NATIONAL MISSION FOR CLEAN GANGA
MINISTRY OF JAL SHAKTI
GOVERNMENT OF INDIA

STRATEGY FOR IMPROVING CONDITION OF WATER BODIES IN THE VICINITY OF PULP AND PAPER INDUSTRIES IN GANGA RIVER BASIN

Centre for Ganga River Basin Management and Studies

JUNE 2019
Volume 2

NATIONAL MISSION FOR CLEAN GANGA (NMCG)

NMCG is the implementation wing of National Ganga Council which was setup in October 2016 under the River Ganga Authority order 2016. Initially NMCG was registered as a society on 12th August 2011 under the Societies Registration Act 1860. It acted as implementation arm of National Ganga River Basin Authority (NGRBA) which was constituted under the provisions of the Environment (Protection) Act (EPA) 1986. NGRBA has since been dissolved with effect from the 7th October 2016, consequent to constitution of National Council for Rejuvenation, Protection and Management of River Ganga (referred to as National Ganga Council).

www.nmcg.in

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cGanga is a think tank formed under the aegis of NMCG, and one of its stated objectives is to make India a world leader in river and water science. The Centre is headquartered at IIT Kanpur and has representation from most leading science and technological institutes of the country. cGanga's mandate is to serve as think-tank in implementation and dynamic evolution of Ganga River Basin Management Plan (GRBMP) prepared by the Consortium of 7 IITs. In addition to this it is also responsible for introducing new technologies, innovations and solutions into India.

www.cganga.org

SUGGESTED CITATION

Strategy for Improving Condition of Water Bodies in the Vicinity of Pulp and Paper Industries in Ganga River Basin by cGanga and NMCG

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PREFACE

The Indian Institute of Technology (IIT) consortium submitted the Ganga River Basin Management Plan (GRBMP) to the National Mission for Clean Ganga (NMCG), Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD & GR), Government of India in 2015. The GRBMP's recommendations were by and large broad-based, strategic measures, and on some aspects detailed, ready-to-implement actions. There was a need to have an action plan that addressed specific issues regarding the river's rejuvenation with technology-based solutions.

Thus, the Centre for Ganga River Basin Management and Studies ("cGanga") was created through a Memorandum of Agreement between the MoWR, RD & GR, Government of India and IIT, Kanpur in April 2016. The objective of cGanga is Continual Scientific Support in the Implementation and Dynamic Evolution of the Ganga River Basin Management Plan.

National Mission for Clean Ganga identified "effectiveness of the Central Pollution Control Board's (CPCB's) 2015 Charter for Water Recycling & Pollution Prevention in Pulp and Paper industry in Uttar Pradesh and Uttarakhand" as an issue of investigation and asked cGanga to carry out an independent study and submit the report.

The CPCB charter had imposed norms and standards for effluent monitoring and discharge. cGanga's task was to comprehensively assess how well these had been implemented and, also, how effective these measures were actually in improving the water bodies in the vicinity in general, and specifically in abetting the pollution from the industries in these two states.

This report describes the objectives and strategic plan, methodology, surveys, analysis, results, suggestions and recommendations of our study on effectiveness of the implementation of CPCB's 2015 Charter. The study was conducted between March 2017 to July 2018.

There are two associated aspects in preparing this report that need to be mentioned. Firstly, the cGanga team spent many months diligently studying, surveying, analysing and discussing various aspects of the Charter's implementation and ground results. Secondly, many other people interacted with us and contributed to this report during various phases of the study. This report is, therefore, the outcome of a cooperative effort betweenTeam cGanga and the various stakeholders of the Ganga River Basin.

The report is intended to be comprehensive and its usefulness would extend much beyond its limited intended purpose in Pulp & Paper industries in Uttrakhand and Uttar Pradesh.

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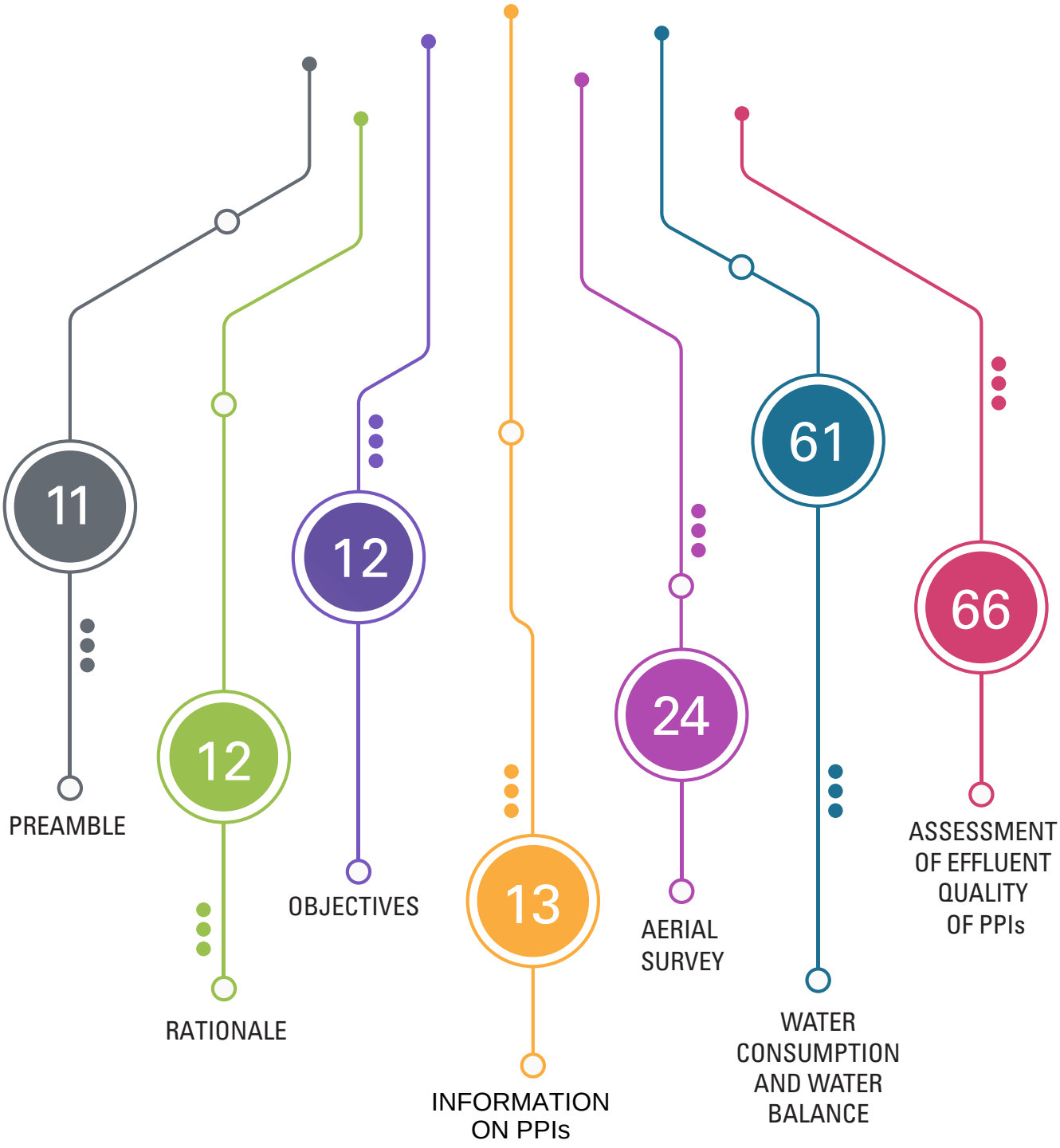
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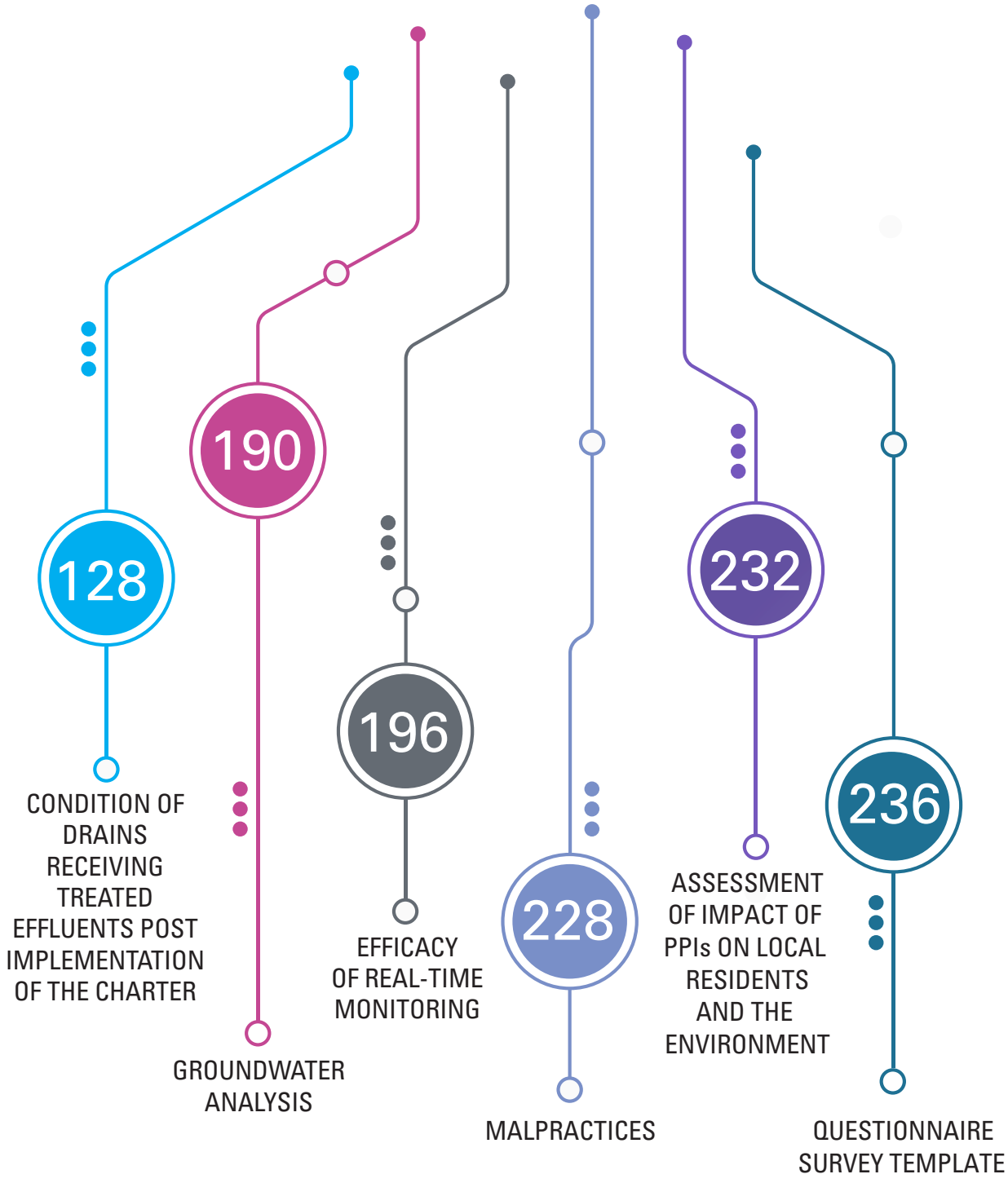
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EXECUTIVE SUMMARY

In 2011 a report titled: "Pulp and Paper Industries in Ganga River Basin: Water Recycling and Pollution Prevention" jointly prepared by Central Pulp and Paper Research Institute (CPPRI), Saharanpur, IIT Roorkee, IIT Delhi and IIT Kanpur with involvement and support from industries was submitted to Central Pollution Control Board (CPCB), New Delhi. This report led to the formulation and subsequent implementation of the Charter 2015.

The National Mission for Clean Ganga (NMCG) assigned the task of assessing the effectiveness of the Charter (CPCB, 2015) implementation to Centre for Ganga River Basin Management & Studies (cGanga). This study was conducted with an objective to have an independent assessment of the efficacy and impact of the implementation of the Charter. The study was planned in consultation with CPCB, NMCG and Industry Association/Clusters and conducted by Team cGanga that involved members from IITs at Roorkee, Delhi and Kanpur. A detailed field survey of 131 Pulp and Paper Industries in Ganga River Basin through 36 random and surprise visits in different shifts was conducted during April 2017 to July 2018. Pulp and Paper Industries (PPIs) of four different broad categories as defined in the Charter were considered. Results were discussed with stakeholders (Industries, CPCB, SPCBs, NMCG, Experts, etc.) prior to the preparation of the report.

OBSERVATIONS

- Charter was by and large effectively implemented; Black liquor is no longer discharged; Barring a few, most industries comply effluent discharge norms; and substantial reduction in BOD/COD/Organic Carbon load on recipient water bodies has been achieved.
- Condition of drains, streams in which effluents are discharged continues to be poor, and groundwater in the vicinity of industries is affected.
- Certain mal practices in a few industries, non-inclusion of certain parameters such as nitrogen and phosphorus in the effluents characteristics in the Charter, and some other external factors contribute to the poor condition of the water bodies in the vicinity of the PPIs.
- Online monitoring as prescribed in the Charter is largely ineffective due to technology issue with sensors of COD, BOD, TSS and governance issues with Flow, pH, DO & TDS sensors.
- Water and Energy balance presented in the report needs to be re-worked with additional information from industries on captive power generation, raw materials input and paper production that was not in the scope of present study.

CONCLUSIONS & RECOMMENDATIONS

- Online effluent quality monitoring has financially loaded industries and has not yielded value for money; May be used by industries voluntarily for diagnostic purposes and should not be made as regulatory requirement.
- Effluents discharged by an industry or group of industries be isolated, discharged in a water body (drain/pond – natural/artificial) and maintenance of the water body of acceptable bio-physical status in public domain be linked to consent to operate the industry (ies).

Pulp and paper industries (PPIs) are recognised as one of the main contributors in declining status of various water bodies (surface and sub-surface) in the Ganga River Basin. The Central Pollution Control Board (CPCB) took cognizance of this impact on water bodies and framed a Charter – Water Recycling & Pollution Prevention in Pulp and Paper industry – in February 2015 (CPCB, 2015) based on a study titled: "Pulp and Paper Industries in Ganga River Basin: Water Recycling and Pollution Prevention" jointly conducted by Central Pulp and Paper Research Institute (CPPRI), Saharanpur, IIT Roorkee, IIT Delhi and IIT Kanpur with involvement and support from industries (Tare et al., 2011). The Charter (CPCB, 2015) imposed certain norms for water consumption, protocol for record keeping and surveillance, setting up effluent treatment systems and limits on quality of effluent discharge. The industries were required to set up Effluent Treatment Plants (ETPs) to treat their wastewater and install Real Time Monitoring devices to monitor quantity and quality of effluent discharge. The National Mission for Clean Ganga (NMCG) then assigned the task of assessing the effectiveness of the Charter (CPCB, 2015) implementation to cGanga. This report presents the result of surveys, measurements and observations made by cGanga during various field visits to 131 PPIs in the Ganga River Basin.

THE CENTRAL POLLUTION CONTROL BOARD TOOK COGNIZANCE OF THE IMPACT ON WATER BODIES AND FRAMED A CHARTER – WATER RECYCLING & POLLUTION PREVENTION IN PULP AND PAPER INDUSTRY

RATIONALE

This study was initiated with an ultimate objective of evolving strategy for improving condition of water bodies in the vicinity of Pulp and Paper Industries in Ganga River Basin that has visibly declined due to utilization of water and discharge of effluents. Specifically, the report focuses on assessing the effectiveness of the imposition of the Charter by CPCB in 2015 regarding Water Recycling & Pollution Prevention in the Pulp and Paper Industry. The study attempts to find the deviations and gaps between CPCB guidelines as per the Charter and the implementation of these by the industry. 131 PPIs in the Ganga River Basin (in Uttrakhand and Uttar Pradesh) were included. Several special features including a variety of surveys covering wide spatial (states of Uttarakhand and Uttar Pradesh) and temporal (capturing diurnal variation) ranges, advance technology (drones) and interaction with stakeholders through well researched interviews and questionnaire were incorporated. The current volume is a supplement to the main report and present the detailed information on each of the pulp and paper industry.

OBJECTIVES

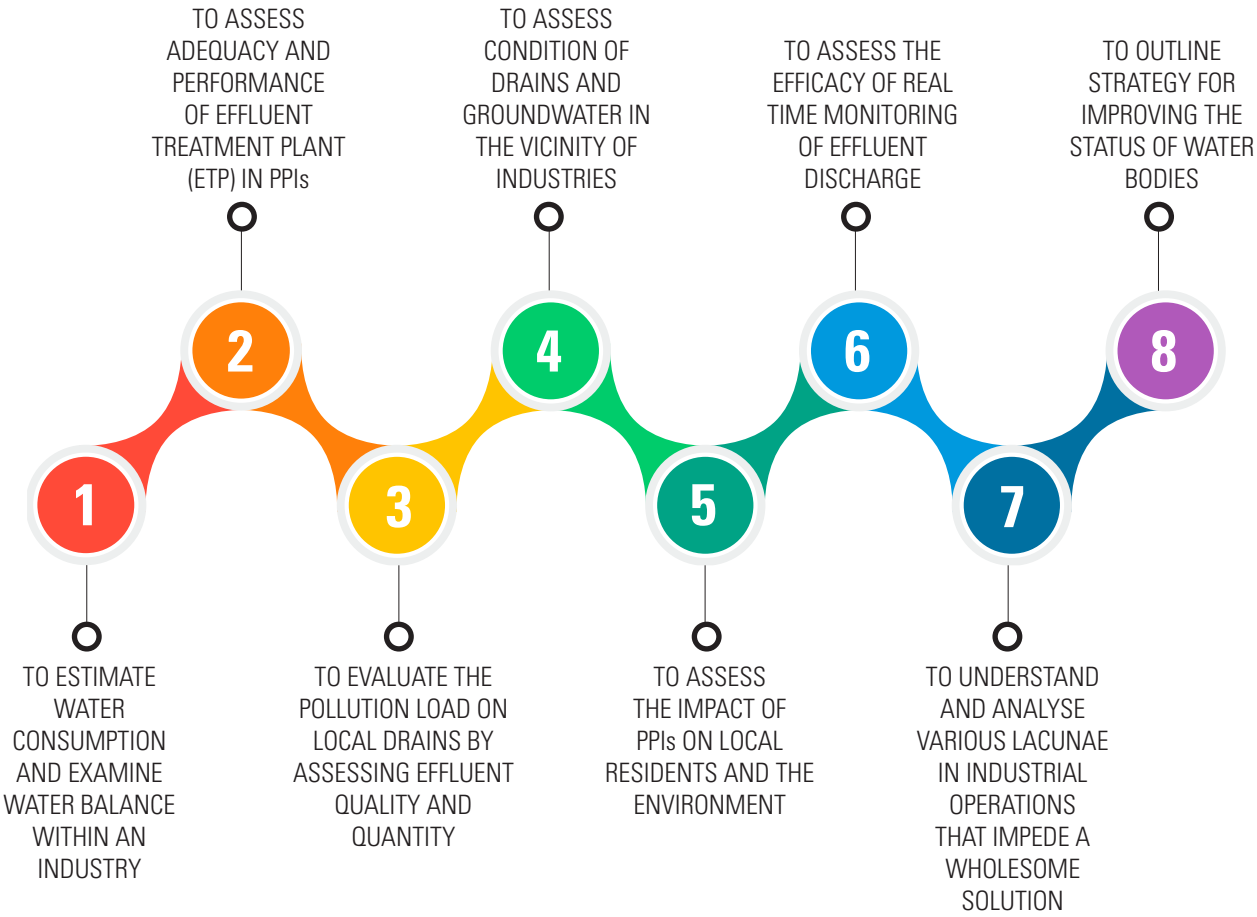
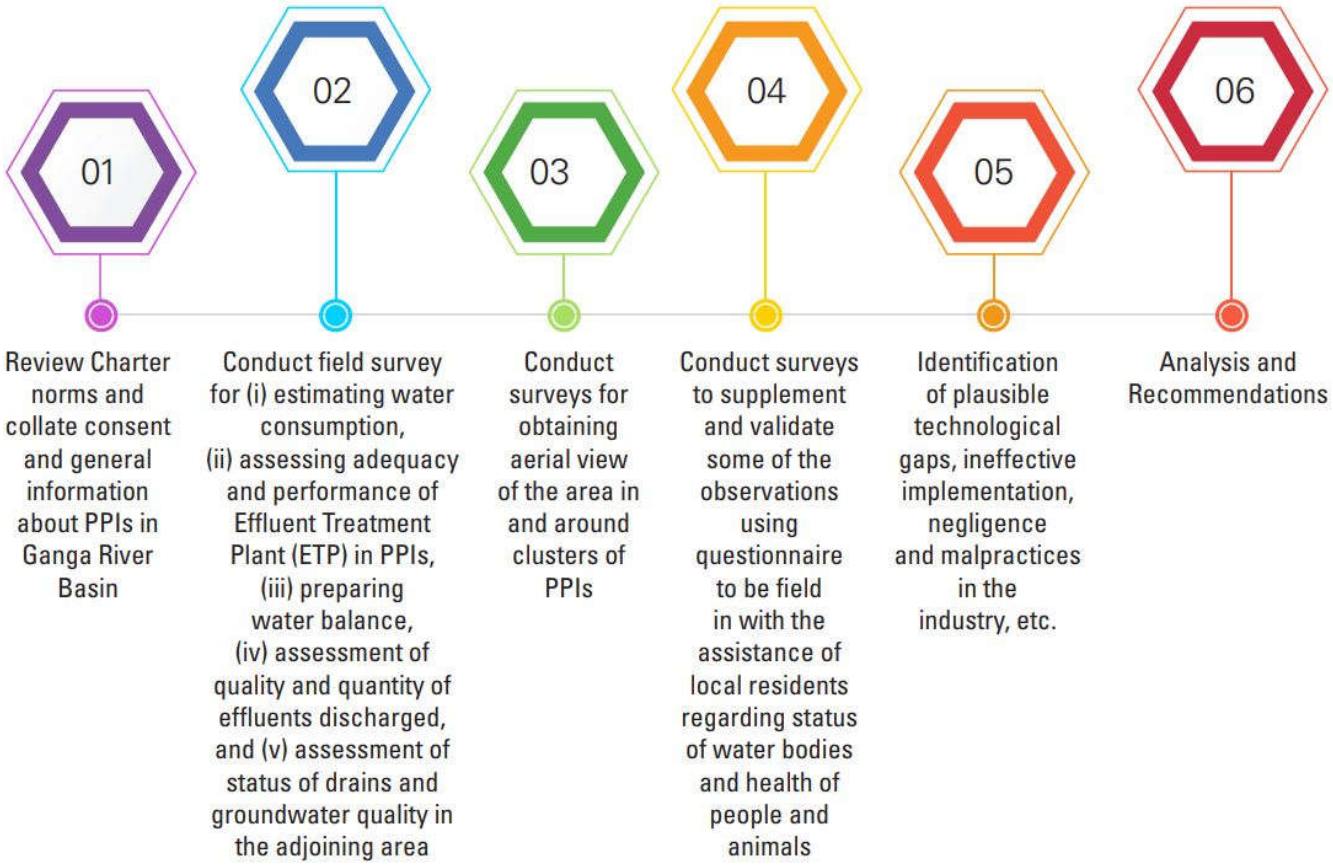


FIGURE-1

FRAMEWORK ADOPTED FOR ASSESSMENT OF EFFECTIVENESS OF CHARTER IMPLEMENTATION BY PPIs



INFORMATION ON PPIs: **STUDY SITE** & CLUSTERS DETAILS

The industries in various clusters (Table 1; Figure 2) were also classified as per the norms laid in the Charter (CPCB, 2015). A category-wise illustration of various industries (mentioned in Table 2), based on base material used for paper production and type of pulp and paper produced, is depicted in Figure 3 and operational status of industries and cluster-wise categorisation are presented in Figures 4 and 5. A list of industries covered during the study is presented in Table 3.

FIGURE-2

LOCATIONS OF 21 CLUSTERS WITHIN THE ADMINISTRATIVE BOUNDARIES OF THE STATES OF UTTARAKHAND AND UTTAR PRADESH

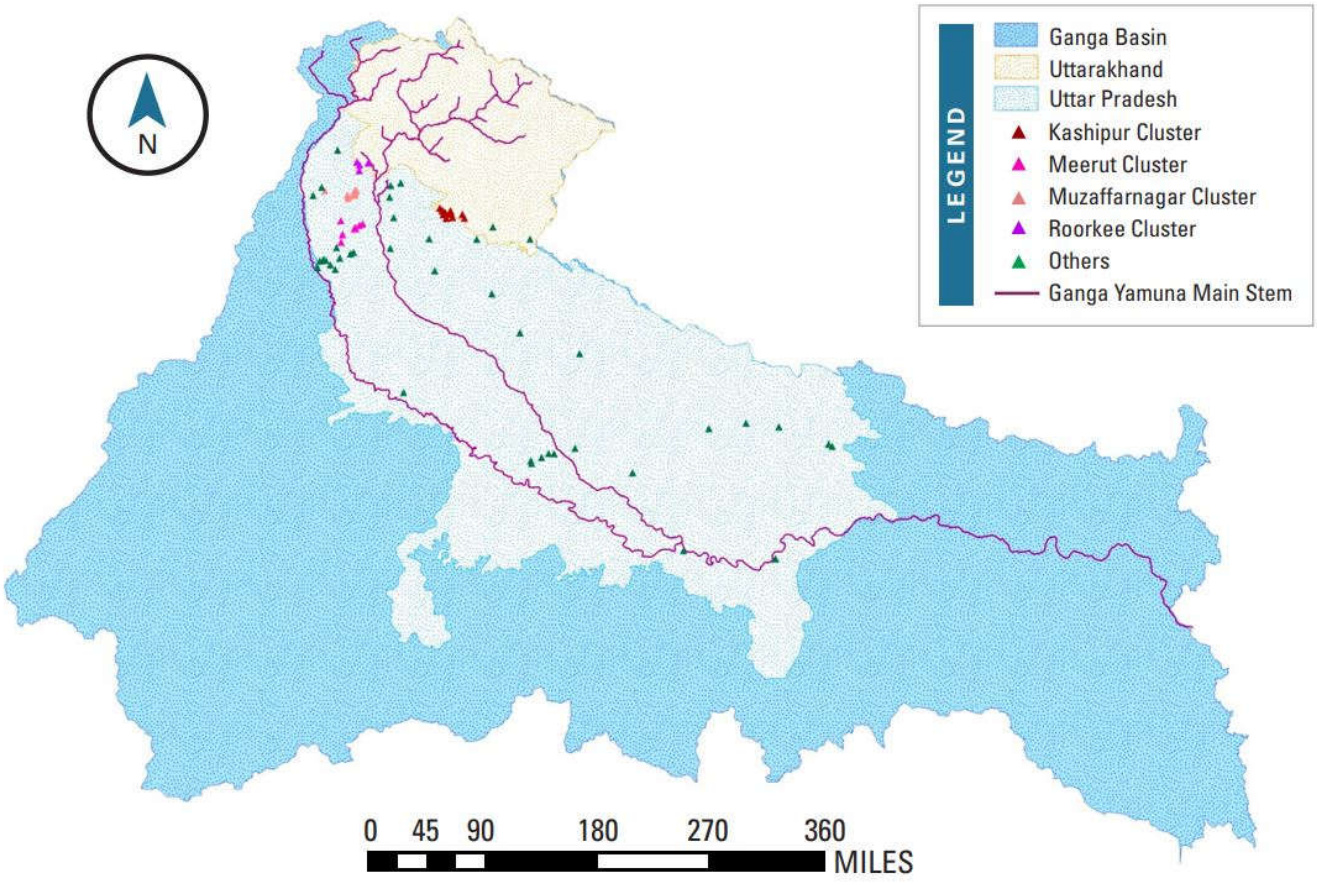


TABLE-1

DETAILS OF VARIOUS CLUSTERS

CLUSTER	AREA COVERED	NUMBER OF INDUSTRIES
1	Kashipur	24
2	Meerut (14), Muzaffarnagar (33)	47
3	Roorkee	6
4	Sitapur (1), Kanpur (6)	7
5	Raebareli	1
6	Faizabad (2), Khalilabad (2), Basti (1)	5
7	Deoria	2
8	Varanasi	2
9	Allahabad	1
10	Uddham Singh Nagar	4
11	Bareilly (1), Moradabad (2)	3
12	Baghpat	1
13	Shamli	2
14	Firozabad	3
15	Saharanpur	2
16	Bilaspur	1
17	Ghaziabad (3), Hapur (4), Modinagar (3)	10
18	Gajraula (1), Amroha (2)	3
19	Bijnor (3), Chandpur (1)	4
20	Sahjahnpur	2
21	Khatima	1

TABLE-2

DETAILED LIST OF 131 PULP AND PAPER INDUSTRIES LOCATED IN UTTRAKHAND AND UTTAR PRADESH

S. NO.	CLUSTER	CATEGORY	OPTERATIONAL STATUS*
1	Kashipur	B1	O
2	Kashipur	B1	O
3	Kashipur	B2	O
4	Kashipur	C1	O
5	Kashipur	B2	O
6	Kashipur	C1	O
7	Kashipur	C1	O
8	Kashipur	C1	O
9	Kashipur	C1	O
10	Kashipur	C1	O
11	Kashipur	C1	O
12	Kashipur	C1	O
13	Kashipur	C1	O
14	Kashipur	C2	O
15	Kashipur	C2	O
16	Kashipur	C2	TC
17	Kashipur	C1	TC
18	Kashipur	C2	O/ ZLD
19	Kashipur	B1	PC
20	Kashipur	B1	PC
21	Kashipur	C1	PC
22	Kashipur	C2	TC
23	Kashipur	C1	PC
24	Kashipur	-	Not Found
25	Meerut	C1	O
26	Meerut	-	O
27	Meerut	C1	O
28	Meerut	C2	O
29	Meerut	C2	O
30	Meerut	-	O
31	Meerut	C1	O
32	Meerut	C1	O
33	Meerut	C1	O
34	Meerut	C1	O
35	Meerut	-	TC
36	Meerut	C2	O/ ZLD
37	Meerut	C2	O/ ZLD
38	Meerut	C2	O/ ZLD
39	Muzaffarnagar	C2	O
40	Muzaffarnagar	B2	O

S. NO.	CLUSTER	CATEGORY	OPTERATIONAL STATUS*
41	Muzaffarnagar	C1	O
42	Muzaffarnagar	B2	O
43	Muzaffarnagar	C2	O
44	Muzaffarnagar	B2	O
45	Muzaffarnagar	D	O
46	Muzaffarnagar	C1	O
47	Muzaffarnagar	B1	O
48	Muzaffarnagar	C2	O
49	Muzaffarnagar	C1	O
50	Muzaffarnagar	C2	O
51	Muzaffarnagar	B2	O
52	Muzaffarnagar	C2	O
53	Muzaffarnagar	B2	O
54	Muzaffarnagar	B2	O
55	Muzaffarnagar	C1	TC
56	Muzaffarnagar	C2	O
57	Muzaffarnagar	C2	O
58	Muzaffarnagar	C2	O
59	Muzaffarnagar	-	TC
60	Muzaffarnagar	C2	O
61	Muzaffarnagar	C2	O
62	Muzaffarnagar	C2	TC
63	Muzaffarnagar	C2	O
64	Muzaffarnagar	C2	O
65	Muzaffarnagar	C2	O/ ZLD
66	Muzaffarnagar	C2	O
67	Muzaffarnagar	-	O
68	Muzaffarnagar	-	PC
69	Muzaffarnagar	-	PC
70	Muzaffarnagar	-	PC
71	Muzaffarnagar	C2	PC
72	Roorkee	C1	O
73	Roorkee	C1	O
74	Roorkee	C1	O
75	Roorkee	-	TC
76	Roorkee	C2	O/ ZLD
77	Roorkee	C2	O/ ZLD
78	Sitapur/ Kanpur	C2	O/ ZLD
79	Sitapur/ Kanpur	C2	O
80	Sitapur/ Kanpur	B2	O

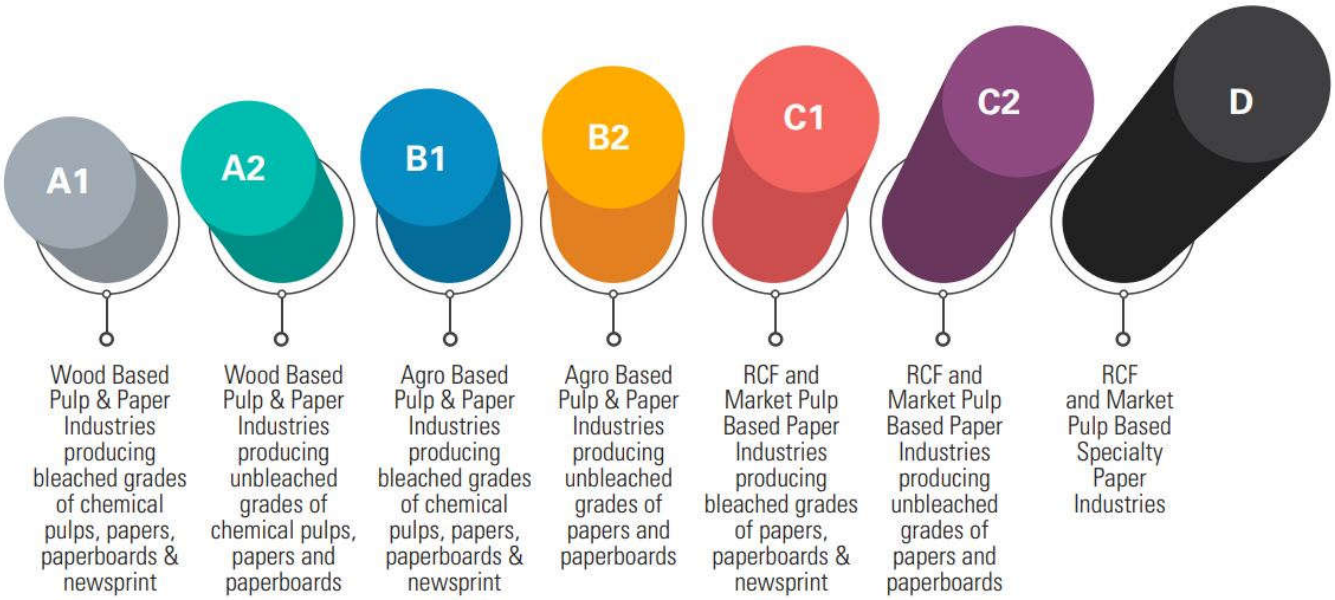
S. NO.	CLUSTER	CATEGORY	OPTERATIONAL STATUS*
81	Sitapur/ Kanpur	C2	TC
82	Sitapur/ Kanpur	C2	O
83	Sitapur/ Kanpur	-	TC
84	Sitapur/ Kanpur	B2	PC
85	Raebareli	B1	TC
86	Faijabad/ Khalilabad/ Basti	B1	O
87	Faijabad/ Khalilabad/ Basti	B1	O
88	Faijabad/ Khalilabad/ Basti	C2	O
89	Faijabad/ Khalilabad/ Basti	B2	O/ZLD
90	Faijabad/ Khalilabad/ Basti	C1	O
91	Deoria	C2	O
92	Deoria	C2	O
93	Varanasi	C1	O
94	Varanasi	-	O/ZLD
95	Allahabad	C2	O/ ZLD
96	U.S. Nagar	C1	PC
97	U.S. Nagar	C1	PC
98	U.S. Nagar	A1	O
99	U.S. Nagar	-	TC
100	Bareilly/ Moradabad	B2	TC
101	Bareilly/ Moradabad	C2	TC
102	Bareilly/ Moradabad	C2	TC
103	Baghpat	C2	TC
104	Shamli	C2	TC
105	Shamli	-	TC
106	Firozabad	C2	TC

S. NO.	CLUSTER	CATEGORY	OPTERATIONAL STATUS*
107	Firozabad	C2	TC
108	Firozabad	C2	TC
109	Saharanpur	C2	TC
110	Saharanpur	A1	TC
111	Bilaspur	-	TC
112	Ghaziabad/ Hapur/ Modinagar	C2	TC
113	Ghaziabad/ Hapur/ Modinagar	C2	TC
114	Ghaziabad/ Hapur/ Modinagar	C1	TC
115	Ghaziabad/ Hapur/ Modinagar	C1	TC
116	Ghaziabad/ Hapur/ Modinagar	C2	TC
117	Ghaziabad/ Hapur/ Modinagar	C1	TC
118	Ghaziabad/ Hapur/ Modinagar	C2	TC
119	Ghaziabad/ Hapur/ Modinagar	C2	TC
120	Ghaziabad/ Hapur/ Modinagar	-	TC
121	Ghaziabad/ Hapur/ Modinagar	C2	TC
122	Gajraula/ Amroha	C1	TC
123	Gajraula/ Amroha	C1	TC
124	Gajraula/ Amroha	-	TC
125	Bijnor/ Chandpur	B1	TC
126	Bijnor/ Chandpur	-	TC
127	Bijnor/ Chandpur	C2	TC
128	Bijnor/ Chandpur	C1	TC
129	Sahjahnpur	B1	TC
130	Sahjahnpur	B2	TC
131	Khatima	C1	TC

**O = Operational; TC = Temporary Closed; PC = Permanently Closed; O/ ZLD = Operational with Zero Liquid Discharge*

FIGURE-3

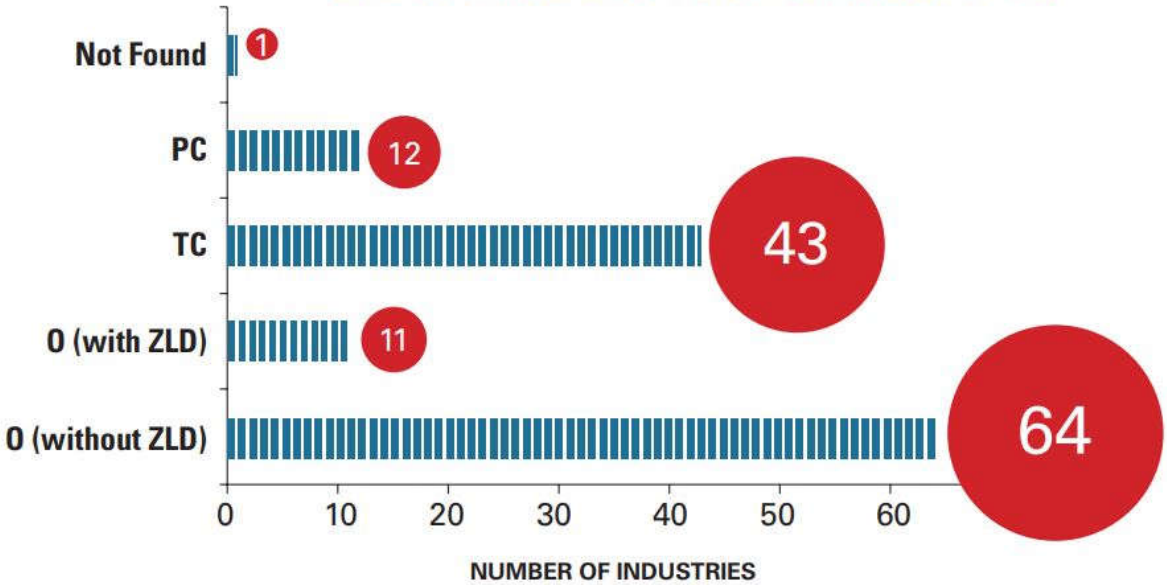
CLASSIFICATION OF PPIs AS PER THE CPCB CHARTER (CPCB, 2015)



** Industries that attract classification in more than one category will be deemed to be in the "highest" among those categories. For example, a mill that is both wood and agro based (A1 & B1) will be classified as A1. The only exception will be industries that also manufacture specialty paper on a daily basis as described elsewhere in this proposed Charter.*

FIGURE-4

OPERATIONAL STATUS OF 131 INDUSTRIES



*O (without ZLD) = Operational without Zero Liquid Discharge; O (with ZLD) = Operational with Zero Liquid Discharge; TC = Temporary Closed; PC = Permanently Closed

FIGURE-5

CLUSTERWISE CATEGORISATION AND STATUS OF INDUSTRIES

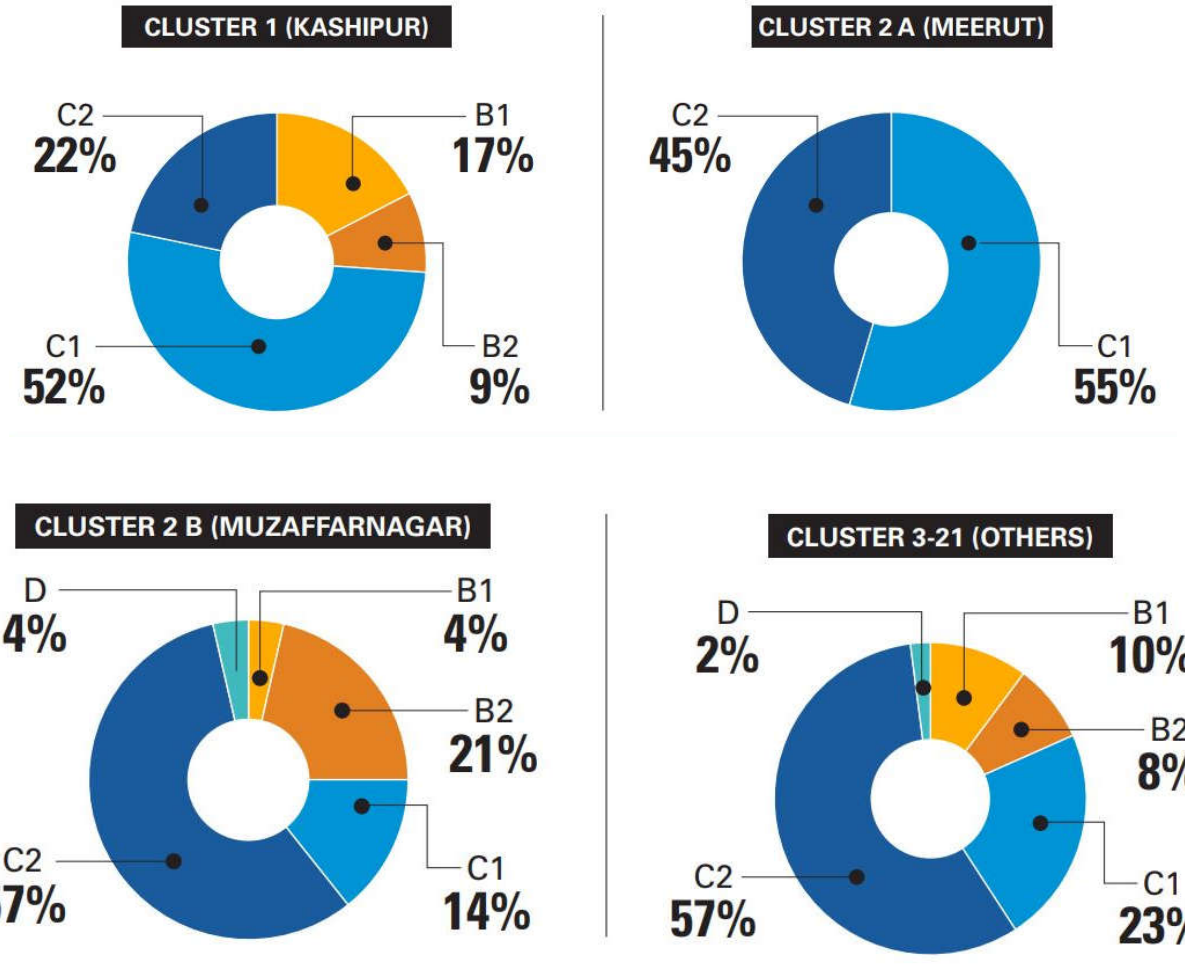


TABLE-3

LIST OF THE INDUSTRIES WITH CODE IN UTTARAKHAND AND UTTAR PRADESH

INDUSTRY CODE	
1	M/s Naini Tissues Ltd.
2	M/s Naini Papers Ltd.
3	M/s Sidharth Papers Pvt. Ltd., Unit I
4	M/s Sidharth Papers Pvt. Ltd., Unit II
5	M/s Vishvakarma Paper & Boards Ltd.
6	M/s Prolific Papers Pvt. Ltd.
7	M/s Bahl Paper Mills Ltd.
8	M/s Banwari Paper Mills Ltd.
9	M/s Multiwal Pulp & Board Mills Pvt. Ltd. .
10	M/s Katyayini Paper Mills Pvt. Ltd.
11	M/s Sahota Paper Ltd.
12	M/s Cheema Papers Ltd.
13	M/s Fibremarx Papers Pvt. Ltd.
14	M/s Uday Paper Mill/ Rajlakshmi Paper & Board Pvt. Ltd.
15	M/s Vishwanath Paper & Board Ltd.
16	M/s BR Paper Pvt. Ltd.
17	M/s Siddheshwari Paper Udyog Ltd.
18	M/s PSB Papers Ltd.
19	M/s Shree Shyam Pulp & Board Mills Ltd., Unit I
20	M/s Shree Shyam Pulp & Board Mills Ltd., Unit II
21	M/s Multiwal Duplex Pvt. Ltd
22	M/s Devrishi Papers Pvt. Ltd.
23	M/s Goraya Sraw Board Mills Pvt. Ltd.
24	M/s Balaji Paper
25	M/s Janki Newsprint Ltd.
26	M/s Kanav Papers Pvt. Ltd.
27	M/s Sangal Papers Ltd.
28	M/s Sardhana Papers Pvt Ltd.
29	M/s New Bonanza India Ltd.
30	M/s Anand Tissue Ltd. / Shri Venktesh Papers Ltd.
31	M/s Anand Triplex Board Ltd.
32	M/s Anand Duplex Ltd. Unit II
33	M/s Dev Priyag Paper Mill Pvt. Ltd.
34	M/s Dev Priya Products Pvt. Ltd.
35	M/s Anand Duplex Ltd. Unit I
36	M/s Dev Star/ Star Kraft Papers Pvt. Ltd.

INDUSTRY CODE	
37	M/s Dev Priya Industries Pvt. Ltd.
38	M/s Paswara Papers Ltd.
39	M/s Parijat Paper Mills Ltd.
40	M/s Bindlas Duplux Ltd., Unit I
41	M/s Bindlas Duplux Ltd., Unit II
42	M/s Tehri Pulp & Paper Ltd., Unit I
43	M/s Tehri Pulp & Paper Ltd., Unit II
44	M/s Shree Bhageshwari Papers Pvt Ltd., Unit I
45	M/s Shree Bhageshwari Papers Pvt Ltd., Unit II
46	M/s Tirupati Balaji Fibres Ltd.
47	M/s Bindals Papers Mills Ltd.
48	M/s Shakumbhari Paper Mills Ltd.
49	M/s Agarwal Duplex Board Mills Ltd.
50	M/s Meenu Paper Mills Ltd.
51	M/s Silvertoan Papers Ltd. Unit I
52	M/s Silverton Pulp & Papers Pvt. Ltd.
53	M/s Garg Duplex & Paper Mills Pvt. Ltd.
54	M/s Shree Sidhbali Paper Mills Ltd.
55	M/s NS Papers Ltd.
56	M/s Mahalaxmi Craft & Tissues Pvt. Ltd.
57	M/s Siddheshwari Industries Pvt. Ltd.
58	M/s KK Duplex & Paper Mills Pvt. Ltd.
59	M/s Orient Board & Paper Mills Pvt. Ltd.
60	M/s Shakti Krafts & Tissues
61	M/s Suyash Kraft & Paper Ltd.
62	M/s Aristocraft Papers Pvt. Ltd.
63	M/s DLS Papers Pvt. Ltd.
64	M/s Disha Industries Ltd.
65	M/s Galaxy Papers Pvt. Ltd.
66	M/s Prime Pulp & Paper Pvt. Ltd.
67	M/s Silvertoan Paper Ltd., Unit II
68	M/s Shalimar Paper Mills Pvt. Ltd.
69	M/s Arihant Pulp and Papers Pvt. Ltd.
70	M/s Seeta Paper Mills Ltd.
71	M/s Taj Paper Pvt. Ltd.
72	M/s Sagar Paper Mills Pvt. Ltd.

INDUSTRY CODE	
73	M/s Aroma craft and Tissues Pvt. Ltd.
74	M/s Uttranchal Pulp & Paper Mills (P) Ltd, Village –Mundet
75	M/s Sagar Pulp & Paper Mills Ltd.
76	M/s Gangotri Paper Mills Pvt. Ltd.
77	M/s JMJ Paper Products Pvt. Ltd.
78	M/s Anandeshwar Industries Pvt. Ltd.
79	M/s Mahadev Pulp Product Pvt. Ltd.
80	M/s Shri Nageshwar Paper Ltd.
81	M/s RD Papers Ltd.
82	M/s Hari Om Industries Ltd.
83	M/s Bajaj Kagaj Ltd.
84	M/s JB Daruka Paper Ltd.
85	M/s Shree Bhawani Paper Mills Ltd.
86	M/s Yash Papers Ltd., Unit II
87	M/s Yash Papers Ltd., Unit I
88	M/s Suyash Paper Mills
89	M/s Rayana Paper Boards Industries Ltd., Unit- I
90	M/s Rayana Paper Boards Industries Ltd., Unit- II
91	M/s Deoria Paper Mills Ltd.
92	M/s Shri Krishna Straw Board Industries Pvt. Ltd.
93	M/s Ganga Pulp and Papers Pvt. Ltd.
94	M/s Newal Calcutta Pvt. Ltd.
95	M/s Devprayag Paper Mill Pvt. Ltd.
96	M/s PN Pulp & Paper Industries Pvt. Ltd.
97	M/s PN Papers Mills Pvt. Ltd.
98	M/s Century Pulp and Paper
99	M/s KM Papers Mill
100	M/s Ramaa Shyama Papers Ltd.
101	M/s Genus Paper & Boards Ltd.
102	M/s Shri Ramchander Straw Products Ltd.
103	M/s Gangeshwar Papers Pvt. Ltd.
104	M/s Maruti Papers Ltd.
105	M/s Nikita Papers Ltd.
106	M/s Lal Ji Board Industries Pvt. Ltd.
107	M/s SR Mittal Paper Mills
108	M/s Dayalji Industries Pvt. Ltd.

INDUSTRY CODE	
109	M/s Swaroop Papers Pvt. Ltd.
110	M/s Star Paper Mills Ltd.
111	M/s Chadha Papers Ltd.
112	M/s Modinagar Paper Mills Ltd.
113	M/s Ved Cellulose Ltd.
114	M/s Nav Bharat Duplex Ltd.
115	M/s Chamunda Papers Pvt. Ltd.
116	M/s Ashoka Pulp & Paper Pvt. Ltd.
117	M/s Magnum Ventures Ltd.
118	M/s Shri Ganga Paper Mills Pvt. Ltd.
119	M/s Suchi Paper Mills Ltd.
120	M/s Kawatra Papers Pvt. Ltd.
121	M/s Sandeep Paper Mills Pvt. Ltd.
122	M/s Kamakshi Papers Pvt. Ltd.
123	M/s Coral Newsprints Ltd.
124	M/s Kaushambhi Paper Mills Pvt. Ltd.
125	M/s Mohit Paper Mills Ltd.
126	M/s Rama Paper Mills Ltd.
127	M/s Shree Badri Kedar Papers Pvt. Ltd.
128	M/s Chandpur Enterprises Ltd.
129	M/s KR Pulp & Paper Ltd., Unit I
130	M/s KR Pulp & Paper Ltd., Unit II
131	M/s Khatema Fibres Ltd.

AERIAL SURVEY

An aerial view of the industry and the status of the nearby recipient drain was captured through drone (Drone Specifications: DJI Phantom 4 Pro RC Quadcopter) survey conducted for almost all the units covered during the study period.The images of drone survey of most of the industries have been incorporated in the current section.

PLATE 1

AERIAL VIEW OF PPIs

INDUSTRY CODE: 1

INDUSTRY CODE: 2

INDUSTRY CODE: 3

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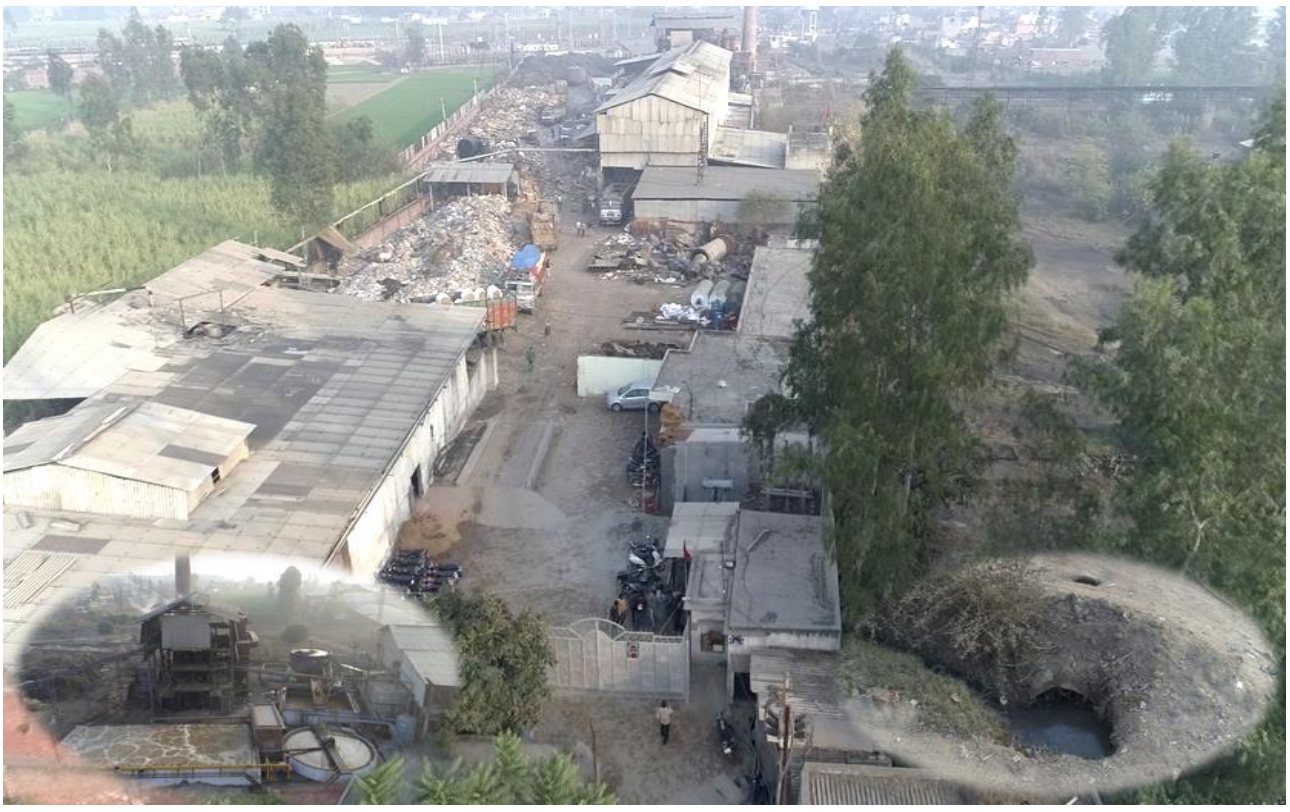

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INDUSTRY CODE: 99

INDUSTRY CODE: 111

INDUSTRY CODE: 131

WATER CONSUMPTION AND WATER BALANCE

A complete water balance for each industrial unit was carried out to assess losses through estimates of fresh water intake, the amount of black liquor produced, effluent discharge, etc. Water balance for different industries is presented in Figure 6 to 8. The paper making process involved significant water loss from various steps through different units. The water balance was done for all the industries by keeping major flow transactions (Table 4).

FIGURE-6

INDUSTRY - AGRO BASED (PRODUCTION 140 t/d)

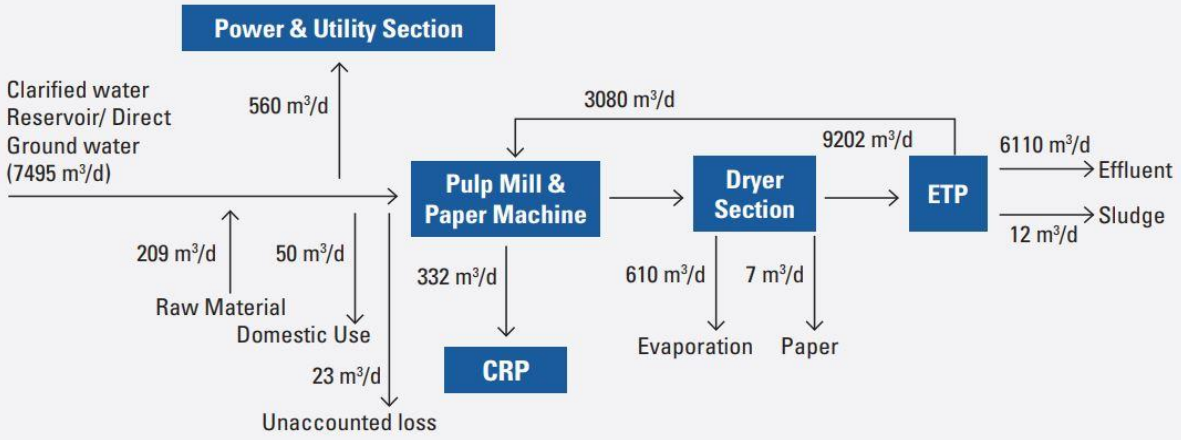


FIGURE-7

INDUSTRY - WSP BASED (PRODUCTION 375 t/d)

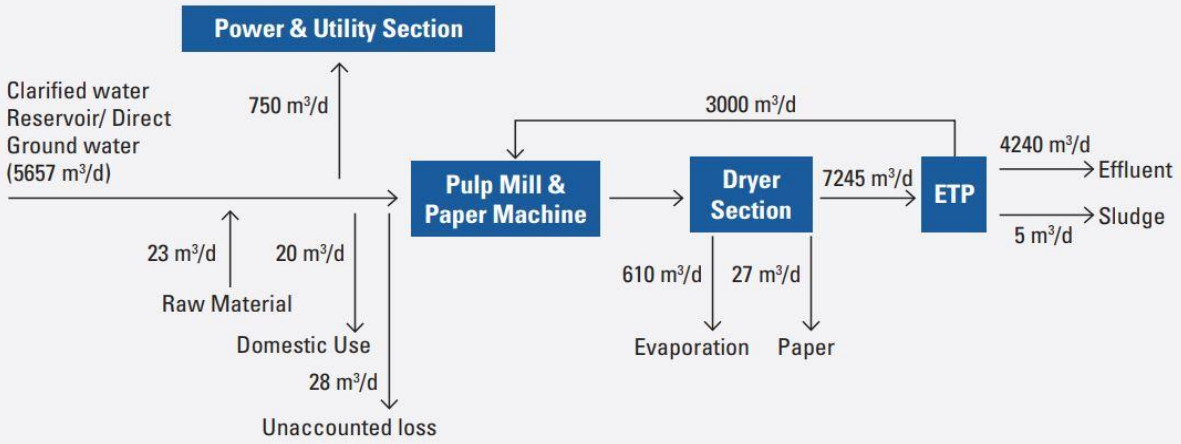


FIGURE-8

INDUSTRY - ZLD BASED (PRODUCTION 120 t/d)

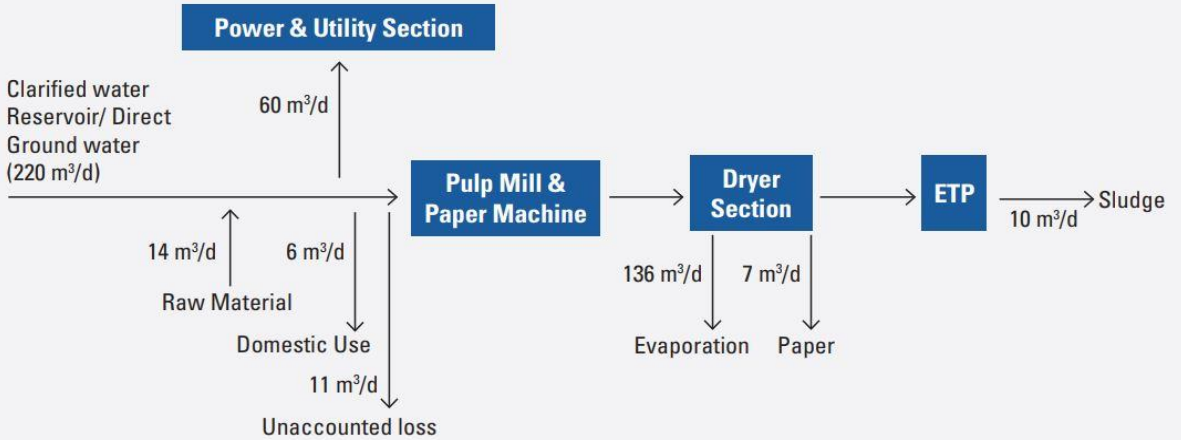


TABLE-4

WATER CONSUMPTION AND WATER BALANCE

Ind. Code	Actual production on the day of visit (TPD)	Fresh water consumption (m^3/d)	Water with raw material (m^3/d)	Evaporation losses (m^3/d)	Water loss along with final paper (m^3/d)	Black liquor evaporation losses (m^3/d)	Treated effluent discharge (m^3/d)	Losses in power and utility (m^3/d)	Unaccounted loss (m^3/d)
1	102	3364	225	436	5	496	2207	408	37
2	115	5406	254	883	6	560	3534	460	218
3	101	2121	73	142	9	492	1508	0	43
4	294	2375	23	452	27	0	1920	0	0
5	36	750	51	54	2	105	534	100	6
6	135	1662	16	203	7	-	1305	104	59
7	202	2820	20	362	14	-	1755	172	537
8	36	420	4	54	2	-	306	54	8
9	100	0	-	-	-	-	-	-	-
10	-	-	-		-	-	-	-	-
11	107	1869	12	160	7	-	1271	58	385
12	175	3616	183	300	13	-	2600	450	436
13	99	1529	8	149	5	-	1038	170	175
14	60	681	7	90	4	-	110	60	424
15	162	1189	18	243	8	-	789	115	52
16	No Data	-	-	-	-	-	-	-	-
17	135	0	-	-	-	-	-	0	0
18	100	190	12	113	6	-	ZLD	80	3
19	PC	-	-	-	-	-	-	-	-
20	PC	-	-	-	-	-	-	-	-
21	PC	-	-	-	-	-	-	-	-
22	TC	-	-	-	-	-	-	-	-
23	PC	-	-	-	-	-	-	-	-
24	Not Found	-	-	-	-	-	-	-	-
25	69	879	8	104	3	-	680	69	31
26	79	416	9	119	4	-	230	59	13
27	80	1481	10	120	4	-	1068	129	170
28	-	-	-	-	-	-	-	-	-
29	54	321	7	81	3	-	140	35	69
30	-		-	-	-	-	722	0	-

Ind. Code	Actual production on the day of visit (TPD)	Fresh water consumption (m^3/d)	Water with raw material (m^3/d)	Evaporation losses (m^3/d)	Water loss along with final paper (m^3/d)	Black liquor evaporation losses (m^3/d)	Treated effluent discharge (m^3/d)	Losses in power and utility (m^3/d)	Unaccounted loss (m^3/d)
31	150	3312	17	412	9	-	1775	1100	40
32	274	1200	32	411	16	-	768	0	36
33	134	1338	15	180	7	-	600	550	16
34	382	2561	40	573	19	-	1588	401	20
35	71	0	-	-	-	-		-	-
36	70	181	8	126	4.2	-	0	57	2
37	370	580	39	555	19	-	0	0	45
38	340	826	36	510	17	-	0	260	75
39	76	902	9	114	4	-	728	55	10
40	96	1550	34	120	5	74	1300	120	-35
41	128	1465	15	192	6	-	1227	0	55
42	201	2100	82	430	10	195	1224	251	71
43	90	450	10	135	5	-	300	0	20
44	50	1278	30	75	3	73	1050	98	9
45	40	1700	5	80	2	-	1420	120	83
46	30	431	4	55	2	-	210	108	60
47	303	9557	32	455	15	811	7400	848	59
48	35	324	4	53	2	-	180	50	43
49	148	1542	18	200	7	-	1200	141	11
50	105	367	13	158	5	-	76	120	21
51	121	864	140	175	6	175	480	162	6
52	166	618	18	235	8	-	310	80	3
53	125	599	45	188	6	-	336	56	58
54	150	620	17	175	8	-	350	105	-1
55	270	976	29	405	14	-	380	120	86
56	70	500	8	105	4	-	168	210	21
57	143	350	16	172	7	-	150	25	12
58	140	848	7	220	3	-	440	130	62
59	TC	-	-	-	-	-	-	-	-
60	-	-	-	-	-	-	-	-	0
61	34	156.4	11	40	5	-	90	30	2.4
62	50	515	7	80	3	-	308	80	51
63	-	-	-	-	-	-	-	-	0
64	40	250	13	64	6	-	192	41	-40

Ind. Code	Actual production on the day of visit (TPD)	Fresh water consumption (m^3/d)	Water with raw material (m^3/d)	Evaporation losses (m^3/d)	Water loss along with final paper (m^3/d)	Black liquor evaporation losses (m^3/d)	Treated effluent discharge (m^3/d)	Losses in power and utility (m^3/d)	Unaccounted loss (m^3/d)
65	200	1065	6	72	2	-	890	96	11
66	O (No data)	-	-	-	-	-	-	-	-
67	-	-	-	-	-	-	-	-	0
68	PC	-	-	-	-	-	-	-	-
69	PC	-	-	-	-	-	-	-	-
70	PC	-	-	-	-	-	-	-	-
71	PC	-	-	-	-	-	-	-	-
72	87	647	10	105	4	-	510	30	8
73	99	361	11	149	5	-	180	34	4
74	78	385	10	117	4	-	201	45	28
75	30	320	5	52	2	-	190	60	21
76	140	308	16	210	7	-	0	101	6
77	PC	-	-	-	-	-	-	-	-
78	80	150	11	120	5	-	0	10	25
79	7.5	65	1	11	1	-	45	12	-2
80	60	175	8	90	4	-	0	96	-7
81	TC	-	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-	-	-
83	TC	-	-	-	-	-	-	-	-
84	PC	-	-	-	-	-	-	-	-
85	TC	-	-	-	-	-	-	-	-
86	103	7798	-	-	-	-	3085	-	-
87	110	0	-	-	-	-	-	-	-
88	110	1111	-	-	-	-	688	-	-
89	O/ZLD	-	-	-	-	-	-	-	-
90	48	710	-	-	-	-	446	-	-
91	62.3	239	-	-	-	-	-	-	-
92	10	0	-	-	-	-	-	-	-
93	25	436	-	-	-	-	99	-	-
94	13	33	-	-	-	-	0	-	-
95	52	95.6	-	-	-	-	0	-	-
96	-	-	-	-	-	-	-	-	-
97	-	-	-	-	-	-	-	-	-
98	1300	-	-	-	-	-	-	-	-

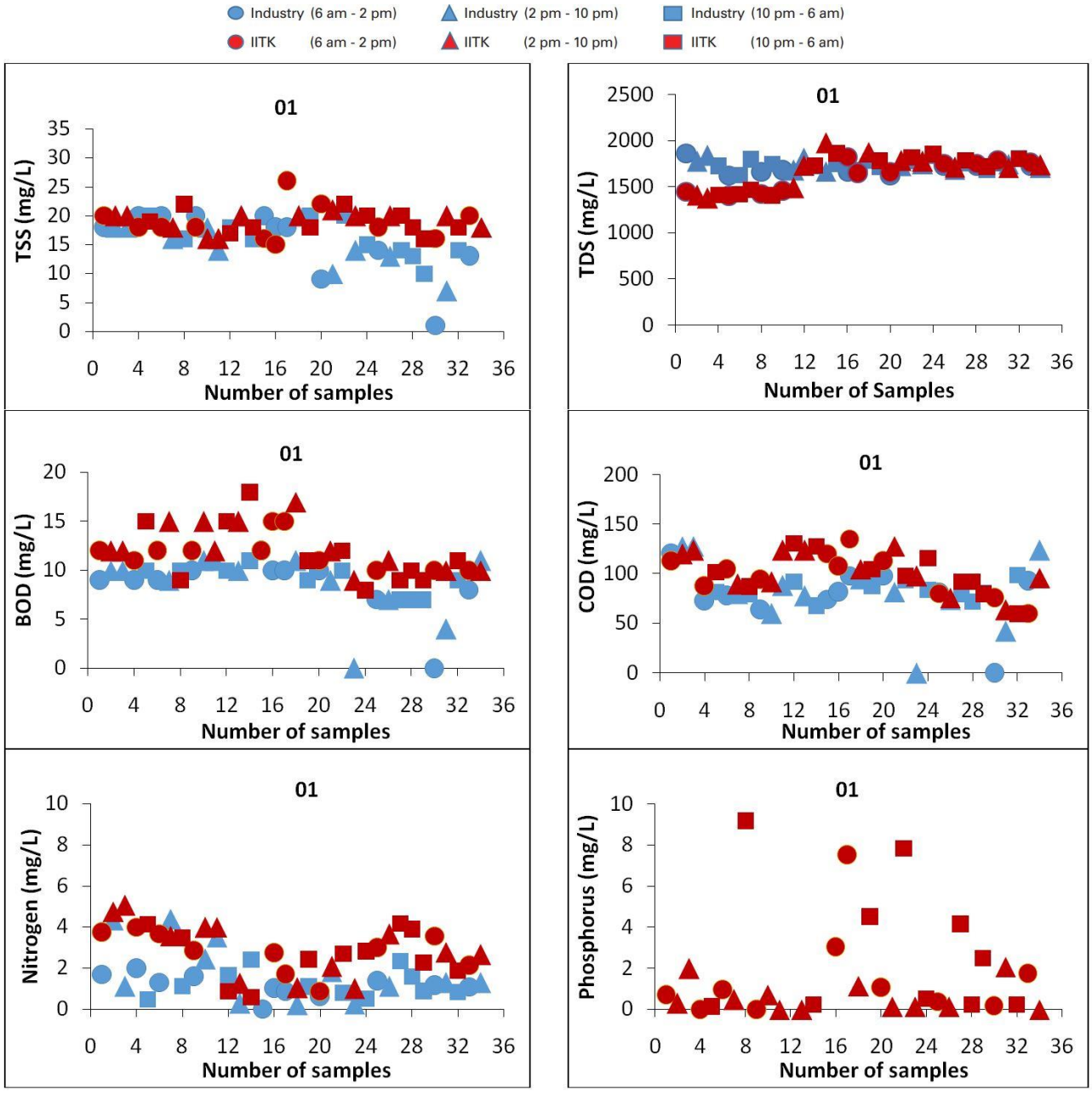
ASSESSMENT OF EFFLUENT QUALITY OF PPIs

ETP effluent from every industry was monitored. Eight parameters, namely Flow, DO, VSS, TSS, BOD, COD, Nitrogen and Phosphorus were monitored at the outlet of the industry. The results of the labs of the industries were compared with the analysis results of Team cGanga for certain effluent parameters. The industry wise typical variation of these parameters in the effluent quality is presented in the current section.

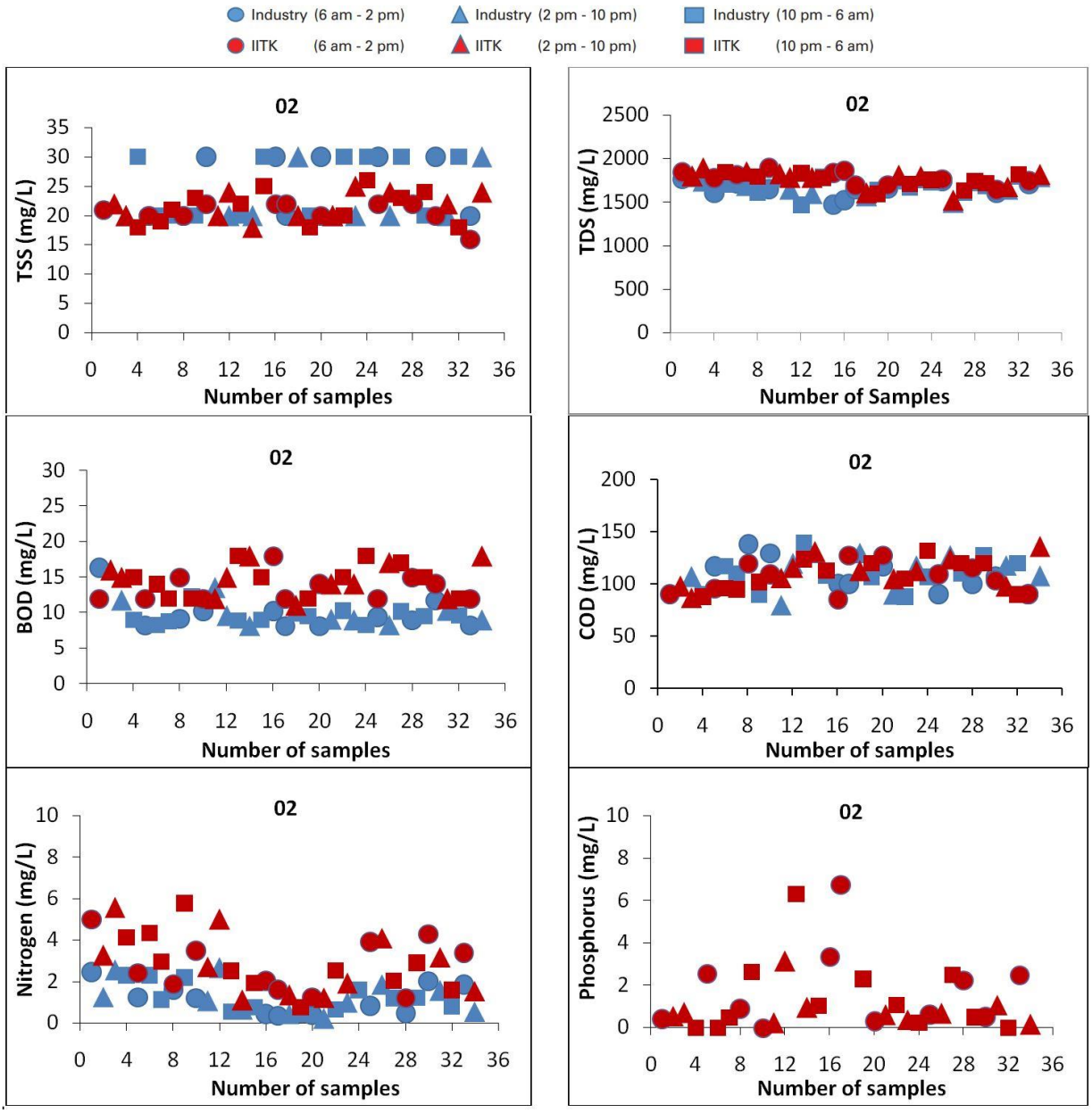
Images at the top of the figure gives an idea of the physical condition of the effluent discharge at industry outlet.

FIGURE-9

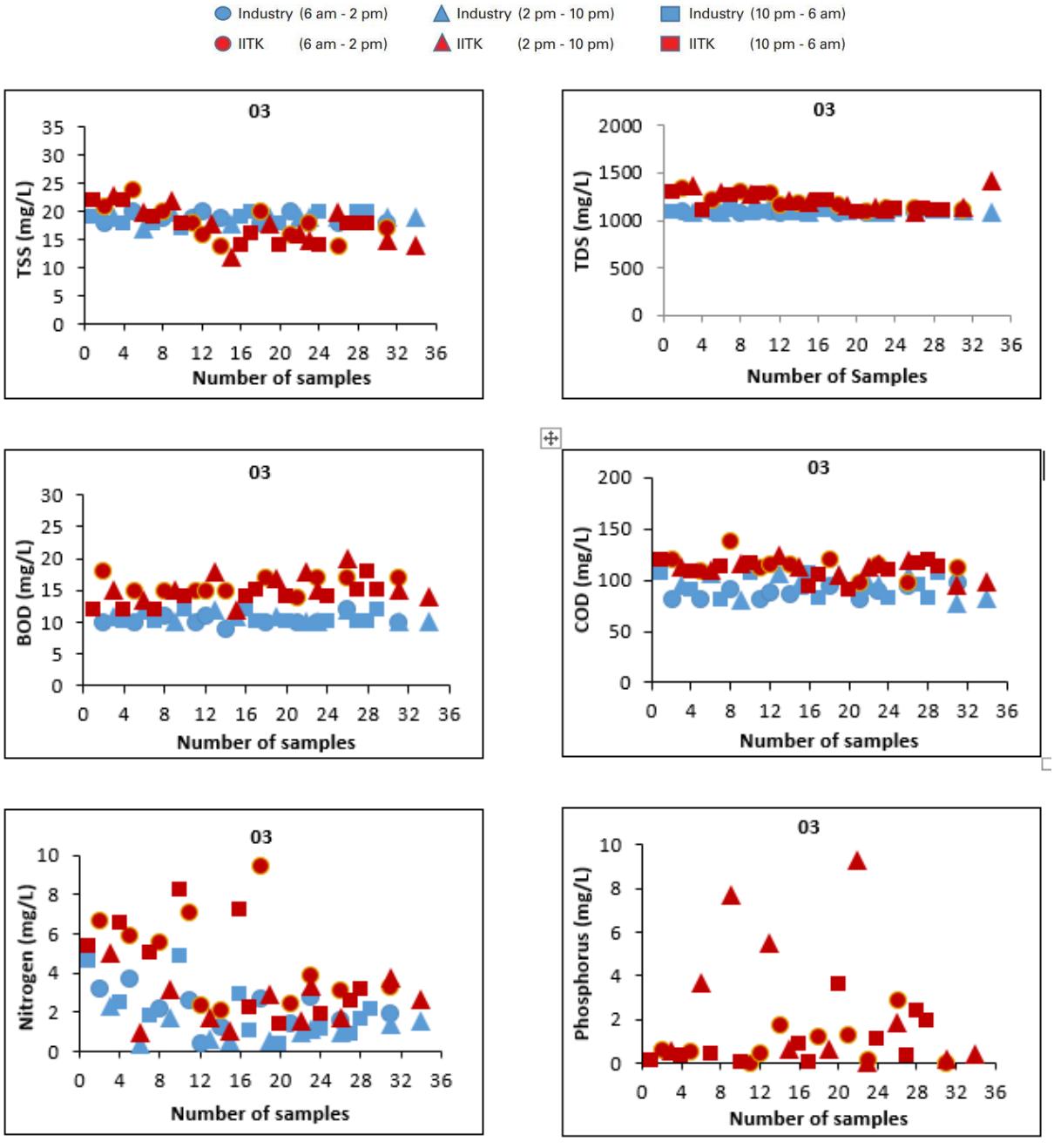
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM



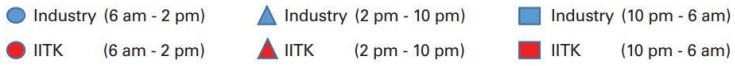
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

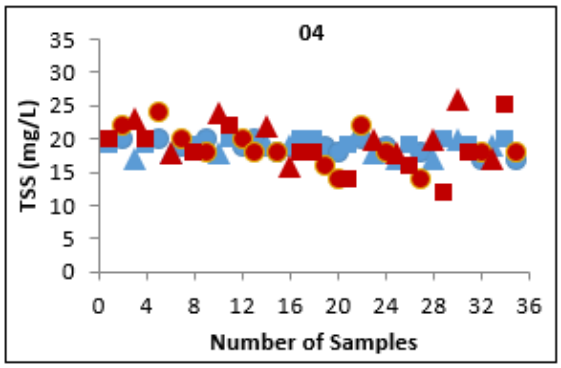


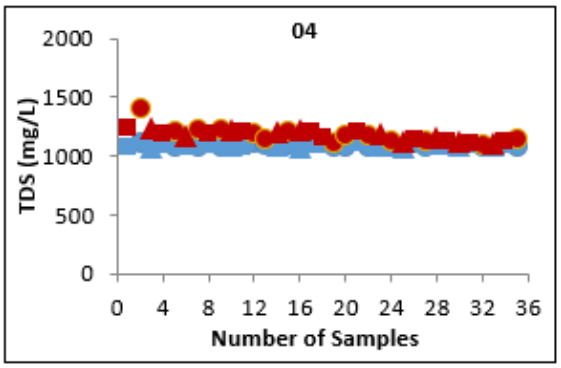
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

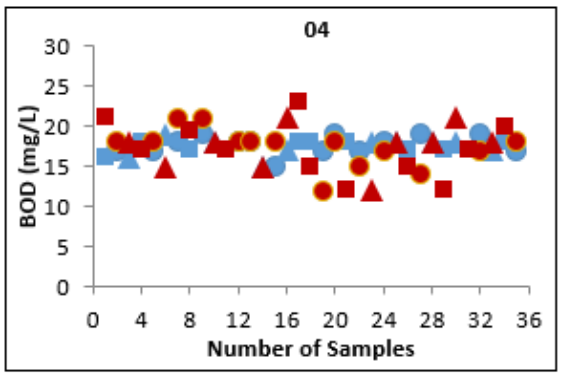


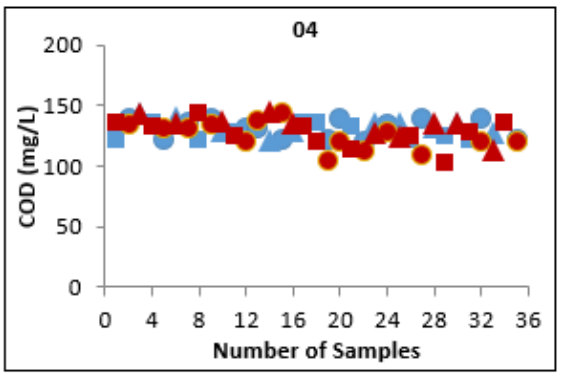
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

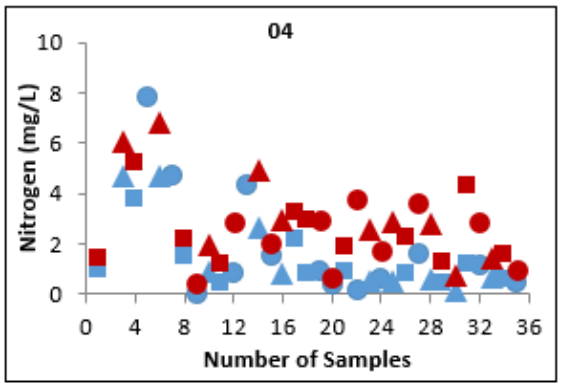


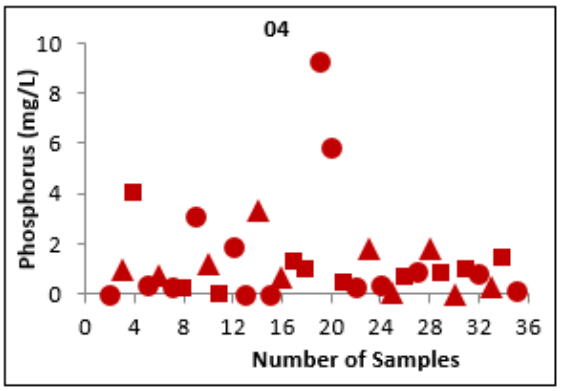




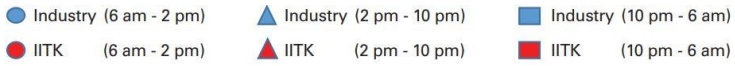


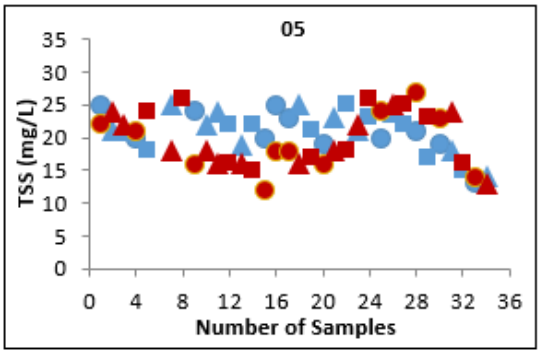


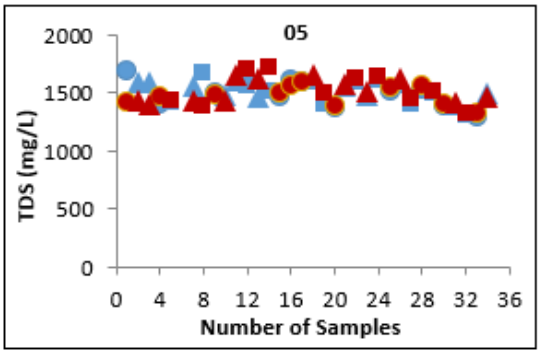


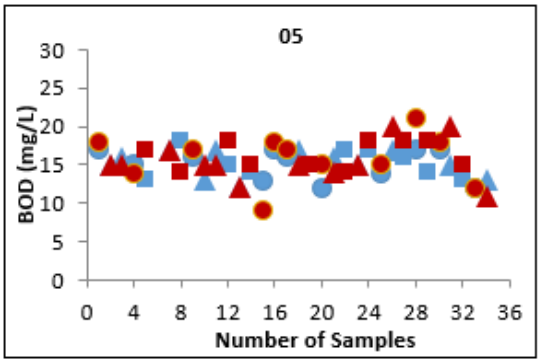


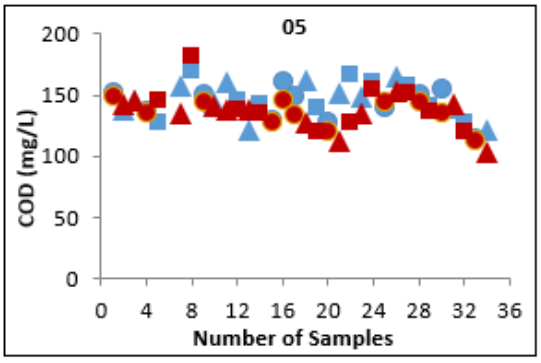
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

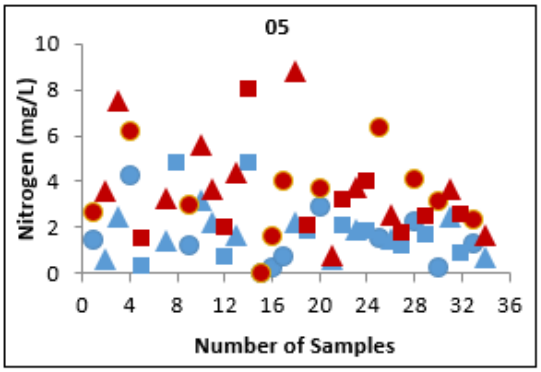


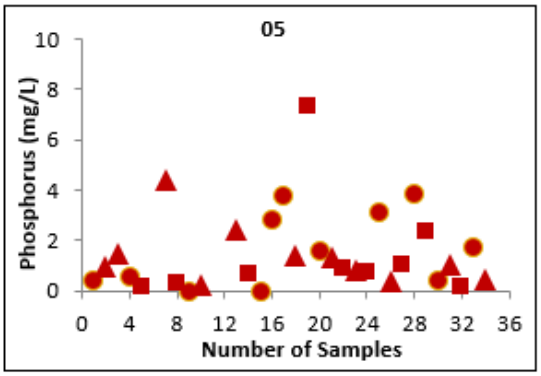




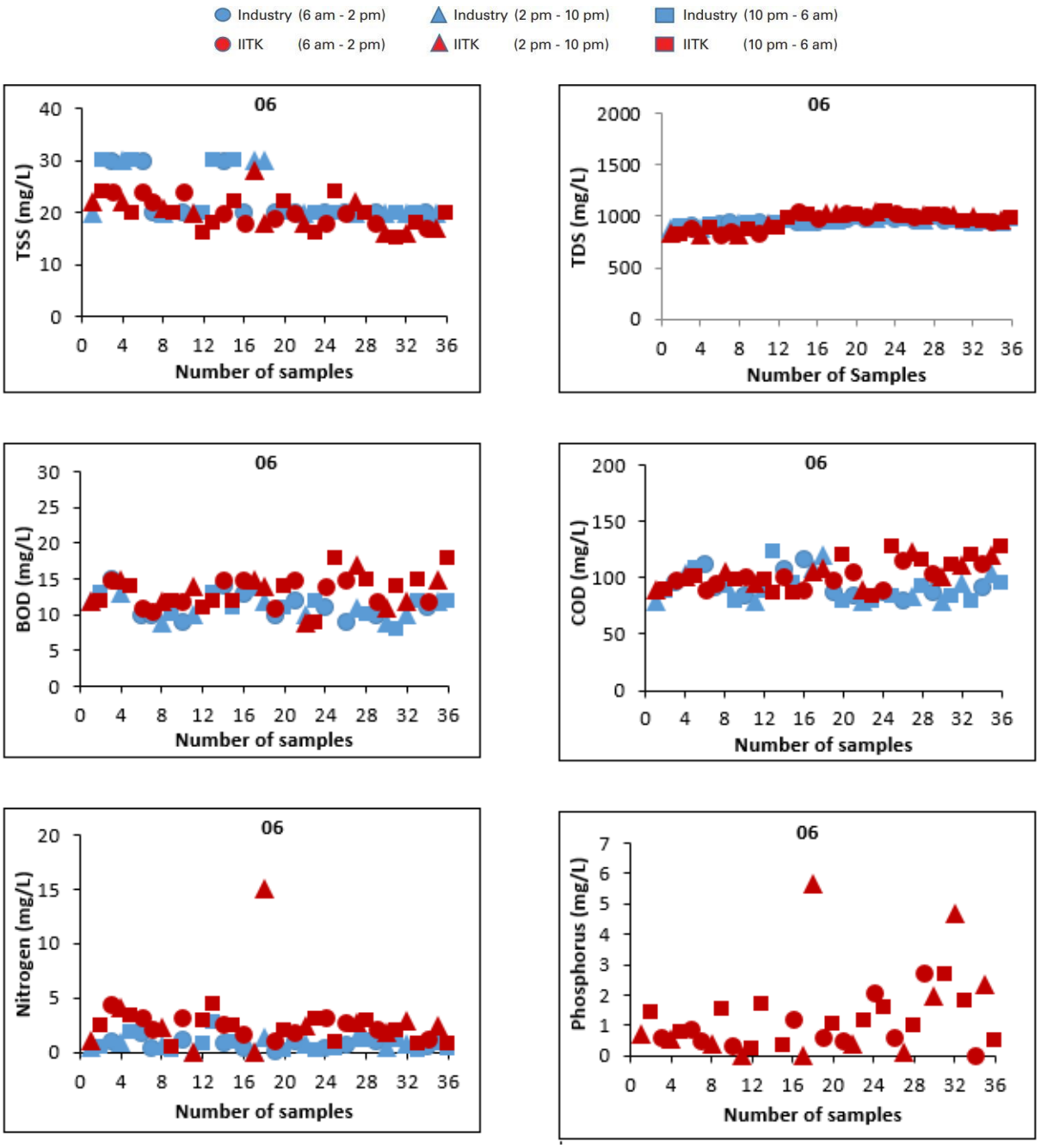








COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM



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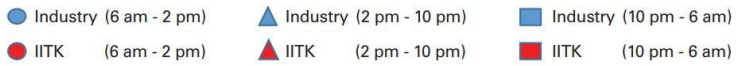
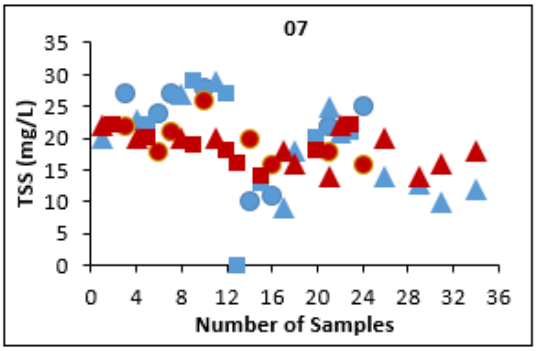
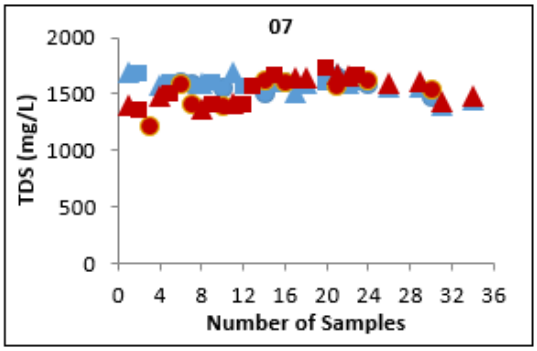
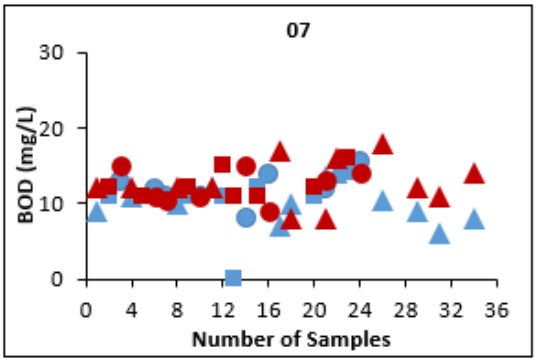
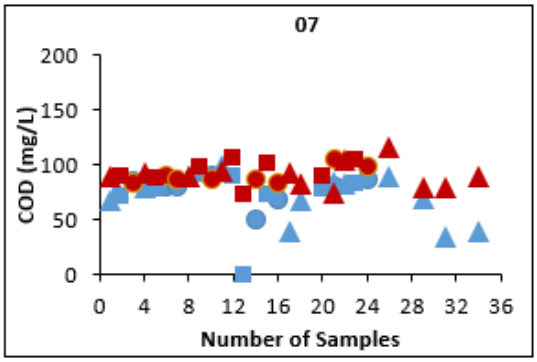
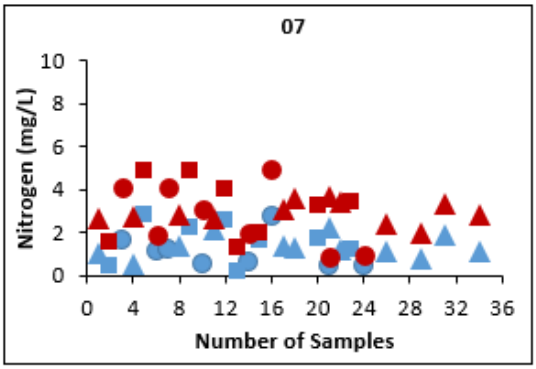


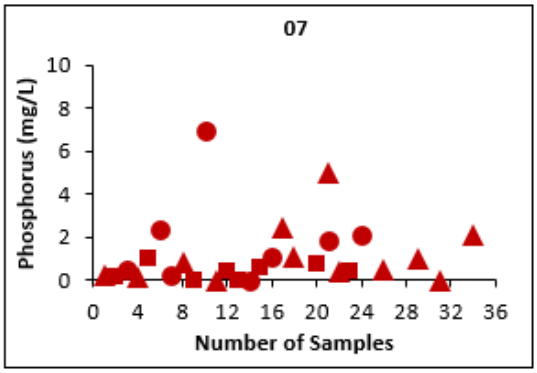




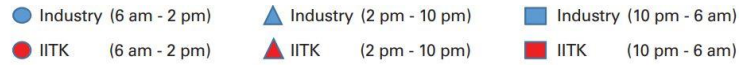


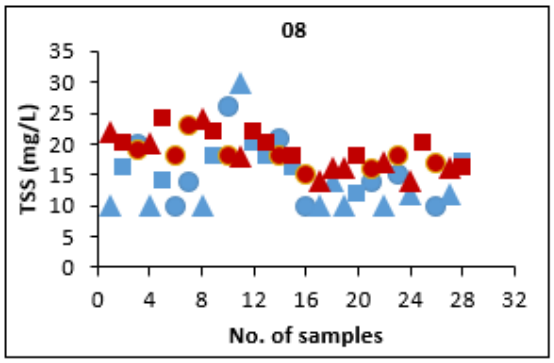


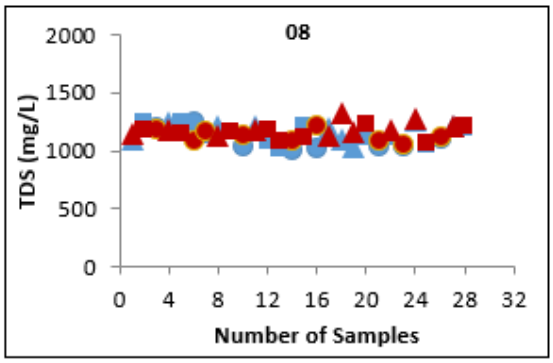


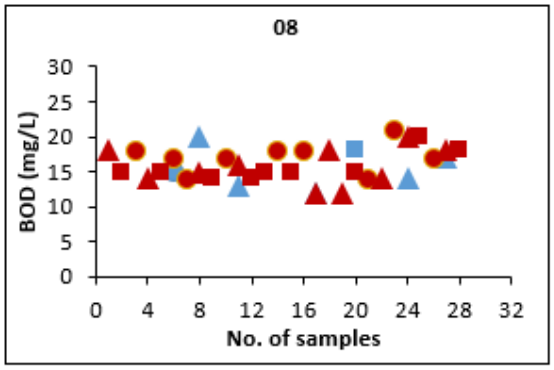


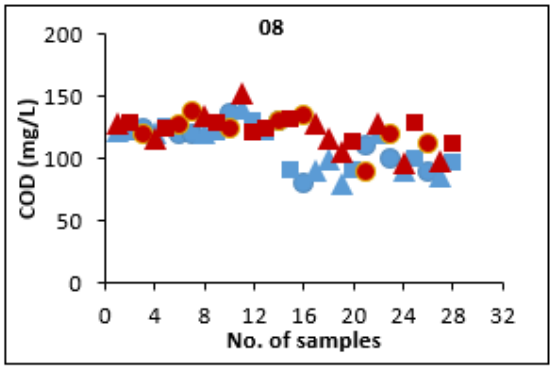
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

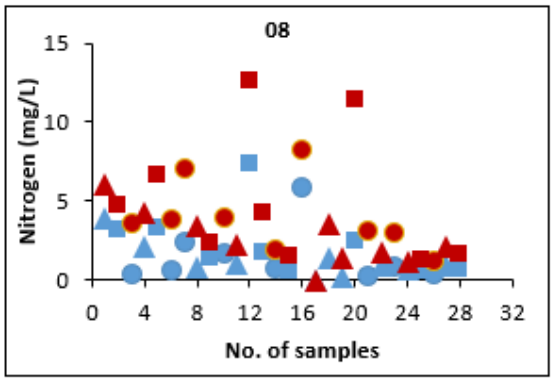


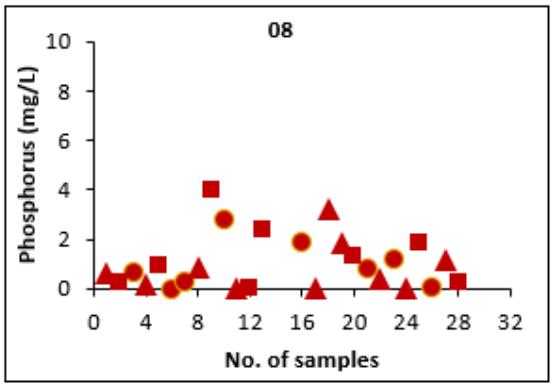




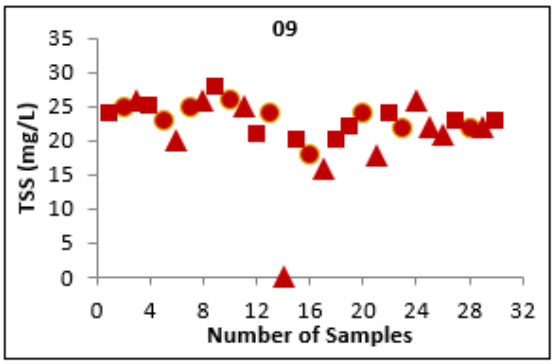


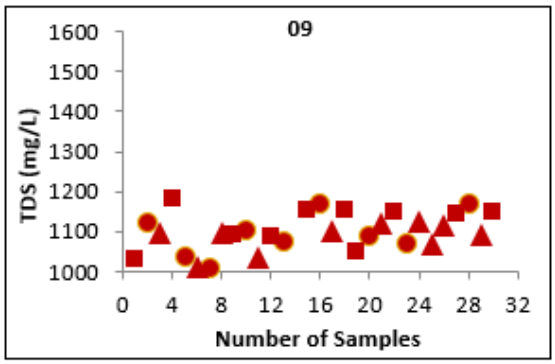


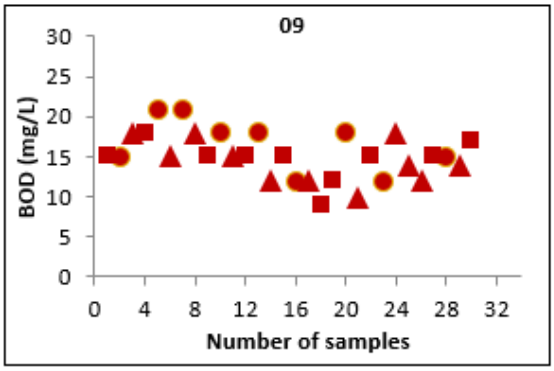


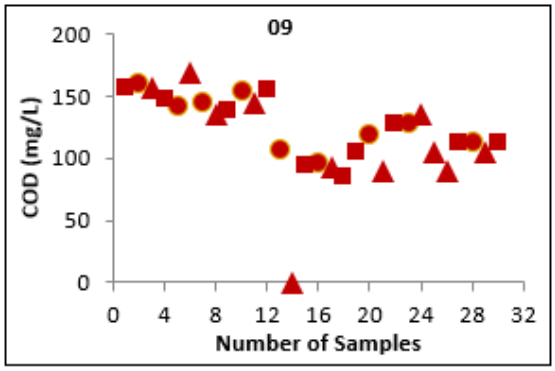


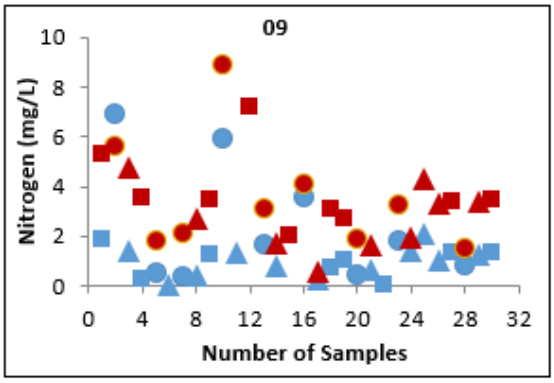
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

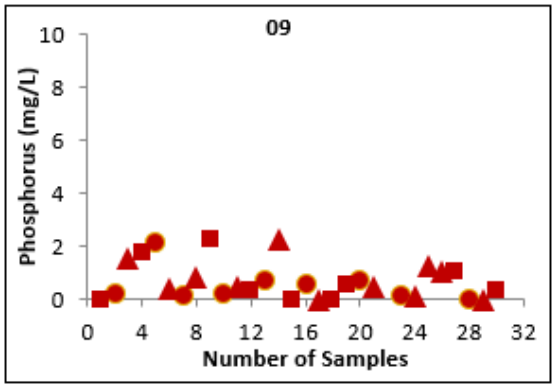




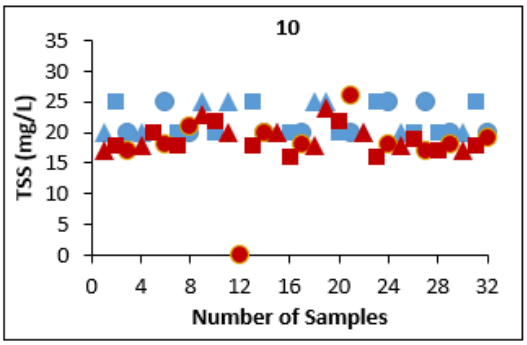


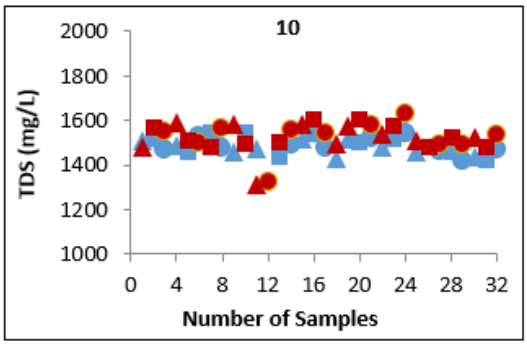


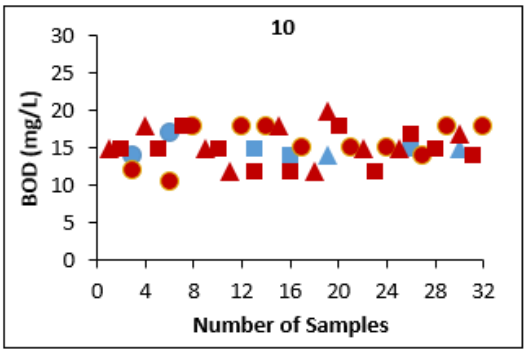


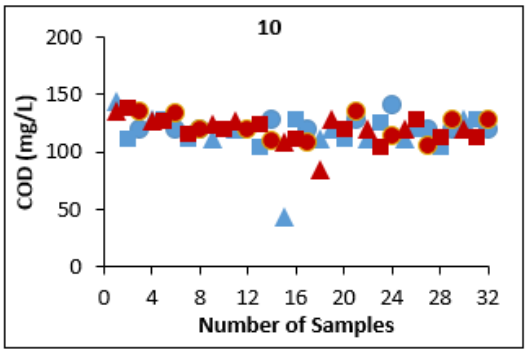


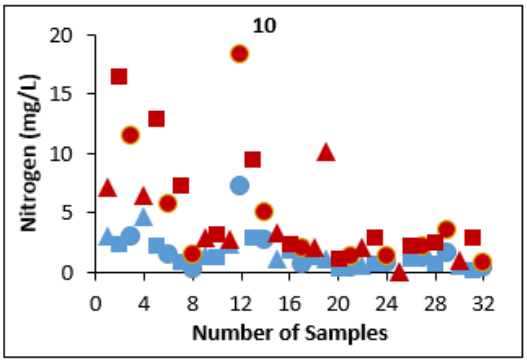
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

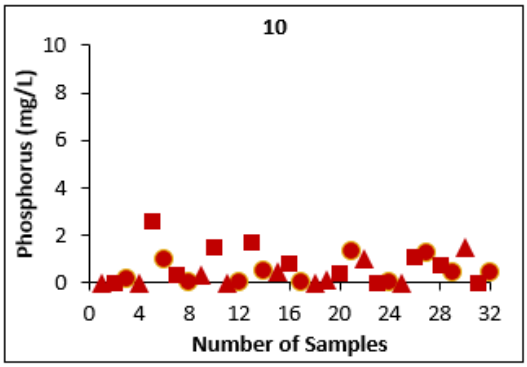




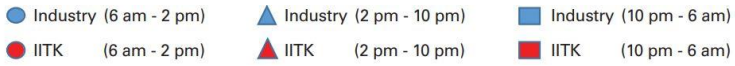


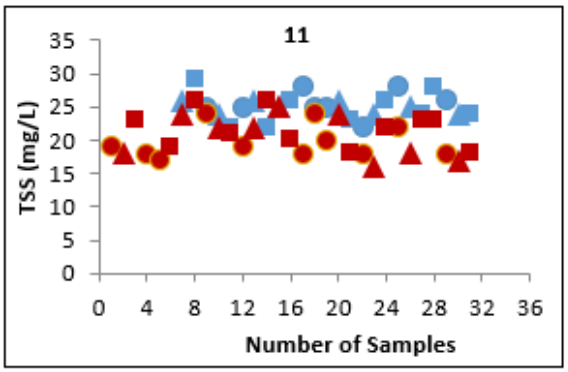


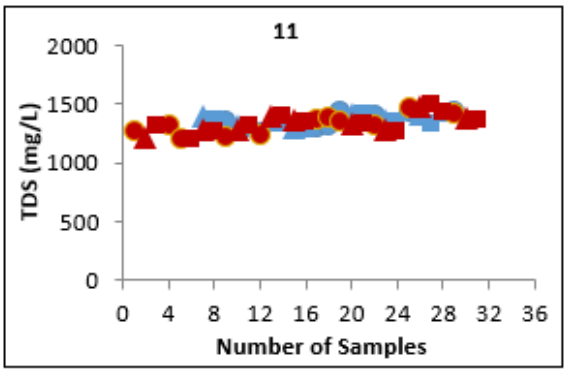


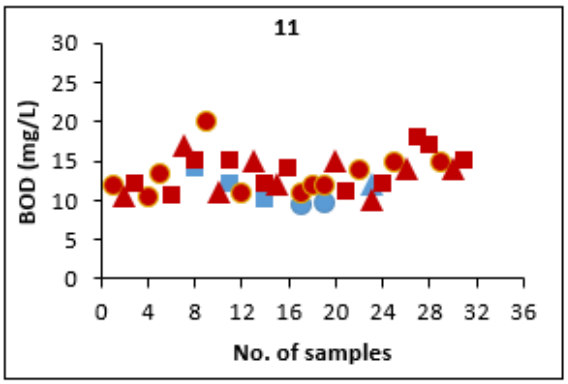


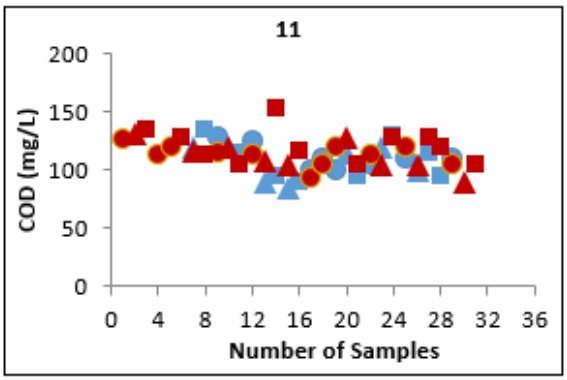
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

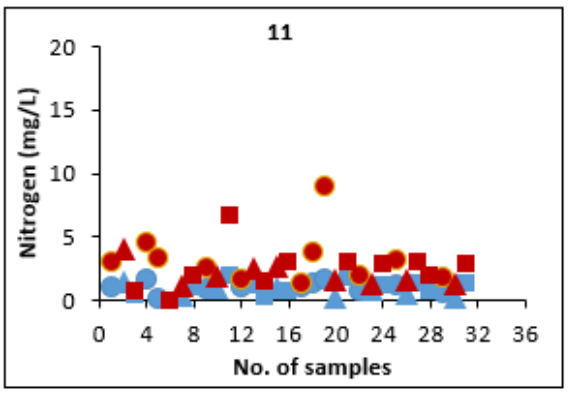


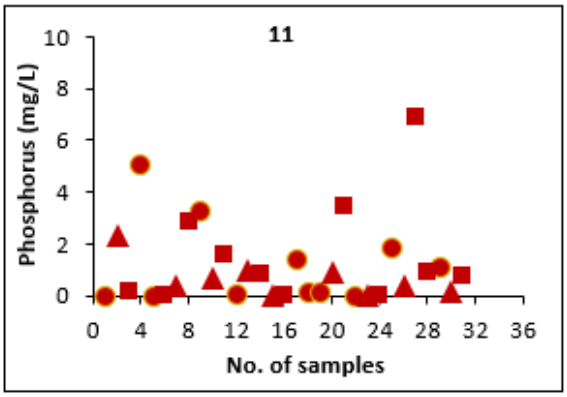




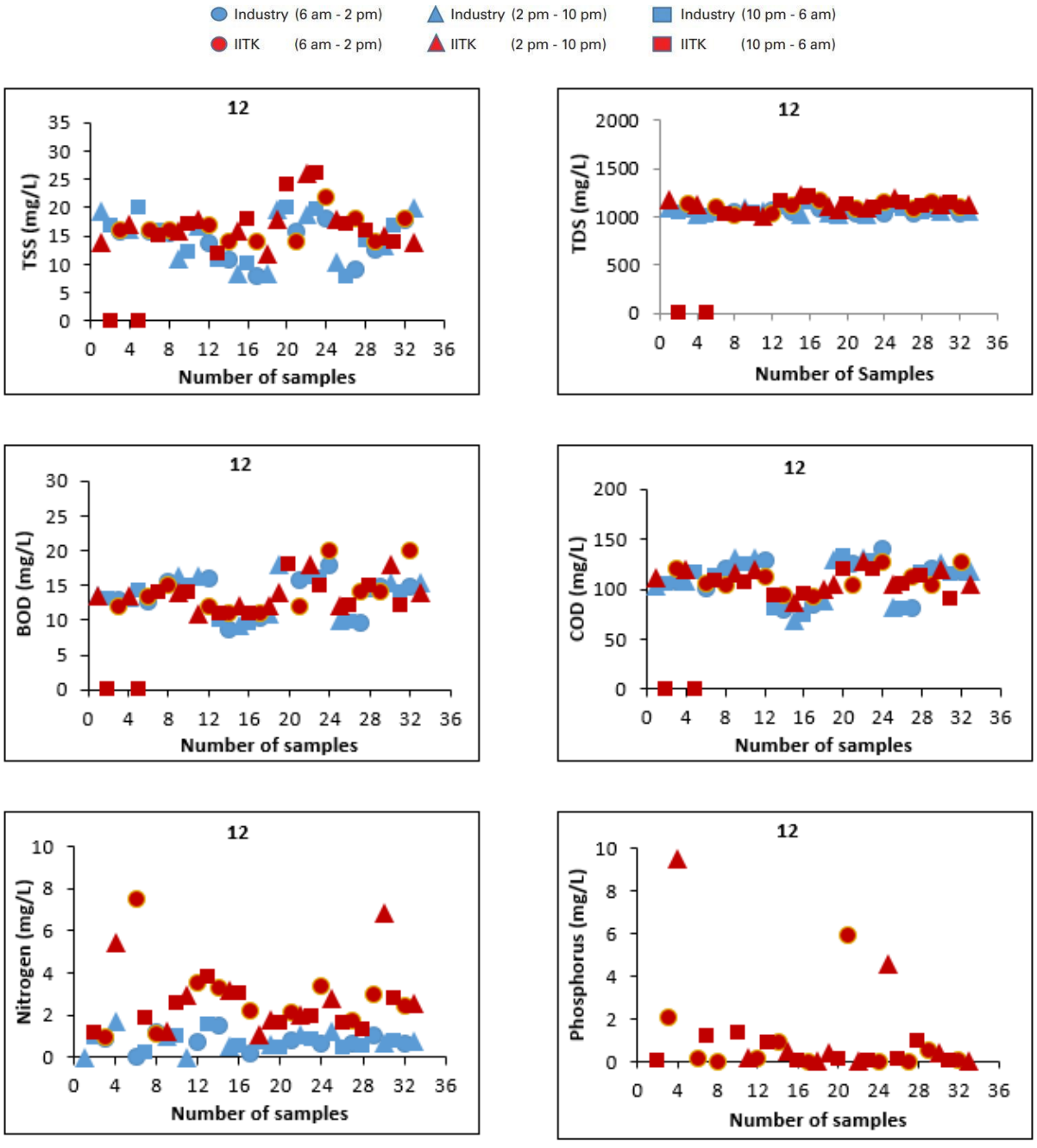




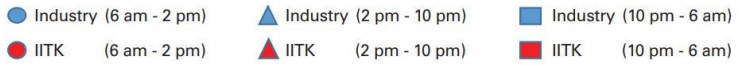


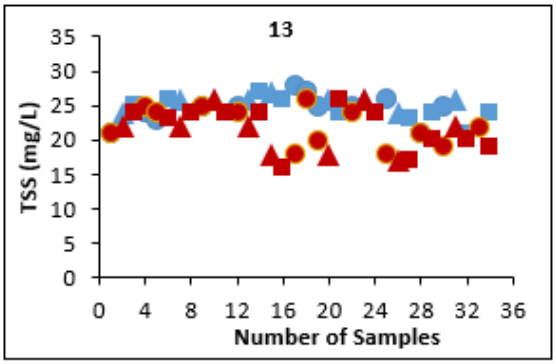


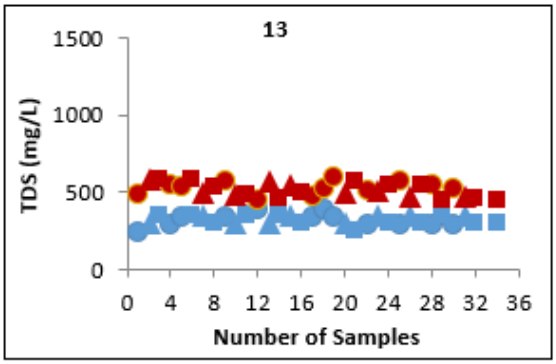
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

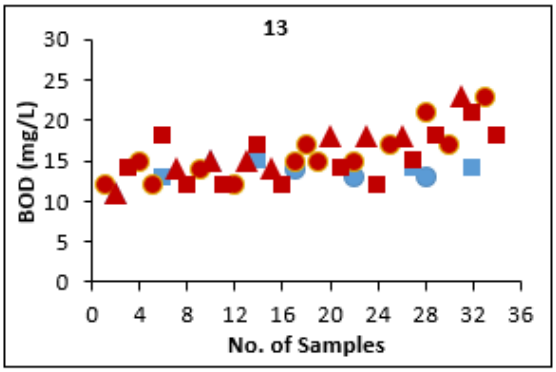


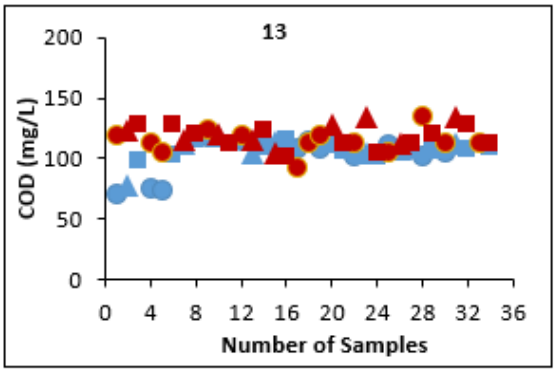
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

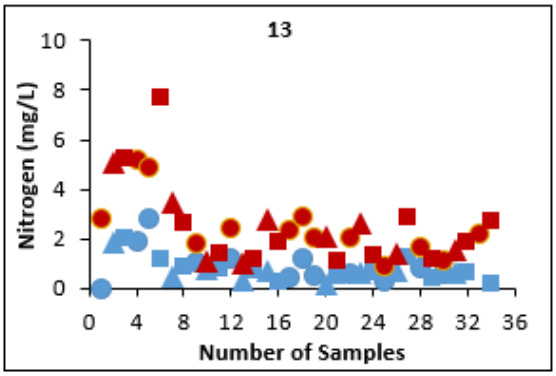


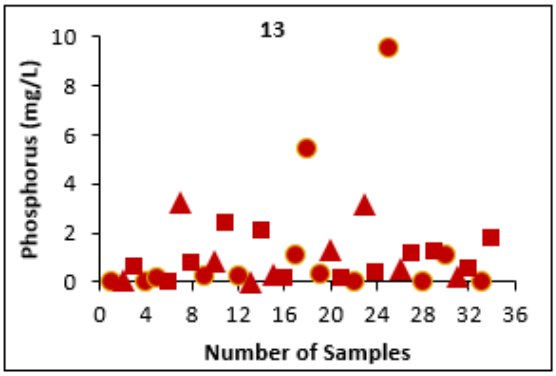




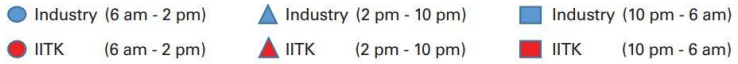


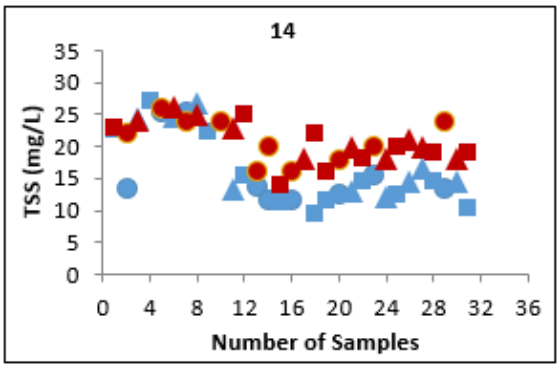


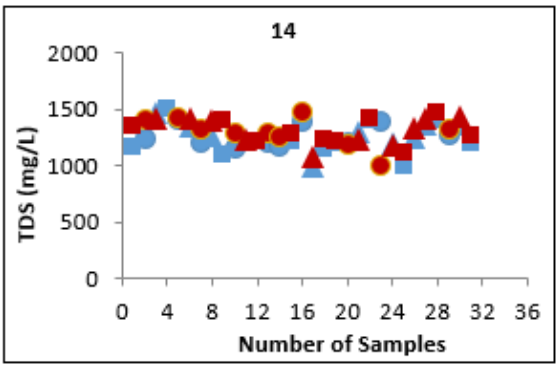


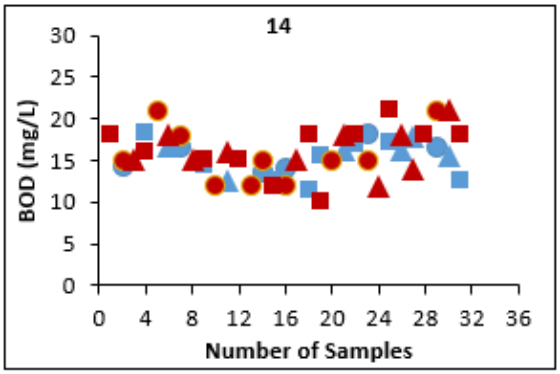


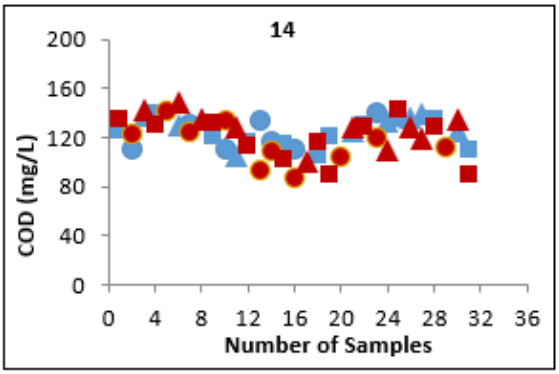
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

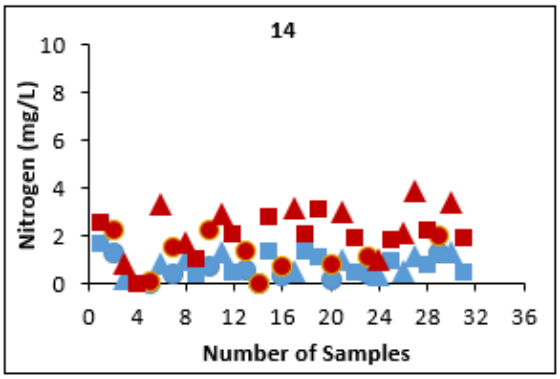


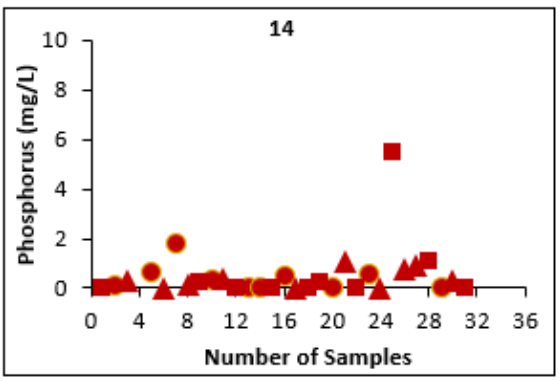




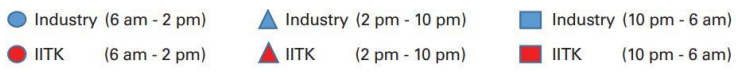


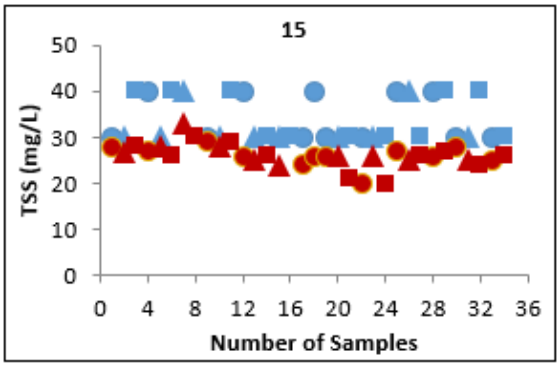


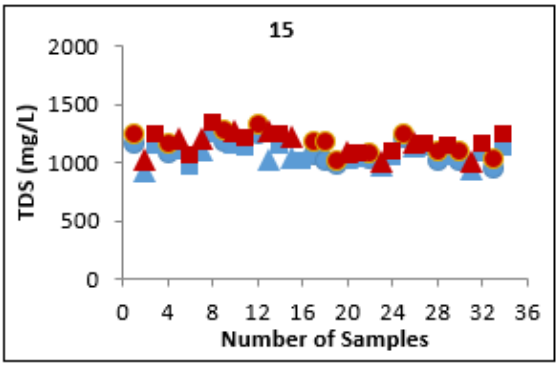


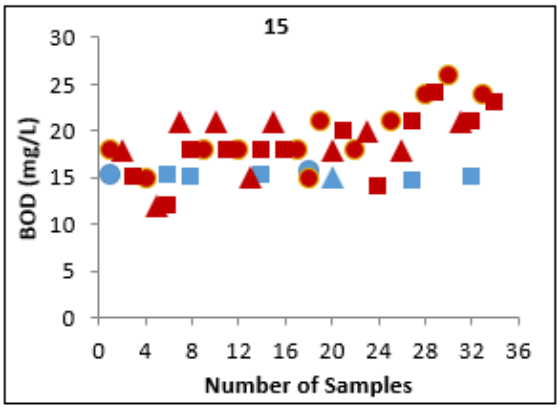


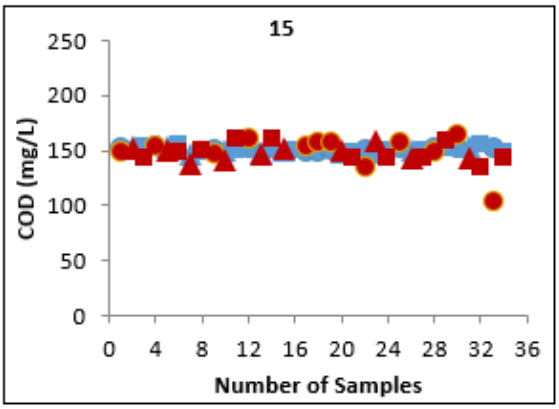
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

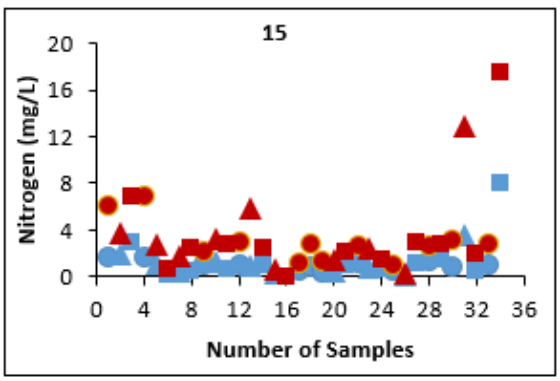


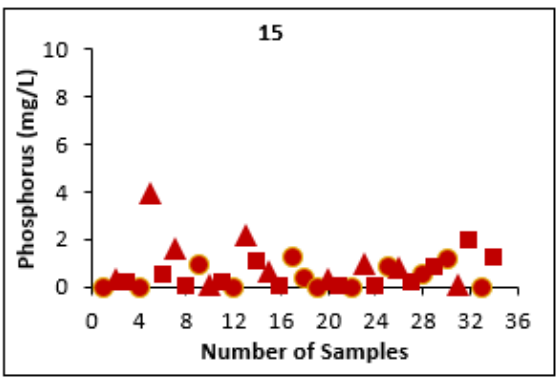




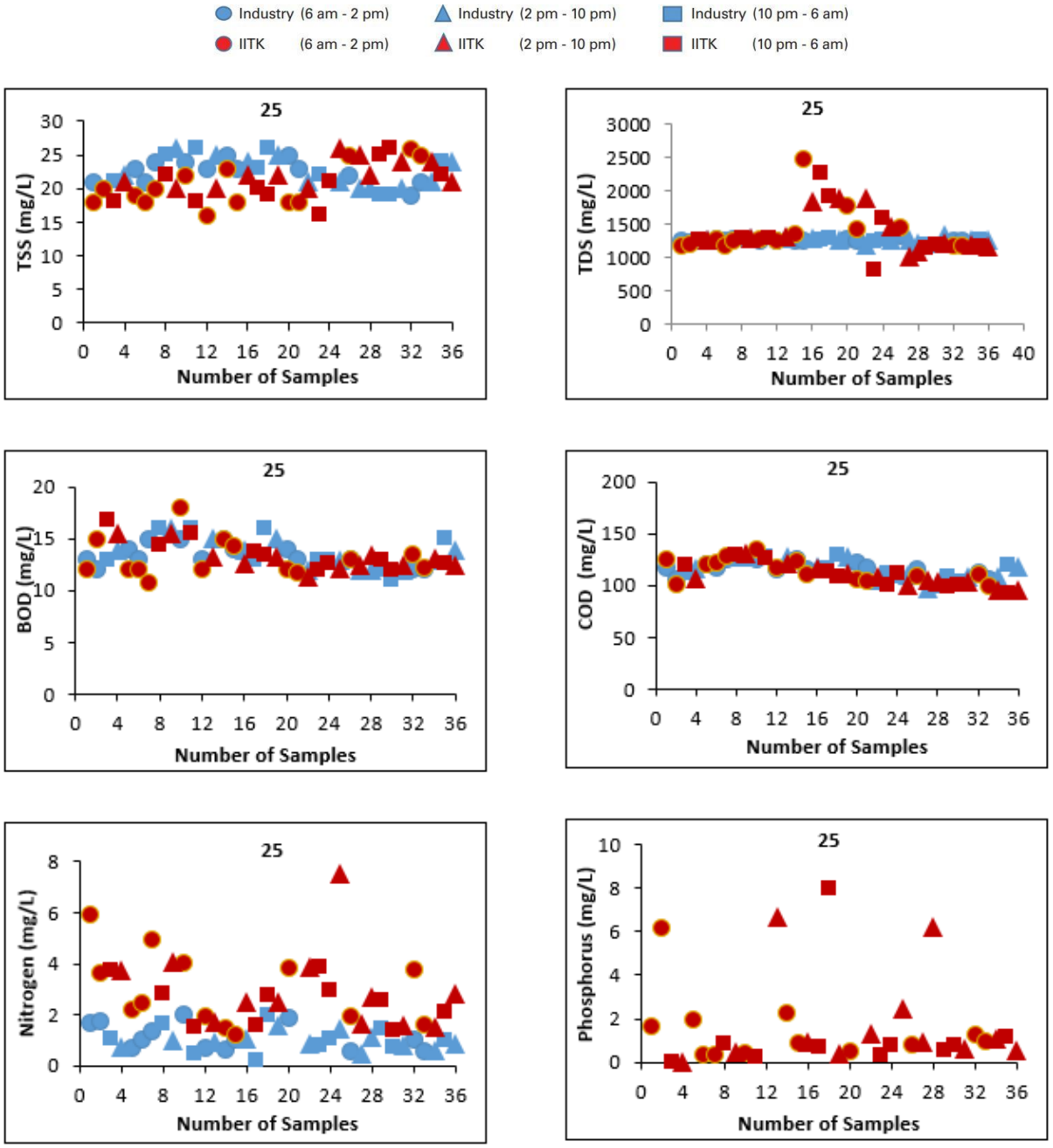




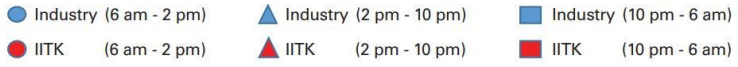


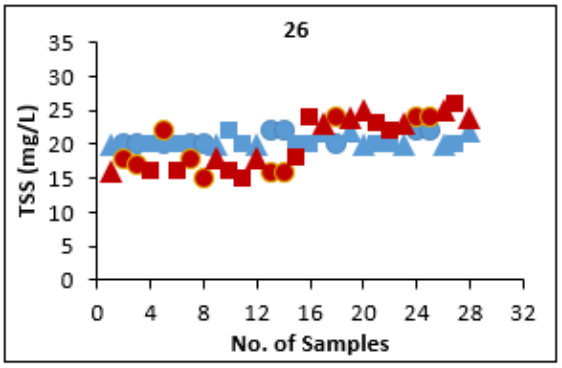


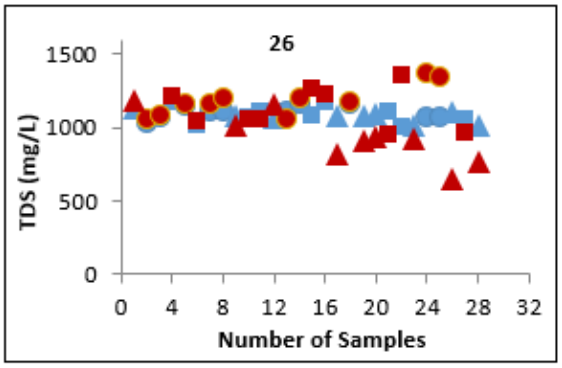
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

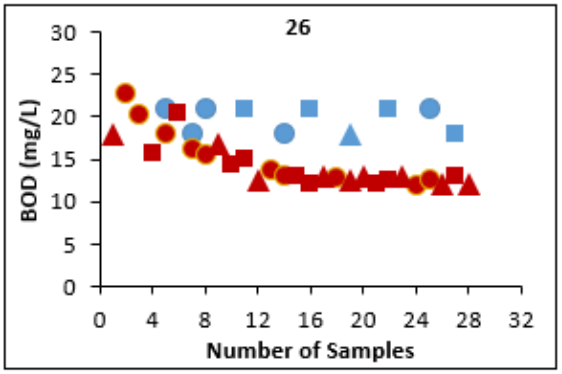


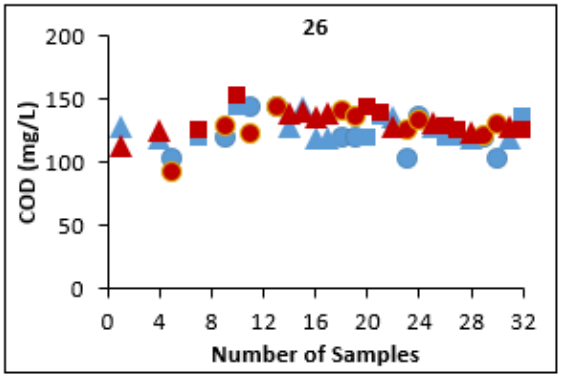
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

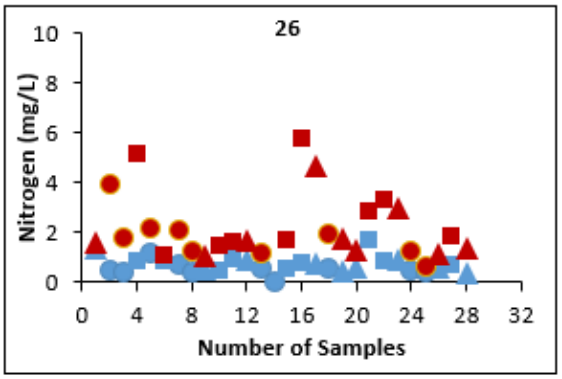


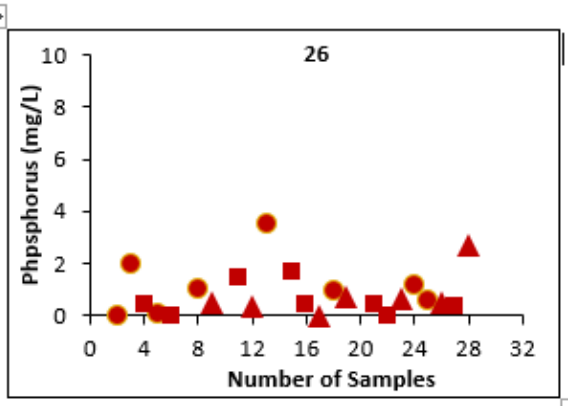




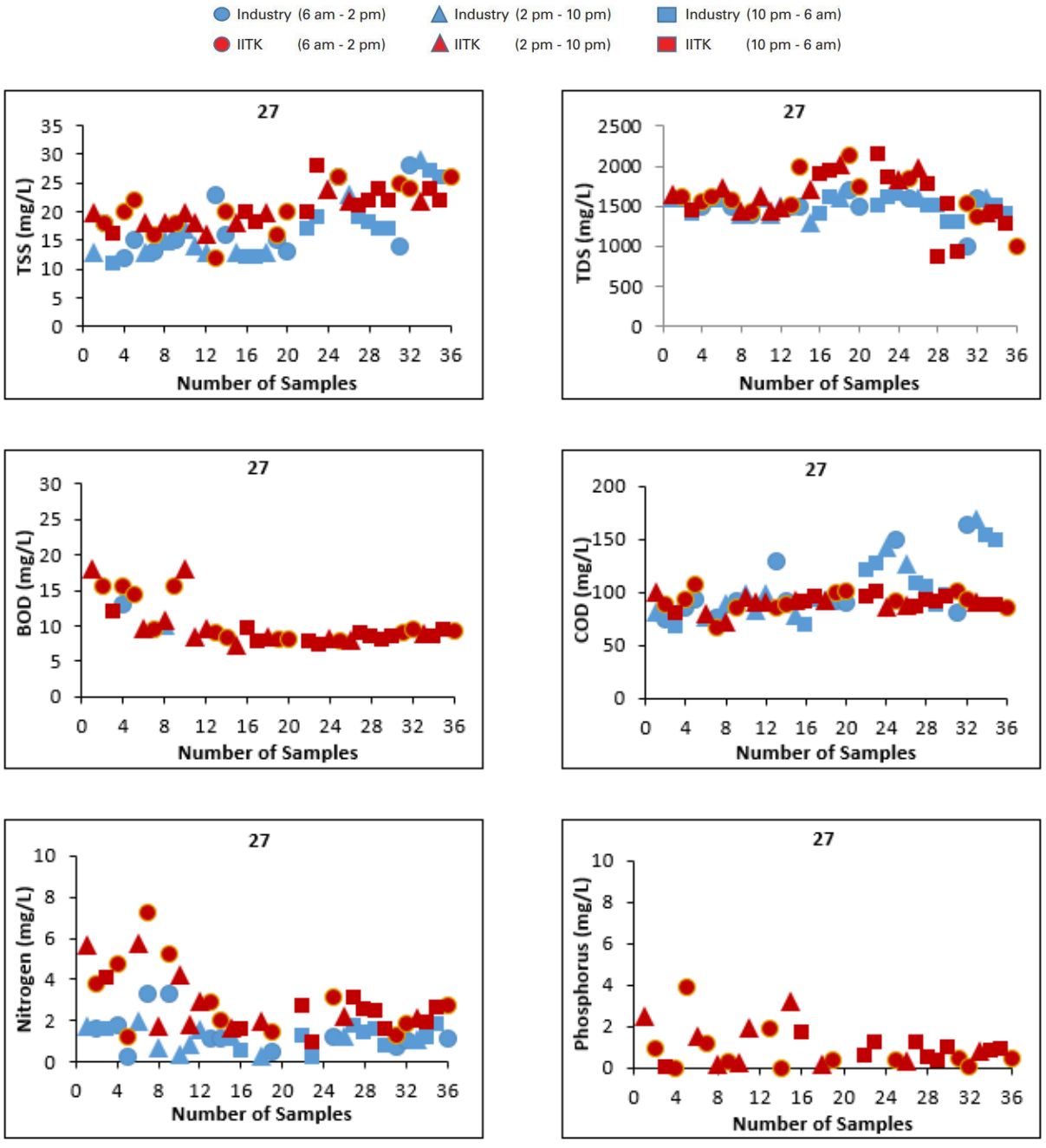








COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM



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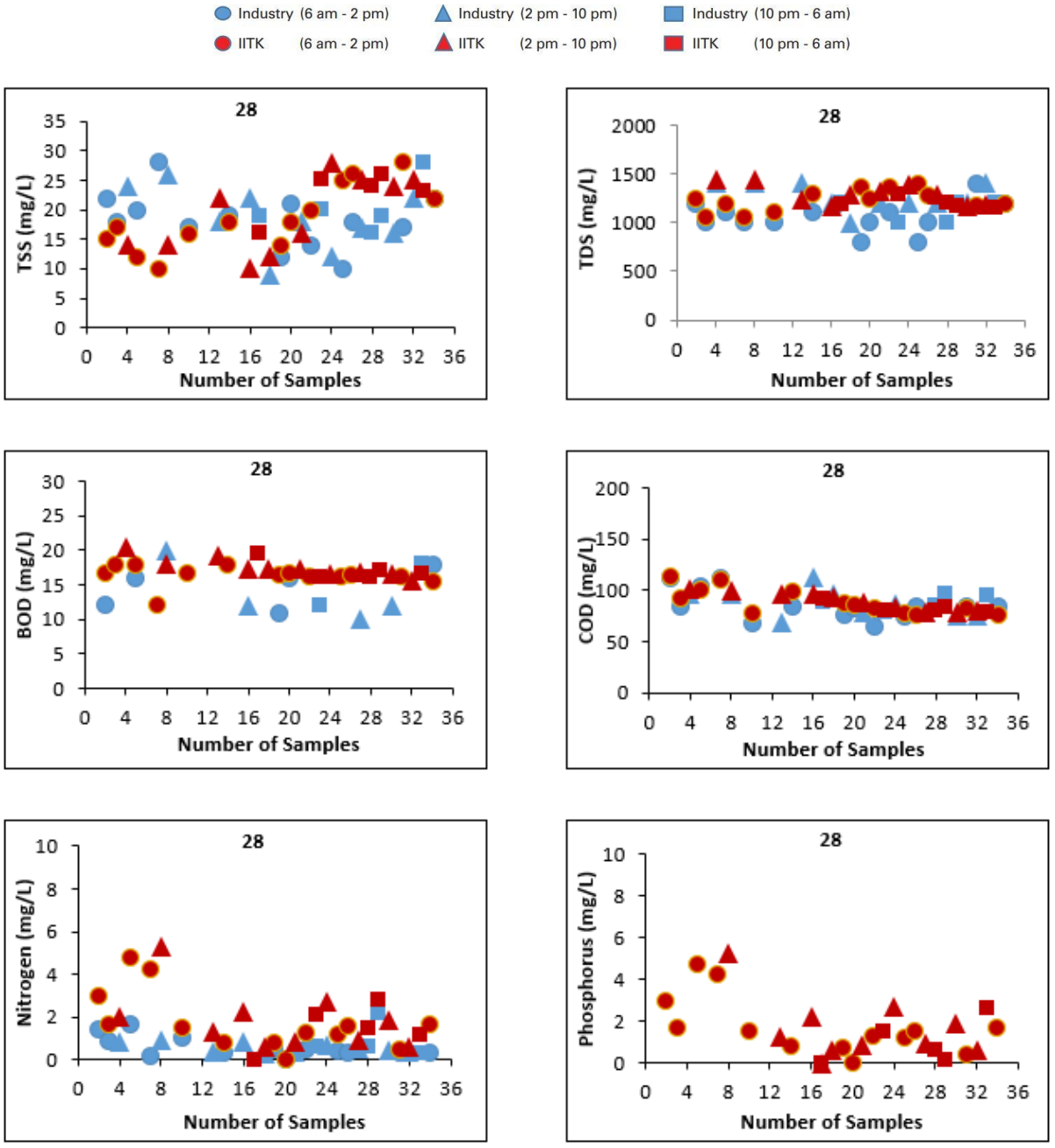

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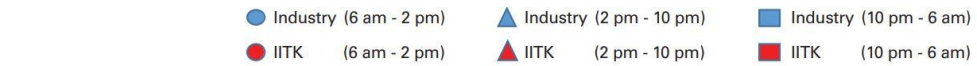
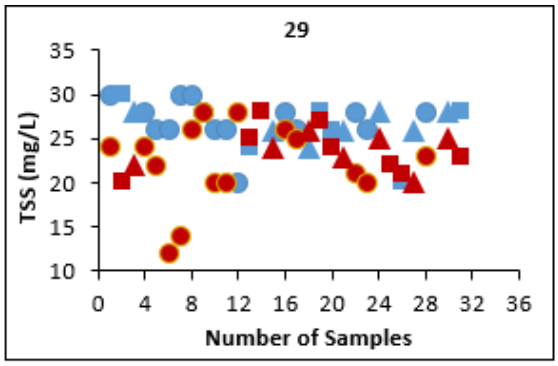
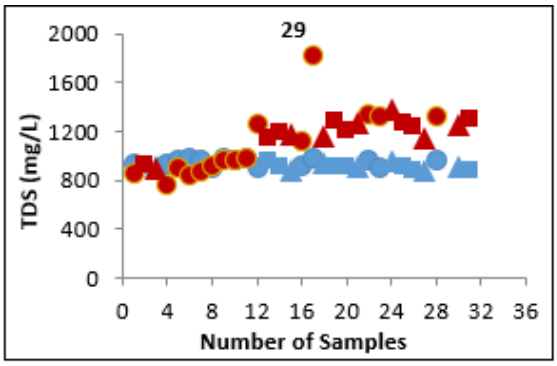
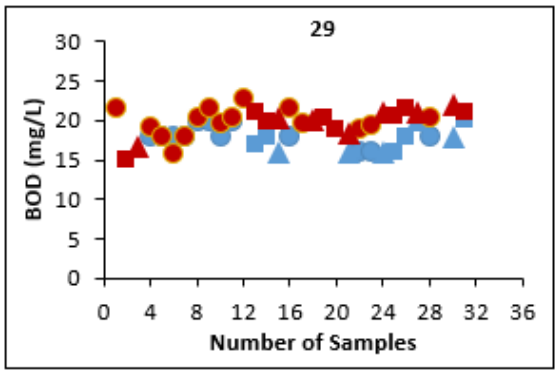
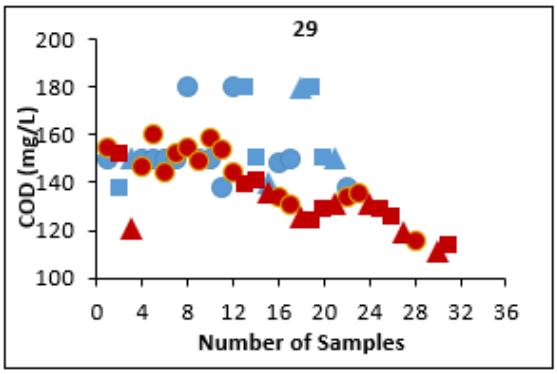
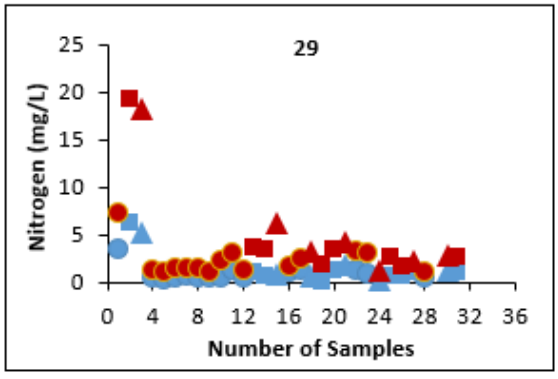


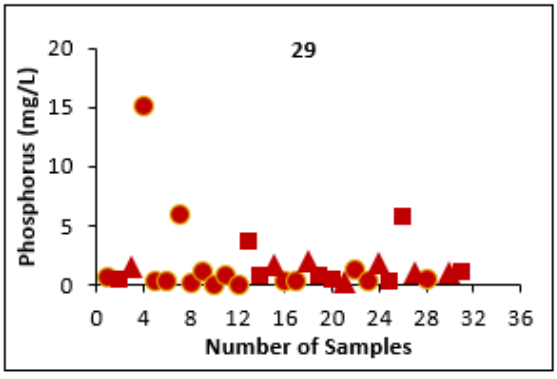




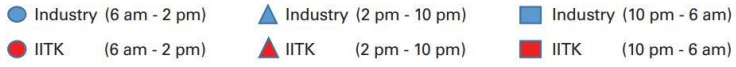


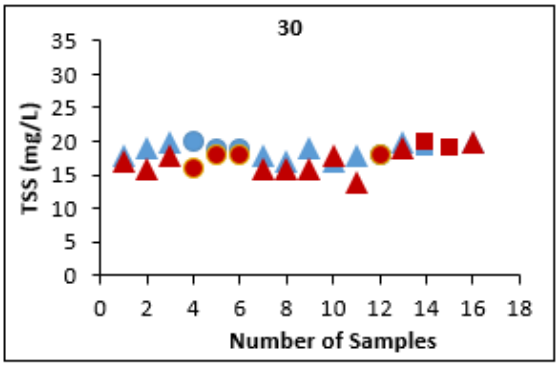


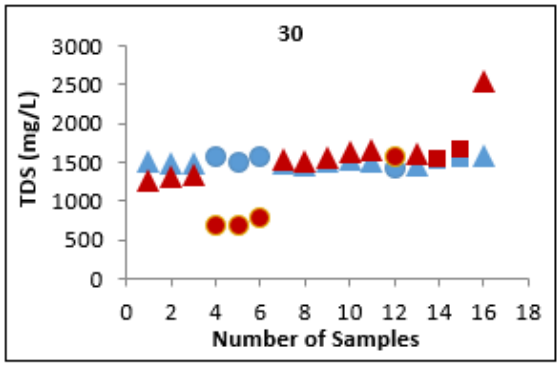


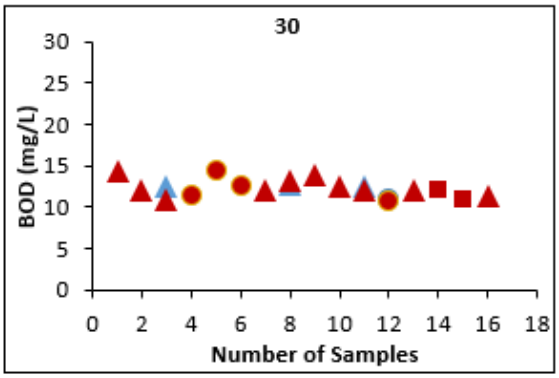


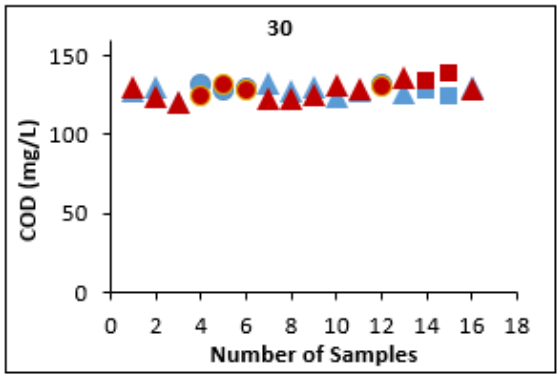
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

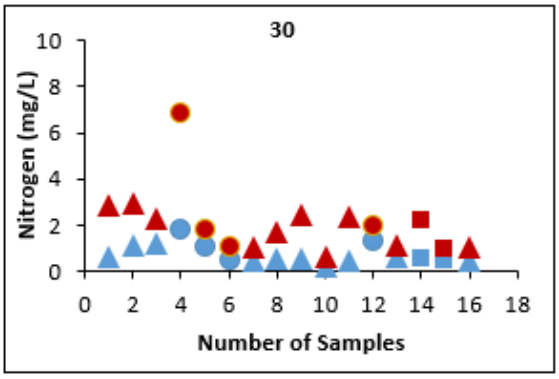


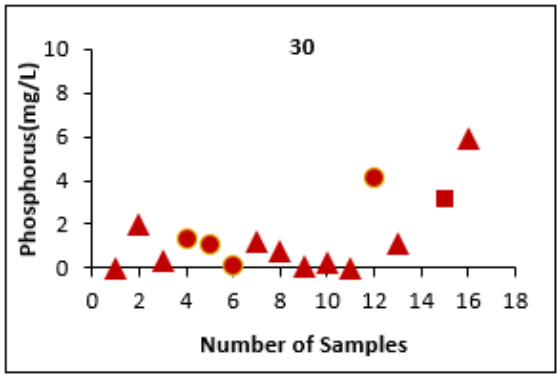












COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

Industry (6 am - 2 pm) Industry (2 pm - 10 pm) Industry (10 pm - 6 am)
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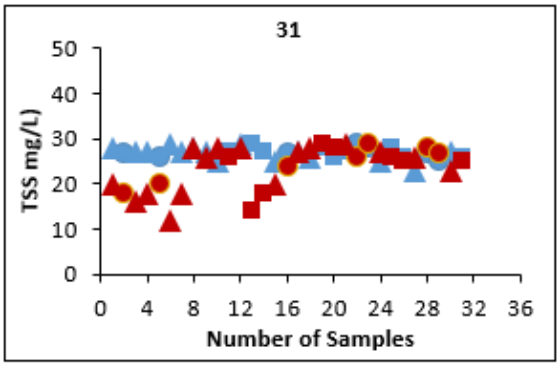
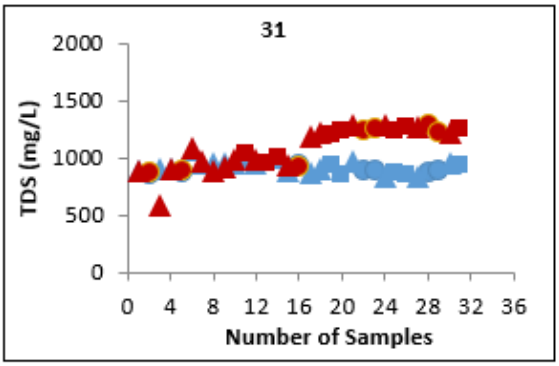
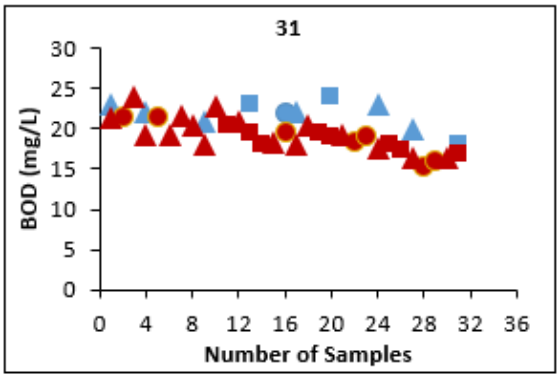
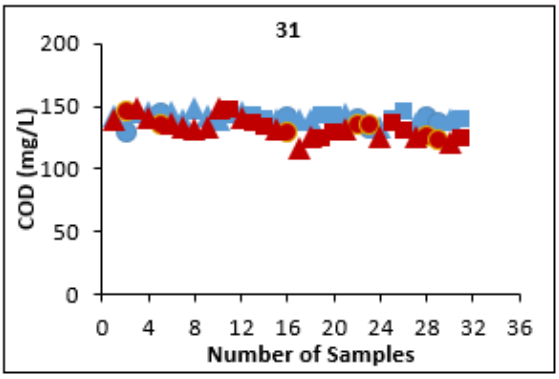
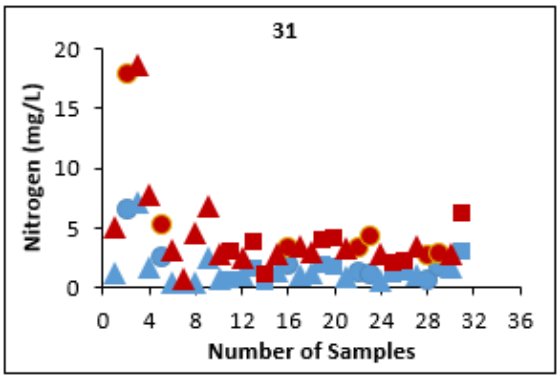
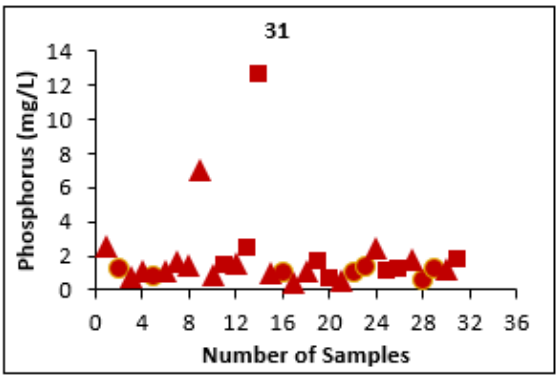




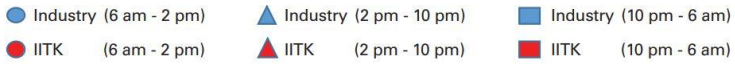


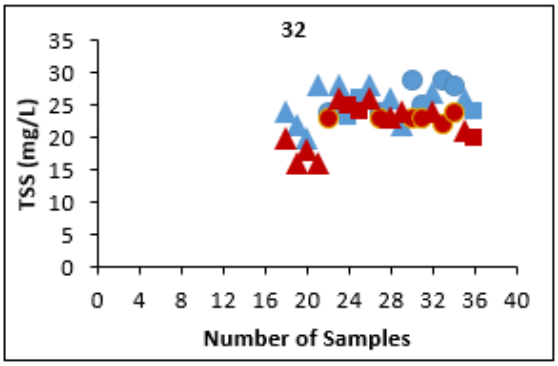


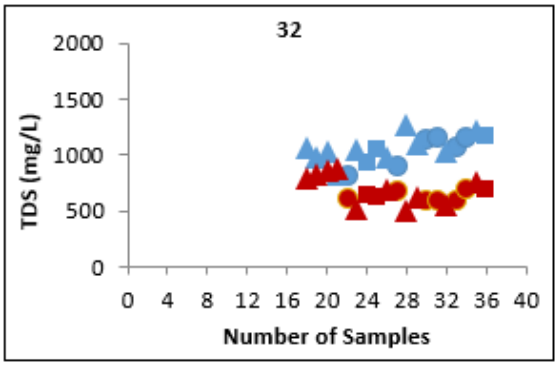


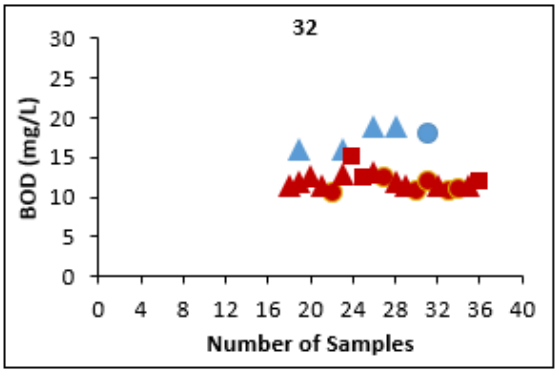


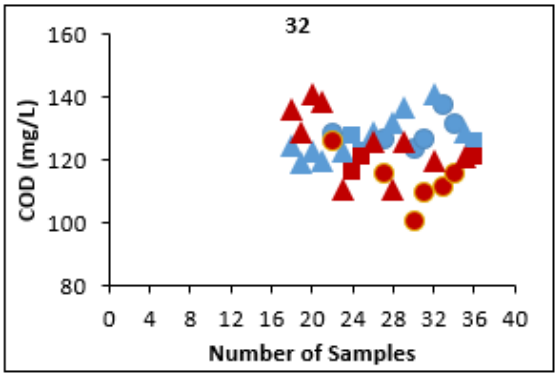
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

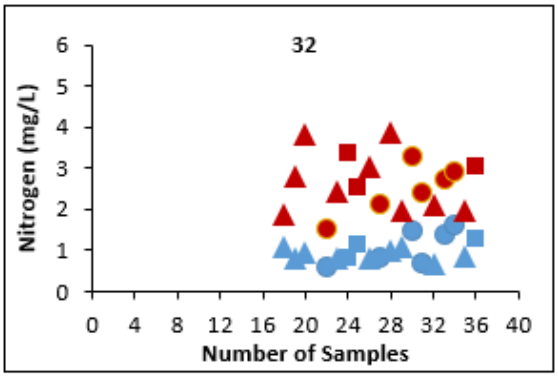


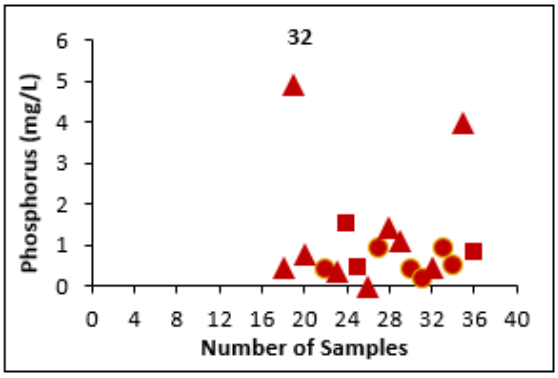




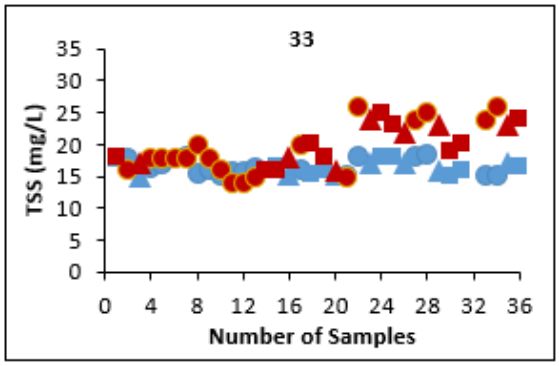


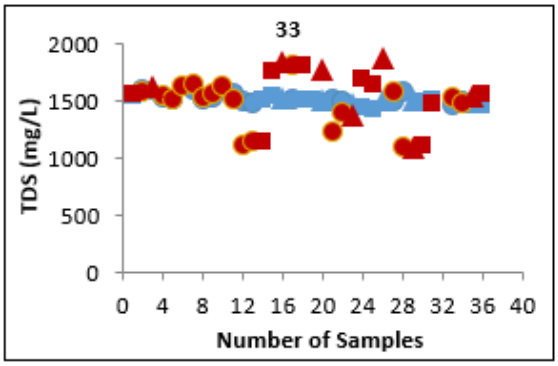


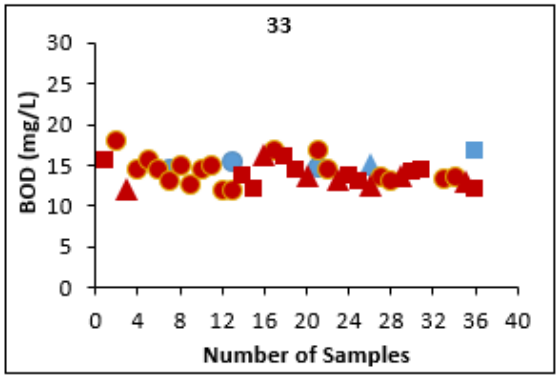


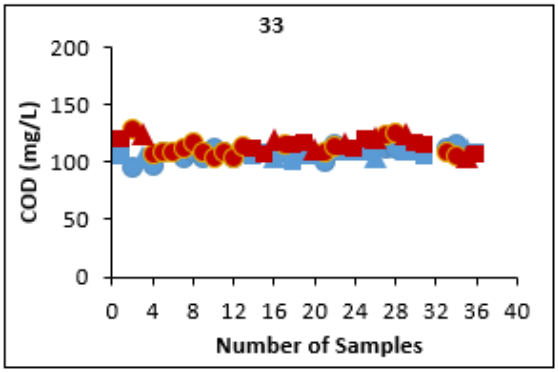


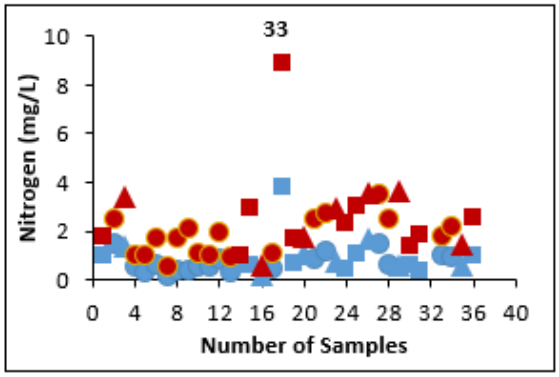
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

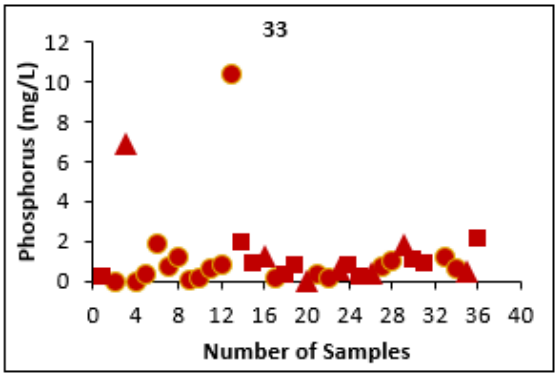




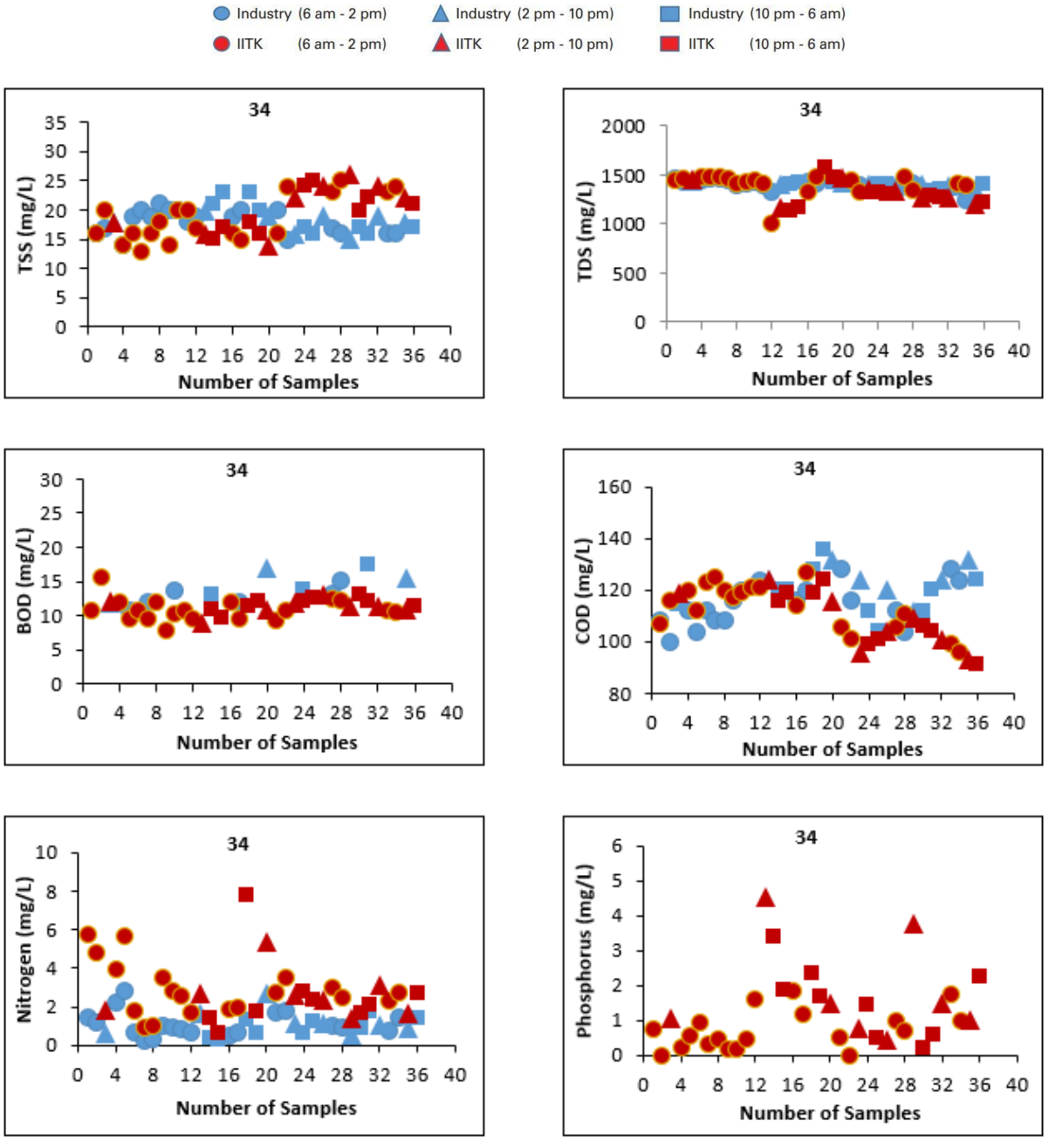








COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM



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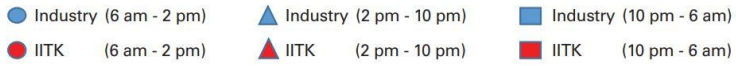
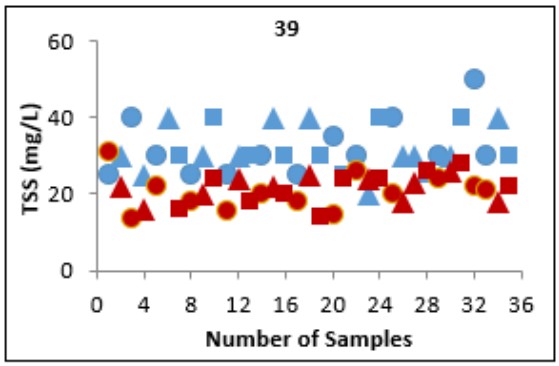
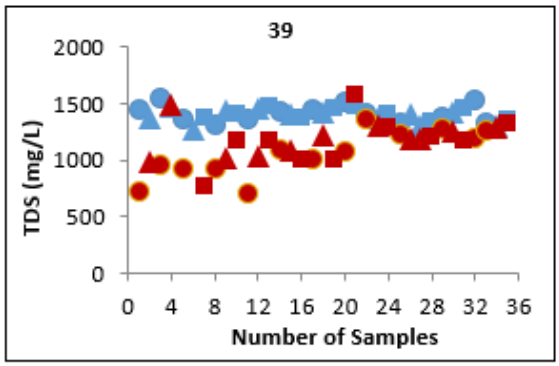
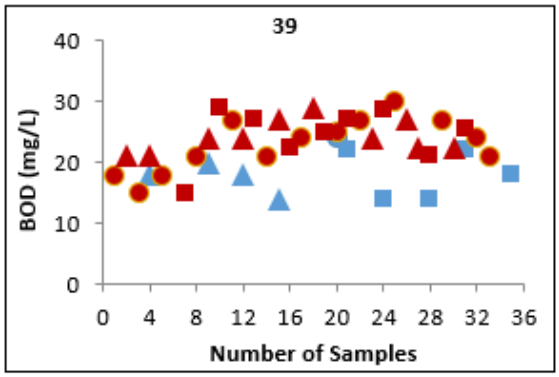
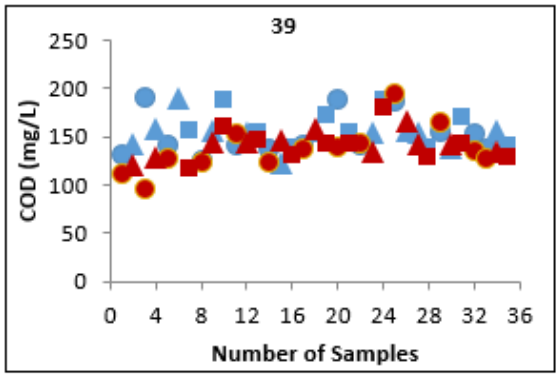
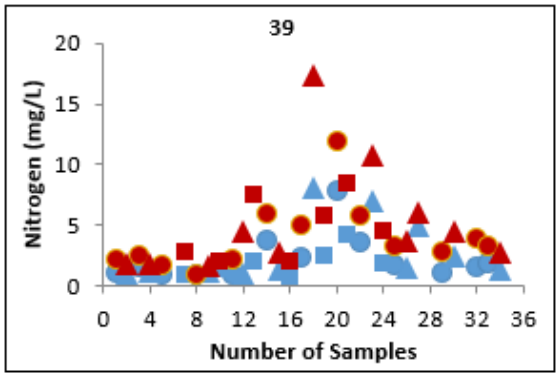


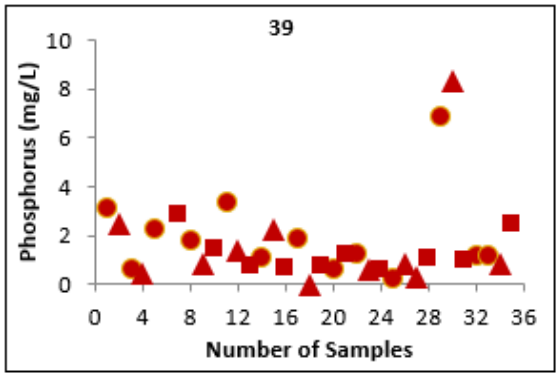




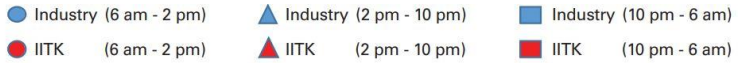


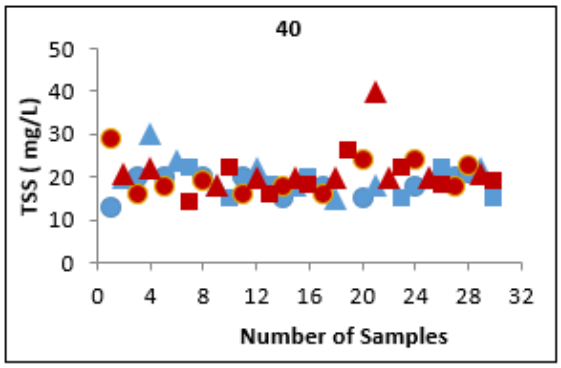


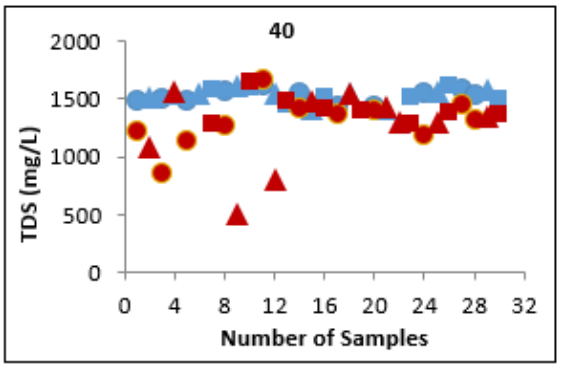


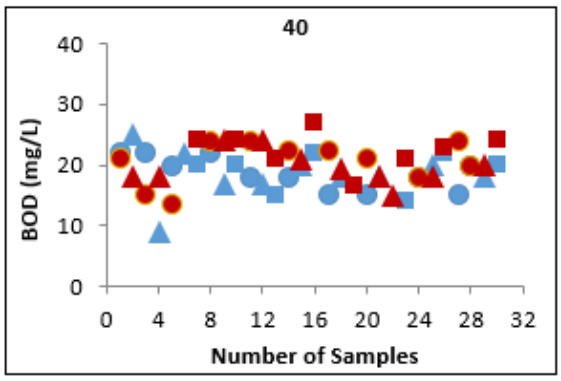


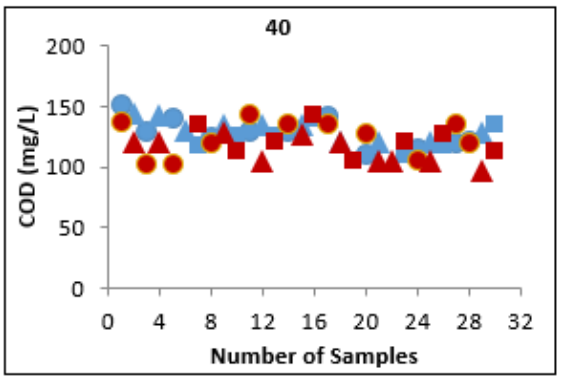
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

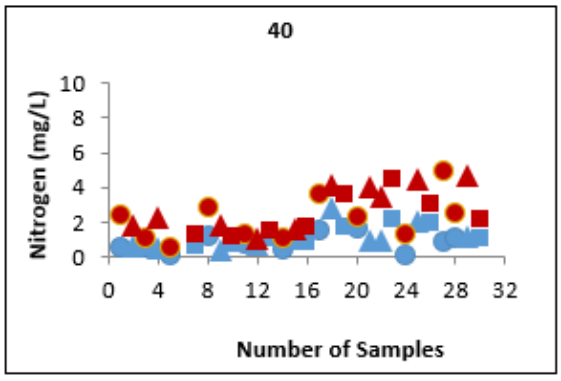


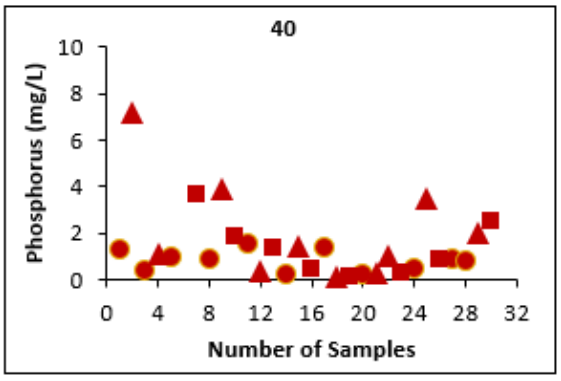




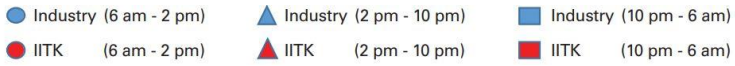


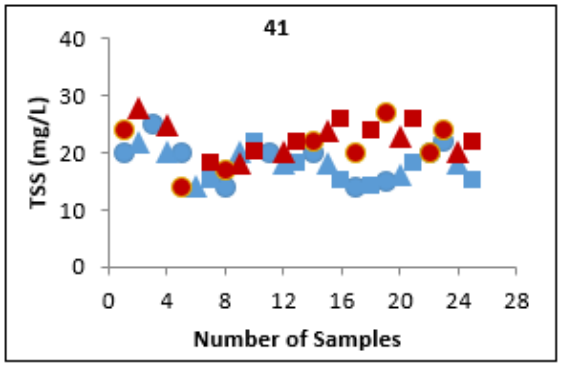


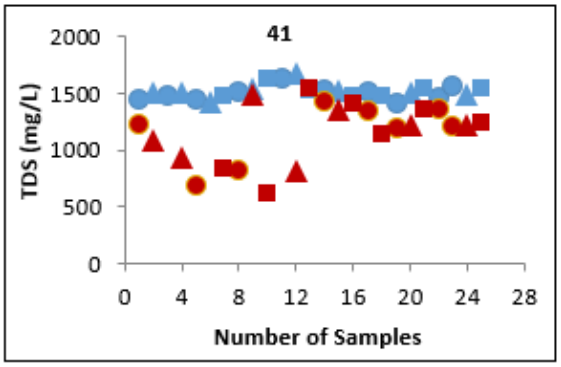


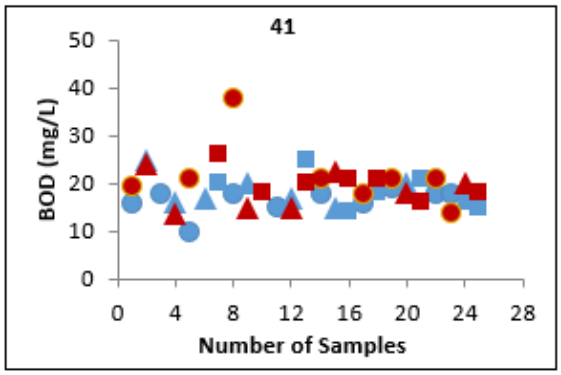


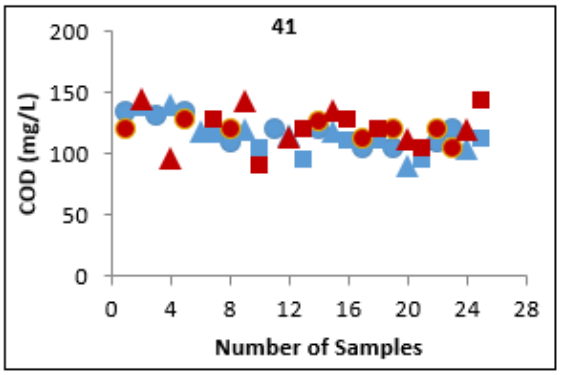
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

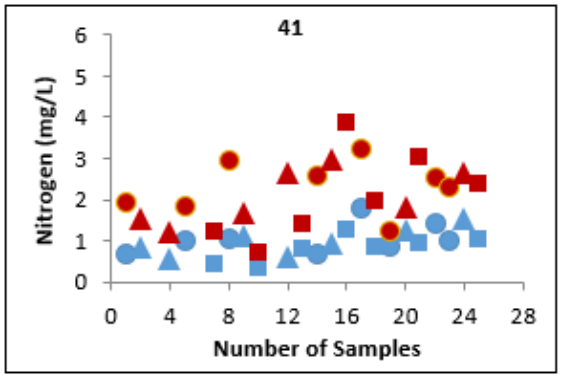


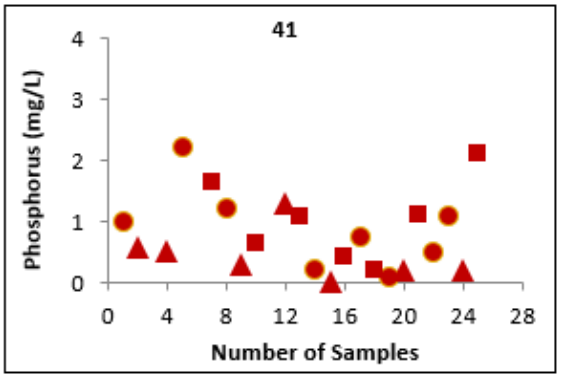




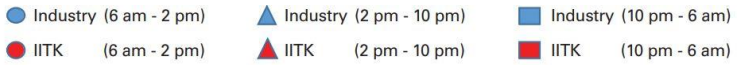


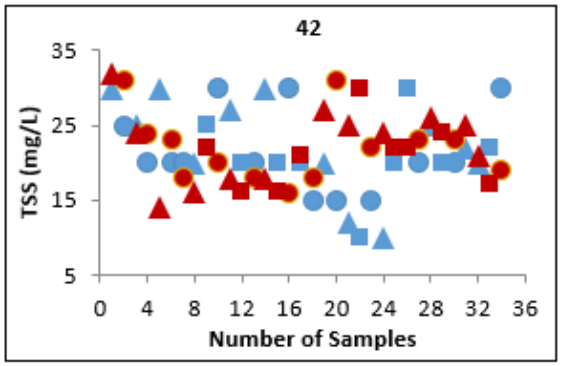


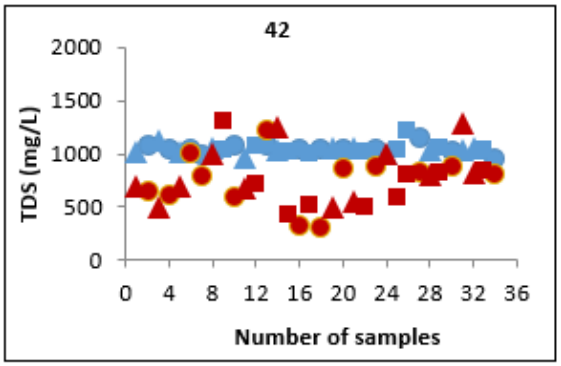


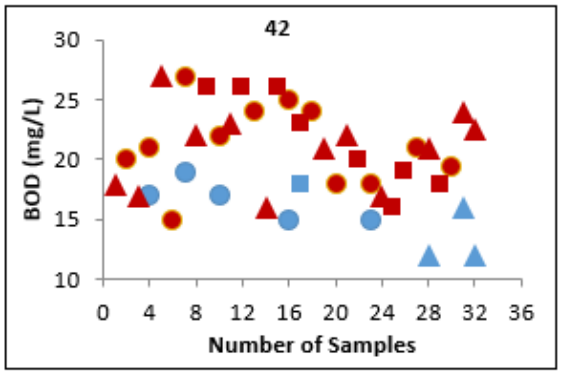


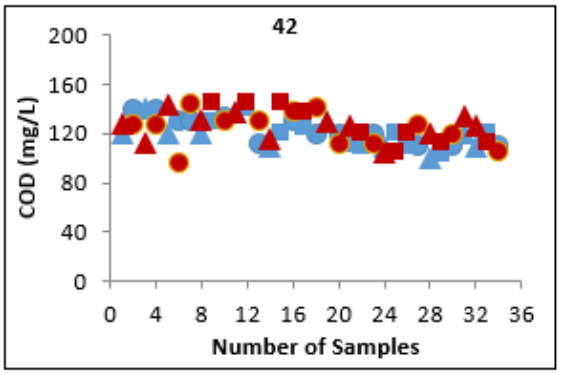
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

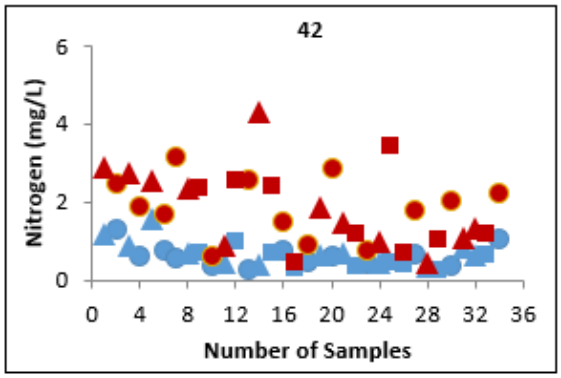


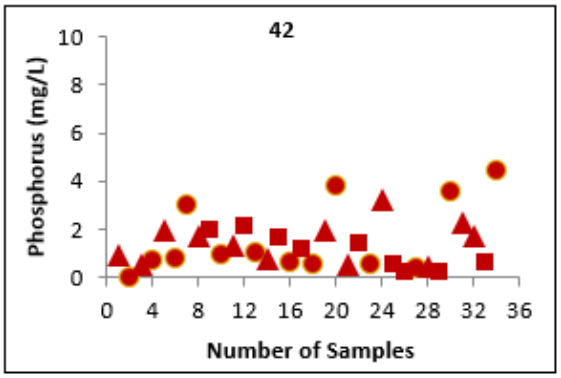




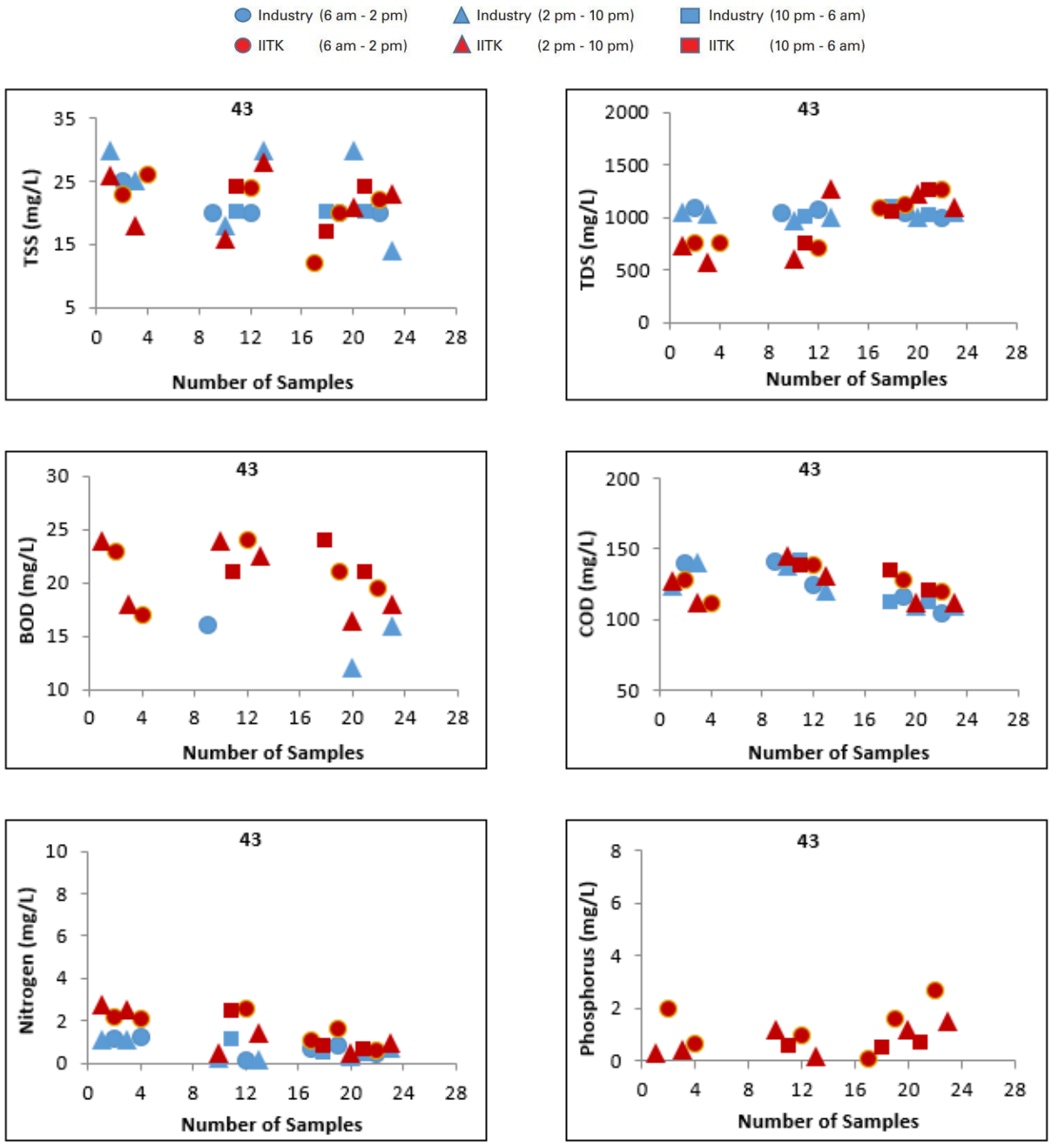




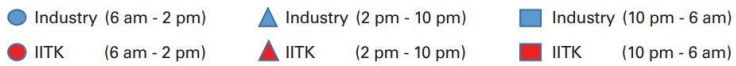


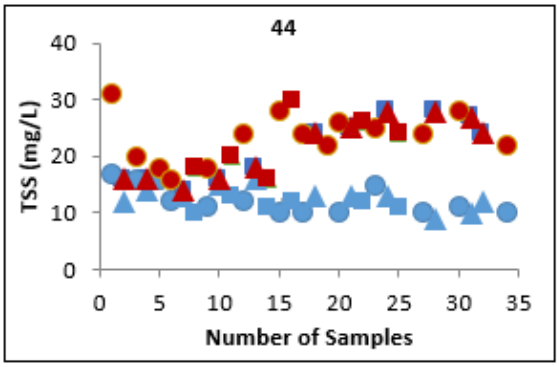


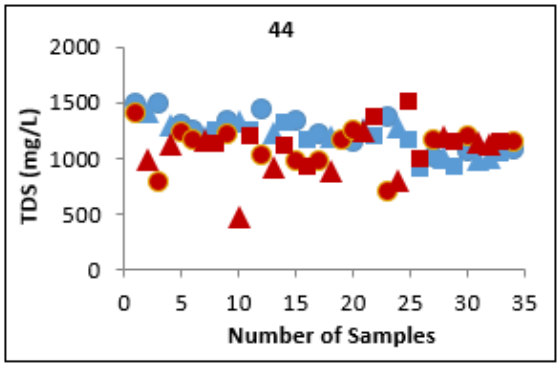
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

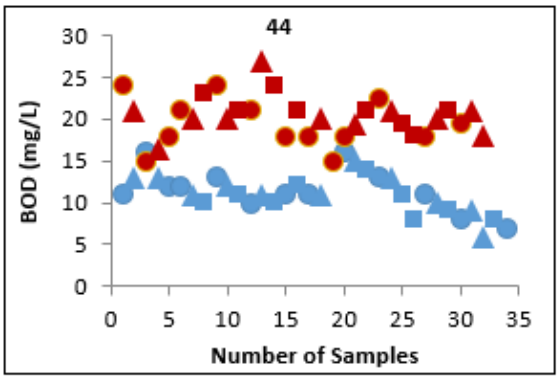


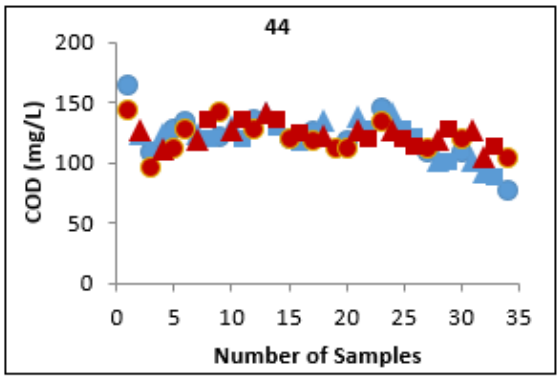
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

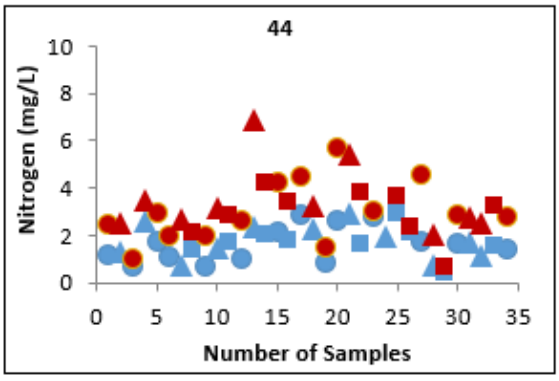


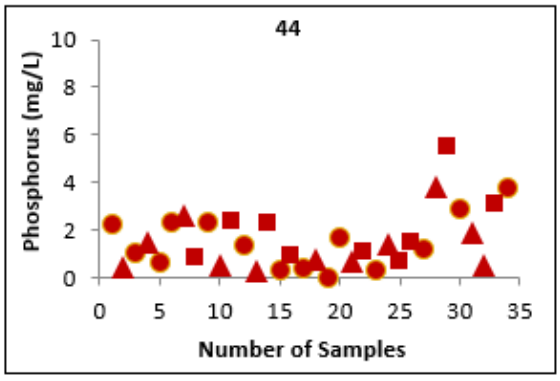






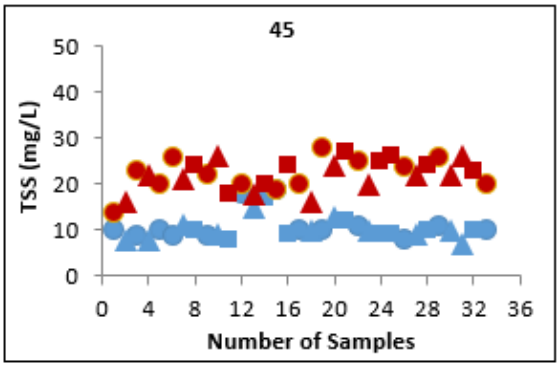


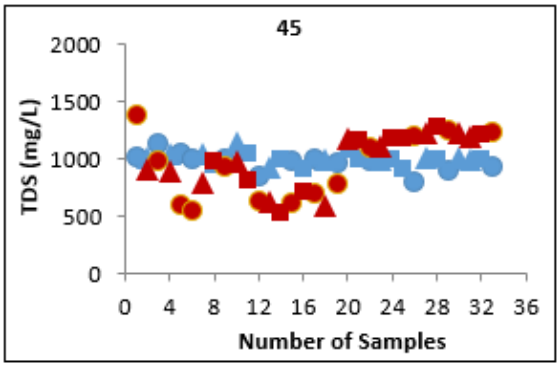


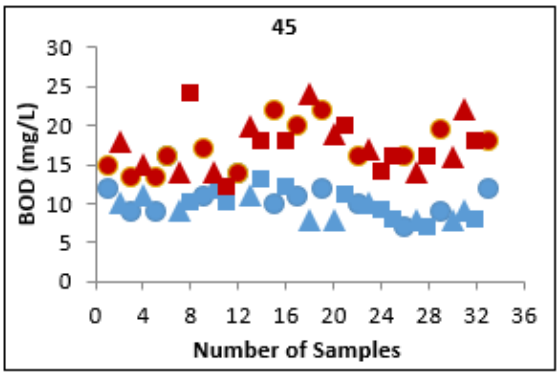


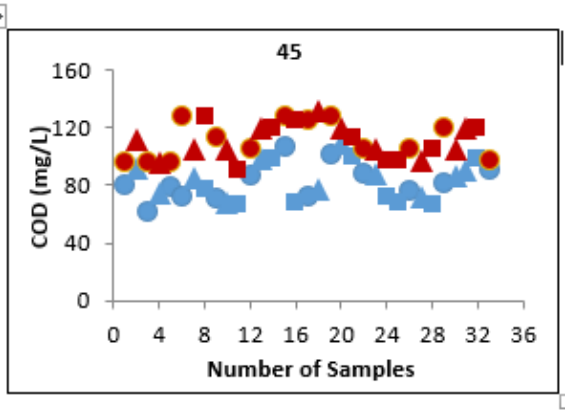
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

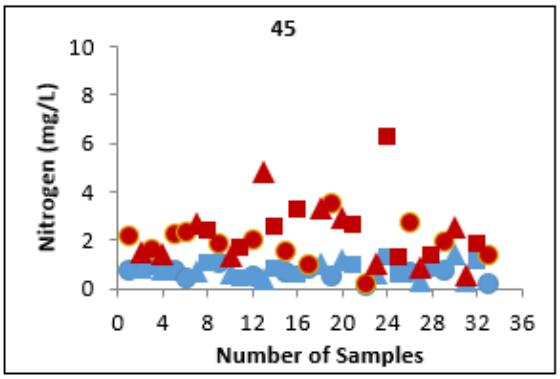
Industry (6 am - 2 pm) Industry (2 pm - 10 pm) Industry (10 pm - 6 am)
IITK (6 am - 2 pm) IITK (2 pm - 10 pm) IITK (10 pm - 6 am)

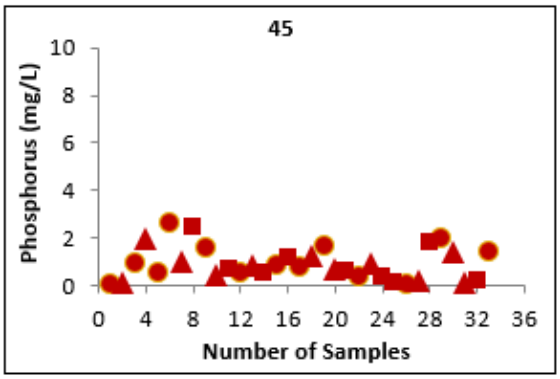




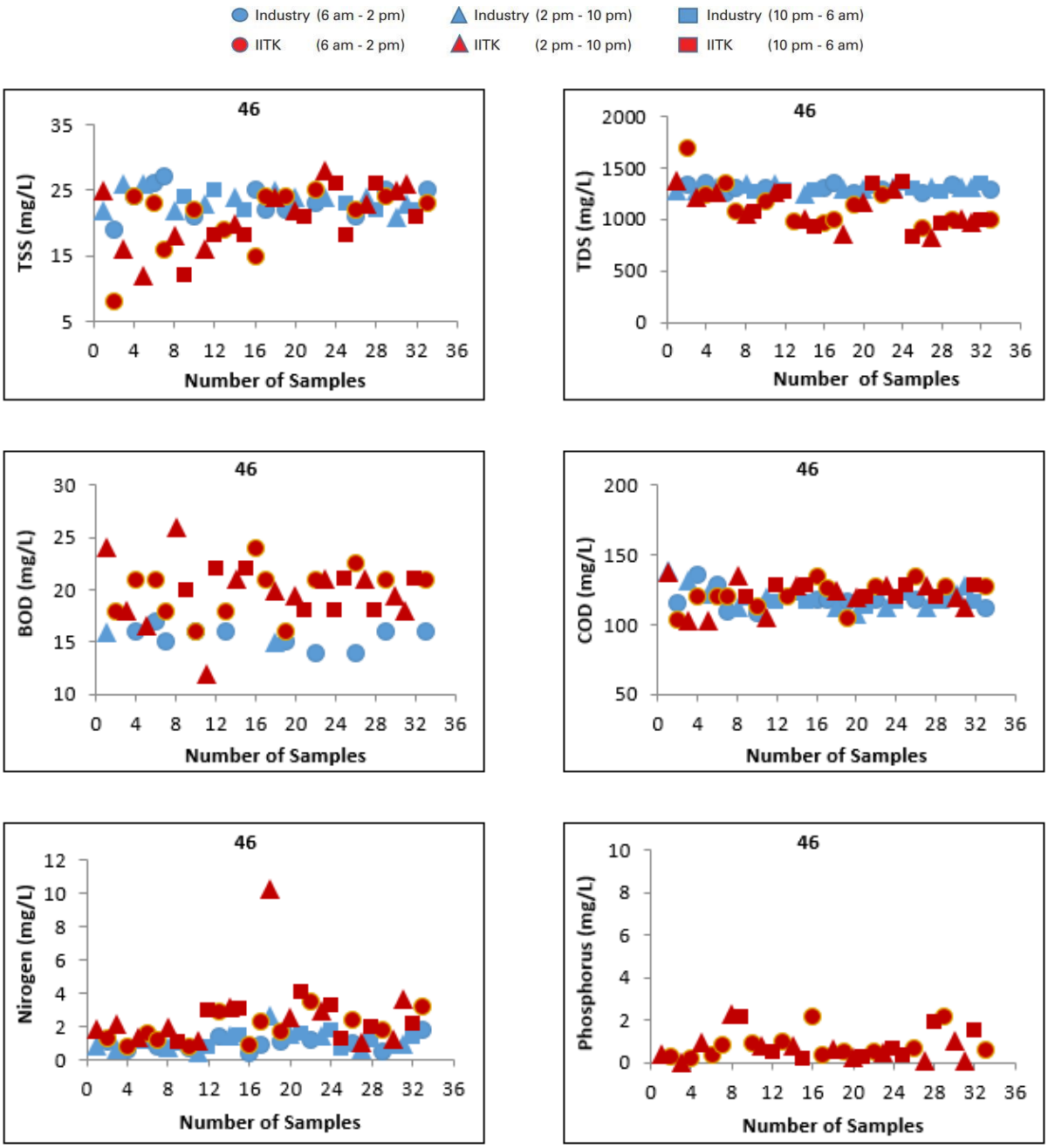






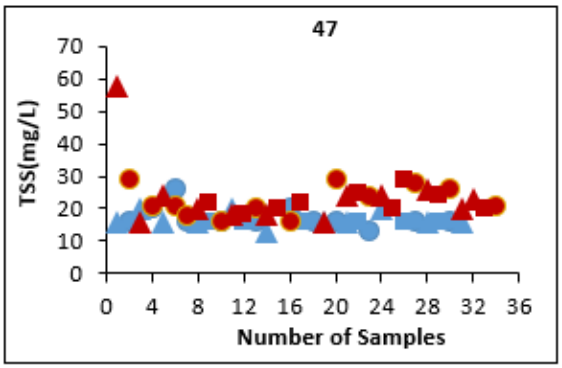


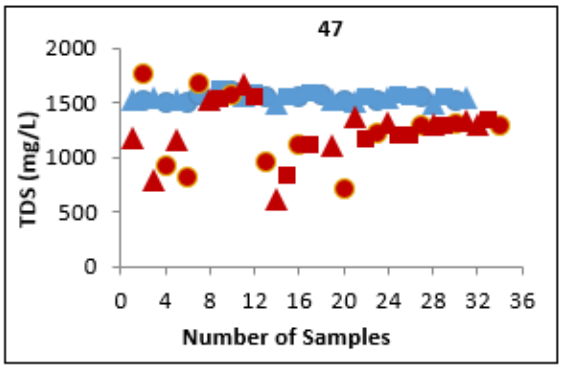
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

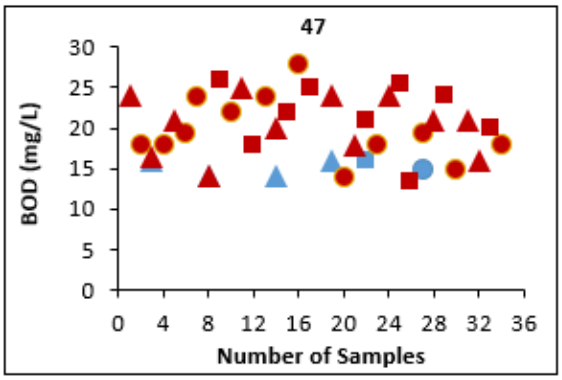


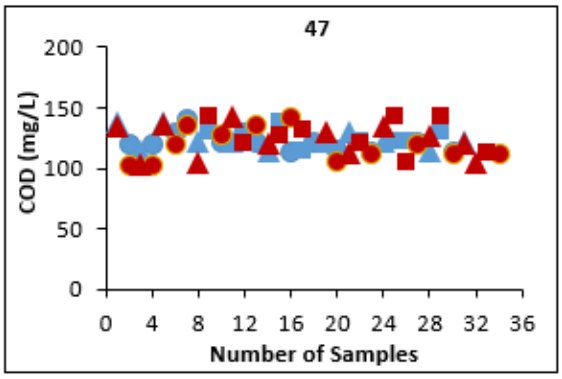
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

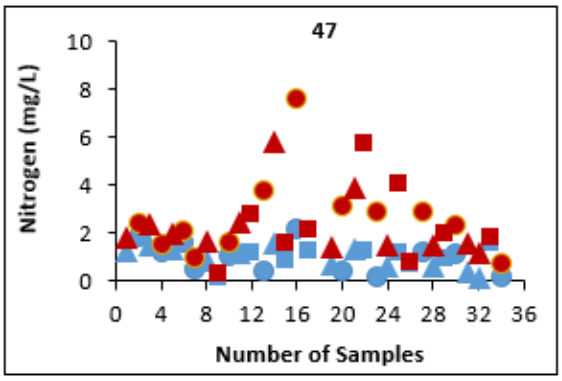
Industry (6 am - 2 pm) Industry (2 pm - 10 pm) Industry (10 pm - 6 am)
IITK (6 am - 2 pm) IITK (2 pm - 10 pm) IITK (10 pm - 6 am)

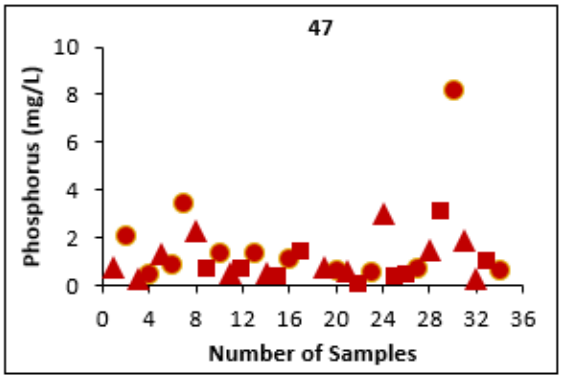












COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

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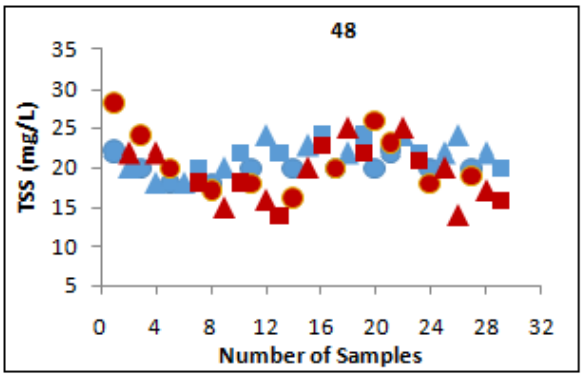

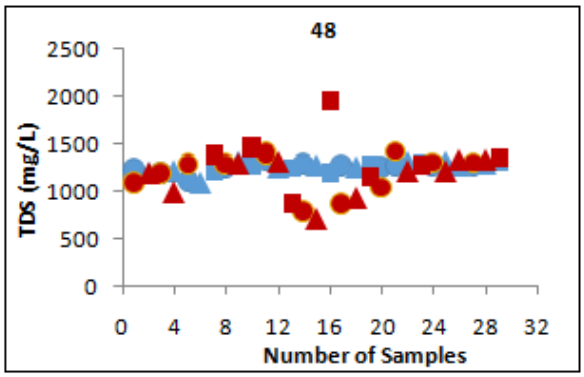

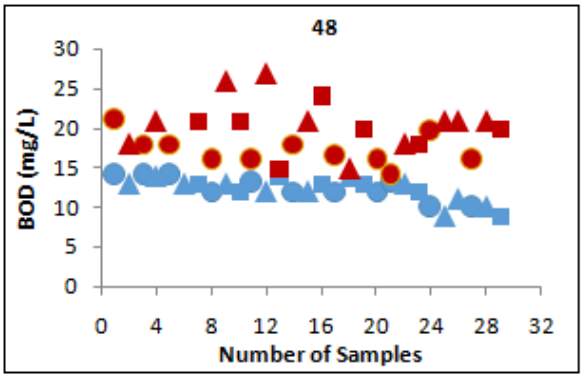

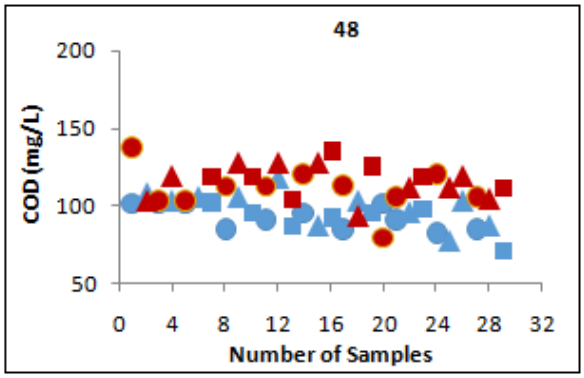

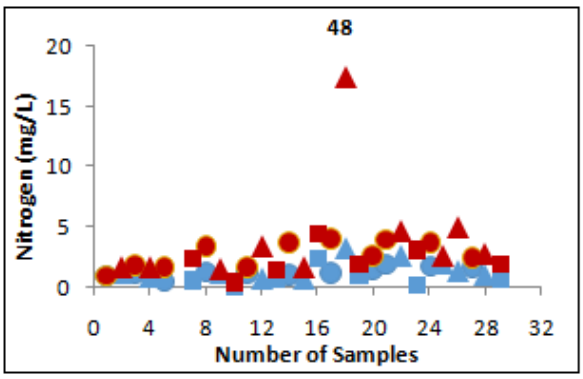

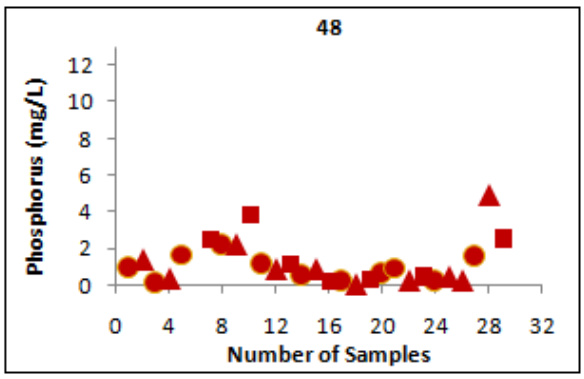

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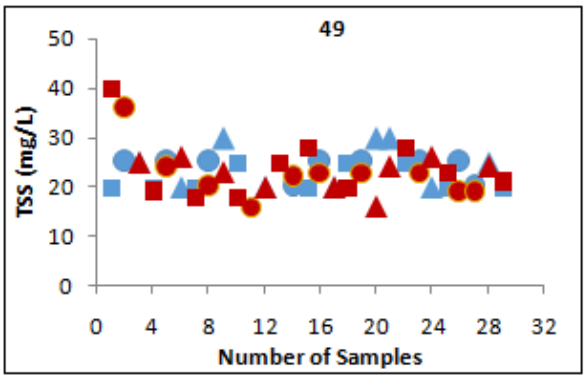
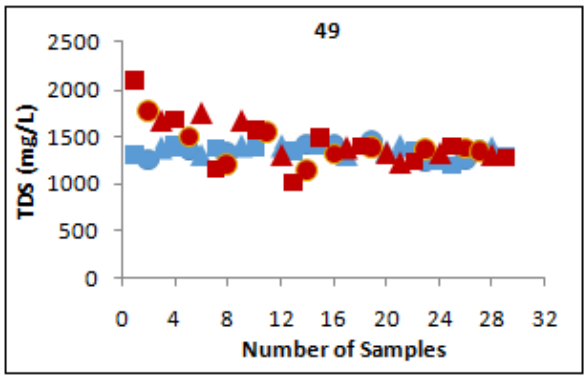
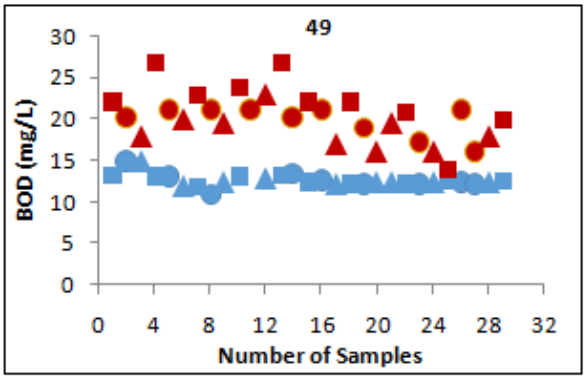
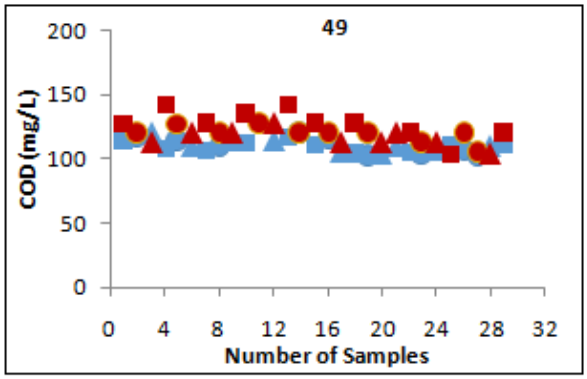
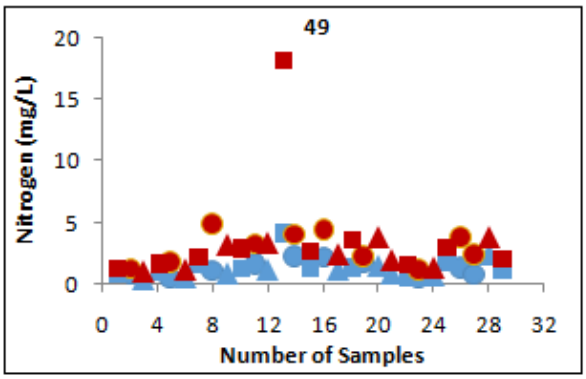
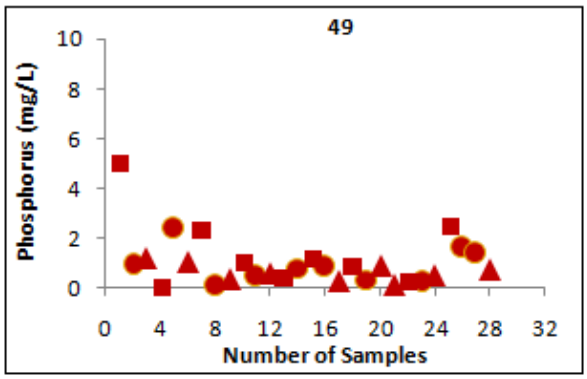




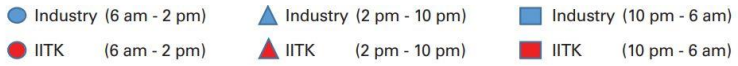


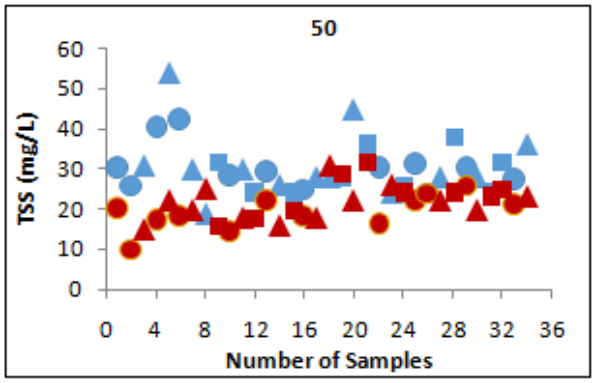


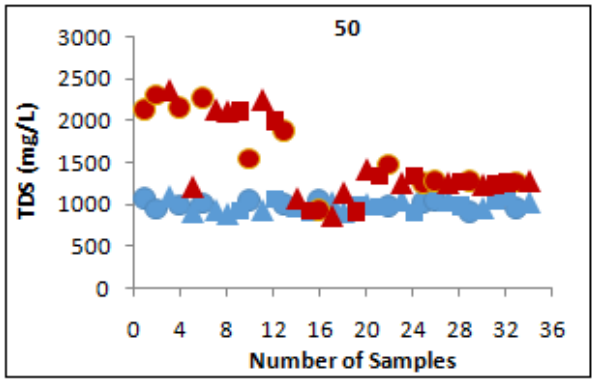


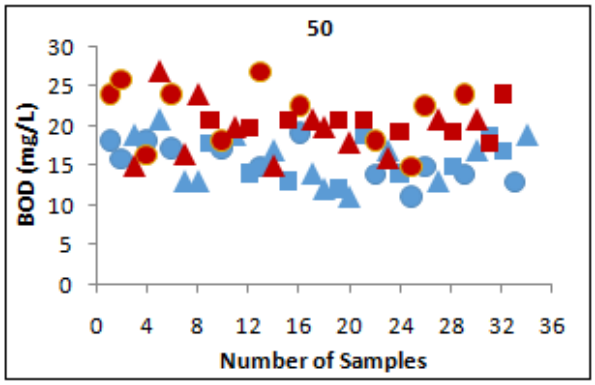


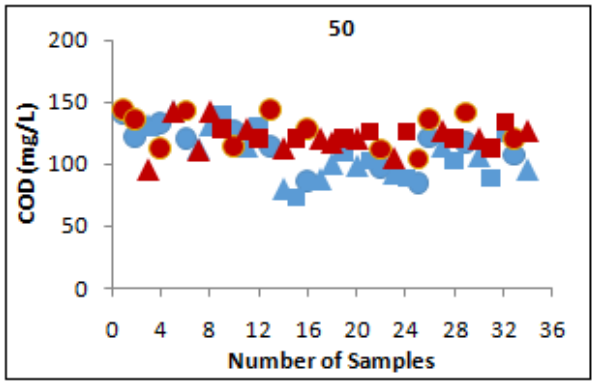
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

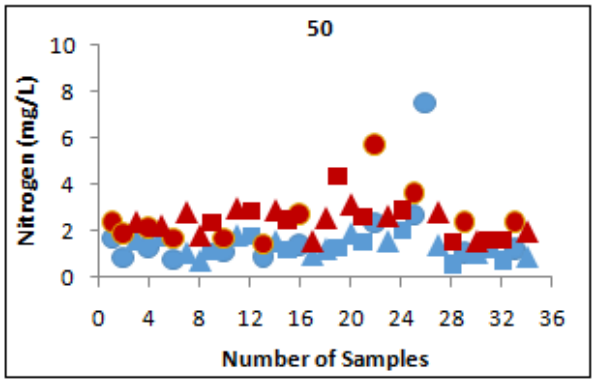


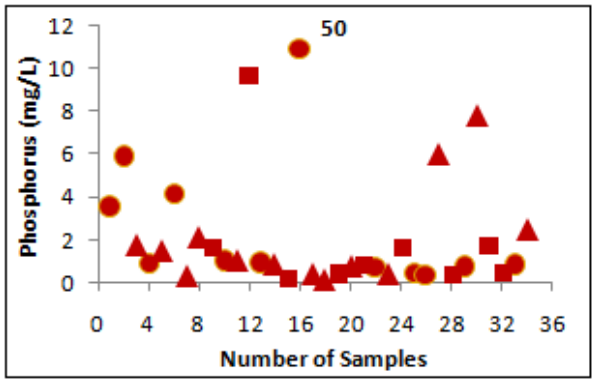












COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

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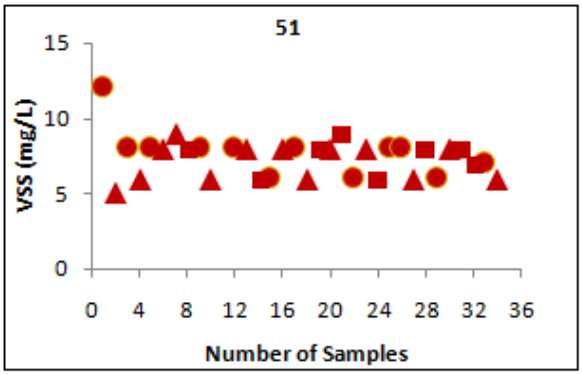
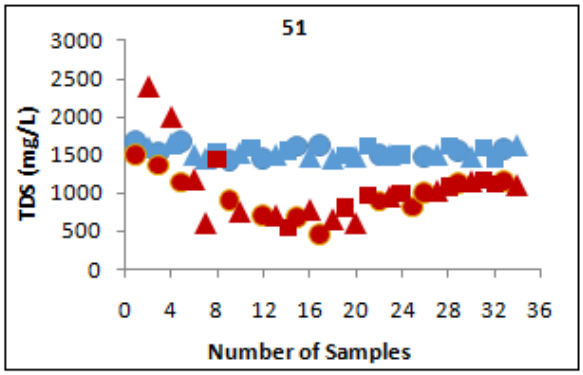
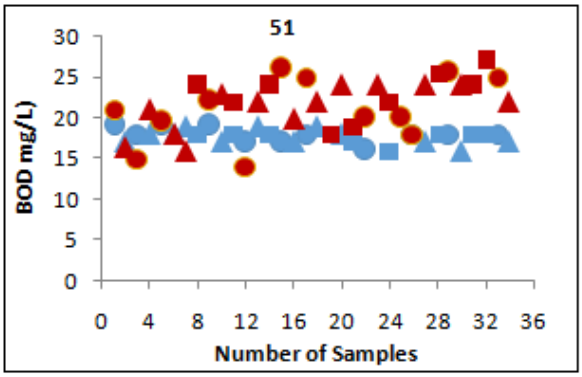
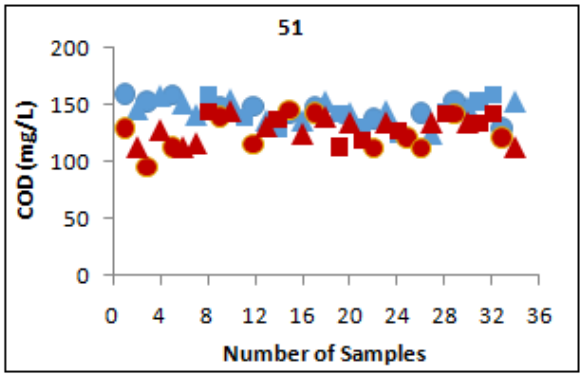
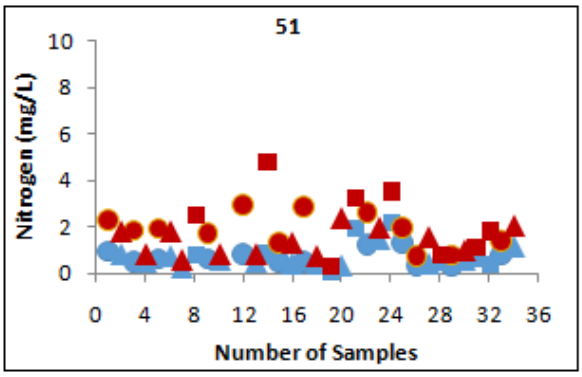
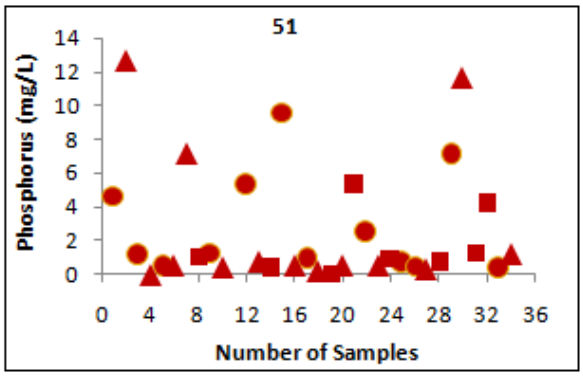




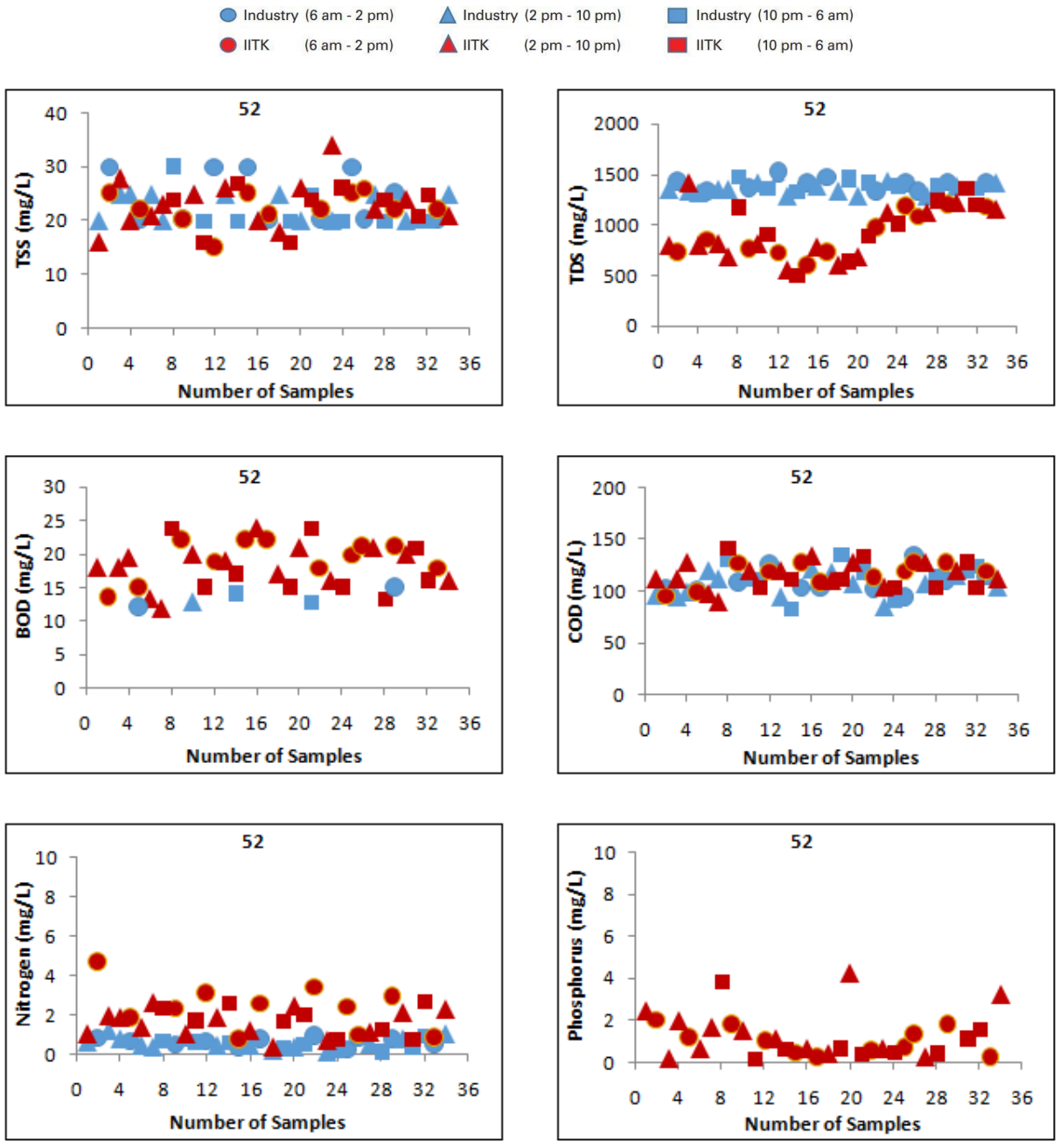








COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM



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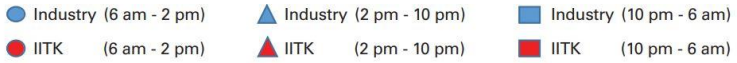
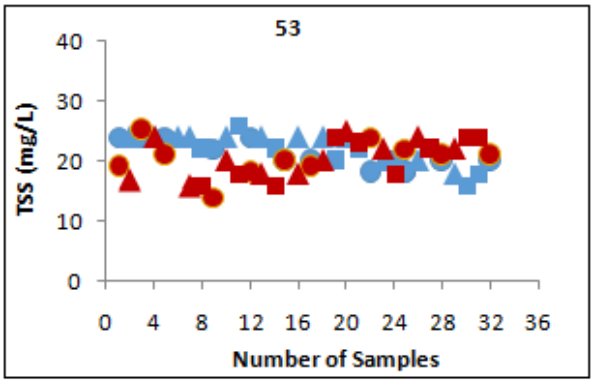
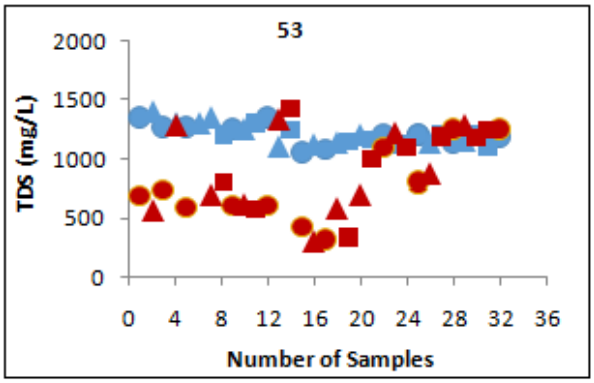
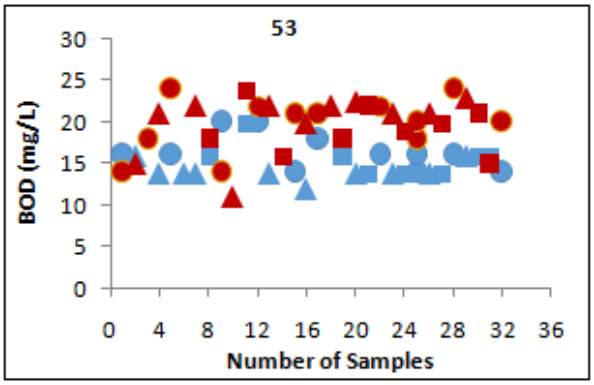
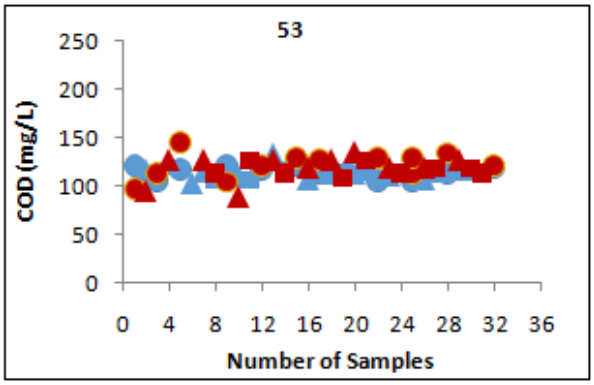
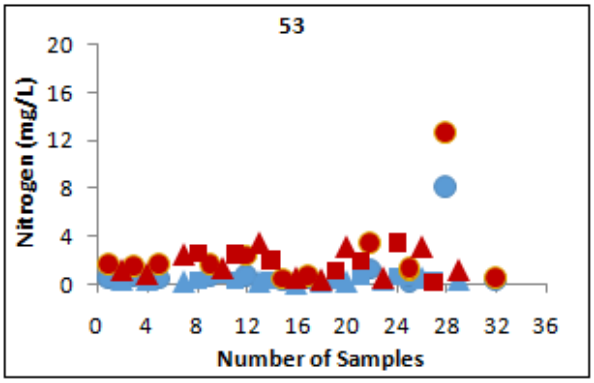


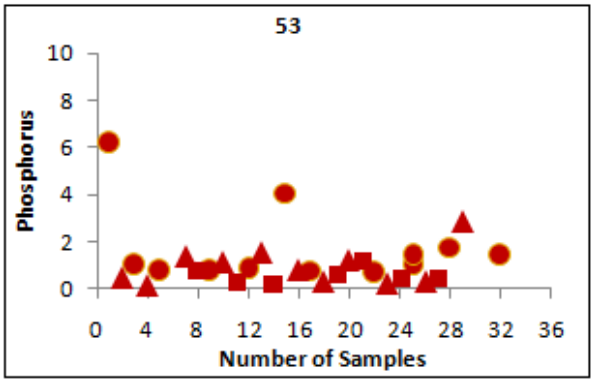




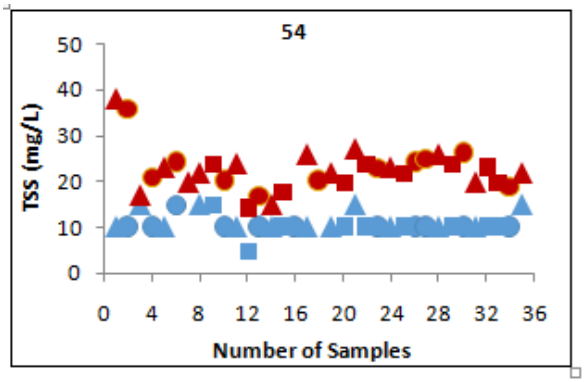


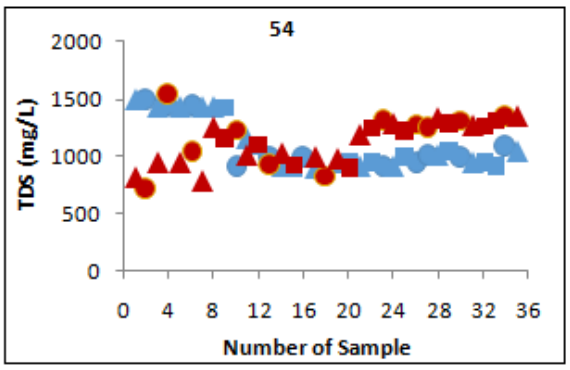


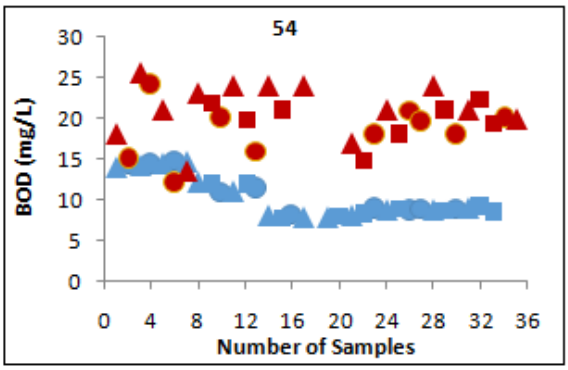


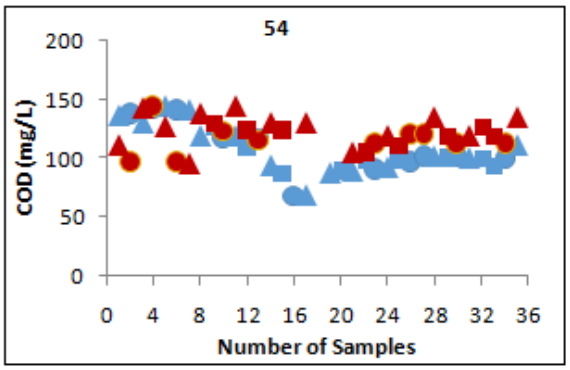


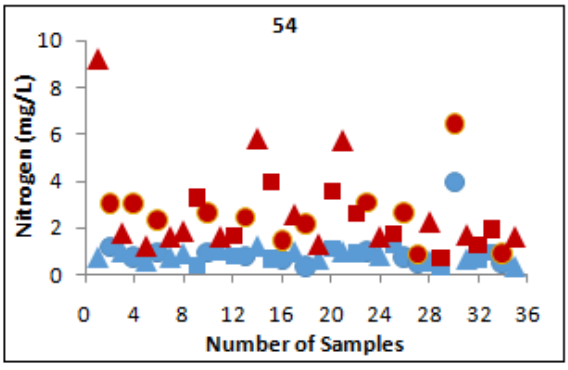
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

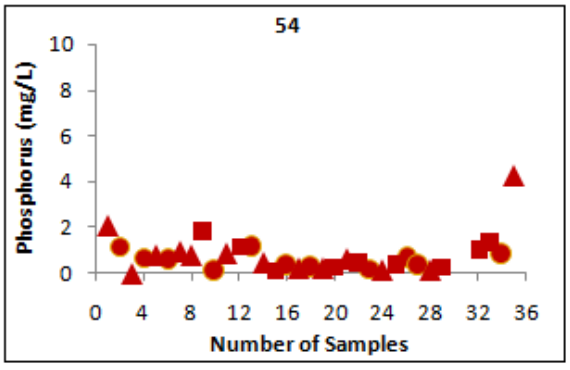












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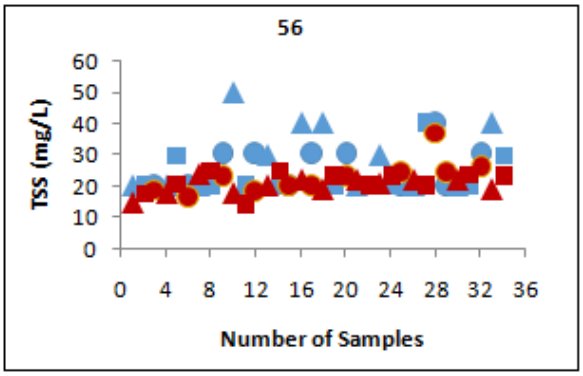
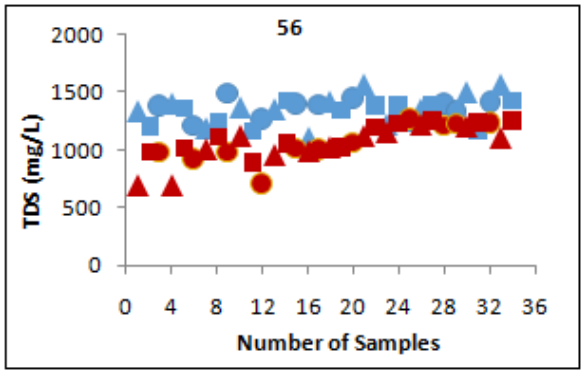
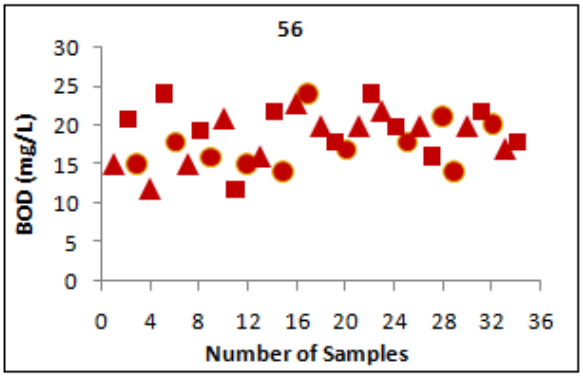
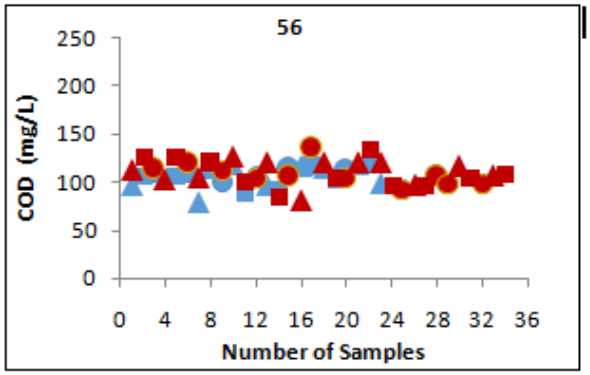
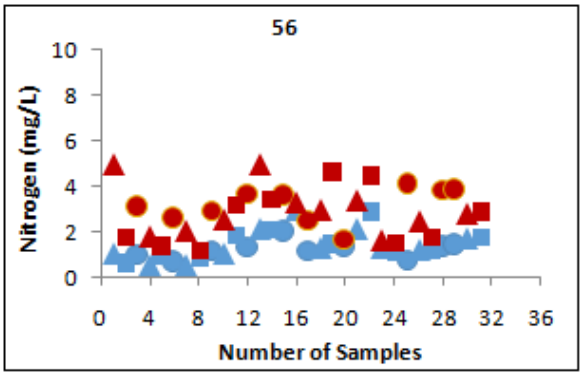
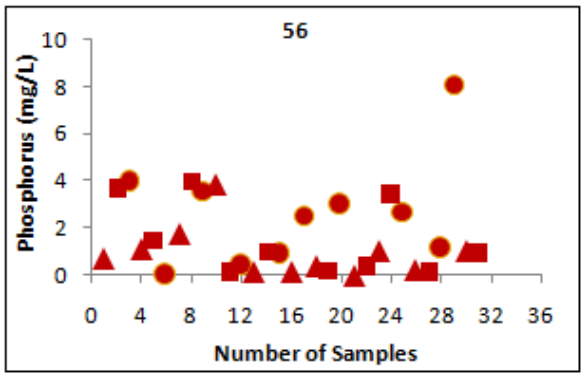




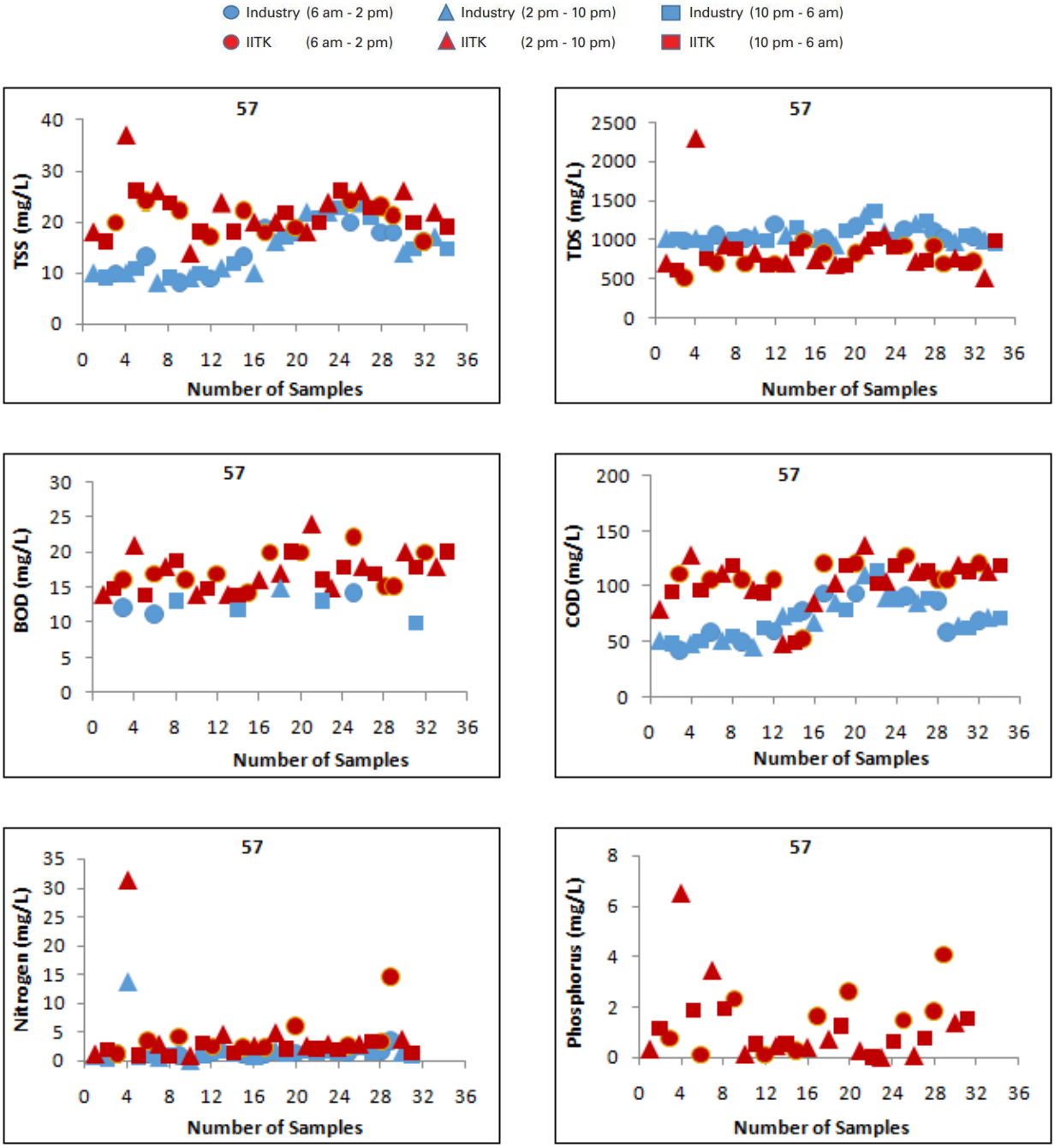




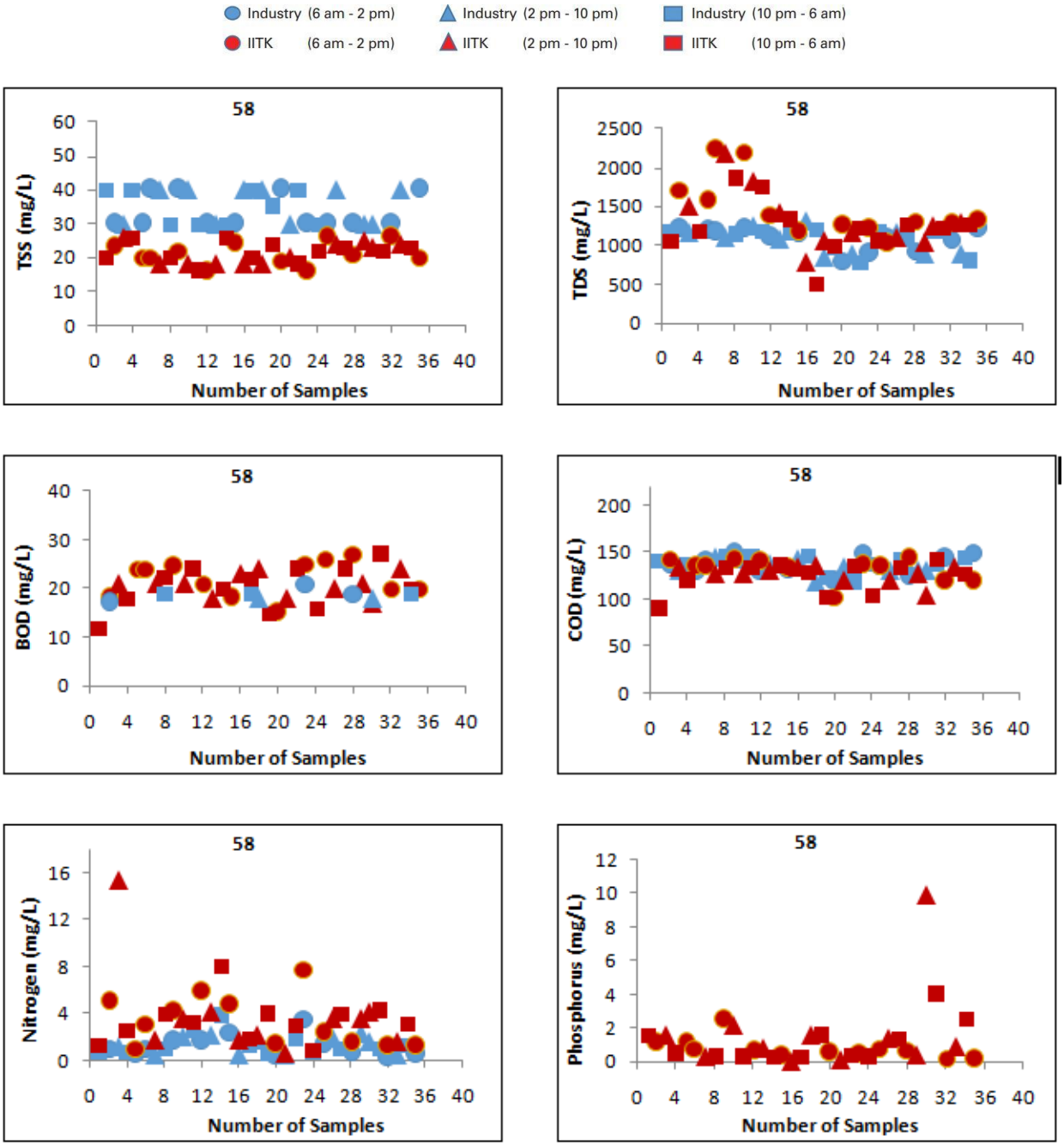




COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM



COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM



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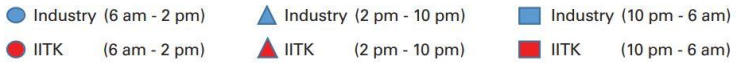

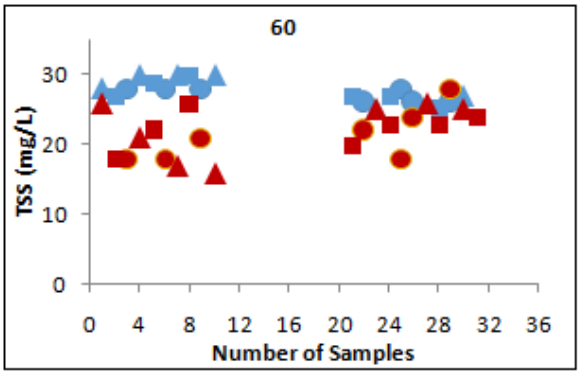

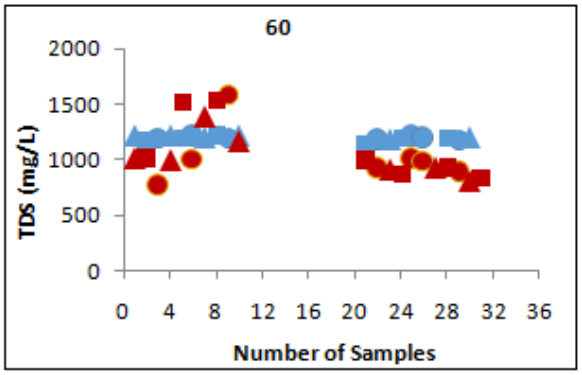

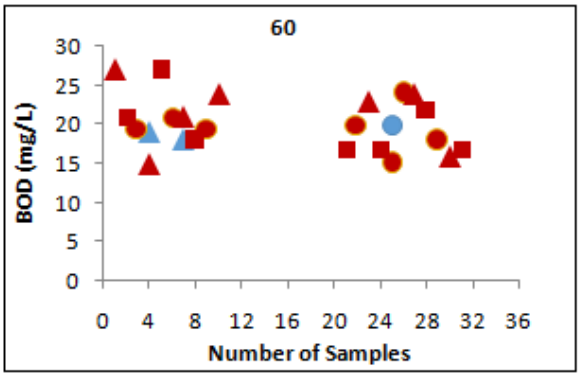

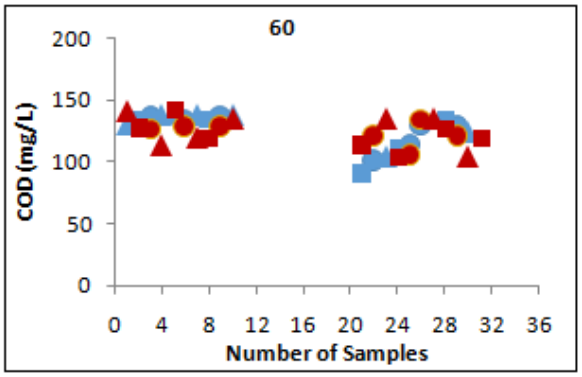

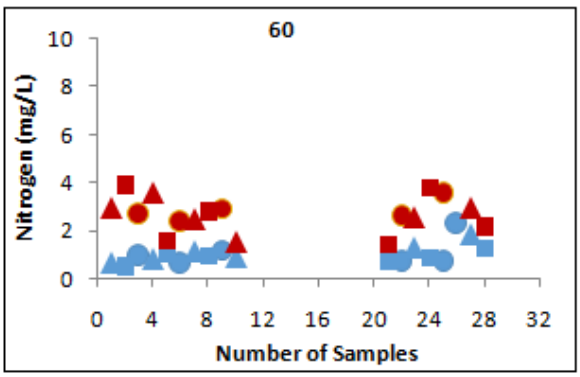

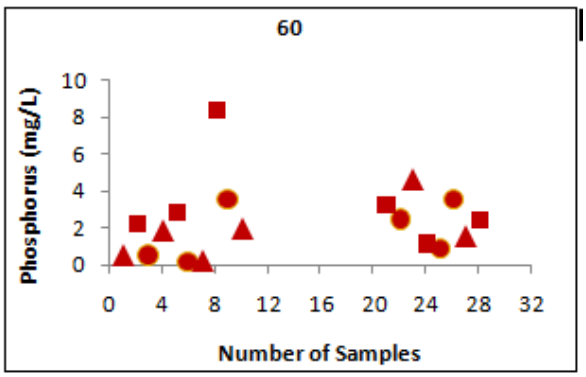

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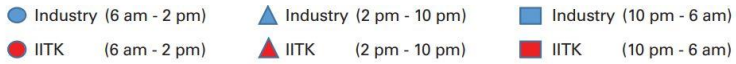
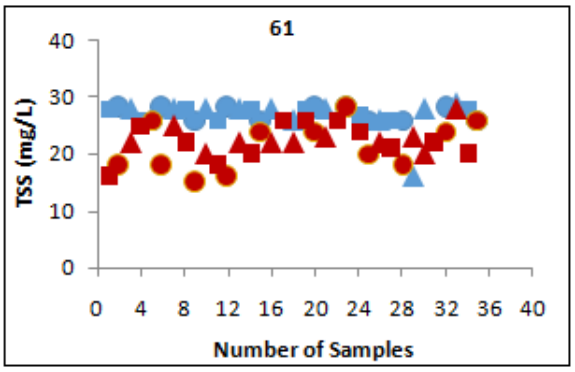
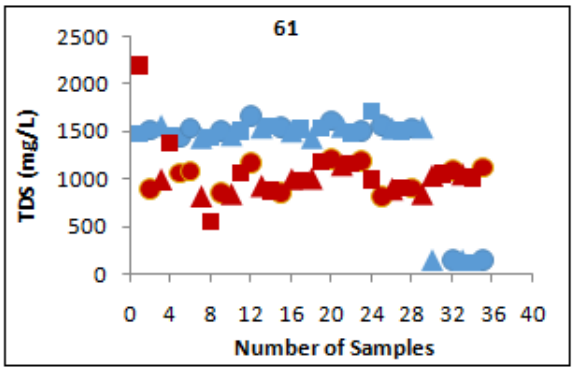
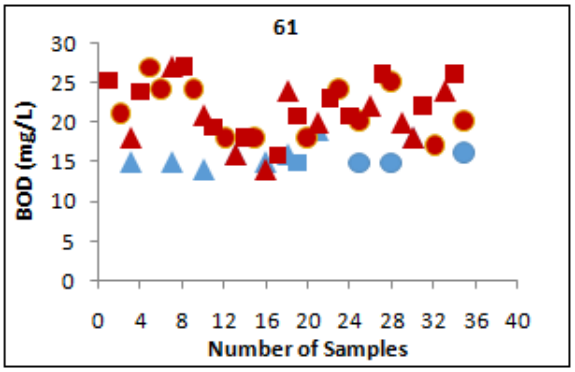
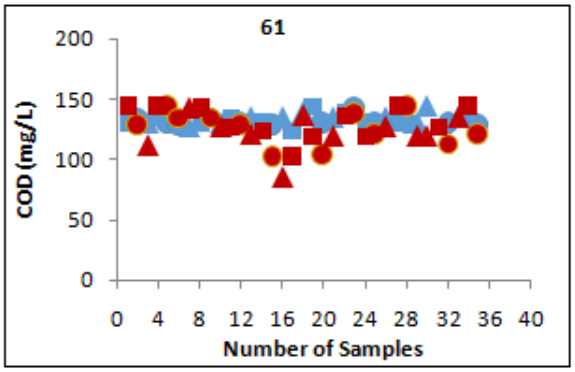
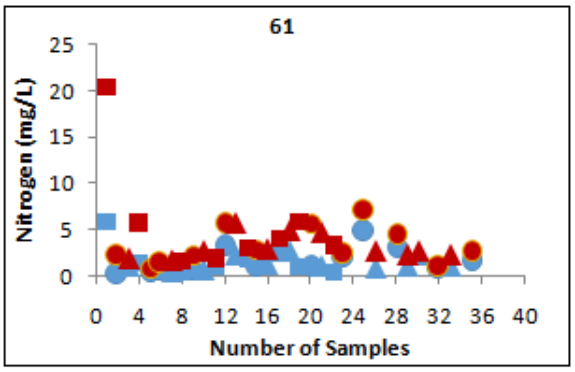


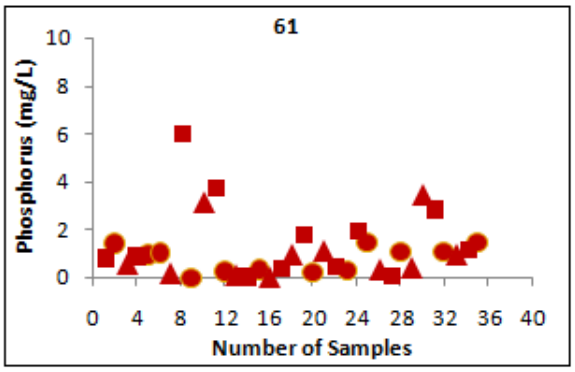




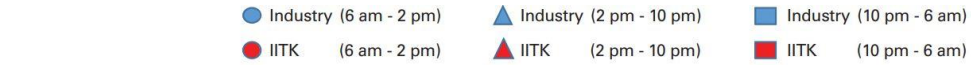


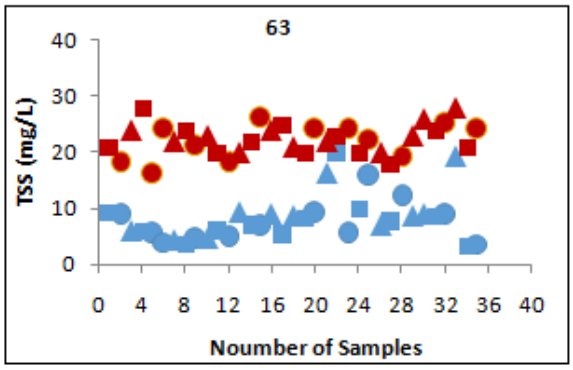


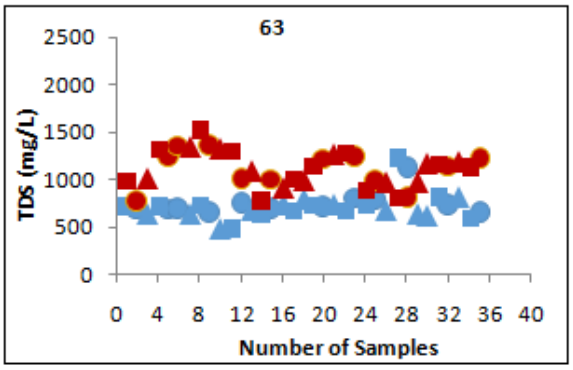


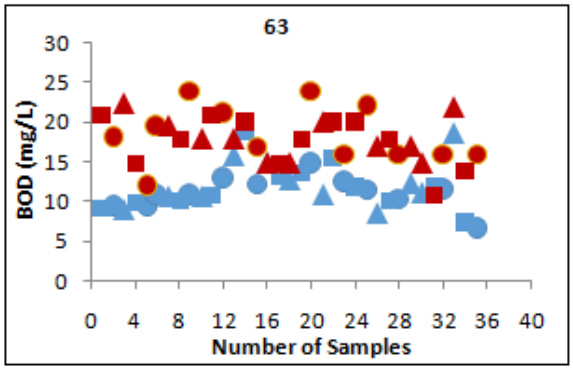


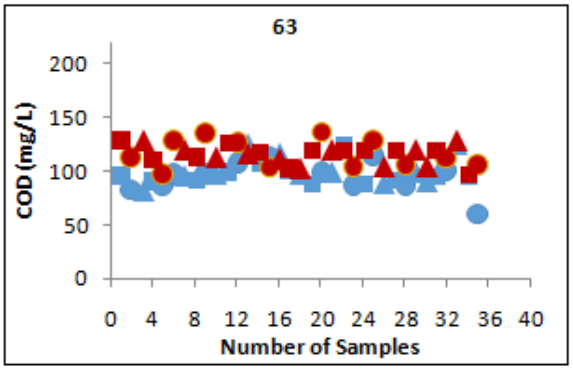
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

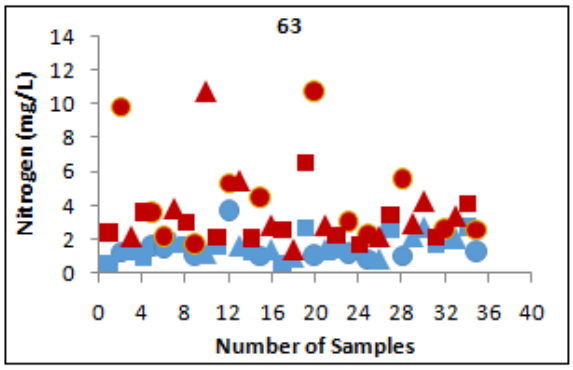


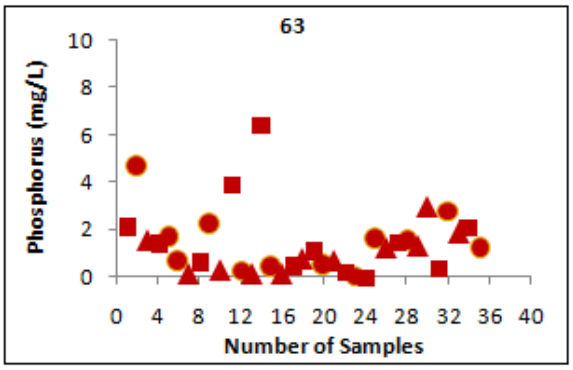




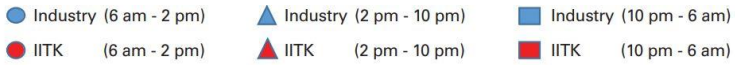


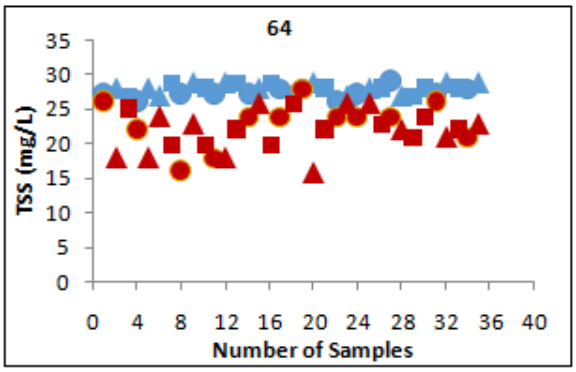


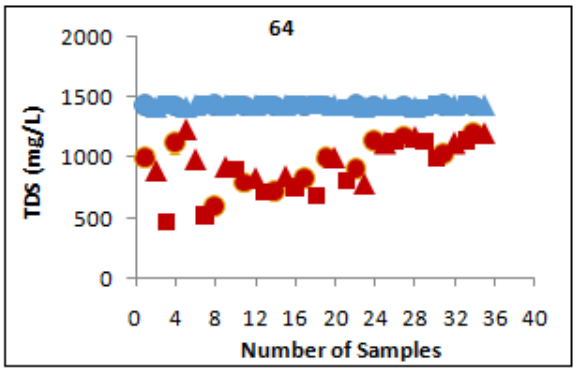


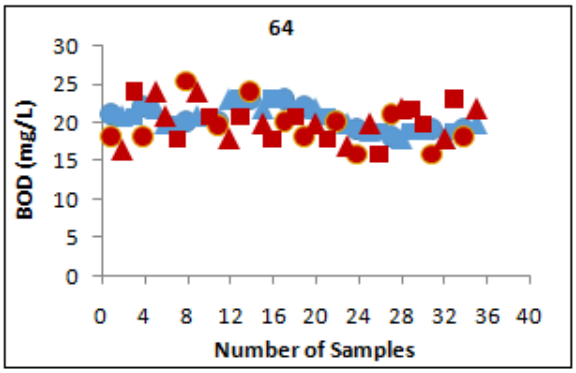


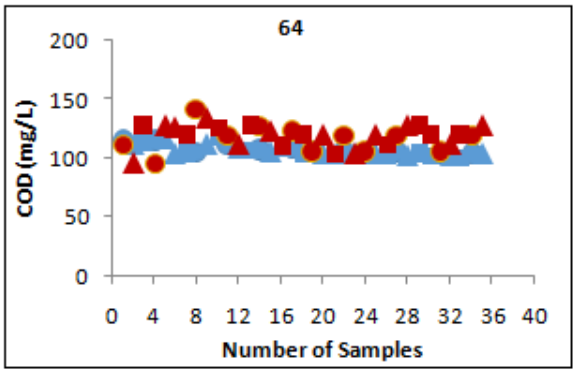
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

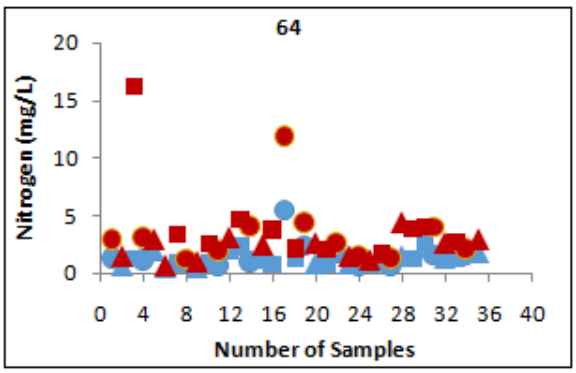


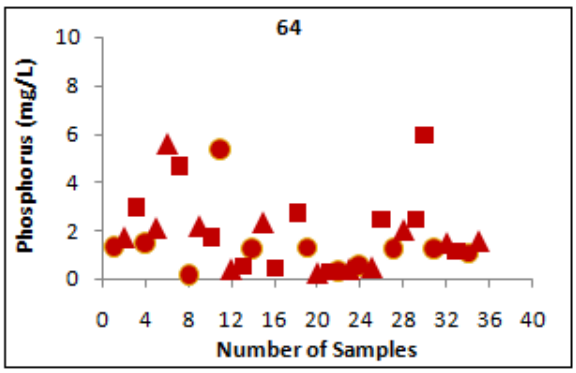




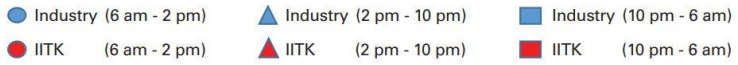


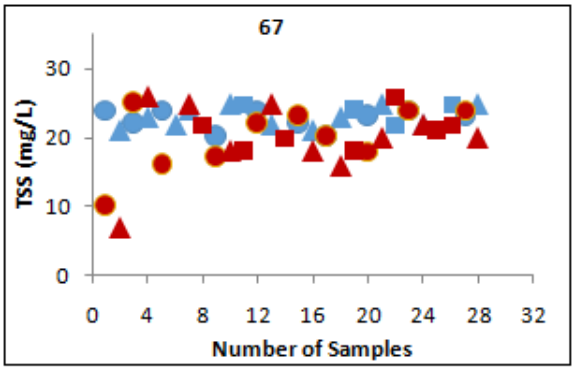


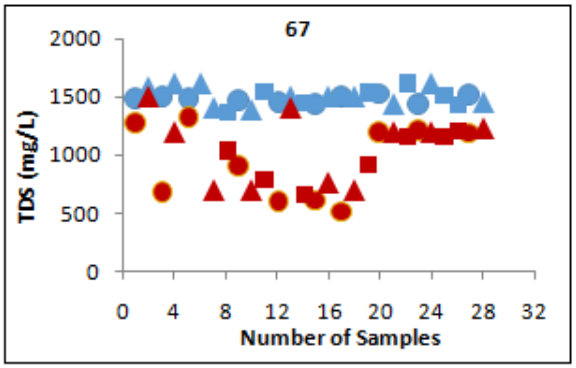


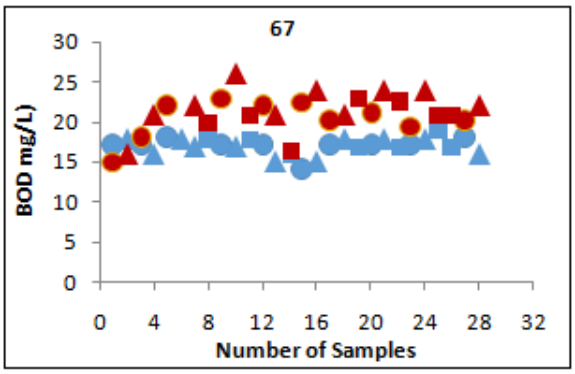


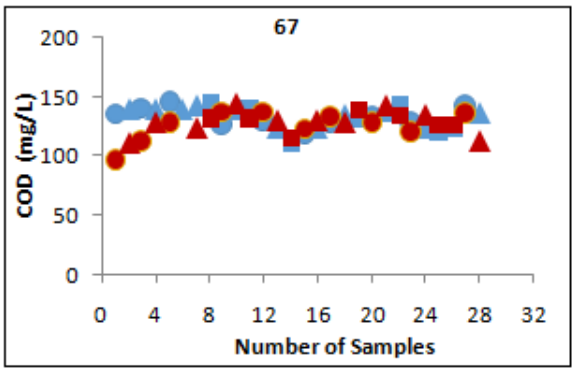
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

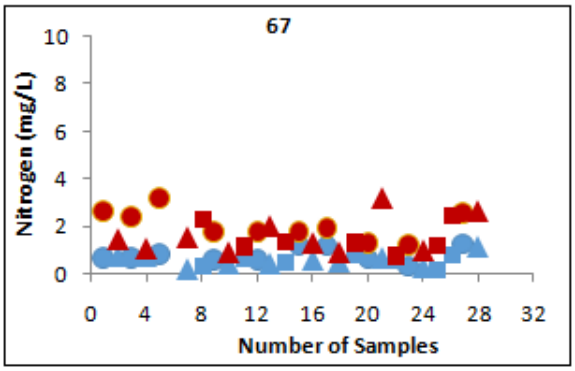


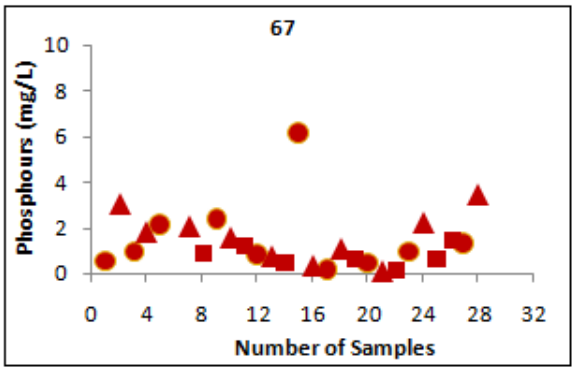












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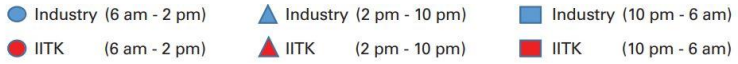

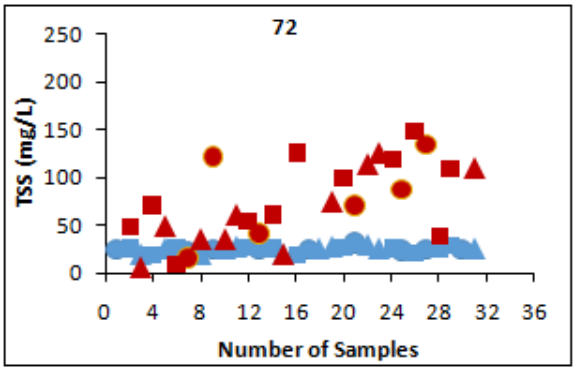

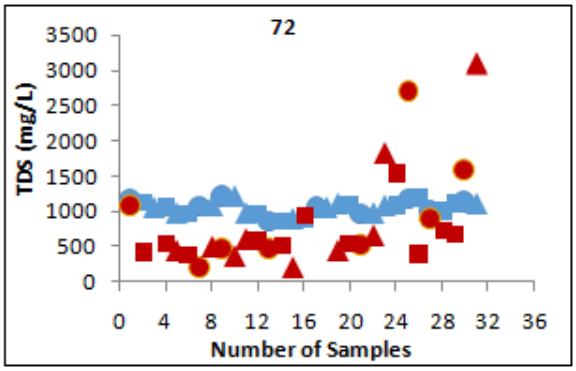

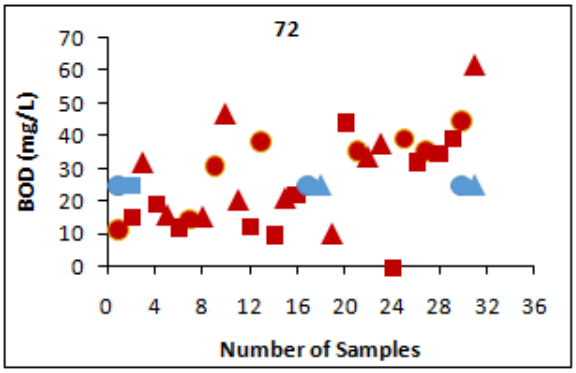

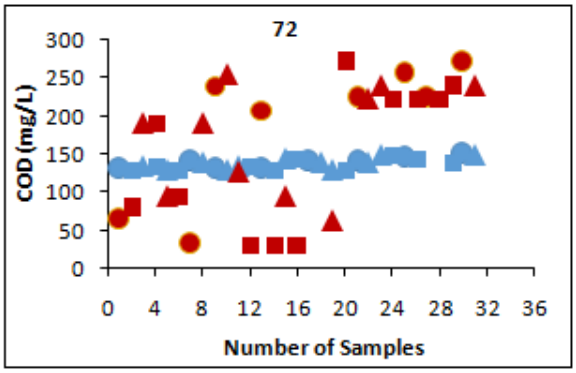

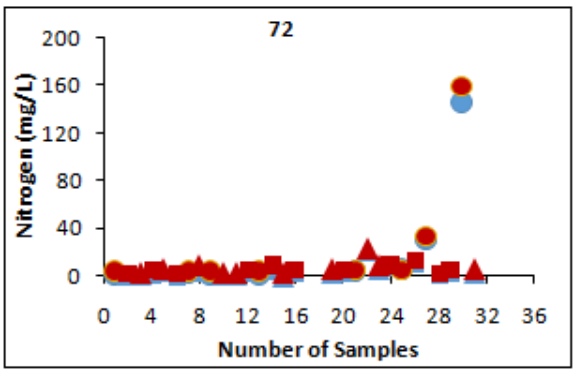

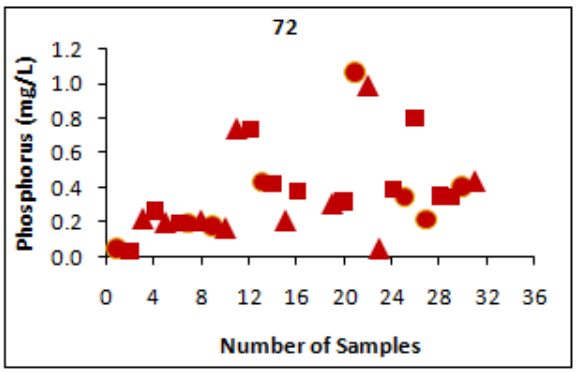

COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

Industry (6 am - 2 pm) Industry (2 pm - 10 pm) Industry (10 pm - 6 am)
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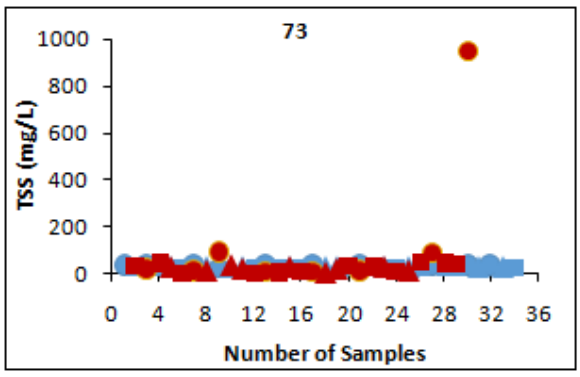

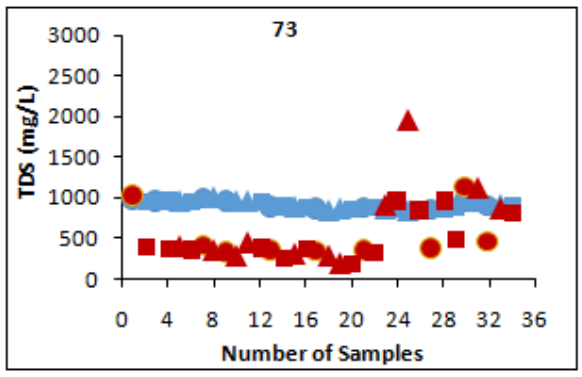

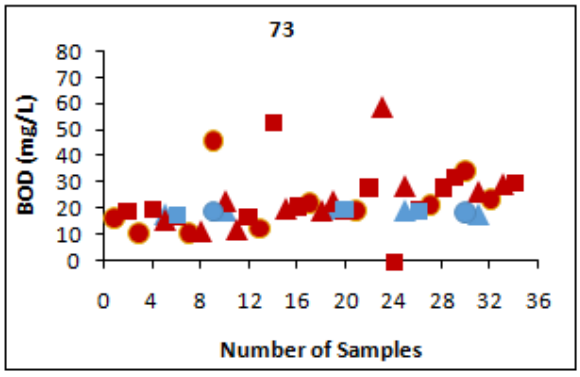

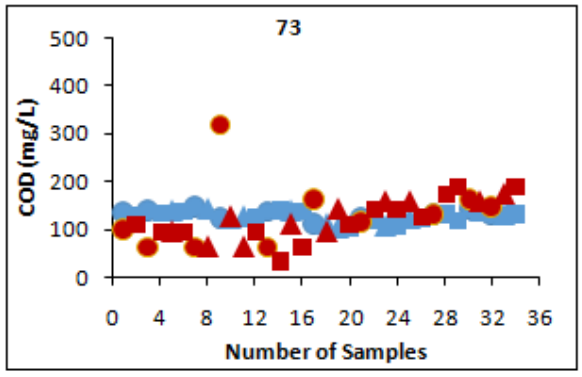

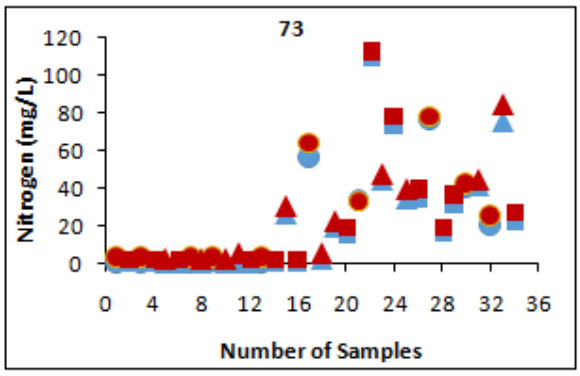

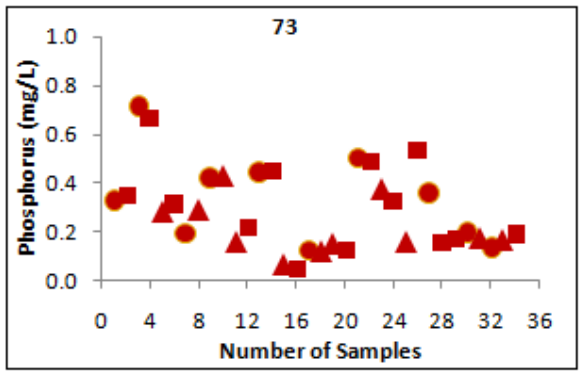

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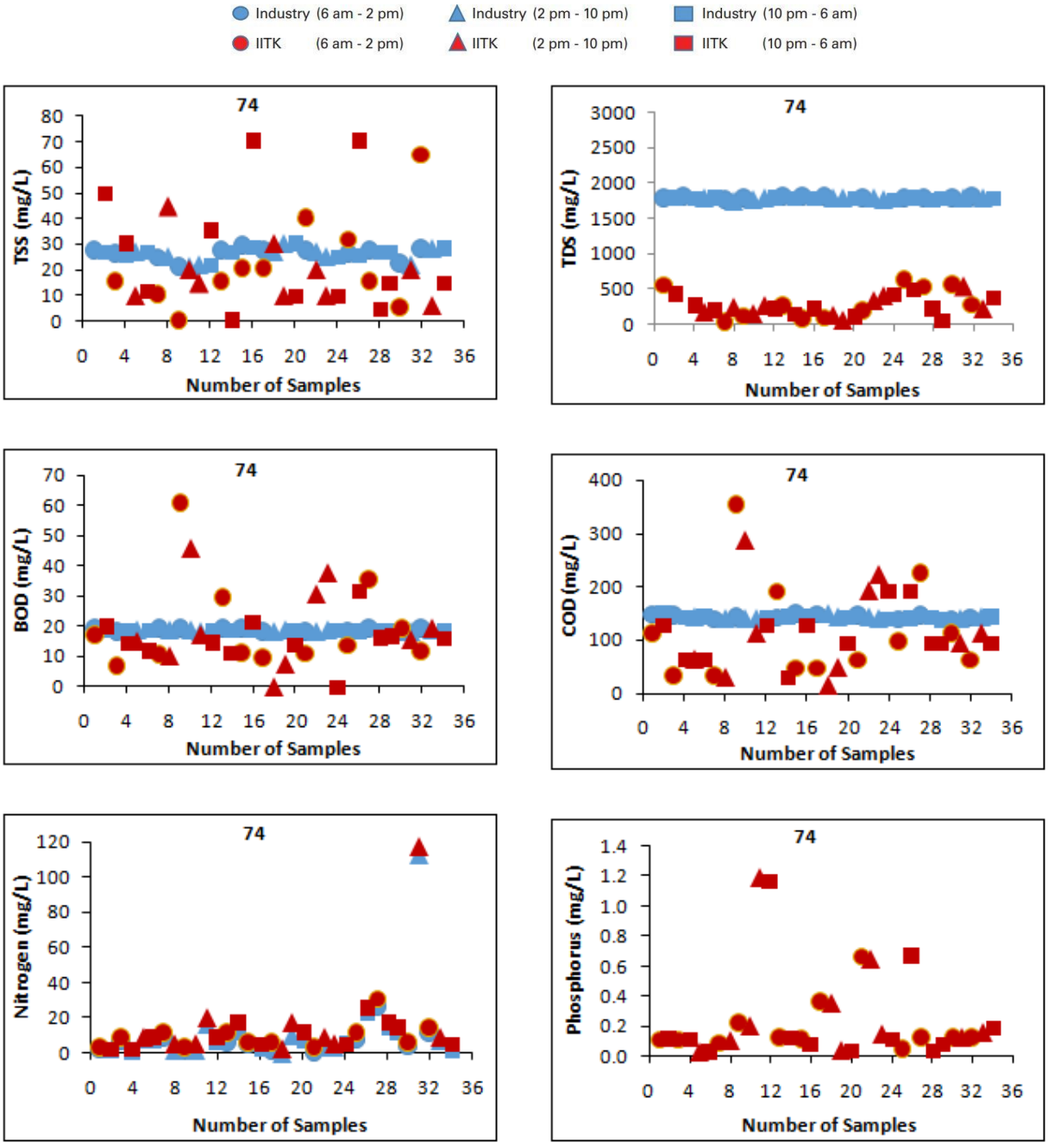

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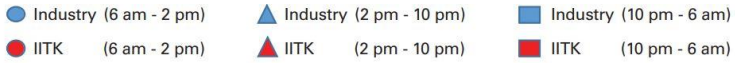
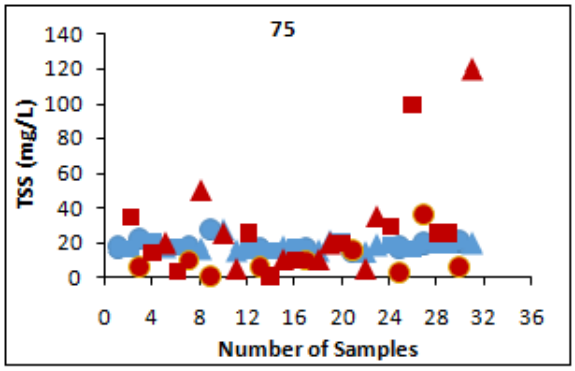
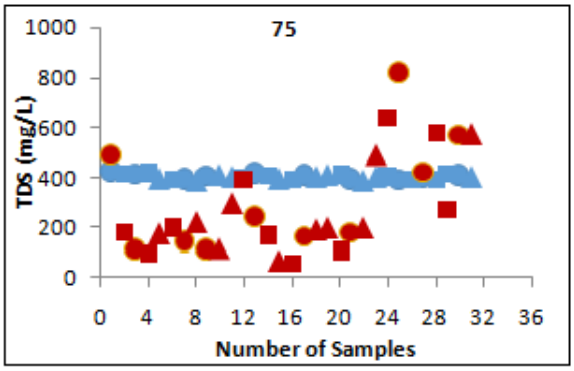
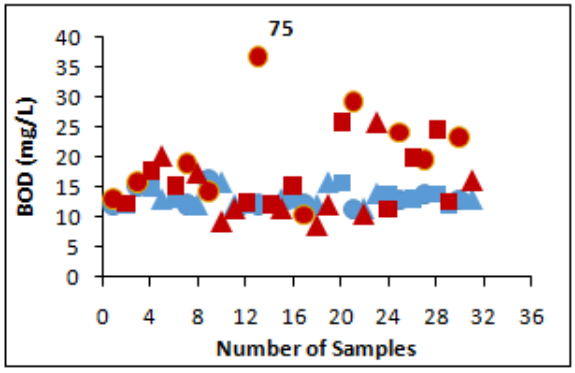
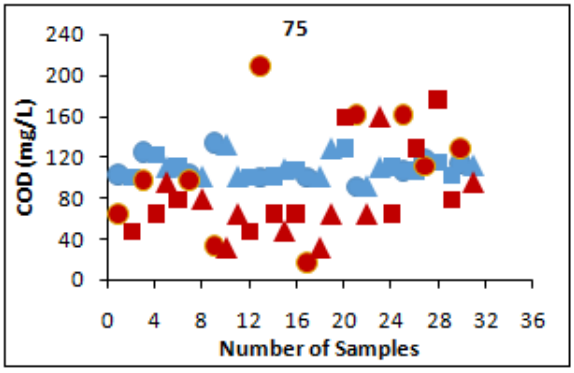
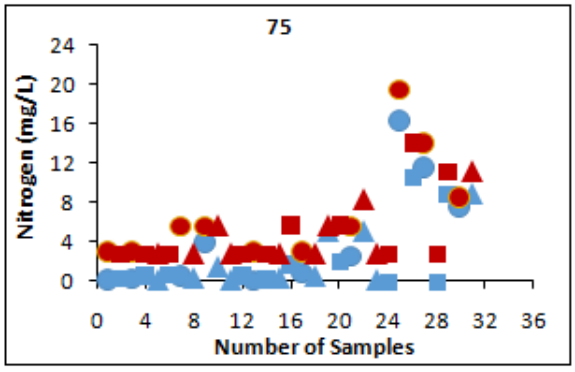


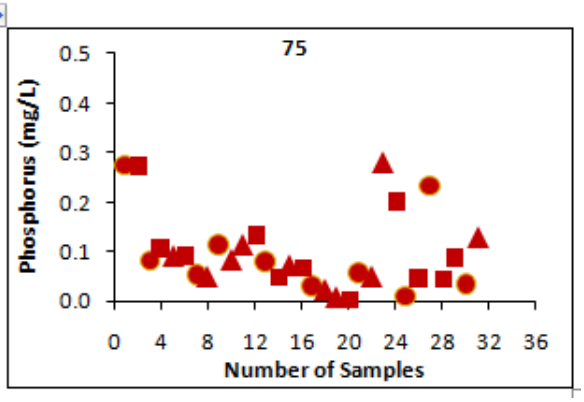




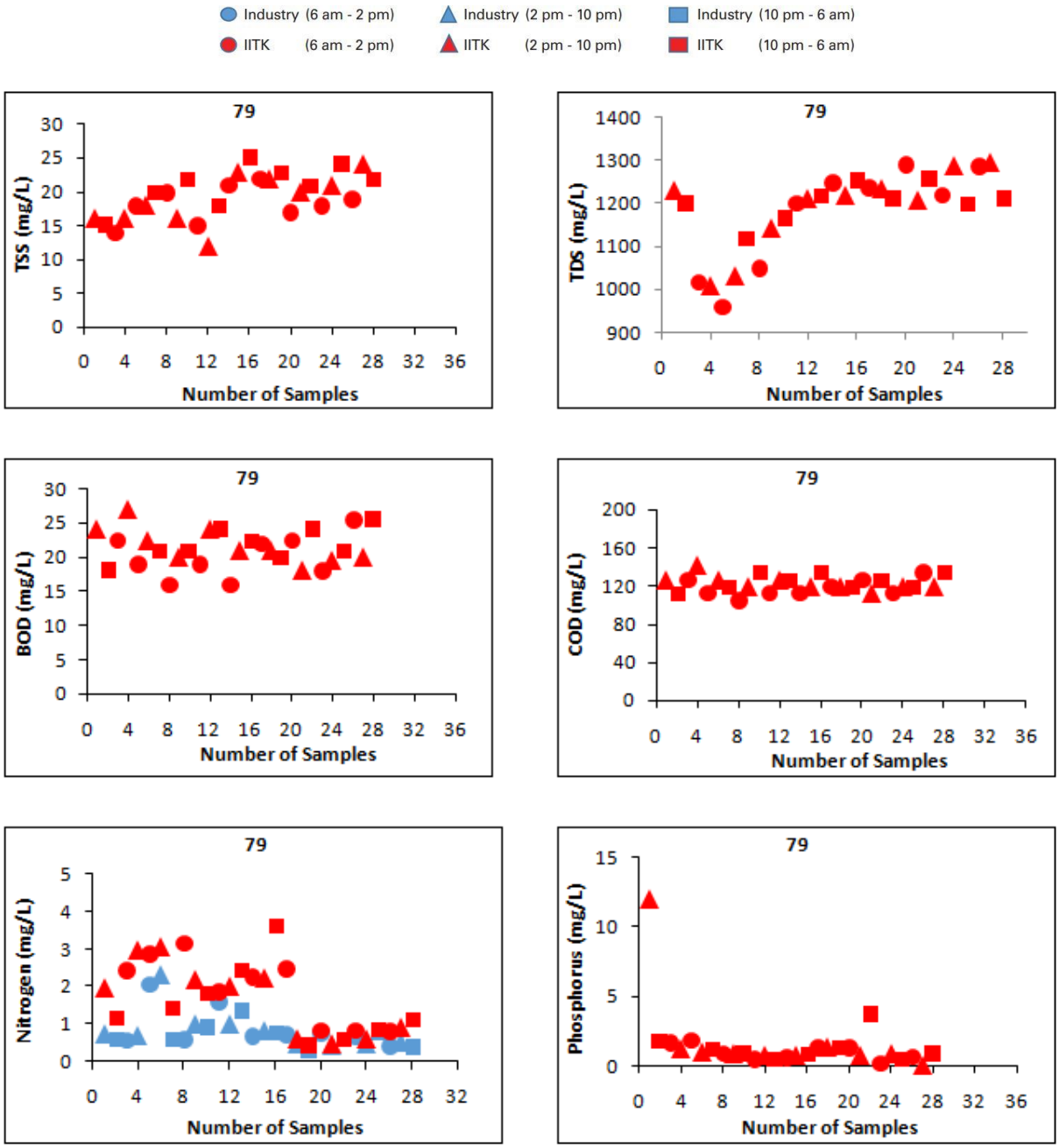






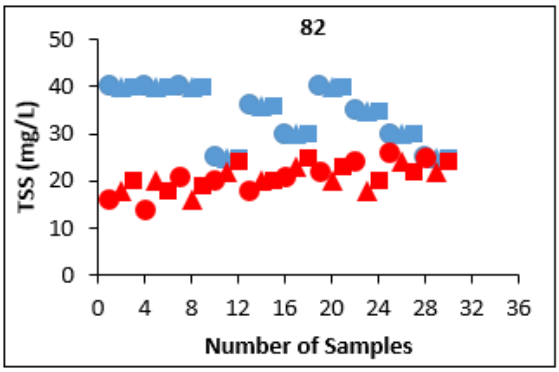


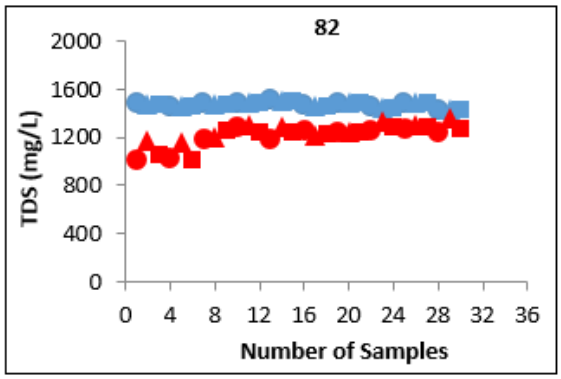
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

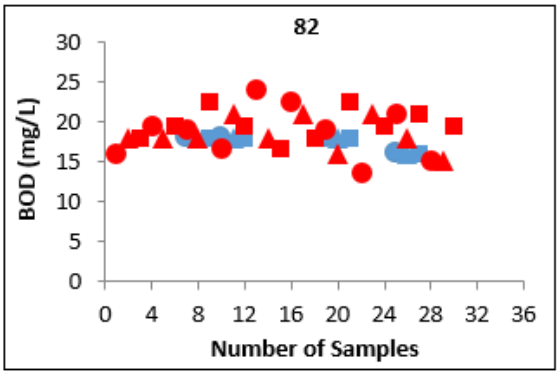


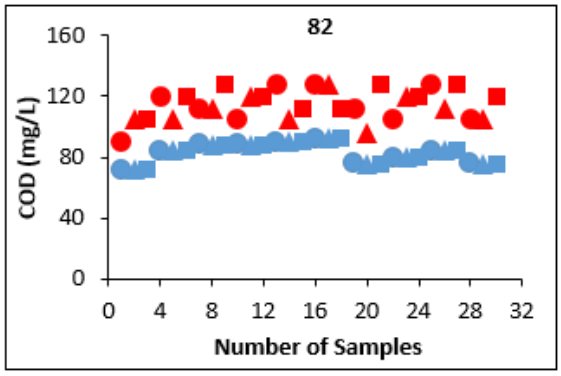
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

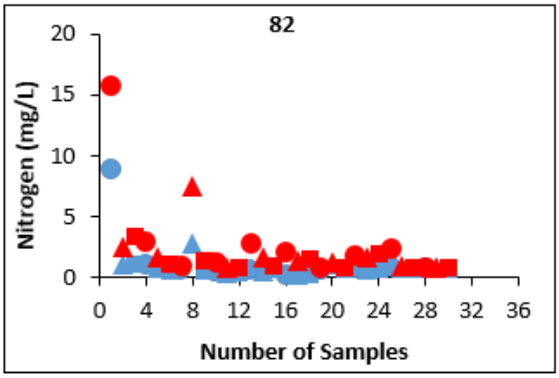
Industry (6 am - 2 pm) Industry (2 pm - 10 pm) Industry (10 pm - 6 am)
IITK (6 am - 2 pm) IITK (2 pm - 10 pm) IITK (10 pm - 6 am)

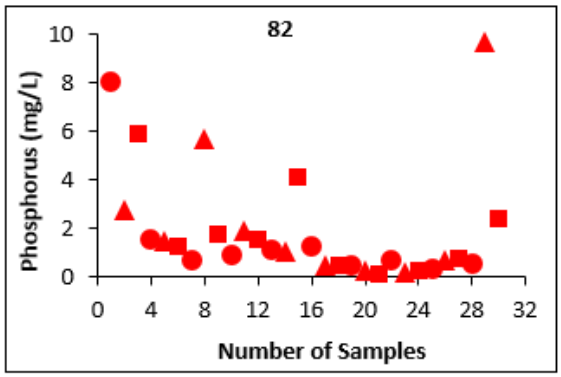






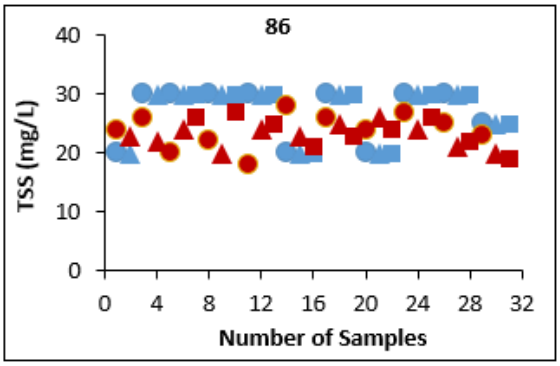


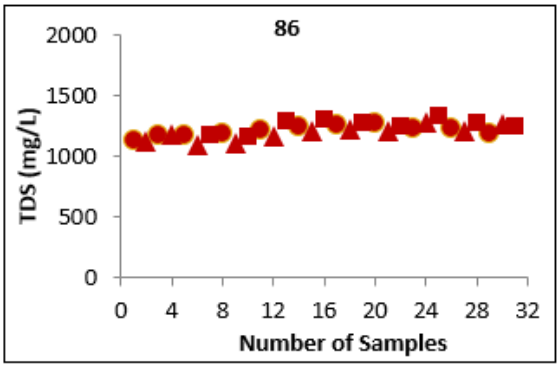


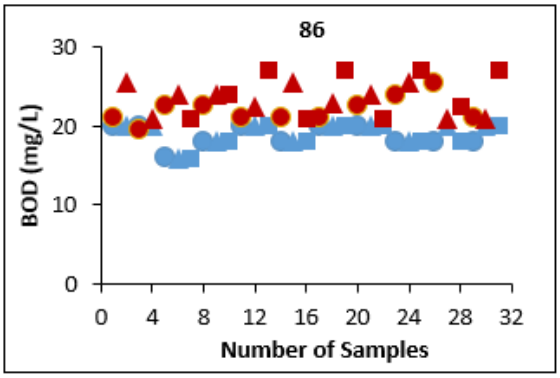


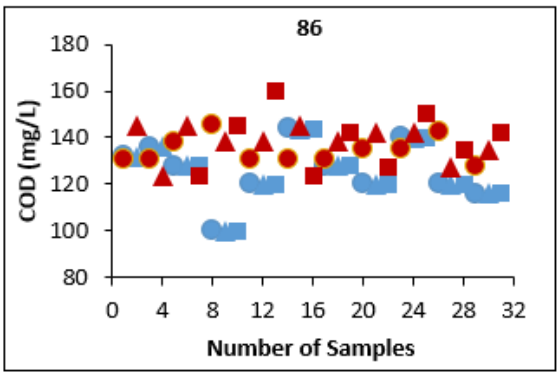
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

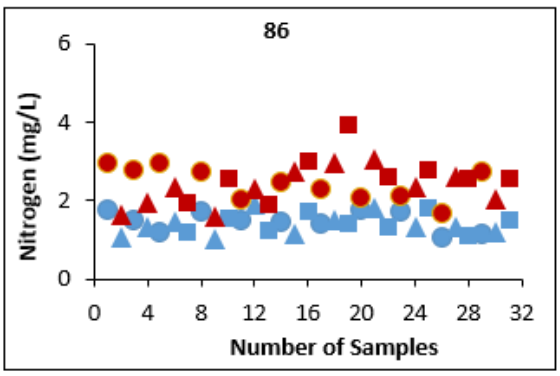
Industry (6 am - 2 pm) Industry (2 pm - 10 pm) Industry (10 pm - 6 am)
IITK (6 am - 2 pm) IITK (2 pm - 10 pm) IITK (10 pm - 6 am)

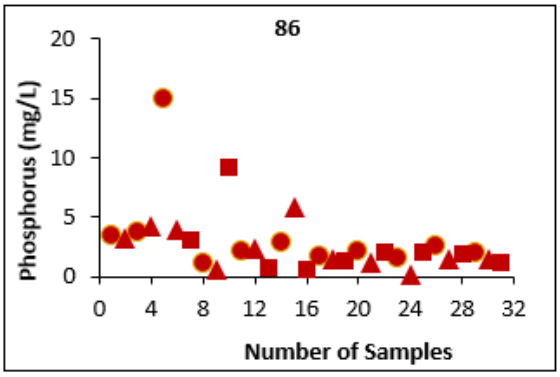




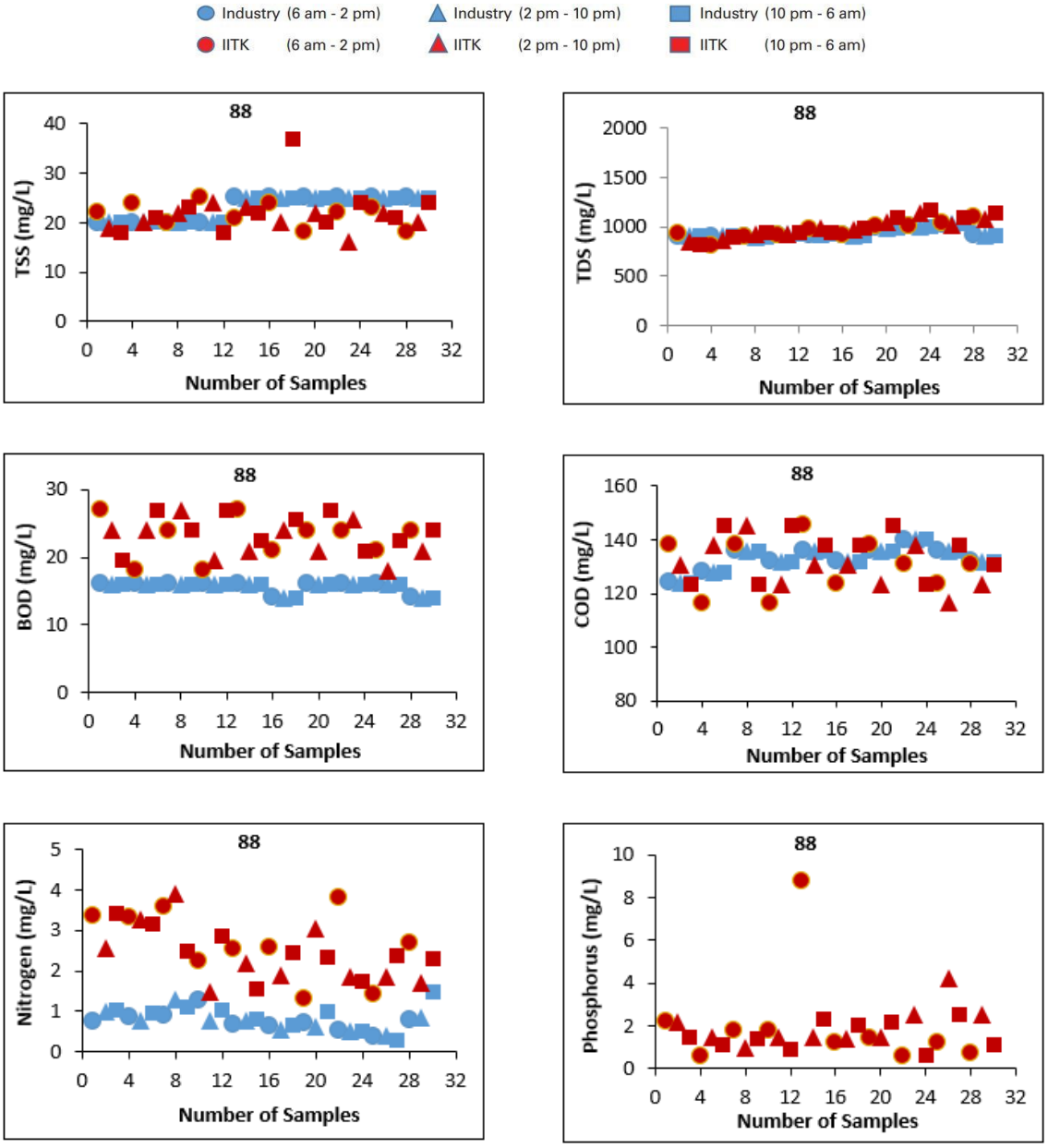




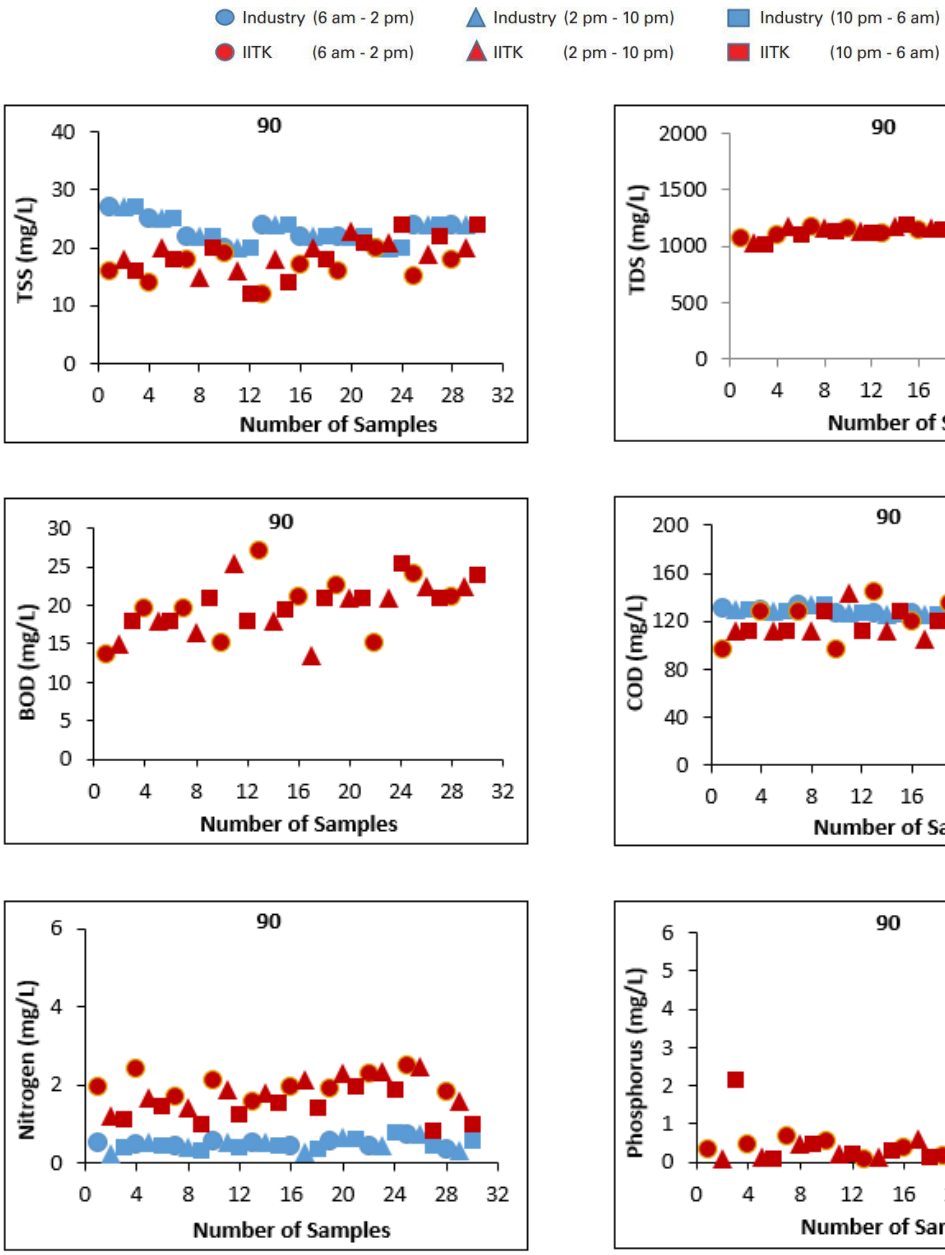




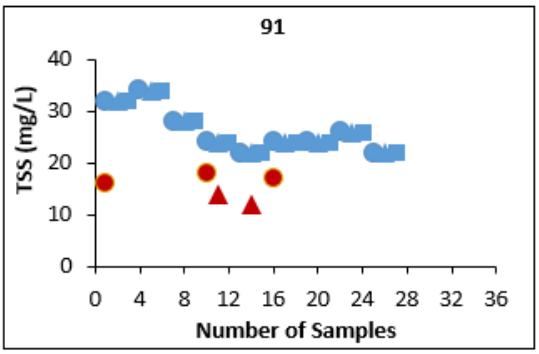
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

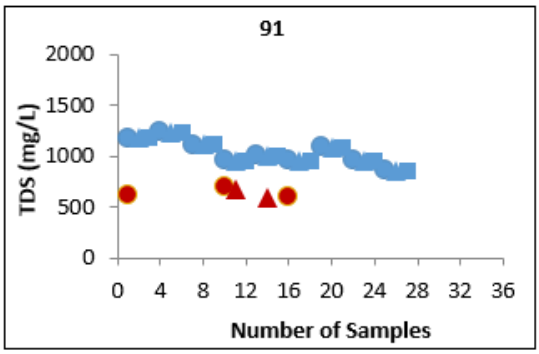


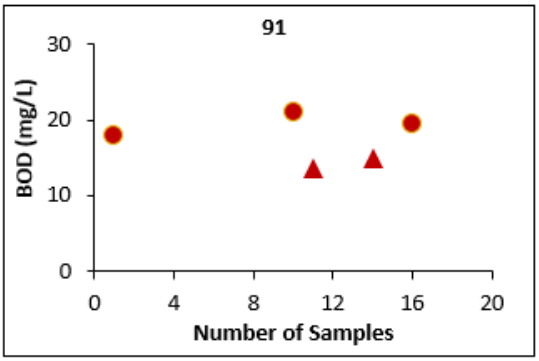
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

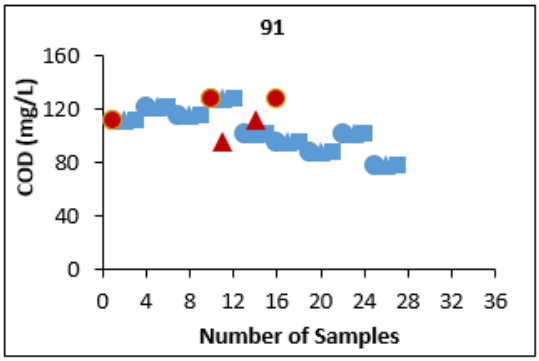


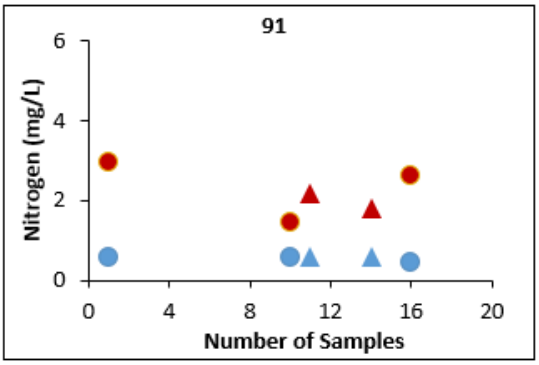
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

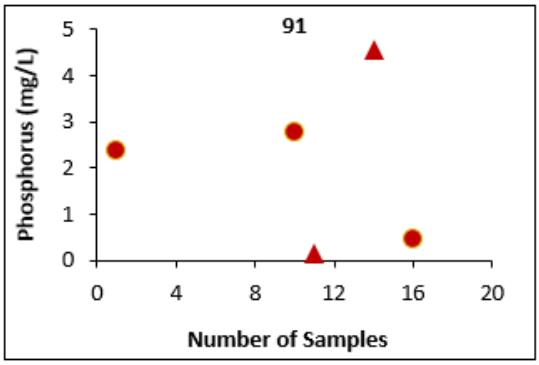




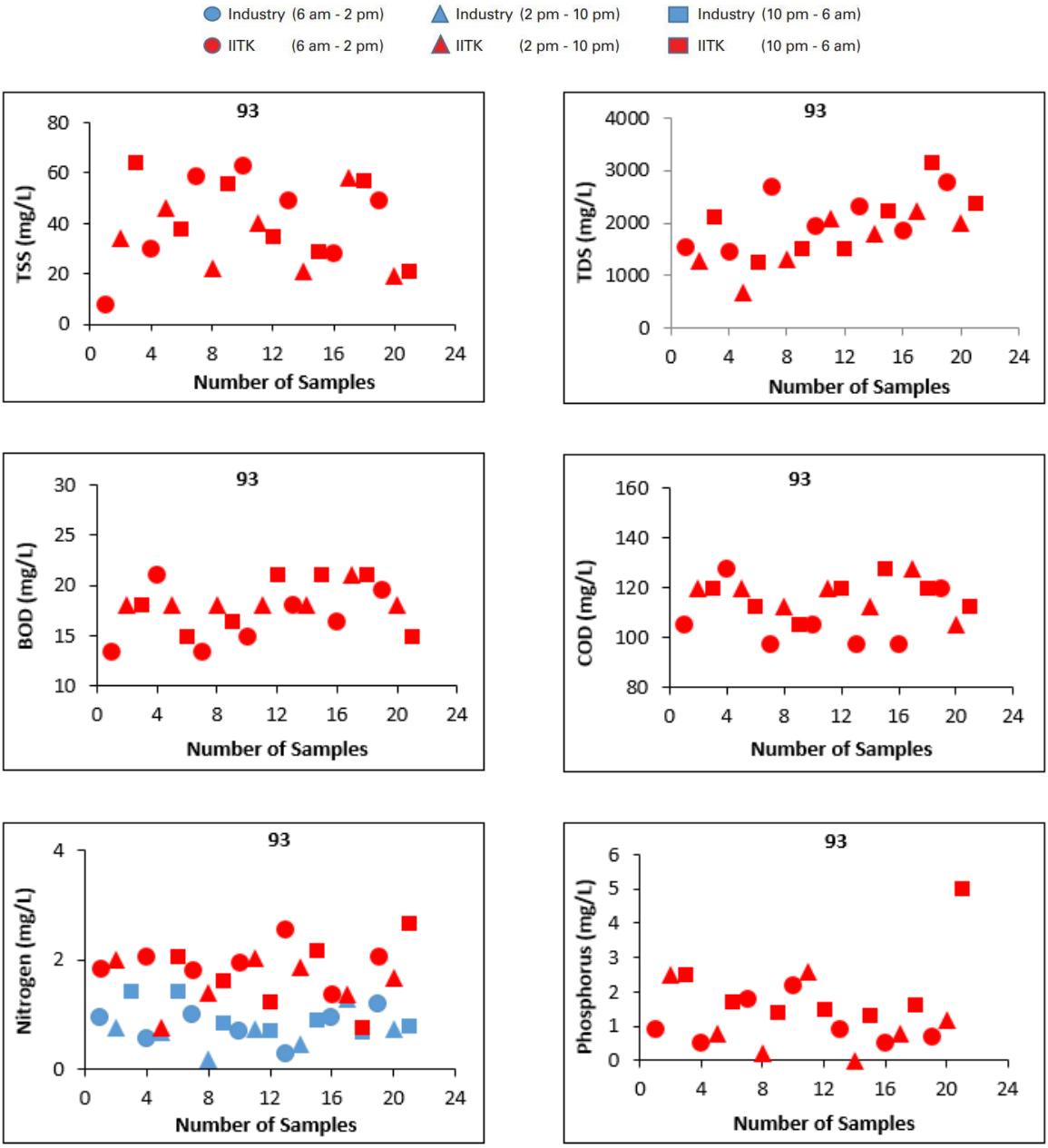




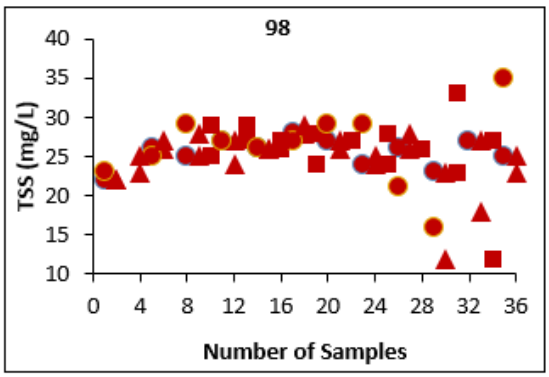


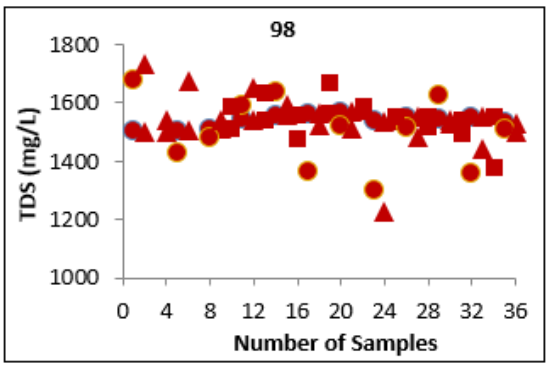


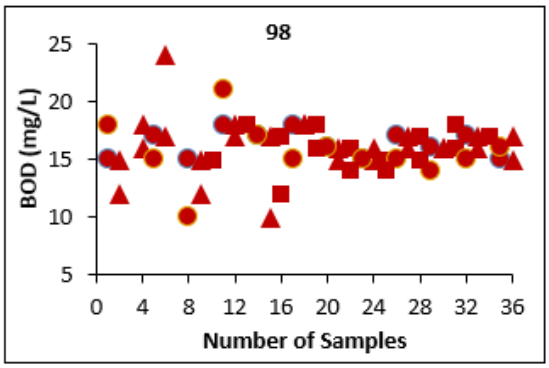
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

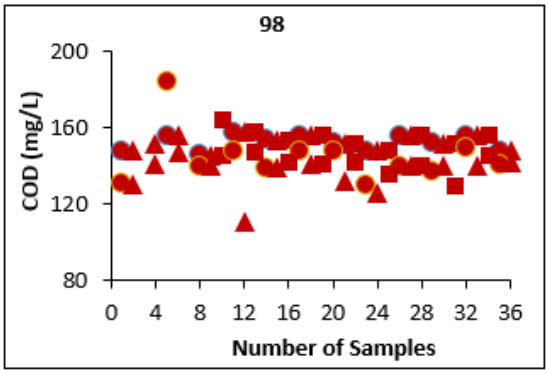


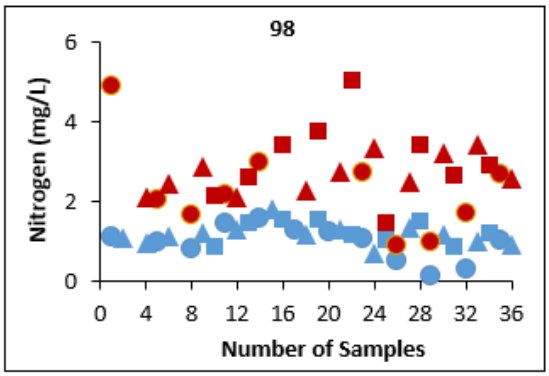
COMPARISON OF TYPICAL EFFLUENT QUALITY ASSESSMENT BY INDUSTRY AND cGanga TEAM

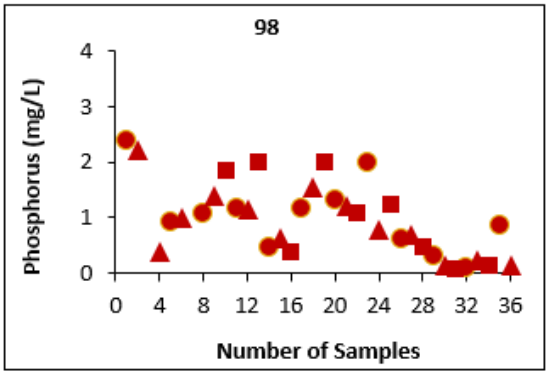












CONDITION OF DRAINS RECEIVING TREATED EFFLUENTS POST IMPLEMENTATION OF THE CHARTER

The effluent quality at PPI's outlet was by and large found to be within the norms specified in the Charter (CPCB, 2015). But it is important to understand that the ultimate concern is to improve the condition of adjoining drains in which treated effluents are being discharged. Therefore, a survey was conducted to assess the physical condition of the drains as well as water quality parameters of the drains where the industrial discharge is released. Sampling from a particular industry was done at three locations (Outlet, Upstream, Downstream).

Variation in six important water quality parameters was observed at the upstream and downstream location of the discharge points in the drain/ river. These parameters were Flow, BOD, COD, TSS, VSS and DO. Figures in this section present variation of these parameters obtained from industry outlet, and the upstream and downstream locations of the drain.

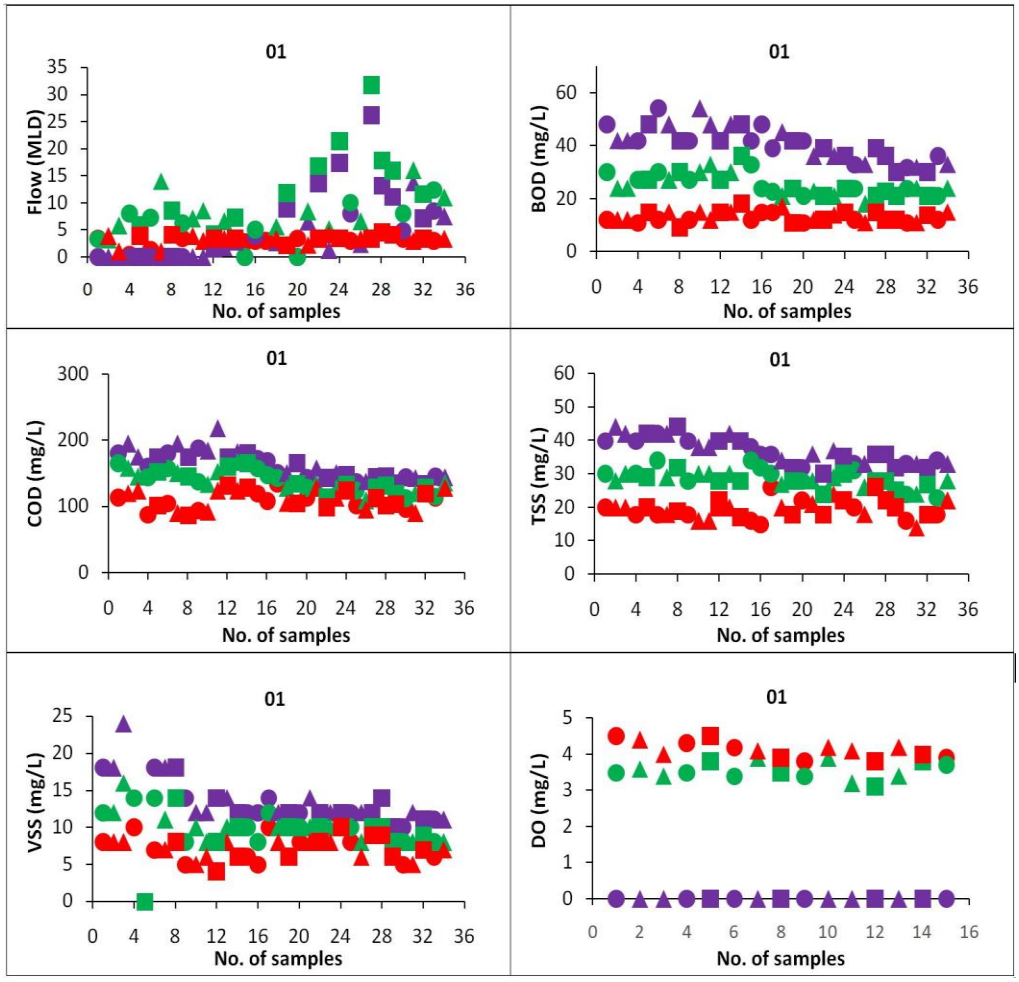
Images at the top of the figure gives an idea of the physical condition of the drain in the vicinity of the effluent discharge point.

FIGURE-10

DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

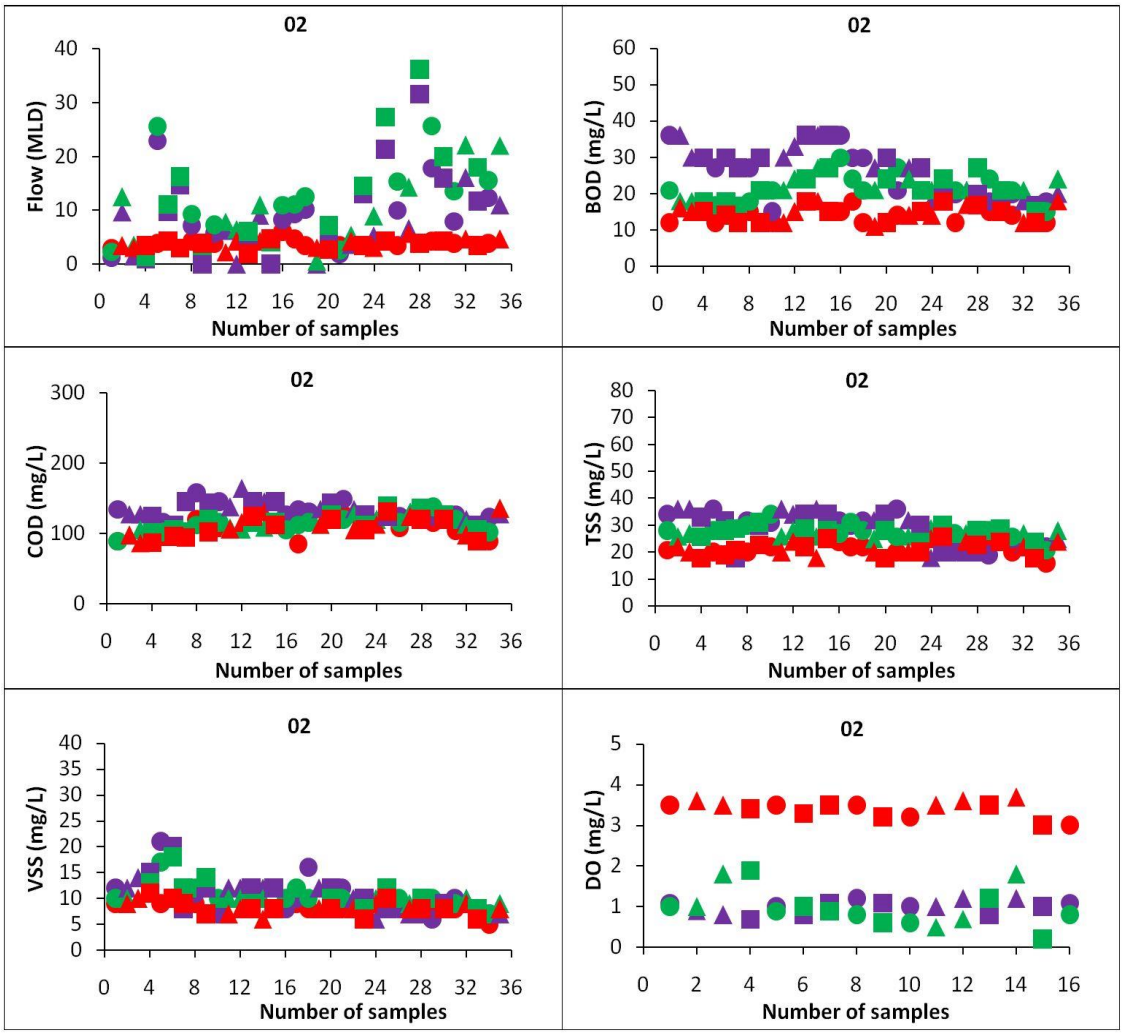
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

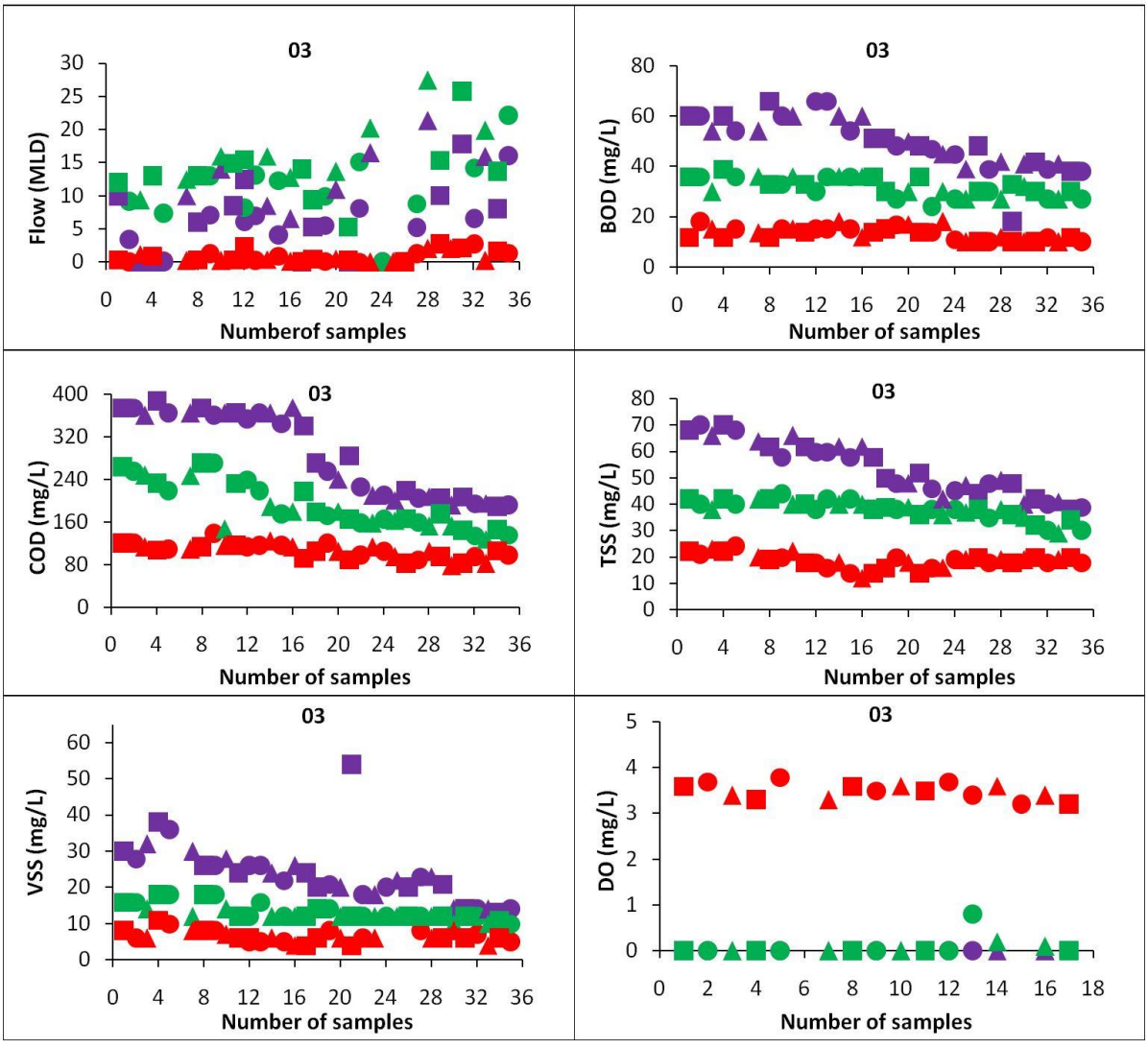
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

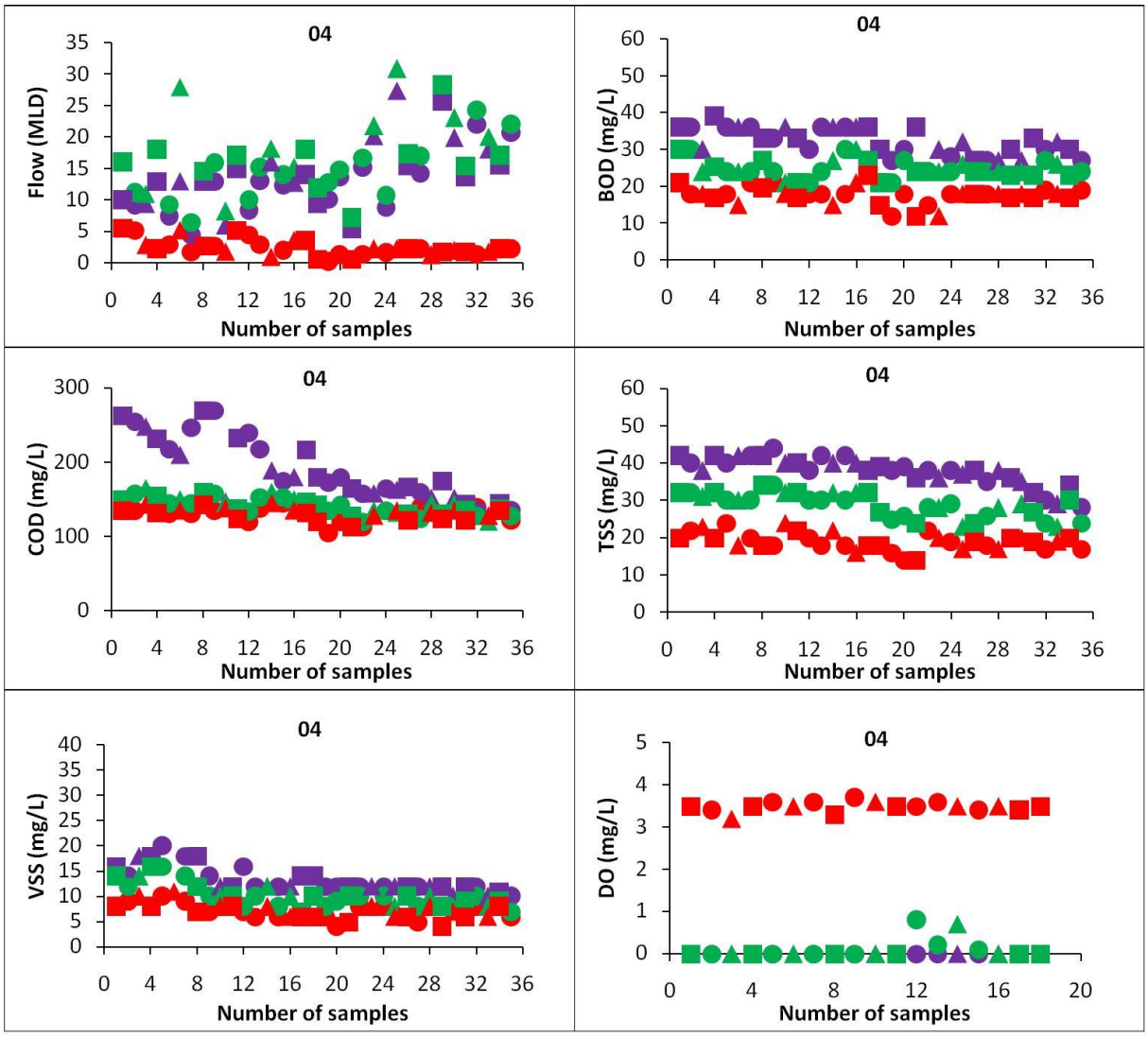
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

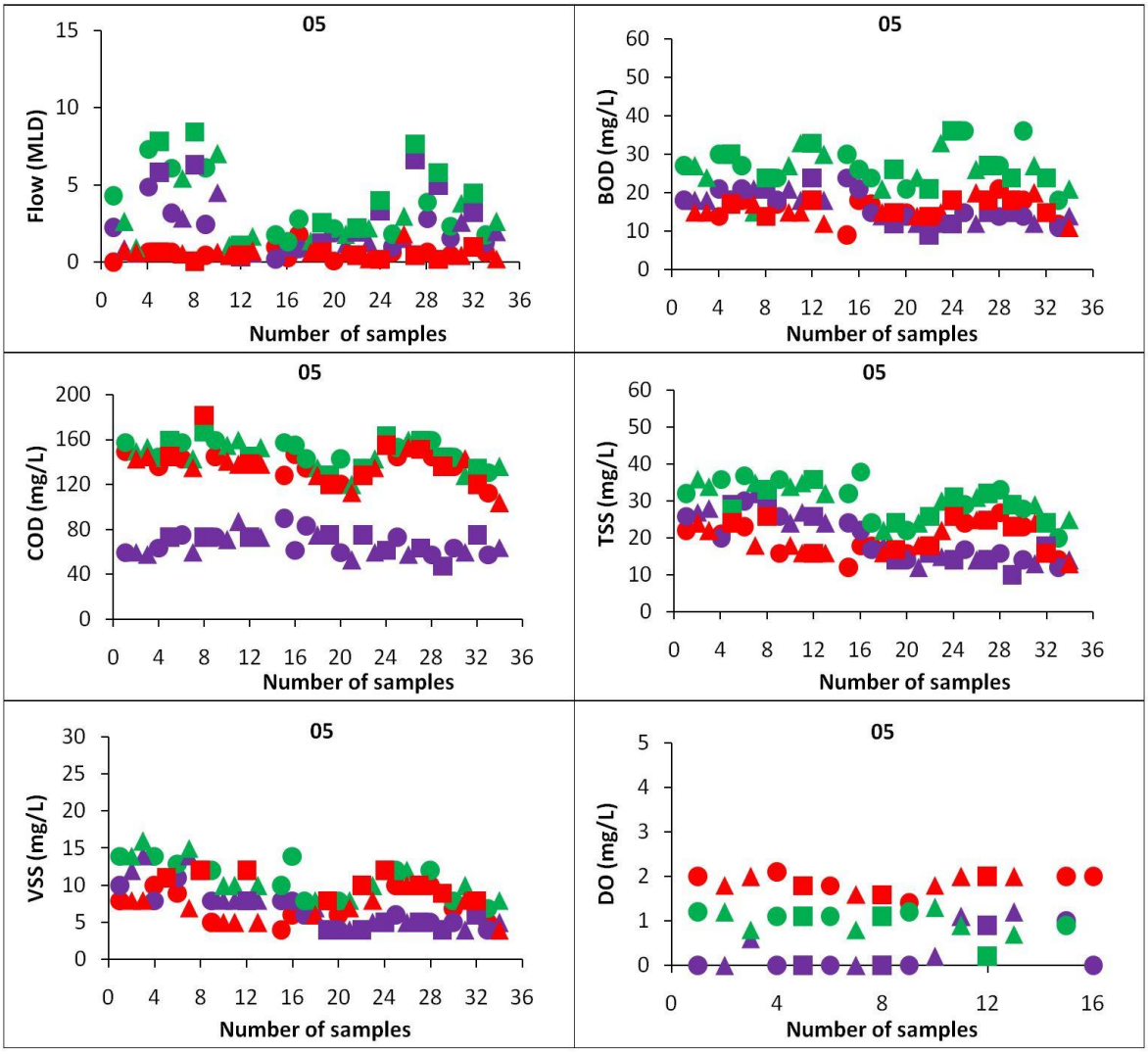
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

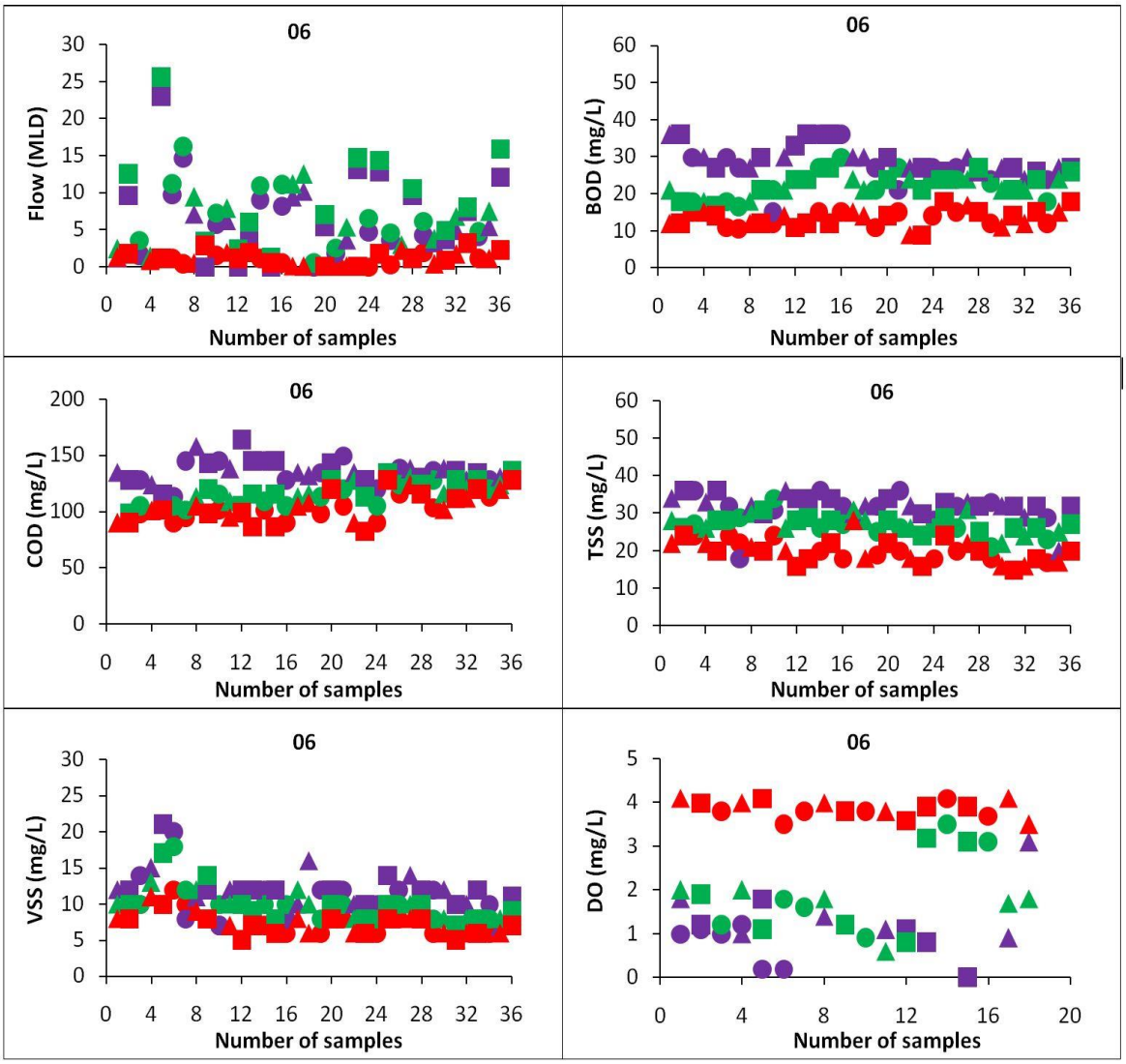
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

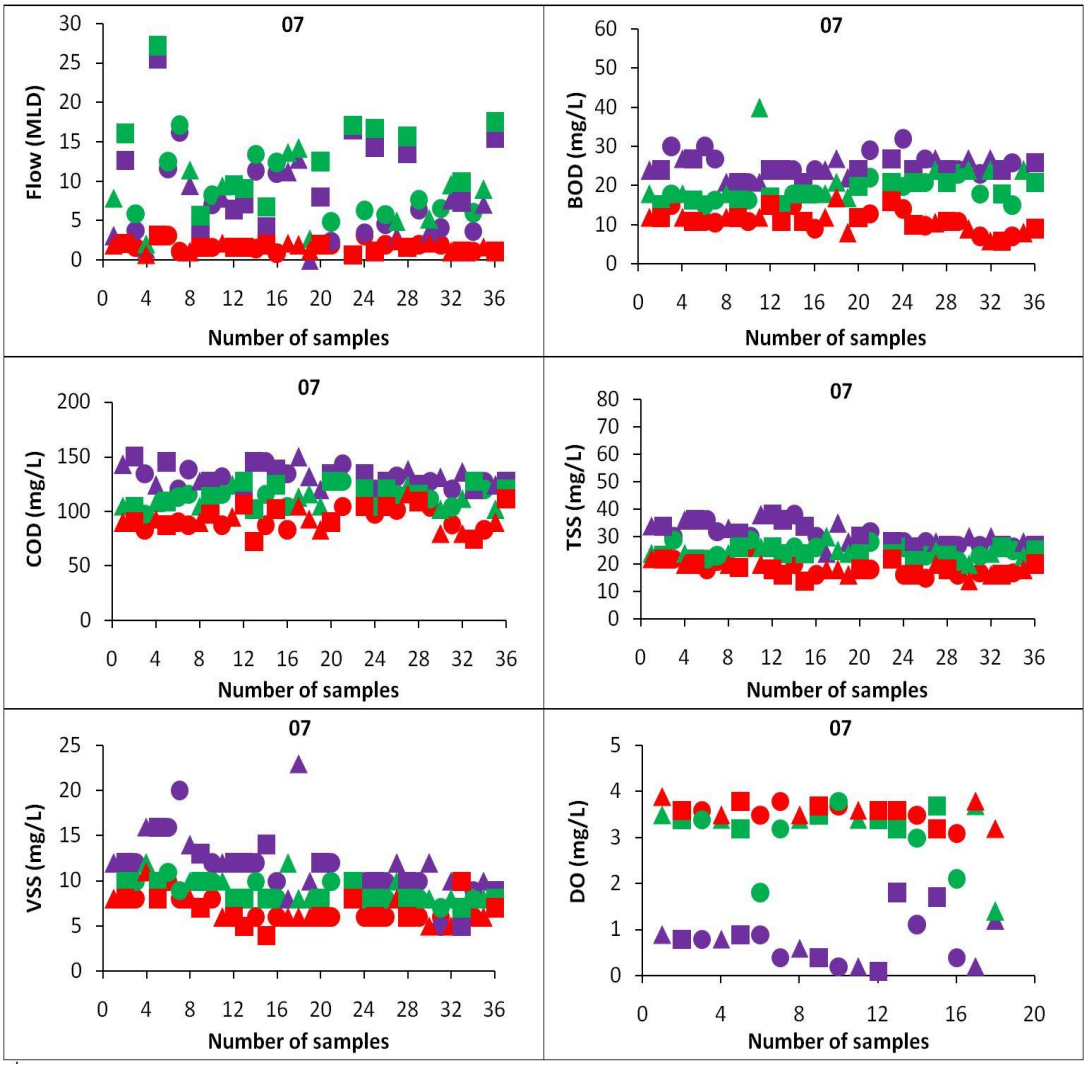
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

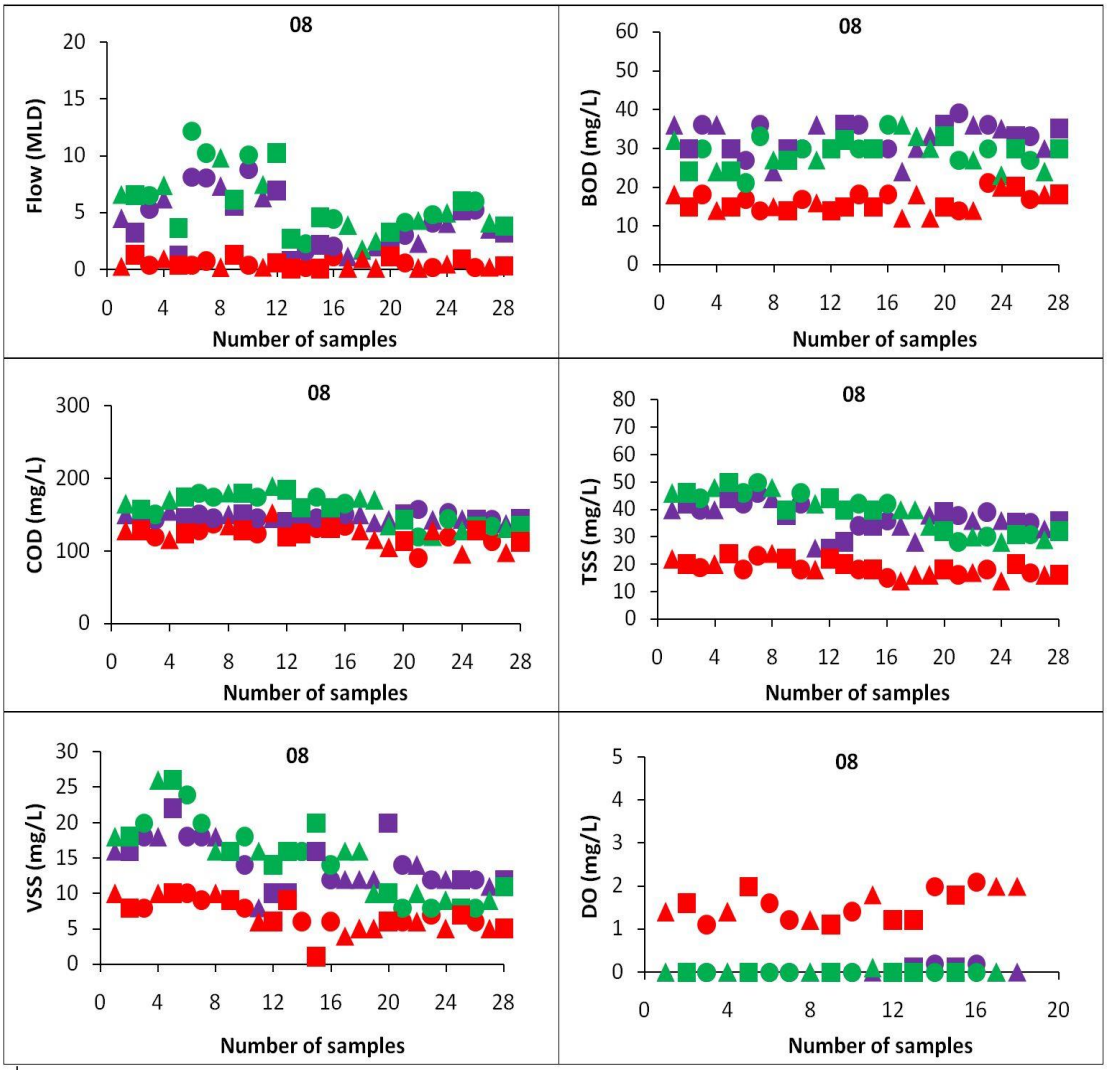
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

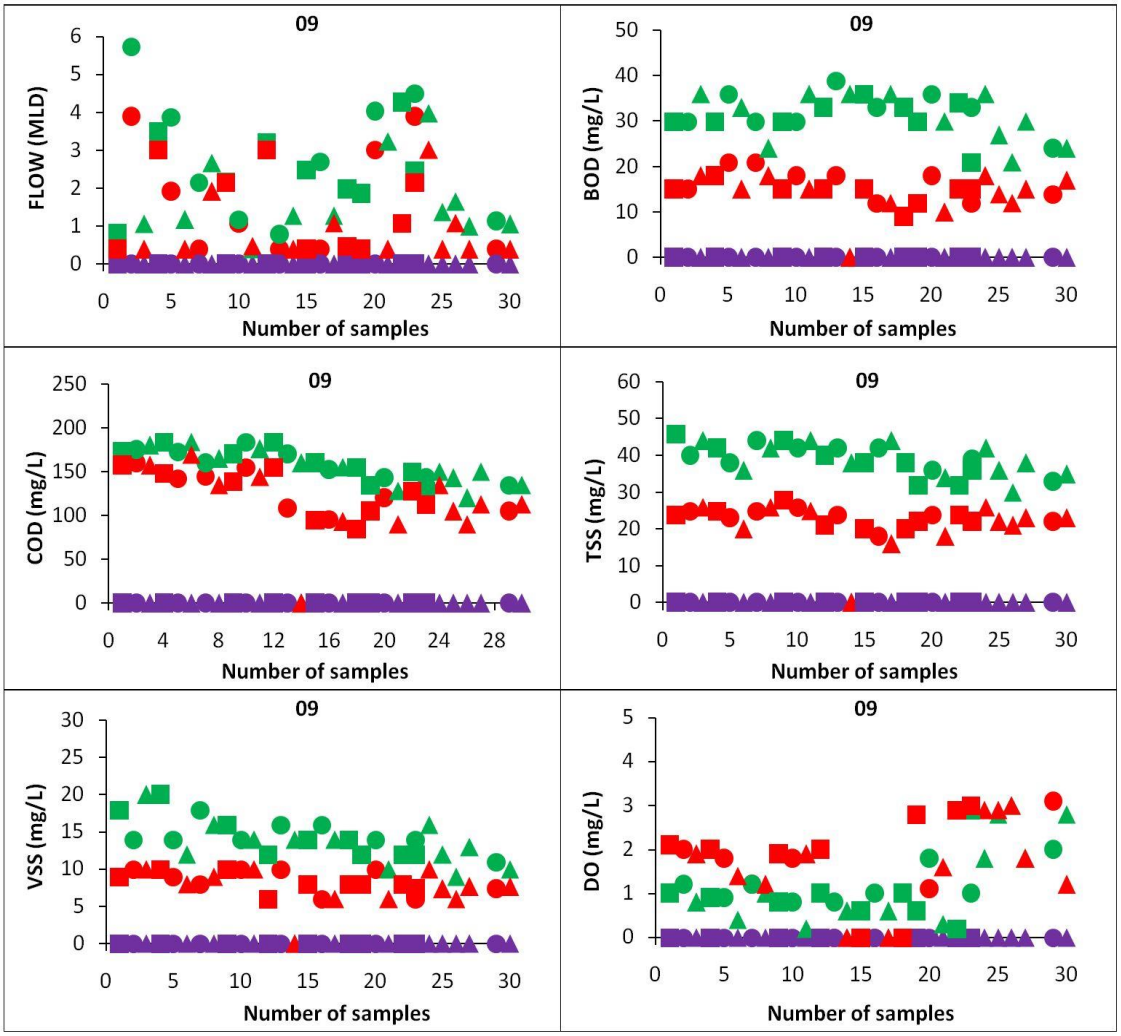
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



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Sampling at drains

Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
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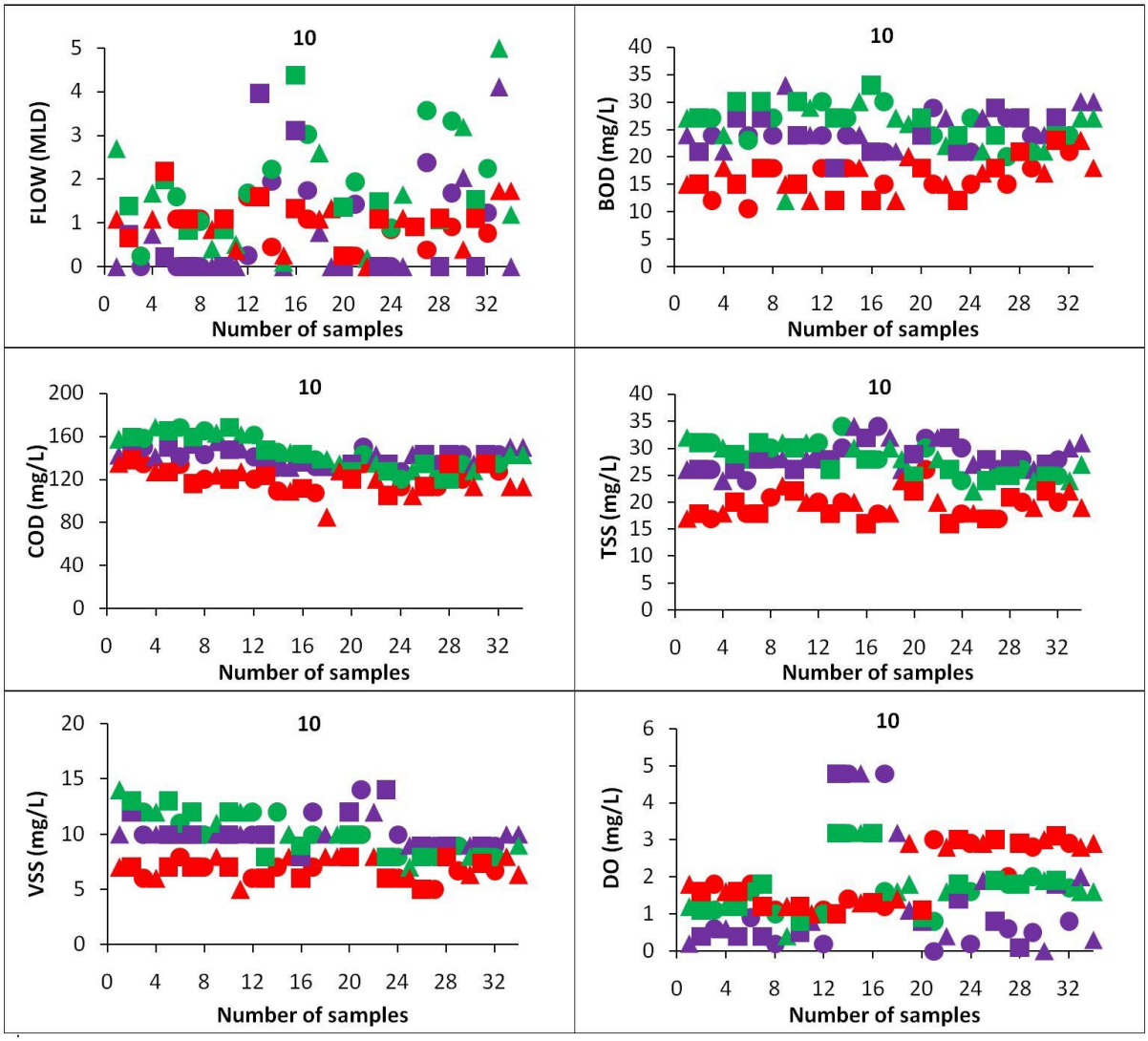
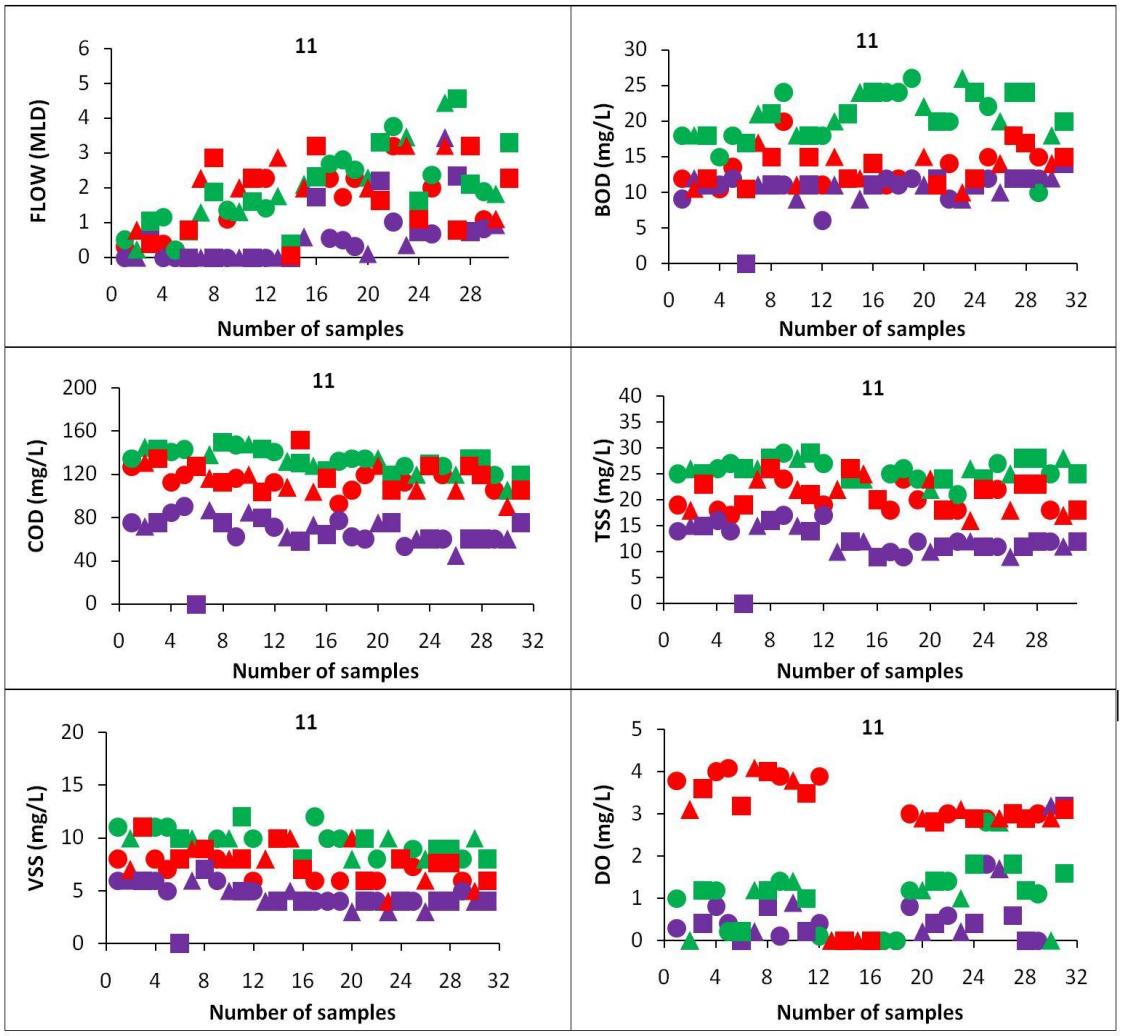


DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
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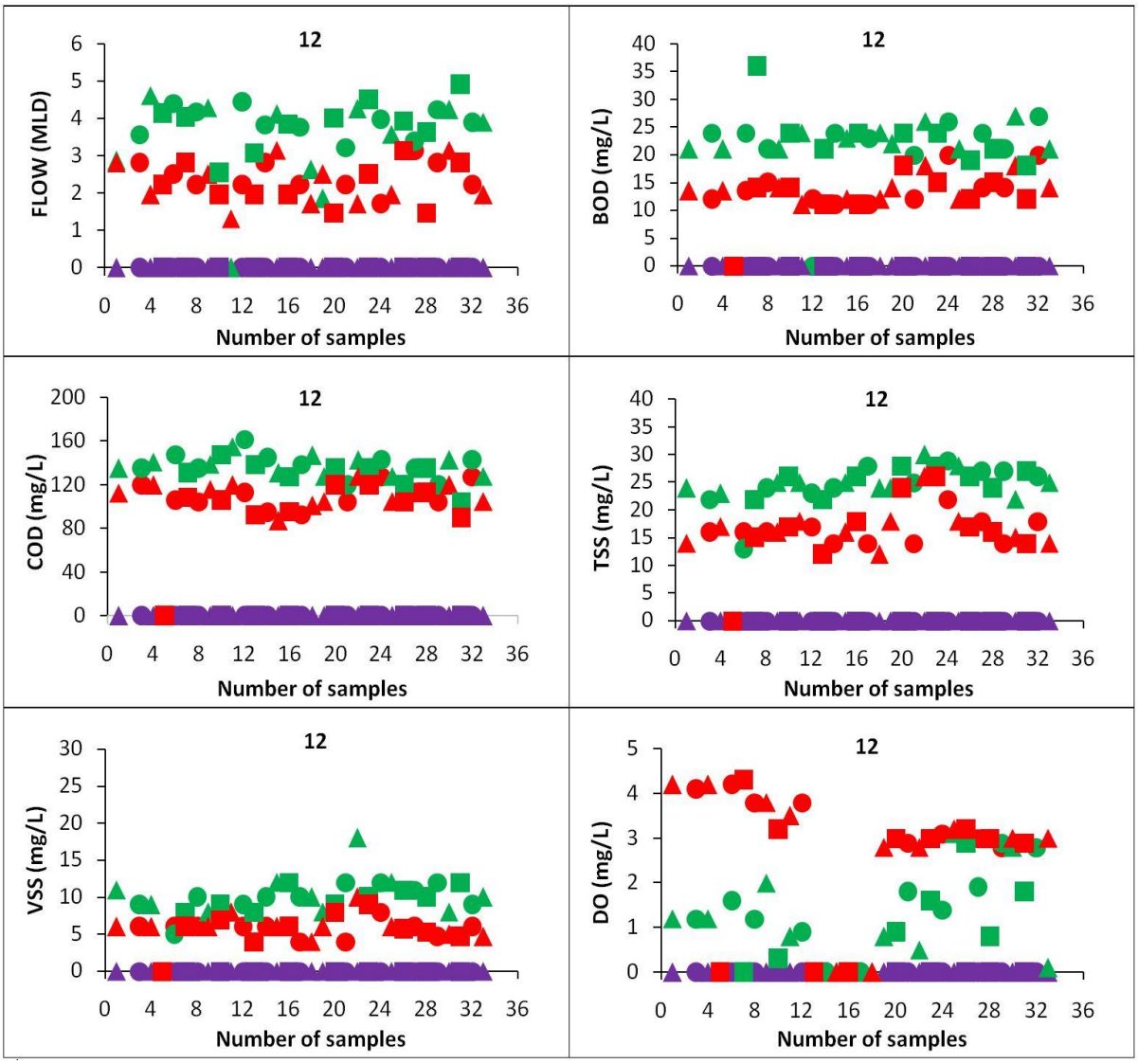

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Sampling at drains

Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
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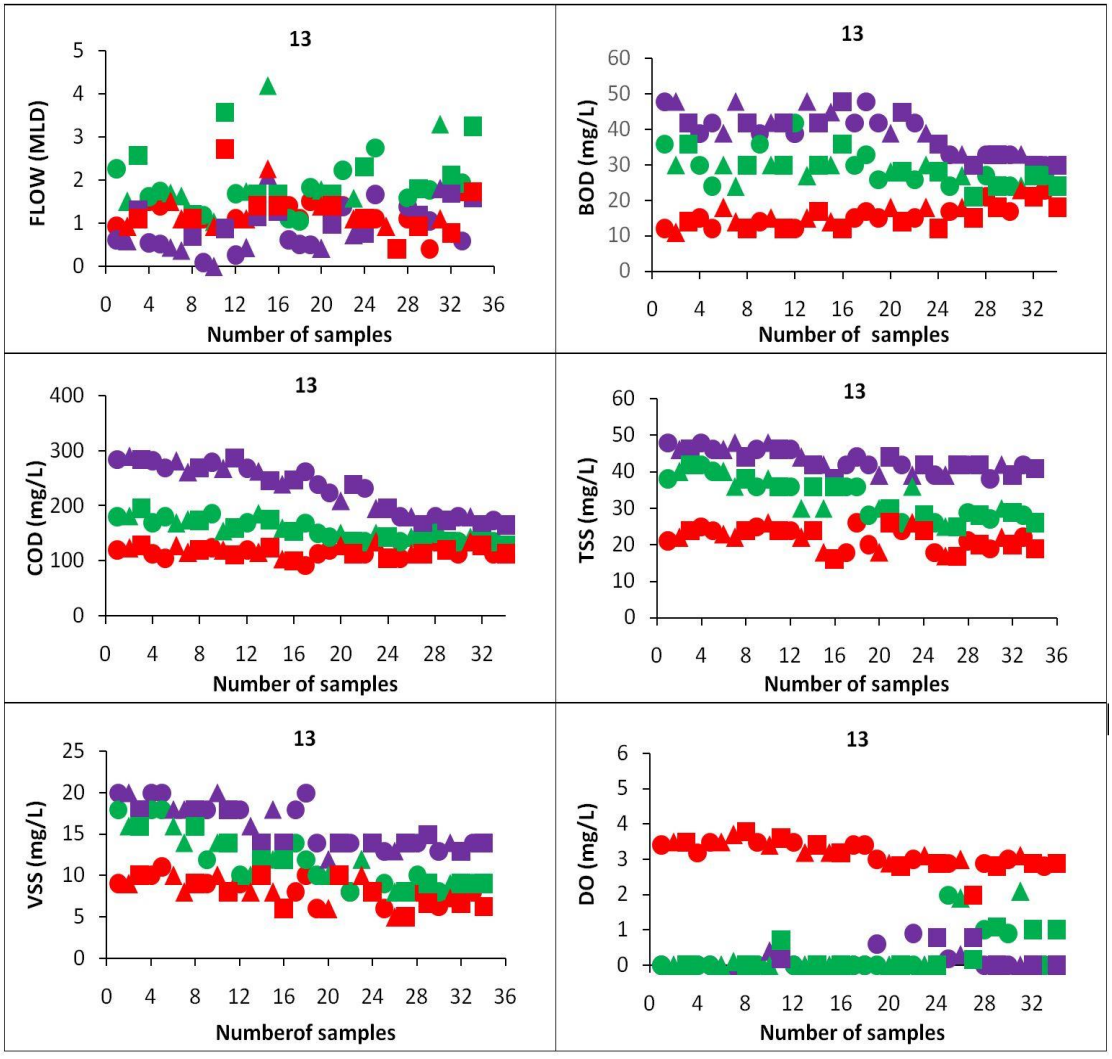

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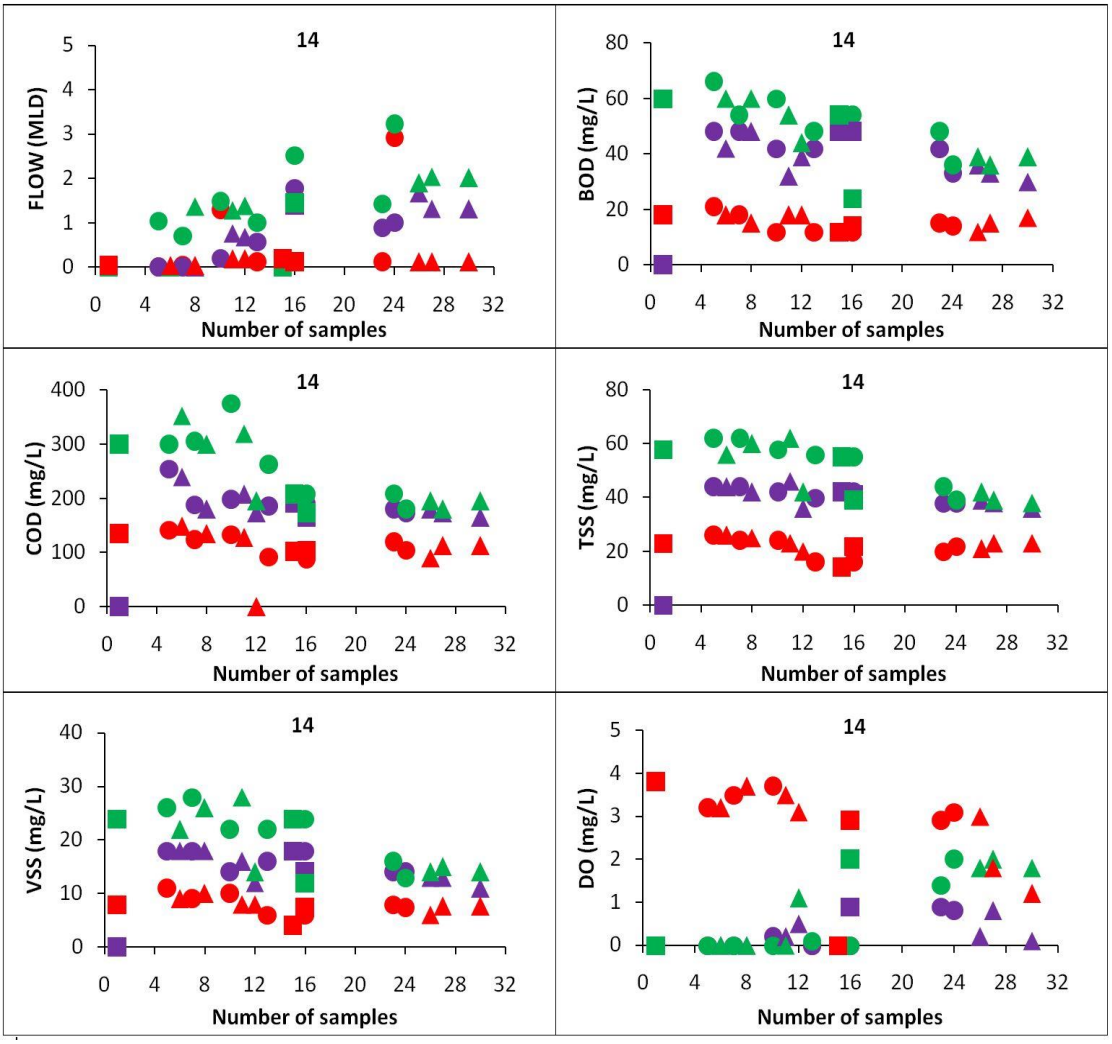
Sampling at drains

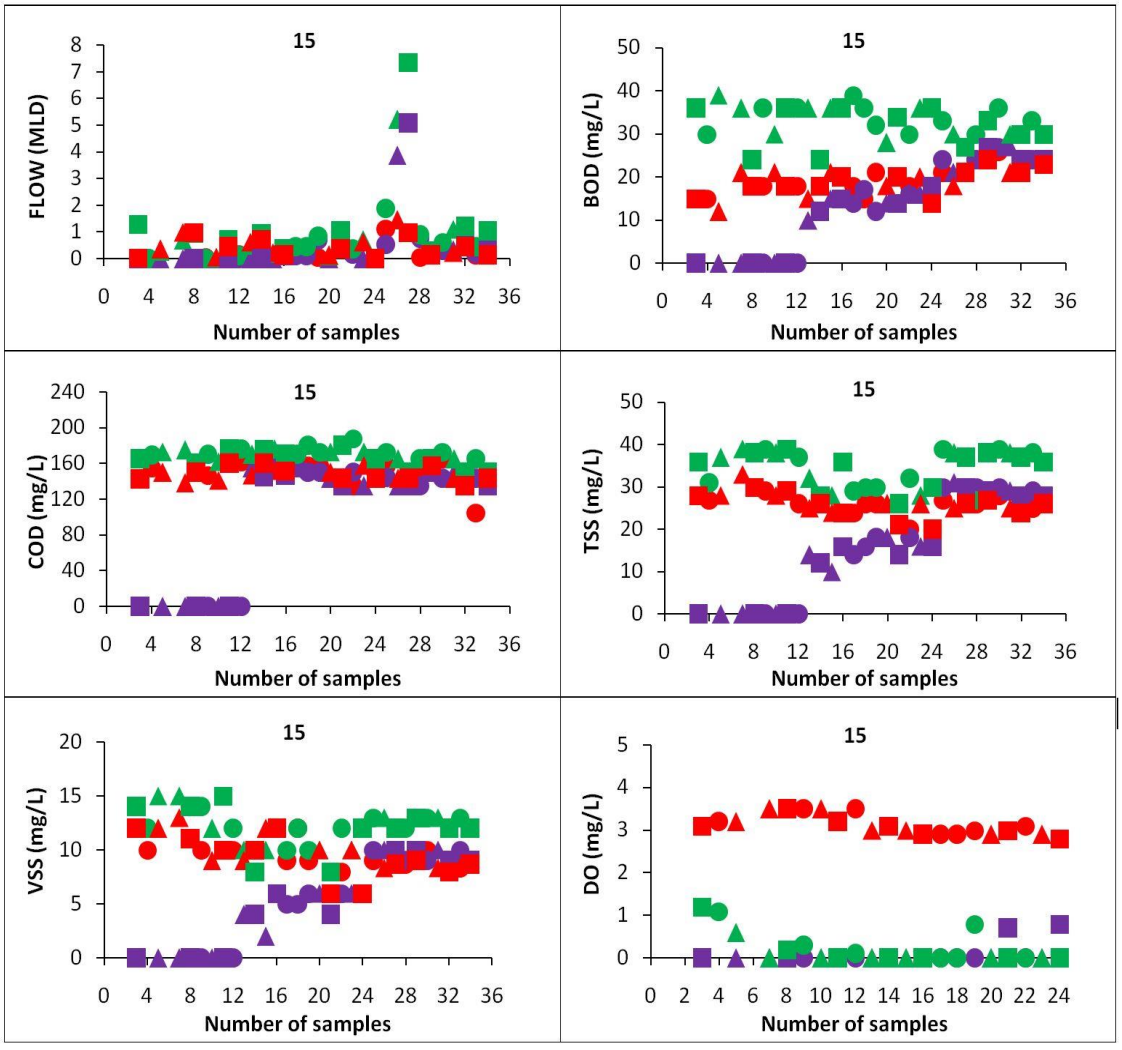
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
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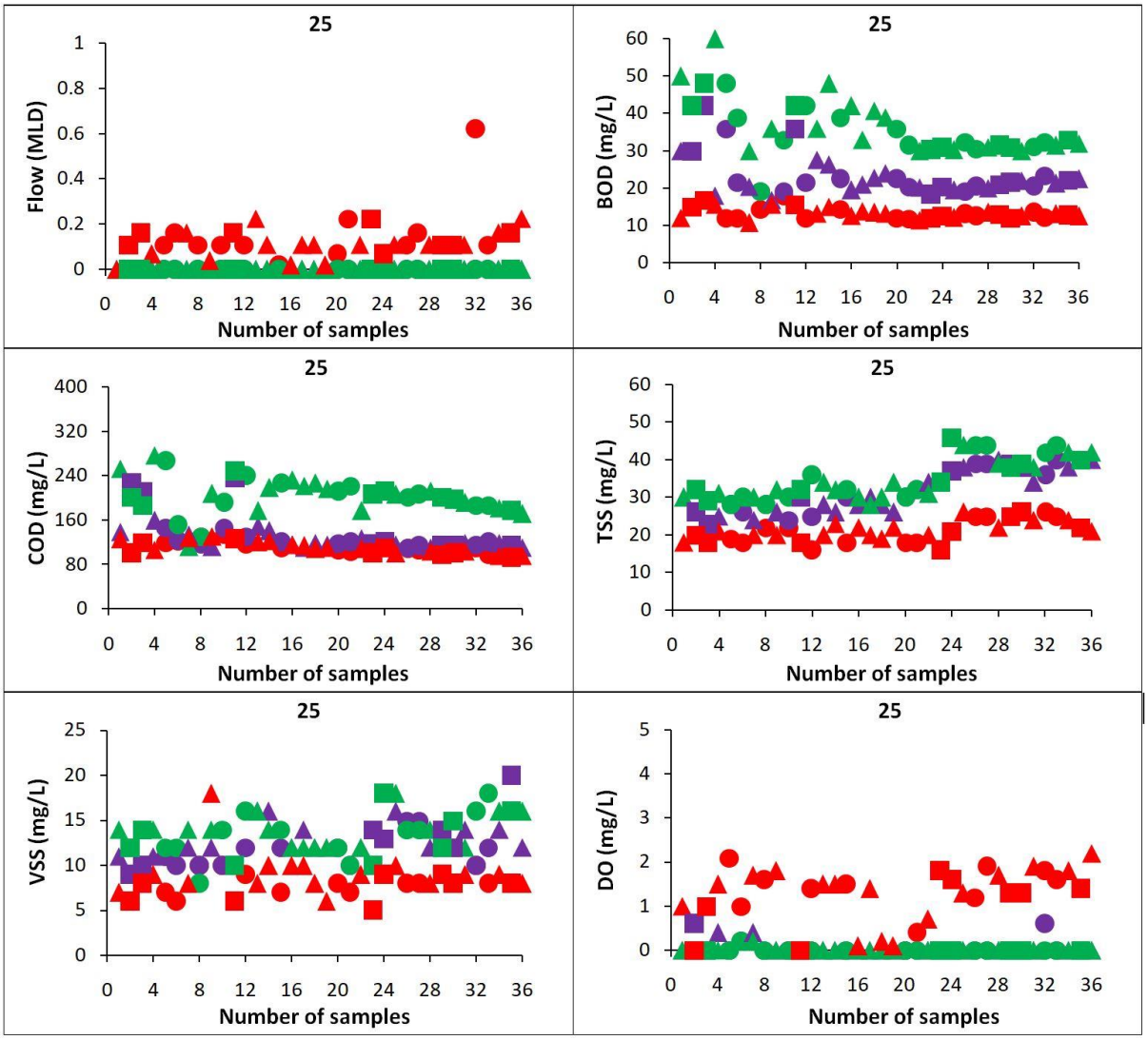

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Sampling at drains

Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
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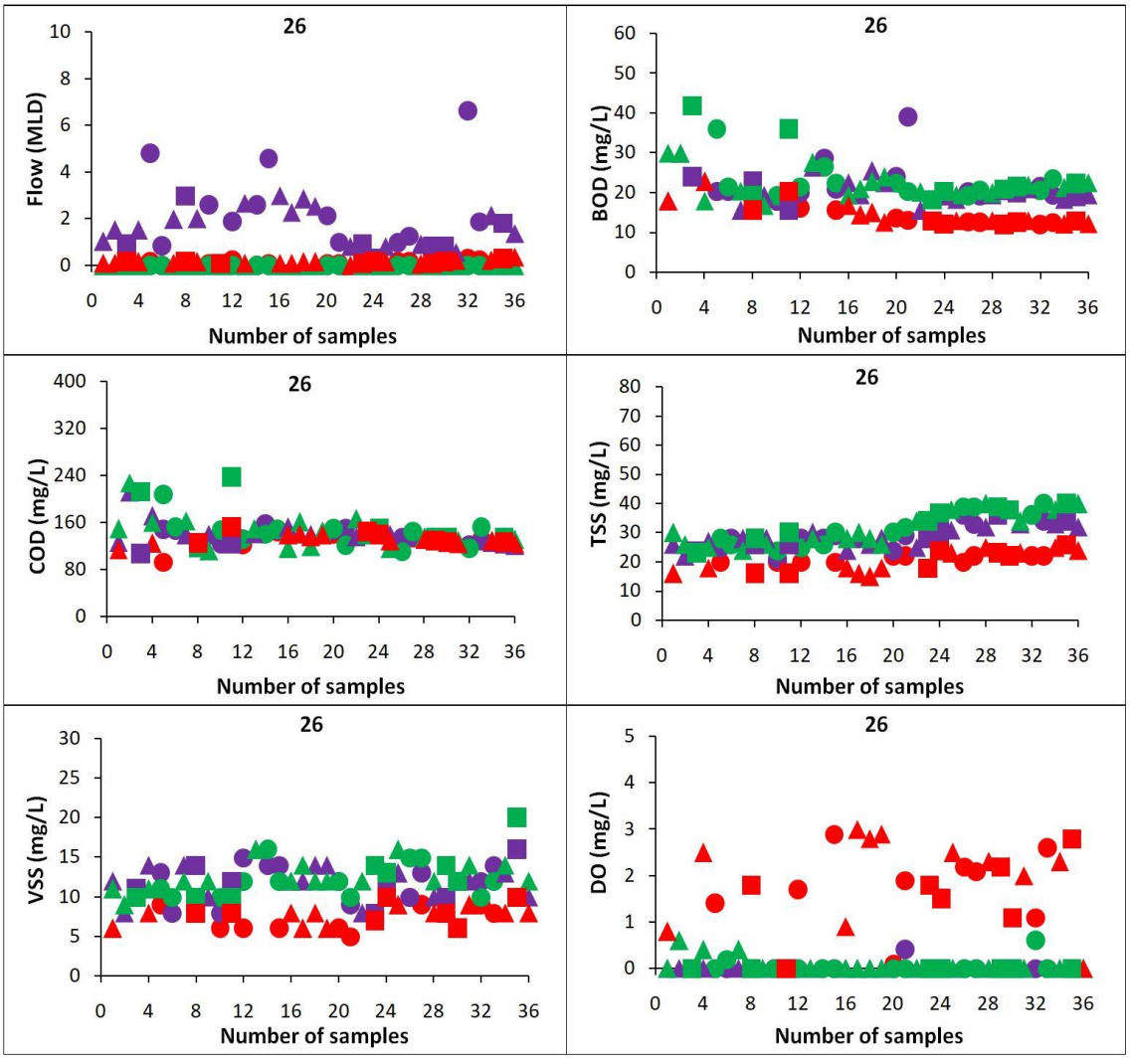

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Sampling at drains

Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
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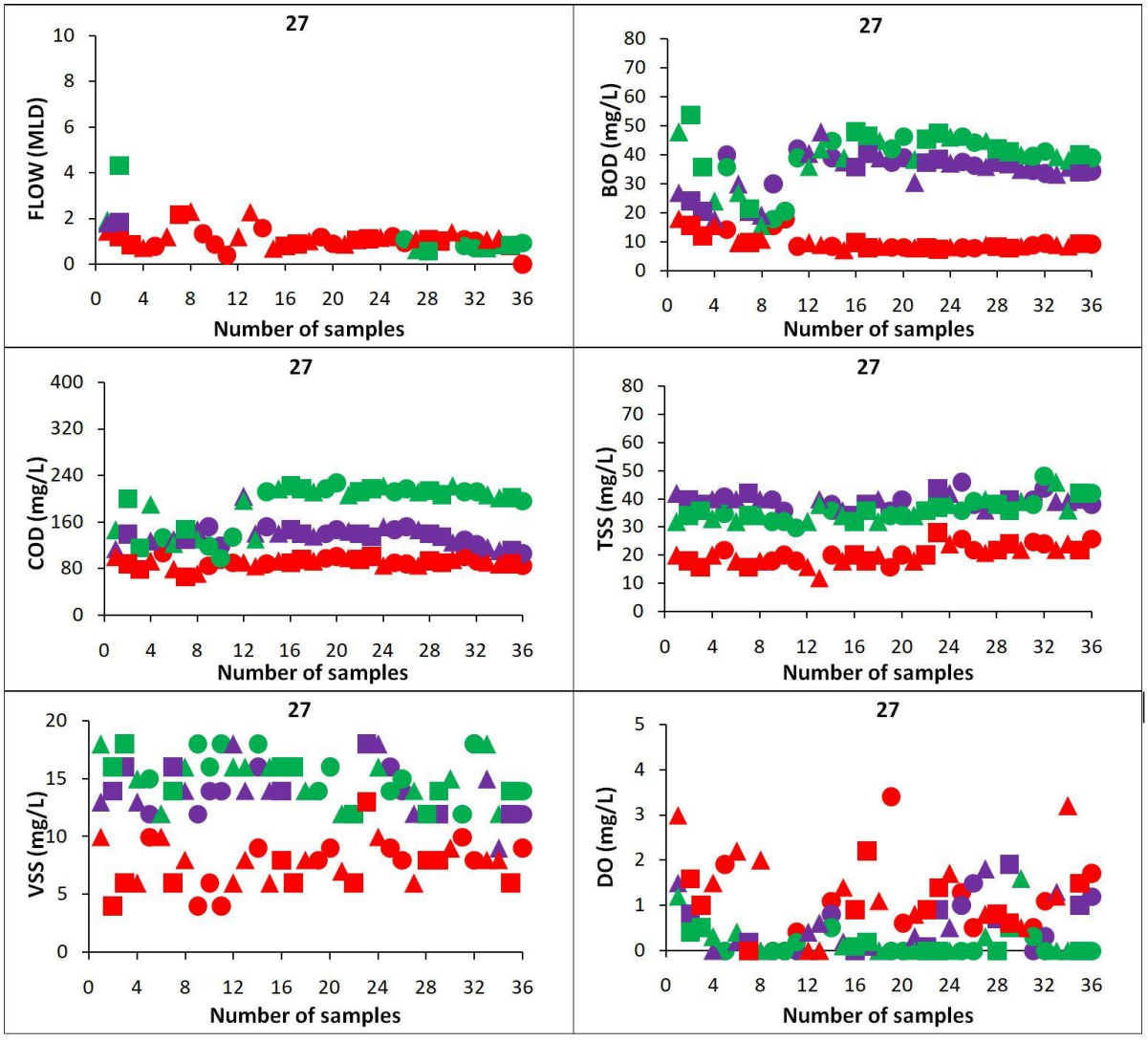

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Sampling at drains

Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
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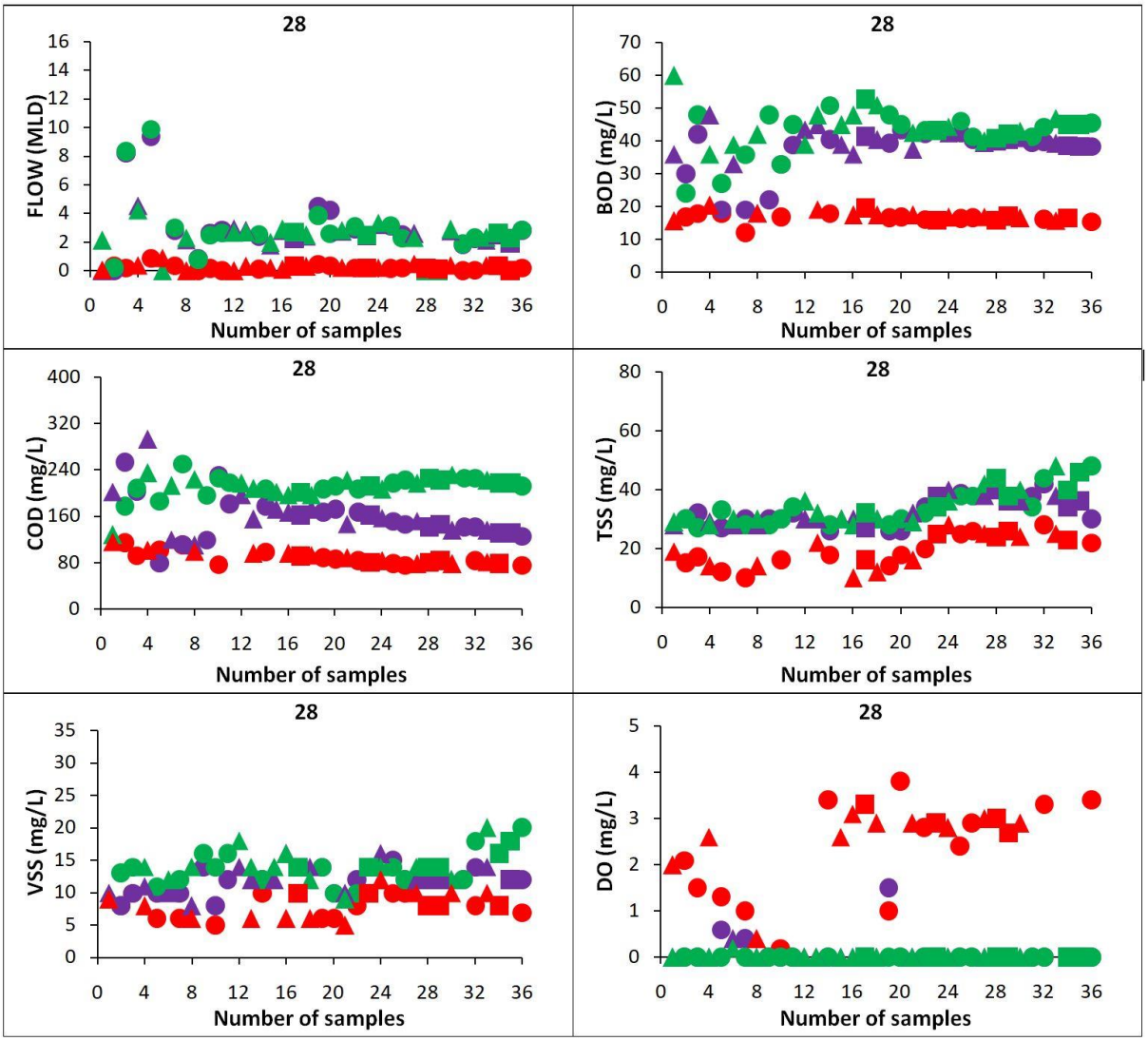

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Sampling at drains

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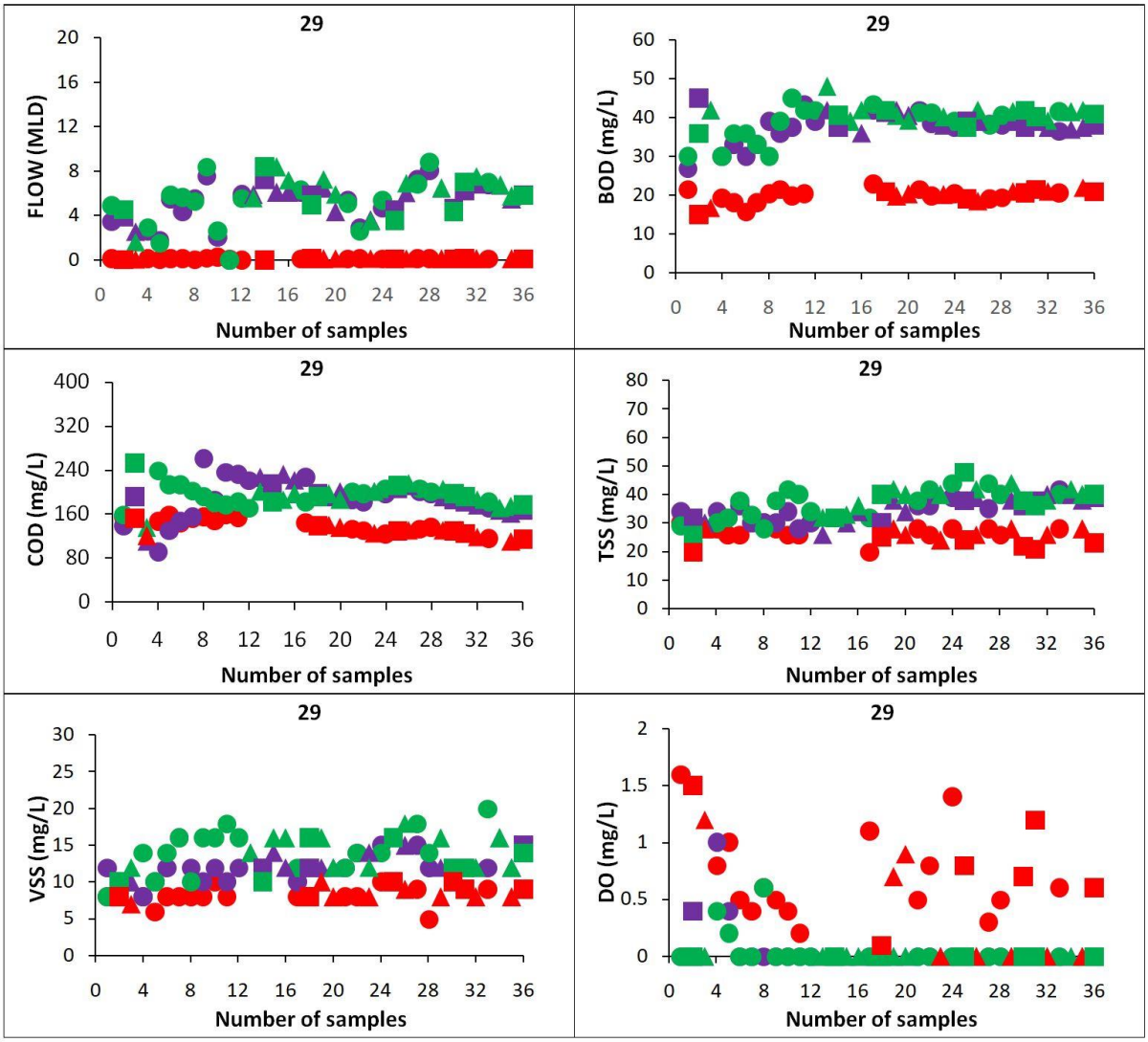

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Sampling at drains

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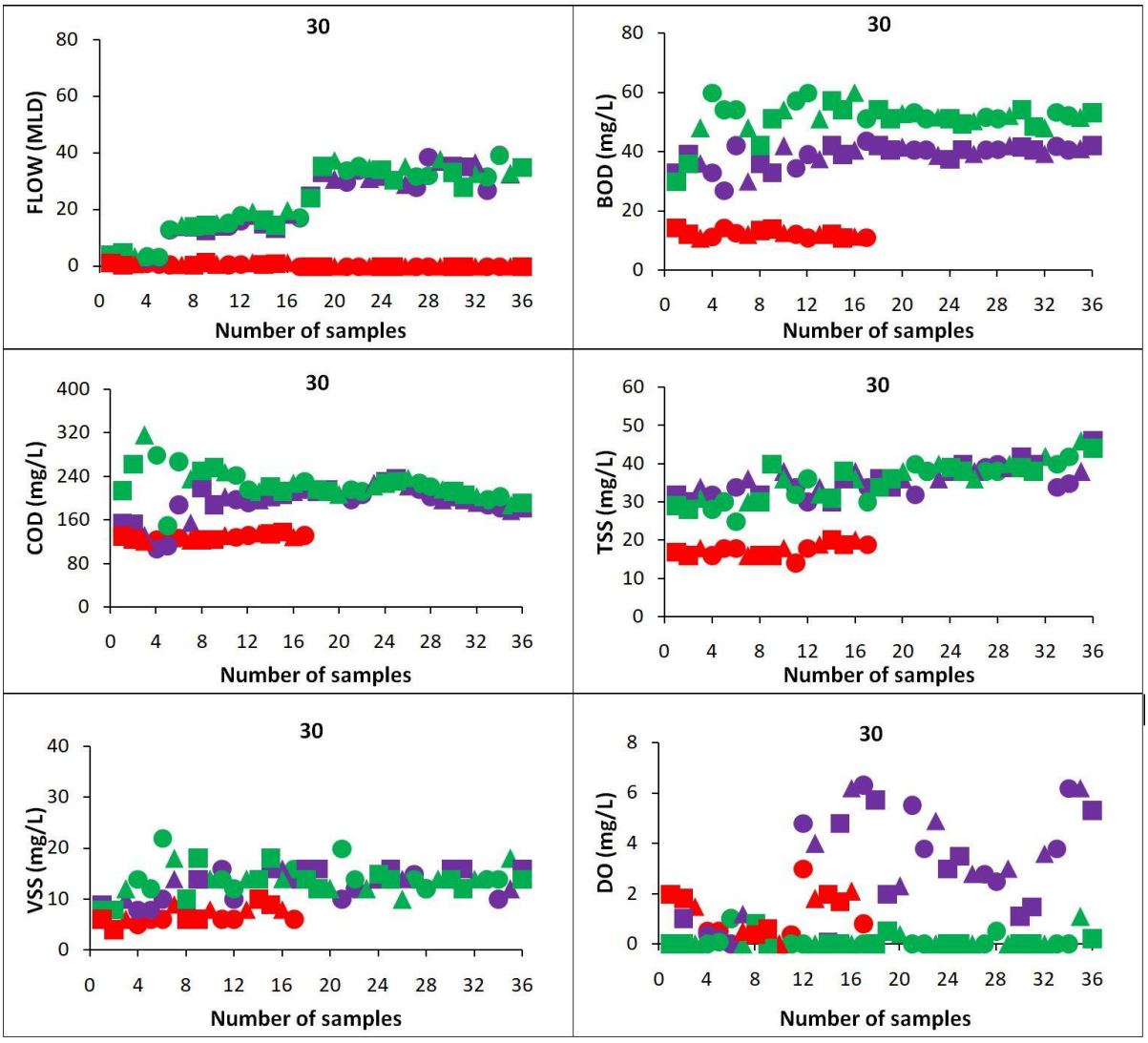

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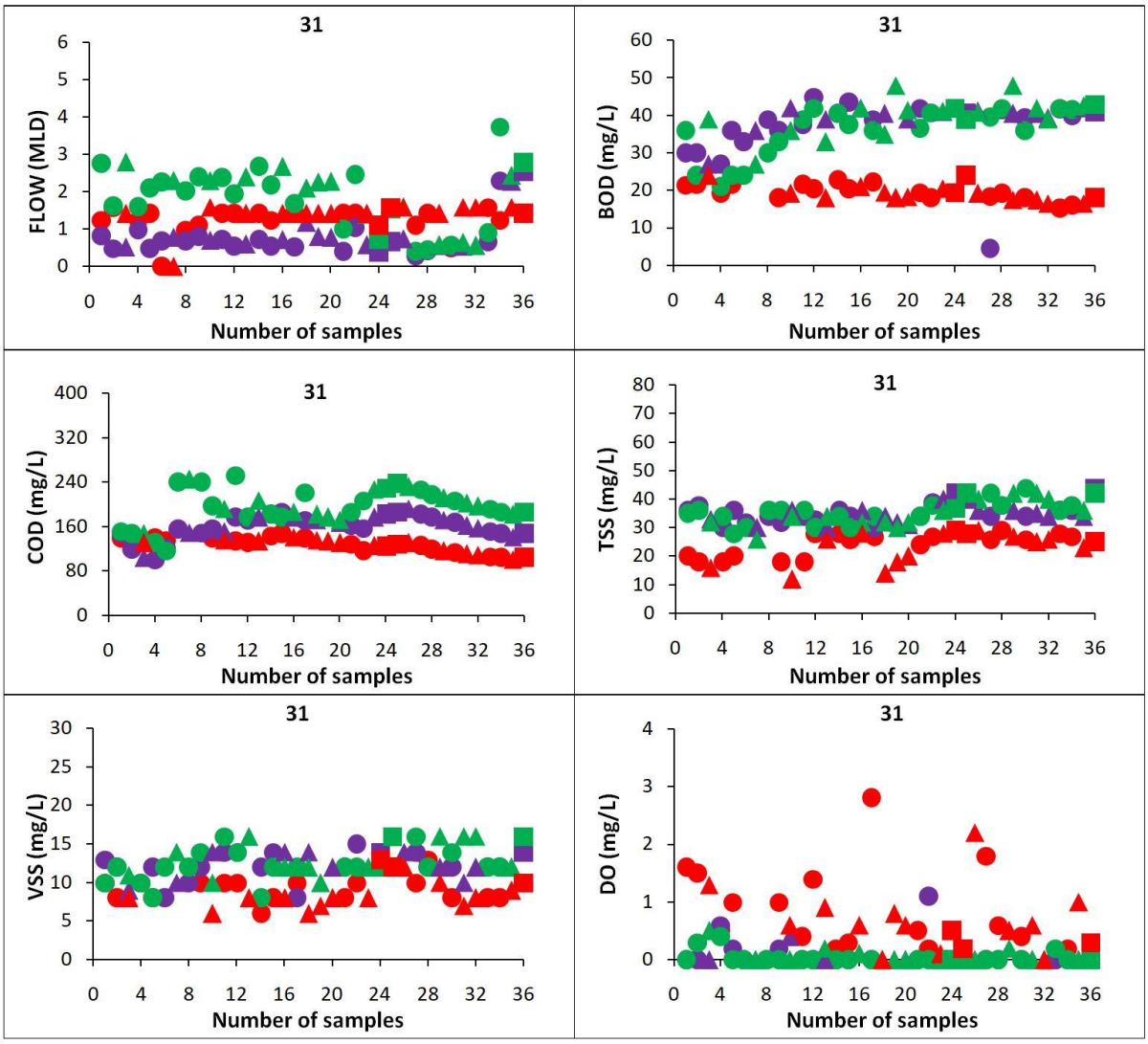

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Sampling at drains

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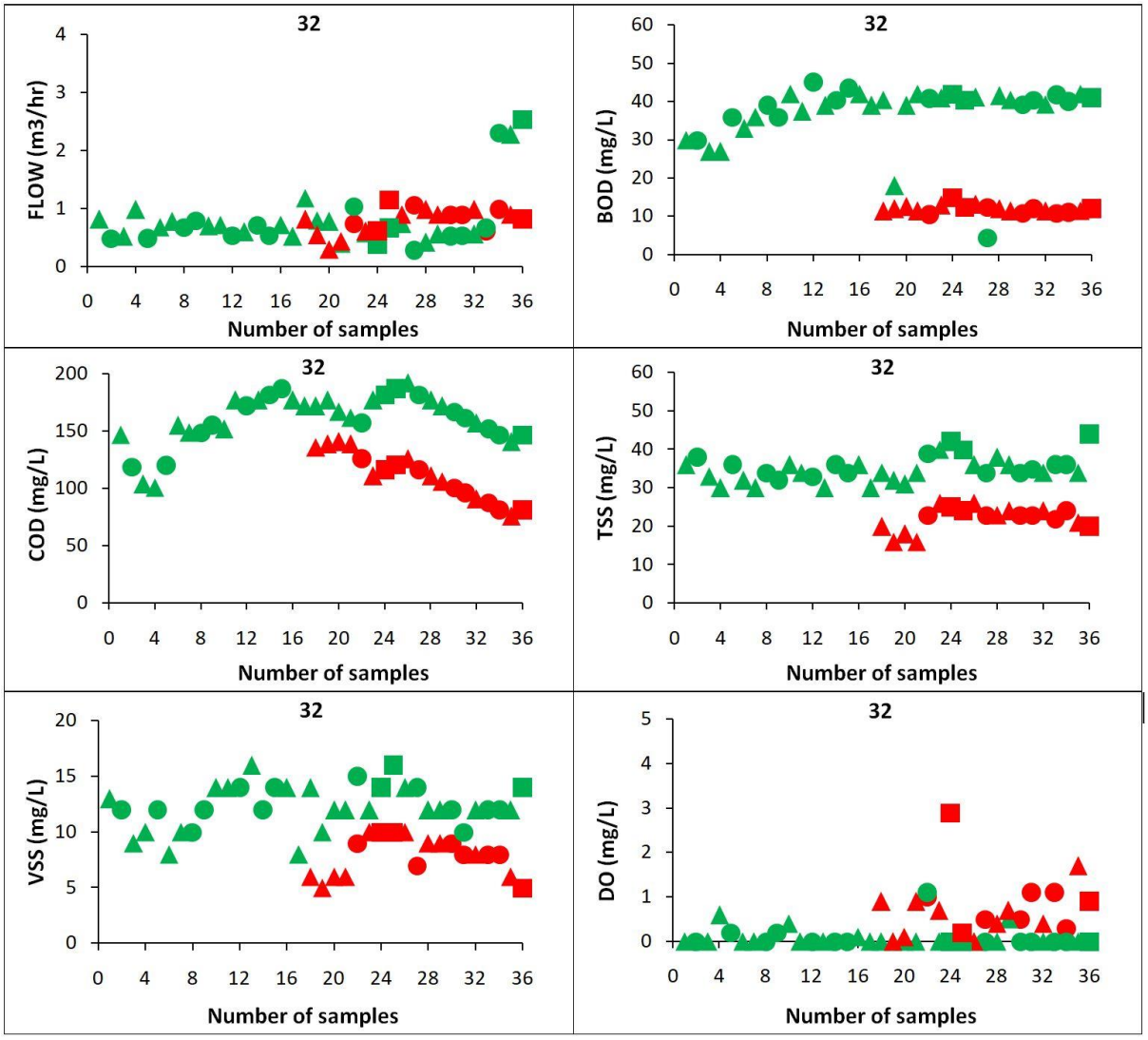

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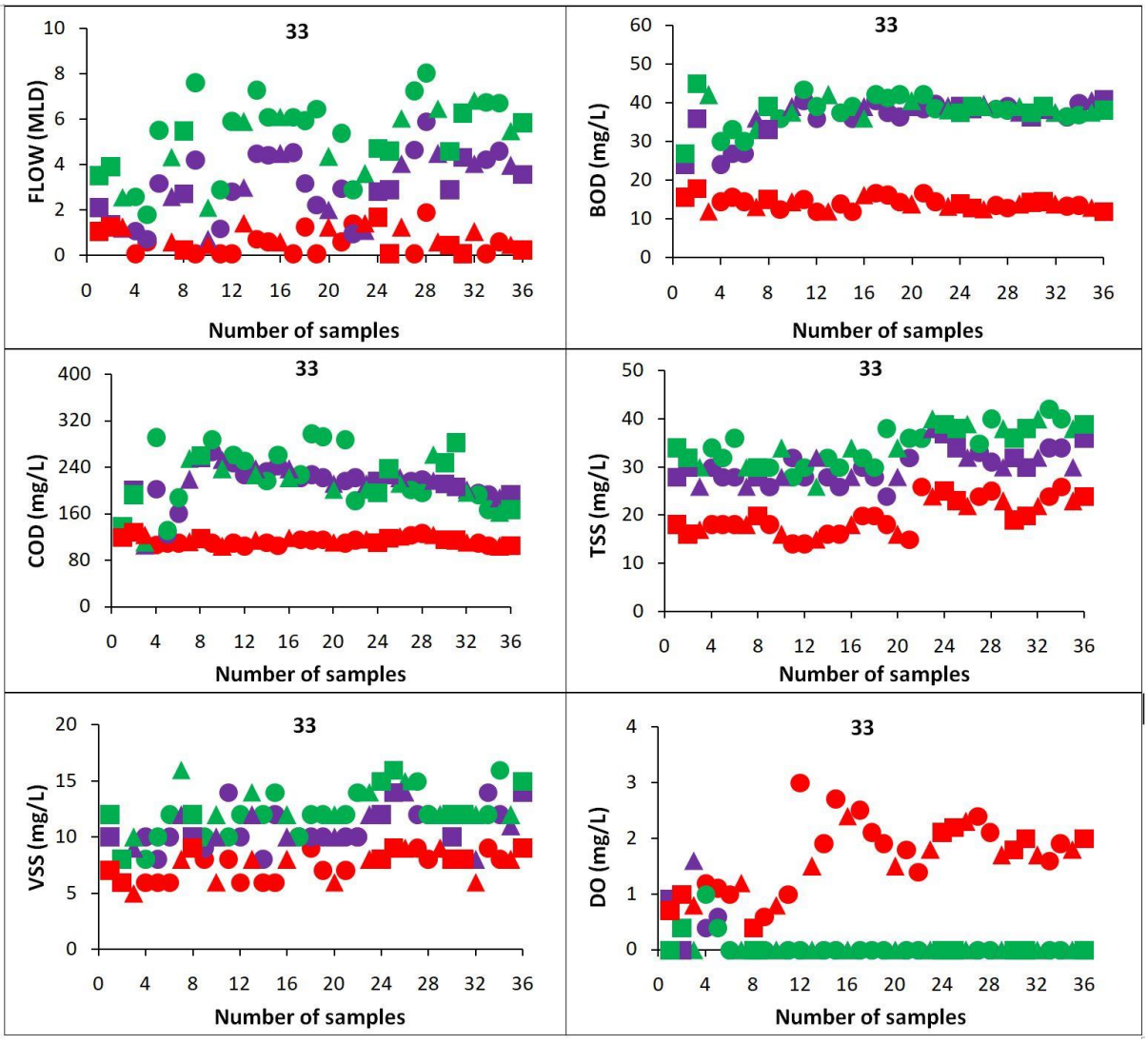

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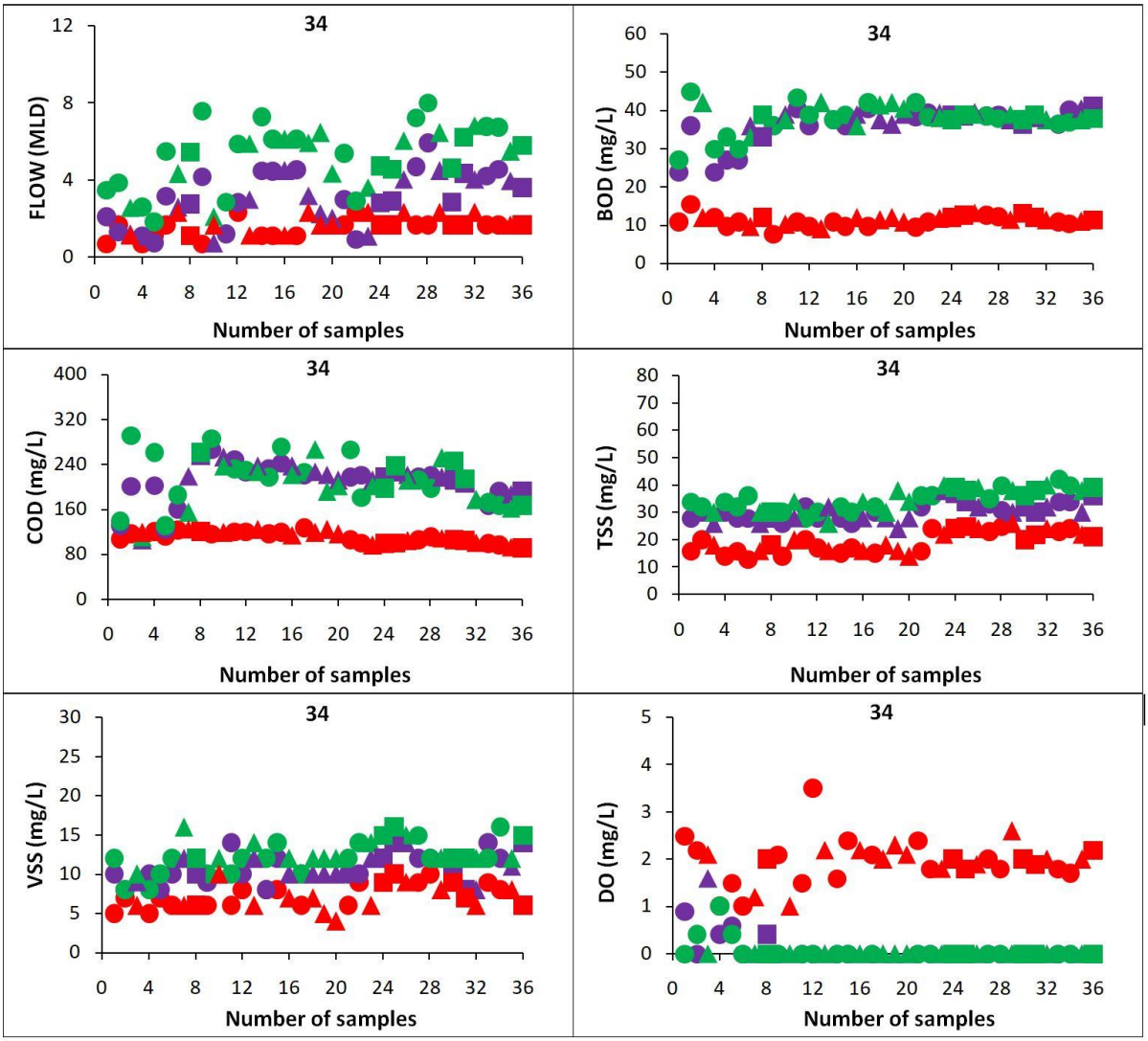

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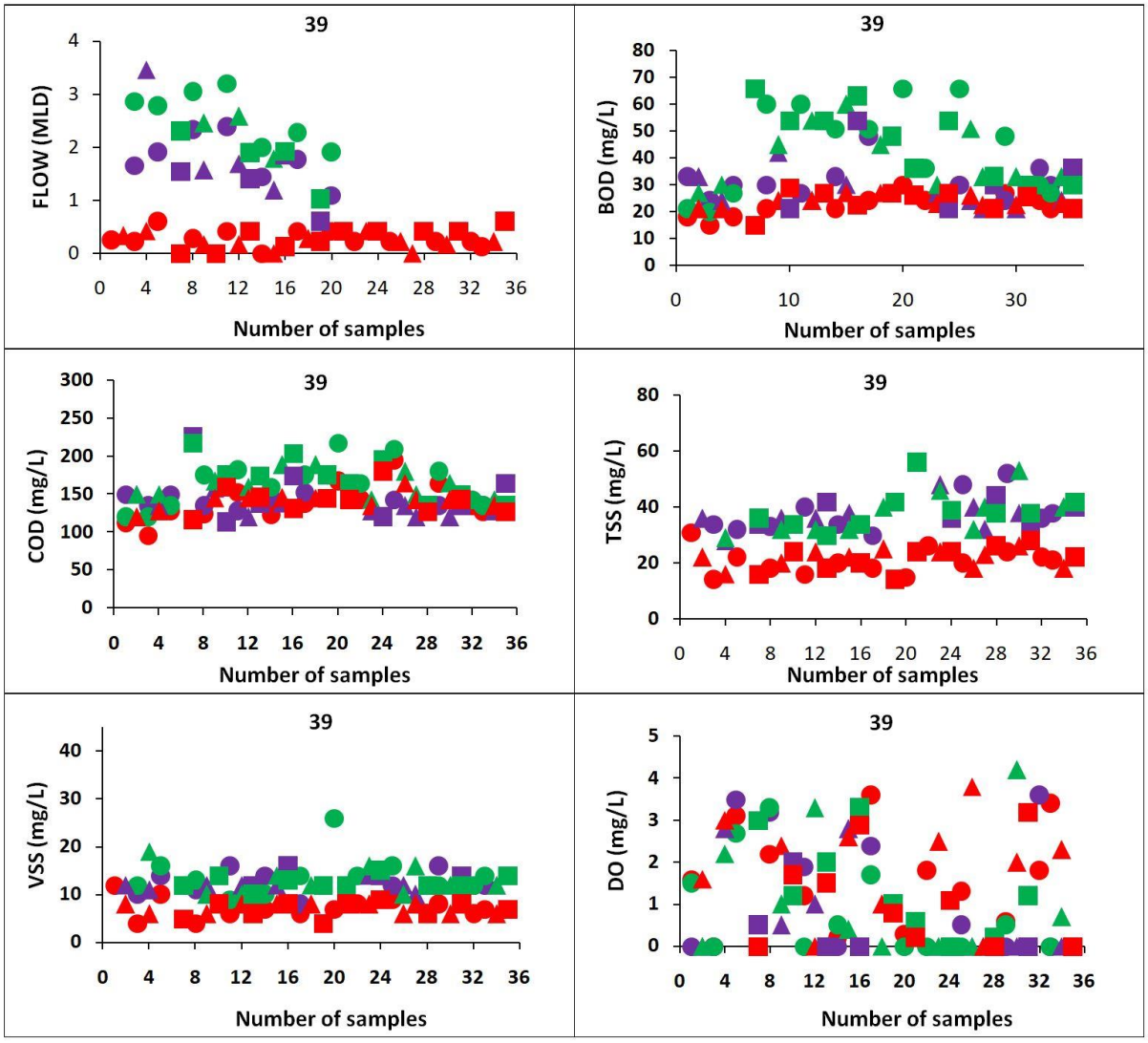

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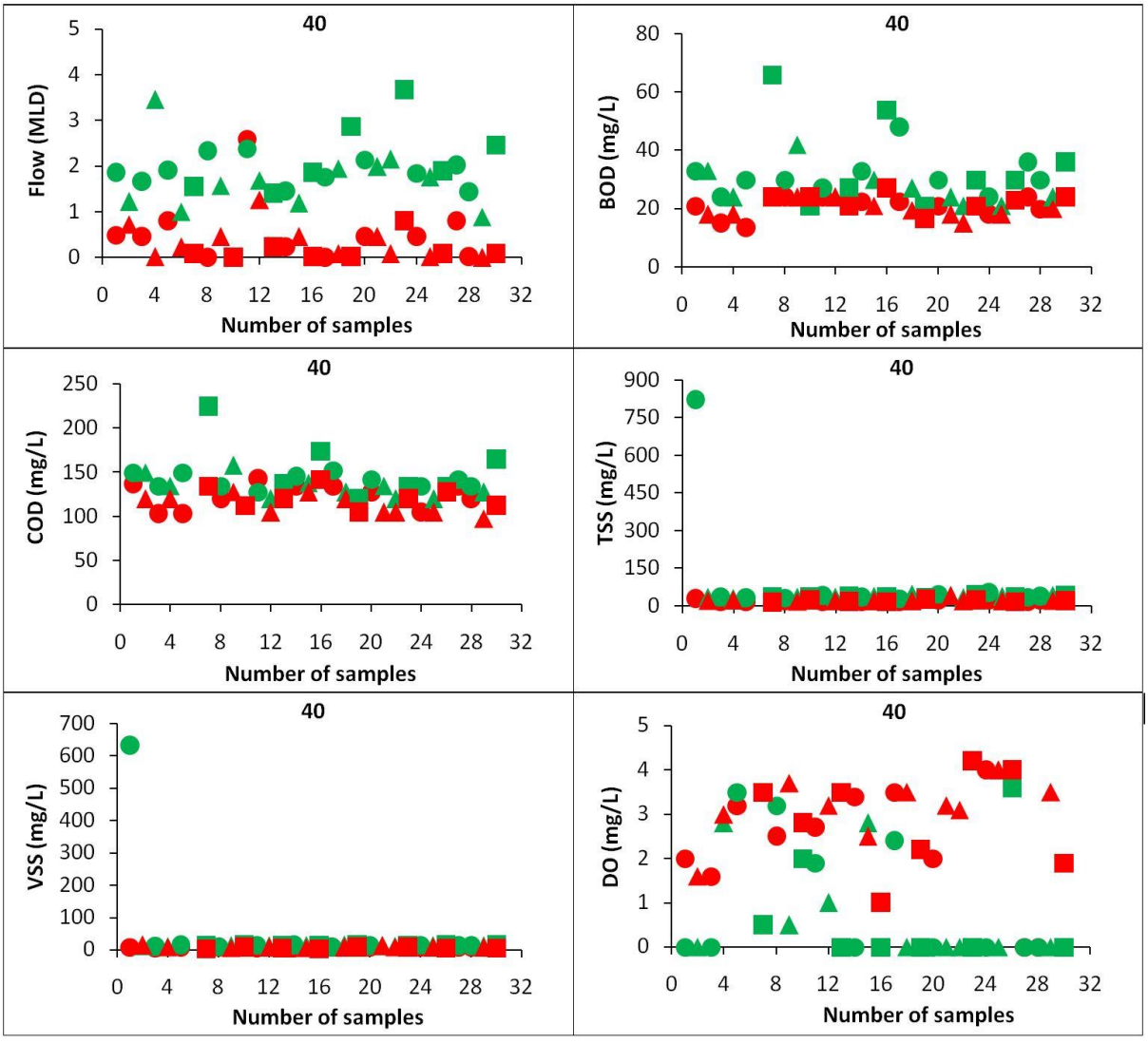

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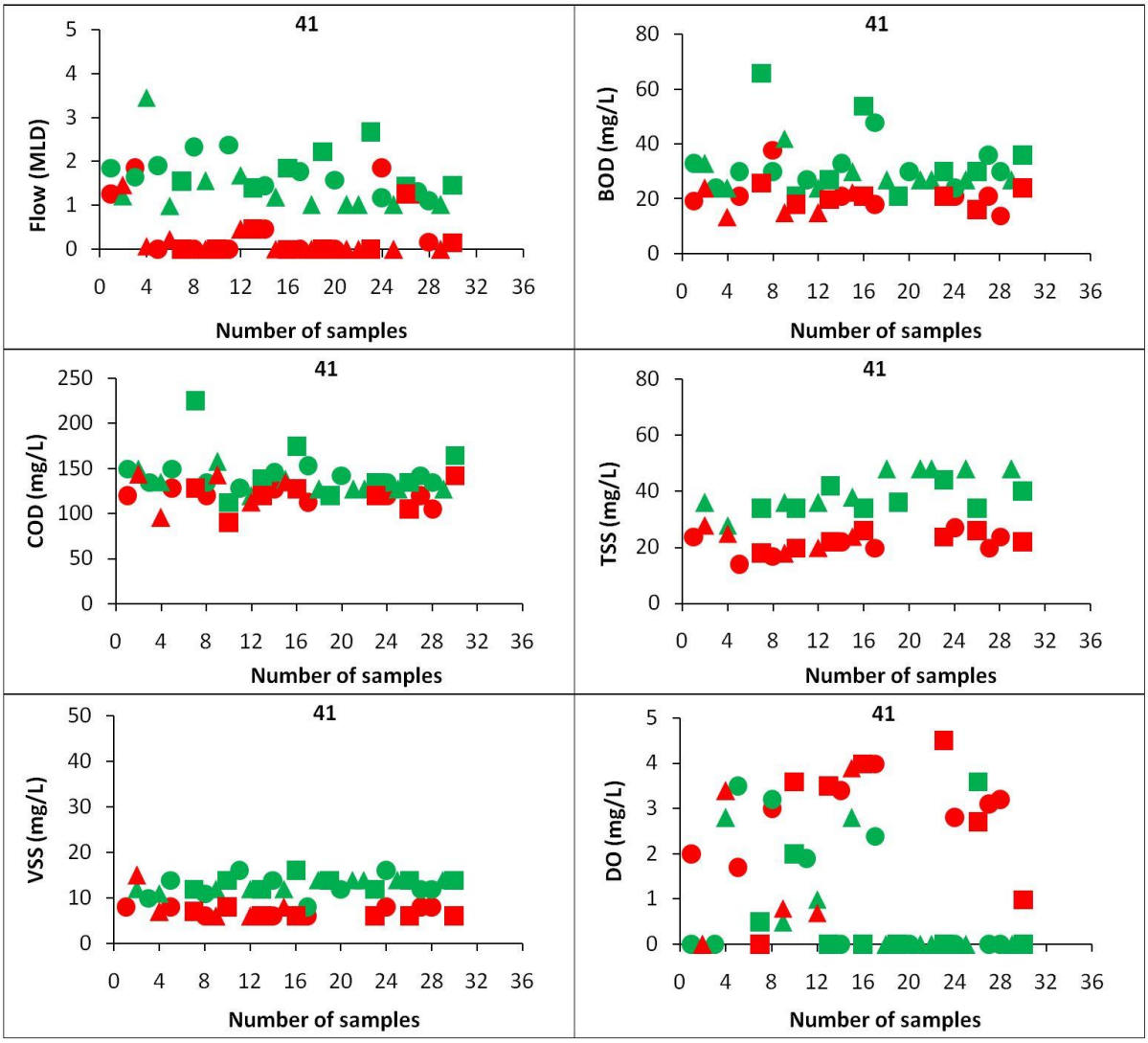

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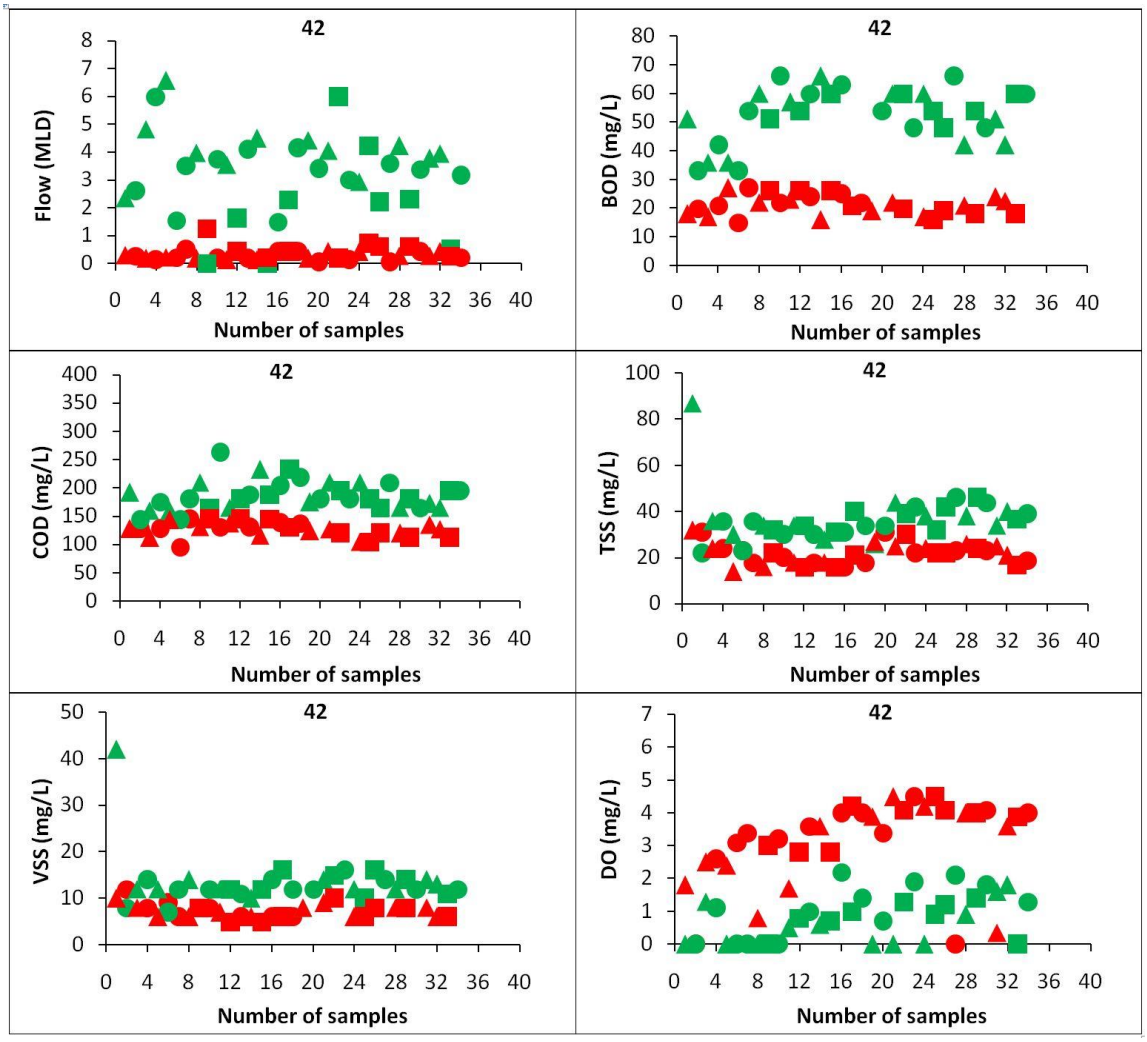

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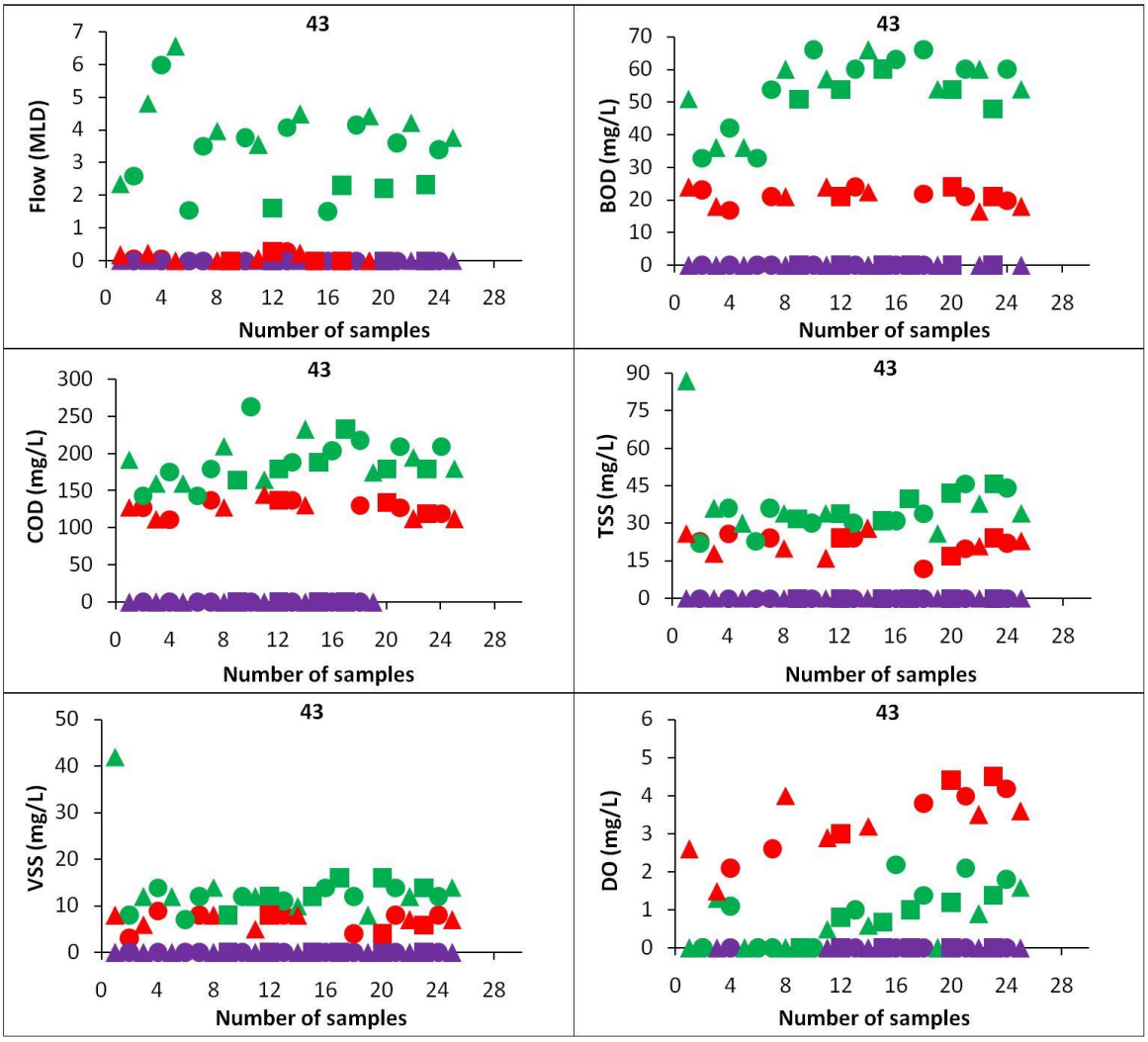

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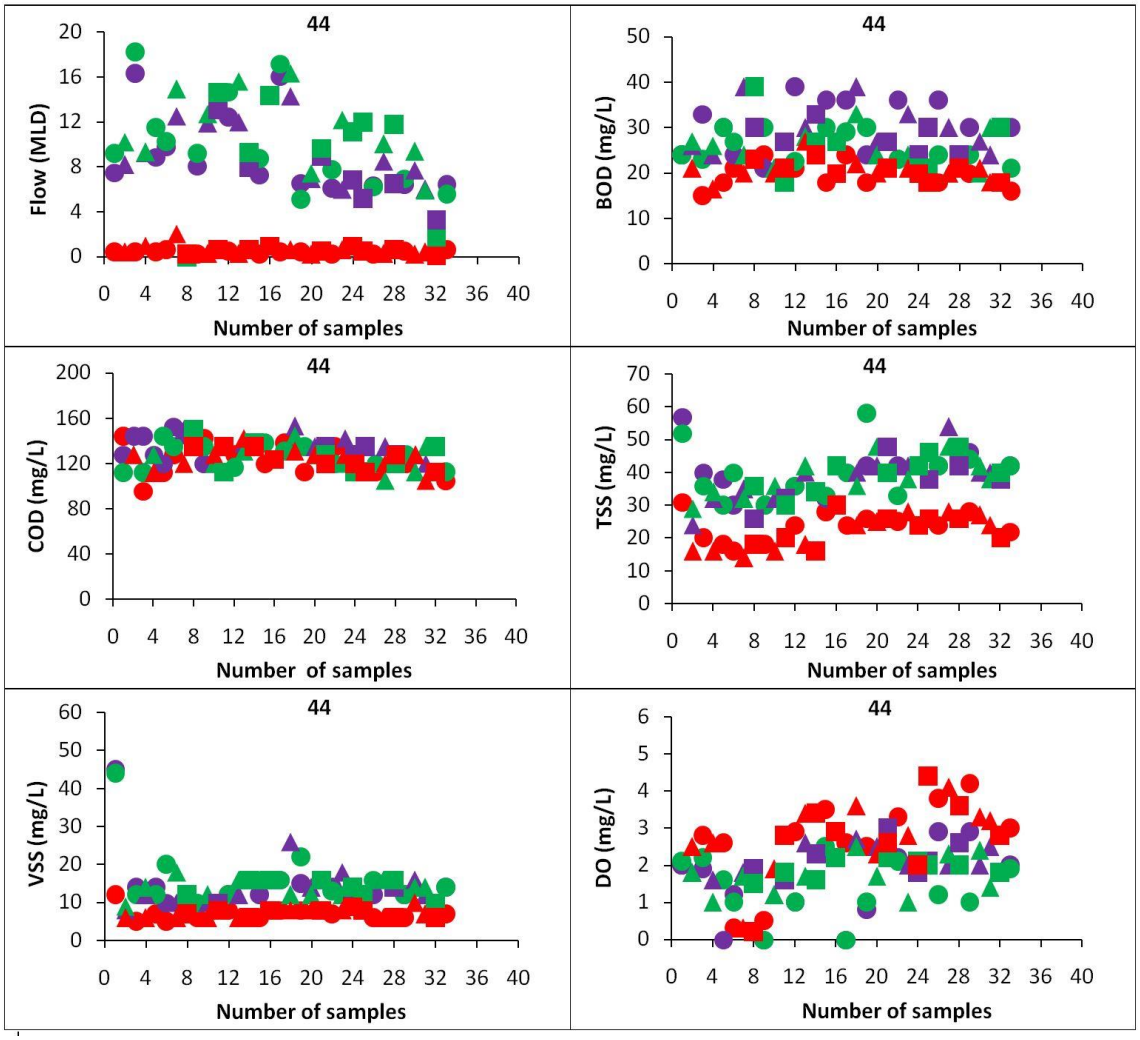

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Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
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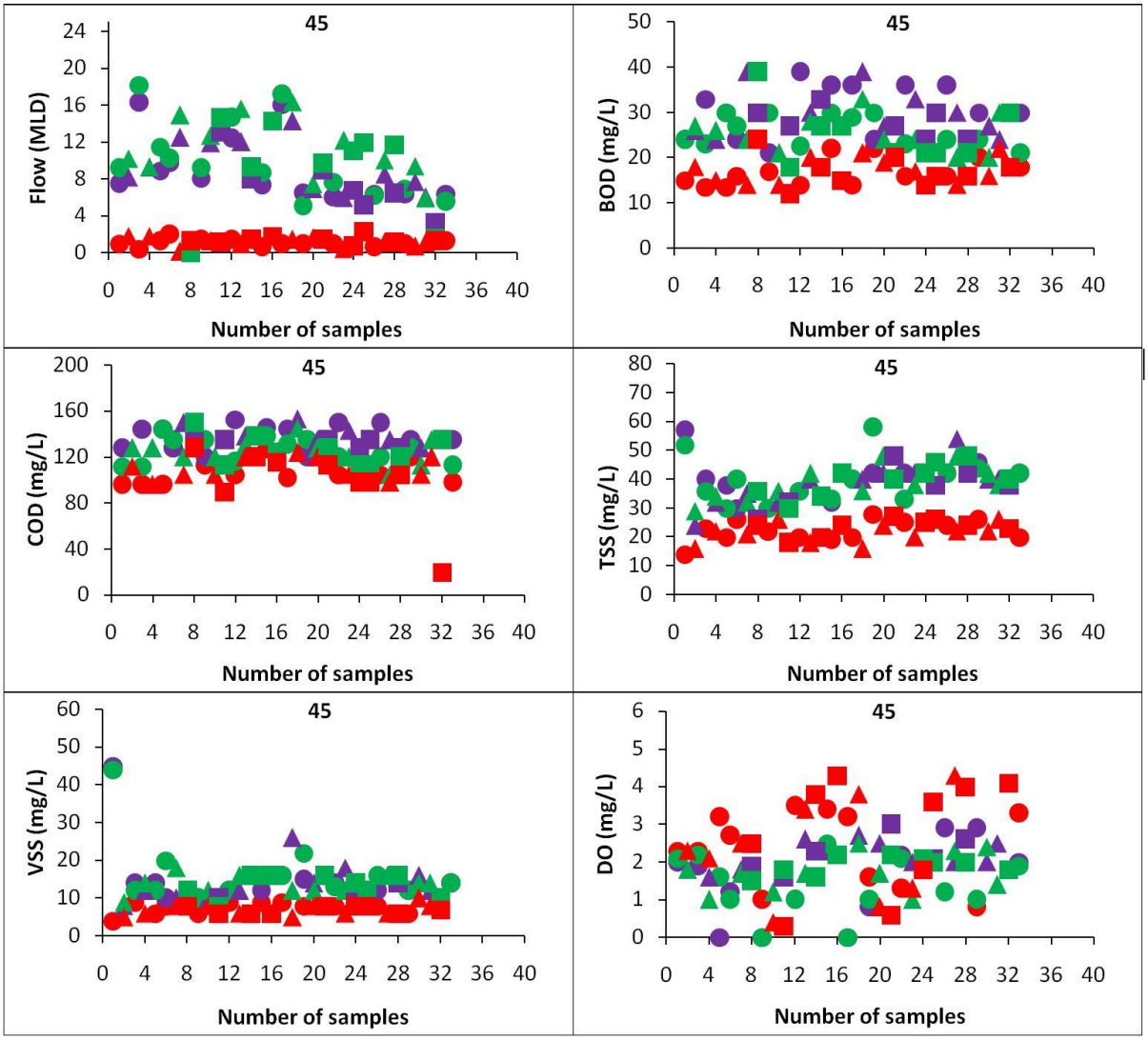

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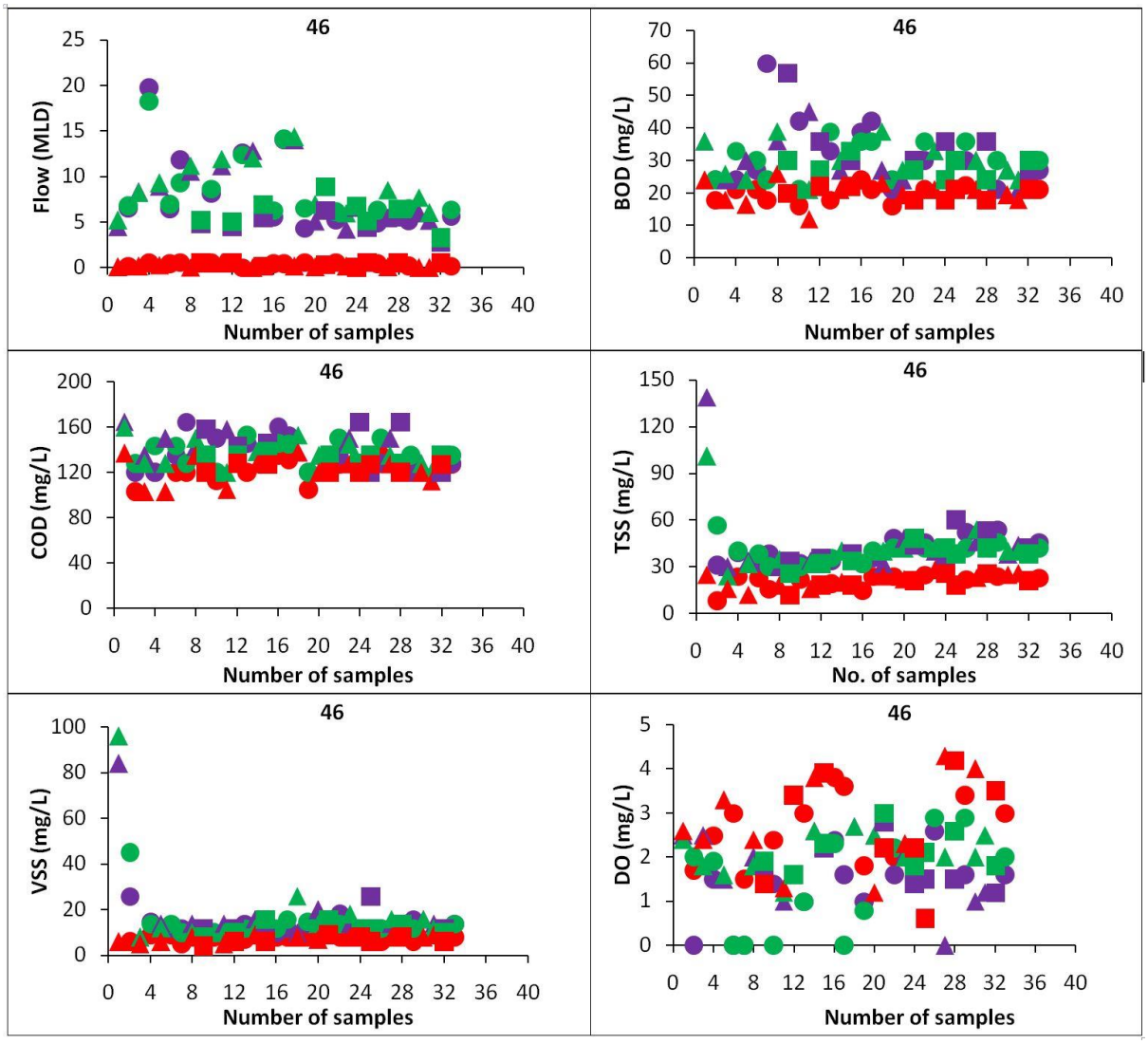

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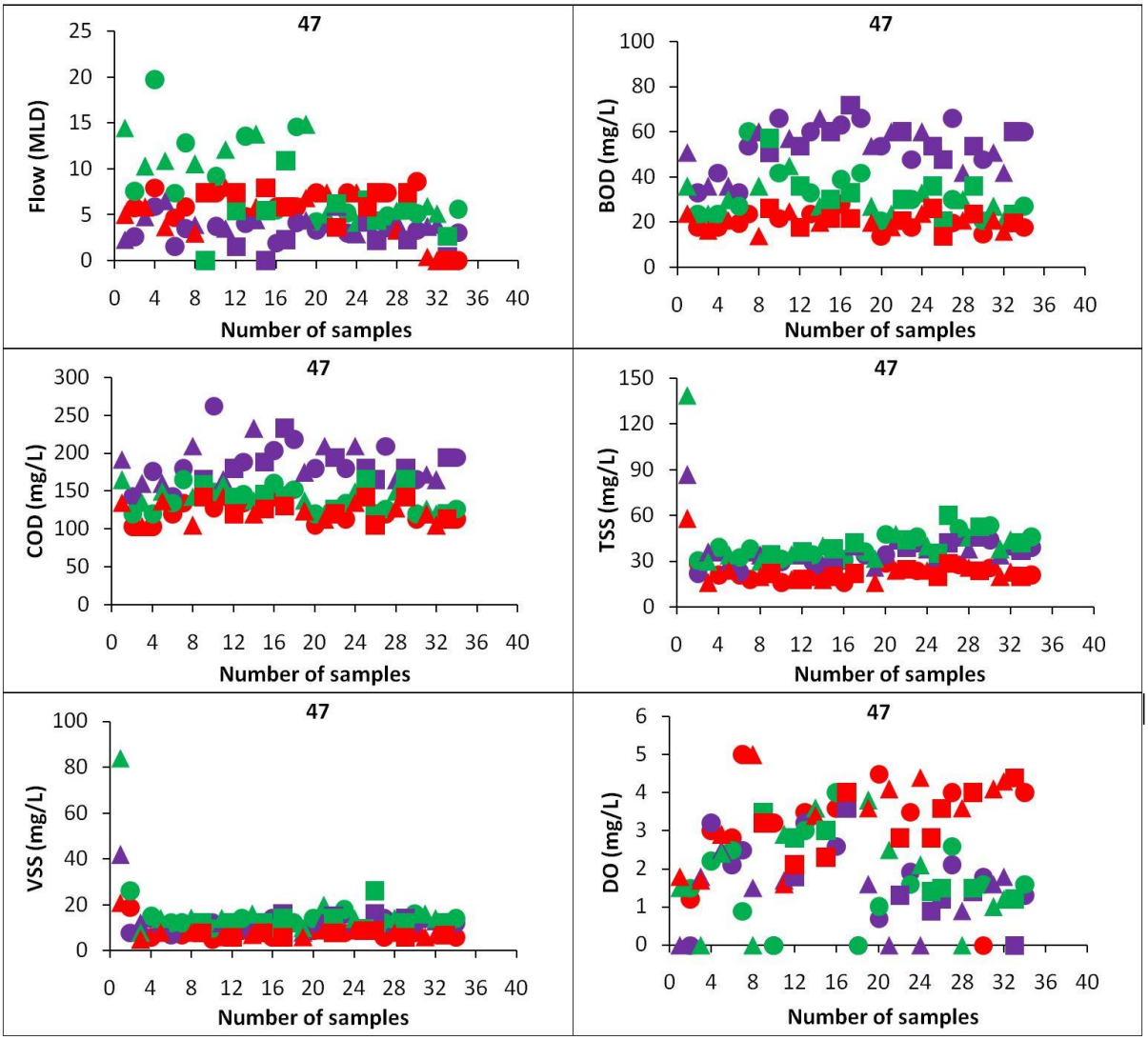

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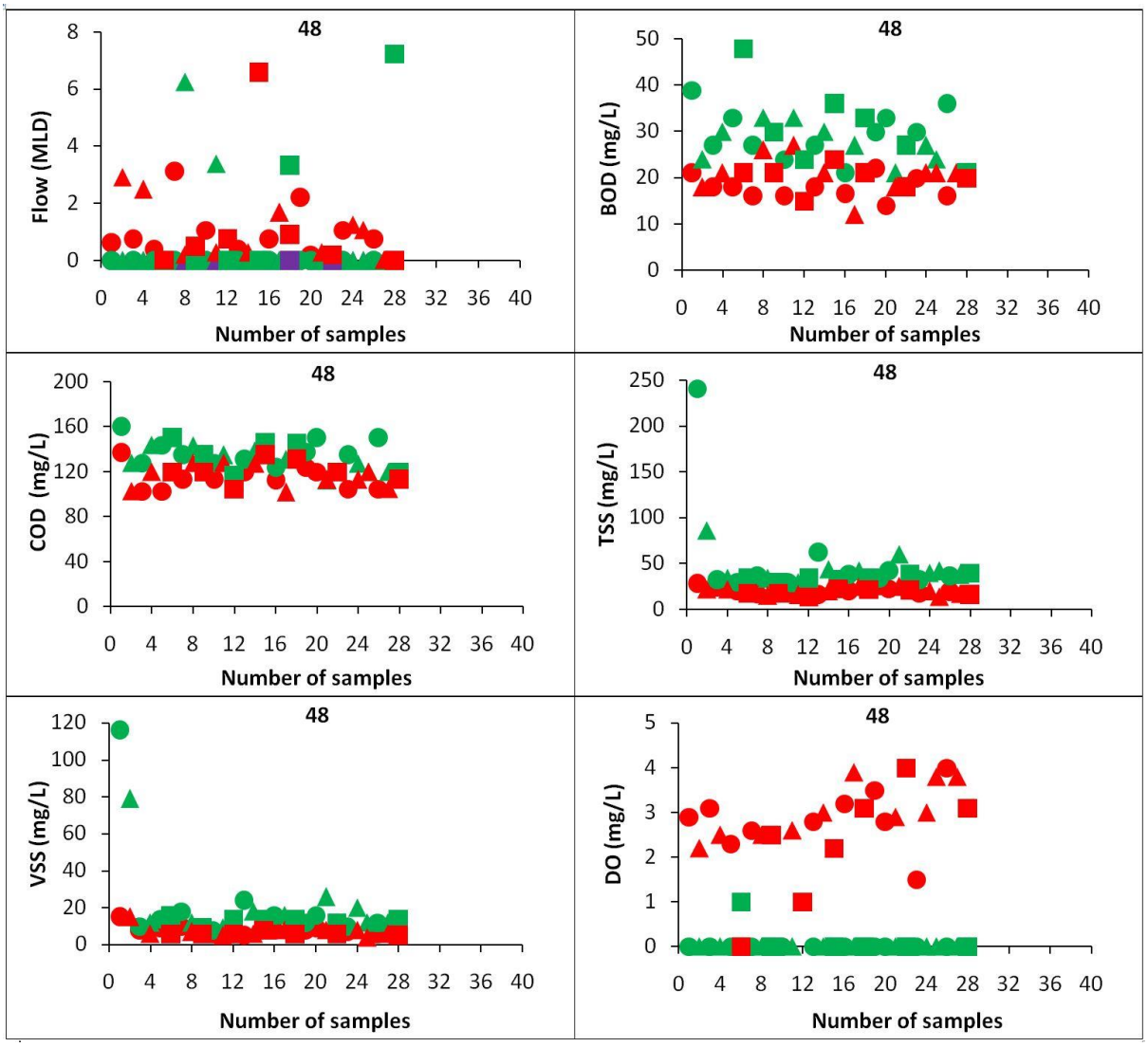

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Sampling at drains

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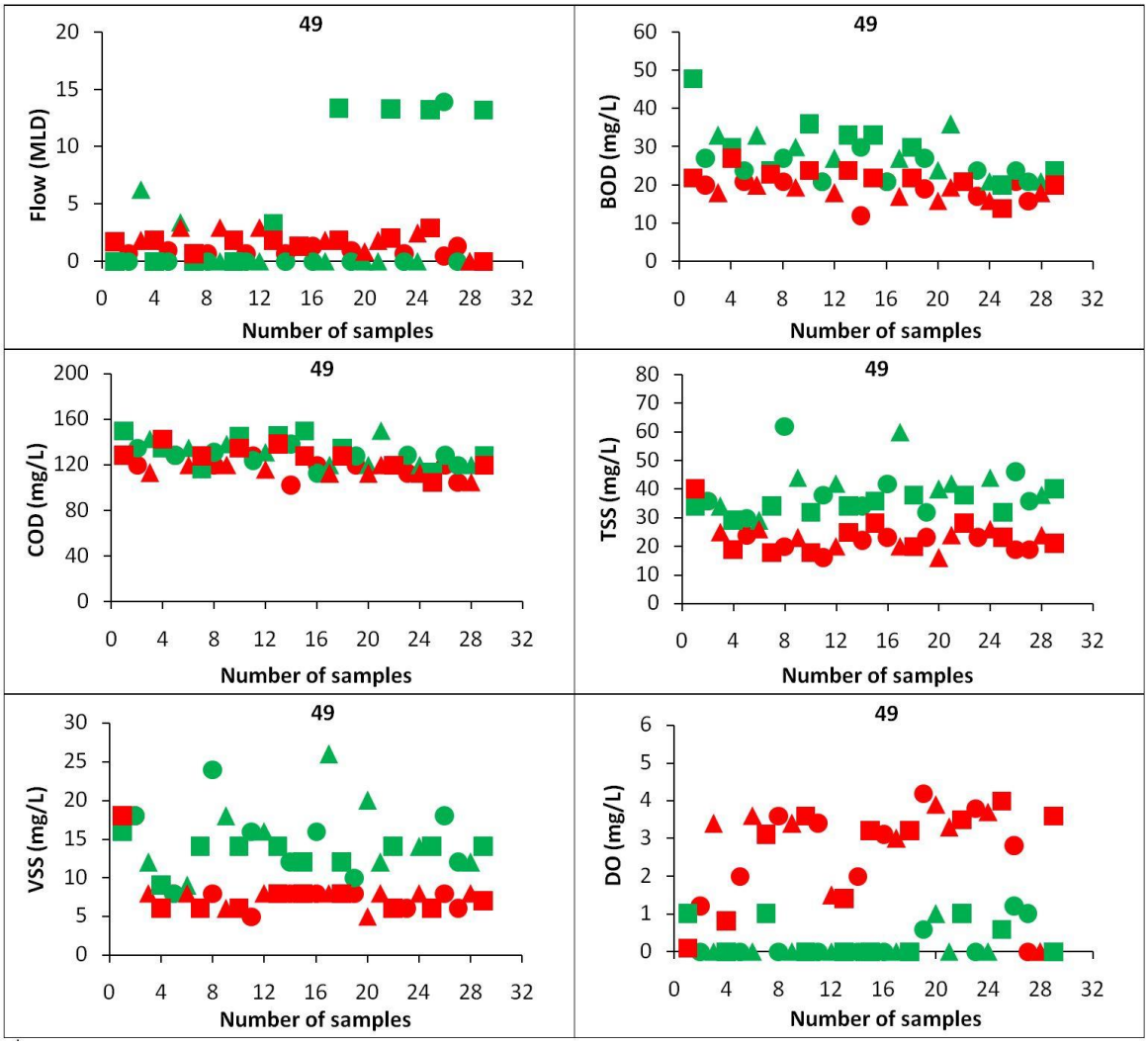

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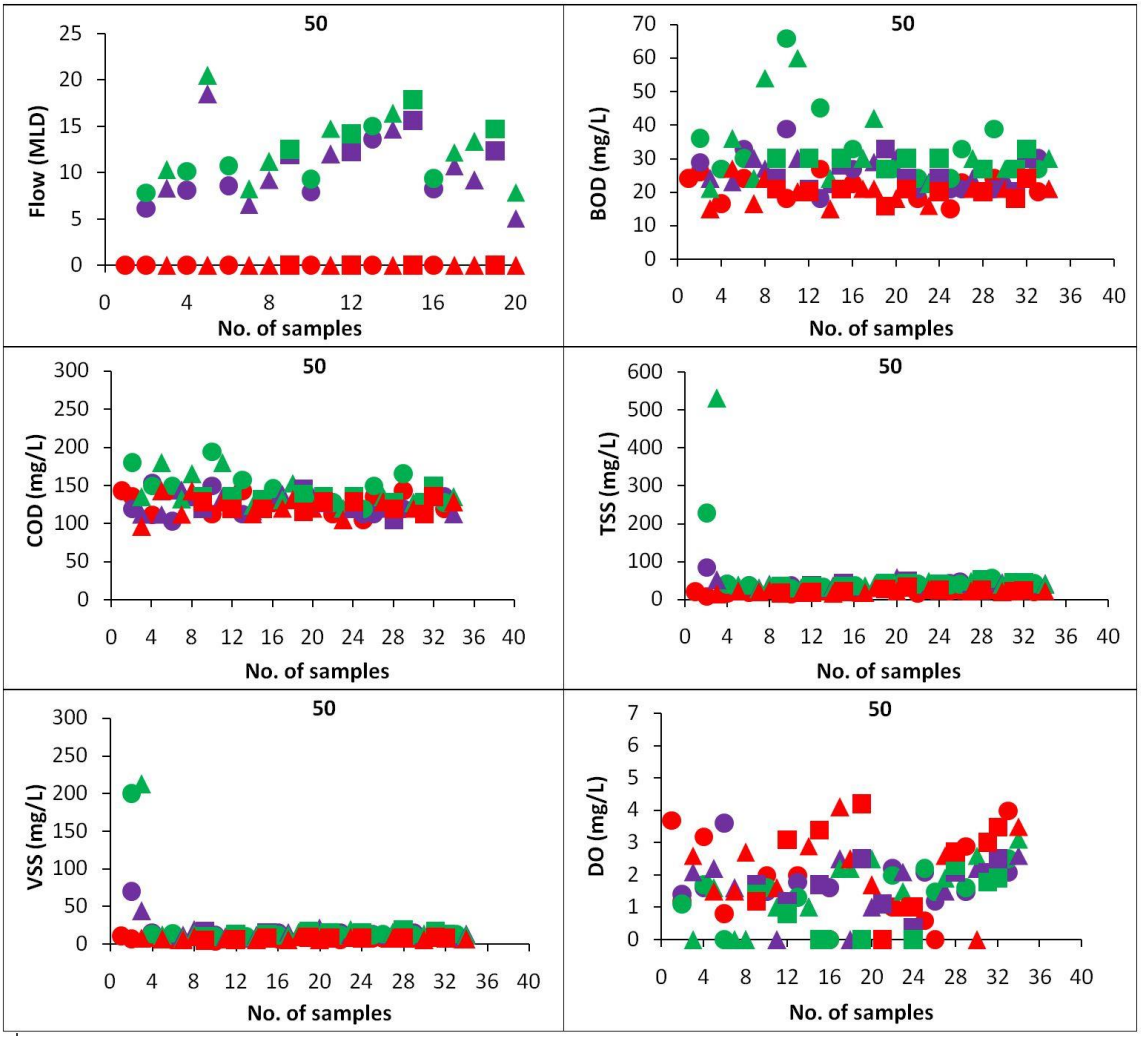

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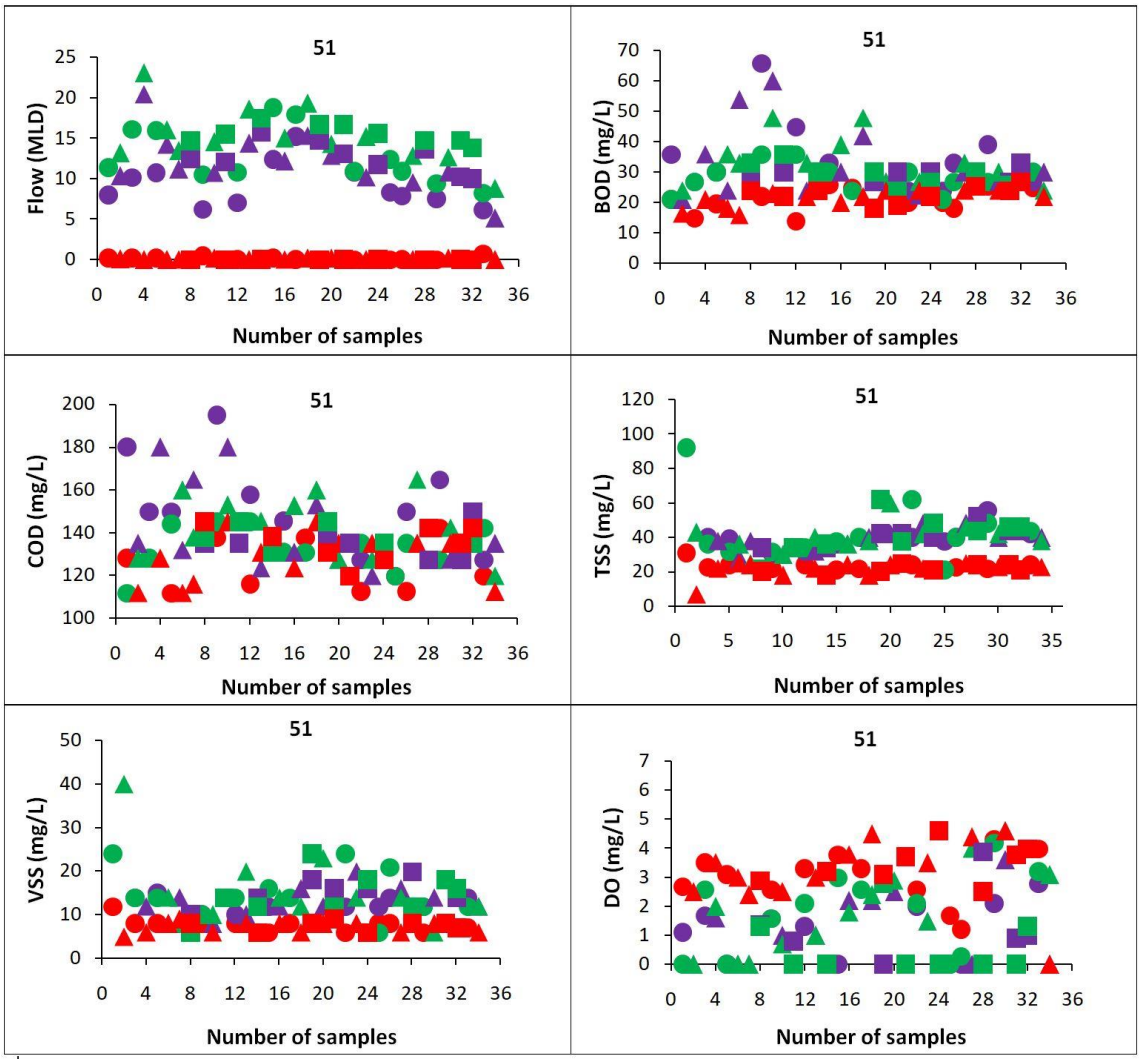

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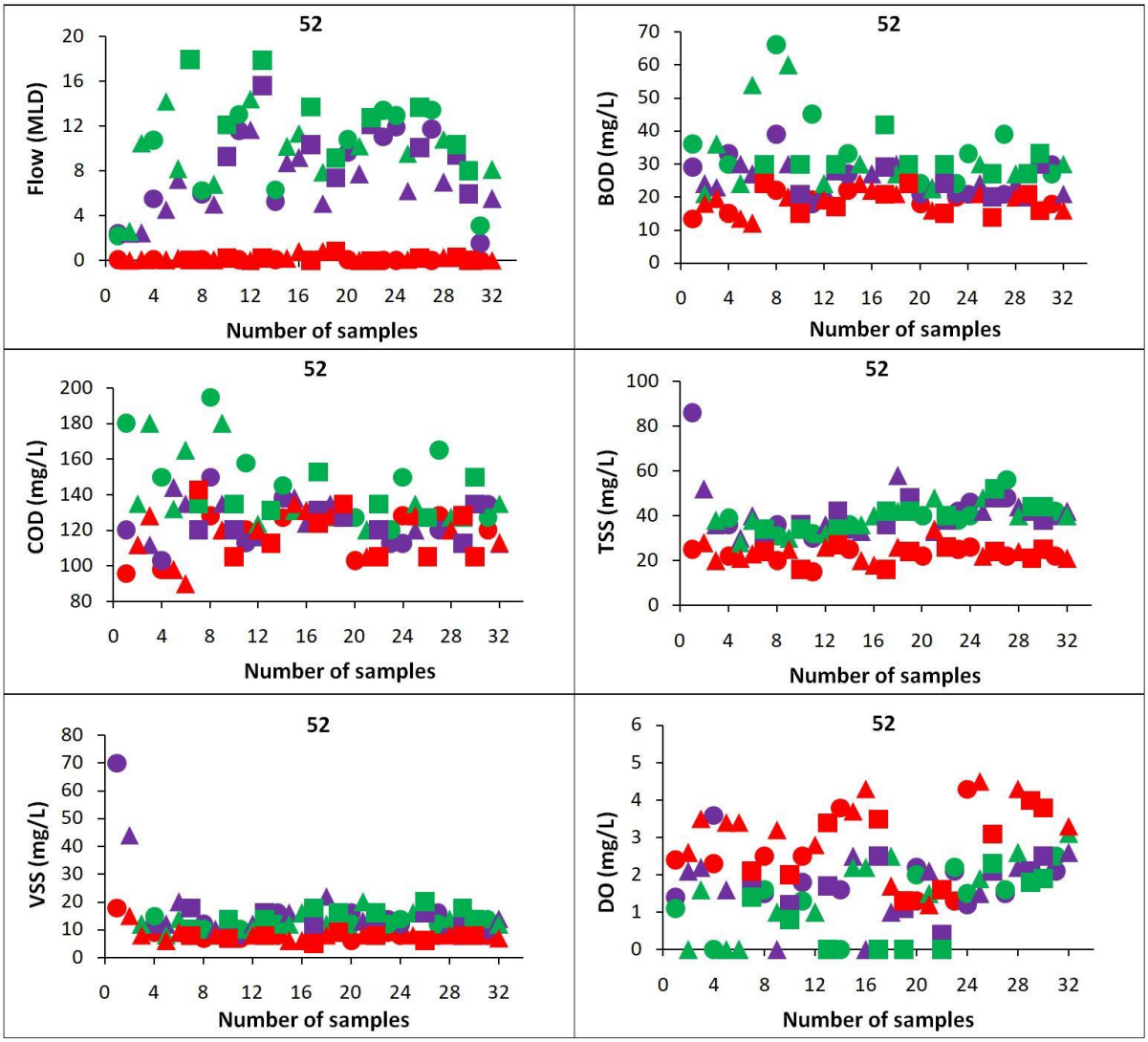

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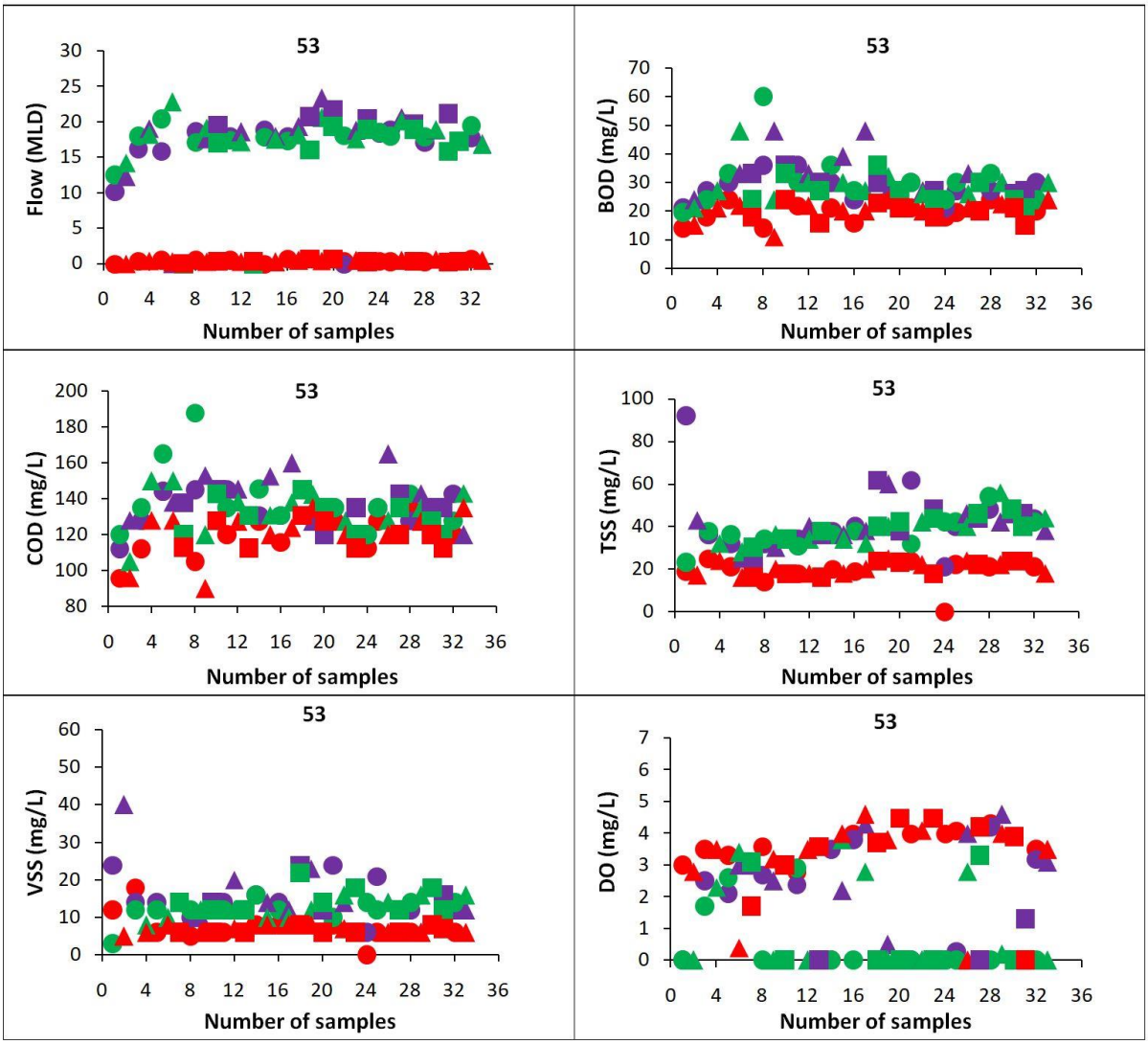

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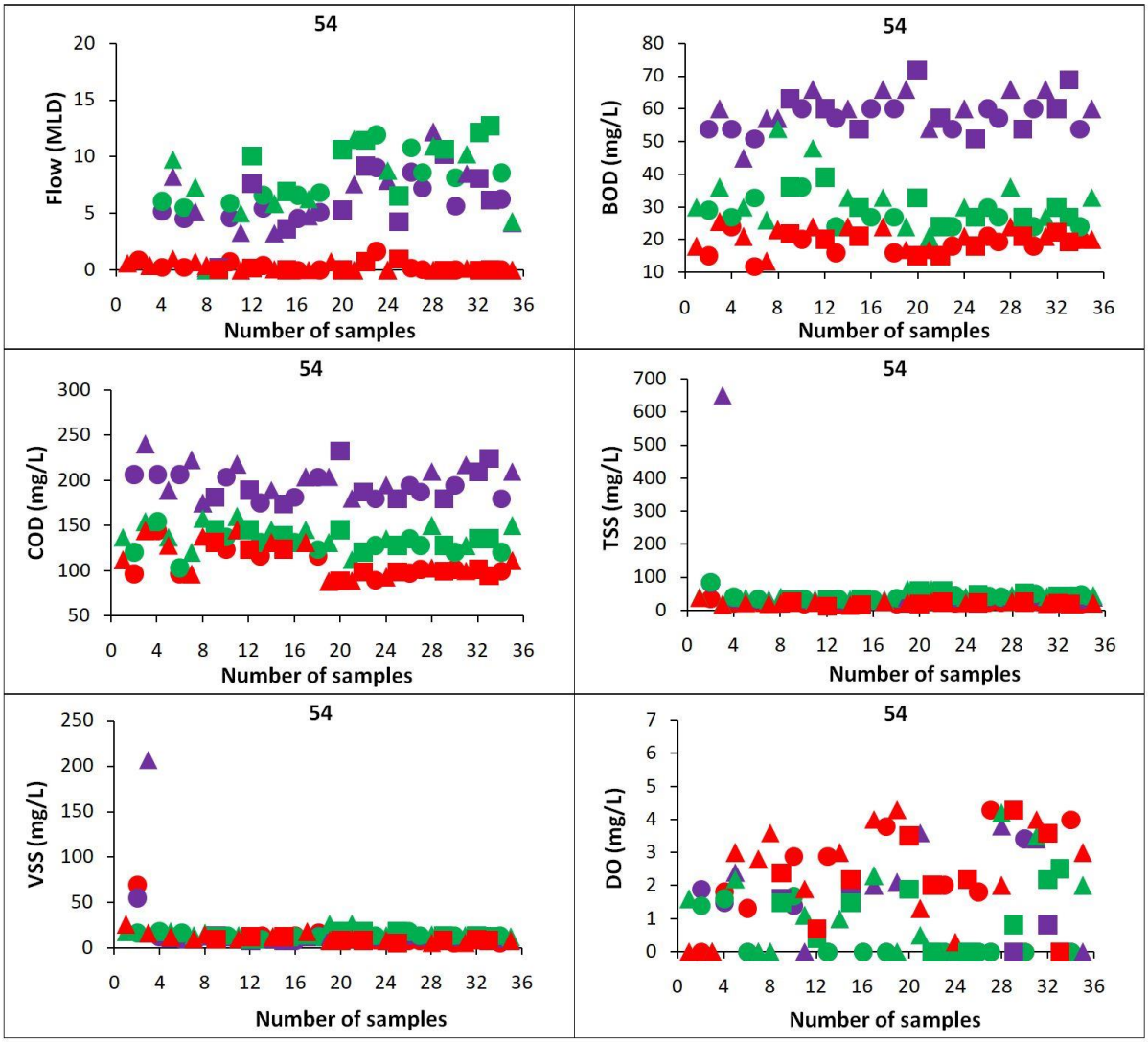

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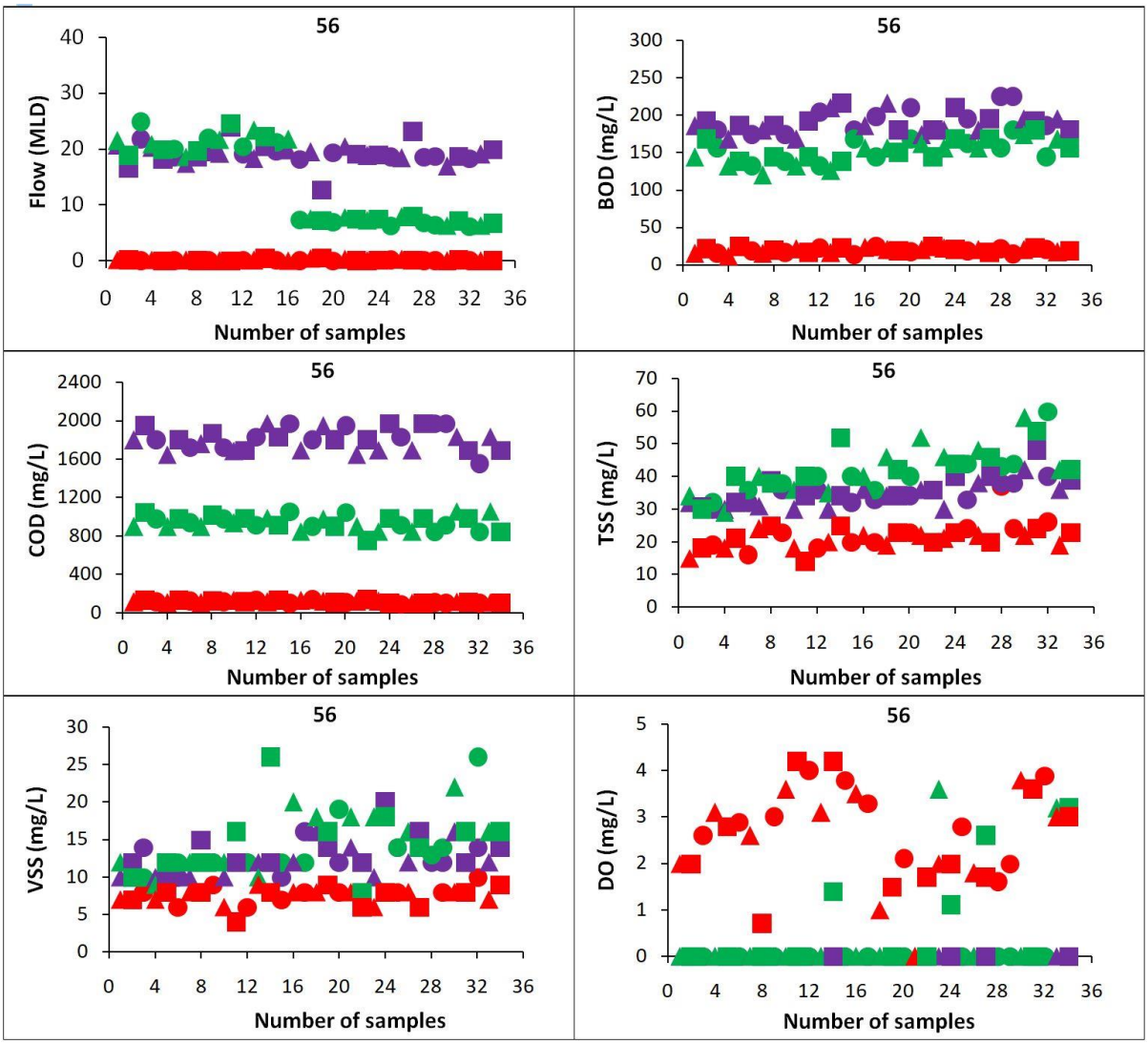

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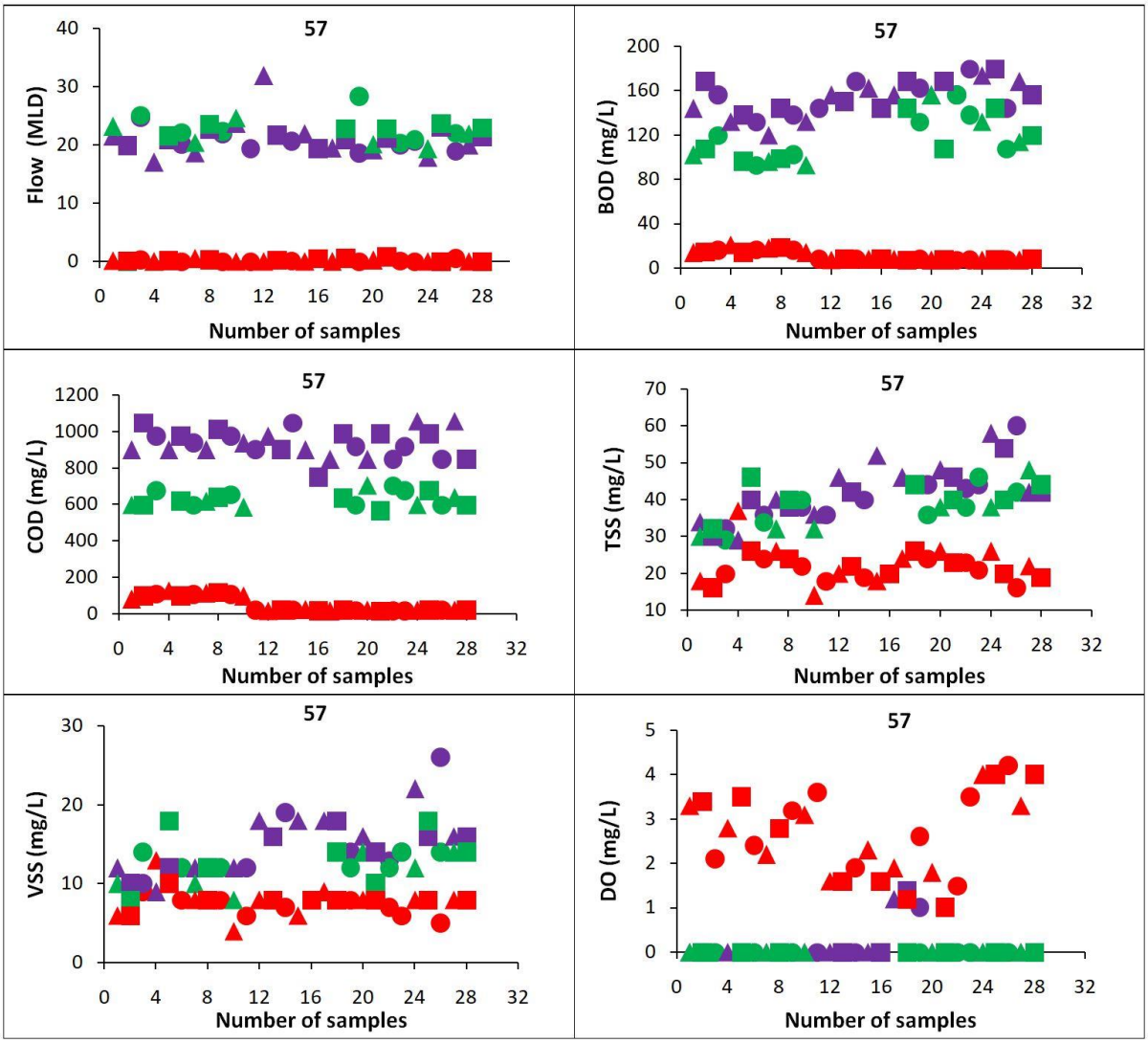

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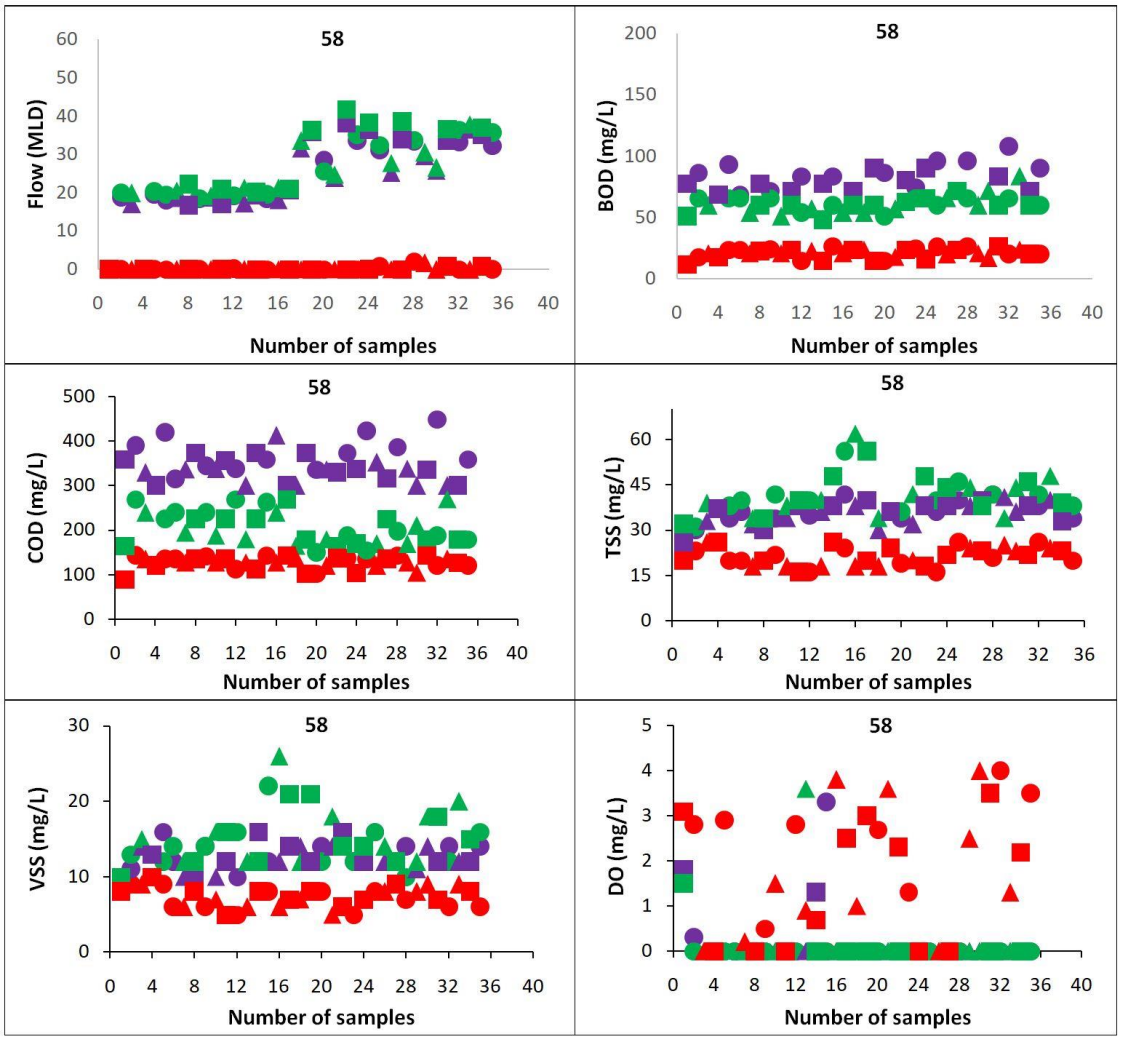

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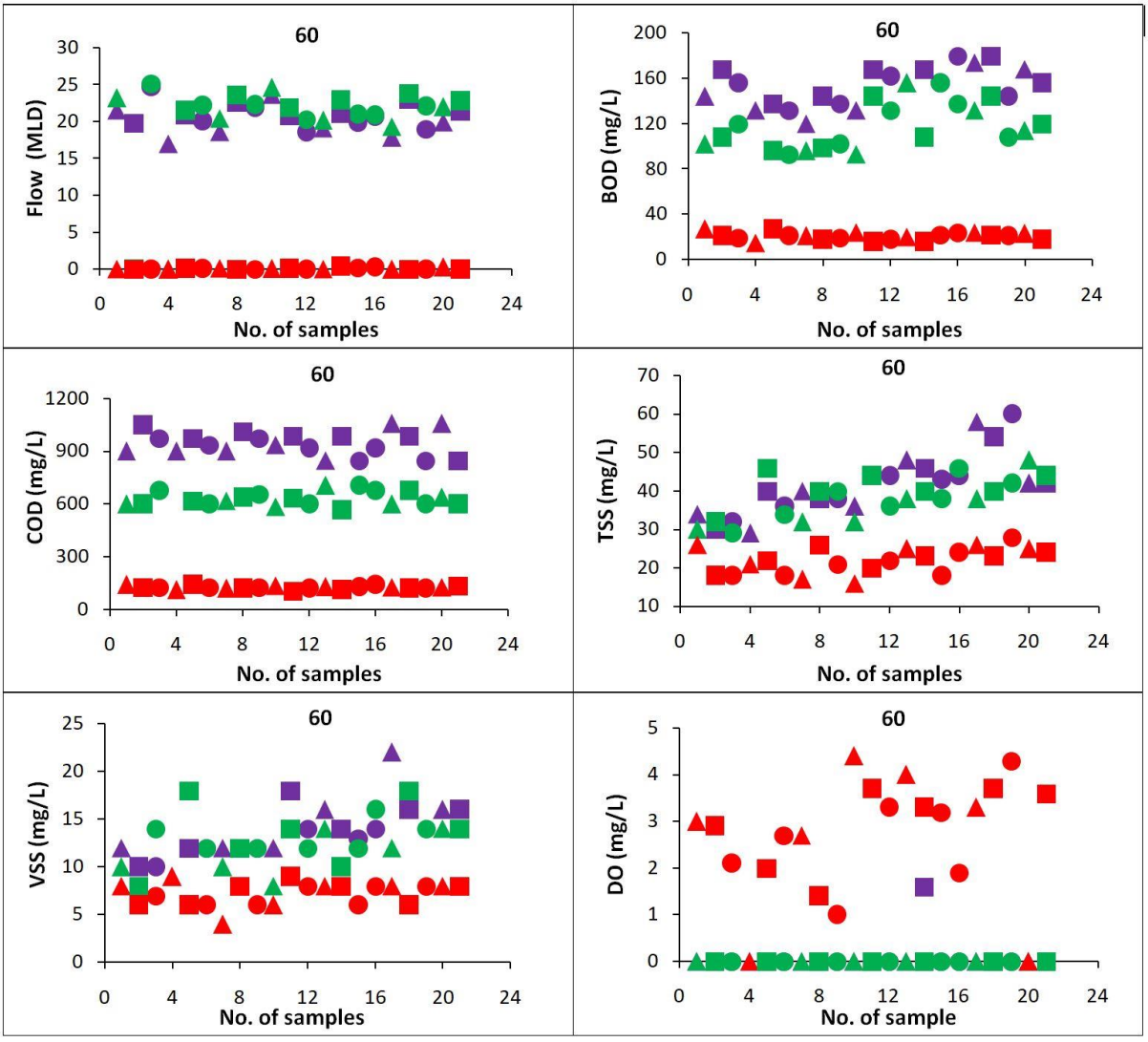
Sampling at drains

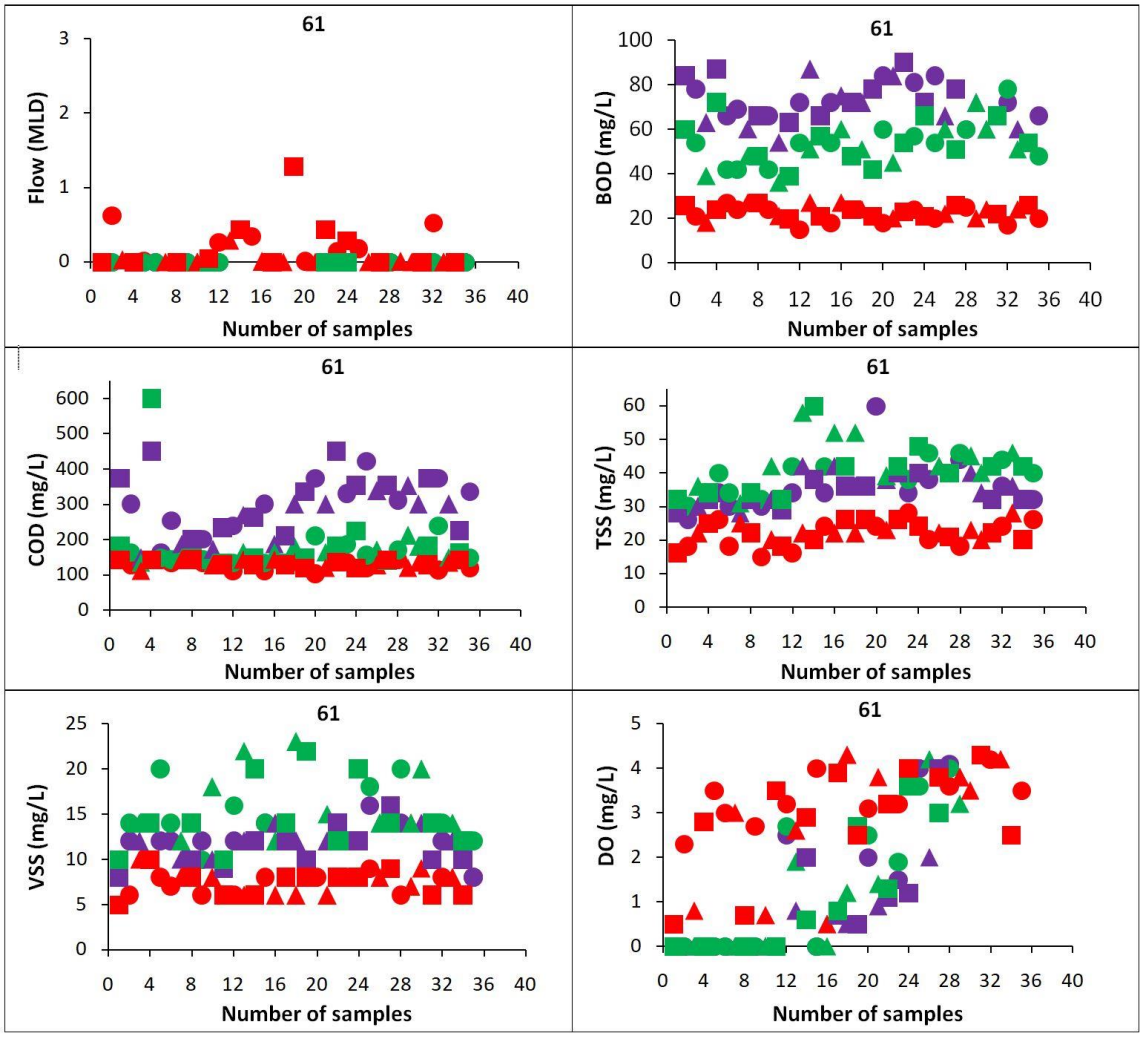
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

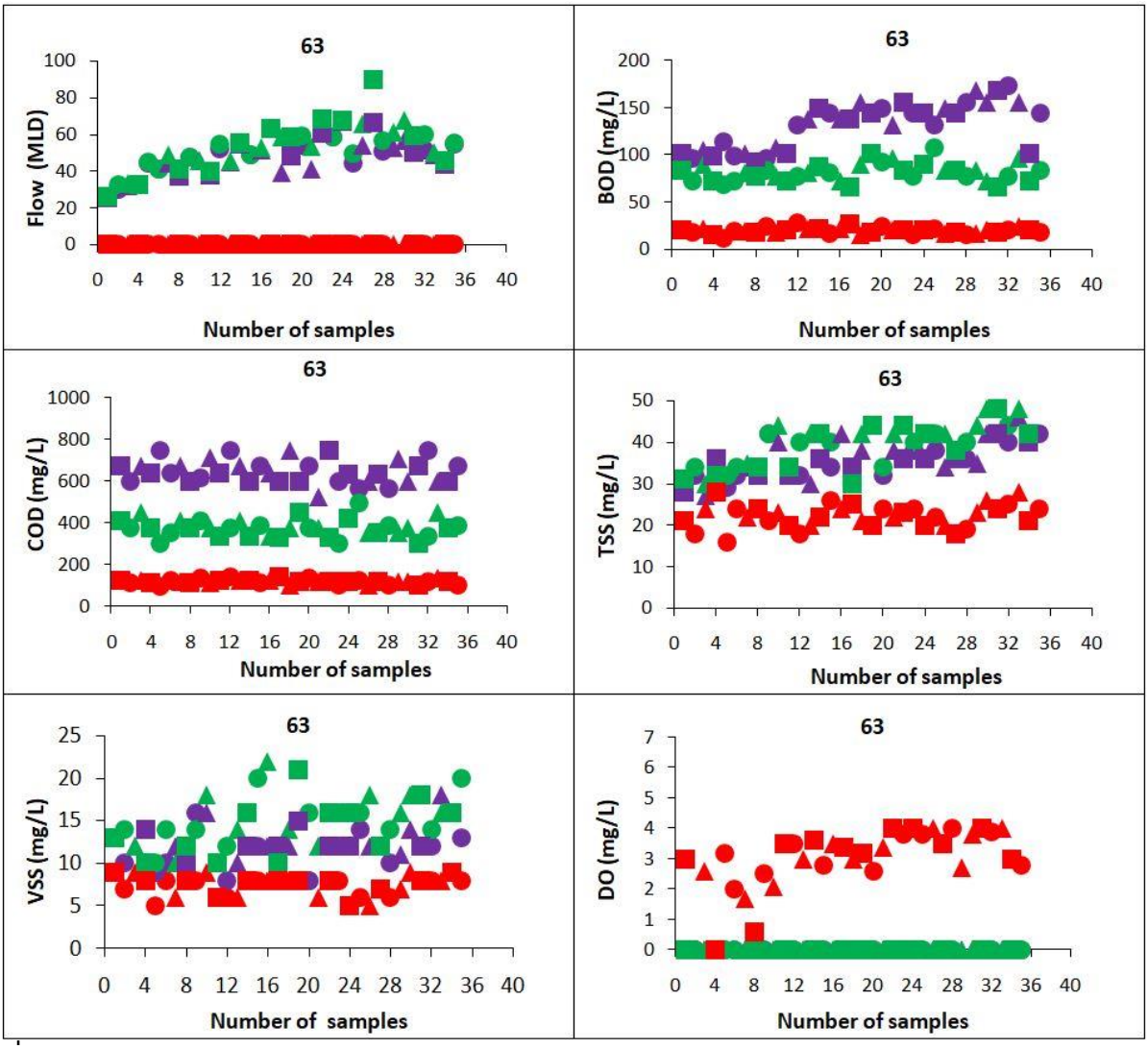
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

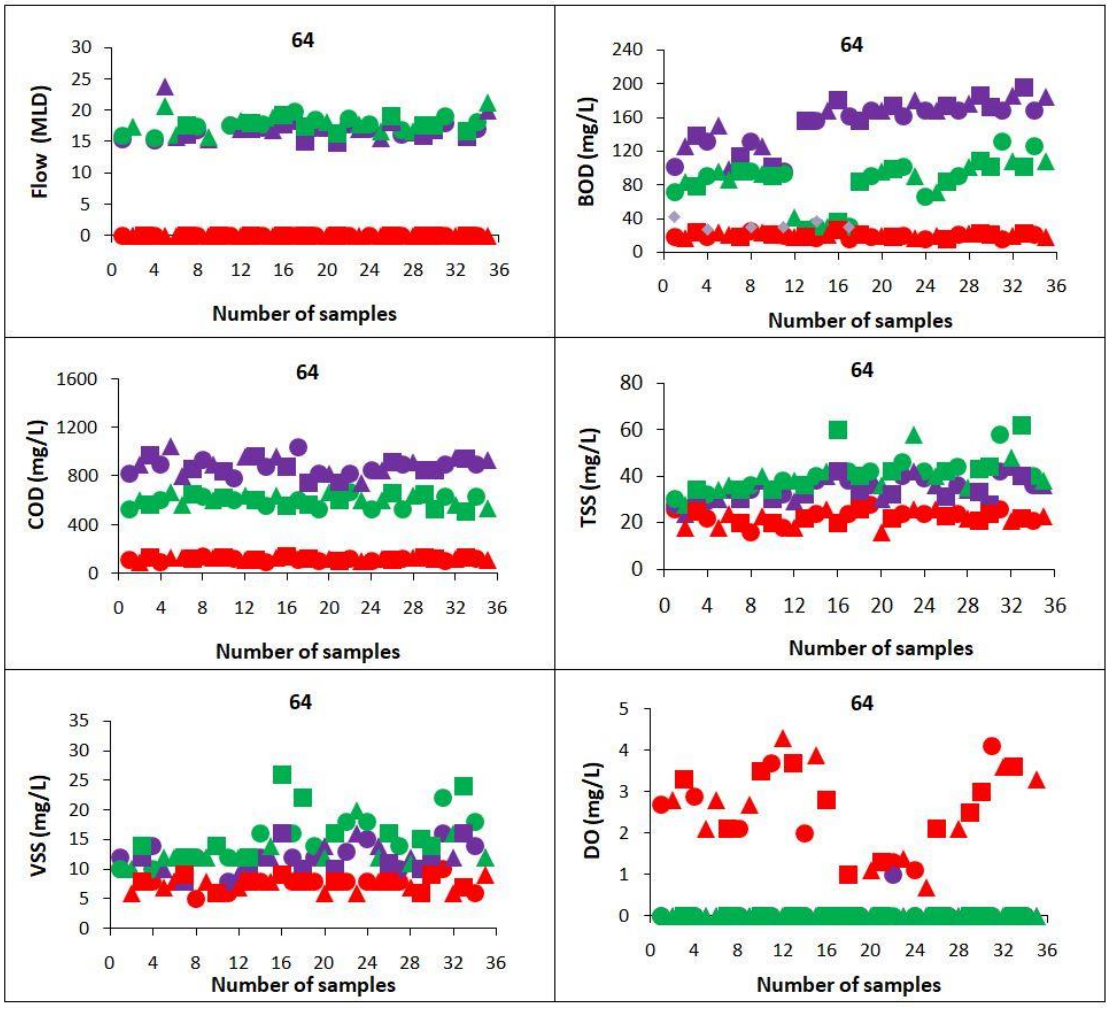
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

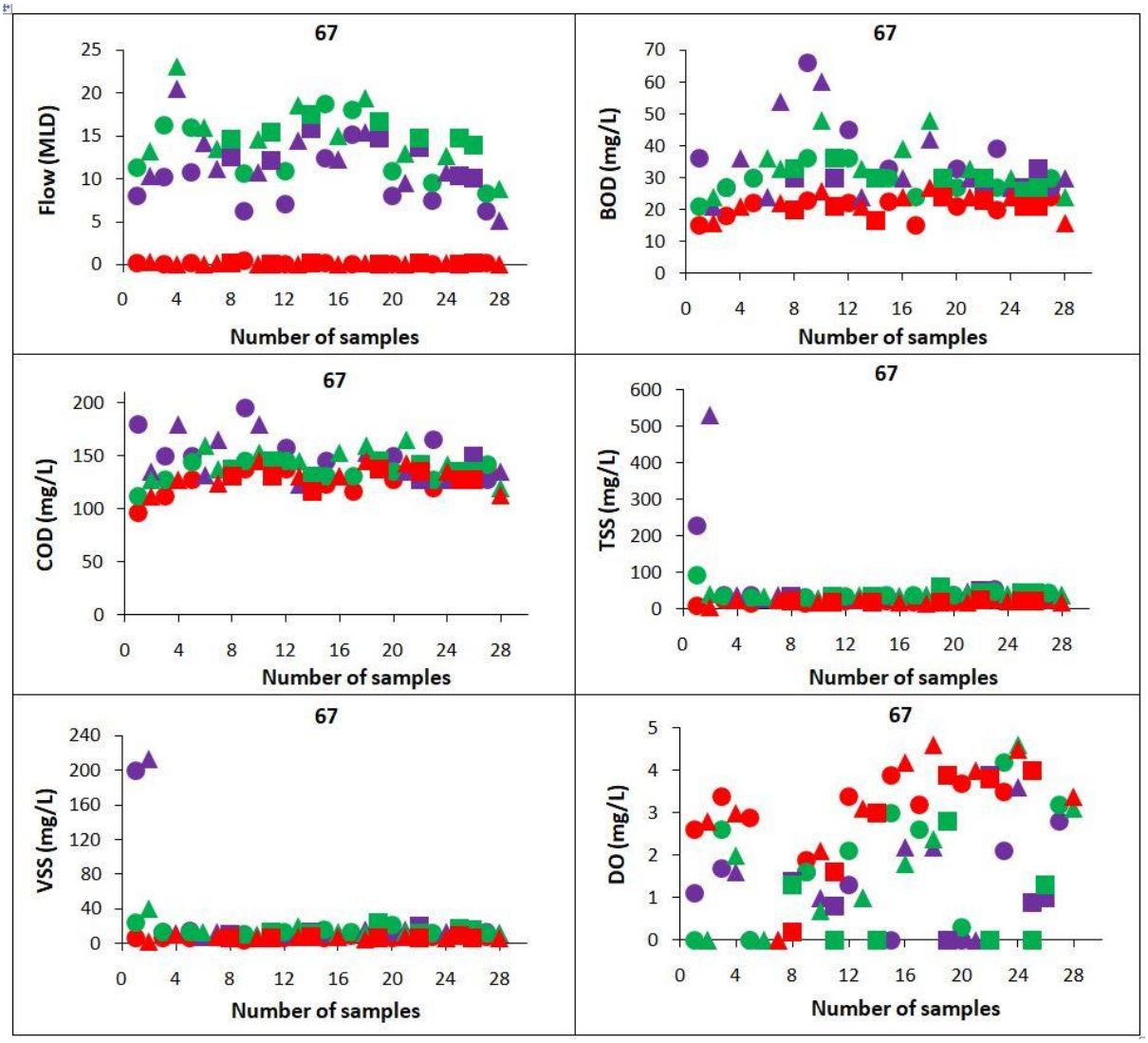
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

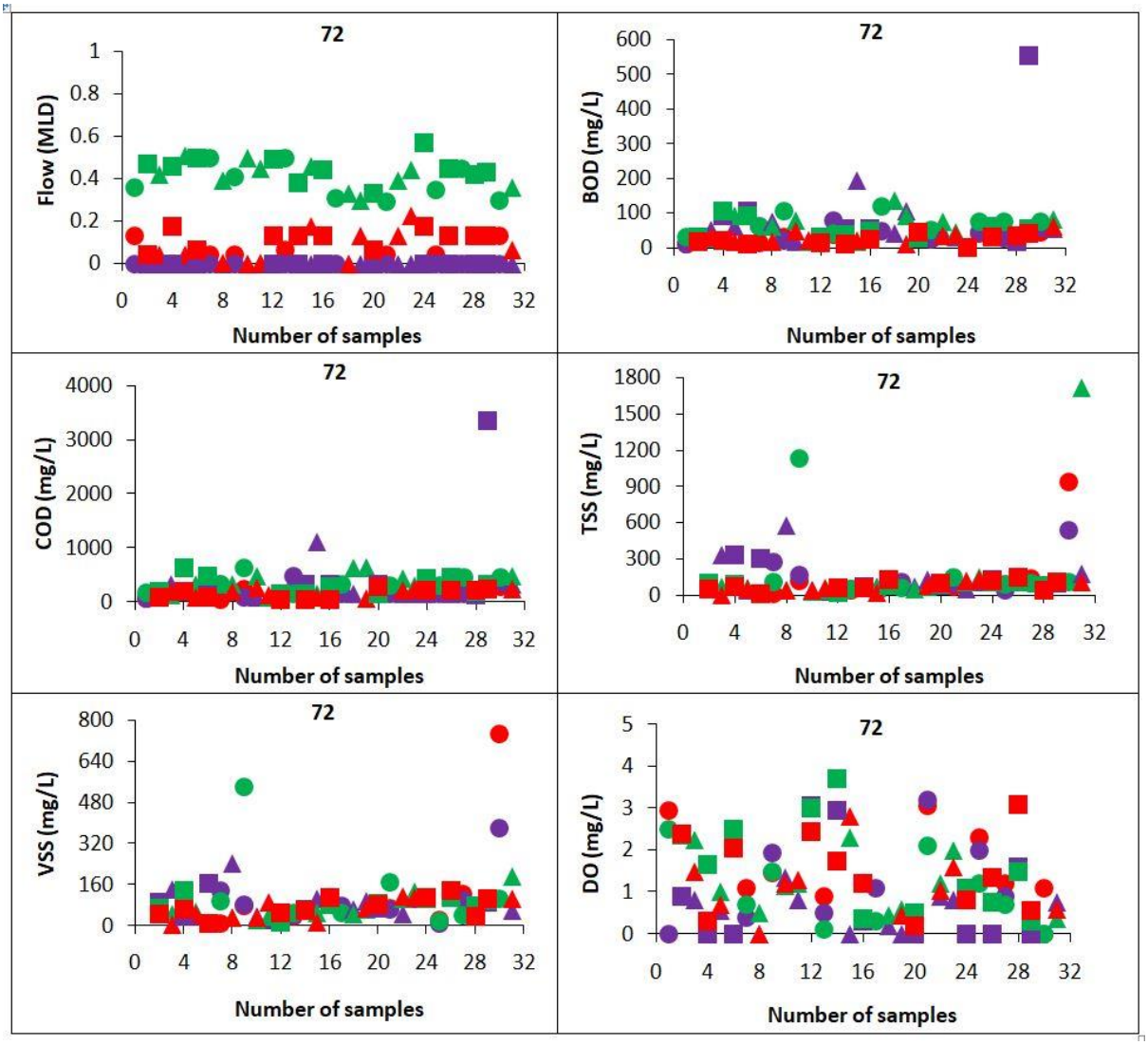
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

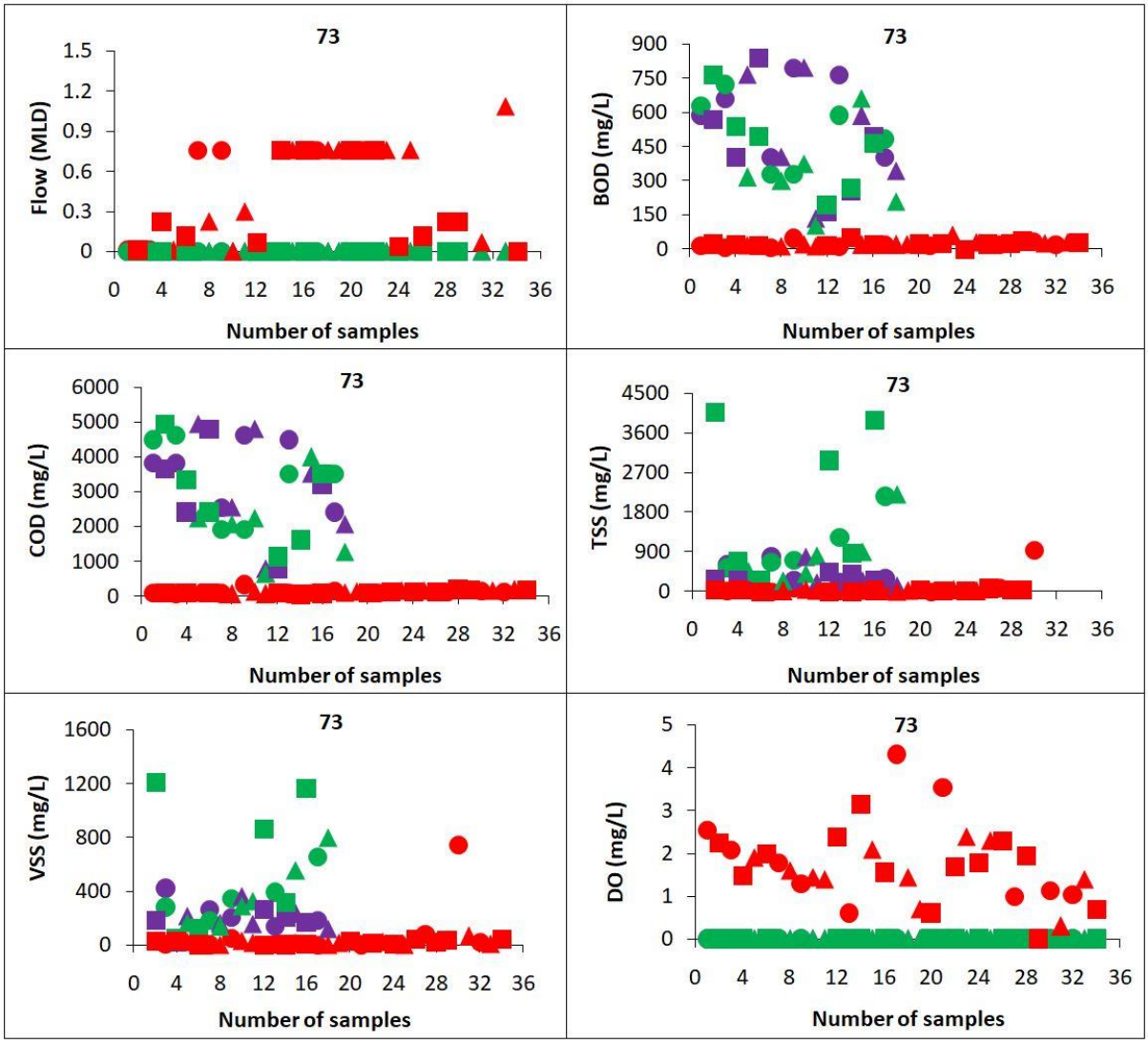
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

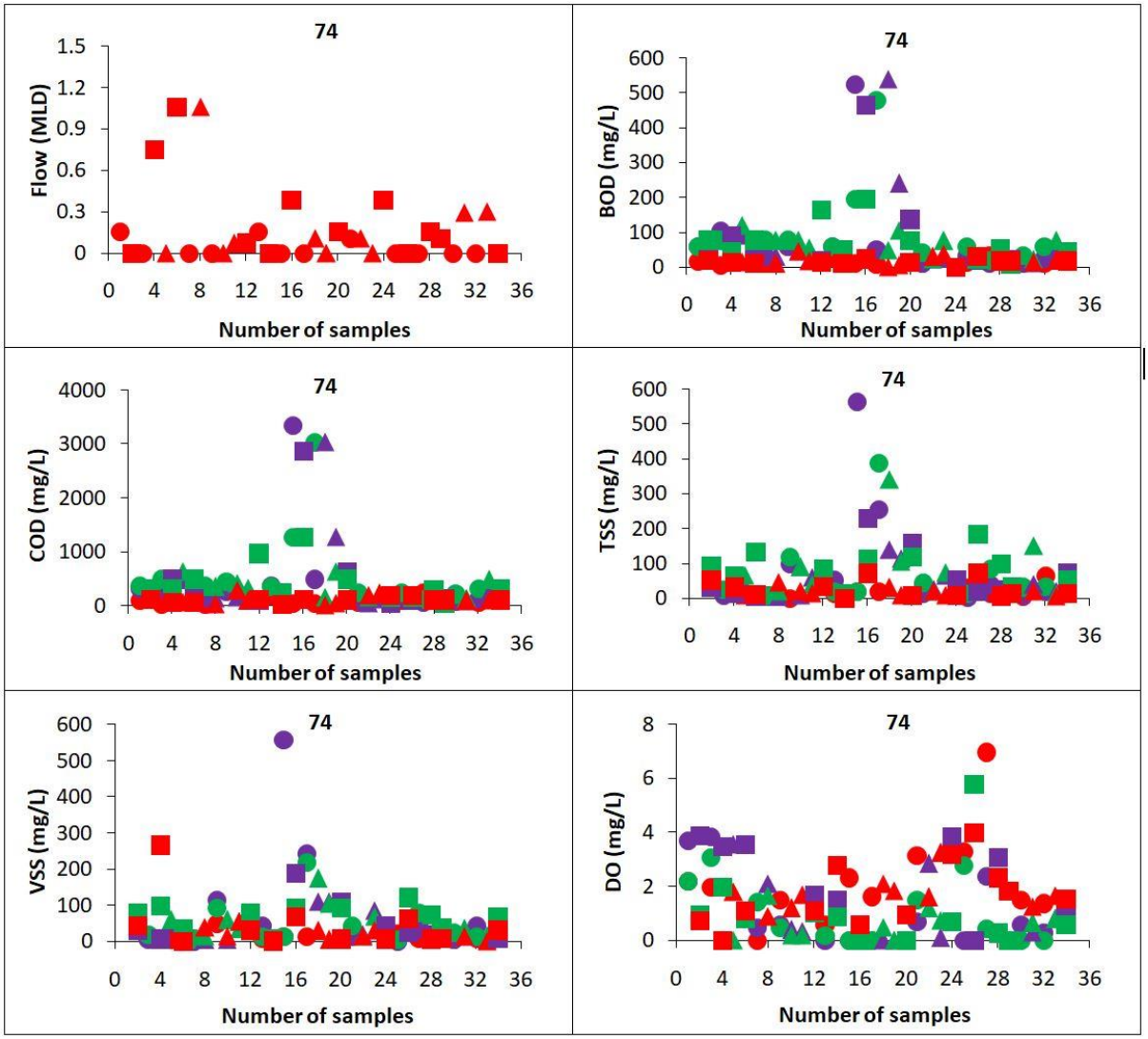
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

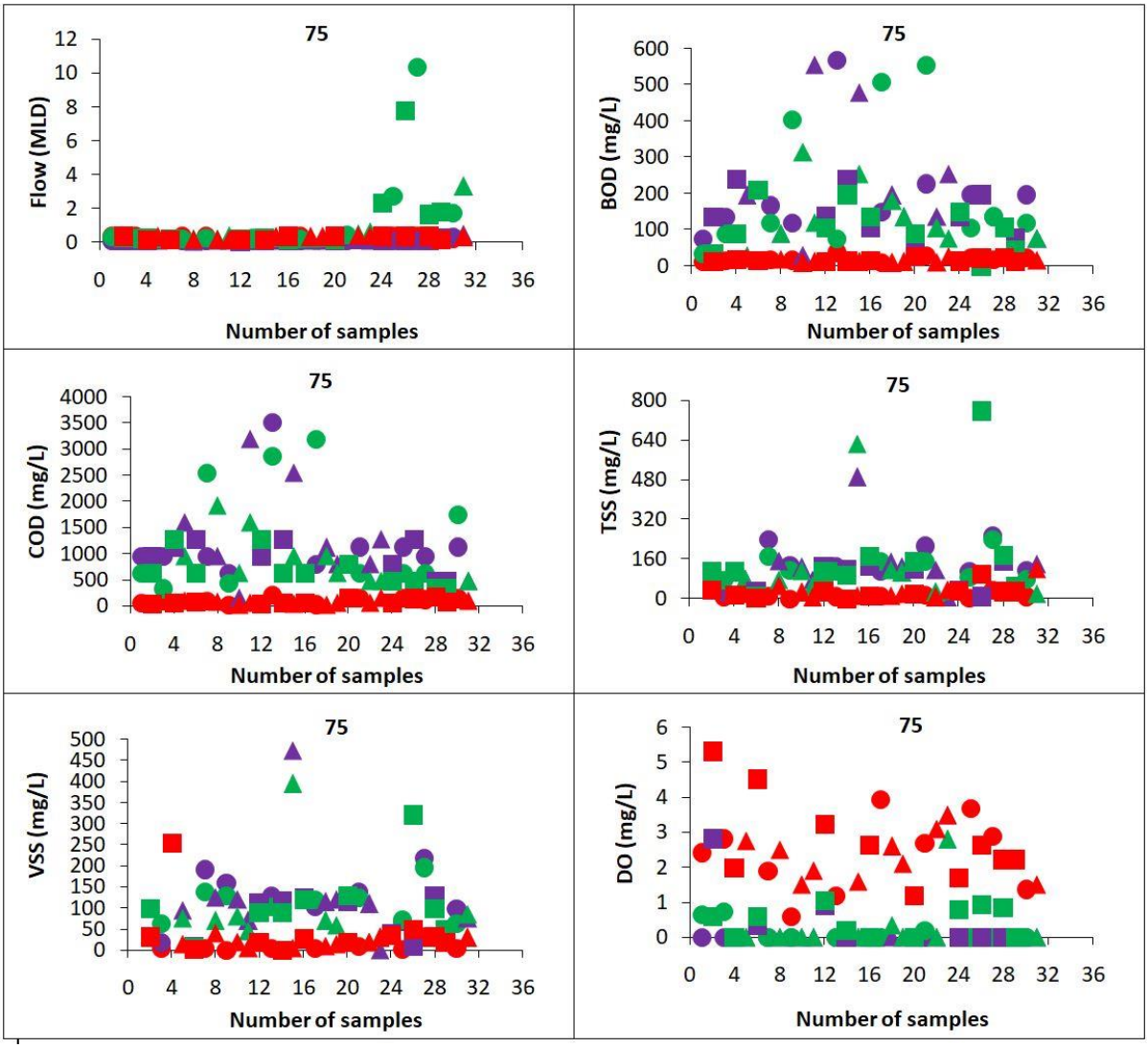
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

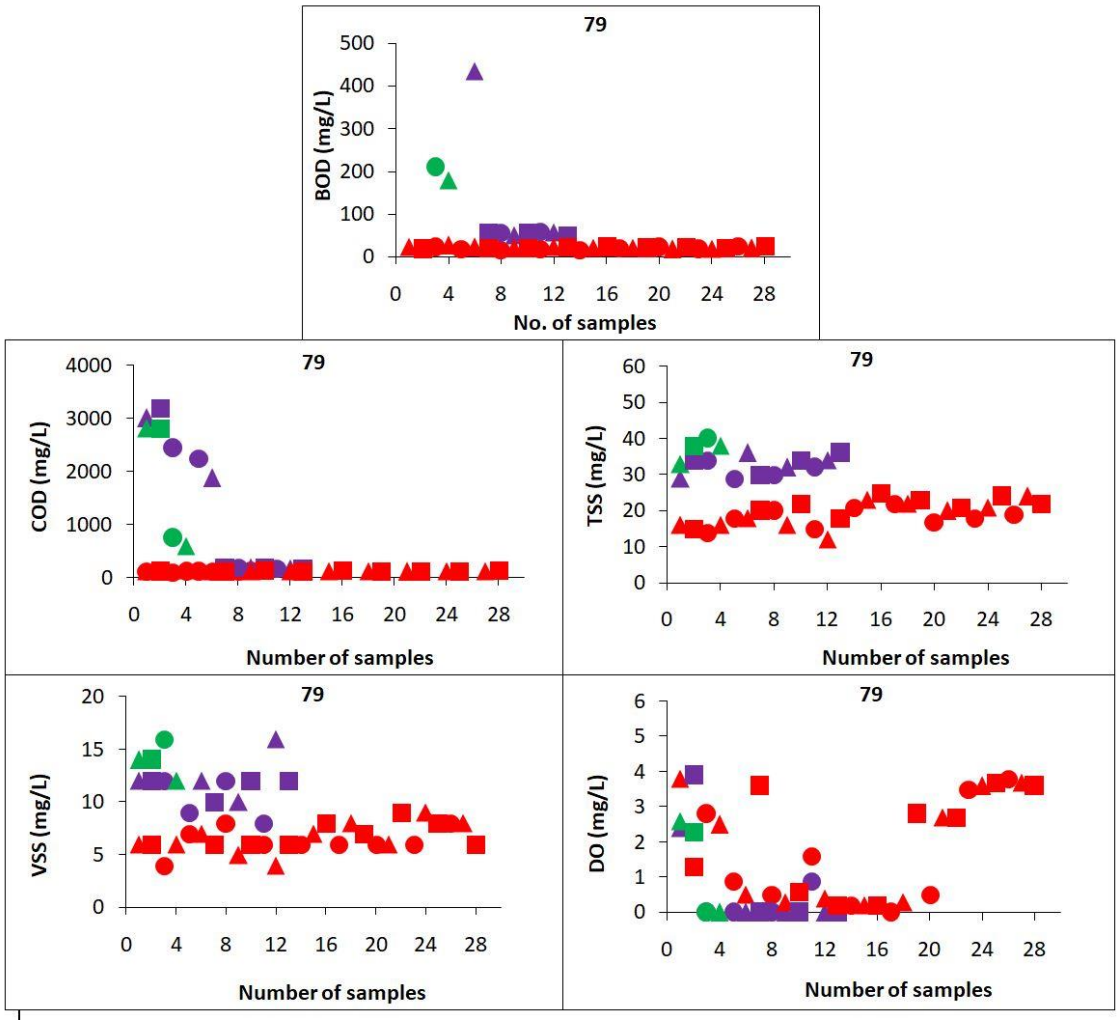
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

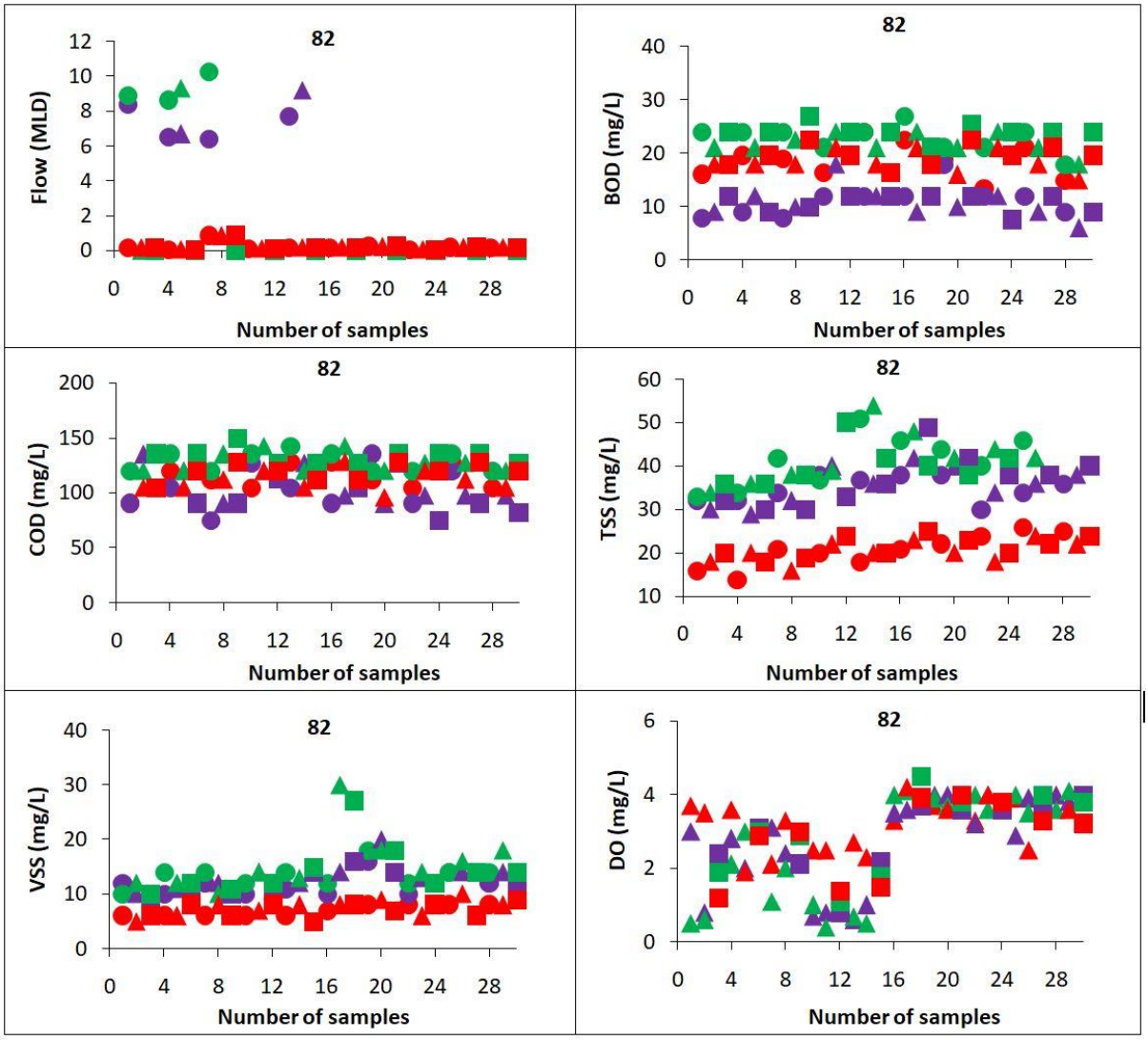
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

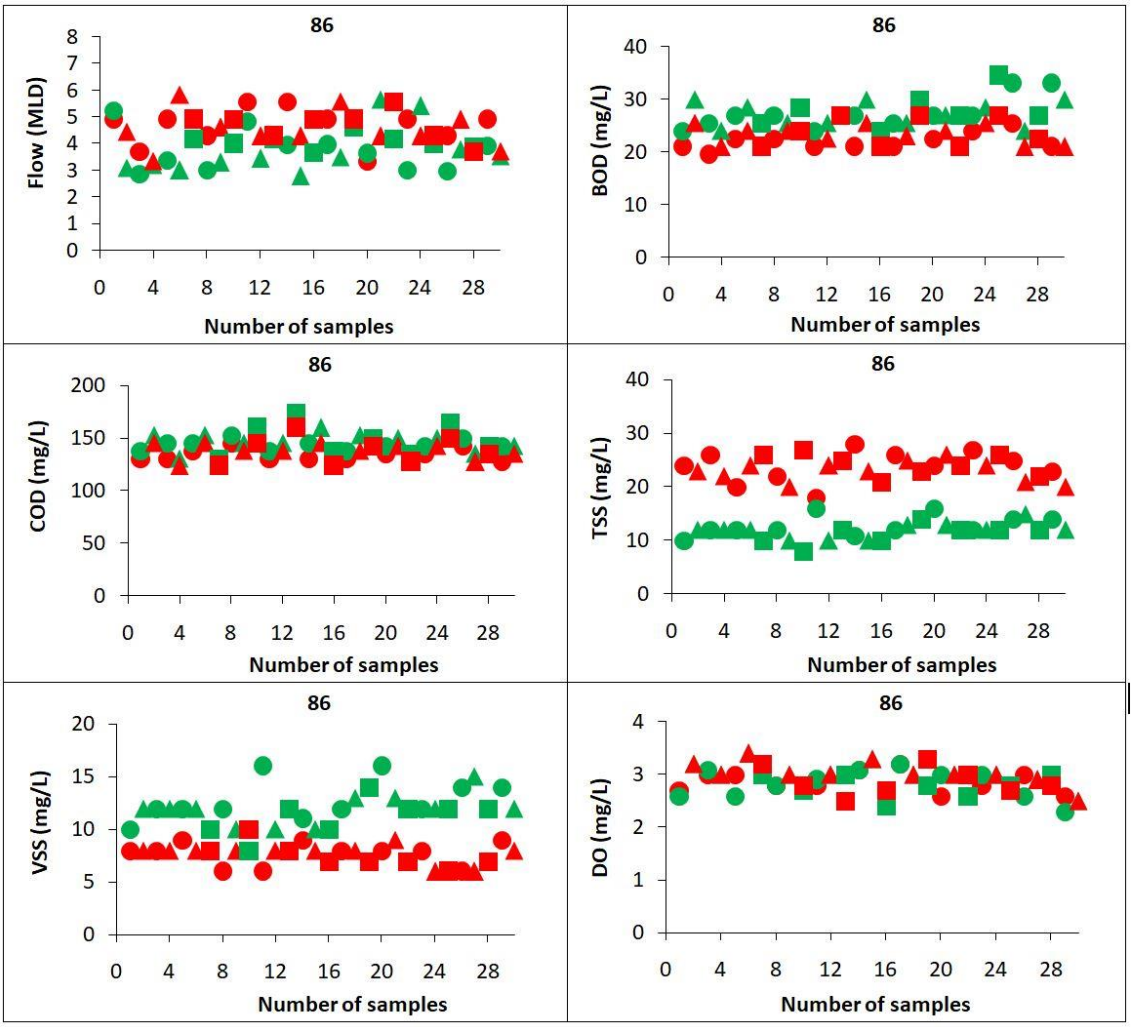
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

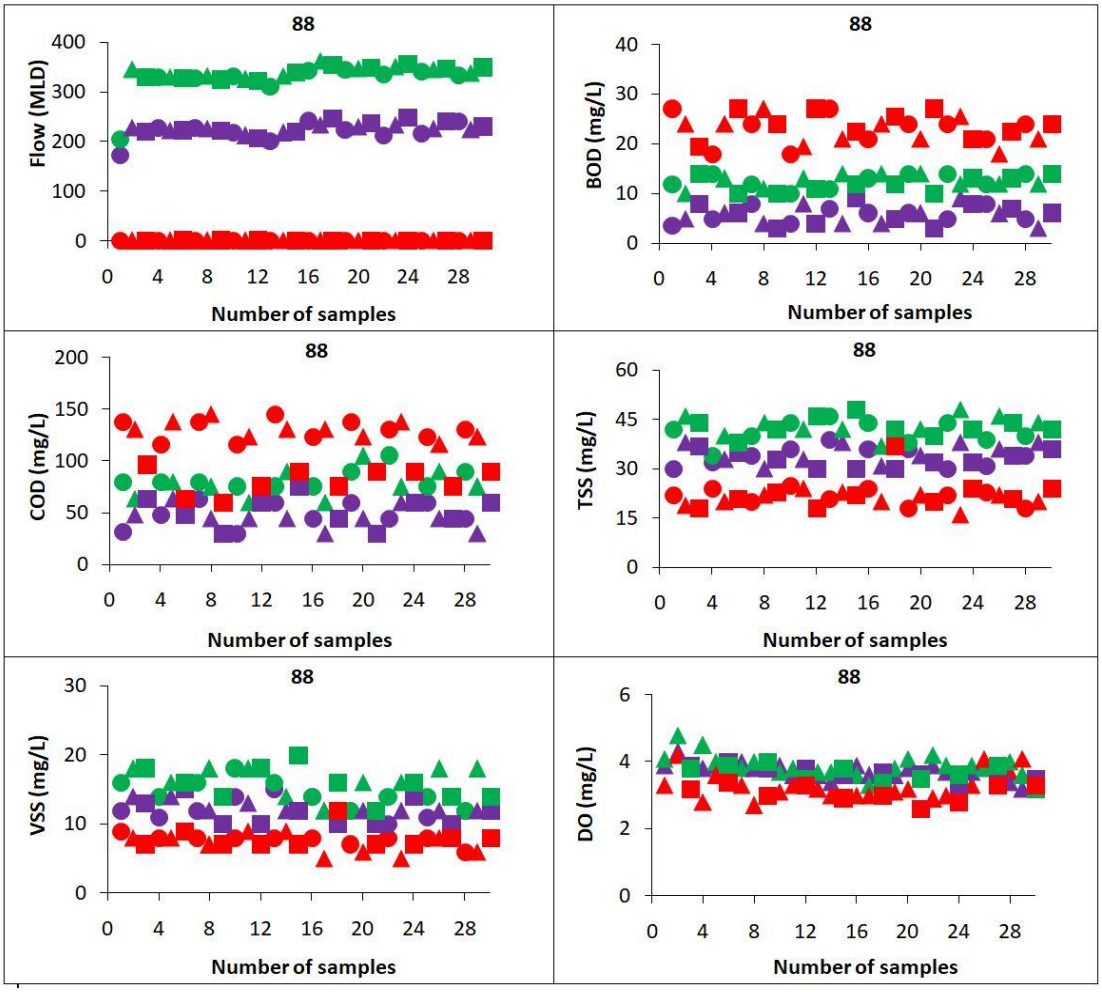
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

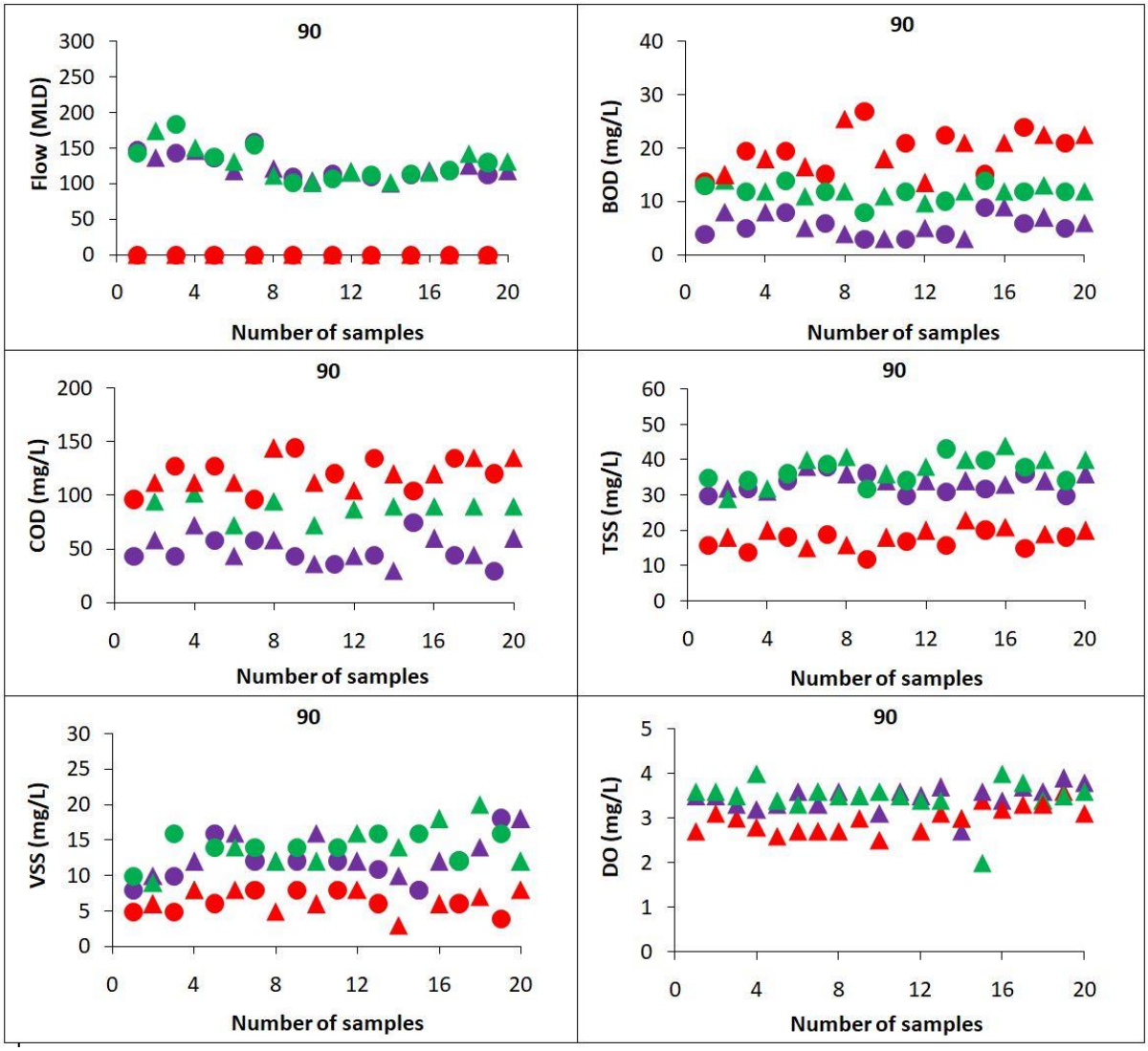
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

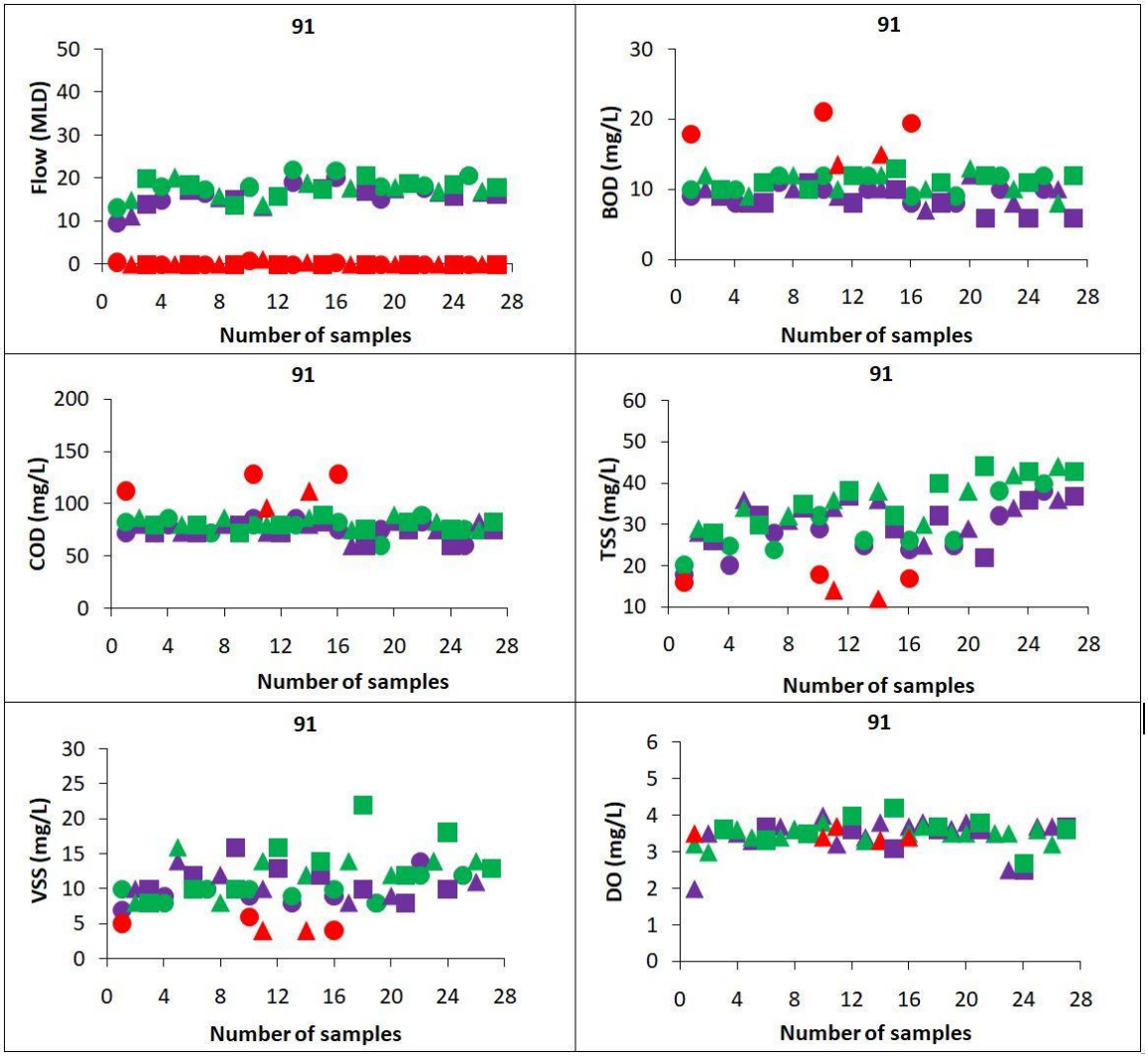
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

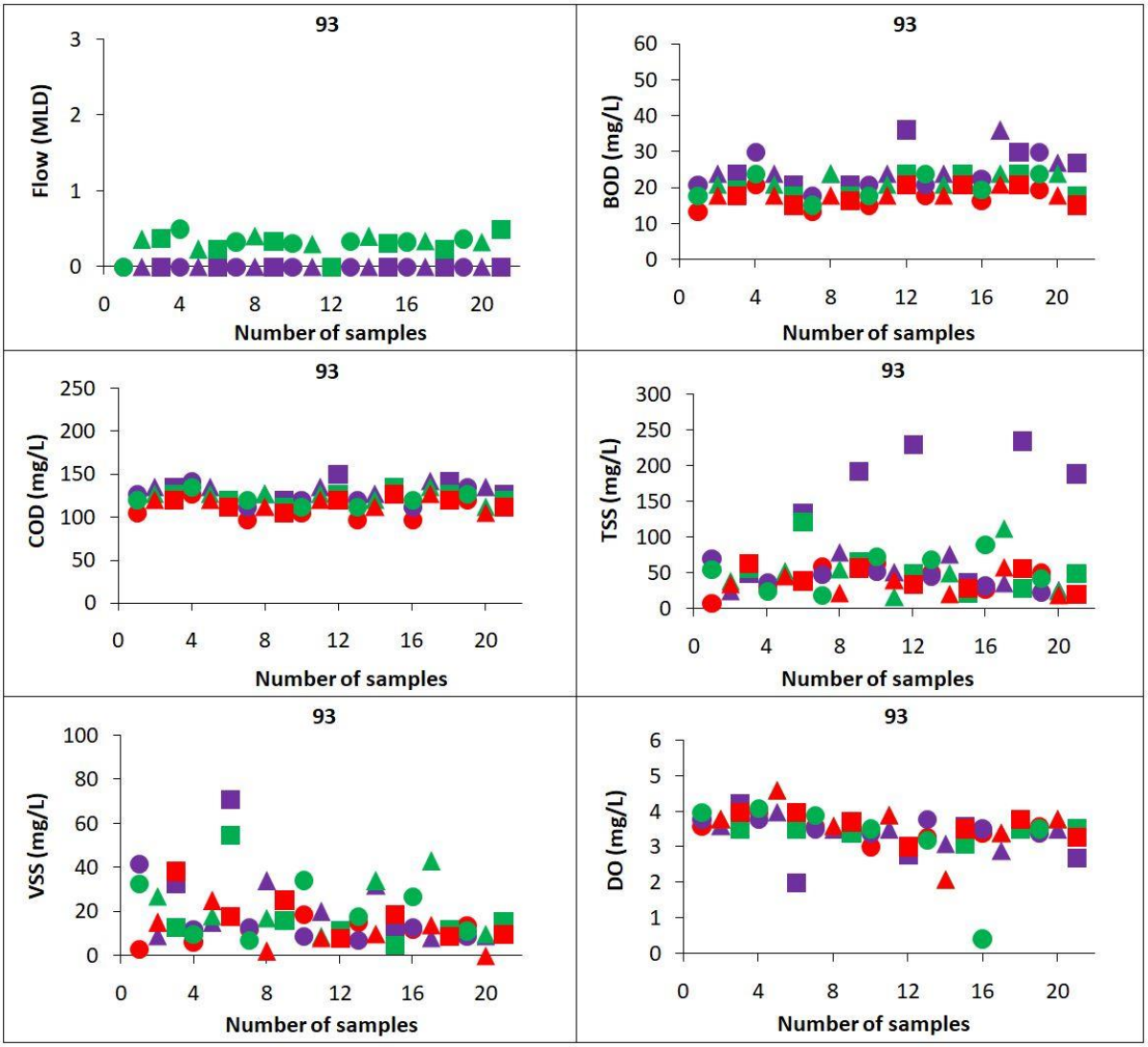
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

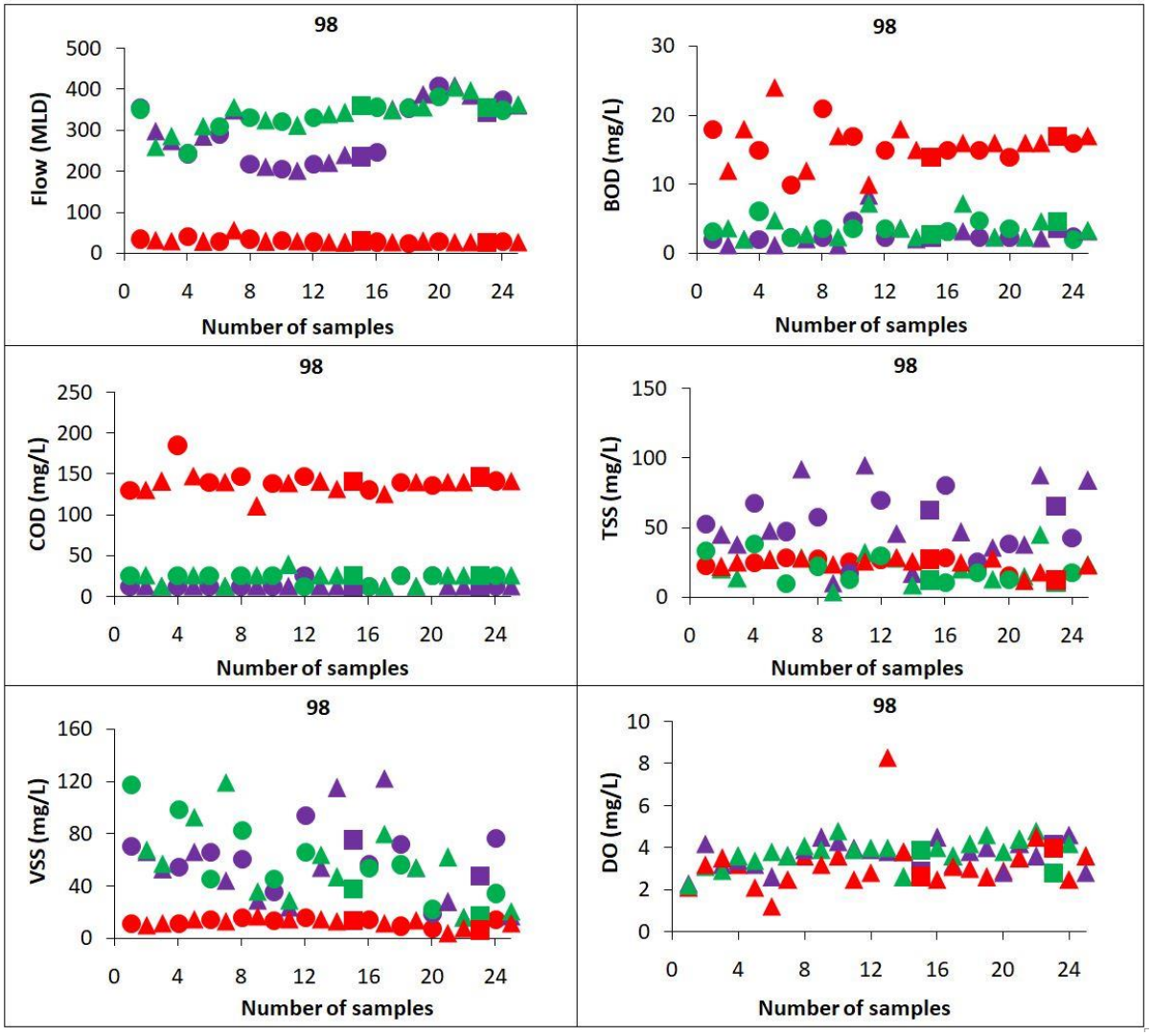
Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



DRAIN WATER QUALITY AND THE CONDITION OF DRAIN IN THE VICINITY OF EFFLUENT DISCHARGE

Sampling at drains

Outlet	(6 am - 2 pm)	Outlet	(2 pm - 10 pm)	Outlet	(10 pm - 6 am)
Upstream	(6 am - 2 pm)	Upstream	(2 pm - 10 pm)	Upstream	(10 pm - 6 am)
Downstream	(6 am - 2 pm)	Downstream	(2 pm - 10 pm)	Downstream	(10 pm - 6 am)



GROUNDWATER ANALYSIS

Groundwater being an important source of water in rural areas, it is important to assess the impact of discharge of industrial effluents in surface water bodies on ground water quality in the vicinity. Along with water pollution, soil pollution is equally or rather more significant in contributing to the degrading quality of land ecosystem of surrounding river. To assess the impact of PPIs on the groundwater, sampling was done in villages surrounding the targeted industries with the objective to understand the effect of industrial pollution on groundwater.

Roughly three villages were selected in the surrounding of every industry. Some villages were common to multiple industries. The number of villages sampled in Kashipur (Cluster 1), Meerut (Cluster 2 A), Muzaffarnagar (Cluster 2 B) and Clusters 3-10 were 34, 32, 24 and 47, respectively. Ground water sampling was done from 2 types of sources namely, hand pumps (including India Mark handpumps) and tube wells. The reason for obtaining two different samples from various places surrounding the industry was to estimate the water quality at different strata of the water table.

9.1. VARIATION OF GROUNDWATER PARAMETERS

Figures 11 and 12 present information on some groundwater parameters, namely pH, TDS, Alkalinity, Hardness, Sulphates, Ammonical Nitrogen, Total Kjeldahl Nitrogen, Chlorides and Phosphorus. The acceptable and maximum permissible limits of these parameters in the groundwater have been indicated in these figures. Acceptable limit is the one that could be tolerated in the absence of any other sources whereas permissible limit is the one which should not be exceeded in any circumstances. The lower and upper limit in graphs represents acceptable and permissible limits, respectively.

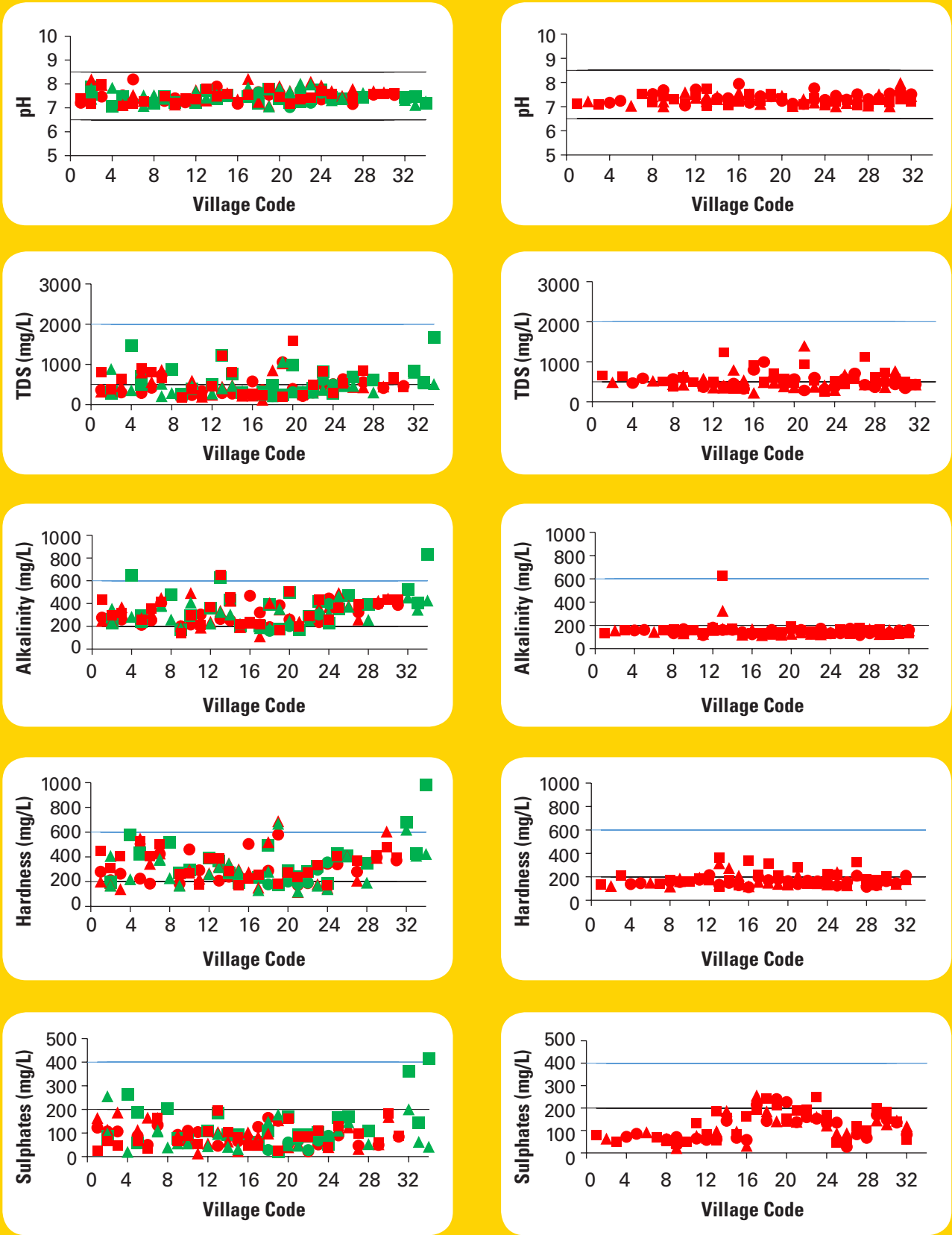
Relatively higher values of TDS, Nitrogen and Phosphorus in groundwater are a matter of concern and this could possibly be due to discharge of industrial effluents as well as agricultural practices. A detailed investigation on contribution of various sources is warranted. Particularly, monitoring of Nitrogen and Phosphorus in effluents of PPIs should be included in the monitoring protocol as these nutrients lead to eutrophication in surface water bodies.

TO ASSESS THE IMPACT OF PPIs ON THE GROUNDWATER, SAMPLING WAS DONE IN VILLAGES SURROUNDING THE TARGETED INDUSTRIES WITH THE OBJECTIVE TO UNDERSTAND THE EFFECT OF INDUSTRIAL POLLUTION ON GROUNDWATER.

FIGURE-11

REPRESENTATION OF INFORMATION ON GROUNDWATER QUALITY IN THE VICINITY OF PPIs IN CLUSTER 1 (KASHIPUR) AND CLUSTER 2 A (MEERUT)

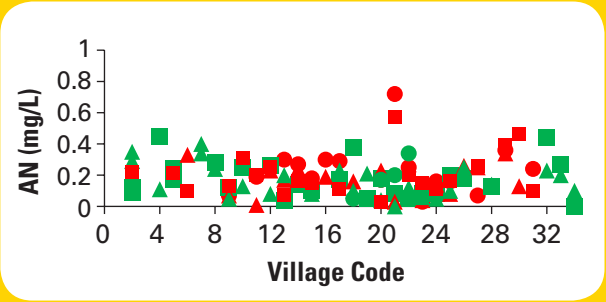
CLUSTER 1 (KASHIPUR) | **CLUSTER 2 A (MEERUT)**

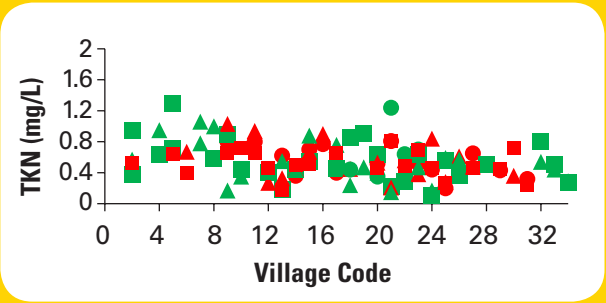


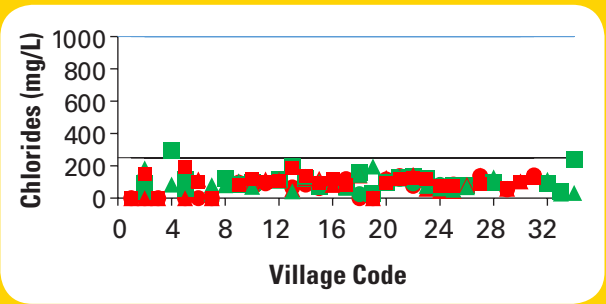
GROUNDWATER SAMPLING

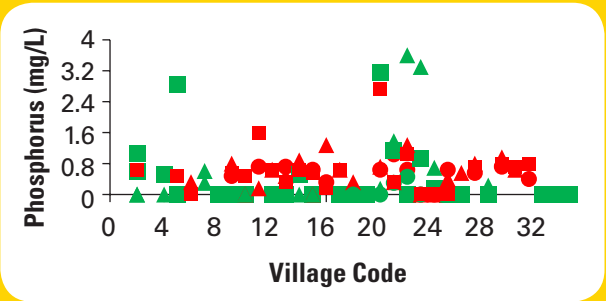
Tubewell (July) Tubewell (August) Indiamark (July) Indiamark (August) Handpump (July) Handpump (August)

CLUSTER 1 (KASHIPUR)

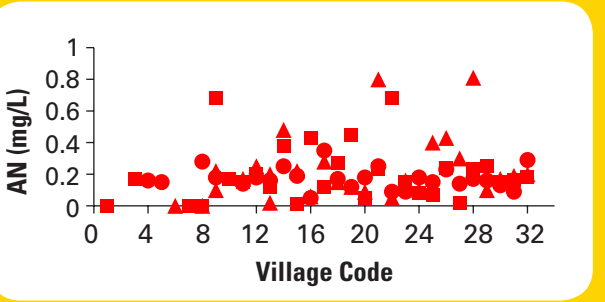


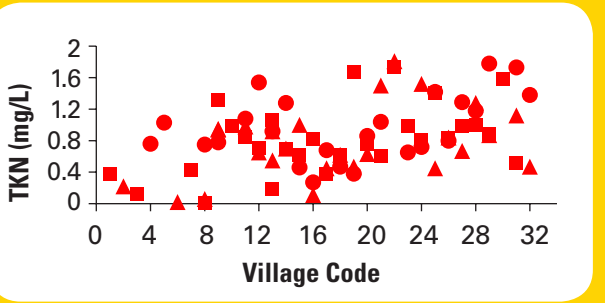


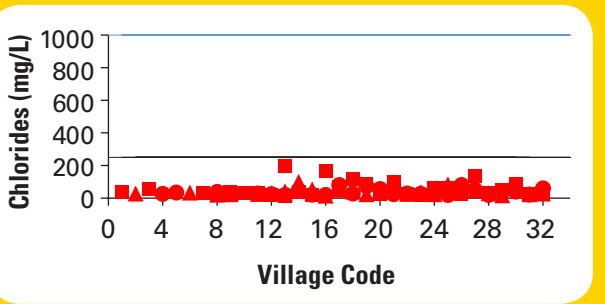


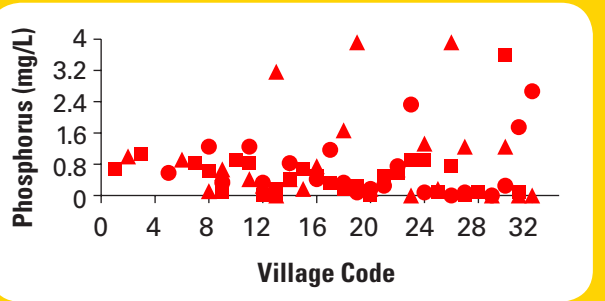


CLUSTER 2 A (MEERUT)







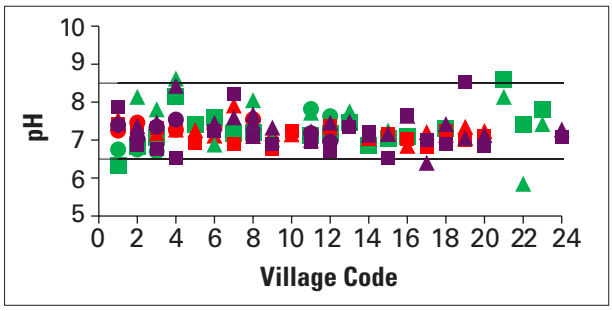


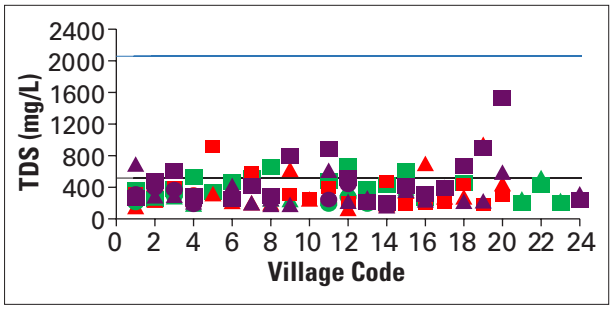
GROUND WATER SAMPLING WAS DONE FROM 2 TYPES OF SOURCES NAMELY, HAND PUMPS (INCLUDING INDIA MARK HANDPUMPS) AND TUBE WELLS. THE REASON FOR OBTAINING TWO DIFFERENT SAMPLES FROM VARIOUS PLACES SURROUNDING THE INDUSTRY WAS TO ESTIMATE THE WATER QUALITY AT DIFFERENT STRATA OF THE WATER TABLE.

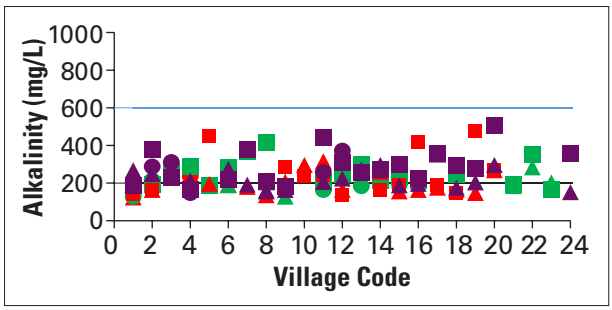
FIGURE-12

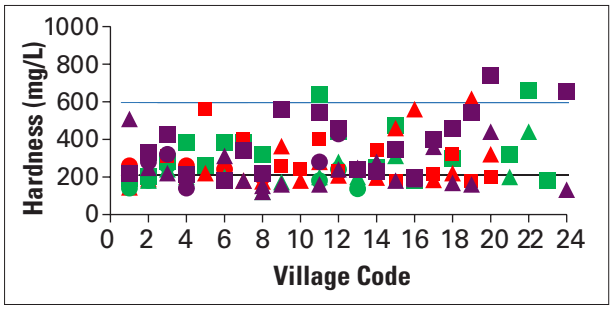
REPRESENTATION OF INFORMATION ON GROUNDWATER QUALITY IN THE VICINITY OF PPIs IN CLUSTER 2 B (MUZAFFARNAGAR) AND CLUSTERS 3-10

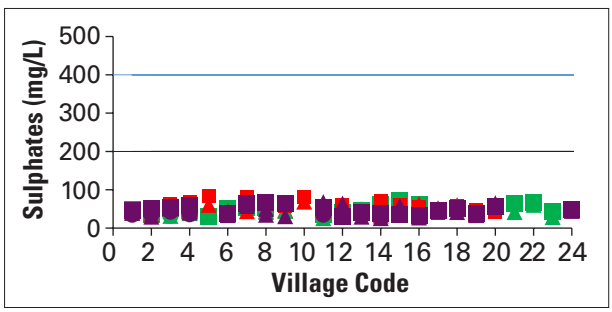
CLUSTER 2 B (MUZAFFARNAGAR)



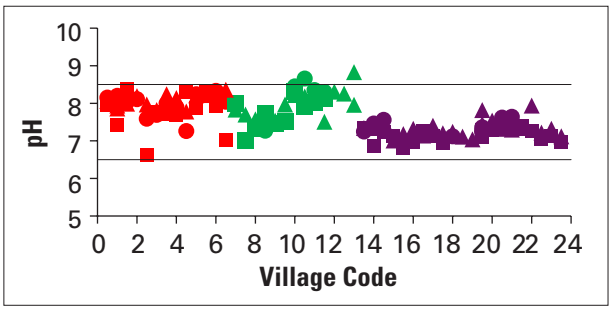


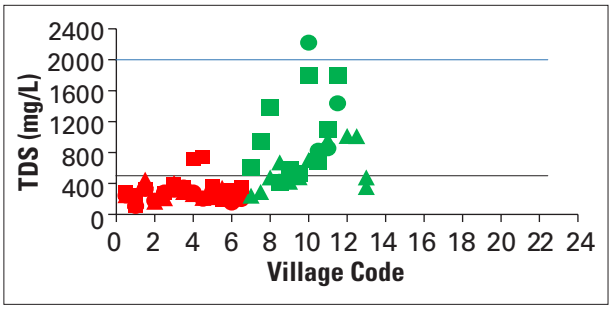


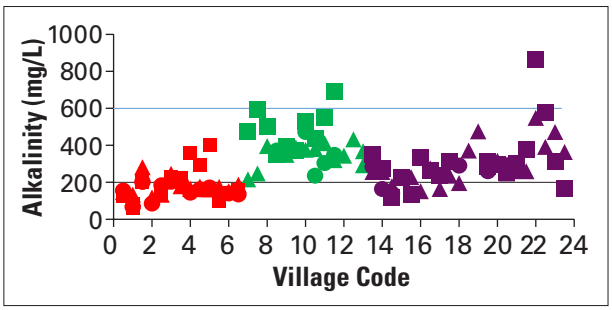


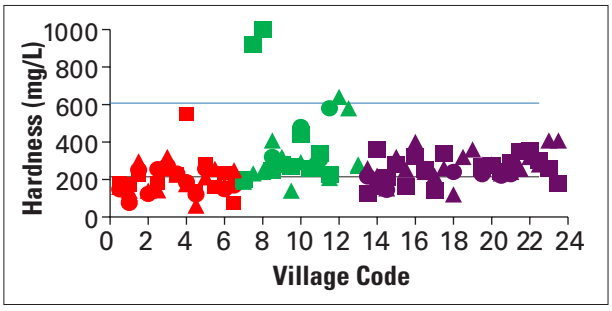


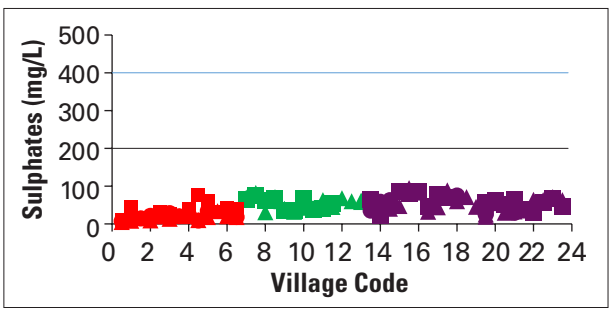
CLUSTER 3-10

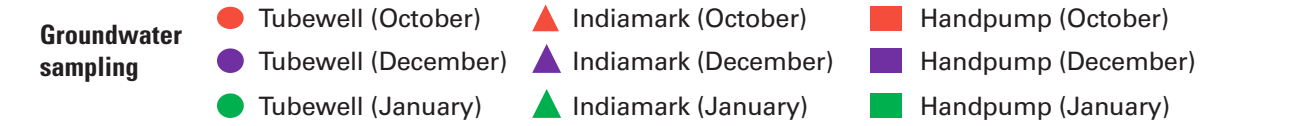




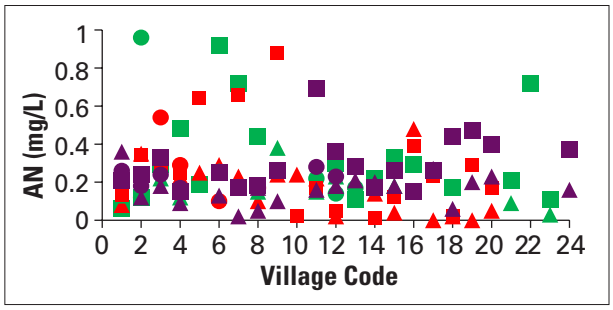


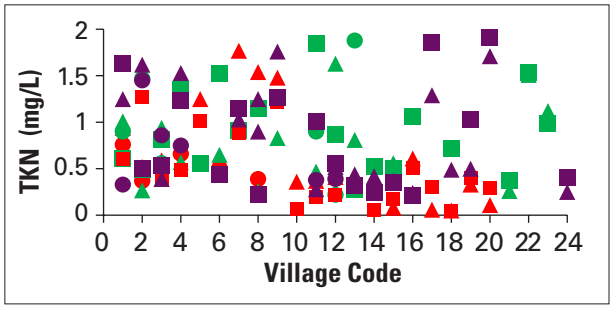


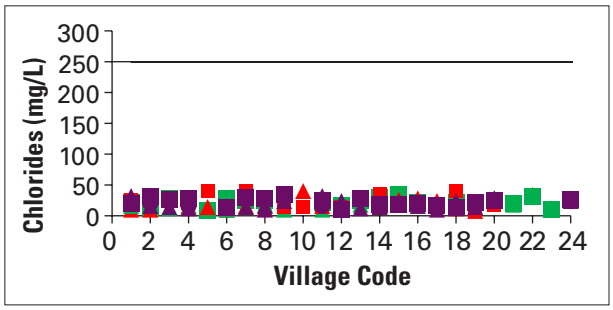


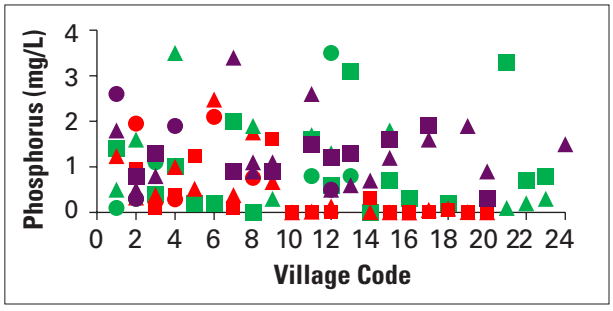


CLUSTER 2 B (MUZAFFARNAGAR)

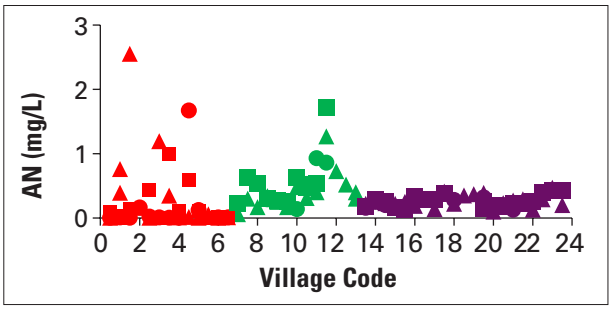


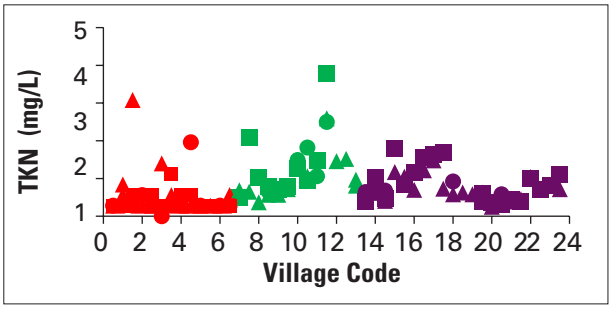


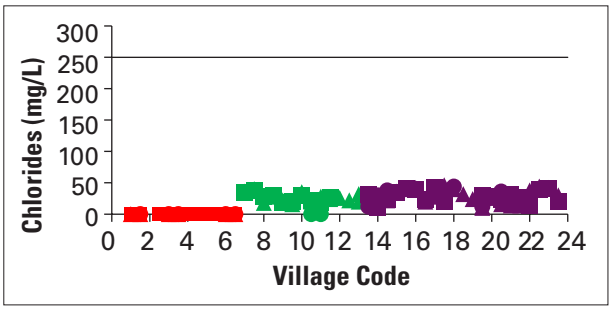


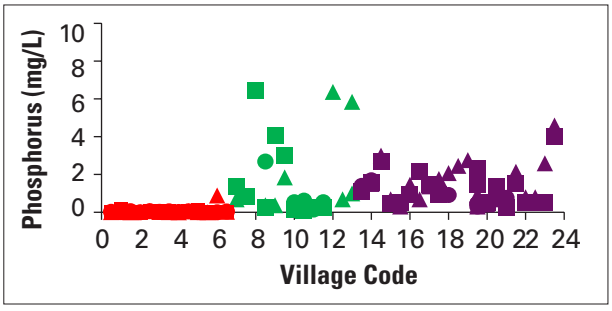


CLUSTER 3-10







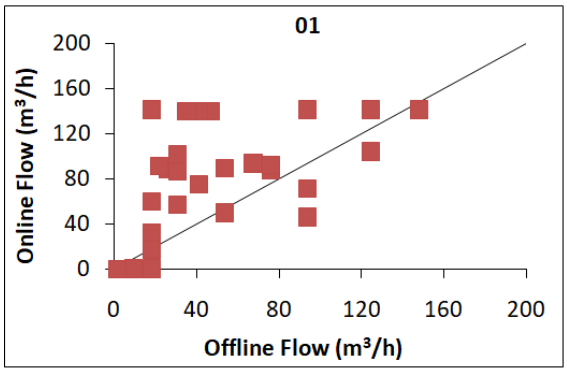


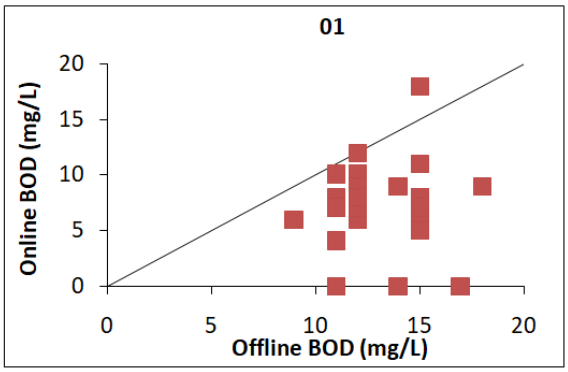
A DETAILED INVESTIGATION ON CONTRIBUTION OF VARIOUS SOURCES IS WARRANTED. PARTICULARLY, MONITORING OF NITROGEN AND PHOSPHORUS IN EFFLUENTS OF PPIs SHOULD BE INCLUDED IN THE MONITORING PROTOCOL AS THESE NUTRIENTS LEAD TO EUTROPHICATION IN SURFACE WATER BODIES.

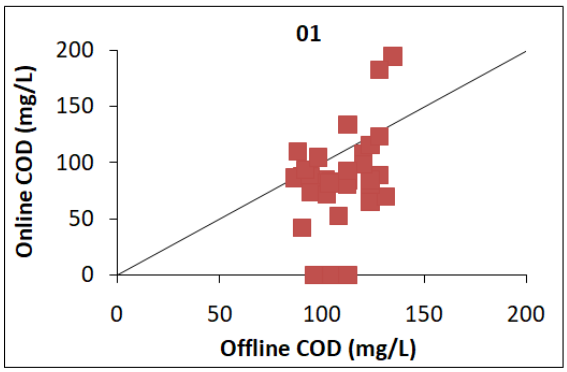
EFFICACY OF REAL-TIME MONITORING

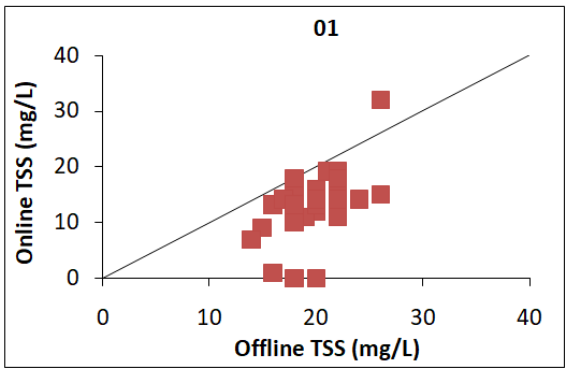
At each industry, real-time monitoring sensors were installed for measuring five effluent parameters namely Flow, pH, BOD, COD and TSS.
Figures of the chapter revealed the correlation graph of all the industries surveyed for flow, BOD, COD and TSS parameters.

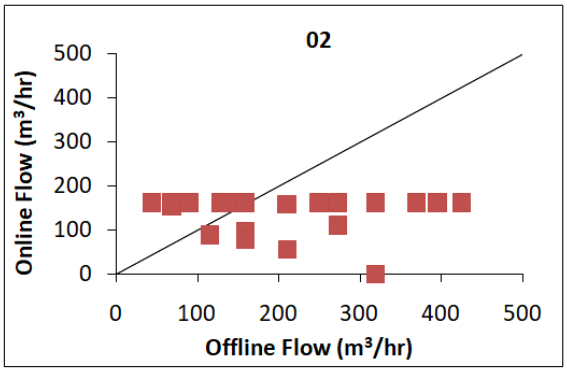
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

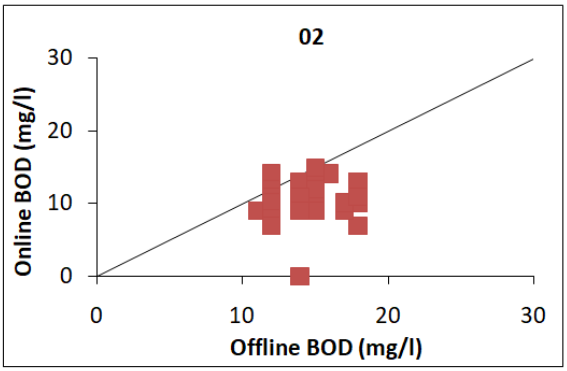


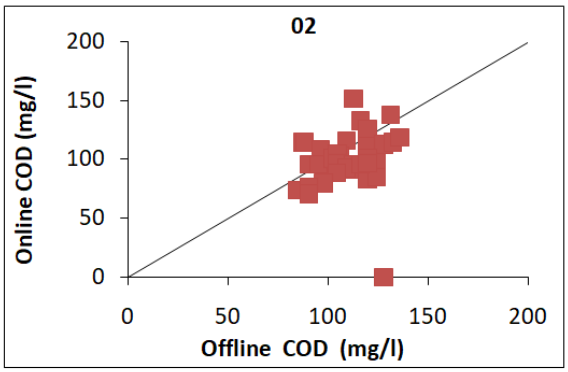


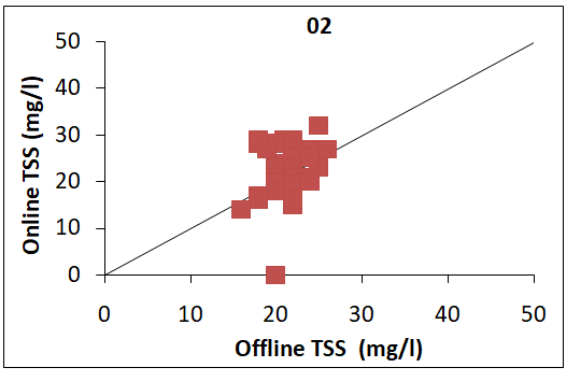




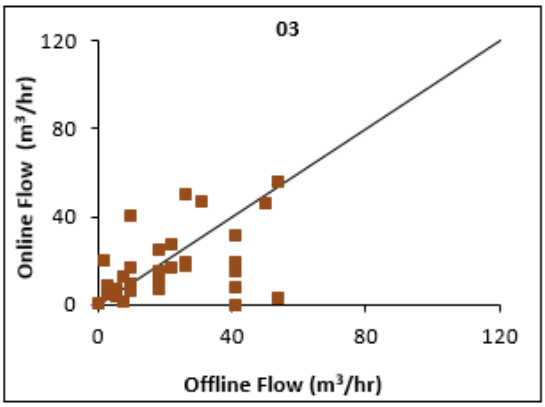


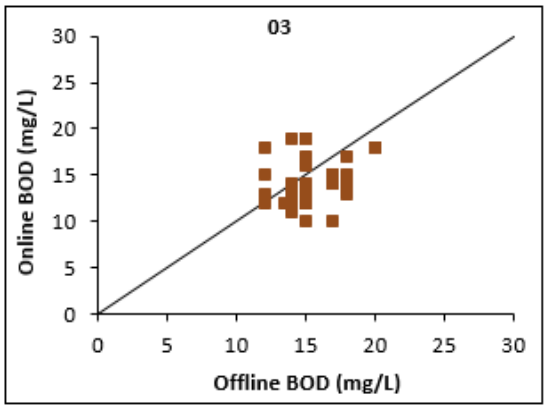


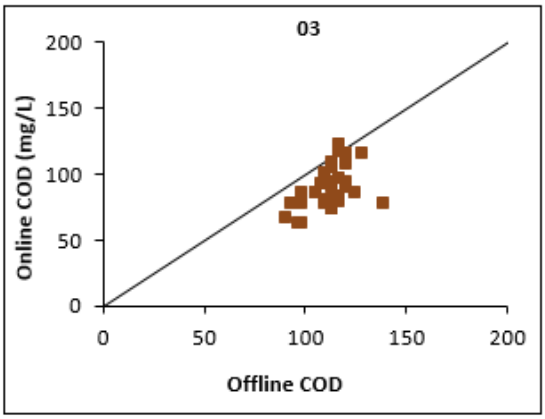


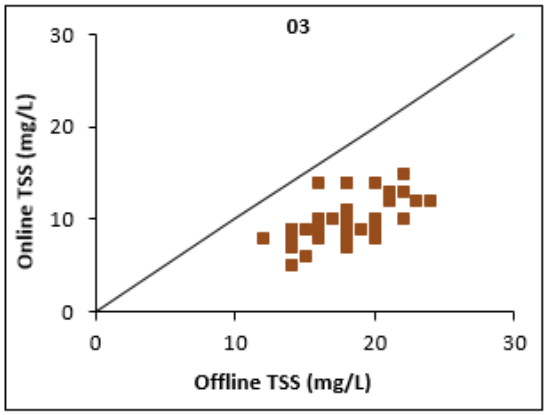


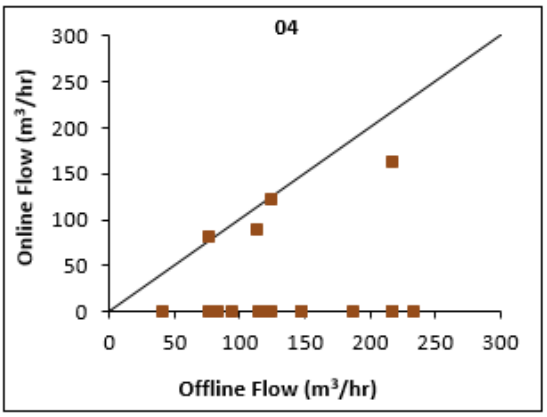
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

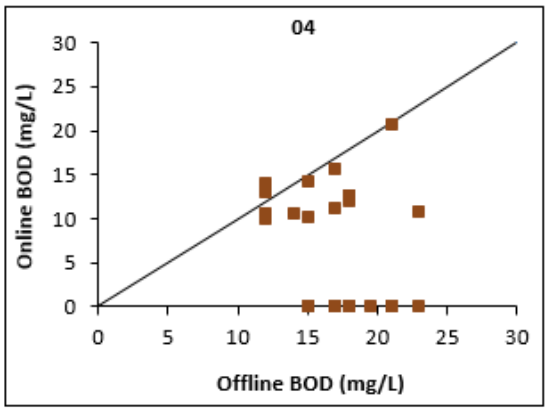


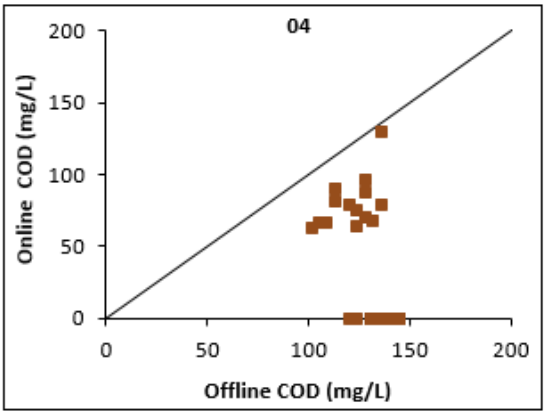


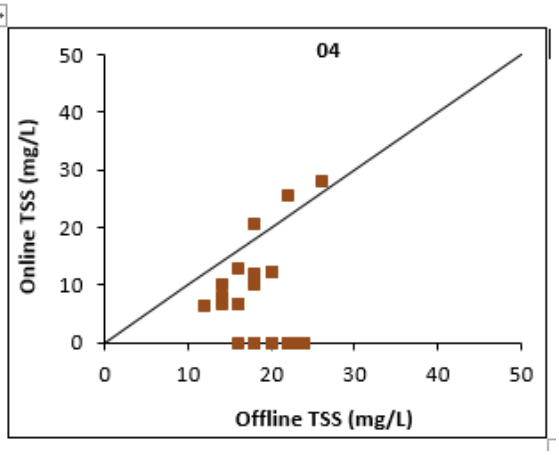




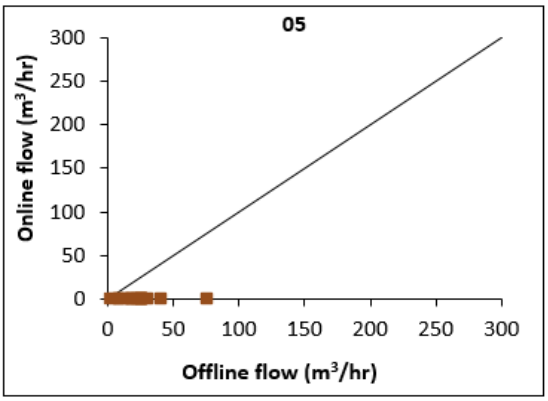


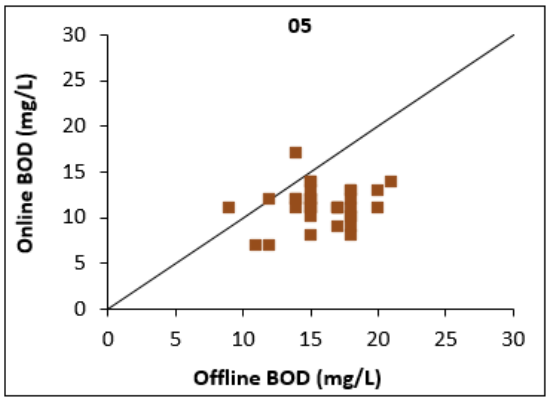


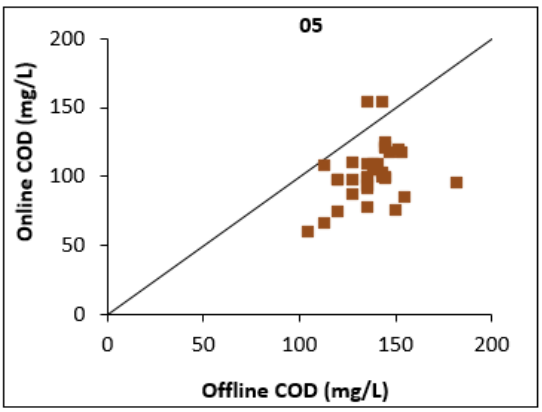


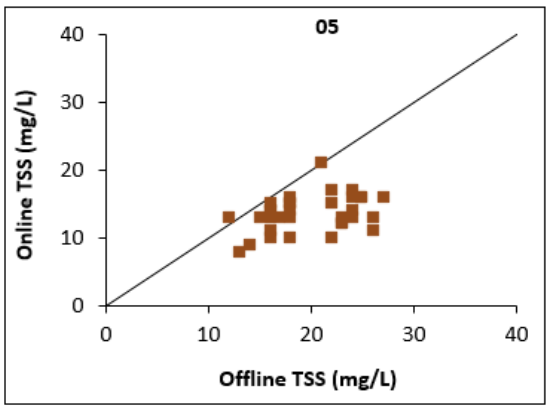


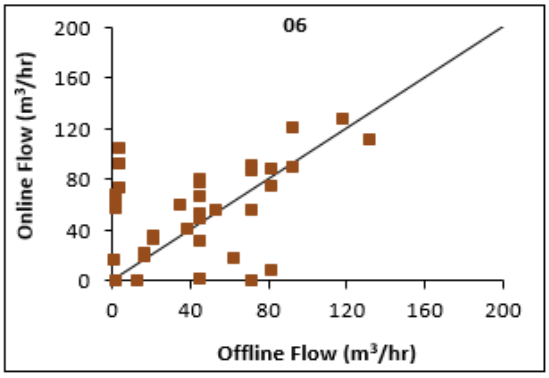
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

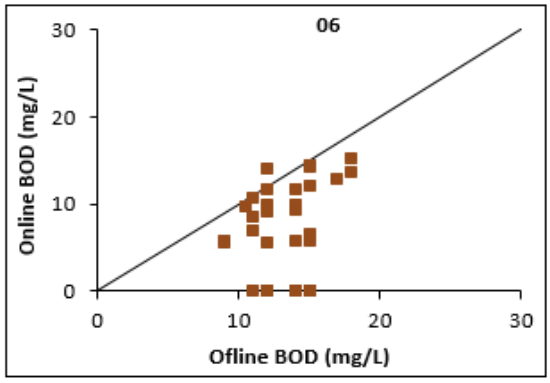


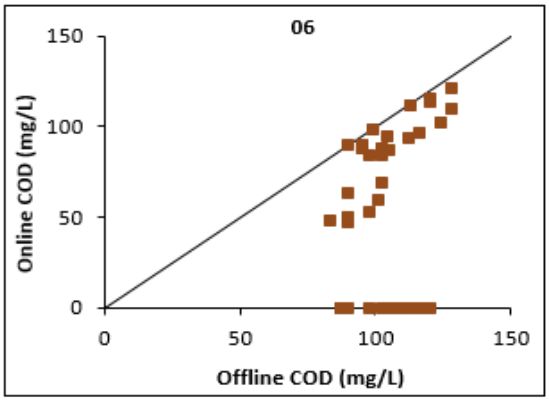


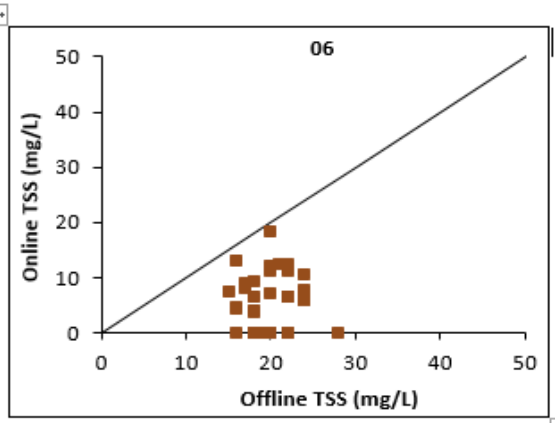




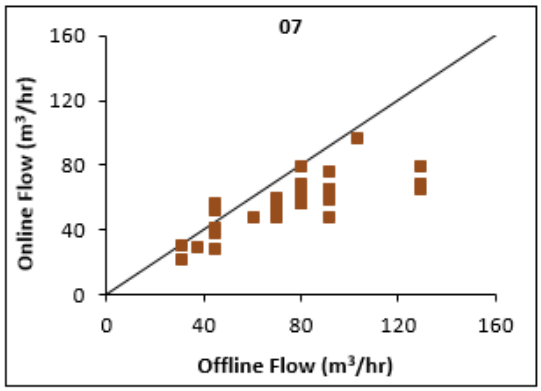


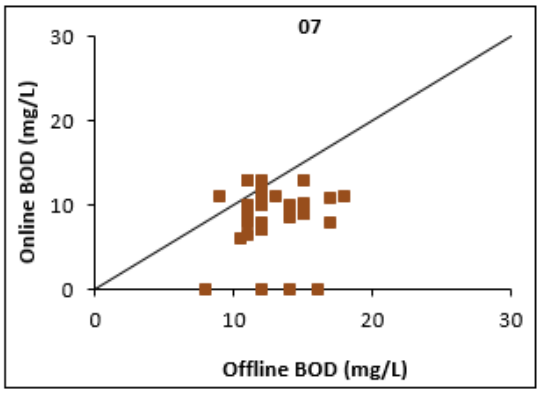


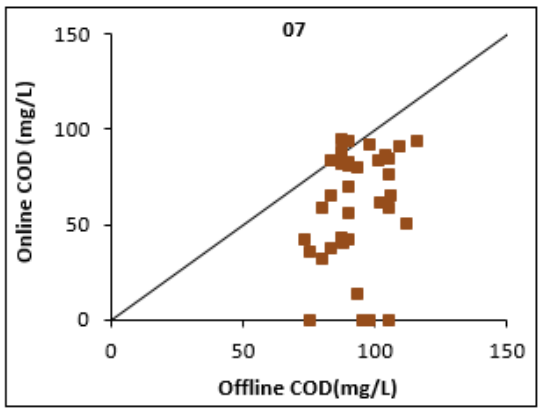


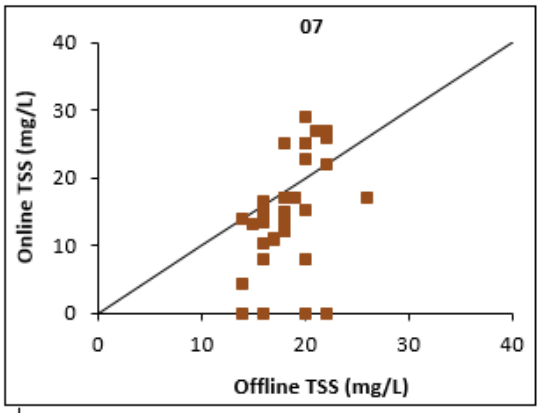


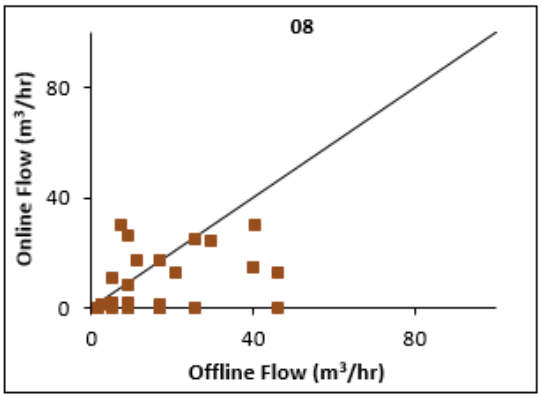
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

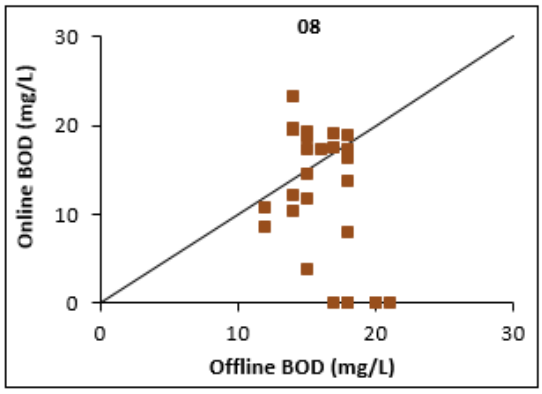


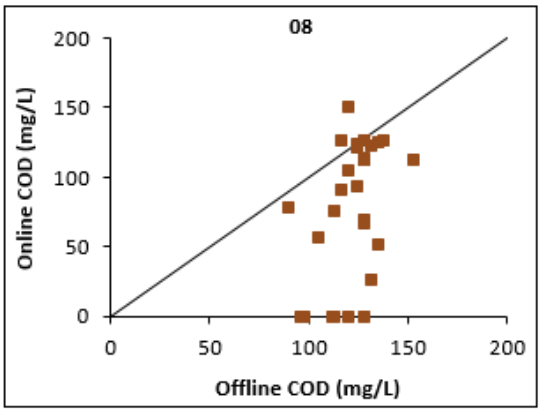


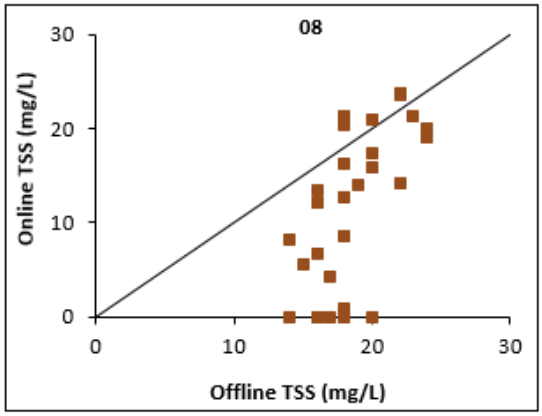




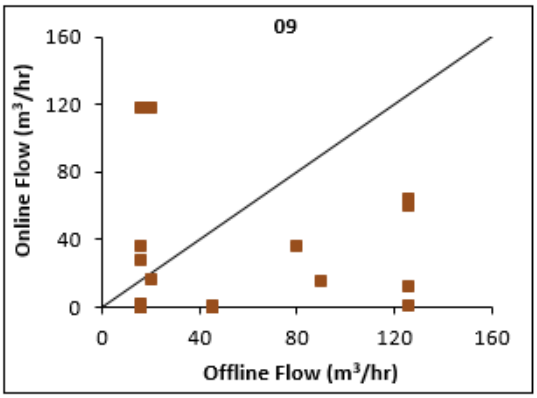


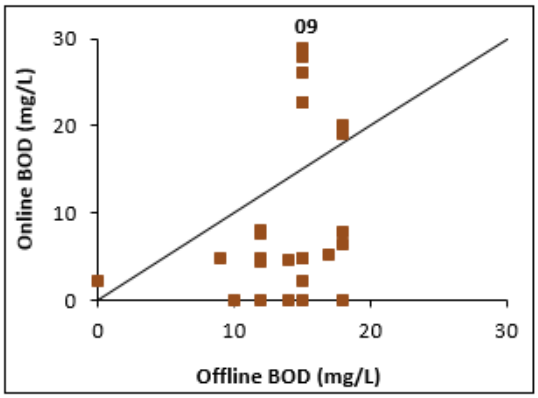


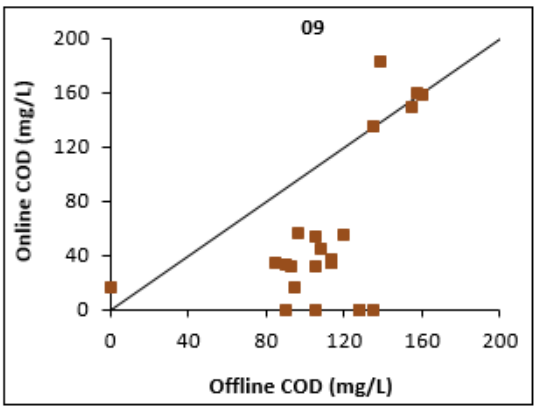


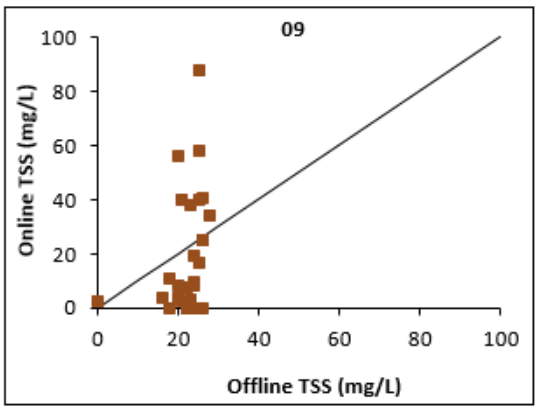


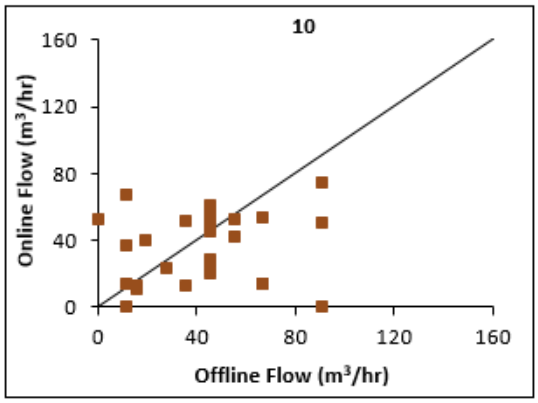
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

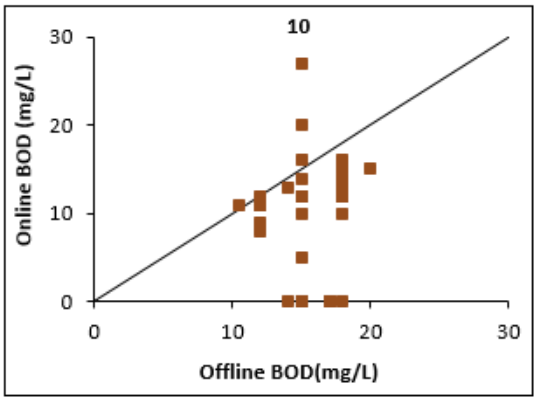


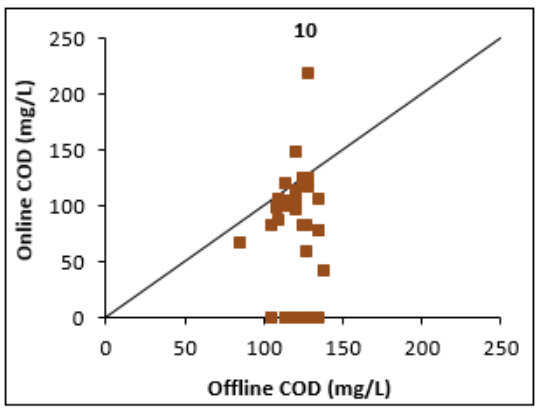


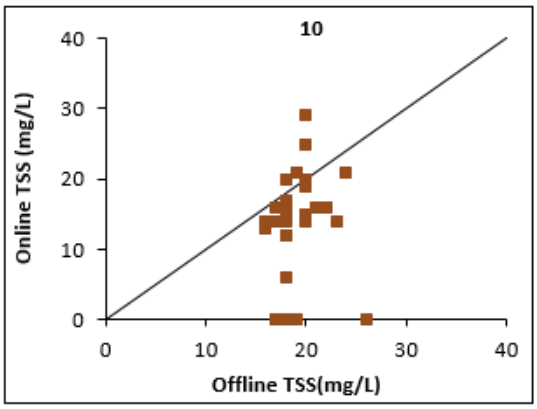




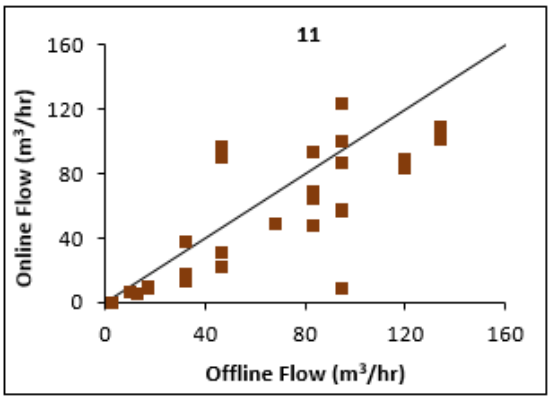


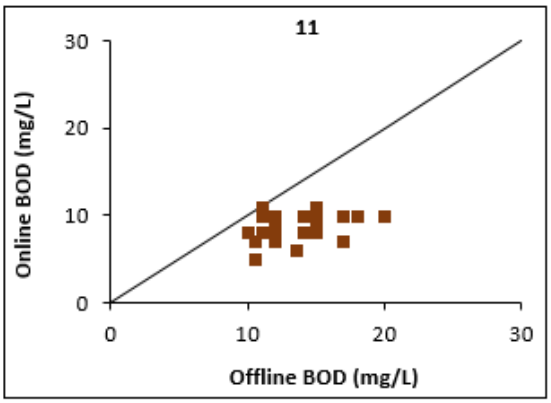


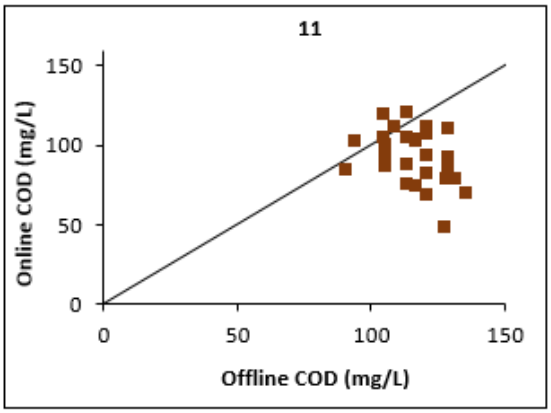


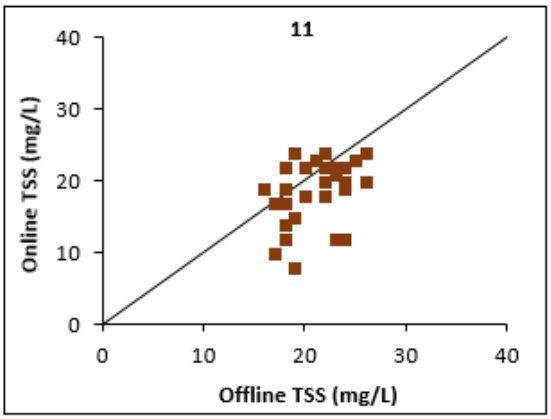


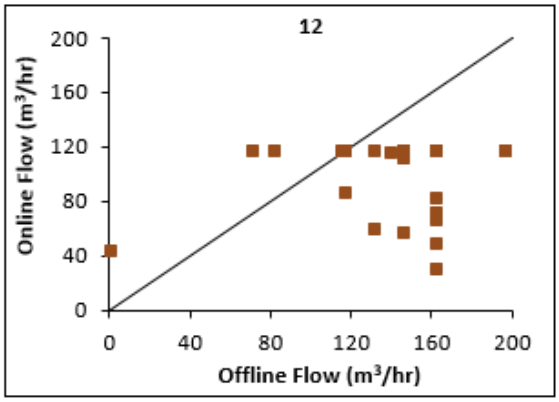
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

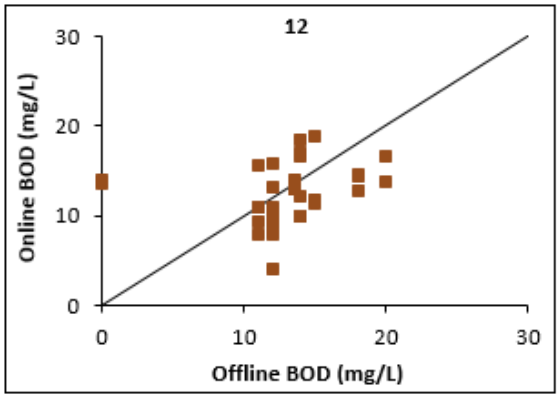


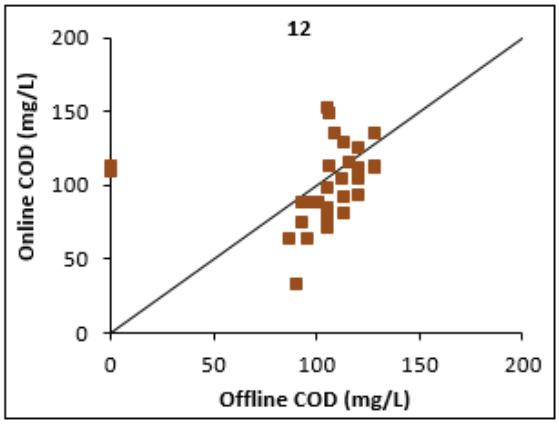


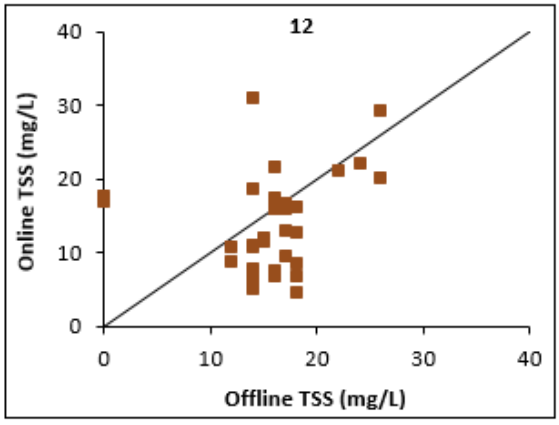




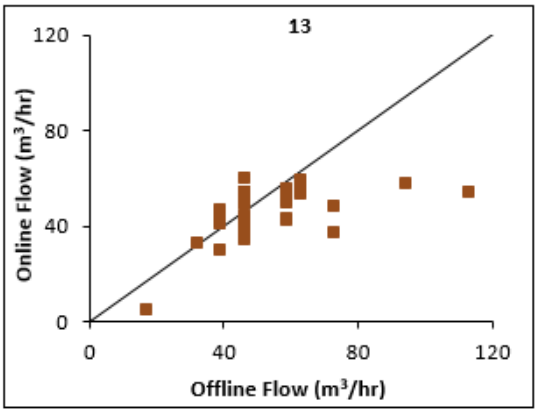


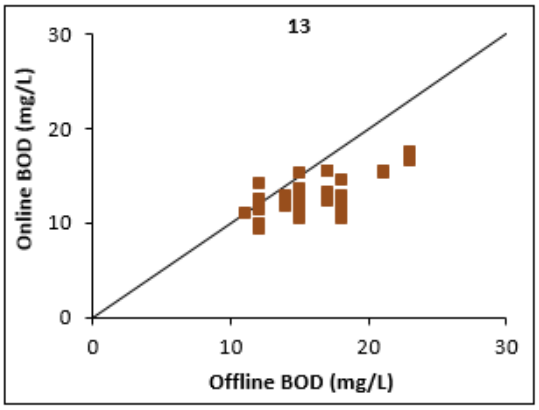


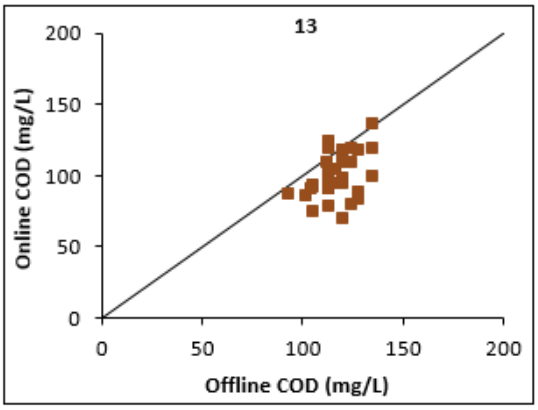


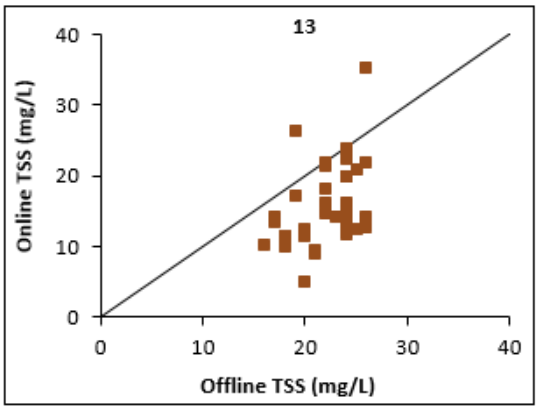


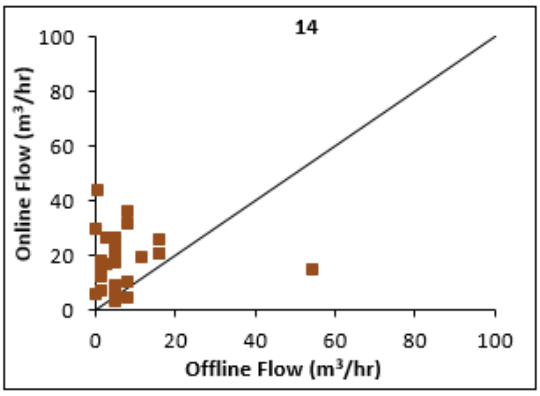
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

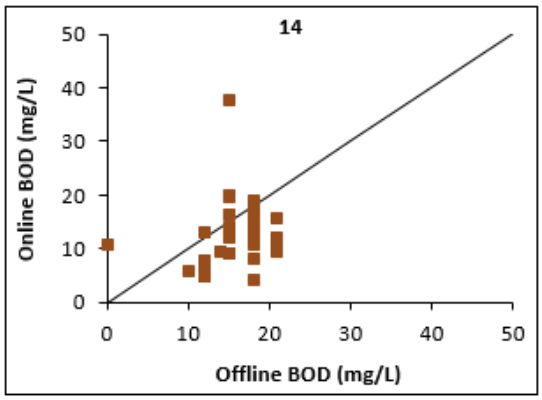


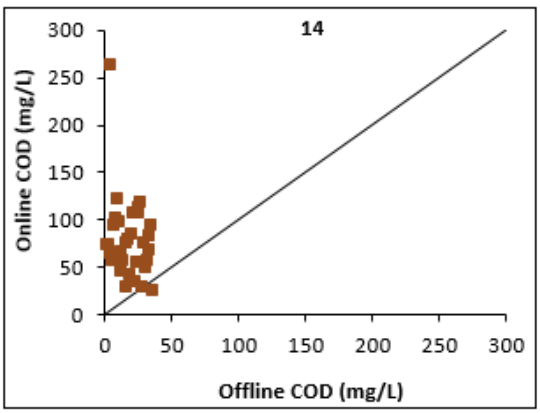


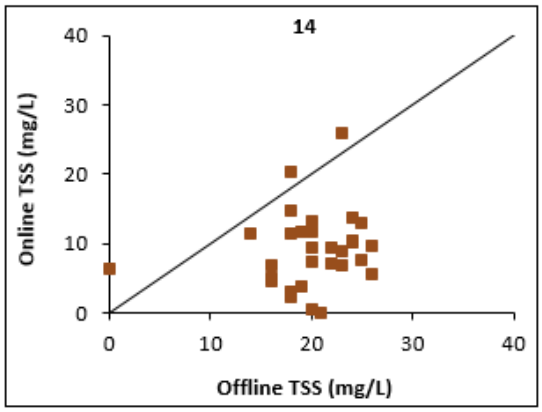




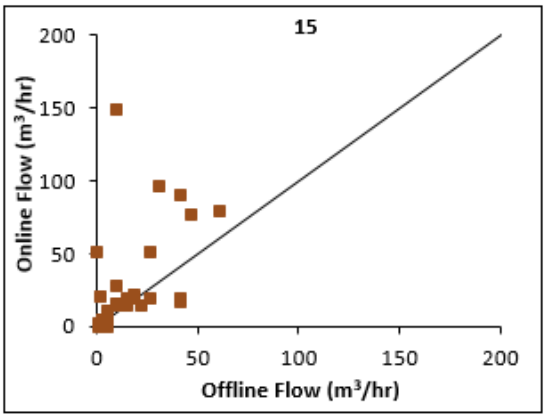


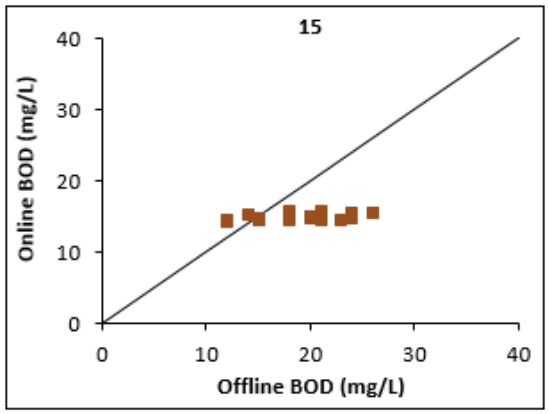


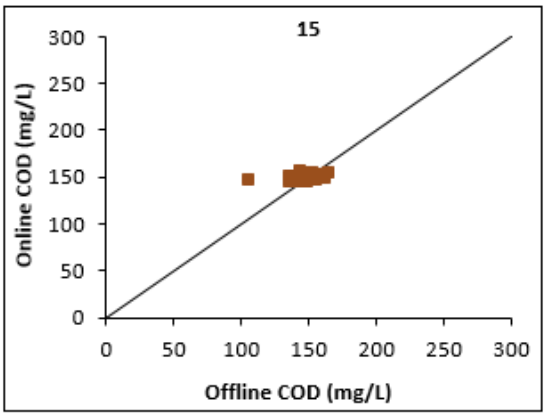


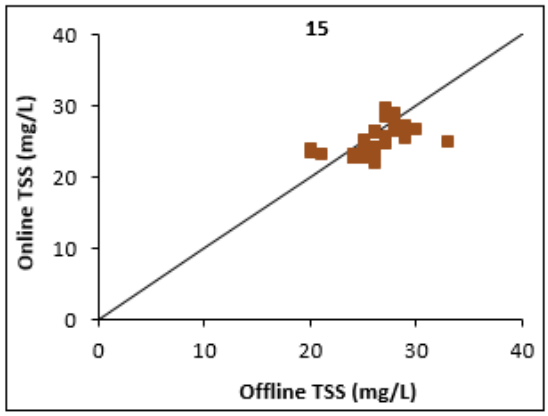


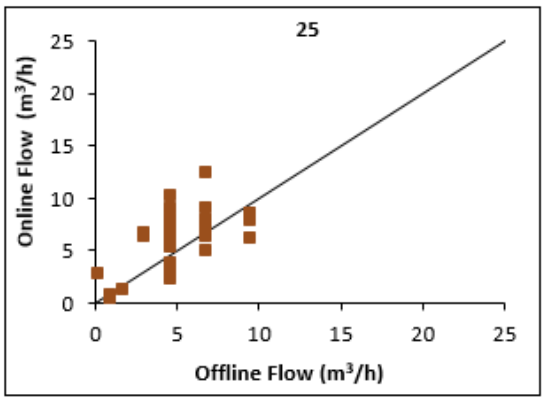
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

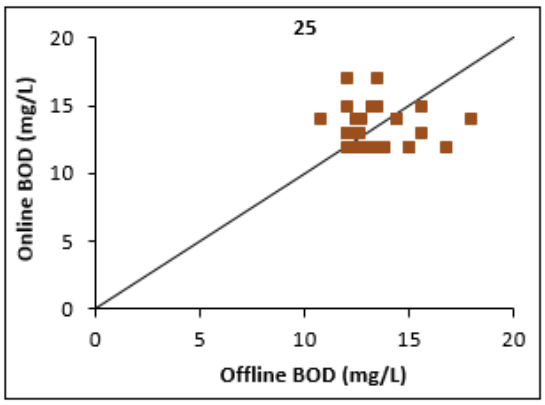


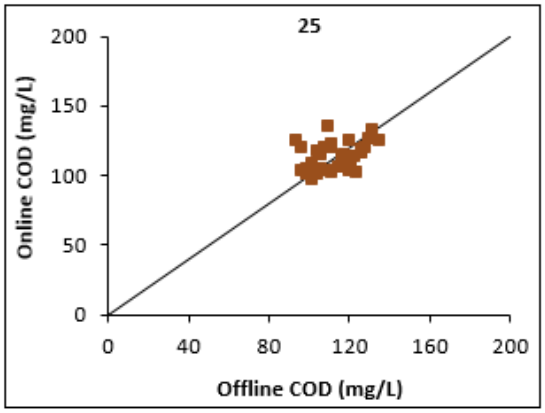


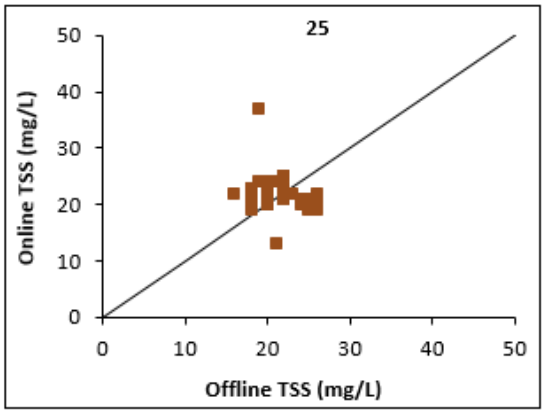




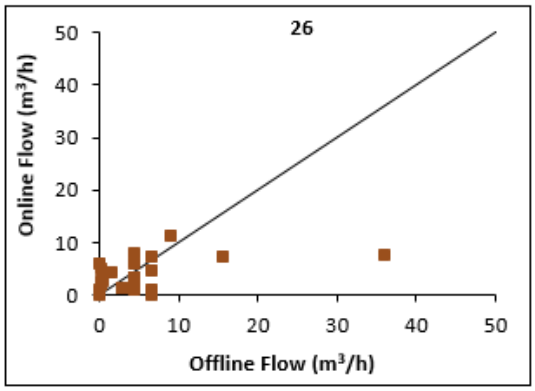


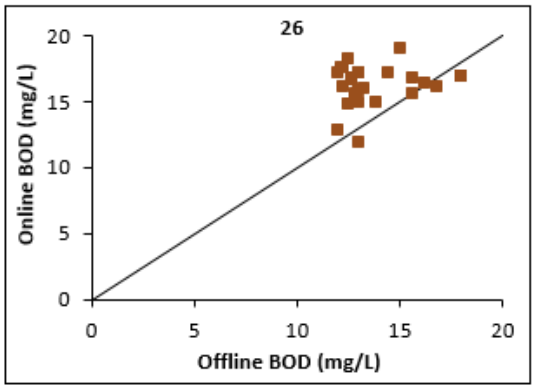


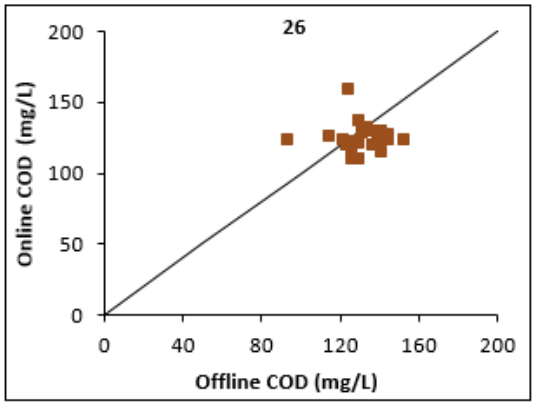


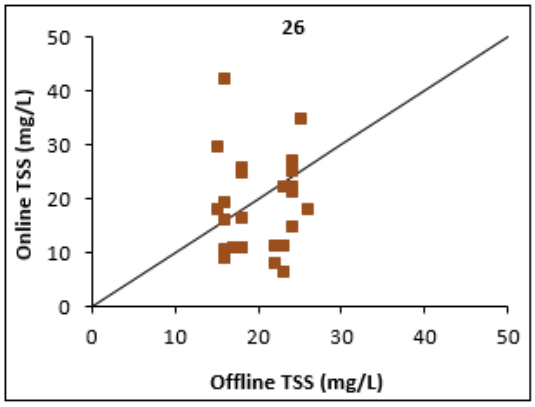


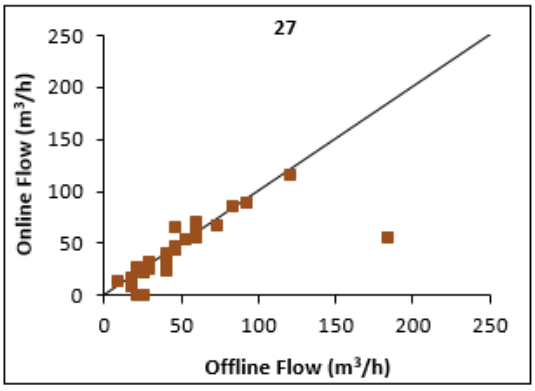
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

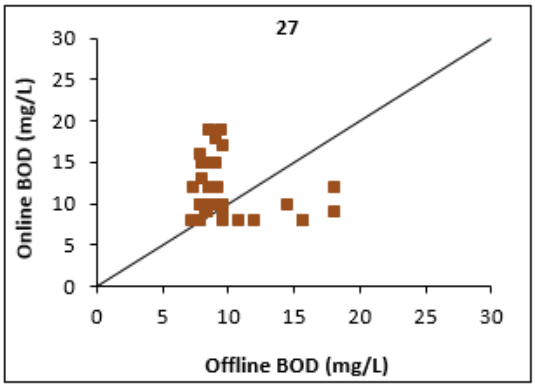


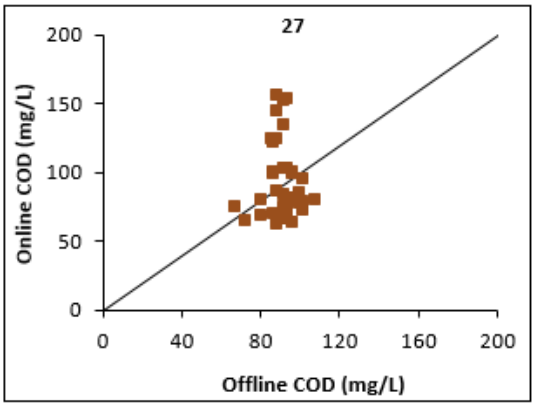


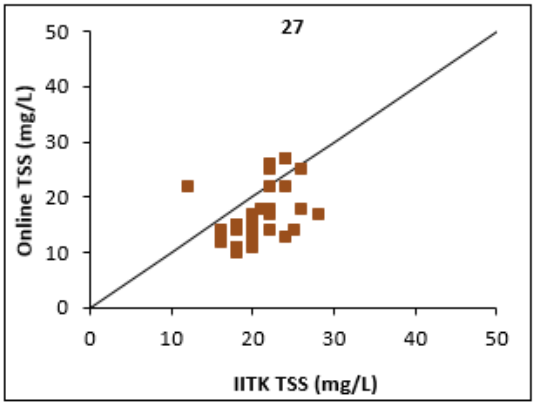




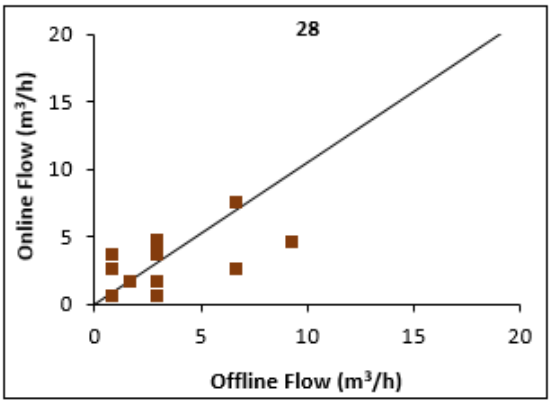


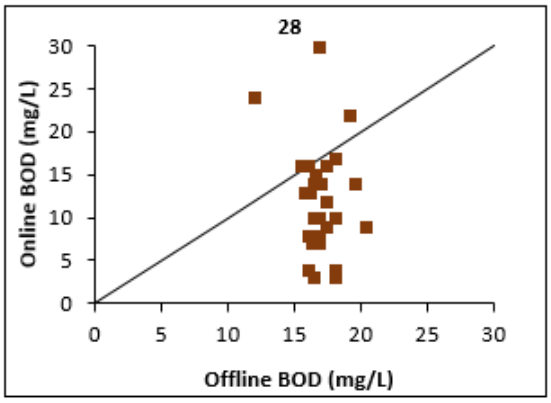


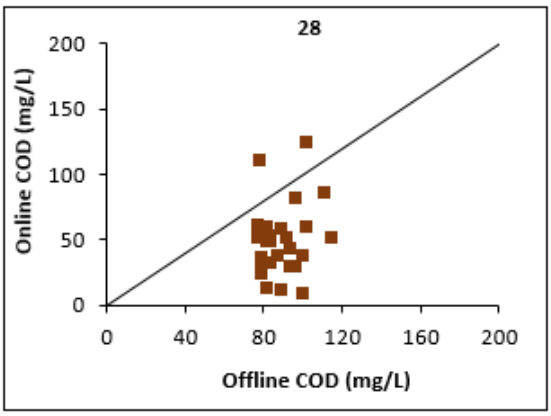


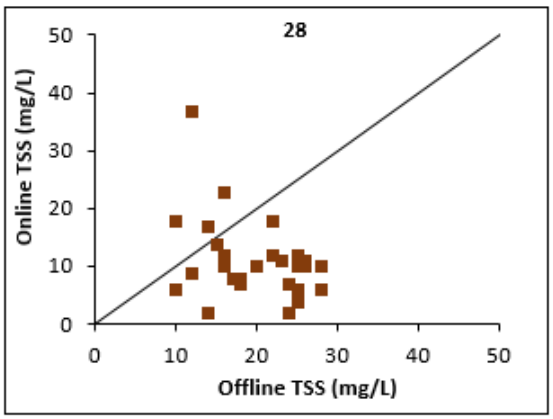


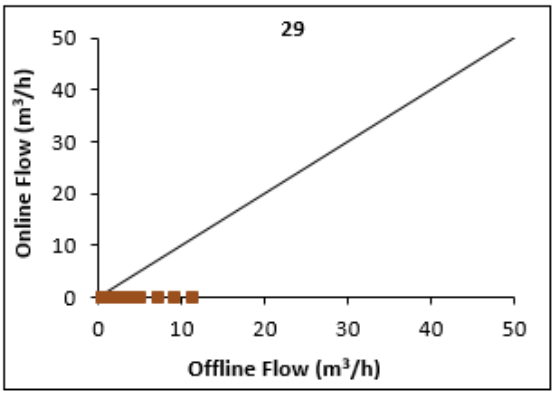
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

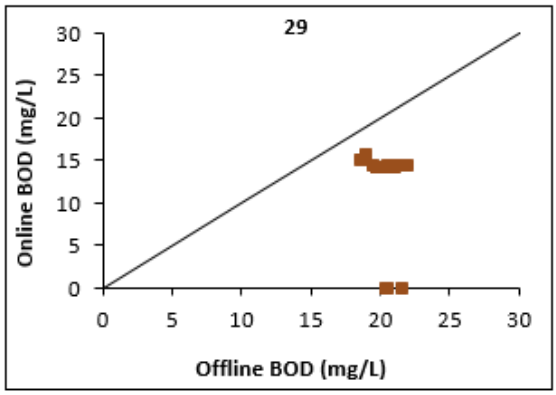


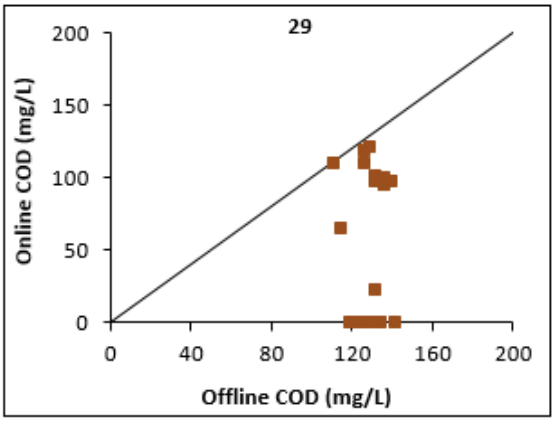


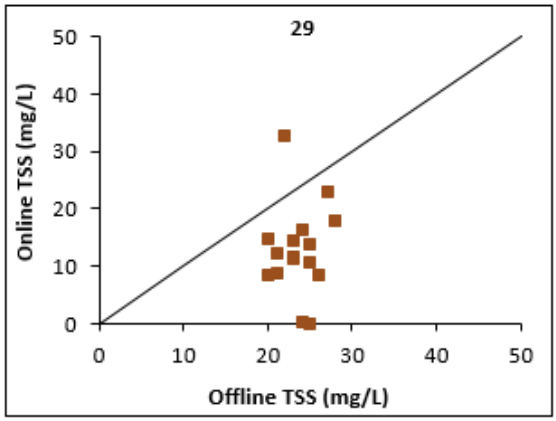




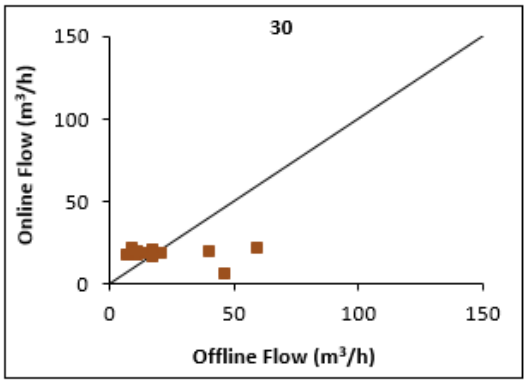


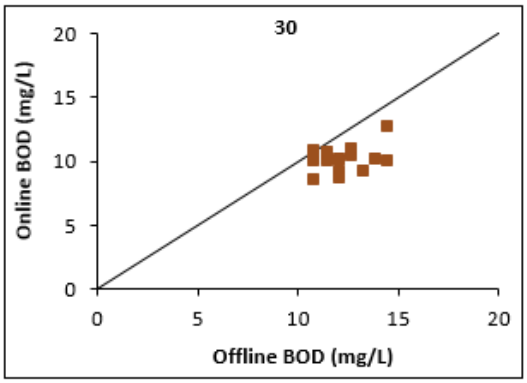


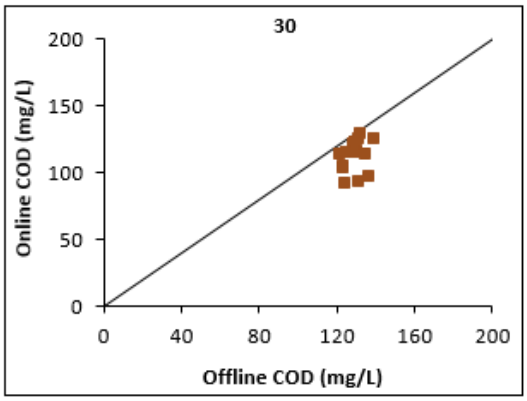


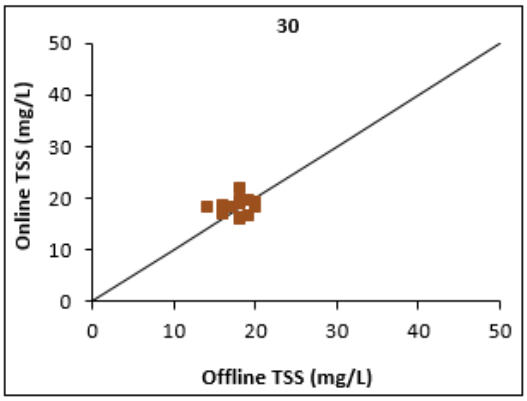


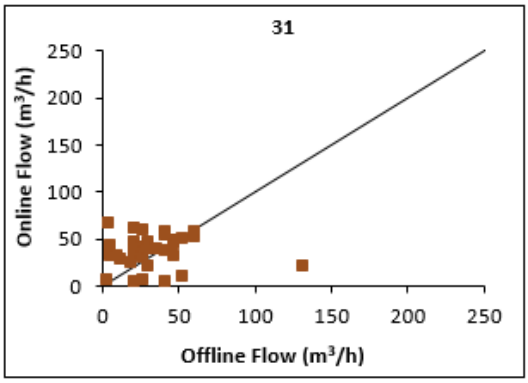
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

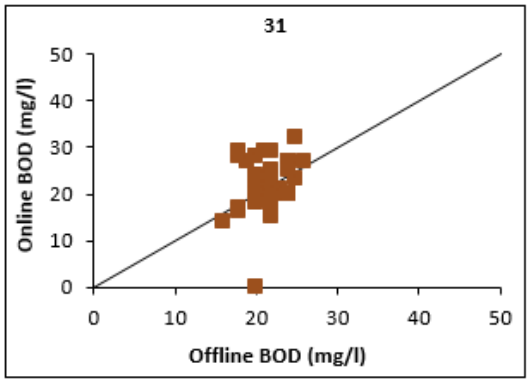


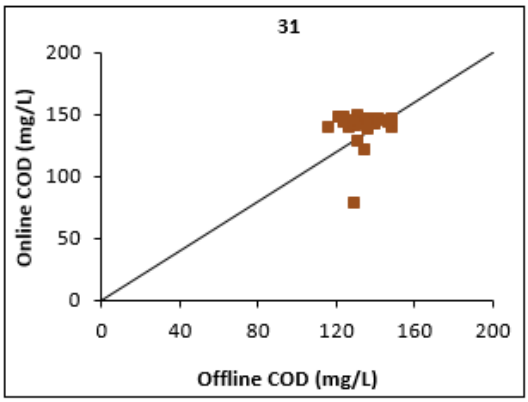


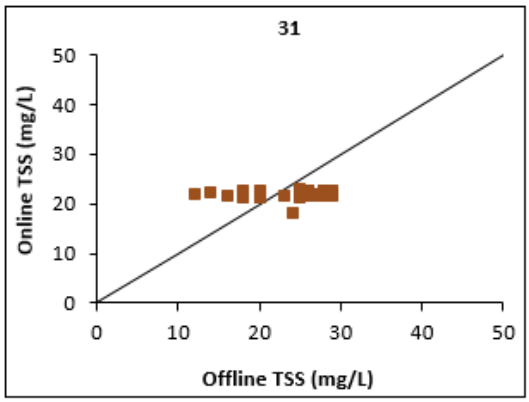




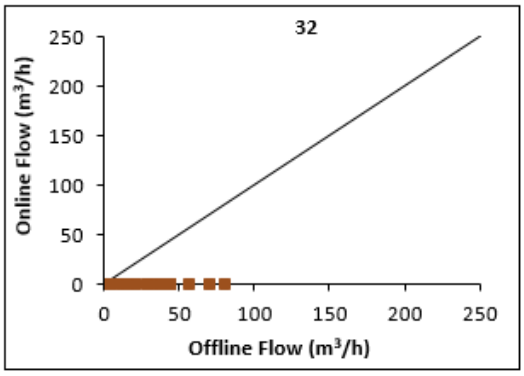


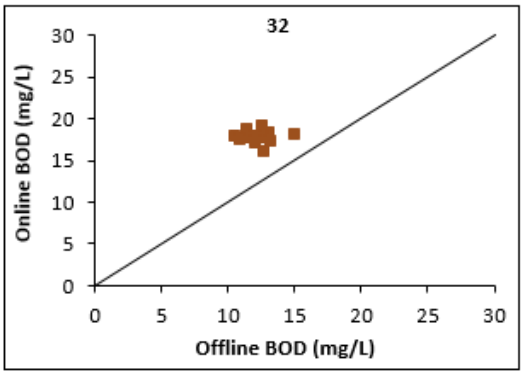


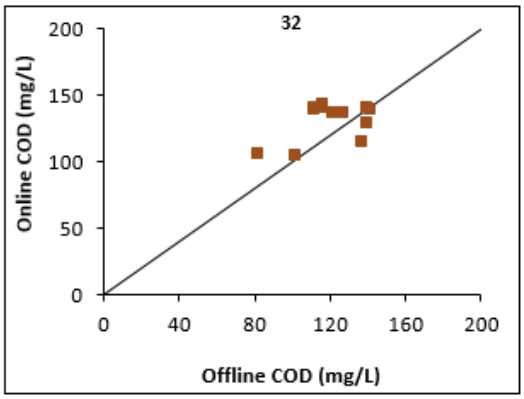


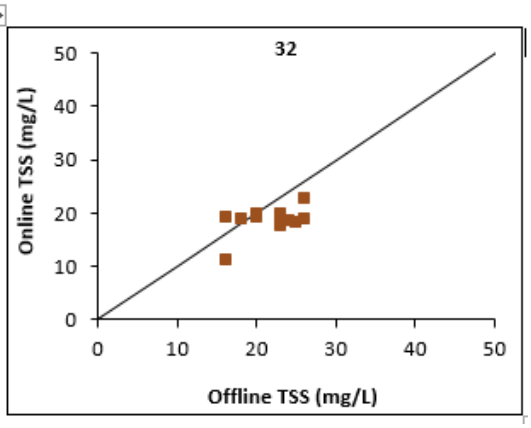


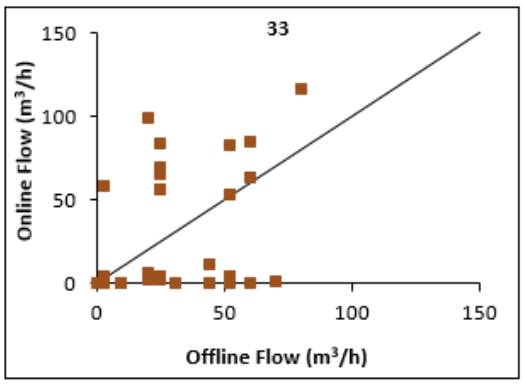
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

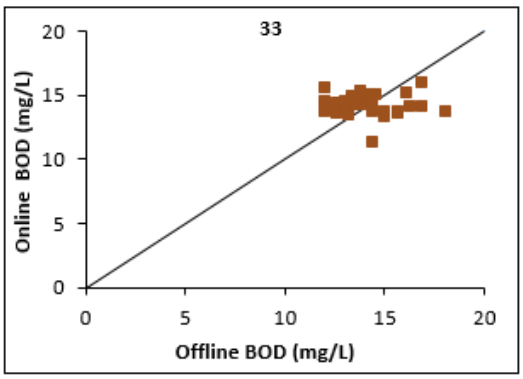


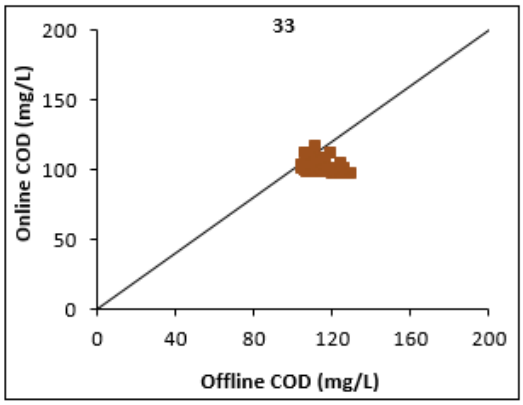


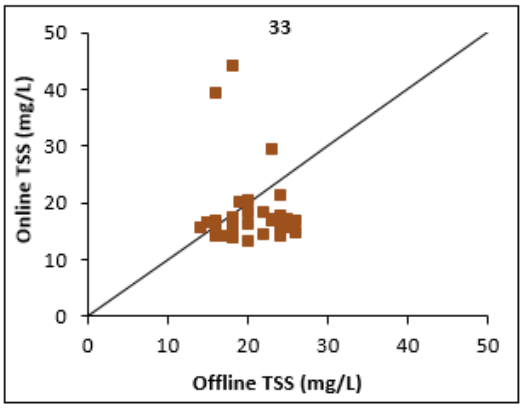




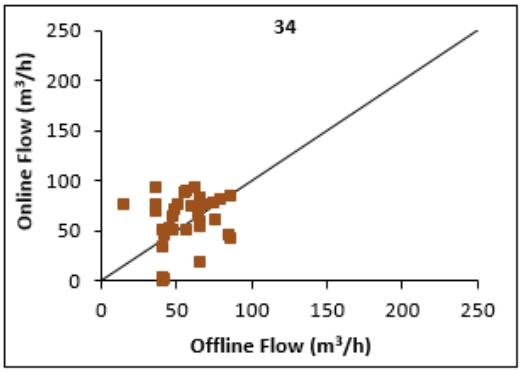


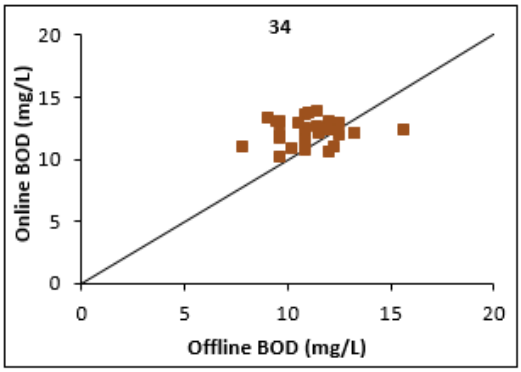


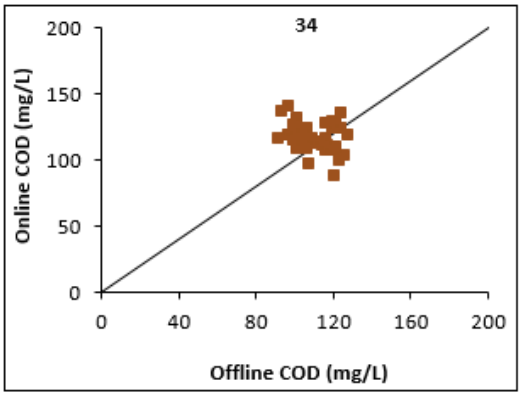


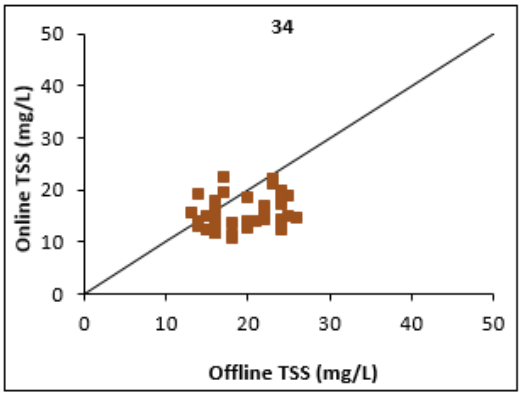


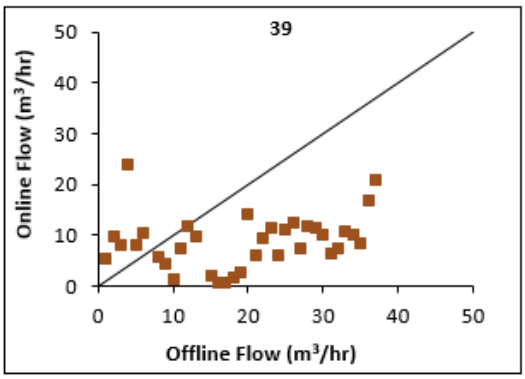
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

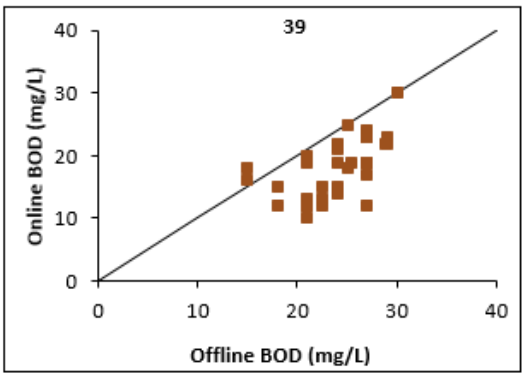


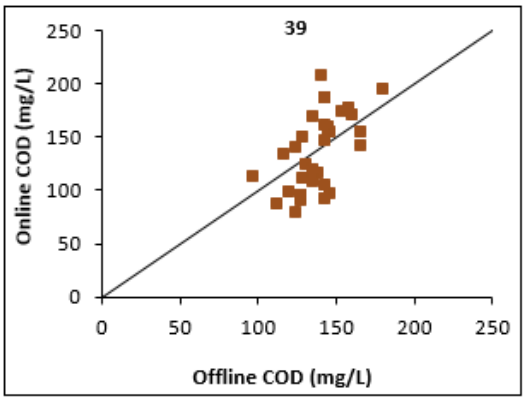


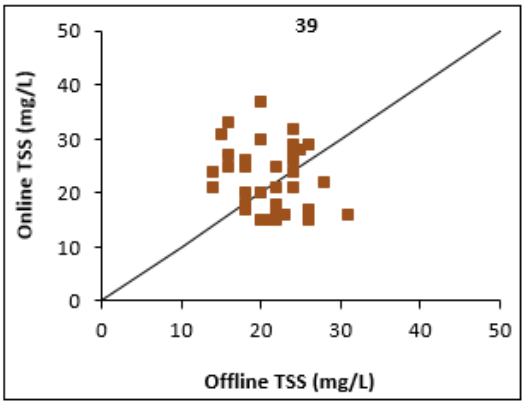












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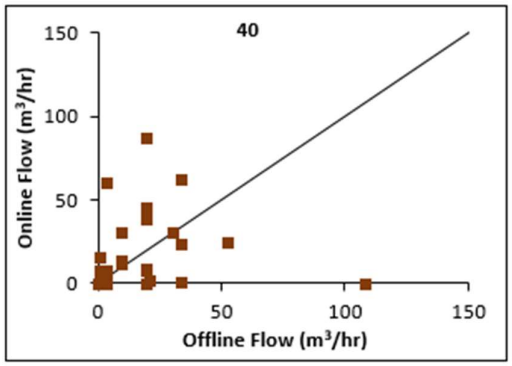

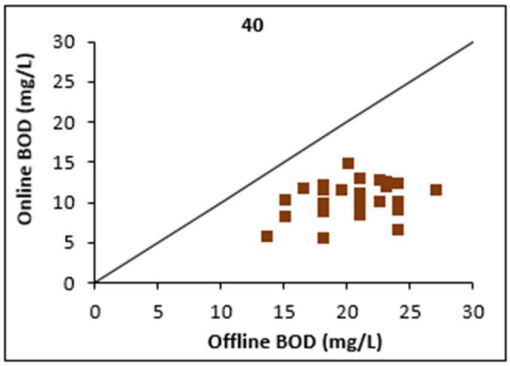

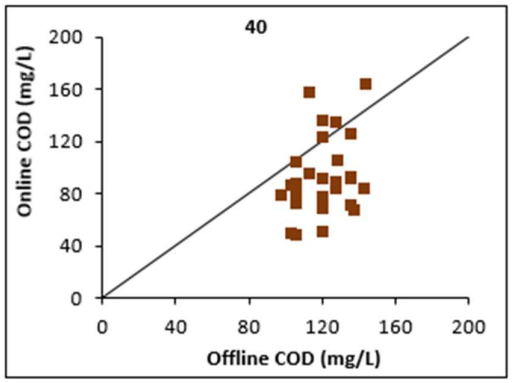

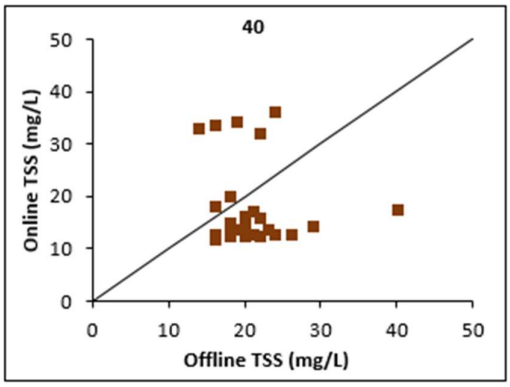

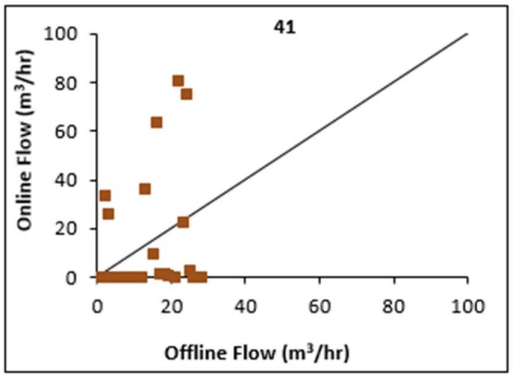

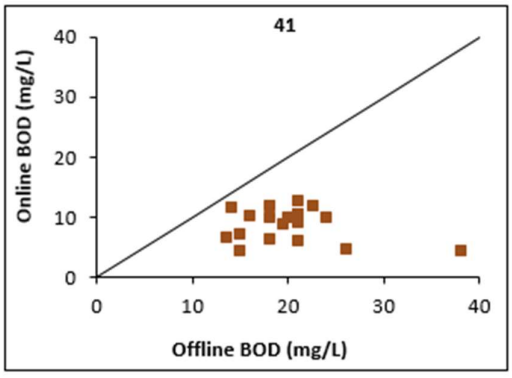

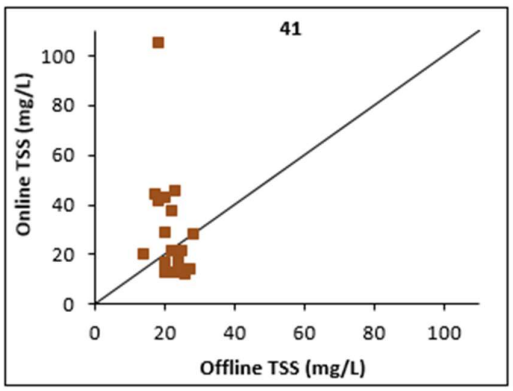

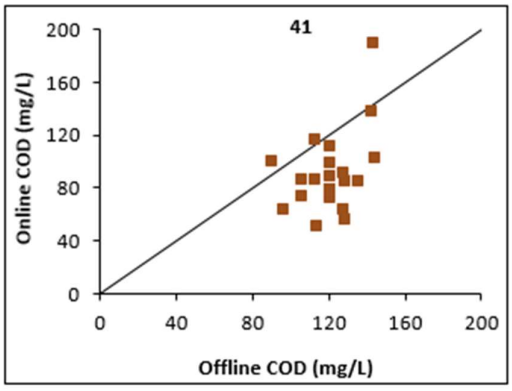

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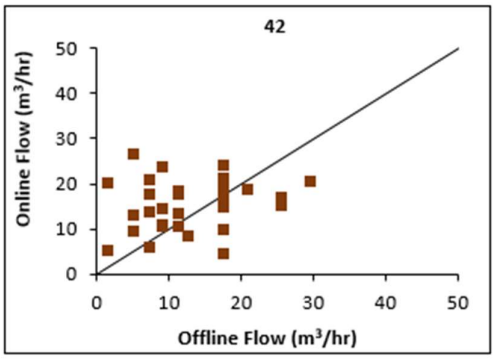
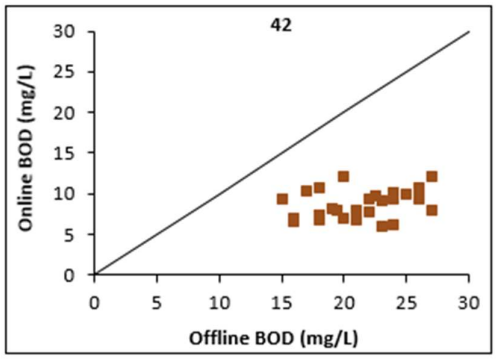
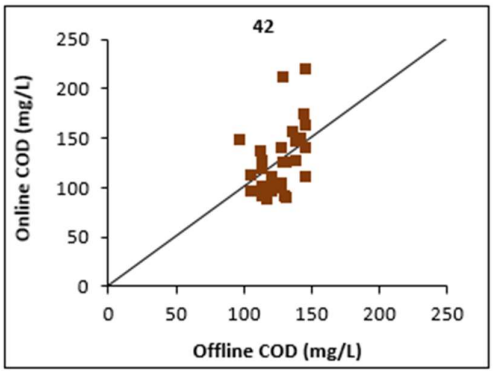
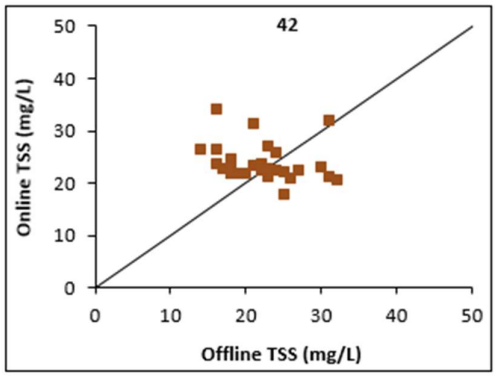
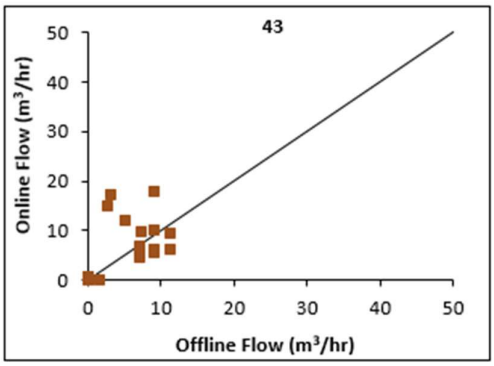
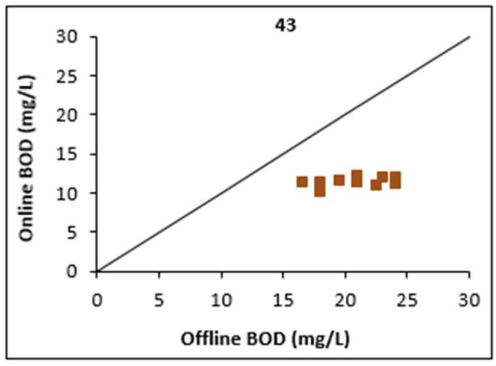


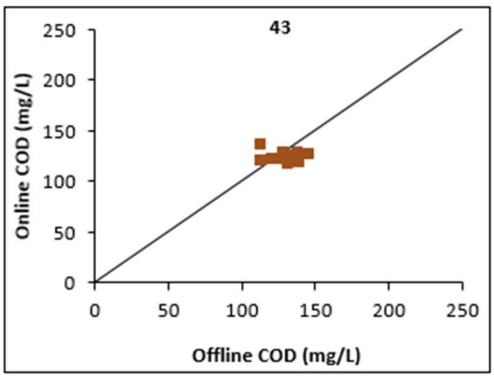


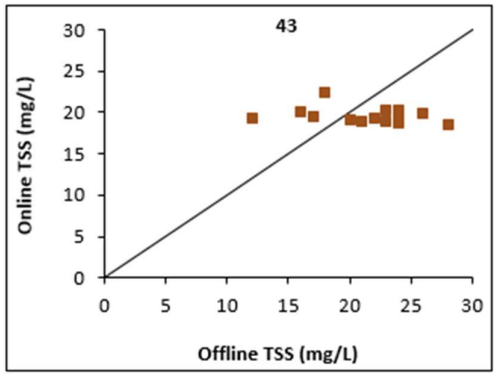




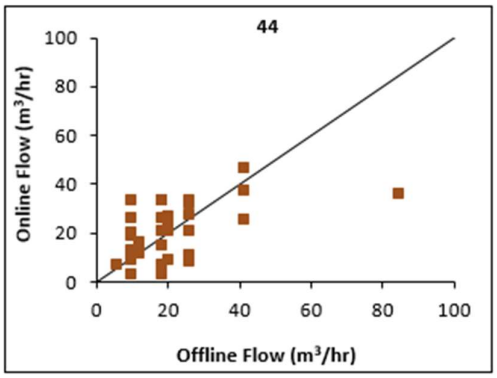


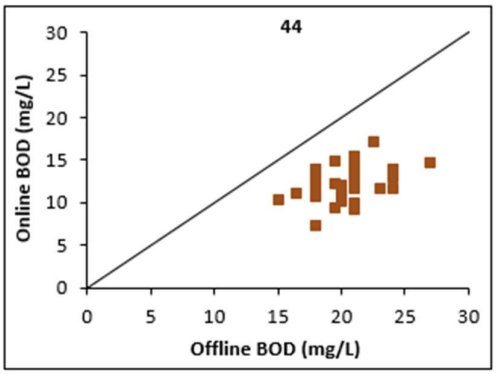


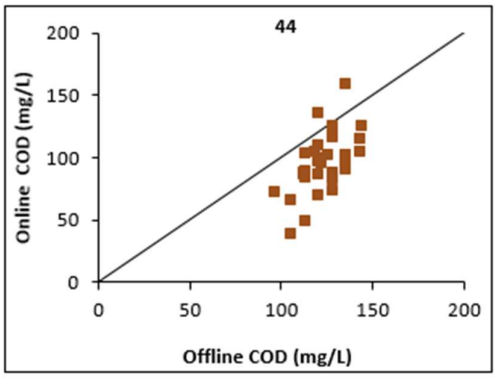


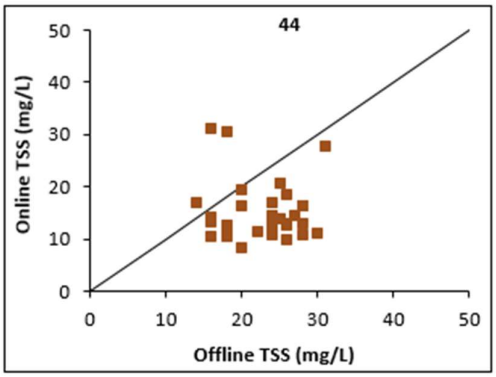


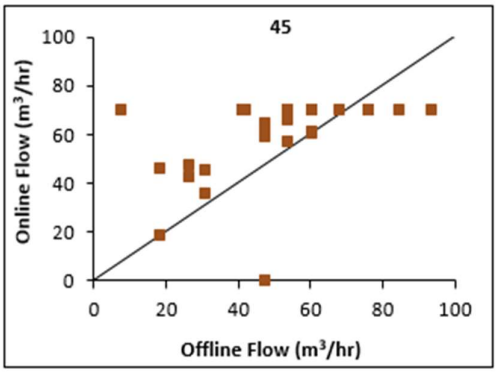
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

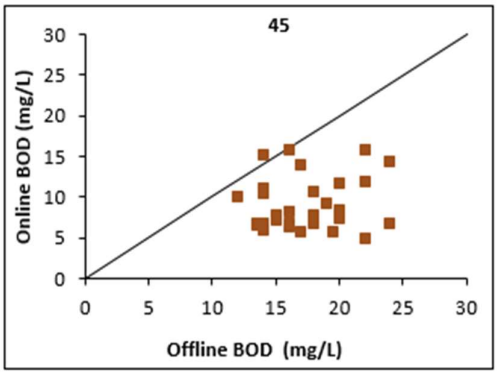


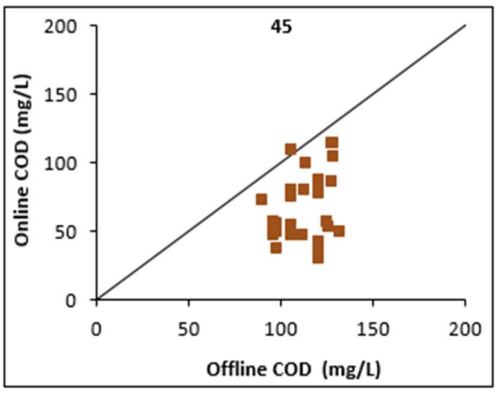


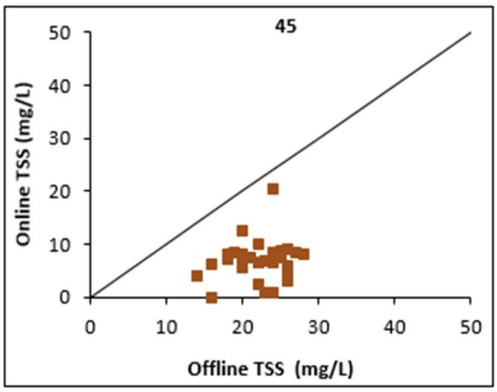




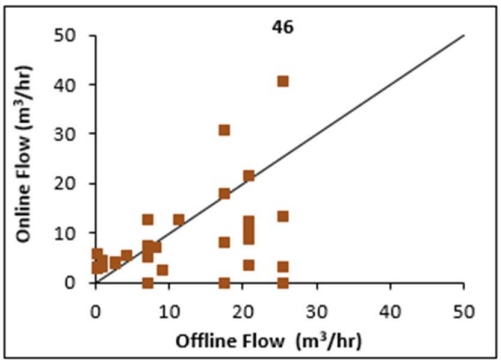


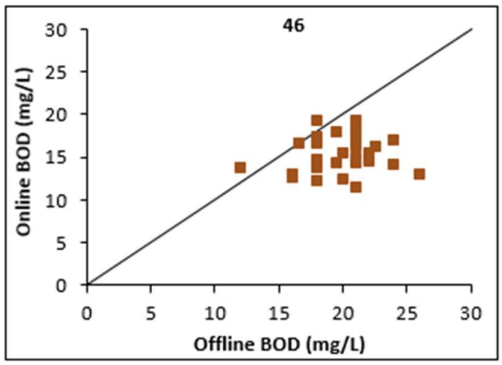


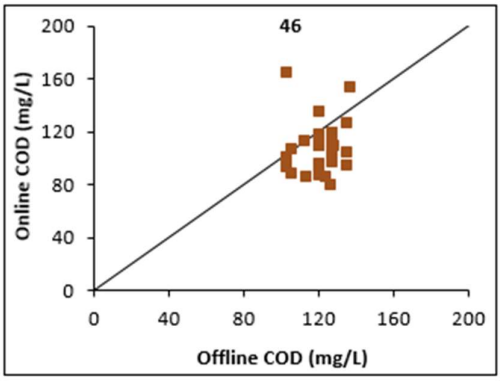


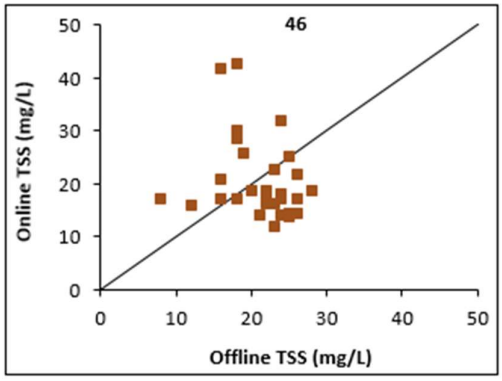


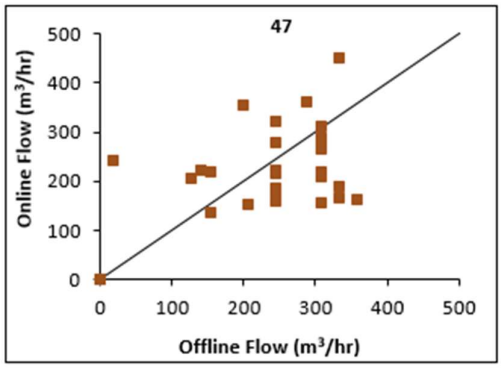
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

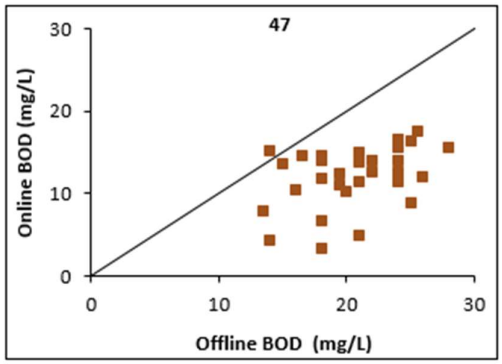


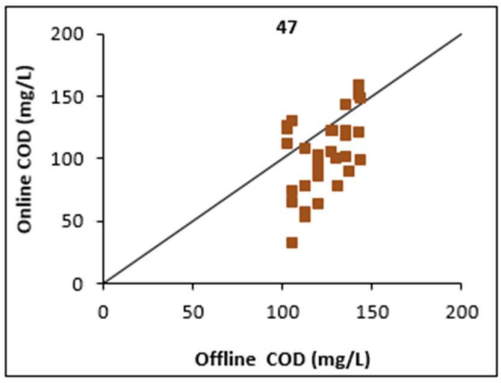


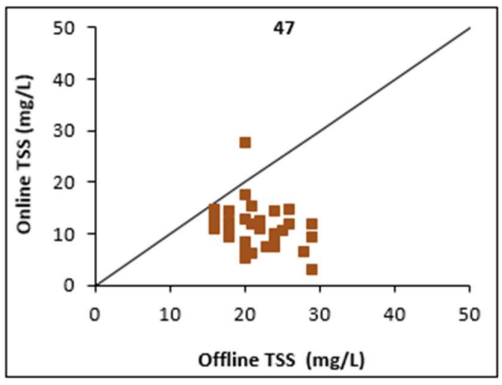




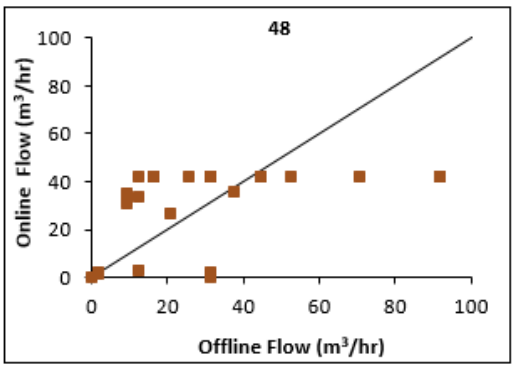


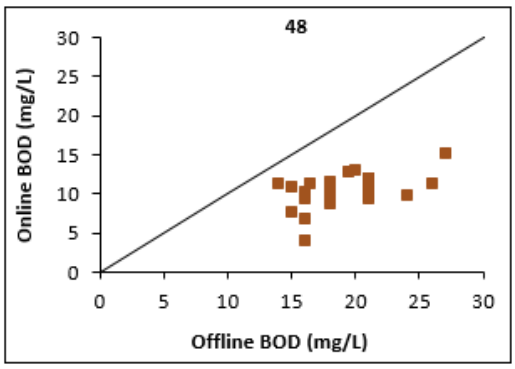


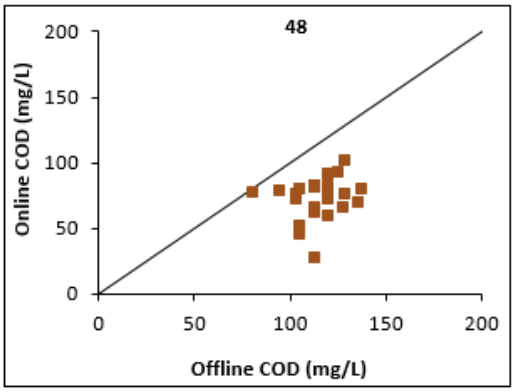


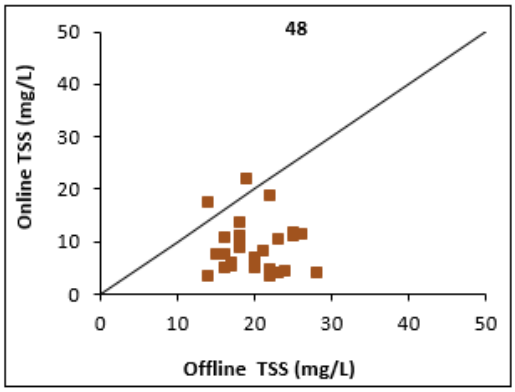


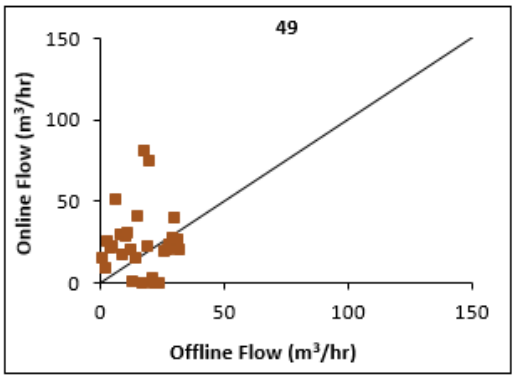
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

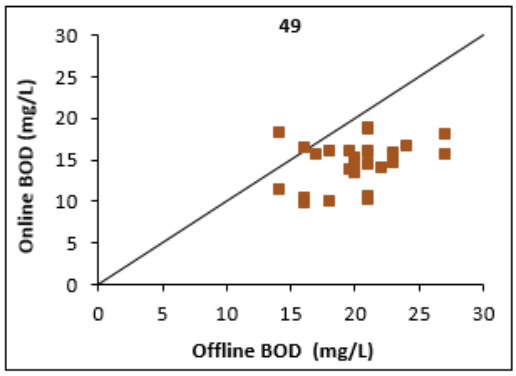


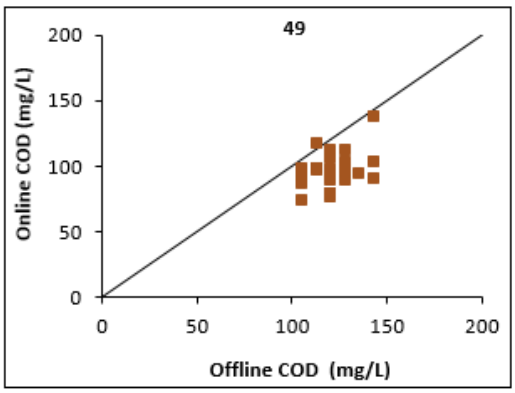


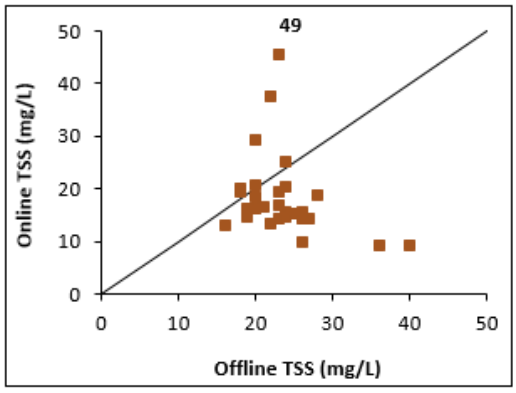




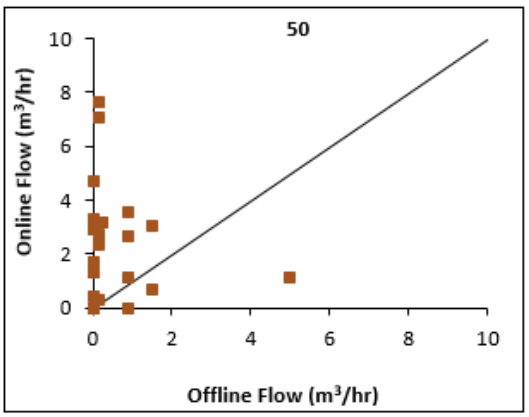


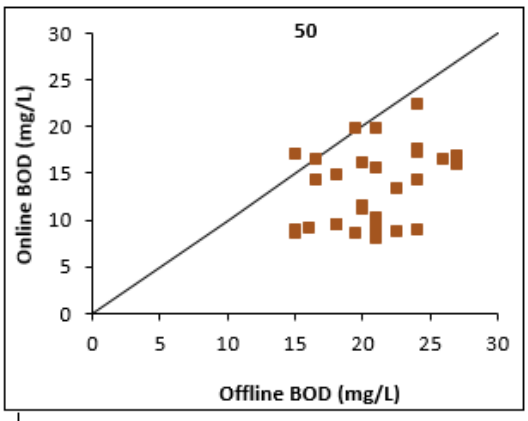


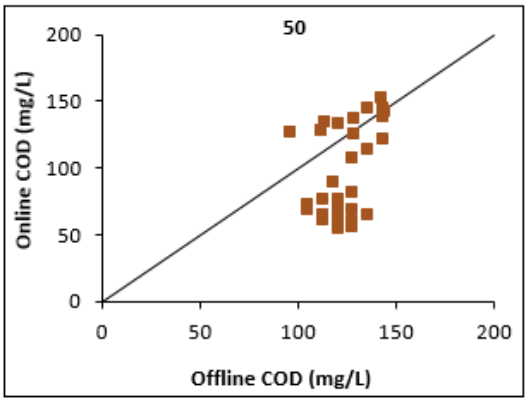


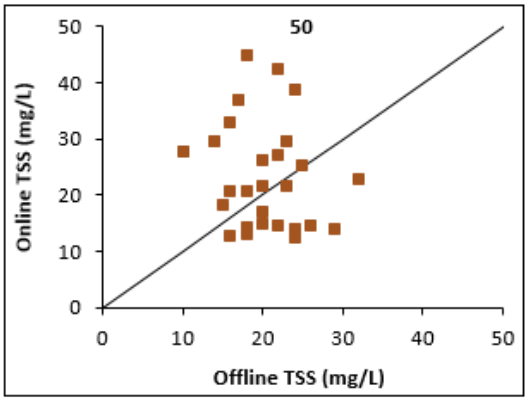


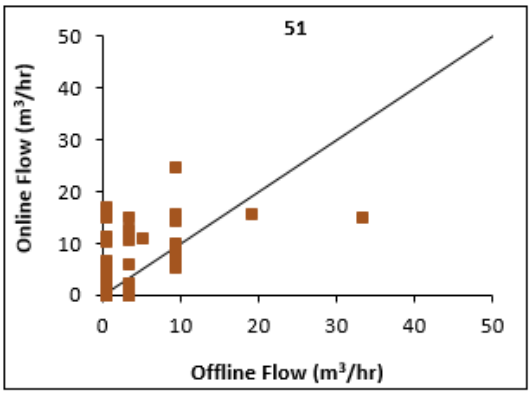
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

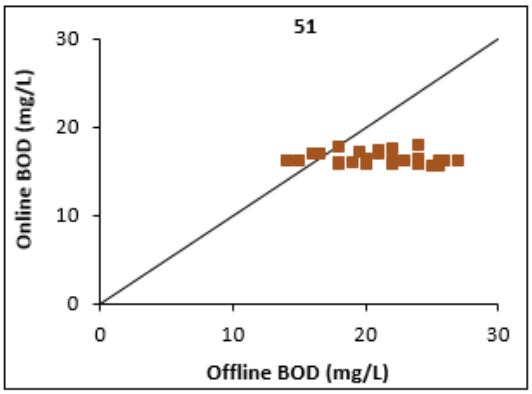


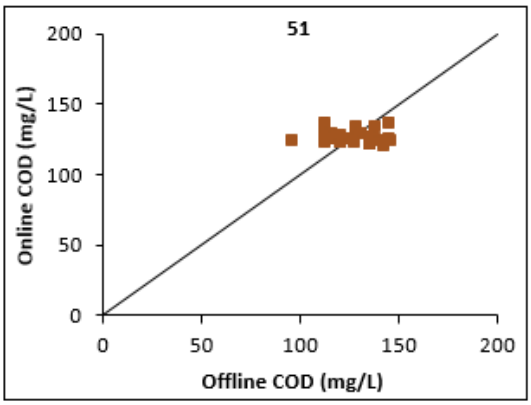


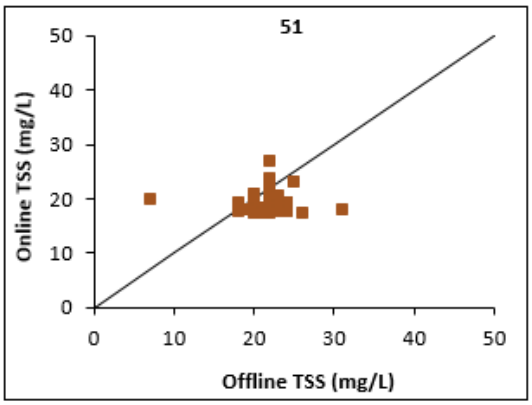




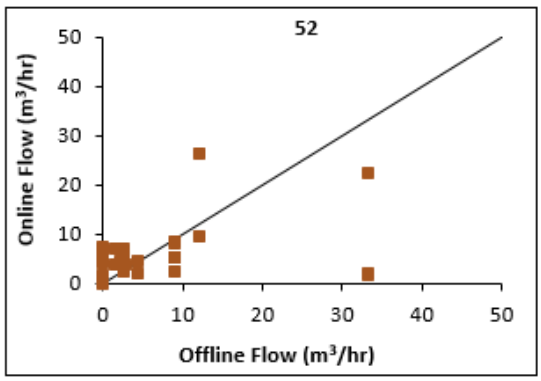


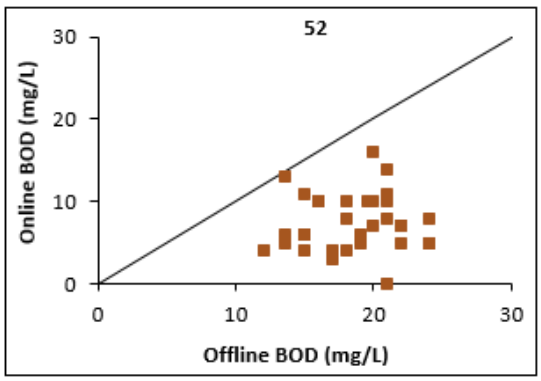


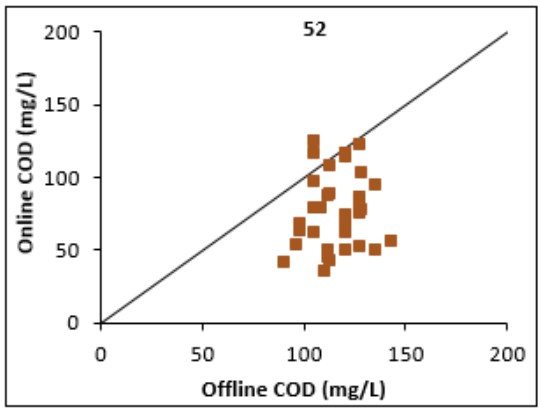


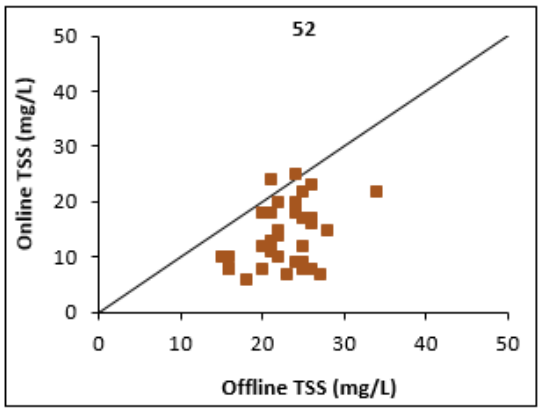


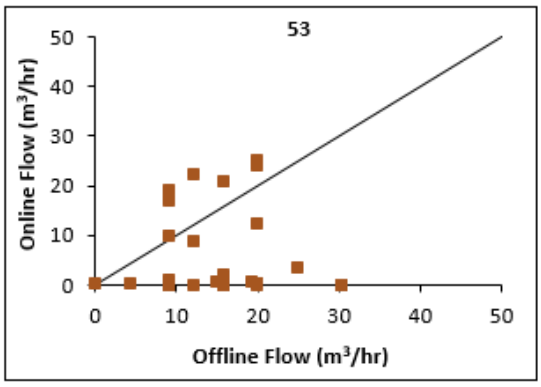
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

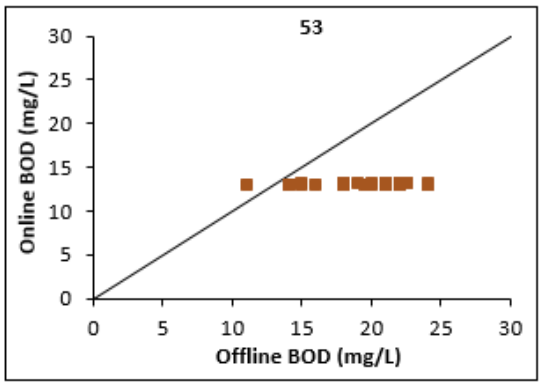


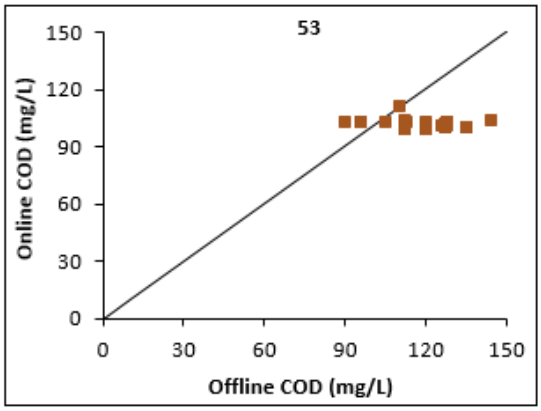


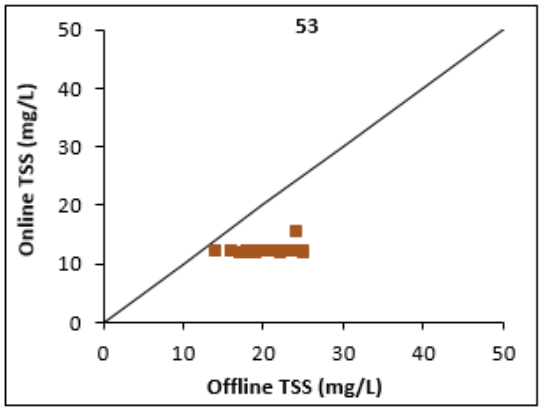




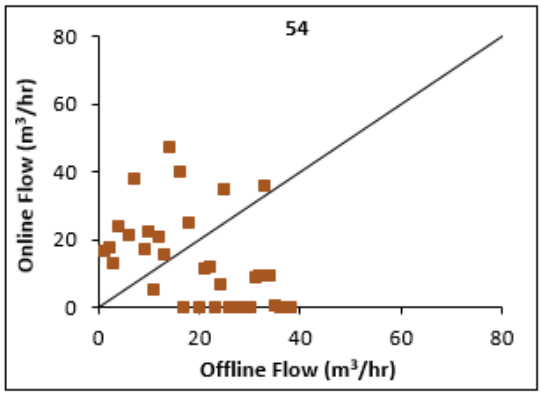


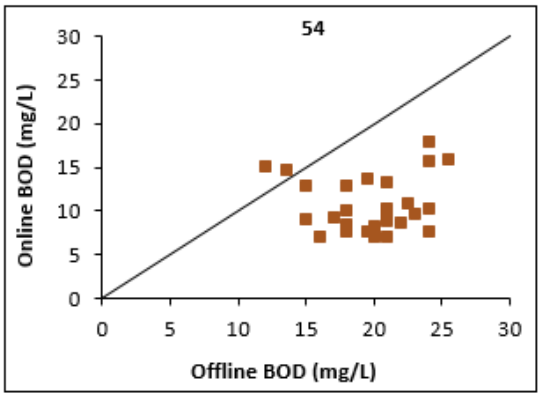


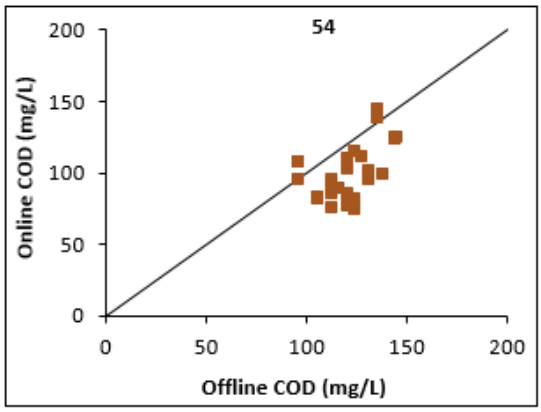


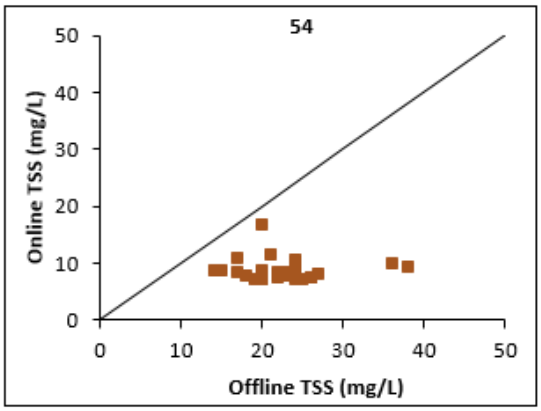


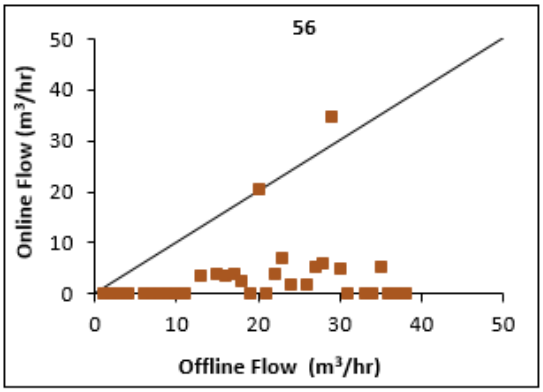
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

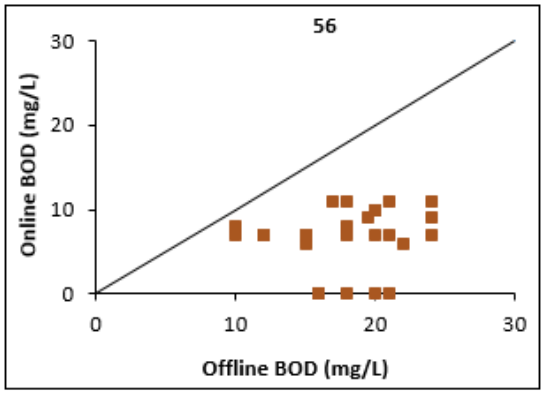


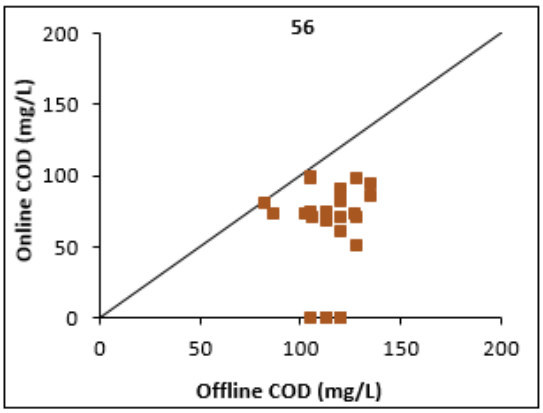


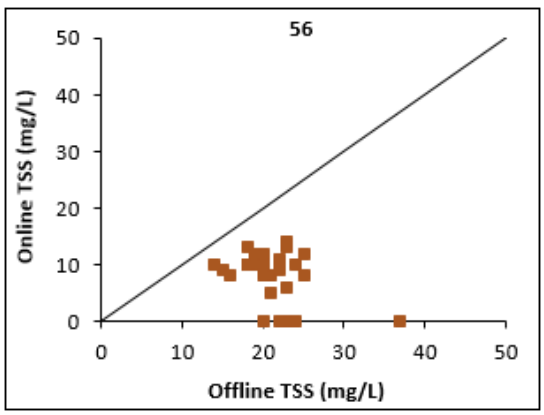




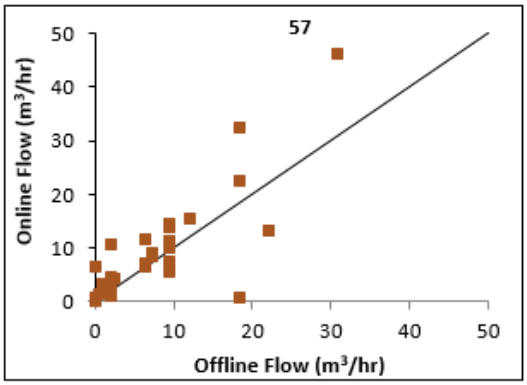


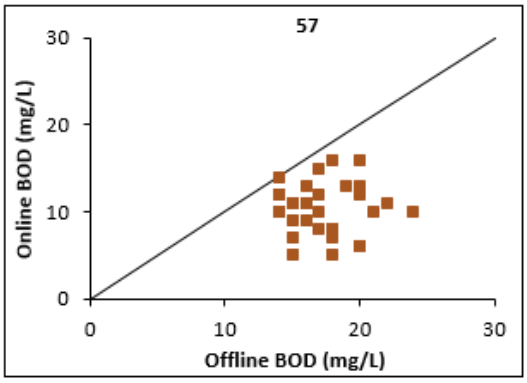


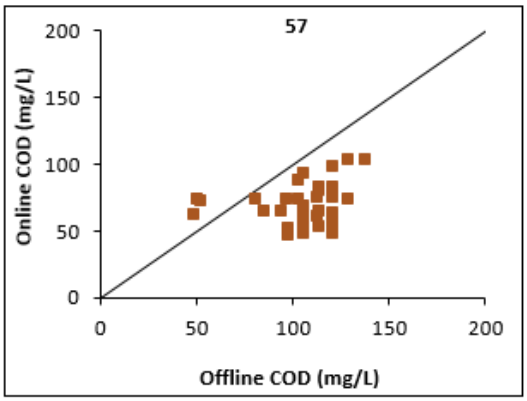


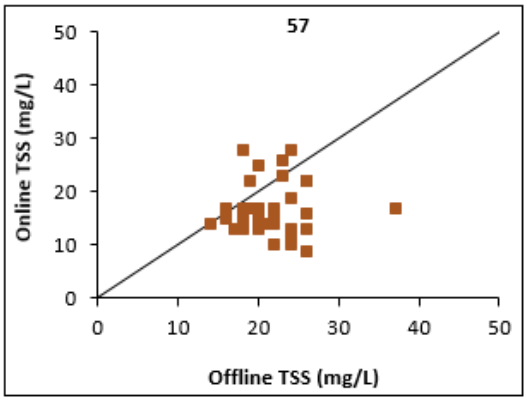


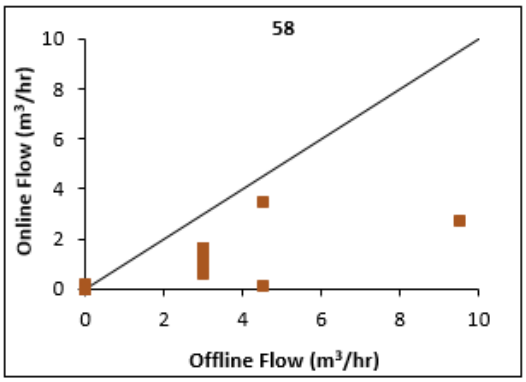
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

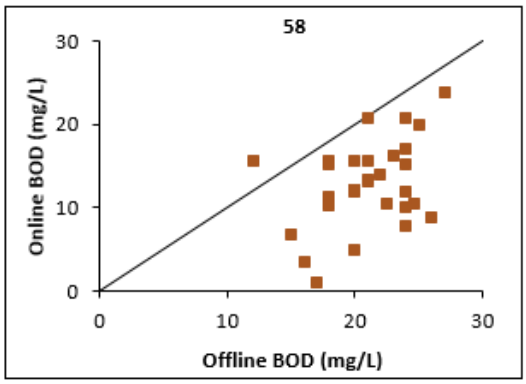


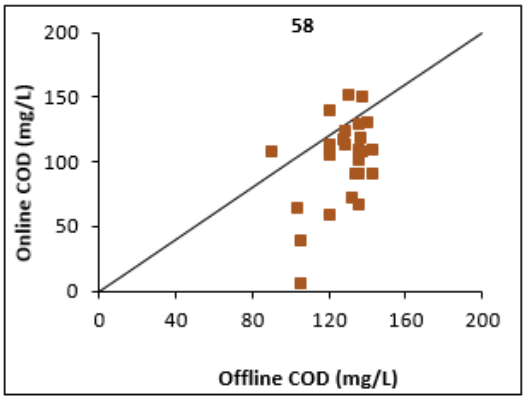


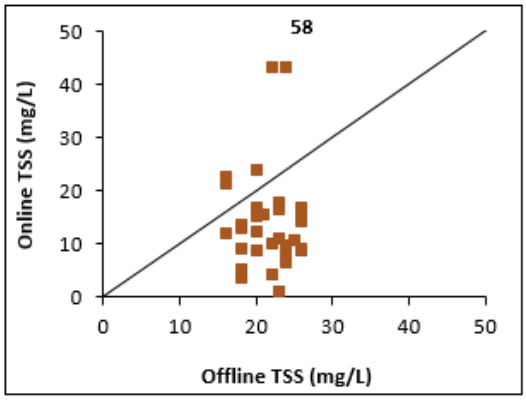




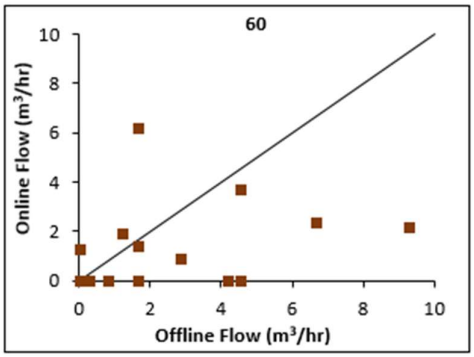


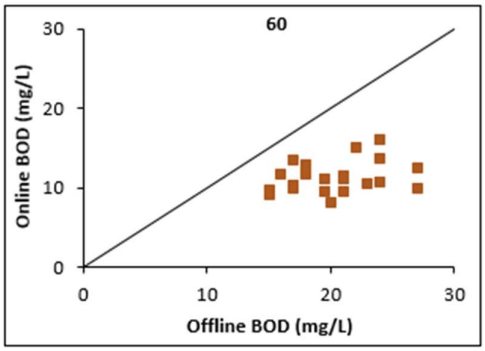


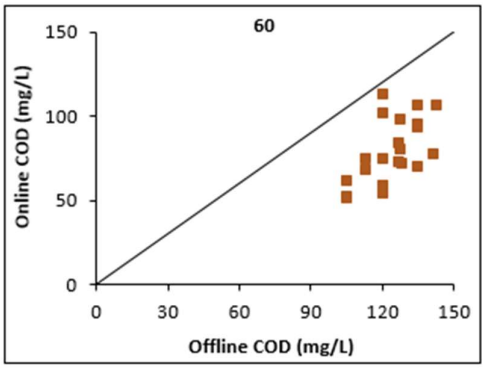


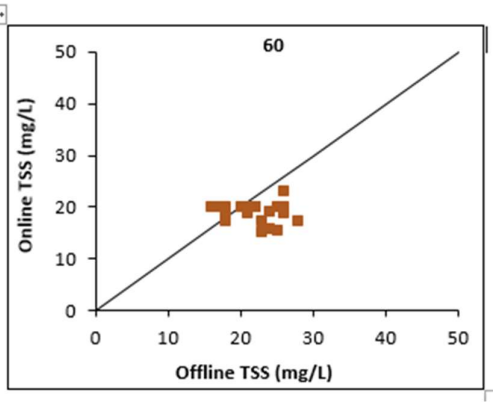


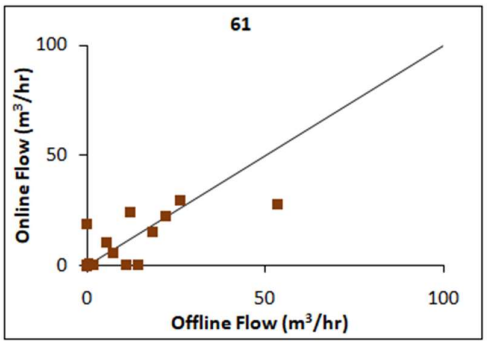
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

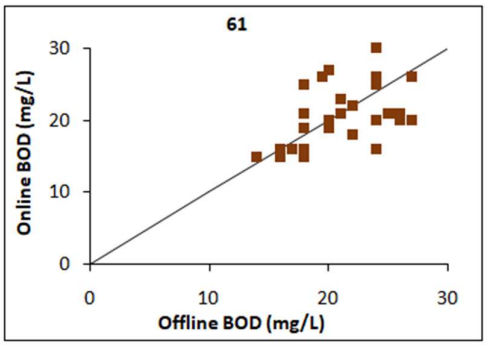


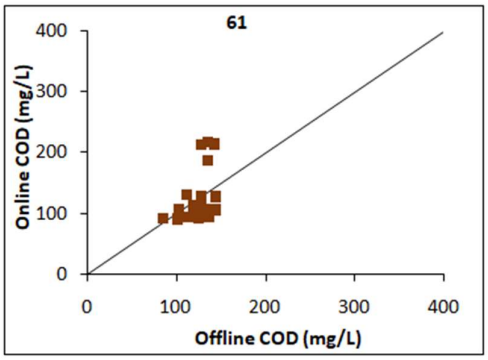


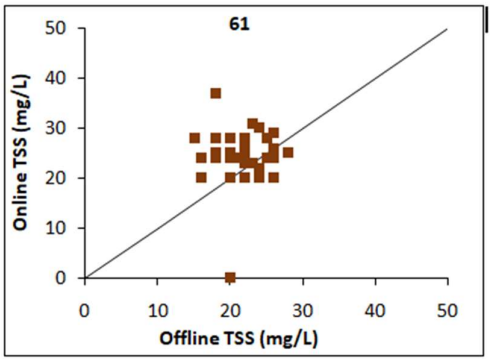




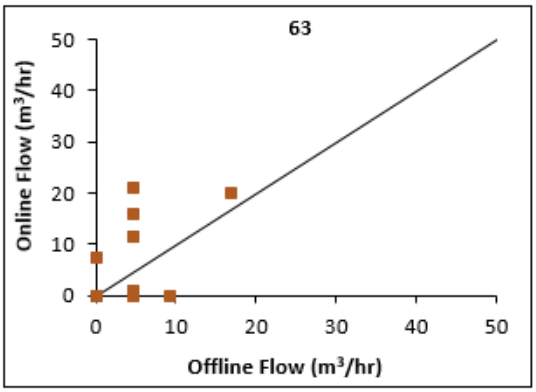


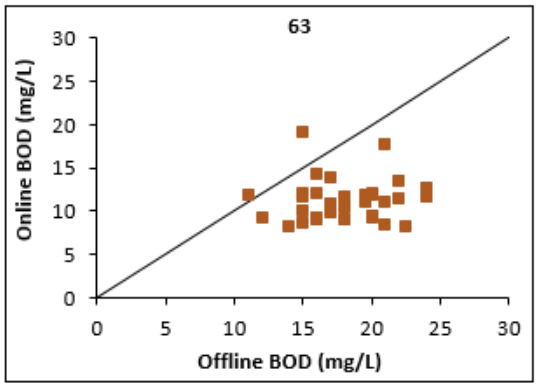


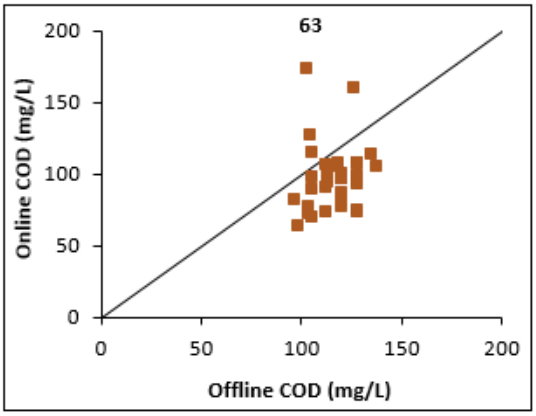


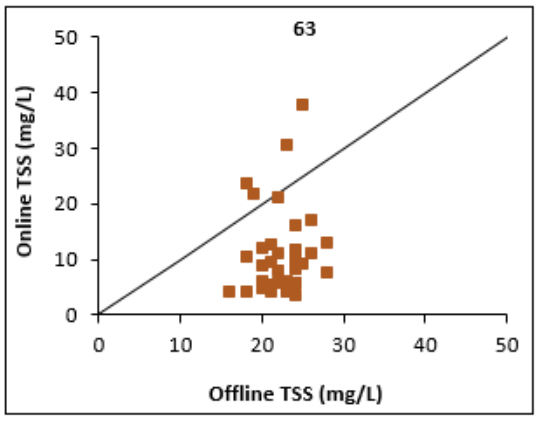


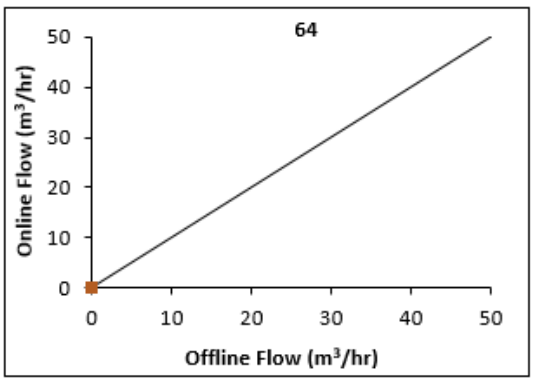
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

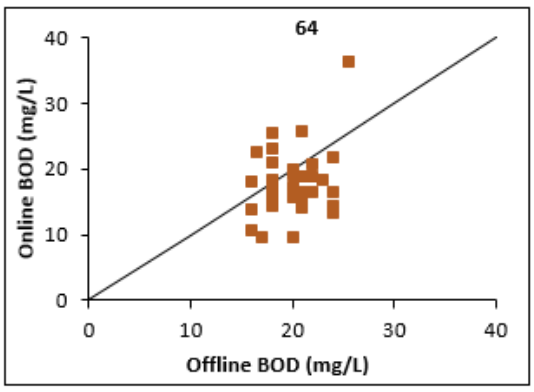


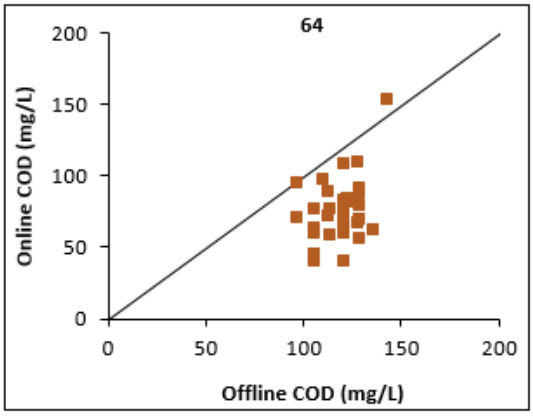


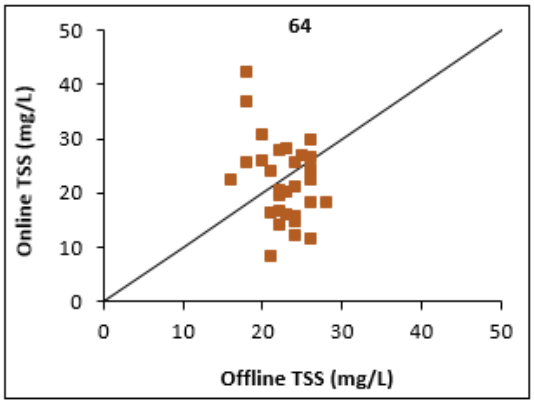




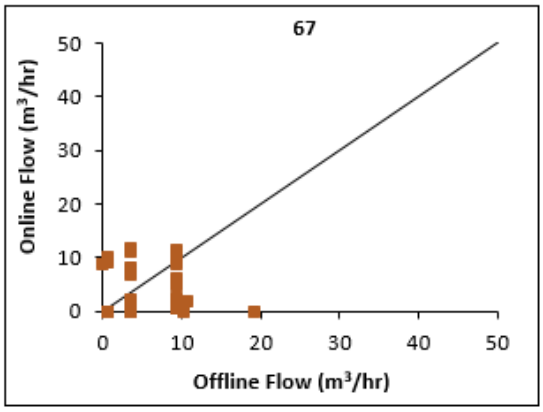


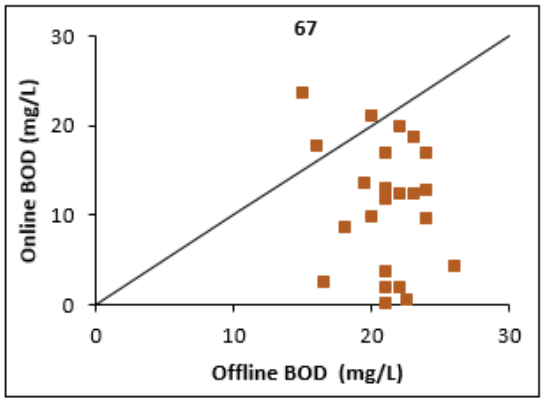


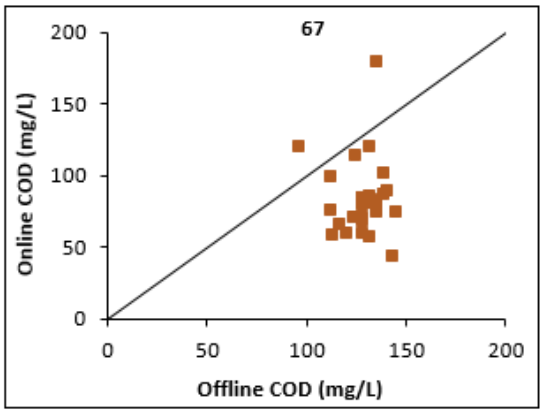


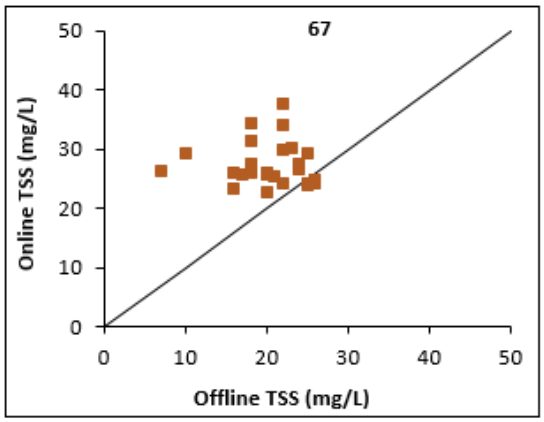


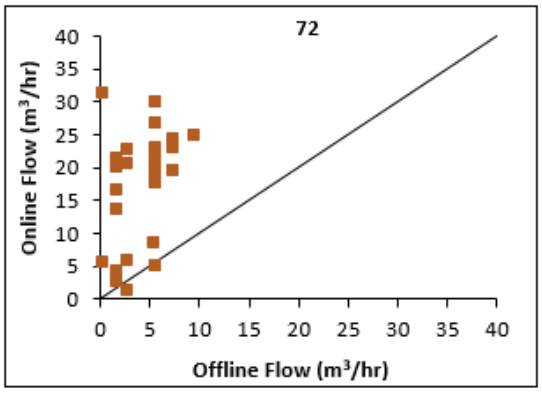
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

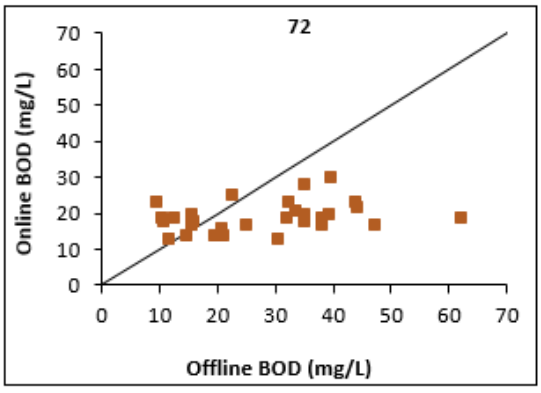


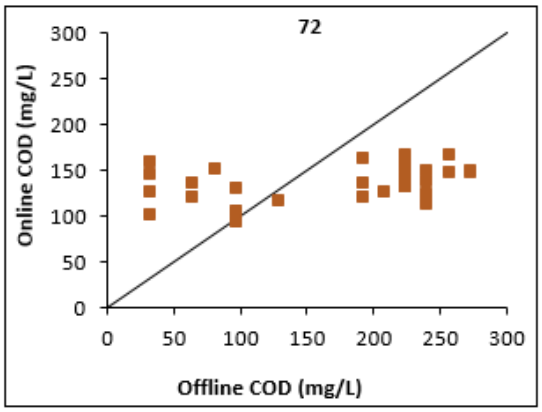


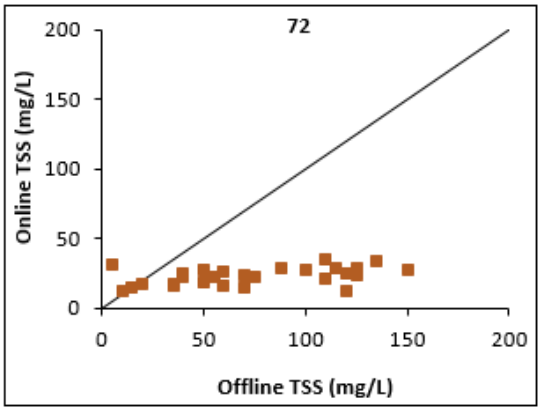












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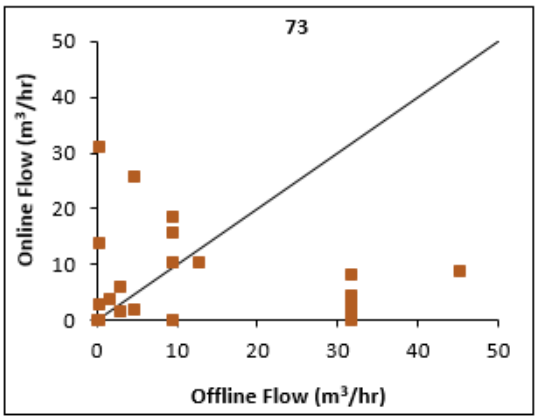
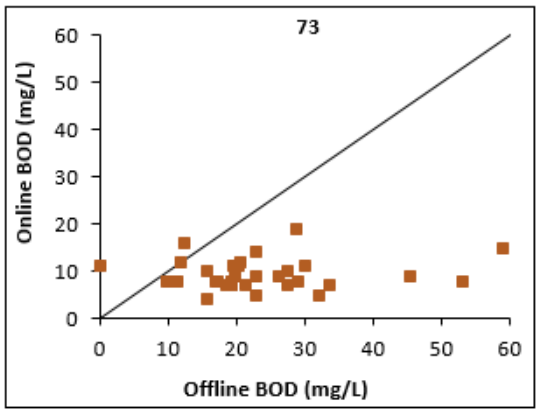
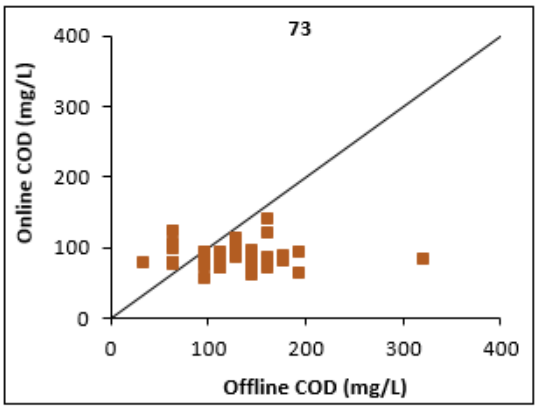
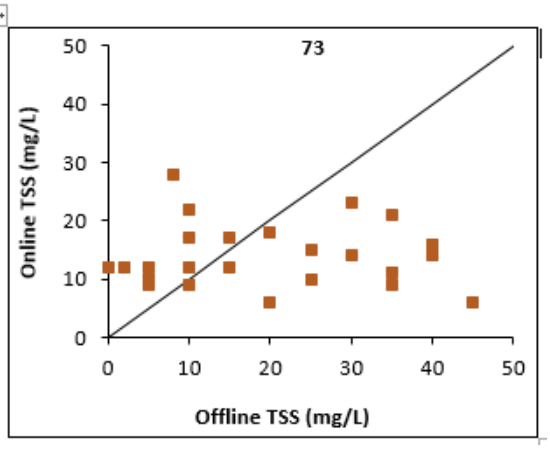
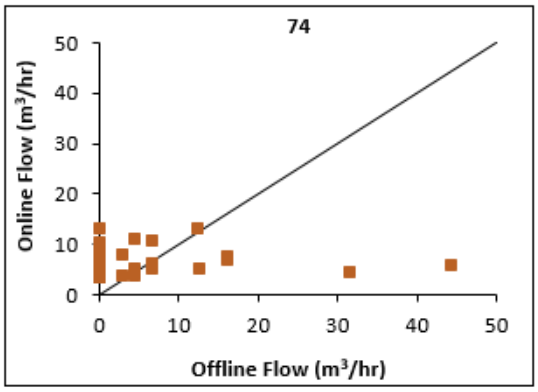
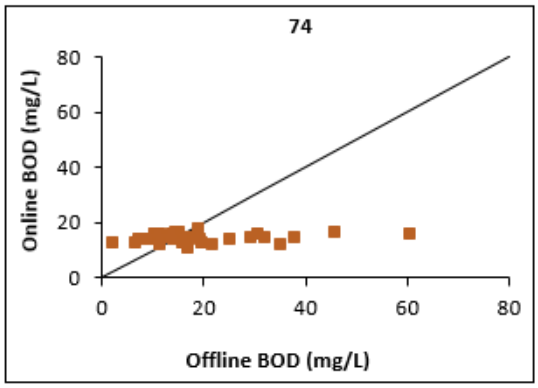


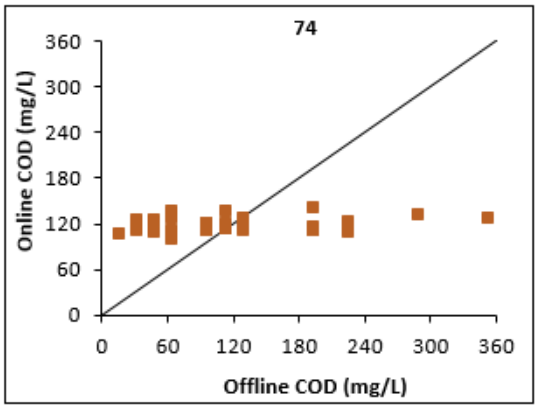


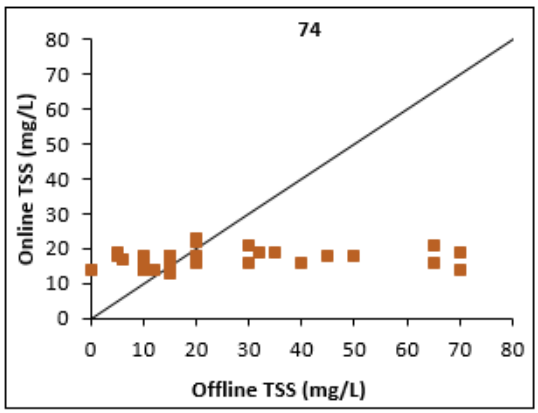




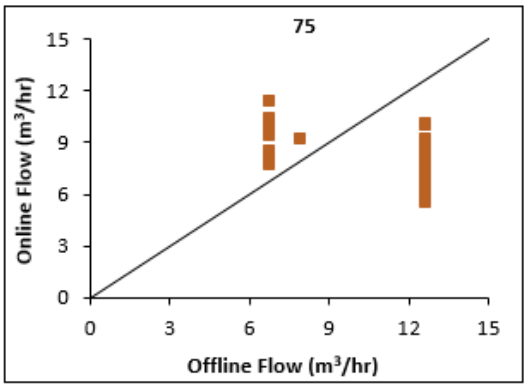


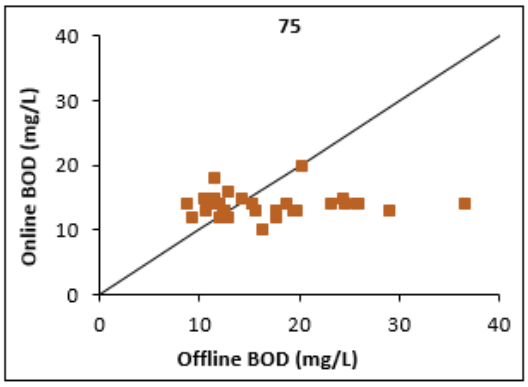


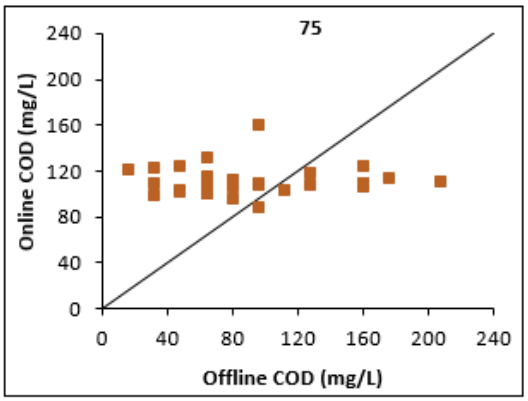


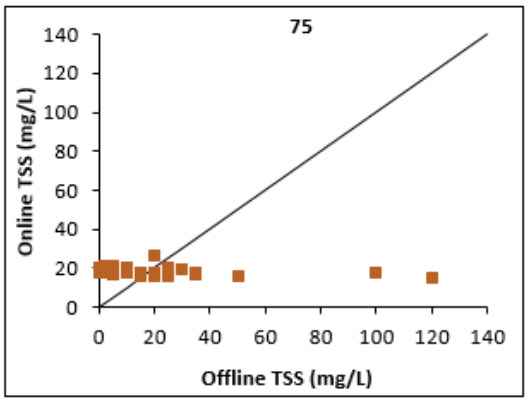


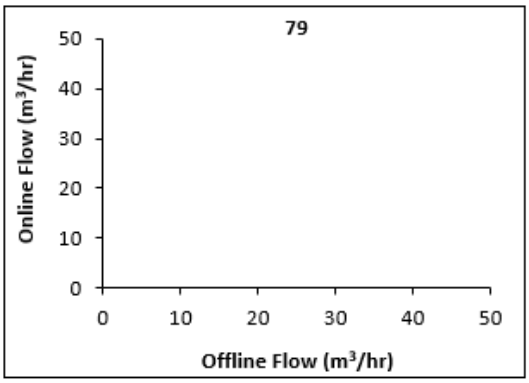
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

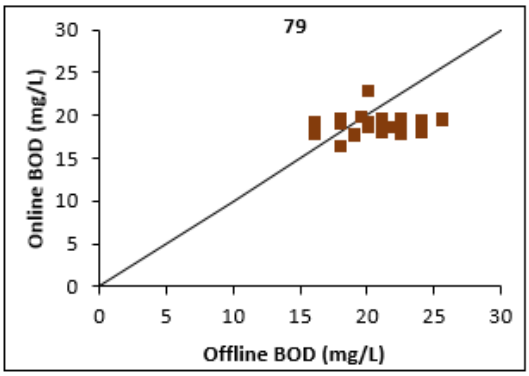


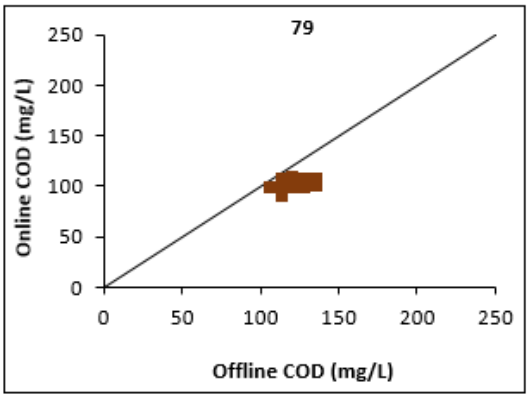


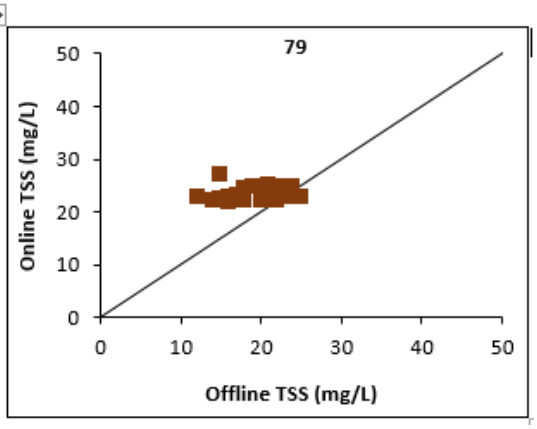




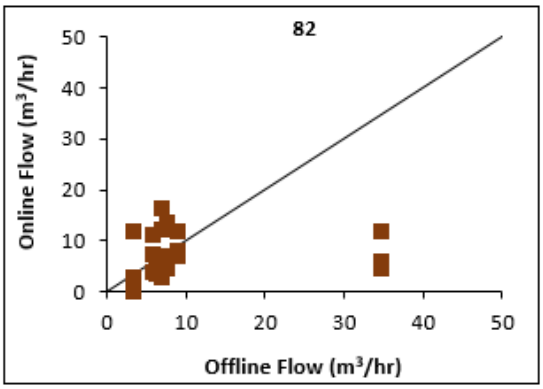


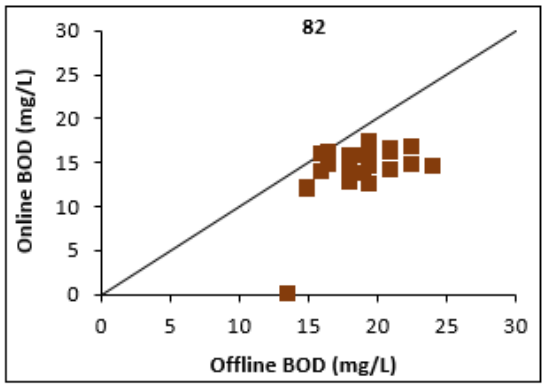


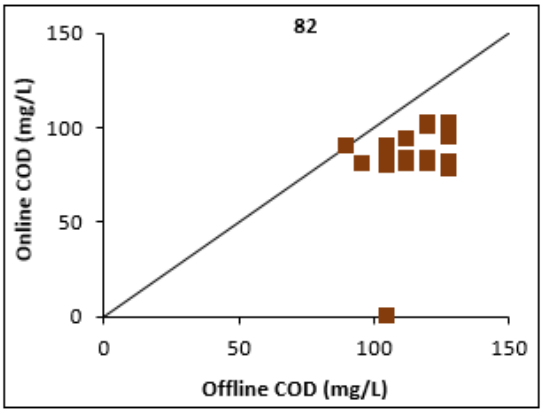


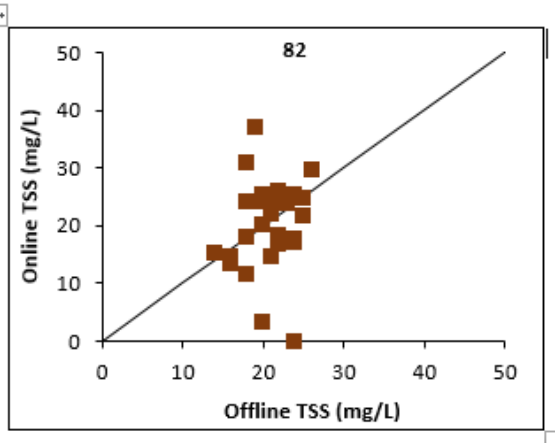


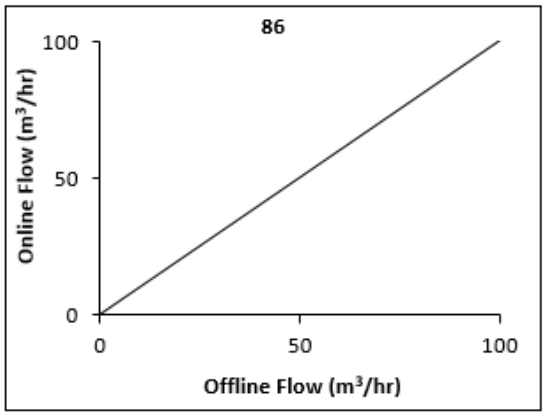
VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)

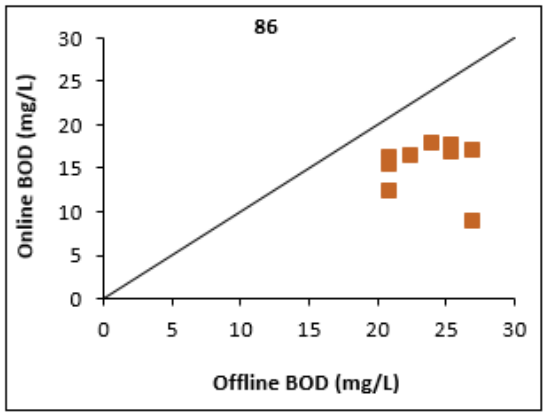


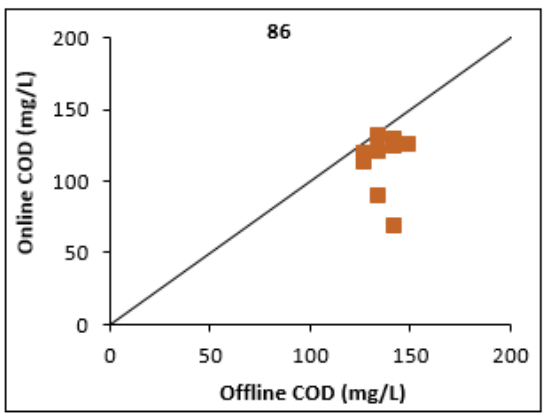


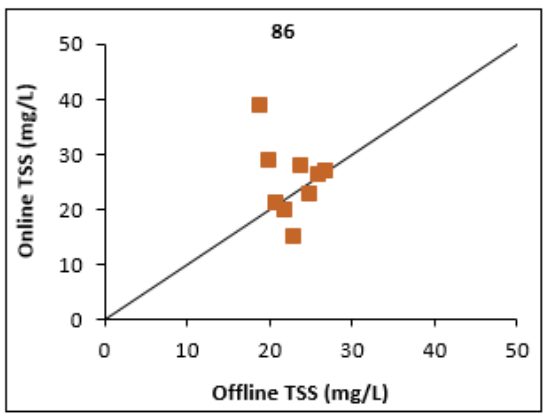












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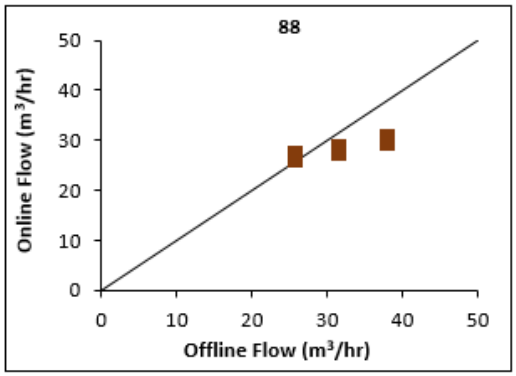

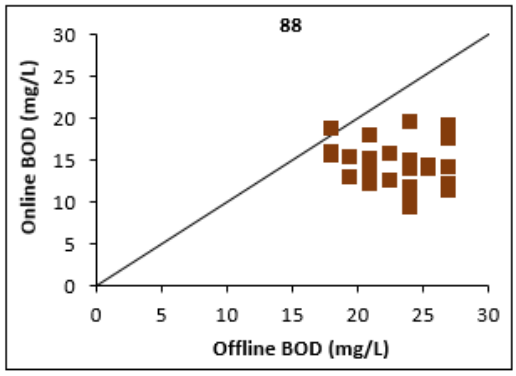

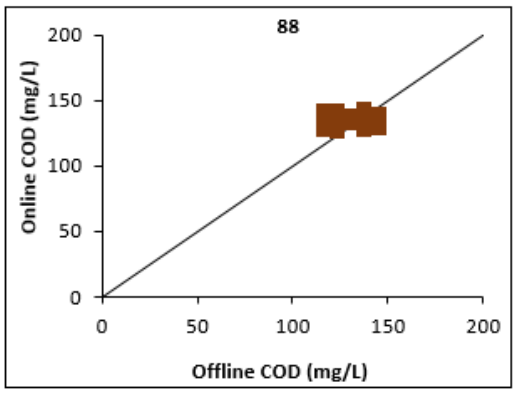

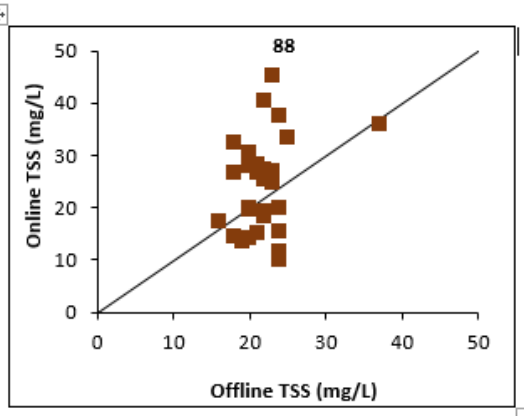

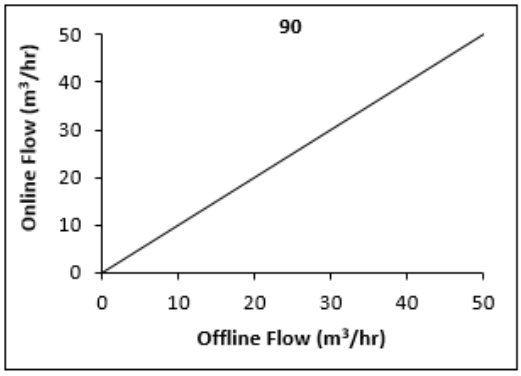

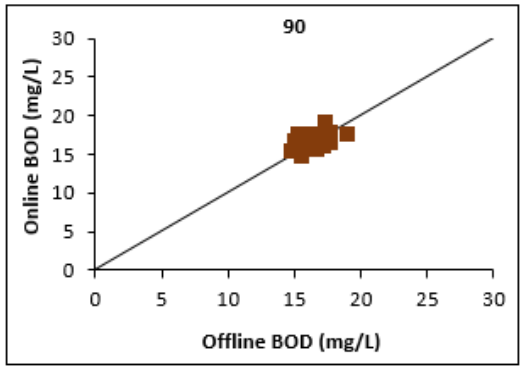

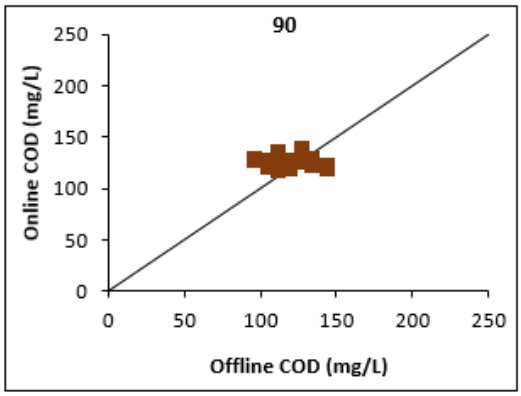

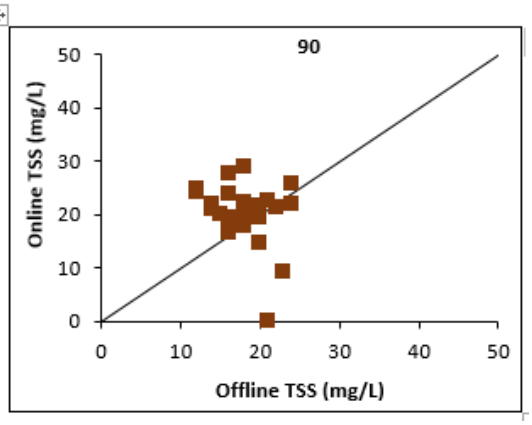

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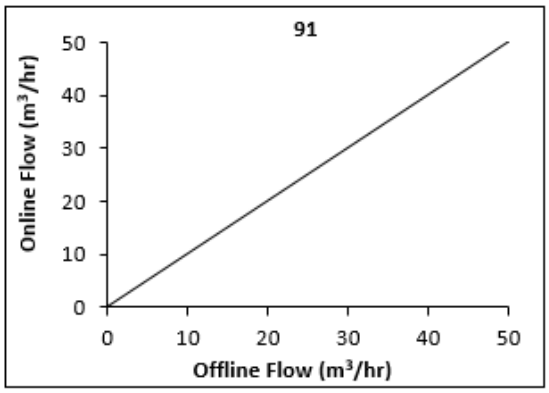
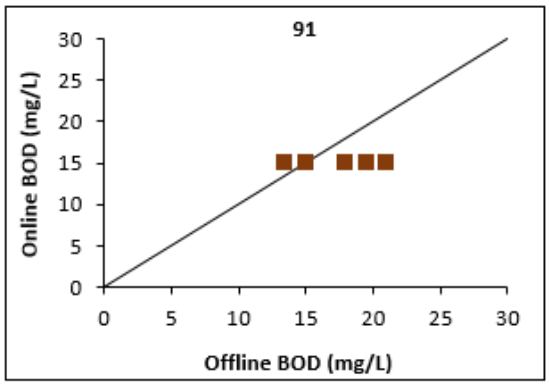
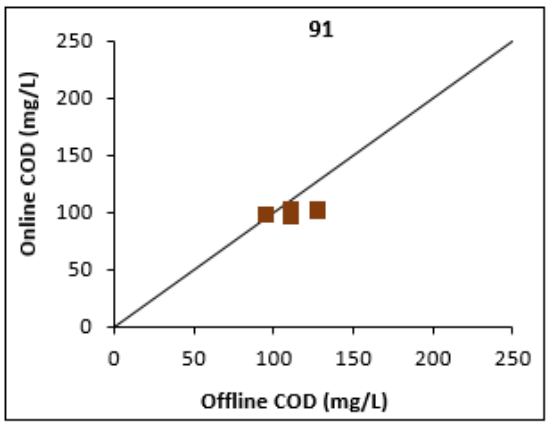
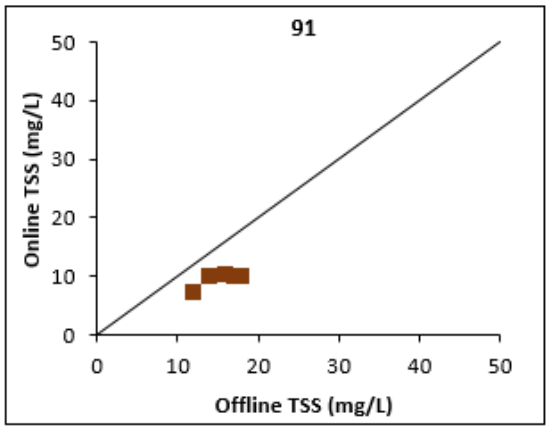
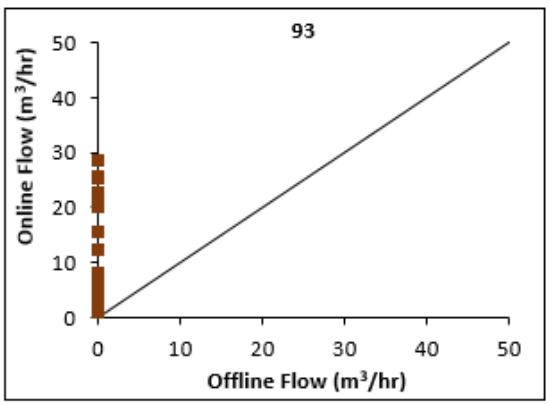
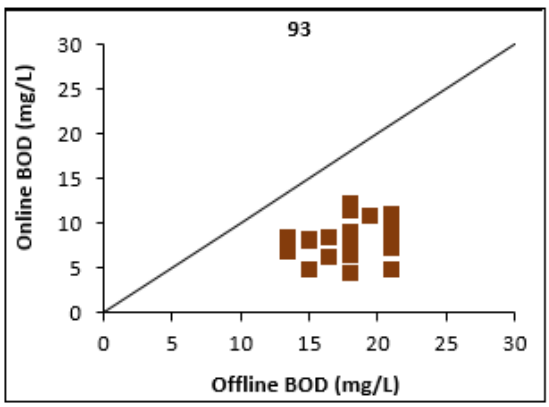


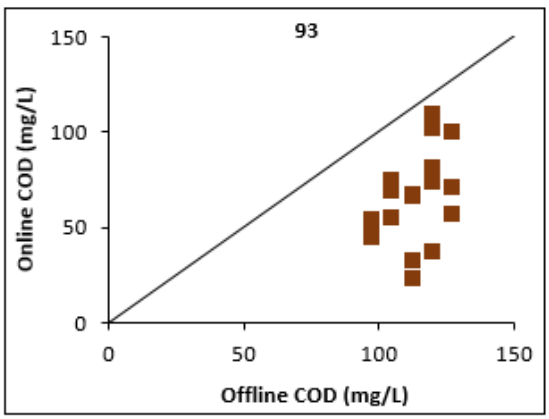


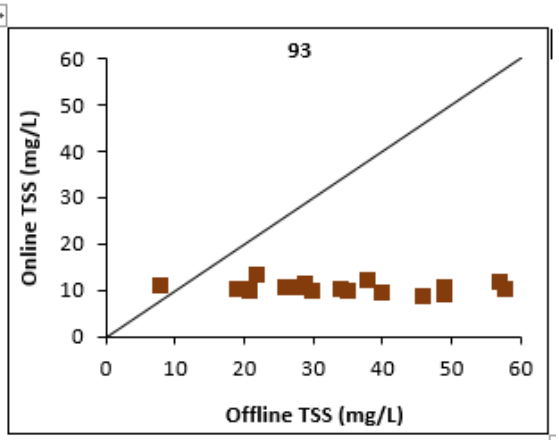




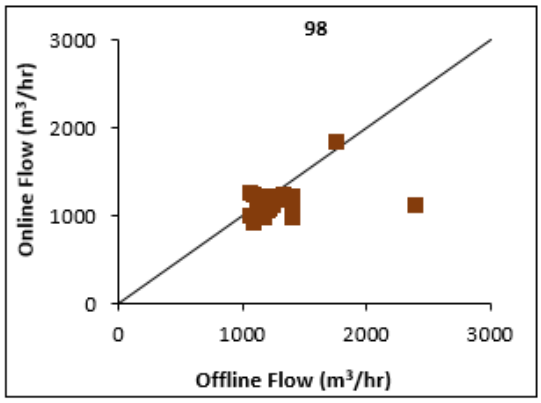


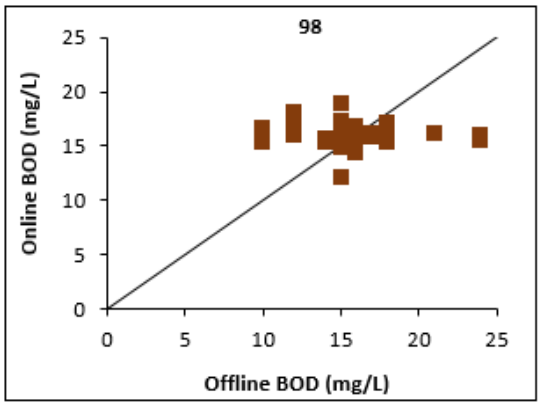


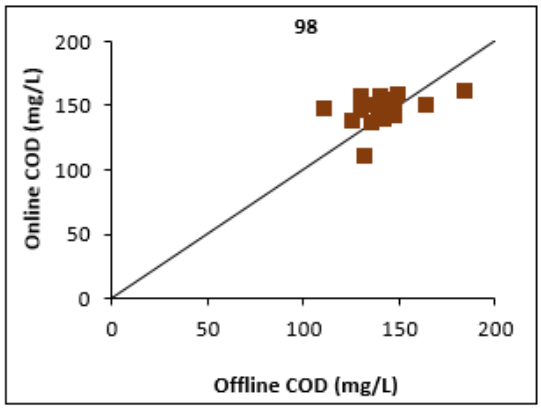


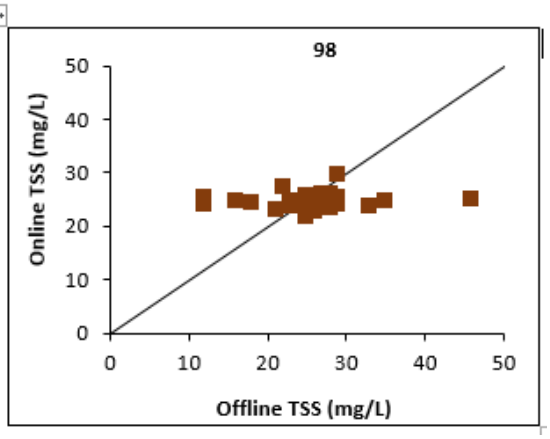


VALIDATION PLOTS FOR REAL-TIME MONITORING PARAMETERS (ONLINE AND OFFLINE)









MALPRACTICES

Apart from poorly correlated real-time sensors, there are few other major malpractices which need to be brought in focus. These malpractices are being carried on by different industries from time to time or only occasionally. However, their effect on the overall ecosystem or management practices could be lethal or prohibitory. It is very significant to know the lacuna in the system before building a strong deterrent policy. The main aim of listing these few malpractices is to ascertain that in the near future robust technologies and management practices should be implemented to curb such incidents from occurring. The major malpractices observed in the pulp and industries are briefly described as follows.

11.1. POOR MAINTENANCE OF RECORDS: Poor/ scanty and scattered records of water consumption, discharge or power consumption are maintained by most industries. This makes extremely difficult for monitoring agencies to determine how much water extraction, discharges and pollution loads are occurring from the industry.

11.2. ILLEGITIMATE DISCHARGE OF WASTE/ SLUDGE: Unregulated and untreated industrial discharge into drains occurs during night hours (Figure 13). Online monitors are bypassed by some of the industries many times.

11.3. ILLEGAL OPERATION: Some of the industries continue production during odd hours despite being served closure notices by regulating agencies (Figure 14).

11.4. USE OF ENVIRONMENTALLY HAZARDOUS BOILER FUEL: Using plastics as a boiler fuel releases dioxins and furans formed by reaction of chlorine and hydrocarbons at high temperature. These compounds have known side effects like cancer, impotence, asthma and myriad of other allergies. This not only pollutes the atmosphere but also has potential to cause deadly diseases in localities in and around the industries. Evidence of use of plastic in the boiler as a fuel is shown in Figure 15.

THE MAIN AIM OF LISTING THESE FEW MALPRACTICES IS TO ASCERTAIN THAT IN THE NEAR FUTURE ROBUST TECHNOLOGIES AND MANAGEMENT PRACTICES SHOULD BE IMPLEMENTED TO CURB SUCH INCIDENTS FROM OCCURRING.

FIGURE-13

UN-RECORDED INDUSTRIAL DISCHARGES AT NIGHT

FIGURE-14

UN-AUTHORIZED INDUSTRIAL OPERATIONS

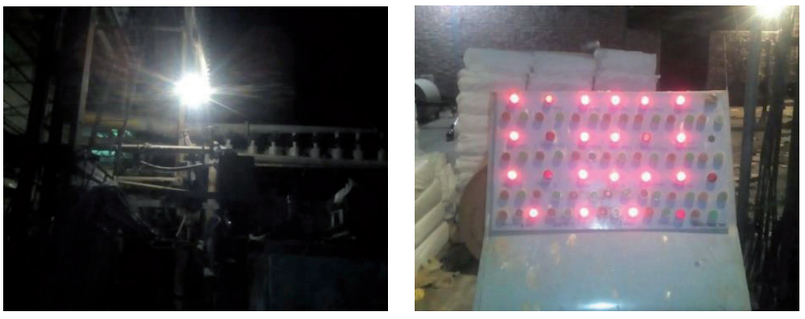


FIGURE-15

USE OF PLASTIC AS A BOILER FUEL

FIGURE-16

EVIDENCE OF AN OPERATIONAL INDUSTRY WITH NON-FUNCTIONAL ETP

11.5. ILLEGAL USE OF WATER METERS: Two or more bore wells were found to be connected to a common water meter. This leads to incorrect measurement of water used in the industry.

11.6. NON-OPERATIONAL ETPs: Some industrial units claim Zero Liquid Discharge without ETP or non-operational ETP. Apart from that, few industries which don't hold ZLD status legally but claim to be on ZLD, have taken liberty for not maintaining any records. Few others, have ETPs butthey were non-functional (Figure 16).

11.7. FLOW METERS PLACED AT NON-APPROACHABLE PLACES: In some of the industrial units flow meters are placed in non-approachable places making it ineffective (Figure 17).

11.8. DISPOSAL OF SLUDGE IN THE DRAIN: Some of the industries were found to discharge sludgethrough different routes to drainsdirectly (Figure 18).

11.9. HESITATION IN SHARING DATA: Industries hesitate to share data related to paper production and captive power generation, if any. It is quite possible that the industries having an authority of say 100 t/d production can produce higher quantities, leading to higher effluent discharge. Since electrical consumption can be linked to paper production capacity, non-sharing of data on captive power generation leads to inaccurate assessment of water consumption.

11.10. MULTIPLE DISCHARGE POINTS: Multiple discharge points were observed for different operations or sub-processes (i.e., at V notch, treated water has been discharged but in between V Notch and subsequent drains, untreated water/ water containing sludge or fiber has been reported (Figure 19).

11.11. TAMPERING OF ONLINE METERS: In a few industries, online monitors were sample-fed or tampered, hence their readings for outlet discharge do not change with time. The meter reading presented in Figure 20, was the same for different days and different times.

FIGURE-17

NON-APPROACHABLE INSTALLATIONS OF FLOW-METERS

FIGURE-18

BYPASS SLUDGE TO DRAINS

FIGURE-19

MULTIPLE EFFLUENT DISCHARGE POINTS

FIGURE-20

METER READINGS REMAIN UNCHANGED

ASSESSMENT OF IMPACT OF PPIs ON LOCAL RESIDENTS AND THE ENVIRONMENT

In order to analyze the social impact and prevailing conditions among the local residents near the PPIs, a questionnaire was designed. The questionnaire is considered to be a research instrument for scientifically collating information from various stakeholders. The survey was done in villages near or adjoining the PPIs. Some villages were common to two or more industries. A total of 58 villages, 231 families and 1,844 persons were sampled during the questionnaire survey. A brief summary of responses obtained from the local residents near the industries is presented in Tables 5 and 6. The survey response has been categorized into socioeconomic conditions, impacton human and domestic animals' health, impact on agriculture, impact on the environment, and recommendations from households.

12.1. SOCIO-ECONOMIC CONDITIONS OF HOUSEHOLD

In socio-economic conditions family size, number of educated members, location and source of drinking water were considered. The numbers of families sampled during the surveys were 48, 23, 69, 39, 18 and 34 with 7-10 persons/ family in Kashipur, Meerut, Muzaffarnagar, Faizabad/ Khalilabad/ Basti, Deoria and Varanasi/ Allahabad regions, respectively (Tables 5 and 6).

Almost all families have drinking water sources in the vicinity of 0-100 m, which comprise of hand pumps including India Mark pumps or submersible pumps. In Kashipur (Cluster 1) and Deoria region (Cluster 7), the major industry is the pulp and paper industry while in other Clusters, some other industries may have equally contributed towards environmental pollution. Hence, while surveying, the questions were made clear and specific that the impact only due to pulp and paper industries is captured.

12.2. IMPACT OF PPIs ON HUMAN AND DOMESTIC ANIMALS' HEALTH

On an average, more than 61% of the population perceive to face problem due to PPIs on the health of their own or their domestic animals. A maximum of 94% families in Deoria to a minimum of 8% families in Faizabad/ Khalilabad/ Basti perceive pollution due to PPIs. Drinking water seems to be a major problem in the areas of Kashipur and Meerut where >80% of the population reported low aesthetic values of drinking water. Secondary problems due to PPIs were respiratory, eye problems, skin problems and smoke-related diseases. More than 84% families reported high smoke related issues in all clusters except in Faizabad/ Khalilabad/ Basti cluster, where people don't face any problem due to smoke. In Kashipur and Deoria, people reported diseases in animals due

ON AN AVERAGE, MORE THAN 61% OF THE POPULATION PERCEIVE TO FACE PROBLEM DUE TO PPIs ON THE HEALTH OF THEIR OWN OR THEIR DOMESTIC ANIMALS. A MAXIMUM OF 94% FAMILIES IN DEORIA TO A MINIMUM OF 8% FAMILIES IN FAIZABAD/ KHALILABAD/ BASTI PERCEIVE POLLUTION DUE TO PPIs.

TABLE-5

QUESTIONNAIRE SURVEY REPORT (CLUSTER 1 AND CLUSTER 2)

		KASHIPUR (CLUSTER 1)	MEERUT (CLUSTER 2 A)	MUZAFFARNAGAR (CLUSTER 2 B)
	Number of families surveyed	48	23	69
	Average number of persons per family	7	7	8
	% of members receiving formal school education	51%	84%	61%
GENERAL STATUS	**DRINKING WATER SOURCE** Hand pump (HP)	100%	52%	56%
	Gov. HP (India Mark)	-	-	17%
	Submersible pump	-	48%	25%
	Distance travelled for collecting drinking water (meter)	0 - 15	0 - 15	0 – 100
INDUSTRIES	Nearby industries in that area	Paper	Paper, sugar, salt, thread, chemical, glass/ bottle, cardboard, balloon, alcohol, holder, fiber, inverter/battery	Paper, iron/steel, chemical, brick, sugar, battery, alcohol
	% families recognizing pollution as a concern	79%	74%	84%
IMPACT OF PPIs ON HUMAN & ANIMAL HEALTH	% families facing problems due to PPIs	77%	65%	77%
	Dirty drinking water	81%	81%	54%
	Eye problem	13%	43%	23%
	Respiratory problem due to smoke	54%	40%	43%
	Health and other adverse effects of smoke	85%	96%	84%
	Other problems	Smoke, sewage and plastic dumping on land	Skin problem, diseases, ash	Smoke, skin problem, ash, new diseases emerge
	% families stating their domestic animals to be adversely affected by PPIs	63%	43%	36%
IMPACT OF PPIs ON AGRICULTURE	% families reporting productivity loss	23%	26%	35%
	% families reporting solid waste dumping on land	77%	61%	58%
	% families using water discharged by PPIs in agriculture	0%	0%	0%
IMPACT OF PPIs ON ENVIRONMENT	% families reporting black fume discharge by PPIs	73%	91%	87%
	% families reporting no improvement in industrial effluent discharge	98%	100%	100%
	% families not satisfied by water quality of drains in the vicinity	75%	61%	72%
RECOMMENDATIONS	Clean the drain and factory outlet water	50%	65%	39%
	Close the factory	10%	17%	3%
	Don't know	40%	18%	58%

IT IS INTERESTING TO NOTE THAT ALMOST ALL INDUSTRIES CLAIM TO TREAT THEIR EFFLUENT EITHER AT SECONDARY TREATMENT STAGE OR TERTIARY TREATMENT STAGE; STILL, THE DISCHARGED WATER IS NOT CONSIDERED APPROPRIATE FOR IRRIGATION PURPOSES EXCEPT IN FAIZABAD/ KHALILABAD / BASTI CLUSTER WHERE VILLAGERS USE THE EFFLUENT FOR IRRIGATION.

to sludge and wastewater discharge by the PPIs to be 63% and 78%, respectively.

12.3. IMPACT OF PPIs ON AGRICULTURE

Less than 35% of the families have reported reduced productivity due to solid waste from PPIs being dumped on agricultural land. Overall, 77%, 61%, 58% and 72% of families raised issues of solid waste dumping on agricultural as well as non-agricultural land in Kashipur, Meerut, Muzaffarnagar and Deoria, respectively.

It is interesting to note that almost all industries claim to treat their effluent either at secondary treatment stage or tertiary treatment stage; still, the discharged water is not considered appropriate for irrigation purposes except in Faizabad/ Khalilabad / Basti cluster where villagers use the effluent for irrigation.

12.4. IMPACT OF PPIs ON ENVIRONMENT

Black fumes were reported to be emitted by PPIs mostly in Cluster 1 and Cluster 2 regions, while Kashipur, Meerut, Muzaffarnagar and Deoria have a larger number of families unsatisfied with their nearby drain conditions. Apart from Faizabad/ Khalilabad/ Basti cluster, a majority of the population in other clusters feel that there is no improvement in drain water quality from the past.

12.5. RECOMMENDATIONS FROM HOUSEHOLDS

There were mainly two recommendations suggested by localities to improve their local and personal conditions: (1) to clean their drains and industrial outlets, and (2) close the industry. 50%, 65% and 39% of the people from Kashipur, Meerut and Muzaffarnagar respectively were in favor of cleaning the local drains. Rest of the population was not sure about how the conditions of water, land and air could be improved.

It should be noted that although questionnaire survey is a tool to capture peoples' perception, the answers of every individual is affected by the level of their understanding of the question, their personal thoughts, their biasness/ seriousness towards a particular topic or sometimes projecting it as a bigger picture to drag more attention from government bodies.

TABLE-6

QUESTIONNAIRE SURVEY REPORT (CLUSTER 6-9)

		FAIZABAD/ KHALILABAD/ BASTI (CLUSTER 6)	DEORIA (CLUSTER 7)	VARANASI, ALLAHABAD (CLUSTER 8, 9)
	Number of families surveyed	39	18	34
	Average number of persons per family	8	7	10
	% of members receiving formal school education	72%	85%	53%
GENERAL STATUS	**DRINKING WATER SOURCE** Hand pump (HP)	54%	11%	44%
	Gov. HP (India Mark)	22%	11%	18%
	Submersible pump	8%	78%	26%
	Distance travelled for collecting drinking water (meter)	0–100	0–5	0–50
INDUSTRIES	Nearby industries in that area	Paper, Carton, Cement pipe	Paper	Paper, poultry, biscuit, pipe, rice, thread, syringe, transformer, cement, oil, coal
	% families recognizing pollution as a concern	3%	100%	65%
IMPACT OF PPIs ON HUMAN & ANIMAL HEALTH	% families facing problems due to PPIs	8%	94%	47%
	Dirty drinking water	0%	54%	18%
	Eye problem	0%	0%	0%
	Respiratory problem due to smoke	0%	22%	24%
	Health and other adverse effects of smoke	0%	96%	84%
	Other problems	Chaff, dust	Skin problem, diseases, ash	Smoke, ash, air pollution
	% families stating their domestic animals to be adversely affected by PPIs	0%	78%	3%
IMPACT OF PPIs ON AGRICULTURE	% families reporting productivity loss	3%	28%	0%
	% families reporting solid waste dumping on land	0%	72%	0%
	% families using water discharged by PPIs in agriculture	21%	0%	-
IMPACT OF PPIs ON ENVIRONMENT	% families reporting black fume discharge by PPIs	0%	0%	21%
	% families reporting no improvement in industrial effluent discharge	18%	100%	71%
	% families not satisfied by water quality of drains in the vicinity	10%	94%	41%
RECOMMENDATIONS	Clean the drain and factory outlet water	39%	89%	38%
	Close the factory	0%	11%	-
	Don't know	Proper supervision and its improvement in terms of quality	-	62%

QUESTIONNAIRE SURVEY TEMPLATE

कारखानों के द्वारा हो रहे प्रदुषण के सम्बन्ध मे प्रश्नावली

विवरण लेने का तिथि ..... समय .....

गाँव का नाम :–.....

ग्रामीण का नामः–.....

लिंग :– पुरुष ( ) महिला ( )

जन्म तिथि :–.....

घर के सदस्यों की संख्या :– .....

घर के शिक्षित सदस्यों की संख्या :– .....

घर का पता :– .....

घर के निर्देशांक :–.....

घर में उपयोग किये जाने वाले जल से सम्बन्धित जानकारी :–

१. घर में उपयोग किये जाने वाले जल का स्रोत :– सार्वजनिक हैंडपम्प/ सार्वजनिक नल/ कुएँ/नदी/ अन्य

२. यदि सार्वजनिक हैंडपम्प का उपयोग करते हैं तो उसकी स्थिति/क्रमांक की जानकारी दें :– .....

३. यदि उपरिलिखित कोई पेय स्रोत पीने योग्य नहीं है तो पेयजल के लिये कितने किमी० रोज जाना पड़ता है :– .....

४. घर में उपयोग किये जाने वाले जल की मात्रा का विवरण दें (लीटर प्रतिदिन प्रति व्यक्ति):– .....

५. स्नान के लिये उपयोग में लिये जाने वाले जल स्रोत का विवरण दें :– .....

६. अन्य कार्यों के लिये उपयोग में लिये जाने वाले जल के स्रोत का विवरण दें :– .....

जल प्रदूषण से सम्बन्धित जानकारी :–

१. क्या आपके गाँव का पानी किसी कारण से प्रदूषित हो रहा है :– हाँ/नहीं

२. यदि हाँ, तो कारण बतायें .....

३. आपके आस पास कितने कारखाने है:-.....

.....

४. कारखानों मे बनने वाले उत्पाद की जानकारी दे:- .....

.....

.....

५. क्या आपके आस पास कोई पेपर मिल है:- हाँ/नहीं

६. पेपर मिल कब से चल रही है:- .....

७. पेपर मिल से किसी प्रकार की असुविधा होती है:- हाँ/नहीं

८. अगर हाँ तो उसका कारण क्या है:-..... .....

९. क्या पेपर मिल से निकल रहे जल से कोई परेशानी होती है:- हाँ/नहीं

- अगर होती है तो किस प्रकार की दिक्कतों का सामना करना पड़ता है:-.....
- अगर नही होती है तो क्या पेपर मिल से निकलने वाले जल का क्या कोई उपयोग करते है (कृषि मे, पशु पालन इत्यादि मे):-

.....

.....

१०. पेपर मिल से निकलने वाले जल का स्तर क्या पहले जितना ही है, या बीते दिनों मे उसमे कुछ कमी आई है:- हाँ/नहीं

११. क्या पेपर मिल से निकलने वाले जल की गुडवत्ता मे पिछले कुछ वर्षो मे कोई सुधर आया है:- हाँ/नहीं

१२. क्या मिल किसी प्रकार का काला पदार्थ का उत्सर्जन करती है या करती थी:- हाँ/नहीं
-अगर हाँ, तो क्या उससे कोई परेशानी का सामना आपको करना पड़ता था:-
१३. क्या मिल से निकल रहे जल से आपको या आपके पशुओ को किसी प्रकार की रोग का सामना करना पड़ रहा है:- हाँ/नहीं
१४. क्या मिल से निकल रहा जल आपकी कृषि भूमि को किसी तरह से प्रभावित कर रहा है:- हाँ/नहीं
-अगर हाँ तो किस तरह से .....
१५. क्या साल मे कभी मिल मे बंदी होती है:- हाँ/नहीं
१६. क्या उस समय जल की मात्रा और गुडवत्ता मे किसी प्रकार का बदलाव देखने को मिलता है:- हाँ/नहीं
१७. उस समय जब मिल बंद होती है तब क्या आपके नाले मे आने वाला जल साफ़ होता है:- हाँ/नहीं
– यदि नही तो उस समय आने वाली गंदगी का क्या कारण है:-.....
१८. क्या आप अपने आस पास स्थित नदी नालो कि स्थिति से संतुस्ट है:- हाँ/नहीं
१९. यदि नही तो उसमे किस तरह का सुधार चाहते है:-
.....
.....
.....
२०.पेपर मिल से निकल रहे धुऐ से कोई परेशानी होती है:- हाँ/नहीं
२१. क्या पेपर मिल से निकलने वाले सॉलिड (पल्प, पॉलिथीन, पिन्स) से कोई असुविधा होती है:- हाँ/नहीं
२२. क्या पेपर मिल से निकलने वाला पल्प आपकी भूमि को उत्पादन छमता को प्रभावित कर रहा है:- हाँ/नहीं
२३. अगर हां तो किस समय इसका प्रभाव सबसे ज्यादा होता है:-.....
२४. सूखे या जब पानी काम बरसता है है उस समय किस तरह से सचाई करते है ? जल कहाँ से आता है? .....
.....
२५. मिल से निकल रहे जल को क्या कभी उपजोग मे लाते है:- हाँ/नहीं
- अगर हाँ तो कब.....
२६. क्या आपका पेपर मिल वालो से किसी तरह का विवाद चल रहा है (नाले कि स्थति को लेकर, जमीन को लेकर, जल को लेकर):- हाँ/नहीं

२७. अगर है तो विवाद का कारण स्पस्ट करे:-.....
२८. आप अपनी जमीन पर क्या क्या उगते है:-.....
२९. कितना २ उत्पादन किस किस चीज का करते है विवरण दे:-.....
.....
.....
३०.दस बीस साल पहले भी क्या यही सब उगाया जाता था:-.....
- यदि नहीं तो और क्या क्या पहले किया जाता था जो आज नही उगते और क्यों?.....
.....
.....
३१. क्या बीते वर्षो कि तुलना मे पैदावार मे कोई परिवर्तन आया है:- हाँ/नहीं
- अगर आया है तो क्या.....
३२. आस पास कि गांव वाले और किस किस चीजों का उत्पादन करते है:-.....
३३. जल के जीवन में महत्व देखते हुए भविष्य की जलीय व्यवस्था के सम्बन्ध में आपके क्या विचार हैं :–.....

....
(हस्ताक्षर सर्वेकर्ता) (हस्ताक्षर ग्राम निवासी)

CENTRE FOR GANGA RIVER BASIN MANAGEMENT AND STUDIES