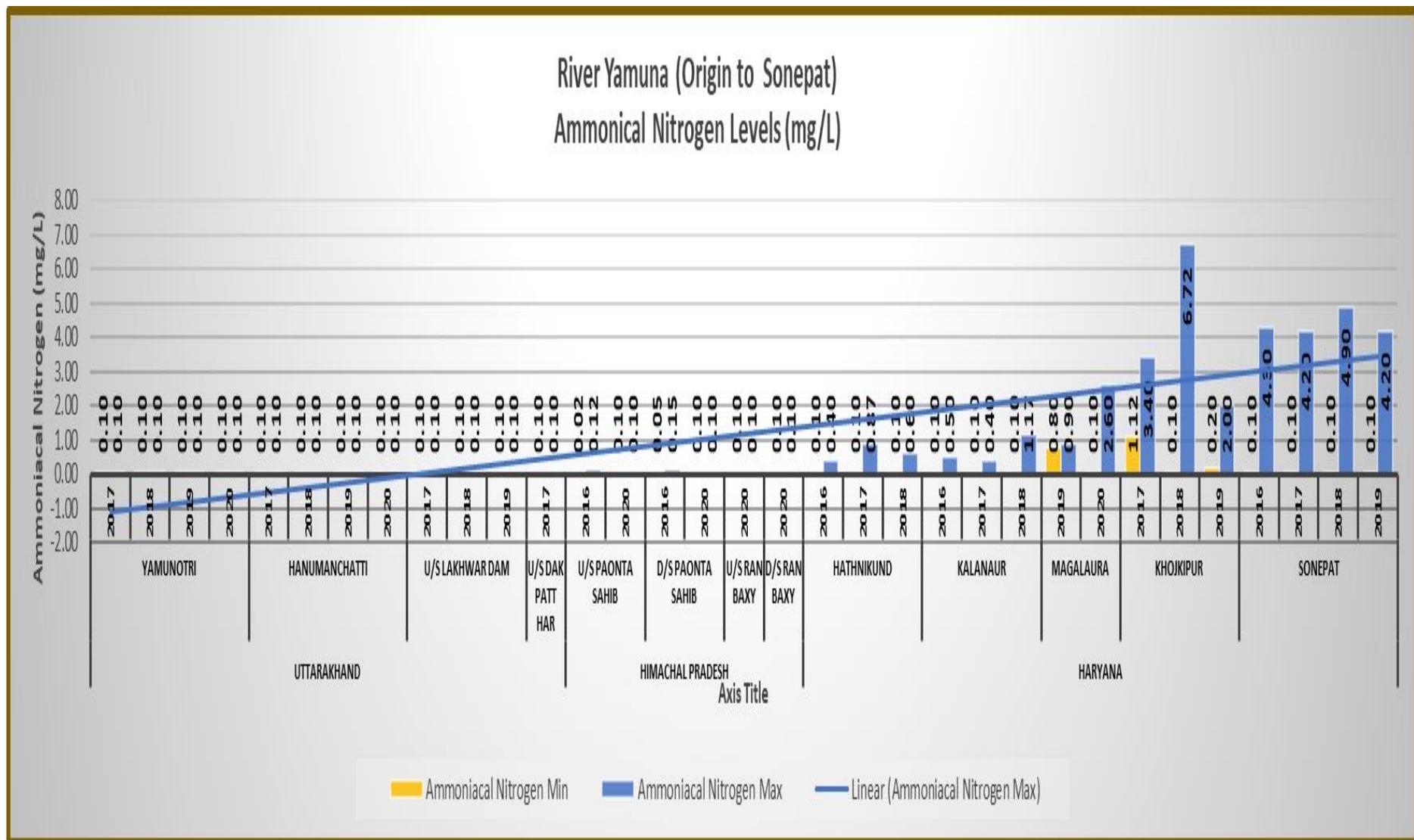


Figure 2: Graphical representation of Ammonical Nitrogen in river Yamuna from Yamunotri, Uttarakhand to Sonapat, Haryana. (2016-2020).

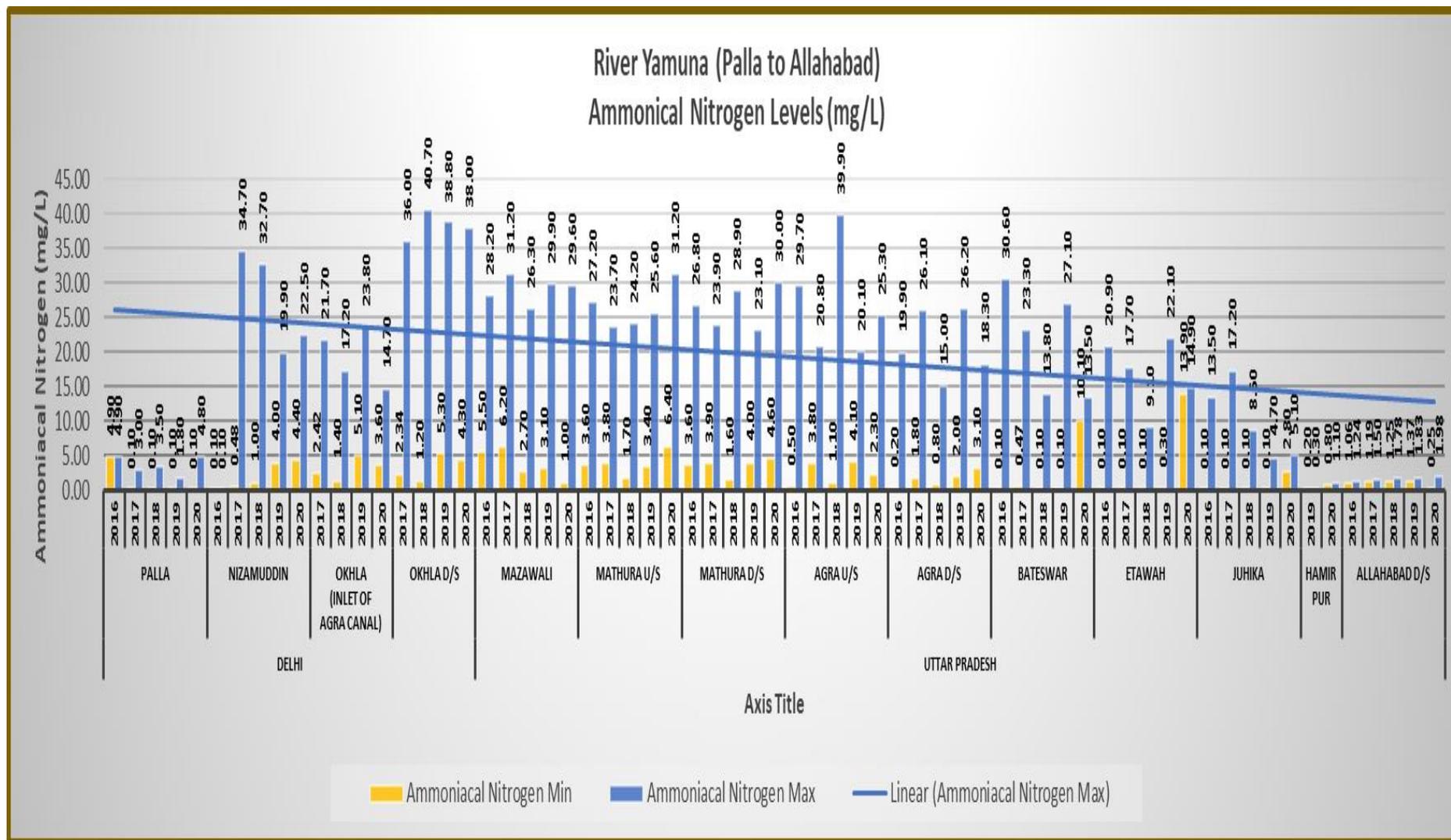


Figure 3: Graphical representation of Ammonical Nitrogen in river Yamuna from Palla, Delhi Border to Allahabad Downstream, UP. (2016-2020).

Ammoniacal Nitrogen in River Yamuna (upto Palla)															
Station Code	Station Name	Month	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
		Year													
1117	YAMUNA AT HATHNIKUND HARYANA	2016	0.2		0.2	0.2	0.2			0.2		0.2		0.2	
		2017	0.2	0.2	0.2	0.2		0.2	0.2	0.4		0.07	0.4	0.2	
		2018	0.2	0.2		0.2	0.2	0.2		0.2	0.2	0.2	0.6	0.2	
		2019					0.2	0.2	0.2	0.2					
		2020													
4914	YAMUNA AT MAGALaura	2016													
		2017													
		2018													
		2019	0.8	0.9	0.9	0.8									
		2020	0.4	0.4	0.7	0.7	0.9	2.6			2.1	0.2		1.8	
10004	YAMUNA AT KHOJKIPUR PANIPAT	2016	0.3		0.7		0.2	1.4	0.2	0.2		0.6	0.3	0.2	
		2017	0.2	0.4	0.4	0.2		3.4		1.12		0.2	1.16	0.2	
		2018	0.4	0.7	0.8	2.1	1.9	1.12	0.7				1.2	1	0.2
		2019	1.3	2	1.7	1.8	0.2		2.3			0.9	0.5	0.8	0.2
		2020	0.2	0.6	2.2	2	3.2	2.4			2.3	0.2	1.5	1.5	
1119	YAMUNA AT SONEPAT	2016	1		2		4.3	1.4	2.1	0.2				0.2	0.2
		2017	0.2	0.8	1.2	2		4.2						0.41	0.2
		2018	0.2	0.6	0.9	2.1	4.9		1.8				0.9	0.6	0.2
		2019	0.8	1.2	0.8	1.1	4.2		0.2	0.2	1.3	0.2	0.7	0.2	
		2020					2.0	1.8			2.0	0.3	0.7	1.5	
1120	YAMUNA AT PALLA, DELHI	2016	0.2	0.7	0.2	0.8	3.4	3.5	0.2	0.2		1.6	0.5	0.2	
		2017	0.2	1.4	0.8	0.7	1.8	1	3	0.7	0.2	0.5	0.48	0.35	
		2018	0.2	0.5	0.7	1.2	2.8	1.3	3.5	0.2	0.2	0.3	0.2	0.3	
		2019	0.4	0.2	0.3	0.7	1.8	0.9	0.6	0.8	0.2	0.2	0.2	0.2	
		2020	0.2	0.2	1.5	0.9	2	2.7	4.8		0.2	0.2	0.2	1.5	

Figure 4: Heat Map Analysis at five monitored locations before entry of river Yamuna in Delhi (2016-2020).

Based on the graphical representation of the trend of Dissolved Oxygen in river Yamuna (2016- 2020), following observations are made:

- i. DO is found to be complying at all the locations from its origin i.e., Yamunotri in Uttarakhand to Sonapat in Haryana, except at 05 instances in 2017, 2018 and 2019 in the stretch in Haryana ranging from 12 mg/L to 15 mg/L. Maximum concentration of 15 mg/L was observed in Panipat (2018) while lowest recorded value is 2.8 mg/L in Sonapat, Haryana (2018). The maximum concentration is attributed to discharge of wastewater resulting into eutrophication and high dissolved oxygen at day time. The low concentration at Panipat and Sonapat is also shows discharge of wastewater.
- ii. Minimum concentration of DO is complying at Palla, however, maximum concentration is ranging between 0.3 to 17.1 mg/L in 2020. The stretch of Delhi from Nizamuddin to Okhla downstream is the anoxic stretch, wherein depletion of DO is clearly observed due to discharge of partially treated or untreated wastewater through 22 drains out falling in River Yamuna.

iii. Further downstream in the stretch of Uttar Pradesh, DO started improving from Vishramghat, U.P. The concentration is observed high in eutrophicated segment of river Yamuna from Agra and up to Bateshwar in different years. Maximum concentration observed was 22.0 mg/ L at Batesar, U. P (2018). After Etawah and Juhika the DO levels were observed in good status complying with bathing criteria.

iv. DO tends to decrease mainly in the stretch of Haryana owing to the discharge of industrial and domestic pollution from the cities situated on the bank of river Yamuna, while it is observed that high concentration of DO in Delhi and Uttar Pradesh stretch is mainly due to eutrophication. However, better DO observed in Uttar Pradesh can be attributed to the larger volume of fresh water from the tributaries.

*Details of Dissolved Oxygen in river Yamuna during the years 2016-2020 detailed in **Figure 5 (Graphical representation of Dissolved Oxygen in river Yamuna from Yamunotri, Uttarakhand to Sonapat, Haryana), Figure 6 (Graphical representation of Dissolved Oxygen in river Yamuna from Palla to Allahabad, U.P.)***

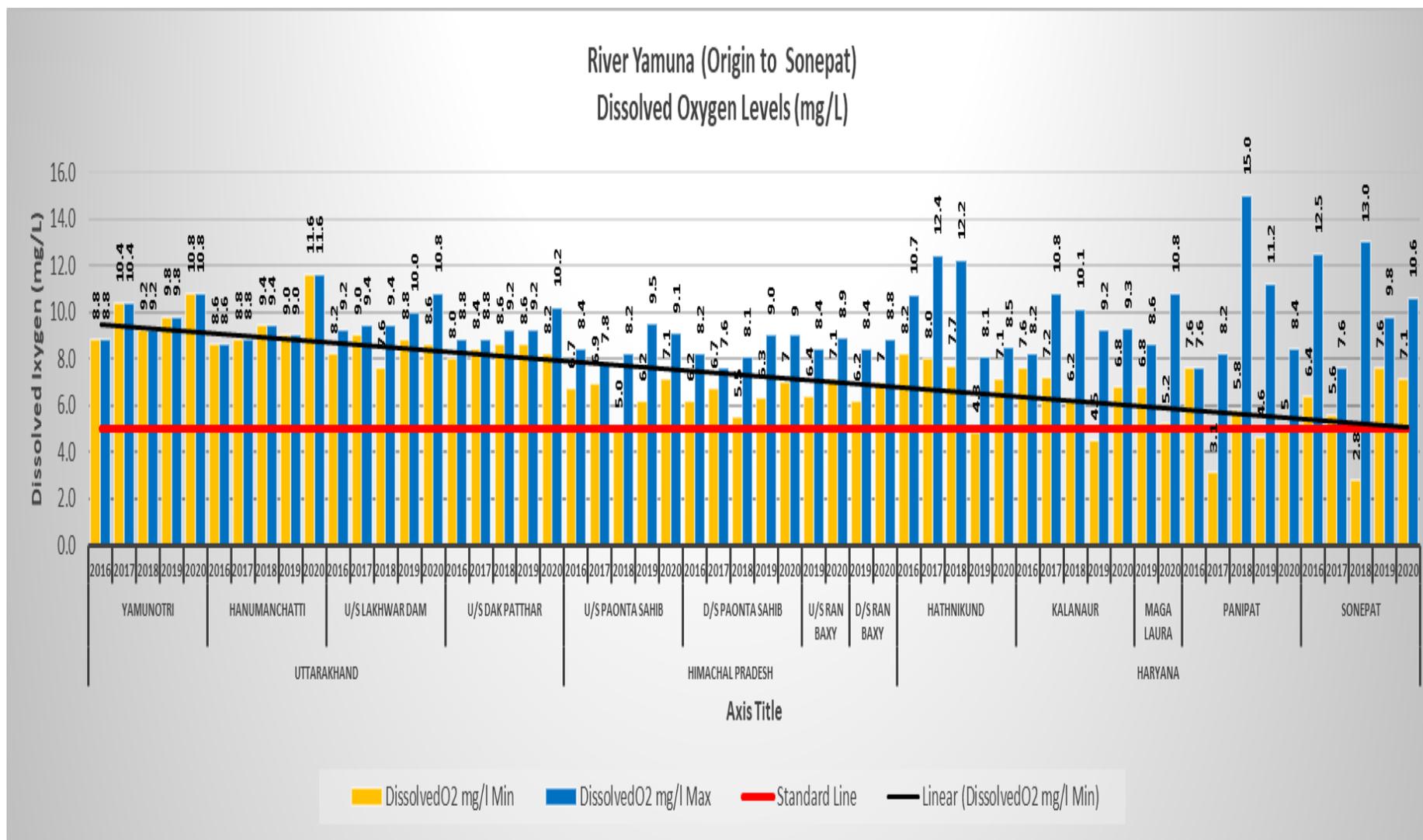


Figure 5: Graphical representation of Dissolved Oxygen in river Yamuna from Yamunotri, Uttarakhand to Sonapat, Haryana. (2016-2020).

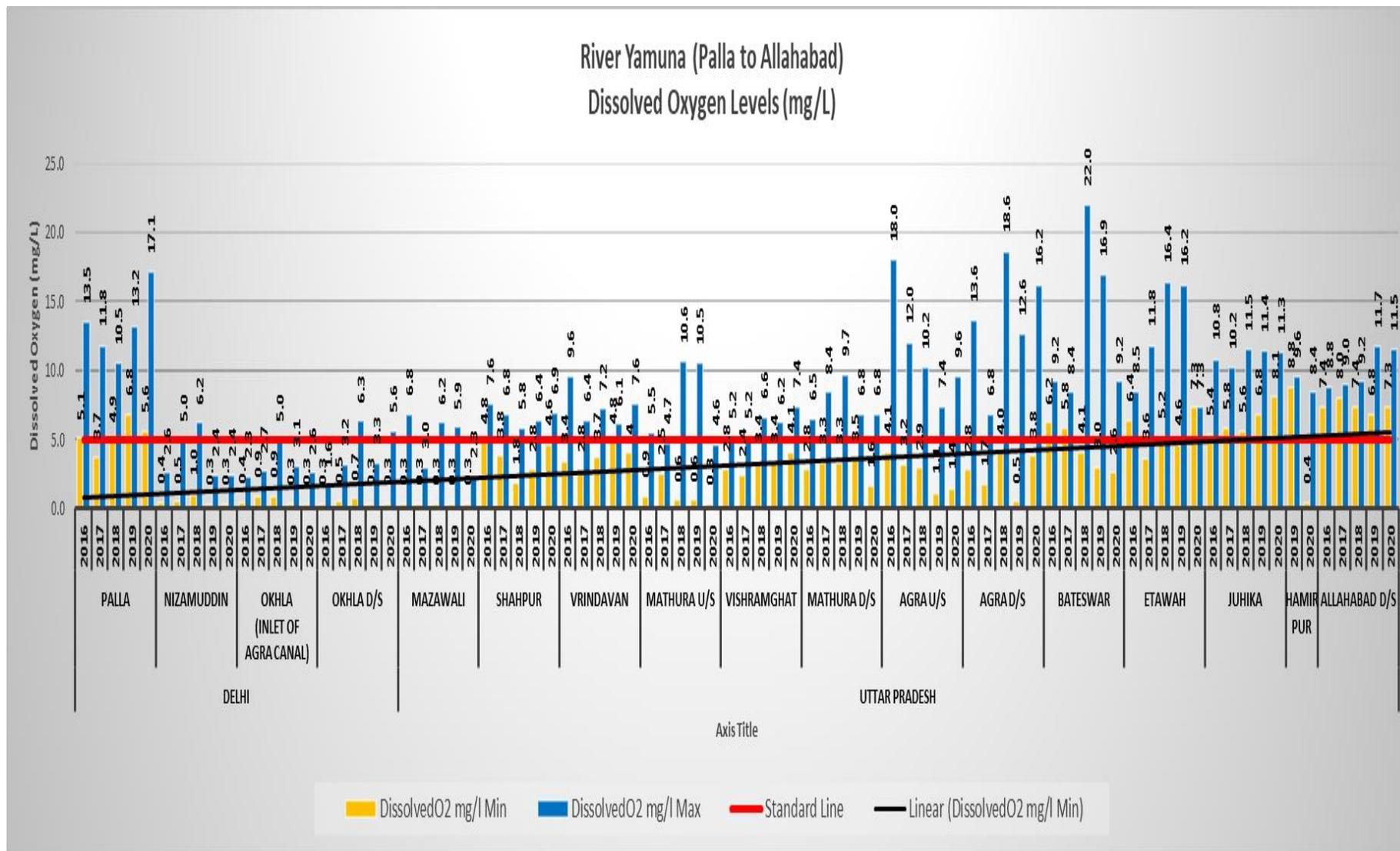


Figure 6: Graphical representation of Dissolved Oxygen in river Yamuna from Palla to Allahabad, U.P. (2016-2020).

Based on the graphical representation of the trend of Biochemical Oxygen Demand in river Yamuna (2016- 2020), following observations are made:

- BOD is complying from Yamunotri, Uttarakhand to Hathnikund in Haryana. In 2020 at Hathnikund BOD was 6.6 mg/L on one instance. BOD showed an increasing trend from Kalanaur onwards to Panipat and Sonapat reaching as high as 55 mg/ L at Panipat, Haryana (2017) and at Sonapat it was observed as 25 mg/L in 2018. This could be attributed to the discharge of untreated industrial waste and domestic sewage through the drains merging with river Yamuna in Haryana.
- In Delhi from Palla to Okhla, there is an increase in the concentration of BOD showing non-compliance. Severe pollution load in the river recorded the highest concentration of BOD as 114 mg/L at Okhla downstream (2020). At Mazawali in Uttar Pradesh, the concentration of BOD was observed as 59 mg/L in 2020.
- From Shahpur onwards upto Etawah & Juhika in U.P, the concentration of BOD starts to decrease, but still remained non-compliant on most of the occasions. After reaching Hamirpur, the river receives more water from tributaries and no major urban centres are situated along the river up to Allahabad.
- Five-year trend of BOD shows increase in BOD starting from origin location to Sonapat in Haryana. Although steep rise in concentration of BOD is observed in the stretch of Delhi and non-compliances at all locations of Uttar Pradesh only after Hamirpur and Allahabad river water quality is meeting to the criteria for outdoor bathing.

*Details of Biochemical Oxygen Demand in river Yamuna during the years 2016-2020 detailed in **Figure 7 (Graphical representation of Biochemical Oxygen Demand in river Yamuna from Yamunotri, Uttarakhand to Sonapat, Haryana) and Figure 8 (Graphical representation of Biochemical Oxygen Demand in river Yamuna from Palla to Allahabad, U.P)***

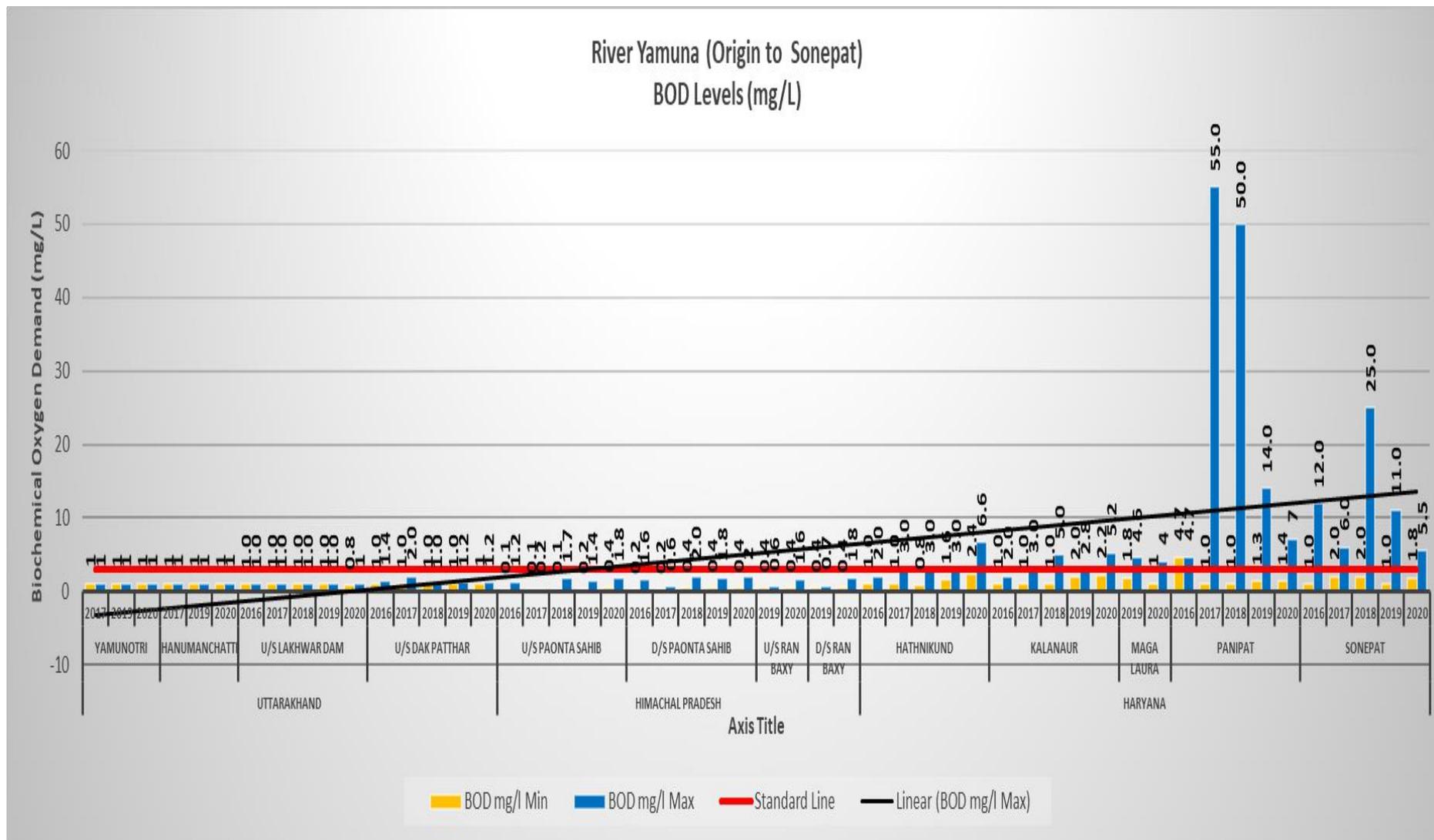


Figure 7: Graphical representation of Biochemical Oxygen Demand in river Yamuna from Yamunotri, Uttarakhand to Sonapat, Haryana (2016-2020).

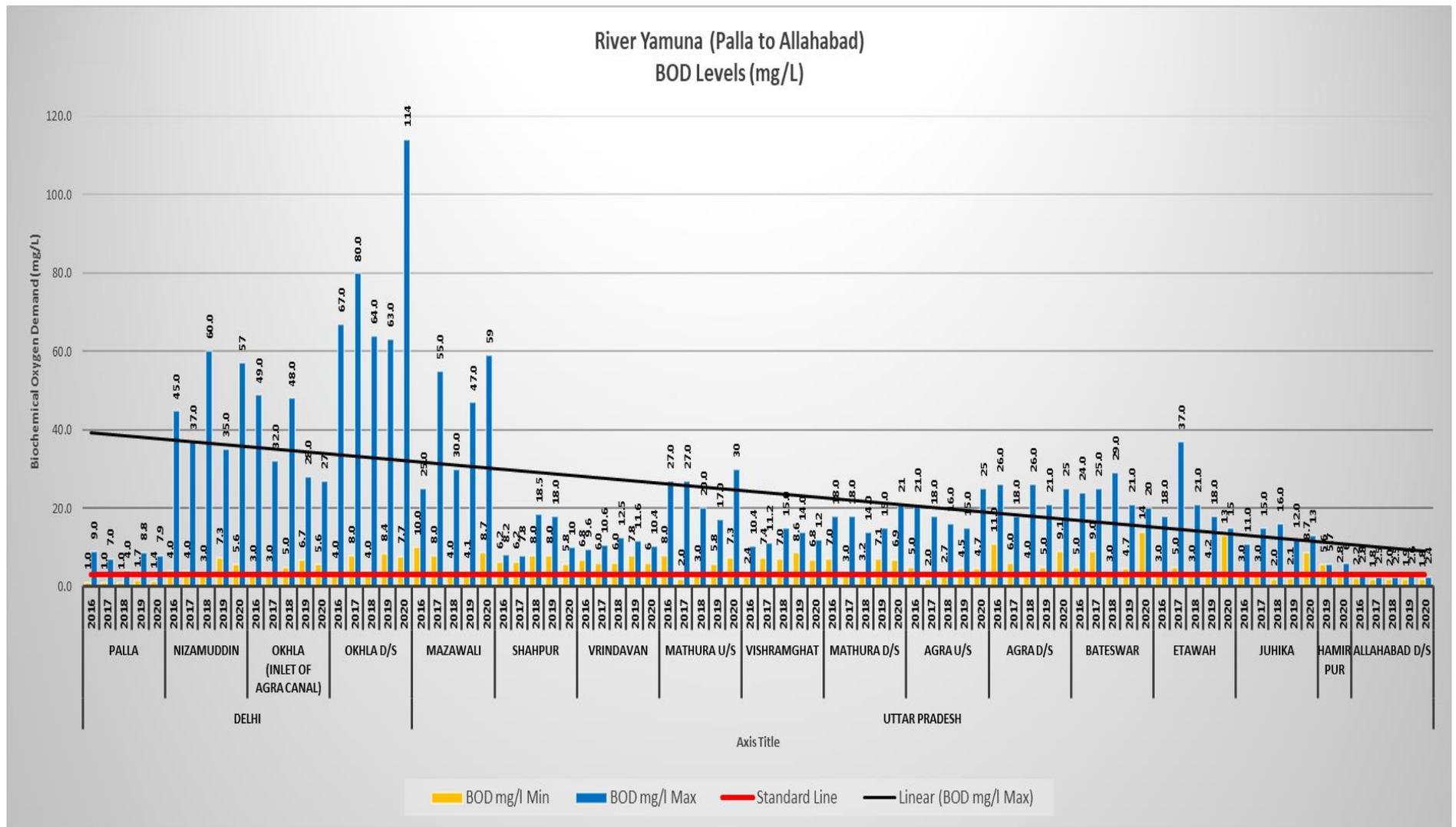


Figure 8: Graphical representation of Biochemical Oxygen Demand in river Yamuna from Palla to Allahabad, U.P. (2016-2020).

Based on the graphical representation of the trend of Fecal Coliform in river Yamuna (2016- 2020), following observations are made:

- FC is found to be complying at all the locations from its origin at Yamunotri in Uttarakhand to downstream of Ranbaxy in Himachal Pradesh, except on 02 instances in 2017 at Hanumanchatti and upstream of Dakpatthar in the stretch in Himachal Pradesh (5400 and 49000 MPN/ 100 ml). Maximum concentration of 110000000 MPN/ 100 ml was observed in Nizamuddin (2017), while the lowest recorded value is 2 MPN/ 100 ml at Yamunotri, Uttarakhand (2017- 2019). The higher concentrations are attributed to discharge of untreated sewage water into the river leading to high bacterial population in the river.
- The concentration of FC starts increasing from Hathnikund in Haryana to Agra in U.P. In Delhi, value of FC ranged between 20 at Palla (2019) to 110000000 MPN/ 100 ml at Nizamuddin (2017).
- In the stretch of UP, FC ranged between 9200000 MPN/ 100 ml at Mazawali (2017) & Mathura (2018) to 2 MPN/ 100 ml at Etawah, Batesar and Juhika (2019). It's anticipated, FC starts to decrease from Batesar to Allahabad, U.P.
- The trend of Faecal Coliform over the five-year period shows increasing trend in the stretches of Haryana and Delhi. The situation in Uttar Pradesh is also not satisfactory due to non-compliances observed at all the locations before Hamirpur.

*Details of Biochemical Oxygen Demand in river Yamuna during the years 2016-2020 detailed in **Figure 9 (Graphical representation of Fecal Coliform in river Yamuna from Yamunotri, Uttarakhand to Sonapat, Haryana) and Figure 10 (Graphical representation of Biochemical Oxygen Demand in river Yamuna from Palla to Allahabad, U.P)***

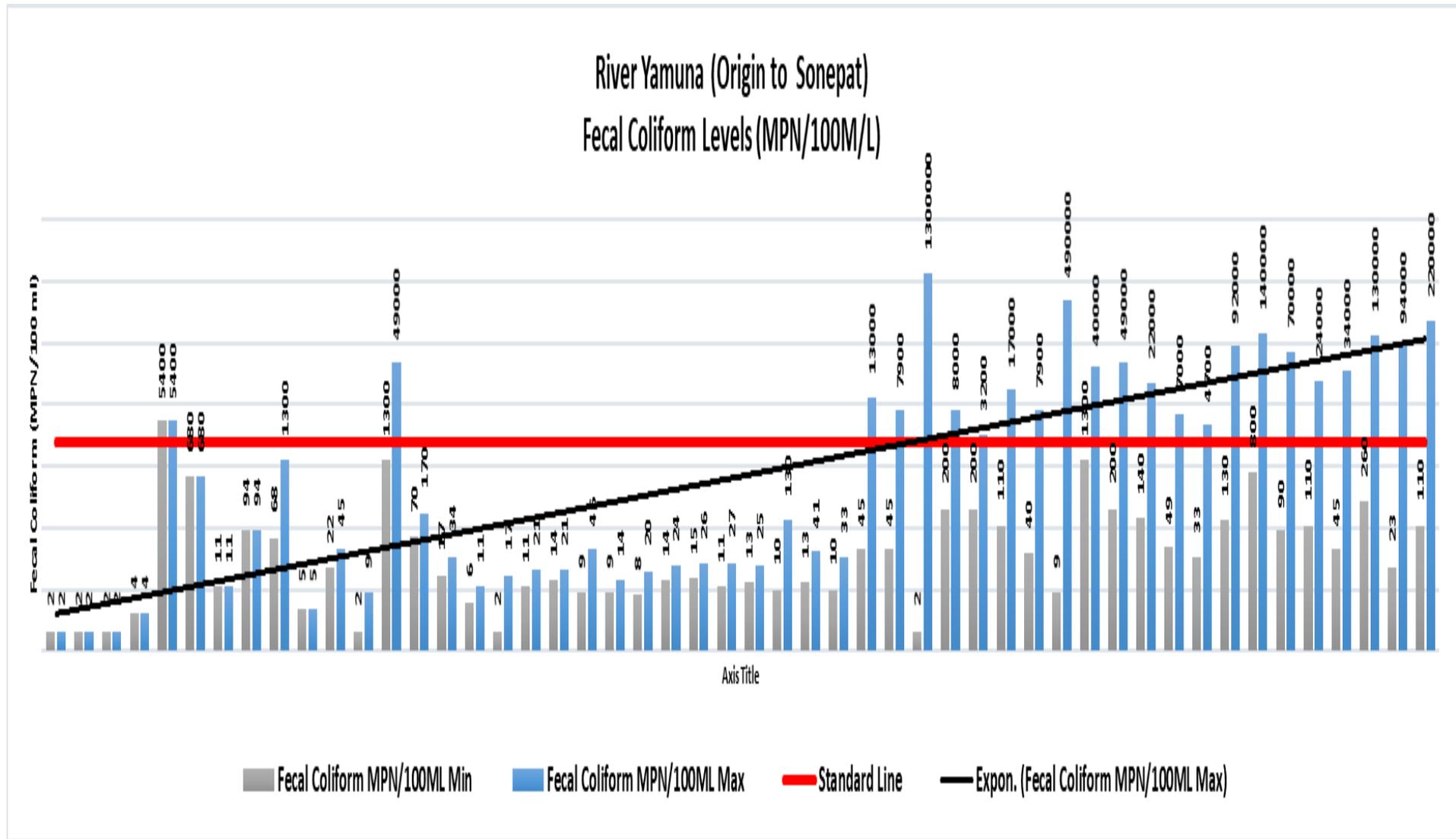


Figure 9: Graphical representation of Fecal Coliform in river Yamuna from Yamunotri, Uttarakhand to Sonapat, Haryana (2016-2020).

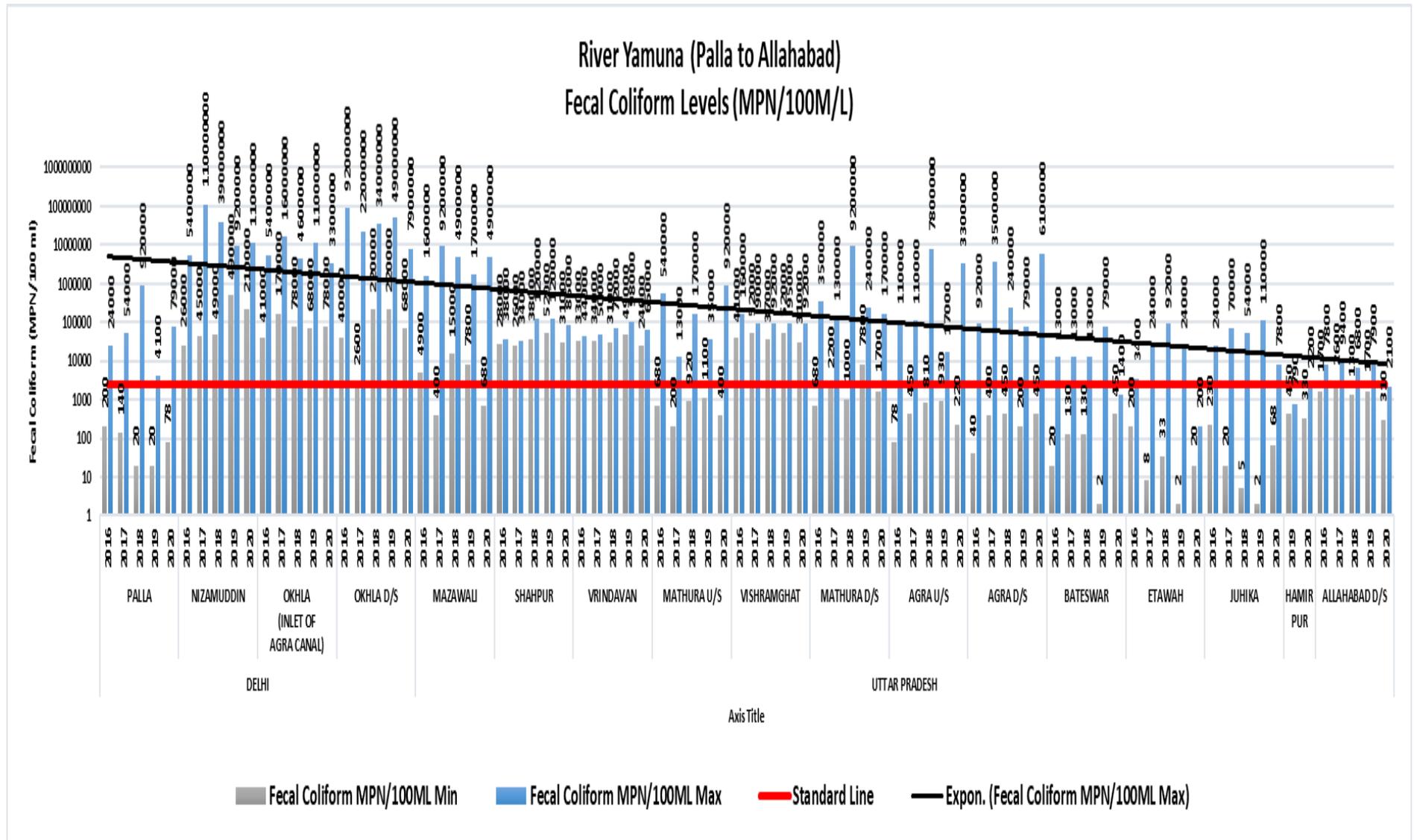


Figure 10: Graphical representation of Fecal Coliform in river Yamuna from Palla to Allahabad, U.P. (2016-2020).

5.1 Latest assessment of Water quality trend of Ammonical Nitrogen in River Yamuna (January, 2021)

CPCB conducted monitoring of River Yamuna and the drains contributing to pollution in upstream of Wazirabad on 7th, 12th & 13th January, 2021. The sampling was conducted at seven locations on River Yamuna from Yamuna Nagar, Haryana to Wazirabad, Delhi. Drain samples were collected from four drains viz., Ditch Drain, Drain No. 2, Panipat drain & Drain No 8. Potential sources of Ammonical Nitrogen (NH₃-N) between Hathnikund - Wazirabad Barrage as identified by CPCB are as follow:

Ditch Drain: Treated/ untreated industrial and domestic wastewater of Yamuna Nagar town.

Drain No.2: Treated/ untreated industrial and domestic wastewater of Panipat via Panipat drain.

Drain No. 8: Earlier Drain No. 8 was used to augment flow in River Yamuna from Delhi Branch Canal. Leakages/ overflow from Delhi Branch Canal add fresh water to the drain along with treated / untreated industrial and domestic wastewater of Sonapat town gets mixed through drain no. 6 on some occasions.

5.2 Sampling Locations

Locations on river Yamuna from where samples collected are given in **Table 3** and also depicted on Google Maps in **Figure 11 (a & b)**. Photographs taken during the monitoring is given in **Annexure VIII**. Schematic representation of the directional flow of drains into river Yamuna vis a vis concentration of Ammonical Nitrogen on monitored locations is given in **Figure 12**.

Table 3. Water Quality Monitoring locations on River Yamuna & Drains

S. No.	Monitoring Location	Date of sampling	Coordinates
River Yamuna			
1.	Kalanaur	12.1.2021	30.0684170, 77.3532650
2.	Manglora, Karnal	12.1.2021	29.5966530, 77.1090740
3.	Kairana	12.1.2021	29.383410, 77.154367
4.	Khojkipur	12.1.2021	29.2503090, 77.1332980
5.	Sonepat	12.1.2021	28.8942930, 77.2212940
6.	Palla	13.1.2021	28.842840, 77.215912
7.	Wazirabad Pond	13.1.2021	28.713196, 77.231987
8.	Wazirabad Pond	7.1.2021	28.713196, 77.231987
Drains			
1.	Ditch Drain	12.1.2021	29.9194550, 77.1658
2.	Drain 2	12.1.2021	29.2738960, 77.1024830
3.	Panipat drain	12.1.2021	29.3288370, 77.0416900
4.	Drain No 8	13.1.2021	28.864361, 77.192211

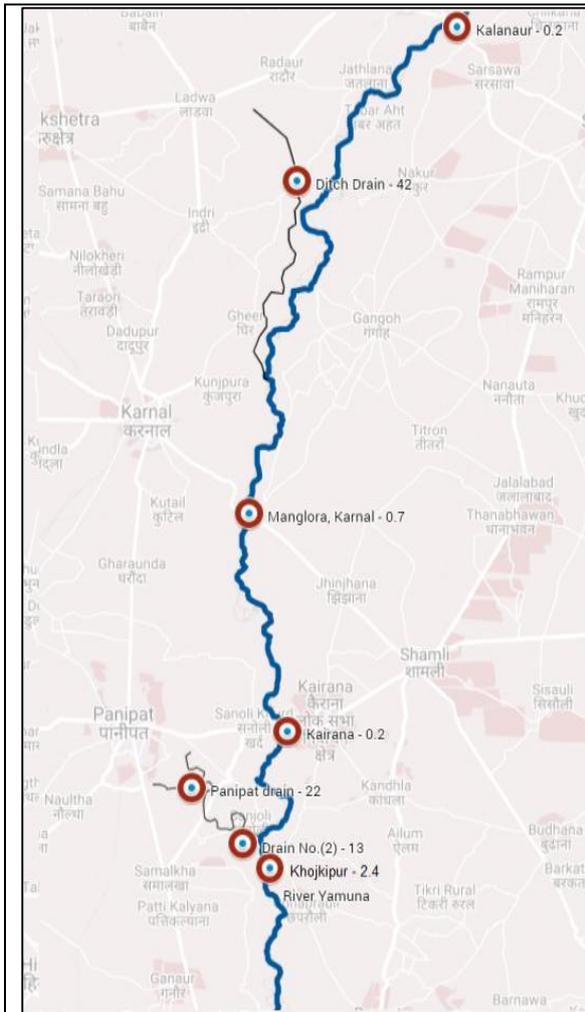


Figure 11 (a)– Ammonical Nitrogen levels (mg/L) observed at monitored locations in River Yamuna & Drains in Upper Stretch in January, 2021

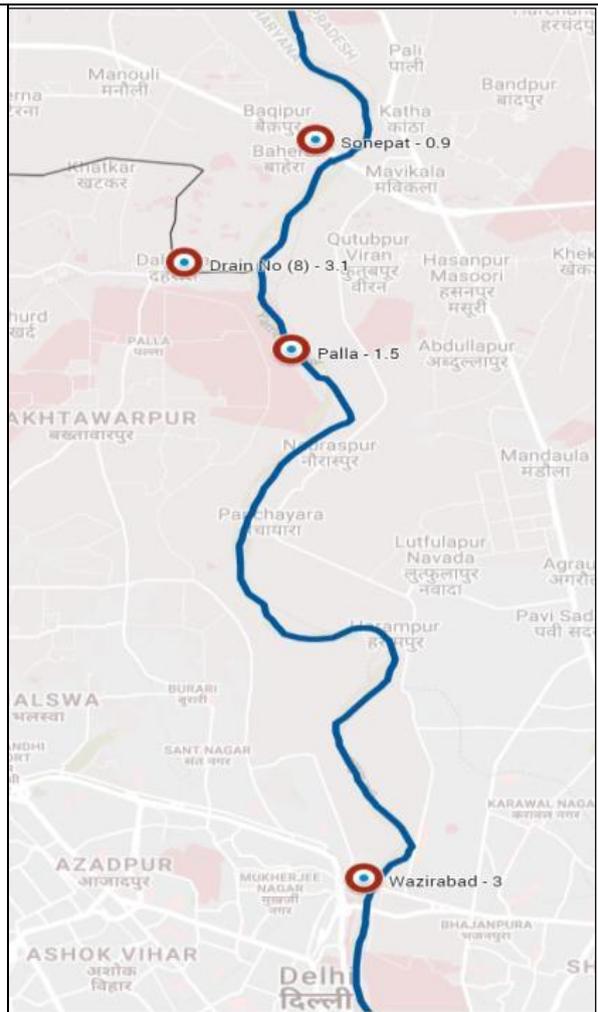


Figure 11 (b) – Ammonical Nitrogen levels (mg/L) observed at monitored locations near Haryana – Delhi Border in River Yamuna & Drains in January, 2021

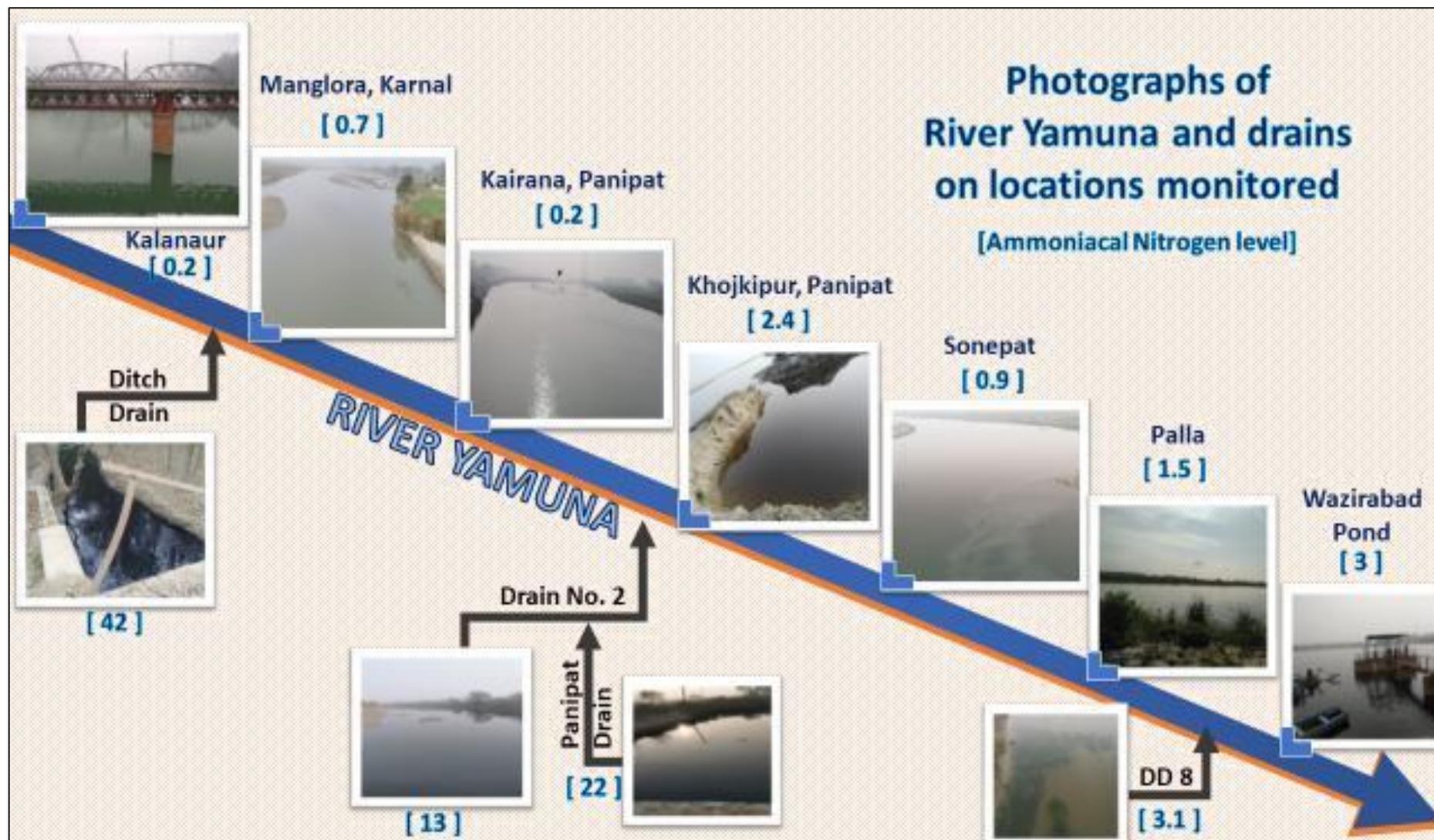


Figure 12: Schematic representation of the directional flow of drains into river Yamuna vis a vis concentration of Ammoniacal Nitrogen on monitored locations.

5.3 Analysis Results

The analysis results of the water quality of River Yamuna and Drains carried out in January 2021 are given in **Annexure IX** and **Annexure X respectively**. The results of River Yamuna are compared with Primary Water Quality Criteria for Bathing Waters and drains' analysis results are compared with General Discharge Standards (Inland surface water), as per Schedule VI of The Environment (Protection) Rules, 1986.

5.4 Observations and Interpretation

The analysis results of water quality of River Yamuna monitored at 08 monitored locations in January 2021 reveal that:

- Physicochemical parameters are in the range of 7.5 – 8 of pH; in the range of 10 – 34 mg/L of COD, in the range of 3.2 - 9.6 mg/L) of BOD; in the range of 210 - 352 mg/L of TDS; in the range of 9 - 98 mg/L of Chloride; in the range of 318 - 758 µmho/cm of Conductivity; in the range of BDL - 0.39 mg/L of Phosphates; in the range of 0.8 - 1.6 mg/L of Nitrates; in the range of 273 - 341 mg/L of Total Hardness; in the range of 152 - 200 mg/L of total Alkalinity; in the range of 92 - 109 mg/L of Calcium; in the range of 11 - 26 mg/L of Magnesium; in the range of 0 - 0.4 mg/L of Fluoride; in the range of 34 - 53 mg/L of Sulphate and in the range of 0.02 - 0.06 mg/L of Nitrite.
- BOD was found exceeding the Primary Water Quality Criteria for Bathing Waters at all the monitored locations.
- Fecal Coliform was found exceeding the Primary Water Quality Criteria for Bathing Waters at Khojkipur and Wazirabad Pond. Fecal Streptococci was found exceeding the Criteria at monitored locations of Karnal and Khojkipur.
- Ammonical Nitrogen in the River Yamuna was observed in the range of 0.2 to 3.3 mg/L.

The analysis results of water quality of Drains samples collected from 04 locations reveal that:

- Physicochemical parameters are in the range of 7.4 – 8 of pH; in the range of 16 - 550 mg/L of COD; in the range of 2 - 235 mg/L of BOD; in the range of 69 - 296 mg/L of TSS; in the range of 712 - 2256 mg/L of TDS; in the range of 117 - 731 mg/L of Chloride; in the range of 1406 - 4080 µmho/cm of Conductivity and in the range of 0.53 - 2.38 mg/L of Phosphates.

- BOD & COD were found exceeding the General Discharge Standards at all the monitored locations, except at Drain No. 8.
- Ammonical Nitrogen was found within the limits stipulated in General Discharge Standards in all the four drains.

Latest water quality joint inspection was conducted by the officials from CPCB, HSPCB and Irrigation & Water Resources Department, Haryana, on 26.02.2021 and samples were collected from Drain No. 6, Drain No. 8 and Drain No. 8 at Regulator (D 81). The observations and analysis results reveal that:

- Drain no. 6 is carrying waste water of Sonapat city and adjoining areas and criss-cross the Drain no. 08 at this location through a conduit pipe. It was observed that the conduit is not regularly cleaned and heaps of solid waste and plastic were observed choking the opening of conduit. This leads to overflow of waste water of Drain No. 06 and Drain No. 08 mainly during monsoons. The officials from Haryana Irrigation & Flood Control Dept. also informed that concrete structure is under construction phase to resolve the overflow and mixing of waste water in Drain No. 06 with fresh water in Drain No. 08 causing occasional increase in concentration of Ammonical Nitrogen. The RCC structure constructed as partition wall between Drain No. 06 and DD8 Drain No. 08 at monitored location (Sonapat) is not of adequate height to prevent overflow and mixing of fresh water with waste water.
- Drain No. 06 at Sonapat was found non-complying for parameters COD (338 mg/L), BOD (90 mg/L), TSS (157 mg/L) and Chloride (388 mg/L). However, Ammonical Nitrogen (36 mg/L) was within the limits. Also, complying with the analysed heavy metals (As, Cd, Cr, Cu, Fe, Mn, Ni, Pb, Zn).
- Drain No. 08 carrying fresh water joins river Yamuna for augmentation of fresh water. Drain No. 8 near drain No. 06 was complying with the standards of Ammonical Nitrogen (18 mg/L) and heavy metals.
- Drain No. 08 near Canal (Rohtak Regulator) had high Ammonical Nitrogen (56 mg/L) while complying with heavy metals. It was observed that the colour of water in DD8 at this location was blackish and receiving waste water from STP and industrial units. Excess fresh water from Delhi branch canal is released downstream of Rohtak Regulator which improves the water quality down the course in Drain No. 08.

The water quality analysis results of monitored drains and photographs taken during the visit are given at **Annexure XI** and **Annexure XII** respectively.

6. Major problems associated with river Yamuna (Froth Formation, Fish Kill and rise in Ammonical Nitrogen

Major problems associated with river Yamuna are (i) Froth Formation on D/s of Okhla Braggage in Delhi, (ii) Incidences of Fish Kill at D/s of Mathura and U/s of Agra, and (iii) Rise in Ammonical Nitrogen especially at intake point of Wazirabad. Details are given in the subsequent paras

6.1 Formation of Froth in River Yamuna on Downstream of the Barrages

Incidences of formation of froth on D/s of Okhla barrage on river Yamuna in Delhi has been reported by media during the last few years. The main causes of foam formation in river Yamuna are highlighted as under:

- (a) Foam is a natural phenomenon that occurs on many lakes and streams. Foam is produced when organic matter decomposes and releases fatty acids that act as *surfactants or surface-active agents*. Smaller amounts of dissolved organic matter are also released from living organisms. These fatty acids are lighter than water so float on the surface of the water as a thin film.
- (b) Foam is usually harmless. The foaming agents are primarily proteinaceous or carbonaceous matter. It only takes a small amount of fatty acids or other foaming agents to produce a large amount of foam.
- (c) Turbulence from waves or currents causes the fatty acids to entrain small bubbles that constitute the foam. In lakes and large rivers, the wind causes the foam to form into parallel streaks, due to wind induced surface currents.
- (d) Synthetic detergents are not bio degradable so this results foam formation under favourable conditions. Modern detergents must be biodegradable so they do not persist, quickly lose their ability to cause foam.
- (e) The organic matter in surface waters comes mostly from decomposing vegetation such as algae and terrestrial plants.
- (f) At Okhla barrage, all treated and untreated wastewater of Delhi including dry cleaning units is impounded and only excess wastewater released downstream. Release of wastewater from barrage agitate surfactants present and foam formation takes place;

A. Sources of pollutants causing foaming at Okhla Barrage:

- (a) The Okhla Barrage is being maintained by U.P. Irrigation Department. It has been observed that there is large amount of water hyacinth growth on the

pondage of Okhla Barrage, which needs to be cleared as these dying weeds continuously releases surfactants.

- (b) Further, as far as Delhi is concerned there are 18 drains which are discharging about 760 MGD of wastewater, out of which 605 MGD is from Delhi area and 155 MGD is coming from Haryana and U.P.
- (c) Out of 605 MGD from Delhi area, about 530 MGD is treated effluent and rest is untreated from the unsewered/unauthorized area. However, Delhi Jal Board (DJB) is upgrading and augmenting its capacity at Okhla, Kondli, Coronation Pillar. The augmentation work is expected to be completed by December 2022 by which treatment capacity will be enhanced from 597 MGD existing to 707 MGD.
- (d) Also, soaps in India are currently not having any set standards for the level of surfactants. This may result in formation of foam if suddenly lot of soap, shampoos, use is made by the consumers.
- (e) Further, Hindon cut canal carrying wastewater from U.P meets upstream of Okhla Barrage into river Yamuna. This canal carries pollutants, which enters in the river Hindon, first from the paper and sugar mills along Saharanpur, Muzaffarnagar, Shamli and Meerut. These then enter the Hindon cut canal at Indira Kunj which flows into Okhla Barrage which may carry a lot of surfactants leading to foaming in some stretches.
- (f) Discharge of impounded effluents including containing soaps, detergents /surfactants/phosphorous compounds at Okhla barrage thorough vertical spillway causing agitation and thereby froth formation on D/s of Okhla barrage.

B. Remedial measure to be taken to reduce foaming:

- (a) ***Under Short-term measures, U.P. Irrigation Department may remove all the water hyacinth existing in the Okhla pondage to reduce the release of surfactants from the dying weeds/ hyacinth in the river.***
- (b) Some relief from the foaming may also come if, bio-culture based foaming treatment may be carried out by drain owning agencies and also by U.P. Irrigation department (for Hindon cut and downstream of Okhla barrage).
- (c) Haryana State also should take adequate measures for control of discharge of untreated sewage/industrial effluent through Najafgarh Drain
- (d) Eventually, up gradation of existing Sewage Treatment Plants (STPs), Common Effluent Treatment Plants (CETPs) in Haryana, Delhi and UP States and ensuring compliance to the discharge norms by the existing STPs, captive ETPs and CETPs located in Haryana, Delhi and UP may also help in reducing the foaming problem by removing the bio nutrient levels.

CPCB monitored and analysed the samples in the year 2019 and 2020. Based on the observations made during the visits, it was concluded that the foam formation in the river was due to the presence of detergents and laundry chemicals containing

phosphates which get settled in the river beds. Due to agitation and turbulence, settled sludge on the river bed gets agitated and piles of foam arises.

Yamuna Monitoring Committee also sought report in this matter from CPCB in the year 2019 and 2020 and YMC passed directions to the States of Delhi, Haryana and UP for taking necessary remedial measures.

DPCC also issued directions under section 33 (A) of The Water (Prevention and Control of Pollution) Act, 1974 to all the concerned prohibiting sale, storage, transportation and marketing of soaps and detergents not conforming to BIS revised norms in NCT of Delhi to curb pollution in river Yamuna.

6.2 Incidences of fish kill in river Yamuna

Reports on incidence of dead fish and shoals of dead fish washed ashore on the banks of river Yamuna in Agra in the month of July, 2021, in the electronic media.

Reasons for fish kill in river Yamuna could be due to:

- Discharge of treated / untreated and partially treated sewage and industrial effluent through drains from the cities and towns located on the U/s of river Yamuna apart from lean flow in river Yamuna
- Non-availability of adequate infrastructure for treatment of generated sewage and improper operation of existing sewage treatment plants (STPs) or captive effluent treatment plants (ETPs) or Common Effluent Treatment Plants (CETPs) located on U/s of Agra including discharges from Delhi.

Generally, water including wastewater from U/s of Mathura in river Yamuna gets accumulated at Gokul barrage at Mathura and discharge of water from Gokul barrage flushes out accumulated sediments/sludges from the river/river bed and gets agitated due to turbulence on the D/s of the Gokul Barrage and thereby depletion of dissolved oxygen occurs and such condition may lead to fish kill.

Water Quality of River Yamuna Observed on 19.07.2021

River Yamuna was monitored at Palwal, Mathura and Agra on 19.07.2021 as a part of water quality monitoring of river Yamuna under National Water Quality Monitoring Programme (NWMP). During the monitoring on 19.07.2021, visited team of CPCB did not observe any fish kill in river Yamuna at all the five monitored locations. Photographs taken during the sampling is given at **Annexure XIII**. Water quality assessment of River Yamuna at Palwal, Mathura and Agra as observed on 19.07.2021 tabulated in **Table 4**.

Table 4: Water Quality of River Yamuna Monitored on 19.07.2021 at Palwal, Mathura and Agra

River Yamuna Monitoring Location	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	BOD (mg/L)	Faecal Coliform (MPN/100 mL)	Faecal Streptococci (MPN/100mL)	Ammonical Nitrogen-N (mg/L)
Primary Water Quality Criteria for Outdoor Bathing	-	> 5	6.5-8.5	< 3	< 2500	< 500	0.5
At Mazawali (Palwal)	29	BDL	7.2	14	460000	9200	9.2
At Mathura U/s	28	0.3	7.1	6.1	35000	3500	10.0
At Mathura D/s	28	5.2	7.2	12	35000	2800	13.4
At Agra U/s	29	3.1	7.1	16	4100	700000	16.7
At Agra D/s	30	1.0	7.2	10	110000	2400	4.3

Based on the water quality assessment of River Yamuna at Palwal, Mathura and Agra as observed on 19.07.2021, following observations are made:

- pH level complied to the Water Quality Criteria for Outdoor Bathing at all the five monitored locations.
- Dissolved Oxygen (DO) level observed at Palwal (Mazawali) (Nil), Mathura U/s (0.3 mg/L), Mathura D/s (5.2 mg/L), Agra U/s (3.1 mg/L) and Agra D/s (1.0 mg/L). DO level not complied to the bathing criteria limit at the monitored locations except at Mathura D/s.
- BOD level exceeded the criteria limit of 3 mg/l at all the five monitored locations. Maximum BOD (16 mg/L) observed at Agra U/s and minimum BOD (6.1 mg/L) at Mathura U/s.
- Faecal Coliform maximum observed as 460000 MPN/100 ml at Palwal and minimum FC (4100 MPN/100 ml) observed at D/s of Agra. All the five monitored locations not complied to the limit of Bathing Criteria.
- Faecal Streptococci exceeded maximum criteria limit of 500 MPN/100 mL at all the five monitored locations.
- Ammonical Nitrogen observed in the range of 4.3 mg/L (minimum at Agra D/s) to 16.7 mg/L (maximum at Agra D/s) at all the five monitored locations.

Reasons for fish kill in river Yamuna could be due to (i) Discharge of treated / untreated and partially treated sewage and industrial effluent through drains from the cities and towns located on the U/s of river Yamuna apart from lean flow in river Yamuna , (ii) Non-availability of adequate infrastructure for treatment of generated sewage and improper operation of existing sewage treatment plants (STPs) or captive effluent treatment plants (ETPs) or Common Effluent Treatment Plants (CETPs) located on U/s of Agra including discharges from Delhi, (iii) Generally, water including wastewater from U/s of Mathura in river Yamuna gets accumulated at Gokul barrage at Mathura and discharge of water from Gokul barrage flushes out accumulated sediments/sludges from the river/river bed and gets agitated due to turbulence on the D/s of the Gokul Barrage and thereby depletion of dissolved oxygen occurs and such condition may lead to fish kill.

6.3 Possible Sources of Ammonical Nitrogen in river Yamuna at entry point of Delhi & at intake point of Wazirabad

Main sources of pollution in river Yamuna (before Wazirabad) include:

- i. Discharge of untreated /partially treated sewage from towns located in Haryana viz. Yamunanagar, Jagadhari, Karnal, Panipat & Sonapat (discharge from Panipat Drain to Drain No. 2 meeting to River Yamuna at Khojkipur village and Ditch Drain (Dhanurea Escape) from Yamuna Nagar carrying waste water to river Yamuna).
- ii. Mixing of fresh water with wastewater due to weak embankment between drain No 6 and drain No 8, specially during monsoon season, receiving discharges from un-sewered colonies between Palla and Wazirabad and also waste water from CETP Kundli Drain (treated water).
- iii. Discharges from scattered industrial units mainly fertiliser, dyeing and tannery units located at Panipat, Sonapat, Kundli and Karnal Industrial area.
- iv. Discharges from CETPs at Panipat, Sonapat and Kundli as well as STPs discharging partially treated effluents located in the catchment of river Yamuna,
- v. Un-sewered colonies located on the outskirts of Delhi which do not have sewer connections and likely to discharge illegally through tankers in river Yamuna.
- vi. In winter season in river Yamuna generally there will be a lean flow and accumulated sludge in the river bed might be undergoing decomposition under anaerobic conditions resulting into increase in Ammonical Nitrogen in river Yamuna.

6.3.1 Schematic flow diagram of Sources of Ammonical Nitrogen between Hathnikund - Wazirabad Barrage

The point sources contributing waste water to river Yamuna and causing increase in Ammonical Nitrogen starting from Hathnikund Barrage to Wazirabad Barrage have been marked on the schematic flow diagram (**Figure13**)

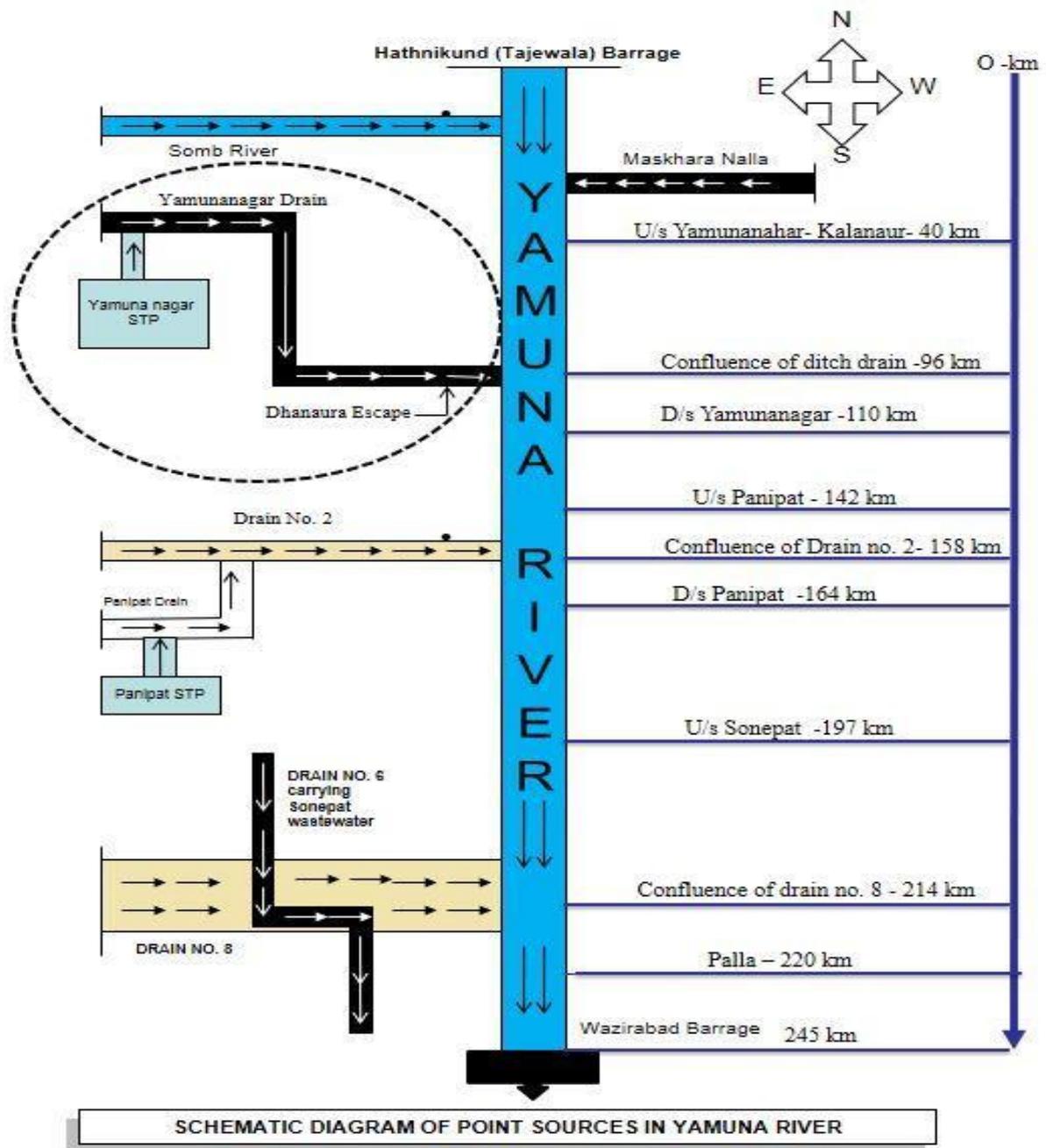


Figure 13: Point sources carrying wastewater to river Yamuna between Hathnikund - Wazirabad Barrage.

6.3.2 Ammonical Nitrogen issue & Water supply

- Water from Wazirabad barrage sourced for drinking water supply in Delhi.
- Occasional rise in Ammonical –Nitrogen levels in river Yamuna at Wazirabad barrage.
- Water Treatment Plants stop water intake when Ammonical Nitrogen exceeds 0.9 mg/L.

6.4.2 Preventive Measures Taken by Haryana Government

Initiatives taken

1. Shifting scattered industrial units at Panipat to designated areas.
2. CETPs constructed for industrial units at designated industrial areas.
3. Treatment facility created for domestic wastewater.

Problems not resolved

1. Non-Compliant CETPs at Panipat / Kundli.
2. Under-utilised/ Non-operational/ Non-Complying STPs at Yamunanagar, Panipat, Sonapat.
3. Incomplete shifting of units to designated areas.

To avoid mixing of wastewater with freshwater

1. Drain No. 8 used to augment fresh water flow in river Yamuna
2. Haryana Irrigation and Flood Control Department (HIFCD) introduced Drain no. 2 to eliminate the pollution caused by Ditch drain (Dhanurea Escape).
3. DJB and HIFCD laid twin channel close conduit line from Munak Escape (Western Yamuna Canal) to Wazirabad Water Treatment Plant.
4. Delhi Government using 100 cusecs of fresh water of river Yamuna for drinking purpose at Wazirabad Pond.

Panipat drain is one of the sources identified for polluting river Yamuna. Due to stagnation of water in Wazirabad pond, issue of Ammonia arises occasionally at Wazirabad water works.

6.4.3 Ammonical Nitrogen in River Yamuna at entry point of Delhi as per RTWQMS at Palla and Wazirabad

RTWQMS at Palla

Period	Range in mg/L	Max Recorded Date
Jan 16-31, 2021	0.4 to 4.3 mg/L	31.01.2021
Feb 1-28, 2021	0.8 to 45.5 mg/L	27- 28.02.2021
March 1-20, 2021	0.5 -38.8 mg/L	02.03.2021

RTWQMS at Wazirabad

Data of Ammonical Nitrogen is analysed for five- month period from December, 2020 to March, 2021. Range of Ammonical Nitrogen is given below:

Period	Range in mg/L	Max Recorded Date
Nov 1-29, 2020	0.02-0.06 mg/L	30.11.2020
Dec 1- 31, 2020	0.07-1.71 mg/L	29.12.2020
Jan1-31, 2021	0.47 -6.49 mg/L	18.01.2021
Feb 1-28, 2021	0.58 -2.18 mg/L	22.01.2021
March 1-31, 2021	0.3 – 2.2 mg/L	11.03.2021

It is observed that RTWQMS data of Ammonical Nitrogen at Palla range between 0.5 to 45.5 mg/L from January to March, 2021 and at Wazirabad between 0.02 mg/L to 6.49 mg/L during November, 2020 to March, 2021.

Graphical representation of the data generated by RTWQMS during November, 2020 to March, 2021 is given at **Annexure XIV**.

7. Present Practices of Sewage Disposal from Scattered Habitations between Palla and Wazirabad

Discharge of wastewater from Delhi Segment: There are habitations (Jagatpur village, Milan Vihar) situated between Palla to Wazirabad on the flood plain of river Yamuna. There is possibility of discharge of wastewater from these habitations through tankers to river Yamuna in upstream of Delhi. Status of unauthorised colonies falling from Palla to Wazirabad is enclosed at **Annexure XV**.

CPCB issued directions to Chief Executive Officer, Delhi Jal Board on 01.05.2019 under Section 5 of the Environment (Protection) Act, 1986 for sewage management of scattered colonies between Palla to Wazirabad and directed to:

- i. Plan sewerage management of scattered colonies between Palla to Wazirabad.
- ii. Set up vigilance system to stop all such discharges or disposal through tankers immediately.
- iii. Penalise defaulters indulging in illegal activities leading to discharge of waste water into river Yamuna.

During regular monitoring visit on 12.07.2021, CPCB team observed illegal disposal of waste water was through tankers from nearby unauthorised colonies and intimated to Joint Surveillance Squad to increase surveillance this area. Photographs taken during the visit are given below in **Figure 14**:



Figure 14: Illegal Discharge of Wastewater Through Tankers as Observed by CPCB Team on 12.7.2021

8. Visit to Real Time Water Quality Monitoring Stations (RTWQMS) at Wazirabad Barrage and Palla on Yamuna River

8.1 Visit to Real Time Water Quality Monitoring Stations (RTWQMS) at Wazirabad Barrage on Yamuna River

As a follow up action of first meeting of Study Group held through VC on 04.01.2021 under chairmanship of Member Secretary, a visit was made by CPCB official to the RTWQM Station at Wazirabad barrage on River Yamuna on 05.01.2021 for assessment of functioning of RTWQM station and calibration of values. Representative of Delhi Pollution Control Committee (DPCC) also accompanied CPCB official for the visit. Photographs taken during the visit to RTWQMS at Wazirabad is enclosed at **Annexure XVI**.

8.1.1 Observations

- RTWQM system has been set up at Delhi Jal Board Water Treatment Plant campus on River Yamuna just adjacent to barrage at Wazirabad. It was informed that contract for supply of RTWQM data is between DPCC and Axis Nano Technologies Pvt Ltd and there is no involvement of DJB, though the system is within DJB campus. Access to RTWQM Data is provided to DPCC (and also to CPCB). The contract between Axis Nano and DPCC was signed nearly 2 years back and will come to an end in 6 months. Since copy of contract was not available, it could not be ascertained the mechanism stipulated for verification of data quality.
- RTWQM system was found working and the values for all 11 parameters were being displayed. The parameters monitored are pH, DO, BOD, COD, Turbidity, Conductivity, TSS, TOC, NH₄-N, NO₃ and Temperature.
- It appeared that there is no mechanism of quality assurance and no involvement of DPCC for ensuring quality control / calibration of RTWQM data. Representative of Axis Nano Technology informed that they carry out manual water quality analysis and calibrate the system periodically. Data generated is provided regularly to DPCC.
- It was observed that due to lack of a proper quality assurance, some of the values are not reflecting prevailing water quality of Yamuna River. The water appeared polluted and was black in colour.

- DJB officials were also present at the time of assessment of RTWQM functioning. In context of high ammonia in Yamuna River (monitored on hourly basis presently by DJB in laboratory), RTWQM data could be a useful supplementary tool, provided quality assurance is followed for RTWQM system. DJB analyses all the important parameters regularly within the same premises itself and in better position to manage RTWQM system.

8.1.2 Recommendations

RTWQM system is a useful supplementary mechanism for water quality monitoring and in context of water pollution of River Yamuna – especially due to frequent high levels of Ammonical nitrogen, its data could be properly utilized. Hence, following recommendations are made:

1. Involvement of DJB in managing RTWQM system is likely to have a positive impact for quality assurance of RTWQM data.
2. A display system may be set up at DJB laboratory displaying RTWQM data continuously to assist the DJB in taking timely action in water treatment plant.
3. DPCC representatives should witness calibration checks done by M/s Aaxis Nano Technologies Pvt Ltd.
4. DPCC may seek further guidance on quality assurance from CPCB, if needed.

8.2 Real Time Water Quality Monitoring of River Yamuna at Palla Delhi-Haryana Border

8.2.1 Introduction

On March 23,2021, official from CPCB along with officials from Delhi Pollution Control Committee (DPCC) jointly inspected location on River Yamuna at Palla (Delhi Haryana-Border) for relocation of real time water quality sensor (Ammonia) in view of reduced/no flow at the location. The Ammonia sensor (Make Xylem WTW) was installed by M/s Nevco Engineers Pvt Limited on left bank to measure Ammonical Nitrogen (NH₄-N) parameter in River Yamuna (**Figure 15**). The data was being provided for one year to DPCC and offsite calibration was being done by the data service provider at regular intervals.



Figure 15: RTWQMS Installed at Palla River Yamuna

8.2.2 Issues

Real Time Water Quality station on River Yamuna at Palla was non- operational since March 02, 2021 due to inadequate flow at the location. Ammonia sensor was removed and kept with DPCC.

8.2.3 Observations

- River Yamuna at Palla was observed dry near the left bank but in the middle within same regime (10-20 meter from left bank) required flow and depth of water was available. This location is most suitable for deploying the sensor in floating mode.
- Nearby locations were surveyed for the feasibility (i.e. location accessibility and security) for relocation of the RTWQM sensor. The team physically visited and verified two locations on upstream where required flow was available on the day of visit. One location is 200 meter on upstream (Coordinates N 28.8516060, E 77.2094266) (**Figure 16 (a)**) and another is 1Km on upstream (Coordinates N 28.8571138, E 77.2076001) **Figure 16 (b)**.
- Team after visiting downstream 4-5 km (approx.) observed that river bed was completely dry and feasibility to relocate and installed sensor (i.e. supporting physical structure Bridge) is not feasible on left bank.

8.2.4 Recommendations

RTWQM system is a valuable additional mechanism for measuring water quality besides manual monitoring in context of water pollution especially due to recurring events of elevated Ammonical nitrogen level at Delhi-Haryana Border. Hence, following recommendations are made:

- Ammonia sensor may be relocated within same regime i.e. from left Bank to middle of the river bed where required depth and flow of water are available. Since River is experiencing lean flow presently in March, 2021 floating subsystem may be deployed till flow in river improves.
- Flow meter may be installed and alerts may be generated for ensuring regular water level at the new location.
- The Data service provider may be requested to follow regular on-site calibration checks, at monthly frequency.



Figure 16 (a) River Yamuna upstream of present location (200 meter) (Coordinates N 28.8516060, E 77. 2094266)



Figure 16 (b) River Yamuna upstream of present location (2 Km) (Coordinates N 28.8571138, E 77.2076001).

9. Visit of CPCB Team to Delhi Jal Board, Wazirabad Water Treatment Plant Laboratory

Officials from CPCB along with officials from Upper River Yamuna Board visited the Laboratory at Wazirabad Delhi Jal Board on 07.01.2021. Earlier, in 2018, officials of CPCB visited the laboratory and it was proposed to organize a training programme for all the laboratory staff for assessment of water quality parameters. A two-day training programme was conducted by CPCB which was attended by 40 officials from DJB. Upon discussion with officials in DJB Laboratory, it was concluded that detection of Ammonical nitrogen parameter was being done by visual method by comparing colour of the sample with standard solutions of different concentration upon addition of Nessler's reagent. DJB officials informed that total seven officials were working in Laboratory in two shifts and analysis of Ammonical nitrogen in inlet water was being done every 10 minutes. Due to manpower and time constraints, advanced methods of detection like UV-VIS Spectrophotometry & Ion-electrode method would not be possible.

9.1 Observations

- The UV-Vis Spectrophotometer was rarely used. There was no maintenance of records for calibration graph, analyst name or date of analysis performed.
- The 1000ppm stock solution for preparation of standards of different concentration was kept in glass bottle in the room instead of being kept in dark in cold condition.
- Detection of chloramines in outlet was being carried out by IIIrd party (CSIR-NEERI) on half yearly basis.
- Basic good quality apparatus and accessories like tissue roll for cleaning of cuvette, Rubber bulbs & pipettes were not available.

The following guidance was provided to the laboratory officials for detection of Ammonical Nitrogen using UV- VIS Spectrophotometer.

- Register wavelength for Ammonical Nitrogen detection at 415nm instead of 425nm.

- Maintain three separate registers for analysis of parameters using (i) Spectrophotometer, (ii) Titrimetric and (iii) Gravimetric.
- Another training session may be conducted by CPCB or CWC for analysis of water quality parameters.

Team also visited the RTWQM station on Wazirabad Pond. Team had taken note of parameters displayed on the screen. CPCB, DJB and UYRB collected the samples for Ammonical nitrogen and other physico-chemical parameters.

The results of sample collected by CPCB and the real-time values displayed at the time of visit are tabulated in **Table 5**.

Table 5: Analytical results of sample collected by CPCB and the real-time values														
	Ammonical N (mg/L)	DO (mg/L)	pH	COD (mg/L)	BOD (mg/L)	TSS (mg/L)	Cl (mg/L)	Conductivity μ hos/cm	Total Coliform (MPN/100ml)	Fecal Coliform (MPN/100ml)	Turbidity as NTU	Nitrate (mg/L)	TOC (mg/L)	Temperature (°C)
Wazirabad Pond Lab report	3.3	6.2	7.5	18	3.2	8	90	758	17000	7000	3	1.4	-	-
RTWQM display	0.72	4.69	7.4	11.16	1.26	12.26		673	-	-	13.28	0.58	2.4	15.8

The photographs of the visit to DJB Wazirabad Water Treatment Plant laboratory are given in **Annexure XVII**.

9.2 Standard protocols for analysis to be followed for determination of Ammonical Nitrogen, IS:3025 (Part34)- 1988 (First reprint April-1992)

Method of sampling and test for water and wastewater, Part-24 Nitrogen

9.2.1 Scope: - Prescribed Method for determination of various types of Nitrogen like Ammonical Nitrogen, Nitrate, Nitrite and organic in water and wastewater

Nesslerization Method

The sample is buffered and distilled. The ammonia in the distillate or in the sample is

treated with Nessler reagent and the colour developed is matched with that series of standard ammonia solution or measured photometrically at 400 to 425 nm of AMMONIACAL NITROGEN – N

Stock Solution: 100 PPM, 0.3819 gm/ L

Working Standard: 10 PPM

Working Range: 0 – 2 PPM

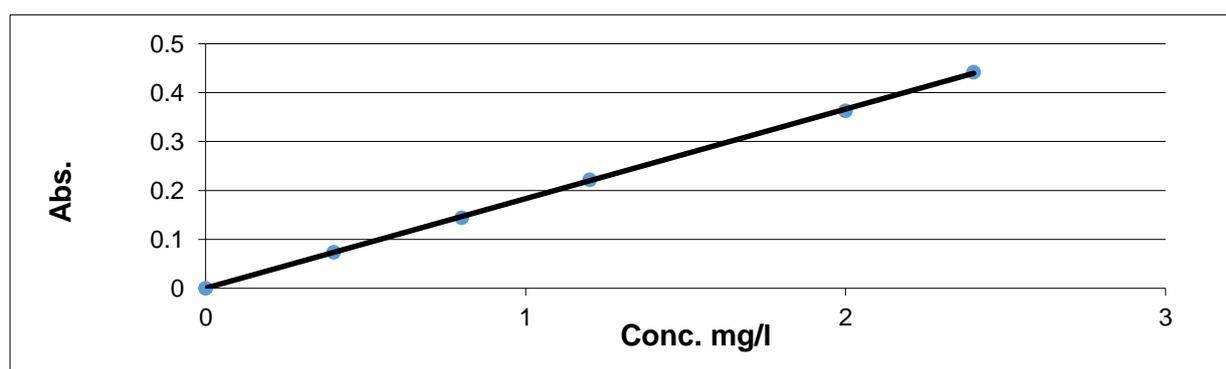
Conc.	Vol. in 50 ml	Abs.
0.0 PPM	0.0 ml	
0.2 PPM	1.0 ml	
0.4 PPM	2.0 ml	
0.6 PPM	3.0 ml	
0.8 PPM	4.0 ml	
1.0 PPM	5.0 ml	

- (i) Take all the standard solution into 50 ml volumetric flask and make up to 50 ml with distilled water
- (ii) Mix well then transfer all the standard into 50 ml Nessler tube.
- (iii) Add 1 ml Rochella salt for remove of calcium and magnesium interference mix than
- (iv) Add 1 ml Nessler reagent further mix well and leave for 10 minutes for complete colour development.
- (v) Set 0 (zero) with reagent blank at 415 nm.
- (vi) Take the absorbance of all standards as well as unknown samples.
- (vii) Plot the calibration graph and find out the multiplying factor (M.F.)

Concentration of Ammonical Nitrogen – N = Absorbance X M. F. X D (mg / L)

Where,

Abs = Absorbance of sample, M. F. = Multiplying factor, D = Dilution if required



Note:

- Treatment of un-distilled sample remove the residue chlorine.
- Always use the filtrate sample for Ammoniacal Nitrogen.
- In case of sewage and drain water having the Ammoniacal Nitrogen more than 20 PPM. Sample should be pre distilled then there are two methods either titration or spectrophotometer.

10. Report of Joint Surveillance Squad

STOP CORONA – WEAR MASK, FOLLOW PHYSICAL DISTANCING & MAINTAIN HAND HYGIENE

JOINT SURVEILLANCE SQUAD (JSS) REPORT

STOP CORONA – WEAR MASK, FOLLOW PHYSICAL DISTANCING & MAINTAIN HAND HYGIENE

Clayton

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4. Sources of Pollution leading to River Yamuna
5. Hotspots Mapping
6. Status of unauthorized colonies falling from Palla to Wazirabad
7. Map
8. Joint Surveillance Squad analysis Reports
9. Suggestions to improve the quality of River Yamuna

Prakash

1. Introduction

A meeting was held on 04.01.2021 of the Study Group through video conferencing under the Chairmanship of Member Secretary, CPCB. As per the decision taken in the said meeting a joint Surveillance Squad (JSS) was constituted comprising of Representatives from Delhi Jal Board, Representative of Delhi Pollution Control Committee, Representative of Irrigation and Flood Control Department, Govt. of Delhi, Representative of Haryana State Pollution Control Board and Representative of Irrigation and Water Resource Department, Haryana.

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2. Objective of Joint Surveillance Squad (JSS)

1. Mapping of the drains DD2 and DD8 shall be done from the point of their origin to the point of confluence with river Yamuna by Joint Surveillance Squad comprising of officials from Delhi and Haryana State agencies.
2. Mapping of the first order drains as well as the second order drains shall be done including the markings of villages, towns and cities of importance and their details.
3. Confluence of second order drains with the major drains shall also be marked and samples shall be collected.
4. Sampling points shall include confluence points of the drains as well as the upstream and downstream points of the confluence.
5. Mapping exercise shall be completed in 07 days by the Joint teams of Delhi and Haryana State.
6. Coordinates (Latitude and longitude) shall also be marked of the sampling point on the map showing its location and importance.
7. Analysis of the additional parameters such as Nitrate in place of Nitrite, Flow of the drain, colour shall also be done.
8. During mapping, illegal disposal through tankers should also track to identify the nearby possible sources of pollution.
9. The report by the Joint Surveillance Squad shall be submitted to CPCB within 10 days.

3. Procedure adopted to carry out the Inspection:-

The inspection was done by Study Group (Yamuna) constituted by CPCB on 12.01.2021 and 14.01.2021. Following officer was present during the time of inspection:-

1. Sh. Jagdish Arora, OSD to Member Water Supply, Delhi Jal Board.
2. Sh. Ashutosh Kaushik, Director Quality Control, Delhi Jal Board.
3. Sh. Mesharam, Representative from Delhi Pollution Control Committee.
4. Sh. Sanjay Saxena, Representative of Irrigation and Flood Control Department, Delhi.
5. Sh. Bhupinder Chahal, Representative of Haryana State Pollution Control Board.
6. Sh. Navdeep Rathore, Superintendent Engineer, Yamuna Water Services, Circle Delhi.

(Signature)

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4. Sources of Pollution leading to River Yamuna

Joint Surveillance Squad has identified the Hotspots points which lead to River Yamuna and affect the quality of River Yamuna. The Hotspots have been identified along Yamuna Nagar, Karnal, Panipat, Sonipat and Delhi. The details of these Hotspots are given as under:-

Yamuna Nagar

There are two major Hotspots points in Yamuna Nagar which affect the quality of River Yamuna;

- i. Maskara Nallah
- ii. Ditch Drain

Karnal

There are four major Hotspots points in Karnal which affect the quality of River Yamuna;

- i. Dhanaura Escapemeets River Yamuna near Jarauli.
- ii. Indri Drain meets Drain No. 2 at Munak.
- iii. Phurlak Drain meets Drain No. 2 at Dadlana.
- iv. Gharaunda Nallah meets Drain No. 2 at Babarpur.

Panipat

There are two major Hotspots points in Panipat which affect the quality of River Yamuna;

- i. Panipat Drain passing through District Panipat.
- ii. Drain No. 2 leading to River Yamuna.

Sonipat

There are two major Hotspots points in Sonipat which affect the quality of River Yamuna;

- i. Drain No. 6 which meets at the Downstream of Wazirabad Water Works, Delhi.
- ii. Diversion Drain No. 8 which meets River Yamuna at Dahessra.

5. Hotspots Mapping

- a. Panipat Drain No. 1, (29.194393, 77.23024)
- b. Drain No. 2 at confluence of Yamuna River (29.276513, 77.1223253)
- c. Rohtak Regulator (28.91483, 77.00482)
- d. Diversion Drain No. 8 at confluence of Yamuna River (28.8620460, 77.2069519)

Clausme

Beside the above said points following points has also been identified contributing to DD2 and DD8. The detail with coordinates is given in table below:-

Sr. No.	Name of Department	Name of Drain	Source of Untreated effluent	Coordinates of drain	
				Latitude	Longitude
1	ULB	Panipat Drain	STP & Old Industrial Area of Panipat City	29.402261	76.963211
2	ULB	Panipat Drain	From Sump near Devi Mandir	29.398994	76.975428
3	HSVP	Panipat Drain	Direct fall of HUDA, Sector 11 & 12	29.384853	76.987608
4	PHED/ HSPCB	Panipat Drain	STP Siwah	29.335692	76.992772
5	PHED/ HSPCB	Panipat Drain	Old STP Siwah	29.335122	76.993203
6	ULB	Main Drain No.2	Untreated Sewage/Effluent of Panipat Drain	29.331231	77.050772
7	Village Panipat (195000)	Rainal, (RD)	Drian No. 2 Untreated Sewage Effluent	29.251359	77.100142
8	Village Panipat (195225)	Rainal, (RD)	Drian No. 2 Untreated Sewage Effluent	29.251456	77.100227
9	Village Panipat	Rainal, (RD)	Drian No. 2 Untreated Sewage Effluent	29.272510	77.151516

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	195750)					
10	Village Begumpur, Panipat (RD 173500	Drian No. 2	Untreated Sewage Effluent	29.288033	77.091666	
11	Village Tajpur (RD 162100)	Drian No. 2	Untreated Sewage Effluent	29.296640	77.066651	
12	Village Tajpur (RD 161900)	Drian No. 2	Untreated Sewage Effluent	29.296333	77.066182	
13	Village Tajpur (RD 161700)	Drian No. 2	Untreated Sewage Effluent	29.296174	77.064884	
14	Village Tajpur (RD 161575)	Drian No. 2	Untreated Sewage Effluent	29.296110	77.064884	
16	Village Shimla Gujran, (RD 151000)	Drian No. 2	Untreated Sewage Effluent	29.317982	77.057377	
17	Village Shimla Gujran, (RD 151300)	Drian No. 2	Untreated Sewage Effluent	29.317363	77.057115	

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6. Status of unauthorized colonies falling from Palla to Wazirabad

S.No.	Name of Colony falling from Palla to Wazirabad	Registration No.	Status of Sewer Line	Likely date of Completion	Remarks
1	Bhagwan Park, Jharoda Majra, Burari, Delhi-84	33	Work is under progress	30.06.2021	Currently all the discharge is falling in Supplementary Drain and no discharge is falling into River Yamuna upstream of Wazirabad (Work is being taken up under Wazirabad GOC).
2	Hardev Nagar, Jharoda Majra, Burari	70A			
3	Hardev Nagar, Jharoda Majra, Burari	70B			
4	Sangam Vihar Wazirabad, Delhi	340			
5	Jharoda Extn, Pt-1, Majra Burari	388			
6	Jharoda Extn.-II, Part Cross Road, Burari, Delhi-84	471			
7	Jharoda Part-3, Surender Colony, Burari, Delhi-84	508			
8	Jagatpur, Village. Jagatpur (Extended Purani Abadi) Delhi-84	568			
9	Harijan Basti Jharoda, Mazra, Delhi-84	622			
10	Milan Vihar Near Jagat Pur Bandh Sant Nagar(Burari) Delhi-84	771			
11	Deepansu Colony Sant Nagar Burari, Delhi	977			
12	Jagat Pur More, Burari, Delhi-84	1101B			

Ansme

B

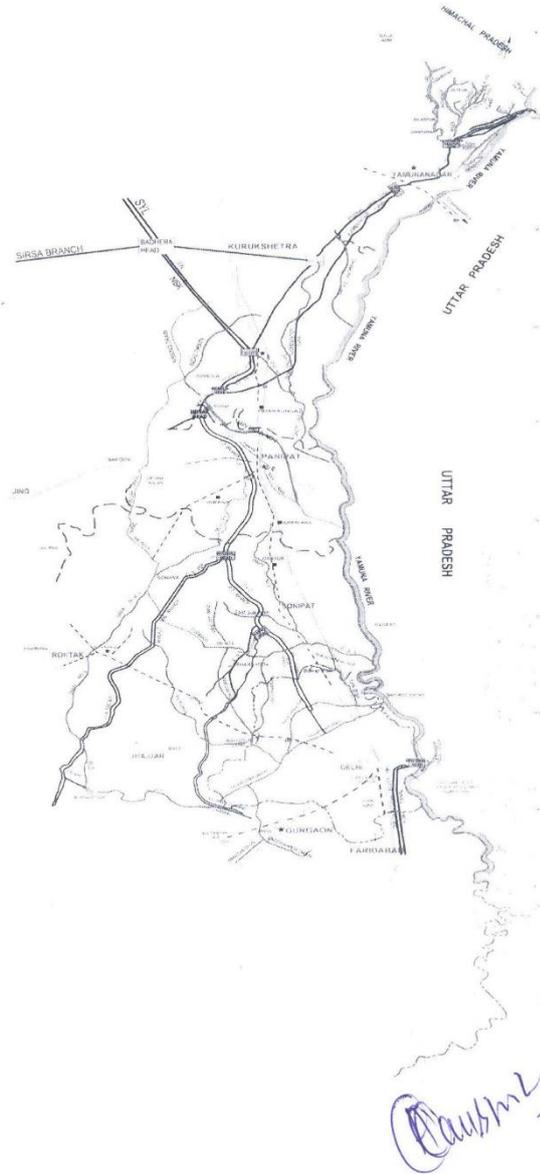
13	Nehru Gali, Bhagat Colony, Burari, Sant Nagar, Delhi-84	87	Work is under progress	30.09.2022	Currently all the discharge is falling in Supplementary Drain and no discharge is falling into River Yamuna upstream of Wazirabad (Work is being taken up under Sant Nagar GOC)
14	Chanden Vihar, West Sant Nagar, Burari, Delhi-84	113A			
15	Chanden Vihar, West Sant Nagar, Burari, Delhi-84	113B			
16	Hingiri enclave, Burari Road, Delhi-84	151			
17	Baba Colony B-Block, Burari, Delhi-84	196			
18	Uttranchal Enclave, Burari, Delhi	233			
19	Sant Nagar Block 'A' Burari Road, Delhi	237			
20	Hingiri Enclave, Mukand Pur (Extn.-II), Burari	245			
21	Tomar Colony (Kamal Pur) Burari, Delhi-84	271			
22	Parvatiya Anchal, C-Block, Sant Nagar, Burari, Delhi-84	282			
23	Kaushik Enclave, A-Block, Burari Road, Delhi	287			
24	Vashisht Enclave, Baba Colony, Burari, Delhi-84	302			

(Kaushik)

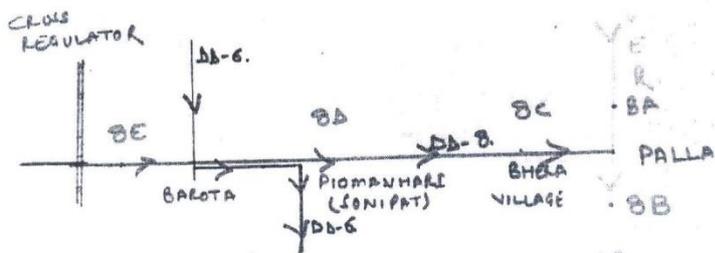
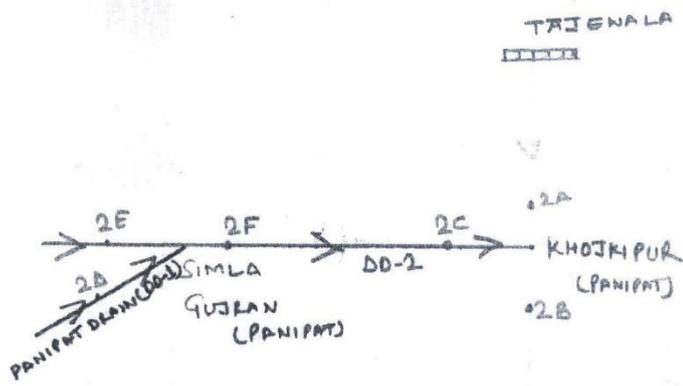
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7. Detail of Hotspots points as mentioned above is given in Map.

YAMUNA BASIN FROM HKB TO OUTFALL NAJAFGARH DRAIN



18



Paushik

8. Joint Surveillance Squad analysis Reports

Date: 12.01.2021

Sampling was done by the study group using DJB Lab team and conducted the 'on the spot' test of Ammonical Nitrogen and a set of same samples (parallel samples) was sent to the NABL accredited lab of Haryana State Pollution Control Board, Panchkula. In two spots (Diversion Drain No.8 and Palla), the samples were collected by DJB but on the spot test was not done and the samples were sent to their Lab. The details of results are given as below:

Table-1

Location of sampling point	Ammonical Nitrogen (on the spot test by DJB) (mg/l)	Ammonical Nitrogen (tested in DJB Lab) (mg/l)	Ammonical Nitrogen (as tested by NABL accredited lab of HSPCB Panchkula) (mg/l) *
Sanjoli, Panipat-(upstream)- (2A)	NIL	ND (Not detected)	0.16
Khojkipur-(after mixing Yamuna), Panipat- (2B)	0.5	0.5	0.23
Drain No 2- (before mixing Yamuna)- (2C)	6	6	4.48
Diversion drain no.8 at Behra Village -(8C)	--	2.0	0.18
River Yamuna at Palla (Shank No. 1) -(8B)	--	1.0	NIL

Date : 14.01.2021

Table-2

Location of sampling point	Ammonical Nitrogen (on the spot test by DJB) (mg/l)	Ammonical Nitrogen (tested in DJB Lab) (mg/l)	Ammonical Nitrogen (as tested by NABL accredited lab of HSPCB Panchkula) *
Barrage at upstream of water treatment plant, Wazirabad, Delhi	2.2	2.2	Not detected
Harmapur Village Point (Pur Point)	1.5	1.5	Not detected
Picholra Village	0.2	0.2	0.036
Ramghat Wazirabad, Delhi	0.3	0.3	Not detected

(Details analysis report along conducted at DJB Lab with photographs and schematic map is attached as annexure-A)

* The report is submitted by Haryana SPCB and is at variance with DJB report and needs to be deliberated further.

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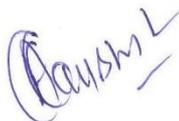
12

9. Suggestions to improve the quality of River Yamuna

1. Real Time Water Quality Monitoring System (RTWQMS) should be installed at the entire pollution source, STPs, CETPs in command area and Hot spots identified by JSS.
2. All the existing STPs and CEPTs in Haryana need to improve to maintain the Quality of the drains contributing the pollution in river.
3. It has been observed that there are colonies, inhabitation, agricultural activities etc on both sides of River Yamuna. For effective monitoring, checking of pollution, it is recommended that CPCB, HSPCB, DPCC, UP SPCB should develop mechanism for preventing pollution in River Yamuna.
4. It has been observed that there may be chances of dumping of sewage pollutants etc. through tankers. For effective monitoring, checking of pollution, it is recommended that CPCB, HSPCB, DPCC, UPS PCB should develop mechanism for preventing pollution in River Yamuna.
5. It is observed that checking and preventing, monitoring of pollution is the mandate of CPCB, HS PCB, DPCC, UP SPCB etc. Therefore, a permanent committee comprising of representative of above Pollution Control Boards and headed by CPCB representative should be constituted. For effective monitoring, checking of pollution, it is recommended that CPCB, HSPCB, DPCC, UP SPCB should develop mechanism for preventing pollution in River Yamuna. The HID, DJB etc should provide logistic support to the committee.



Jagdish Arora,
OSD to Member WS, DJB

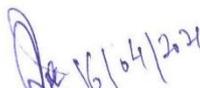


Ashutosh Kaushik,
Dir (T&QC) DJB

Bhupinder Singh
RO, HSPCB, Sonapat



Navdeep Rathore,
SE, ID, Haryana



Sanjay Saxena
IFCD, Delhi



P. B. Mesharam,
DPCC

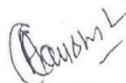
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9. Suggestions to improve the quality of River Yamuna

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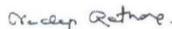
Jagdish Arora,
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Ashutosh Kaushik,
Dir (T&QC) DJB



Bhupinder Singh
RO, HSPCB, Sonapat



Navdeep Rathore,
SE, ID, Haryana

Sanjay Saxena
IFCD, Delhi



P. B. Mesharam,
DPCC

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**DELHI JAL BOARD
GOVT. OF N.C.T. OF DELHI
QUALITY CONTROL LABORATORY
W.W.WAZIRABAD, DELHI-110054**

Study Group Yamuna river survey report on dated 12.1.2021

S.N.	Point of Sampling	Time	Ammonical-N (PPM)	Chloride (PPM)	T. Alkalinity (PPM)	T. Hardness (PPM)	E.con (µm/cm)	D.O (PPM)	pH Value
1.	Sanjoli Village Up Stream <i>2A</i>	01:48PM	ND	6.0	134	160	370	10.6	8.2
2.	Khojkipur DD-2 After Mixing Yamuna River <i>2B</i>	02:20PM	0.50	44	168	184	550	8.8	8.0
3.	DD-2 Pure Drain <i>2C</i>	03:40PM	6.0	330	420	306	1965	ND	7.7
4.	Behra Village DD-8 <i>8C</i>	05:42PM	2.0	388	154	420	2310	9.0	7.9
5.	Shank No.1 (Palla) <i>8B</i>	06:00PM	1.0	118	140	226	920	7.4	8.1

Member of study group;

1. Sh. J.K. Arora, OSD to Member (WS)DJB
2. Sh. Ashutosh Kaushik, Director(T&QC)DJB
3. Sh. Pankaj Rajwanshi, EE(E&M)DJB
4. Sh. Navdeep Rathor, SE, HID
5. Sh. Bhupender Singh, RO, HPPCB
6. Sh. Meshram, DPCC

(Signature)
(ASHUTOSH KAUSHIK)
DIRECTOR (T&QC)
DELHI JAL BOARD
(GOVT. OF NCT DELHI)
WW WAZIRABAD, DELHI-54

STOP CORONA

WASH YOUR HANDS

WEAR MASK

DELHI JAL BOARD
GOVT. OF N.C.T. OF DELHI
QUALITY CONTROL LABORATORY
W.W.WAZIRABAD, DELHI-110054

Joint Yamuna river survey Analysis report on dated 14.01.2021

S.N.	Point of Sampling	Time	pH Value	Ammonical-N (PPM)	E.cond. (μ S/cm)	Chloride (Mg/l)	T. Alkalinity (Mg/l)	T. Hardness (Mg/l)	D.O. (Mg/l)	C.O.D (Mg/l)
1.	Yamuna River at Wazirabad Barrage	01:00 PM	7.5	2.2	786	92	140	218	6.8	40
2.	Pur (Delhi-UP Border)	01:30 PM	7.5	1.5	724	82	140	206	8.2	30
3.	Puchara (U.P.)	02:40 PM	7.9	0.20	734	84	162	228	7.2	18
4.	Ramghat Wazirabad	03:15 PM	7.1	0.30	1209	144	324	334	9.4	85

16/1/21
ACWA

AShah
CHEMIST 16/1/21

Sharma
A/CHEMIST 16/1/21

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Sanjoli Village , Dtd 12.01.2021- 2A



Sanioli Villaae . Dtd 12.01.2021- 2A

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Khojki pur , Dtd 12.01.2021- 2B



Behra Village DD-8, Dated 12.01.2021- 8C

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Joint Surveillance Squad collect the result of water samples of Hotspots points of Different District. The detail of which is given below:

Table-1

Results of water samples collected from Trains/River Yamuna Yamuna Nagar Region																			
1 River Yamuna before meeting Maskara Nallah, up stream, Kalanaur (YMN-RDQ-001)																			
Date of sample collection	A/R No. & date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci
10.04.2020	2491 dt. 22.04.2020		7.72	BLD(DL=1)	BLD(DL=5)	BDL (DL=5)	BDL (DL=2)	BDL				272							
13.05.2020	2742 dt. 22.05.2020		7.72	1.6	6.4	BDL (DL=5)	BDL (DL=2)					180							
15.07.2020	3369 dt. 29.07.2020	2.55	7.88	3.6	11.8	7	BDL (DL=2)		6.9	9000	94000	275	0.119	0.25	14	0.21	2.68	144	5000
14.08.2020	3630 dt. 24.08.2020	0.61	7.14	5.5	26.4	77	BDL (DL=2)		7.1	11000	79000	272	ND	0.11	22	0.3			9000
09.10.2020	4082 dt. 10.10.2020		7.83	2.4	8	14	BDL	N.D.	7.3	11000	70000	196	N.D.	0.29					86
07.11.2020	4341 dt. 08.11.2020		8.34	5.2	22	12	N.D.	N.D.	7.1	7000	21000	378		0.06	18				196
16.12.2020	4599 dt. 30.12.2020		8.36	N.D.	4	N.D.	N.D.	N.D.	8.2	70	210	387	0.114	0.16	12				202
21.01.2021	156 dt. 01.02.2021		8.08	1.4	8	6	N.D.	N.D.	7.6	110	26000	287		0.09	8				148
12.02.2021	385 dt. 22.02.2021		7.88	3.6	16	18	N.D.	N.D.	7.6	1100	5800	335		0.41	22				198
2 Maskara Nallah, before meeting River Yamuna, Kalanaur, Vill. Ghorpipli, Yamuna Nagar (YMN-RDQ-002)																			
Date of sample collection	A/R No. & date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci
10.04.2020	2490 dt. 22.04.2020		8.2	2.5	17.6	8	BDL (DL=2)	BDL				776							
29.06.2020	3047 dt. 14.07.2020	0.12	7.45	11	36.4	17		BDL	6.4	20000	120000	152	0.074	0.007	24	BDL	1	78	14000
15.07.2020	3371 dt. 29.07.2020	3.05	7.87	7.2	23.2	11	BDL (DL=2)		6.7	14000	141000	266	BDL	0.12	10	0.41	4.33	142	9000
14.08.2020	3632 dt. 24.08.2020	1.48	7.1	42	140.8	89	BDL (DL=2)		5.2	26000	120000	288	ND	0.11	32	0.18			17000
09.10.2020	4084 dt. 10.10.2020		7.94	7	36.4	34	BDL	N.D.	BDL	26000	109000	196	N.D.	N.D.					102
07.11.2020	4343 dt.		8.31	7	40	15	N.D.	10.72	6.4	11000	26000	359		N.D.	18				178

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		08.11.2020																			
16.12.2020	4598 dt. 30.12.2020		8.33	2.4	9	10	N.D.	N.D.	7.2	2100	5800	490	0.114	0.12	16			252			
21.01.2021	157 dt. 01.02.2021		8.15	3.6	14	9	N.D.	N.D.	7.2	1700	3900	385		0.12	10			202			
12.02.2021	386 dt. 22.02.2021		7.92	22	88	32	N.D.	N.D.	6.7	1700	34500	318		0.024	26			186			
3 River Yamuna after meeting Maskara Nallah, Down Stream, Kalanaur (YMN-RDQ-003)																					
Date of sample collection	A/R No. & date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci		
10.04.2020	2492 dt. 22.04.2020		8.52	BDL (DL=1)	11.2	7	BDL (DL=2)	BDL				275									
13.05.2020	2743 dt. 25.05.2020		7.69	2.2	9.6	7	BDL (DL=2)					176									
09.06.2020	2857 dt. 15.06.2020		7.85	2.6	10.4	12	BDL (DL=2)					1830									
15.07.2020	3370 dt. 29.07.2020	2.84	8	3.8	14.4	8	BDL (DL=2)		6.6	11000	120000	266	BDL		10	0.24	4.88	136	9000		
14.08.2020	3631 dt. 24.08.2020	0.93	7.09	12	48.8	81	BDL (DL=2)		6.8	21000	21000	290	ND		26	0.19			11000		
09.10.2020	4083 dt. 10.10.2020		7.9	4.5	19.6	23	BDL	N.D.	6.9	17000	84000	195	N.D.	0.09					88		
07.11.2020	4342 dt. 08.11.2020		8.28	6.2	28	26	N.D.	N.D.	6.8	9000	27000	357		0.018	14				182		
16.12.2020	4600 dt. 30.12.2020		8.37	3.8	16	12	N.D.	N.D.	8	110	330	426	N.D.	0.17	18				222		
21.01.2021	158 dt. 01.02.2021		8.22	2.8	12	7	N.D.	N.D.	7.4	2200	4100	399		0.18	16				222		
12.02.2021	387 dt. 22.02.2021		8.02	4	16	30	N.D.	N.D.	7.6	700	6300	312		0.29	24				198		
4 Ditch Drain, Starting Point (YMN-RDQ-004)																					
Date of sample collection	A/R No. & date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci		
10.04.2020	2489 dt. 22.04.2020		7.9	26	112.4	65	2.5	14.56				1107									
13.05.2020	2740 dt. 22.05.2020		6.92	120	392.4	490	12					670									
15.07.2020	3368 dt. 29.07.2020	4.72	7.09	52	179.2	147	9		BDL	270000	1750000	119	0.191	0.44	90		12.75	642	39000		
14.08.2020	3629 dt. 24.08.2020	2.34	6.33	60	203.6	167	4.5		BDL (DL=1)	490000	1410000	337	ND	0.06	56	0.13		174	63000		
09.10.2020	4081 dt. 10.10.2020		7.38	56	193.6	92	11.5	7.83	BDL	460000	1200000	1014	N.D.	0.38					538		

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07.11.2020	4340 dt. 08.11.2020		7.94	46	176	328	N.D.	18.36	N.D.	109000	278000	1341		0.07	114				722	
16.12.2020	4597 dt. 30.12.2020		7.28	80	324	162	4.5	7.36	N.D.	109000	542000	8820	1.072	0.09	78				4826	
21.01.2021	159 dt. 01.02.2021		7.31	180	744	428	9.5	16.54	N.D.	212000	426000	1761		0.07	48				960	
12.02.2021	384 dt. 22.02.2021		7.38	42	172	152	3.5	8.66	1.2	2700	42600	1139		2.21	72				648	
Karnal																				
1 River Yamuna before meeting Dhanaura Escape upstream, Karnal (KRN-RDQ-001)																				
Date of sample collection	A/R No. & date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci	
11.04.2020	2499 dt. 22.04.2020		6.84	BDL (DL=1)	12.4	6	BDL (DL=2)	BDL				318								
23.04.2020	2598 dt. 08.05.2020		6.66	BDL (DL=1)	11.2	4	BDL (DL=2)	BDL				679								
04.05.2020	2673 dt. 19.05.2020		5.92	1.8	9.2	6	BDL (DL=2)	BDL				747	0.751							
27.06.2020	3024 dt. 08.07.2020	0.14	7	3.8	14.8	21		BDL	6.8	17000	120000	200	0.202	0.05	10	0.12	4.12	122	11000	
15.07.2020	3306 dt. 29.07.202	2.04	7.12	3.8	11.8	11	BDL (DL=2)		6.9	22000	109000	243	BDL	0.3	18	0.32	0.46	124	9000	
07.08.2020	3588 dt. 21.08.2020		6.65	11	47.2	51	BDL (DL=2)	N.D.	6.5	80000	940000	255	N.D.					148		
01.09.2020	3793 dt. 24.09.2020		7.23	6.8	20.8	94	BDL (DL=2)	N.D.	6.7	14000		482	N.D.							
05.10.2020	4032 dt. 22.10.2020		8.37	3.8	13.2	8	BDL	0.31	7.8	12000		379	N.D.							
04.11.2020	4305 dt. 05.11.2020		7.08	5.2	20	26	N.D.	N.D.	7.8	390	2700	326	0.196	0.18	14			188		
04.12.2020	4498 dt. 21.12.2020		8.12	5.2	20	15	N.D.	N.D.	6.9	250	2210	790	0.118					422		
04.01.2021	11 dt. 14.01.2021		8.07	2.8	12	9	N.D.	N.D.	8.2	270	2120	275	N.D.	0.11	10			142		
04.02.2021	315 dt. 19.02.2021		7.69	1.8	8	21	N.D.	N.D.	8.1	110	2100	365	0.587	0.28	14			226		
03.03.2021	487 dt. 12.03.2021		8.02	7.6	36	28	BDL	N.D.	6.4	1700	3600	410	N.D.	0.26	34			248		
2 Dhanaura Escape before meeting River Yamuna, Village Jarauli, Karnal (KRN-RDQ-002)																				
Date of sample collection	A/R No. & date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci	

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	03.03.2021	19.02.2021 489 dt. 12.03.2021		8.15	8	40	41	BDL	N.D.	6.7	2000	4100	480	0.218	0.27	28			282	
4	Indri Drain Near Village Dadlana on Dadlana bridge at Moonak Road, Karnal (KRN-RDQ-004)																			
	Date of sample collection	A/R No. & date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci
	11.04.2020	2501 dt. 22.04.2020		7.13	3	20.4	5	BDL (DL=2)	BDL				1030							
	23.04.2020	2600 dt. 08.05.2020		7.1	4.5	17.6	7	BDL (DL=2)	BDL				1231							
	04.05.2020	2670 dt. 19.05.2020		6.95	7.6	22.4	12	BDL (DL=2)	BDL		27000		1123	0.38						
	02.06.2020	2825 dt. 12.06.2020	26000	7.3	11	28.8	43	7.5	17.92				849	BDL	BDL	BDL				
	27.06.2020	3027 dt. 08.07.2020	4.99	7.78	8	32.8	26		BDL	5.3	33000	130000	280	0.264	0.2	20	0.56	2.54	152	23000
	17.07.2020	3393 dt. 29.07.2020	3.52	6.59	10	40.8	56	BDL (DL=2)	BDL	BDL	170000	940000	440	0.12	0.09	26	0.21	41.24		27000
	07.08.2020	3539 dt. 18.08.2020		6.88	5.8	15.2	19	BDL (DL=2)	BDL	6.2	4000	14000	330	BDL						172
	01.09.2020	3797 dt. 24.09.2020		7.02	13	45.6	119	BDL (DL=2)	N.D.	6.4	27000		227							
	05.10.2020	4035 dt. 22.10.2020		8.08	10	36.4	15	BDL (DL=2)	4.48	6.3	22000		815	N.D.						
	04.11.2020	4308 dt. 05.11.2020		8.04	32	128	21	N.D.	1.85	5.6	49000	141000	1126	0.156	0.18	114				602
	04.12.2020	4502 dt. 21.12.2020		8.34	2.5	12	23	N.D.	N.D.	7.2	400	2000	410	0.209	0.07	18				220
	04.01.2021	15 dt. 14.01.2021		8	1.8	8	26	N.D.	N.D.	8.4	170	2100	360	0.195	0.09	20				176
	04.02.2021	321 dt. 19.02.2021		6.59	5.4	28	17	N.D.	1.86	7.8	270	4260	957	0.367	0.15	26				532
	03.03.2021	491 dt. 12.03.2021		7.74	14	64	8	BDL	N.D.	6.1	400	2700	517	0.186	0.19	22				296
5	Gharaunda Nallah at RD 30500 near bridge at Kohand Karnal (KRN-RDQ-005)																			
	Date of sample collection	A/R No. & date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci
	11.04.2020	2502 dt. 22.04.2020		7.32	16	46.4	26	BDL (DL=2)	17.36				1658							
	23.04.2020	2601 dt. 08.05.2020		7	11	40.8	20	BDL (DL=2)	14.56				1817							
	04.05.2020	2671 dt. 19.05.2020		6.88	12	52.4	30	BDL (DL=2)	15.68		17000		1694	0.558						
	02.06.2020	2826 dt. 12.06.2020	14000	7.25	27	78.4	46	5.5	15.68				866	BDL	BDL	BDL				

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27.06.2020	3026 dt. 08.07.2020	3.9	6.81	29	93.2	38		9.52	4.2	320000	1480000	1442	0.189	0.14	114	3.65	0.83	782	25000	
17.07.2020	3392 dt. 29.07.2020	3.36	6.99	42	141.6	88	4.5		3.6	220000	1410000	1420	0.212	0.02	42	0.62	82.14	772	32000	
07.08.2020	3536 dt. 18.08.2020		6.87	135.6						90000	200000	1471								
01.09.2020	3798 dt. 24.09.2020		6.94	36	122	124	BDL (DL=2)	15.12	N.D.	17000		1406								
05.10.2020	4034 dt. 22.10.2020		7.61	28	90.8	75	BDL (DL=2)	4.14	2.8	14000		1342	N.D.							
04.11.2020	4307 dt. 05.11.2020		7.82	42	160	89	N.D.	0.99	2.1	33000	109000	1185	0.316	0.29	74				648	
04.12.2020	4501 dt. 21.12.2020		7.66	46	172	312	N.D.	N.D.	4.2	33000	109000	1314	0.53						734	
04.01.2021	14 dt. 14.01.2021		7.46	90	324	222	6.5	22.19	N.D.	84000	426000	1018	0.579	0.15	64				548	
04.02.2021	320 dt. 19.02.2021		6.6	74	296	192	7.5	4.45	N.D.	109000	1600000	1100	0.499	0.42	62				618	
03.03.2021	490 dt. 12.03.2021		7.25	48	184	37	BDL	8.46	BDL	58000	212000	876	0.345	0.32	44				472	
6 Ditch Drain upstream of RSL Distillery, Karnal (KRN-RDQ-006)																				
Date of sample collection	A/R No. & date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci	
04.05.2020	2668 dt. 19.05.2020		6.9	130	385.6	426	12.5	26.32		21000		1420	0.951							
08.09.2020	3847 dt. 26.10.2020		6.46	23	76.8	84	N.D.					800	244							
05.10.2020	4029 dt. 22.10.2020		7.65	27	89.6	34	BDL (DL=2)	6.73	2.8			1068	N.D.							
04.11.2020	4302 dt. 05.11.2020		7.69	38	132	112	N.D.	5.84	2.6	26000	86000	890	0.377	0.14	66				472	
04.12.2020	4503 dt. 21.12.2020		7.39	92	368	52	3.5	5.06	N.D.	348000	426000		0.286						588	
06.01.2021	28 dt. 15.01.2021		8.03	8	36	37	N.D.	24.95				320	1.24		52					
04.02.2021	318 dt. 19.02.2021		6.93	23	80	118	N.D.	2.64	4.4	27000	177000	610	1.071	0.52	32				348	
03.03.2021	492 dt. 12.03.2021		6.95	120	464	112	8	14.18	BDL	109000	240000	1303	0.402	0.32	48				734	
7 Ditch Drain Downstream of RSL Distillery, Karnal (KRN-RDQ-007)																				
Date of sample collection	A/R No. & date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci	
04.05.2020	2669 dt. 19.05.2020		6.87	90	280	184	9.5	22.96		26000		1394	1.102							
08.09.2020	3848 dt. 26.09.2020		6.48	32	108.4	88	3.5					798	BDL							

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	05.10.2020	4030 dt 02.10.2020		7.64	29	100.8	36	BDL (DL=2)	8.79	2.6			1068	N.D.							
	04.11.2020	4303 dt 05.11.2020		7.82	58	208	136	N.D.	14.87	2.4	31000	94000	878	0.32						482	
	04.12.2020	4504 dt 21.12.2020		7.22	130	504	72	6	4.32	N.D.	542000	900000	1243	0.286						678	
	06.01.2021	28 dt 15.01.2021		7.97	9	40	42	N.D.	N.D.				327	0.528		32					
	04.02.2021	319 dt 19.02.2021		6.91	26	96	90	N.D.	2.52	4.1	31000	212000	998	0.527	0.35	44				556	
	03.03.2021	493 dt 12.03.2021		6.91	104	396	105	7.5	14.78	BDL	120000	278000	1301	0.4	0.37	52				726	
Panipat Region																					
1	Gharaunda Drain before meeting (Upstream) M/s Varun Beverage Ltd. (Old name Pepsico India Holdings Pvt. Ltd.), Vill. Ali Asgarpur, P.O. Ganjbar, G.T. Road Panipat (PNP-RDQ-001)																				
	Date of sample collection	A/R No. & Date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci	
	11.04.2020	2503 dt 22.04.2020		7.65	14	50.8	40	BDL(DL+2)	15.68		21000		1731	0.373	0.031						
	04.05.2020	2677 dt 19.05.2020		6.89	11	45.2	32	BDL(DI=2)	9.52		17000		1725	0.357	0.1						
	01.10.2020	4019 dt 02.10.2020		7.61	27	96.8	23	BDL	N.D.				1421	N.D.	0.1						
	06.11.2020	4317 dt 07.11.2020		8.23	25	108	46	N.D.	11.92	N.D.			1348		0.04	108				732	
	10.12.2020	4551 dt 22.12.2020		7.92	23	88	56	N.D.	8.57	3.8	84000	172000	761	N.D.	0.06	56				402	
	07.01.2021	36 dt 18.01.2021		7.55	23	92	46	N.D.	8.37	1.8	79000	172000	812	0.192	0.31					438	
	06.02.2021	334 dt 19.02.2021		7.55	36	140	88	N.D.	7.96	2.8	83000	345000	1354	0.04	2.04	102				756	
2	Gharaunda Drain after meeting M/s Varun Beverage Ltd. (Old name Pepsico India Holdings Pvt. Ltd.), Vill. Ali Asgarpur, P.O. Ganjbar, G.T. Road Panipat (PNP-RDQ-002)																				
	Date of sample collection	A/R No. & Date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci	
	11.04.2020	2504dt 22.04.2020		7.62	17	61.2	43	BDL(DL+2)	18.48		48000		1691	0.377	0.121						
	04.05.2020	2678 dt 19.05.2020		6.76	12	50.4	36	BDL(DI=2)	12.32		32000		1701	0.504	0.102						
	01.10.2020	4020 dt 02.10.2020		7.63	32	118.4	28	3.5	0.33				1418	N.D.	0.06						
	06.11.2020	4318 dt 07.11.2020		8.23	21	84	38	N.D.	13.85	N.D.			1403		0.35	142				762	
	10.12.2020	4552 dt		7.94	25	96	61	N.D.	8.4	3.6	84000	177000	760	0.293	0.38	68				412	

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		22.12.2020																			
	07.01.2021	37 dt 18.01.2021		7.56	28	120	54	N.D.	8.5	0.6	94000	212000	797	0.541	0.17					412	
	06.02.2021	335 dt 19.02.2021		7.5	28	116	41	N.D.	9.82	3.6	94000	348000	1460	0.529	2.94	112				818	
3	Drain No. 2 near vill. Dadola before meeting Panipat drain (PNP-RDQ-003)																				
Date of sample collection	A/R No. & Date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci		
11.04.2020	2707 dt 22.04.2020		7.35	4.5	26.4	7	BDL(DI=2)	BDL		23000		677	0.405	bdl							
04.05.2020	2681 dt 19.05.2020		7.79	11	28.4	6	BDL(DI=2)	BDL		21000		1347	0.373	BDL							
01.10.2020	4021 dt 02.10.2020		7.92	28	94	42	BDL	0.36				1460	N.D.	0.29							
06.11.2020	4319 dt 07.11.2020		8.13	26	116	32	3	7.32	4.2			1856		0.041	382				998		
10.12.2020	4553 dt 22.12.2020		8.14	16	64	42	N.D.	6.91	5.2	33000	109000	564	0.111	0.42	26				318		
07.01.2021	38 dt 18.01.2021		7.7	21	84	52	N.D.	3.14	2	39000	120000	1090	0.799	0.22					618		
06.02.2021	336 dt 19.02.2021		7.52	38	156	48	N.D.	13.19	N.D.	109000	426000	1433	0.671	2.51	132				792		
4	Panipat Drain Near Vill. Sewah before 35 MLD STP. (PNP-RDQ-004)																				
Date of sample collection	A/R No. & Date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci		
11.04.2020	2506 dt 22.04.2020		7.69	85	304.8	94	12	19.04		27000		2400	0.064	2.26							
04.05.2020	2680 dt 19.05.2020		6.86	48	162.4	78	4	14.56		26000		2030	0.552	1.853							
01.10.2020	4022 dt 02.10.2020		7.35	110	366.8	78	6.5	0.55				3730	N.D.	0.51							
06.11.2020	4320 dt 07.11.2020		8.05	104	420	82	7.5	8.02	N.D.			2010		0.37	778				1092		
10.12.2020	4554 dt 22.12.2020		7.59	180	724	148	7.5	7.76	N.D.	41000	148000	1320	0.578	0.39	78				700		
07.01.2021	39 dt 18.01.2021		7.5	110	500	159	6.5	2.22	N.D.	39000	141000	1470	0.105	0.21					788		
06.02.2021	337 dt 19.02.2021		7.36	68	264	110	4	6.4	N.D.	141000	1600000	3500	0.721	1.91	148				1956		
5	Drain No.2 after meeting discharge of Panipat drain at vill. Simla, Gujran (PNP-RDQ-005)																				

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Date of sample collection	A/R No. & Date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci	
11.04.2020	2508 dt. 22.04.2020		7.53	26	112.4	14	BDL(DI=2)	14.56		26000		1951	0.192	0.041						
04.05.2020	2682 dt. 19.05.2020		6.95	21	98.4	14	BDL(DI=2)	10.08		21000		2010	0.283	0.829						
01.10.2020	4023 dt. 02.10.2020		7.51	82	267.2	123	4	N.D.				2820	0.026	0.51						
06.11.2020	4321 dt. 07.11.2020		8.06	60	216	134	6.5	7.47	N.D.			2170		0.57	708			1172		
10.12.2020	4555 dt. 22.12.2020		7.83	62	284	108	3.5	8.94	N.D.	79000	120000	1006	0.438	0.52	86			526		
07.01.2021	40 dt. 18.01.2021		7.48	106	3.29	210	5.5	3.29	N.D.	76000	120000	1212	0.853	0.17				642		
06.02.2021	338 dt. 19.02.2021		7.44	72	268	122	4.5	5.33	N.D.	94000	1600000	2520	0.798	1.02	92			1392		
6 Drain No. 2 after meeting Gharanunda drain at G.T. Road crossing Babarpur, G.T. Road, Panipat (PNP-RDQ-006)																				
Date of sample collection	A/R No. & Date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci	
11.04.2020	2505 dt. 22.04.2020		7.11	18	64.4	16	BDL(DI=2)	BDL		33000		1531	0.194	0.153						
04.05.2020	2679 dt. 19.05.2020		7.18	14	59.2	12	BDL(DI=2)	BDL		27000		1447	0.307	0.122						
01.10.2020	4024 dt. 02.10.2020		8.03	16	52.8	42	BDL	N.D.				1169	N.D.	0.06						
06.11.2020	4322 dt. 07.11.2020		8.16	13	62	36	N.D.	7.93	7.1			1533		0.31	240			822		
10.12.2020	4556 dt. 22.12.2020		8.04	8	44	12	N.D.	8.18	6.9	76000	130000	322	0.133	0.31	16			152		
07.01.2021	41 dt. 18.01.2021		7.63	10	44	54	N.D.	3.38	0.8	79000	141000	880	0.842	0.19				462		
06.02.2021	339 dt. 19.02.2021		7.63	15	68	52	N.D.	6.45	3.2	58000	278000	1376	0.368	0.81	76			802		
7 River Yamuna before meeting the discharge of Drain No. 2 at Vill. Sanjoli (PNP-RDQ-007)																				
Date of sample collection	A/R No. & Date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci	
11.04.2020	2510 dt. 22.01.2020		7.5	BDL(DI=2)		22	BDL(DI=2)	BDL		11000		320	0.099	0.062						

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	04.05.2020	2684 dt. 19.05.2020		7.48	BDL(DI=2)	8.8	15	BDL(DI=2)	BDL		9000		257	1.437	0.022						
	26.06.2020	3035 dt. 08.07.2020	1.16	7.24	9	34.4	129		BDL	6.1	15000	172000	190	0.103	0.06	10	0.12	160.3	98	14000	
	27.07.2020	3454 dt. 07.08.2020		7.55	5.2	18.4	6		BDL	BDL	17000	120000	234	BDL	0.05	26	0.28	5.61	122	11000	
	07.09.2020	3842 dt. 26.09.2020		7.25	5.8	19.2	6	BDL(DL=2)	BDL		17000		277		0.16						
	01.10.2020	4025 dt. 20.10.2020		8.33	3.5	12.8	17	BDL(DL=2)	ND				314		0.27						
	06.11.2020	4323 dt. 27.11.2020	2.6	8.33	3.2	12	19	ND	1.85	7.8			363		0.1	16	0.24	1.82	199		
	15.12.2020	4576 dt. 30.12.2020		8.45	3.5	16	9	N.D.	N.D.	6.8	40	170	365	0.057	0.2	20				220	
	07.01.2021	42 dt. 18.01.2021		8.08	2.5	12	11	N.D.	N.D.	7.6	1100	4000	458	0.838	0.54					246	
	06.02.2021	340 dt. 19.02.2021		8.07	6	32	19	N.D.	N.D.	7.8	1100	4100	436	0.3	0.22	22				302	
8	Drain No.2 before meeting river Yamuna at vill. Khojkipur (PNP-RDQ-008)																				
	Date of sample collection	A/R No. & Date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci	
	11.04.2020	2509 dt. 22.04.2020		7.8	24	140.0	34	BDL(DI=2)	12.32		17000		1844	0.203	0.062						
	04.05.2020	2683 dt. 19.05.2020		7.49	19	86.4	30	BDL(DI=2)	8.96		14000		2240	0.723	0.044						
	26.06.2020	3037 dt. 08.07.2020	0.19	7.22	32	134.8	712		BDL	6.1	23000	240000	195	0.211	0.1	10	BDL	3.9	102	22000	
	27.07.2020	3456 dt. 07.08.2020	1.37	7.43	9	36.4	18		BDL	BDL	21000	141000	368	BDL	0.14	52	0.23	6.65	196	14000	
	07.09.2020	3843 dt. 26.09.2020		6.44	38	127.6	136	6.5	8.83		22000		1647	0.125	0.08						
	01.10.2020	4026 dt. 20.10.2020		7.91	40	154	37	2.5	ND				2930	0.144	0.38						
	06.11.2020	4324 dt. 27.11.2020	4.08	8.18	36	152	39	3.5	7.52	4.2			2060		0.37	700	0.28	4.58	1122		
	15.12.2020	4577 dt. 30.12.2020		7.69	52	192	178	N.D.	7.32	N.D.	40000	120000	1397	0.649	0.12	48				830	
	07.01.2021	43 dt. 18.01.2021		7.57	80	312	188	4.5	3.14	N.D.	26000	120000	1494	0.662	0.16					816	
	06.02.2021	341 dt. 19.02.2021		7.56	104	376	205	7.5	7.96	N.D.	94000	426000	3040	0.721	0.85	88				1688	
9	River Yamuna after meeting the discharge of Drain No. 2 near Vill. Khojkipur. (NWMP-10004) (PNP-RDQ-009)																				
	Date of sample collection	A/R No. & Date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci	

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	14.03.2020	2412 dt. 24.03.2020		7.38	7	46.8	190		BDL	8.2	70000	278000	290		0.1	12		6.81	198		
		2520 dt. 12.04.2020		7.6	0	4.4	6			8.4	200	3300	333			10	0.23		190		
	26.06.2020	3037 dt. 08.07.2020		7.22	7.12	32	134.8		BDL	6.1	23000	240000		0.211	0.1	10	BDL	3.9	102		
	10.07.2020	3295 dt. 12.07.2020		6.91	4.2	15.6	21			7.2	9000	58000	417		0.01	24	0.54	1.22	201		
	08.09.2020	3846 dt. 26.09.2020		6.66	3.8		26		ND	7.1	17000	94000	390		0.12	26	0.18	11.86	216		
	1.10.2020	4018 dt. 02.10.2020		7.75	5.2	19.6	12		N.D.	5	11000	84000	942	N.D.	0.46	10	0.91	2.21	504		
	07.11.2020	4327 dt. 27.11.2020		8.42	4.8	16	16		N.D.	7.9	9000	79000	901		0.09	124	N.D.	6.72	482		
	10.12.2020	4561 dt. 29.12.2020		8	4.5	16	21		N.D.	8.2	90	270	540		0.11	26	0.14	4.48	276		
	07.01.2021	35 dt. 18.01.2021		7.74	30	104	42		0.23	N.D.	2600	177000	1080		0.11	166	3.8	68.28	578		
	06.02.2021	333 dt. 19.02.2021		7.56	16	108	52		0.31	7.5	2100	4900	1294		0.44	36	0.16	17.52	732		
10	Nohra/ Drain No. 4 (PNP-RDQ-010)																				
		Date of sample collection	A/R No. & Date	SAR	PH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphates	Total Chlorides	Nitrate-mg/l	Turbidity	TDS	Fecal Streptococci
		11.04.2020	2511 dt. 22.04.2020		7.68	19	74.4	37	BDL(DL=2)	17.36		14000		1700	0.431	0.088					
		22.04.2020	2596 dt. 08.05.2020		6.74	26	15	69.6	BDL(DL=2)	15.12		12000			0.519	0.6					
		04.05.2020	2685 dt. 19.05.2020		6.59	13	64.4	23	BDL(DL=2)	13.44		11000		1554	0.333	0.406					
		05.06.2020	2833 dt. 05.06.2020		7.61	5.6	16.4	8			7.4	11000	63000	255		0.022	26	0.68	1.72	182	
		10.07.2020	3295 dt. 12.07.2020		6.91	4.2	15.6	21			7.2	9000	58000	417		0.01	24	0.54	1.22	201	
		01.10.2020	4027 dt. 02.10.2020		8.15	62	209.6	52	3	N.D.				1865	0.103	0.29					
		06.11.2020	4325 dt. 07.11.2020		8.25	54	188	63	2.5	8.02	3.6			1640		0.32	404			872	6.1
		10.12.2020	4559 dt. 22.12.2020		7.91	90	340	123	N.D.	7.36	N.D.	27000	141000	990	0.324	0.33	78			532	
		07.01.2021	44 dt. 18.01.2021		7.73	52	196	79	N.D.	2.04	N.D.	94000	212000	1310	0.892	0.19				718	
		06.02.2021	343 dt. 19.02.2021		7.65	70	272	178	7	11.19	N.D.	141000	542000	2410	0.489	1.02	130			2136	
	Sonepat Region																				
1	Drain no. 6 before entry in Delhi (SNP-RDQ-001)																				

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Date of sample collection	A/R No. & Date	SAR	pH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci
28.09.2020	3986 dt. 12.10.2020		7.46	74	278.8	84	3.5	7.74		49000	278000	2340							
44113	4101 dt. 26-10-2020		7.62	34	136	116	BDL (DL=2)	9.05		46000	221000	1772	--	--	--				
44162	4460 dt. 09-12-2020		7.63	78	276	108	3.5	11.37		70000	345000	1860			64				
44221	197 dt. 04-02-2021		7.66	92	384	112	5.5	7.43	ND	49000	278000	2600	ND	0.08	68				
44235	354 dt. 19-02-2021		7.4	108	420	136	7	7.17	ND	76000	426000	2710		0.24	62				
2 River Yamuna before meeting Diversion Drain no. 8 (SNP-RDQ-002)																			
Date of sample collection	A/R No. & Date	SAR	pH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci
28.09.2020	3985 dt. 12.10.2020		9.11	8	35.6	12	BDL (DL=2)	0.38		9000	79000	480	--	--	--	--	--	--	--
09.10.2020	4103 dt. 10.11.2020		7.76	5.5	22		BDL	N.D.		9000	58000	525							
27.11.2020	4464 dt. 28.11.2020		7.96	7	40	13	N.D.	N.D.		1700	17200	679		0.21	32				
26.01.2021	200 dt. 04.02.2021		7.95	12	60	52	N.D.	N.D.	6.3	400	3100	770	N.D.	0.12	42			412	
08.02.2021	358 dt. 19.02.2021		8.04	6.5	32	26	ND	0.12	7.2	900	3900	880		0.19	18				
3 Diversion Drain no. 8 before meeting Yamuna (SNP-RDQ-003)																			
Date of sample collection	A/R No. & Date	SAR	pH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci
28-Sep-20	3987 dt. 12.10.2020		8.36	17	60.8	24	BDL (DL=2)	0.57		14000	94000	2130							
09-Oct-20	4098 dt. 26-10-2020		7.41	9	42	10	BDL (DL=2)	4.52		11000	84000	1780							
27.11.2020	4462 dt. 28.11.2020		7.36	9	56	14	N.D.	2.17		2700	7900	1760			48				
25.01.2021	196 dt. 04-02-2021		7.7	6.5	44	36	N.D.	2.46	7.1	26000	84000	2650	ND	0.1	34				
08.02.2021	356 dt. 19.02.2021		8.02	5.6	28	11	N.D.	N.D.	7.8	1100	4900	531		0.1	32				

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4 River Yamuna after meeting Diversion Drain No. 8 at Palla (NWMP-10095) (SNP-RDQ-004)																			
Date of sampling	A/R No. & Date	SAR	pH	BOD mg/l	COD mg/l	TSS mg/l	O & G mg/l	Ammonical Nitrogen (as N) mg/l	DO mg/l	Faecal Coliform	Total Coliform	Conductivity	Iron	Phosphate	Chlorides (as Cl) mg/l	Nitrate mg/l	Turbidity	TDS	Fecal Streptococci
18.03.2020	2445 dt. 19.03.2020		8.12	4.6	13.6				8.4	92000	341000	482		0.206	18	0.14		290	
11.04.2020	2526 dt. 12.04.2020		7.65	0	6.4				8.2	46000	177000	349		0	10	0.33		210	
12.05.2020	2924 dt. 13.05.2020		7.36	1.6	6.8					39000	172000	465			10	0.28		216	
09.07.2020	3228 dt. 10.07.2020		6.74	1.6	8.8				6.8	27000	141000	454		0.04	10	0.43		232	
21.08.2020	3687 dt. 04.09.2020		7.4	3.5	12.8	BDL		N.D.	7.1	17000	90000	271		0.07	12	0.04	1.12	130	
29.09.2020	3984 dt. 12.10.2020		8.63	5.6	18.4	BDL			7.2	700	3900	272		0.005	10	N.D.	1.66	152	
10.10.2020	4108 dt. 30.10.2020		8.15	5.4	21.2	BDL			7	9000	76000	515	N.D.	0.007	16	0.42	1.68	276	
28.11.2020	4470 dt. 09.12.2020		7.95	5.2	24	12		N.D.	7.2		4900	682		0.17	16	0.08	Nil	362	
16.12.2020	4617 dt. 30.12.2020		8.07	2.4	12	7		N.D.	8.4	170	410	556		0.12	12	0.3		296	
26.01.2021	189 dt. 04.02.2021		7.78	2.4	16	28		0.18	7.6	200	2600	760		0.1	16	0.22	2.73	422	
09.02.2021	360 dt. 19.02.2021		7.97	2.6	108	38		N.D.	7.2	1400	6300	809		0.23	18	0.14	3.76	462	

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11. Short Term and Long term measures for Control of Pollution River Yamuna

11.1 Short-term measures

1. Ensure 100 % treatment of industrial and domestic wastewater from Ditch drain (Dhanurea Escape) (Yamunanagar), Panipat drain (Panipat) and Drain no. 6 (Sonapat), through adequate measures.
2. Strict vigilance of industrial units at Panipat, Sonapat and Kundli industrial region and CETP / STP at Yamunagar, Kundli, Panipat and Sonapat.
3. Identify SSI units at Yamunanagar (Metal finishing units), Panipat (Scattered Dyeing units) and Kundli without ETP and closure of such industrial units.
4. Stop disposal of sewage from scattered habitations (Jagatpur Khadar Village, Milan Vihar, etc) situated between Palla to Wazirabad and arrangement of transportation of generated sewage for further treatment through the existing STPs in Delhi
5. There may be accumulation of sludge in the bed of Wazirabad pond, which may be probable cause of in-situ generation of ammonia. Regular desludging may be carried out.
6. Government of Haryana may explore use of in-situ treatment of drain No. 2 to contain pollutants being discharged in river Yamuna especially during lean period.
7. Government of Haryana shall ensure proper functioning of all STPs/Common Effluent Treatment Plants (CETPs) in compliance to extant norms.
8. Government of Haryana may put in place an appropriate mechanism for surveillance and inspection and take appropriate step with the help of local administration to stop discharge of untreated industrial effluent in STPs/domestic sewer lines.
9. Immediate repair of embankment of drain No. 6 in DD-8 may be undertaken by Haryana at their own cost. Similarly, the effluent channel flowing alongside DD-8 on its right bank may be taken through a closed conduit or its embankment walls should be strengthened by Haryana.

11.2 Long-term measures

1. Government of Haryana shall ensure that works on all the Sewage Treatment Plants (hereinafter referred to as STPs) awaiting commissioning as well as works of sewerage network and their connection with households are expedited. The work of online monitoring system of STPs to be completed expeditiously.
2. Government of Haryana shall ensure proper functioning of all STPs/Common Effluent Treatment Plants (CETPs) in compliance to norms.
3. Government of Haryana may put in place an appropriate mechanism for surveillance and inspection and take appropriate step with the help of local administration to stop discharge of untreated industrial effluent in STPs/domestic sewer lines.
4. Haryana State Pollution Control Board being a regulator, should notify discharge norms for individual member units of CETPs.
5. On-line monitoring system to be installed at inlet and outlet of CETPs of Haryana for surveillance.
6. On-line monitoring system to be installed at inlet and outlet of CETPs of Haryana for performance reporting.
7. A special squad comprising of officials from HSPCB, CPCB and local administration be formed for surprise inspection of the industries for their pollution regulatory compliance.
8. All CETPs shall be assessed for their adequacy & performance and necessary action to be initiated by HSPCB, in case non-compliance is observed.
9. All CETPs shall be assessed for their performance and necessary action to be initiated by HSPCB, in case non-compliance is observed.
10. DJB may examine the possibility of upgrading of the existing WTPs, so that increased level of ammonia can be eliminated by purification.
11. DJB should make arrangements (by commissioning of additional pipeline along twin pipeline system) to take its all the requirement of raw water through twin pipeline and avoid taking raw water from the Wazirabad pond.

Time bound actions to be taken by the Haryana and Delhi States are detailed in **Table 6**

Table 6: Time Bound Actions to be taken by Haryana and Delhi States

S. No.	Actions to be taken by Haryana Pollution Control Board and its Departments	Agency /Department Responsible	Time lines
1.	Issuing notice to non-operating STPs of Haryana	HSPCB	2 weeks
2.	Action plan be submitted on Badshahpur Nalla. Flow and water quality characteristics of Badshahpur Nalla.	HSPCB	1 month
3.	To provide water quality data of drains out falling in River Yamuna.	HSPCB	1 month
4.	Status of industrial inspection and compliance to the prescribed emissions/discharge norms	HSPCB	1 month
5.	Municipal Sewage Generation of Panipat, Sonapat, Yamuna Nagar and Karnal and the existing treatment capacity & compliance status of STPs.	RO Panipat, RO Sonapat, RO Yamuna Nagar, HSPCB PHED, Haryana State	1 month
6.	If the existing treatment capacity is not adequate, then plan for development of adequate treatment capacity both at Yamuna Nagar and Karnal Regions in Haryana	PHED, Haryana State	1 month
7.	Assessment of Industrial Effluent Generation and the existing treatment capacity at Panipat, Sonapat Regions, Yamuna Nagar and Karnal for the prospective industries.	HSIDC/HSPCB	2 months
8.	If the existing Industrial Effluent treatment capacity is not adequate, then plans for development and execution of adequate treatment capacity both at Panipat and Sonapat Regions in Haryana under the supervision of HSPCB.	HSIDC/HSPCB	1 month
9.	Identification of industries which are in operation in non-confirming areas in Panipat and Sonapat Regions.	HSIDC/HSPCB	2 weeks
10.	Suspension or cancellation of Consents or Authorization or closure of industries which are in operation in non-confirming areas both in Haryana	HSPCB	1 month
11.	Relocation of all the industries located in non-confirming areas	HSIDC/HSPCB	2 months

S. No.	Actions to be taken by Haryana Pollution Control Board and its Departments	Agency /Department Responsible	Time lines
12.	Inspection of the industries for verification of compliance to the conditions of Consents or Authorization as well as norms prescribed under the E (P) Act, 1986.	HSPCB	2 months
13.	Action against violating industries under The Water(Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act,1981 or under Section 5 of the E (P) Act, 1986	HSPCB	3 months
17.	Installation of Continuous Online Emission Monitoring Systems by all the industries (red category)/CETPs/STPs located at Panipat and Sonapat regions for monitoring of relevant parameters and its connectivity to the CPCB servers.	Concerned Industry/CETP/ S TP Operators and PHED/HSIDC/H SPCB	As per CPCB Directions
18.	To prescribe the inlet quality standards in accordance with CETP Notification of 1/1/2016.	HSPCB	2 weeks
19.	Ensuring Proper Operation and Maintenance of CETPs/STPs and submission of reports in the prescribed formats by the CETPs/STPs Operatorsto the HSPCB.	CETPs/STPs Operators in Haryana	2 months
20.	Periodic performance assessment of CETPs/STPs (once in 3 months) located in Haryana and upload the performance evaluation on the website.	HSPCB	Quarterly
21.	Ensuring upgradation or augmentation of existing STPs/CETPs to comply with the standards prescribed under the E (P) Act, 1986 in Haryana State.	HSPCB//HSIDC/ PHED of Haryana State	1 month
22.	Installation of RTWQM Stations at the inter-state borders in the respective jurisdictions for continuous assessment of river water quality.	HSPCB	2 months
23.	Updated status on drains and quantification of domestic and industrial effluent received through drains in Haryana.	Irrigation and Flood Control Dept. of Haryana State	1 month

S. No.	Actions to be taken by Haryana Pollution Control Board and its Departments	Agency /Department Responsible	Time lines
24.	Assessment of water quality of rivers or drains located in the respective regions of the Haryana and Delhi State for identification of sources of pollution in the rivers or streams or drains.	HSPCB	1 month
25.	Formation of local area environmental surveillance squads for identification of improperly operating industries/CETPs/STPs and for initiating action against violating industries or CETPs/STPs as per Rules.	HSPCB	1 month
26.	City-wise sewerage network available in % and proposed plan with time line.	HSPCB	1 month
27.	Name of cities discharging waste water in River Yamuna, sewage generation, Treatment capacity available, No. of STPs.& Actual Treatment being done.	HSPCB	1 month

S. No.	Actions to be taken by Delhi Pollution Control Committee	Agency Responsible	Time lines
1.	Registration by DJB on CPCB server for obtaining SMS alert for STPs.	DJB	1 month
2.	Connectivity of all 13 CETPs to online monitoring system, 2 CETPs managed by DSIDC (Bawana and Narela) for SMS alert.	DSIDC	1 month
3.	Name of cities discharging waste water in River Yamuna, sewage generation, Treatment capacity available, No. of STPs.& Actual Treatment being done.	DPCC	1 month
4.	City-wise sewerage network available in % and proposed plan with time line.	DPCC	1 month
5.	Ensuring upgradation or augmentation of existing Water Treatment Plants with Primary Treatment Unit Operation like aeration or any other suitable technology as tertiary treatment prior to chlorination.	DJB/DPCC in Delhi State	2 months
6.	Ensuring upgradation or augmentation of existing STPs/ CETPs to comply with the standards prescribed under the E (P) Act, 1986 in Delhi State.	DJB/DPCC/DSI DC of Delhi State	2 months
7.	To prescribe the inlet quality standards in	DPCC	2 weeks

S. No.	Actions to be taken by Delhi Pollution Control Committee	Agency Responsible	Time lines
	accordance with CETP Notification of 1/1/2016.		
8.	Periodic inspection of the industries for verification of compliance to the conditions of Consents or Authorisation as well as norms prescribed under the E (P) Act, 1986	DPCC	1 month
9.	Periodic performance assessment of CETPs/STPs(once in 3 months) located in Delhi and upload the performance evaluation on their website.	DPCC	Quarterly
10.	Installation of RTWQM Stations at the inter-state borders in the respective jurisdictions for continuous assessment of river water quality.	DPCC	2 months
11.	Assessment of water quality of rivers and drains located in the respective regions of the Delhi State for identification of sources of pollution in the rivers or streams or drains.	DPCC	1 month
12.	Formation of local area environmental surveillance squads for identification of improperly operating industries/CETPs/STPs and for initiating action against violating industries or CETPs/STPs as per Rules.	DPCC	1 month
13.	Installation of Continuous Online Emission Monitoring Systems by all the industries (red category)/CETPs/STPs located at NCT of Delhi for monitoring of relevant parameters and its connectivity to the CPCB servers.	Concerned Industry/CETP/STP Operators and DJB/DSIDC/DPCC	As per CPCB Directions
14.	Ensuring Proper Operation and Maintenance of CETPs/STPs and submission of reports in the prescribed formats by the CETPs/STPs Operators to the DPCC.	CETPs/STPs Operators in Delhi State	1 month
15.	Up gradation of all the existing Water Treatment Plants (WTPs) in Delhi with a suitable provision to accept untreated raw water from river Yamuna, within one year.	DJB	One year
16.	Periodic cleaning/ de-silting of Canals prior to the monsoon season apart from periodic Dredging, De-weeding of the Okhla and Wazirabad Barrage and rescheduling of cleaning of Canals joining Okhla barrage to be explored in consultation with the concerned Department (s) in UP.	Delhi Irrigation & Flood Control Department	

S. No.	Actions to be taken by Delhi Pollution Control Committee	Agency Responsible	Time lines
17.	Use of De-foaming/Foam suppressing chemicals to avoid foam formation at Okhla Barrage subject to no impact on aquatic environment in river Yamuna.	Delhi Irrigation & Flood Control Department	
18.	In the event of increase in Ammonical Nitrogen in river Yamuna, addition or re-circulation of treated water from the respective Water Treatment Plant (WTP) into the raw water intake of Water Treatment Plant also be explored as a temporary and short term measure.	DJB	
19.	Arrangement of adequate capacity of surface aerators or floating aerators (solar powered) or diffused aerators at Okhla and Wazirabad barrages to disperse excess ammonium levels in river Yamuna.	DJB and Delhi Irrigation & Flood Control Department	
20.	Enforcement of provisions of the "Delhi Water Board Septage Management Regulations 2018" notified by the Urban Development Department, GNCTD vide Notification dated 12.11.2018 to prevent unauthorized disposal of Septic Tank Waste (Septage) in drains or river Yamuna.	District Magistrates in NCT Delhi	
21.	A feasibility of change in the design of spillway of Okhla Barrage shall be explored to ensure smooth discharge from the barrage instead of vertical fall.	Delhi Irrigation & Flood Control Department	
22.	Take stringent actions against the tankers indulged in illegal discharges in river Yamuna within the jurisdiction of Delhi State.	Delhi Police/ Delhi Traffic Police/ Road Transport Authority	

Further, based on the discussions held on 10.11.2021 with the officials of Delhi, Haryana and Uttar Pradesh, actions to be taken are listed in Table 7 below:

Table 7: Action to be taken by Delhi, Haryana & Uttar Pradesh

S. No	Action	Action To be complied by
1	To ensure 100 % treatment of generated sewage, industrial effluent and wastes, by providing adequate infrastructure on ground in a time bound manner and also to comply to various directions passed by Hon'ble National Green Tribunal (NGT) for rejuvenation of identified polluted rivers including river Yamuna within the jurisdiction of the Haryana State/ NCT Delhi & U.P.	All the Three States i.e., Haryana, Delhi and U.P.

S. No	Action	Action To be complied by
2	Enhance monitoring frequency of drains, river Yamuna, industries, STPs and CETPs and strict enforcement of discharge norms in the respective State. Action should be initiated against the violators in accordance with the provisions of The Water (Prevention and Control of Pollution) Act, 1974, as applicable.	All the Three States i.e., Haryana, Delhi and U.P.
3	To carryout random inspections of water polluting industries, Sewage Treatment Plants (STPs), Common Effluent Treatment Plants (CETPs) falling in the catchment of river Yamuna and located within the jurisdiction of State and to identify violating industries or operators of STPs /CETPs and Imposition of 'Environmental Compensation' on the violators in line with the Hon'ble NGT directions.	DPCC, HSPCB, UPPCB
4	To identify the violators of environmental norms falling in the catchment of river Yamuna and located within the jurisdiction of State and criminal proceedings also shall be initiated against such violators under the provisions of The Water (Prevention and Control of Pollution) Act, 1974 or The Environment (Protection) Act, 1986.	All the Three States i.e., Haryana, Delhi and U.P.
5	An effective surveillance from State authorities also be formed for control of Ammonical Nitrogen in river Yamuna and if required, use of advanced technologies such as 'drones for surveillance' also be explored.	HSPCB/DPCC/ UPPCB
6	Stringent measures against the tankers indulged in illegal discharges in river Yamuna also be taken within the jurisdiction of the State.	Police /Traffic Police and Road Transport Authorities in the States of Haryana, Delhi and UP.
8	Periodic Cleaning/Desilting of Canals should be taken up prior to the monsoon season apart from periodic Dredging, De-weeding of the Okhla and Wazirabad Barrages and rescheduling of cleaning of Canals joining Okhla barrage to be explored in consultation with the concerned Departments in UP by Delhi State.	UP Irrigation Department/ Irrigation and Flood Control Department in Delhi
9	De-foaming/Foam suppressing chemicals may be used at Okhla Barrage to avoid foam formation subject to no impact on the aquatic environment in river Yamuna	UP Irrigation Department
12	All the District Magistrates/Local and Urban Authorities in Haryana /Uttar Pradesh State to prevent unauthorized disposal of Septic Tank Waste (Septage) in drains or river Yamuna .	District Magistrates in Haryana & Uttar Pradesh
13	Feasibility of change in the design of spillway of Okhla, Wazirabad Barrage also be explored by the Irrigation and Flood Control Department to ensure smooth discharge	UP Irrigation Department

S. No	Action	Action To be complied by
	from the barrages instead of vertical fall specially at Okhla Barrage.	
14	Recommendations of the Study Group and MoJS (i.e., long term and short term measures) also be implemented by all the concerned departments in State/NCT of Delhi in a time bound manner, for which time bound action plans be prepared and submitted to MoJS and its implementation is ensured.	Concerned departments of Delhi, Haryana and Uttar Pradesh
15	To submit the action taken reports on the directions issued by CPCB from 2019- 2021 in case of river Yamuna	Delhi , Haryana & Uttar Pradesh State Governments
16	A 'Joint Working Group' shall be constituted to assess the progress and keep track of all the activities taken up by the concerned authorities of Haryana, Delhi & Uttar Pradesh regarding the control of pollution in river Yamuna. Experts/ institutions of the subject matter shall also be consulted, if required.	By CPCB
17	A mechanism shall be developed to alert the authorities in case of incidences of increase in Ammonical Nitrogen or Phosphate concentration in river Yamuna (by way of installing Real Time Water Quality Monitoring Station at the interstate borders, so that short term measures be implemented if necessary by all the concerned. All the authorities of Delhi, Haryana and UP should coordinate with each other to resolve episodal spike in Ammonical Nitrogen and Phosphate/ surfactants in river Yamuna by implementing suitable measures.	HSPCB, DPCC & UPPCB
18	Washing activities at Dhobhi Ghats on the banks of river Yamuna within Haryana State should be prohibited. Dry Cleaning Units in operation without captive Effluent Treatment Plants in Haryana and contributing to pollution in river Yamuna should be closed with immediate effect. Dedicated Dhobi Ghats on the banks of river Yamuna shall be developed with a provision of wash water collection and treatment of wash wastewater, before its discharge into river Yamuna, in a time bound manner.	Delhi, Haryana & Uttar Pradesh

Annexure – I



Central Pollution Control Board
(Ministry of Environment, Forest & Climate Change)
Parivesh Bhawan, East Arjun Nagar,
Delhi – 110032

Minutes of meeting held on 14.12.2020 through *Video Conferencing* to discuss issue of increase of Ammonical-Nitrogen in river Yamuna at entry point in Delhi

A meeting was held on 14.12.2020 at 02:30 PM through Video Conferencing under the Chairmanship of Dr Prashant Gargava, Member Secretary, Central Pollution Control Board with the officials of Delhi Pollution Control Committee(DPCC), Haryana State Pollution Control Board (HSPCB), Delhi Jal Board (DJB), Irrigation & Water Resources Department (I&WR), Haryana to discuss the issue of increase in Ammonical –Nitrogen levels in river Yamuna at entry point of Delhi. List of participants is given at **Annexure-I**.

Dr Prashant Gargava, Member Secretary, CPCB welcomed the participants and in his opening remarks mentioned that Delhi Jal Board (DJB) raised concern on issue of increase in Ammonical Nitrogen level in river Yamuna vide letter dated 12.12.2020 at the entry point in Delhi resulting into shutdown of Water Treatment Plants (WTP) at Wazirabad. He also reiterated that this is a perpetual issue and reported mostly in winter season in the past, therefore this meeting is called to deliberate the issues for preparing short term and long term plans. Thereafter, he requested Sh. A. Sudhakar, Divisional Head, Water Quality Management –I DIV to apprise on observations on the water quality of river Yamuna.

Sh A. Sudhakar, DH-WQM-I briefly outlined the core issue of hike in Ammonical Nitrogen in river Yamuna at entry point in Delhi and categorically mentioning about three drains as major sources causing pollution on upstream of Delhi and illegal dumping of sewage /sludge through tankers. The Real Time Water Quality Monitoring System(RTWQMS) at Palla during December 1-14, 2020 recorded as 0.07mg/l (on 1.12.2020 at 12.00 A.M) to 1.12 mg/l (on 13.12.2020 at 7.00 PM). The probable reason could be shock load at the site of sampling, resulted from illegal disposal of septic tank waste from scattered habitations situated between Palla to Wazirabad. Another reason could be mixing of fresh

water with wastewater due to weakening of embankment between drain No 6 and drain No 8, specially during monsoon season which finally merges with river Yamuna. The fresh water releases from upstream in Haryana flushes the settled impurities at the bottom of river Yamuna bed and resulted in increase in pollution of Ammonical Nitrogen. DJB stops intake of water from Wazirabad barrage and shuts down WTPs at Wazirabad and Chandrawal whenever Ammonical Nitrogen Level exceeds 0.8 mg/l.

Sh Shalabh Kumar, Member (Water) DJB explained that data for last one year is available with Water Quality Division of DJB. He stated that one of the major sources identified is DD-8, sudden discharge of wastewater in river Yamuna results into hike in pollution spiking Ammonia Levels. He mentioned that the scattered habitations in Delhi with sewer connectivity low are not allowed discharge septage in the river. He requested that in case of any discharge on upstream side of Haryana, Delhi Jal Board may be informed by the Haryana State Government authorities in advance and alerted to avoid such shock loads. The shut down of WTP at Wazirabad severely impacts WTP supplies in many VVIP areas of Delhi. He also mentioned that Delhi has empanelled vendors for carrying septage from unsewered area to designated STPs and in the process of tendering for collection of waste from septic tanks.

Sh S. Narayanan, Member Secretary of Haryana State Pollution Control Board opined that time and again this issue is being raised by Delhi Jal Board. The members of monitoring Committee appointed by Haryana Government also visited the laboratory of Delhi Jal Board at Wazirabad subsequently CPCB also inspected the same laboratory and found some gaps in analytical procedures as well as reporting of Ammonia as free ammonia as high levels reported as 12PPM by DJB were never recorded in river Yamuna in Haryana. He ruled out discharge of septage in river Yamuna within the jurisdiction of Haryana as septage is collected by empanelled vendors and is being sent to terminal STP in Haryana for further treatment. The tankers are fitted with GPS tracking to ensure no illegal dumping /discharge takes place. Online Monitoring system will be installed at Inter – State border for surveillance. He also stated that Schedule-VI of the Environment (Protection) Rules, 1986 stipulated discharge standards for disposal on inland surface water for Ammonical Nitrogen as 50 mg/l and under the present circumstances CPCB may guide HSPCB on legal actions to be taken.

Upon deliberations following decisions were made: -

A study group shall be constituted comprising representatives from concerned organisations (if required outside experts also be included) for finalising Long Term and Short Term measures required for control of Ammonical Nitrogen in river Yamuna: -

- a. To analyse five-year water quality data including the profile or trend of Ammonical Nitrogen in River Yamuna.*
- b. To assess the present practices of sewage generated from scattered habitations situated between Palla and Wazirabad in Delhi and to suggest treatment and disposal options to avoid pollution in river Yamuna.*
- c. To identify possible sources of sudden spike in Ammonical Nitrogen in river Yamuna especially at entry point of Delhi & at intake point of Wazirabad reservoir.*
- d. Need for strengthening of monitoring of river Yamuna through Real Time Water Quality Monitoring System (RTWQMS) and for increasing frequency of manual monitoring of drains and river Yamuna.*
- e. To suggest uniform and standard protocols to be followed for sampling and analysis of river samples both by HSPCB and DJB.*
- f. Requirement of enhancement of ESS to stop illegal discharges in river Yamuna.*
- g. Long term measures to be implemented including upgradation requirement of existing Water Treatment Plants in Delhi to handle Ammonical Nitrogen in river Yamuna beyond 0.8 mg/L.*
- h. Short term measures to be implemented in the event of sudden spike in Ammonical Nitrogen content in river Yamuna.*

Meeting ended with vote of thanks to the Chair

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Annexure-I

List of Participants attended the meeting held on 14.12.2020 through Video Conferencing to discuss increase of Ammonical-Nitrogen in river Yamuna at entry point in Delhi.

S. N	Name of Officials attended the meeting through VC	Designation	Phone No	E mail id
1	Sh A Sudhakar	DH-WQM-I , CPCB and Member	8800326699	asudhakar.cpcb@nic.in
2	Sh S. Narayanan	MS, HSPCB	0172-2581105 0172-2711413	hspcbms@gmail.com
3	Sh K. S. Jaychandran	MS , DPCC	011- 23860389, 23392306	ssenv@delhi.gov.in
4	Sh Shalabh Kumar	Member , DJB(Water)	011-23528578	memberwsdjb@gmail.com
5	Sh Sandeep Taneja	Chief Engineer , Yamuna Water Services Delhi Irrigation & Water Resources Deptt , Haryana	-	eic.irrigation@hry.nic.in
6	Sh Vishal Gandhi	Sc D, UPC-I DIV, CPCB	9891254423	vishalcpcb@gmail.com
7	Sh J. Chandra Babu	Sc E, WQM-I Div, CPCB	9868278903	jcb.cpcb@nic.in
8	Mrs Suniti Parashar	Sc C, WQM-I Div, CPCB	9868819711	suniti.cpcb@nic.in



Central Pollution Control Board
(Ministry of Environment, Forest & Climate Change)
Parivesh Bhawan, East Arjun Nagar,
Delhi – 110032

Minutes of First meeting of Study Group held on 04.01.2021 through Video Conferencing to discuss the course of action by the study Group on the issue of increase of Ammonical-Nitrogen in river Yamuna at entry point in Delhi

A meeting was held on 04.01.2021 at 11:30 AM through Video Conferencing under the Chairmanship of Dr Prashant Gargava, Member Secretary, Central Pollution Control Board with the officials of Delhi Pollution Control Committee(DPCC), Haryana State Pollution Control Board (HSPCB), Delhi Jal Board (DJB), Irrigation & Water Resources Department Delhi to discuss the course of action by the Study Group in light of the decisions taken in a meeting held on 14.12.2020 w.r t issue of increase in Ammonical – Nitrogen level in river Yamuna at entry point of Delhi. List of participants is given at **Annexure-I.**

Dr Prashant Gargava, Member Secretary, CPCB welcomed the participants and in his opening remarks mentioned that a study group was constituted during previous meeting and mandate was assigned to the group such as to identify the possible sources responsible for sudden spike in concentration of Ammonical Nitrogen mapping of sources, analysis of data to find out the critical months during which incremental rise of $\text{NH}_3\text{-N}$ is observed, increase in frequency of monitoring if needed and enhanced surveillance to stop illegal discharges along the stretch of River Yamuna at entry point in Delhi . He also mentioned that there is no correlation between the News report published in Times of India on Ammonical Nitrogen & data generated by the Real Time Water Quality Monitoring Systems (RTWQMS) installed on river Yamuna. Thereafter, he requested Sh. A. Sudhakar, Divisional Head, Water Quality Management –I DIV to take forward the meeting.

Sh A. Sudhakar, DH-WQM-I briefly outlined that occasional rise in Ammonical Nitrogen in river Yamuna (i) occasional rise in Ammonical Nitrogen in river Yamuna during specific period (ii) contention of DJB regarding industrial effluent and municipalities having inadequate treatment system. He also indicated that industrial effluent discharges are generally controlled & regulated as well as Uniform protocol to be followed for analysis of Ammonical Nitrogen. Earlier, in the year 2018, officials of CPCB visited laboratories of DJB and also organised two days training to the DJB officials. He also informed that while analysing the data of RTWQMS being operated by DPCC during last month, data gaps were also observed, hence regular witness of calibration by the vendors is required to ensure consistency in data availability.

Sh S. Narayanan, Member Secretary, Haryana State Pollution Control Board apprised that tenders for laying a conduit line is under pipeline and tenders are expected to be issued soon. He also informed that surveillance has been increased for control of discharges from industrial units. HSPCB is also expediting suitable site for installation of RTWQMS at Inter State border within the jurisdiction of Haryana. Special Surveillance

Squads are deployed to prevent & stop illegal discharges through tankers with the support of Administrative & Police Departments along with HSPCB.

Sh Shalabh Kumar, Member (Water) DJB appreciated the proposal of constitution of 'Study Group' and opined that this group may analyse the data and find out the periods and locate points of discharge in river Yamuna at bordering locations. He also expected that the study group may come out with long term & short term measures to resolve the issue of spikes in Ammoniacal Nitrogen in river Yamuna.

Upon detailed deliberations following decisions were taken by the study group: -

1. *Water quality analysis for five years' data be carried out to identify the critical months & the areas where spike in Ammonical Nitrogen is observed including the profile or trend of Ammonical Nitrogen in River Yamuna. (Action: By WQM-I DIV, CPCB)*
2. *Witness of Calibration by CPCB officials for RTWQMS at Wazirabad (Action: By WQM-I DIV, CPCB)*
3. *Visit of Delhi Jal Board Laboratory to oversee the analytical procedures followed and recommendation (Action: By Water Laboratory, CPCB)*
4. *Meeting with the Vendors operating RTWQMS at Palla & Wazirabad for regular calibration without data gap (Action: By DPCC)*
5. *Performance assessment of few STPs, CETPs & ETPs of industrial units located at Panipat, Sonapat, Yamunanagar & Karnal along river Yamuna and submission of report to CPCB (Action : By HSPCB)*
6. *Joint Surveillance Squad (JSS) was constituted comprising representative of Delhi Jal Board (Sh Jagdish Arora, OSD to Member Water Supply # 9650291123, Sh Ashutosh Kaushik, Director, Quality Control, DJB # 9650098921), representative of Delhi Pollution Control Committee (Dr Nandita Moitra, Sc D # 9717593521 & Sh Meshram # 8527499218), representative of Irrigation & Flood Control Deptt, Govt of Delhi (Sh Sanjay Saxena # 01127306411; Haryana State Pollution Control Board (Sh Bhupendar Chahal, Regional Officer, Sonapat, HSPCB # 09896376055), Irrigation & Water Resources Deptt, Haryana (Sh Navdeep Rathore, SE, YWS Circle Delhi # 9467282039) for identification of sources of Pollution, hots-spots, identification of illegal discharges between Palla and Wazirabad, present practices followed for discharge of sewage generated from unsewered colonies.*
 - *The 'Study Group' shall submit its report with recommendations to CPCB covering Short term and Long term measures for control of Ammonical Nitrogen issue in River Yamuna at entry point of Delhi.*
 - *Next meeting shall be organised after a week. The date, time & web link for Video Conference shall be intimated before the meeting.*

Meeting ended with vote of thanks to the Chair

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Annexure-I

List of Participants attended the First meeting of Study Group held on 04.01.2021 through *Video Conferencing* to discuss the course of action by the study Group on the issue of increase of Ammonical-Nitrogen in river Yamuna at entry point in Delhi

S. N	Name of Officials attended the meeting through VC	Designation & Organisation	Phone No	E mail id
1	Sh A Sudhakar	DH-WQM-I , CPCB and Member	8800326699	asudhakar.cpcb@nic.in
2	Sh S. Narayanan	MS, HSPCB	0172-2581105 0172-2711413	hspcbms@gmail.com
3	Sh Shalabh Kumar	Member , DJB(Water)	011-23528578	memberwsdj@gmail.com
4	Sh Ashutosh Kaushik	Director, Quality Control , DJB	9650098921	dtqc.djb@gmail.com
5	Sh Sanjay Saxena	CE, II&FC , Delhi	011-27306411	sswbranchifcd@gmail.com ceifcd@gmail.com
6	Mrs Nandita Moitra	Sc D , DPCC	9717593521	nandita moitra@rediffmail.com
7	Sh J.P Singh	SEE. HSPCB	9216849307	jpsinghhspcb@gmail.com
8	Sh Sandeep Taneja	Chief Engineer , Yamuna Water Services-South I&WR Deptt, Haryana	9810293501	irrigation@hry.nic.in ceywsn.irr@gov.in
9	Sh J. Chandra Babu	Sc E, WQM-I Div, CPCB	9868278903	jcb.cpcb@nic.in
10	Sh Vishal Gandhi	Sc D, UPC-I DIV, CPCB	9891254423	vishalcpceb@gmail.com
11	Sh J.K Bhatia	Sc C, Water Lab, CPCB	9968076207	bhatiajk61@gmail.com
12	Mrs Suniti Parashar	Sc C, WQM-I Div, CPCB	9868819711	suniti.cpcb@nic.in

Annexure – III



केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE GOVT. OF INDIA

By Speed Post/E-mail

F.No.A-14011/2/2020/WQM-I

05.01.2021 /354

To

The Chief Engineer,
Yamuna Water Services Delhi Irrigation & Water Resources Deptt,
Haryana
Eic.irrigation@hry.nic.in, ceyswn.irr@gov.in

Sub: Follow –up actions as per decision taken in First meeting of Study Group held on 04.01.2021 through Video Conferencing on the issue of control of increase in Ammonical-Nitrogen in river Yamuna at entry point in Delhi-reg.

Sir,

This has reference to the Study Group meeting held on 04.01.2021 through video conferencing under the chairmanship of 'MS, CPCB' on the above captioned subject. As per decision taken in the afore-said meeting, action is required to be taken on the following aspects:-

1. Meeting with the Vendors operating RTWQMS at Palla & Wazirabad for regular calibration without data gap (Action: By DPCC)
2. Performance assessment of few STPs, CETPs & ETPs of industrial units located at Panipat, Sonapat, Yamunanagar & Karnal along river Yamuna and submission of report to CPCB (Action : By HSPCB)
3. Joint Surveillance Squad (JSS) constituted comprising representative of Delhi Jal Board (Sh Jagdish Arora ,OSD to Member Water Supply # 9650291 123, Sh Ashutosh Kaushik , Director, Quality Control, DJB # 9650098921), representative of Delhi Pollution Control Committee (Dr Nandita Moitra , Sc D # 9717593521 & Sh Meshram # 8527499218), representative of Irrigation & Flood Control Deptt, Govt of Delhi (Sh Sanjay Saxena # 01127306411) Haryana State Pollution Control Board (Sh Bhupendar Chahal , Regional Officer , Sonapat ,HSPCB # 09896376055), representative of Irrigation & Water Resources Deptt , Haryana (Sh Navdeep Rathore, SE, YWS Circle Delhi # 9467282039) for identification of sources of Pollution , hot-spots , identification of illegal discharges between Palla and Wazirabad , present practices being followed for discharge of sewage generated from unsewered colonies, identification of drains which require frequent monitoring.

In view of above, it is requested that necessary action on the above mentioned aspects be ensured in a time bound manner. Action taken report please be submitted to CPCB (Head Office) within 15 days to enable Study Group for finalization of report in the matter.

Yours faithfully,

(J.Chandra Babu)
Sc 'E', WQM-I

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032
दूरभाष/Tel : 43102030, 22305792, वेबसाइट/Website : www.cpcb.nic.in



Central Pollution Control Board
(Ministry of Environment, Forest & Climate Change)
Parivesh Bhawan, East Arjun Nagar,
Delhi - 110032

Minutes of First meeting of Joint Surveillance Squad (JSS), (Study Group) held on 13.01.2021 to review the status of action taken so far by the JSS on the issue of increase of Ammonical-Nitrogen in river Yamuna at entry point in Delhi.

First meeting of the Joint Surveillance Squad (JSS) (Study Group) was held on 13.01.2021 at 04:00 PM through Video conferencing under the Chairmanship of Dr. A.K. Vidyarthi, Additional Director & DH, WQM-I, CPCB with the members of JSS of Delhi Pollution Control Committee (DPCC), Haryana State Pollution Control Board (HSPCB), Irrigation & Flood Control Department, Govt. of Delhi (I&FC), Delhi Jal Board (DJB), Irrigation & Water Resources Department and CPCB. List of participants is given at Annexure-I.

Upon detailed discussions during the meeting, following decisions were made: -

Actions to be taken by SPCBs/ PCCs: -

1. Industries in the catchment areas including CETPs, STPs and others shall be mapped by the Joint teams of Delhi and Haryana SPCBs/ PCCs.
2. Surprise visits/ inspection of the industries/ CETPs/ STPs shall also be done by HSPCB & DPCC to identify all probable sources of pollution such as industries situated along the drains/ rivers.

Actions to be taken by Joint Surveillance Squad (JSS): -

1. Mapping of the drains DD2 and DD8 shall be done from the point of their origin to the point of confluence with river Yamuna by Joint Surveillance Squad comprising of officials from Delhi and Haryana State agencies.
2. Mapping of the first order drains as well as the second order drains shall be done including the markings of villages, towns and cities of importance and their details.
3. Confluence of second order drains with the major drains shall also be marked and samples shall be collected.
4. Sampling points shall include confluence points of the drains as well as the upstream and downstream points of the confluence.
5. Mapping exercise shall be completed in 07 days by the Joint teams of Delhi and Haryana State.

6. Coordinates (Latitude and longitude) shall also be marked of the sampling point on the map showing its location and importance.
7. Analysis of the additional parameters such as Nitrate in place of Nitrite, Flow of the drain, colour shall also be done.
8. During mapping, illegal disposal through tankers should also be tracked to identify the nearby possible sources of pollution.
9. The report by the Joint Surveillance Squad shall be submitted to CPCB within 10 days.

The meeting ended with thanks to the Chair.

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Annexure-I

List of Participants attended the meeting of JSS held on 13.01.2021 to review the status of action taken so far by the JSS on the issue of increase of Ammonical-Nitrogen in river Yamuna at entry point in Delhi.

Name of Officials attended the meeting through VC	Designation	Phone No	E mail id
1. Sh. Jagdish K. Arora	OSD to Member Water Supply, DJB	9650291123	--
2. Sh. Ashutosh Kaushik	Director, Quality Control, DJB	9650098921	dtqc.djb@gmail.com
3. Dr. Nandita Moitra	Sc-D, Delhi Pollution Control Committee	9717593521	nandita_moitra@rediffmail.com
4. Sh. Meshram	Sc-C, Delhi Pollution Control Committee	8527499218	--
5. Sh. Sanjay Saxena	CE, Irrigation & Flood Control Department, Govt. of Delhi	011-2730611	sswbranchifcd@gmail.com, ceifcd@gmail.com
6. Sh. Bhupendar Chahal	Regional Officer, Sonapat, HSPCB	9896376055	hspcbrosr@gmail.com
7. Sh. Navdeep Rathore	SE, YWS, Circle Delhi, Irrigation & Water Resources Department	9467282039	ywsdel.irr@gov.in
8. Sh. Vishal Gandhi	Sc-E, UPC-I, CPCB	9891254423	vishalpcb@gmail.com
9. Sh. Ajay Aggarwal	DH, IPC-VII Division, CPCB	9868210860	ajayaggarwal.cpcb@nic.in
10. Sh. Vinay K. Upadhyay	Sc-B, IPC-VII Division, CPCB	8745073839	vinay0408@gmail.com



Central Pollution Control Board
(Ministry of Environment, Forest & Climate Change)
Parivesh Bhawan, East Arjun Nagar,
Delhi - 110032

Minutes of Meeting of Study Group on activities undertaken on issue of increase in Ammonical-Nitrogen in River Yamuna.

A Review meeting for assessment of activities undertaken by the Study Group (Joint Surveillance Squad) constituted by CPCB, was held on 16.01.2021 (Saturday) at 10:30 AM, through video conference on the issue of increase in Ammonical-Nitrogen in River Yamuna in Delhi region. The meeting was attended by officers from Delhi Jal Board (DJB), Delhi Pollution Control Committee (DPCC), Irrigation & Flood Control Department, Govt. of Delhi, Haryana State Pollution Control Board (HSPCB), Public Health Engineering Department (PHED) Haryana, Haryana State Industrial and Infrastructure Development Corporation (HSIDC) and, the Municipal Corporation Yamuna Nagar and also by the National Mission for Clean Ganga (NMCG), Ministry of Jal Shakti. The meeting was chaired by Chairman, CPCB. List of participants is Annexed.

The meeting started with welcome note by Chairman, CPCB to all the participants. Chairman stated that the level of participation from concerned agencies should have been at higher level in view of the gravity of pollution of River Yamuna, specially in context of high Ammonical nitrogen, due to which water treatment plants are shut down and water supply is affected to major parts of Delhi. Chairman also observed that it is good to have ED (Technical), NMCG, MoJS in this meeting.

Member Secretary CPCB, Dr. Prashant Gargava, informed that the Study Group was constituted on 04.01.2021 with the objective of identification of sources of pollution, study of the data, suggest permanent solutions for water quality problem of River Yamuna and for seeking suggestions on augmentation of capacities of water treatment plants. A Joint Surveillance Squad for finding out illegal discharges and for control of pollution was also constituted which is likely to submit its report shortly. He further informed that low water flow of Yamuna River in Delhi region is a very important issue and injunction of fresh water is required to be done at certain points and, for that Ministry of Jal Shakti, has to play an important role.

Divisional Head WQM-I, Dr A.K Vidyarthi made a presentation stating discharges from drains and water quality values based on CPCB data and also from the results provided by Delhi Jal Board. He said that pollution sources in River Yamuna needs to be mapped properly from all perspectives -sewage discharge, industrial pollution and solid waste disposal point of view.

Member Secretary, Haryana SPCB stated that the analysis results of Delhi Jal Board do not appear to have follow proper protocol and suggested that CPCB should consider results from their analysis. There are high variations between the CPCB values and DJB values for ammonical nitrogen. He said that it is important that CPCB collates and verifies the results properly before filing reply to Hon'ble Supreme Court. Representation of ammonical nitrogen by CPCB should be scientific and should reflect actual

Chairman CPCB, observed that there could be some variations in results but there is no denying in the fact that there is a very high pollution in River Yamuna and Ammonical nitrogen values are high. He directed to document all the relevant information such as sewage generation, capacity of STPs, industrial pollution, sources of pollution including cities and villages not only from present perspective but from historical perspective also. CPCB should strictly follow the requirements of the Hon'ble Supreme Court, identify all the drains, concentration of Ammonical Nitrogen in them and their flow, contributing to the spike. Locate all the industries, their no, type and total effluent generated. Calcite the load of Ammonical Nitrogen to facilitate the identification of the priority areas.

Dr. D.P Mathuria, Executive Director (Technical), NMCG informed that a special meeting with the Chief Secretaries of Haryana and Delhi was conducted in the Ministry on the issue of water quality of River Yamuna. Ammonia in February 2018 as per direction of Hon'ble NGT and the concerned State agencies were required to take necessary action for prevention and control of pollution in Yamuna River.

Following decisions were taken for preparation of Report for submission to the Hon'ble Supreme Court:

1. All concerned agencies of both the States of Haryana and Delhi shall provide the required information, as discussed in the meeting by 12 noon of 17.01.2020.
2. CPCB to collate all information and document properly.
3. Finalization of CPCB reply by 18.01.2021.

The meeting ended with thanks to and from the Chair

Annexure I

List of Participants attended the meeting held on 16.01.2021 to review the status of action taken on the issue of increase of Ammonical-Nitrogen in river Yamuna at entry point in Delhi.

Name and Organization	Email
1. Sh. Shiv Das Meena, Chairman, CPCB -in the Chair	ccb.cpcb@nic.in
2. Dr. Prashant Gargava, Member Secretary, CPCB	mscb.cpcb@nic.in
3. Sh. D.P Mathuria, ED Technical, NMCG	uyrb-mowr@nic.in
4. Sh. Devendra Dahiya, Production and Maintenance Manager, HSIDC	mdhsiidchry@gmail.com
5. Dr. Hema Patel, Project Officer, NMCG	hhasija@gmail.com
6. Sh. S. Narayanan, Member Secretary, Haryana State Pollution Control Board	hspcbho@gmail.com ,
7. <u>Sh. Sandeep Kulshrestha, EE (Proj.)PHED</u>	<u>eeproject@phedharyana.gov.in</u>
8. Sh. Vivek Sangwan, Public Health Engineering Department	eicphed@phedharyana.gov.in
9. Sh. Jagdish Arora, OSD to Member Water Supply, Delhi Jal Board	--
10.Sh. Ashutosh Kaushik, Director, Quality Control, Delhi Jal Board	dtqc.djb@gmail.com
11. Dr. Nandita Moitra, Sc-D, Delhi Pollution Control Committee	nandita_moitra@rediffmail.com
12. Sh. P.B. Meshram, Sc-C, Delhi Pollution Control Committee	--
13. Sh. Sanjay Saxena, Irrigation & Flood Control Department, Govt. of Delhi	<u>sswbranchifcd@gmail.com,</u> ceifcd@gmail.com
14. Sh. Bhupendar Chahal, RO, Sonapat, HSPCB	hspcbrosr@gmail.com
15.Sh. Kamaljeet Singh, Regional Officer, HSPCB	hspcbropr@gmail.com
16. Sh. Navdeep Rathore, SE, YWS, Circle Delhi, Irrigation & Water Resources Department	ywsdel.irr@gov.in
17. Dr. A.K Vidyarthi , Divisional Head, WQM-II	akvidyarthi@gmail.com
18. Sh. N. K. Gupta,DH, UPC-I Division, CPCB	nkgupta.cpcb@nic.in
19. Sh. Vishal Gandhi, Sc-E, UPC-I	vishalpcb@gmail.com
20. Sh. Ajay Aggarwal, DH, IPC-VII Division, CPCB	ajayaggarwal.cpcb@nic.in
21.Sh. Vinay K. Upadhyay, Sc-B, IPC-VII Div	vinay0408@gmail.com
22. Dr. Brajesh Shrivastva, Sc-C, WQM-I	<u>brajeshchem@gmail.com</u>
23. Smt. Suniti Parashar, Sc-C, WQM-I	sunitiparashar@gmail.com

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Central Pollution Control Board
(Ministry of Environment, Forest & Climate Change)
Parivesh Bhawan, East Arjun Nagar,
Delhi - 110032

Minutes of Meeting of Study Group on activities undertaken on issue of increase in Ammonical-Nitrogen in River Yamuna.

In continuation of the first meeting held on 16.01.2021, the second meeting for assessment of activities undertaken by Study Group (Joint Surveillance Squad) was held on 17.01.2021 (Sunday) at 01:30 PM, through video conference on the issue of increase in Ammonical-Nitrogen in River Yamuna in Delhi. The meeting was chaired by Member Secretary, CPCB.

At the start of the meeting Shri. N. K Gupta, Divisional Head, UPC, informed that the required information has been received in the given format from state of Haryana and Delhi. However, additional information and some clarifications are required which CPCB is requesting the concerned agencies.

Member Secretary, CPCB enquired about the action plans from Delhi Jal Board for providing water supply to the people in the wake of high ammonical nitrogen. Shri Jagdish K. Arora, from DJB informed that DJB is upgrading WTP at Chandrawal and Wazirabad and their completion is scheduled by 2023 and 2024 respectively. MS observed that the timeline is already very lengthy and they should work on 24 X 7 basis.

Dr. Nandita Moitra, Sc-D from DPCC said that DPCC has installed Online Monitoring System at Palla and Wazirabad which also provides information about the Ammonical Nitrogen. Member Secretary, CPCB directed DPCC to share the Real Time Water Quality Data of Ammonical Nitrogen in River Yamuna. He also opined that the data presented in the Hon'ble Court should be same and uniform so as to avoid any confusion or discrepancy. Sh. Jagdish K. Arora requested DPCC to share the data with DJB also so as to review at their end and provide justifications if needed.

Shri D.P Mathuria (ED) NMCG informed about a special meeting with concerned Chief Secretaries in Feb, 2018 and the minutes of meeting were also shared to the concerned states/ agencies with the approval from competent authority. State needed to act on that but still the work has not been done. He observed that drains in Panipat and Yamunanagar should have been tapped and the under utilized capacity of STPs should have been used using sewage water from panipat drain.

Insitu generation of ammonia from the sludge at Wazirabad (pond) was also discussed. Shri Jagdish K. Arora informed that no insitu generation has been found by CPCB during the visit. It was decided that it should be properly investigated.

DJB representative informed that letters for laying conduit were sent to Haryana State Pollution Control Board but no response was received. If HSPCB permits, DJB will revive the project. It was decided that HSPCB has to act fast on this matter.

Member Secretary, CPCB informed that the information should be submitted to Hon'ble Court in the structured format. It should include directions of Hon'ble NGT, Action plans for managing sewage, information about the Joint Surveillance Squad, analysis of the recent data. He asked Sh. D.P Mathuria, NMCG to share the findings of their Joint Squad.

Sh. D.P Mathuria, NMCG informed that NMCG has already shared the required to CPCB. He further stated that there are two STPs in Panipat and one in Yamuna Nagar which are operating below their capacity. The sewage from Panipat Drain and Tejab Nalla could be intercepted and diverted to the STPs for treatment and in the process, capacity of STPs will also be augmented with sewage. He informed that HSPCB itself has concurred that the drains do not have industrial waste and thus could be diverted to the STPs.

Member Secretary, HSPCB, stated that they will consider the suggestion made by ED (Tech) NMCG. He also suggested that the data to be submitted in the Hon'ble Court should be CPCB's own data or from any Joint team.

Member Secretary, CPCB, while concluding the meeting, requested that DJB and DPCC should provide the relevant information at the earliest for review by CPCB and for submission of response to the Hon'ble Supreme Court.

The Meeting ended with thanks to the Chair

Annexure I

List of Participants attended the meeting held on 17.01.2021 to review the status of action taken on the issue of increase of Ammonical-Nitrogen in river Yamuna at entry point in Delhi.

Name of participants officers and organization	Email
1. Dr. Prashant Gargava, Member Secretary, CPCB	mscb.cpcb@nic.in
2. Sh. D.P Mathuria, ED Technical, NMCG	uyrb-mowr@nic.in
3. Sh. Devendra Dahiya, Production and Maintenance Manager, Haryana State Industrial and Infrastructure Development	mdhsiidchry@gmail.com
4. Sh. S. Narayanan, Member Secretary, Haryana State Pollution Control Board	hspcbho@gmail.com ,
5. Sh. Vivek Sangwan, Public Health Engineering Department	eicphed@phedharyana.gov.in
6. Sh. Jagdish Arora, OSD to Member, Water Supply, Delhi Jal Board	--
7. Sh. M.K Hans, CE (E&M) WW,	ce.ww.djb@gmail.com
8. Sh. Ashutosh Kaushik, Director, Quality Control, Delhi Jal Board	dtqc.djb@gmail.com
9. Dr. Nandita Moitra, Sc-D, Delhi Pollution Control Committee	nandita_moitra@rediffmail.com
10. Sh. P.B. Meshram, Sc-C, Delhi Pollution Control Committee	--
11. Sh. Sanjay Saxena, Irrigation & Flood Control Department, Govt. of Delhi	sswbranchifcd@gmail.com, ceifcd@gmail.com
12. Sh. Bhupendar Chahal, Regional Officer, Sonapat, HSPCB	hspcbrosr@gmail.com
13. Sh. Sandeep Taneja, Chief Engineer, Yamuna Water Services Delhi Irrigation & Water Resources Department, Haryana	eic.irrigation@hry.nic.in ceywsn.irr@gov.in
14. Sh. Navdeep Rathore, SE, YWS, Circle Delhi, Irrigation & Water Resources Department	ywsdel.irr@gov.in
15. Sh. N. K. Gupta, DH, UPC-I Division, CPCB	nkgupta.cpcb@nic.in
16. Sh. Vishal Gandhi, Sc-E, UPC-I	vishalcpb@gmail.com
17. Sh. Ajay Aggarwal, DH, IPC-VII Division, CPCB	ajayaggarwal.cpcb@nic.in
18. Sh. Vinay K. Upadhyay, Sc-B, IPC-VII Div	vinay0408@gmail.com
19. Dr. Brajesh Shrivastva, Sc-C, WQM-I, CPCB	brajeshchem@gmail.com

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Annexure VI (a)

Water Quality Data of river Yamuna (Year 2020)

S No.	Location Name	State Name	Temperature °C		Dissolved Oxygen mg/L		pH		Conductivity (µmhos/cm)		BOD mg/L		Fecal Coliform MPN/100mL		Total Coliform MPN/100mL	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Primary Water Quality Criteria for outdoor bathing					>5 mg/L		6.5-8.5				< 3 mg/L		< 2500 MPN/100 mL			
1.	Yamunotri*	Uttarakhand	–		10.8		7.4		79		BDL		4		4	
2.	Hanumanchatti*	Uttarakhand	–		11.6		7.9		145		BDL		94		140	
3.	U/S Lakhwar Dam	Uttarakhand	16	22	8.6	10.8	7.7	8.4	142	320	0.8	1.0	2	9	2	30
4.	U/S Dak Patthar	Uttarakhand	17	24	8.2	10.2	8.0	8.2	106	162	1.0	1.2	17	34	40	70
5.	U/S Paonta Sahib	Himachal Pradesh	13	28	7.1	9.1	6.4	8.0	214	5866	0.4	1.8	9	46	32	140
6.	D/S Paonta Sahib	Himachal Pradesh	11	31	7.0	9.0	6.6	7.7	248	448	0.4	2.0	11	27	38	94
7.	U/S Ranbaxy	Himachal Pradesh	16	34	7.1	8.9	7.0	7.6	162	605	0.4	1.6	10	13	32	94
8.	D/S Ranbaxy	Himachal Pradesh	16	34	7.0	8.8	7.0	7.6	161	2593	0.4	1.8	10	33	33	110
9.	Hathnikund, Yamunanagar	Haryana	21	29	7.1	8.5	7.3	8.3	192	620	2.4	6.6	200	3200	1100	21200
10.	Kalanaur, Yamuna Nagar	Haryana	19	29	6.8	9.3	7.2	8.3	197	608	2.2	5.2	200	49000	3900	1600000
11.	Magalaura	Haryana	–		5.2	10.8	7.2	8.5	157	451	BDL	4.0	49	7000	230	35000
12.	Khojkipur Panipat	Haryana	21	29	5.0	8.4	6.6	8.4	255	942	1.4	7.0	90	70000	270	278000
13.	Sonepat, Haryana	Haryana	14	35	7.1	10.6	6.5	8.6	235	683	1.8	5.5	110	220000	330	1600000
14.	Palla	Delhi	16	33	5.6	17.1	7.6	9.0	273	789	1.4	7.9	78	79000	330	350000
15.	Nizamuddin	Delhi	13	31	BDL	2.4	7.1	7.9	460	1641	5.6	57.0	210000	11000000	700000	28000000
16.	Okhla Bridge (Inlet of Agra Canal)	Delhi	15	31	BDL	2.6	7.1	7.9	488	1526	5.6	27.0	78000	3300000	350000	16000000

S No.	Location Name	State Name	Temperature °C		Dissolved Oxygen mg/L		pH		Conductivity (µmhos/cm)		BOD mg/L		Fecal Coliform MPN/100mL		Total Coliform MPN/100mL	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Primary Water Quality Criteria for outdoor bathing					>5 mg/L		6.5-8.5				< 3 mg/L		< 2500 MPN/100 mL			
17.	Okhla After Meeting of Shahdara Drain	Delhi	15	33	BDL	5.6	7.2	7.8	499	1773	7.7	114.0	68000	7900000	490000	35000000
18.	Agra Canal at Madanpur Khadar	Delhi	15	31	BDL	1.4	7.1	7.8	573	1541	11.4	32	330000	4900000	1100000	24000000
19.	Mazawali	Uttar Pradesh	14		BDL	2.3	6.4	8.1	978	1719	8.7	59.0	680	4900000	3300	9200000
20.	Shahpur	Uttar Pradesh	14	32	4.6	6.9	7.1	7.5	–	–	5.8	10.0	31000	85000	53000	110000
21.	Kesighat, Vrindavan	Uttar Pradesh	15	32	4.0	7.6	7.1	7.6	–	–	6.0	10.4	24000	65000	46000	88000
22.	Mathura U/S	Uttar Pradesh	13		BDL	4.6	6.5	8.5	1096	1816	7.3	30.0	400	920000	1100	9200000
23.	Vishramghat, Mathura	Uttar Pradesh	14	32	4.1	7.4	6.9	7.6	–	–	6.8	12.0	31000	92000	54000	140000
24.	Mathura D/S	Uttar Pradesh	12		1.6	6.8	6.5	8.3	1195	1903	6.9	21.0	1700	170000	2200	1400000
25.	Agra U/S	Uttar Pradesh	12		1.4	9.6	6.5	8.5	1154	1872	4.7	25.0	220	3300000	2200	7900000
26.	D/S Of Agra	Uttar Pradesh	–	–	3.8	16.2	6.5	8.7	875	1920	9.1	25.0	450	6100000	2200	32000000
27.	Bateswar	Uttar Pradesh	–	–	2.6	9.2	7.8	7.9	1054	1471	14.0	20.0	450	1400	3300	13000
28.	Etawah	Uttar Pradesh	–	–	7.3	7.3	7.7	7.9	1288	1507	13.0	15.0	20	200	1300	1700
29.	Juhika B/C With Chambal, Etawah	Uttar Pradesh	–	–	8.1	11.3	7.7	8.2	846	937	8.7	13.0	68	7800	1700	220000
30.	Hamirpur	Uttar Pradesh	–	–	0.4	8.4	8.0	8.4	750	832	2.8	6.0	330	2200	1300	13000
31.	Allahabad D/S (Balua Ghat)	Uttar Pradesh	22	27	7.3	11.5	7.8	8.4	418	725	1.8	2.4	310	2100	1700	3900

Note: * locations monitored on yearly basis. BDL value for DO is 0.3 mg/L

93. Primary Water Quality Criteria for Bathing Waters.

In a water body or its part, water is subjected to several types of uses. Depending on the types of uses and activities, water quality criteria have been specified to determine its suitability for a particular purpose. Among the various types of uses there is one use that demands highest level of water quality or purity and that is termed as "Designated Best Use" in that stretch of water body. Based on this, water quality requirements have been specified for different uses in terms of primary water quality criteria. The primary water quality criteria for bathing water are specified along with the rationale in table 1.

Table 1.

**PRIMARY WATER QUALITY CRITERIA FOR BATHING WATER
(Water used for organised outdoor bathing)**

CRITERIA		RATIONALE
1. Fecal Coliform MPN/100 ml:	500 (desirable) 2500 (Maximum Permissible)	To ensure low sewage contamination. Fecal coliform and fecal streptococci are considered as they reflect the bacterial pathogenicity.
2. Fecal Streptococci MPN/100 ml:	100 (desirable) 500 (Maximum Permissible)	The desirable and permissible limits are suggested to allow for fluctuation in environmental conditions such as seasonal change, changes in flow conditions etc.
2. pH:	Between 6.5 –8.5	The range provides protection to the skin and delicate organs like eyes, nose, ears etc. which are directly exposed during outdoor bathing.
3. Dissolved Oxygen:	5 mg/l or more	The minimum dissolved oxygen concentration of 5 mg/l ensures reasonable freedom from oxygen consuming organic pollution immediately upstream which is necessary for preventing production of anaerobic gases (obnoxious gases) from sediment.
4. Biochemical Oxygen demand 3 day, 27°C:	3 mg/l or less	The Biochemical Oxygen Demand of 3 mg/l or less of the water ensures reasonable freedom from oxygen demanding pollutants and prevent production of obnoxious gases";

**ANALYSIS RESULTS OF SAMPLES COLLECTED FROM RIVER YAMUNA AT PALLA
LOCATION FROM 31.05.2021 to 12.07.2021**

S. No	Date of Sampling	Dissolved Oxygen (mg/L)	pH	BOD (mg/L)	Faecal Coliform MPN-100ML	Faecal Streptococci (MPN/100ml)	Amoniacal Nitrogen / N (mg/L)
PWQC for outdoor bathing notified under E(P) Rules		> 5 mg/l	6.5 - 8.5	<3 mg/l	< 2500 MPN/100ml	<500 MPN/100ml	
1	31.05.2021	5.6	7.2	7.3	3500	79	1.6
2	03.06.2021	5.4	7.8	5.5	45000	350	1.1
3	07.06.2021	5.6	7.7	5.6	1300	70	0.7
4	10.06.2021	5.5	8.3	9.9	7900	230	BDL
5	14.06.2021	7.1	8.4	12	1700	1300	5.1
6	17.06.2021	3.9	8	11	7800	1100	1.5
7	21.06.2021	4.3	7.1	7.9	23	460	0.9
8	23.06.2021	10.5	7.8	9	3500	79	BDL
9	25.06.2021	3.8	7.5	9.5	330	79	1.0
10	30.06.2021	4.5	7.8	6.5	21000	790	0.7
11	05.07.2021	10.5	7.2	12	610	79	7.2
12	08.07.2021	4.3	7.4	14	68	33	1.4
13	12.07.2021	9.2	7.4	20	4900	2400	1

Note: BDL for Ammoniacal Nitrogen is 0.4 mg/L

Photographs taken during River Yamuna and drains sampling



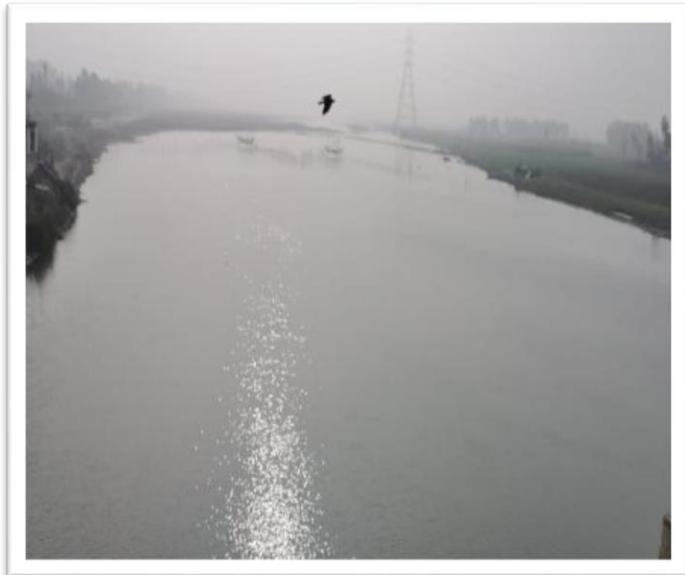
**Yamuna at Sonepat
(Date of sampling - 12.01.2021)**



**Yamuna at Khojkipur
(Date of sampling - 12.01.2021)**



**Yamuna at Kalanaur
(Date of sampling - 12.01.2021)**



**Yamuna at Kairana
(Date of sampling - 12.01.2021)**



**Yamuna at Manglora, Karnal
(Date of sampling - 12.01.2021)**



Panipat Drain
(Date of sampling - 12.01.2021)



Drain No 2
(Date of sampling - 12.01.2021)



Ditch Drain
(Date of sampling - 12.01.2021)

Water quality of monitored locations on River Yamuna carried out in January 2021

Table 11 (i) - Analysis results (Physico-chemical) of samples of River Yamuna for all the 08 monitored locations carried out in January, 2021																		
S. No	Sampling point	pH	Ammoniacal Nitrogen (mg/L)	DO (mg/L)	BOD (mg/L)	COD (mg/L)	Conductivity (µmho/cm)	TDS (mg/L)	Total alkalinity as CaCO ₃ (mg/L)	Total Hardness as CaCO ₃ (mg/L)	Calcium as Ca (mg/L)	Magnesium as Mg (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Chloride (mg/L)	Flouride (mg/L)	Sulphate (mg/L)	Phosphate (mg/L)
Primary Water Quality Criteria for Bathing Water		6.5-8.5	-	5	3	-	-	-	-	-	-	-	-	-	-	-	-	-
1	Kalanaur	7.8	0.2	10.2	3.9	10	346	234	172	313	108	11	0.8	0.02	9	0.3	34	BDL*
2	Manglora, Karnal	7.8	0.7	10.6	4.5	12	318	220	160	341	95	26	1	0.03	13	0.3	39	0.12
3	Kairana	7.9	0.2	10.8	4.1	10	320	210	152	293	100	11	1.2	0.05	12	0.3	35	0.09
4	Khojkipur	7.8	2.4	7.2	9.6	34	531	352	200	333	109	15	1.6	0.06	59	0	53	0.39
5	Sonepat	7.9	0.9	8.5	3.6	20	383	264	156	273	92	11	1.5	0.05	33	0.4	41	0.23
6	Palla	8	1.5	9.6	3.2	15	646								98			
7	Wazirabad Pond	7.9	3	8.9	3.3	11	541								72			
8	Wazirabad Pond	7.5	3.3		3.2	18	758						1.4		90			

*Detection limit of Phosphate = 0.05 mg/L

Table 11 (ii) - Analysis results (Bacteriological parameters) of samples of River Yamuna for all the 08 monitored locations carried out in January, 2021					
S No.	Location	Date	Total Coliform MPN/100mL	Fecal Coliform MPN/100mL	Fecal Streptococci MPN/100mL
Primary Water Quality Criteria for Bathing Water			-	2500 MPN/100mL (Maximum Permissible)	500 MPN/100mL (Maximum Permissible)
1	Kalanaur	12.1.2021	3300	200	70
2	Manglora, Karnal	12.1.2021	3500	490	630
3	Kairana	12.1.2021	240	49	23
4	Khojkipur	12.1.2021	920000	280000	7000
5	Sonepat	12.1.2021	3300	1100	170
6	Wazirabad Pond	7.1.2021	17000	7000	-

Water Quality of Drains monitored in January, 2021

Table 12 - Analysis results (Physico-chemical & Bacteriological parameters) of samples of Drains for all the 04 monitored locations carried out in January, 2021															
S. No	Sampling point	pH	Ammoniacal Nitrogen (mg/L)	DO (mg/L)	Flow (MLD)	BOD (mg/L)	COD (mg/L)	Conductivity (μ mho/cm)	TDS (mg/L)	TSS (mg/L)	Chloride (mg/L)	Phosphate (mg/L)	Total Coliform MPN/100mL	Fecal Coliform MPN/100mL	Fecal Streptococci MPN/100mL
General Discharge Standards (Inland surface water) as per schedule VI of E(P)Rules, 1986		5.5-9	50			30	250			100					
1	Ditch Drain	7.4	42	-	27	145	342	1406	712	296	117	0.53	17000000	17000000	110000
2	Drain No. 2	7.7	13	-	309	124	306	2561	1372	69	356	2.18	170000000	170000000	700000
3	Panipat drain	7.5	22	-	160	235	550	4080	2256	187	731	2.38	-	-	-
4	Drain No. 8	8	3.1	10.8	-	2	16	2748	-	-	607	-	-	-	-

Water Quality of Drains monitored on 26.02.2021

Analysis results of samples of Drains monitored on 26.02.2021							
S.No	Sampling Point	pH	COD (mg/L)	BOD (mg/L)	TSS(mg/L)	Cl(mg/L)	NH3-N(mg/L)
Discharge Standards (Inland surface water) as per schedule VI of E(P)Rules,1986		5.5-9	250	30	100	--	50
1	Drain No. 6 (D6)	7.2	338	90	157	388	36
2	Drain No. 8 (D8)	7.5	24	6.8	14	854	18
3	Drain No. 8 near Regulator (D81)	7.6	37	8.6	23	1165	56

Analysis results of samples of Drains monitored on 26.02.2021										
S.No	Sampling Point	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	Ni (mg/L)	Pb (mg/L)	Zn (mg/L)
Detection limit		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
1	Drain No. 6 (D6)	BDL	BDL	0.06	0.03	1.95	0.43	0.01	0.04	0.11
2	Drain No. 8 (D8)	BDL	BDL	BDL	0.01	0.27	0.25	BDL	BDL	0.03
3	Drain No. 8 near Regulator (D81)	0.08	BDL	0.18	BDL	0.07	13.32	0.05	BDL	0.04

Photographs taken during the visit dated 26.02.2021



Partition wall between DD6 and DD8 at Sonepat (26.02.2021)



DD8 at Rohtak Regulator (26.02.2021)

Photographs taken during the visit dated 19.07.2021 - River Yamuna at Mathura, Palwal & Agra U/s



Figure 1: River Yamuna at Mathura U/s



Figure 2: River Yamuna at Mathura D/s



Figure 3: River Yamuna at Agra U/s

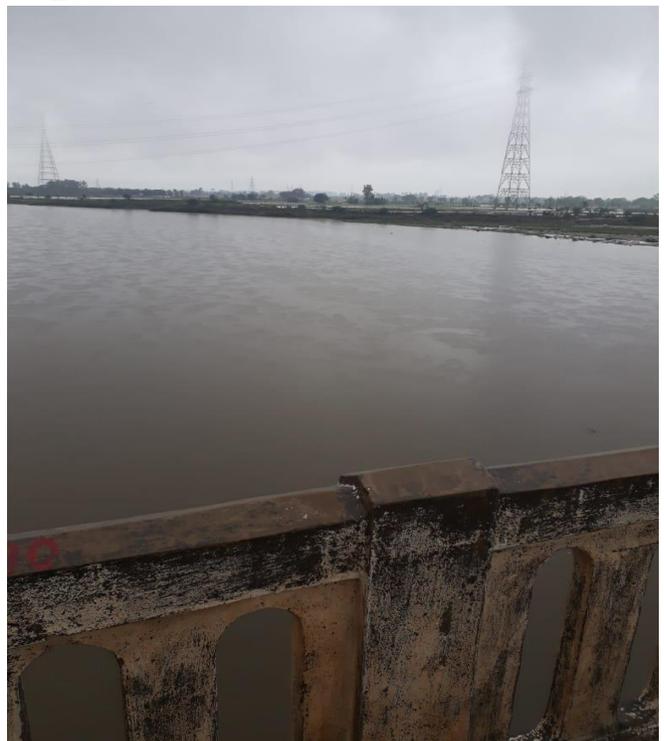
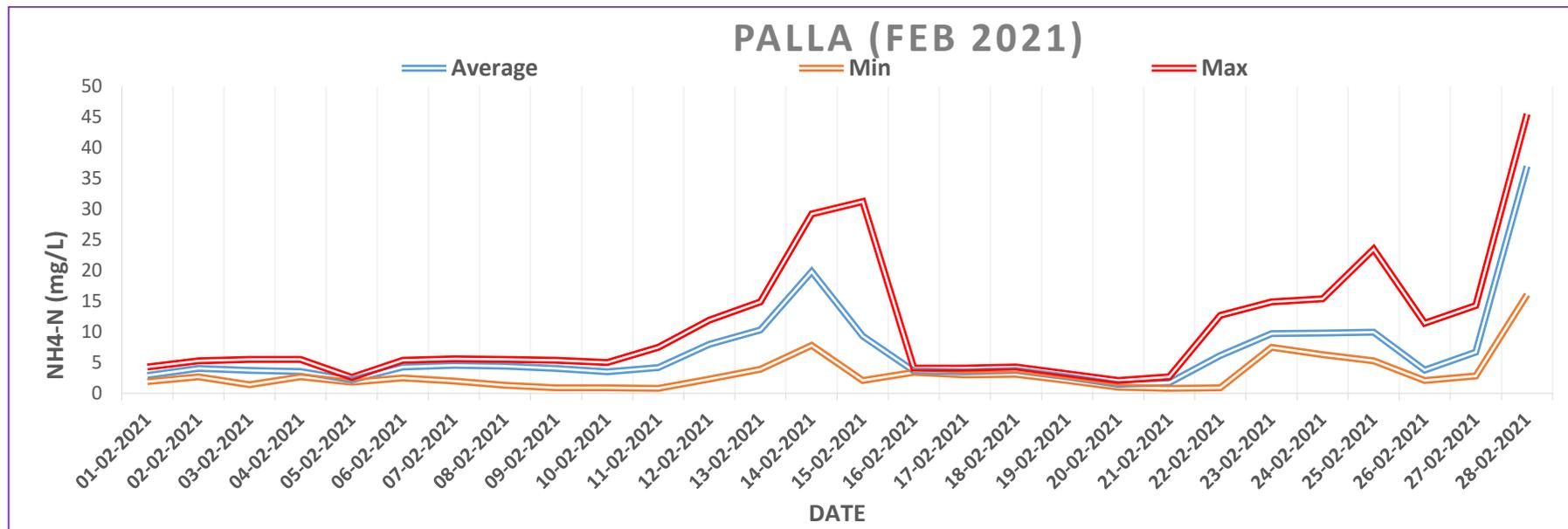
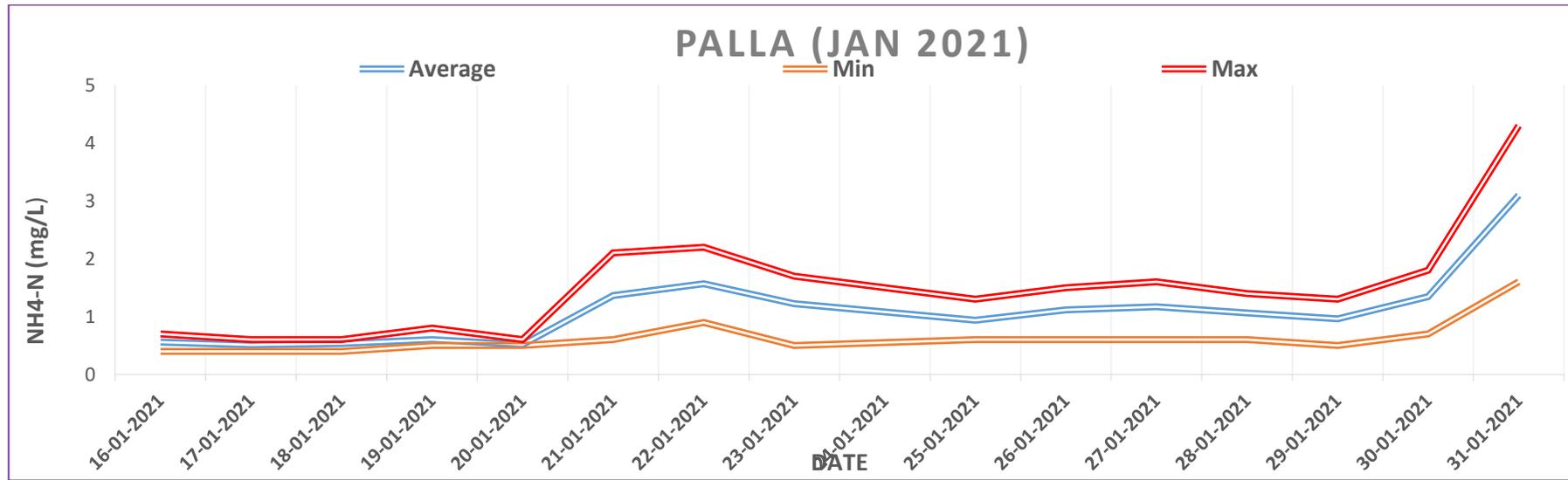
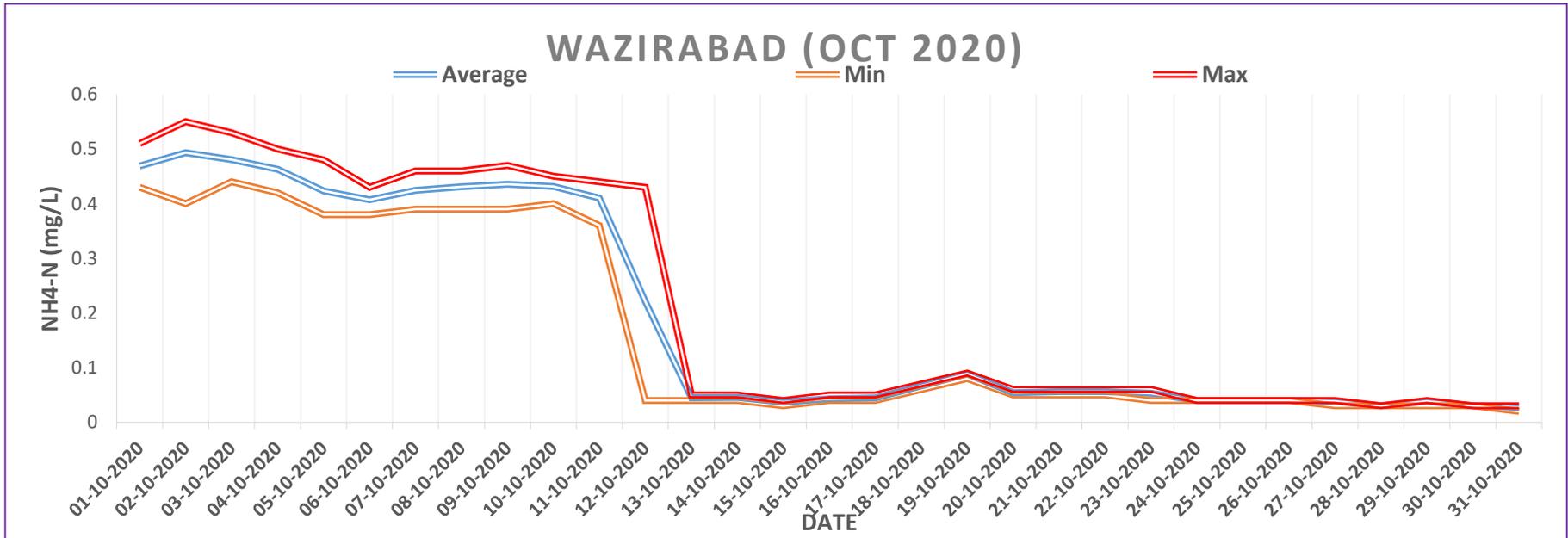
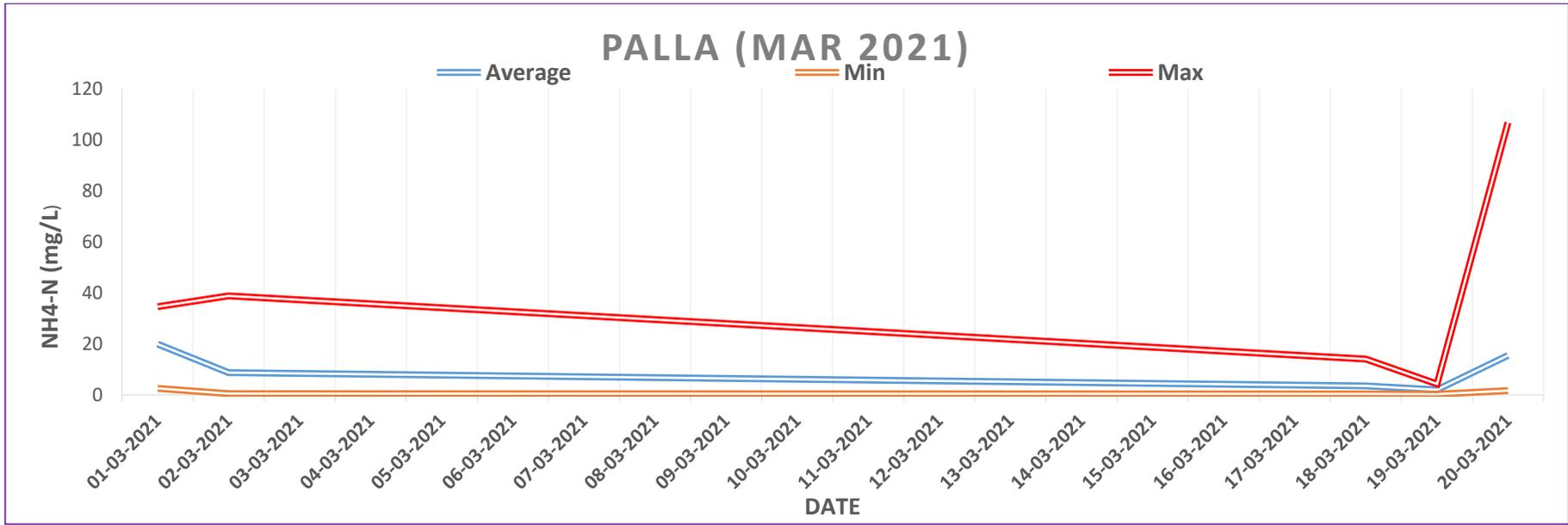
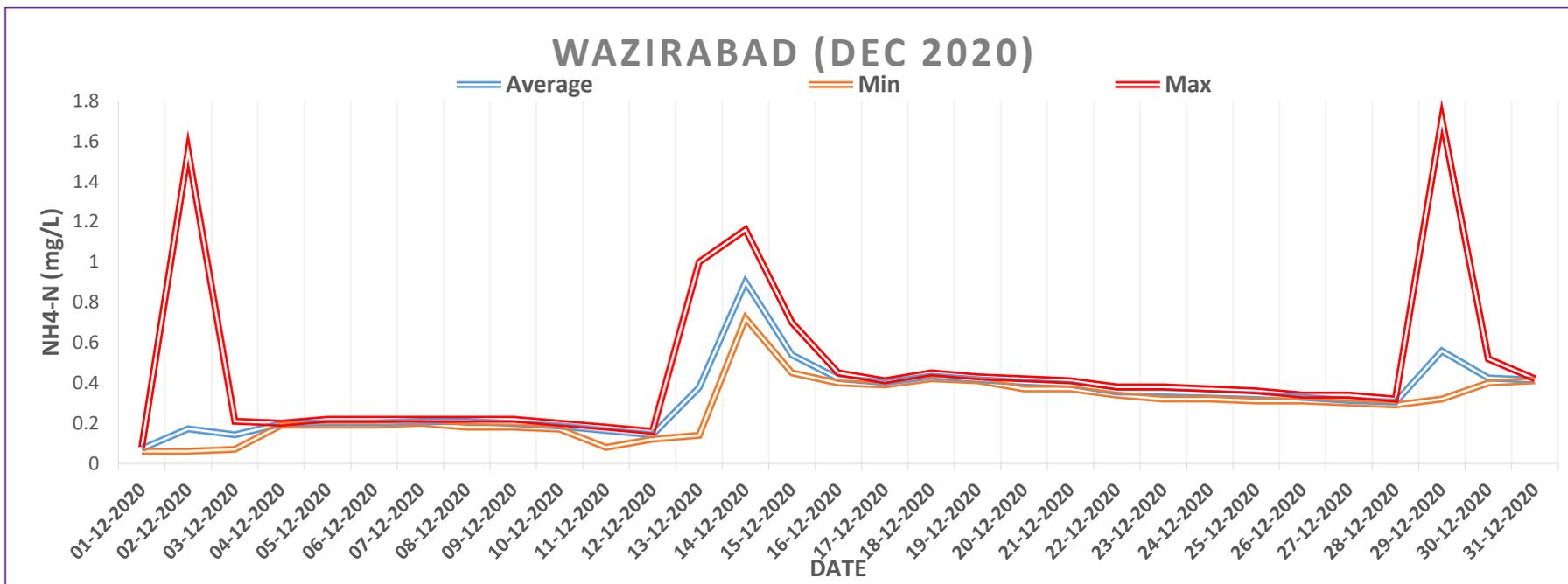
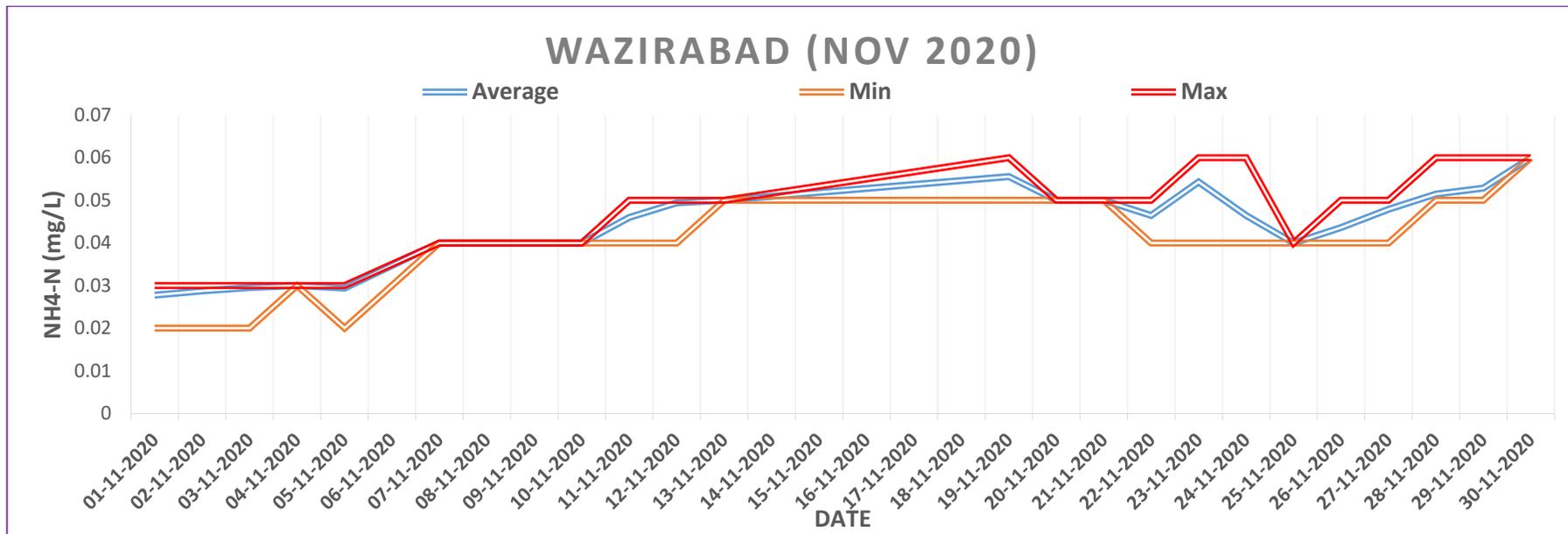


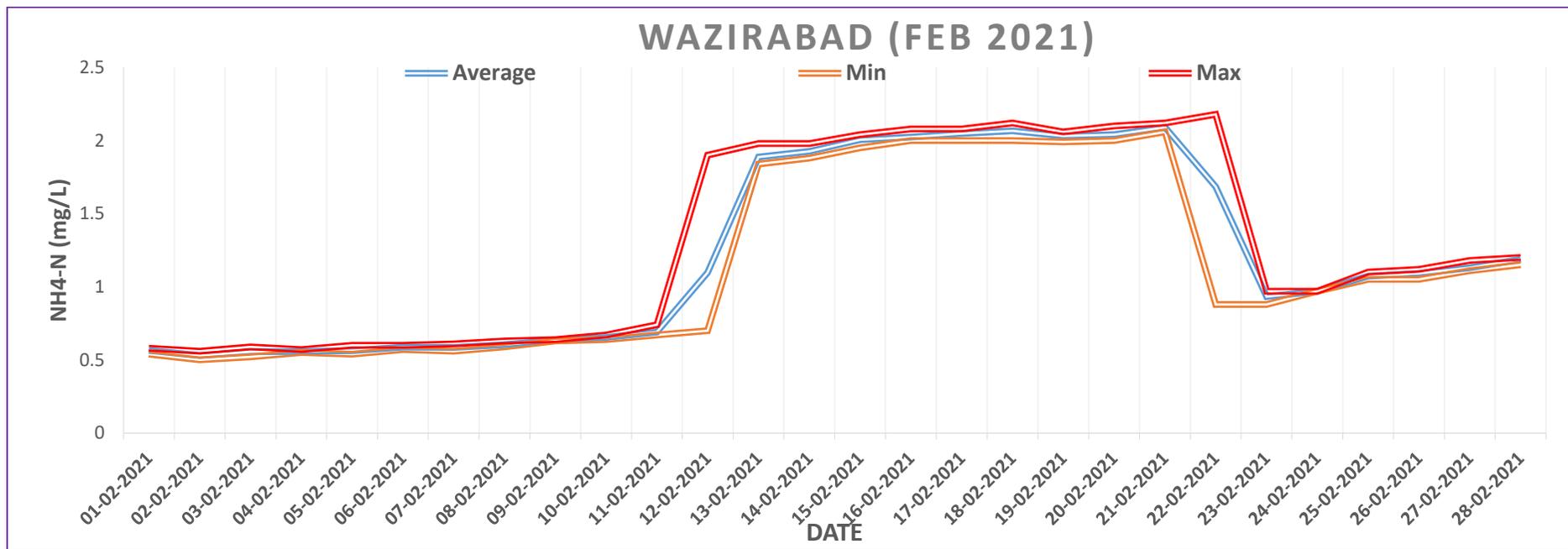
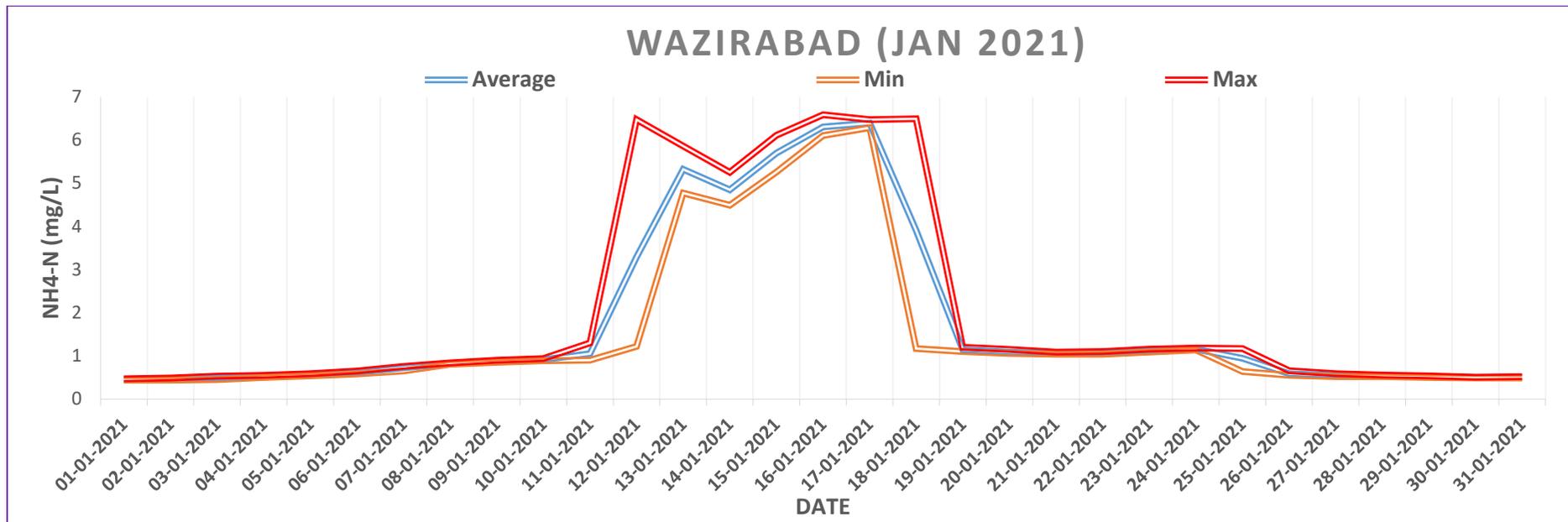
Figure 4: River Yamuna at Palwal

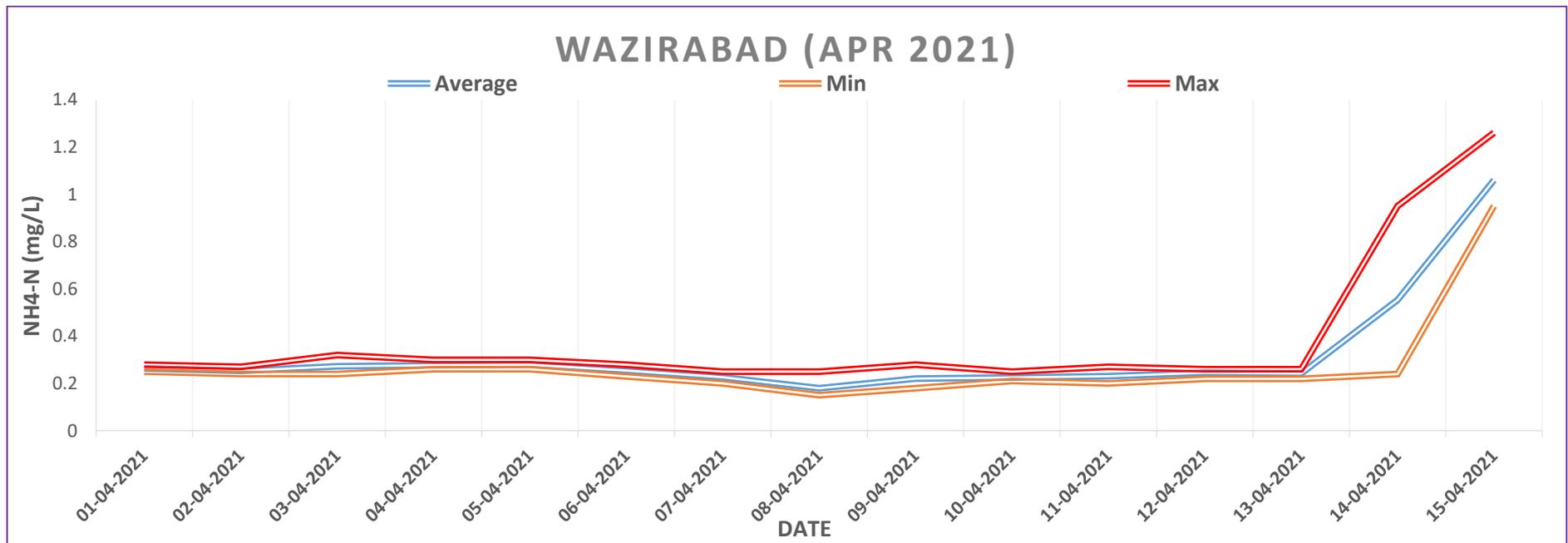
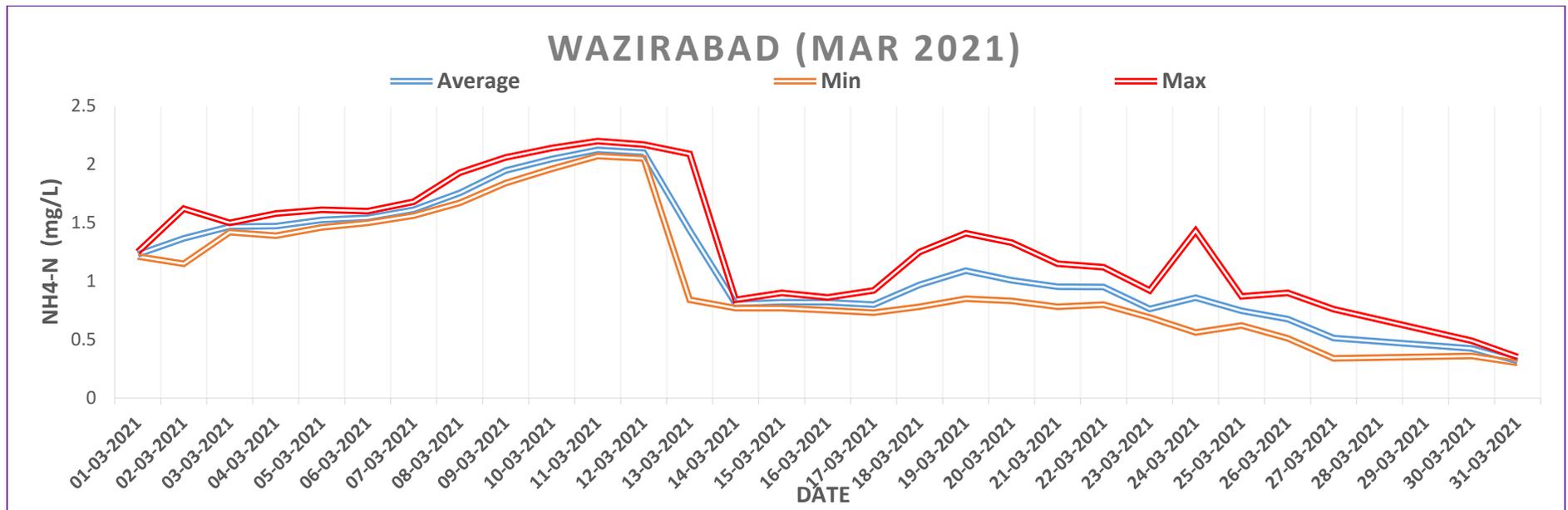
Ammonical Nitrogen in River Yamuna as per RTWQMS











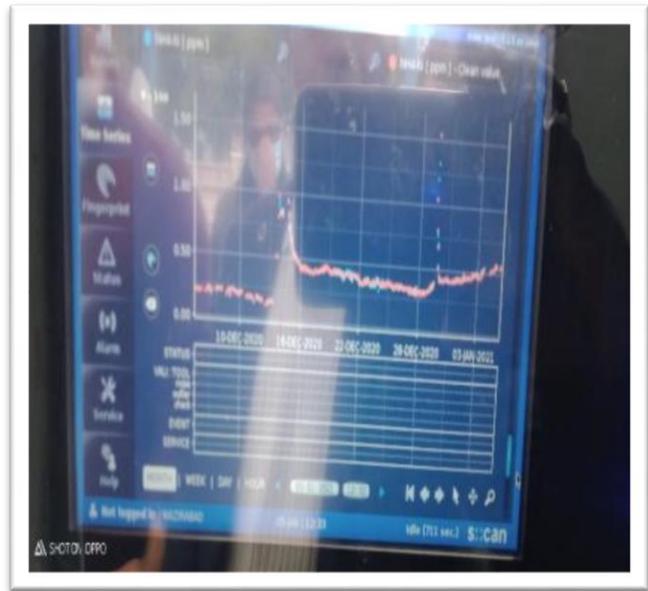
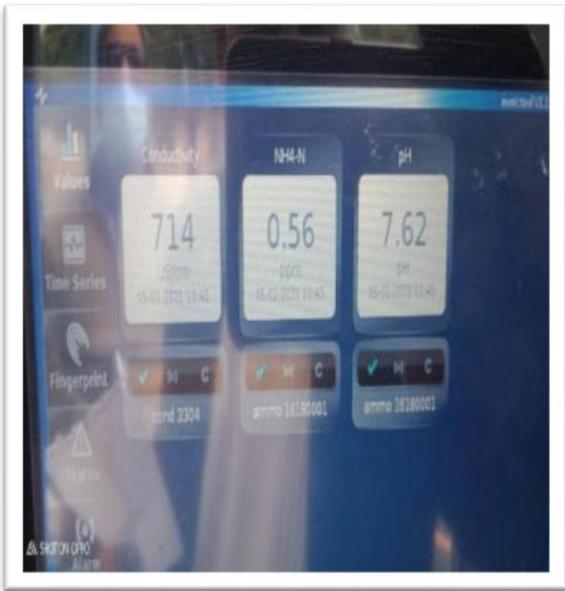
Annexure XV

Subject: Status of Unauthorized Colonies falling from Palla to Wazirabad

S.No.	Name of Colony falling from Palla to Wazirabad	Registration No.	Status of Sewer Line	Likely date of Completion	Remarks
1	Bhagwan Park, Jharoda Majra, Burari, Delhi-84	33	Work is under progress	30.06.2021	Currently all the discharge is falling in Supplementary Drain and no discharge is falling into River Yamuna upstream of Wazirabad (Work is being taken up under Wazirabad GOC).
2	Hardev Nagar, Jharoda Majra, Burari	70A			
3	Hardev Nagar, Jharoda Majra, Burari	70B			
4	Sangam Vihar Wazirabad, Delhi	340			
5	Jharoda Extn, Pt-1, Majra Burari	388			
6	Jharoda Extn.-II, Part Cross Road, Burari, Delhi-84	471			
7	Jharoda Part-3, Surender Colony, Burari, Delhi-84	508			
8	Jagatpur, Village. Jagatpur (Extended Purani Abadi) Delhi-84	568			
9	Harijan Basti Jharoda, Mazra, Delhi-84	622			
10	Milan Vihar Near Jagat Pur Bandh Sant Nagar(Burari) Delhi-84	771			
11	Deepansu Colony Sant Nagar Burari, Delhi	977			
12	Jagat Pur More, Burari, Delhi-84	1101B			
13	Nehru Gali, Bhagat Colony, Burari, Sant Nagar, Delhi-84	87	Work is under progress	30.09.2022	Currently all the discharge is falling in Supplementary Drain and no discharge is falling into River Yamuna upstream of Wazirabad (Work is being taken up under Sant Nagar GOC)
14	Chanden Vihar, West Sant Nagar, Burari, Delhi-84	113A			
15	Chanden Vihar, West Sant Nagar, Burari, Delhi-84	113B			
16	Himgiri enclave, Burari Road, Delhi-84	151			
17	Baba Colony B-Block, Burari, Delhi-84	196			
18	Uttranchal Enclave, Burari, Delhi	233			
19	Sant Nagar Block 'A' Burari Road, Delhi	237			
20	Himgiri Enclave, Mukand Pur (Extn.-II), Burari	245			
21	Tomar Colony (Kamal Pur) Burari, Delhi-84	271			
22	Parvatiya Anchal, C-Block, Sant Nagar, Burari, Delhi-84	282			
23	Kaushik Enclave, A-Block, Burari Road, Delhi	287			
24	Vashisht Enclave, Baba Colony, Burari, Delhi-84	302			

25	Sant Nagar,B-Block Burari, Delhi-84	444			
26	Shiv Kunj,Area No.5 B- Block, Sant Nagar Burari	486			
27	Mukundpur Extn., Part-1, Delhi-42	530			
28	Baba Colony, A-Block, Burari, Delhi-94	646			
29	West Sant Nagar Colony,A 2 Block, Burari, Delhi-84	683			
30	Kaushik Enclave (B) Block, Part-II, Burari, Nathupura Road, Delhi- 84	696			
31	Kaushik Enclave, Burari Extn. Delhi-84	725			
32	Mukand Pur Vistar Delhi-42	772A			
33	Mukand Pur Vistar Delhi-42	772B			
34	Kamal Vihar Kamal Pur Burari Delhi-84	809			
35	Harit Vihar Kamalpur Burari Delhi-84	843			
36	Harit Vihar Kamalpur Burari Delhi-84	843A			
37	Harit Vihar Kamalpur Burari Delhi-84	843B			
38	Satya Vihar(Kamal Pur) Burari Delhi-84	845			
39	Satya Vihar(Kamal Pur) Burari Delhi-84	845A			
40	West kamal Vihar Near Kamal Pur Burari Delhi- 84	928			
41	Sant Nagar Block A1 Extn.Burari Road Delhi- 84	987			

Photographs of visit to RTWQM Station on River Yamuna at Wazirabad, Delhi



Photographs of visit to Wazirabad Laboratory, Delhi



Work Station for analysis of Residual Chlorine and Ammoniacal Nitrogen



Analysis of Ammoniacal Nitrogen by visible method



Record register



UV –VIS Spectrophotometer in the Laboratory



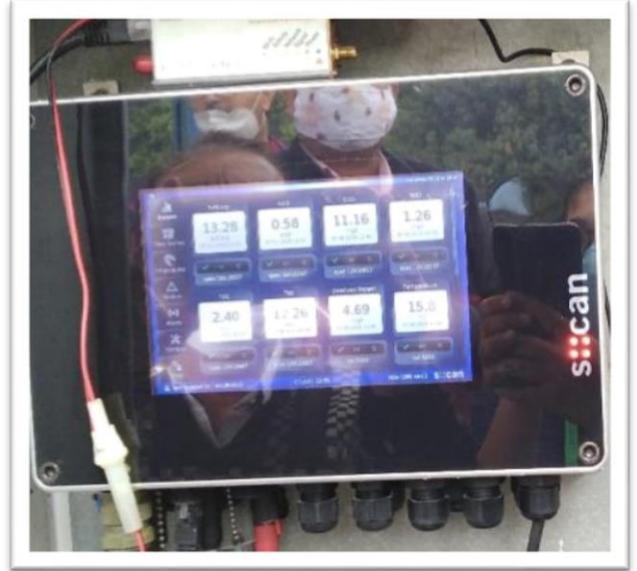
Verification of calibration curve in UV –VIS Spectrophotometer in the Laboratory



Stock solution of standard Ammonium Chloride



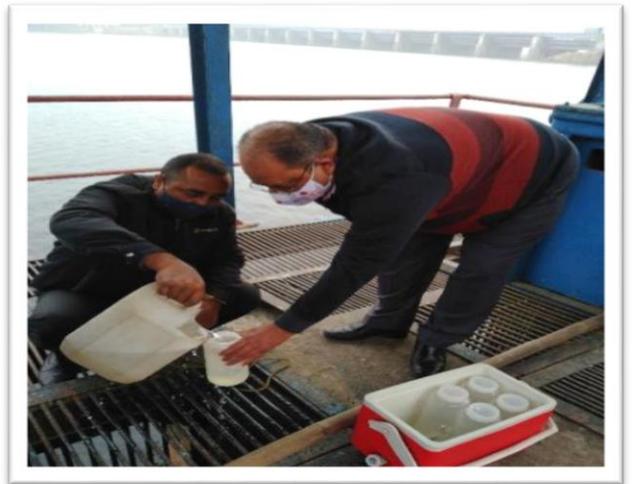
Wazirabad Pond



RTWQM display



RTWQM display



Collection of samples by CWC & CPCB at Wazirabad Pond